

FOREWORD

This workshop manual has been prepared to provide information regarding repair procedures on Hino Trucks.

Applicable for HINO 238, 258LP, 268, 338 series, equipped with J08E-VB and J08E-VC engine

When making any repairs on your vehicle, be careful not to be injured through improper procedures.

As for maintenance items, refer to the Driver's / Owner's Manual.

All information and specifications in this manual are based upon the latest product information available at the time of printing.

Hino Motors Sales U.S.A., Inc. reserves the right to make changes at any time without prior notice.

Please note that the publications below have also been prepared as relevant service manuals for the components and systems in these vehicles.

Manual Name	Pub. No.
Chassis Workshop Manual	S1-UNAE09A 1/2 S1-UNAE09A 2/2
J08E-VB, VC Engine Workshop Manual	S5-UJ08E09A
Trouble Shooting Workshop Manual	S7-UNAE09A 2/3 S7-UNAE09A 3/3

Hino Motors Sales U.S.A. , Inc.

CHAPTER REFERENCES REGARDING THIS WORKSHOP MANUAL

Use this chart to the appropriate chapter numbers for servicing your particular vehicle.

CHAPTER	MANUAL NO.	S7-UNAE09A 1/3 (U.S.A.), S7-CNAE09A 1/3 (CANADA)					
	MODELS	HINO 238, 258LP, 268, 338, 358					
	Production Model Code	NE8J, NF8J, NJ8J, NV8J					
GENERAL INTRODUCTION		GN01-001					
TROUBLE SHOOTING		TS01-001					
VEHICLE CONTROL		DN01-001					
FUEL CONTROL (J08E)		DN02-001					
FUEL CONTROL (DEF SCR)		DN02-002					
FUEL CONTROL (BURNER)		DN02-003					
OTHERS (CAN COMMUNICATION)		DN06-001					
DX MANUAL		DX01-001	DX02-001	DX03-001	DX04-001	DX06-001	DX07-001

This manual does not contain items on half-tone dot meshing.



WORKSHOP MANUAL

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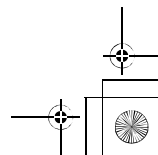
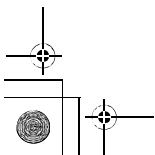
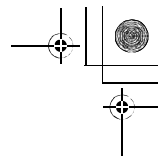
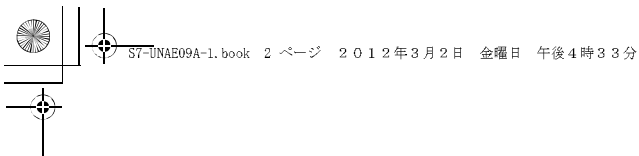
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GENERAL INTRODUCTION

GENERAL PRECAUTIONS

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Some recommended and standard maintenance services for your vehicle are included in this section. When performing maintenance on your vehicle be careful not to get injured by improper work. Improper or incomplete work can cause a malfunction of the vehicle which may result in personal injury and/or property damage. If you have any question about performing maintenance, please consult your Hino dealer.

WARNING

When working on your vehicle, observe the following general precautions to prevent death, personal injury and/or property damage in addition to the particular DANGERS, WARNINGS, CAUTIONS and NOTICES in each chapter.

- Always wear safety glasses or goggles to protect your eyes.
- Remove rings, watches, ties, loose hanging jewelry and loose clothing before starting work on the vehicle.
- Bind long hair securely behind the head.
- When working on the vehicle, apply the parking brake firmly, place the gear shift lever in "Neutral" or "N" and block the wheels.
- Always turn off the starter switch to stop the engine, unless the operation requires the engine running. Removing the key from the switch is recommended.
- To avoid serious burns, keep yourself away from hot metal parts such as the engine, exhaust manifold, radiator, muffler, exhaust pipe and tail pipe.
- Do not smoke while working on the vehicle since fuel, and gas from battery are flammable.
- Take utmost care when working on the battery. It contains corrosive sulfuric acid.
- Large electric current flows through the battery cable and starter cable. Be careful not to cause a short which can result in personal injury and/or property damage.
- Read carefully and observe the instructions specified on the jack before using it.
- Use safety stands to support the vehicle whenever you need to work under it. It is dangerous to work under a vehicle supported only by a jack.
- If it is necessary to run the engine after the hood is raised (tilted), make sure that the parking brake is firmly applied, the wheels are blocked, and the gear shift lever is positioned in "Neutral" before starting the engine.
- Run the engine only in a well-ventilated area to avoid inhalation of carbon monoxide.
- Keep yourself, your clothing and your tools away from moving parts such as the cooling fan and V-belts when the engine is running.
- Be careful not to damage lines and hoses by stepping or holding your feet on them.
- Be careful not to leave any tool in the engine compartment. The tool may be hit by moving parts, which can cause personal injury.

DEFINITION OF SAFETY TERMS

 DANGER	Indicates an extremely hazardous situation if proper procedures are not followed and could result in death or serious injury.
 WARNING	Indicates a potential hazardous situation if proper procedures are not followed and could result in death or serious injury.
 CAUTION	Indicates a hazardous situation if proper procedures are not followed and could result in serious injury or damage to parts/equipment.
NOTICE	Indicates the need to follow proper procedures and to pay attention to precautions so that efficient service is provided.
HINT	Provides additional information to help you to perform the repair efficiently.

TOWING

- When being towed, always place the gear shift lever in "Neutral" and release the parking brake completely. In order to protect the bumper, fit a protection bar against the lower edge of the bumper and put a wood block under the frame near the No. 1 cross member when attaching the towing chain. Never lift or tow the vehicle if the chain is in direct contact with the bumper.
1. **Towing procedures**
 - (1) Make sure that the propeller shaft of the vehicle to be towed is removed. When the differential gear or rear axle shaft is defective, remove both right and left rear axle shafts, then cover the hub opening to prevent loss of axle lubricant and entry of dirt or foreign matter.
 - (2) Use a heavy duty cable or rope when towing the vehicle. Fasten the cable securely to the towing hook on the frame.
 - (3) The angle of pulling direction of the cable fastened to the towing hook must not exceed 15° in horizontal and vertical directions from the straight ahead, level direction. Avoid using the hook in a way that subjects it to jerk, as in towing a vehicle trapped in a gutter.
 - (4) Keep the gear shift lever in Neutral.
 - (5) Make sure that the starter switch is kept in the "ON" position, if the engine is not running.
 - (6) Make sure that the engine of the towed vehicle is kept running. If the engine is off, no compressed air/ no vacuum will be available for the brake. This is dangerous, as the brake system does not function if the engine is not running. In addition, the power steering system will not function. The steering wheel, therefore, will become unusually hard to turn, making it impossible to control the vehicle.
 - (7) Note that the engine brake and exhaust brake cannot be applied, if the propeller shaft is removed.
 - (8) Make a slow start to minimize shock. Towing speed should be less than 30 km/h {18 mile/h}.
 2. **If the engine of the towed vehicle is defective, make sure that the vehicle is towed only by a tow truck designed for that purpose.**
 - (1) **Front end towing (with front wheels raised off the ground)**

When towing from the front end with the front wheels raised off the ground, remove the rear axle shafts to protect the transmission and differential gears from being damaged. The hub openings should be covered to prevent the loss of axle lubricant or the entry of dirt or foreign matter. The above-mentioned precautions should be observed for vehicles equipped with either manual or automatic transmission, and for even short distance towing. After being towed, check and refill the rear axle housing with lubricant if necessary.
 - (2) **Rear end towing**

When being towed with the rear wheels raised off the ground, fasten and secure the steering wheel in a straight-ahead position.

CLEAN AIR ACT

1. **Heavy-duty engine rebuilding practices.**
§ 86.004-40
 - The provisions of this section are applicable to heavy-duty engines subject to model year 2004 or later standards and are applicable to the process of engine rebuilding (or rebuilding a portion of an engine or engine system). The process of engine rebuilding generally includes disassembly, replacement of multiple parts due to wear, and reassembly, and also may include the removal of the engine from the vehicle and other acts associated with rebuilding an engine. Any deviation from the provisions contained in this section is a prohibited act under section 203(a) (3) of the Clean Air Act (42 U.S.C. 7522(a) (3)).
- (1) When rebuilding an engine, portions of an engine, or an engine system, there must be a reasonable technical basis for knowing that the resultant engine is equivalent, from an emissions standpoint, to a certified configuration (i.e., tolerances, calibrations, specifications) and the model year(s) of the resulting engine configuration must be identified. A reasonable basis would exist if:
 - a. Parts installed, whether the parts are new, used, or rebuilt, are such that a person familiar with the design and function of motor vehicle engines would reasonably believe that the parts perform the same function with respect to emissions control as the original parts; and
 - b. Any parameter adjustment or design element change is made only:
 - In accordance with the original engine manufacturer's instructions; or
 - Where data or other reasonable technical basis exists that such parameter adjustment or design element change, when performed on the engine or similar engines, is not expected to adversely affect in-use emissions.
- (2) When an engine is being rebuilt and remains installed or is reinstalled in the same vehicle, it must be rebuilt to a configuration of the same or later model year as the original engine. When an engine is being replaced, the replacement engine must be an engine of (or rebuilt to) a configuration of the same or later model year as the original engine.

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GENERAL INTRODUCTION

- (3) At time of rebuild, emissions-related codes or signals from on-board monitoring systems may not be erased or reset without diagnosing and responding appropriately to the diagnostic codes, regardless of whether the systems are installed to satisfy requirements in § 86.004-25 or for other reasons and regardless of form or interface. Diagnostic systems must be free of all such codes when the rebuilt engine is returned to service. Such signals may not be rendered inoperative during the rebuilding process.
- (4) When conducting a rebuild without removing the engine from the vehicle, or during the installation of a rebuilt engine, all critical emissions-related components listed in § 86.004-25(2) not otherwise addressed by paragraphs (1) through (3) of this section must be checked and cleaned, adjusted, repaired, or replaced as necessary, following manufacturer recommended practices.
- (5) Records shall be kept by parties conducting activities included in paragraphs (1) through (4) of this section. The records shall include at minimum the mileage and/or hours at time of rebuild, a listing of work performed on the engine and emissions-related control components including a listing of parts and components used, engine parameter adjustments, emissions-related codes or signals responded to and reset, and work performed under paragraph (4) of this section.
 - a. Parties may keep records in whatever format or system they choose as long as the records are understandable to an EPA enforcement officer or can be otherwise provided to an EPA enforcement officer in an understandable format when requested.
 - b. Parties are not required to keep records of information that is not reasonably available through normal business practices including information on activities not conducted by themselves or information that they cannot reasonably access.
 - c. Parties may keep records of their rebuilding practices for an engine family rather than on each individual engine rebuilt in cases where those rebuild practices are followed routinely.
 - d. Records must be kept for a minimum of two years after the engine is rebuilt.

2. Maintenance instructions.

§ 86.010-38

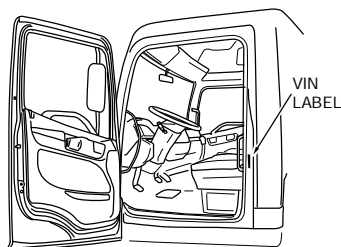
- (1) For each new diesel-fueled engine subject to the standards prescribed in § 86.007-11, as applicable, the manufacturer shall furnish or cause to be furnished to the ultimate purchaser a statement that
"This engine must be operated only with ultra low-sulfur diesel fuel (meeting EPA specifications for highway diesel fuel, including a 15 ppm sulfur cap)."

IDENTIFICATION INFORMATION

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1. VEHICLE IDENTIFICATION NUMBER

- VEHICLE IDENTIFICATION NUMBER (VIN) is comprised of 17 digits and letters. The VIN label is affixed to the left pillar of the cab.
These numbers are used for identification purposes when you have a vehicle registered or inspected. Please quote these numbers when ordering spare parts or reporting technical matter to receive prompt service attention.
- The following is an explanation of the items that are listed on the VIN label.



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GENERAL INTRODUCTION

(1) VIN

See VEHICLE IDENTIFICATION NUMBER (VIN) STRUCTURE on the following page.

(2) P.S. (PRODUCTION SERIES) AND VEHICLE COMPONENTS

MODEL (CLASS)	PRODUCTION CODE		CLUTCH SIZE	TRANS- MISSION SERIES	TRANSMISSION RATIO						REAR AXLE SERIES	REAR AXLE RATIO	SER- VICE BRAKE	PARK- ING BRAKE	SUS- PEN- SION
	MODEL	SERIES			1st	2nd	3rd	4th	5th	6th					
HINO238 (6)	NE8J	HBA	-	2200HS	3.10	1.81	1.41	1.00	0.71	0.61	RS17-145	5.13/ 5.29	H	D	L or A
			2200RDS	3.10	1.81	1.41	1.00	0.71	0.61						
		YBA	350mm	FO- 5506B- DM3	6.55	4.13	2.52	1.59	1.00	0.78	RS17-145	4.88/ 5.13	H	D	
HINO258 LP*(6)	NE8J	GBA	350mm	FS-5406A	9.01	5.27	3.22	2.04	1.36	1.00	RS17-145	3.07	H	D	L or A
		HBA	-	2200HS	3.10	1.81	1.41	1.00	0.71	0.61	RS17-145	4.11	H	D	
				2200RDS	3.10	1.81	1.41	1.00	0.71	0.61			H	D	
		YBA	350mm	FO- 5506B- DM3	6.55	4.13	2.52	1.59	1.00	0.78	RS17-145	3.90	H	D	
	NJ8J	JBA	350mm	FS-5406A	9.01	5.27	3.22	2.04	1.36	1.00	RS17-145	3.07	F	W	A
		KBA	-	2200HS	3.10	1.81	1.41	1.00	0.71	0.61	RS17-145	4.11	F	W	L or A
				2200RDS	3.10	1.81	1.41	1.00	0.71	0.61					
				2500RDS	3.51	1.90	1.44	1.00	0.74	0.64					
		UBA	350mm	FO- 5506B- DM3	6.55	4.13	2.52	1.59	1.00	0.78	RS17-145	3.90	F	W	
HINO268 (6)	NE8J	GBA	350mm	FS-5406A	9.01	5.27	3.22	2.04	1.36	1.00	RS19-145	4.11/ 3.73/ 3.90	H	D	L or A
		HBA	-	2200HS	3.10	1.81	1.41	1.00	0.71	0.61	RS19-145	5.57/ 5.13/ 5.29	H	D	
				2200RDS	3.10	1.81	1.41	1.00	0.71	0.61					
				2500RDS	3.51	1.90	1.44	1.00	0.74	0.64					
		YBA	350mm	FO- 5506B- DM3	6.55	4.13	2.52	1.59	1.00	0.78	RS19-145	5.29/ 4.88/ 5.13	H	D	

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MODEL (CLASS)	PRODUCTION CODE		CLUTCH SIZE	TRANS- MISSION SERIES	TRANSMISSION RATIO						REAR AXLE SERIES	REAR AXLE RATIO	SER- VICE BRAKE	PARK- ING BRAKE	SUS- PEN- SION
	MODEL	SERIES			1st	2nd	3rd	4th	5th	6th					
HINO268 (6)	NF8J	DBA	350mm	FS-6406A	9.01	5.27	3.22	2.04	1.36	1.00	RS21-145	4.11/ 3.90	H	D	L or A
		EBA	-	2500RDS	3.51	1.90	1.44	1.00	0.74	0.64	RS21-145	5.57/ 5.29	H	D	
		FBA	350mm	FO- 6406B- DM3	6.55	4.13	2.52	1.59	1.00	0.78	RS21-145	5.29/ 5.13	H	D	
	NJ8J	JBA	350mm	FS-5406A	9.01	5.27	3.22	2.04	1.36	1.00	RS19-145	4.11/ 3.73/ 3.90	F	W	L or A
		KBA	-	2200HS	3.10	1.81	1.41	1.00	0.71	0.61	RS19-145	5.57/ 5.13/ 5.29	F	W	
				2200RDS	3.10	1.81	1.41	1.00	0.71	0.61					
				2500RDS	3.51	1.90	1.44	1.00	0.74	0.64					
	UBA	350mm	FO- 5506B- DM3	6.55	4.13	2.52	1.59	1.00	0.78	RS19-145	5.29/ 4.88/ 5.13	F	W		
HINO338 (6)	NV8J	NBA	350mm	FS-6406A	9.01	5.27	3.22	2.04	1.36	1.00	RS21-145	4.11/ 3.90/ 4.33/ 4.63	F	W	L or A
		PBA	-	2500RDS	3.51	1.90	1.44	1.00	0.74	0.64	RS21-145	5.57/ 4.88/ 5.29/ 5.86/ 6.14	F	W	
				3000RDS	3.49	1.86	1.41	1.00	0.75	0.65					
		WBA	350mm	FO- 6406B- DM3	6.55	4.13	2.52	1.59	1.00	0.78	RS21-145	5.29/ 4.63/ 5.13/ 5.57/ 5.86	F	W	
		TBA	350mm	FS-6406A	9.01	5.27	3.22	2.04	1.36	1.00	RS21-145	4.11/ 3.90/ 4.33/ 4.63	F	W	
		SBA	-	2500RDS	3.51	1.90	1.44	1.00	0.74	0.64	RS21-145	5.57/ 4.88/ 5.29/ 5.86/ 6.14	F	W	
				3000RDS	3.49	1.86	1.41	1.00	0.75	0.65					
	XBA	350mm	FO- 6406B- DM3	6.55	4.13	2.52	1.59	1.00	0.78	RS21-145	5.29/ 4.63/ 5.13/ 5.57/ 5.86	F	W	L or A	

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GENERAL INTRODUCTION

MODEL (CLASS)	PRODUCTION CODE		CLUTCH SIZE	TRANS- MISSION SERIES	TRANSMISSION RATIO						REAR AXLE SERIES	REAR AXLE RATIO	SER- VICE BRAKE	PARK- ING BRAKE	SUS- PEN- SION
	MODEL	SERIES			1st	2nd	3rd	4th	5th	6th					
HINO338 (7)	NF8J	DBA	350mm	FS-6406A	9.01	5.27	3.22	2.04	1.36	1.00	RS21-145	4.11/ 3.90	H	D	L or A
		EBA	-	2500RDS	3.51	1.90	1.44	1.00	0.74	0.64	RS21-145	5.57/ 5.29	H	D	
		FBA	350mm	FO- 6406B- DM3	6.55	4.13	2.52	1.59	1.00	0.78	RS21-145	5.29/ 5.13	H	D	
	NV8J	NBA	350mm	FS-6406A	9.01	5.27	3.22	2.04	1.36	1.00	RS21-145	4.11/ 3.90/ 4.33/ 4.63	F	W	L or A
		PBA	-	2500RDS	3.51	1.90	1.44	1.00	0.74	0.64	RS21-145	5.57/ 4.88/ 5.29/ 5.86/ 6.14	F	W	
				3000RDS	3.49	1.86	1.41	1.00	0.75	0.65					
		WBA	350mm	FO- 6406B- DM3	6.55	4.13	2.52	1.59	1.00	0.78	RS21-145	5.29/ 4.63/ 5.13/ 5.57/ 5.86	F	W	
											RS23-160	4.89/ 5.29/ 5.38/ 5.63			
		TBA	350mm	FS-6406A	9.01	5.27	3.22	2.04	1.36	1.00	RS21-145	4.11/ 3.90/ 4.33/ 4.63	F	W	
		SBA	-	2500RDS	3.51	1.90	1.44	1.00	0.74	0.64	RS21-145	5.57/ 4.88/ 5.29/ 5.86/ 6.14	F	W	
				3000RDS	3.49	1.86	1.41	1.00	0.75	0.65					
		XBA	350mm	FO- 6406B- DM3	6.55	4.13	2.52	1.59	1.00	0.78	RS21-145	5.29/ 4.63/ 5.13/ 5.57/ 5.86	F	W	
	RS23-160										4.89/ 5.29/ 5.38/ 5.63				

GENERAL INTRODUCTION

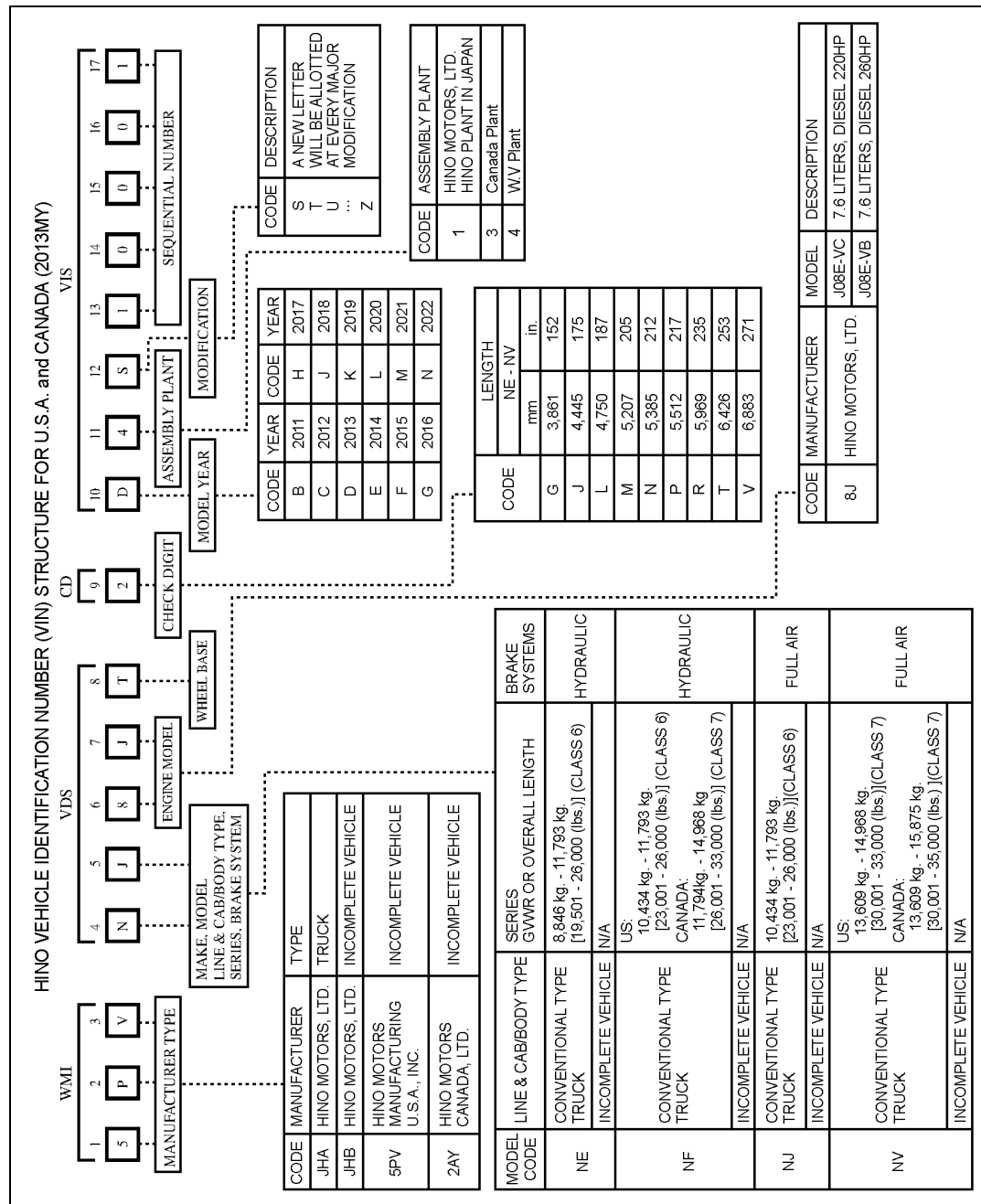
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MODEL (CLASS)	PRODUCTION CODE		CLUTCH SIZE	TRANS- MISSION SERIES	TRANSMISSION RATIO						REAR AXLE SERIES	REAR AXLE RATIO	SER- VICE BRAKE	PARK- ING BRAKE	SUS- PEN- SION
	MODEL	SERIES			1st	2nd	3rd	4th	5th	6th					
HINO358 (7)	NV8J	NBA	350mm	FS-6406A	9.01	5.27	3.22	2.04	1.36	1.00	RS23-160	3.91/ 4.10/ 4.56	F	W	L or A
		PBA	-	3000RDS	3.49	1.86	1.41	1.00	0.75	0.65	RS23-160	5.38/ 5.63/ 6.14	F	W	
		TBA	350mm	FS-6406A	9.01	5.27	3.22	2.04	1.36	1.00	RS23-160	3.91/ 4.10/ 4.56	F	W	
		SBA	-	3000RDS	3.49	1.86	1.41	1.00	0.75	0.65	RS23-160	5.38/ 5.63/ 6.14	F	W	
CODE	SERVICE BRAKE				PARKING BRAKE CONTROL CODE						SUSPENSION				
	H: Hydraulic F: Full air				D: ACTING ON DIFFERENTIAL W: ACTING ON REAR WHEEL						L: LEAF A: AIR				

LP*: Low profile

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GENERAL INTRODUCTION



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GENERAL INTRODUCTION

GN01-11

FOR HINO 238, 258 AND 268 MODEL

THIS CHASSIS-CAB CONFORMS TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NOS. 101, 102, 103, 104, 106, 111, 113, 116, 119, 124, 205, 206, 207, 208, 209, 210 AND 302.

THIS VEHICLE WILL CONFORM TO STANDARD NOS. 105, 108 AND 120 IF IT IS COMPLETED IN ACCORDANCE WITH THE INSTRUCTIONS CONTAINED IN THE INCOMPLETE VEHICLE DOCUMENT FURNISHED PURSUANT TO 49 CFR PART 568.

CONFORMITY TO THE OTHER SAFETY STANDARDS APPLICABLE TO THIS VEHICLE WHEN COMPLETED IS NOT SUBSTANTIALLY AFFECTED BY THE DESIGN OF THE CHASSIS-CAB.

DATE OF MANUFACTURE 03/2009
CHASSIS-CAB MFD BY: HINO MOTORS, LTD. MADE IN JAPAN

SAPH00Z000100008

FOR HINO 268, 338 AND 358 MODEL

THIS CHASSIS-CAB CONFORMS TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NOS. 101, 102, 103, 104, 106, 111, 113, 119, 124, 205, 206, 207, 208, 209, 210 AND 302.

THIS VEHICLE WILL CONFORM TO STANDARD NOS. 108, 120 AND 121 IF IT IS COMPLETED IN ACCORDANCE WITH THE INSTRUCTIONS CONTAINED IN THE INCOMPLETE VEHICLE DOCUMENT FURNISHED PURSUANT TO 49 CFR PART 568.

CONFORMITY TO THE OTHER SAFETY STANDARDS APPLICABLE TO THIS VEHICLE WHEN COMPLETED IS NOT SUBSTANTIALLY AFFECTED BY THE DESIGN OF THE CHASSIS-CAB.

DATE OF MANUFACTURE 03/2009
CHASSIS-CAB MFD BY: HINO MOTORS, LTD. MADE IN JAPAN

SAPH00Z000100009

FOR ALL MODELS

VEHICLE NOISE EMISSION CONTROL INFORMATION

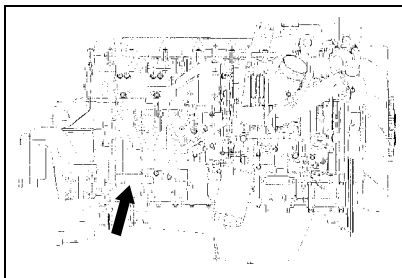
THIS VEHICLE CONFORMS TO U.S. EPA REGULATIONS FOR NOISE EMISSION APPLICABLE TO MEDIUM AND HEAVY TRUCKS. THE FOLLOWING ACTS OR THE CAUSING THEREOF BY ANY PERSON ARE PROHIBITED BY THE NOISE CONTROL ACT OF 1972:

(A) THE REMOVAL OR RENDERING INOPERATIVE, OTHER THAN FOR PURPOSES OF MAINTENANCE, REPAIR OR REPLACEMENT, OF ANY NOISE CONTROL DEVICE OR ELEMENT OF DESIGN LISTED IN THE OWNER'S MANUAL INCORPORATED INTO THIS VEHICLE IN COMPLIANCE WITH THE NOISE CONTROL ACT.

(B) THE USE OF THIS VEHICLE AFTER SUCH DEVICE OR ELEMENT OF DESIGN HAS BEEN REMOVED OR RENDERED INOPERATIVE.

MFD BY: HINO MOTORS, LTD. DATE OF MANUFACTURE 03/2009

SAPH00Z000100010



SAPH00Z000100011

2. VEHICLE CERTIFICATION LABEL

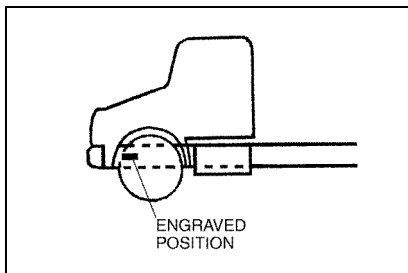
- The Vehicle Certification Label is affixed to the left pillar of the cab. The name of manufacturer, production year and month, and verification of items which are in conformity with Federal Motor Vehicle Safety Standards are displayed.

3. VEHICLE NOISE EMISSION CONTROL INFORMATION

- The Vehicle Noise Emission Control Information is affixed to the side of the left door. The name of manufacturer, production year and month, and noise emission applicable to medium and heavy trucks in conformity with U.S. EPA Regulations are displayed.

4. ENGINE SERIAL NUMBERS.

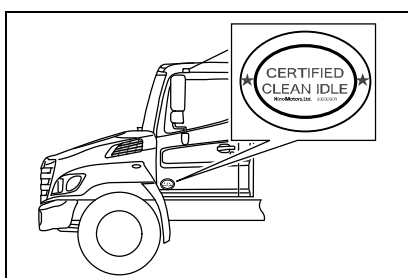
- Please quote these numbers when ordering spare parts or reporting technical matter to receive prompt service attention. The engine serial number is engraved on the engine cylinder block.



SAPH00Z000100012

5. CHASSIS SERIAL NUMBER

- Chassis serial number is engraved on the left side frame near the front wheel.



SAPH00Z000100013

6. CLEAN IDLE CERTIFIED LABEL FOR U.S.

- Make sure that the following clean engine idling certified label is affixed to the outside of the left door.
By the CARB below, the label must be affixed there to prove that the new vehicle with diesel engine manufactured from Jan., 2008 conforms to this low.

CARB § 1956.8. Exhaust Emission Standard and Test Procedure (a) (b) Heavy-Duty Diesel Engine Idling Requirements

HOW TO USE THIS WORKSHOP MANUAL

EN00Z0001020002

This workshop manual is designed as a guide for servicing the vehicle.
An INDEX is provided on the first page of each chapter.

INTRODUCTION TO DESCRIPTIONS

EN00Z0001020003

1. TROUBLE SHOOTING FOR EACH TROUBLE SYMPTOM WITH REFERENCE TO THE CHART

TROUBLESHOOTING			TS01-7
Difficulty starting engine			
Symptom	Possible cause	Remedy/Prevention	
Difficulty starting engine (Electrical system)	Discharged battery	Charge battery	
	Defective wiring in starter circuit	Repair wiring of starter	
	Loose or open-circuit battery cable	Tighten battery terminal connections or replace battery cable	
	Broken glow plug	Replace	
Difficulty starting engine (Supply pump)	Defective supply pump	Replace the supply pump	
Difficulty starting engine (Air cleaner)	Clogged element	Replace the element	
Difficulty starting engine (Fuel system)	No fuel in tank	Supply fuel	
	Clogged fuel line	Clean fuel line	
	Air sucked into fuel system through fuel line connections	Tighten fuel line connections	
	Clogged fuel filter	Replace element	
	Loose connection in high-pressure line	Tighten sleeve nut of high-pressure line	
Difficulty starting engine (Oil system)	Water in fuel	Drain and clean fuel system	
	Oil viscosity too high	Use proper viscosity oil, or install an oil immersion heater and warm up oil	
Difficulty starting engine (Other problems)	Seized piston	Replace piston, piston rings, and liner	
	Seized bearing	Replace bearing and/or crankshaft	
	Reduced compression pressure	Overhaul engine	
	Ring gear damaged or worn	Replace the ring gear and/or starter pinion	
	Improperly adjusted or broken	Adjust	

SAPH00Z000100014

2. INTRODUCTION TO TROUBLE SHOOTING

(1) This document covers the trouble shooting steps 2 and 3 listed below.

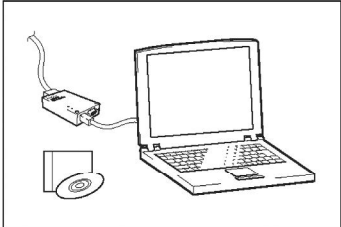
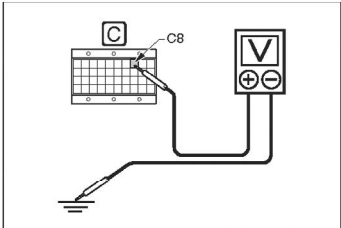
(1) Hearing	"Step 1"	Identify a fact through adequate hearings on the situation and environment where a trouble has occurred.
(2) Prior check (3) Reproducing technique	"Step 2"	Conduct a diagnosis inspection, a symptom check, a functional inspection and a basic inspection to identify a symptom. If a symptom check does not gain enough reproducibility, use a reproducing technique.
(4) Trouble shooting for each diagnosis code (5) Trouble shooting for each trouble symptom	"Step 3"	Sort the inspection results obtained from the step 2 and conduct an systematized inspection in accordance with the procedures for trouble shooting for each trouble symptom.
(6) Verification test	"Step 4"	Verify that the same trouble will not occur after trouble shooting. If a trouble is not reproducible enough, conduct a verification test under the reproduced conditions and environment.

(2) Prior check

Prior check	<ul style="list-style-type: none"> Take the following prior check steps. Diagnosis inspection→diagnosis deletion→trouble symptom verification (use a reproducing technique if not reproducible.)→diagnosis recheck Prior to a reproduction test, identify a system suspected to have a trouble, attach a tester and other apparatuses and then conduct both a symptom check and an examination on a suspected trouble. For a suspected cause of a trouble symptom, the trouble shooting chart. Instantaneous occurrence of a trouble symptom will also trigger a failure code. If no troubles are observed, use a reproducing technique in performing each trouble shooting activity. Trouble symptom verification If not reproducible, take the steps 2, →3 and →4. If not reproducible, use a reproducing technique (e.g. adjust external conditions and inspect each wire harness and connector part).
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3. INTRODUCTION TO TROUBLE SHOOTING FOR EACH DIAGNOSIS MONITOR CODE

- (1) The "diagnosis code list" and the "trouble shooting for each code" are contained in this document to address each system for which a diagnosis monitor code will be output. If a diagnosis monitor code is already identified, it is possible to immediately proceed with a trouble shooting process based on the code list.

FUEL CONTROL (J08E)		DN02-155
CLUTCH SWITCH		
EN1610602F200072		
DTC	P0704	Clutch Switch Input Circuit
 <small>SHTS161060200194</small>		<p>1. CHECK THE FUEL CUT RELAY USING THE PC DIAGNOSIS TOOL (HINO-DX).</p> <p>(1) Connect the PC DIAGNOSIS TOOL (HINO-DX).</p> <p>(2) Set the starter switch to "ON".</p> <p>(3) Turn on and off the clutch pedal and check that the signal switches.</p> <p>HINT If you drive with the foot on the clutch, judgement may take place.</p>
 <small>SHTS161060200195</small>		<p>2. MEASURING VOLTAGE BETWEEN TERMINALS AND GND.</p> <p>(1) Set the starter switch to "LOCK" and connect the signal check harness.</p> <p>(2) Set the starter switch to "ON".</p> <p>(3) Measure the voltage between CLSW (C8) terminal and cab GND.</p> <p>Standard value: More than 10 V (Clutch pedal released) 0 V (Clutch pedal pressed)</p>

↓ NO
Proceed to 2.

↓ YES

Normal

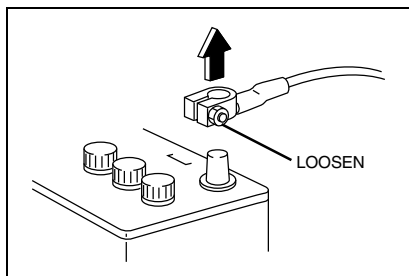
↓ NO
Proceed to 3.

↓ YES

Fault in engine ECU

PRECAUTIONS

EN0020001C100001



SAPH002000100016

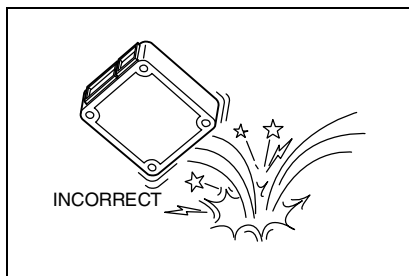
PRECAUTIONS FOR ELECTRICAL SYSTEM

1. REMOVING THE BATTERY CABLE

⚠ WARNING

- Be sure to wait for at least ten minutes after the starter key is turned to "LOCK" position before you disconnect the battery terminals from the battery, as the vehicle data is recorded on ECU and DCU starts working for the exhaust gas after treatment after the starter key is turned to "LOCK" position. Otherwise, the vehicle data will not be recorded on ECU properly and DCU will not complete working properly, which may result in the malfunction of DPR system and DEF-SCR system.
- The MIL (malfunction indicator light) may come on when the starter key is turned to "ON" position again, even if you wait for at least ten minutes before disconnecting the battery terminals from the battery after the starter key is turned to "LOCK" position. In this case, use Hino-DX to clear the DTC (P204F and P068A), to turn off the MIL and to conduct DPR regeneration manually.

- (1) Before electrical system work, remove the cable from the minus terminal of the battery in order to avoid burning caused by short-circuiting.
- (2) To remove the battery cable, fully release the nut to avoid damage to the battery terminal. Never twist the terminal.



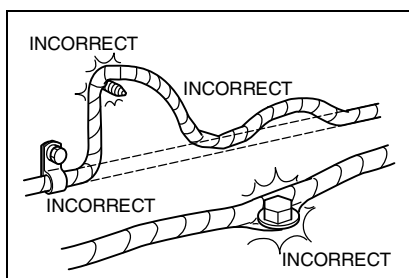
SAPH002000100017

2. HANDLING OF ELECTRONIC PARTS

- (1) Never give an impact to electronic parts of a computer or relay.
- (2) Keep electronic parts away from high temperatures and humidity.
- (3) Never splash water onto electronic parts in washing the vehicle.
- (4) Do not remove the harness connector, electric component box, and cover except for repair and inspection.

If removal is necessary, pay attention that water and foreign matters do not attach or enter to the connector, terminals, electric component box, and cover.

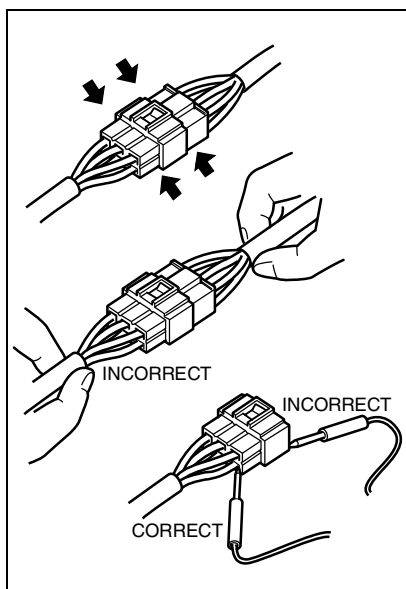
In restoration, make sure there is no attachment or entry of water and foreign matters and mount them properly, because it causes degradation of waterproof function.



SAPH002000100018

3. HANDLING OF WIRE HARNESS

- (1) Perform marking on a clamp and a clip and secure then in original position so that the wire harness will not interfere with the end and acute angle section of the body and a bolt.
- (2) To attach a part, take care not to bite the wire harness.



4. HANDLING OF CONNECTOR

- (1) To remove a connector, hold the connector (indicated by an arrow in the figure) to pull it out. Never pull the harness.
- (2) To remove a connector with lock, release the lock then pull it out.
- (3) To connect a connector with lock, insert it until it clicks.
- (4) To insert a test lead into the connector, insert it from behind the connector.
- (5) In case it is difficult to insert a test lead from behind the connector, prepare a harness for inspection and perform inspection.

5. INSTALLATION OF BATTERY DISCONNECT SWITCH

⚠ WARNING

- Installation of the battery disconnect switch on the power supply circuit for the dosing control unit of DEF-SCR (DCU) may damage or result in the malfunction of DEF-SCR system.
- Be sure to read and follow the procedures and instructions on the service bulletin before the installation of the battery disconnect switch.

6. HANDLING OF BATTERY DISCONNECT SWITCH

⚠ WARNING

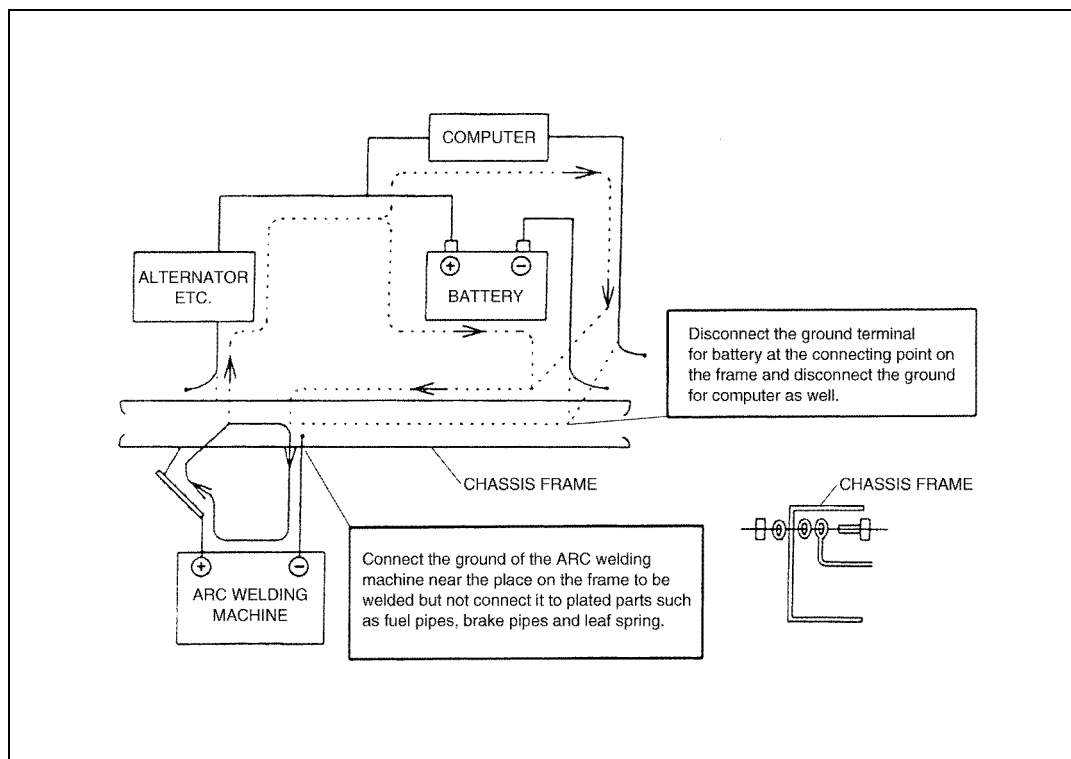
- Wait for at least one minute before using the battery disconnect switch after the starter key is turned to "LOCK" position. Otherwise, the vehicle data will not be recorded on ECU properly, which may result in the malfunction of DPR system.

PRECAUTIONS FOR ELECTRIC WELDING

1. PRECAUTION FOR ELECTRIC WELDING

Electrical components such as the alternator and tachograph are directly connected to the battery and one end is earthed to the chassis frame. Under these conditions, welding current will flow back along the earth circuit if electric welding is carried out and damage may be caused to the alternator, tachograph, electrical components, etc. Consequently, the following precautions are always to be taken during welding.

- (1) Disconnect the earth terminal of the battery at the frame fitment and earth the welding equipment securely to the frame itself. (Do not fit the welding equipment earth to such things as the tire rims, brake pipes or fuel pipes and leaf spring, etc.)
 - a. Turn the starter switch off.
 - b. Disconnect the negative terminal of the battery.
 - c. Earth welding equipment securely, near to the area to be welded.
 - d. Put back battery negative ground as original condition.
 - e. Finally check the functioning of all instruments.



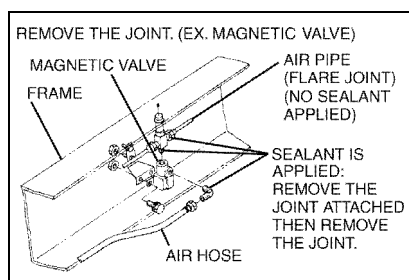
SAPH00Z000100020

- (2) In order to prevent damage to ancillary equipment components from sparks during welding, take steps such as putting fire-resistant covers over things like the engine, meters, steering wheel, hoses, tubes, leaf spring and tires.

SEALANT ON THE TAPERED SCREW FOR PIPING

EN00Z00010200004

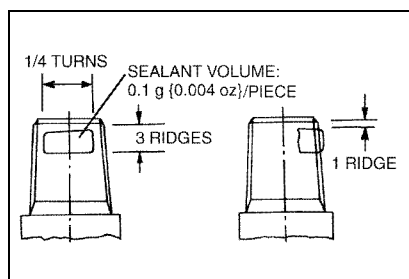
To the tapered thread of the air pipe joint is applied the sealant "LOCTITE #575". Follow the procedure below to remove/attach the piping.



SAPH00Z000100021

1. REMOVAL

- (1) The sealant (LOCTITE #575) has a high sealing capability. The return torque of taper joint is about 1.5 times as high as the initial tightening torque. To remove the joint, use a longer wrench.
- (2) For replacement of joint in a place with poor workability, remove the auxiliaries with the joint attached then remove the joint.



SAPH00Z000100022

2. ATTACHING

- (1) To apply sealant (LOCTITE #575), use waste and thinner to wipe the dirt off the sealing section, directly apply the sealant by a quarter turn (three ridges) starting from the second ridge from the tip, then assemble in accordance with the tightening torque table below.
Wipe dirt off the mating part (female screw) before tightening it.

⚠ WARNING

In case the sealant has entered your eye or attached to your skin, wash it away in running water.

Tightening torque of tapered joint

Unit: N·m {kgf·cm, lbf·ft}

Screw diameter	1/8	1/4	3/8	1/2
Material				
Steel	20±5 {200±50, 14.4±3.6}	49±10 {500±100, 36.2±7.2}	64±15 {650±150, 47±10}	
Aluminum, brass		25±5 {250±50, 18.1±3.6}	34±5 {350±50, 25.3±3.6}	44±5 {450±50, 32.5±3.6}

- (2) To replace vulcanized tape with sealant, remove the tape beforehand, same as (1).

NOTICE

Take special care not to let dirt and foreign matters enter the piping.

- (3) In the event of air leakage after sealant is applied and piping attached, retightening cannot check the air leakage. Follow the steps (1) and (2) to reassemble the piping.

METRIC INFORMATION

EN00Z00011200001

METRIC FASTENERS

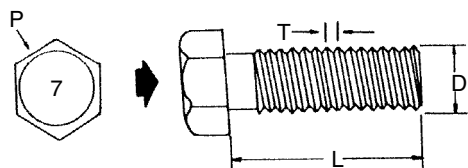
1. Most threaded fasteners on the Hino trucks series are metric. Be careful not to mix them up with threaded fasteners using the inch system. Mismatched or incorrect bolts, nuts and screws can cause damage or malfunction, resulting in personal injury and/or property damage.
2. When bolts, nuts and screws are removed from the vehicle, they should be kept for reuse whenever possible. If they are not re-usable, parts that are equivalent to the original parts in dimensions, strength, and thread pitch must be selected.
3. Most original bolts are marked with identification numbers indicating the strength of the bolts. The markings are shown below.
4. When replacing bolts, be careful to use bolts with the same markings as the original bolts.

NOMENCLATURE FOR BOLTS

METRIC SYSTEM

BOLT M12-1.75 25

D T L



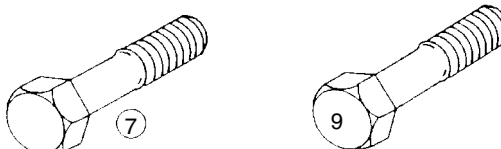
D- Nominal Diameter
(millimeters)

L- Length (millimeters)

P- Property Class
(bolt strength)

T- Thread Pitch (thread
width crest to crest
millimeters)

BOLT STRENGTH IDENTIFICATION



Metric Bolts P Identification class numbers correspond to bolt strength. Increasing numbers represent increasing strength.

SAPH00Z000100023

DECIMAL AND METRIC EQUIVALENTS

Fractions	Decimal In.	Metric mm.	Fractions	Decimal In.	Metric mm.
1/64	0.015625	0.397	33/64	0.515625	13.097
1/32	0.03125	0.794	17/32	0.53125	13.494
3/64	0.046875	1.191	35/64	0.546875	13.891
1/16	0.0625	1.588	9/16	0.5625	14.288
5/64	0.078125	1.984	37/64	0.578125	14.684
3/32	0.09375	2.381	19/32	0.59375	15.081
7/64	0.109375	2.778	39/64	0.609375	15.478
1/8	0.125	3.175	5/8	0.625	15.875
9/64	0.140625	3.572	41/64	0.640625	16.272
5/32	0.15625	3.969	21/32	0.65625	16.669
11/64	0.171875	4.366	43/64	0.671875	17.066
3/16	0.1875	4.763	11/16	0.6875	17.463
13/64	0.203125	5.159	45/64	0.703125	17.859
7/32	0.21875	5.556	23/32	0.71875	18.256
15/64	0.234375	5.953	47/64	0.734375	18.653
1/4	0.250	6.35	3/4	0.750	19.05
17/64	0.265625	6.747	49/64	0.765625	19.447
9/32	0.28125	7.144	25/32	0.78125	19.844
19/64	0.296875	7.54	51/64	0.796875	20.241
5/16	0.3125	7.938	13/16	0.8125	20.638
21/64	0.328125	8.334	53/64	0.828125	21.034
11/32	0.34375	8.731	27/32	0.84375	21.431
23/64	0.359375	9.128	55/64	0.859375	21.828
3/8	0.375	9.525	7/8	0.875	22.225
25/64	0.390625	9.922	57/64	0.890625	22.622
13/32	0.40625	10.319	29/32	0.90625	23.019
27/64	0.421875	10.716	59/64	0.921875	23.416
7/16	0.4375	11.113	15/16	0.9375	23.813
29/64	0.453125	11.509	61/64	0.953125	24.209
15/32	0.46875	11.906	31/32	0.96875	24.606
31/64	0.484375	12.303	63/64	0.984375	25.003
1/2	0.500	12.7	1	1.00	25.4





GN01-22

GENERAL INTRODUCTION

SPECIFIED TORQUE FOR STANDARD BOLTS AND NUTS

EN00200013200001

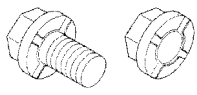
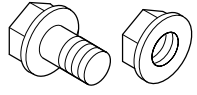
Unit: N·m {kgf·cm, lbf·ft.}

Class	4T	7T	9T
Representation		 	
Diameter	No Mark		
M6	4.4-6.6 {45-67, 3.3-4.8}	7.2-10.8 {74-110, 5.4-7.9}	9.5-13.5 {94-140, 6.8-10.1}
M8	11.5-16.5 {114-172, 8.3-12.4}	18.0-26.0 {179-269, 13.0-19.4}	23.5-34.5 {237-355, 17.2-25.6}
M10	22.0-32.0 {221-331, 16.0-23.9}	34.5-51.5 {351-527, 25.4-38.1}	46.0-68.0 {466-698, 33.7-50.4}
M12	38.5-57.5 {392-588, 28.4-42.5}	61.0-91.0 {621-931, 44.9-67.3}	80.0-120.0 {816-1,224, 59.0-88.5}
M14	62.0-92.0 {629-943, 45.5-68.1}	96.0-144.0 {976-1,464, 70.6-105.8}	128.0-192.0 {1,304-1,956, 94.3-141.4}
M16	96.0-144.0 {976-1,464, 70.6-105.8}	152.0-228.0 {1,552-2,328, 112.3-168.3}	200.0-300.0 {2,040-3,060, 147.5-221.2}
M18	132.0-198.0 {1,344-2,016, 97.2-145.7}	208.0-312.0 {2,120-3,180, 153.3-229.9}	276.0-414.0 {2,816-4,224, 203.6-305.4}
M20	188.0-282.0 {1,920-2,880, 138.8-208.2}	296.0-444.0 {3,024-4,536, 218.7-327.9}	392.0-588.0 {4,000-6,000, 289.3-433.8}
M22	256.0-384.0 {2,616-3,924, 189.2-283.7}	405.0-605.0 {4,120-6,180, 297.9-446.8}	540.0-800.0 {5,470-8,210, 395.5-593.6}
M24	324.0-486.0 {3,304-4,956, 238.9-358.3}	515.0-765.0 {5,220-7,840, 377.5-566.8}	680.0-1,010.0 {6,900-10,340, 499.0-747.6}

SPECIFIED TORQUE FOR FLANGE BOLTS AND NUTS

EN0020001C100002

Unit: N·m {kgf·cm, lbf·ft.}

Class	7T	9T	12T	Shape
Diameter				
M8	18.0-26.0 {184-265, 13.3-19.2}	—	—	
M10	41.5-61.5 {421-631, 30.5-45.6}	55.0-82.0 {560-840, 40.5-60.7}	—	
M12	73.0-109.0 {744-1,116, 53.8-80.7}	96.0-114.0 {979-1,469, 70.8-106.2}	—	
M14	—	—	86.0-142.0 {877-1,448, 63.4-104.7}	

RECOMMENDED LUBRICANTS

EN00Z0001H600001

No.	LUBRICANTS	POSITONS	ATMOSPHERIC TEMP.	S.A.E. No
1	Engine oil A.P.I.: CF, CH-4, CI-4, CJ-4 JASO: DH-2 ACEA: E-3, E-4, E-5, E-6	Cylinder Block	-22°F—100°F (-8°C—38°C)	10W-40
			Above 32°F (0°C)	40
			32°F—100°F (0°C—39°C)	30
2	Heavy duty engine oil MIL-L-2104D, API-CD, or Cat TO-4	EATON Fuller® FS-5406A,FS-6406A	Above 10°F (-12°C)	50
			Above 10°F (-12°C)	40
			Below 10°F (-12°C)	30
	Above 10°F (-12°C)		80W-90	
	Automotive gear oil API-MT-1		Below 10°F (-12°C)	75W
3	Mobil Delvac Synthetic Transmission Fluid 50, Shell SPIRAX GSX SAE 50, EATON Roadranger SAE 50, EATON Approved Synthetic Transmission oil, or equivalent	EATON Fuller® FO-5506B-DM3, FO-6406B-DM3, FS-5406A, FS-6406A	All	50
4	Automatic transmission fluid; TES 295-approved fluid	Allison® 2200HS, 2200RDS, 2500RDS, 3000RDS	—	—
	Automatic transmission fluid; TES 389-approved fluid	Allison® 2200HS, 2200RDS, 2500RDS, 3000RDS		
5	Axle lubricant Non- Extended Drain Lubri- cants (Petroleum with EP Additives) (A.P.I. GL-5) (MIL-PRF-2105E and SAE J2360)	Rear axle	Above 10°F (-12°C)	85W/140
			Above -15°F (-26°C)	80W/140
			Above -15°F (-26°C)	80W/90
			Above -40°F (-40°C)	75W/90
			From -40°F (-40°C) to -35°F (2°C)	75W
	Axle lubricant Extended Drain Lubricants (Petroleum with EP Additives) (A.P.I. GL-5) (MIL-PRF-2105E and SAE J2360)		Above -40°F (-40°C)	75W/140
			Above -15°F (-26°C)	80W/90
			Above -15°F (-26°C)	80W/90
			Above -40°F (-40°C)	75W/140
			Above -40°F (-40°C)	75W/90

GN01-24

GENERAL INTRODUCTION

No.	LUBRICANTS	POSITONS
6	POWER STEERING FLUID (ATF DEXRON® 2 or 3)	Integral Power Steering Gear
7	BRAKE AND CLUTCH FLUID (DOT-3) or (DOT-4)	Brake & Clutch
8	WHEEL BEARING GREASE (MIL-G-10924B/18709A) (N.L.G.I.'s No.2 LITHIUM-SOAP)	Propeller Shaft Universal Joint and Slip Joint
9	HEAT RESISTANCE GREASE (MIL-G-22615/23549/21164) (N.L.G.I.'s No.2 or No.3)	Clutch Disc Hub Spline T/M Main Drive Shaft Spline Q-Plus Brake (Retainer Clip, Anchor Pin, Roller (Journal only), Camshaft, Automatic Slack Adjuster, Clevis Pin) Parking Brake (Camshaft, Anchor Pin, Shoe web)
10	SPECIAL GREASE (KLUBER GLKO)	B-Frame Disc Brake (Guide buss, Caliper body, Piston)
11	STARTER GREASE (N.L.G.I.'s No.2 LITHIUM-SOAP)	Bushing, Clutch, Drive Shaft, Pinion Shaft Lever & Reduction Gear
12	BEARING GREASE (N.L.G.I.'s No.2 LITHIUM-SOAP)	Clutch Release Sleeve Clutch Release Shaft Alternator Bearing Starter Bearing
13	CHASSIS GREASE (MIL-G-17740) (N.L.G.I.'s No.1 CALCIUM or LITHIUM-SOAP)	Chassis Grease Fitting
14	LONG LIFE COOLANT	Engine, Radiator
15	Mobil Synthetic 75W-90	Front Wheel Hub (Oil Lubricated Bearings)

No.	LUBRICANTS	POSITONS	SHEEL	MOBIL	EXXON
16	LITHIUM BASE DISULFIDE MOLYBDENUM GREASE	Drag Link & Tie Rod Ball Joint	Retinax AM	Mobil Grease Special	Beacon Q2

INFORMATION DISPLAY

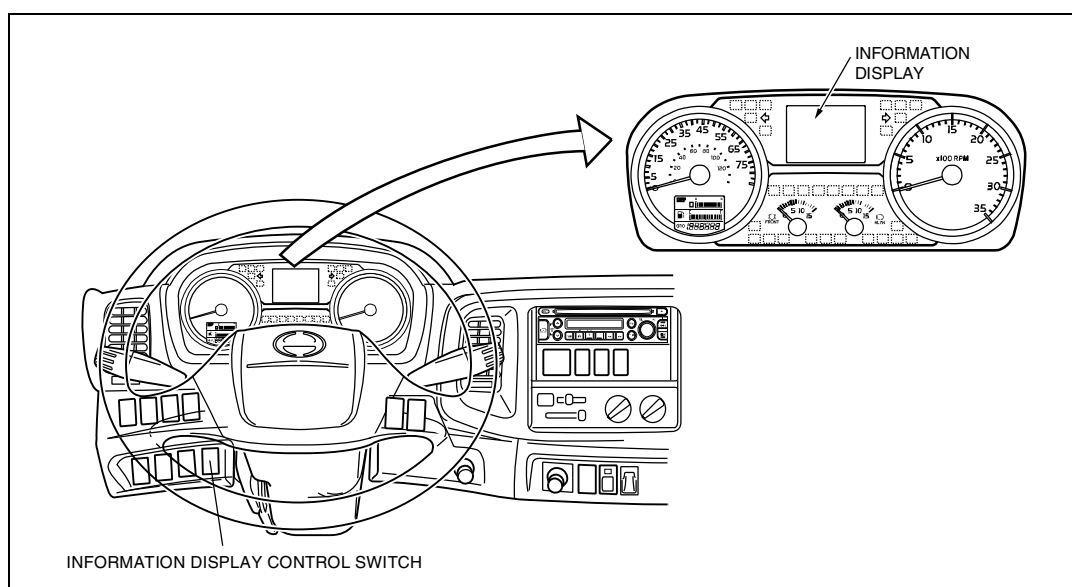
EN00Z0001A200001

1. INFORMATION DISPLAY ITEMS

- Information display shows following items.
- (1) Ordinary display
Trip meter, voltage, date, fuel consumption, average speed and engine or vehicle maintenance information etc.
- (2) Warning display
The warning display is automatically displayed and shows messages.

NOTICE

- When turn the key to "ON" position, display shows last message. But in case of device operating, the warning display is prior to ordinary display.



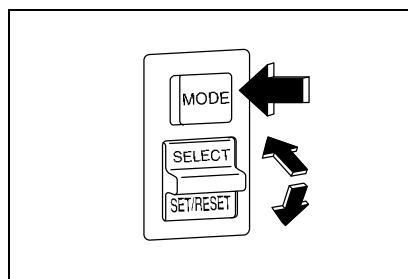
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2. INFORMATION DISPLAY CONTROL SWITCH

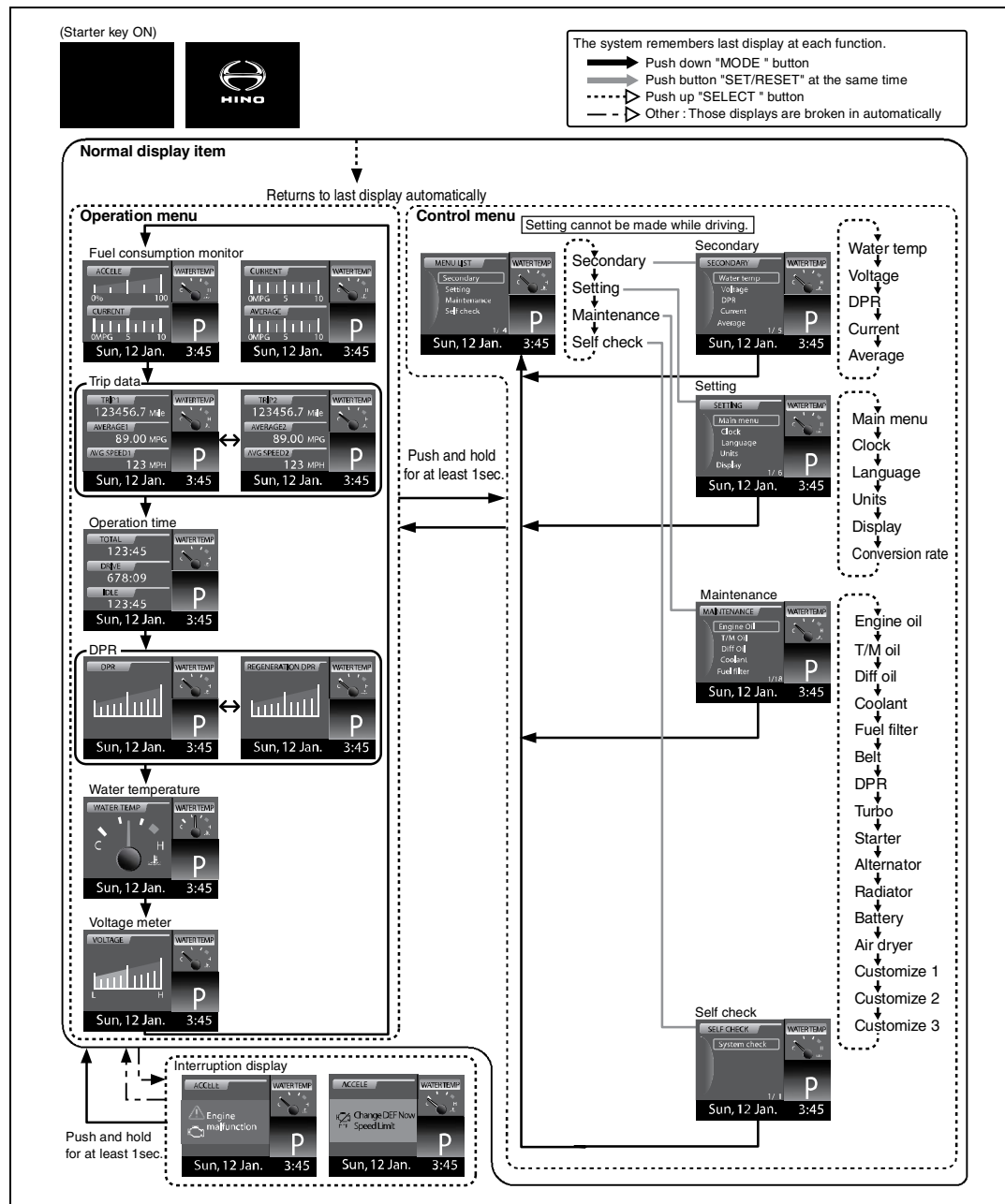
- The following information is shown with the key turned on. Each time you push the "MODE" button, the displayed information is changed.

NOTICE

- Diagram on the next page shows the operation method of the information display.
- If you push and hold "SET/RESET" button, as the display case, data may be reset.
- Press the "MODE" button more than 1 second to release the warning information.





SAPH00Z000100030



3. WARNING DISPLAY





(1) Warning display

Display	Warning Display remarks
	Engine control system has malfunction. This is important and must be addressed immediately.
	DPR cleaner needs to be manually regenerated.

NOTICE

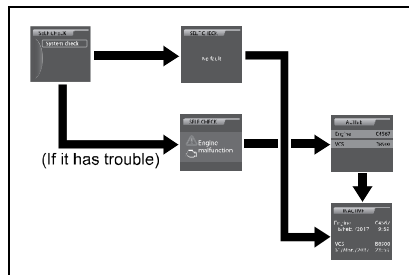
- The display shows **DPR MANUAL REGENERATE REQUIRED** with the buzzer sound when DPR cleaner needs to be manually regenerated.

(2) Information display

Display	Display remarks
	Appears when idling is stopped due to emergency.
	DPR regenerate on time.
	DPR remaining for few minute.
	DPR regenerate completed.

NOTICE

- The DPR system automatically regenerates when the quantity of soot collected in the DPR cleaner exceeds a specific quantity. This prevents an abnormal accumulation of soot and keeps the DPR cleaner in good condition. Use of high-performance catalyst and an electronically controlled common rail fuel injection system has made it possible to burn (regenerate) the soot while driving.



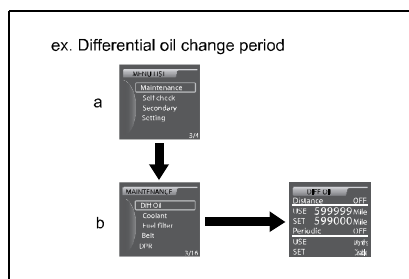
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4. SELF DIAGNOSIS SYSTEM

If the vehicle has fault, display shows the trouble.

- (1) Select to "Self check" and push "SET/RESET" button.
- (2) Select to "System check" and push "SET/RESET" button, display shows "No fault" in case of no trouble. If it has trouble, display shows fault item.
- (3) If display shows trouble warning, Immediately get the vehicle checked and repaired at an authorized Hino dealer.
- (4) In case of "Engine malfunction" displayed, push and hold "SELECT" button for more than 1 sec. until the display shows trouble code. Push "SELECT" button, display shows another trouble codes, if there are.
- (5) Push and hold "SELECT" button for longer than 1 sec. to display the "Inactive".
- (6) Trouble code display

Initial Display	Remarks
	It has no trouble.
	It has trouble.
	Yellow background. It has trouble code, now. Get the vehicle checked and repaired.
	It had trouble code, previously.



SAPH00Z000100043

5. RESETTING PROCEDURE

EX. Differential oil change period

- (1) Scroll up and select "Maintenance" and push "SET/RESET" button.
- (2) Scroll up and select the preferred setting item and push "SET/RESET" button.
- (3) Push and hold "SET/RESET" button for longer than 1 sec.

NOTICE

- In the case of the other item on trouble code, data may be reset as the same procedure.
- But, especially in the case of "DPR", push and hold "MODE" and "SET/RESET" button at the same time for more than 20sec. to reset. (Following to the low, use only at an authorized Hino dealer.)

6. AVAILABLE SETTING ITEMS

- Engine oil
- T/M oil
- Diff oil
- Coolant
- Fuel filter
- Belt
- DPR
- Turbo
- Starter
- Alternator
- Radiator
- Battery
- Air dryer
- Customize1
- Customize2
- Customize3

SYMPTOM SIMULATION

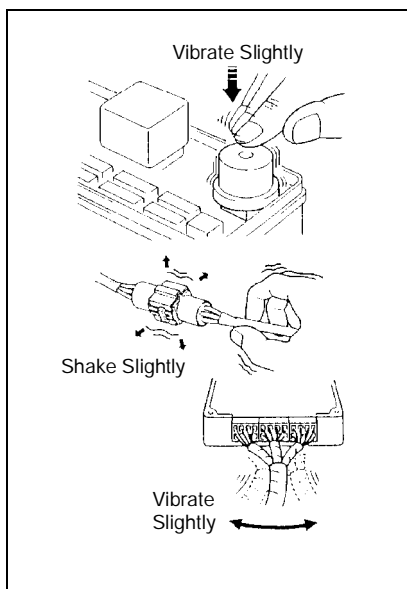
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HINT

The most difficult case in troubleshooting is when no problem symptoms occur. In such a case, a thorough problem analysis must be carried out. A simulation of the same or similar conditions and environment in which the problem occurred in the customer's vehicle should be carried out. No matter how much skill or experience a technician has, troubleshooting without confirming the problem symptoms will lead to important repairs being overlooked and mistakes or delays.

For example:

With a problem that only occurs when the engine is cold or as a result of vibration caused by the road during driving, the problem can never be determined if the symptoms are being checked on a stationary vehicle or a vehicle with a warmed-up engine. Vibration, heat or water penetration (moisture) is difficult to reproduce. The symptom simulation tests below are effective substitutes for the conditions and can be applied on a stationary vehicle. Important points in the symptom simulation test: In the symptom simulation test, the problem symptoms as well as the problem area or parts must be confirmed. First, narrow down the possible problem circuits according to the symptoms. Then, connect the tester and carry out the symptom simulation test, judging whether the circuit being tested is defective or normal. Also, confirm the problem symptoms at the same time. Refer to the problem symptoms table for each system to narrow down the possible causes.



SAPH00Z000100044

1. VIBRATION METHOD: When malfunction seems to occur as a result of vibration.

(1) PART AND SENSOR

Apply slight vibration with a finger to the part of the sensor suspected to be the cause of the problem, and check whether or not the malfunction occurs.

NOTICE

Applying strong vibration to relays may open relays

(2) CONNECTORS

Slightly shake the connector vertically and horizontally.

(3) WIRE HARNESS

Slightly shake the wire harness vertically and horizontally.

HINT

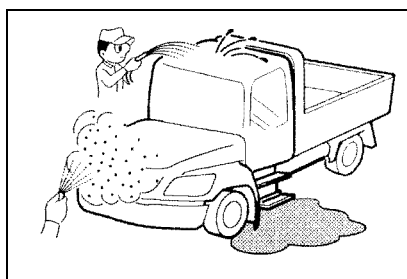
The connector joint and fulcrum of the vibration are the major areas that should be checked thoroughly.

2. HEAT METHOD: When a malfunction seems to occur when the area in question is heated.

- (1) Heat the component that is the possible cause of the malfunction with a hair dryer or similar device. Check if the malfunction occurs.

NOTICE

- Do not heat to more than 60°C (140°F). Exceeding this temperature may damage components.
- Do not apply heat directly to the parts in the ECU.



3. WATER SPRINKLING METHOD: When a malfunction seems to occur on a rainy day or in high-humidity.

- (1) Sprinkle water onto the vehicle and check if the malfunction occurs.

NOTICE

- Never sprinkle water directly into the engine compartment. Indirectly change the temperature and humidity by spraying water onto the front of the radiator.
- Never apply water directly onto the electronic components.

HINT

If the vehicle has or had a water leakage problem, the leakage may have damaged the ECU or connections. Look for evidence of corrosion or short circuits. Proceed with caution during water tests.

4. HIGH ELECTRICAL LOAD METHOD: When a malfunction seems to occur when electrical load is excessive.

- (1) Turn on the heater blower, headlight, rear window defogger and all other electrical loads. Check if the malfunction reoccurs.

GLOSSARY OF SAE AND HINO TERMS

EN00Z00010200005

This glossary lists all SAE-J2403 terms and abbreviations used in this manual in compliance with SAE recommendation, as well as their HINO equivalents.

SAE ABBREVIATIONS	SAE TERMS	HINO TERMS ()-ABBREVIATIONS
A/T	AUTOMATIC TRANSMISSION	Automatic transmission
AAT	AMBIENT AIR TEMPERATURE	Ambient Air Temperature
ACL	AIR CLEANER	Air cleaner
ACL Element	ACL (Air Cleaner) Element	Air Cleaner element
ACL Element	AIR CLEANER Element	Air Cleaner element
ACL Housing	AIR CLEANER Housing	Air cleaner body assembly
ACL Housing Cover	AIR CLEANER Housing Cover	Air Cleaner Housing Cover
AFTDEF	AFTERTREATMENT DIESEL EXHAUST FLUID	DEF
AFTDEFDU	AFTERTREATMENT DIESEL EXHAUST FLUID DOSING UNIT	DCU
AFTDOC	AFTERTREATMENT DIESEL OXIDATION CATALYST	DOC (Diesel Oxidation Catalyst)
AFTDOS	AFTERTREATMENT DOSER AFTDOS	DEF injector
AFTDPF	AFTERTREATMENT DIESEL PARTICULATE FILTER	DPR filter
AFTDPFDP	Aftertreatment Diesel Particulate Filter Differential Pressure	DPR differential pressure
AFTEGT	AFTERTREATMENT EXHAUST GAS TEMPERATURE	Exhaust gas temperature
AP	ACCELERATOR PEDAL	Accelerator pedal
AP Sensor	ACCELERATOR PEDAL Sensor	Accelerator Pedal Position Sensor
APP	ACCELERATOR PEDAL POSITION	Accelerator Pedal Position
CAC	CHARGE AIR COOLER	Intercooler
CPP Switch	CLUTCH PEDAL POSITION Switch	Clutch Switch
DCC	DIAGNOSTIC CONNECTOR, Cab	Diagnosis connector
DCU	DIAGNOSTIC CONNECTOR, Underhood	Diagnosis connector
DRIVER	DRIVER	driver
DTC	DIAGNOSTIC TROUBLE CODE	Diagnosis Trouble Code
DTM Switch	DIAGNOSTIC TEST MODE Switch	Diagnosis switch
EBP	EXHAUST BACK PRESSURE	Backpressure
EBP	EXHAUST BACK PRESSURE	Exhaust backpressure
EBP Sensor	EXHAUST BACK PRESSURE Sensor	Back Pressure Sensor
EBPR Valve	EXHAUST BACK PRESSURE REGULATOR Valve	Exhaust control valve

GENERAL INTRODUCTION

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SAE ABBREVIATIONS	SAE TERMS	HINO TERMS ()--ABBREVIATIONS
EC	ENGINE CONTROL	Engine control
ECT	ENGINE COOLANT TEMPERATURE	Coolant Temperature
ECT	ENGINE COOLANT TEMPERATURE	Water Temperature
EFT	ENGINE FUEL TEMPERATURE	Fuel temperature
EFT Sensor	ENGINE FUEL TEMPERATURE Sensor	Fuel temperature sensor
EGR	EXHAUST GAS RECIRCULATION	EGR
EGR Valve	EXHAUST GAS RECIRCULATION Valve	EGR valve
EGRT	EXHAUST GAS RECIRCULATION TEMPERATURE	EGR temperature
EGRT Sensor	EXHAUST GAS RECIRCULATION TEMPERATURE Sensor	EGR exit temperature sensor
EGT	EXHAUST GAS TEMPERATURE	Exhaust gas temperature
EI	ELECTRONIC IGNITION	Ignition coil
EOP	ENGINE OIL PRESSURE	Oil Pressure
EOT	ENGINE OIL TEMPERATURE	Oil Temperature
FP	FUEL PUMP	Fuel pump
FUEL PRESSURE Sensor	FUEL PRESSURE Sensor	Fuel Pressure sensor
GLOW PLUG	GLOW PLUG	Glow plug
GND	GROUND	GROUND
IA	INTAKE AIR	Air Intake
IA System	INTAKE AIR System	Air Intake System
IAT	INTAKE AIR TEMPERATURE	Intake temperature
IAT Sensor	INTAKE AIR TEMPERATURE Sensor	Intake temperature sensor
IDLE	IDLE	idle
IMAT	INTAKE MANIFOLD AIR TEMPERATURE	Intake manifold Air temperature sensor
IMAT	INTAKE MANIFOLD TEMPERATURE	Intake manifold temperature sensor
INJ	INJECTOR	Injector
MAF Sensor	MASS AIR FLOW Sensor	Air flow sensor
MIL	MALFUNCTION INDICATOR LAMP	MIL (Malfunction Indicator Light)
OSS Sensor	OUTPUT SHAFT SPEED Sensor	Output Speed Sensor
OSS Sensor	OUTPUT SHAFT SPEED Sensor	Speed Sensor
PC Solenoid Valve	PRESSURE CONTROL Solenoid Valve	Solenoid control valves
PCV	POS CRANKCASE VENTILATION	PCV (Positive Crankcase Vent)
PCV Valve	POS CRANKCASE VENTILATION Valve	PCV (Positive Crankcase Vent) Valve
PCV Valve	POS CRANKCASE VENTILATION Valve	PCV Valve
PCV Valve	POSITIVE CRANKCASE VENT Valve	PCV Valve

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GENERAL INTRODUCTION

SAE ABBREVIATIONS	SAE TERMS	HINO TERMS ()-ABBREVIATIONS
PNP	PARK/NEUTRAL POSITION	Neutral position
PNP Switch	PARK/NEUTRAL POSITION Switch	Neutral switch
RFP	RAIL FUEL PRESSURE	Common rail Pressure
RFP Sensor	RAIL FUEL PRESSURE Sensor	Common rail pressure sensor
SPARK PLUG	SPARK PLUG	Spark plug
SRI	SERVICE REMINDER INDICATOR	Check engine
ST	SCAN TOOL	Diagnostic tool
TC	TURBOCHARGER	Turbocharger
TCC	TORQUE CONVERTER CLUTCH	Torque Converter
TP Sensor	THROTTLE POSITION Sensor	Throttle Sensor
TSS Sensor	TURBINE SHAFT SPEED Sensor	Turbine Speed Sensor
VAF Sensor	VOLUME AIR FLOW Sensor	Air flow sensor
VLS	VEHICLE LIMITING SPEED	Speed Limiter Upper Limit
VSS	VEHICLE SPEED SENSOR	Vehicle Speed sensor

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ENGINE INTRODUCTION (J08E)

ENGINE ASSEMBLY

EN70ZZZ10F300001

Engine overheating

Symptom	Possible cause	Remedy/Prevention
Engine overheating (Coolant)	Insufficient coolant	Add coolant
	Defective thermostat	Replace thermostat
	Overflow of coolant due to leakage of exhaust into cooling system	Repair
	Damaged rubber hose	Replace rubber hose
	Coolant leakage due to deteriorated rubber hose	Replace rubber hose
	Coolant leakage from coolant pump	Replace the coolant pump
	Coolant leakage from rubber hose connection	Retighten or replace clamp
	Coolant leakage from cylinder head gasket	Replace gasket
Engine overheating (Coolant pump)	Bearing seizure	Replace
	Damaged (corroded) vane	Replace vane
Engine overheating (Radiator)	Clogged with rust or scale	Clean radiator
	Clogged with iron oxide due to leakage of exhaust into cooling system	Clean coolant passage and correct exhaust leakage
	Coolant leakage	Repair or replace radiator
	Damaged cooling fan	Replace cooling fan
	Clogged radiator core due to mud or other debris	Clean radiator
	Defective radiator cap pressure valve	Replace radiator cap
Engine overheating (Abnormal combustion)	Poor fuel	Use good quality fuel
	Breakdown of injector	Replace the injector
Engine overheating (Other problems)	Defective or deteriorated engine oil	Change engine oil
	Unsatisfactory operation of oil pump	Replace or repair
	Insufficient oil	Add oil
	Brake drag	Repair or adjust
	Break water temperature sensor	Replace it
Engine overheating (Severe operating condition)	Lugging the engine	Operate engine properly

TS01-4

TROUBLESHOOTING

Excessive oil consumption

Symptom	Possible cause	Remedy/Prevention
Excessive oil consumption (Pistons, cylinder liners, and piston rings)	Wear of piston ring and cylinder liner	Replace piston rings and cylinder liner
	Worn, sticking or broken piston rings	Replace piston rings and cylinder liner
	Insufficient tension on piston rings	Replace piston rings and cylinder liner
	Unsatisfactory breaking in of piston rings	Replace piston rings and cylinder liner
	Unsuitable oil (viscosity too low)	Change oil as required and replace piston rings and cylinder liners
	Incorrectly fitted piston rings (upside down)	Replace piston rings
	Gaps of piston rings in cell with each other	Reassemble piston rings
Excessive oil consumption (Valve and valve guides)	Worn valve stem	Replace valve and valve guide
	Worn valve guide	Replace valve guide
	Incorrectly fitted valve stem seal	Replace the stem seal
	Excessive lubricant on rocker arm	Check clearance of rocker arm and shaft
Excessive oil consumption (Excess oil feed)	Defective oil level gauge	Replace oil level gauge
	Oil level too high	Drain excess oil
Excessive oil consumption (Oil leakage from miscellaneous parts)	Oil leakage from oil seal	Replace oil seal
	Cracks or blowhole in cylinder block	Replace cylinder block
	Oil leakage from connections of oil lines	Tighten connections of oil lines
	Oil leakage from oil cooler	Replace oil cooler
	Oil leakage from oil pan gasket	Replace oil pan gasket
	Oil leakage from O-ring	Replace O-ring
Excessive oil consumption (Other problems)	Overcooled engine (low temperature wear)	Warm up engine before moving vehicle. Check cooling system.

NOTICE

If oil consumption is excessive, the problems above will occur. Complaints from the customer are often related to such problems.

1. White smoke is emitted continuously when the engine is run at high speed.
2. White smoke is emitted only immediately after the engine speed is abruptly raised when idling.
3. The tail pipe is blackened with oil.
4. Oil leaks from the flanges of the exhaust manifold.
5. Lack of power.

Piston seizure

Symptom	Possible cause	Remedy/Prevention
Piston seizure (Pistons, cylinder liners and piston rings)	Incorrect clearance between piston and cylinder liner	Replace piston, piston rings and cylinder liner
	Unsatisfactory installation of piston pin	Replace piston, piston rings, cylinder liner and piston pin as required
	Broken piston ring	Replace piston, piston rings and cylinder liner
	Difference in expansion due to use of wrong piston	Replace piston, piston rings and cylinder liner
Piston seizure (Coolant)	Reduction in capacity of coolant pump (due to vane corrosion)	Replace the coolant pump
	Leakage of coolant	Repair
	Insufficient coolant	Add coolant
	Dirty coolant	Clean and replace coolant
	Defective radiator (coolant leakage, clogging)	Repair or replace the radiator
	Defective rubber hose (leakage)	Replace rubber hose
	Defective thermostat	Replace the thermostat
Piston seizure (Operation)	Leakage of exhaust into cooling system	Repair
	Abrupt stoppage of engine after running at high speed	Operate engine properly
Piston seizure (Oil)	Hill climbing using unsuitable gear	Select suitable gear
	Insufficient oil	Add oil
	Dirty oil	Change oil
	Poor quality oil	Replace with proper engine oil
	High oil temperature	Repair
	Low oil pressure	Repair
	Defective oil pump	Repair oil pump
	Reduced performance due to worn oil pump	Replace oil pump
Piston seizure (Abnormal combustion)	Suction strainer sucking air	Add oil and/or repair strainer
	Use of defective fuel	Change fuel
	Engine overheating	See Symptom: "Engine overheating"
	Breakdown of injector	Replace the injector

NOTICE

If piston seizure occurs, the problems above will occur. Complaints from the customer are often related to these problems.

1. White smoke is emitted.
2. Lack of power

TS01-6

TROUBLESHOOTING

Lack of power

Symptom	Possible cause	Remedy/Prevention
Lack of power (Supply pump)	Damaged suction control valve (SCV)	Replace the suction control valve (SCV)
	Use of poor fuel	Use good quality fuel
Lack of power (Intake)	Clogged air cleaner	Clean element or replace element
Lack of power (Overheating)		See Symptom: "Engine overheating"
Lack of power (Fuel and injector)	Air in fuel system	Repair and bleed air from fuel system
	Clogged fuel filter	Replace element
	Use of poor fuel	Use good quality fuel
	Breakdown of injector	Replace the injector
Lack of power (Pistons, cylinder liners and piston rings)	Seized or wear of piston	Replace the piston, piston rings and liner
	Worn or broken piston rings, piston and cylinder liner	Replace piston rings, piston and liner
Lack of power (Other problems)	Exhaust brake butterfly valve stuck in half-open position	Replace or repair exhaust brake
	Connecting rod bent	Replace or repair connecting rod
	Exhaust pipe or muffler crushed (increased back-pressure)	Replace exhaust pipe or muffler
	Breakage of turbine or blower	Replace turbocharger

Leakage of exhaust

Symptom	Possible cause	Remedy/Prevention
Leakage of exhaust (Head gasket)	Fatigued gasket (aging)	Replace gasket
	Damage	Replace gasket
	Improper installation	Replace gasket
Leakage of exhaust (Head bolts)	Loose bolts	Tighten bolts
	Elongated bolts	Replace bolts
	Improper tightening torque or tightening sequence	Tighten properly
Leakage of exhaust (Cylinder block)	Cracking	Replace cylinder block
	Surface distortion	Repair or replace
	Fretting of cylinder liner insertion portion (insufficient projection of cylinder liner)	Replace cylinder block
Leakage of exhaust (Cylinder head)	Cracking	Replace cylinder head
	Surface distortion	Repair or replace
Leakage of exhaust (Cylinder liners)	Cracking	Replace cylinder liner
	Corrosion	Replace cylinder liner
	Insufficient projection of cylinder liner	Replace cylinder liner

NOTICE

If leakage of the exhaust occurs, the problems above will occur. Complaints from the customer are often related to these problems.

1. Lack of power.
2. The engine overheats.
3. The coolant is discolored.

Difficulty starting engine

Symptom	Possible cause	Remedy/Prevention
Difficulty starting engine (Electrical system)	Discharged battery	Charge battery
	Defective wiring in starter circuit	Repair wiring of starter
	Loose or open-circuit battery cable	Tighten battery terminal connections or replace battery cable
	Broken glow plug	Replace
Difficulty starting engine (Supply pump)	Defective supply pump Use of poor fuel	Replace the supply pump Use good quality fuel
Difficulty starting engine (Air cleaner)	Clogged element	Replace the element
Difficulty starting engine (Fuel system)	No fuel in tank	Supply fuel
	Clogged fuel line	Clean fuel line
	Air sucked into fuel system through fuel line connections	Tighten fuel line connections
	Clogged fuel filter	Replace element
	Loose connection in high-pressure line	Tighten sleeve nut of high-pressure line
	Water in fuel	Drain and clean fuel system
Difficulty starting engine (Oil system)	Oil viscosity too high	Use proper viscosity oil, or install an oil immersion heater and warm up oil
Difficulty starting engine (Other problems)	Seized piston	Replace piston, piston rings, and liner
	Seized bearing	Replace bearing and/or crankshaft
	Reduced compression pressure	Overhaul engine
	Ring gear damaged or worn	Replace the ring gear and/or starter pinion
	Improperly adjusted or broken	Adjust

Rough idling

Symptom	Possible cause	Remedy/Prevention
Rough idling (Supply pump)	Damaged suction control valve (SCV) Use of poor fuel	Replace the suction control valve (SCV) Use good quality fuel
Rough idling (Injector)	Breakdown of injector Use of poor fuel	Replace the injector Use good quality fuel
Rough idling (Engine proper)	Improper valve clearance	Adjust valve clearance
	Improper contact of valve seat	Replace or repair valve and valve seat
	Idling speed too low	Adjust idling speed
	Coolant temperature too low	Warm up engine
	Compression pressure of cylinders markedly different from one another	Overhaul engine
Rough idling (Other problems)	Clogged high pressure injection line	Replace line
	Leakage due to improper tightening of high pressure fuel line	Tighten sleeve nut
	Engine seizure	Replace pistons, piston rings and liners
	Incorrect valve timing	Replace camshaft

TS01-8

TROUBLESHOOTING

Diesel knock

Symptom	Possible cause	Remedy/Prevention
Diesel knock (Supply pump)	Damaged suction control valve (SCV) Use of poor fuel	Replace the suction control valve (SCV) Use good quality fuel
Diesel knock (Injector)	Breakdown of injector Use of poor fuel	Replace the injector Use good quality fuel
Diesel knock (Fuel system)	Use of poor fuel	Use good quality fuel
Diesel knock (Other problems)	Excessively cooled or heated engine	Warm up or cool engine
	Insufficient air intake	Correct
	Insufficient compression pressure	Repair
	Compression pressure leaks at cylinder head gasket	Replace head gasket
	Improper valve clearance or valve sticking	Adjust or repair
	Tappet sticking	Replace tappet and camshaft

Unusual engine noise

Symptom	Possible cause	Remedy/Prevention
Unusual engine noise (Piston)	Wear of piston pin boss or piston pin	Replace piston and/or piston pin
	Seized, damaged, or worn piston pin bushing	Replace piston pin bushing
	Worn pistons or cylinder liners	Replace piston or cylinder liner
	Damaged or seized piston	Replace piston and cylinder liner
	Foreign matter on top surface of the piston	Remove foreign matter and repair or replace piston, cylinder liner, and/or cylinder head
Unusual engine noise (Valve mechanism)	Incorrect valve clearance	Adjust valve clearance
	Valve cotter out of place	Replace valve cotter
	Seized valve stem	Replace valve and valve guide
	Broken valve	Replace valve
	Damaged rocker arm support	Replace rocker arm support
	Broken valve spring	Replace valve spring
Unusual engine noise (Bearings seizure)	Insufficient lubricating oil	Add oil
	Excessive or insufficient tightening of bearing housings	Retighten to specified torque
	Pits and scratches on bearing surface	Replace bearing and crankshaft
	Oil film formed on back of bearing	Replace bearing
	Improper installation of bearing	Replace bearing
	Reduction of spread dimension of bearing	Replace bearing
	Distorted bearing housing	Replace or correct bearing housing
	Excessive oil clearance	Replace bearing

TROUBLESHOOTING

TS01-9

Symptom	Possible cause	Remedy/Prevention
Unusual engine noise (Various other parts)	Exhaust gas leakage from exhaust pipe joints	Retighten joints
	Loosen or missing intake manifold flange gasket	Retighten or replace
	Intake valve seating is not concentric	Replace or correct the valve and valve seat
	Intake gas leakage	Retighten
Unusual engine noise (Other problems)	Loose cooling fan mounting bolts or fan pulley nut	Tighten the fan and crankshaft pulley
	Lack of lubricating oil (coolant pump, valves, etc.)	Lubricate
	Worn timing gear	Replace the timing gear
	Breakage of turbine or blower	Replace turbocharger

NOTICE

The items on this page concern unusual engine noise which is due to causes other than those given for diesel knock.

ENGINE ASSEMBLY (COMMON RAIL SYSTEM)

EN70ZZZ10F300002

Engine does not start

Symptom	Possible cause	Remedy/Prevention
Engine does not start (Fuel not reaching supply pump)	Fuel lines clogged or damaged	Clean or replace fuel lines
	Fuel filter clogged	Clean or replace the filter element
	Air in fuel caused by improper connections of fuel line between fuel tank and feed pump	Repair connections
	Filter incorporated in inlet side of feed pump clogged	Remove foreign material
	Breakdown feed pump	Replace the supply pump
Engine does not start (Fuel reaching supply pump)	Leakage due to improper tightening of high pressure fuel line	Tighten sleeve nut
	Breakdown ECU	Replace the ECU
Engine does not start (Injector faulty)	Injector broken	Replace the injector
Engine does not start (Electrical system)	Defective sensors or circuits	Refer to the chapter "FUEL CONTROL".
Engine starts and stops	Fuel lines clogged	Clean or replace fuel lines
	Air in fuel caused by damaged fuel lines or improper connection of fuel lines	Repair fuel lines or replace fuel lines and gaskets
Engine has low power (Injector faulty)	Injector broken	Replace the injector
Engine has low power (Electrical system)	Defective sensors or circuits	Refer to the chapter "FUEL CONTROL".

Excessive smoke

Symptom	Possible cause	Remedy/Prevention
Excessive smoke (Black smoke)	Defective sensors or circuits	Refer to the chapter "FUEL CONTROL".
	Defective injector	Replace the injector
Excessive smoke (White smoke)	Water in fuel	Check and clean fuel lines
	Glow plug not operating	Check glow plug circuit

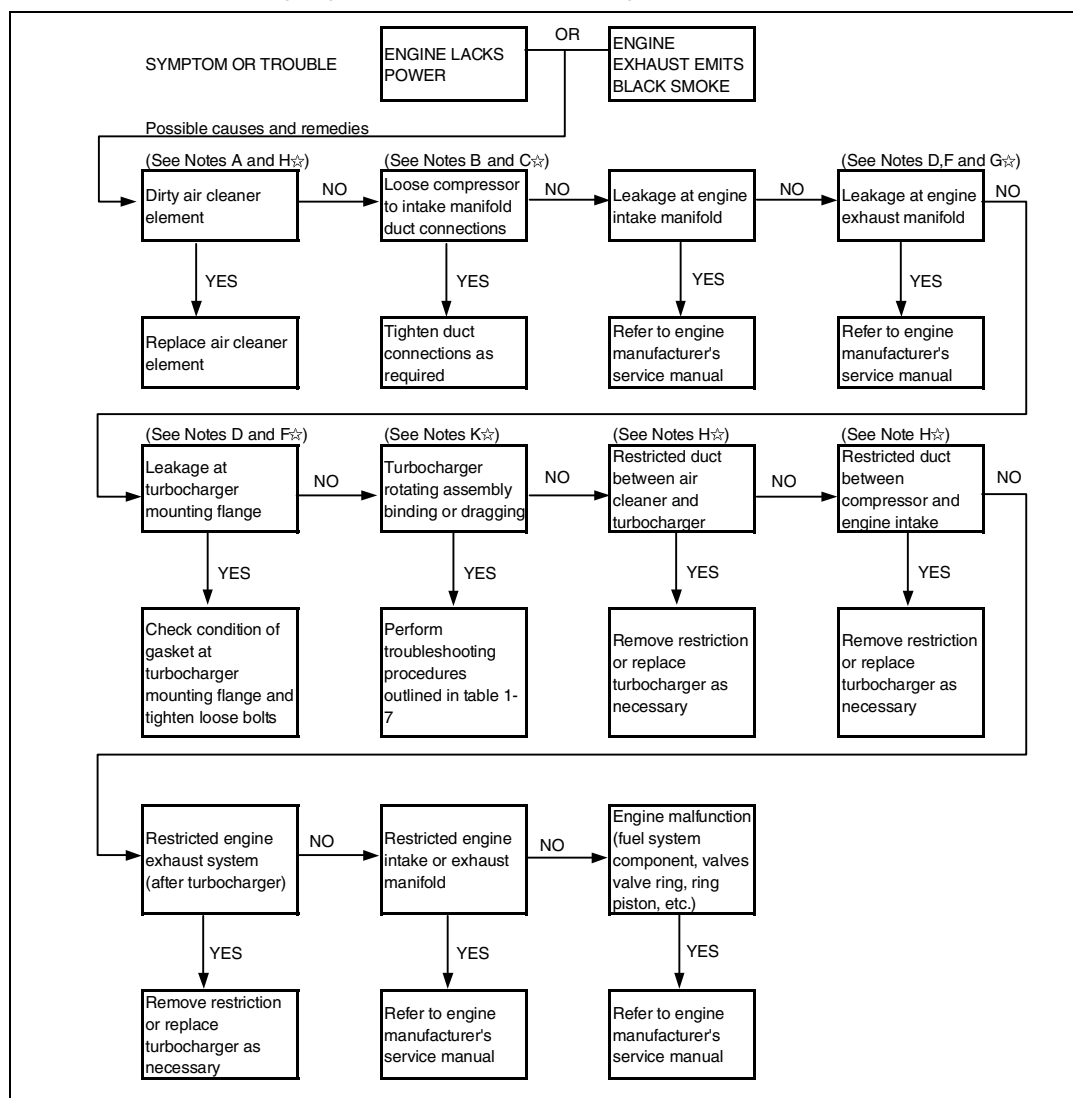
Low idle speed irregular

Symptom	Possible cause	Remedy/Prevention
Low idle speed irregular	Defective sensors or circuits	Refer to the chapter "FUEL CONTROL".
	Defective injector	Replace the injector

TURBOCHARGER (J08E)

TURBOCHARGER

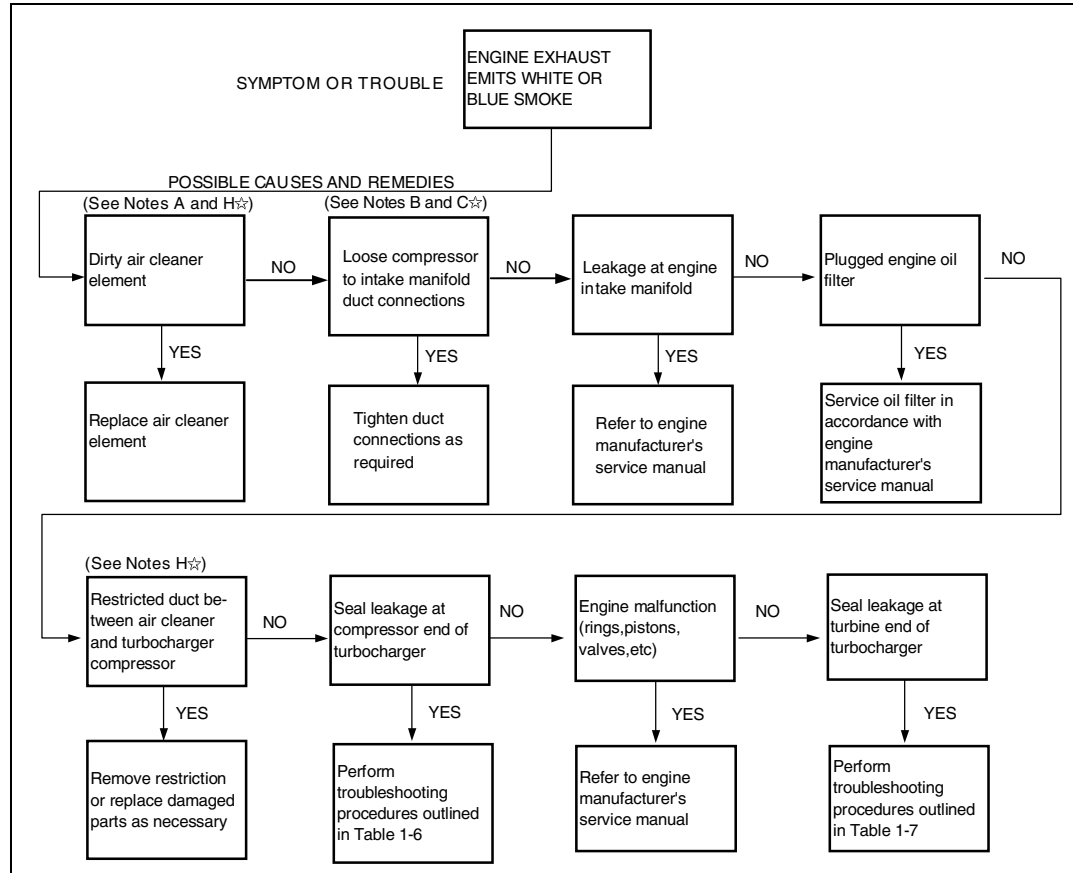
EN70ZZZ10F300003

1. Table 1-1 Troubleshooting-Engine Exhaust Lacks Power or Engine Exhaust Emits Black Smoke

SAPH70ZZZ1000001

☆ Shown on Table 1-9

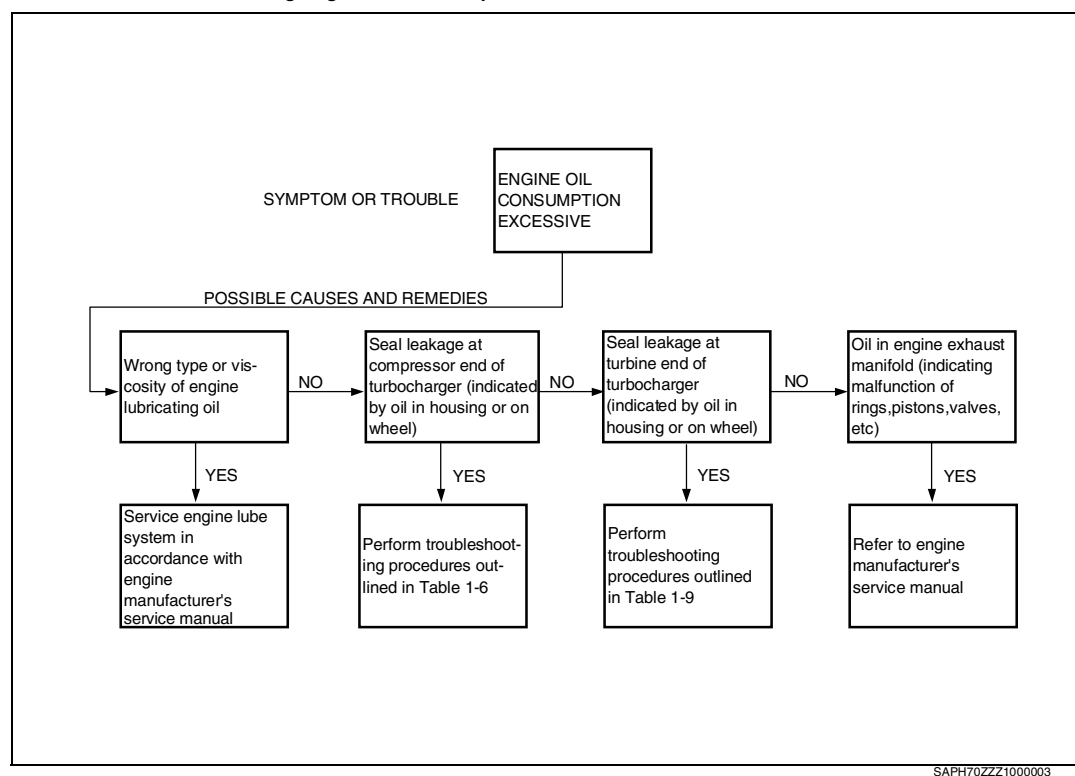
2. Table 1-2 Troubleshooting Engine Exhaust Emits WHITE or BLUE SMOKE



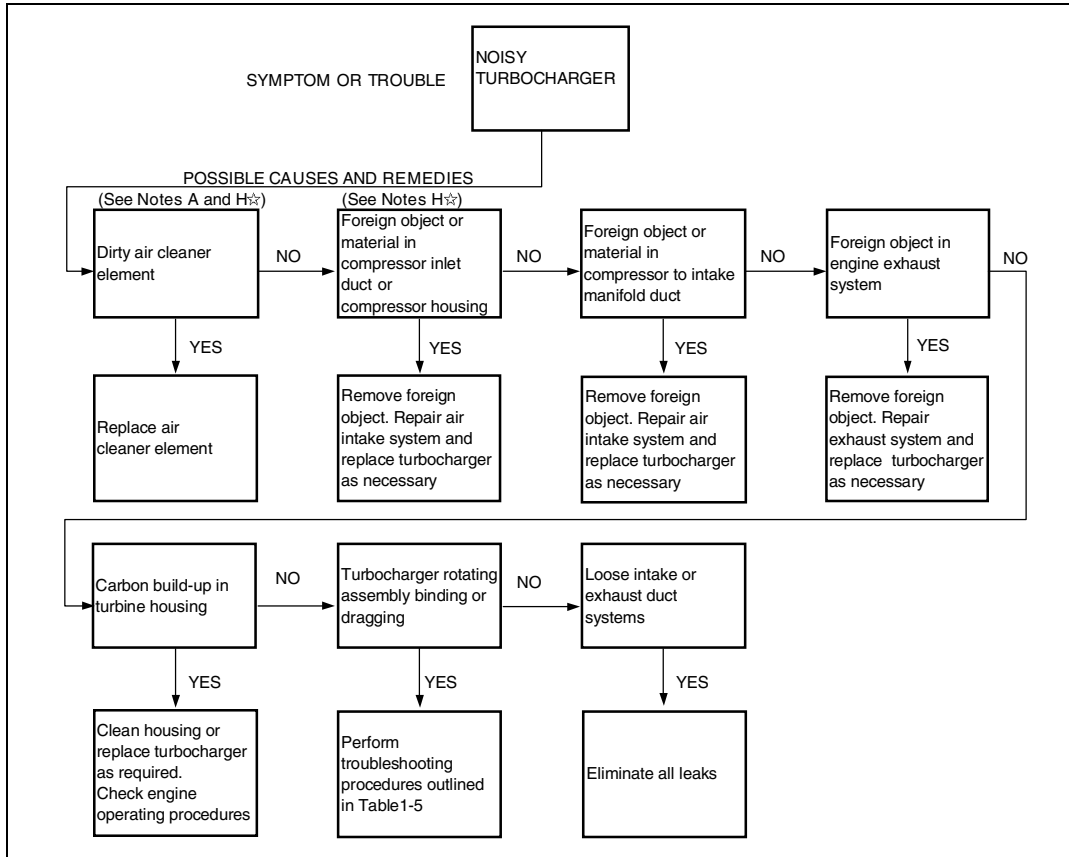
SAPH70ZZ1000002

☆ Shown on Table 1-9

3. Table 1-3 Troubleshooting Engine Oil Consumption Excessive

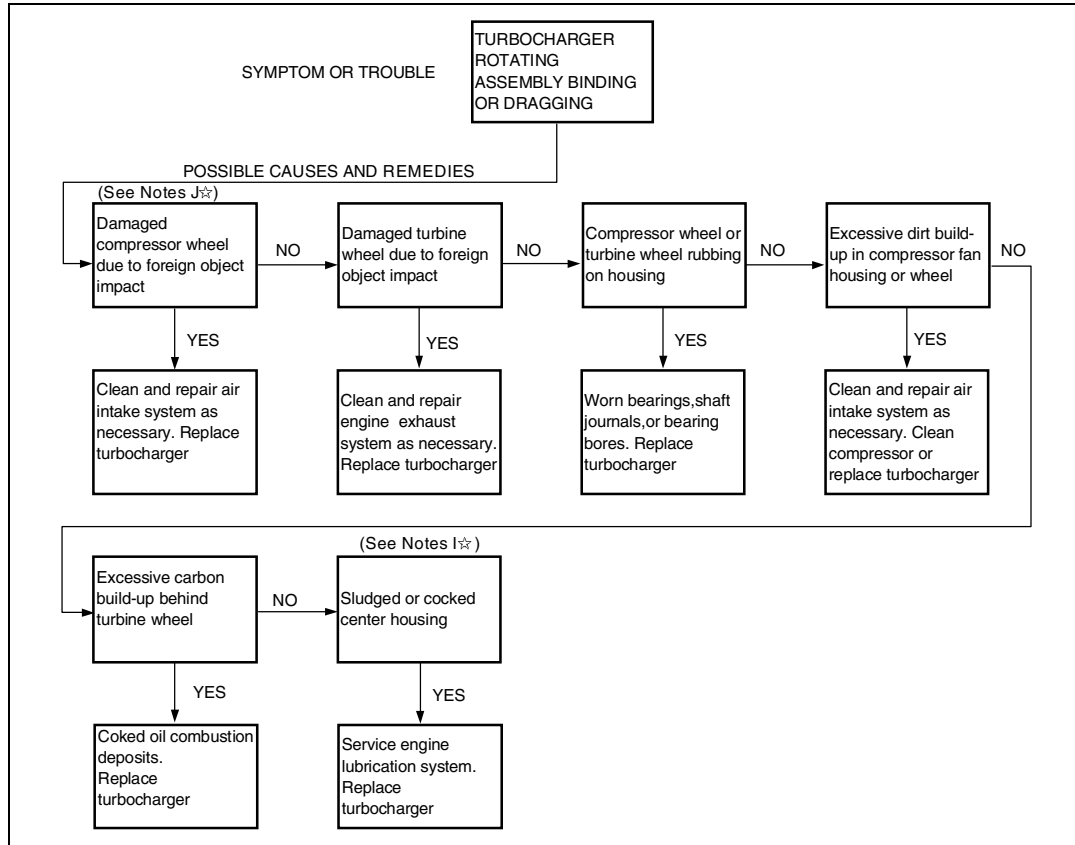


4. Table 1-4 Troubleshooting Noisy Turbocharger



☆ Shown on Table 1-9

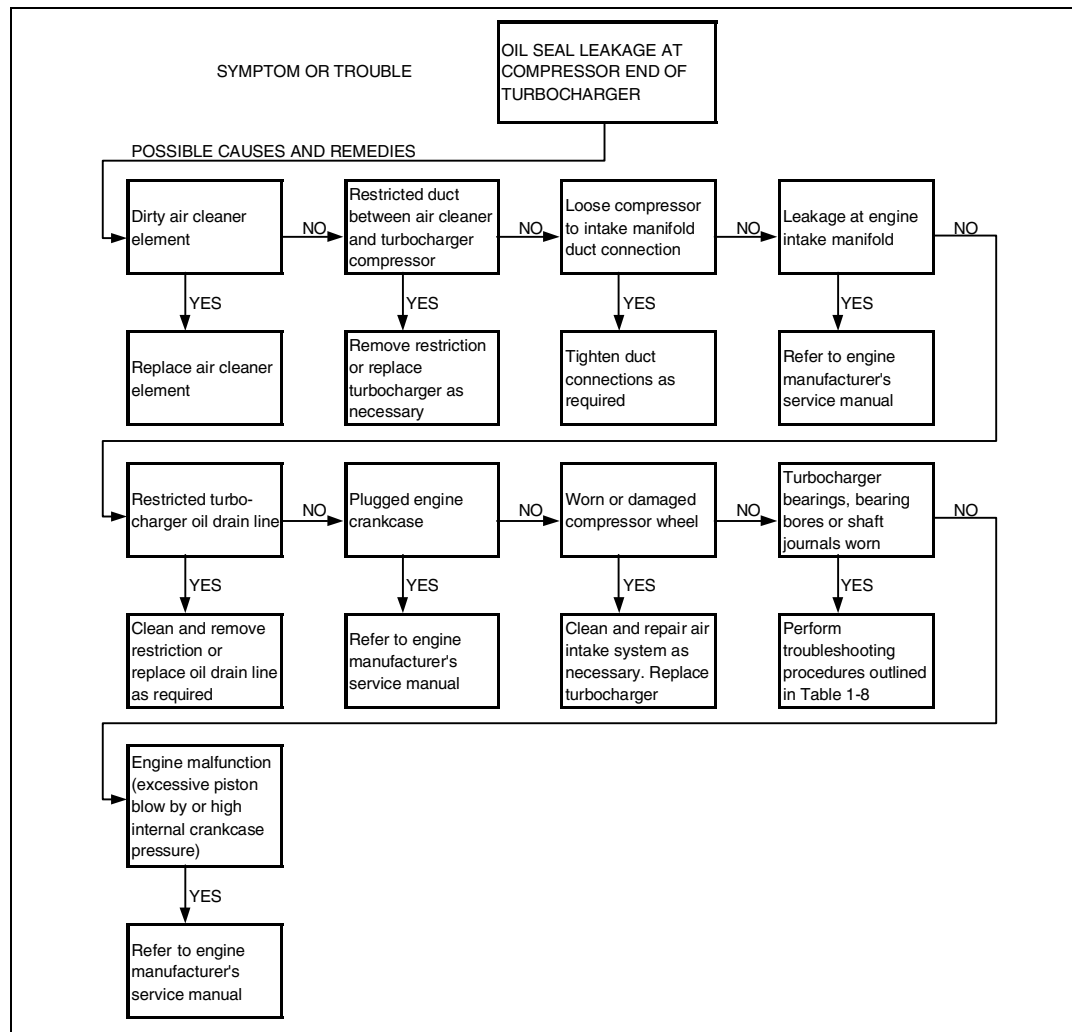
5. Table 1-5 Troubleshooting Turbocharger Rotating Assembly Binding or Dragging



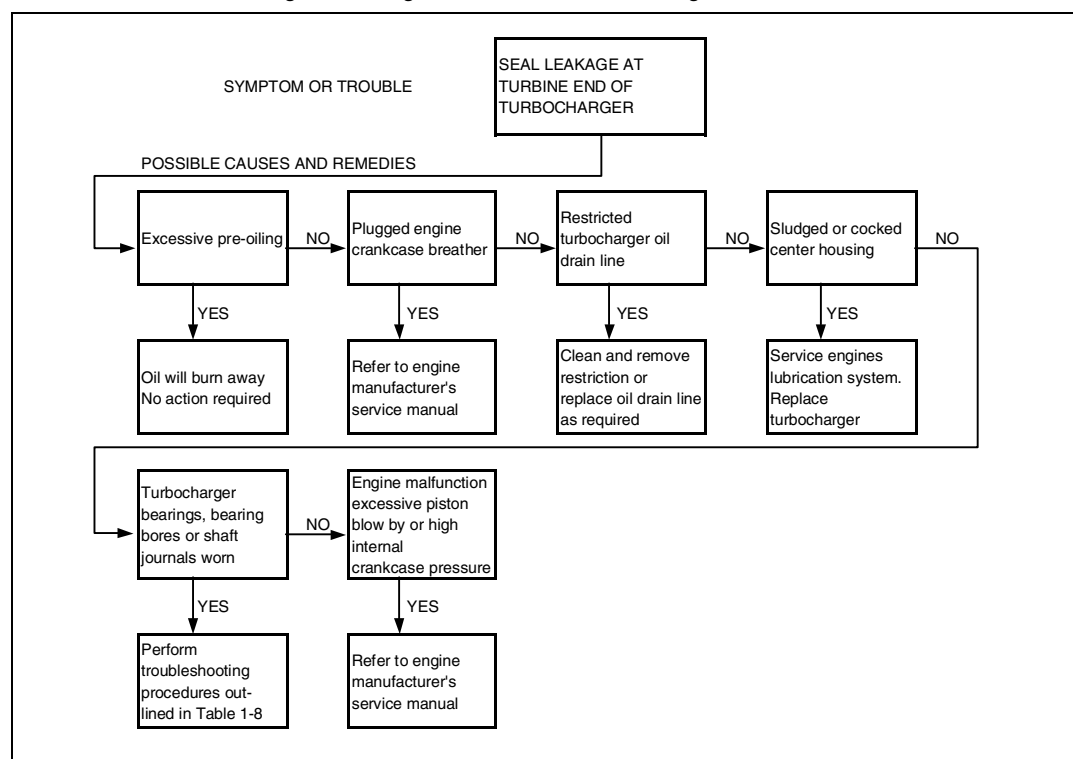
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6. Table 1-6 Troubleshooting-Seal Leakage at Compressor End of Turbocharger

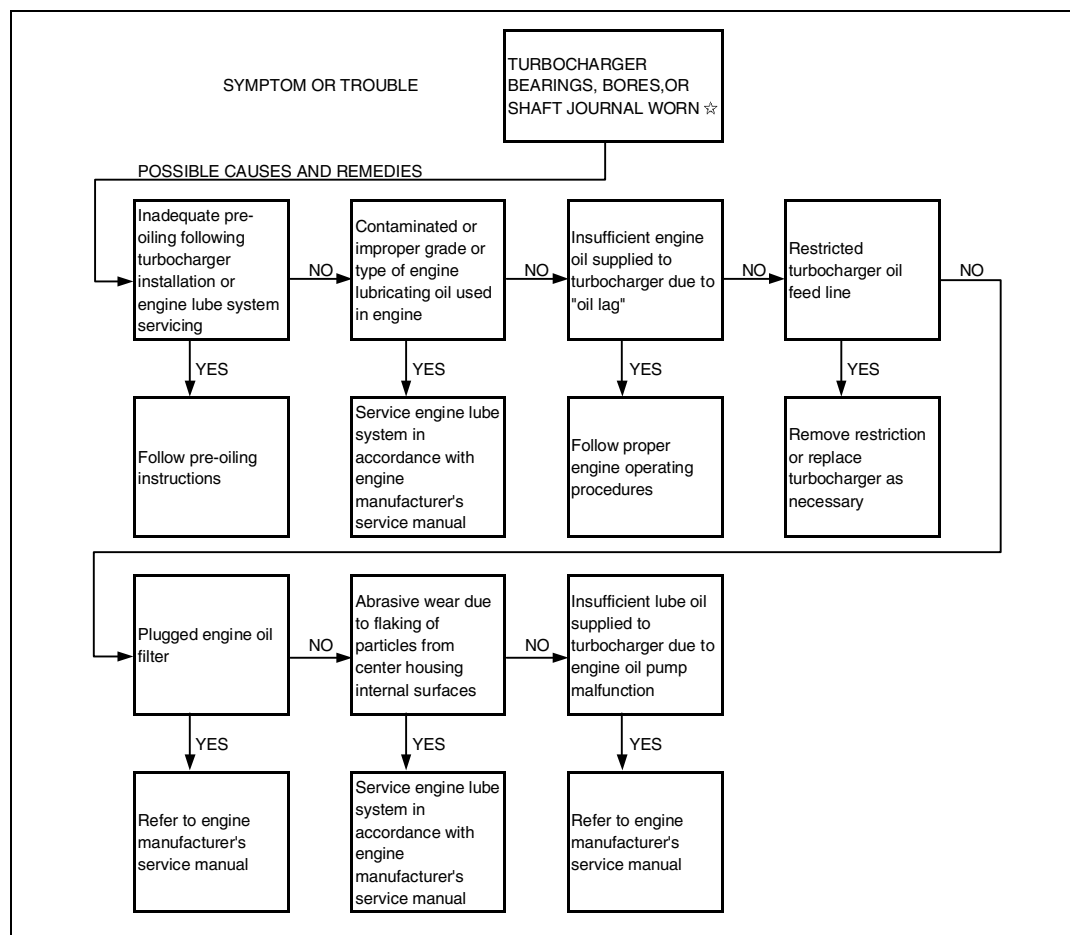


7. Table 1-7 Troubleshooting-Seal Leakage at Turbine End of Turbocharger



SAPH70ZZZ1000007

8. Table 1-8 Troubleshooting-Turbocharger Bearings, Bores, or Journals are Worn



SAPH70ZZ1000008

☆ Replace turbocharger, then use this table to determine cause of failure.

9. Table 1-9 Troubleshooting Procedures Notes

A	Refer to engine manufacturer's service manual for inspection requirements and replacement specifications.
B	With engine stopped, check duct clamping devices for tightness.
C	With engine running at idle speed, lightly spray duct connections with starting fluid. Leaks at connections will be indicated by an increase in engine speed due to the starting fluid being drawn into the compressor and pumped into the engine combustion chambers.
D	With engine running at idle speed, check duct connections for leaks by applying lightweight oil or liquid soap to areas of possible leakage and checking for bubbles. Exhaust gas leakage between the engine block and the turbocharger inlet will also create a noise level change.
E	With engine running at idle speed, check for unusual noise and vibration. If either condition is noted, shut down the engine immediately to protect the turbocharger and engine from further damage. With the engine stopped, check the turbocharger shaft wheel assembly for damage as outlined Note I, below.
F	With engine running, a change in the noise level to a higher pitch can indicate air leakage between the air cleaner and the engine or a gas leak between the engine block and the turbocharger inlet.
G	Exhaust gas leakage may be indicated by hat discoloration in the area of the leak.
H	With the engine running, noise level cycling from one level to another can indicate a plugged air cleaner, a restriction in the air-cleaner to compressor duct, or a heavy build-up of dirt in the compressor housing or on the compressor wheel.
I	Internal inspection of the center housing can be accomplished by removing the oil drain line and looking through the oil drain opening. When a slugged or cocked condition exists, a heavy sludge build-up will be seen on the shaft between the bearing journals and in the center housing from the oil drain opening back to the turbine end.
J	Thorough cleaning of the air intake system is essential following compressor wheel damage due to foreign object impact. In many cases, metal pieces from the wheel become imbedded in the air cleaner element. If the element is not changed, these metal pieces can be drawn into the replacement turbocharger and cause it to fail in the same manner as the original unit.
K	With the air inlet and exhaust gas ducting removed from the turbocharger, examine both the compressor and turbine wheels for blade damage. Examine the outer blade tip edges for evidence of rubbing on housing surfaces.

- Turn the rotating assembly by hand and feel for dragging or binding. Push the rotating assembly side-ways while rotating to feel for wheel rub. If there is any indication of rubbing, perform the bearing clearance inspection procedure. If the rotating assembly rotates freely and there is no evidence of binding or rubbing, it can be assumed that the turbocharger is serviceable.

ALTERNATOR (J08E: REMY 12V-130A,135A,180A)

ALTERNATOR

EN70ZZZ10F300004

Symptom	Possible cause	Remedy/Prevention
Charge warning light does not light with starter switch ON and engine off	Fuse blown	Determine cause and replace fuse
	Light burned out	Replace light
	Wiring connection loose	Tighten loose connections
	IC regulator faulty	Replace IC regulator
Charge warning light does not go out with engine running (Battery requires frequent recharging)	Drive belt loose or worn	Adjust or replace drive belt
	Battery cables loose, corroded or worn	Repair or replace cables
	Fuse blown	Determine cause and replace fuse
	Fusible link blown	Replace fusible link
	IC regulator or alternator faulty	Check charging system
	Wiring faulty	Repair wiring

STARTER (J08E)

STARTER

EN70ZZ10F300005

Symptom	Possible cause	Remedy/Prevention
Engine does not crank, or cranks slowly. (Starter switch)	Poor contact	Replace the starter switch.
Engine does not crank, or cranks slowly. (Battery)	Discharged battery	Charge.
	Short circuited between electrodes	Replace battery.
	Poor contact at battery terminal	Clean or retighten.
Engine does not crank, or cranks slowly. (Engine oil)	Improper viscosity oil	Change oil.
Engine does not crank, or cranks slowly. (Magnetic switch)	Poor contact caused by burnt contact plate	Replace the magnetic switch assembly.
	Contact plate worn out	Replace the magnetic switch assembly.
	Holding coil disconnected (Overrunning clutch moves back and forth)	Replace the magnetic switch assembly.
	Pull-in coil disconnected or short circuited	Replace the magnetic switch assembly.
Engine does not crank, or cranks slowly. (Starter relay)	Defective or poor contact	Repair or replace the starter relay.
Engine does not crank, or cranks slowly. (Starter)	Brush worn out	Replace.
	Commutator burnt out	Replace the armature assembly.
	Commutator worn out	Replace the armature assembly.
	Field winding shorted or grounded	Replace the yoke assembly.
	Armature winding shorted or grounded	Replace the armature assembly.
	Insufficient brush spring tension	Replace the brush spring.
	Poor contact between magnetic switch and field windings	Repair.
	Armature contact pole core because of worn bearing bushing or bent armature shaft	Replace the end frame or armature assembly.
	Overrunning clutch malfunction	Replace.
Engine does not crank while starter is running in good condition. (Overrunning clutch)	Overrunning clutch malfunction	Replace.
	Pinion teeth worn out	Replace.
	Poor sliding of spline teeth	Remove foreign particles, dirt or replace.
Starter does not stop running. (Starter switch)	Contacts keep closing	Replace.
	Key switch sticks	Replace.
	Overrunning clutch sticks to armature	Repair or replace overrunning or armature.
Starter does not stop running. (Starter relay)	Contacts keep closing	Repair or replace.

AIR COMPRESSOR (J08E: 340 cm³)

AIR COMPRESSOR

EN70ZZZ10F300006

Symptom	Possible cause	Remedy/Prevention
Charging efficiency dropped (Valve)	Abnormal wear, damage, or poor contact	Replace.
Charging efficiency dropped (Piston, cylinder liner and piston rings)	Worn piston and cylinder liner	Replace.
	Seized piston	Replace (piston, piston rings and cylinder liner).
	Worn or broken piston ring	Replace.
Charging efficiency dropped (Air pipe and joints)	Leakage of high-pressure air	Replace or tighten pipe joint.
	Clogged air pipe	Replace.
Charging efficiency dropped (Air cleaner)	Clogged element	Clean or replace element.
Noisy operation (Piston)	Wear of piston pin boss or piston pin	Replace.
	Seized, damaged or worn connecting rod small end	Replace.
	Worn piston or cylinder liner	Replace.
	Damaged or seized piston	Replace.
	Foreign particles on the top surface of piston	Clean or replace.
Noisy operation (Bearing)	Damaged, or worn ball bearing and/or connecting rod bearing	Replace.
Excessive carbon or oil in the compressor cylinder head or discharge line (Piston ring)	Worn, sticking or broken piston rings	Replace piston rings and/or cylinder liner.
	Insufficient piston ring tension	Replace piston rings and/or cylinder liner.
	Malfunction of piston rings	Replace piston rings and/or cylinder liner.
Excessive carbon or oil in the compressor cylinder head or discharge line (Cylinder liner and piston rings)	Worn cylinder liner and piston rings	Replace.

CLUTCH MAIN UNIT (EATON 1401)

CLUTCH ASSEMBLY (EATON SAS1401)

EN70ZZ10F300007

Symptom	Possible cause	Remedy/Prevention
Clutch dragging.	Clutch disc distorted or warped.	Replace clutch disc.
	Transmission input shaft worn.	Replace input shaft and check clutch hub for excessive wear. If worn, replace disc. Check flywheel housing alignment.
	Excessive clutch control parts wear.	Replace control parts.
	Clutch control parts not functioning properly.	Replace control parts.
	Improper clutch control adjustment.	Adjust clutch control.
	Clutch disc assembly too thick.	Replace clutch disc.
Clutch slipping.	Release lever and release bearing clearance incorrectly adjusted.	Adjust clearance.
	Clutch disc facing gummed with oil or grease.	Replace disc assembly.
	Release bearing worn.	Replace bearing.
	Clutch pedal free-play incorrectly adjusted.	Adjust free-play.
	Compression spring weak.	Replace cover assembly.
	Clutch facing worn.	Replace disc assembly.
	Failing to remove plate from the clutch pressure plate assembly.	Remove plate.
	Driver riding clutch pedal.	Do not ride the clutch pedal.
Vehicle vibrates when starting.	Improper engine idling.	Adjust idling.
	Clutch control incorrectly adjusted.	Adjust clutch control
	Clutch disc facing gummed with oil or grease.	Replace disc assembly.
	Glazed flywheel friction surface.	Deglaze flywheel surface with coarse emery cloth, stroking parallel to machining lines.
	Clutch disc distorted or warped.	Replace disc.
	Improper clutch cover tightening.	Tighten bolts.
	Flywheel housing misalignment.	Replace flywheel housing.
Abnormal noise in transmission.	Malfunction of engine.	Tune up engine.
	Improper clutch disc used.	Replace proper clutch disc.
	Trouble in transmission.	Check transmission.
	The engine idle speed is low.	Increase the idle speed.

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TROUBLESHOOTING

Symptom	Possible cause	Remedy/Prevention
Noisy clutch.	Release bearing worn or dried.	Replace release bearing.
	Pilot bearing worn or dried.	Replace pilot bearing.
	Clutch disc distorted or warped.	Replace clutch disc.
	Flywheel housing misalignment.	Replace flywheel housing.
	Transmission input shaft or clutch disc spline worn.	Clean and lubricate or replace.
	Insufficient lubrication of pedal and its accessories.	Lubricate.
	Insufficient lubrication of release shaft and release bearing hub.	Lubricate.
	Transmission input shaft retainer rusted or soiled.	Clean or replace if rusted.
	Clutch pedal free-play incorrectly adjusted.	Adjust free-Play.
Clutch pedal cannot be depressed.	Clutch control incorrectly adjusted.	Adjust clutch control.
	Insufficient lubricant release shaft and release bearing hub.	Lubricate.
Change in clutch pedal give.	Air trapped in clutch fluid.	Bleed air.

CLUTCH MAIN UNIT (EATON 1402)

CLUTCH ASSEMBLY (EATON SAS1402)

EN70ZZ10F300008

Symptom	Possible cause	Remedy/Prevention
Clutch dragging.	Clutch disc distorted or warped.	Replace clutch disc.
	Transmission input shaft worn.	Replace input shaft and check clutch hub for excessive wear. If worn, replace disc. Check flywheel housing alignment.
	Excessive clutch control parts wear.	Replace control parts.
	Clutch control parts not functioning properly.	Replace control parts.
	Improper clutch control adjustment.	Adjust clutch control.
	Clutch disc assembly too thick.	Replace clutch disc.
Clutch slipping.	Release lever and release bearing clearance incorrectly adjusted.	Adjust clearance.
	Clutch disc facing gummed with oil or grease.	Replace disc assembly.
	Release bearing worn.	Replace bearing.
	Clutch pedal free-play incorrectly adjusted.	Adjust free-play.
	Compression spring weak.	Replace cover assembly.
	Clutch facing worn.	Replace disc assembly.
	Failing to remove plate from the clutch pressure plate assembly.	Remove plate.
	Driver riding clutch pedal.	Do not ride the clutch pedal.
Vehicle vibrates when starting.	Improper engine idling.	Adjust idling.
	Clutch control incorrectly adjusted.	Adjust clutch control.
	Clutch disc facing gummed with oil or grease.	Replace disc assembly.
	Glazed flywheel friction surface.	Deglaze flywheel surface with coarse emery cloth, stroking parallel to machining lines.
	Clutch disc distorted or warped.	Replace disc.
	Improper clutch cover tightening.	Tighten bolts.
	Flywheel housing misalignment.	Replace flywheel housing.
Abnormal noise in transmission.	Malfunction of engine.	Tune up engine.
	Improper clutch disc used.	Replace proper clutch disc.
	Trouble in transmission.	Check transmission.
	The engine idle speed is low.	Increase the idle speed.

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TROUBLESHOOTING

Symptom	Possible cause	Remedy/Prevention
Noisy clutch.	Release bearing worn or dried.	Replace release bearing.
	Pilot bearing worn or dried.	Replace pilot bearing.
	Clutch disc distorted or warped.	Replace clutch disc.
	Flywheel housing misalignment.	Replace flywheel housing.
	Transmission input shaft or clutch disc spline worn.	Clean and lubricate or replace.
	Insufficient lubrication of pedal and its accessories.	Lubricate.
	Insufficient lubrication of release shaft and release bearing hub.	Lubricate.
	Transmission input shaft retainer rusted or soiled.	Clean or replace if rusted.
	Clutch pedal free-play incorrectly adjusted.	Adjust free-Play.
Clutch pedal cannot be depressed.	Clutch control incorrectly adjusted.	Adjust clutch control.
	Insufficient lubricant release shaft and release bearing hub.	Lubricate.
Change in clutch pedal give.	Air trapped in clutch fluid.	Bleed air.

CLUTCH MAIN UNIT (EATON MD DM)

CLUTCH ASSEMBLY (EATON MD DM)

EN70ZZZ10F300009

NOTICE

When diagnosing transmission problems, refer to the Eaton Shop Manual or troubleshooting procedures for detailed information on items that could be causing the problem.

AUTOMATIC TRANSMISSION (ALLISON 2200RDS, 2500RDS, 2200HS)

AUTOMATIC TRANSMISSION ASSEMBLY

EN70ZZZ10F300010

NOTICE

When diagnosing transmission problems, refer to the Allison Shop Manual or troubleshooting procedures for detailed information on items that could be causing the problem.

AUTOMATIC TRANSMISSION (3000RDS)

AUTOMATIC TRANSMISSION ASSEMBLY

EN70ZZZ10F300011

NOTICE

When diagnosing transmission problems, refer to the Allison Shop Manual or troubleshooting procedures for detailed information on items that could be causing the problem.

TRANSMISSION/TRANSFER CONTROL (EATON MANUAL TRANSMISSION)

TRANSMISSION CONTROL UNIT

EN70ZZZ10F300012

1. MANUAL TRANSMISSION

Symptom	Possible cause	Remedy/Prevention
Unable to shift the gear or very difficult to shift when the engine is turned off.	Damaged shift lever assembly	Replace shift lever.
	Damaged or broken transmission upper cover (lever, spring, etc.)	Replace.
	The looseness of tightening bolt and nut	Inspect and tighten each bolt and nut.
Gear disengages when driving on bumpy roads.	Loose control lever joint	Tighten or replace.
The play of the lever is excessive.	A joint is seriously worn	Replace the joint.
	The looseness of tightening bolt and nut	Inspect and tighten each bolt and nut.

TRANSMISSION/TRANSFER CONTROL (ALLISON AUTOMATIC TRANSMISSION)

TRANSMISSION CONTROL UNIT

EN70ZZZ10F300013

1. AUTOMATIC TRANSMISSION

- (1) Allison 2200RDS, 2200HS, 2500RDS auto-transmission problem, refer to the Allison shop manual or troubleshooting procedures for detailed information on items that could be causing the problem.

PROPELLER SHAFT (SPL 100, 140)

PROPELLER SHAFT ASSEMBLY

EN70ZZZ10F300014

Symptom	Possible cause	Remedy/Prevention
Abnormal vibration when driving.	Looseness of universal joint yoke and flange tightening nuts.	Tighten the nuts.
	Looseness of universal joint flange lock nut.	Replace the lock nut with new one, then tighten the lock nut with specified torque and caulk the nut securely.
	Excessively bent propeller shaft.	Replace the shaft.
	Worn or damaged universal joint.	Replace the universal joint.
	Worn or damaged center bearing.	Replace the bearing.
	Worn or damaged center bearing rubber cushion.	Replace the rubber cushion.
	Incorrect phasing of the yokes.	Match the phasing arrows correctly.

DIFFERENTIAL CARRIER (MERITOR RS-17.19.21&23)

DIFFERENTIAL CARRIER ASSEMBLY

EN70ZZ10F300015

Symptom	Possible cause	Remedy/Prevention
Abnormal noise (Bearing system)	Worn or damaged pinion bearings	Replace bearings.
	Worn or damaged differential side bearings	Replace bearings.
	Loose pinion bearings	Adjust bearing preload.
	Loose differential side bearings	Adjust bearing preload.
Abnormal noise (Gear system)	Inadequate backlash on ring gear and pinion gear	Adjust backlash.
	Worn thrust washers	Replace.
	Worn differential spider	Replace.
	Worn or damaged ring gear and pinion	Replace.
	Worn or damaged differential side gear and pinion	Replace.
	Loose ring gear bolts	Tighten bolts.
	Inadequate tooth contact of ring gear and pinion gear	Replace or adjust tooth contact.
	Worn opinion spline	Replace.
Abnormal noise (rear axle system)	Worn rear axle shaft spline	Replace.
	Worn hub bearings	Replace.
	Loose hub bearings	Adjust bearing preload.
	Loose differential case tightening bolts	Tighten bolts.
Abnormal noise (Oil system, etc.)	Insufficient oil	Add oil, check for leakage.
	Poor oil quality	Change oil.
	Abnormal propeller shaft noise	Refer to chapter " PROPELLER SHAFT ".

BRAKE EQUIPMENT (MODELS WITH HYDRAULIC BRAKE)

SERVICE BRAKE ASSEMBLY

EN70ZZZ10F300016

Symptom	Possible cause	Remedy/Prevention
No response upon working the pedal or there is the feeling of stepping on sponge (Air trapped in the brake lines)	Insufficient seal of master cylinder secondary cup	Replace master cylinder assembly.
	Insufficient air bleeding	Bleed air from brake line.
No response upon working the pedal or there is the feeling of stepping on sponge	Vapor lock in brake system	Bleed air from brake.
	Leakage of fluid from brake system	Tighten further or replace gasket, O-ring, cup, etc.
	Poor quality brake fluid or improper fluid (low boil point)	Drain the system, flush and refill with the recommended fluid.
Brake fluid decreases	Leakage of brake fluid from brake system	Tighten further or replace gasket, O-ring, etc.
	Leakage of brake fluid from master cylinder	Replace master cylinder assembly.
	Worn pad	Replace pad if it is worn to limit. Refill brake fluid.
Excessive pedal travel (though there is response upon working the pedal)	Insufficient brake fluid in the master cylinder	Search the cause of insufficient fluid, repair or replace it. Then refill fluid and bleed air.
	Air trapped in the brake lines	Bleed air from brake lines.
	Leakage of fluid from brake system	Check the leak point, repair or replace.
	Poor quality brake fluid or improper fluid	Drain the system, flush and refill with the recommended fluid.
	Contamination of the brake fluid	Replace the brake system and refill with the recommended fluid.
	Insufficient seal of the master cylinder cup	Replace master cylinder assembly.
Unequal or unstable braking	Pad is wet with grease or fluid	Replace the pad.
	Defective pad material (improper combination)	Replace the pad.
	Non-uniform pad contact	Correct.
	Excessive abrasion loss of rotors	Correct or replace.
	Distorted rotors	Correct or replace.
	Loose hub bearing	Adjust or replace the bearing.
	Improper or unequal pneumatic pressure of tire	Adjust to proper pneumatic pressure.
	Clogging of brake system	Replace, the pipe, hose, etc.
	Abnormal piston operation of the disc brake	Check the piston seal.

TROUBLESHOOTING

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Symptom	Possible cause	Remedy/Prevention
Brake drags or does not release	Improper return of master cylinder piston	Replace master cylinder assembly.
	Clogging of brake system	Replace the pipe, hose, etc.
	Constricted master cylinder reservoir vent	Clean vent passage in reservoir cap.
	Self applied booster (fluid flow too high)	Repair or replace power steering pump.
	Soft or swollen master cylinder seals due to brake fluid contamination	Flush out old brake fluid then replace master cylinder and add new brake fluid.
	Clogging compensating valve of master cylinder	Replace master cylinder assembly.
	Improper return of brake pedal	Repair or replace.
	Improper return of brake booster piston	Replace booster assembly.
	Improper installation pad	Check the installed condition of the pad. Repair.
	Improper return of caliper piston	Repair or replace.
Not enough braking, or too much pedal resistance (Wheel brake and rotor)	Pad is wet with grease or fluid	Replace the pad.
	Improper contact of rotor and pad	Correct.
	Improper pad material or glazed pad	Correct.
	Deformation or hardening of rotor	Correct or replace.
	Excessively worn pad	Replace.
	Glazed rotor	Correct.
Not enough braking, or too much pedal resistance (Control system pipings)	Leakage of brake fluid from brake system	Tighten further or replace gasket.
Not enough braking, or too much pedal resistance (Lack of power steering pump pressure)	Improper operation of power steering pump	Repair or replace.
	Clogging of brake system	Replace pipe, hose, etc.
Not enough braking, or too much pedal resistance (Not enough power steering pump pressure or rise of power steering pump pressure)	Check the pipe joints for tightness	Repair.
	There is a rupture or twist in the pipe leading to the power steering pump	Replace.
	The hose is ruptured or collapsed	Replace.
	Power steering pump relief valve setting too low	Replace power steering pump.
	Fluid contamination	Drain, flush and refill system, replace booster or master cylinder as appropriate and power steering reservoir filter as necessary.
Not enough braking, or too much pedal resistance	Lack of brake fluid	Supply brake fluid periodically.
	Improper power steering pump	Replace.
	Stuck piston in the master cylinder	Replace master cylinder assembly.
	Insufficient power steering fluid	Refill to proper level.
	Air trapped in the power steering fluid or brake fluid	Search the cause, refill the fluid and bleed air.
	Binding brake pedal linkage	Overhaul and lubricate.
	Worn or damaged brake booster	Replace booster assembly.
	Leakage around the check ball in the backup pump	Replace the backup pump.

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TROUBLESHOOTING

Symptom	Possible cause	Remedy/Prevention
Brake squeal	Improper pad material or glazed pad	Replace pad.
	Pad back plate contact with rotor	Replace pad.
	Deformation or wear of rotor	Repair or replace.
	Intrusion of foreign matter between rotor and pad	Clean the surface of pad or replace.
	Loose hub bearing	Adjust or replace bearing.
	Hardening of pad surface	Replace pad.
	Different pad	Replace proper pad.
	Rotor is wet with grease, fluid and dust	Check the leakage position and repair. Clear the rotor.
Impossible to bleed air completely	Piston cup of master cylinder sucks in air	Replace master cylinder assembly.
	Improper tightness of joints of brake system	Tighten further or replace gasket.
Pulsating brake pedal	ABS operation	Feature of ABS operation (No problem).
	Wheel bearings loose or worn	Readjust or replace.
	Excessive rotor thickness variation	Repair or replace.
Decreasing pedal travel	Clogging of the compensating valve of master cylinder	Replace master cylinder assembly.
	Swollen pressure seals of master cylinder	Replace master cylinder assembly.
	Improper return of the master cylinder piston	Replace master cylinder assembly.
Delay pedal return	Broken return spring	Replace master cylinder assembly.
	Restricted fluid return line of the power steering or hydraulic pump	Remove the obstruction and replace the line.
	Swollen power piston seal of the booster	Replace booster assembly.
Backup pump operates continuously	Abnormal brake switch	Replace.
	Abnormal monitor module	Replace.
	Abnormal relay	Replace.
	Abnormal flow switch	Remove switch components, clean and inspect for damage or contamination and replace if necessary.
	Binding pedal linkage	Disassemble and lubricate.
Backup pump does not operate	Abnormal brake switch	Replace.
	Abnormal monitor module	Replace.
	Abnormal relay	Replace.
	Abnormal flow switch	Remove switch components, clean and inspect for damage or contamination and replace if necessary.
	Binding pedal linkage	Disassemble and lubricate.
	Abnormal backup pump	Replace backup pump.
	Abnormal battery	Recharge or replace.

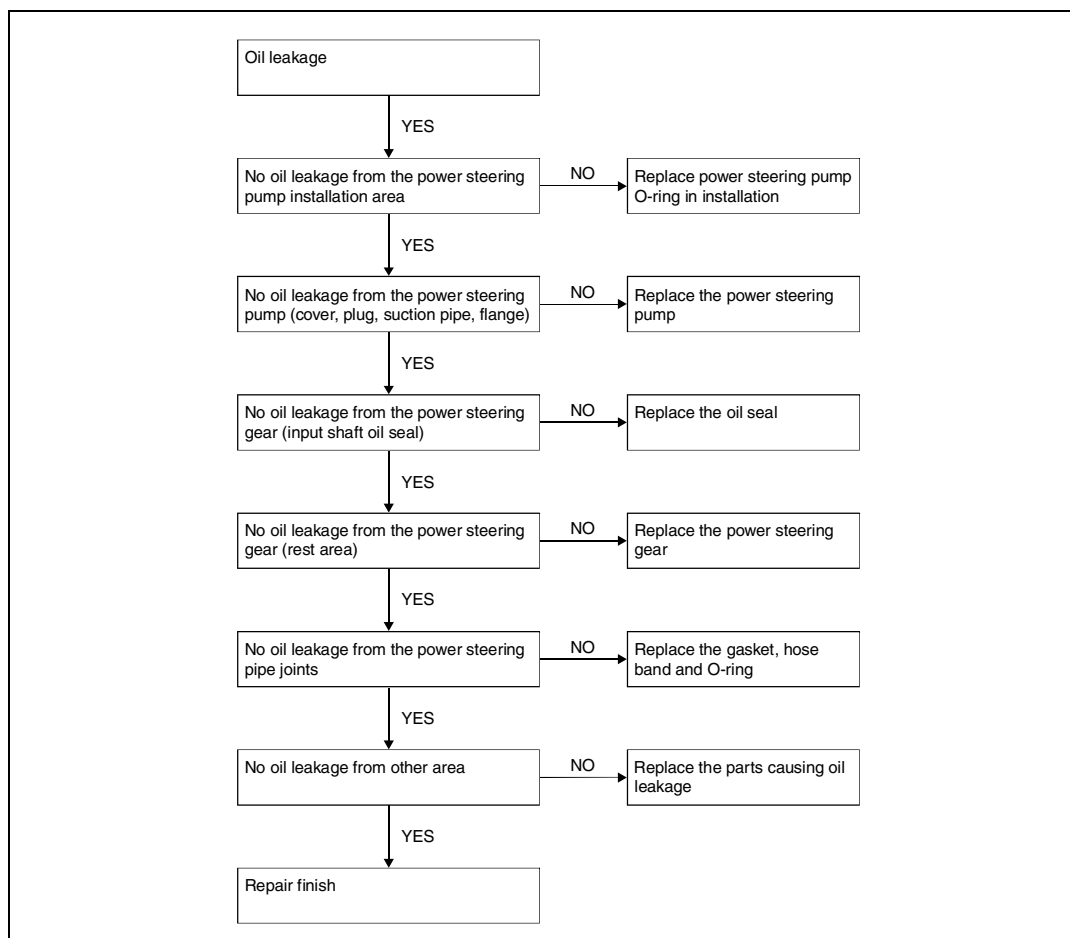
TROUBLESHOOTING

TS01-37

Symptom	Possible cause	Remedy/Prevention
Power steering pump is noisy	Insufficient power steering fluid	Refill proper level.
	Air trapped in the power steering fluid	Bleed air from power steering system.
	Contamination in the power steering fluid	Replace power steering pump and fluid.
Severe reaction to pedal pressure (Grabby brakes)	Throttle valve cut in spring defective	Replace booster assembly.
	Binding brake pedal linkage	Disassemble and lubricate.
	Incorrect pads, or pads loose on plate	Replace pads. Be sure pads are tight on caliper.
	Grease or brake fluid on pad	Repair grease seal or caliper as required. Replace pads in axle sets.
	Loose caliper on caliper mounting bracket	Retighten.
Leakage between booster and master cylinder	Primary pressure seal or backup ring of the master cylinder is worn or damaged	Replace master cylinder assembly.
	Seal or O-ring of the booster end cap assembly is worn or damaged	Replace booster assembly.

Symptom	Trouble shooting and repair
Leakage from booster or power steering pump	Reference: TROUBLESHOOTING, BRAKE EQUIPMENT (MODELS WITH HYDRAULIC BRAKE), SERVICE BRAKE ASSEMBLY, OIL LEAKAGE (Page TS01-38)

OIL LEAKAGE



SAPH70ZZ1000009

BRAKE EQUIPMENT (MODELS WITH FULL AIR BRAKE)

SERVICE BRAKE ASSEMBLY

EN70ZZ10F300017

Symptom	Possible cause	Remedy/Prevention
Not enough braking (Wheel brake and drum)	Lining is wet with grease or oil	Replace lining.
	Improper contact of drum and lining	Correct.
	Improper lining material or hardening lining	Replace lining.
	Deformation or hardening of drum	Correct or replace.
	Excessively worn lining	Replace.
	Improper adjustment of shoe clearance	Check automatic slack adjuster.
Not enough braking (Control system)	Leakage of compressed air from brake system	Tighten further or replace gasket.
	Lack of compressed air pressure due to excessive use	Use properly.
	Improper operation of air compressor	Repair or replace.
	Improper operation of brake valve	Repair or replace.
	Improper operation of relay valve	Repair or replace.
	Improper operation of spring brake control valve	Repair or replace.
	Improper operation of spring brake chamber	Repair or replace.
	Clogging of brake system	Replace pipe, hose, etc.
Unequal or unstable braking (Wheel brake and drum)	Lining is wet with grease or oil	Replace lining.
	Defective lining material (Improper combination)	Replace lining.
	Non-uniform lining contact	Correct.
	Non-uniform brake chamber rod stroke	Check automatic slack adjuster.
	Distorted drums	Correct or replace.
	Excessive abrasion of drums	Correct or replace.
Unequal or unstable braking (Control system)	Clogging of brake system	Replace pipe, hose, etc.
Unequal or unstable braking (Others)	Loose hub bearing	Adjust or replace bearing.
	Improper or unequal pneumatic pressure of tire	Adjust to proper pneumatic pressure.
Brake drags or does not release (Wheel brake and drum)	Improper adjustment of shoe clearance	Check automatic slack adjuster.
	Defective shoe return spring	Replace.

TS01-40

TROUBLESHOOTING

Symptom	Possible cause	Remedy/Prevention
Brake drags or does not release (Control system)	Lack of pedal play	Adjust.
	Improper return of brake pedal	Repair or replace.
	Improper operation of brake valve	Repair or replace.
	Improper operation of relay valve	Repair or replace.
	Leakage of air pressure from brake system	Tighten connections further or replace gaskets.
	Improper operation of spring brake control valve	Repair or replace.
	Improper operation of spring brake chamber	Repair or replace.
	Improper operation of air compressor	Repair or replace.
Brake squeal (Wheel brake and drum)	Clogging of brake system	Replace pipe, hose, etc.
	Improper lining material or glazed lining	Replace lining.
	Loose lining rivet	Replace or tighten the rivet further.
	Lining rivet in contact with drum	Replace lining and rivet.
	Deformation or wear of drum	Repair or replace.
Brake squeal (Others)	Intrusion of foreign matter between drum and lining	Clean the surface of lining or replace.
	Loose hub bearing	Adjust or replace bearing.

SERVICE BRAKE (HYDRAULIC BRAKE)

WHEEL BRAKE (TYPE: 4 PISTON)

EN70ZZ10F300018

Symptom	Possible cause	Remedy/Prevention
Excessive Pedal Effort	Pads worn below minimum thickness	Install new pads.
	Faded, overheated condition, glazed pads, blued or heat-checked rotors	Replace the rotor and/or reface pads if sufficient lining remains.
	Grease, oil and/or brake fluid on linings	Install new pads in the axle sets.
	Seized or frozen pistons	Disassemble the calipers and free pistons, or replace the caliper.
Pedal Pulsation (Brake Roughness or Chatter)	Excessive lateral runout of brake rotor	Check with a dial indicator. Install a new rotor if the runout exceeds the maximum specified.
	Excessive out-of-parallelism of brake rotor	Check the parallelism or rotor thickness variation with a micrometer. Resurface the rotor or install a new rotor if the parallelism exceeds the maximum allowed.
	Loose or worn steering or suspension parts	Replace the parts and realign.
	Excessive front bearing clearance	Readjust the bearing to specifications.
Vehicle Pulls to One Side	Brake fluid, oil and/or grease on linings	Install new pads in the axle sets.
	Unmatched linings, uneven lining wear, distorted pads	Install new pads in the axle sets.
	Rough rotor surfaces on one rotor	Resurface or replace the rotor in the axle sets.
	Seized or frozen pistons	Disassemble the caliper and repair or replace.
	Loose caliper mounting bolts	Tighten to specifications.
	Uneven tire pressure, tread wear or size, right to left	Equalize to the recommended pressures. Install the correct size tires with good tread.
	Excessive rotor parallelism or runout	Resurface or replace the rotor.
	Restricted hose or line	Examine the hoses and lines, and replace as necessary.
	Front end out of alignment	Reset the alignment.
Leaky Caliper	Cylinder bore surface scored or corroded	Disassemble the calipers, clean the bore and replace the seals and boots.
	Caliper piston seal damaged or worn	Disassemble the calipers and install new seals and boots.
	Caliper piston damaged	Replace the piston.

TS01-42

TROUBLESHOOTING

Symptom	Possible cause	Remedy/Prevention
No Braking Effect or Excessive Pedal Travel	Reservoir fluid level low	Check for causes of fluid leak, repair as required and refill the reservoir. Bleed the system as needed.
	Air in the hydraulic system	Bleed the system.
	Bleed screw loose or open	Bleed the system and tighten the bleed screw.
	Caliper piston seal damaged	Disassemble the caliper and replace the piston seals. Replace the piston if it is damaged.
	Excessive rotor runout or bent rotor	Check the rotor with a dial indicator. Install a new rotor if the runout exceeds the maximum specified.
	Worn or excessively loose wheel bearings	Adjust or replace the bearings as needed.
	Low quality brake fluid	Drain and clean the system. Replace with the recommended brake fluid.
	Weak brake hose that expands under pressure	Replace the hoses.
Brake Noise (Chatter)	Excessive lateral runout of rotor	Check the runout with a dial indicator. Install a new rotor if the runout exceeds the maximum specified.
	Lack of rotor parallelism	Check the parallelism with a micrometer. Resurface or install a new rotor as required.
	Loose wheel bearing	Readjust the bearing to the specified torque.
Brake Noise (Scraping)	Rust or mud build-up on edges of rotor and on caliper housing	Clean or replace as necessary.
	Worn pad or pad installed backward	Replace the pads in the axle sets only with the friction surface against the rotor.
	Incorrect caliper alignment permitting rotor to scrape on housing	Correct the alignment.
Brake Noise (Groan)	Pressure on the brake pedal too light	Slightly increase the pedal effort to eliminate the noise.
Brake Noise (Rattle)	Excessive clearance between the shoe and caliper	Install new pads.
	Pad retainer spring missing or not correctly positioned	Install a new pad retainer spring or position it correctly.
Brake Noise (Squeal)	Glazed pads	Resurface or replace the pads in the axle sets only.
	Weak pad retainer spring	Install a new pad retainer spring.
	Pad wear indicator contacting rotor	Install new pads in the axle sets only.
	Foreign material embedded in linings	Replace the pads in the axle sets only.

SERVICE BRAKE (FULL AIR BRAKE)

AIR DRYER AND RESERVOIR SYSTEM (MODEL: BENDIX AD-IS)

EN70ZZ10F300019

SYMPTOMS	CAUSE	REMEDY
1. Dryer is constantly "cycling" or purging	A. Excessive system leakage	A. Test for excessive system leakage. Allowable leakage observed at dash gauge: Single vehicle - 1 psi/minute. Tractor trailer - 3 psi/minute. Using soap solution, test vehicle for leakage at fittings, drain valves and system valves. Repair or replace as necessary.
	B. Defective delivery check valve.	B. Build system pressure to governor cut-out. Wait 1 minute for completion of purge cycle. Using soap solution at exhaust of purge valve, leakage should not exceed a 1" bubble in less than 5 seconds. If a rapid loss of pressure is found, the following procedure will determine if the delivery check valve is malfunctioning: Build system pressure to governor cut-out and allow a full minute for the normal dryer purge cycle to empty the purge reservoir. Switch off the engine and "fan" the brakes so that the system pressure reaches governor cut-in. The purge valve will return to its closed position. The purge reservoir has a drain valve which is opened by moving the center lever away from its closed position. Open the drain valve and wait 10 seconds to allow any residual purge pressure to be released. Release the lever, closing the drain valve. Carefully remove the air dryer cartridge using a strap wrench and then test for air leaking through the center of the threaded boss by applying a soap solution to the boss. Replace the delivery check valve if there is excessive leakage (exceeding a 1" bubble in 5 seconds). Regrease the seal on the air dryer cartridge before reinstalling. Be sure the drain valve on the purge reservoir is not leaking before restoring vehicle to service.
	C. Defective governor.	C. Check governor at both "cut-in" and "cut-out" position for (i) proper pressures and (ii) excessive leakage at fittings and exhaust.
	D. Compressor unloader mechanism leaking excessively.	D. Remove air strainer or fitting from compressor inlet cavity. With compressor unloaded, check for unloader piston leakage. Slight leakage is permissible.

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TROUBLESHOOTING

SYMPTOMS	CAUSE	REMEDY
2. Water in vehicle reservoirs.	A. Maximum air dryer inlet temperature is exceeded due to improper discharge line length.	A. Check for excessive carbon build up in compressor discharge line. Replace if required. Make certain that discharge line length is at least 6 ft. Increase discharge line length and/or diameter to reduce air dryer inlet temperature.
	B. Air system charged from outside air source (outside air not passing through air dryer).	B. If system must have outside air fill provision, outside air should pass through air dryer.
	C. Excessive air usage - Air dryer not compatible with vehicle air system requirement (Improper air dryer/ vehicle application).	C. Refer to Bendix Advanced Troubleshooting Guide for Air Brake Compressors (BW1971) for proper application of the AD-IS® air dryer and reservoir system. An extended purge model (AD-ISEP) is available for many higher air usage vehicles, such as city buses and construction vehicles. If the vehicle is equipped with high air usage accessories such as trailer pump-off systems or central tire inflation, the air for these accessories must by-pass the dryer reservoir system.
	D. Desiccant requires replacement.	D. Replace desiccant cartridge assembly.
	E. Air by-passes desiccant cartridge assembly.	E. If vehicle uses Holset compressor, inspect feed-back check valve for proper installation and operation.
	F. Air dryer not purging.	F. Refer to Symptom 6.
	G. Purge (air exhaust) time insufficient due to excessive system leakage.	G. Refer to Symptom 1.
3. Safety valve on air dryer "popping off" or exhausting air.	A. Defective AD-IS® air dryer and reservoir system delivery check valve.	A. Test to determine if air is passing through check valve. Repair or replace. Refer to Symptom 1, Remedy B.
	B. Safety valve setting too low (<150 p.s.i.)	B. Replace safety valve.
	C. System pressure too high (>135 p.s.i.)	C. Test with accurate gauge. Replace governor if necessary.
	D. Excessive pressure pulsations from compressor. (Typical single cylinder type).	D. Increase volume in discharge line. This can be accomplished by adding a 90 cubic inch (or larger) reservoir between the compressor and the AD-IS® air dryer and reservoir system.

TROUBLESHOOTING

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SYMPTOMS	CAUSE	REMEDY
4. Constant exhaust of air at air dryer purge valve exhaust or unable to build system pressure. (Charge mode.)	A. Air dryer purge valve leaking excessively.	A. With compressor loaded, apply soap solution on purge valve exhaust, to test for excessive leakage. Repair or replace purge valve as necessary. Refer to Technical Bulletin TCH-008-040.
	B. Purge valve frozen open - faulty heater and thermostat, wiring, blown fuse.	B. Refer to paragraph 5 of Operation and Leakage Tests for heater and thermostat test.
	C. Defective AD-IS® air dryer delivery check valve.	C. Refer to Symptom 1, Remedy B.
	D. Leaking Turbo Cut-Off valve.	D. Repair or replace purge valve assembly.
	E. Defective governor.	E. Check governor at both "cut-in" and "cut-out" position for (i) proper pressures and (ii) excessive leakage at fittings and exhaust.
	F. Leaking purge valve control piston quad-ring.	F. Repair or replace purge valve assembly.
5. Cannot build system air pressure.	A. Kinked or blocked (plugged) discharge line.	A. Check to determine if air passes through discharge line. Check for kinks, bends, excessive carbon deposits, or ice blockage.
	B. Excessive bends in discharge line (water collects and freezes).	B. Discharge line should be constantly sloping from compressor to air dryer with as few bends as possible.
	C. Pressure protection valve(s) in air dryer will not open.	C. Replace air dryer (pressure protection valves are not serviceable).
	D. Refer to Symptom 4.	D. Refer to Symptom 4, Remedy A.
	E. Refer to Symptom 7.	E. Refer to Symptom 7, Remedies A and B.
6. Air dryer does not purge or exhaust air.	A. Faulty air dryer purge valve.	A. After determining air reaches purge valve control port by installing a T-fitting with a pressure gauge into the governor unloader port, repair purge valve if necessary.
	B. See Causes B, E, and F for Symptom #4.	B. Refer to Symptom 4, Remedies B, E, and F. Also refer to Symptom 1, Remedy B.
7. Desiccant material being expelled from air dryer purge valve exhaust (may look like whitish liquid or paste or small beads.)	A. Faulty dryer cartridge.	A. Replace AD-IS® air dryer cartridge and/or AD-IS® air dryer.
	B. Excessive dryer vibration.	B. Check the AD-IS® air dryer mounting for looseness or damage. Repair mounting and replace cartridge.
8. Unsatisfactory desiccant life.	A. Excessive system leakage.	A. Refer to Symptom 1, Remedy A.
	B. Wrong vehicle application for AD-IS® air dryer.	B. Refer to Symptom 2, Remedy C.
	C. Compressor passing excessive oil.	C. Check for proper compressor installation; if symptoms persist, replace compressor. Refer to Bendix Advanced Troubleshooting Guide for Air Brake Compressor (BW1971).

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TROUBLESHOOTING

SYMPTOMS	CAUSE	REMEDY
9. "Pinging" noise excessive during compressor loaded cycle.	A. Single cylinder compressor with high pulse cycles.	A. A slight "pinging" sound may be heard during system build up when a single cylinder compressor is used. If this sound is deemed objectionable, it can be reduced substantially by increasing the discharge line volume. This can be accomplished by adding a 90 cubic inch (or larger) reservoir between the compressor and the AD-IS® air dryer and reservoir system.
10. The air dryer purge piston cycles rapidly in the compressor unloaded (noncompressing) mode.	A. Compressor fails to "unload".	A. Check air hose from governor to compressor for a missing, kinked or restricted line. Install or repair air hose. Repair or replace compressor unloader.

EXHAUST BRAKE

EXHAUST BRAKE SYSTEM

EN70ZZZ10F300020

Symptom	Possible cause	Remedy/Prevention
Switch does not work	Defective contacts	Check and correct.
	Open circuit in harness	Check and correct.
Valve does not close	Valve clogged with carbon	Remove carbon.
	Burnt shaft	Check and correct.

PARKING BRAKE (BOSCH 12")

PARKING BRAKE ASSEMBLY

EN70ZZZ10F300021

Symptom	Possible cause	Remedy/Prevention
Light force or lack of resistance when applying brake lever (on manual apply systems)	Shoe cage under-adjusted(*1)	Adjust shoes per cage adjustment procedure.
	Worn or deformed actuation components (lever, cam lugs shoe ends)	Inspect and replace per Anchor Screw, Lever and Cam. Replacement procedure or Shoe Replacement procedure
	Maladjusted control linkage	Readjust.
Heavy force or excessive resistance when applying when applying brake lever (on manual apply system)	Over adjusted brake	Adjust brake cage clearance diameter.
	Apply system over adjusted.	Adjust or repair per manufacture's recommended procedures.
Brake does not release.	Internal damage to brake.	Inspect and replace damaged components.
	Apply cable bound up.	Check cable for corrosion, binding, kinks, or damage.
	The parking brake lever in the cab is binding	Check the parking brake lever assembly for damage or corrosion. Repair or replace as needed.
Brake does not hold vehicle on hill.	Grease, oil or other foreign material on or embedded in shoe linings.	Replace shoes and clean drum(*2).
	Damaged or incorrect shoes.	Replace with correct shoes.
	Worn out lining (metal shoe run contacting drum)	Replace shoes and resurface or replace drum as necessary.
	Excessive drum runout.	Resurface or replace drum per manufacturer's recommended procedure.
	Shoe cage under-adjusted.	Adjust shoes per primary (or alternate) Shoe Cage Adjustment procedure.
	Worn or deformed actuation components (lever, cam lugs, shoe).	Inspect and replace per Anchor, Screw, Lever and Cam. Replacement procedure

*1: Inspect adjuster components to see if any are damaged or jammed.

*2: Inspect the rear pinion seal for leakage that can contaminate the park brake system part. Repair as necessary.

STEERING EQUIPMENT

STEERING SYSTEM

EN70ZZ10F300022

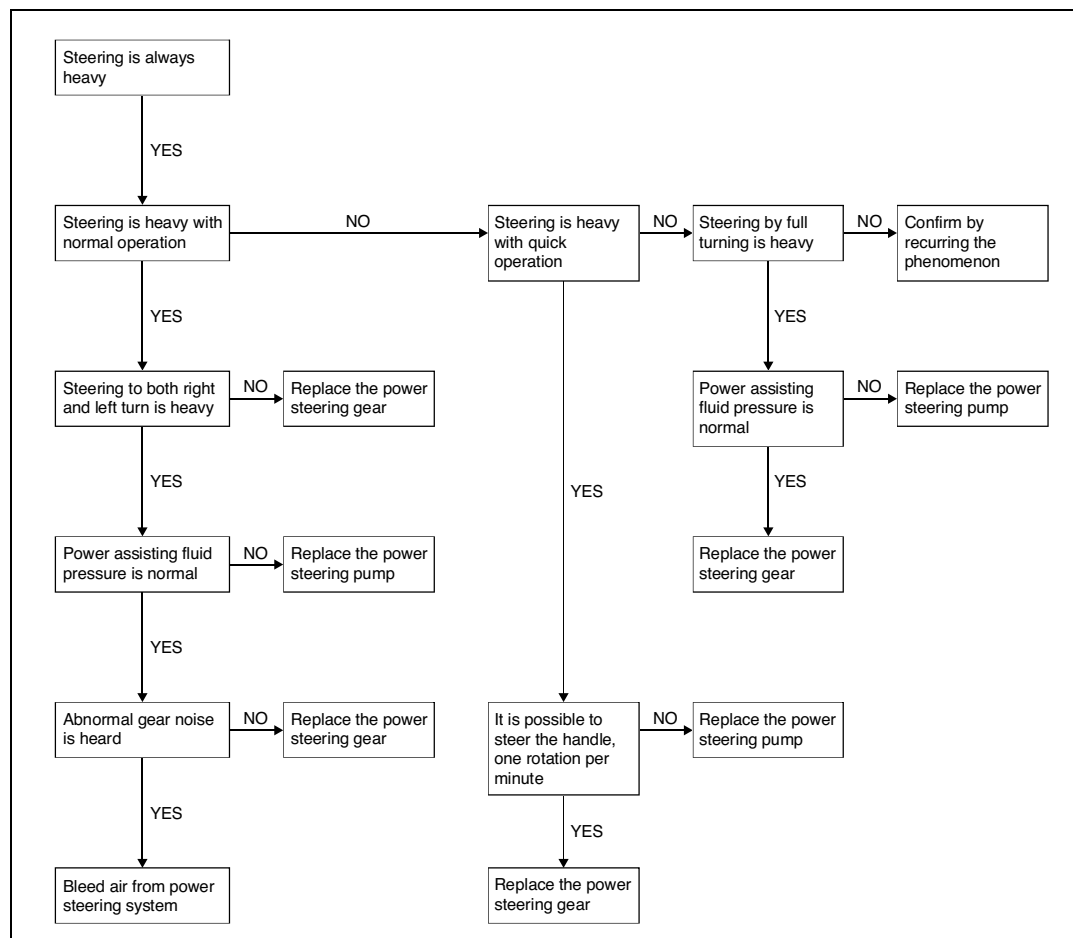
Symptom	Possible cause	Remedy/Prevention
Steering wheel shimmy	Steering system linkage is loose.	Tighten properly.
	Too much wear or play in steering linkage (spline and ball joints).	Replace parts.
	Other front axle problems.	Refer to chapter "FRONT AXLE".
	Power steering gear badly adjusted.	Refer to chapter "POWER STEERING".
	The wheels are out of balance.	Balance the wheels.
	Wheel wobbles.	Replace wheel.
	Tire air pressure is not uniform or sufficient.	Adjust tire pressure.
	Distorted disc wheel.	Replace parts.

Symptom	Trouble shooting and repair
Hard steering or poor return of steering wheel to center	Reference: TROUBLESHOOTING, STEERING EQUIPMENT, STEERING SYSTEM, STEERING IS HEAVY (Page TS01-50)
	Reference: TROUBLESHOOTING, STEERING EQUIPMENT, STEERING SYSTEM, STEERING RETURN IS RELUCTANT (Page TS01-51)
Abnormal noise	Reference: TROUBLESHOOTING, STEERING EQUIPMENT, STEERING SYSTEM, ABNORMAL NOISE (Page TS01-52)

STEERING IS HEAVY**1. CHECK AND CONFIRM THE FOLLOWING POINTS AND TAKE COUNTERMEASURE.**

- (1) Check the front tire pressure, and supply compressed air with the specified pressure if insufficient.
- (2) Check the tire for abnormal wear and improper groove depth, if any problem found, replace the tire.
- (3) Measure the front axle loading, if it exceeds the specified value, correct or empty the cargo.
- (4) If frontward cargo causes the excessive front axle loading, correct it by reviewing the weight balance.
- (5) If superstructure causes the excessive front axle loading, refurbish the superstructure to reduce loading.
- (6) Check the power steering fluid level and replenish if insufficient.

In spite of the above check and countermeasure taken, if the troubles still remain, pursue the true cause with the following procedures, and repair the troubles.

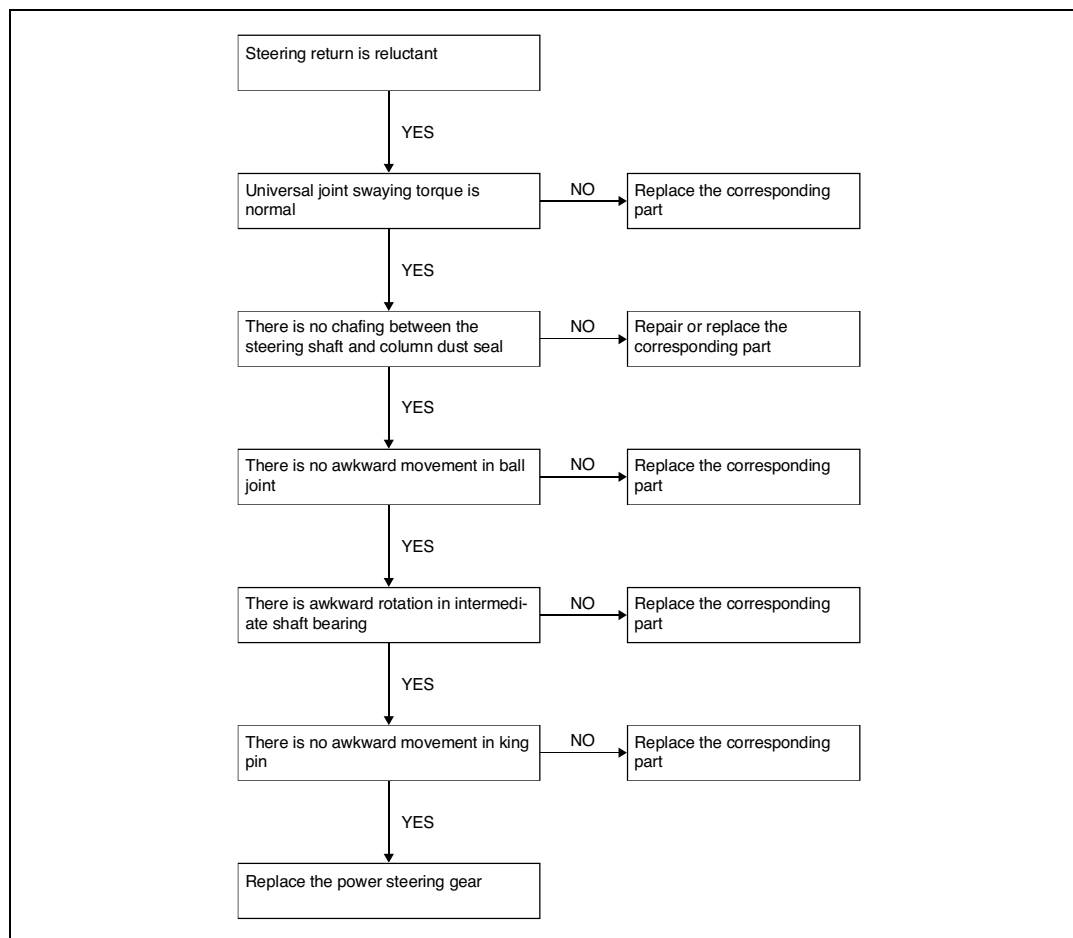


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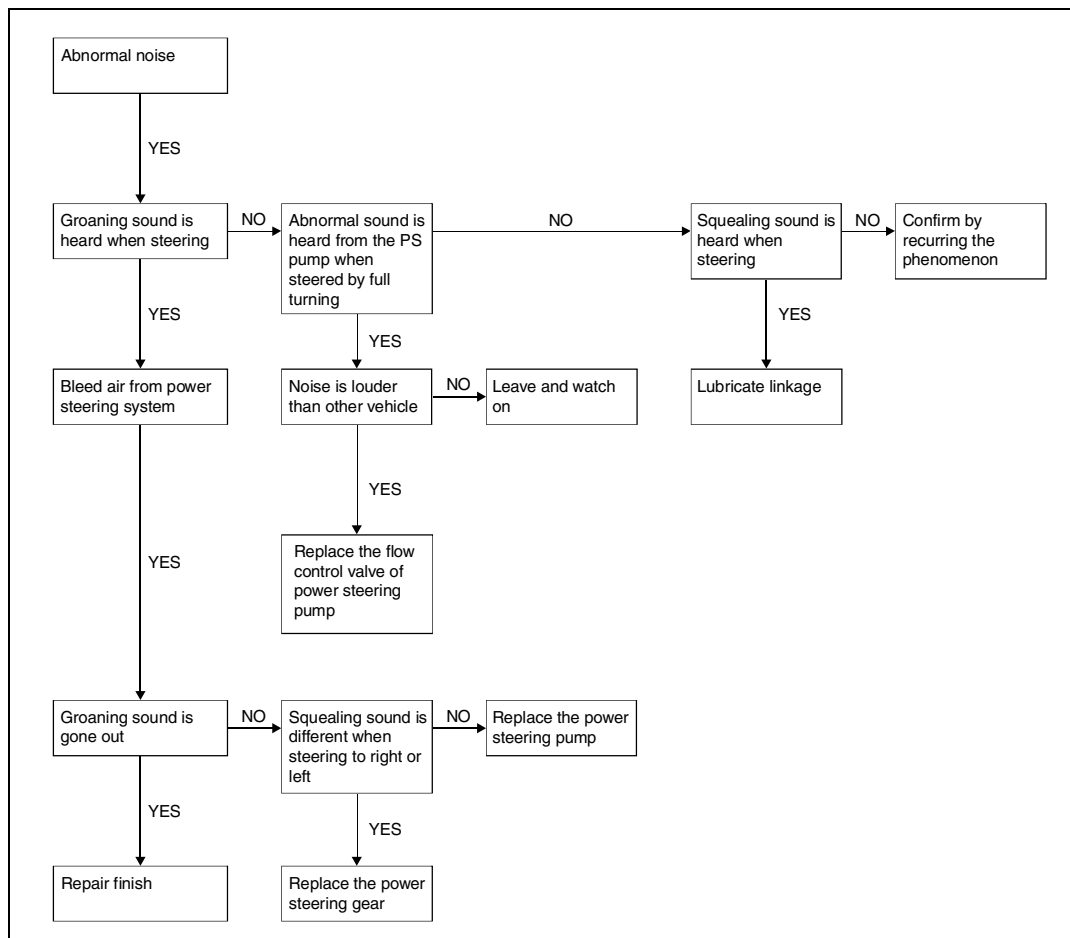
STEERING RETURN IS RELUCTANT**1. CHECK AND CONFIRM THE FOLLOWING POINTS AND TAKE COUNTERMEASURE.**

- (1) Check the front tire pressure, and supply compressed air with the specified pressure if insufficient.
- (2) Check the tire for abnormal wear and improper groove depth, if any problem found, replace the tire.
- (3) Measure the front axle loading, if it exceeds the specified value, correct or empty the cargo.
- (4) If frontward cargo causes the excessive front axle loading, correct it by reviewing the weight balance.
- (5) If superstructure causes the excessive front axle loading, refurbish the superstructure to reduce loading.
- (6) Check the power steering fluid level and replenish if insufficient.

In spite of the above check and countermeasure taken, if the troubles still remain, pursue the true cause with the following procedures, and repair the troubles.



SAPH70ZZZ1000011

ABNORMAL NOISE

SAPH70ZZ1000012

FRONT AXLE (MFS)

FRONT AXLE (MFS)

EN70ZZZ10F300023

FRONT NON-DRIVE STEER AXLE DIAGNOSTIC TABLE

Condition	Cause	Correction
Tire wear out quickly or have uneven tire tread wear.	Tire have incorrect air pressure.	Place specified air pressure in tires.
	Tire out-of-balance.	Balance or replace tires.
	Incorrect tandem axle alignment.	Align tandem axles.
	Incorrect toe-in setting.	Adjust toe-in specified setting.
	Incorrect steering arm geometry.	Service steering system as necessary.
	Excessive wheel end play exists.	Readjust wheel bearing.
Vehicle is hard to steer.	Power steering system pressure low.	Repair power steering system.
	Steering gear linkage not assembled correctly.	Assemble steering gear correctly.
	Steering linkage needs lubrication.	Lubricate steering linkage.
	King pins binding.	Replace king pins.
	Incorrect steering arm geometry.	Service steering system as necessary.
	Caster out-of-adjustment.	Adjust caster as necessary.
	Tie rod ends hard to move.	Replace tie rod ends.
	Worn thrust bearing.	Replace thrust bearing.
	Tie rod ends require lubrication.	Lubricate ends of cross tube. Make sure lubrication schedule is followed.
Tie rod ends are worn and require replacement.	Severe operating conditions.	Increase frequency of inspection and lubrication intervals.
	Damaged boot on tie rod end.	Replace boot.

SAPH70ZZZ1000013

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TROUBLESHOOTING

Condition	Cause	Correction
Bent or broken cross tube, tie rod end ball stud, steering arm or tie rod end. Component requires replacement.	Too much pressure in the power steering system, pressure exceeds vehicle manufacturer's specification.	Adjust power steering system to specified pressure.
	Power steering system cut-off pressure, out of adjustment.	Adjust power steering system to specified pressure.
	Vehicle operated under severe conditions.	Verify that vehicle is operated correctly.
	Add-on type of power steering system not installed correctly.	Correctly install add-on power steering system.
	Steering gear overtravel poppets incorrectly set or malfunctioning.	Check for correct operation or adjust overtravel of poppets to vehicle manufacturer's specifications.
Worn or broken steering ball stud.	Axle stops incorrectly set.	Set axle stops to vehicle manufacturer's specification.
	Drag link fasteners tightened higher than vehicle manufacturer specified.	Tighten drag link fasteners to vehicle manufacturer's specified torque.
	Lack of lubrication or incorrect lubricant.	Lubricate linkage with specified lubricant.
	Power steering stops out-of-adjustment.	Adjust stops to specified dimension.
Worn king pins and king pin bushings.	Worn or missing seals and gaskets.	Replace seals and gaskets.
	Incorrect lubricant.	Lubricate axle with specified lubricant.
	Axle not lubricated at scheduled frequency.	Lubricate axle at scheduled frequency.
	Incorrect lubrication procedures.	Use correct lubrication procedures.
Vibration or shimmy of front axle during operation.	Lubrication schedule does not match operating conditions.	Change lubrication schedule to match operating conditions.
	Caster out-of-adjustment.	Adjust caster.
	Wheels and/or tires out-of-balance.	Balance or replace wheels and/or tires.
	Worn shock absorbers.	Replace shock absorbers.

SAPH70ZZ1000014

REAR AXLE

REAR AXLE

EN70ZZZ10F300024

HAZARD ALERT MESSAGES

Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.

WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

1. TROUBLESHOOTING DIAGNOSTIC CHART

Significant wheel end component wear may enable the ABS warning light and cause a fault code to be set. Slow return of the steering wheel to its neutral position following completion of a turn may be another indication of wheel end component wear.

Wheel-End Component Troubleshooting

Condition	Cause	Correction
Tires wear out quickly or have uneven tire tread wear.	Tires have incorrect air pressure.	Place the specified air pressure in the tires.
	Tires are out-of-balance.	Balance or replace the tires.
	Tandem axle alignment is incorrect.	Align the tandem axles.
	Toe-in setting is incorrect.	Adjust the toe-in to the specified setting.
	Steering arm geometry is incorrect.	Service the steering system as necessary.
	Wheel end play is excessive.	Readjust the wheel bearings.

SAPH70ZZZ1000015

WHEEL & TIRE

WHEEL AND TIRE

EN70ZZZ10F300025

Symptom	Possible cause	Remedy/Prevention
Excessive wear on edges of tread	Under inflated tires	Properly inflate with the recommended pressure.
	Vehicle overloading	Correct as required by Factory spec.
	High speed cornering	Correct as required by Factory spec.
	Incorrect wheel alignment	Set to the correct specifications.
Tires show excessive wear in center of tread	Tires overinflated	Properly inflate with the recommended pressure.
Excessive tire wear	Improper tire pressure	Properly inflate with the recommended pressure.
	Incorrect tire wheel usage	Install the correct tire wheel combination.
	Bent wheel	Repair or replace.
	Front end out of alignment	Align front end.
	Loose, worn or damaged steering linkage, joints, suspension components, bushing or ball joints	Inspect, repair or replace as required
Wheel hopping (vehicle vibration and rough steering) (Disc wheels)	Rocks or debris wedged between dual disc wheels	Remove the rocks and the debris.
	Out-of-balance tire and/or hub and drum	Determine the out-of-balance component and balance or replace.
Wheel hopping (vehicle vibration and rough steering) (Vehicle)	Loose or worn drive line or suspension	Identify the location of vibration carefully. Then repair or replace the loose or worn parts. (Refer to PROPELLER SHAFT for vehicle vibration.)
Wobbling (vehicle vibration and rough steering) (Disc wheels)	Bent or distorted due to the overloading or improper handling	Replace the wheel.
	Loose mountings, damaged studs, wheel nuts, enlarged stud holes, worn or broken hub face, or foreign material on mounting surfaces	Replace worn or damaged parts. Clean mounting surfaces.
Wobbling (vehicle vibration and rough steering) (Vehicle)	Improper alignment	Have vehicle aligned.
	Loose, worn or broken suspension parts	Repair or replace.
Cracked or broken wheel discs (cracks develop in the wheel disc from hand hole to hand hole, from hand hole to rim, or from hand hole to stud hole.)	Metal fatigue resulting from overloading	Replace wheel.

TROUBLESHOOTING

TS01-57

Symptom	Possible cause	Remedy/Prevention
Damaged wheel bolt holes (wheel bolt holes become worn, elongated or deformed, metal builds up around wheel bolt hole edges, cracks develop from wheel bolt hole to wheel bolt hole.)	Loose wheel mounting	<ul style="list-style-type: none"> • Replace wheel and check the installation of correct wheel bolt and nuts. • Check the cracked or broken wheel bolt-replace. • Check the worn hub face-replace. • Check the broken or cracked hub-replace. • Clean mounting surfaces (Re-torque the wheel nuts periodically.) • Rust streaks fanning out from wheel bolts holes: indicates that the wheel nuts are or have been loose.
Tire slippage on rim (Disc wheels)	Improper storage or operating conditions	Correct as required.
	Poor maintenance	Follow the proper maintenance procedures.
	Rust, corrosion or bead seating	Correct as required.
	Loss of pressure	Follow the proper maintenance procedures.
Tire mounting difficulties (Wheel rims)	Mismatched tire and rim sizes	Correct as required.
	Defective or mismatched rings for the rim	Correct as required.
	Tires overinflated	Properly inflate with the recommended pressure.
	Corrosion and dirt	Correct as required.
Loose inner wheel	Excessive wheel bolt standout from the mounting face of hub allowing the wheel nut to bottom out	Replace with the proper length wheel bolt.
	Improper torque	Follow the recommended torque procedure.
	Wrong inner nut	Use correct inner nuts.
Broken wheel bolts	Loose wheel nuts	Replace the wheel bolt and follow the proper torque procedures.
	Overloading	Replace the wheel bolt.
Stripped threads	Excessive clamp load	Replace wheel bolt and follow the proper torque procedures.
Rust streaks from wheel bolt holes	Loose wheel nuts	Check complete assembly, replace damaged parts and follow the proper torque procedures.
Damaged inner or outer wheel nuts	Loose wheel assembly	Replace wheel nuts. Check the proper torque procedures.
Frozen inner or outer wheel nuts	Corrosion or damage	Replace wheel nuts and wheel bolts.

SUSPENSION

LEAF SUSPENSION ASSEMBLY

EN70ZZZ10F300026

Symptom	Possible cause	Remedy/Prevention
Rough ride	Broken leaves	Replace the leaves. Check the load capacity rating.
	Cracked or damaged	Replace the leaves. Check the load capacity rating.
	Overloading	Decrease the load.
Heavy sway	Inoperative shock absorber	Replace the shock absorber.
Leaves broken at the center bolt hole	Loosen U-bolts	Replace the leaves and tighten the U-bolts to specified torque.
Squeaking of the leaves	Friction between the leaves	Apply chassis grease between leaves.

AIR SUSPENSION ASSEMBLY

EN70ZZZ10F300027

Symptom	Possible cause	Remedy/Prevention
Abnormal sound occurs from the spring while driving.	Eccentric wear of the shock absorber fitting pin	Replace the pin and/or rubber bushing.
Uncomfortably (Rolling and pitching)	Deflection and damage of the bushings of the main support member or the transverse rod	Replace the main support member or the bushing of the transverse rod.
	Faulty of the shock absorber	Replace the shock absorber.
	Faulty of the height control valve	Repair the height control valve.
Vibration of the steering wheel, and the car shake	Deflection of the bushing in the main support member or the transverse rod	Replace the main support member or the bushing of the transverse rod.
	Looseness of the transverse rod bracket bolt	Replace the lock nut and tighten with the specified torque.
Vehicle height is not adjusted correctly	Faulty of the height control	Repair the parts.

CHASSIS FRAME

CHASSIS FRAME

EN70ZZ10F300028

Symptom	Possible cause	Remedy/Prevention
Frame distortion (Vehicle inclination)	Flattening or breakage of springs on one side	Replace spring
	Incorrect mounting (Attachment of heavy weight on one side of the vehicle)	Correct mounting
Bent frame	Overloading or concentrated weight on rear end of frame	<ul style="list-style-type: none">• Correct load• Correct with frame correction device
Frame cracking or rivets breaking	Wrong body mounting	Correct mounting
	Overloading	<ul style="list-style-type: none">• Improvement of the usage• Reinforce with stiffener

CAB

CAB ASSEMBLY

EN70ZZZ10F300029

HOOD TILT

Symptom	Possible cause	Remedy/Prevention
Hood does not tilt up.	Hood mounting hook does not release.	Inspection of hood mounting hook.
	Oil damper does not release.	Inspection of oil damper mechanism.
	Damaged torsion bar	Replace torsion bar.
Hood tilting is difficult.	Tilt up force is weak.	Replace torsion bar.
Hood does not lock to hood mounting member.	Mounting hook does not operate.	Replace mounting hook.
	Hood mounting cushion is not correctly installed.	Correct installation of hood mounting.

DOOR

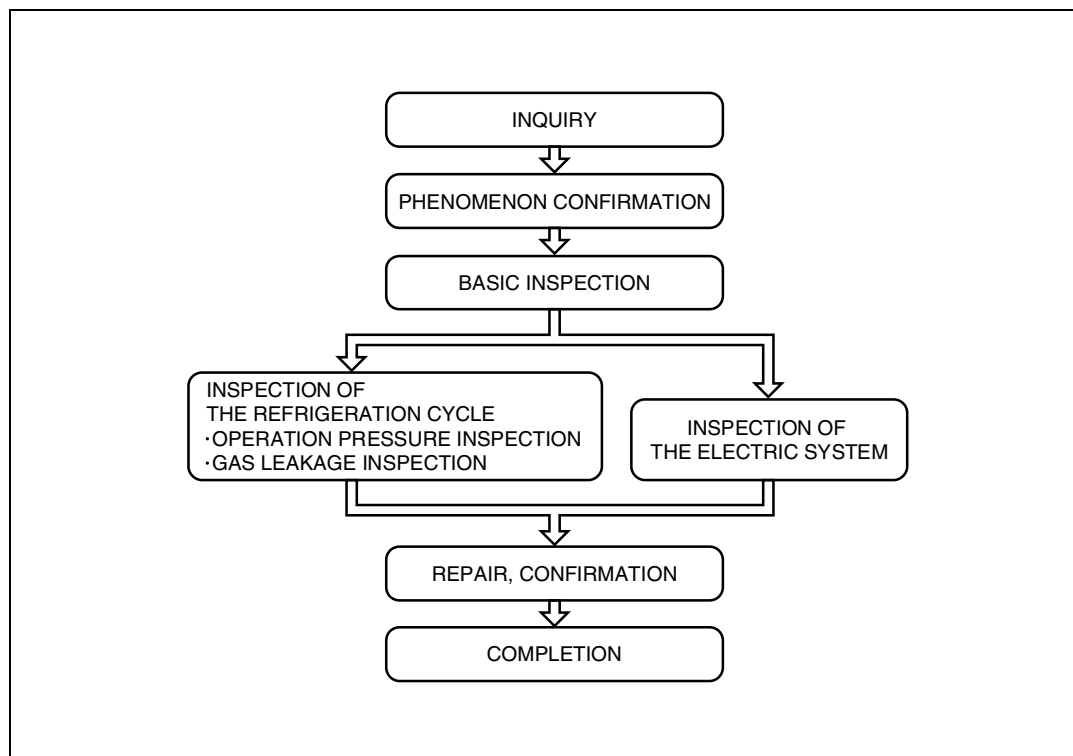
Symptom	Possible cause	Remedy/Prevention
Door does not close properly.	Door is not adjusted	Adjust door installation.
	Striker is not adjusted	Adjustment of shim for door lock striker
	Damaged door lock	Replace door lock.
Door does not lock by inside lock knob.	Deformation of rod	Replace rod.
	Rod is disconnected	Connect rod.
	Damaged door lock	Replace door lock.
Door does not lock by key.	Rod is disconnected	Connect rod.
	Damaged door lock	Replace door lock.
	Damaged lock cylinder	Replace lock cylinder.
Door does not open by outside handle.	Outside handle push rod is not adjusted.	Adjust push rod.
	Damaged door lock	Replace door lock.
Door does not open by inside handle.	Inside handle is not installed properly.	Install inside handle properly.
	Deformation of rod	Replace rod.
	Rod is disconnected.	Connect rod.
	Damaged door lock	Replace door lock.
Inside handle does not return to its normal position.	Interference between rods.	Replace rod.
	Inside handle is not installed properly.	Adjust inside handle.
	Return spring is damaged.	Replace inside handle.
Door window goes down while driving.	Window is not in the glass holder.	Repair.
	Regulator is damaged.	Replace regulator.
Regulator makes abnormal noise while driving.	Window sill weather strip is installed improperly.	Install properly or replace clips.

BLOWER

Symptom	Possible cause	Remedy/Prevention
Malfunction of blower when power is ON.	Blown fuse	Change fuse or check for short circuit.
	Malfunction in heater relay	Inspect relay.
	Malfunction of heater blower switch	Inspect power switch.
	Malfunction of register	Check register.
	Blower motor malfunction	Replace motor.
	Damaged electrical wiring or poor grounding	Repair as necessary.

AIR CONDITIONING SYSTEM

EN70ZZZ10F300030

FAULT DIAGNOSIS PROCEDURE

SAPH70ZZZ1000016

The diagram shows the basic procedure for fault diagnosis.

TS01-62

TROUBLESHOOTING

BASIC INSPECTION

Symptom	Possible cause	Remedy/Prevention
Abnormal noise from around the compressor	Loosened mounting bolts of compressor or bracket	Retighten
	Broken discharge or suction valve Loosening of the connecting rod	Contact DENSO Service station for compressor repair or replacement.
	Insufficient compressor oil	Contact DENSO Service station and request oil quantity inspection and refilling.
Oil leakage at connection parts or tightening parts of the refrigeration cycle.	Gas leakage	Retighten. Replace the related parts.
Abnormal noise from around the blower	Foreign objects caught in the blower Insufficient blower tightening	Repair or replace the blower motor.
Many air bubbles in the sight glass	Insufficient refrigerant filling quantity	Contact DENSO Service station for refrigerant filling to a suitable quantity.
No air bubbles visible in the sight glass and suction and discharge pressure both high	Excessive refrigerant filling	Contact DENSO Service station for refrigerant bleeding to a suitable quantity (discharge into the atmosphere is prohibited).
Insufficient V-belt tension	—	V-belt retightening. If the V-belt has been worn thin, replace it by a new one.
Condenser fins covered by mud or dust	—	Wash off any mud or dust covering the condenser fins.
Clogged air filter	—	Clean the air filter.
The control mechanism does not operate smoothly and accurately.	—	Operate the levers and switches of the control panel and replace in case of abnormalities. Also inspect fuses and relays as required and replace them in case of abnormalities.

COMPRESSOR-RELATED

ABNORMALLY HIGH DISCHARGE PRESSURE

Symptom	Possible cause	Remedy/Prevention
Even when the condenser is cooled with water, no air bubbles can be seen in the sight glass.	Excessive refrigerant filling	Contact DENSO Service station station for refrigerant bleeding to a suitable quantity (discharge into the atmosphere is prohibited).
The pressure on the high-pressure side is abnormally high and immediately after the compressor is stopped, the pressure rapidly drops to approximately 2 kg/cm².	Air has entered into the refrigeration cycle.	Contact DENSO Service station station for refrigerant bleeding to a suitable quantity (discharge into the atmosphere is prohibited), and refill refrigerant after sufficient vacuum drawing in the refrigeration cycle.

TROUBLESHOOTING

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ABNORMALLY HIGH SUCTION PRESSURE

Symptom	Possible cause	Remedy/Prevention
Abnormally cold around low-pressure hose and service valve on the low-pressure side	Excessive opening of the expansion valve	Contact DENSO Service station and request repair or replacement of the expansion valve.
The pressure on the high-pressure side is high, but when the condenser is cooled, the suction pressure drops.	Excessive refrigerant filling	Contact DENSO Service station for refrigerant bleeding (discharge into the atmosphere is prohibited).
When the compressor is stopped, the pressure immediately becomes the same on high-pressure side and low-pressure side.	Gasket breakage, high-pressure valve breakage, or entry of foreign matter	Contact DENSO Service station for gasket replacement, high-pressure valve replacement, or removal of foreign matter.

ABNORMALLY LOW DISCHARGE PRESSURE

Symptom	Possible cause	Remedy/Prevention
No dew becomes attached to the outlet of the expansion valve and the pressure on the low-pressure side is a negative pressure.	Expansion valve freezing or defective expansion valve	Contact DENSO Service station and request replacement of the expansion valve.
Many air bubbles pass through the sight glass and the condenser is not hot.	Too little refrigerant.	Contact DENSO Service station for refrigerant filling to a suitable quantity.
When the compressor is stopped, the pressure immediately becomes the same on high-pressure side and low-pressure side.	Breakage of compressor discharge valve and/or suction valve, catching of foreign matter	Contact DENSO Service station for compressor repair or replacement.

ABNORMALLY LOW SUCTION PRESSURE

Symptom	Possible cause	Remedy/Prevention
Many air bubbles can be seen in the sight glass and the condenser is not hot.	Insufficient refrigerant filling	Contact DENSO Service station for refrigerant filling to a suitable quantity.
No dew becomes attached to the outlet of the expansion valve and the low-pressure piping is not cold.	Expansion valve freezing or defective expansion valve	Contact DENSO Service station and request replacement of the expansion valve.
Low temperature of the discharge port, no air is blown out.	There is frost on the evaporator.	Contact DENSO Service station for thermistor replacement and position confirmation.
There is frost on the expansion valve.	The expansion valve tends to become clogged.	Contact DENSO Service station for cleaning (moisture removal) or replacement.
There is a temperature difference around receiver and drier, and in extreme cases, there is frost on the piping after the receiver strainer.	Clogging of receiver and drier	Contact DENSO Service station for desiccant in the modulator and for replacement of receiver and drier.

TS01-64

TROUBLESHOOTING

DISCHARGE PRESSURE AND SUCTION PRESSURE BOTH HIGH

Symptom	Possible cause	Remedy/Prevention
Much dust on the condenser fins	Insufficient condenser cooling	Wash off the dust to improve air passage.
No air bubbles pass through the sight glass	Excessive refrigerant filling	Contact DENSO Service station for refrigerant bleeding to a suitable quantity (discharge into the atmosphere is prohibited).
The surroundings of the service valve are cold compared to the evaporator.	Clogging in the equipment and/or piping on the low-pressure side.	Contact DENSO Service station for repair or replacement.
The temperature at the expansion valve inlet is low in comparison with the temperature around receiver and drier.	Clogging in the piping on the high-pressure side.	Contact DENSO Service station for compressor repair or replacement.

GAS LEAKAGE

Symptom	Possible cause	Remedy/Prevention
Notable dirt on the shaft seal part and decreasing gas	Gas leakage from the shaft seal	Contact DENSO Service station for shaft seal replacement.
Oil contamination on the bolt part	Gas leakage from the respective tightening bolt part	Retighten
Oil contamination on the gasket part	Gas leakage from each gasket part	Contact DENSO Service station for gasket replacement.
Leakage from broken parts	Gas leakage from broken parts	Contact DENSO Service station for replacement of the broken parts.

NO ADSORPTION

Symptom	Possible cause	Remedy/Prevention
The wiring relation is correct.	Coil wire break	Contact DENSO Service station for replacement of the coil with a wire break.
No adsorption even with cooler switch ON	Wire break, wrong wiring, defective contact of wiring-related parts (ground, fuse)	Inspect the harness connectors and repair or replace in case of abnormalities.
	Defective contact or operation of switches (thermostat, relay, cooler switch)	Inspect the switch-related parts and repair or replace in case of abnormalities.
Simultaneously with switch ON, the rotor moves and there is adsorption when it is pushed.	Too large gap between rotor and stator	Contact DENSO Service station for repair or compressor replacement.

SLIPPING OCCURS

Symptom	Possible cause	Remedy/Prevention
The clutch slips at the time of rotation.	Drop of the battery voltage	Charge the battery.
	Clutch surface contaminated with oil	Contact DENSO Service station for oil removal.
	Coil layer short-circuit	Contact DENSO Service station for replacement of the coil with a wire break.

RELATED TO THE EXPANSION VALVE**THE VALVE OUTLET IS NOT COLD**

Symptom	Possible cause	Remedy/Prevention
No temperature difference can be felt between inlet and outlet.	Extremely little refrigerant in the refrigeration cycle.	Check for gas leakage and repair if there is leakage. After repair fill in the correct quantity of refrigerant.
No temperature difference can be felt between inlet and outlet.	Excessive opening of the expansion valve	Contact DENSO Service station and request replacement of the expansion valve.

THE VALVE INLET IS COLD AND THERE IS DEW ON IT

Symptom	Possible cause	Remedy/Prevention
Frost is formed.	Excessively closed expansion valve	Contact DENSO Service station and request adjustment or replacement of the expansion valve.
	A tendency for clogging in the expansion valve	Contact DENSO Service station for replacement of the desiccant in expansion valve and modulator and for replacement of receiver and drier.

ABNORMAL NOISE DURING OPERATION

Abnormal noise can occur with various operation conditions. Accordingly, careful inspection must be performed under sufficient consideration of the contents of the inquiry.

- Does the abnormal noise occur with the air conditioner OFF?
- Does the abnormal noise occur with the air conditioner ON?
- Does the noise occur sometimes, continuously, or directly after air conditioner ON?

WHEN THE AIR CONDITIONER IS ON

Symptom	Possible cause	Remedy/Prevention
Abnormal noise occurring when the refrigerant is discharged from the compressor	Caused by refrigerant compression fluctuations	Contact DENSO Service station to have the refrigerant filling quantity reduced to the specified minimum value (discharge into the atmosphere is prohibited).
Abnormal noise from the compressor	Defective compressor	Contact DENSO Service station for compressor repair or replacement.

DIRECTLY AFTER THE AIR CONDITIONER IS SWITCHED ON

Symptom	Possible cause	Remedy/Prevention
Abnormal noise occurring when the compressor is started with liquid refrigerant remaining on the inside	Accumulation of liquid refrigerant caused by liquid compression	Contact DENSO Service station to have the refrigerant filling quantity reduced to the specified minimum value (discharge into the atmosphere is prohibited).
Abnormal metallic noise when the magnet clutch disengages and engages	Caused by disengaging and engaging of the magnet clutch	Contact DENSO Service station for setting the attraction gap of the magnet clutch to the lower limit value.

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TROUBLESHOOTING

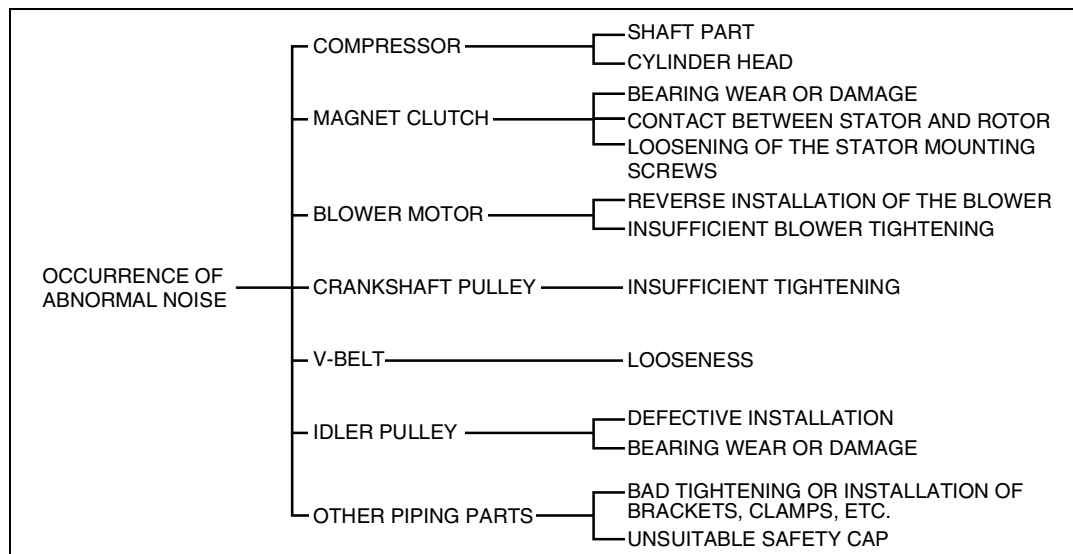
FROM TIME TO TIME AFTER THE AIR CONDITIONER IS SWITCHED ON

Symptom	Possible cause	Remedy/Prevention
An abnormal knocking noise when the clutch pulley deflection is transmitted via the shaft to the inside of the compressor	Weak belt tension	Adjust the belt tension to the standard upper limit value. Contact DENSO Service station for setting the attraction gap of the magnet clutch to the lower limit value.
Abnormal noise caused by refrigerant passing through expansion valve and magnet valve	Noise caused by passage of refrigerant through the expansion valve	Confirm that the refrigerant quantity is the specified filling quantity, and if this is not the case, recover or refill as required.

ONLY WHEN THE AIR CONDITIONER SWITCH IS ON

Symptom	Possible cause	Remedy/Prevention
Abnormal noise from the compressor	Defective compressor	Contact DENSO Service station for compressor repair or replacement.

ABNORMAL NOISE BY PARTS



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ABNORMAL NOISE FROM THE COMPRESSOR

Symptom	Possible cause	Remedy/Prevention
A knocking noise from inside the compressor	Foreign matter caught in discharge valve or suction valve	Contact DENSO Service station for disassembly of the compressor and removal of the foreign matter.
	Broken discharge valve or suction valve	Contact DENSO Service station for replacement of the discharge valve or the suction valve.

ABNORMAL NOISE FROM THE MAGNET CLUTCH

Symptom	Possible cause	Remedy/Prevention
A rattling noise from the magnetic clutch while it is not operating	Bearing wear or breakage	Contact DENSO Service station for bearing replacement.

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TROUBLESHOOTING

ABNORMAL NOISE FROM THE PIPING

Symptom	Possible cause	Remedy/Prevention
The piping is vibrating.	The piping is not fixed.	Fix the piping.

ABNORMAL NOISE FROM THE BRACKET

Symptom	Possible cause	Remedy/Prevention
The bracket has play when touched and causes noise during operation.	The bracket is cracked or broken.	Replace the bracket.
	Loose fixing bolts	Retighten

ABNORMAL NOISE FROM THE IDLER PULLEY

Symptom	Possible cause	Remedy/Prevention
Abnormal rattling noise	Broken bearing	Replace the bearing.
Shows play when touched	Cracked or loose bracket	Replace or retighten the bracket.

ABNORMAL NOISE FROM THE CRANKSHAFT PULLEY

Symptom	Possible cause	Remedy/Prevention
Rattling	Defective installation of the crankshaft pulley	Install the crankshaft pulley correctly.
	Broken bearing	Replace the bearing.
	Defective key groove	Replace the crankshaft pulley.

ABNORMAL NOISE FROM THE V-BELT

Symptom	Possible cause	Remedy/Prevention
Large deflection of the V-belt	Loose V-belt	Retighten the V-belt.
Cut side of the V-belt	The pulley is off-center.	Center the pulley.

INSPECTION OF THE REFRIGERATION CYCLE

INSPECTION WITH A GAUGE MANIFOLD

NORMAL VALUE	< CONDITIONS >	
	HIGH-PRESSURE SIDE:	
	1.37 - 1.57 MPa {14 - 16 kgf/cm ² , 200 - 227 lbf/in ² }	<ul style="list-style-type: none"> • DOORS : FULLY OPEN • INSIDE/OUTSIDE AIR SWITCHING : INSIDE AIR • ENGINE SPEED : 1500 rpm • SUCTION PORT TEMPERATURE : 30 - 35°C {86.0 - 95.0°F}
	LOW-PRESSURE SIDE:	
	0.15 - 0.25 MPa {1.5 - 2.5 kgf/cm ² , 22 - 351 lbf/in ² }	<ul style="list-style-type: none"> • BLOWER SPEED : HI • TEMPERATURE CONTROL : COLDEST

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BAD COOLING

Symptom	Possible cause	Remedy/Prevention
No air bubbles occur in the sight glass.	Excessive refrigerant filling, insufficient condenser cooling	Adjust to a suitable refrigerant filling quantity (discharge into the atmosphere is prohibited). Check the condenser fins for clogging, inspect the vehicle cooling system, and clean or repair in case of abnormalities.
Air bubbles occur in the sight glass.	Insufficient refrigerant filling	Contact DENSO Service station for repair in case of gas leakages and for refrigerant filling to a suitable quantity.
Insufficient air flow	Frosted evaporator	Contact DENSO Service station for inspection of evaporator and thermostat. Repair or replace in case of abnormalities.
Bad cooling	Insufficient evaporator heat exchange, defective operation of the electric fan	Remove any clogging of the evaporator fins. Inspect the electric fan and replace it in case of abnormalities.

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TROUBLESHOOTING

OTHER PHENOMENA

Symptom	Possible cause	Remedy/Prevention
The low-pressure piping does not cool, there are always bubbles in the sight glass.	Entry of air into the refrigeration cycle	Contact DENSO Service station for refrigerant bleeding to a suitable quantity (discharge into the atmosphere is prohibited), and refill refrigerant after sufficient vacuum drawing in the refrigeration cycle.
The low-pressure side shows a negative pressure (when the refrigeration cycle is completely clogged. In case of a clogging tendency, negative pressure is shown gradually).	Clogging of the refrigeration cycle (piping, expansion valve, receiver, drier, etc.)	Contact DENSO Service station for replacement of abnormal parts in the refrigeration cycle.
After expiration of a fixed time, the low-pressure side gradually shows a negative pressure.	Entry of water into the refrigeration cycle, water absorption capacity of receiver and drier exceeded	Contact DENSO Service station for desiccant in the modulator and for replacement of receiver and drier. Perform sufficient vacuum drawing and moisture removal before refrigerant filling.
Condensation forms on the low-pressure-piping.	Excessive opening of the expansion valve	Contact DENSO Service station and request replacement of the expansion valve.
When the compressor is switched off, high pressure and low pressure show the same value (the compressor does not become very hot).	Defective compressor compression	Contact DENSO Service station for compressor repair.

ELECTRICAL EQUIPMENT

ELECTRICAL PARTS

EN70ZZ10F300031

STARTING SYSTEM

Symptom	Possible cause	Remedy/Prevention
Engine does not operate (Starter switch)	Poor contact condition	Clean or replace contacts.
Engine does not operate (Battery)	Open circuit in harness	Check and correct.
	Short circuit between electrodes	Replace battery.
	Poor contact condition of battery terminal	Clean or retighten.
Engine does not operate (Engine oil)	Improper viscosity oil	Change oil.
Engine does not operate (Starter relay)	Defective or poor contact of starter relay	Repair or replace.
Engine does not operate (Starter)	Starter does not operate	Repair or replace. Refer to chapter "STARTER".

HEAD LIGHT CIRCUIT

Symptom	Possible cause	Remedy/Prevention
Head light does not turn on (Head light)	Bulb burned out	Replace bulb.
	Not grounded	Check the grounding.
	Broken wire	Repair wire.
Head light does not turn on (Fuse)	Fuse burned out	Replace fuse.
Head light does not turn on (Head light relay)	Defective relay	Replace relay.
Head light does not turn on (Lighting switch)	Broken wire between relay and switch	Repair wire.
	Defective switch	Replace switch.

TURN SIGNAL CIRCUIT

Symptom	Possible cause	Remedy/Prevention
Turn signal does not work (Turn signal light)	Bulb burned out	Replace bulb.
	Not grounded	Check the grounding.
	Broken wire	Repair wire.
Turn signal does not work (Fuse)	Fuse burned out	Replace fuse.
Turn signal does not work (Turn signal flasher)	Not grounded	Check the grounding.
	Defective flasher	Replace flasher.
Turn signal does not work (Turn signal switch)	Broken wire between fuse and switch	Repair wire.
	Defective switch	Replace switch.

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TROUBLESHOOTING

TAIL AND LICENSE PLATE LIGHT CIRCUIT

Symptom	Possible cause	Remedy/Prevention
Tail and license plate light does not turn on (Light)	Bulb burned out	Replace bulb.
	Not grounded	Check the grounding.
	Broken wire	Repair wire.
Tail and license plate light does not turn on (Fuse)	Fuse burned out	Replace fuse.
Tail and license plate light does not turn on (Tail light relay)	Defective relay	Replace relay
Tail and license plate light does not turn on (Lighting switch)	Broken wire between fuse and switch	Replace wire.
	Defective switch	Replace switch.

VEHICLE CONTROL (J08E)

DN01-001

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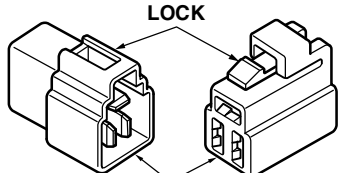
VEHICLE CONTROL SYSTEM

PRECAUTIONS FOR DIAGNOSIS

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- Ensure that individual connectors are certainly connected before start of checking works.
- Make sure to set the starter key to the "LOCK" position before disconnecting a connector.
- Replace the part or the component that have a failure or trouble. Do not fix and reuse it.
- Delete the past malfunction code after recording. Then conduct a diagnosis again to check for present failures.
- Delete the past failure memory after completion of a diagnostic analysis.

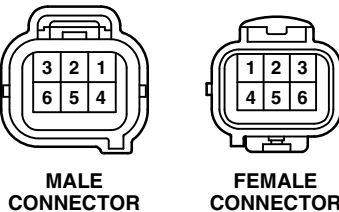
1. ILLUSTRATION OF CONNECTOR AND MEASUREMENT ON TERMINAL



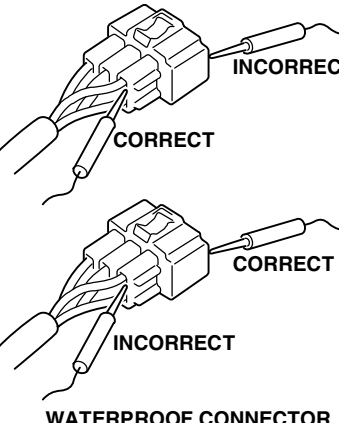
LOCK

TO BE CONNECTED

MALE CONNECTOR FEMALE CONNECTOR



MALE CONNECTOR FEMALE CONNECTOR



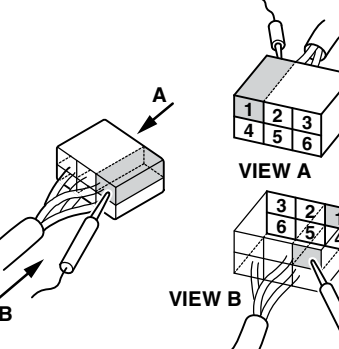
INCORRECT

CORRECT

CORRECT

INCORRECT

WATERPROOF CONNECTOR



A

VIEW A

B

VIEW B

ILLUSTRATION OF CONNECTOR

The illustration of a connector contained in this document represents an image of a connector with its lock positioned on top as viewed from the connecting face.

NUMBERING OF CONNECTOR TERMINALS

The terminals are symmetrically numbered (symmetrically reversed numbering) as viewed on the connecting faces of a pair of connectors.

The terminal #1 is located at the top right corner of a male connector and at the top left corner of a female connector respectively in this document.

PRECAUTIONS FOR TERMINAL MEASUREMENT

Unless otherwise specified in this document, the illustration of a connector represents an image of a connector as viewed from the connecting face. A test probe must access the back face of a connector.

However, some types of connector do not allow a test probe to contact with the back face such as a waterproof connector. In such case, a test probe may be allowed to access the front face of a connector but a special care must be used to avoid a risk of damage in terminals.

As to a connector that is designed to use the signal check harness for terminal measurement, do not place a test probe directly onto the front or back face. Use a contact box of the connected signal check harness to take measurement on terminals.

ILLUSTRATION OF CONNECTOR AND MEASUREMENT SURFACE

The illustration of a connector contained in this document represents an image of a connector as viewed from the connecting face. For example, the terminal #1 of a female connector is located at the top left corner of a connector as viewed from the connecting face.

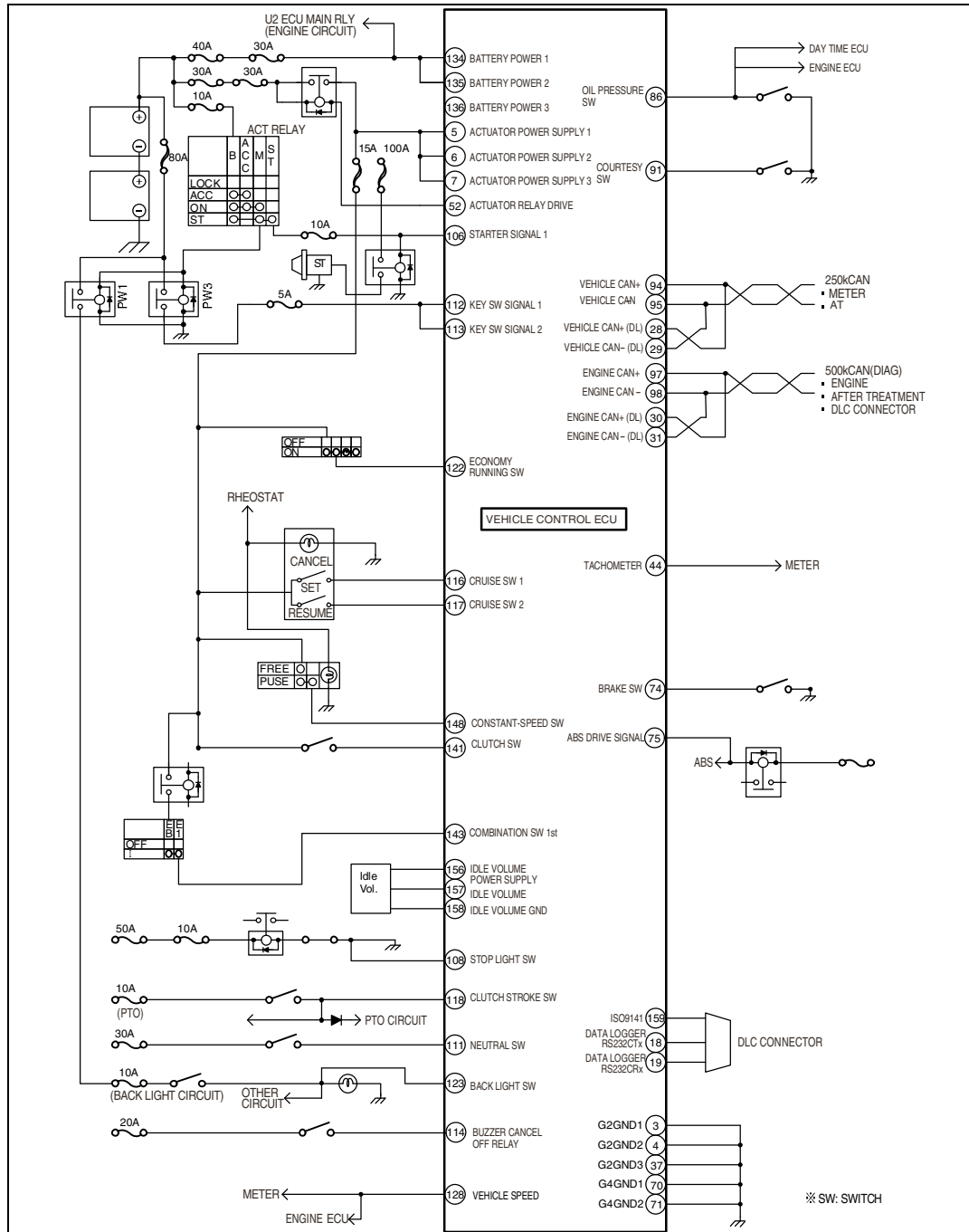
In actual measurement on the terminal #1 of a female connector, a test probe must be placed onto the top right corner on the back face of a connector.

DN01-4

VEHICLE CONTROL (J08E)

ELECTRICAL

EN1610601F200002



SHTS161060100002

SIGNAL CHECK HARNESS

EN1610601F200003

1. MENTION OF THE SIGNAL CHECK HARNESS

- (1) HINO provides a signal check harness to check the ECU.

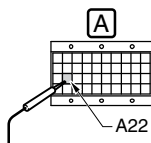
⚠ CAUTION

To prevent damage of the ECU connector, connect the signal check harness and perform measuring by bringing the test probe into contact with the signal check harness side (Contact box).

HINT

The terminal numbers referred in text or illustrations in this document correspond to the numbering in the next section "COMPUTER (ECU) PIN ASSIGNMENT" as shown in the figure below.

EXAMPLE: A22 TERMINAL



COMPUTER (ECU)
TERMINAL SIGNAL

						SP2	SP1
ISSW		CRSW	BBSW	RANH	CSW3	CSW2	CSW1
	ISOK	AGD4	ASC	APC4			

COMPUTER (ECU)
TERMINAL No.

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35

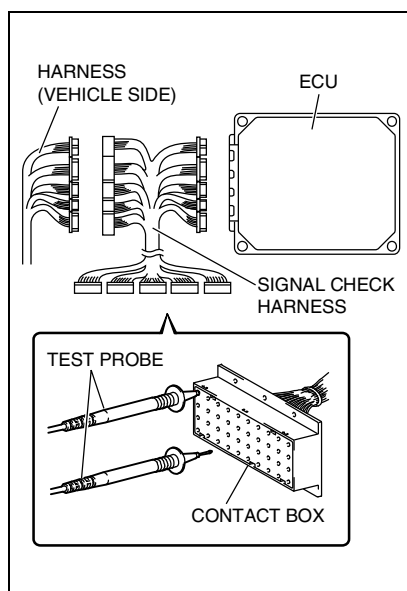
SIGNAL CHECK
HARNESS
(CONTACT BOX)

A									
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40

SHTS161060100003

DN01-6

VEHICLE CONTROL (J08E)



SHTS161060100004

2. CONNECT THE SIGNAL CHECK HARNESS.

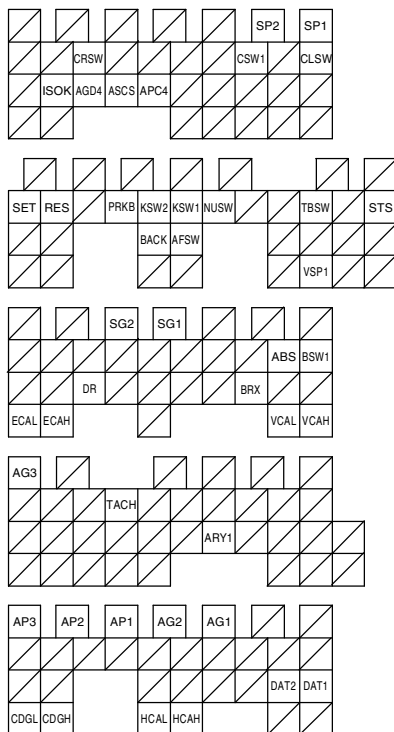
- (1) Turn the starter switch to the "LOCK" position and disconnect the connectors from the vehicle control ECU.
- (2) Connect a signal check harness to the vehicle harness and the vehicle control ECU.

SST: Signal check harness (S0904-91080)

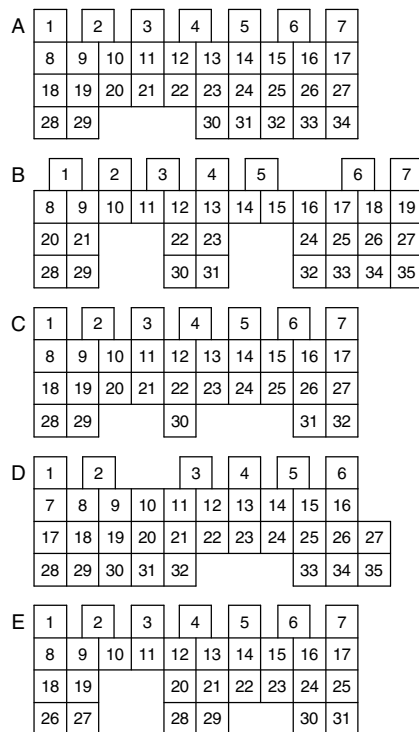
COMPUTER (ECU) PIN ASSIGNMENT

EN1610601F200004

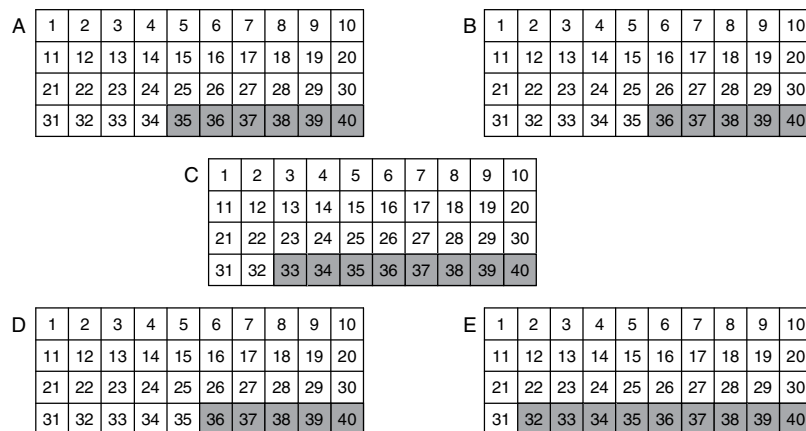
COMPUTER (ECU) TERMINAL SIGNAL



COMPUTER (ECU) TERMINAL No.



SIGNAL CHECK HARNESS (CONTACT BOX) TERMINAL No.



SHTS161060100006

DN01-8

VEHICLE CONTROL (J08E)

COMPUTER (ECU) PIN CONNECTION

- The terminal number in the table correspond with the contact box of signal check harness.

CONTACT BOX (A)					
No.	Signal	Connection destination	No.	Signal	Connection destination
1	—		18	—	
2	—		19	ISOK	Diagnosis connector
3	—		20	AGD4	Idle volume switch
4	—		21	ASCS	Idle volume switch
5	—		22	APC4	Idle volume switch
6	SP2	Fuse 7B	23	—	
7	SP1	Fuse 7B	24	—	
8	—		25	—	
9	—		26	—	
10	CRSW	Auto cruising switch	27	—	
11	—		28	—	
12	—		29	—	
13	—		30	—	
14	—		31	—	
15	CSW1	Combination switch	32	—	
16	—		33	—	
17	CLSW	Clutch switch	34	—	

VEHICLE CONTROL (J08E)

DN01-9

CONTACT BOX (B)					
No.	Signal	Connection destination	No.	Signal	Connection destination
1	—		19	STS	Starter switch signal
2	—		20	—	
3	—		21	—	
4	—		22	BACK	Back light switch
5	—		23	AFSW	Economy running switch
6	—		24	—	
7	—		25	—	
8	SET	Auto cruising switch 1	26	—	
9	RES	Auto cruising switch 2	27	—	
10	—		28	—	
11	PRKB	Parking buzzer off switch	29	—	
12	KSW2	Starter switch	30	—	
13	KSW1	Starter switch	31	—	
14	NUSW	Neutral switch	32	—	
15	—		33	VSP1	Speed sensor
16	—		34	—	
17	TBSW	Stop light switch	35	—	
18	—				

DN01-10

VEHICLE CONTROL (J08E)

CONTACT BOX (C)					
No.	Signal	Connection destination	No.	Signal	Connection destination
1	—		17	BSW1	Brake switch
2	—		18	—	
3	SG2	Ground	19	—	
4	SG1	Ground	20	DR	Courtesy switch
5	—		21	—	
6	—		22	—	
7	—		23	—	
8	—		24	—	
9	—		25	BRX	Engine oil hydraulic failure signal
10	—		26	—	
11	—		27	—	
12	—		28	ECAL	Junction CAN
13	—		29	ECAH	Junction CAN
14	—		30	—	
15	—		31	VCAL	Junction CAN
16	ABS	ABS cut relay	32	VCAH	Junction CAN

VEHICLE CONTROL (J08E)

DN01-11

CONTACT BOX (D)					
No.	Signal	Connection destination	No.	Signal	Connection destination
1	AG3	Ground	19	—	
2	—		20	—	
3	—		21	—	
4	—		22	—	
5	—		23	ARY1	Actuator relay
6	—		24	—	
7	—		25	—	
8	—		26	—	
9	—		27	—	
10	TACH	Tachometer	28	—	
11	—		29	—	
12	—		30	—	
13	—		31	—	
14	—		32	—	
15	—		33	—	
16	—		34	—	
17	—		35	—	
18	—				

DN01-12

VEHICLE CONTROL (J08E)

CONTACT BOX (E)					
No.	Signal	Connection destination	No.	Signal	Connection destination
1	AP3	Fuse 7B	17	—	
2	AP2	Fuse 7B	18	—	
3	AP1	Fuse 7B	19	—	
4	AG2	Ground	20	—	
5	AG1	Ground	21	—	
6	—		22	—	
7	—		23	—	
8	—		24	DAT2	Data logger RxD
9	—		25	DAT1	Data logger TxD
10	—		26	CDGL	Junction CAN
11	—		27	CDGH	Junction CAN
12	—		28	HCAH	Junction CAN
13	—		29	HCAH	Junction CAN
14	—		30	—	
15	—		31	—	
16	—				

PRIOR CHECK

EN1610601F200005

1. CHECKING THE BATTERY VOLTAGE.

- (1) Check the battery voltage.

Standard: 10-16V

HINT

- If power would not be supplied to the vehicle control ECU, a vehicle could still run, but various troubles might occur as described below.
 - The tachometer might not work.
 - The water temperature gauge might not work.
 - Indicating "Engine system trouble" on the multi information.
- The function listed below might not properly operate.
 - FS cruise
 - Economy running
 - Auxiliary brake (Exhaust brake)
 - Idle volume

2. CHECKING THE FUSE.

- (1) Check the fuse.

3. CHECKING THE CONNECTION OF THE VEHICLE CONTROL ECU CONNECTOR.

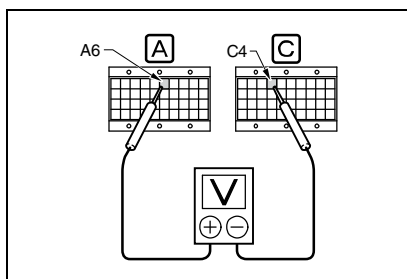
- (1) Check that the vehicle control ECU connector is surely connected.

4. CHECKING THE VEHICLE CONTROL ECU.

- (1) Diagnose the engine ECU and check that diagnosis codes would not output.

VEHICLE CONTROL ECU INSPECTION

EN1610601F200006



SHTS161060100007

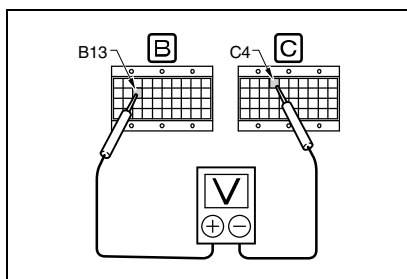
1. CHECK THE VEHICLE CONTROL ECU INPUT VOLTAGE.

- (1) Set the starter switch to the "LOCK" position.
- (2) Connect the signal check harness to the vehicle control ECU.
- (3) Measure the voltage between the terminals SP2 (A6) and SG1 (C4) of the signal check harness.

Standard: 10V or more

YES
NO

Trouble of harness between vehicle control ECU and battery



SHTS161060100008

2. CHECK THE VEHICLE CONTROL ECU INPUT VOLTAGE.

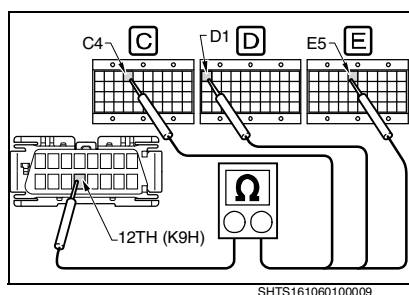
- (1) Set the starter switch to the "ON" position, and measure the voltage between the terminals KSW (B13) and SG1 (C4) of the signal check harness.

Standard: 10V or more

YES
NO

Trouble of harness between vehicle control ECU and starter switch

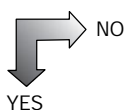
Proceed to 3.

**3. CHECK THE RESISTANCE BETWEEN VEHICLE CONTROL ECU AND GND.**

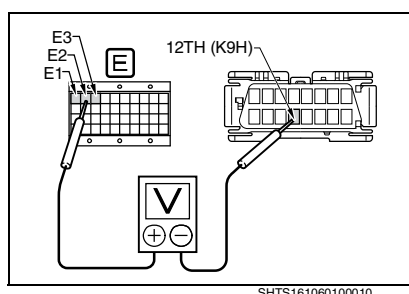
- (1) Set the starter switch to the "LOCK" position and measure the resistance between the terminals SG1 (C4), AG3 (D1), AG1 (E5) of the signal check harness and 12th (K9H) terminals of the DLC connector (16P).

Standard: 1 Ω or less

Terminal to measure the resistance	
SG1 (C4)	12th (K9H)
AG3 (D1)	
AG1 (E5)	



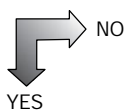
- Disconnection of GND harness
• Loose connection

**4. CHECK THE VEHICLE CONTROL ECU ACTUATOR RELAY ACTIVATION.**

- (1) Set the starter switch to the "ON" position and measure the voltage between the terminals AP3 (E1), AP2 (E2), AP1 (E3) of the signal check harness and 12th (K9H) terminals of the DLC connector (16P).

Standard: 10V or more

Terminal to measure the voltage	
+ Side	- Side
AP3 (E1)	12th (K9H)
AP2 (E2)	
AP1 (E3)	

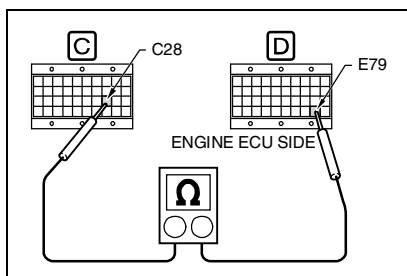


Trouble of actuator power supply circuit

Proceed to 5.

DN01-16

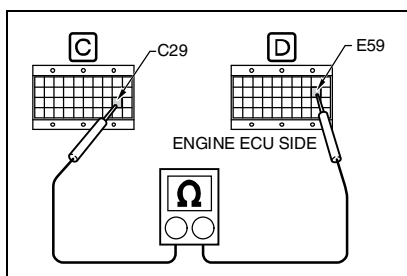
VEHICLE CONTROL (J08E)



5. CHECK THE RESISTANCE BETWEEN VEHICLE CONTROL ECU AND ENGINE CAN LINE.

- (1) Set the starter switch to the "LOCK" position and disconnect the engine ECU connector.
- (2) Connect the signal check harness on the engine ECU.
- (3) Measure the resistance between ECAL (C28) terminal and CA1L (E79) terminal of the signal check harness.

Standard: 1 Ω or less



- (4) Measure the resistance between ECAH (C29) terminal and CA1H (E59) terminal of the signal check harness.

Standard: 1 Ω or less

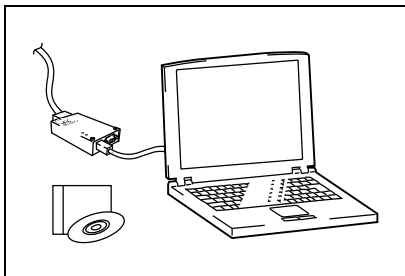
YES
NO

Trouble of CAN harness between vehicle control ECU and engine ECU

Clear and recheck the DTC.

DIAGNOSIS USING THE PC (PERSONAL COMPUTER) DIAGNOSIS TOOL WITH INTERFACE

EN1610601F200007



SHTS161060100013

1. INTRODUCTION TO HINO-DX

- (1) The Hino-DX is designed to diagnose the vehicle control ECU. For connection to the vehicle, the Hino-Bowie (interface box) and dedicated cables must be used.

SST:

Computer interface (Hino-Bowie)

The main body and cables for RS232C and USB (09993-E9070)

Cable between vehicle and Hino-Bowie (S0904-21220)

(DENSO DST-i set without LCD)

Without Bluetooth® (95171-01020)

With Bluetooth® (95171-01040)

(DENSO DST-i set with LCD)

Without Bluetooth® (95171-01030)

With Bluetooth® (95171-01050)

Diagnosis software: HINO Diagnostic explorer (DX)

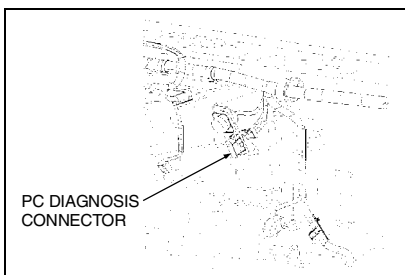
Reprogramming software: HINO Reprog Manager

NOTICE

Only ECU reprogramming can be performed by authorized HINO dealer.

HINT

- The Hino-Bowie and the cable to connect computer are included in the Hino-Bowie kit.
Select the RS-232C cable or the USB cable.
- Also, read the operation manual of the Hino-Bowie.
- Install the Hino Diagnostic eXplorer (Hino-DX) software on a personal computer. For installation procedures, read the manual supplied with a CD.



SHTS161060100014

2. CONNECT THE PC DIAGNOSIS TOOL (Hino-DX).

- (1) Turn the starter switch to the "LOCK" position.
- (2) Connect the diagnosis cable between diagnosis connector and interface.
- (3) Connect the interface to the PC.
- (4) Turn the starter switch to the "ON" position.
(Do not start the engine.)
- (5) The opening menu will be displayed on the PC screen.


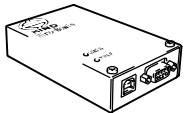
HINT

When the Hino-Bowie is connected to a vehicle, the power supply will turn on and the power light (red) on the Hino-Bowie will light on.

DN01-18

VEHICLE CONTROL (J08E)

3. LIST OF DIAGNOSTIC TOOLS

Part name	Part No.	Appearance	Outline/feature
Personal computer (DOS/V standard)	—		<ul style="list-style-type: none">Operating system (OS): Windows 95, Windows 98 (IE 5.0 or later), Windows 2000 (SP3, IE 5.0 or later), Windows XP (SP1a, IE 6.0 or later)CPU and memory: Must be guaranteed for the performances of the aforesaid operating systems.Display: 800 x 600 (Resolution), 256 or more colors
Hino-Bowie (Interface box)	09993-E9070 Interface box the body and cables (For RS-232C and USB) S0904-21220 Cable of between vehicle and Hino-Bowie		<ul style="list-style-type: none">Personal computer interface

4. OPERATION OF THE HINO-DX SYSTEM SPECIFICATION CHNAGE FUNCTION WHEN THE PARTS REPLACEMENT

- (1) By compare with the factory manufactured vehicle between the retro-fitted vehicle, If would retrofit the different size of tire or the differential from default installation, use the system specification change function of the Hino-DX, to update the ECU data.
- (2) If the drive master (with a printer) and drive master PRO are installed in a later stage, use the installation specification change function of the Hino-DX to turn on the drive master identification.
Turning on the identification will stop operation of the MY drive master.

DIAGNOSIS MONITOR CODE AND DIAGNOSIS TROUBLE CODE TABLE

EN1610601F200008

NOTICE

DTC No.: Diagnosis Trouble Code (Using the PC diagnosis tool)

DTC No.	DIAGNOSIS ITEM	PRESUMED CAUSE OF TROUBLE
P0704	Clutch switch malfunction	No clutch change, during in a vehicle speed range from 0 km/h to 80 km/h or from 80 km/h to 0 km/h.
P1565	Cruise switch malfunction	The cruise switch 1 or switch 2 is ON when the starter is ON.
P0850	Neutral switch malfunction	No neutral change, during a vehicle speed range from 0 km/h to 80 km/h or from 80 km/h to 0 km/h.
P0501	Vehicle speed sensor signal error	A deviation in the vehicle speed is 200 km/h or more in a cycle of 16 msec.
P0500	Vehicle speed sensor input open/short	The engine speed is 800 r/min or more, the water temperature is 80°C {176°F} or more and the vehicle speed is zero.
P0617	Starter switch battery short	The engine speed is 1,000 r/min or more and the starter switch is ON.
P0563	VBB fail trouble (High range)	Voltage of 32V or more.
P0562	VBB fail trouble (Low range)	Voltage of 0V.
P1143	VIMC fail trouble (High range)	Idle volume voltage of 4.59V or more.
P1142	VIMC fail trouble (Low range)	Idle volume voltage of 0V.
U0101	Disconnection of bus line between Automatic transmission controller and vehicle control	ETC1 blackout in the vehicle CAN.
U0155	Disconnection of bus line between meter and vehicle control	DISP_METER blackout in the vehicle CAN.
U0105	Blackout in the engine CAN (EEC1)	EEC1 blackout in the engine CAN.
	Blackout in the engine CAN (EEC2)	EEC2 blackout in the engine CAN.
	Blackout in the engine CAN (EEC3)	EEC3 blackout in the engine CAN.
	Blackout in the engine CAN (CCVS)	CCVS blackout in the engine CAN.
	Blackout in the engine CAN (ET1)	ET1 blackout in the engine CAN.
	Blackout in the engine CAN (EEP1)	EEP1 blackout in the engine CAN.
	Blackout in the engine CAN (EC)	EC blackout in the engine CAN.
	Blackout in the engine CAN (RC_EXR)	RC_EXR blackout in the engine CAN.

DN01-20

VEHICLE CONTROL (J08E)

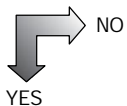
CLUTCH SWITCH MALFUNCTION

EN1610601F200009

DTC No.	P0704	Clutch switch malfunction
---------	-------	---------------------------

1. INSPECTION

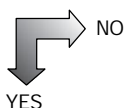
- (1) Prior check and check to see that there is no abnormal.
Refer to the section "**PRIOR CHECK**" (DN01-13).



Repair the trouble

2. CHECK THE CLUTCH SWITCH.

- (1) Check the clutch switch and check to see that there is no abnormal.
Refer to the section "**CLUTCH SWITCH INSPECTION**" (DN01-37).



- Trouble of connector
- Trouble of harness

Clear and recheck the DTC.

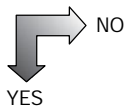
CRUISE SWITCH MALFUNCTION

EN1610601F200010

DTC No.	P1565	Cruise switch malfunction
---------	-------	---------------------------

1. INSPECTION

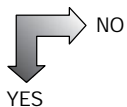
- (1) Prior check and check to see that there is no abnormal.
Refer to the section "**PRIOR CHECK**" (DN01-13).



Repair the trouble

2. CHECK THE CRUISE MAIN SWITCH.

- (1) Check the cruise main switch and check to see that there is no abnormal.
Refer to the section "**CRUISE MAIN SWITCH INSPECTION**" (DN01-40).



- Trouble of connector
- Trouble of harness

Clear and recheck the DTC.

DN01-22

VEHICLE CONTROL (J08E)

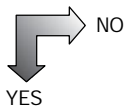
NEUTRAL SWITCH MALFUNCTION

EN1610601F200011

DTC No.	P0850	Neutral switch malfunction
---------	-------	----------------------------

1. INSPECTION

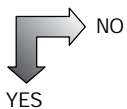
- (1) Prior check and check to see that there is no abnormal.
Refer to the section "**PRIOR CHECK**" (DN01-13).



Repair the trouble

2. CHECK THE NEUTRAL SWITCH.

- (1) Check the neutral switch and check to see that there is no abnormal.
Refer to the section "**NEUTRAL SWITCH INSPECTION**" (DN01-41).



- Trouble of connector
- Trouble of harness

Clear and recheck the DTC.

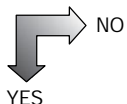
EXCESSIVE VEHICLE SPEED SENSOR INPUT

EN1610601F200012

DTC No.	P0501	Vehicle speed sensor signal error
---------	-------	-----------------------------------

1. INSPECTION

- (1) Prior check and check to see that there is no abnormal.
Refer to the section "**PRIOR CHECK**" (DN01-13).



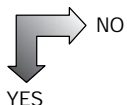
NO

Repair the trouble

YES

2. CHECK THE VEHICLE SPEED SENSOR.

- (1) Check the vehicle speed sensor and check to see that there is no abnormal.
Refer to the section "**VEHICLE SPEED SENSOR INSPECTION**" (DN01-39).



NO

- Trouble of connector
- Trouble of harness

YES

Clear and recheck the DTC.

VEHICLE SPEED SENSOR INPUT OPEN/SHORT

EN1610601F200013

DTC No.	P0500	Vehicle speed sensor input open/short
---------	-------	---------------------------------------

1. INSPECTION ITEM

- (1) Take the same procedures as described in the section "Excessive vehicle speed sensor input".
Refer to the section "**EXCESSIVE VEHICLE SPEED SENSOR INPUT (DTC No.P0501)**" (DN01-23).

DN01-24

VEHICLE CONTROL (J08E)

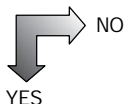
STARTER SWITCH BATTERY SHORT

EN1610601F200014

DTC No.	P0617	Starter switch battery short
---------	-------	------------------------------

1. INSPECTION

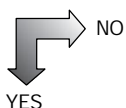
- (1) Prior check and check to see that there is no abnormal.
Refer to the section "**PRIOR CHECK**" (DN01-13).



Repair the trouble

2. CHECK THE STARTER SWITCH.

- (1) Check the starter switch and check to see that there is no abnormal.
Refer to the section "**STARTER SWITCH INSPECTION**" (DN01-36).



- Trouble of connector
- Trouble of harness

Clear and recheck the DTC.

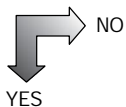
VBB FAIL TROUBLE (HIGH/LOW RANGE)

EN1610601F200015

DTC No.	P0563	VBB fail trouble (High range)
DTC No.	P0562	VBB fail trouble (Low range)

1. INSPECTION

- (1) Prior check and check to see that there is no abnormal.
Refer to the section "**PRIOR CHECK**" (DN01-13).



Repair the trouble

Clear and recheck the DTC.

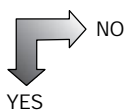
VIMC FAIL TROUBLE (HIGH/LOW RANGE)

EN1610601F200016

DTC No.	P1143	VIMC fail trouble (High range)
DTC No.	P1142	VIMC fail trouble (Low range)

1. INSPECTION

- (1) Prior check and check to see that there is no abnormal.
Refer to the section "**PRIOR CHECK**" (DN01-13).



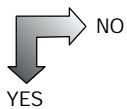
NO

Repair the trouble

YES

2. CHECK THE IDLE VOLUME.

- (1) Check the idle volume and check to see that there is no abnormal.
Refer to the section "**IDLE VOLUME INSPECTION**" (DN01-35).



NO

- Trouble of connector
- Trouble of harness

YES

Clear and recheck the DTC.

DN01-26

VEHICLE CONTROL (J08E)

DISCONNECTION OF BUS LINE BETWEEN AUTOMATIC TRANSMISSION CONTROLLER AND VEHICLE CONTROL

EN1610601F200017

DTC No.	U0101	Disconnection of bus line between Automatic transmission controller and vehicle control
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1. INSPECTION ITEM

- (1) Check the CAN communication line.
Refer to the chapter "**OTHERS (CAN COMMUNICATION)**" in the "**WORKSHOP MANUAL (CHASSIS)**".

DISCONNECTION OF BUS LINE BETWEEN METER AND VEHICLE CONTROL

EN1610601F200018

DTC No.	U0155	Disconnection of bus line between meter and vehicle control
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1. INSPECTION ITEM

- (1) Check the CAN communication line.
Refer to the chapter "**OTHERS (CAN COMMUNICATION)**" in the "**WORKSHOP MANUAL (CHASSIS)**".

BLACKOUT IN THE ENGINE CAN

EN1610601F200019

DTC No.	U0105	Blackout in the engine CAN
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1. INSPECTION ITEM

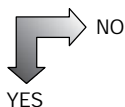
- (1) Check the CAN communication line.
Refer to the chapter "**OTHERS (CAN COMMUNICATION)**" in the "**WORKSHOP MANUAL (CHASSIS)**".

NO ACTIVATION OF AUXILIARY BRAKE

EN1610601F200020

1. INSPECTION

- (1) Prior check and check to see that there is no abnormal.
Refer to the section "**PRIOR CHECK**" (DN01-13).



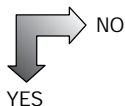
NO

Repair the trouble

YES

2. CHECK THE VEHICLE SPEED SENSOR.

- (1) Check the vehicle speed sensor and check to see that there is no abnormal.
Refer to the section "**VEHICLE SPEED SENSOR INSPECTION**" (DN01-39).



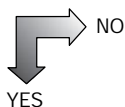
NO

- Trouble of connector
- Trouble of harness

YES

3. CHECK THE NEUTRAL SWITCH.

- (1) Check the neutral switch and check to see that there is no abnormal.
Refer to the section "**NEUTRAL SWITCH INSPECTION**" (DN01-41).



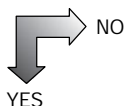
NO

- Trouble of connector
- Trouble of harness

YES

4. CHECK THE CLUTCH SWITCH.

- (1) Check the clutch switch and check to see that there is no abnormal.
Refer to the section "**CLUTCH SWITCH INSPECTION**" (DN01-37).



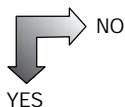
NO

- Trouble of connector
- Trouble of harness

YES

5. CHECK THE EXHAUST BRAKE SWITCH.

- (1) Check the exhaust brake switch and check to see that there is no abnormal.
Refer to the section "**EXHAUST BRAKE SWITCH INSPECTION**" (DN01-39).



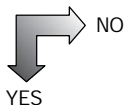
NO

- Trouble of connector
- Trouble of harness

YES

6. CHECK THE STOP LIGHT SWITCH.

- (1) Check the stop light switch and check to see that there is no abnormal.
- Refer to the section "**STOP LIGHT SWITCH INSPECTION**" (DN01-40).



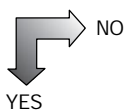
NO

- Trouble of connector
- Trouble of harness

YES

7. CHECK THE AUXILIARY BRAKE ACTIVATION CONDITION.

- (1) Check whether under condition of the auxiliary brake activation.
- Engine retarder activation conditions
(Under all of the conditions 1 to 9.)
 - One of the requests listed below:
 - Driver's request for engine retarder (1st or 2nd lever position)
 - Engine retardation by auxiliary brake interlock function
 - Engine retardation by cruise interlock
 - Engine retardation by external request
 - No engine stall
 - P.T.O. inactive
 - Engine retarder setting selected
 - Engine speed predetermined for engine retarder activation
(850 r/min or more)
 - Water temperature predetermined for engine retarder activation (40°C {104°F} or more)
 - Injection flow predetermined for engine retarder activation
 - No cut in engine retarder (clutch pedal not depressed; accelerator opening of 0%; ABS not activated)
 - No auxiliary brake control stop
 - Exhaust braking is requested when a vehicle stops.



NO

Repair the trouble

YES

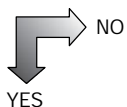
Clear and recheck the DTC.

NO ACTIVATION/RELEASE OF ENGINE REVOLUTION CONTROL

EN1610601F200021

1. INSPECTION

- (1) Prior check and check to see that there is no abnormal.
Refer to the section "**PRIOR CHECK**" (DN01-13).



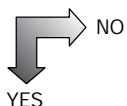
NO

Repair the trouble

YES

2. CHECK THE IDLE VOLUME.

- (1) Check the idle volume and check to see that there is no abnormal.
Refer to the section "**IDLE VOLUME INSPECTION**" (DN01-35).



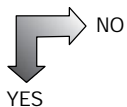
NO

- Trouble of connector
- Trouble of harness

YES

3. CHECK THE NEUTRAL SWITCH.

- (1) Check the neutral switch and check to see that there is no abnormal.
Refer to the section "**NEUTRAL SWITCH INSPECTION**" (DN01-41).



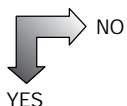
NO

- Trouble of connector
- Trouble of harness

YES

4. CHECK THE STOP LIGHT SWITCH.

- (1) Check the stop light switch and check to see that there is no abnormal.
Refer to the section "**STOP LIGHT SWITCH INSPECTION**" (DN01-40).



NO

- Trouble of connector
- Trouble of harness

YES

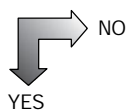
Clear and recheck the DTC.

DN01-30

VEHICLE CONTROL (J08E)

5. CHECKING IDLING ENGINE SPEED.

(1) Check that idling engine speed is proper as required.



- Trouble of connector
- Trouble of harness

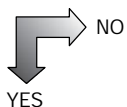
Clear and recheck the DTC.

NO ACTIVATION/RELEASE OF CRUISE FUNCTION

EN1610601F200022

1. INSPECTION

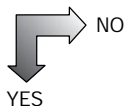
- (1) Prior check and check to see that there is no abnormal.
Refer to the section "**PRIOR CHECK**" (DN01-13).



Repair the trouble

2. CHECK THE CRUISE MAIN SWITCH.

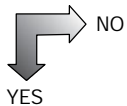
- (1) Check the cruise main switch and check to see that there is no abnormal.
Refer to the section "**CRUISE MAIN SWITCH INSPECTION**" (DN01-40).



- Trouble of connector
- Trouble of harness

3. CHECK THE CRUISE SWITCH 1, 2.

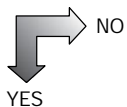
- (1) Check the cruise switch 1, 2 and check to see that there is no abnormal.
Refer to the section "**CRUISE SWITCH 1 & 2 INSPECTION**" (DN01-38).



- Trouble of connector
- Trouble of harness

4. CHECK THE VEHICLE SPEED SENSOR.

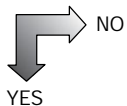
- (1) Check the vehicle speed sensor and check to see that there is no abnormal.
Refer to the section "**VEHICLE SPEED SENSOR INSPECTION**" (DN01-39).



- Trouble of connector
- Trouble of harness

5. CHECK THE CLUTCH SWITCH.

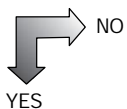
- (1) Check the clutch switch and check to see that there is no abnormal.
Refer to the section "**CLUTCH SWITCH INSPECTION**" (DN01-37).



- Trouble of connector
- Trouble of harness

6. CHECK THE NEUTRAL SWITCH.

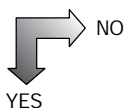
- (1) Check the neutral switch and check to see that there is no abnormal.
Refer to the section "**NEUTRAL SWITCH INSPECTION**" (DN01-41).



- Trouble of connector
- Trouble of harness

7. CHECK THE STOP LIGHT SWITCH.

- (1) Check the stop light switch and check to see that there is no abnormal.
Refer to the section "**STOP LIGHT SWITCH INSPECTION**" (DN01-40).



- Trouble of connector
- Trouble of harness

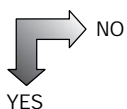
Clear and recheck the DTC.

NO ACTIVATION OF ECO MODE

EN1610601F200023

1. INSPECTION

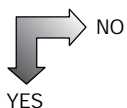
- (1) Prior check and check to see that there is no abnormal.
Refer to the section "**PRIOR CHECK**" (DN01-13).



Repair the trouble

2. CHECK THE ECONOMY RUNNING SWITCH.

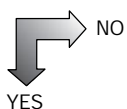
- (1) Check the economy running switch and check to see that there is no abnormal.
Refer to the section "**ECONOMY RUNNING SWITCH INSPECTION**" (DN01-42).



- Trouble of connector
- Trouble of harness

3. CHECK THE CLUTCH SWITCH.

- (1) Check the clutch switch and check to see that there is no abnormal.
Refer to the section "**CLUTCH SWITCH INSPECTION**" (DN01-37).



- Trouble of connector
- Trouble of harness

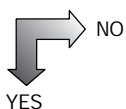
Clear and recheck the DTC.

NO RELEASE OF ECO MODE

EN1610601F200024

1. INSPECTION

- (1) Prior check and check to see that there is no abnormal.
Refer to the section "**PRIOR CHECK**" (DN01-13).



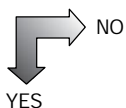
NO

Repair the trouble

YES

2. CHECK THE ECONOMY RUNNING SWITCH.

- (1) Check the economy running switch and check to see that there is no abnormal.
Refer to the section "**ECONOMY RUNNING SWITCH INSPECTION**" (DN01-42).



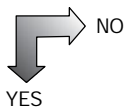
NO

- Trouble of connector
- Trouble of harness

YES

3. CHECK THE VEHICLE SPEED SENSOR.

- (1) Check the vehicle speed sensor and check to see that there is no abnormal.
Refer to the section "**VEHICLE SPEED SENSOR INSPECTION**" (DN01-39).



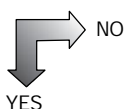
NO

- Trouble of connector
- Trouble of harness

YES

4. CHECK THE CLUTCH SWITCH.

- (1) Check the clutch switch and check to see that there is no abnormal.
Refer to the section "**CLUTCH SWITCH INSPECTION**" (DN01-37).



NO

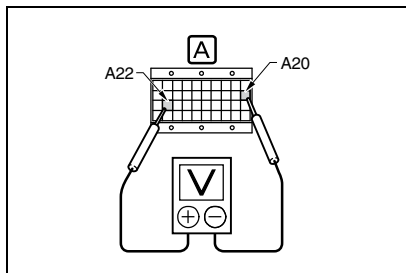
- Trouble of connector
- Trouble of harness

YES

Clear and recheck the DTC.

IDLE VOLUME INSPECTION

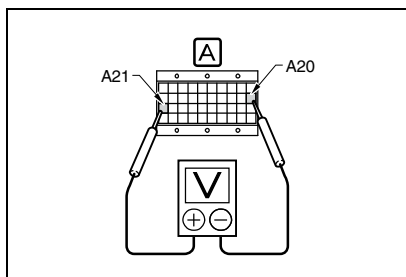
EN1610601F200025



SHTS161060100017

1. CHECK THE IDLE VOLUME POWER SUPPLY VOLTAGE.

- (1) Set the starter switch to the "LOCK" position and connect the signal check harness to the vehicle control ECU.
- (2) Set the starter switch to the "ON" position, and measure the voltage between the terminals APC4 (A22) and AGD4 (A20) of the signal check harness.

Standard: 4.5V or more

SHTS161060100018

2. CHECK THE IDLE VOLUME VOLTAGE.

- (1) Measure the voltage between the terminals ASCS (A21) and AGD4 (A20) of the signal check harness. Check that a voltage increases when the idle volume is turned clockwise.

Standard: 1.5-4.5V

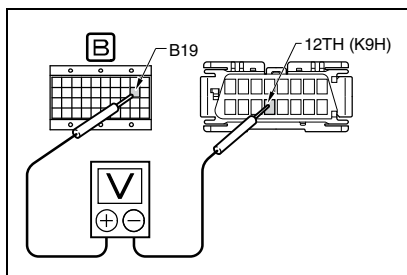
YES
NO

- Trouble of connector
- Trouble of harness
- Trouble of idle volume switch

Clear and recheck the DTC.

STARTER SWITCH INSPECTION

EN1610601F200026

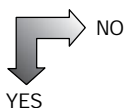


SHTS161060100019

1. MEASURE THE STARTER SWITCH SIGNAL.

- (1) Set the starter switch to the "LOCK" position and connect the signal check harness to the vehicle control ECU.
- (2) With the starter running, measuring the voltage between 12th (K9H) and STS (B19) terminals of the signal check harness.

Standard:

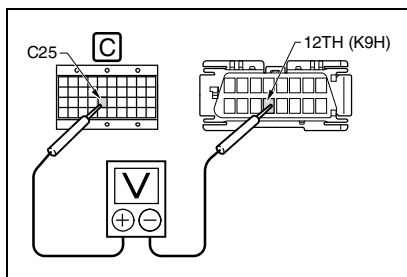
Starter activated: 9V or more**Other: APPROX. 0V**

- Trouble of connector
- Trouble of harness

Clear and recheck the DTC.

ENGINE OIL HYDRAULIC FAILURE INSPECTION

EN1610601F200027



SHTS161060100020

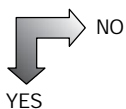
1. MEASURE THE ENGINE OIL HYDRAULIC FAILURE SIGNAL.

- (1) Set the starter switch to the "LOCK" position and connect the signal check harness to the vehicle control ECU.
- (2) Set the starter switch to the "ON" position, and measure the voltage between 12th (K9H) and BRX (C25) terminals of the signal check harness.

Standard: APPROX. 0V

- (3) Release air from the air tank (max. 98 kPa [1.0 kgf/cm²]) and measure voltage again between C25 and 12th (K9H) terminal.

Standard: 10V or less

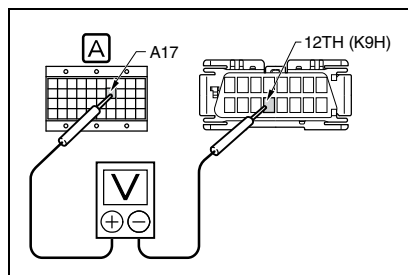


- Trouble of connector
- Trouble of harness

Clear and recheck the DTC.

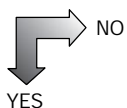
CLUTCH SWITCH INSPECTION

EN1610601F200028



1. MEASURE THE CLUTCH SWITCH SIGNAL.

- (1) Set the starter switch to the "LOCK" position and connect the signal check harness to the vehicle control ECU.
- (2) Set the starter switch to the "ON" position, and measure the voltage between 12th (K9H) and CLSW (A17) terminals of the signal check harness when the clutch pedal would be step on and would be step off.

Standard:**Clutch pedal depressed: 10-16V****Clutch pedal released: APPROX. 0V**

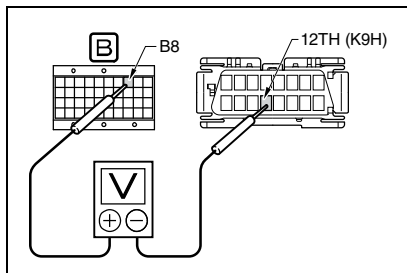
NO

- Trouble of connector
- Trouble of harness

Clear and recheck the DTC.

CRUISE SWITCH 1 & 2 INSPECTION

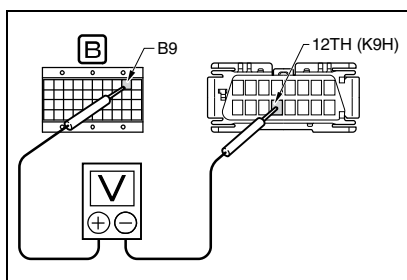
EN1610601F200029



SHTS161060100022

1. MEASURE THE SIGNALS OF CRUISE SWITCHES 1 & 2.

- (1) Set the starter switch to the "LOCK" position and connect the signal check harness to the vehicle control ECU.
- (2) Set the starter switch to the "ON" position, and measure the voltage between 12th (K9H) and SET (B8) terminals of the signal check harness when the cruise set switch is ON and OFF.

Standard:**Set switch "ON": 10V or more****Set switch "OFF": APPROX. 0V**

SHTS161060100023

- (3) Also measure the voltage between 12th (K9H) and RES (B9) the terminals of the signal check harness when the resume switch is ON and OFF.

Standard:**Resume switch "ON": 10V or more****Resume switch "OFF": APPROX. 0V**

YES

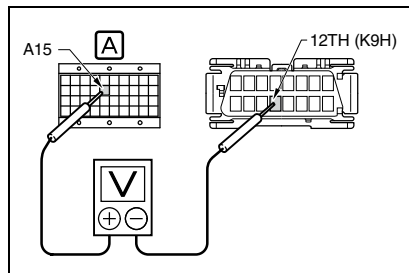
NO

- Trouble of connector
- Trouble of harness

Clear and recheck the DTC.

EXHAUST BRAKE SWITCH INSPECTION

EN1610601F200030



SHTS161060100024

1. MEASURE THE SIGNAL OF EXHAUST BRAKE SWITCH.

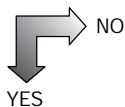
- (1) Set the starter switch to the "LOCK" position and connect the signal check harness to the vehicle control ECU.
- (2) With the starter key to the ON position and the exhaust brake switch to the level indicated below, measure voltage between 12th (K9H) and each terminal of the signal check harness.

HINT

This may vary depending on vehicle specifications. See auxiliary brake specifications.

Standard:

	Terminal A15
No switch operation	0V
1st position	10V or more

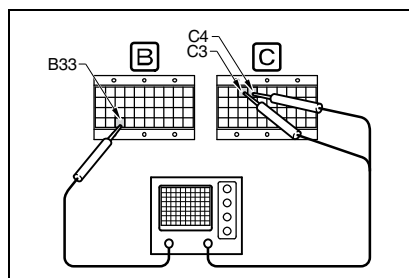


- Trouble of connector
- Trouble of harness

Clear and recheck the DTC.

VEHICLE SPEED SENSOR INSPECTION

EN1610601F200031



SHTS161060100025

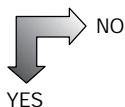
1. MEASURING A VEHICLE SPEED PULSE SIGNAL.

- (1) Set the starter switch to the "LOCK" position and connect the signal check harness to the vehicle control ECU.
- (2) Start the engine. Slowly move the vehicle while checking that it is safe around the vehicle.
- (3) Use an oscilloscope (voltage axis: 5 V-DIV, time axis: 20 msec/DIV) to check that a signal waveform is output between the VSP1 terminal (B33) and the terminal SG2 (C3) or SG1 (C4) of the signal check harness.

Standard:

Presence of vehicle speed: A pulse waveform will be output.

No vehicle speed: No pulse waveform

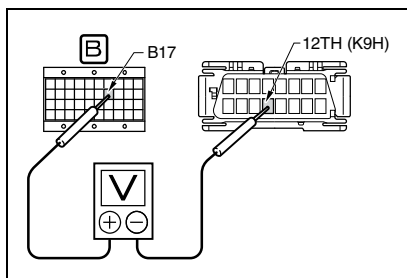


- Trouble of connector
- Trouble of harness

Clear and recheck the DTC.

STOP LIGHT SWITCH INSPECTION

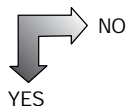
EN1610601F200032



SHTS161060100026

1. MEASURE THE STOP LIGHT SWITCH SIGNAL.

- (1) Set the starter switch to the "LOCK" position and connect the signal check harness to the vehicle control ECU.
- (2) Set the starter switch to the "ON" position, and measure the voltage between 12th (K9H) and TBSW (B17) terminals of the signal check harness when the brake pedal is depressed and released.

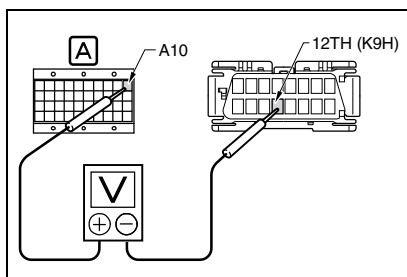
Standard:**Brake pedal depressed: APPROX. 0V****Brake pedal released: 10V or more**

- Trouble of connector
- Trouble of harness

Clear and recheck the DTC.

CRUISE MAIN SWITCH INSPECTION

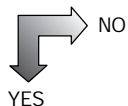
EN1610601F200033



SHTS161060100027

1. MEASURE THE CRUISE MAIN SWITCH SIGNAL.

- (1) Set the starter switch to the "LOCK" position and connect the signal check harness to the vehicle control ECU.
- (2) Set the starter switch to the "ON" position, and measure the voltage between 12th (K9H) and CRSW (A10) terminals of the signal check harness when the constant-speed switch is ON and OFF.

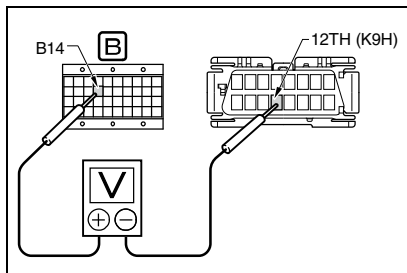
Standard:**Constant-speed switch "ON": 10V or more****Constant-speed switch "OFF": APPROX. 0V**

- Trouble of connector
- Trouble of harness

Clear and recheck the DTC.

NEUTRAL SWITCH INSPECTION

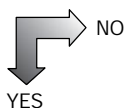
EN1610601F200034



SHTS161060100028

1. MEASURE THE NEUTRAL SWITCH SIGNAL.

- (1) Set the starter switch to the "LOCK" position and connect the signal check harness to the vehicle control ECU.
- (2) Set the starter switch to the "ON" position, and measure the voltage between 12th (K9H) and NUSW (B14) terminals of the signal check harness when the shift lever is set to and not set to the neutral position.

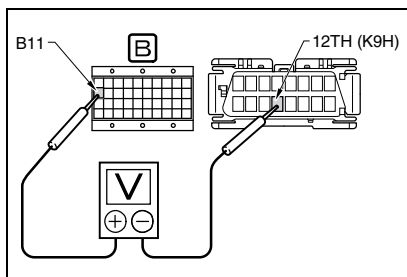
Standard:**In neutral position: 10V or more****Not in neutral position: APPROX. 0V**

- Trouble of connector
- Trouble of harness

Clear and recheck the DTC.

PARKING SWITCH INSPECTION

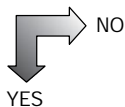
EN1610601F200035



SHTS161060100029

1. MEASURING A SIGNAL FROM THE PARKING SWITCH (buzzer OFF switch).

- (1) Set the starter switch to the "LOCK" position and connect the signal check harness to the vehicle control ECU.
- (2) Set the starter key to the ON position. With the parking brake lever in the pulled position, measure voltage between 12th (K9H) and PRKB (B11) terminals of the signal check harness. And take the same measurement with the parking brake lever in the released position.

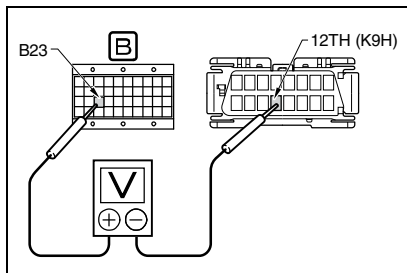
Standard:**Parking brake lever in the pulled position: APPROX. 0V****Parking brake lever in the released position: 10V or more**

- Trouble of connector
- Trouble of harness

Clear and recheck the DTC.

ECONOMY RUNNING SWITCH INSPECTION (MANUAL TRANSMISSION)

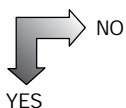
EN1610601F200036



SHTS161060100030

1. MEASURE THE ECONOMY RUNNING SWITCH SIGNAL.

- (1) Set the starter switch to the "LOCK" position and connect the signal check harness to the vehicle control ECU.
- (2) Set the starter switch to the "ON" position, and measure the voltage between 12th (K9H) and AFSW (B23) terminals of the signal check harness when the economy running switch is ON and OFF.

Standard:**Economy running switch "ON": 10V or more****Economy running switch "OFF": APPROX. 0V**

- Trouble of connector
- Trouble of harness

Clear and recheck the DTC.

FUEL CONTROL (J08E)

DN02-001

COMMON RAIL FUEL INJECTION

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DTC:P0106.....	DN02-120
DTC:P0108 (Check sheet).....	DN02-122
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DTC:P0112 (Check sheet).....	DN02-128

DTC:P0113 (Check sheet).....	DN02-130
DTC:P0112/P0113.....	DN02-132
DTC:P0115 (Check sheet 1).....	DN02-134
DTC:P0116 (Check sheet 1).....	DN02-136
DTC:P0116 (Check sheet 2).....	DN02-138
DTC:P0116.....	DN02-140
DTC:P0117 (Check sheet).....	DN02-142
DTC:P0118 (Check sheet).....	DN02-144
DTC:P0117/P0118.....	DN02-146
DTC:P011C (Check sheet).....	DN02-148
DTC:P011C.....	DN02-150
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DTC:P0192 (Check sheet).....	DN02-174
DTC:P0192.....	DN02-178
DTC:P0193 (Check sheet).....	DN02-184
DTC:P0193.....	DN02-188
DTC:P0200 (Check sheet).....	DN02-192
DTC:P0605 (Check sheet).....	DN02-194
DTC:P0606 (Check sheet).....	DN02-196
DTC:P0607 (Check sheet).....	DN02-198
DTC:P0611 (Check sheet).....	DN02-200
DTC:P0200/P0605/P0606/	
P0607/P0611.....	DN02-202
DTC:P0201 (Check sheet).....	DN02-204
DTC:P0202 (Check sheet).....	DN02-206
DTC:P0203 (Check sheet).....	DN02-208
DTC:P0204 (Check sheet).....	DN02-210
DTC:P0205 (Check sheet).....	DN02-212
DTC:P0206 (Check sheet).....	DN02-214
DTC:P0201/P0202/P0203/P0204/	
P0205/P0206.....	DN02-216
DTC:P0217 (Check sheet).....	DN02-220
DTC:P0217.....	DN02-222
DTC:P0219 (Check sheet).....	DN02-224
DTC:P0219.....	DN02-226
DTC:P0222 (Check sheet).....	DN02-228
DTC:P0222.....	DN02-230
DTC:P0223 (Check sheet).....	DN02-234

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FUEL CONTROL (J08E)

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DTC:P0234 (Check sheet)	DN02-240	DTC:P0504 (Check sheet)	DN02-378
DTC:P0234.....	DN02-242	DTC:P0504	DN02-380
DTC:P0237 (Check sheet)	DN02-244	DTC:P0519 (Check sheet)	DN02-384
DTC:P0237.....	DN02-246	DTC:P0519	DN02-386
DTC:P0263 (Check sheet)	DN02-250	DTC:P0524 (Check sheet)	DN02-388
DTC:P0263.....	DN02-252	DTC:P0524	DN02-390
DTC:P0266 (Check sheet)	DN02-262	DTC:P0562 (Check sheet)	DN02-392
DTC:P0266.....	DN02-264	DTC:P0562	DN02-394
DTC:P0269 (Check sheet)	DN02-270	DTC:P0563 (Check sheet)	DN02-396
DTC:P0269.....	DN02-272	DTC:P0563	DN02-398
DTC:P0272 (Check sheet)	DN02-278	DTC:P05F1 (Check sheet)	DN02-400
DTC:P0272.....	DN02-280	DTC:P05F1	DN02-402
DTC:P0275 (Check sheet)	DN02-286	DTC:P0610 (Check sheet)	DN02-404
DTC:P0275.....	DN02-288	DTC:P0610	DN02-406
DTC:P0278 (Check sheet)	DN02-294	DTC:P0617 (Check sheet)	DN02-408
DTC:P0278.....	DN02-296	DTC:P0617	DN02-410
DTC:P0299 (Check sheet)	DN02-302	DTC:P0628 (Check sheet)	DN02-412
DTC:P0299.....	DN02-304	DTC:P0629 (Check sheet)	DN02-414
DTC:P0301 (Check sheet)	DN02-306	DTC:P0628/P0629.....	DN02-416
DTC:P0302 (Check sheet)	DN02-308	DTC:P0642 (Check sheet)	DN02-418
DTC:P0303 (Check sheet)	DN02-310	DTC:P0642	DN02-419
DTC:P0304 (Check sheet)	DN02-312	DTC:P0643 (Check sheet 1).....	DN02-422
DTC:P0305 (Check sheet)	DN02-314	DTC:P0643 (Check sheet 2).....	DN02-424
DTC:P0306 (Check sheet)	DN02-316	DTC:P0643	DN02-426
DTC:P0301/P0302/P0303/P0304/ P0305/P0306.....	DN02-318	DTC:P064C (Check sheet)	DN02-428
DTC:P0335 (Check sheet)	DN02-320	DTC:P064C.....	DN02-430
DTC:P0340 (Check sheet)	DN02-322	DTC:P0652 (Check sheet)	DN02-432
DTC:P0335/P0340	DN02-324	DTC:P0652	DN02-434
DTC:P0335.....	DN02-326	DTC:P0653 (Check sheet)	DN02-436
DTC:P0336 (Check sheet)	DN02-328	DTC:P0653	DN02-438
DTC:P0336.....	DN02-330	DTC:P0671 (Check sheet)	DN02-440
DTC:P0340 (Check sheet)	DN02-332	DTC:P0672 (Check sheet)	DN02-442
DTC:P0340.....	DN02-334	DTC:P0675 (Check sheet)	DN02-444
DTC:P0341 (Check sheet)	DN02-336	DTC:P0676 (Check sheet)	DN02-446
DTC:P0341.....	DN02-338	DTC:P0671/P0672/P0675/P0676	DN02-448
DTC:P0381 (Check sheet)	DN02-342	DTC:P0683 (Check sheet)	DN02-450
DTC:P0381.....	DN02-344	DTC:P0683	DN02-452
DTC:P0401 (Check sheet)	DN02-346	DTC:P0686 (Check sheet)	DN02-454
DTC:P0401.....	DN02-349	DTC:P0686	DN02-456
DTC:P0402 (Check sheet)	DN02-350	DTC:P06D3 (Check sheet)	DN02-458
DTC:P1459 (Check sheet)	DN02-352	DTC:P06D3.....	DN02-460
DTC:P0402/P1459	DN02-354	DTC:P06D4 (Check sheet)	DN02-462
DTC:P041B (Check sheet 1).....	DN02-356	DTC:P06D4.....	DN02-464
DTC:P041B (Check sheet 2).....	DN02-358	DTC:P0704 (Check sheet)	DN02-466
DTC:P041B.....	DN02-360	DTC:P0704	DN02-468
DTC:P041C (Check sheet).....	DN02-362	DTC:P073D (Check sheet)	DN02-470
DTC:P041D (Check sheet).....	DN02-364	DTC:P073D.....	DN02-473
DTC:P041C/P041D.....	DN02-366	DTC:P081A (Check sheet).....	DN02-474
DTC:P0420 (Check sheet)	DN02-368	DTC:P081A	DN02-476
DTC:P0420.....	DN02-370	DTC:P081B (Check sheet).....	DN02-478
DTC:P0500 (Check sheet)	DN02-372	DTC:P081B	DN02-480
DTC:P0501 (Check sheet)	DN02-374	DTC:P0850 (Check sheet)	DN02-482
		DTC:P0850	DN02-484

FUEL CONTROL (J08E)

DN02-3

DTC:P1133 (Check sheet).....	DN02-486	DTC:P2123 (Check sheet)	DN02-608
DTC:P1133	DN02-488	DTC:P2127 (Check sheet)	DN02-610
DTC:P1197 (Check sheet).....	DN02-492	DTC:P2128 (Check sheet)	DN02-612
DTC:P1197	DN02-495	DTC:P2120/P2122/P2123/ P2127/P2128.....	DN02-613
DTC:P1198 (Check sheet).....	DN02-500	DTC:P2122 (Check sheet)	DN02-614
DTC:P1198	DN02-503	DTC:P2122	DN02-616
DTC:P119F (Check sheet).....	DN02-508	DTC:P2123 (Check sheet)	DN02-620
DTC:P119F	DN02-510	DTC:P2123	DN02-622
DTC:P1211 (Check sheet).....	DN02-512	DTC:P2127 (Check sheet)	DN02-626
DTC:P1214 (Check sheet).....	DN02-514	DTC:P2127	DN02-628
DTC:P1211/P1214.....	DN02-516	DTC:P2128 (Check sheet)	DN02-632
DTC:P1212 (Check sheet).....	DN02-518	DTC:P2128	DN02-634
DTC:P1215 (Check sheet).....	DN02-520	DTC:P2135 (Check sheet)	DN02-638
DTC:P1212/P1215.....	DN02-522	DTC:P2135	DN02-640
DTC:P141F (Check sheet).....	DN02-524	DTC:P2138 (Check sheet)	DN02-642
DTC:P141F	DN02-525	DTC:P2138	DN02-644
DTC:P1426 (Check sheet).....	DN02-526	DTC:P2214 (Check sheet)	DN02-646
DTC:P1426	DN02-528	DTC:P2227 (Check sheet)	DN02-650
DTC:P1427 (Check sheet).....	DN02-530	DTC:P2228 (Check sheet)	DN02-652
DTC:P1427	DN02-532	DTC:P2229 (Check sheet)	DN02-654
DTC:P1428 (Check sheet).....	DN02-538	DTC:P2227/P2228/P2229.....	DN02-655
DTC:P1428	DN02-540	DTC:P2269 (Check sheet)	DN02-656
DTC:P1458 (Check sheet).....	DN02-544	DTC:P2269	DN02-658
DTC:P240F (Check sheet).....	DN02-546	DTC:P226C (Check sheet).....	DN02-660
DTC:P1458/P240F.....	DN02-548	DTC:P226C	DN02-662
DTC:P1515 (Check sheet).....	DN02-550	DTC:P242B (Check sheet 1)	DN02-664
DTC:P1515	DN02-552	DTC:P242B (Check sheet 2)	DN02-666
DTC:P1530 (Check sheet).....	DN02-554	DTC:P242B	DN02-668
DTC:P1530	DN02-556	DTC:P242C (Check sheet).....	DN02-670
DTC:P1601 (Check sheet).....	DN02-558	DTC:P242D (Check sheet).....	DN02-672
DTC:P1601	DN02-560	DTC:P242C/P242D	DN02-674
DTC:P1676 (Check sheet).....	DN02-562	DTC:P244A (Check sheet 1)	DN02-676
DTC:P1681 (Check sheet).....	DN02-564	DTC:P244A (Check sheet 2)	DN02-678
DTC:P1681	DN02-566	DTC:P244A	DN02-680
DTC:P1682 (Check sheet).....	DN02-568	DTC:P244B	DN02-682
DTC:P1682	DN02-570	DTC:P244B (Check sheet 1)	DN02-683
DTC:P200C (Check sheet)	DN02-572	DTC:P244B (Check sheet 1)	DN02-686
DTC:P200C	DN02-574	DTC:P244B (Check sheet 2)	DN02-690
DTC:P203F (Check sheet).....	DN02-576	DTC:P244B (Check sheet 2)	DN02-695
DTC:P203F	DN02-578	DTC:P2457 (Check sheet)	DN02-702
DTC:P204F (Check sheet).....	DN02-580	DTC:P2457	DN02-705
DTC:P204F	DN02-581	DTC:P2459 (Check sheet)	DN02-706
DTC:P207F (Check sheet).....	DN02-582	DTC:P2459	DN02-707
DTC:P207F	DN02-584	DTC:P2463	DN02-708
DTC:P20EE (Check sheet)	DN02-586	DTC:P246F (Check sheet 1)	DN02-710
DTC:P20EE	DN02-588	DTC:P246F (Check sheet 2)	DN02-712
DTC:P2100 (Check sheet).....	DN02-590	DTC:P246F	DN02-714
DTC:P2103 (Check sheet).....	DN02-592	DTC:P2470 (Check sheet)	DN02-716
DTC:P2100/P2103.....	DN02-594	DTC:P2471 (Check sheet)	DN02-718
DTC:P2101 (Check sheet 1).....	DN02-596	DTC:P2470/P2471	DN02-720
DTC:P2101 (Check sheet 2).....	DN02-598	DTC:P2635 (Check sheet)	DN02-722
DTC:P2101	DN02-602	DTC:P2635	DN02-724
DTC:P2120 (Check sheet).....	DN02-604		
DTC:P2122 (Check sheet).....	DN02-606		

DN02-4

FUEL CONTROL (J08E)

DTC:U0073 (Check sheet)	DN02-726
DTC:U0073	DN02-728
DTC:U010E (Check sheet)	DN02-730
DTC:U010E	DN02-732
DTC:U029D (Check sheet)	DN02-736
DTC:U029D	DN02-739
DTC:U029E (Check sheet)	DN02-744
DTC:U029E	DN02-746
DTC:U0301 (Check sheet)	DN02-750
DTC:U1001 (Check sheet)	DN02-752
DTC:U1001	DN02-753
DTC:U110A (Check sheet)	DN02-754
DTC:U110A	DN02-756
DTC:U111E (Check sheet)	DN02-758
DTC:U111E	DN02-761
DTC:U1122 (Check sheet)	DN02-766
DTC:U1122	DN02-768
DTC:U1123 (Check sheet)	DN02-770
DTC:U1123	DN02-772

COMMON RAIL FUEL INJECTION SYSTEM

PRECAUTIONS FOR DIAGNOSIS

EN1610602F200001

- Ensure that individual connectors are certainly connected before start of checking works.
- Make sure to set the starter key to the "LOCK" position before disconnecting a connector.
- Replace the part or the component that have a failure or trouble. Do not fix and reuse it.
- Delete the past malfunction code after recording. Then conduct a diagnosis again to check for present failures.
- Delete the past failure memory after completion of a diagnostic analysis.50

1. ILLUSTRATION OF CONNECTOR AND MEASUREMENT ON TERMINAL

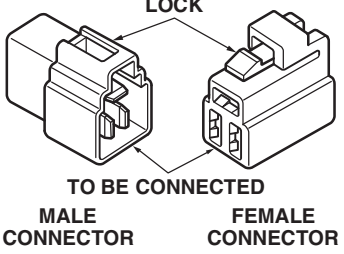
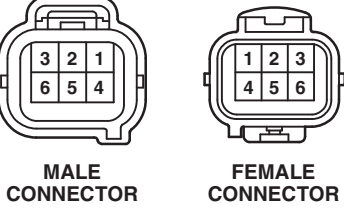
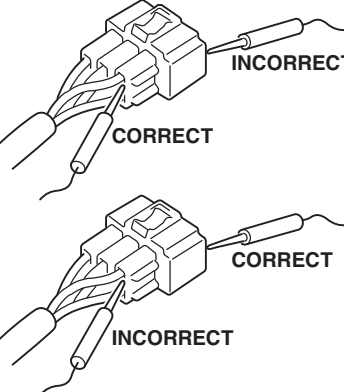
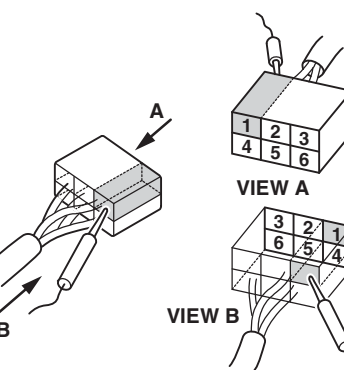





ILLUSTRATION OF CONNECTOR

The illustration of a connector contained in this document represents an image of a connector with its lock positioned on top as viewed from the connecting face.

NUMBERING OF CONNECTOR TERMINALS

The terminals are symmetrically numbered (symmetrically reversed numbering) as viewed on the connecting faces of a pair of connectors. The terminal #1 is located at the top right corner of a male connector and at the top left corner of a female connector respectively in this document.

PRECAUTIONS FOR TERMINAL MEASUREMENT

Unless otherwise specified in this document, the illustration of a connector represents an image of a connector as viewed from the connecting face. A test probe must access the back face of a connector.

However, some types of connector do not allow a test probe to contact with the back face such as a waterproof connector. In such case, a test probe may be allowed to access the front face of a connector but a special care must be used to avoid a risk of damage in terminals.

As to a connector that is designed to use the signal check harness for terminal measurement, do not place a test probe directly onto the front or back face. Use a contact box of the connected signal check harness to take measurement on terminals.

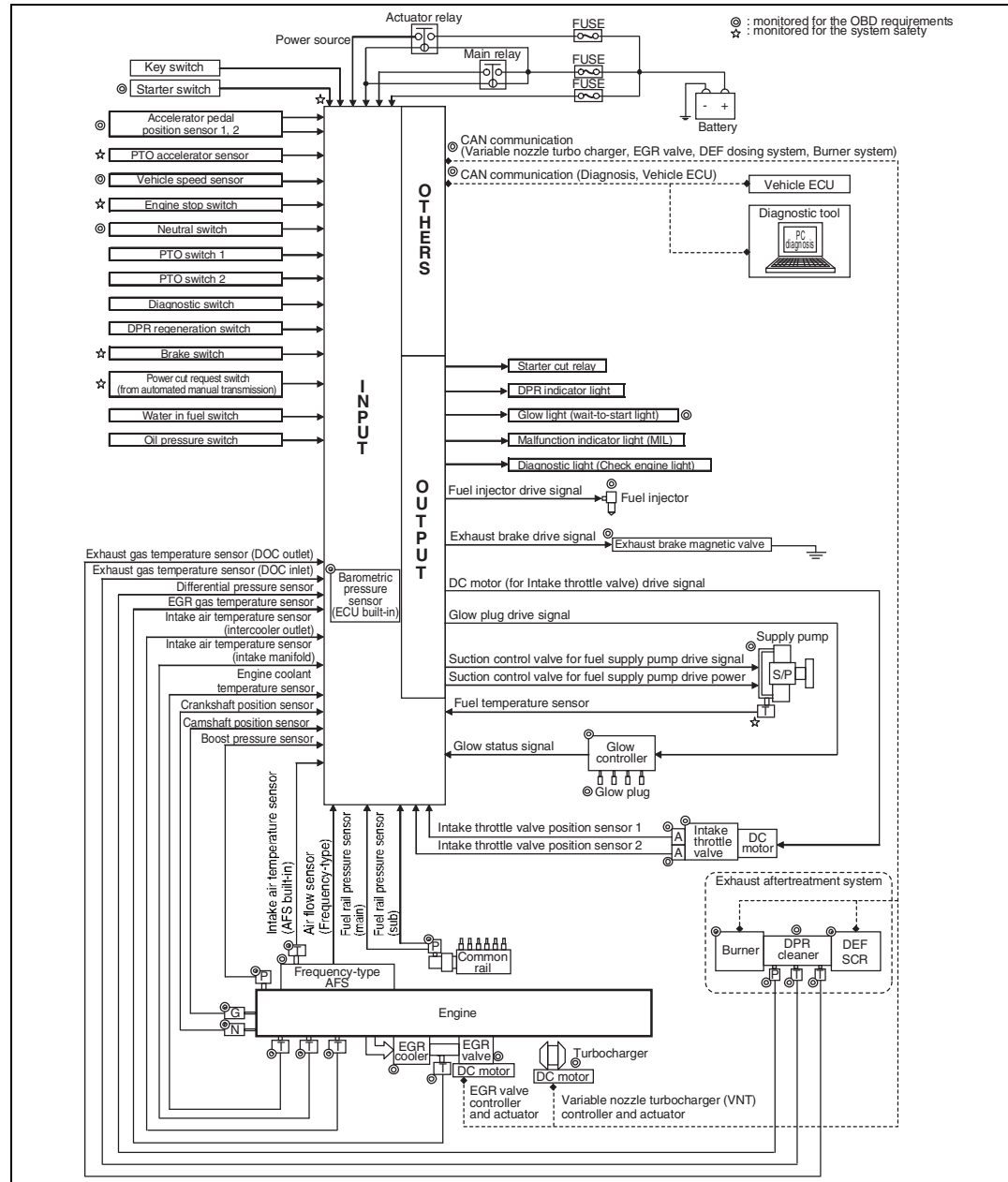
ILLUSTRATION OF CONNECTOR AND MEASUREMENT SURFACE

The illustration of a connector contained in this document represents an image of a connector as viewed from the connecting face. For example, the terminal #1 of a female connector is located at the top left corner of a connector as viewed from the connecting face.

In actual measurement on the terminal #1 of a female connector, a test probe must be placed onto the top right corner on the back face of a connector.

ELECTRICAL

EN1610602F200002



SAPH161060200002

PRECAUTIONS

EN1610602F200003

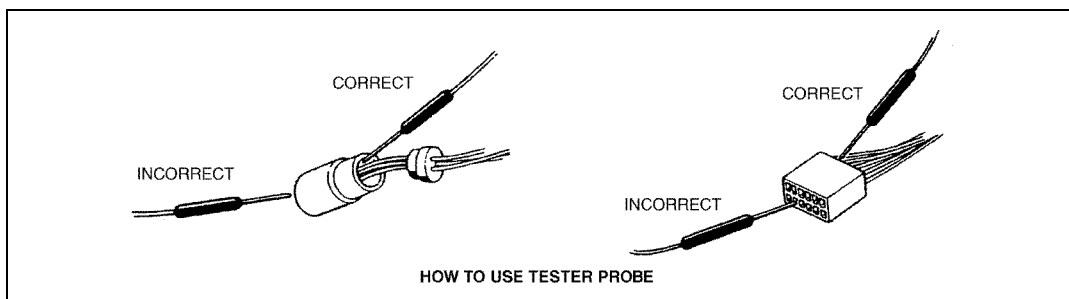
⚠ WARNING

Approximately 110V is generated for the injector drive actuation system. For this reason, electrical shock may result if the injector drive circuit is touched directly by hand. Turn the starter switch to the LOCK position if it is necessary to check or repair the computer, harnesses, or connectors.

1. BE CAREFUL NOT TO LET DIRT OR DUST GET INSIDE THE ACTUATOR OR MAGNETIC VALVES.

2. HARNESS WIRE CONNECTOR.

- (1) Multi-contact connectors suitable for the small electrical signals of electronic circuitry are used for wiring connections to the sensors, actuator and control unit. Be very careful when handling them.
 - Before disconnecting any connectors, make sure that the starter switch is in the "LOCK" position.
 - When disconnecting connectors, try to pull them out in a straight line, disengaging the lock and holding onto the housing.
 - Do not try to disconnect connectors by gripping the wires or twisting them, as this could bend the contacts.
 - Do not disconnect connectors unnecessarily.
 - When using a circuit tester, apply the tester probe to the harness wire side only. Never stick the tester probe into the holes on the connector terminal side, as this could cause poor contacts when the connector is reconnected.



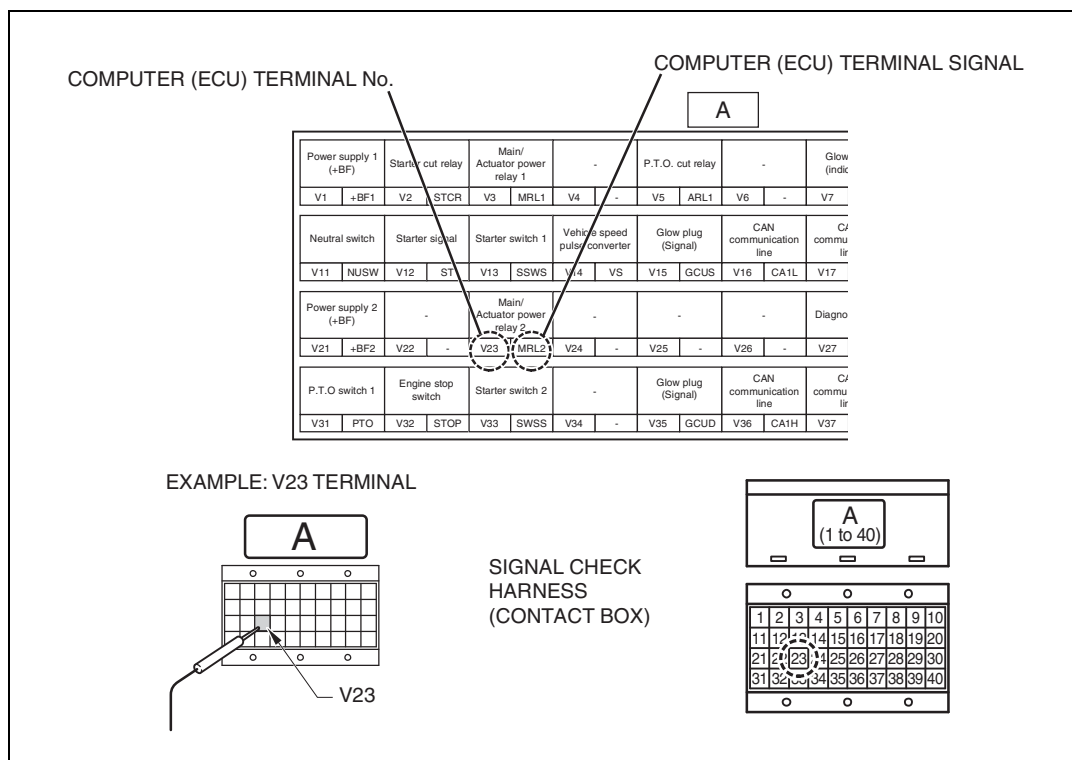
SAPH161060200003

- Do not let water, oil or dust get on the connector when it is disconnected, as this could cause poor contacts when the connector is reconnected.
 - Do not open the control unit cover. It could malfunction if dust or water gets inside.
 - Take care to ensure that water, oil or dust do not get on or inside parts.
 - When connecting in connectors, push them in all the way and make sure that the lock engages.
- #### 3. ERASING THE MALFUNCTION MEMORY STORED IN THE PAST, CHECK THE CURRENT MALFUNCTION BY PERFORMING A DIAGNOSIS OF THE PRESENT MALFUNCTION AGAIN.

4. **AFTER COMPLETING THE MALFUNCTION ANALYSIS, ERASE THE MALFUNCTION MEMORY STORED IN THE PAST. OTHERWISE, THE MALFUNCTION LIGHT IN THE DISPLAY WILL REMAIN LIT.**
5. **CONNECTOR DRAWING, ALL OF WHICH HAS A VIEW TO BE SEEN FROM THE CONNECTION SIDE, INSERT THE TESTING LEAD FROM THE BACKSIDE.**
6. **USING A CIRCUIT TESTER**
 - Use a circuit tester with an internal resistance of 100 k Ω or greater in the voltage measuring range.
7. **USING A SIGNAL CHECK HARNESS**
 - To prevent breakage of the ECU connector, connect the signal check harness and perform measuring by bringing the test lead into contact with the signal check harness side (contact box).

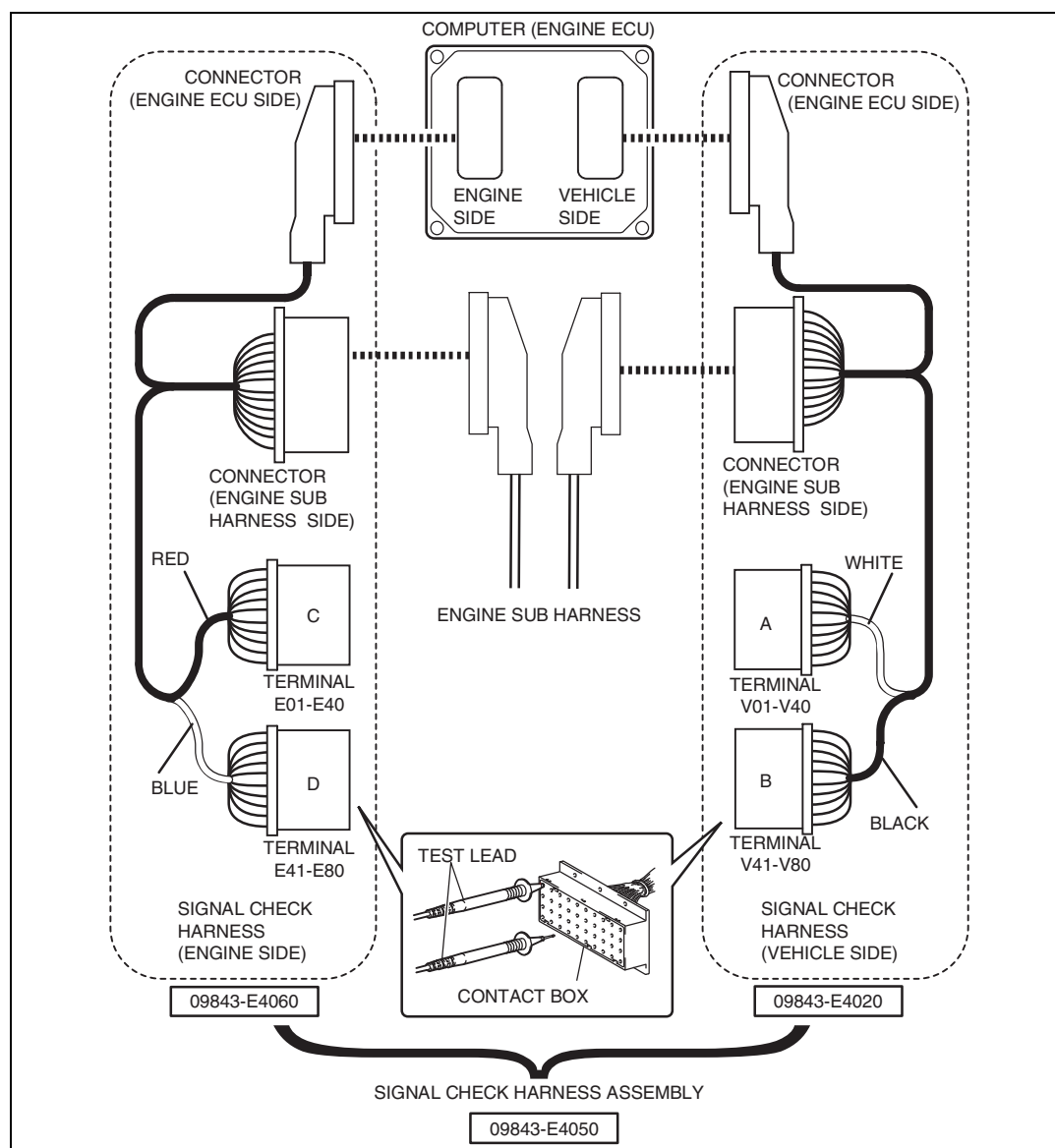
NOTICE

The terminal numbers in the text and in the illustrations correspond to the table on the next page (computer pin assignment) as shown below.



8. CONNECT THE SIGNAL CHECK HARNESS.

- (1) Set the starter switch to the "LOCK" position and disconnect the connectors from the engine ECU.
- (2) Connect a signal check harness to the engine sub harness and the engine ECU.

SST: Signal check harness (09843-E4050)

9. RADIO INSTALLATION

- There is a danger that the control unit might malfunction if a high output radio transmitter (over 50W) is installed in the vehicle.

10. USING A QUICK CHARGER

- Disconnect both battery terminals before using a quick charger.

11. AIR CONDITIONER INSTALLATION

- Be careful not to scratch or damage the engine, chassis or the harness inside the cab when installing an air conditioner. Also, make sure to reattach afterward any connectors that were disconnected during the installation process.

12. PERFORMING ELECTRIC WELDING

- Disconnect the negative terminal of the battery before performing any electric welding.

13. OTHER

- Make sure to check the other connectors before connecting them in to prevent incorrect connections.
- Be careful not to allow the connectors to become soiled with dust, water, fuel or oil when performing inspections or removing and replacing parts.

COMPUTER (ECU) PIN ASSIGNMENT

EN1610602F200004

A

Power supply 1 (+BF)	Starter cut relay	Main/ Actuator power relay 1	-	P.T.O. cut relay	-	Glow plug (Indicator)	DPR refresh light	Check engine warning light	-
V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
+BF1	STOR	MRL1	-	ARL1	-	GLOW	DPF	CE/G	-
Neutral switch	Starter signal	Starter switch 1	Vehicle speed pulse converter	Glow plug (Signal)	CAN communication line	CAN communication line	Power supply 1 (+B)	Back up power supply	-
V11	V12	V13	V14	V15	V16	V17	V18	V19	V20
NUSW	ST	SSWS	VS	GCUS	CA1L	CA2L	VB1	BATT	-
Power supply 2 (+BF)	-	Main/ Actuator power relay 2	-	-	-	Diagnosis light	-	Stop light switch	Diagnosis switch
V21	V22	V23	V24	V25	V26	V27	V28	V29	V30
+BF2	-	MRL2	-	-	-	DGLP	-	BSW1	DGSW
P.T.O switch 1	Engine stop switch	Starter switch 2	-	Glow plug (Signal)	CAN communication line	CAN communication line	Power supply 2 (+B)	Power ground 1	Signal ground 1
V31	V32	V33	V34	V35	V36	V37	V38	V39	V40
PTO	STOP	SWSS	-	GCUD	CA1H	CA2H	VB2	PGD1	CGD1

SAPH161060200006

FUEL CONTROL (J08E)

DN02-13

B

-		WIF signal		-		-		Sensor ground 7		Sensor ground 9		Accelerator sensor 1		-		Exhaust gas temperature sensor (DOC inlet)		Sensor power supply 3	
V41	-	V42	WIF	V43	-	V44	-	V45	ADG7	V46	ADG9	V47	ACS1	V48	-	V49	ET2+	V50	AVC3
Sensor power supply 4		-		-		-		-		DPR refresh switch		Exhaust gas temperature sensor (DOC outlet)		Power supply 3 (+B)		Power ground 2		Signal ground 2	
V51	AVC4	V52	-	V53	-	V54	-	V55	-	V56	DPSW	V57	ET4+	V58	VB3	V59	PGD2	V60	CGD2
-		P.T.O switch 2		-		-		Sensor ground 8		-		Accelerator sensor 2		P.T.O. Accelerator sensor		-		DPR differential pressure sensor	
V61	-	V62	BUSW	V63	-	V64	-	V65	ADG8	V66	-	V67	ACS2	V68	ASCS	V69	-	V70	EXPS
Sensor power supply 5		1st. Reversw switch		-		-		Brake switch		-		-		Power supply 4 (+B)		Power ground 3		Power ground 4	
V71	AVC5	V72	PCS	V73	-	V74	-	V75	BSW2	V76	-	V77	-	V78	VB4	V79	PGD3	V80	PGD4

SAPH161060200007

Intake throttle valve motor (+)		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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FUEL CONTROL (J08E)

DN02-15

D

Engine oil pressure switch		-		-		Intake air temperature sensor (Intercooler outlet)		EGR cooler outlet temperature sensor	Intake throttle valve position sensor 2		Intake air temperature sensor (Air flow sensor built-in)		Fuel temperature sensor		Fuel rail pressure sensor 1 (Main)				
E41	OLSW	E42	-	E43	-	E44	ICTH	E45	ETH2	E46	DTS2	E47	THA+	E48	THF+	E49	PCR1	E50	-
-		Ne sensor (+)		G sensor (Supply)		G sensor (ground)		-		Sensor ground 1		Sensor ground 3		Sensor ground 5		CAN communication line		No.5 Fuel injector (Main)	
E51	-	E52	NE1+	E53	GVCC	E54	GGND	E55	-	E56	AGD1	E57	AGD3	E58	AGD5	E59	CA1H	E60	INJ6
-		Intake throttle valve position sensor 1		Intake manifold temperature sensor		Fuel rail pressure sensor 2 (Main)		Fuel rail pressure sensor 2 (Sub)		Coolant temperature sensor		Boost pressure sensor		Fuel rail pressure		-		-	
E61	-	E62	DTS1	E63	ATI+	E64	PCR3	E65	PCR4	E66	THW+	E67	PIM	E68	PCR2	E69	-	E70	-
-		NE sensor (-)		G sensor		Air flow sensor		NE sensor (SLD)		Sensor ground 2		Sensor ground 4		Sensor ground 6		CAN communication line		No.5 Fuel injector (Sub)	
E71	-	E72	NE1-	E73	G3+	E74	AFSI	E75	NESD	E76	AGD2	E77	AGD4	E78	AGD6	E79	CA1L	E80	IJ06

SAPH161060200009

ENGINE ECU CONNECTOR

EN1610602F200005

Removing the engine ECU connector

NOTICE

Before replacement, wait until the engine cools down as you may get burned. (Turn the starter key to the "LOCK" position and leave it for more than 30 minutes to cool.)

1. CLEANING THE ENGINE ECU CONNECTOR

- (1) Check that the engine ECU connector is completely connected to the engine ECU.
- (2) Directly spray water around the engine ECU connector by using a small spray bottle.

NOTICE

Do not remove the connector while at work.

HINT

If it is much dirty, squirt water at the connector sliding portion and connector surface.

- (3) Blow air around the engine ECU connector and engine ECU surface to remove dirt and foreign matter.

NOTICE

- Do not remove the connector while at work.
- Blow off water with air as much as possible for drying.

- (4) Using a small brush, carefully remove dirt and foreign matter remaining at the sliding portion.

NOTICE

Do not remove the connector while at work.

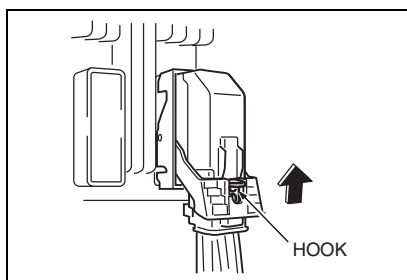
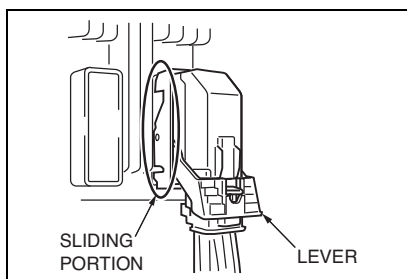
- (5) Using a waste cloth, wipe off around the engine ECU connector and engine ECU surface.

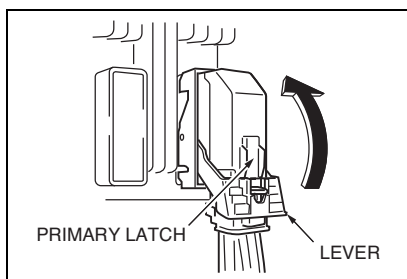
NOTICE

- Do not remove the connector while at work.
- Wipe up water thoroughly.

- (6) If you feel the movement of the lever unsmooth, repeat steps (1), (2), (3), (4) and (5).

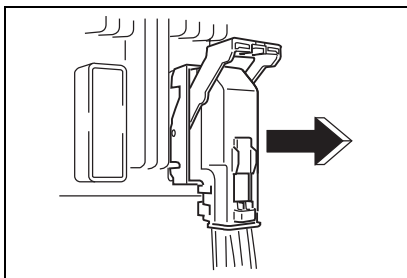
- (7) Disconnect the engine ECU connector and check it for deposition of dirt and foreign matter.
 - a. Set the hook of the connector in the direction of the arrow to release the lock.





SAPH161060200012

- b. While pushing the primary latch of the connector, move the lever in the direction of the arrow as shown in the figure until a "click" is heard and then detach the connector.



SAPH161060200013

- c. Pull out the connector straight.

NOTICE

- Do not insert and remove the connector more than necessary.
- Do not give shocks to the engine ECU.
- Never detach the harness by holding and pulling or prying as it may result in wire or terminal deformation.
- Never insert a test lead from the rear of the connector.
- Do not paint or apply grease or oil to the connector to maintain its function and durability.

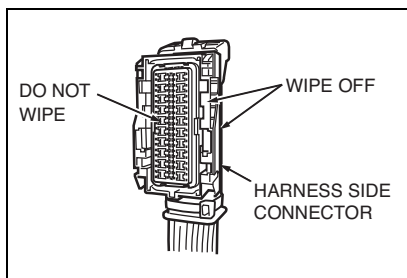
HINT

If it cannot be pulled out with a light force, check if the lever is fully open.

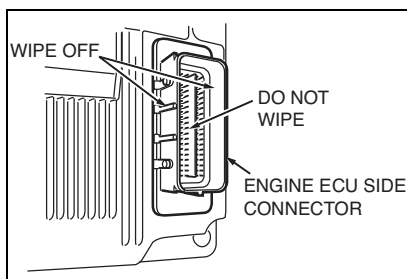
- (8) If the side of the harness side connector is found dirty, wipe it off with a moistened waste cloth while being careful not allowing dirt and foreign matter to drop.

NOTICE

- Use a thoroughly wrung waste cloth.
- Do not wipe off the terminal opening.
- Do not directly spray water.



SAPH161060200014



SAPH161060200015

- (9) If the engine ECU side connector is found dirty, wipe off its side with a moistened waste cloth.

NOTICE

- Use a thoroughly wrung waste cloth.
- Do not wipe off the terminal opening.
- Do not directly spray water.

- (10) Blow air on the terminal part inside the engine ECU side connector to remove dirt and foreign matter.

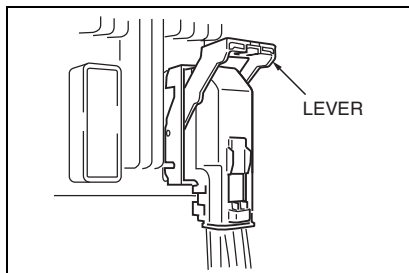
MOUNTING THE ENGINE ECU CONNECTOR

1. Attaching the engine ECU connector

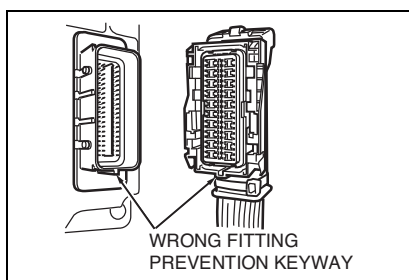
- (1) Check that the harness side connector lever is fully open and place it straight on the engine ECU side connector.

NOTICE

At this time, check that the lever is fully open.



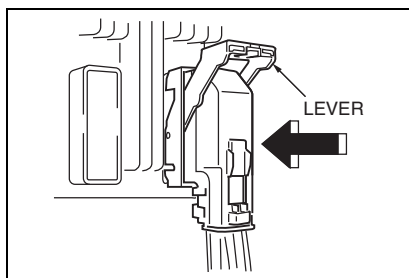
SAPH161060200016



SAPH161060200017

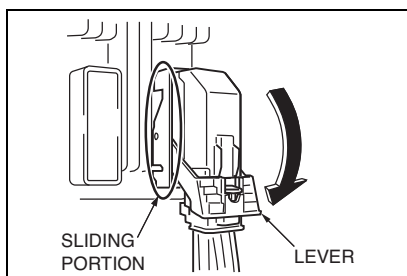
HINT

Check that it is inserted along the wrong fitting prevention keyway.



SAPH161060200018

- (2) Press the upper part of the harness side connector and insert the connector uniformly.

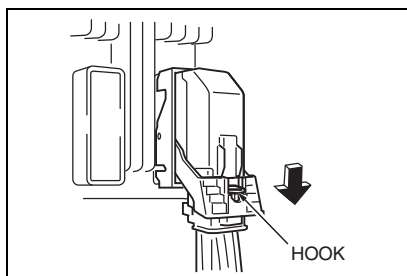


SAPH161060200019

- (3) Move the lever in the direction of the arrow as shown in the figure until a "click" is heard and attach the connector.

NOTICE

If the lever cannot move smoothly, repeat steps (1) and (2). Also drop a few drops of water to the sliding portion to make it smooth.



SAPH161060200020

- (4) Move the hook in the direction of the arrow as shown in the figure until a "click" is heard in order to lock the connector.

INSPECTION

EN1610602F200006

1. PRIOR CHECK

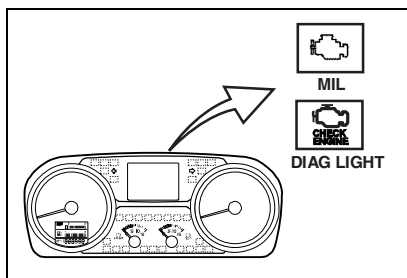
- (1) Set the starter switch to the "ON" position (do not start the engine) and confirm that the check engine light in the indicator area lights up.

HINT

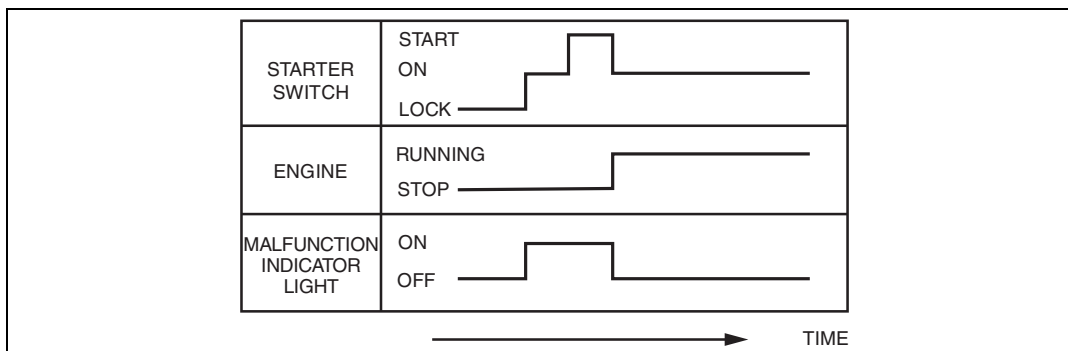
- If the MIL (Malfunction Indicator Light) is lit, perform a system check to see if the malfunction is of the past or present.
- In the case of the past malfunction, this light will turn off if a status is judged to be normal in 3 times of driving.
- DTC must be cleared on the Hino-DX, after MIL comes off.

(DEFINITION OF 1 TIME OF DRIVING)

- a. Begins with engine start and ends with engine shut off.
 - b. Begins with engine start and ends after four hours of continuous engine-on operation.
 - c. Begins at end of the previous four hours of continuous engine-on operation and ends after four hours of continuous engine-on operation.
 - d. Begins at the end of the previous four hours of continuous engine-on operation and ends with engine shut off.
 - Since the normal judgment method and time differ according to the malfunction code, a proper definition will be selected from the above 4 definitions.
- If the malfunction indicator light does not go out, the system is abnormal. Check the system according to diagnosis on the following page.



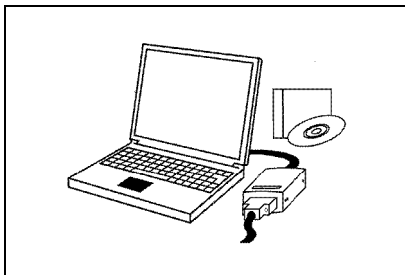
MALFUNCTION INDICATOR LIGHT ILLUMINATION PATTERN



SAPH161060200022

DIAGNOSIS USING THE PC DIAGNOSIS TOOL

EN1610602F200007



SAPH161060200023

1. DIAGNOSIS TOOL

- Trouble diagnosis can be performed using the PC diagnosis tool. By connection to the diagnosis connector, the trouble location is indicated.

SST:

Computer interface

(Hino-Bowie)

The main body and cables for RS232C and USB (09993-E9070)

Cable between vehicle and Hino-Bowie (S0904-21220)

(DENSO DST-i set without LCD)

Without Bluetooth® (95171-01020)

With Bluetooth® (95171-01040)

(DENSO DST-i set with LCD)

Without Bluetooth® (95171-01030)

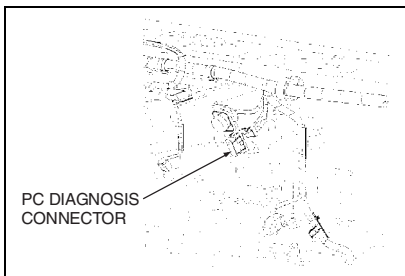
With Bluetooth® (95171-01050)

Diagnosis software: HINO Diagnostic explorer (DX)

Reprogramming software: HINO Reprog Manager

NOTICE

Only ECU reprogramming can be performed by authorized HINO dealer.



SAPH161060200024

2. CONNECT THE PC DIAGNOSIS TOOL

- (1) Turn the starter switch on the "LOCK" position.
- (2) Connect the PC DIAGNOSIS TOOL.

DIAGNOSTIC TROUBLE CODE (DTC) TABLE					
MIL	DIAG LIGHT	DTC NO.	DIAGNOSIS ITEM	INSPECTION ITEM	REFER PAGE
Light	No light	P0016	Crankshaft position sensor and Camshaft position sensor - rationality	<ul style="list-style-type: none"> Cam gear Flywheel Crankshaft position sensor Camshaft position sensor 	DN02-44
Light	No light	P0045	Nozzle position sensor failure DC motor open circuit DC motor short circuit Nozzle stuck Nozzle operating range failure Initialization failure	<ul style="list-style-type: none"> Turbocharger Wire harness 	DN02-48
Light	No light	P007B	Intake air temperature sensor (intercooler outlet) - rationality	<ul style="list-style-type: none"> Intake air temperature sensor (intercooler outlet) ECU (ECU connector) 	DN02-58
Light	No light	P007C	Intake air temperature sensor (intercooler outlet) - out of range (Out of range low)	<ul style="list-style-type: none"> Intake air temperature sensor (intercooler outlet) ECU (ECU connector) Wire harness 	DN02-66
Light	No light	P007D	Intake air temperature sensor (intercooler outlet) - out of range (Out of range high)	<ul style="list-style-type: none"> Intake air temperature sensor (intercooler outlet) ECU (ECU connector) Wire harness 	DN02-68
Light	No light	P0087	Fuel system pressure control - low	<ul style="list-style-type: none"> Flow dumper SCV Supply pump 	DN02-72, 76
Light	No light	P0088	Fuel system pressure control - high	<ul style="list-style-type: none"> SCV Supply pump Pressure limiter Fuel filter 	DN02-74, 76
Light	No light	P0096	Intake air temperature sensor (intake manifold) - rationality	<ul style="list-style-type: none"> Intake air temperature sensor (intercooler outlet) ECU (ECU connector) 	DN02-94, 96
Light	No light	P0097	Intake air temperature sensor (intake manifold) - out of range (Out of range low)	<ul style="list-style-type: none"> Intake air temperature sensor (intercooler outlet) ECU (ECU connector) Wire harness 	DN02-100
Light	No light	P0098	Intake air temperature sensor (intake manifold) - out of range (Out of range high)	<ul style="list-style-type: none"> Intake air temperature sensor (intercooler outlet) ECU (ECU connector) Wire harness 	DN02-102
Light	No light	P00AF	VNT controller CAN communication (ECM) Power supply failure EEPROM failure	<ul style="list-style-type: none"> VNT controller 	DN02-106

FUEL CONTROL (J08E)

DN02-23

DIAGNOSTIC TROUBLE CODE (DTC) TABLE					
MIL	DIAG LIGHT	DTC NO.	DIAGNOSIS ITEM	INSPECTION ITEM	REFER PAGE
Light	No light	P0101	Air flow sensor - rationality	<ul style="list-style-type: none"> Air flow sensor ECU (ECU connector) 	DN02-110
Light	No light	P0104	Air flow sensor - out of range	<ul style="list-style-type: none"> Air flow sensor ECU (ECU connector) 	DN02-114
Light	No light	P0106	Boost pressure sensor - rationality	<ul style="list-style-type: none"> Boost pressure sensor ECU (ECU connector) 	DN02-118
Light	No light	P0108	Boost pressure sensor - out of range (Out of range high)	<ul style="list-style-type: none"> Boost pressure sensor ECU (ECU connector) Wire harness 	DN02-122
Light	No light	P0112	Intake air temperature sensor (air flow sensor built-in) - out of range (Out of range low)	<ul style="list-style-type: none"> Intake air temperature sensor (air flow sensor built-in) ECU (ECU connector) 	DN02-128
Light	No light	P0113	Intake air temperature sensor (air flow sensor built-in) - out of range (Out of range high)	<ul style="list-style-type: none"> Intake air temperature sensor (air flow sensor built-in) ECU (ECU connector) 	DN02-130
Light	No light	P0115	Malfunction of coolant temperature sensor and intake air temperature sensor	<ul style="list-style-type: none"> Engine coolant temperature sensor Intake air temperature sensor 	DN02-134
Light	No light	P0116	Engine coolant temperature sensor - rationality	<ul style="list-style-type: none"> Engine coolant temperature sensor ECU (ECU connector) Wire harness 	DN02-136, 138
Light	No light	P0117	Engine coolant temperature sensor - out of range (Out of range low)	<ul style="list-style-type: none"> Engine coolant temperature sensor ECU (ECU connector) Wire harness 	DN02-142
Light	No light	P0118	Engine coolant temperature sensor - out of range (Out of range high)	<ul style="list-style-type: none"> Engine coolant temperature sensor ECU (ECU connector) Wire harness 	DN02-144
Light	No light	P011C	Intake air temperature sensor (air flow sensor built-in) - rationality	<ul style="list-style-type: none"> Intake air temperature sensor (air flow sensor built-in) ECU (ECU connector) 	DN02-148
Light	No light	P0122	Intake throttle valve-opening sensor 1 out of range (Out of range low)	<ul style="list-style-type: none"> Intake throttle valve opening sensor 1 ECU (ECU connector) Wire harness 	DN02-152
Light	No light	P0123	Intake throttle valve position sensor 1 - out of range (Out of range high)	<ul style="list-style-type: none"> Intake throttle valve opening sensor 1 ECU (ECU connector) Wire harness 	DN02-158

DN02-24

FUEL CONTROL (J08E)

DIAGNOSTIC TROUBLE CODE (DTC) TABLE					
MIL	DIAG LIGHT	DTC NO.	DIAGNOSIS ITEM	INSPECTION ITEM	REFER PAGE
Light	No light	P0128	Thermostat - The coolant temperature does not reach a warmed-up temperature	<ul style="list-style-type: none"> Thermostat Engine coolant temperature 	DN02-164
No light	Light	P0182	Fuel temperature sensor Low	<ul style="list-style-type: none"> Fuel temperature sensor ECU (ECU connector) Wire harness 	DN02-168
No light	Light	P0183	Fuel temperature sensor High	<ul style="list-style-type: none"> Fuel temperature sensor ECU (ECU connector) Wire harness 	DN02-170
Light	No light	P0192	Fuel rail pressure sensor (main) - out of range (Out of range low)	<ul style="list-style-type: none"> Common rail pressure sensor 1 ECU (ECU connector) Wire harness 	DN02-174
Light	No light	P0193	Fuel rail pressure sensor (main) - out of range (Out of range high)	<ul style="list-style-type: none"> Common rail pressure sensor1 ECU (ECU connector) Wire harness 	DN02-184
Light	No light	P0200	Fuel injector driver charge circuit (circuit high)	<ul style="list-style-type: none"> ECU (ECU connector) 	DN02-192
Light	No light	P0201	Fuel injector - disconnection (#1cyl)	<ul style="list-style-type: none"> ECU (ECU connector) Wire harness Injector 	DN02-204
Light	No light	P0202	Fuel injector - disconnection (#2cyl)	<ul style="list-style-type: none"> ECU (ECU connector) Wire harness Injector 	DN02-206
Light	No light	P0203	Fuel injector - disconnection (#3cyl)	<ul style="list-style-type: none"> ECU (ECU connector) Wire harness Injector 	DN02-208
Light	No light	P0204	Fuel injector - disconnection (#4cyl)	<ul style="list-style-type: none"> ECU (ECU connector) Wire harness Injector 	DN02-210
Light	No light	P0205	Fuel injector - disconnection (#5cyl)	<ul style="list-style-type: none"> ECU (ECU connector) Wire harness Injector 	DN02-212
Light	No light	P0206	Fuel injector - disconnection (#6cyl)	<ul style="list-style-type: none"> ECU (ECU connector) Wire harness Injector 	DN02-214
No light	Light	P0217	Engine coolant over temperature condition	<ul style="list-style-type: none"> ECU (ECU connector) Engine coolant temperature sensor Engine cooling system 	DN02-220
No light	No light	P0219	Engine overspeed condition	—	DN02-224

FUEL CONTROL (J08E)

DN02-25

DIAGNOSTIC TROUBLE CODE (DTC) TABLE					
MIL	DIAG LIGHT	DTC NO.	DIAGNOSIS ITEM	INSPECTION ITEM	REFER PAGE
Light	No light	P0222	Intake throttle valve position sensor 2 - out of range (Out of range low)	<ul style="list-style-type: none">Intake throttle valve-opening sensor 2ECU (ECU connector)Wire harness	DN02-228
Light	No light	P0223	Intake throttle valve position sensor 2 - out of range (Out of range high)	<ul style="list-style-type: none">Intake throttle valve-opening sensor 2ECU (ECU connector)Wire harness	DN02-234
Light	No light	P0234	Overboost	<ul style="list-style-type: none">TurbochargerVNT controllerExhaust system partsBoost pressure sensorEGR valve	DN02-240
Light	No light	P0237	Boost pressure sensor - out of range (Out of range low)	<ul style="list-style-type: none">Boost pressure sensorECU (ECU connector)Wire harness	DN02-244
Light	No light	P0263	Injection quantity and timing (#1cyl)	<ul style="list-style-type: none">Flow damperInjectorFuel filterInjection pipeECU(ECU connector)	DN02-250
Light	No light	P0266	Injection quantity and timing (#2cyl)	<ul style="list-style-type: none">Flow damperInjectorFuel filterInjection pipeECU(ECU connector)	DN02-262
Light	No light	P0269	Injection quantity and timing (#3cyl)	<ul style="list-style-type: none">Flow damperInjectorFuel filterInjection pipeECU(ECU connector)	DN02-270
Light	No light	P0272	Injection quantity and timing (#4cyl)	<ul style="list-style-type: none">Flow damperInjectorFuel filterInjection pipeECU(ECU connector)	DN02-278
Light	No light	P0275	Injection quantity and timing (#5cyl)	<ul style="list-style-type: none">Flow damperInjectorFuel filterInjection pipeECU(ECU connector)	DN02-286

DN02-26

FUEL CONTROL (J08E)

DIAGNOSTIC TROUBLE CODE (DTC) TABLE					
MIL	DIAG LIGHT	DTC NO.	DIAGNOSIS ITEM	INSPECTION ITEM	REFER PAGE
Light	No light	P0278	Injection quantity and timing (#6cyl)	<ul style="list-style-type: none"> Flow damper Injector Fuel filter Injection pipe ECU(ECU connector) 	DN02-294
Light	No light	P0299	Underboost	<ul style="list-style-type: none"> VNT controller Turbocharger 	DN02-302
Light	No light	P0301	Continuously misfiring (#1cyl)	<ul style="list-style-type: none"> Piston Cylinder 	DN02-306
Light	No light	P0302	Continuously misfiring (#2cyl)	<ul style="list-style-type: none"> Piston Cylinder 	DN02-308
Light	No light	P0303	Continuously misfiring (#3cyl)	<ul style="list-style-type: none"> Piston Cylinder 	DN02-310
Light	No light	P0304	Continuously misfiring (#4cyl)	<ul style="list-style-type: none"> Piston Cylinder 	DN02-312
Light	No light	P0305	Continuously misfiring (#5cyl)	<ul style="list-style-type: none"> Piston Cylinder 	DN02-314
Light	No light	P0306	Continuously misfiring (#6cyl)	<ul style="list-style-type: none"> Piston Cylinder 	DN02-316
Light	Light	P0335	Crankshaft position sensor - disconnection	<ul style="list-style-type: none"> Wire harness ECU(ECU connector) Engine speed main sensor 	DN02-320
Light	No light	P0336	Crankshaft position sensor - rationality	<ul style="list-style-type: none"> Wire harness ECU(ECU connector) Engine speed main sensor 	DN02-328
Light	No light	P0340	Camshaft position sensor - disconnection	<ul style="list-style-type: none"> Wire harness ECU(ECU connector) Engine speed sub sensor 	DN02-322, 332
Light	Light	P0341	Camshaft position sensor - rationality	<ul style="list-style-type: none"> Wire harness ECU(ECU connector) Engine speed sub sensor 	DN02-336
Light	No light	P0381	Glow light (wait-to-start light) - circuit	<ul style="list-style-type: none"> Glow light ECU(ECU connector) Wire harness 	DN02-342
Light	No light	P0401	EGR low flow	<ul style="list-style-type: none"> EGR valve Wire harness 	DN02-346
Light	No light	P0402	EGR high flow	<ul style="list-style-type: none"> EGR valve Wire harness ECU (ECU connector) 	DN02-350

FUEL CONTROL (J08E)

DN02-27

DIAGNOSTIC TROUBLE CODE (DTC) TABLE					
MIL	DIAG LIGHT	DTC NO.	DIAGNOSIS ITEM	INSPECTION ITEM	REFER PAGE
Light	No light	P041B	EGR gas temperature sensor - rationality	<ul style="list-style-type: none"> EGR gas temperature sensor ECU(ECU connector) 	DN02-356, 358
Light	No light	P041C	EGR gas temperature sensor - out of range (Out of range low)	<ul style="list-style-type: none"> EGR gas temperature sensor ECU(ECU connector) Wire harness 	DN02-362
Light	No light	P041D	EGR gas temperature sensor - out of range (Out of range high)	<ul style="list-style-type: none"> EGR gas temperature sensor ECU(ECU connector) Wire harness 	DN02-364
Light	No light	P0420	Catalyst located downstream of PM filter	<ul style="list-style-type: none"> DPF Engine Burner Fuel 	DN02-368
Light	No light	P0500	Vehicle speed sensor - low	<ul style="list-style-type: none"> Vehicle speed sensor Pulse converter ECU (ECU connector) Wire harness 	DN02-372
Light	No light	P0501	Vehicle speed sensor - high	<ul style="list-style-type: none"> Vehicle speed sensor Pulse converter ECU (ECU connector) Wire harness 	DN02-374
No light	No light	P0504	Brake Switch Correlation	<ul style="list-style-type: none"> Brake switch Stop light switch ECU (ECU connector) Wire harness 	DN02-378
Light	No light	P0519	Idle speed control system	—	DN02-384
No light	Light	P0524	Engine oil pressure Too Low	<ul style="list-style-type: none"> Engine oil Wire harness Engine oil pressure switch ECU (ECU connector) 	DN02-388
No light	Light	P0562	Sensor supply voltage - out of range (out of range low)	<ul style="list-style-type: none"> Alternator ECU (ECU connector) 	DN02-392
No light	Light	P0563	Sensor supply voltage - out of range (out of range high)	<ul style="list-style-type: none"> Battery ECU (ECU connector) 	DN02-396
Light	No light	P05F1	Crankcase ventilation system - disconnection between the CV valve and the intake manifold	<ul style="list-style-type: none"> Breather hose Air flow sensor 	DN02-400
Light	No light	P0605	Flash ROM error	<ul style="list-style-type: none"> ECU (ECU connector) 	DN02-194
No light	Light	P0606	Control module processor	<ul style="list-style-type: none"> ECU (ECU connector) 	DN02-196
No light	Light	P0607	Control module performance	<ul style="list-style-type: none"> ECU (ECU connector) 	DN02-198
Light	No light	P0610	VIN data error	<ul style="list-style-type: none"> ECU (ECU connector) 	DN02-404

DN02-28

FUEL CONTROL (J08E)

DIAGNOSTIC TROUBLE CODE (DTC) TABLE					
MIL	DIAG LIGHT	DTC NO.	DIAGNOSIS ITEM	INSPECTION ITEM	REFER PAGE
Light	No light	P0611	Fuel injector driver charge circuit - circuit (circuit low)	• ECU (ECU connector)	DN02-200
Light	No light	P0617	Starter switch - rationality	• Wire harness • ECU (ECU connector)	DN02-408
Light	No light	P0628	Suction control valve for fuel supply pump - circuit (Circuit low)	• Supply pump • Wire harness • ECU (ECU connector)	DN02-412
Light	No light	P0629	Suction control valve for fuel supply pump - circuit (Circuit high)	• Supply pump • Wire harness • ECU (ECU connector)	DN02-414
No light	No light	P0642	ECU sensor supply 1 failure (Low)	• Wire harness • ECU (ECU connector)	DN02-418
No light	No light	P0643	ECU sensor supply 1 failure (High)	• Wire harness • ECU (ECU connector)	DN02-422, 424
Light	No light	P064C	Glow controller - Battery for glow plug open, GND short Glow controller - Over temperature	• Wire harness • GCU	DN02-428
No light	No light	P0652	ECU sensor supply 2 failure (Low)	• Wire harness • ECU (ECU connector)	DN02-432
No light	No light	P0653	ECU sensor supply 2 failure (High)	• Wire harness • ECU (ECU connector)	DN02-436
Light	No light	P0671	Glow Plug (circuit low) (#1cyl) Glow Plug (circuit high) (#1cyl)	• Glow plug	DN02-440
Light	No light	P0672	Glow Plug (circuit low) (#2cyl) Glow Plug (circuit high) (#2cyl)	• Glow plug	DN02-442
Light	No light	P0675	Glow Plug (circuit low) (#5cyl) Glow Plug (circuit high) (#5cyl)	• Glow plug	DN02-444
Light	No light	P0676	Glow Plug (circuit low) (#6cyl) Glow Plug (circuit high) (#6cyl)	• Glow plug	DN02-446
Light	No light	P0683	Glow controller - Battery for glow controller open, GND short Glow controller - Glow control signal Glow controller - Diagnosis signal	• Wire harness • ECU (ECU connector)	DN02-450
No light	Light	P0686	ECM/PCM Power Relay Control Circuit high	• Main relay • Wire harness • ECU (ECU connector)	DN02-454
No light	No light	P06D3	Air flow sensor power supply failure Short to GND	• Air flow sensor • ECU (ECU connector) • Wire harness	DN02-458

FUEL CONTROL (J08E)

DN02-29

DIAGNOSTIC TROUBLE CODE (DTC) TABLE					
MIL	DIAG LIGHT	DTC NO.	DIAGNOSIS ITEM	INSPECTION ITEM	REFER PAGE
No light	No light	P06D4	Air flow sensor power supply failure (High)	<ul style="list-style-type: none"> Battery ECU (ECU connector) Alternator 	DN02-462
No light	No light	P0704	Clutch Switch Input Circuit	<ul style="list-style-type: none"> Wire harness ECU (ECU connector) Clutch switch 	DN02-466
Light	No light	P073D	Transmission information - rationality	<ul style="list-style-type: none"> Neural switch circuit CAN circuit Transmission ECU 	DN02-470
No light	No light	P081A	Starter Disable Circuit Low	<ul style="list-style-type: none"> Starter cut relay Wire harness ECU (ECU connector) 	DN02-474
No light	No light	P081B	Starter Disable Circuit High	<ul style="list-style-type: none"> Starter cut relay Wire harness ECU (ECU connector) 	DN02-478
Light	No light	P0850	Neutral switch - rationality	<ul style="list-style-type: none"> Wire harness ECU (ECU connector) Neutral switch 	DN02-482
No light	No light	P1133	P.T.O. accelerator sensor (Hi)	<ul style="list-style-type: none"> P.T.O. accelerator sensor ECU (ECU connector) Wire harness 	DN02-486
Light	No light	P1197	Fuel rail pressure sensor (sub) - out of range (Out of range low)	<ul style="list-style-type: none"> Common rail pressure sensor 2 ECU (ECU connector) Wire harness 	DN02-492
Light	No light	P1198	Fuel rail pressure sensor (sub) - out of range (Out of range high)	<ul style="list-style-type: none"> Common rail pressure sensor 2 ECU (ECU connector) Wire harness 	DN02-500
Light	No light	P119F	Fuel rail pressure sensor - rationality	<ul style="list-style-type: none"> Common rail pressure sensor ECU (ECU connector) 	DN02-508
Light	No light	P1211	Fuel injector driver circuit 1 - circuit (Circuit low)	<ul style="list-style-type: none"> Wire harness Injector ECU (ECU connector) 	DN02-512
Light	No light	P1212	Fuel injector driver circuit 1 - circuit (Circuit high)	<ul style="list-style-type: none"> Wire harness Injector ECU (ECU connector) 	DN02-518
Light	No light	P1214	Fuel injector driver circuit 2 - circuit (Circuit low)	<ul style="list-style-type: none"> Wire harness Injector ECU (ECU connector) 	DN02-514

DN02-30

FUEL CONTROL (J08E)

DIAGNOSTIC TROUBLE CODE (DTC) TABLE					
MIL	DIAG LIGHT	DTC NO.	DIAGNOSIS ITEM	INSPECTION ITEM	REFER PAGE
Light	No light	P1215	Fuel injector driver circuit 2 - circuit (Circuit high)	<ul style="list-style-type: none"> Wire harness Injector ECU (ECU connector) 	DN02-520
Light	No light	P141F	Burner system malfunction	<ul style="list-style-type: none"> Burner system 	DN02-524
Light	No light	P1426	Differential pressure sensor - rationality	<ul style="list-style-type: none"> Differential pressure sensor Differential pressure line ECU (ECU connector) Wire harness 	DN02-526
Light	No light	P1427	Differential pressure sensor - out of range (Out of range low)	<ul style="list-style-type: none"> Differential pressure sensor ECU (ECU connector) Wire harness 	DN02-530
Light	No light	P1428	Differential pressure sensor - out of range (Out of range high)	<ul style="list-style-type: none"> Differential pressure sensor ECU (ECU connector) Wire harness 	DN02-538
Light	No light	P1458	Valve position control failure - DC motor out of range, functional Valve link failure Low battery voltage	<ul style="list-style-type: none"> EGR valve Battery 	DN02-544
Light	No light	P1459	EGR actuator malfunction 2	<ul style="list-style-type: none"> EGR valve Wire harness ECU (ECU connector) 	DN02-352
Light	No light	P1515	Charge air undercooling	<ul style="list-style-type: none"> Intercooler ECU (ECU connector) 	DN02-550
No light	No light	P1530	Engine stop switch malfunction	<ul style="list-style-type: none"> Engine stop switch ECU (ECU connector) Wire harness 	DN02-554
Light	No light	P1601	Fuel injector adjustment data error	<ul style="list-style-type: none"> ECU (ECU connector) 	DN02-558
Light	No light	P1681	Exhaust brake - Circuit (circuit low)	<ul style="list-style-type: none"> Exhaust brake solenoid valve Wire harness 	DN02-564
Light	No light	P1682	Exhaust brake - Circuit (circuit high)	<ul style="list-style-type: none"> Exhaust brake solenoid valve ECU (ECU connector) Wire harness 	DN02-568
Light	No light	P200C	DPF over temperature	<ul style="list-style-type: none"> Engine Burner DPF Wire harness Temperature sensor 	DN02-572
Light	No light	P203F	Empty reductant tank	<ul style="list-style-type: none"> DEF tank level sensor 	DN02-576
Light	No light	P204F	Reductant System Performance	—	DN02-580
Light	No light	P207F	Improper reductant	<ul style="list-style-type: none"> DEF 	DN02-582

FUEL CONTROL (J08E)

DN02-31

DIAGNOSTIC TROUBLE CODE (DTC) TABLE					
MIL	DIAG LIGHT	DTC NO.	DIAGNOSIS ITEM	INSPECTION ITEM	REFER PAGE
Light	No light	P20EE	NOx converting catalyst conversion efficiency	<ul style="list-style-type: none"> • NOx sensor • DEF • Catalyst 	DN02-586
Light	No light	P2100	DC motor for intake throttle valve - circuit (Open circuit (circuit low))	<ul style="list-style-type: none"> • Intake throttle • Wire harness • ECU (ECU connector) 	DN02-590
Light	No light	P2101	Intake throttle valve - functional	<ul style="list-style-type: none"> • Intake throttle • Wire harness • ECU (ECU connector) 	DN02-596, 598
Light	No light	P2103	DC motor for intake throttle valve - circuit (Short circuit (circuit high))	<ul style="list-style-type: none"> • Intake throttle • Wire harness • ECU (ECU connector) 	DN02-592
Light	No light	P2120	Throttle/Pedal Position Sensor/Switch "D" Circuit	<ul style="list-style-type: none"> • Wire harness • ECU (ECU connector) • Accelerator sensor 	DN02-604
Light	No light	P2122	Accelerator pedal position sensor 1 - out of range (Out of range low)	<ul style="list-style-type: none"> • Accelerator sensor 1 • ECU (ECU connector) • Wire harness 	DN02-606, 614
Light	No light	P2123	Accelerator pedal position sensor 1 - out of range (Out of range high)	<ul style="list-style-type: none"> • Accelerator sensor 1 • ECU (ECU connector) • Wire harness 	DN02-608, 620
Light	No light	P2127	Accelerator pedal position sensor 2 - out of range (Out of range low)	<ul style="list-style-type: none"> • Accelerator sensor 2 • ECU (ECU connector) • Wire harness 	DN02-610, 626
Light	No light	P2128	Accelerator pedal position sensor 2 - out of range (Out of range high)	<ul style="list-style-type: none"> • Accelerator sensor 2 • ECU (ECU connector) • Wire harness 	DN02-612, 632
Light	No light	P2135	Intake throttle valve position sensor - rationality	<ul style="list-style-type: none"> • Intake throttle valve opening sensor • ECU (ECU connector) 	DN02-638
Light	No light	P2138	Accelerator pedal position sensor - rationality	<ul style="list-style-type: none"> • Accelerator sensor • ECU (ECU connector) 	DN02-642
Light	No light	P2214	Abnormal characteristics of downstream NOx sensor	<ul style="list-style-type: none"> • Downstream NOx sensor • Upstream NOx sensor 	DN02-646
Light	No light	P2227	Barometric pressure sensor - rationality	<ul style="list-style-type: none"> • ECU (ECU connector) 	DN02-650
Light	No light	P2228	Barometric pressure sensor - out of range (out of range low)	<ul style="list-style-type: none"> • ECU (ECU connector) 	DN02-652
Light	No light	P2229	Barometric pressure sensor - out of range (out of range high)	<ul style="list-style-type: none"> • ECU (ECU connector) 	DN02-654

DN02-32

FUEL CONTROL (J08E)

DIAGNOSTIC TROUBLE CODE (DTC) TABLE					
MIL	DIAG LIGHT	DTC NO.	DIAGNOSIS ITEM	INSPECTION ITEM	REFER PAGE
No light	No light	P2269	Water in Fuel Condition	<ul style="list-style-type: none"> Fuel filter water level sensor Wire harness ECU (ECU connector) 	DN02-656
Light	No light	P226C	VNT slow response	<ul style="list-style-type: none"> VNT controller Turbocharger 	DN02-660
Light	No light	P240F	EGR flow slow response	<ul style="list-style-type: none"> EGR valve Battery 	DN02-546
Light	No light	P242B	Exhaust gas temperature sensor (DOC inlet) - rationality	<ul style="list-style-type: none"> Exhaust gas temperature sensor (DOC inlet) ECU (ECU connector) 	DN02-664, 666
Light	No light	P242C	Exhaust gas temperature sensor (DOC inlet) - out of range (Out of range low)	<ul style="list-style-type: none"> Exhaust gas temperature sensor (DOC inlet) ECU (ECU connector) Wire harness 	DN02-670
Light	No light	P242D	Exhaust gas temperature sensor (DOC inlet) - out of range (Out of range high)	<ul style="list-style-type: none"> Exhaust gas temperature sensor (DOC inlet) ECU (ECU connector) Wire harness 	DN02-672
Light	No light	P244A	Filtering performance (missing substrate)	<ul style="list-style-type: none"> DPF Engine Burner Temperature 	DN02-676, 678
Light	No light	P244B	Incomplete regeneration	<ul style="list-style-type: none"> DPF Burner Differential pressure sensor Meter 	DN02-682, 683, 690
Light	No light	P2457	EGR cooler performance	<ul style="list-style-type: none"> EGR cooler ECU (ECU connector) 	DN02-702
Light	No light	P2459	Frequent regeneration	<ul style="list-style-type: none"> ECU (ECU connector) 	DN02-706
Light	No light	P2463	DPF clogged	<ul style="list-style-type: none"> DPF Meter 	DN02-708
Light	No light	P246F	Exhaust gas temperature sensor (DOC outlet) - rationality	<ul style="list-style-type: none"> Exhaust gas temperature sensor (DOC outlet) ECU (ECU connector) 	DN02-710, 712
Light	No light	P2470	Exhaust gas temperature sensor (DOC outlet) - out of range (Out of range low)	<ul style="list-style-type: none"> Exhaust gas temperature sensor (DOC outlet) ECU (ECU connector) Wire harness 	DN02-716
Light	No light	P2471	Exhaust gas temperature sensor (DOC outlet) - out of range (Out of range high)	<ul style="list-style-type: none"> Exhaust gas temperature sensor (DOC outlet) ECU (ECU connector) Wire harness 	DN02-718

FUEL CONTROL (J08E)

DN02-33

DIAGNOSTIC TROUBLE CODE (DTC) TABLE					
MIL	DIAG LIGHT	DTC NO.	DIAGNOSIS ITEM	INSPECTION ITEM	REFER PAGE
No light	No light	P2635	Fuel Pump "A" Low Flow/Performance	<ul style="list-style-type: none"> Supply pump: by HINO-DX ECU (ECU connector) 	DN02-722
Light	No light	U0073	Engine ECU CAN communication bus for Emission control system - bus off	<ul style="list-style-type: none"> VNT controller Wire harness 	DN02-726
Light	No light	U010E	Engine ECU CAN communication (DeNOx ECU)	—	DN02-730
Light	No light	U029D	Engine ECU CAN communication (NOx sensor (SCR upstream)) DeNOx ECU CAN communication (NOx sensor (SCR upstream))	—	DN02-736
Light	No light	U029E	Engine ECU CAN communication (NOx sensor (SCR downstream)) DeNOx ECU CAN communication (NOx sensor (SCR downstream))	—	DN02-744
No light	No light	U0301	Software Incompatibility with DeNOx ECU	<ul style="list-style-type: none"> DeNOx ECU 	DN02-750
Light	No light	U1001	Engine ECU CAN communication bus for vehicle control bus off	<ul style="list-style-type: none"> Wire harness ECU (ECU connector) Meter 	DN02-752
Light	No light	U110A	Engine ECU CAN communication (Vehicle control ECU)	—	DN02-754
Light	No light	U111E	Engine ECU CAN communication (Burner ECU)	—	DN02-758
Light	No light	U1122	Engine ECU CAN communication (EGR valve controller)	—	DN02-766
Light	No light	U1123	Engine ECU CAN communication (VNT controller)	<ul style="list-style-type: none"> VNT controller Wire harness 	DN02-770

NOTICE

- It is necessary to reset the ECU default value using the diagnosis tool at the time of supply pump service replacement. In addition, the ECU has a function enabling it to learn the performance of the supply pump at the time of ECU service replacement, so ensure sufficient time (several minutes) is available.
- When an injector is newly installed in a vehicle, it is necessary to enter the ID codes in the engine ECU using the Diagnostic tool.

GROUP SHARING THE SENSOR SUPPLY TERMINAL

- If one of the sensor power supplies fails, more than one malfunction codes will occur for the sensors sharing the sensor supply terminal.
Check the sensors for short circuits and whether the sensor supply circuit is in normal condition.

ECU terminal	Sensor	DTC
E33	Intake throttle valve position sensor 1	P0122
	Intake throttle valve position sensor 2	P0222
	Common rail pressure sensor (Main)	P0193
	Boost pressure sensor	P0237
V71	P.T.O. accelerator sensor	—
	Differential pressure sensor	P1428

- If P0642 or P0652 has also occurred, the sensor supply of the ECU may be in abnormal condition or the GND may be shorted somewhere in the following sensor group.

Group	Sensor	DTC
P0642	Accelerator pedal position sensor 1	P2122
	Common rail pressure sensor (Sub)	P1198
		P1197
	Differential pressure sensor	P1428
		P1427
	P.T.O. accelerator sensor	P1133
P0652	Boost pressure sensor	P0237
	Common rail pressure sensor	P0193
		P0192
	Intake throttle valve position sensor 1	P0122
	Intake throttle valve position sensor 2	P0222
	Accelerator pedal position sensor 2	P2127
	Camshaft position sensor	P0304

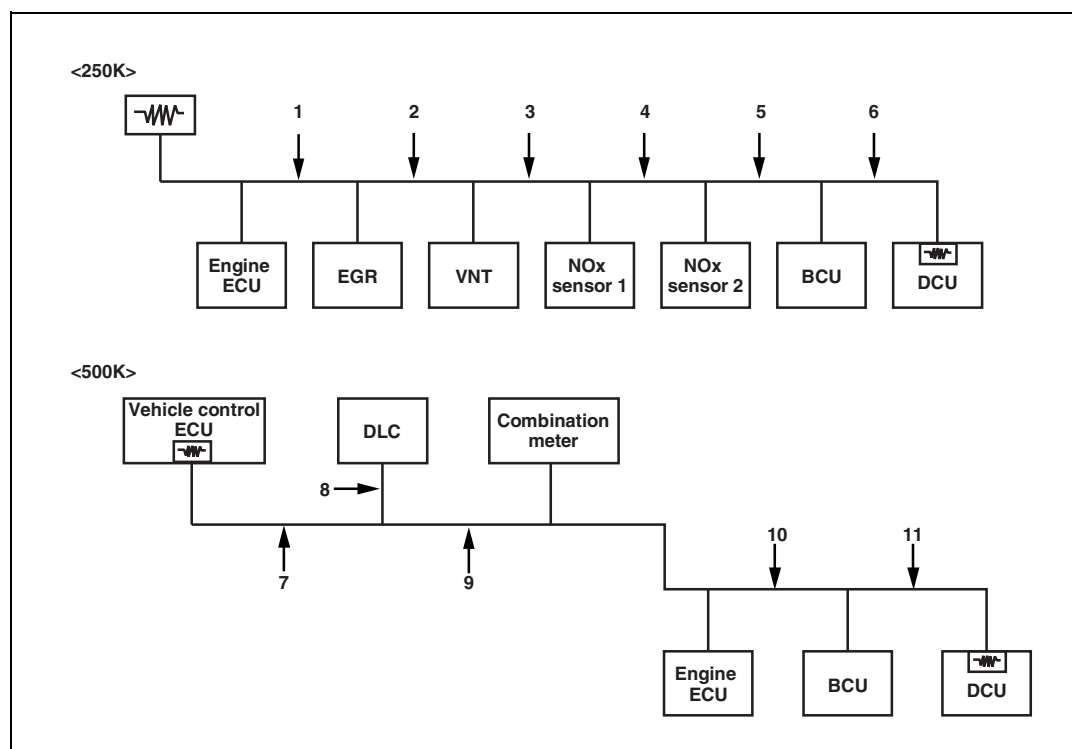
GROUP SHARING THE SENSOR GND TERMINAL

ECU terminal	Sensor
E76	Fuel temperature sensor
	Intake air temperature sensor (intake manifold)
	Common rail pressure sensor (Main)
E77	Boost sensor
	Intake air temperature sensor (Intercooler outlet)
	EGR gas temperature sensor
E58	Engine coolant temperature sensor
	Intake air temperature sensor
V46	Exhaust gas temperature sensor 2
	Exhaust gas temperature sensor 3
	Differential pressure sensor
V45	Accelerator sensor 1
	P.T.O. accelerator sensor
E57	Intake throttle valve position sensor 1
	Intake throttle valve position sensor 2
E56	Common rail pressure sensor (Sub)
E65	Accelerator sensor 2

MALFUNCTION CODES IN CASE OF DISRUPTION OF CAN COMMUNICATION

Since the CAN communication line is configured as described below, more than one malfunction code may occur depending on the faulty area of the circuit.

- For single failure
The system itself is suspected of being faulty due to the broken harness or connector or supply circuit failure of the CAN communication circuit for each actuator and controller.



SAPH161060200025

Malfunction part	Case
1	U1122, U1123, U029D, U029E, U111E, U010E
2	U1123, U029D, U029E, U111E, U010E
3	U029D, U029E, U111E, U010E
4	U029E, U111E, U010E
5	U111E, U010E
6	U010E
7	U110A
8	Communication failure of the Hino-DX
9	U110A, Communication failure of the Hino-DX
10	Failure to communicate between BCU and DCU with the Hino-DX
11	Hino-DX's failure to make the DCU communicate

MALFUNCTION CODES FOR FAULTY ACTUATOR POWER RELAY

Since the following actuators and switches are connected in the downstream of the actuator power relay, more than one malfunction code or functional failure can occur.

Check the supply circuit from the actuator power relay.

Sensor	Case
Clutch switch	P0704
Neutral switch	P0850
Brake switch	P0504
EGR actuator	U1122
VNT actuator	U1123
DPR regeneration switch	Manual regeneration failure of DPR
Exhaust brake	Functional failure
Cruise	

DN02-38

FUEL CONTROL (J08E)

ENG basic inspection sheet (engine inspection check sheet)

EN1610602F200008

* After inspection, indicate a check mark in the boxes below.

Inspection steps	1	2	3	4	5	6	7	8	9
Inspection area	Engine/ECU	Fuel tank, filter	Air intake system parts	Sensor system	Exhaust system/exhaust brake	VN turbo-charger	EGR valve/cooler	Injector	Supply pump
Check items	Checking the diagnosis code.	Inspect the fuel tank. Low-grade fuel, contaminants or moisture inclusion	Inspect the air cleaner. Fouled element	Damage in the sensor harness Poor fit of the sensor coupler	Gas leak from tightened and fastened areas	Followability during inspection (Deviation $\pm 8\%$ or under)	Followability during inspection (Deviation $\pm 5\%$ or under)	Inspect the injector drive wiring.	Inspect the power supply. Actuation and wiring of main relay
	Check the program part No.	Inspect the fuel hose. Breakage, crush or clogging	Inspect the air flow meter for any degradation/deterioration. Fouling and assembly direction	Inspect the rotation signal system. NE or G active flag and pulser damage	Inspect actuation of the exhaust brake.		Clogged cooler	Inspect the compression.	Inspect SCV resistance.
	Check the injector calibration data.	Inspect the fuel pipe. Connection to IN/OUT and wrong assembly	Inspect the air hose. Looseness, crush and loose clamp	Inspect the accelerator sensor. 0 to 100% voltage	Check a valve gap.			Inspect appearance of the injector. Presence of deposit at the end	Inspect SCV amperage during idling. Variance in amperage (+/- 40 mA)
	Check the supply pump specification learning	Inspect the fuel filter. Element, separator and gauze filter	Inspect the boost sensor. Inspect the sensors and check the hoses for clogging.	Coolant temperature sensor Output voltage and resistance				Injection quantity compensation between cylinders Check through data monitoring.	Inspect the set timing. Check gear phases.
	Check for freesmoke.	Inspect air inclusion. Priming operation and air bleeding	Intercooler body and Damage in hoses	Common rail pressure sensor Inspect Hino-DX fuel leakage and check followability to actual level.				Inspect a compensated injection quantity. Check writing.	
	ECU data monitor (Check Hino-DX reports.)	External fuel leakage Check pipes and hoses for leakage.						Inspect an injection quantity at engine idling speed	
		Internal fuel leakage Presence of an increase in engine oil							

FUEL CONTROL (J08E)

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Inspection steps	1	2	3	4	5	6	7	8	9
Inspection area	Engine/ECU	Fuel tank, filter	Air intake system parts	Sensor system	Exhaust system/exhaust brake	VN turbo-charger	EGR valve/cooler	Injector	Supply pump
Actions to be taken upon "fail" judgment	- Check parts based on each diagnosis code.	- Remove contaminants and fouling and replace low-grade fuel.	- Replace the element.	- Re-fit and repair damaged parts.	- Retighten.	- Inspect or replace the turbo charger.	- Clean or replace the valve.	- Check for disconnection.	- Inspect the relay upstream fuse.
	- Reprogram with the latest part No.	- Replace deformed parts.	- Clean or replace the air flow meter.	- Replace the sensor.	- Check air leakage and M/V operation.	- Inspect or replace the turbo charger.	- Clean the cooler.	- Clean the end of the nozzle needle.	
	- Write a correct calibration data.	- Correct wrong assembly to proper assembly.	- Replace the hose and retighten the clamp.		- Adjust a gap.			- Standard +/- 5q	
	- Perform the supply pump specification learning again.	- Replace the element.	- Replace the sensor.						
	- Free acceleration method smoke test Standard: 10% or less without muffler.	- Air bleeding	- Replace the hose and retighten the clamp.						
	- Clear data after outputting a HinoDX report.	- Inspect for fuel leakage (check connections and pipings).							

Standard injection quantity

		J08E
Idling (normal)	r/min	750
	Injection quantity	7 to 16
Standard DPR filter differential pressure	r/min	2,800
	Differential pressure	5 kPa or under

DN02-40

FUEL CONTROL (J08E)

No DTC	Engine low power, miss-fire, hesitation, knocking, running rough	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Injector	Cylinder cut out test (Detail on next page A)	Find knocking cylinder		Injector Replace
2	Air filter	Check restriction or contamination of the air cleaner element (Detail on next page B)	No restriction Genuine parts		Filter Replace
3	Air hoses	Visually check (Detail on next page C)	No bending No leaking		Fix Replace
4	Intake throttle	Visually check Activation test by Hino-DX (Detail on next page D)	No excessive dirt inside Drilled 3 holes Following target		Drill holes
5	Mass air flow sensor	Mass air flow test at 100% Free acceleration (Detail on next page E)	Difference between old and new sensor less than 10%		MAF Replace
6	Exh. Brake	Visually check Open and close butterfly valve (Detail on next page F)	No sticking No seizing		ExB Replace
7	Engine	Compression test	More than 340psi		Overhaul

A	<p>Cylinder cut out test</p> <div> </div> <div> <p>System fix ↓ Check function ↓ Activation test ↓ Cylinder cut out ↓ Start</p> </div> <div> <ol style="list-style-type: none"> 1. Park vehicle with parking brake set, and chock wheels. 2. Set engine speed at 1,500rpm by cruise control switch. 3. Check each cylinder for decreased level of knock. If the knock decreases during cut out test, that cylinder should be considered abnormal fueling injector </div>
B	<p>Air Filter Visually check</p> <div> </div> <div> </div>
C	<p>Air hoses Visually check</p> <div> </div> <div> </div> <div> </div>

DN02-42

FUEL CONTROL (J08E)

D	<p>Intake throttle Visually check</p> <div> </div> <div> <p>No excessive dirt inside of throttle body and no movement between butterfly valve and shaft</p> </div> <div> </div>
	<p>Intake throttle activation test</p> <div> </div> <div> <p>System fix ↓ Check function ↓ Intake throttle valve check</p> </div> <div> <ol style="list-style-type: none"> 1. Park vehicle with parking brake set, and chock wheels. 2. When click [Intake throttle UP/ Intake throttle DOWN] button, the directed Intake throttle valve position changes from 0% to 90% by 10% step. Confirm actual intake throttle valve position is followed directed intake throttle valve. </div>
E	<p>Mass air flow sensor check</p> <div> </div> <div> <p>System fix ↓ Check function ↓ Suction air volume check</p> </div> <div> <ol style="list-style-type: none"> 1. Park vehicle with parking brake set, and chock wheels. 2. Make accelerator 100% when parking. Coolant temp must be more than 80°C {176°F} 3. Click keep and write down the value. (A) 4. Replace initial MAF to bran new one. 5. Do again (2) and (3). (B) <p>Calculation form: $\{(B)-(A)\} / (B) \times 100 < 10$</p> </div>
F	<p>Exh. Brake valve check</p> <div> </div> <div> </div>



FUEL CONTROL (J08E)

DN02-43



DTC:P0016 (Check sheet)

EN1610602F200009

DTC:P0016

Crankshaft position sensor and Camshaft position sensor - rationality

1. Technical description

- A phase difference (deviation) between the crankshaft position sensor (Engine speed main sensor) and camshaft position sensor (Engine speed sub sensor) is diagnosed.
- <Description of malfunction>
- Detect the phase difference between crankshaft position sensor (Engine speed main sensor) pulse and camshaft position sensor (Engine speed sub sensor) pulse.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- Engine speed is in the range from 700 to 1,000 r/min.
- Engine coolant temperature is 60 °C {140°F} or higher.
- A difference between an actual engine speed and a target engine speed is 20 r/min or less.

(2) Judgment criteria

- A phase difference between the crankshaft position sensor (Engine speed main sensor) pulse and camshaft position sensor (Engine speed sub sensor) pulse remains 13° or less or 23° or greater for 1 second or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Camshaft gear: Check assembly.**Flywheel:** Check for misassembly.**Crankshaft position sensor (Engine speed main sensor):** Check the installation position.**Camshaft position sensor (Engine speed sub sensor):** Check the installation position.

DTC:P0016	Crankshaft position sensor and Camshaft position sensor - rationality	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Camshaft gear	Check that the camshaft gear is properly assembled.	Assembled properly.		Proceed to Step 2.	Assemble the camshaft gear properly.
2	Flywheel	Check that the flywheel is properly assembled.	Assembled properly.		Proceed to Step 3.	Assemble the flywheel normally.
3	Crankshaft position sensor (Engine speed main sensor) Camshaft position sensor (Engine speed sub sensor)	Check that the sensor are installed to the proper position.	Installed properly.		Delete the DTC and reload	Install the sensor in proper locations .

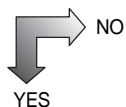
DN02-46

FUEL CONTROL (J08E)

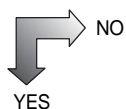
DTC:P0016

EN1610602F200010

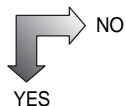
DTC	P0016	Crankshaft position sensor and Camshaft position sensor - rationality
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1. CHECK THAT THE CAMSHAFT GEAR IS PROPERLY ASSEMBLED.

Assemble the camshaft gear normally.

2. CHECK THAT THE FLYWHEEL IS ASSEMBLED.

Assemble the flywheel normally.

3. CHECK THAT CRANKSHAFT POSITION SENSOR AND CAMSHAFT POSITION SENSOR ARE INSTALLED IN PROPER LOCATIONS RESPECTIVELY.

Install the crankshaft position sensor and camshaft position sensor in proper locations respectively.

Delete the DTC and reload.



FUEL CONTROL (J08E)

DN02-47



DTC:P0045 (Check sheet)

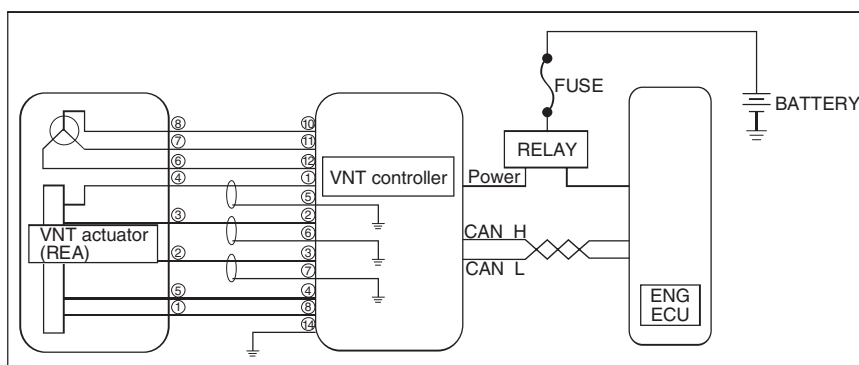
EN1610602F200093

DTC:P0045

VNT failure

1. Technical description

- The VNT moves the nozzle vane steplessly by the REA (Rotary Electric Actuator) to control the turbo speed and boost pressure.
- The REA has a sensor to detect the movement of the actuator, always monitoring the reading and actual value of the nozzle vane opening.
- Wiping operation is performed while the engine is stopped for the purpose of removing soot and oil coming out from the range of vane operation and checking the turbo mechanical operating range for abnormality.

**2. DTC set condition****(1) Check conditions**

- During the engine operation.
- During the wiping operation after stopping the engine.

(2) Judgment criteria

Event	Detail (reference)
• Position control error	After the motor drive load continues to be more than 95% for three seconds, restoration has failed upon five times of recovery operation.
• Short-circuiting of motor circuit	A state with a current value of more than 20.7A on the HI or LO side has been detected three times.
• Motor circuit open	A voltage of less than 1V has been detected at the third time with the power ON or nozzle stuck.
• Wiping function error	A state exceeding the range of movement on the HI or LO side has continued twice (too large or too small).
• Initialize error	The range of movement upon power ON is larger than at the HI range or the hall IC output is not constant five seconds later.
• Position sensor error	The abnormal output value from the sensor IC has continued for one second.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Unsmooth moving or sticking due to rust, etc. of VNT link.
- Poor contact of connector to VNT actuator (REA).
- Disconnection or short-circuiting of harness.

DN02-50

FUEL CONTROL (J08E)

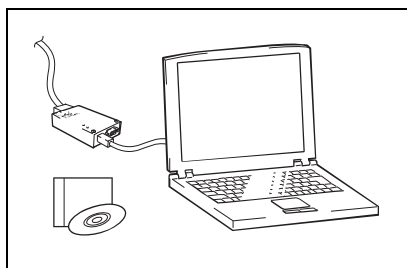
DTC:P0045	VNT failure	Inspection Procedure
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Step	Parts	Description	Judgment	Action		
				Check (YES/NO)	YES	NO
1	DTC confirmation	Check Engine ECU if any other DTC is stored other than following. (P0045)	DTC is stored → YES No DTC is stored → NO		Go to diagnostic procedure of a relevant DTC	Go to Step 2
2	Wire Harness/ Connector	Check open or short circuit of wire harness (VNT actuator - VNT controller, VNT controller - Engine ECU), poor contact of the connector.	Abnormal → YES No open/short circuit, No poor contact → NO		Repair or replace the wire harness or coupler/connector	Go to Step 3
3	VNT controller	Confirm the label color of VNT controller.	Label collar is light blue → YES Label collar is light green → NO		Replace the VNT controller → Go to step 8 after replacement	Go to Step 4
4	Turbo-charger	Check the VNT opening response delay. (The response delay should be less than 3 seconds.)	Response delays more than 3 seconds → YES No response delay → NO		Replace the Turbocharger assembly	Go to Step 5
5	Supply voltage for Turbo-charger	Check power supply voltage of VNT controller connector. (Engine sub-harness side)	10V or more → YES Less than 10V → NO		Go to Step 6	Inspect and repair the power supply circuit
6	VNT controller harness	Check continuity of the harness between VNT controller and VNT actuator.	Abnormality in harness → YES No abnormalities of the harness → NO		Repair or replace the wire harness	Go to Step 7
7	VNT motor (DC motor) of Turbo-charger	Check the connection of DC motor connector. Check the DC motor rod operation.	Abnormal connection Abnormal operation → YES No abnormalities for connector connection or rod operation → NO		Abnormal connection → repair or replace the connector Abnormal operation → replace the Turbocharger	Go to Step 8
8	DTC confirmation	Clear the DTC and check if the DTC P0045 is stored again.	DTC is stored → YES No DTC is stored → NO		Go to Step 9	Go to Step 1
9	Engine ECU	Check if the DTC P0045 is stored after replace the engine ECU.	DTC is stored → YES No DTC is stored → NO		Replace the Turbocharger assembly	Completed

DTC:P0045

EN16Z0702F200001

DTC	P0045	VNT failure
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1 Check DTC for Engine control system

- 1 Warm-up the engine. (Coolant temperature: 60°C {140°F} or more)
- 2 Stop the engine.
- 3 Connect Hino-DX to the vehicle.
- 4 Start the engine.
- 5 Select "Engine", and check engine ECU if any of DTC other than P0045 is stored in the engine ECU.

Judgment

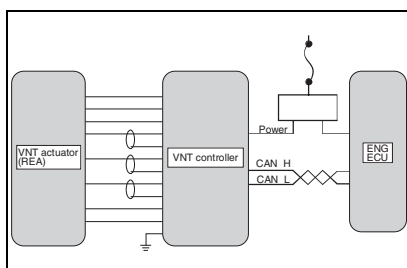
Any of DTC is stored → YES

No any other DTC → NO

YES

Go to diagnostic procedure of a relevant DTC.

NO

2 Check wire harness

- 1 Set the starter switch to the "LOCK" position.
- 2 Slightly shake the wire harness of VNT actuator to VNT controller, and VNT controller to engine ECU.
- 3 Set the starter switch to the "ON" position.
- 4 Check DTC again with Hino-DX.
- 5 Check whether the DTC changes to "Active" or "Inactive".

Judgment

DTC changed → YES

DTC remains same → NO

YES

Repair or replace the wire harness or connector.

NO

DN02-52

FUEL CONTROL (J08E)

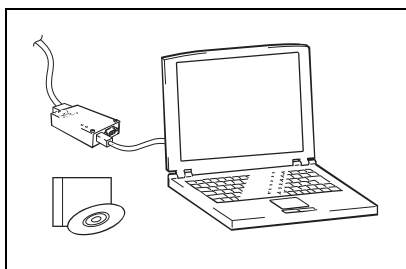
3 Confirm the label color of VNT controller**1 Confirm the label color of VNT controller.**

Judgment	Light green → YES
	Light blue → NO

YES

Replace the VNT controller
Go to Step 8.

NO

4 Check the followability of VNT controller

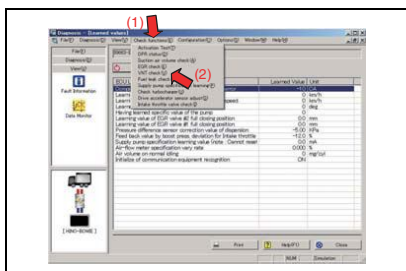
saph161060200038

- 1 Set the starter switch to the "LOCK" position.
- 2 Warm-up the engine. (Coolant temperature: 60°C {140°F} or more)
- 3 Stop the engine.
- 4 Connect Hino-DX to the vehicle.
- 5 Set the starter switch to the "ON" position.
- 6 Select "Engine ECU" on Hino-DX.
- 7 Check the followability of VNT controller by "check functions" of Hino-DX.
- 8 Check time lag between directed VNT position value and VNT actual position value.

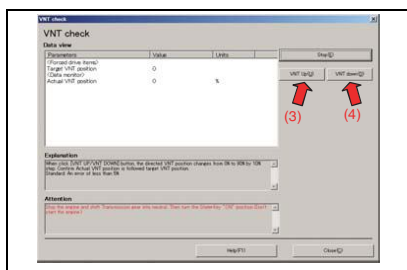
Judgment	Response delay:less than 3 seconds
-----------------	------------------------------------

[Inspection procedure]

- (1) Select "Check functions".
- (2) Select "VNT check".



P0045-03



P0045-04

- (3) Select "VNT UP" and click "Check start":
Check time lag (followability) between target VNT position value and actual VNT position value.
- (4) Select "VNT Down" and click "Check start":
Check time lag (followability) between target VNT position value and actual VNT position value.

Judgment	Response delay exists → YES
	No response delay → NO

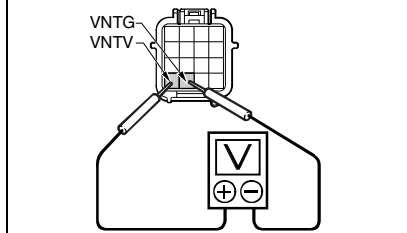
YES

Replace the Turbocharger assembly.
Go to Step 8.

NO

5 Confirmation of the turbocharger power supply voltage

Connector terminals on the engine sub-harness side of the turbocharger assembly variable nozzle controller



SAPH161060200039

- 1 Set the starter switch to the "LOCK" position.
- 2 Disconnect the connector of the VNT controller.
- 3 Set the starter switch to the "ON" position.
- 4 Use an electrical tester and inspect the voltage between the terminals.

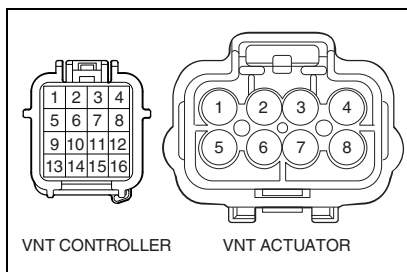
Inspection terminal VNT controller connector (engine sub-harness side)	Inspection condition	Standard value
VNTV to VNTG	Starter switch ON	10 V or more

Judgment	Abnormal → YES
	Normal → NO

YES

Inspection or repair the power supply circuit.

NO

6 Confirmation of the harness between VNT controller and actuator

- 1 Set the starter switch to the "LOCK" position.
- 2 Disconnect the connector of the VNT controller and VNT actuator.
- 3 Use an electrical tester and inspect the continuity between the VNT controller connector and the VNT actuator with reference to the following table.

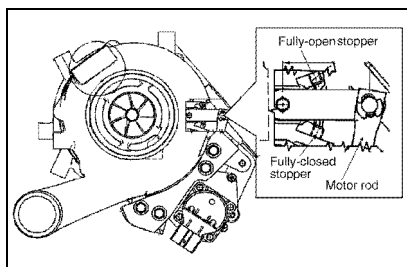
Terminals to measure the continuity	
VNT controller side	VNT actuator side
1	4
2	3
3	2
4	5
8	1
10	8
11	7
12	6

Judgment	Abnormal → YES
	Normal → NO

YES

Inspect and repair or replace the harness.

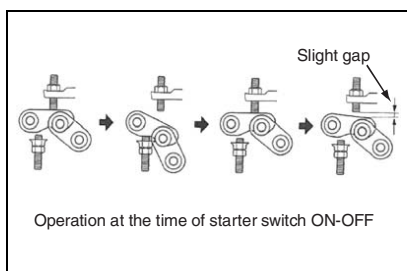
NO

7 Confirmation of the turbocharger VNT motor (DC motor).

P0045-05

1 Stroke inspection.

- (1) Make sure that the connector is connected correctly to the DC motor.



P0045-05

- (2) Repeat the starter switch ON-OFF and confirm operation as shown in the figure.

CAUTION

The lock nuts for Fully-open stopper and Fully-closed stopper must not be loosened or tightened.

HINT

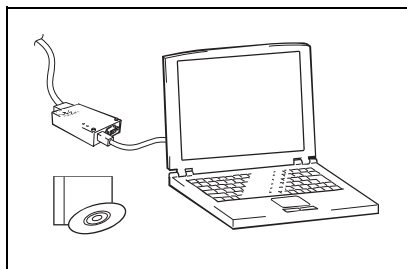
At the time of OFF, confirm that the link for driving the variable nozzle does not contact the Fully-open stopper, but that a slight gap remains.

Judgment	Abnormal → YES
	Normal → NO

YES

Replace the turbocharger assembly.

NO

8 DTC confirmation

saph161060200038

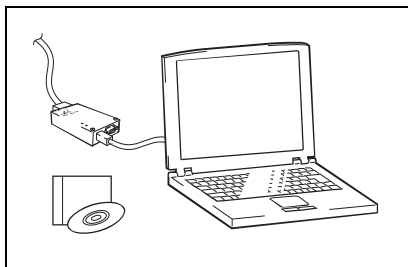
- 1 Warm-up the engine. (Coolant temperature: 60°C {140°F} or more)
- 2 Stop the engine.
- 3 Connect Hino-DX to the vehicle.
- 4 Set the starter switch to the "ON" position.
- 5 Clear the DTC by Hino-DX.
- 6 After engine start, again confirm the DTC output.

Judgment	DTC is stored → YES
	No DTC is stored → NO

NO

Go to Step 1.

YES

9 Replacement of the engine ECU

saph161060200038

- 1 Set the starter switch to the "LOCK" position.
- 2 Replace the engine ECU.
- 3 Warm-up the engine. (Coolant temperature: 60°C {140°F} or more)
- 4 Stop the engine.
- 5 Connect Hino-DX to the vehicle.
- 6 Set the starter switch to the "ON" position.
- 7 Clear the DTC by Hino-DX.
- 8 After engine start, again confirm the DTC output.

Judgment	DTC is stored → YES
	No DTC is stored → NO

YES

Replace the turbocharger assembly.

NO

Completed.



FUEL CONTROL (J08E)

DN02-57



DTC:P007B (Check sheet 1)

EN1610602F200014

DTC:P007B

Intake air temperature sensor (intercooler outlet) - rationality

1. Technical description

- The intake air temperature sensor (intercooler outlet) installed to the downstream of the boost pressure sensor consistently measures temperature at the outlet of the intercooler.

2. DTC set condition**(1) Check conditions**

- Engine speed is in the range of 500 to 890 r/min.
- The fuel injection quantity is 35mm³/st.cyl or less.
- Engine coolant temperature is in the range of -30°C {-22°F} to 35°C {95°F}.
- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- A difference between an intercooler outlet temperature and an intake air temperature sensor reading (built in the air flow sensor) is 30°C {86°F} or more and a difference between an intercooler outlet temperature and an intake manifold temperature is 30°C {86°F} or more.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Intake air temperature sensor (intercooler outlet):**Intake air temperature sensor (air flow sensor built-in):****Intake air temperature sensor (intake manifold):**

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormality in resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact

DTC:P007B	Intake air temperature sensor (intercooler outlet) - rationality	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Intake air temperature sensor (intercooler outlet)	Check whether the sensor is loose/disconnected.	Sensor connection		Connect
2	Intake air temperature sensor (intercooler outlet)	Check whether a sensing area of the sensor is contaminated, clogged or damaged.	Check the sensor.		Remove all contaminants and clogging. Replace if damaged.
3	Intake air temperature sensor (intercooler outlet)	Check whether the resistance of the sensor is proper.	Resistance value 20°C {68°F}: 7.336 to 5.794 kΩ 50°C {122°F}: 2.435 to 2.41 kΩ		Replace the sensor.
4	Intake air temperature sensor (intercooler outlet) harness, connector	Check whether irregular contact of the sensor harness or harness connector has occurred.	Check continuity.		Repair or replace the harness and/or connector.
5	Intake air temperature sensor (intercooler outlet) harness	Check whether the sensor harness is disconnected or short-circuited.	Check continuity.		Replace harness.
6	Intake air temperature sensor (intake manifold) / (Air flow sensor built-in)	Check whether a failure or an abnormality described above has occurred in the intake air temperature sensor (intake manifold) and intake air temperature sensor (air flow sensor built-in).	Conduct the same check as described above 1-5		Repair or replace faulty parts.
7	Battery	Check whether the battery has degraded/deteriorated or malfunctioned.	Battery voltage 10 to 16 V		Charge or replace the battery.

DN02-60

FUEL CONTROL (J08E)

DTC:P007B (Check sheet 2)

EN1610602F200015

DTC:P007B

Intake air temperature sensor (intercooler outlet) - rationality

1. Technical description

- The intake air temperature sensor (intercooler outlet) installed to the downstream of the boost pressure sensor consistently measures temperature at the outlet of the intercooler.

2. DTC set condition**(1) Check conditions**

- Engine speed is in the range of 500 to 890 r/min.
- The fuel injection quantity is 25 mm³/st.cyl or less.
- Engine coolant temperature is in the range of -10°C {14°F} to 35°C {95°F}.
- Battery voltage is in the 10 - 16 V range.
- Within 6 seconds after engine start

Followed by

- Engine coolant temperature is 60°C {140°F} or higher.
- Boost pressure is 140 or less.
- Engine speed is 1,750 r/min or more.
- The fuel injection quantity is 50 mm³/st.cyl.

(2) Judgment criteria

- At the start, a -20°C {-4°F} or less difference between an intake air temperature sensor reading and an intercooler outlet temperature remains for 30 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Intake air temperature sensor (intercooler outlet):**Intake air temperature sensor (air flow sensor built-in):****Intake air temperature sensor (intake manifold):**

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormality in resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact

DTC:P007B	Intake air temperature sensor (intercooler outlet) - rationality	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Intake air temperature sensor (intercooler outlet)	Check whether the sensor is loose/disconnected.	Sensor connection		Install
2	Intake air temperature sensor (intercooler outlet)	Check whether a sensing area of the sensor is contaminated, clogged or damaged.	Check the sensor.		Remove all contaminants and clogging. Replace if damaged.
3	Intake air temperature sensor (intercooler outlet)	Check whether resistance of the sensor is proper.	Resistance value 20°C {68°F}: 7.336 to 5.794 kΩ 50°C {122°F}: 2.435 to 2.41 kΩ		Replace the sensor.
4	Intake air temperature sensor (intercooler outlet) harness, connector	Check whether irregular contact of the sensor harness or harness connector has occurred.	Check continuity.		Repair or replace the harness and/or connector.
5	Intake air temperature sensor (intercooler outlet) harness	Check whether the sensor harness is disconnected or short-circuited.	Check continuity.		Replace harness.
6	Intake air temperature sensor (intake manifold) / (Air flow sensor built-in)	Check whether a failure or an abnormality described above has occurred in the intake air temperature sensor (intake manifold) and intake air temperature sensor (air flow sensor built-in).	Conduct the same check as described above 1-5		Repair or replace faulty parts.
7	Battery	Check whether the battery has degraded/deteriorated or malfunctioned.	Battery voltage 10 to 16 V		Charge or replace the battery.

DTC:P007B (Check sheet 3)

EN1610602F200016

DTC:P007B

Intake air temperature sensor (intercooler outlet) - rationality

1. Technical description

- The intake air temperature sensor (intercooler outlet) installed to the downstream of the boost pressure sensor consistently measures temperature at the outlet of the intercooler.

2. DTC set condition**(1) Check conditions**

- Engine speed is in the range of 500 to 890 r/min.
 - The fuel injection quantity is 35 mm³/st.cyl or less.
 - Engine coolant temperature is in the range of -30°C {-22°F} to 35°C {95°F}.
 - Battery voltage is in the 10 - 16 V range.
 - Within 6 seconds after engine start
 - The conditions described above remain for 5 seconds.
- Followed by
- Engine coolant temperature is 60°C {140°F} or more.
 - Boost pressure is 140 kPa or less.
 - Engine speed is 1,250 r/min or less.
 - Fuel injection quantity is 20 mm³/st or less.
 - The conditions described above remain for 20 seconds.

(2) Judgment criteria

- At the start, a 25°C {77°F} or more difference between an intake air temperature sensor reading and an intercooler outlet temperature remains for 30 seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Intake air temperature sensor (intercooler outlet):**Intake air temperature sensor (air flow sensor built-in):****Intake air temperature sensor (intake manifold):**

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormality in resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact

DTC:P007B	Intake air temperature sensor (intercooler outlet) - rationality	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Intake air temperature sensor (intercooler outlet)	Check whether the sensor is loose/disconnected.	Sensor connection		Install
2	Intake air temperature sensor (intercooler outlet)	Check whether a sensing area of the sensor is contaminated, clogged or damaged.	Check the sensor.		Remove all contaminants and clogging. Replace if damaged.
3	Intake air temperature sensor (intercooler outlet)	Check whether resistance of the sensor is proper.	Resistance value 20°C {68°F}: 7.336 to 5.794 kΩ 50°C {122°F}: 2.435 to 2.41 kΩ		Replace the sensor.
4	Intake air temperature sensor (intercooler outlet) harness, connector	Check whether irregular contact of the sensor harness or harness connector has occurred.	Check continuity.		Repair or replace the harness and/or connector.
5	Intake air temperature sensor (intercooler outlet) harness	Check whether the sensor harness is disconnected or short-circuited.	Check continuity.		Replace harness.
6	Intake air temperature sensor (intake manifold) / (Air flow sensor built-in)	Check whether a failure or an abnormality described above has occurred in the intake air temperature sensor (intake manifold) and intake air temperature sensor (air flow sensor built-in).	Conduct the same check as described above 1-5		Repair or replace faulty parts.
7	Battery	Check whether the battery has degraded/deteriorated or malfunctioned.	Battery voltage 10 to 16 V		Charge or replace the battery.

DN02-64

FUEL CONTROL (J08E)

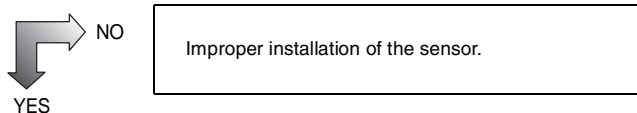
DTC:P007B

EN1610602F200017

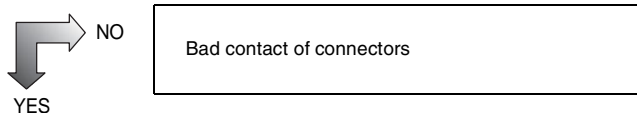
DTC	P007B	Intake air temperature sensor (intercooler outlet) - rationality
-----	-------	--

1. CHECK THE INTAKE AIR TEMPERATURE SENSOR (INTER-COOLER OUTLET).

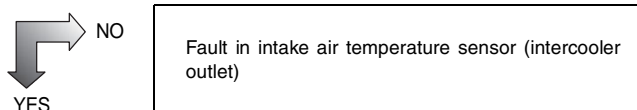
- (1) Check that the intake air temperature sensor (intercooler outlet) is normally installed.
- (2) Check the intake air temperature sensor (intercooler outlet) measurement portion for dirt and foreign matters.
- (3) Check the air intake systems such as the intercooler for clogging and leakage.

**2. CHECK INSTALLATION OF CONNECTOR.**

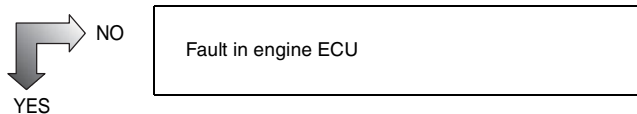
- (1) Check that the intake air temperature sensor (intercooler outlet) connector is properly installed.

**3. CHECK WHETHER THE SENSOR IS IN NORMAL CONDITION.**

- (1) Troubleshoot the P007C and P007D and check whether the intake air temperature sensor (intercooler outlet) is in normal condition.

**4. CHECK WHETHER OTHER SENSORS ARE IN NORMAL CONDITION.**

- (1) If the GND terminal is shared in use, disconnect all sensor connectors that use the GND terminal and check whether condition is normal.



Fault in other sensors



FUEL CONTROL (J08E)

DN02-65



DN02-66

FUEL CONTROL (J08E)

DTC:P007C (Check sheet)

EN1610602F200018

DTC:P007C	Intake air temperature sensor (intercooler outlet) - out of range (Out of range low)
------------------	--

1. Technical description

- The intake air temperature sensor (intercooler outlet) installed to the downstream of the boost pressure sensor consistently measures temperature at the outlet of the intercooler.

2. DTC set condition**(1) Check conditions**

- Engine speed of 500 r/min or more
- Battery voltage is in the 10 - 16 V range.
- The conditions described above remain for 5 seconds or longer.

(2) Judgment criteria

- Output of the intake air temperature sensor (intercooler outlet) remains at 0.06 V or less for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Intake air temperature sensor (intercooler outlet):

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormality in resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact
- Short-circuit in the sensor

DTC:P007C	Intake air temperature sensor (intercooler outlet) - out of range (Out of range low)	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Intake air temperature sensor (intercooler outlet)	Check whether the sensor is loose/disconnected.	Sensor connection		Install the sensor.
2	Intake air temperature sensor (intercooler outlet)	Check whether a sensing area of the sensor is contaminated, clogged or damaged.	Check the sensor.		Remove all contaminants and clogging. Replace if damaged.
3	Intake air temperature sensor (intercooler outlet)	Check whether resistance of the sensor is proper.	Resistance value 20°C {68°F}: 7.336 to 5.794 kΩ 50°C {122°F}: 2.435 to 2.41 kΩ		Replace the sensor.
4	Intake air temperature sensor (intercooler outlet) harness, connector	Check whether irregular contact of the sensor harness or harness connector has occurred.	Check continuity.		Repair or replace the harness and/or connector.
5	Intake air temperature sensor (intercooler outlet) harness	Check whether the sensor harness is disconnected or short-circuited.	Check continuity.		Repair or replace the harness.
6	Sensor	Check whether a failure or malfunction has occurred in the sensors that use the same power supply or GND (ECU internal power supply).	Conduct the same check as described above 1-5.		Replace faulty sensors.
7	ECU	Check the ECU internal power supply for any failure or malfunction.			Replace the ECU.
8	Battery	Check whether the battery has degraded/deteriorated or malfunctioned.	Battery voltage 10 to 16V		Charge or replace the battery.

DN02-68

FUEL CONTROL (J08E)

DTC:P007D (Check sheet)

EN1610602F200019

DTC:P007D	Intake air temperature sensor (intercooler outlet) - out of range (Out of range high)
------------------	---

1. Technical description

- The intake air temperature sensor (intercooler outlet) installed to the downstream of the boost pressure sensor consistently measures temperature at the outlet of the intercooler.

2. DTC set condition**(1) Check conditions**

- Engine speed of 500 r/min or more
- Battery voltage is in the 10 - 16 V range.
- A reading taken by the intake air temperature sensor built in the air flow sensor is -20°C {-4°F} or higher.
- The conditions described above remain for 5 seconds or longer.

(2) Judgment criteria

- Output of the intake air temperature sensor (intercooler outlet) remains at 4.87 V or higher for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Intake air temperature sensor (intercooler outlet):

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormality in resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact
- Short-circuit in the sensor

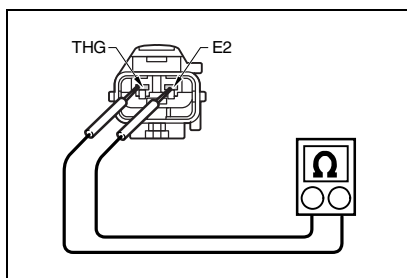
DTC:P007D	Intake air temperature sensor (intercooler outlet) - out of range (Out of range high)	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Intake air temperature sensor (intercooler outlet)	Check whether the sensor is loose/disconnected.	Sensor connection		Install the sensor.
2	Intake air temperature sensor (intercooler outlet)	Check whether a sensing area of the sensor is contaminated, clogged or damaged.	Check the sensor.		Remove all contaminants and clogging. Replace if damaged.
3	Intake air temperature sensor (intercooler outlet)	Check whether resistance of the sensor is proper.	Resistance value 20°C {68°F}: 7.336 to 5.794 kΩ 50°C {122°F}: 2.435 to 2.41 kΩ		Replace the sensor.
4	Intake air temperature sensor (intercooler outlet) harness, connector	Check whether irregular contact of the sensor harness or harness connector has occurred.	Check continuity.		Repair or replace the harness and/or connector.
5	Intake air temperature sensor (intercooler outlet) harness	Check whether the sensor harness is disconnected or short-circuited.	Check continuity.		Repair or replace the harness.
6	Sensor	Check whether a failure or malfunction has occurred in the sensors that use the same power supply or GND (ECU internal power supply).	Conduct the same check as described above 1-5.		Replace faulty sensors.
7	ECU	Check the ECU internal power supply for any failure or malfunction.			Replace the ECU.
8	Battery	Check whether the battery has degraded/deteriorated or malfunctioned.	Battery voltage 10 to 16V		Charge or replace the battery.

DTC:P007C/P007D

EN1610602F200020

DTC	P007C	Intake air temperature sensor (intercooler outlet) - out of range (Out of range low)
DTC	P007D	Intake air temperature sensor (intercooler outlet) - out of range (Out of range high)

**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the connector of intake air temperature sensor (intercooler outlet).
- (3) Measure the resistance between the terminals THG and E2 of the intake air temperature sensor (intercooler outlet).

HINT

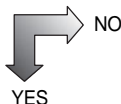
If it is difficult to check only the sensor, proceed to Step 3.

Standard value:

2.202 k Ω (50°C {122°F}): Warm water temperature

508.1 Ω (100°C {212°F}): Warm water temperature

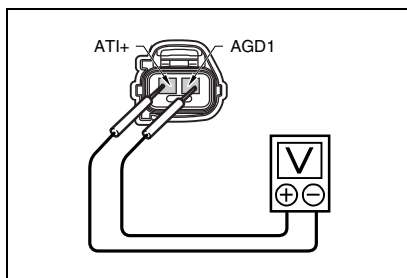
160.4 Ω (150°C {302°F}): Warm water temperature



NO

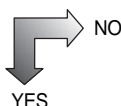
Faulty in intake air temperature sensor (intercooler outlet).

YES

**2. MEASURING VOLTAGE BETWEEN TERMINALS**

- (1) Set the starter switch to "ON" position.
- (2) Measure voltage between the terminals AT1+ and AGD1 of the intake air temperature sensor (intercooler outlet) connector (engine sub harness side).

Standard value: 4.5-5.5 V

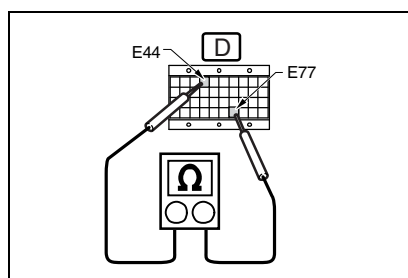


NO

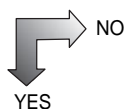
Proceed to 3.

YES

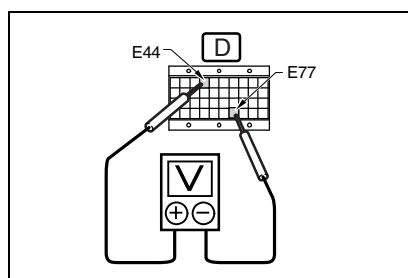
Bad contact of connectors

**3. MEASURING RESISTANCE BETWEEN TERMINALS**

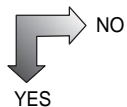
- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness on the engine side.
- (3) Disconnect the connector on the engine ECU side.
- (4) Set the starter switch to "ON" position.
- (5) Measure resistance between the terminals ICTH (E44) and AGD4 (E77).

Standard value:**2.202 k Ω (50°C {122°F}): Warm water temperature****508.1 Ω (100°C {212°F}): Warm water temperature****160.4 Ω (150°C {302°F}): Warm water temperature**

- Faulty in harness
- Faulty in intake air temperature sensor (inter-cooler outlet).

**4. MEASURING VOLTAGE BETWEEN TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the connector on the engine ECU side.
- (3) Disconnect the connector on the engine sub harness side.
- (4) Set the starter switch to "ON" position.
- (5) Measure voltage between the terminals ICTH (E44) and AGD4 (E77).

Standard value: 4.5-5.5 V

- Fault in engine ECU
- Faulty ECU connector

Bad contact of connectors

DTC:P0087 (Check sheet 1)

EN1610602F200021

DTC:P0087

Fuel system pressure control - low

1. Technical description

- Common rail pressure is controlled by a discharge rate of the supply pump.
- A discharge rate of the supply pump is adjusted by the SCV (suction control valve).

2. DTC set condition**(1) Check conditions**

- Engine speed of 700r/min or more
- The fuel injection quantity is 10 mm³/st.cyl or more.
- A change in fuel injection quantity is less than 2.6 mm³/st.cyl.
- A SCV amperage reading is 1,250 mA or lower.
- No DTCs related to supply pump

(2) Judgment criteria

- A calculated value of (actual common rail pressure reading - target common rail pressure) remains at -15 MPa or less for 15 seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Fuel filter: Clogging**Common rail pressure sensor:**

- Irregular contact (fault in power supply, fault in GND)
- Fault in sensor

Supply pump:

- Fault in SCV
- Fault in learned value

Common rail: Pressure limiter opened**Harness related:**

- Irregular contact of crankshaft position sensor and camshaft position sensor
- Misconnection

DTC:P0087	Fuel system pressure control - low	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Fuel Filter	Visually check ; water in fuel (Detail on next page A)	No water No restriction		Drain the water
2	Fuel filter	Element clogging, genuine part element Fuel level at high idle	One inch or more from the collar Element upper level or below Fuel level shall not keep decreasing at high idle.		Go to 3 after replacing the element.
3	Fuel line	Visually check (Detail on next page A)	No bending No restriction		Clean Replace
4	Fuel tank	Visually check ; Breather hose Contaminations, rust (Detail on next page B)	No restriction No excessive debris		Clean
5	Supply pump	Visually check (Detail on next page C)	No leak or crack		Replace
6	SCV	Connector check	Fully seated		Fix
7	Common rail pressure sensor	Voltage, Resistance check Connector check (Detail on next page D)	Within criteria Fully seated		Fix Replace
8	Supply pump	FINAL VALUE OF PUMP CURRENT TARGET test with Hino-DX (Detail on next page E)	Average: 1,740±80mA Fluctuation<80mA		Relearning, before replace SCV
9	SCV	Free acceleration test (Detail on next page F)	Following target rail pressure Refer to previous page		SCV Replace
10	Common rail pressure limiter	Free acceleration test (Detail on next page F)	Following target rail pressure Refer to previous page		Common Rail assy Replace
11	Common rail pressure sensor	Free acceleration test (Detail on next page F)	Following target rail pressure Refer to previous page		Common Rail assy Replace
12	Supply pump	Free acceleration test (Detail on next page F)	Following target rail pressure Refer to previous page		Pump Replace
13	Crankshaft position sensor and camshaft position sensor	Resistance, Voltage Hino-DX Data-Monitor; NE active & G active (Detail on next page G)	Within criteria Both Active		Replace

DTC:P0088 (Check sheet 1)

EN1610602F200022

DTC:P0088

Fuel system pressure control - high

1. Technical description

- Common rail pressure is controlled by a discharge rate of the supply pump.
- A discharge rate of the supply pump is adjusted by the SCV (suction control valve).

2. DTC set condition**(1) Check conditions**

- Engine speed of 700r/min or more
- The fuel injection quantity is 10 mm³/st.cyl or more.
- A change in fuel injection quantity is less than 1.7 mm³/st.cyl.
- A SCV amperage reading is 1,500 mA or higher.
- No DTCs related to supply pump

(2) Judgment criteria

- A calculated value of (actual common rail pressure reading - Target common rail pressure.) remains at 15 MPa or greater for 15 seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Fuel filter: Clogging**Common rail pressure sensor:**

- Irregular contact (fault in power supply, fault in GND)
- Fault in sensor

Supply pump:

- Fault in SCV
- Fault in learned value

Common rail: Pressure limiter opening valve**Harness related:**

- Irregular contact of crankshaft position sensor and camshaft position sensor
- Misconnection

DTC:P0088	Fuel system pressure control - high	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Fuel filter	Visually check ; water in fuel (Detail on next page A)	No water No restriction		Drain the water
2	Fuel filter	Element clogging, genuine part element Fuel level at high idle	One inch or more from the collar Element upper level or below Fuel level shall not keep decreasing at high idle.		Go to 3 after replacing the element.
3	Fuel line	Visually check (Detail on next page A)	No bending No restriction		Clean Replace
4	Fuel tank	Visually check ; Breather hose Contaminations, rust (Detail on next page B)	No restriction No excessive debris		Clean
5	Supply pump	Visually check (Detail on next page C)	No leak or crack		Replace
6	SCV	Connector check	Fully seated		Fix
7	Common rail pressure sensor	Voltage, Resistance check Connector check (Detail on next page D)	Within criteria Fully seated		Fix Replace
8	Supply pump	FINAL VALUE OF PUMP CURRENT TARGET test with Hino-DX (Detail on next page E)	Average: 1,740±80mA Fluctuation<80mA		Relearning, before replace SCV
9	SCV	Free acceleration test (Detail on next page F)	Following target rail pressure Refer to previous page		SCV Replace
10	Common rail pressure limiter	Free acceleration test (Detail on next page F)	Following target rail pressure Refer to previous page		Common Rail assy Replace
11	Common rail pressure sensor	Free acceleration test (Detail on next page F)	Following target rail pressure Refer to previous page		Common Rail assy Replace
12	Supply pump	Free acceleration test (Detail on next page F)	Following target rail pressure Refer to previous page		Pump Replace
13	Crankshaft position sensor and camshaft position sensor	Resistance, Voltage Hino-DX Data-Monitor; NE active & G active (Detail on next page G)	Within criteria Both Active		Replace

DTC:P0087 (Check sheet 2)/P0088 (Check sheet 2)

EN1610602F200023

DTC:P0087
DTC:P0088Insufficient common-rail pressure
Excessive common-rail pressure**1. Technical description**

- Common-rail pressure is achieved by the output of Supply pump
- Supply pump output is adjusted by SCV (Suction Control Valve)

2. DTC set condition**(1) Check conditions****Diagnosis code : 68, 69**

- Battery voltage : 8 to 16 V
- No abnormalities of Common-rail pressure sensor

Diagnosis code : 76

- Fuel injection : More than 10 mm³/st.cyl
- NE sensor active or G sensor active
- No abnormalities of Supply pump
- Engine revolution : 700 - 3,000rpm

(2) Judgment criteria**Diagnosis code : 68, 69**

- Common-rail pressure : More than 232MPa (33,648psi)

Diagnosis code : 76

- Common-rail pressure gap between Actual/target :
Continue more than +/- 15MPa (2,176psi) for 15sec

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Fuel filter: Restricted**Supply pump:** Malfunction of SCV**Harnesses:**

- Poor contact of harness at crankshaft position sensor and camshaft position sensor
- Miss connection

Common-rail: Pressure limiter valve open**Common-rail pressure sensor:**

- Poor contact of harness connector
(Power Source or GND failure)
- Malfunction of sensor

FUEL CONTROL (J08E)

DN02-77

DTC:P0087 DTC:P0088	Insufficient common-rail pressure Excessive common-rail pressure	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/Fail)	If pass	If fail
1	Engine	Check whether the engine starts.	Engine shall be started.		Go to 4.	Go to 2.
2	Supply pump	Check the appearance.	There shall be no cracks or leakage.		Go to 3.	Go to 4 after replacement.
3	Supply pump	Check the pressure feed.	Actual rail pressure shall increase.		Report to TSM.	Go to 4 after replacement.
4	SCV supply pump	Check the freeze frame and conduct SCV test. Refer to the attachment for details.	No (Shall serve as the basis for countermeasure check after repair.)		Go to 5.	Go to 5.
5	ECU	Check the ECU part number.	Latest part number shall be used.		Go to 6.	Go to 6 after re-programming.
6	Fuel filter	Element clogging, genuine part element Fuel level at high idle	One inch or more from the collar Element upper level or below Fuel level shall not keep decreasing at high idle.		Go to 12.	Go to 7 after replacing the element.
7	Fuel hose joint bolt	Inspect the fuel hose visually from the fuel tank to the fuel filter.	There shall be no clogging in the hose, bend and crush of the hose.		Go to 8.	Go to 8 after replacement and repair.
8	Fuel tank breather	Check clogging of the hose and function of the check valve.	Air must pass through. Check the check valve for normal function.		Go to 9	Go to 9 after replacement and repair.
9	Fuel tank Fuel suction pipe	Clogging of pipe	Check the pipe for clogging.		Go to 10.	Go to 10 after replacement and repair.
10	Inside the fuel tank	Foreign matters	There shall be no foreign matters after fuel drain.		Go to 11.	Go to 11 after cleaning.
11	Gauze filter (inside the supply pump)	Foreign matters	There shall be no clogging due to foreign matters.		Go to 12.	Go to 12 after cleaning.
12	High-pressure pipe	Check for leaks.	Must be free from leakage.		Go to 13.	Go to 13 after repair.

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FUEL CONTROL (J08E)

No	Parts	Check contents	Judge	Check (Pass/Fail)	If pass	If fail
13	Valve separator	Check for clogging.	Must be free from clogging.		No problem with 7-12: Go to 16. If any problem, go to 14.	Go to 14 after repair.
14	SCV supply pump	SCV test (Refer to the attachment for details.) Compare with the results of 4 and check for improvement.	Refer to the attachment for details.		Go to 15.	Go to 16.
15	SCV supply pump	Reproduction test (Refer to the attachment for details.)	Refer to the attachment for details.		Completion of checking	Go to 16.
16	SCV connector	Check the contact.	Check the contact for abnormal wear. Check the connector for cracks.		Go to 17.	Go to 17 after replacement and repair.
17	Rail pressure sensor	Check the contact. Check the power supply voltage.	Check the contact for abnormal wear. Check the connector for cracks. 5 volts between power supply and GND		Go to 18.	Go to 18 after replacement and repair.
18	NE and G sensors	DX monitor	Both shall be active continually.		Go to 19.	Go to 19 after replacement and repair.
19	SCV supply pump	SCV test (Refer to the attachment for details.) Reproduction test (Refer to the attachment for details.) Compare with the results of 4 and check for improvement.	Refer to the attachment for details. Refer to the defect pattern.		Completion of checking	Replace the parts 20 to 23 depending on the pattern.
20	Pressure limiter	Conduct SCV test and reproduction test after replacement.	↑		Completion of checking	Go to 24.
21	SCV	Conduct SCV test and reproduction test after replacement.	↑		Completion of checking	Go to 24.
22	Supply pump	Conduct SCV test and reproduction test after replacement.	↑		Completion of checking	Go to 24.
23	Return pipe and hose	Check for clogging.	There shall be no clogging due to foreign matters.		Go to 24.	Go to 24 after repairing.

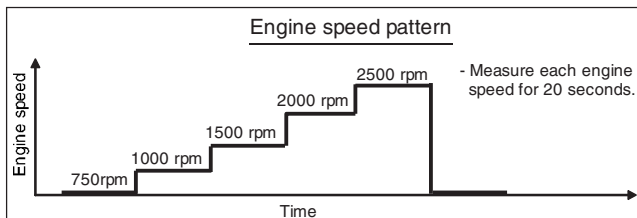
FUEL CONTROL (J08E)

DN02-79

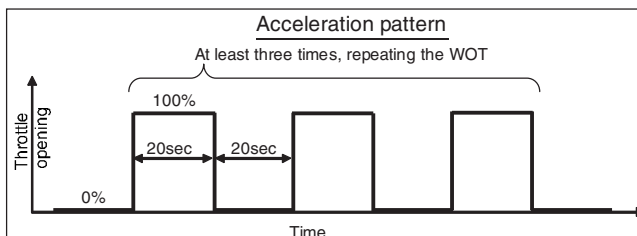
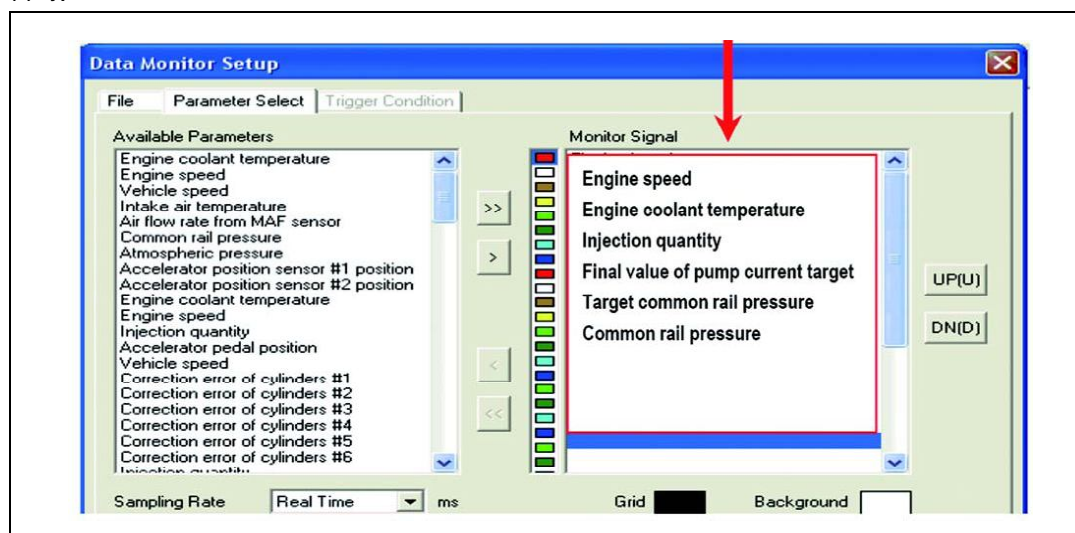
No	Parts	Check contents	Judge	Check (Pass/Fail)	If pass	If fail
24	SCV supply pump	SCV test (Refer to the attachment for details.) Reproduction test (Refer to the attachment for details.) Compare with the results of 4 and check for improvement.	Refer to the attachment for details. Refer to the defect pattern.		Completion of checking	Replace the parts 20 to 23 depending on the pattern.
25	Fuel piping	Thorough checking: Recheck Nos. 8-13.	There shall be no clogging due to foreign matters.		Go to 26.	Go to 24 after repairing.
26	Sensors	Thorough checking: Recheck Nos. 16-18.	There shall be no problems with resistance and voltage.		Report to TSM.	Go to 24 after repairing.

(1) Test method

1. After engine has reached operating temperature (more than 82°C {180°F}).
2. After air compressor completed building pressure.
3. A/C, Head lights off.
4. All device off.
(PTO, Refrigeration compressor. etc)
5. Control the engine revolution by means of operating Cruise Control system.

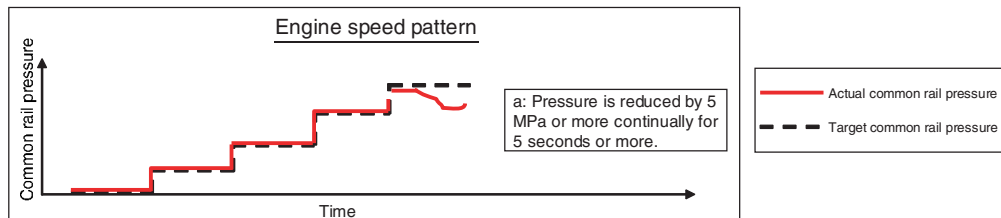


1. After engine has reached operating temperature (more than 82°C {180°F}).
2. After air compressor completed building pressure.
3. A/C, Head lights off.
4. All device off.
(PTO, Refrigeration compressor. etc)
5. Check that actual common rail pressure following target. Refer support documentation.

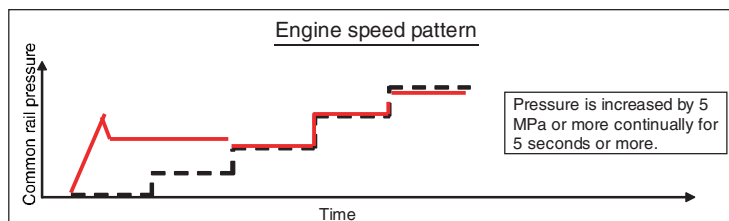
**(2) Types of DX data to be measured**

(3) **Criterion:** If the following symptoms occur, FAIL. If not, OK.

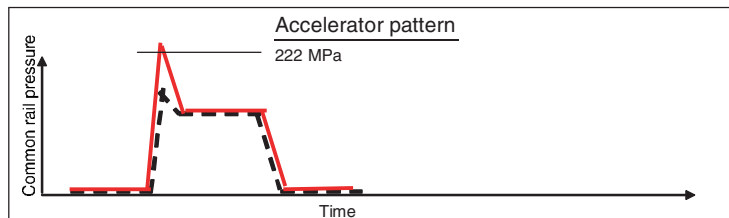
a. Pressure is reduced by 5 MPa or more continually for 5 seconds or more. -> Replace the supply pump.



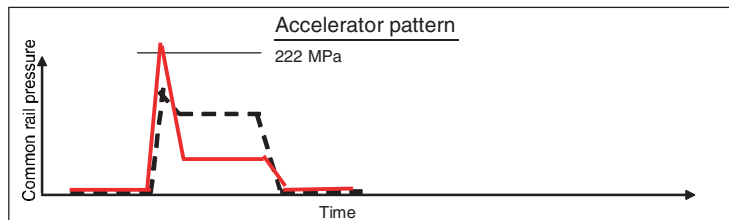
b. Pressure is increased by 5 MPa or more continually for 5 seconds or more. -> Replace the SCV.



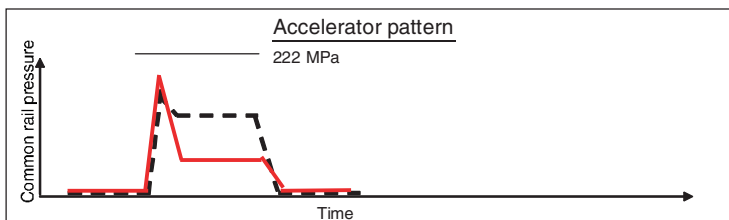
c. The maximum common rail pressure exceeds 222 MPa for even a moment during pressure increase. -> Replace the SCV.



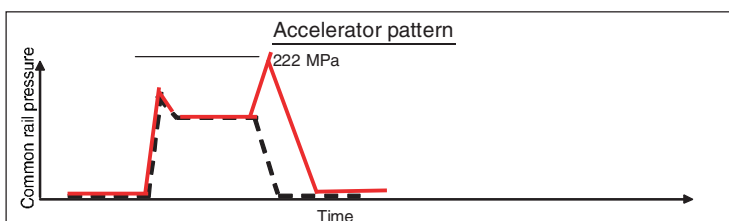
d. After the maximum common rail pressure exceeds 222 MPa during pressure increase, the actual rail pressure falls below the target rail pressure. -> Replace the SCV.



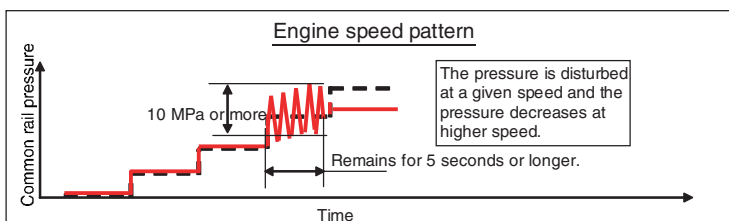
e. Before the maximum common rail pressure exceeds 222 MPa during pressure increase, the actual rail pressure falls below the target rail pressure rapidly. -> Replace the common rail.



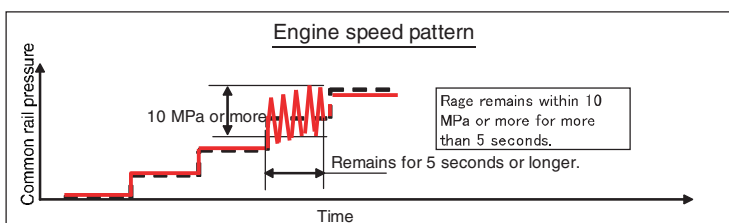
f. The maximum common rail pressure exceeds 222 MPa during pressure drop. -> Check the return pipe.



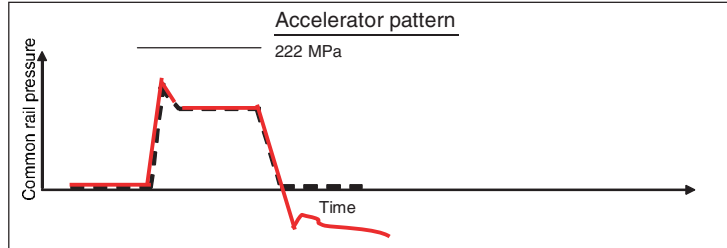
g. The pressure is disturbed at a given speed and the pressure decreases at higher speed. -> Replace the supply pump.



h. Hunting remains within 10 MPa or more for more than 5 seconds. -> Replace the SCV.



i. The engine stops during pressure relief. -> Replace the SCV.

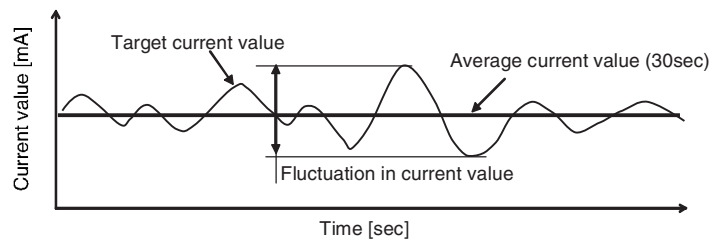





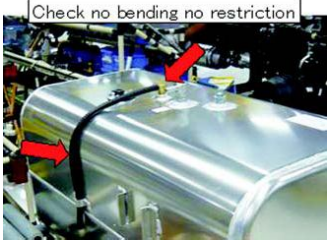


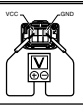

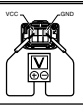

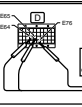

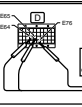

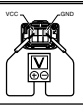

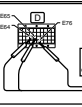

j. Target common rail pressure during idling deviates from the standard value. -> Replace the SCV.

FINAL VALUE OF PUMP CURRENT TARGET test

- (1) After engine has reached operating temperature. (more than 82°C {180°F})
- (2) After air compressor has completed building pressure.
- (3) A/C, Head lights are off.
- (4) All other devices turned off.
(PTO, Refrigeration compressor. etc)
- (5) Engine speed : 750rpm

Criteria		Criteria	Measurement Value
FINAL VALUE OF PUMP CURRENT TARGET	Average current value	1740+/-80mA	mA
	Fluctuation in current value	< 80mA	mA



Fuel Filter and line visually check																												
A	<p>Check no water no restriction</p> 	<p>Check no bending no restriction</p> 																										
Fuel tank visually check																												
B	<p>Check no restriction and no excessive debris</p> 	<p>Check no bending no restriction</p> 																										
Supply pump visually check																												
C	<p>Check No leak or crack</p> 	<p>Check No leak or crack</p> 																										
Common rail pressure sensor Voltage check																												
D	<table border="1"><thead><tr><th>KEY position</th><th>Descriptions</th><th>Terminal</th><th>Criteria</th><th>Measurement Value</th></tr></thead><tbody><tr><td rowspan="2">ON</td><td></td><td>[VCC]-[GND] (MAIN)</td><td rowspan="2">4.5-5.5V</td><td>V</td></tr><tr><td></td><td>[VCC]-[GND] (SUB)</td><td>V</td></tr></tbody></table>	KEY position	Descriptions	Terminal	Criteria	Measurement Value	ON		[VCC]-[GND] (MAIN)	4.5-5.5V	V		[VCC]-[GND] (SUB)	V	<table border="1"><thead><tr><th>KEY position</th><th>Descriptions</th><th>Terminal</th><th>Criteria</th><th>Measurement Value</th></tr></thead><tbody><tr><td rowspan="2">ON Idle</td><td></td><td>[E64]-[E76] [E65]-[E76]</td><td rowspan="2">Approx 1.50V</td><td>V</td></tr><tr><td></td><td>[E49]-[E56] [E68]-[E56]</td><td>V</td></tr></tbody></table>	KEY position	Descriptions	Terminal	Criteria	Measurement Value	ON Idle		[E64]-[E76] [E65]-[E76]	Approx 1.50V	V		[E49]-[E56] [E68]-[E56]	V
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		[E49]-[E56] [E68]-[E56]		V																								

FUEL CONTROL (J08E)

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E	FINAL VALUE OF PUMP CURRENT TARGET test																																
	<ol style="list-style-type: none"> After warm up of engine (More than 82°C {180°F}) After charge air compressor. A/C, Head light off. All device off. (PTO, Refrigeration compressor. etc) Engine speed : 750rpm 			<table> <tr> <th></th><th>Criteria</th><th>Measurement Value</th></tr> <tr> <td rowspan="3">FINAL VALUE OF PUMP CURRENT TARGET</td><td>Average current value</td><td>1740+/-80mA mA</td></tr> <tr> <td>Fluctuation in current value</td><td>< 80mA mA</td></tr> </table>		Criteria	Measurement Value	FINAL VALUE OF PUMP CURRENT TARGET	Average current value	1740+/-80mA mA	Fluctuation in current value	< 80mA mA																					
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ON Idle wiggle		Parameter NE active flag G active flag	Both Active																														
KEY position	Descriptions	Terminal	Criteria	Measurement Value																													
ON		[E53]-[E54]	4.5-5.5V	V																													

DN02-86

FUEL CONTROL (J08E)

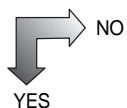
DTC:P0087/P0088

EN1610602F200024

DTC	P0087	Fuel system pressure control - low
DTC	P0088	Fuel system pressure control - high

1. CHECK THE FUEL FILTER AND FUEL PIPE FOR FUEL LEAKAGE.

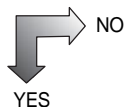
(1) Check the fuel filter and fuel pipe for fuel oozing and leakage.



- Defective fuel filter
- Defective fuel pipe

2. CHECK THE FUEL TANK FOR CLOGGING OF THE AIR HOLE AND THE REMAINING AMOUNT.

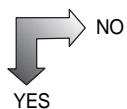
(1) Check the air hole for clogging.
(2) Check if fuel is sufficiently supplied.



- Clogging of the air hole
- Insufficient fuel supply

3. CHECK THE SUPPLY PUMP FOR FUEL LEAKAGE.

(1) Check the supply pump for fuel oozing and leakage.



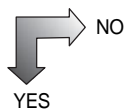
Faulty supply pump

4. MEASURING RESISTANCE BETWEEN TERMINALS

(1) Set the starter switch to "LOCK" position.
(2) Connect the signal check harness on the engine side.
(3) Disconnect the connector on the engine ECU side.
(4) Measure the resistance between the terminals.

Standard value: 1.6-2.6 Ω (20°C {68°F})

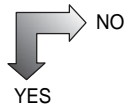
Terminals to measure the resistance
SPV1 (E9) \leftrightarrow SP2S (E30)
SPV1 (E9) \leftrightarrow SPV2 (E10)
SP1S (E29) \leftrightarrow SP2S (E30)
SP1S (E29) \leftrightarrow SPV2 (E10)



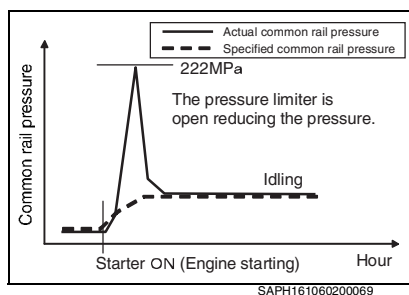
Faulty SCV

5. CHECK THE DTC.

- (1) Check that no other DTC exist.



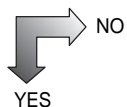
Check with other diagnosis codes.

**6. USING THE HINO-DX, CHECK THE ACTUAL COMMON RAIL PRESSURE AT THE ENGINE START WHILE MONITORING.**

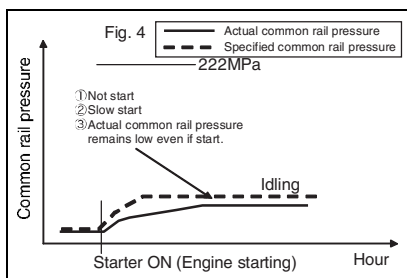
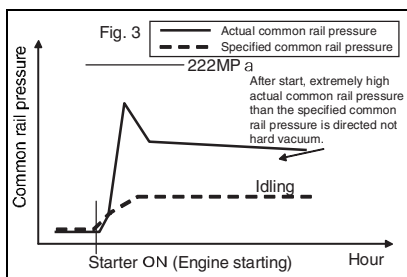
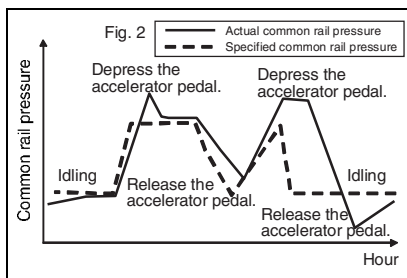
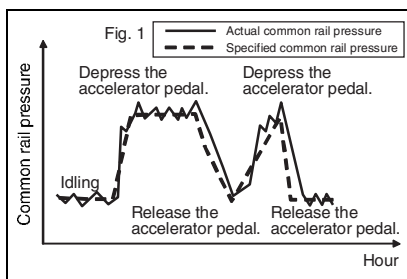
- (1) Connect Hino-DX to the vehicle.
(2) Start the engine while monitoring the actual common rail pressure.

Standard value:

The peak of the actual common rail pressure is 222 MPa or under.



Proceed to 12.

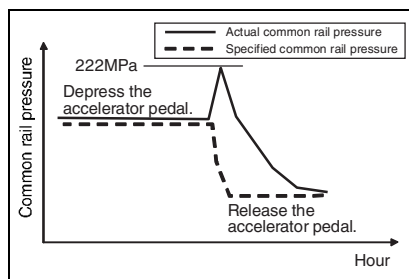


7. USING THE HINO-DX, CHECK THE ACTUAL COMMON RAIL PRESSURE DURING DRIVING WHILE MONITORING.

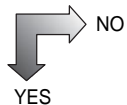
- (1) Check the actual common rail pressure while depressing the accelerator pedal.
- (2) Check that there are no characteristics shown in Fig.1, Fig.2, Fig.3 and Fig.4.

NO
YES

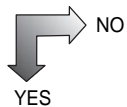
Restudy the supply pump (If there is no improvement after restudying, proceed to 8.)

**8. USING THE HINO-DX, CHECK THE LEAKAGE OF FUEL.**

- (1) Lower the pressure while monitoring the actual common rail pressure.
- (2) Check that the pressure is reduced when the actual common rail pressure exceeds 222 MPa.



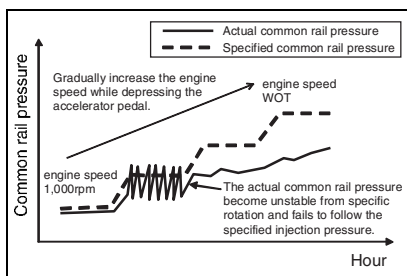
- If the pressure is reduced without the actual common rail pressure exceeding 222 MPa, proceed to 10.
- If the actual common rail pressure does not rise to 200 MPa, hold the pressure limiter pipe and check for flow of fuel.
 - a. The pressure limiter is defective if there is flow of fuel.
 - b. If there is no flow of fuel, proceed to 10.

9. CHECK THE INJECTOR LEAK PIPE FOR CLOGGING.

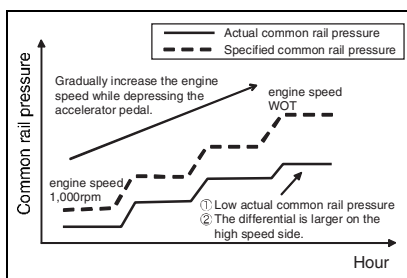
Defective leak pipe

DN02-90

FUEL CONTROL (J08E)



SAPH161060200075



SAPH161060200076

10. USING THE HINO-DX, CHECK THE SPECIFIED COMMON RAIL PRESSURE AND ACTUAL COMMON RAIL PRESSURE WHILE MONITORING.

- (1) While monitoring the common rail pressure, gradually increase the engine speed from idle to wide open throttle.
- (2) Check if the specified common rail pressure corresponds to the actual common rail pressure.

NO

YES

- The specified common rail pressure does not correspond to the actual common rail pressure at high speed.
- The specified common rail pressure does not correspond to the actual common rail pressure in the full range.
 - a. The actual common rail pressure is lower than the specified common rail pressure in the full range.
→Faulty supply pump
 - b. The SCV is defective for other than a.

11. Check the SCV harness for disconnection.

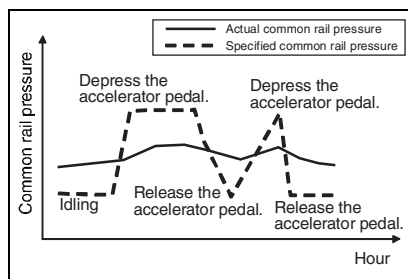
- (1) Shake the harness between the SCV and ECU and check that the specified injection quantity and actual injection quantity are unaffected.

NO

YES

Faulty harness

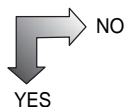
Faulty SCV



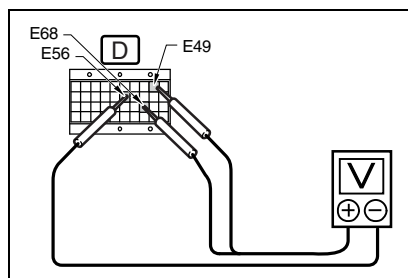
SAPH161060200077

12. USING THE HINO-DX, CHECK THE ACTUAL COMMON RAIL PRESSURE DURING DRIVING WHILE MONITORING.

- (1) Check if the specified common rail pressure corresponds to the actual common rail pressure while depressing the accelerator pedal.



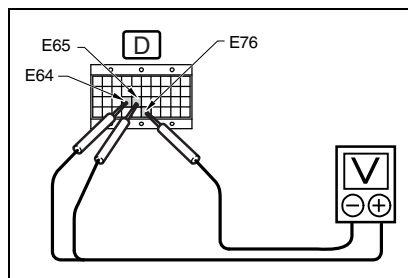
Faulty SCV



SAPH161060200078

13. CHECK THE VOLTAGE BETWEEN TERMINALS.

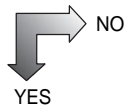
- (1) Set the starter switch to "LOCK" position and connect the signal check harness.
- (2) Start the engine.
- (3) Perform warm-up until the coolant temperature gauge moves.
- (4) At engine speed idling. The target pressure (P FIN) = APPROX 35 MPa {357 kgf/cm², 5,076 lbf/in²} (APPROX 1.5 V)
- (5) Measure the voltage between PCR1 (E49), PCR2 (E68) and AGD1 (E56) terminals.



SAPH161060200079

- (6) Measure the voltage between PCR3 (E64), PCR4 (E65) and AGD2 (E76) terminals.

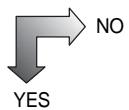
Standard value: less than 1.56 V



Faulty common rail pressure sensor

Faulty SCV

14. CHECK THE FUEL FILTER AND FUEL PIPE FOR CLOGGING.



- Faulty fuel filter
- Faulty fuel pipe

Faulty supply pump



FUEL CONTROL (J08E)

DN02-93



DTC:P0096 (Check sheet 1)

EN1610602F200025

DTC:P0096

Intake air temperature sensor (intake manifold) - rationality

1. Technical description

- The intake air temperature sensor (intake manifold) installed to the intake manifold consistently measures intake manifold temperature.

2. DTC set condition**(1) Check conditions**

- Engine speed is in the range of 500 to 890 r/min.
- The fuel injection quantity is 35mm³/st.cyl or less.
- Engine coolant temperature is in the range of -30°C {-22°F} to 35°C {95°F}.
- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- A difference between the intake manifold temperature sensor value and the intake air temperature sensor value built in the air flow sensor remains at 30°C {86°F} or greater for 40 seconds or longer and a difference between the intercooler outlet temperature sensor value and the intake manifold temperature sensor value remains at 30°C {86°F} or greater for 40 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Intake air temperature sensor (intercooler outlet):**Intake air temperature sensor (air flow sensor built-in):****Intake air temperature sensor (intake manifold):**

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormality in resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact

DTC:P0096	Intake air temperature sensor (intake manifold) - ratio-nality	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Intake air temperature sensor (intake manifold)	Check whether the sensor is loose/disconnected.	The sensor is installed properly		Install the sensor.
2	Intake air temperature sensor (intake manifold)	Check whether a sensing area of sensor is contaminated, clogged or damaged.			Replace the sensor.
3	Intake air temperature sensor (intake manifold)	Check whether the resistance of the sensor is proper.	Resistance value 20°C (68°F): 7.336 to 5.794 kΩ 50°C (122°F): 2.435 to 2.41 kΩ		Replace the sensor.
4	Intake air temperature sensor (intake manifold) harness connector	Check whether irregular contact of the sensor harness or harness connector has occurred.			Repair or replace the sensor harness. Replace the connector.
5	Intake air temperature sensor (intake manifold) harness	Check whether the intake manifold temperature sensor harness is disconnected or short-circuited.	Check continuity.		Repair or replace the sensor harness.
6	Intake air temperature sensor (intercooler outlet)	Check whether a failure or an abnormality described above has occurred in the intake air temperature sensor (intercooler outlet) and intake air temperature sensor (air flow sensor built-in).	Conduct the same check as described above 1-5		Replace faulty sensors.
7	Battery	Check whether the battery has degraded/deteriorated or malfunctioned.	Battery voltage: 10 to 16 V		Charge or replace the battery.

DTC:P0096 (Check sheet 2)

EN1610602F200026

DTC:P0096

Intake air temperature sensor (intake manifold) - rationality

1. Technical description

- Calculated EGR cooler efficiency and calculated intake manifold gas temperature is used for judgement to compare with each calculation consistency.

2. DTC set condition**(1) Check conditions****for 2011, 2012 model year**

- Engine speed is in the range of 500 to 1,250 r/min.
- The fuel injection quantity is 50 mm³/st.cyl or less.
- Engine coolant temperature is 60°C {140°F} or more.
- Battery voltage is in the range of 10 to 16 V.
- 30% or greater target EGR valve opening
- EGR HIGH FLOW CHECK is completed.
- 100 mg/cyl or less difference between target air supply and air volume

for 2013 model year

- (1) Intercooler outlet temperature sensor rationality check is completed.
- (2) Engine speed and a fuel injection rate fall within the ranges specified below respectively.
 - Engine speed: more than 2000 r/min
 - Injection rate: more than 40 mm³/st.
 - Barometric pressure: more than 81 kPa
 - Δ Engine speed: less than 20 r/min|calc
 - Δ Injection rate: less than 10 mm³/st.|calc
 - Exhaust brake: deactivated
 - EGR flow: more than 36 kg/h
 - Continues: 40 sec

(2) Judgment criteria**for 2011, 2012 model year**

A difference between an intake manifold temperature and an intercooler outlet temperature remains at 31°C {187.8°F} or less for 30 seconds or longer.

for 2013 model year

Calculated EGR cooler efficiency within 80 to 105%
and
|(Calculated - Actual) Intake manifold gas temperature| \geq 60°C {140°F}
2 drive cycles.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Intake air temperature sensor (intercooler outlet):

Intake air temperature sensor (air flow sensor built-in):

Intake air temperature sensor (intake manifold):

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormality in resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact

DN02-98

FUEL CONTROL (J08E)

DTC:P0096	Intake air temperature sensor (intake manifold) - ratio- nality	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Intake air temperature sensor (intake manifold)	Check whether the sensor is loose/disconnected.	The sensor is installed properly		Install the sensor.
2	Intake air temperature sensor (intake manifold)	Check whether a sensing area of sensor is contaminated, clogged or damaged.			Replace the sensor.
3	Intake air temperature sensor (intake manifold)	Check whether the resistance of the sensor is proper.	Resistance value 20°C (68°F): 7.336 to 5.794 kΩ 50°C (122°F): 2.435 to 2.41 kΩ		Replace the sensor.
4	Intake air temperature sensor (intake manifold) harness connector	Check whether irregular contact of the sensor harness or harness connector has occurred.			Repair or replace the sensor harness. Replace the connector.
5	Intake air temperature sensor (intake manifold) harness	Check whether the intake manifold temperature sensor harness is disconnected or short-circuited.	Check continuity.		Repair or replace the sensor harness.
6	Intake air temperature sensor (intercooler outlet)	Check whether a failure or an abnormality described above has occurred in the intake air temperature sensor (intercooler outlet) and intake air temperature sensor (air flow sensor built-in).	Conduct the same check as described above 1-5		Replace faulty sensors.
7	Battery	Check whether the battery has degraded/deteriorated or malfunctioned.	Battery voltage: 10 to 16 V		Charge or replace the battery.

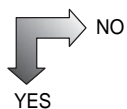
DTC:P0096

EN1610602F200027

DTC	P0096	Intake air temperature sensor (intake manifold) - rationality
-----	-------	---

1. CHECK THE INTAKE MANIFOLD TEMPERATURE SENSOR.

- (1) Check that the intake air temperature sensor (intake manifold) is normally installed.
- (2) Check the intake air temperature sensor (intake manifold) measurement portion for dirt and foreign matters.
- (3) Check the air intake systems such as the intake manifold for clogging and leakage.



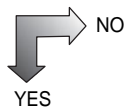
NO

Improper installation of the sensor.

YES

2. CHECK INSTALLATION OF THE CONNECTOR.

- (1) Check that the intake air temperature sensor (intake manifold) connector is properly installed.



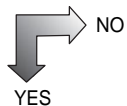
NO

Improper connection of connector

YES

3. CHECK WHETHER THE SENSOR IS IN NORMAL CONDITION.

- (1) Troubleshoot the P0097 and P0098 and check whether the intake air temperature sensor (intake manifold) is in normal condition.



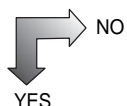
NO

Fault in intake air temperature sensor (intake manifold)

YES

4. CHECK WHETHER OTHER ARE IN NORMAL CONDITION.

- (1) If the GND terminal is shared in use, disconnect all sensor connectors that use the GND terminal and check whether condition is normal.



NO

Fault in engine ECU

YES

Fault in other sensors

DTC:P0097 (Check sheet)

EN1610602F200028

DTC:P0097	Intake air temperature sensor (intake manifold) - out of range (Out of range low)
------------------	---

1. Technical description

- The intake air temperature sensor (intake manifold) installed to the intake manifold consistently measures intake manifold temperature.

2. DTC set condition**(1) Check conditions**

- Engine speed of 500 r/min or more
- A reading taken by the intake air temperature sensor built in the air flow sensor is -20°C {-4°F} or higher.
- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- Output of the intake air temperature sensor (intake manifold) remains at 4.88 V (-20°C {-4°F}) or greater for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Intake air temperature sensor (intake manifold):

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormality in resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact

DTC:P0097	Intake air temperature sensor (intake manifold) - out of range (Out of range low)	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Intake air temperature sensor (intake manifold)	Check whether the sensor is loose/disconnected.			Install the sensor.
2	Intake air temperature sensor (intake manifold)	Check whether a sensing area of the sensor is contaminated, clogged or damaged.			Remove all contaminants and clogging. Replace if damaged.
3	Intake air temperature sensor (intake manifold)	Check whether the resistance of the sensor is proper.	Resistance value 20°C {68°F}: 7.336 to 5.794 kΩ 50°C {122°F}: 2.435 to 2.41 kΩ		Replace the sensor.
4	Intake air temperature sensor (intake manifold) harness, connector	Check whether irregular contact of the sensor harness or harness connector has occurred.			Repair or replace the harness and/or connector.
5	Intake air temperature sensor (intake manifold) harness	Check whether the sensor harness is disconnected or short-circuited.	Check continuity.		Repair or replace the harness.
6	Intake air temperature sensor (intake manifold)	Check whether the sensor itself has electrical continuity.			Replace the sensor.
7	Sensors	Check whether a failure or malfunction has occurred in the sensors that use the same power supply or GND (ECU internal power supply).	Battery voltage: 10 to 16 V		Replace faulty sensors.
8	ECU	Check the ECU internal power supply for any failure or malfunction.			Replace the ECU.
9	Battery	Check whether the battery has degraded/deteriorated or malfunctioned.			Charge or replace the battery.

DTC:P0098 (Check sheet)

EN1610602F200029

DTC:P0098	Intake air temperature sensor (intake manifold) - out of range (Out of range high)
------------------	--

1. Technical description

- The intake air temperature sensor (intake manifold) installed to the intake manifold consistently measures intake manifold temperature.

2. DTC set condition**(1) Check conditions**

- Engine speed of 500 r/min or more
- A reading taken by the intake air temperature sensor built in the air flow sensor is -20°C {-4°F} or higher.
- Battery voltage is in the 10 - 16 V range.
- No disconnection or failure is allowed in the intake air temperature sensor built in the air flow sensor.

(2) Judgment criteria

- Output of the intake air temperature sensor (intake manifold) remains less than 4.87 V (-35°C {-31°F}) for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Intake air temperature sensor (intake manifold):

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormality in resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact

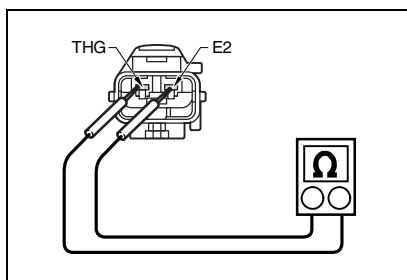
DTC:P0098	Intake air temperature sensor (intake manifold) - out of range (Out of range high)	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Intake air temperature sensor (intake manifold)	Check whether the sensor is loose/disconnected.			Install the sensor.
2	Intake air temperature sensor (intake manifold)	Check whether a sensing area of the sensor is contaminated, clogged or damaged.			Remove all contaminants and clogging. Replace if damaged.
3	Intake air temperature sensor (intake manifold)	Check whether the resistance of the sensor is proper.	Resistance 20°C {68°F}: 7.336 to 5.794 kΩ 50°C {122°F}: 2.435 to 2.41 kΩ		Replace the sensor.
4	Intake air temperature sensor (intake manifold) harness, connector	Check whether irregular contact of the sensor harness or harness connector has occurred.			Repair or replace the harness and/or connector.
5	Intake air temperature sensor (intake manifold) harness	Check whether the sensor harness is disconnected or short-circuited.	Check continuity.		Repair or replace the harness.
6	Intake air temperature sensor (intake manifold)	Check whether the sensor itself has electrical continuity.			Replace the sensor.
7	Sensors	Check whether a failure or malfunction has occurred in the sensors that use the same power supply or GND (ECU internal power supply).	Battery voltage: 10 to 16 V		Replace faulty sensors.
8	ECU	Check the ECU internal power supply for any failure or malfunction.			Replace the ECU.
9	Battery	Check whether the battery has degraded/deteriorated or malfunctioned.			Charge or replace the battery.

DTC:P0097/P0098

EN1610602F200030

DTC	P0097	Intake air temperature sensor (intake manifold) - out of range (Out of range low)
DTC	P0098	Intake air temperature sensor (intake manifold) - out of range (Out of range high)

**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the connectors of intake air temperature sensor (intake manifold).
- (3) Measure resistance between the terminals THG and E2 of the intake air temperature sensor (intake manifold).

HINT

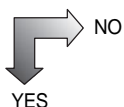
If it is difficult to check only the sensor, proceed to Step 3.

Standard value:

2.202 k Ω (50°C {122°F}): Warm water temperature

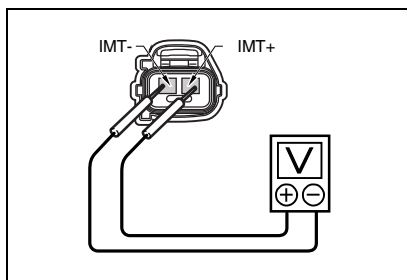
508.1 Ω (100°C {212°F}): Warm water temperature

160.4 Ω (150°C {302°F}): Warm water temperature



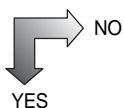
NO

Faulty in intake air temperature sensor (intake manifold)

**2. MEASURING VOLTAGE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "ON" position.
- (2) Measure voltage between the terminals IMT+ and IMT- of the intake air temperature sensor (intake manifold) connector (engine sub harness side).

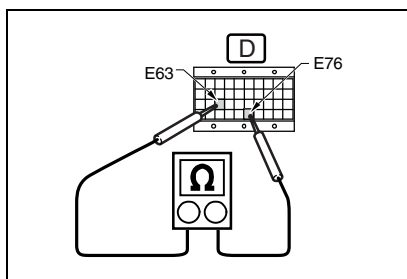
Standard value: 4.5-5.5 V



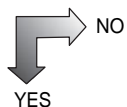
NO

Proceed to 3.

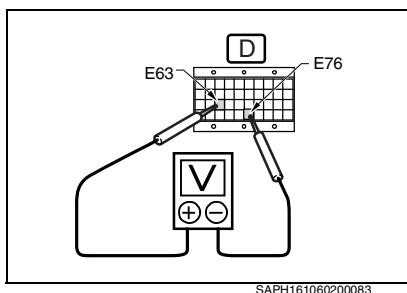
Bad contact of connectors

**3. MEASURING RESISTANCE BETWEEN TERMINALS**

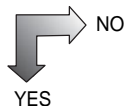
- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness on the engine side.
- (3) Disconnect the connector on the engine ECU side.
- (4) Set the starter switch to "ON" position.
- (5) Measure resistance between the terminals ATI+ (E63) and AGD2 (E76).

Standard value:**2.202 k Ω (50°C {122°F}): Warm water temperature****508.1 Ω (100°C {212°F}): Warm water temperature****160.4 Ω (150°C {302°F}): Warm water temperature**

Faulty intake air temperature sensor (intake manifold)

**4. MEASURING VOLTAGE BETWEEN TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the connector on the engine ECU side.
- (3) Disconnect the connector on the engine sub harness side.
- (4) Set the starter switch to "ON" position.
- (5) Measure voltage between the terminals ATI+ (E63) and AGD2 (E76).

Standard: 4.5-5.5 V

- Fault in engine ECU
- Faulty ECU connector

Bad contact of connectors

DN02-106

FUEL CONTROL (J08E)

DTC:P00AF (Check sheet)

EN1610602F200012

DTC:P00AF	VNT controller CAN communication (ECM)
------------------	--

1. Technical description

- The VNT controller is attached to the engine as a separate part from the turbocharger. It performs CAN communication with the engine ECU to control the motor installed in the REA (Rotary Electric Actuator).
- Wiping operation is performed while the engine is stopped for the purpose of removing soot and oil coming out from the range of vane operation and checking the turbo mechanical operating range for abnormality.

2. DTC set condition**(1) Check conditions**

- While the engine is in operation - Always
- While the engine is stopped - When wiping

(2) Judgment criteria

- When the engine ECU has continued to receive malfunction information from the VNT controller for five seconds: The malfunction information transmission conditions of the VNT controller are described below.

Power supply voltage error	The power supply voltage continues to be less than 8V or more than 18V for five seconds.
EEPROM read error	The consistency of the read value has become abnormal.
CAN communication line error	Reception of no message or a state with the target position outside the range of movement continues for one second.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Power shortage of battery
- Irregular contact of connector of VNT controller or engine ECU
- Disconnection or short-circuiting of harness

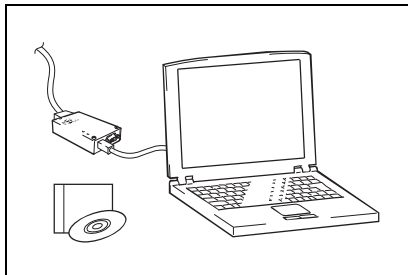
DTC:P00AF	VNT controller CAN communication (ECM)	Inspection Procedure
------------------	---	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	CAN communication	DTC U1123 is stored at the same time.	No U1123 is stored.		Go to diagnosis of the DTC: U1123.
2	VNT controller	Measure the power supply voltage of the controller.	More than 8V		Check of supply circuit
3	VNT REA (VNT actuator)	Check the harness between the controller and REA.	Must be conducting.		Repair of harness
4	VNT controller	If all OK			Replace the VNT controller.

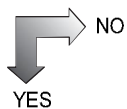
DTC:P00AF

EN1610602F200013

DTC	P00AF	VNT controller CAN communication (ECM) Power supply failure EEPROM failure
-----	-------	--

**1. CHECK THE VNT.**

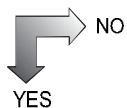
- (1) Connect Hino-DX.
- (2) Set the starter switch "ON" position.
- (3) Select the "VNT" menu and check the VNT.

Standard: Max. 2 sec. delay in opening

Proceed to 4.

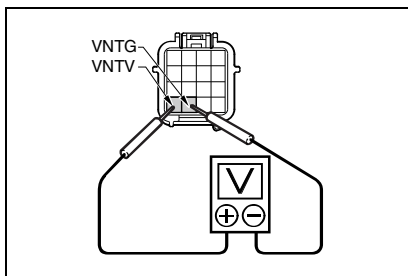
2. CHECK CONNECTION OF THE CONNECTOR.

- (1) Check connection of the VNT controller connector and the VNT actuator connector.
- (2) Set the starter switch to "LOCK" position and then to "ON" position again.
- (3) Check that no malfunction codes exist.



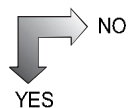
Proceed to 3.

Normal

**3. MEASURING VOLTAGE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch "LOCK" position.
- (2) Disconnect the connectors of VNT controller.
- (3) Set the starter switch "ON" position.
- (4) Measure the voltage between VNTV and VNTG terminal of VNT controller connector (engine sub harness side).

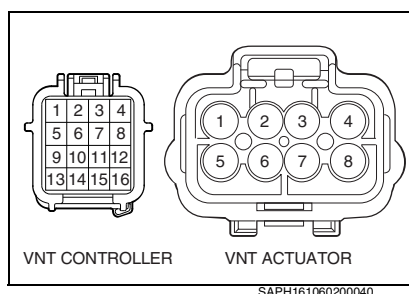
Standard value: 10 V or more



NO

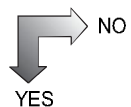
Faulty in harness

YES

**4. CHECK THE CONTINUITY OF HARNESS.**

- (1) Check continuity between the VNT controller connector and the VNT actuator connector. Check for continuity according to the table below.

Terminals to measure the continuity	
VNT controller side	VNT actuator side
1	4
2	3
3	2
4	5
8	1
10	8
11	7
12	6



NO

Faulty in harness

YES

Faulty in turbocharger

DTC:P0101 (Check sheet)

EN1610602F200031

DTC:P0101**Air flow sensor - rationality****1. Technical description**

- The air flow sensor installed to the air cleaner consistently measures an intake air volume.

2. DTC set condition**(1) Check conditions**

- Engine speed is in the range of 2,000 to 2,600 r/min.
- A change in engine speed is 30 r/min or less.
- The fuel injection quantity is in the range of 0 to 80 mm³/st.cyl.
- A change in fuel injection quantity is 10 mm³/st.cyl. or less.
- A change in intake air volume is 10 g/s or less.
- Engine coolant temperature is 60°C {140°F} or lower.
- 0% or less EGR valve opening (EGR-CUT status)
- NO MALFUNCTION

(2) Judgment criteria

- Compare a theoretical air volume calculated from a boost pressure and an atmospheric pressure with an actual air volume for 10 seconds or longer.
If a ratio of the theoretical air volume to the actual air volume is 1.15 or greater or 0.85 or less, make a temporary judgment.
After the key is turned OFF to stop the engine, observe that (a boost pressure - an atmospheric pressure) does not remain at 18 kPa or greater for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Air flow sensor:

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormality in resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact

DTC:P0101	Air flow sensor - rationality	Inspection Procedure
------------------	--------------------------------------	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Air cleaner	<ul style="list-style-type: none"> Check the air cleaner for clogging or deformation. Check whether non-Hino-genuine parts are used. Check that the cover is closed. 			Clean or replace the air cleaner.
2	Air intake hose	<ul style="list-style-type: none"> Check whether the air intake hose is loose/disconnected or crushed. 			Connect or replace the hose.
3	Air flow sensor	Check whether the air flow sensor is loose/disconnected.			Install the sensor.
4	Air flow sensor	Check whether a sensing area of the air flow sensor is contaminated, clogged or damaged.			Replace the sensor.
5	Air flow sensor	Check whether sensor resistance of the air flow sensor is proper.	Resistance value		Replace the sensor.
6	Air flow sensor	Check whether irregular contact has occurred in the air flow sensor connector.			Repair or replace the sensor harness. Replace the connector.
7	Air flow sensor harness	Check whether the air flow sensor harness is disconnected or short-circuited.	Check continuity.		Repair or replace the sensor harness.
8	Air flow sensor	Check whether output of the air flow sensor is proper.	Check output.		Replace the sensor.
9	ECU	Check whether a failure or malfunction has occurred in the ECU internal sensor power supply.	Check continuity. Resistance value		Replace the ECU.

DN02-112

FUEL CONTROL (J08E)

DTC:P0101

EN1610602F200032

DTC	P0101	Air flow sensor - rationality
-----	-------	-------------------------------

1. CHECK THE AIR FLOW SENSOR.

- (1) Check that the air flow sensor is normally installed.
- (2) Check the air flow sensor for dirt and foreign matters.
- (3) Check the air intake systems such as the air cleaner for clogging and leakage.



NO

Improper installation of the sensor.

YES

2. CHECK INSTALLATION OF THE CONNECTOR.

- (1) Check that the air flow sensor connector is properly installed.



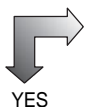
NO

Improper connection of connector

YES

3. CHECK WHETHER THE SENSOR IS IN NORMAL CONDITION.

- (1) Troubleshoot the P06D3 and P06D4 and check whether the air flow sensor is in normal condition.



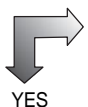
NO

Fault in air flow sensor

YES

4. CHECK WHETHER OTHER ARE IN NORMAL CONDITION.

- (1) If the GND terminal is shared in use, disconnect all sensor connectors that use the GND terminal and check whether condition is normal.



NO

Fault in engine ECU

YES

Fault in other sensors



DN02-114

FUEL CONTROL (J08E)

DTC:P0104 (Check sheet)

EN1610602F200033

DTC:P0104

Air flow sensor - out of range

1. Technical description

- The air flow sensor installed to the air cleaner consistently measures an intake air volume.

2. DTC set condition**(1) Check conditions**

- Engine speed remains at 500 r/min or lower for 5 seconds or longer.
- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- Output of the air flow sensor remains less than 0.85 kHz (-5.5 kg/h) for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Air flow sensor:

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormality in resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact

DTC:P0104		Air flow sensor - out of range		Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Air flow sensor	Check whether the air flow sensor is loose/disconnected.			Install the sensor.
2	Air flow sensor	Check whether a sensing area of the air flow sensor is contaminated, clogged or damaged.			Replace the sensor.
3	Air flow sensor	Check whether sensor resistance of the air flow sensor is proper.	Resistance value		Replace the sensor.
4	Air flow sensor	Check whether irregular contact has occurred in the air flow sensor connector.			Repair or replace the sensor harness. Replace the connector.
5	Air flow sensor harness	<ul style="list-style-type: none"> Check whether the air flow sensor harness is disconnected or short-circuited. Check whether the sensor power supply is disconnected or short-circuited and whether diagnosis codes are indicated (P0652, P0653, P0642 and P0643). 	Check continuity. Sensor voltage check = 5 V		Repair or replace the harness.
6	Air flow sensor	Check whether output of the air flow sensor is proper.	Check output.		Replace the ECU.
7	ECU	Check whether a failure or malfunction has occurred in the ECU internal sensor power supply.	Check continuity. Resistance value		Replace the ECU.

DN02-116

FUEL CONTROL (J08E)

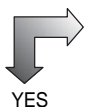
DTC:P0104

EN1610602F200034

DTC	P0104	Air flow sensor - out of range
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1. CHECK INSTALLATION OF THE CONNECTOR.

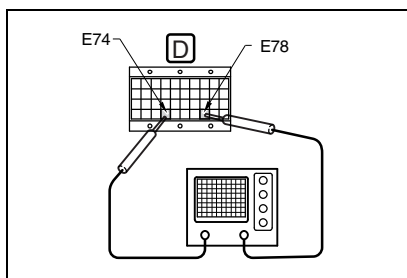
- (1) Check that the air flow sensor connector is properly installed.



NO

Faulty connector

YES



SAPH161060200084

2. MEASURING FREQUENCY BETWEEN TERMINALS.

- (1) Set the starter switch "LOCK" position.
(2) Connect the signal check harness on the engine side.
(3) Measure frequency between the terminals AFSI (E74) and AGD6 (E78) while idling.

Standard value: 5-6 kHz

NO

Fault in air flow sensor

YES

Fault in engine ECU



FUEL CONTROL (J08E)

DN02-117



DTC:P0106 (Check sheet)

EN1610602F200035

DTC:P0106

Boost pressure sensor - rationality

1. Technical description

- The boost pressure sensor installed at the outlet of the Diesel throttle (intake throttle valve) consistently measures boost pressure.

2. DTC set condition**(1) Check conditions**

- Engine speed is in the range of 2,000 to 2,600 r/min.
- A change in engine speed is 30 r/min or less.
- The fuel injection quantity is in the range of 0 to 80 mm³/st.cyl.
- A change in fuel injection quantity is 10 mm³/st.cyl. or less.
- A change in intake air volume is 10 g/s or less.
- Engine coolant temperature is 60°C {140°F} or lower.
- 0% or less EGR valve opening (EGR-CUT status)
- NO MALFUNCTION

(2) Judgment criteria

- Compare a theoretical air volume calculated from a boost pressure and an atmospheric pressure with an actual air volume for 10 seconds or longer. If a ratio of the theoretical air volume to the actual air volume is 1.15 or greater or 0.85 or less, make a temporary judgment (temporary diagnosis).
Turn the key OFF to stop the engine. If (a boost pressure - an atmospheric pressure) remains at 18 kPa or greater for 3 seconds or longer, it proves a failure in the boost pressure sensor.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Boost pressure sensor:

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormality in resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact

DTC:P0106		Boost pressure sensor - rationality		Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Boost pressure sensor	Check whether the sensor is loose/disconnected.			Install the sensor.
2	Boost pressure sensor	Check whether a sensing area of the sensor is contaminated, clogged or damaged.			Replace the sensor.
3	Boost pressure sensor	Check whether the resistance of the sensor is proper.	Resistance value		Replace the sensor.
4	Boost pressure sensor connector	Check whether irregular contact has occurred in the sensor connector.			Repair or replace the sensor harness. Replace the connector.
5	Boost pressure sensor harness	<ul style="list-style-type: none"> Check whether the sensor harness is disconnected or short-circuited. Check that the sensor power supply is disconnected or short-circuited and that diagnosis codes are indicated (P0652, P0653, P0642 and P0643). 	Check continuity. Sensor voltage check = 5 V		Repair or replace the harness.
6	ECU	Check whether a failure or malfunction has occurred in the ECU internal sensor power supply.	Check continuity. Resistance value		Replace the ECU.
7	Sensor coupler	Check whether a failure or malfunction (irregular contact, sensor malfunction, sensor disconnection, noncontinuity) has occurred in other sensors (crankshaft position sensor, camshaft position sensor, accelerator sensor, Diesel throttle (intake throttle valve) sensor, common rail pressure sensor) that use the power supply in the ECU internal power supply.	Conduct the same check as described above.		Replace the sensor or coupler.

DN02-120

FUEL CONTROL (J08E)

DTC:P0106

EN1610602F200036

DTC	P0106	Boost pressure sensor - rationality
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1. CHECK THE BOOST PRESSURE SENSOR.

- (1) Check that the boost pressure sensor is normally installed.
- (2) Check the hose between the boost pressure sensor and intake manifold for detachment and clogging.
- (3) Check the air intake systems such as the intake manifold for clogging and leakage.



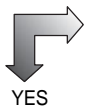
NO

Improper installation of the sensor.

YES

2. CHECK INSTALLATION OF THE CONNECTOR.

- (1) Check that the boost pressure sensor connector is properly installed.



NO

Improper connection of connector

YES

3. CHECK WHETHER THE SENSOR IS IN NORMAL CONDITION.

- (1) Troubleshoot the P0108 and P0237 and check whether the boost pressure sensor is in normal condition.



NO

Fault in boost pressure sensor

YES

4. CHECK WHETHER OTHER ARE IN NORMAL CONDITION.

- (1) If the GND terminal is shared in use, disconnect all sensor connectors that use the GND terminal and check whether condition is normal.



NO

Fault in engine ECU

YES

Fault in other sensors



FUEL CONTROL (J08E)

DN02-121



DTC:P0108 (Check sheet)

EN1610602F200037

DTC:P0108

Boost pressure sensor - out of range (Out of range high)

1. Technical description

- The boost pressure sensor installed at the outlet of the Diesel throttle (intake throttle valve) consistently measures boost pressure.

2. DTC set condition**(1) Check conditions**

- Engine speed of 500 r/min or more
- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- Output of the boost pressure sensor remains greater than 4.11 V (365 kPa) for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Boost pressure sensor:

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormality in resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact

DTC:P0108	Boost pressure sensor - out of range (Out of range high)	Inspection Procedure
------------------	---	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Boost pressure sensor	Check whether the sensor is loose/disconnected.			Install the sensor.
2	Boost pressure sensor	Check whether a sensing area of the sensor is contaminated, clogged or damaged.			Replace the sensor.
3	Boost pressure sensor	Check whether the resistance of the sensor is proper.	VCC-SIG: 2-15 k Ω SIG-GND: 209-231 k Ω		Replace the sensor.
4	Boost pressure sensor	Check whether irregular contact has occurred in the sensor connector.			Repair or replace the sensor harness. Replace the connector.
5	Boost pressure sensor harness	<ul style="list-style-type: none"> Check whether the sensor harness is disconnected or short-circuited. Check that the sensor power supply is disconnected or short-circuited and that diagnosis codes are indicated (P0652, P0653, P0642 and P0643). 	Check continuity. Sensor voltage check = 5 V		Repair or replace the sensor harness.
6	ECU	Check whether a failure or malfunction has occurred in the ECU internal sensor power supply.	Check continuity. Resistance value		Replace the ECU.

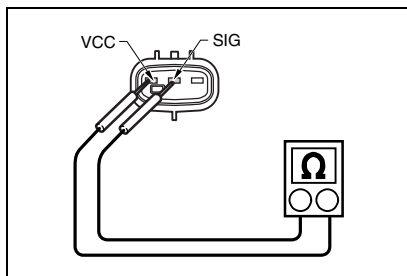
DN02-124

FUEL CONTROL (J08E)

DTC:P0108

EN1610602F200038

DTC	P0108	Boost pressure sensor - out of range (Out of range high)
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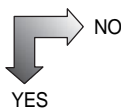
**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch "LOCK" position.
- (2) Disconnect the connector of boost pressure sensor.
- (3) Measure the resistance between VCC and SIG terminal of the boost pressure sensor connector.

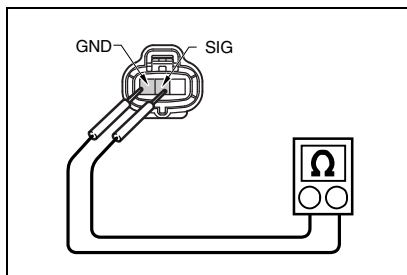
HINT

If it is difficult to check only the sensor, proceed to Step 5.

Standard value: 2-15 k Ω

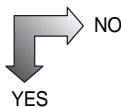


Faulty in boost pressure sensor

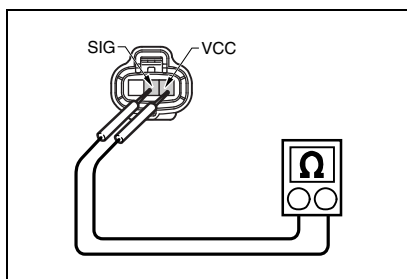
**2. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Measure resistance between the terminals SIG and GND of the boost pressure sensor connector (engine sub harness side).

Standard value: 209-231 k Ω

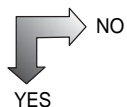


- Faulty in harness
- Irregular contact of connectors

**3. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Measure resistance between the terminals VCC and SIG of the boost pressure sensor connector (engine sub harness side).

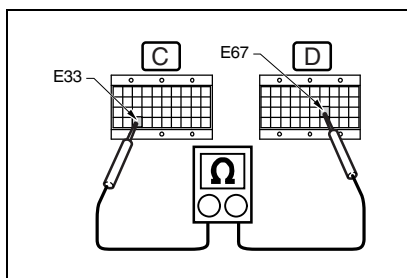
Standard value: $\infty \Omega$



NO

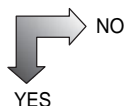
Faulty in harness

YES

**4. MEASURING RESISTANCE BETWEEN TERMINALS**

- (1) Connect the signal check harness on the engine side.
(2) Disconnect the connector on the engine sub harness side.
(3) Measure resistance between the terminals AVC2 (E33) and PIM (E67).

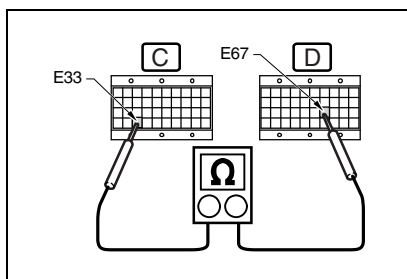
Standard value: $\infty \Omega$



NO

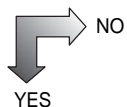
Faulty in engine harness

YES

**5. MEASURING RESISTANCE BETWEEN TERMINALS**

- (1) Connect the boost pressure sensor connector.
(2) Connect the signal check harness on the engine side.
(3) Disconnect the connector on the engine ECU side.
(4) Measure resistance between the terminals AVC2 (E33) and PIM (E67).

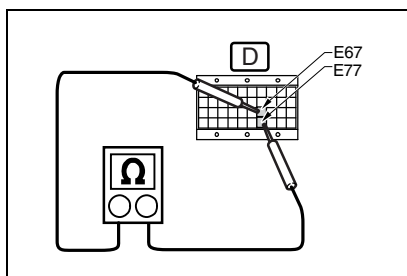
Standard value: 2-15 k Ω



NO

- Fault in harness
- Fault in boost pressure sensor

YES

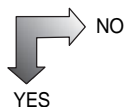


SAPH161060200090

6. MEASURING RESISTANCE BETWEEN TERMINALS

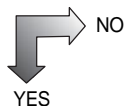
- (1) Measure resistance between the terminals AGD4 (E77) and PIM (E67).

Standard value: 2-15 k Ω



NO

- Faulty in harness
- Irregular contact of connectors



NO

Fault in engine ECU

Clear and recheck the DTC.



FUEL CONTROL (J08E)

DN02-127



DN02-128

FUEL CONTROL (J08E)

DTC:P0112 (Check sheet)

EN1610602F200039

DTC:P0112	Intake air temperature sensor (air flow sensor built-in) - out of range (Out of range low)
------------------	--

1. Technical description

- The intake air temperature sensor built in the air flow sensor consistently measures intake air temperature.

2. DTC set condition**(1) Check conditions**

- Engine speed of 500 r/min or more
- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- Output of the intake air temperature sensor remains less than 0.06 V (105°C {221°F}) for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Intake air temperature sensor (air flow sensor built-in):

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormality in resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact

DTC:P0112	Intake air temperature sensor (air flow sensor built-in) - out of range (Out of range low)	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Intake air temperature sensor (air flow sensor built-in)	Check whether the sensor is loose/disconnected.			Install the sensor.
2	Intake air temperature sensor (air flow sensor built-in)	Check whether a sensing area of the sensor is contaminated, clogged or damaged.			Replace the sensor.
3	Intake air temperature sensor (air flow sensor built-in)	Check whether the resistance of the sensor is proper.	Resistance (between thermistor terminals) -20°C {-4°F): 18.4 to 13.6kΩ 20°C {68°F): 2.69 to 2.21kΩ		Replace the sensor.
4	Intake air temperature sensor (air flow sensor built-in) connector	Check whether irregular contact has occurred in the sensor connector.			Repair or replace the sensor harness. Replace the connector.
5	Intake air temperature sensor (air flow sensor built-in) harness	Check whether the sensor harness is disconnected or short-circuited.	Check continuity.		Repair or replace the sensor harness.
6	ECU	Check whether a failure or malfunction has occurred in the ECU internal sensor power supply.	Check continuity. Resistance value		Replace the ECU.

DTC:P0113 (Check sheet)

EN1610602F200040

DTC:P0113	Intake air temperature sensor (air flow sensor built-in) - out of range (Out of range high)
------------------	---

1. Technical description

- The intake air temperature sensor built in the air flow sensor consistently measures intake air temperature.

2. DTC set condition**(1) Check conditions**

- Engine speed of 500 r/min or more
- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- Output of the intake air temperature sensor remains greater than 4.55 V (-40°C {-40°F}) for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Intake air temperature sensor (air flow sensor built-in):

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormality in resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact

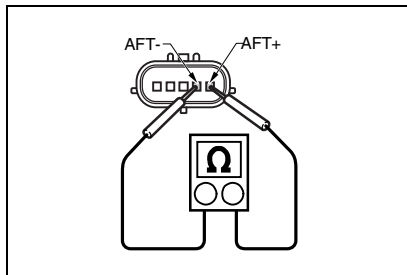
DTC:P0113	Intake air temperature sensor (air flow sensor built-in) - out of range (Out of range high)	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Intake air temperature sensor (air flow sensor built-in)	Check whether the sensor is loose/disconnected.			Install the sensor.
2	Intake air temperature sensor (air flow sensor built-in)	Check whether a sensing area of the sensor is contaminated, clogged or damaged.			Replace the sensor.
3	Intake air temperature sensor (air flow sensor built-in)	Check whether the resistance of the sensor is proper.	Resistance (between thermistor terminals) -20°C {-4°F): 18.4 to 13.6kΩ 20°C {68°F): 2.69 to 2.21kΩ		Replace the sensor.
4	Intake air temperature sensor (air flow sensor built-in) connector	Check whether irregular contact has occurred in the sensor connector.			Repair or replace the sensor harness. Replace the connector.
5	Intake air temperature sensor (air flow sensor built-in) harness	Check whether the sensor harness is disconnected or short-circuited.	Check continuity.		Repair or replace the sensor harness.
6	ECU	Check whether a failure or malfunction has occurred in the ECU internal sensor power supply.	Check continuity. Resistance value		Replace the ECU.

DTC:P0112/P0113

EN1610602F200041

DTC	P0112	Intake air temperature sensor (air flow sensor built-in) - out of range (Out of range low)
DTC	P0113	Intake air temperature sensor (air flow sensor built-in) - out of range (Out of range high)

**1. CHECK THE INTAKE AIR TEMPERATURE SENSOR.**

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the connector of intake air temperature sensor (air flow sensor built-in).
- (3) Measure the resistance between AFT+ and AFT- terminal of the intake air temperature sensor (air flow sensor built-in).

HINT

If it is difficult to check only the sensor, proceed to Step 3.

Standard value:

2.202 k Ω (50°C {122°F}): Outside air temperature

508.1 Ω (100°C {212°F}): Outside air temperature

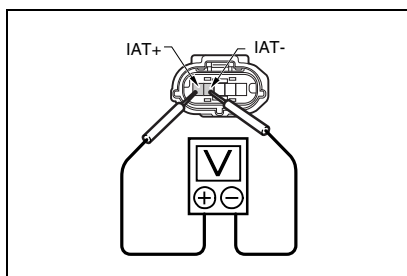
160.4 Ω (150°C {302°F}): Outside air temperature



NO

Faulty in intake air temperature sensor (air flow sensor built-in)

YES

**2. MEASURING VOLTAGE BETWEEN SENSOR TERMINALS.**

- (1) Set the starter switch to "ON" position.
- (2) Measure the voltage between IAT+ and IAT- terminal of the intake air temperature sensor (air flow sensor built-in) (engine sub harness side).

Standard: 4.5-5.5 V

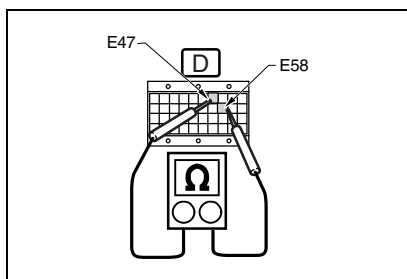


NO

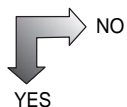
Proceed to 3.

YES

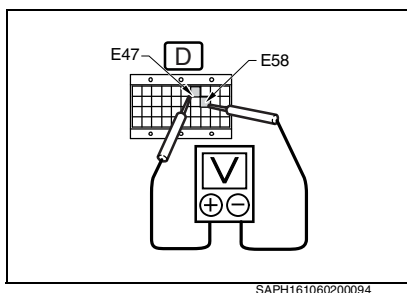
Bad contact of connectors

**3. MEASURING RESISTANCE BETWEEN TERMINALS**

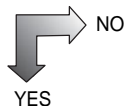
- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness on the engine side.
- (3) Disconnect the connector on the engine ECU side.
- (4) Measure resistance between the terminals THA+ (E47) and AGD5 (E58).

Standard value:**2.202 k Ω (50°C {122°F}): Outside air temperature****508.1 Ω (100°C {212°F}): Outside air temperature****160.4 Ω (150°C {302°F}): Outside air temperature**

Faulty in intake air temperature sensor (air flow sensor built-in)

**4. MEASURING VOLTAGE BETWEEN TERMINALS**

- (1) Connect the connector on the engine ECU side.
- (2) Disconnect the connector on the engine sub harness side.
- (3) Set the starter switch to "ON" position.
- (4) Measure voltage between the terminals THA+ (E47) and AGD5 (E58).

Standard: 4.5-5.5 V

- Fault in engine ECU
- Faulty ECU connector

Bad contact of connectors

DTC:P0115 (Check sheet 1)

CHDICFBH

DTC:P0115	Malfunction of coolant temperature sensor and intake air temperature sensor
------------------	--

1. Technical description

- The intake air temperature (in the air stream) is used to predict the water temperature, should a thermostat failure occur; this also serves as the backup function in case of failure of the engine coolant temperature sensor, but the exhaust gas control is continued. However, when the engine coolant temperature sensor and the intake air temperature sensor (in the air flow) both have failed, the water temperature can no longer be predicted, and the following measures are taken.
 - Thermostat diagnostics (P0128) stop
 - Default value of the engine coolant temperature sensor
 - At the time of starter switch ON and engine stall: -20°C {-4°F}
 - When the engine is not stalled: 80°C {174°F}
- This diagnostic is the DTC for execution of the above measures

2. DTC set condition**(1) Check conditions**

- See the check sheet of below DTC intake air temperature sensor malfunction P011C or P0112 or P0113 and coolant temperature sensor malfunction P0116 or P0117 or P0118

(2) Judgment criteria

- See the check sheet of below DTC intake air temperature sensor malfunction P011C or P0112 or P0113 and coolant temperature sensor malfunction P0116 or P0117 or P0118

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Coolant temperature sensor:

- Check the DTC except P0115
- See the check sheet of below DTC intake air temperature sensor malfunction P011C or P0112 or P0113 and coolant temperature sensor malfunction P0116 or P0117 or P0118



FUEL CONTROL (J08E)

DN02-135



DTC:P0116 (Check sheet 1)

EN1610602F200042

DTC:P0116

Engine coolant temperature sensor - rationality

1. Technical description

- The coolant temperature sensor installed to the thermostat case consistently measures coolant temperature.

2. DTC set condition**(1) Check conditions**

- Engine speed of 700 r/min or more
- Engine coolant temperature is 60 °C {140°F} or less.
- A difference in temperature between intake air temperature and EGR gas temperature falls within a range from -5 °C {23°F} to 5°C {41°F}.
- Elapse of 10 to 30 seconds after engine start
- No malfunction codes

(2) Judgment criteria

- A 15°C {59°F} or greater difference in temperature between intake air temperature and EGR gas temperature remains for 5 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Engine coolant temperature sensor:

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormal resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact

DTC:P0116		Engine coolant temperature sensor - rationality		Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Engine coolant temperature sensor	Check whether the sensor is loose/disconnected.			Install the sensor.
2	Engine coolant temperature sensor	Check whether a sensing area of the sensor is contaminated, clogged or damaged.			Replace the sensor.
3	Engine coolant temperature sensor	Check whether the resistance of the sensor is proper.	Resistance value 20°C {68°F}: 2.59 to 2.32 kΩ 80°C {176°F}: 0.326 to 0.310 kΩ		Replace the sensor.
4	Engine coolant temperature sensor	Check whether irregular contact has occurred in the sensor connector.			Repair or replace the sensor harness. Replace the connector.
5	Engine coolant temperature sensor Harness	Check whether the harness is disconnected or short-circuited.	Check continuity.		Repair or replace the sensor harness.
6	ECU	Check whether a failure or malfunction has occurred in the ECU internal sensor power supply.	Check continuity. Resistance value		Replace the ECU.
7	ECU	Check whether a failure or malfunction has occurred in the ECU internal sensor power supply.	Check continuity. Resistance value.		Replace the ECU.

DTC:P0116 (Check sheet 2)

EN1610602F200043

DTC:P0116

Engine coolant temperature sensor - rationality

1. Technical description

- The coolant temperature sensor installed to the thermo case consistently measures coolant temperature.

2. DTC set condition**(1) Check conditions**

- Engine speed of 700 r/min or more
- Engine coolant temperature is lower than 60°C {140°F}.
- Elapse of at least 60 seconds after engine start
- No malfunction codes

(2) Judgment criteria

- Calculate heat loss and heat release based on engine speed, fuel injection rate, intake air temperature and vehicle speed to identify fuel consumption required for coolant temperature rise by 1°C {33.8°F}.
When accumulated fuel consumption is 300 cc or greater, fuel consumption required for coolant temperature rise by 1°C {33.8°F} remains greater than 40 cc/°C for 5 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Engine coolant temperature sensor:

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormal resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact

DTC:P0116		Engine coolant temperature sensor - rationality		Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Engine coolant temperature sensor	Check whether the sensor is loose/disconnected.			Install the sensor.
2	Engine coolant temperature sensor	Check whether a sensing area of the sensor is contaminated, clogged or damaged.			Replace the sensor.
3	Engine coolant temperature sensor	Check whether the resistance of the sensor is proper.	Resistance 20°C {68°F}: 2.59 to 2.32 kΩ 50°C {122°F}: 0.326 to 0.310 kΩ		Replace the sensor.
4	Engine coolant temperature sensor	Check whether irregular contact has occurred in the sensor connector.			Repair or replace the sensor harness. Replace the connector.
5	Engine coolant temperature sensor Harness	Check whether the harness is disconnected or short-circuited.	Check continuity.		Repair or replace the sensor harness.
6	Thermostat	Check whether the thermostat is stuck causing the valve to remain opened. Check that thermostat valve opening temperature is proper.	Inspect the thermostat.		Replace the thermostat.
7	ECU	Check whether a failure or malfunction has occurred in the ECU internal sensor power supply.	Check continuity. Resistance value.		Replace the ECU.

DN02-140

FUEL CONTROL (J08E)

DTC:P0116

EN1610602F200044

DTC	P0116	Engine coolant temperature sensor - rationality
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1. CHECK THE ENGINE COOLANT TEMPERATURE SENSOR.

- (1) Check that the engine coolant temperature sensor is normally installed.
- (2) Check the engine coolant temperature sensor measurement portion for dirt and foreign matters.



NO

Improper installation of the sensor.

YES

2. CHECK INSTALLATION OF THE CONNECTOR.

- (1) Check that the engine coolant temperature sensor connector is properly installed.



NO

Improper connection of connector

YES

3. CHECK WHETHER THE SENSOR IS IN NORMAL CONDITION.

- (1) Troubleshoot the P0117 and P0118 and check whether the engine coolant temperature sensor is in normal condition.



NO

Fault in engine coolant temperature sensor

YES

4. CHECK WHETHER OTHER ARE IN NORMAL CONDITION.

- (1) If the GND terminal is shared in use, disconnect all sensor connectors (intake air temperature sensor (air flow sensor built-in)) that use the GND terminal and check whether condition is normal.



NO

Fault in engine ECU

YES

- Fault in other sensors
- Wrong wiring



FUEL CONTROL (J08E)

DN02-141



DTC:P0117 (Check sheet)

EN1610602F200045

DTC:P0117

Engine coolant temperature sensor - out of range (Out of range low)

1. Technical description

- The coolant temperature sensor installed to the thermo case consistently measures coolant temperature.

2. DTC set condition**(1) Check conditions**

- Engine speed of 500 r/min or more
- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- Output of the sensor remains at 0.1 V (139°C {282.2°F}) or less for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Coolant temperature sensor:

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormal resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact

DTC:P0117	Engine coolant temperature sensor - out of range (Out of range low)	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Coolant temperature sensor	Check whether the coolant temperature sensor is loose/disconnected.			Install the sensor.
2	Coolant temperature sensor	Check whether a sensing area of the coolant temperature sensor is contaminated, clogged or damaged.			Replace the sensor.
3	Coolant temperature sensor	Check whether sensor resistance of the coolant temperature sensor is proper.	Resistance 20°C {68°F}: 2.59 to 2.32 kΩ 80°C {176°F}: 0.326 to 0.310 kΩ		Replace the sensor.
4	Coolant temperature sensor	Check whether irregular contact has occurred in the coolant temperature sensor connector.			Repair or replace the sensor harness. Replace the connector.
5	Coolant temperature sensor Harness	Check whether the coolant temperature sensor harness is disconnected or short-circuited.	Check continuity.		Repair or replace the sensor harness.
6	ECU	Check whether a failure or malfunction has occurred in the ECU internal sensor power supply.	Check continuity. Resistance value.		Replace the ECU.

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FUEL CONTROL (J08E)

DTC:P0118 (Check sheet)

EN1610602F200046

DTC:P0118

Engine coolant temperature sensor - out of range (Out of range high)

1. Technical description

- The coolant temperature sensor installed to the thermo case consistently measures coolant temperature.

2. DTC set condition**(1) Check conditions**

- Engine speed remains at 500 r/min or higher for 5 seconds or longer.
- Battery voltage is in the 10 - 16 V range.
- A reading taken by the intake air temperature sensor built in the air flow sensor is -20°C {-4°F} or higher.

(2) Judgment criteria

- Output of the sensor remains at 4.77 V (-39°C {-38.2°F}) or greater for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Coolant temperature sensor:

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormal resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact

DTC:P0118	Engine coolant temperature sensor - out of range (Out of range high)	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Coolant temperature sensor	Check whether the coolant temperature sensor is loose/disconnected.			Install the sensor.
2	Coolant temperature sensor	Check whether a sensing area of the coolant temperature sensor is contaminated, clogged or damaged.			Replace the sensor.
3	Coolant temperature sensor	Check whether sensor resistance of the coolant temperature sensor is proper.	Resistance 20°C {68°F}: 2.59 to 2.32 kΩ 80°C {176°F}: 0.326 to 0.310 kΩ		Replace the sensor.
4	Coolant temperature sensor	Check whether irregular contact has occurred in the coolant temperature sensor connector.			Repair or replace the sensor harness. Replace the connector.
5	Coolant temperature sensor Harness	Check whether the coolant temperature sensor harness is disconnected or short-circuited.	Check continuity.		Repair or replace the sensor harness.
6	ECU	Check whether a failure or malfunction has occurred in the ECU internal sensor power supply.	Check continuity. Resistance value.		Replace the ECU.

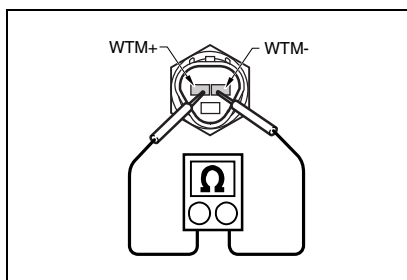
DN02-146

FUEL CONTROL (J08E)

DTC:P0117/P0118

EN1610602F200047

DTC	P0117	Engine coolant temperature sensor - out of range (Out of range low)
DTC	P0118	Engine coolant temperature sensor - out of range (Out of range high)

**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the coolant temperature sensor connector.
- (3) Measure resistance between the terminals WTM+ and WTM- of the engine coolant temperature sensor.

HINT

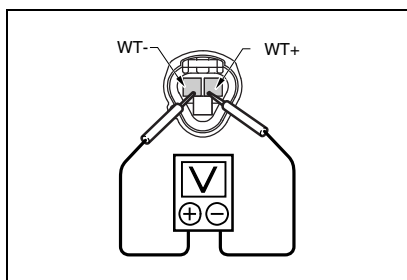
If it is difficult to check only the sensor, proceed to Step 3.

Standard value:**2.45 kΩ (20°C {68°F})****1.15 kΩ (40°C {104°F})****584 Ω (60°C {140°F})****318 Ω (80°C {176°F})**

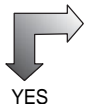
NO

Fault in engine coolant temperature sensor

YES

**2. MEASURING VOLTAGE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "ON" position.
- (2) Measure voltage between the terminals WT+ and WT- of the engine coolant temperature sensor connector (engine sub harness side).

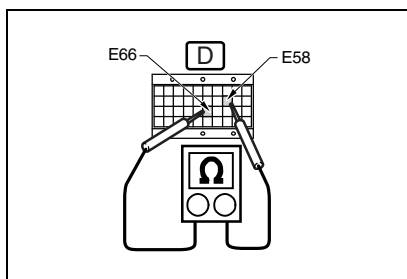
Standard: 4.5-5.5 V

NO

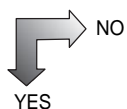
Proceed to 3.

YES

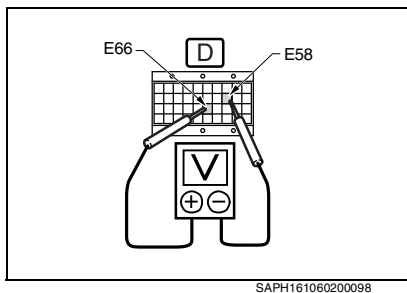
Bad contact of connectors

**3. MEASURING RESISTANCE BETWEEN TERMINALS**

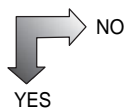
- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness on the engine side.
- (3) Disconnect the connector on the engine ECU side.
- (4) Measure resistance between the terminals THW+ (E66) and AGD5 (E58).

Standard:**2.45 k Ω (20°C {68°F})****1.15 k Ω (40°C {104°F})****584 Ω (60°C {140°F})****318 Ω (80°C {176°F})**

- Fault in engine coolant temperature sensor
- Fault in harness

**4. MEASURING VOLTAGE BETWEEN TERMINALS**

- (1) Connect the connector on the engine ECU side.
- (2) Disconnect the connector on the engine sub harness side.
- (3) Set the starter switch to "ON" position.
- (4) Measure voltage between the terminals THW+ (E66) and AGD5 (E58).

Standard: 4.5-5.5 V

- Fault in engine ECU
- Faulty ECU connector

Bad contact of connectors

DTC:P011C (Check sheet)

EN1610602F200048

DTC:P011C

Intake air temperature sensor (air flow sensor built-in) - rationality

1. Technical description

- The air flow sensor installed to the air cleaner consistently measures intake air temperature.

2. DTC set condition**(1) Check conditions**

The conditions described below remain for 30 seconds.

- Engine speed of 890 r/min or less
- Starter switch in ON position
- Starter switch in OFF position
- The fuel injection quantity is 35 mm³/st.cyl or less.
- Engine coolant temperature is in the range of -30°C {-22°F} to 35°C {95°F}.
- Battery voltage: 10 V to 15 V
- The monitor disable DTC table can be referred to.

(2) Judgment criteria

- The conditions described below remain for 3 seconds or longer.
A difference between an intake air temperature and an intercooler outlet air temperature is 30 °C {86°F} or greater.
And a difference between an intake air temperature and an intake manifold air temperature is 30 °C {86°F} or greater.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Air flow sensor:

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormal resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact

DTC:P011C	Intake air temperature sensor (air flow sensor built-in) - rationality	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Air flow sensor	Check whether the air flow sensor is loose/ disconnected.			Install the sensor.
2	Air flow sensor	Check whether a sensing area of the air flow sensor is contaminated, clogged or damaged.			Replace the sensor.
3	Air flow sensor	Check whether sensor resistance of the air flow sensor is proper.	Resistance (between ther- mistor terminals) -20°C {-4°F): 18.4 to 13.6 kΩ 20°C {68°F): 2.69 to 2.21 kΩ		Replace the sensor.
4	Air flow sensor	Check whether irregular contact has occurred in the air flow sensor connector.			Repair or replace the sensor har- ness. Replace the connector.
5	Air flow sensor Harness	Check whether the air flow sensor harness is disconnected or short-circuited.	Check continuity.		Repair or replace the sensor har- ness.
6	ECU	Check whether a failure or malfunction has occurred in the ECU internal sensor power supply.	Check continuity. Resistance value.		Replace the ECU.

DN02-150

FUEL CONTROL (J08E)

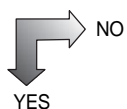
DTC:P011C

EN1610602F200049

DTC	P011C	Intake air temperature sensor (air flow sensor built-in) - rationality
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1. CHECK THE SENSOR.

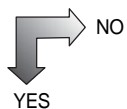
- (1) Check that the air flow sensor is normally installed.
- (2) Check the intake air temperature sensor (air flow sensor built-in) measurement portion for dirt and foreign matters.
- (3) Check the air intake systems such as the air cleaner for clogging and detachment.



Improper installation of the sensor.

2. CHECK INSTALLATION OF THE CONNECTOR.

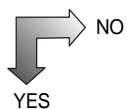
- (1) Check that the intake air temperature sensor (air flow sensor built-in) connector is properly installed.



Improper connection of connector

3. CHECK WHETHER THE SENSOR IS IN NORMAL CONDITION.

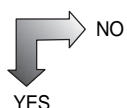
- (1) Troubleshoot the P0112 and P0113 and check whether the intake air temperature sensor (air flow sensor built-in) is in normal condition.



Fault in intake air temperature sensor (air flow sensor built-in)

4. CHECK WHETHER OTHER ARE IN NORMAL CONDITION.

- (1) If the GND terminal is shared in use, disconnect all sensor connectors that use the GND terminal and check whether condition is normal.



Fault in engine ECU

Fault in other sensors



FUEL CONTROL (J08E)

DN02-151



DN02-152

FUEL CONTROL (J08E)

DTC:P0122 (Check sheet)

EN1610602F200050

DTC:P0122

Intake throttle valve-opening sensor 1 out of range (Out of range low)

1. Technical description

- The diesel throttle controls valves steplessly to control boost pressure and intake air volume.
- Inside the diesel throttle, a sensor designed to detect a travel of the valve consistently monitors a measurement reading and an actual opening.

2. DTC set condition**(1) Check conditions**

- A receiving process continues for 5 seconds or longer at battery voltage of 10 V to 16 V and at engine speed of 500 r/min or higher.

(2) Judgment criteria

- Output of the sensor remains at 0.2 V (5 degrees) or less for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Fault in harness and/or connector
- Malfunction of sensor body
- Malfunction of ECU

DTC:P0122	Intake throttle valve-opening sensor 1 out of range (Out of range low)	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check the connector and/or harness between the ECU and the sensor.			Repair the harness.
2	Position sensor	Check the sensor harness.			Replace the sensor.

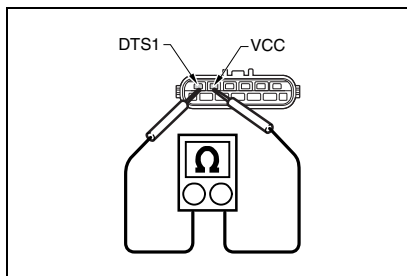
DN02-154

FUEL CONTROL (J08E)

DTC:P0122

EN1610602F200051

DTC	P0122	Intake throttle valve position sensor 1 - out of range (Out of range low)
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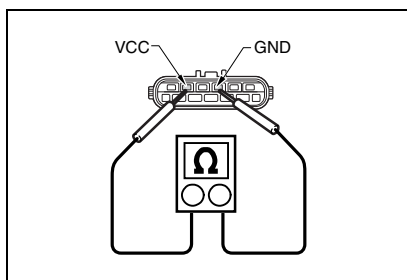
**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the connector of the intake throttle valve position sensor 1 connector.
- (3) Check continuity between the terminals VCC and DTS1 of the intake throttle valve position sensor 1 connector.

HINT

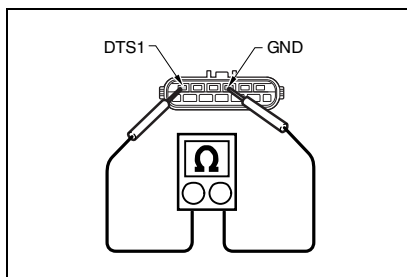
If it is difficult to check only the sensor, proceed to Step 4.

Standard value: Approximately 180 Ω



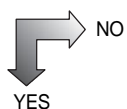
- (4) Check continuity between the terminals VCC and GND of the intake throttle valve position sensor 1 connector.

Standard value: Approximately 3 k Ω

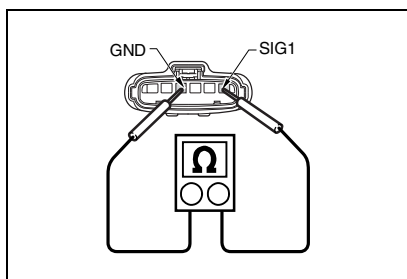


- (5) Check continuity between the terminals DTS1 and GND of the intake throttle valve position sensor 1 connector.

Standard value: Approximately 3 k Ω

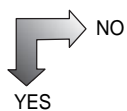


Faulty in intake throttle valve position sensor 1

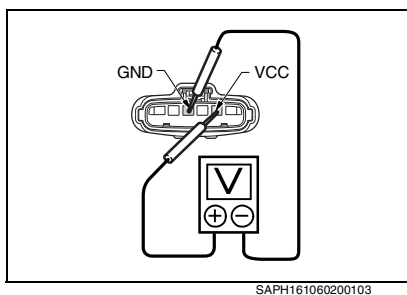
**2. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Measure resistance between the terminals SIG1 and GND of the intake throttle valve position sensor 1 connector (engine sub harness side).

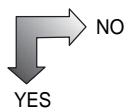
Standard value: Approximately 25-35 k Ω



- Faulty in harness
- Irregular contact of connectors

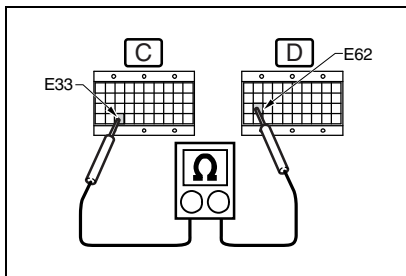
**3. MEASURING VOLTAGE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "ON" position.
(2) Measure voltage between the terminals VCC and GND of the intake throttle valve position sensor 1 connector (engine sub harness side).
Standard value: 4.5-5.5 V



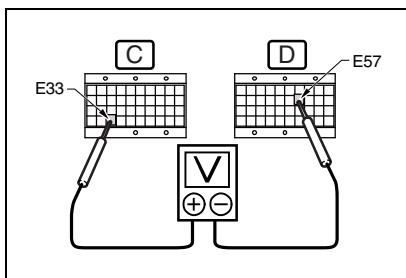
- Faulty in harness
- Irregular contact of connectors

Bad contact of connectors

**4. MEASURING RESISTANCE BETWEEN TERMINALS**

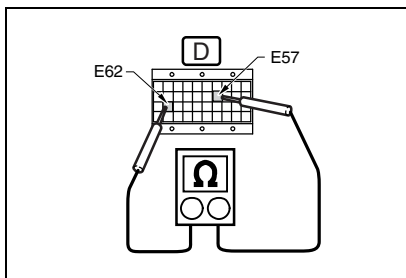
- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness on the engine side.
- (3) Disconnect the connector on the engine ECU side.
- (4) Measure resistance between the terminals AVC2 (E33) and DTS1 (E62).

Standard value: 2 Ω or more



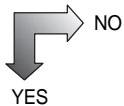
- (5) Measure resistance between the terminals AVC2 (E33) and AGD3 (E57).

Standard value: Approximately 3 kΩ

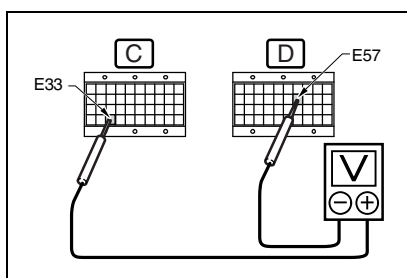


- (6) Measure resistance between the terminals DTS1 (E62) and AGD3 (E57).

Standard value: ∞ Ω



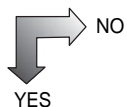
- Faulty in harness
- Fault in intake throttle valve position sensor 1



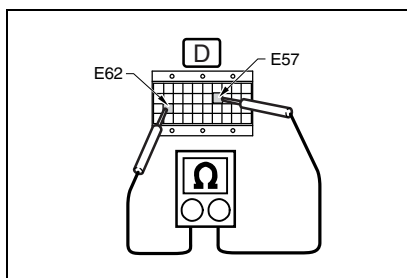
SAPH161060200107

5. MEASURING VOLTAGE BETWEEN TERMINALS

- (1) Connect the connectors on the engine ECU side.
- (2) Disconnect the connector on the engine sub harness side.
- (3) Set the starter switch to "ON" position.
- (4) Measure voltage between the terminals AVC2 (E33) and AGD3 (E57).

Standard value: 4.5-5.5 V

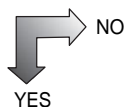
- Fault in engine ECU
- Faulty ECU connector



SAPH161060200108

6. MEASURING RESISTANCE BETWEEN TERMINALS

- (1) Measure resistance between the terminals DTS1 (E62) and AGD3 (E57).

Standard value: Approximately 25-35 kΩ

- Fault in engine ECU
- Faulty ECU connector

Bad contact of connectors

DN02-158

FUEL CONTROL (J08E)

DTC:P0123 (Check sheet)

EN1610602F200052

DTC:P0123

Intake throttle valve position sensor 1 - out of range (Out of range high)

1. Technical description

- The diesel throttle controls valves steplessly to control boost pressure and intake air volume.
- Inside the diesel throttle, a sensor designed to detect a travel of the valve consistently monitors a measurement reading and an actual opening.

2. DTC set condition**(1) Check conditions**

- A receiving process continues for 5 seconds or longer at battery voltage of 10 V to 16 V and at engine speed of 500 r/min or higher.

(2) Judgment criteria

- Output of the sensor remains at 4.8 V (120 degrees) or less for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Fault in harness and/or connector
- Malfunction of sensor
- Malfunction of ECU

DTC:P0123	Intake throttle valve position sensor 1 - out of range (Out of range high)	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check the connector and/or harness between the ECU and the sensor.			Repair the harness.
2	Position sensor	Check the sensor harness.			Replace the sensor.

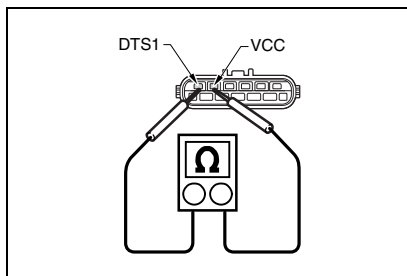
DN02-160

FUEL CONTROL (J08E)

DTC:P0123

EN1610602F200053

DTC	P0123	Intake throttle valve position sensor 1 - out of range (Out of range high)
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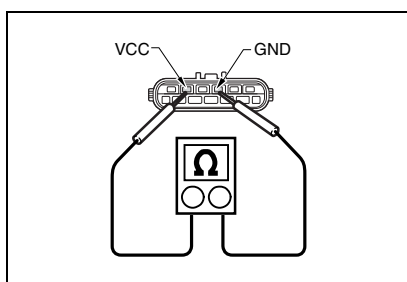
**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch "LOCK" position.
- (2) Disconnect the connector of the intake throttle valve position sensor 1.
- (3) Measure resistance between the terminals VCC and DTS1 of the intake throttle valve position sensor 1 connector.

HINT

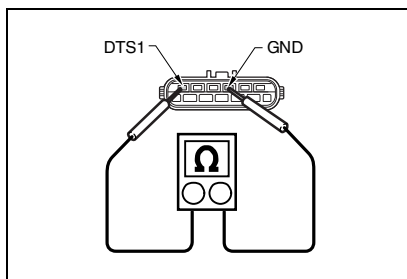
If it is difficult to check only the sensor, proceed to Step 5.

Standard value: Approximately 180 Ω



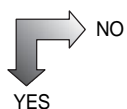
- (4) Check continuity between the terminals VCC and GND of the intake throttle valve position sensor 1 connector.

Standard value: Approximately 3 k Ω

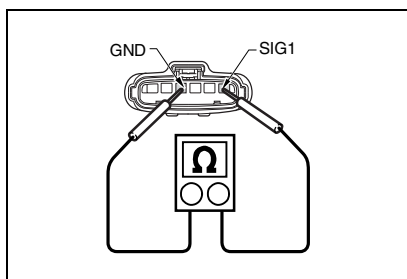


- (5) Check continuity between the terminals DTS1 and GND of the intake throttle valve position sensor 1 connector.

Standard value: Approximately 3 k Ω



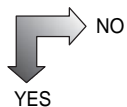
Faulty in intake throttle valve position sensor 1



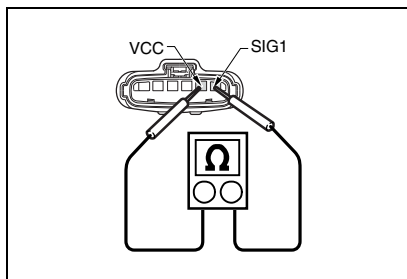
2. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS

- (1) Measure resistance between the terminals SIG1 and GND of the intake throttle valve position sensor 1 connector (engine sub harness side).

Standard value: Approximately 25-35 k Ω



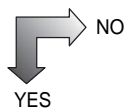
- Faulty in harness
- Irregular contact of connectors



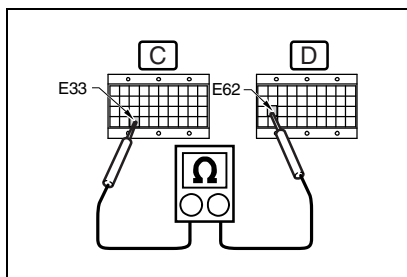
3. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS

- (1) Measure resistance between the terminals VCC and SIG1 of the intake throttle valve position sensor 1 connector (engine sub harness side).

Standard value: $\infty \Omega$



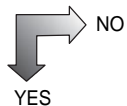
Faulty in harness



4. MEASURING RESISTANCE BETWEEN TERMINALS

- Connect the signal check harness on the engine side.
- Disconnect the connector on the engine sub harness side.
- Measure resistance between the terminals AVC2 (E33) and DTS1 (E62).

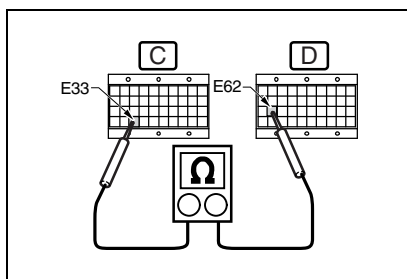
Standard value: $\infty \Omega$



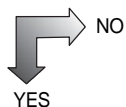
Faulty in engine ECU

DN02-162

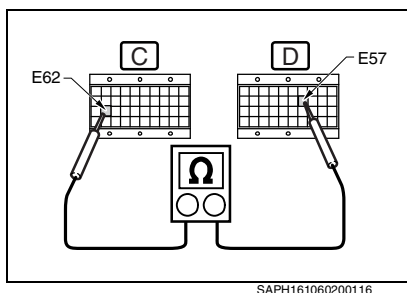
FUEL CONTROL (J08E)

**5. MEASURING RESISTANCE BETWEEN TERMINALS**

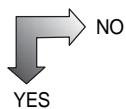
- (1) Connect the intake throttle valve position sensor 1.
- (2) Connect the signal check harness on the engine side.
- (3) Disconnect the connector on the engine ECU side.
- (4) Measure resistance between the terminals AVC2 (E33) and DTS1 (E62).

Standard value: 2 Ω or more

- Faulty in harness
- Faulty intake throttle valve position sensor 1

**6. MEASURING RESISTANCE BETWEEN TERMINALS**

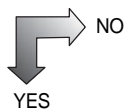
- (1) Measure resistance between the terminals AGD3 (E57) and DTS1 (E62).

Standard value: Approximately 3 k Ω 

- Faulty in harness
- Irregular contact of connectors

7. CHECK A MALFUNCTION CODE.

- (1) Connect the connector on the engine ECU side.
- (2) Set the starter switch "ON" position.
- (3) Make sure that the malfunction code P0122 is present.



Fault in engine ECU

Clear and recheck the DTC.



FUEL CONTROL (J08E)

DN02-163



DN02-164

FUEL CONTROL (J08E)

DTC:P0128 (Check sheet)

EN1610602F200054

DTC:P0128

Thermostat - The coolant temperature does not reach a warmed-up temperature

1. Technical description

- The coolant temperature sensor detects a failure or malfunction by comparing an actual coolant temperature with a forecasted coolant temperature.

2. DTC set condition**(1) Check conditions**

The conditions described below are met (both).

1. The starter switch is ON.
2. The conditions described below are met (either).
 - (1) Battery voltage is in the 10 - 16 V range.
 - (2) The engine has stalled or runs at 500 r/min or higher for continuous 5 seconds or longer.
 - (3) Engine speed falls within a range from 1,000 to 1,750 r/min and a fuel injection rate falls within a range from 0 to 40 mm²/st.
 - (4) A target EGR valve opening is 30% or greater.
3. No failures or malfunctions are found in the coolant temperature sensor.

(2) Judgment criteria

- Observe a coolant temperature sensor reading to detect excessively high temperature. (71°C {159.8°F} or higher for continuous 5 seconds or longer. 2 drive cycles.)

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Failure in thermostat:

- Inclusion of foreign matters in the thermostat
- Damaged spring in the thermostat
- Remove the thermostat and check that the thermostat remains closed at ambient temperature and the valve does not open in hot water of 82°C {179.6°F} or hotter.

Coolant temperature sensor: Check the coolant temperature sensor.

DTC:P0128	Thermostat - The coolant temperature does not reach a warmed-up temperature	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Coolant temperature sensor	Disconnection, play, looseness, contamination, clogging or damage	Must be free from the items at left.		Connect correctly or replace if damaged.
2	Coolant temperature sensor	Check whether the resistance of the sensor is proper.	Resistance value 20°C {68°F}: 2.59 to 2.32 kΩ 80°C {176°F}: 0.326 to 0.310 kΩ		Remove contaminants. Replace if damaged.
3	Coolant temperature sensor	Contamination, clogging or damage in the sensing area	Must be free from the items at left.		Remove contaminants. Replace if damaged.
4	Thermostat	Inclusion of foreign matters and spring damage	Must be free from the items at left.		Remove all foreign matters. Replace if damaged.
5	Thermostat	Check valve opening temperature.	Submerge in hot water of 95°C {203°F} and check whether a 13 mm or greater lift is reached.		Proceed to Step 6.
6	Thermostat	Check valve opening time.	After taking out from hot water, submerge in water and check that the valve closes within 5 minutes.		Replace if no motions are seen in Steps 5 and 6.

DN02-166

FUEL CONTROL (J08E)

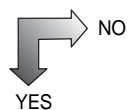
DTC:P0128

EN1610602F200055

DTC	P0128	Thermostat - The coolant temperature does not reach a warmed-up temperature
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1. INSPECT THE THERMOSTAT

- (1) Remove the thermostat.
- (2) Check that the thermostat remains closed at ambient temperature.
- (3) Submerge in hot water not exceeding 80-84 °C {176-183 °F} and check that a valve does not open.



Faulty thermostat

Check the coolant temperature sensor for malfunctions or troubles.



FUEL CONTROL (J08E)

DN02-167



DN02-168

FUEL CONTROL (J08E)

DTC:P0182 (Check sheet)

EN1610602F200056

DTC:P0182

Fuel temperature sensor Low

1. Technical description

- The fuel temperature sensor consistently measures fuel temperature.
 - The fuel temperature sensor is installed to the supply pump.
- <Description of malfunction>
- Temperature cannot be correctly sensed.
Sensor malfunction or harness GND short-circuit is likely to have occurred.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Starter in inactive status
- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- Output of the fuel temperature sensor remains at 0.1 V or less for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Fuel temperature sensor: Irregular contact (disconnection, poor fit or wet of connector)
Supply pump: Abnormal resistance of sensor
Engine harness: Harness disconnection or short-circuit

DTC:P0182		Fuel temperature sensor Low			Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Fuel temperature sensor	Check whether the fuel temperature sensor connector is loose/disconnected or poorly fit.	Secure fitting		Proceed to Step 2.	Connect
2	Fuel temperature sensor	Check that resistance of the fuel temperature sensor (parts side) is proper. (The resistance may vary depending on temperature.) (If it is difficult to check, go to Step 4.)	Check resistance value. 2.32 to 2.59k Ω (20°C {68°F})		Proceed to Step 3.	Replace the supply pump.
3	Fuel temperature sensor	Check that the fuel temperature sensor harness and harness connector are in normal condition. (Voltage, irregular contact, non-continuity, disconnection, short-circuit or the like)	Check voltage. 4.5 to 5.5V Check the harness and/or connector.		Repair or replace the harness and/or connector.	Proceed to Step 5.
4	Fuel temperature sensor	Check that resistance of the fuel temperature sensor (parts side) is proper. (The resistance may vary depending on temperature.) * Use a signal check harness.	Check resistance value. 2.32 to 2.59k Ω (20°C {68°F})		Proceed to Step 5.	Replace the supply pump.
5	Fuel temperature sensor	Check that the fuel temperature sensor harness and harness connector are in normal condition. (Voltage, irregular contact, non-continuity, disconnection, short-circuit or the like) * Use a signal check harness.	Check voltage. 4.5 to 5.5 V Check the harness and/or connector.		Repair or replace the harness and/or connector.	Replace the ECU.

DTC:P0183 (Check sheet)

EN1610602F200057

DTC:P0183

Fuel temperature sensor High

1. Technical description

- The fuel temperature sensor consistently measures fuel temperature.
 - The fuel temperature sensor is installed to the supply pump.
- <Description of malfunction>
- Temperature cannot be correctly sensed.
Sensor malfunction, harness disconnection or +B short-circuit is likely to have occurred.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Starter in inactive status
- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- Output of the fuel temperature sensor remains at 4.85 V or greater for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Fuel temperature sensor: Irregular contact (disconnection, poor fit or wet of connector)
Supply pump: Abnormal resistance of sensor
Engine harness: Harness disconnection or short-circuit

FUEL CONTROL (J08E)

DN02-171

DTC:P0183		Fuel temperature sensor High			Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Fuel temperature sensor	Check whether the fuel temperature sensor connector is loose/disconnected or poorly fit.	Secure fitting		Proceed to Step 2.	Connect
2	Fuel temperature sensor	Check that resistance of the fuel temperature sensor (parts side) is proper. (The resistance may vary depending on temperature.) (If it is difficult to check, go to Step 4.)	Check resistance value. 2.32 to 2.594k Ω (20°C {68°F})		Proceed to Step 3.	Replace the supply pump.
3	Fuel temperature sensor	Check that the fuel temperature sensor harness and harness connector are in normal condition. (Voltage, irregular contact, non-continuity, disconnection, short-circuit or the like)	Check voltage. 4.5 to 5.5V Check the harness and/or connector.		Repair or replace the harness and/or connector.	Proceed to Step 5.
4	Fuel temperature sensor	Check that resistance of the fuel temperature sensor (parts side) is proper. (The resistance may vary depending on temperature.) * Use a signal check harness.	Check resistance value. 2.32 to 2.59k Ω (20°C {68°F})		Proceed to Step 5.	Replace the supply pump.
5	Fuel temperature sensor	Check that the fuel temperature sensor harness and harness connector are in normal condition. (Voltage, irregular contact, non-continuity, disconnection, short-circuit or the like) * Use a signal check harness.	Check voltage. 4.5 to 5.5 V Check the harness and/or connector.		Repair or replace the harness and/or connector.	Replace the ECU.

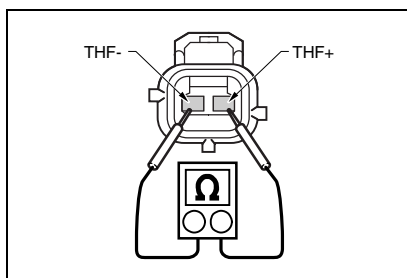
DN02-172

FUEL CONTROL (J08E)

DTC:P0182/P0183

EN1610602F200058

DTC	P0182	Fuel temperature sensor Low
DTC	P0183	Fuel temperature sensor High

**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the fuel temperature sensor connector.
- (3) Measure resistance between the terminals THF+ and THF- of the fuel temperature sensor connector.

HINT

If it is difficult to check only the sensor, proceed to Step 3.

Standard:

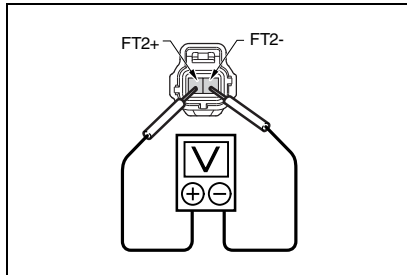
Temperature °C {°F}	Resistance (kΩ)
-20 {-4}	13.84 - 16.33
20 {68}	2.32 - 2.59
80 {176}	0.310 - 0.326
110 {230}	0.1399 - 0.1435



NO

Fault in fuel temperature sensor

YES

**2. MEASURING VOLTAGE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "ON" position.
- (2) Measure voltage between the terminals FT2+ and FT2- of the fuel temperature sensor connector (engine sub harness side).

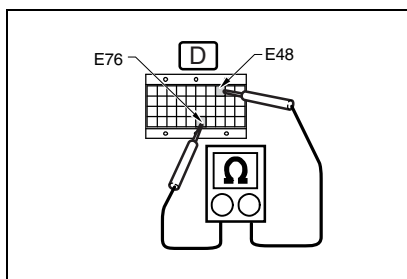
Standard: 4.5-5.5 V

NO

Proceed to 3.

YES

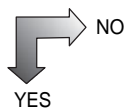
Bad contact of connectors

**3. MEASURING RESISTANCE BETWEEN TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness on the engine side.
- (3) Disconnect the connector on the engine ECU side.
- (4) Set the starter switch to "ON" position.
- (5) Measure resistance between the terminals THF+ (E48) and AGD2 (E76).

Standard:

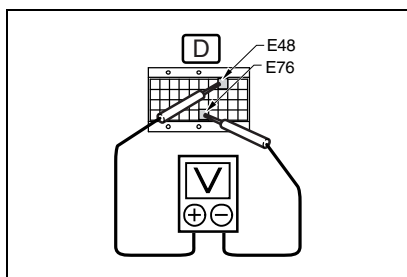
Temperature °C {°F}	Resistance (kΩ)
-20 {-4}	13.84 - 16.33
20 {68}	2.32 - 2.59
80 {176}	0.310 - 0.326
110 {230}	0.1399 - 0.1435



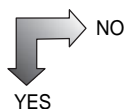
NO

- Fault in fuel temperature sensor
- Faulty in harness

YES

**4. MEASURING VOLTAGE BETWEEN TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the connector on the engine ECU side.
- (3) Disconnect the connector on the engine sub harness side.
- (4) Set the starter switch to "ON" position.
- (5) Measure voltage between the terminals THF+ (E48) and AGD2 (E76).

Standard: 4.5-5.5 V

NO

- Fault in engine ECU
- Faulty ECU connector

YES

Bad connect of connectors

DN02-174

FUEL CONTROL (J08E)

DTC:P0192 (Check sheet)

EN1610602F200059

DTC:P0192

Fuel rail pressure sensor (main) - out of range (Out of range low)

1. Technical description

- The common rail pressure sensor consistently measures common rail pressure.

<Description of malfunction>

- Common rail pressure cannot be correctly sensed.
Sensor malfunction or harness GND short-circuit is likely to have occurred.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- Starter is inactive.

(2) Judgment criteria

- Output of the common rail pressure sensor (main) remains at 0.64 V (-15 MPa) or lower for 0.2 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Common rail pressure sensor (main):

- Irregular contact (disconnection or poor fit of connector)
- Abnormal resistance of sensor

Engine harness: Harness or short-circuit**Engine ECU:** Malfunction of ECU

DTC:P0192	Fuel rail pressure sensor (main) - out of range (Out of range low)	Inspection Procedure
------------------	---	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Battery	Check the battery for degradation/deterioration and/or malfunction.	Battery voltage 10 to 16 V		Proceed to No. 2.	Replace the battery.
2	Common rail pressure sensor	Check whether the common rail pressure connector is loose/disconnected.	Connection of connector		Proceed to No. 3.	Connect the connector.
3	Common rail pressure sensor	Check whether the common rail pressure sensor terminals and harness terminals are contaminated, clogged, damaged or worn.	Condition of terminals		Proceed to No. 4.	Remove all contaminants and clogging. Replace if damaged.
4	Common rail pressure sensor	<ul style="list-style-type: none"> Check resistance between the sensor power supply terminal and the GND. Check resistance between the sensor signal terminal and the power supply. 	Check resistance PCR-PCR+ 1.05-3.55 k Ω PCR-PCR- 6.7-18.7 k Ω		Proceed to No. 5.	Replace the rail assembly.
5	Harness	<ul style="list-style-type: none"> Check that there is no continuity between the sensor power supply terminal of the engine harness connector and the ECU GND terminal. Check that there is no continuity between the sensor signal terminal of the engine harness connector and the ECU GND terminal. 	Check resistance. $\infty\Omega$		Proceed to No. 6.	Repair or replace the harness.
6	Harness	<ul style="list-style-type: none"> Check that there is no continuity between the sensor power supply terminal of the signal check harness and the ECU GND terminal. Check that there is no continuity between the sensor signal terminal of the signal check harness and the ECU GND terminal. 	Check resistance. $\infty\Omega$		Proceed to No. 7.	Repair or replace the harness.
7	Harness	Check resistance between the sensor power supply line and (engine side) the sensor ground line (engine side) of the signal check harness.	Check resistance. 2 Ω or more		Proceed to No. 8.	Repair or replace the harness.
8	Harness	Check resistance between the sensor signal line and (engine side) the sensor ground line (engine side) of the signal check harness.	Check resistance. 2 Ω or more		Proceed to No. 9.	Repair or replace the harness.

DN02-176

FUEL CONTROL (J08E)

No	Parts	Check contents	Judge	Check (Pass/ Fail)	If OK	If fail
9	ECU	Check resistance between the sensor signal terminal (ECU side) and the sensor power supply (ECU side) of the signal check harness. * Use a signal check harness.	Check resistance. 200 to 250 k Ω		Proceed to No. 10.	Replace the ECU con- nector and/ or ECU.
10	ECU	Check whether common rail sensor supply voltage is proper.	Check voltage. 4.5 to 5.5 V Check the har- ness and/or con- nector.		Replace the com- mon rail assem- bly.	Replace the ECU con- nector and/ or ECU.



FUEL CONTROL (J08E)

DN02-177



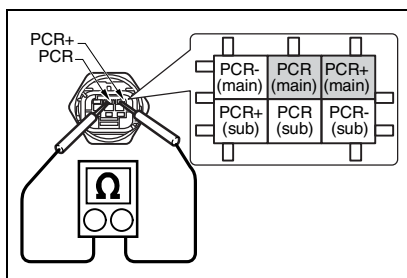
DN02-178

FUEL CONTROL (J08E)

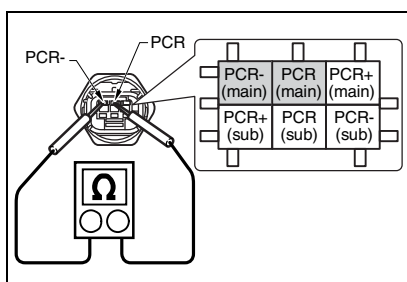
DTC:P0192

EN1610602F200060

DTC	P0192	Fuel rail pressure sensor (main) - out of range (Out of range low)
-----	-------	--

**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the common rail pressure sensor connector.
- (3) Check continuity between the terminals PCR+ and PCR of the common rail pressure sensor (main) connector.

Standard value: 1.05-3.55 k Ω 

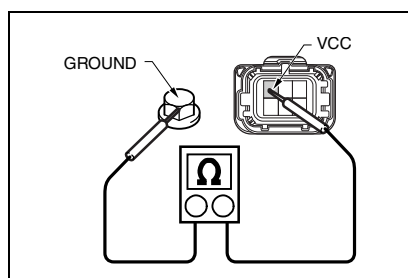
- (4) Check continuity between the terminals PCR- and PCR- of the common rail pressure sensor (main) connector.

Standard value: 6.7-18.7 k Ω

YES

NO

Fault in common rail pressure sensor

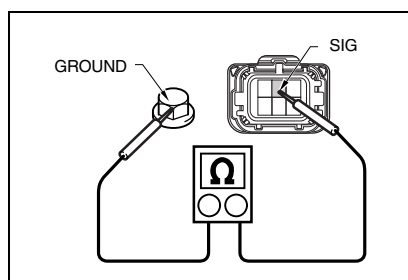
**2. CHECK THE CONTINUITY OF HARNESS.**

- (1) Disconnect the engine ECU connector.
- (2) Check continuity between the terminals ECU GND and VCC of the common rail pressure sensor (main) connector on the engine sub harness side.

Standard value: $\infty \Omega$

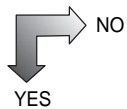
HINT

If it is difficult to check only the sensor, proceed to Step 3.



- (3) Check continuity between the terminals ECU GND and SIG of the common rail pressure sensor (main) connector on the harness side.

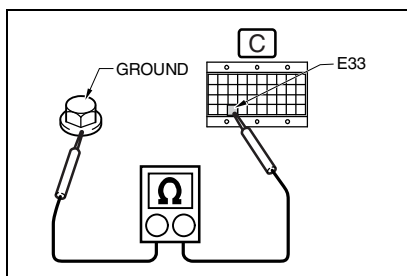
Standard value: $\infty \Omega$



NO

Faulty in harness

YES

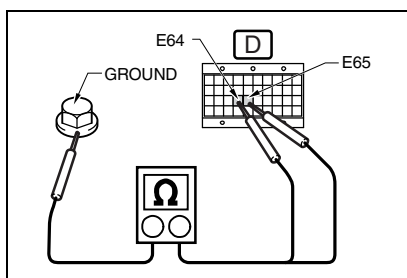


SAPH161060200125

3. MEASURING RESISTANCE BETWEEN TERMINALS

- (1) Measure resistance between the terminals AVC2 (E33) and ECU GND.

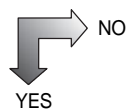
Standard value: $\infty \Omega$



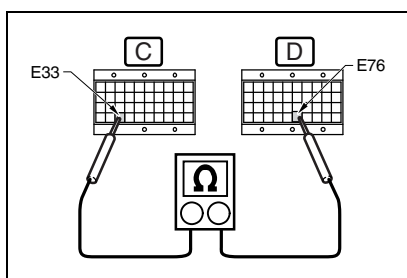
SAPH161060200126

- (2) Measure resistance between the terminals PCR3 (E64), PCR4 (E65) and ECU GND.

Standard value: $\infty \Omega$



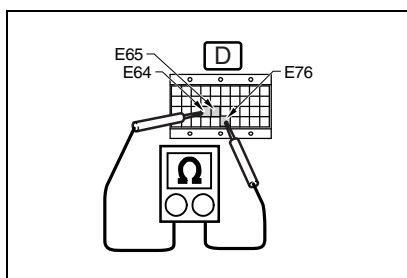
Faulty in harness



4. MEASURING RESISTANCE BETWEEN TERMINALS

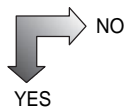
- (1) Connect the signal check harness on the engine side.
- (2) Disconnect the connector on the engine ECU side.
- (3) Measure resistance between the terminals AVC2 (E33) and AGD2 (E76).

Standard value: 2 Ω or more

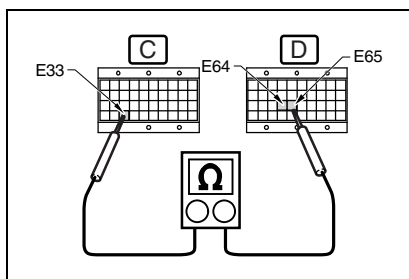


- (4) Measure resistance between the terminals PCR3 (E64), PCR4 (E65) and AGD2 (E76).

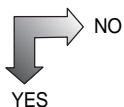
Standard value: 2 Ω or more



Faulty common rail pressure sensor

**5. MEASURING RESISTANCE BETWEEN TERMINALS**

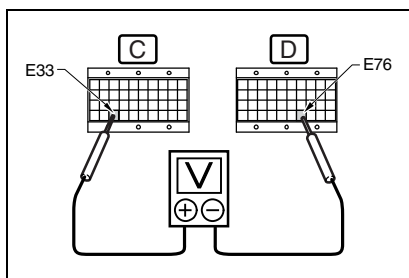
- (1) Also connect the signal check harness on the engine ECU side.
- (2) Measure resistance between the terminals AVC2 (E33) and PCR4 (E65); AVC2 (E33) and PCR3 (E64).

Standard value: 200-250 k Ω 

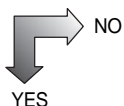
NO

Fault in engine ECU (ECU connector)

YES

**6. MEASURING VOLTAGE BETWEEN TERMINALS**

- (1) Set the starter switch to "ON" position.
- (2) Measure voltage between the terminals AVC2 (E33) and AGD2 (E76).

Standard value: 4.5-5.5 V

NO

Fault in engine ECU (ECU connector)

YES

Replace the engine ECU



DN02-184

FUEL CONTROL (J08E)

DTC:P0193 (Check sheet)

EN1610602F200061

DTC:P0193

Fuel rail pressure sensor (main) - out of range (Out of range high)

1. Technical description

- The common rail pressure sensor consistently measures common rail pressure.
<Description of malfunction>
- Common rail pressure cannot be correctly sensed.
Sensor malfunction, harness disconnection or +B short-circuit is likely to have occurred.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- Starter is inactive status

(2) Judgment criteria

- Output of the common rail pressure sensor (main) remains at 4.78 V (281 MPa) or higher for 0.2 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Common rail pressure sensor(main):

- Irregular contact (disconnection or poor fit of connector)
- Abnormal resistance of sensor

Engine harness: Harness disconnection or short-circuit**Engine ECU:** Malfunction of ECU

DTC:P0193	Fuel rail pressure sensor (main) - out of range (Out of range high)	Inspection Procedure
------------------	--	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Battery	Check the battery for degradation/deterioration and/or malfunction.	Battery voltage 10 to 16 V		Proceed to No. 2.	Replace the battery.
2	Common rail pressure sensor	Check whether the common rail pressure sensor connector is loose/disconnected.	Connection of connector		Proceed to No. 3.	Connect the connector.
3	Common rail pressure sensor	Check whether the common rail pressure sensor terminals and harness terminals are contaminated, clogged, damaged or worn.	Condition of terminals		Proceed to No. 4.	Remove all contaminants and clogging. Replace if damaged.
4	Fuel tank	Check whether the breather path is not blocked or crushed.	Appearance check		Proceed to No. 5.	Remove all contaminants and clogging. Replace if damaged.
5	Fuel path	Check for clogging, crush or fuel leak.	Appearance check		Proceed to No. 6.	Remove all contaminants and clogging. Replace if damaged.
6	Fuel filter	Check for clogging, contamination or crush	Appearance check		Proceed to No. 7.	Replace the filter.
7	SCV	Check whether a target rail pressure is followed.	Use HinoDX to check.		Proceed to No. 8.	Replacement
8	Common rail pressure sensor	<ul style="list-style-type: none"> Check resistance between the sensor power supply terminal and the GND terminal. Check resistance between the sensor signal terminal and the power supply terminal. 	Check resistance value.		Proceed to No. 9.	Replace the common rail assembly.
9	Connector	<ul style="list-style-type: none"> Check voltage of the sensor power supply terminal and GND terminal of the engine harness connector. 	Check voltage. 4.5 to 5.5 V Check the harness and/or connector.		connect the connector	Proceed to No. 10.
10	Harness	Check resistance between the sensor power supply line and (engine side) the sensor ground line (engine side) of the signal check harness.	Check resistance 2 Ω or more		Proceed to No. 11.	Repair or replace the harness.

DN02-186

FUEL CONTROL (J08E)

No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
11	Harness	Check resistance between the sensor signal line and (engine side) the sensor ground line (engine side) of the signal check harness.	Check resistance 2 Ω or more		Proceed to No. 12.	Repair or replace the harness.
12	ECU	Check resistance between the sensor signal terminal (ECU side) and the sensor power supply (ECU side) of the signal check harness. * Use a signal check harness.	Check resistance value. 200 to 250 k Ω		Proceed to No. 13.	Replace the ECU.
13	ECU	<ul style="list-style-type: none">Check voltage of the power supply (C-E33) and ground (D-E76).Check voltage of the signal (D-E64 or E65) and ground (D-E76). * Use a signal check harness.	Check voltage. 4.5 to 5.5 V Check the harness and/or connector.		Replace the rail assembly. Harness	Replace the ECU.



FUEL CONTROL (J08E)

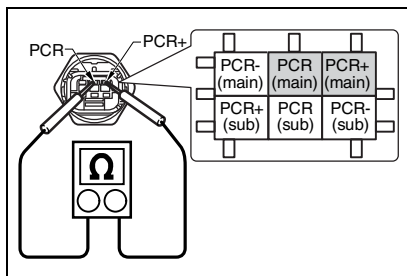
DN02-187



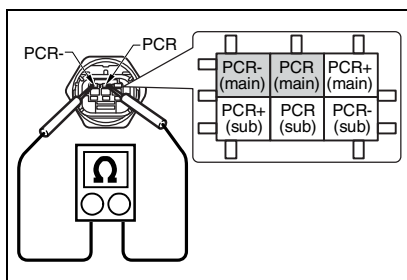
DTC:P0193

EN1610602F200062

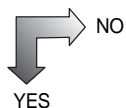
DTC	P0193	Fuel rail pressure sensor (main) - out of range (Out of range high)
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**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

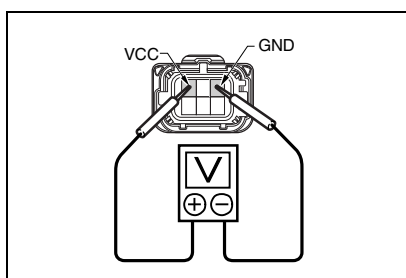
- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the common rail pressure sensor connector.
- (3) Check continuity between the terminals PCR+ and PCR of the common rail pressure sensor (main) connector.

Standard value: 1.05-3.55 k Ω 

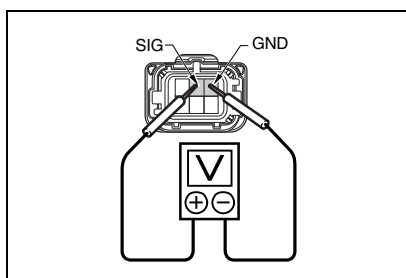
- (4) Check continuity between the terminals PCR- and PCR of the common rail pressure sensor (main) connector.

Standard value: 6.7-18.7 k Ω 

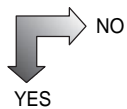
Fault in common rail pressure sensor

**2. MEASURING VOLTAGE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "ON" position.
- (2) Check voltage between the terminals VCC and GND of the common rail pressure sensor (main) connector on the engine sub harness side.

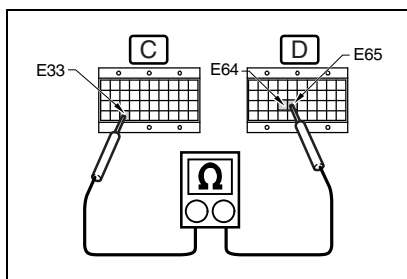
Standard value: 4.5V-5.5 V

- (3) Check voltage between the terminals SIG and GND of the common rail pressure sensor (main) connector on the engine sub harness side.

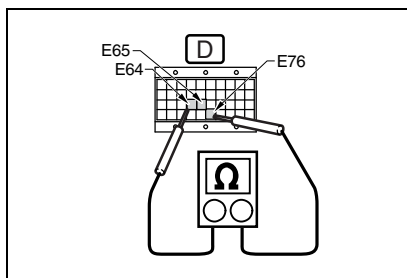
Standard value: 4.5V-5.5 V

Proceed to 3.

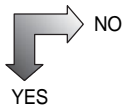
Improper connection of connector

**3. MEASURING RESISTANCE BETWEEN TERMINALS**

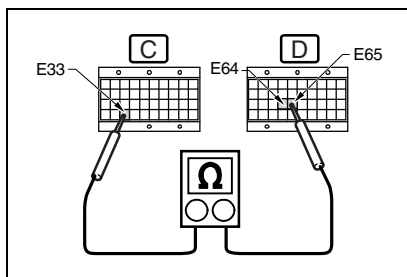
- (1) Connect the signal check harness on the engine side (blue).
- (2) Disconnect the connector on the ECU side.
- (3) Measure resistance between the terminals AVC2 (E33) and PCR4 (E65); AVC2 (E33) and PCR3 (E64).

Standard value: 1 k Ω or more

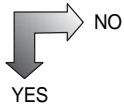
- (4) Measure resistance between the terminals AGD2 (E76) and PCR4 (E65); AGD2 (E76) and PCR3 (E64).

Standard value: 1 k Ω or more

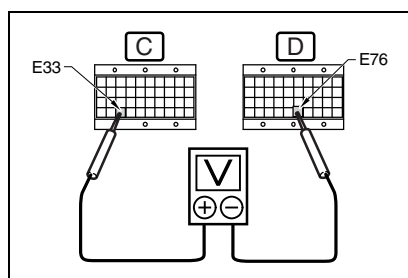
- Improper connection of connector
- Faulty in harness

**4. MEASURING RESISTANCE BETWEEN TERMINALS**

- (1) Disconnect the connector on the engine sub harness side.
- (2) Connect the signal check harness on the engine ECU side.
- (3) Measure resistance between the terminals AVC2 (E33) and PCR4 (E65); AVC2 (E33) and PCR3 (E64).

Standard value: 1 k Ω or more

Fault in engine ECU

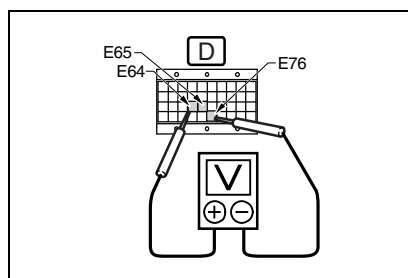


SAPH161060200138

5. MEASURING VOLTAGE BETWEEN TERMINALS

- (1) Set the starter switch to "ON" position.
- (2) Measure voltage between the terminals AVC2 (E33) and AGD2 (E76).

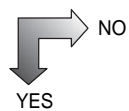
Standard value: 4.5-5.5 V



SAPH161060200139

- (3) Measure voltage between the terminals PCR3 (E64), PCR4 (E65) and AGD2 (E76).

Standard value: 4.5-5.5 V



- Fault in engine ECU
- Faulty engine ECU connector

Replace the engine ECU

DTC:P0200 (Check sheet)

EN1610602F200063

DTC:P0200

Fuel injector driver charge circuit (circuit high)

1. Technical description

- Excessively high voltage has been detected in the injector charge circuit.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- Fuel injector ; deactivated

(2) Judgment criteria

- Fuel injector driver charge circuit voltage > 105V
- Failure timer >= 0.384sec

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

ECU: Malfunction of ECU

FUEL CONTROL (J08E)

DN02-193

DTC:P0200	Fuel injector driver charge circuit (circuit high)	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	ECU	1. Turn the key OFF from ON and wait until the ECU main relay turns off. 2. Turn the key ON again. If the relay does not turn on, replace ECU.			ECU Replace

DN02-194

FUEL CONTROL (J08E)

DTC:P0605 (Check sheet)

EN1610602F200064

DTC:P0605

Flash ROM error

1. Technical description

- A failure has been detected in the ECU flash ROM.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.

(2) Judgment criteria

- Flash ROM check sum error
- Failure timer ≥ 96 msec

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

ECU: Malfunction of ECU

DTC:P0605	Flash ROM error	Inspection Procedure
------------------	-----------------	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	ECU	1. Turn the key OFF from ON and wait until the ECU main relay turns off. 2. Turn the key ON again. If the relay does not turn on, replace the ECU.			ECU Replace

DTC:P0606 (Check sheet)

EN1610602F200065

DTC:P0606

Control module processor

1. Technical description

- Malfunction has been detected in the ECU.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.

(2) Judgment criteria

- The monitor IC detects malfunction of the microcomputer inside the ECU.
- Failure timer $\geq 96\text{msec}$

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

ECU: Malfunction of ECU

FUEL CONTROL (J08E)

DN02-197

DTC:P0606	Control module processor	Inspection Procedure
------------------	--------------------------	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	ECU	1. Turn the key OFF from ON and wait until the ECU main relay turns off. 2. Turn the key ON again. If the relay does not turn on, replace ECU.			ECU Replace

DN02-198

FUEL CONTROL (J08E)

DTC:P0607 (Check sheet)

EN1610602F200066

DTC:P0607

Control module performance

1. Technical description

- Malfunction has been detected in the ECU.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.

(2) Judgment criteria

- Malfunction has been detected in the monitor IC inside the ECU.
- Failure timer \geq 96msec

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

ECU: Malfunction of ECU

FUEL CONTROL (J08E)

DN02-199

DTC:P0607	Control module performance	Inspection Procedure
------------------	----------------------------	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	ECU	1. Turn the key OFF from ON and wait until the ECU main relay turns off. 2. Turn the key ON again. If the relay does not turn on, replace ECU.			ECU Replace

DTC:P0611 (Check sheet)

EN1610602F200067

DTC:P0611

Fuel injector driver charge circuit - circuit (circuit low)

1. Technical description

- Excessively low voltage has been detected in the injector charge circuit.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- Fuel injector ; deactivated

(2) Judgment criteria

- Fuel injector driver charge circuit voltage
< 55V
- Failure timer >= 0.096sec

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

ECU: Malfunction of ECU

FUEL CONTROL (J08E)

DN02-201

DTC:P0611	Fuel injector driver charge circuit - circuit (circuit low)	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	ECU	1. Turn the key OFF from ON and wait until the ECU main relay turns off. 2. Turn the key ON again. If the relay does not turn on, replace ECU.			ECU Replace

DTC:P0200/P0605/P0606/P0607/P0611

EN1610602F200068

DTC	P0200	Fuel injector driver charge circuit - circuit (Circuit high)
DTC	P0605	Flash ROM error
DTC	P0606	Control Module Processor
DTC	P0607	Control Module Performance
DTC	P0611	Fuel injector driver charge circuit - circuit (Circuit low)

1. After the starter switch is positioned on the "LOCK" once, it should be turned to "ON" position again.
2. After erasing the DTC, check that the same code is displayed again.



NO

Fault in engine ECU

YES

Normal
(Temporary malfunction because of radio interference noise)



FUEL CONTROL (J08E)

DN02-203



DN02-204

FUEL CONTROL (J08E)

DTC:P0201 (Check sheet)

EN1610602F200069

DTC:P0201

Fuel injector - disconnection (#1cyl)

1. Technical description

- An injection rate is controlled to a valve opening duration of the injector.
- The valve opening duration of the injector is adjusted by the solenoid valve.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
- Engine speed is higher than 0.
- The fuel injector driver charge circuit is active.
- No other DTCs are present.

(2) Judgment criteria

- The fuel injector driver circuit remains at 0 mA until it reaches a threshold.
(Approximately 4 seconds at 750r/min. This may vary depending on engine speed.)

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Fault in harness and/or connector
- Disconnected coil in the injector
- Malfunction of ECU

DTC:P0201	Fuel injector - disconnection (#1cyl)	Inspection Procedure
------------------	---------------------------------------	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check the connector and/or harness between the ECU and the sensor.			Repair the harness.
2	Injector	Check the internal coil in the injector for disconnection.			Replace the injector.
3	ECU	Check output from the ECU power supply and others.			Replace the ECU.

DN02-206

FUEL CONTROL (J08E)

DTC:P0202 (Check sheet)

EN1610602F200070

DTC:P0202

Fuel injector - disconnection (#2cyl)

1. Technical description

- An injection rate is controlled to a valve opening duration of the injector.
- The valve opening duration of the injector is adjusted by the solenoid valve.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
- Engine speed is higher than 0.
- The fuel injector driver charge circuit is active.
- No other DTCs are present.

(2) Judgment criteria

- The fuel injector driver circuit remains at 0 mA until it reaches a threshold.
(Approximately 4 seconds at 750r/min. This may vary depending on engine speed.)

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Fault in harness and/or connector
- Disconnected coil in the injector
- Malfunction of ECU

DTC:P0202	Fuel injector - disconnection (#2cyl)	Inspection Procedure
------------------	---------------------------------------	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check the connector and/or harness between the ECU and the sensor.			Repair the harness.
2	Injector	Check the internal coil in the injector for disconnection.			Replace the injector.
3	ECU	Check output from the ECU power supply and others.			Replace the ECU.

DN02-208

FUEL CONTROL (J08E)

DTC:P0203 (Check sheet)

EN1610602F200071

DTC:P0203

Fuel injector - disconnection (#3cyl)

1. Technical description

- An injection rate is controlled to a valve opening duration of the injector.
- The valve opening duration of the injector is adjusted by the solenoid valve.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
- Engine speed is higher than 0.
- The fuel injector driver charge circuit is active.
- No other DTCs are present.

(2) Judgment criteria

- The fuel injector driver circuit remains at 0 mA until it reaches a threshold.
(Approximately 4 seconds at 750r/min. This may vary depending on engine speed.)

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Fault in harness and/or connector
- Disconnected coil in the injector
- Malfunction of ECU

FUEL CONTROL (J08E)

DN02-209

DTC:P0203	Fuel injector - disconnection (#3cyl)	Inspection Procedure
------------------	---------------------------------------	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check the connector and/or harness between the ECU and the sensor.			Repair the harness.
2	Injector	Check the internal coil in the injector for disconnection.			Replace the injector.
3	ECU	Check output from the ECU power supply and others.			Replace the ECU.

DN02-210

FUEL CONTROL (J08E)

DTC:P0204 (Check sheet)

EN1610602F200072

DTC:P0204

Fuel injector - disconnection (#4cyl)

1. Technical description

- An injection rate is controlled to a valve opening duration of the injector.
- The valve opening duration of the injector is adjusted by the solenoid valve.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
- Engine speed is higher than 0.
- The fuel injector driver charge circuit is active.
- No other DTCs are present.

(2) Judgment criteria

- The fuel injector driver circuit remains at 0 mA until it reaches a threshold.
(Approximately 4 seconds at 750r/min. This may vary depending on engine speed.)

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Fault in harness and/or connector
- Disconnected coil in the injector
- Malfunction of ECU

FUEL CONTROL (J08E)

DN02-211

DTC:P0204	Fuel injector - disconnection (#4cyl)	Inspection Procedure
------------------	---------------------------------------	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check the connector and/or harness between the ECU and the sensor.			Repair the harness.
2	Injector	Check the internal coil in the injector for disconnection.			Replace the injector.
3	ECU	Check output from the ECU power supply and others.			Replace the ECU.

DTC:P0205 (Check sheet)

EN1610602F200073

DTC:P0205

Fuel injector - disconnection (#5cyl)

1. Technical description

- An injection rate is controlled to a valve opening duration of the injector.
- The valve opening duration of the injector is adjusted by the solenoid valve.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
- Engine speed is higher than 0.
- The fuel injector driver charge circuit is active.
- No other DTCs are present.

(2) Judgment criteria

- The fuel injector driver circuit remains at 0 mA until it reaches a threshold.
(Approximately 4 seconds at 750r/min. This may vary depending on engine speed.)

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Fault in harness and/or connector
- Disconnected coil in the injector
- Malfunction of ECU

FUEL CONTROL (J08E)

DN02-213

DTC:P0205	Fuel injector - disconnection (#5cyl)	Inspection Procedure
------------------	---------------------------------------	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check the connector and/or harness between the ECU and the sensor.			Repair the harness.
2	Injector	Check the internal coil in the injector for disconnection.			Replace the injector.
3	ECU	Check output from the ECU power supply and others.			Replace the ECU.

DN02-214

FUEL CONTROL (J08E)

DTC:P0206 (Check sheet)

EN1610602F200074

DTC:P0206

Fuel injector - disconnection (#6cyl)

1. Technical description

- An injection rate is controlled to a valve opening duration of the injector.
- The valve opening duration of the injector is adjusted by the solenoid valve.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
- Engine speed is higher than 0.
- The fuel injector driver charge circuit is active.
- No other DTCs are present.

(2) Judgment criteria

- The fuel injector driver circuit remains at 0 mA until it reaches a threshold.
(Approximately 4 seconds at 750r/min. This may vary depending on engine speed.)

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Fault in harness and/or connector
- Disconnected coil in the injector
- Malfunction of ECU

FUEL CONTROL (J08E)

DN02-215

DTC:P0206	Fuel injector - disconnection (#6cyl)	Inspection Procedure
------------------	---------------------------------------	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check the connector and/or harness between the ECU and the sensor.			Repair the harness.
2	Injector	Check the internal coil in the injector for disconnection.			Replace the injector.
3	ECU	Check output from the ECU power supply and others.			Replace the ECU.

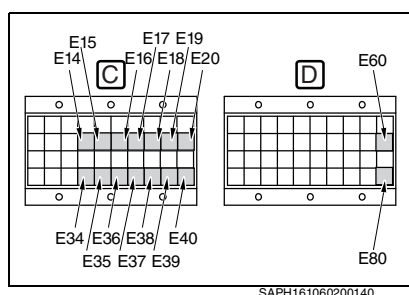
DN02-216

FUEL CONTROL (J08E)

DTC:P0201/P0202/P0203/P0204/P0205/P0206

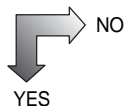
EN1610602F200075

DTC	P0201	Fuel injector - disconnection (#1cyl)
DTC	P0202	Fuel injector - disconnection (#2cyl)
DTC	P0203	Fuel injector - disconnection (#3cyl)
DTC	P0204	Fuel injector - disconnection (#4cyl)
DTC	P0205	Fuel injector - disconnection (#5cyl)
DTC	P0206	Fuel injector - disconnection (#6cyl)

**1. MEASURING RESISTANCE BETWEEN TERMINALS.**

- (1) Set the starter switch to "LOCK" and connect the signal check harness.
- (2) Disconnect the signal check harness connector on the engine ECU side.
- (3) Measure the resistance between the terminals.

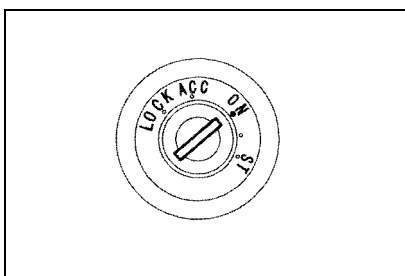
DTC NO.	Failure position (Breaking position)	Terminals to measure the resistance
P0201	#1 Injector	INJ1 (E15) ↔ IJ1+ (E14) INJ1 (E15) ↔ I1+S (E34) IJ01 (E35) ↔ IJ1+ (E14) IJ01 (E35) ↔ I1+S (E34)
P0202	#2 Injector	INJ3 (E16) ↔ IJ1+ (E14) INJ3 (E16) ↔ I1+S (E34) IJ03 (E36) ↔ IJ1+ (E14) IJ03 (E36) ↔ I1+S (E34)
P0203	#3 Injector	INJ5 (E17) ↔ IJ1+ (E14) INJ5 (E17) ↔ I1+S (E34) IJ05 (E37) ↔ IJ1+ (E14) IJ05 (E37) ↔ I1+S (E34)
P0204	#4 Injector	INJ2 (E19) ↔ IJ2+ (E18) INJ2 (E19) ↔ I2+S (E38) IJ02 (E39) ↔ IJ2+ (E18) IJ02 (E39) ↔ I2+S (E38)
P0205	#5 Injector	INJ6 (E60) ↔ IJ2+ (E18) INJ6 (E60) ↔ I2+S (E38) IJ06 (E80) ↔ IJ2+ (E18) IJ06 (E80) ↔ I2+S (E38)
P0206	#6 Injector	INJ4 (E20) ↔ IJ2+ (E18) INJ4 (E20) ↔ I2+S (E38) IJ04 (E40) ↔ IJ2+ (E18) IJ04 (E40) ↔ I2+S (E38)

Standard value: Less than 2 Ω

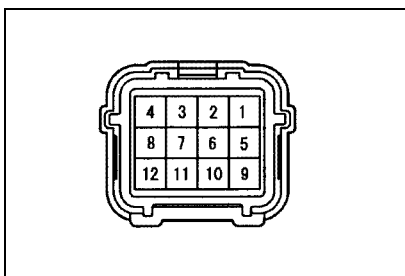
Proceed to (7)

FUEL CONTROL (J08E)

DN02-217



SAPH161060200141

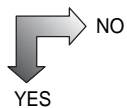


SAPH161060200142

- (4) This is ECU failure or defective contact of the connector. Restore all connectors and start the engine.
- (5) Erase the DTC. (Be sure to store freeze frame data.)
- (6) Check the current failure. If the same DTC is displayed, replace ECU. If there is no DTC, then the connector contact would have been defective. As long as no DTC is displayed, there is no problem.
- (7) Tilt the hood. Disconnect the injector connector that is located at the front side of the cam housing.

- (8) Measure the resistance between the pins of the injector connector (male) at the cam housing side.

DTC NO.	Terminals to measure the resistance
P0201	11 ↔ 12
P0202	3 ↔ 4
P0203	5 ↔ 6
P0204	7 ↔ 8
P0205	1 ↔ 2
P0206	9 ↔ 10

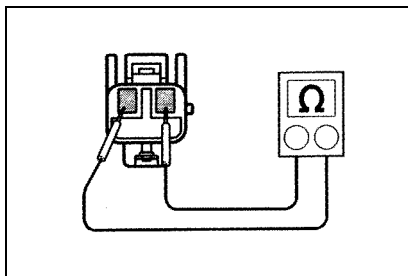
Standard value: Less than 2 Ω

Proceed to (9)

Harness disconnections (engine sub harness side)
(Check the harness between ECU and the injector connector.)

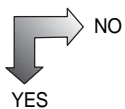
DN02-218

FUEL CONTROL (J08E)



SAPH161060200143

- (9) Dismount the head cover.
(10) Disconnect the injector connector (injector side) of the cylinder displayed by DTC. Measure the resistance between the pins.
Standard value: 0.37-0.57 Ω at 20°C {68°F}

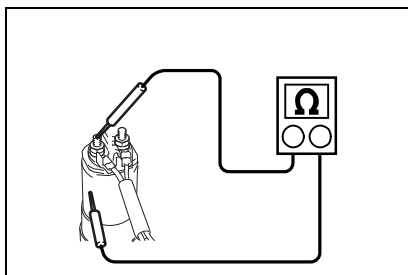


NO

Proceed to (11)

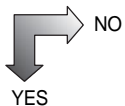
YES

Bad contact of the connector or the harness in the head cover
(Check the connector or the harness in the head cover.)



SAPH161060200144

- (11) Remove the injector terminal cap of the cylinder display by DTC.
Measure the insulation resistance between the terminal and injector body.
Standard value: More than 10 M Ω



NO

Injector coil disconnection (Replace the injector assembly.)

YES

Injection harness disconnections (Replace the injector harness.)



FUEL CONTROL (J08E)

DN02-219



DTC:P0217 (Check sheet)

EN1610602F200076

DTC:P0217

Engine coolant over temperature condition

1. Technical description

- Measure the engine coolant temperature with the coolant temperature sensor.

2. DTC set condition

(1) Check conditions

- The engine must not be stopped.

(2) Judgment criteria

P0217 (overheat) is established under the following condition.
The coolant temperature value of the coolant temperature sensor is above 115°C {239°F} C for 30 seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

1. Check for the relevant symptom by referring to the Workshop Manual, Engine Introduction, and Troubleshooting Overheating.
 - Faulty coolant-related component
 - Faulty cooling system
 - Faulty injection system
 - Faulty lubricating system
2. Malfunction of cooling fan, malfunction of fan clutch
3. Malfunction of coolant temperature sensor

DTC:P0217	Engine coolant over temperature condition	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Refer to the Workshop Manual, Engine Introduction, and Troubleshooting.				
2	Cooling fan	Appearance check	With or without damage to blades		Replace the cooling fan.
3	Fan clutch	Appearance check	With or without sil- icon oil leakage		Replace the fan clutch.
4	Coolant temperature sensor	Refer to the Workshop Manual.			

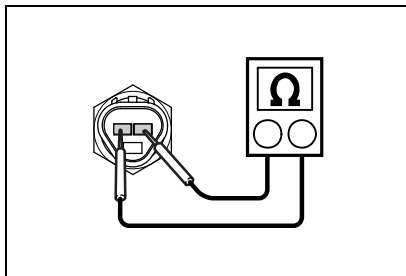
DN02-222

FUEL CONTROL (J08E)

DTC:P0217

EN1610602F200077

DTC	P0217	Engine Coolant Over Temperature Condition
-----	-------	---

**1. CHECK THE COOLANT TEMPERATURE SENSOR.**

- (1) Set the starter switch to "LOCK".
- (2) Disconnect the connector of engine coolant temperature sensor.
- (3) Measure the resistance between terminals.

HINT**Measure the resistance under any of the following conditions.****Standard value:****2.45 k Ω at 20°C {68°F}****1.15 k Ω at 40°C {104°F}****584 Ω at 60°C {140°F}****318 Ω at 80°C {176°F}**

NO

Faulty in engine coolant temperature sensor

Faulty in engine cooling system

HINT

This code will be displayed when the coolant temperature sensor operates normally and coolant temperature ascends over 115°C {239°F}. Also, while the DTC is being detected, Max. volume of fuel injection will be limited and will return back to normal control volume when it descends less than 80°C {176°F}.



FUEL CONTROL (J08E)

DN02-223



DN02-224

FUEL CONTROL (J08E)

DTC:P0219 (Check sheet)

EN1610602F200078

DTC:P0219

Engine overspeed condition

1. Technical description

The revolution sensor assembled to the flywheel housing senses the engine speed. (crankshaft position sensor)

2. DTC set condition**(1) Check conditions**

While the engine is in operation

(2) Judgment criteria

An engine speed of more than 3,000 r/min

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Miss-shift (MT vehicle)
Operated with excessive engine oil running around to the air intake system.
Irregular contact of connector and harness
Malfunction of revolution sensor (crankshaft position sensor)

DTC:P0219		Engine overspeed condition		Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Driver's dragging	Check for overrun driving.			
2	Check the engine oil level.	Check the oil quantity with the oil level gauge.	Must be below the upper level.		Investigation of cause of increasing oil
3	ECU connector	Connection ECU connector and with or without damage	No irregular contact, no damage		Clean the contact and replace the harness if it is damaged.
4	Crankshaft position sensor connector	Connection of the sensor connector and with or without damage	No irregular contact, no damage		Clean the contact and replace the harness if it is damaged.
5	Crankshaft position sensor connection harness	With or without damage and disconnection of revolution sensor connection harness	No damage, no disconnection		Replace if damage or disconnection is found.
6	Crankshaft position sensor	Function	Normal pulses must be generated.		Replace if faulty.
7	ECU	Function	Correct speeds must be generated.		Replace if faulty.

DN02-226

FUEL CONTROL (J08E)

DTC:P0219

EN1610602F200079

DTC	P0219	Engine Overspeed Condition
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1. The DTC will be displayed, once detected over 4,000 r/min. in the Engine revolution. Also, the fuel injection will be suspended during the DTC to be detected and the fuel injection will be resumed when Engine revolution goes down less than 3,800 r/min.

NOTICE

The DTC aim is not for detecting the Engine over-run under abnormal operation of the system, but for storing in memory the high revolution of the Engine. (For detection of wrong shifting, etc.) Also, there is a case in which "overrun" will be detected by misunderstanding the Engine revolution, with a noise to be generated by harness malfunction and its modification.



FUEL CONTROL (J08E)

DN02-227



DN02-228

FUEL CONTROL (J08E)

DTC:P0222 (Check sheet)

EN1610602F200080

DTC:P0222

Intake throttle valve position sensor 2 - out of range (Out of range low)

1. Technical description

- The diesel throttle (intake throttle) controls valves steplessly to control boost pressure and intake air volume.
- Inside the diesel throttle, a sensor designed to detect a travel of the valve consistently monitors an actual opening to compare with command value.

2. DTC set condition**(1) Check conditions**

- A receiving process continues for 5 seconds or longer at battery voltage of 10 V to 16 V and at engine speed of 500 r/min or higher.

(2) Judgment criteria

- Output of the sensor remains at 0.2 V (5 degrees) or less for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Fault in harness and/or connector
- Malfunction of sensor body
- Malfunction of ECU

FUEL CONTROL (J08E)

DN02-229

DTC:P0222	Intake throttle valve position sensor 2 - out of range (Out of range low)	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check the connector and/or harness between the ECU and the sensor.			Repair the harness.
2	Position sensor	Check the sensor harness.			Replace the sensor.

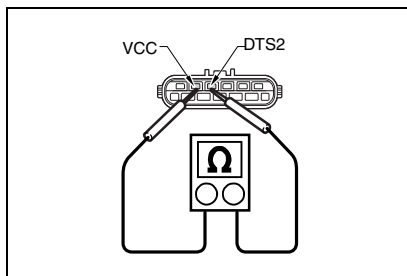
DN02-230

FUEL CONTROL (J08E)

DTC:P0222

EN1610602F200081

DTC	P0222	Intake throttle valve position sensor 2 - out of range (Out of range low)
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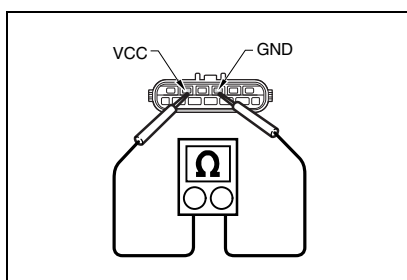
**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the diesel throttle (intake throttle) valve position sensor 2 connector.
- (3) Check continuity between the terminals VCC and DTS2 of the intake throttle valve position sensor 2 connector.

HINT

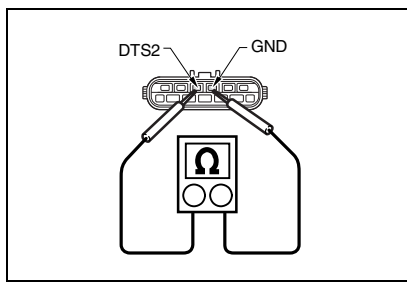
If it is difficult to check only the sensor, proceed to Step 4.

Standard value: Approximately 180 Ω



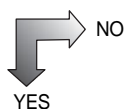
- (4) Check continuity between the terminals VCC and GND of the diesel throttle (intake throttle) valve position sensor 2 connector.

Standard value: Approximately 3 k Ω

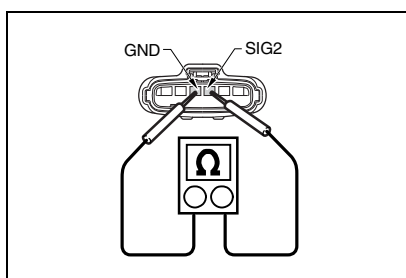


- (5) Check continuity between the terminals DTS2 and GND of the diesel throttle (intake throttle) valve position sensor 2 connector.

Standard value: Approximately 3 k Ω



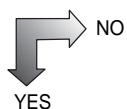
Faulty in intake throttle valve position sensor 2



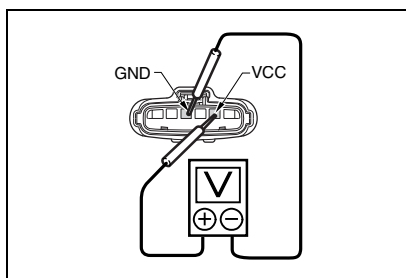
SAPH161060200149

2. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS

- (1) Measure resistance between the terminals SIG2 and GND of the intake throttle valve position sensor 2 connector (engine sub harness side).

Standard value: 25-35 k Ω 

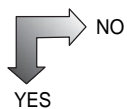
- Faulty in harness
- Irregular contact of connectors



SAPH161060200150

3. MEASURING VOLTAGE BETWEEN SENSOR TERMINALS

- (1) Set the starter switch to "ON" position.
(2) Measure voltage between the terminals VCC and GND of the intake throttle valve position sensor 2 connector (engine sub harness side).

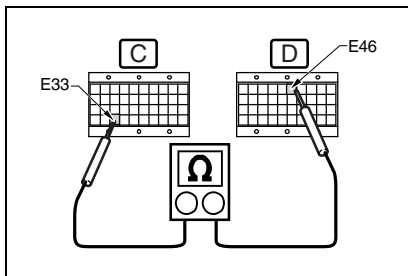
Standard value: 4.5-5.5 V

- Faulty in harness
- Irregular contact of connectors

Bad contact of connectors

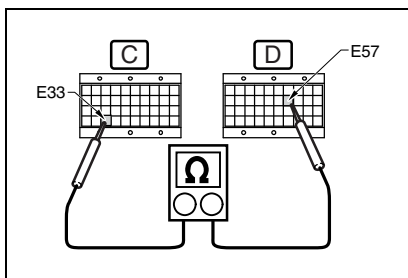
DN02-232

FUEL CONTROL (J08E)

**4. MEASURING RESISTANCE BETWEEN TERMINALS**

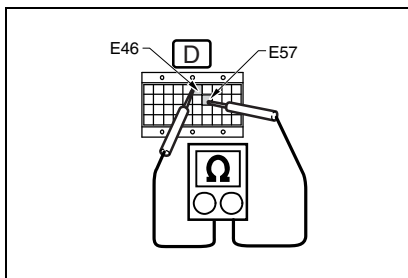
- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness on the engine side.
- (3) Disconnect the connector on the engine ECU side.
- (4) Measure resistance between the terminals AVC2 (E33) and DTS2 (E46).

Standard value: 2 Ω or more



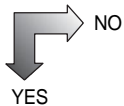
- (5) Measure resistance between the terminals AVC2 (E33) and AGD3 (E57).

Standard value: Approximately 3 kΩ

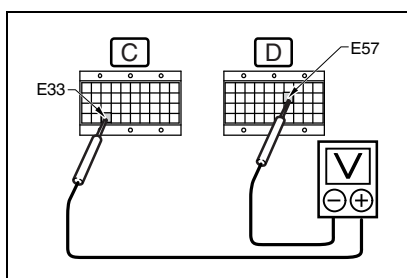


- (6) Measure resistance between the terminals DTS2 (E46) and AGD3 (E57).

Standard value: ∞ Ω



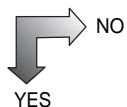
- Faulty in harness
- Faulty in intake throttle valve position sensor 2



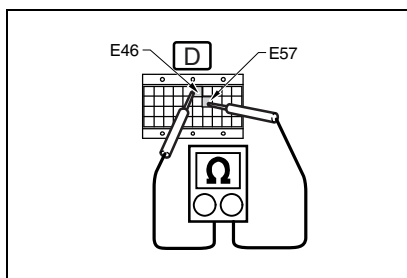
SAPH161060200154

5. MEASURING VOLTAGE BETWEEN TERMINALS

- (1) Connect the connectors on the engine ECU side.
- (2) Disconnect the connector on the engine sub harness side.
- (3) Set the starter switch to "ON" position.
- (4) Measure voltage between the terminals AVC2 (E33) and AGD3 (E57).

Standard value: 4.5-5.5 V

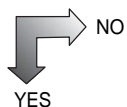
- Fault in engine ECU
- Faulty ECU connector



SAPH161060200155

6. MEASURING RESISTANCE BETWEEN TERMINALS

- (1) Measure resistance between the terminals DTS2 (E46) and AGD3 (E57).

Standard value: 25-35 kΩ

- Fault in engine ECU
- Faulty ECU connector

Bad contact of connectors

DN02-234

FUEL CONTROL (J08E)

DTC:P0223 (Check sheet)

EN1610602F200082

DTC:P0223

Intake throttle valve position sensor 2 - out of range (Out of range high)

1. Technical description

- The diesel throttle (intake throttle) controls valves steplessly to control boost pressure and intake air volume.
- Inside the diesel throttle (intake throttle), a sensor designed to detect a travel of the valve consistently monitors an actual opening to compare with command value.

2. DTC set condition**(1) Check conditions**

- A receiving process continues for 5 seconds or longer at battery voltage of 10 V to 16 V and at engine speed of 500 r/min or higher.

(2) Judgment criteria

- Output of the sensor remains at 4.8 V (120 degrees) or less for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Fault in harness and/or connector
- Malfunction of sensor body
- Malfunction of ECU

DTC:P0223	Intake throttle valve position sensor 2 - out of range (Out of range high)	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check the connector and/or harness between the ECU and the sensor.			Repair the harness.
2	Position sensor	Check the sensor harness.			Replace the sensor.

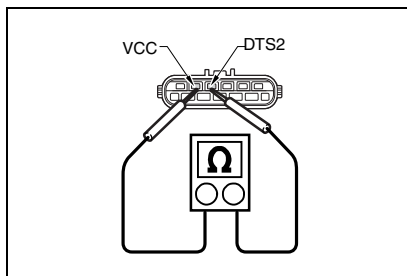
DN02-236

FUEL CONTROL (J08E)

DTC:P0223

EN1610602F200083

DTC	P0223	Intake throttle valve position sensor 2 - out of range (Out of range high)
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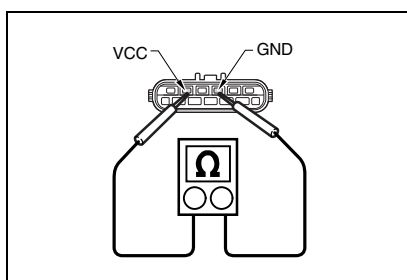
**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the diesel throttle (intake throttle) valve position sensor 2 connector.
- (3) Check continuity between the terminals VCC and DTS2 of the diesel throttle (intake throttle) valve position sensor 2 connector.

HINT

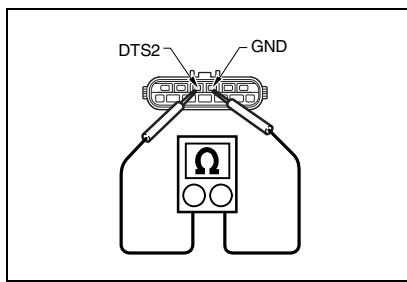
If it is difficult to check only the sensor, proceed to Step 5.

Standard value: Approximately 180 Ω



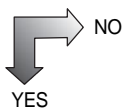
- (4) Check continuity between the terminals VCC and GND of the diesel throttle (intake throttle) valve position sensor 2 connector.

Standard value: Approximately 3 k Ω

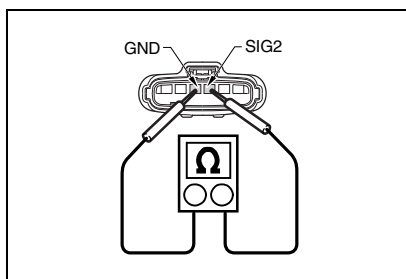


- (5) Check continuity between the terminals DTS2 and GND of the diesel throttle (intake throttle) valve position sensor 2 connector.

Standard value: Approximately 3 k Ω



Faulty in diesel throttle (intake throttle) valve position sensor 2

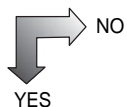


SAPH161060200159

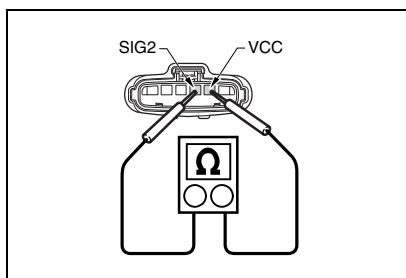
2. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS

- (1) Measure resistance between the terminals SIG2 and GND of the diesel throttle (intake throttle) valve position sensor 2 connector (engine sub harness side).

Standard value: Approximately 30 k Ω



- Faulty in harness
- Irregular contact of connectors

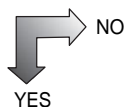


SAPH161060200160

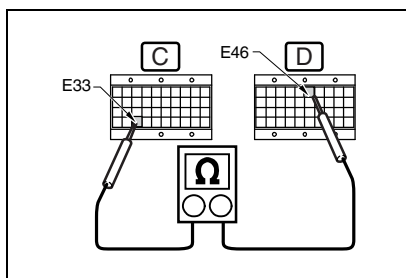
3. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS

- (1) Measure resistance between the terminals VCC and SIG2 of the diesel throttle (intake throttle) valve position sensor 2 connector (engine sub harness side).

Standard value: $\infty \Omega$



Faulty in harness

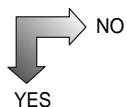


SAPH161060200161

4. MEASURING RESISTANCE BETWEEN TERMINALS

- Connect the signal check harness on the engine side.
- Disconnect the connector on the engine sub harness side.
- Measure resistance between the terminals AVC2 (E33) and DTS2 (E46).

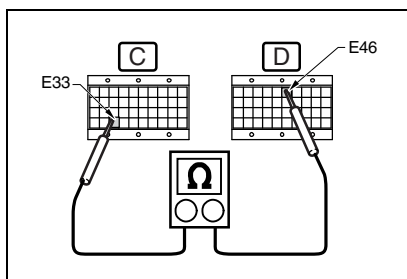
Standard value: $\infty \Omega$



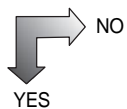
Faulty in engine ECU

DN02-238

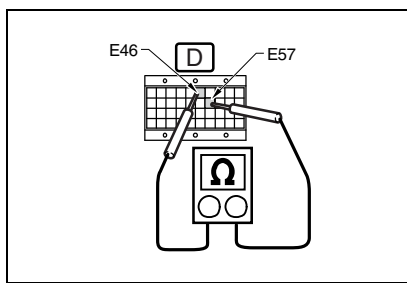
FUEL CONTROL (J08E)

**5. MEASURING RESISTANCE BETWEEN TERMINALS**

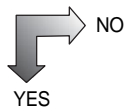
- (1) Connect the diesel throttle (intake throttle) valve position sensor 2 connector.
- (2) Connect the connector on the engine sub harness side.
- (3) Disconnect the connector on the engine ECU side.
- (4) Measure resistance between the terminals AVC2 (E33) and DTS2 (E46).

Standard value: 2 Ω or more

- Faulty in harness
- Faulty diesel throttle (intake throttle) valve position sensor 2

**6. MEASURING RESISTANCE BETWEEN TERMINALS**

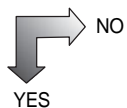
- (1) Measure resistance between the terminals AGD3 (E57) and DTS2 (E46).

Standard value: 25-35 k Ω 

- Faulty in harness
- Irregular contact of connectors

7. CHECK A MALFUNCTION CODE.

- (1) Connect the connector on the engine ECU side.
- (2) Set the starter switch "ON" position.
- (3) Make sure that the malfunction code P0222 is present.



Fault in engine ECU

Clear and recheck the DTC.



FUEL CONTROL (J08E)

DN02-239



DN02-240

FUEL CONTROL (J08E)

DTC:P0234 (Check sheet)

EN1610602F200084

DTC:P0234

Overboost

1. Technical description

- The VNT moves the nozzle vane steplessly by the REA (Rotary Electric Actuator) to control the turbo speed and boost pressure. It observes a deviation between the target boost pressure and actual boost pressure to check if the actual pressure is higher than the target pressure.

2. DTC set condition**(1) Check conditions**

- While the engine is in operation - Always

(2) Judgment criteria

- A boost pressure value exceeding the threshold value has been detected (abnormally high pressure).
- Deviation between actual boost pressure and theoretical boost pressure ... 18 - 29kPa

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Malfunction of boost pressure sensor
- Malfunction of air flow sensor
- Malfunction of VNT
- Malfunction of EGR valve

FUEL CONTROL (J08E)

DN02-241

DTC : P0234	Overboost	Inspection Procedure
--------------------	------------------	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Boost pressure sensor	Inspection of boost pressure sensor			
2	Air flow sensor	Inspection of air flow sensor			
3	VNT	Inspection of VNT			
4	EGR valve	Inspection of EGR valve			

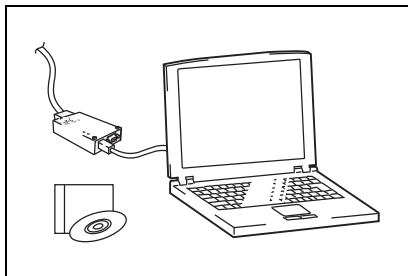
DN02-242

FUEL CONTROL (J08E)

DTC:P0234

EN1610602F200085

DTC	P0234	Overboost
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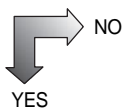
SAPH161060200164

1. USE THE Hino-DX TO INSPECT THE VNT.

- (1) Connect Hino-DX to the vehicle.
- (2) Set the starter switch "ON" position.
- (3) Check that no other codes (P0045, P00AF, P0108, P0237, P226C and U1123) exist.

If a DTC code is stored, follow each diagnostic flow.

- (4) Inspect the VNT.

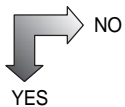
Standard: Max. 2 sec. delay in opening

NO

- Faulty VNT controller
- Faulty turbocharger

2. CHECK EXHAUST SYSTEM PARTS.

- (1) Check that exhaust system parts are not modified or blocked.

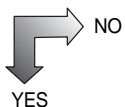


NO

Faulty exhaust system parts

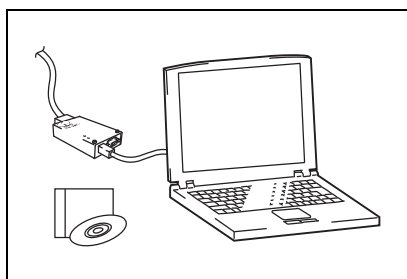
3. CHECK THE BOOST PRESSURE SENSOR HOSE.

- (1) Check the boost pressure sensor hose for looseness or damage.



NO

Faulty boost pressure sensor hose

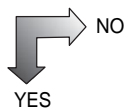


SAPH161060200165

4. USE THE Hino-DX TO INSPECT THE EGR.

(1) Inspect the EGR.

Standard: Actual opening must follow required opening.



Proceed to inspect the EGR valve.

Proceed to inspect the boost pressure sensor.

DN02-244

FUEL CONTROL (J08E)

DTC:P0237 (Check sheet)

EN1610602F200086

DTC:P0237

Boost pressure sensor - out of range (Out of range low)

1. Technical description

- The pressure sensor consistently detects boost pressure.

2. DTC set condition**(1) Check conditions**

- The conditions remain for 5 seconds or longer at battery voltage of 10 V to 16 V and at engine speed of 500 r/min or higher.

(2) Judgment criteria

- Output of the sensor remains at 0.19 V (22.8 kPa) or less for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Fault in harness and/or connector
- Malfunction of sensor body
- Malfunction of ECU

FUEL CONTROL (J08E)

DN02-245

DTC:P0237	Boost pressure sensor - out of range (Out of range low)	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check the connector and/or harness between the ECU and the sensor.			Repair the harness.
2	Sensor	Check the sensor harness.			Replace the sensor.

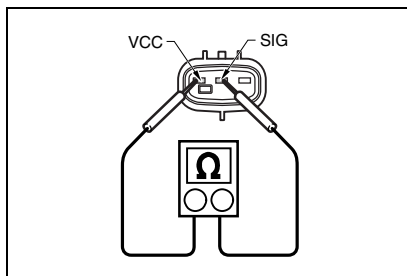
DN02-246

FUEL CONTROL (J08E)

DTC:P0237

EN1610602F200087

DTC	P0237	Boost pressure sensor - out of range (Out of range low)
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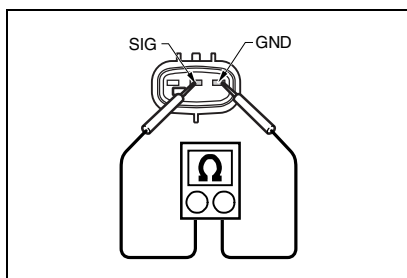
**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the connector boost pressure sensor.
- (3) Check continuity between the terminals VCC and SIG of the boost pressure sensor connector.

HINT

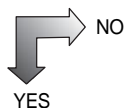
If it is difficult to check only the sensor, proceed to Step 4.

Standard value: 2-15 k Ω

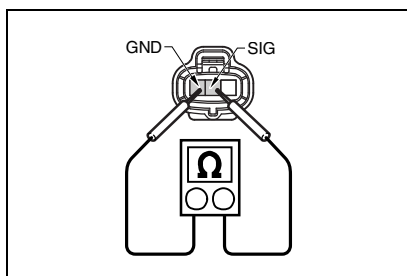


- (4) Check continuity between the terminals SIG and GND of the boost pressure sensor connector.

Standard value: 2-15 k Ω



Fault in boost pressure sensor

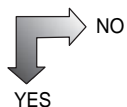


SAPH161060200168

2. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS

- (1) Measure resistance between the terminals SIG and GND of the boost pressure sensor connector (engine sub harness side).

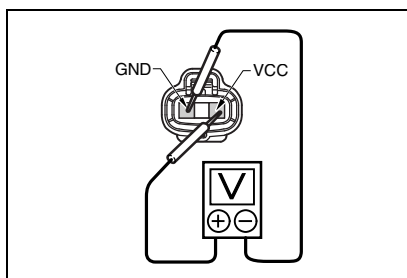
Standard value: 209-231 kΩ



YES

NO

Proceed to 4.

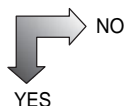


SAPH161060200169

3. MEASURING VOLTAGE BETWEEN SENSOR TERMINALS

- (1) Set the starter switch to "ON" position.
(2) Measure voltage between the terminals VCC and GND of the boost pressure sensor connector (engine sub harness side).

Standard value: 4.5-5.5 V

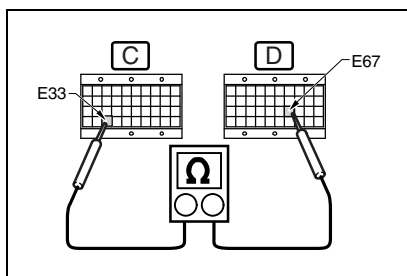


YES

NO

Proceed to 4.

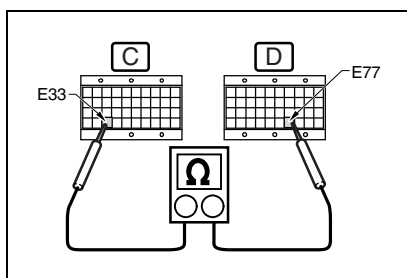
Bad contact of harness connector



SAPH161060200170

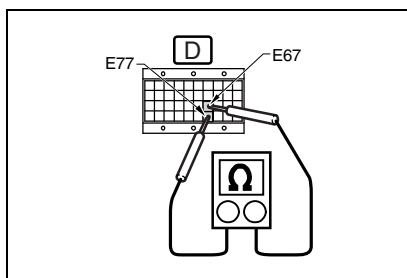
4. MEASURING RESISTANCE BETWEEN TERMINALS

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness on the engine side.
- (3) Disconnect the connector on the engine ECU side.
- (4) Measure resistance between the terminals AVC2 (E33) and PIM (E67).

Standard value: 2-15 kΩ

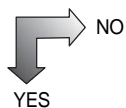
SAPH161060200171

- (5) Measure resistance between the terminals AVC2 (E33) and AGD4 (E77).

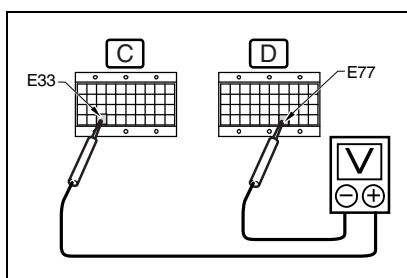
Standard value: 2-15 kΩ

SAPH161060200172

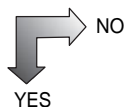
- (6) Measure resistance between the terminal PIM (E67) and AGD4 (E77).

Standard value: ∞ kΩ

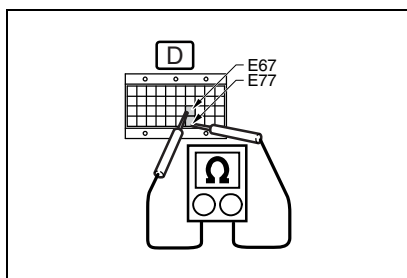
- Faulty harness
- Fault in boost pressure sensor

**5. MEASURING VOLTAGE BETWEEN TERMINALS**

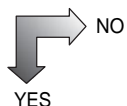
- (1) Connect the connectors on the engine ECU side.
- (2) Disconnect the connector on the harness side.
- (3) Set the starter switch to "ON" position.
- (4) Measure voltage between the terminals AVC2 (E33) and ADG4 (E77).
Standard value: 4.5-5.5 V



Fault in engine ECU

**6. MEASURING RESISTANCE BETWEEN TERMINALS**

- (1) Measure resistance between the terminals PIM (E67) and AGD4 (E77).
Standard value: 209-231 kΩ



Fault in engine ECU

Bad contact of harness connector

DTC:P0263 (Check sheet)

EN1610602F200093

DTC:P0263**Injection quantity and timing (#1cyl)****1. Technical description**

- The engine speed main sensor (Crankshaft position sensor) monitors the speed of the #1 cylinder.
- For control, it increases or reduces the compensation of the injection quantity of the #1 cylinder to make constant the speed of each cylinder.
- If the speed of the #1 cylinder is found abnormal, diagnostic judgment will take place.

2. DTC set condition**(1) Check conditions**

All the following conditions continue for more than 30 seconds.

- The engine speed is in the range of 250 to 900 r/min.
- The fuel injection quantity is within 0 to 50 mm³/st.cyl.
- The exhaust brake and PTO are inactive.

(2) Judgment criteria

1. All the following conditions continue for more than 10 seconds.
- The engine speed is within the table below.

Engine speed (rpm)

	MT	AMT	AT
D range	N/A	695-745	725-775
N range	725-775	725-775	725-775
P range	N/A	725-775	725-775

Note.

MT; Manual transmission

AMT; Automated manual transmission

AT; Automatic transmission

- Gear position unchanged
 - The fuel injection quantity is less than 50 mm³/st.cyl.
 - The coolant temperature is above 60°C {140°F}.
 - The accelerator opening is 0%.
 - The vehicle speed is 0 mile/h.
 - The exhaust brake and PTO are inactive.
 - Other DTC judgments have not been detected (system normal).
2. If the speed of the #1 cylinder measured by the engine speed main sensor continues to be abnormal for more than 20 seconds, a DTC judgment will be detected.
1 and 2 must be established continuously.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Fuel injection pipe: Breakage, crack, fuel leakage

Cylinder: Compression leakage

Common rail: Malfunction of flow damper

Injector: Clogging, keeping injecting

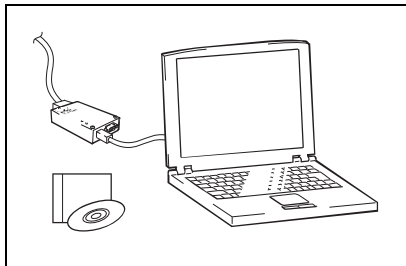
DTC:P0263	Injection quantity and timing (#1cyl)	Inspection Procedure
------------------	--	-----------------------------

Step	Parts	Description	Judgment	Action		
				Check (YES/NO)	YES	NO
1	DTC confirmation	Check Engine ECU if any other DTC is stored other than the following. (P0266, P0269, P0272, P0275, P0278)	DTC is stored → YES NO DTC is stored → NO		Go to the diagnostic procedure of a relevant DTC	Go to Step 2
2	Fuel line	Confirm that the fuel line has no leaks or clogging.	Fuel leakage, clogging, etc. → YES No abnormalities → NO		Repair or replace leaking or clogged fuel line	Go to Step 3
3	Fuel filter	Check the fuel filter for dirt and clogging.	Clogging, dirt, etc. → YES No abnormalities → NO		Replace the fuel filter	Go to Step 4
4	Injector clamp	Check the injector clamp for loosening.	Loosening, installation abnormalities → YES No abnormalities → NO		Repair the faulty locations	Go to Step 5
5	Valve	Valve clearance confirmation.	Excessive clearance → YES Within the standard value → NO		Adjust the valve clearance	Go to Step 6
6	Cylinder	Compression measuring.	Out of standard or reach the limit → YES No abnormalities → NO		Repair the faulty locations	Go to Step 7
7	Cylinder	Cylinder cut off test.	There is NO difference in sound or performance when the injection is cut off → YES There is a clear difference in sound or performance when the injection is cut-off → NO		Replace the injector (Replace the failed injector detected by the cut-off test not the injector noted in the DTC.)	Go to Step 8
8	Engine speed main sensor (Crankshaft position sensor)	Confirmation of the sensor installation status.	Abnormalities → YES No abnormalities → NO		Repair the faulty locations	Go to Step 9
9	DTC confirmation	Check if the DTC P0263 is stored.	P0263 is stored → YES P0263 is not stored → NO		After common rail assembly replacement, go to Step 10	Completed
10	DTC confirmation	Check if the DTC P0263 is stored.	P0263 is stored → YES P0263 is not stored → NO		Inspect the engine drive system components	Completed

DTC:P0263

EN16Z0702F200001

DTC	P0263	Injection quantity and timing (#1cyl)
-----	-------	---------------------------------------

1 DTC confirmation

- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Stop the engine.
- 3 Connect Hino-DX to the vehicle.
- 4 Check engine ECU if any of DTC is stored other than the following. (P0266, P0269, P0272, P0275, P0278)

Judgment	Other DTC is stored → YES
	No other than P0266, P0269, P0272, P0275, P0278 is stored → NO

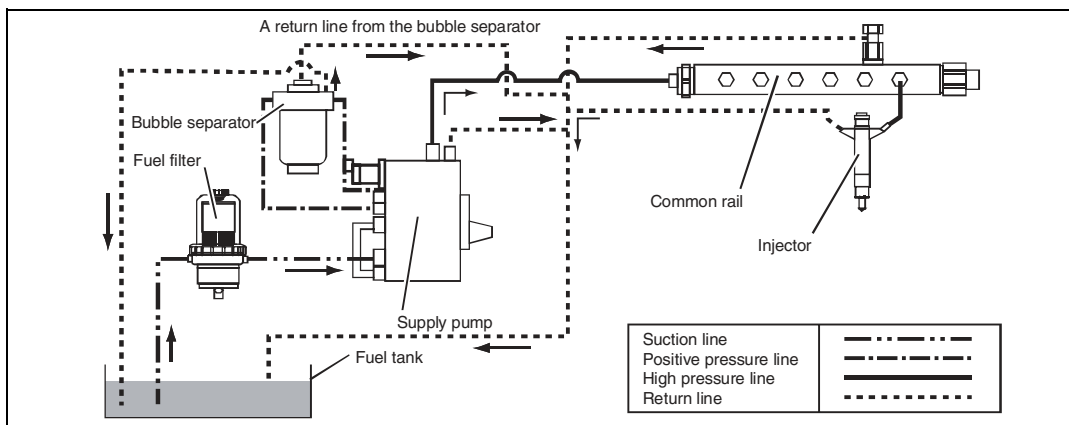
YES

Go to diagnostic procedure of a relevant DTC.

NO

2 Fuel line confirmation

- 1 Confirm that the fuel line is free of fuel leakage and clogging.



P0278-8

<Main confirmation locations>

- Entry of foreign matter into the fuel tank
- Fuel hose breakage, collapsing, looseness
- High-pressure pipe breakage, collapsing, looseness

Judgment

Fuel leakage, clogging, etc. → YES

No fuel leakage, clogging, etc. → NO

YES

Repair the faulty locations.

NO

3 Fuel filter inspection**1 Confirm that the fuel filter is not dirty or clogged.**

Judgment

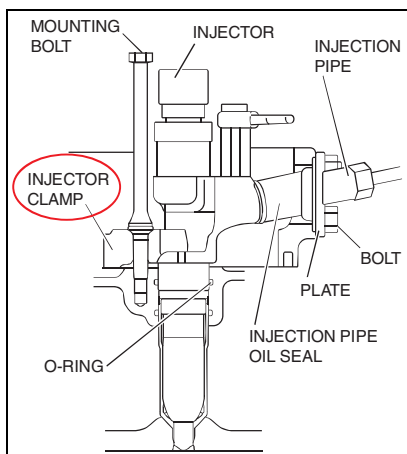
Fuel leakage, clogging, etc. → YES

No abnormality → NO

YES

Replace the fuel filter.

NO

4 Injector clamp confirmation

saph011060700056

1 Confirm that there is no loosening of the injector clamp.**2 Confirm that there is no "insufficient engagement" of the injector clamp claw.**

Judgment

Looseness etc. → YES

No abnormality → NO

YES

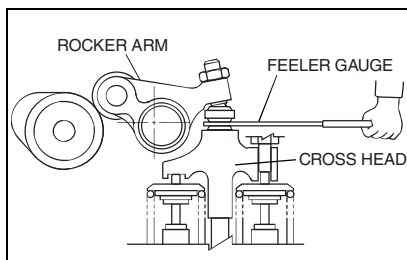
Repair the faulty locations.

NO

DN02-254

FUEL CONTROL (J08E)

5 Valve clearance confirmation



shts011060100009

- 1 Confirm that the valve clearance of each cylinder is within the standard value.
(Confirm all valves.)

Valve clearance standard value (when cold)

Intake valve	0.3 mm (0.0118 in)
Exhaust valve	0.45 mm (0.0177 in)

	Cylinder			1		2		3		4		5		6	
	Valve			IN	EX	IN	EX	IN	EX	IN	EX	IN	EX	IN	EX
With No.1 piston at T.D.C. on compression stroke	Cam-shaft gear condition		Two drill holes and camshaft housing is horizontal. The rest of drill hole is visible. #1	○	○		○	○			○	○			
With No.6 piston at T.D.C. on compression stroke			Two drill holes and camshaft housing is horizontal. The rest of drill hole is invisible. #1			○			○	○			○	○	○

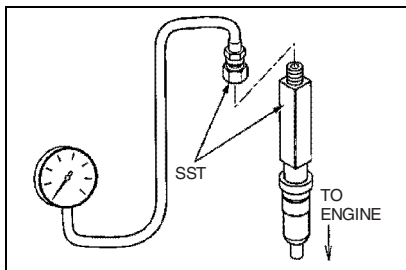
- #1= View from rear side of camshaft housing
- OMark: Possible to check valve clearance
- Firing order: 1-4-2-6-3-5
- T.D.C.: Top Dead Center

Judgment	Specified value → YES
	NOT specified value → NO

YES

Adjust the valve clearance.

NO

6 Compression confirmation

P0278-6

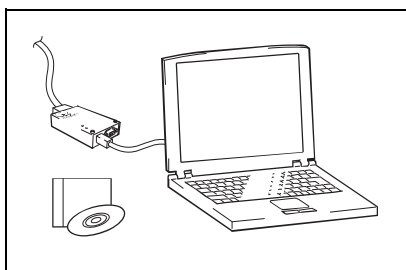
- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Remove the air cleaner.
- 3 Remove the cylinder head cover.
- 4 Remove the all injectors .
- 5 Set the special service tool (SST) and measure the compression.
- 6 Check whether the compression value is exceeded the limit.
Engine speed 150 r/min

Item	Compression: Unit MPa {kg/cm ² }
Standard value	3.2 - 3.4 {33 - 35}
Limit value	2.3 {24}

Judgment	Reach to the limit → YES
	No abnormality → NO

YES → Engine overhaul

NO

7 Cylinder cut-off test

saph161060200038

- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Connect Hino-DX to the vehicle and select the engine.
- 3 Use the cruise function to run the engine at 1500 r/min.
- 4 Confirm the engine sound at the time of normal operation.
- 5 Use the "active test" of the Hino-DX to perform a cut-off test.
(For details, refer to the cut-off test procedure on the following pages.)

<Cylinder cut-off test>

By stopping the fuel inject session for any one cylinder of an engine normally running with six or four cylinders, this method can judge combustion abnormalities by means of the different sound.

Judgment	There is NO difference in sound or performance when the injection is cut off → YES
	There is a clear difference in sound or performance when the injection is cut-off → NO

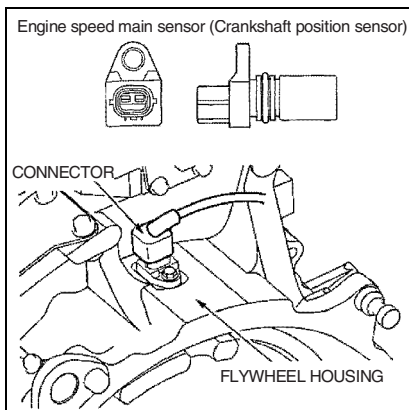
DN02-256

FUEL CONTROL (J08E)

YES

Replace the injector
(Replace the failed injector detected by the cut-off
test not the injector noted in the DTC.)

NO

8 Engine speed sensor confirmation

- 1 Confirm the installation condition of the engine speed main sensor. (Crankshaft position sensor)
- 2 Confirm the installation condition of the engine speed main sensor connector.

Judgment

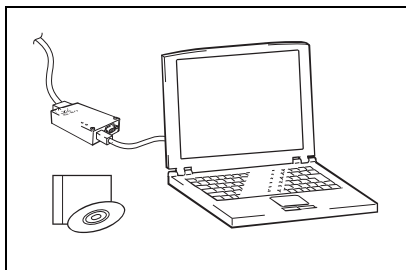
Defective installation → YES

No abnormality → NO

YES

Repair the faulty locations.

NO

9 DTC confirmation

- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Stop the engine.
- 3 Connect Hino-DX to the vehicle.
- 4 Start the "Engine ECU".
- 5 Check if the DTC P0263 is stored.

Judgment

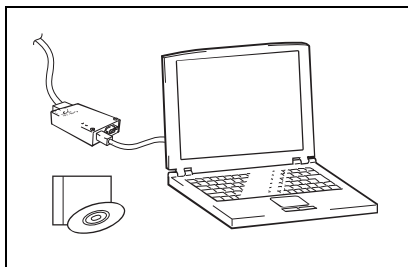
DTC is stored → YES → Replace the common rail assembly.

No DTC is stored → NO

NO

Completed

YES

10 DTC confirmation (After common rail assembly replacement)

saph161060200038

- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Stop the engine.
- 3 Connect Hino-DX to the vehicle.
- 4 Start the engine.
- 5 Select the "engine ECU" and confirm the DTC.

Judgment

DTC is stored → YES

No DTC is stored → NO

YES

Inspect the crankshaft, connecting rods, flywheel, and other parts of the drive system

NO

Completed

Cylinder cut-off test

<Cylinder cut-off test>

By stopping fuel injection for one of the cylinders of an engine normally running with six or four cylinders, this test detects combustion abnormalities of any cylinder.

<Purpose>

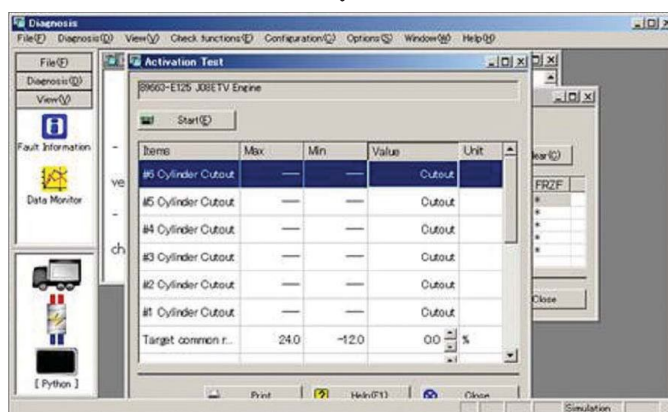
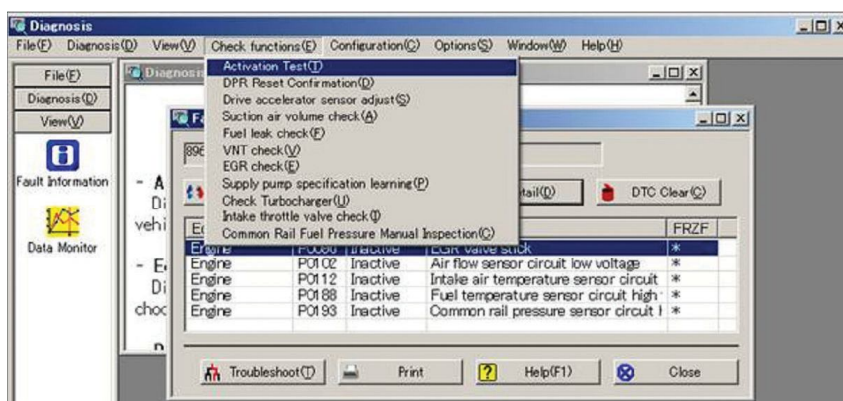
Evaluation of combustion abnormalities of any cylinder by differences in the sound.

<Know-how & examples>

Detect combustion abnormalities of any cylinder from differences in the sound and perform the required corrections.

Cylinder cut-off test method

- 1 Use the cruise function to run the engine at 1500 rpm.
- 2 Confirm the engine sound at the time of normal operation. (The sound at this time shall be α .)
- 3 Select Active test with Hino-DX.



- 4 Stop injection for cylinder No. 1 and confirm the engine sound. (The sound at this time shall be A.)
→ Stop the test after confirmation.

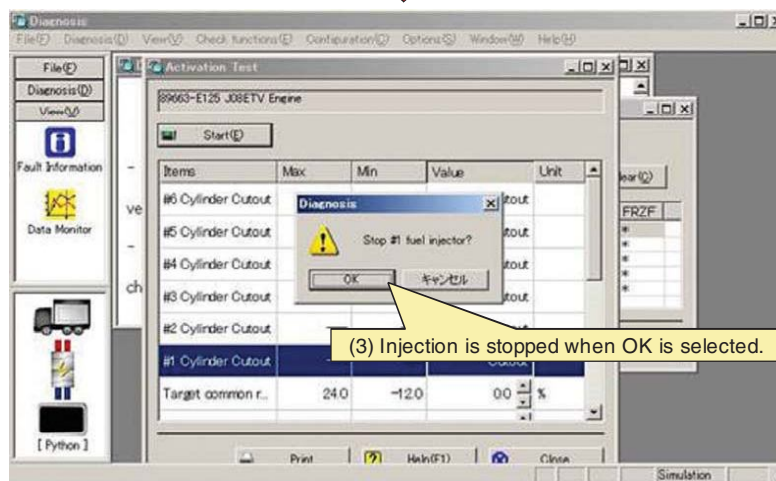
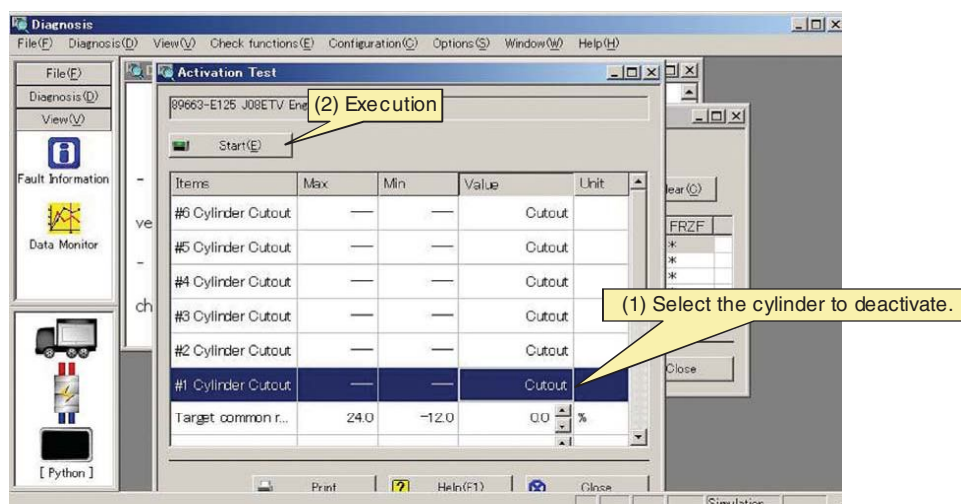
HINT

During the test, the engine tries to maintain the original six-cylinder speed, but using only five cylinders, so that the sound A becomes larger in comparison with the sound α. (No abnormality.)

As the engine is running with combustion of one cylinder less than normal, it is normal that the vibrations increase.

For an engine with no injection or reduced injection quantity, injection stop causes no vibration change.

For engines increasing the injection quantity for some cylinders, the vibrations become larger when all cylinders are operating, and the vibrations decrease when injection is stopped for the defective cylinder.



- 5 Sequentially stop the injection for cylinders No. 2, No. 3, No. 4, No. 5, and No. 6 in the same way as for a cylinder No. 1. (The measure sounds shall be B, C, D, E, and F respectively.)

<Judgment standard>

Judgment	Comparison of the sounds A — F shows no clear difference → OK
	One out of A to F is abnormally loud or the same as α. However, for vehicles with abnormal vibrations while running on six cylinders, the vibrations will decrease. → FAIL

HINT

- When the difference in the sound is difficult to detect, repeat steps 4 and 5.
- if one of the sounds A — F is the same as α, always check for a communication problem.



FUEL CONTROL (J08E)

DN02-261



DTC:P0266 (Check sheet)

EN1610602F200093

DTC:P0266**Injection quantity and timing (#2cyl)****1. Technical description**

- The engine speed main sensor (Crankshaft position sensor) monitors the speed of the #2 cylinder.
- For control, it increases or reduces the compensation of the injection quantity of the #2 cylinder to make constant the speed of each cylinder.
- If the speed of the #2 cylinder is found abnormal, diagnostic judgment will take place.

2. DTC set condition**(1) Check conditions**

All the following conditions continue for more than 30 seconds.

- The engine speed is in the range of 250 to 900 r/min.
- The fuel injection quantity is within 0 to 50 mm³/st.cyl.
- The exhaust brake and PTO are inactive.

(2) Judgment criteria

1. All the following conditions continue for more than 10 seconds.
- The engine speed is within the table below.

Engine speed (rpm)

	MT	AMT	AT
D range	N/A	695-745	725-775
N range	725-775	725-775	725-775
P range	N/A	725-775	725-775

Note.

MT; Manual transmission

AMT; Automated manual transmission

AT; Automatic transmission

- Gear position unchanged
 - The fuel injection quantity is less than 50 mm³/st.cyl.
 - The coolant temperature is above 60°C {140°F}.
 - The accelerator opening is 0%.
 - The vehicle speed is 0 mile/h.
 - The exhaust brake and PTO are inactive.
 - Other DTC judgments have not been detected (system normal).
2. If the speed of the #2 cylinder measured by the engine speed main sensor continues to be abnormal for more than 20 seconds, a DTC judgment will be detected.
1 and 2 must be established continuously.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Fuel injection pipe: Breakage, crack, fuel leakage

Cylinder: Compression leakage

Common rail: Malfunction of flow damper

Injector: Clogging, keeping injecting

DTC:P0266	Injection quantity and timing (#2cyl)	Inspection Procedure
------------------	--	-----------------------------

Step	Parts	Description	Judgment	Action		
				Check (YES/NO)	YES	NO
1	DTC confirmation	Check Engine ECU if any other DTC is stored other than the following. (P0263, P0269, P0272, P0275, P0278)	DTC is stored → YES NO DTC is stored → NO		Go to the diagnostic procedure of a relevant DTC	Go to Step 2
2	Fuel line	Confirm that the fuel line has no leaks or clogging.	Fuel leakage, clogging, etc. → YES No abnormalities → NO		Repair or replace leaking or clogged fuel line	Go to Step 3
3	Fuel filter	Check the fuel filter for dirt and clogging.	Clogging, dirt, etc. → YES No abnormalities → NO		Replace the fuel filter	Go to Step 4
4	Injector clamp	Check the injector clamp for loosening.	Loosening, installation abnormalities → YES No abnormalities → NO		Repair the faulty locations	Go to Step 5
5	Valve	Valve clearance confirmation.	Excessive clearance → YES Within the standard value → NO		Adjust the valve clearance	Go to Step 6
6	Cylinder	Compression measuring.	Out of standard or reach the limit → YES No abnormalities → NO		Repair the faulty locations	Go to Step 7
7	Cylinder	Cylinder cut off test.	There is NO difference in sound or performance when the injection is cut off → YES There is a clear difference in sound or performance when the injection is cut-off → NO		Replace the injector (Replace the failed injector detected by the cut-off test not the injector noted in the DTC.)	Go to Step 8
8	Engine speed main sensor (Crankshaft position sensor)	Confirmation of the sensor installation status.	Abnormalities → YES No abnormalities → NO		Repair the faulty locations	Go to Step 9
9	DTC confirmation	Check if the DTC P0266 is stored.	P0266 is stored → YES P0266 is not stored → NO		After common rail assembly replacement, go to Step 10	Completed
10	DTC confirmation	Check if the DTC P0266 is stored.	P0266 is stored → YES P0266 is not stored → NO		Inspect the engine drive system components	Completed

DN02-264

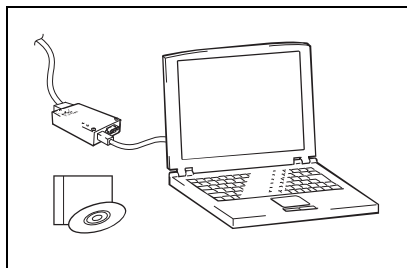
FUEL CONTROL (J08E)

DTC:P0266

EN16Z0702F200001

DTC	P0266	Injection quantity and timing (#2cyl)
-----	-------	---------------------------------------

1	DTC confirmation
----------	-------------------------



- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Stop the engine.
- 3 Connect Hino-DX to the vehicle.
- 4 Check engine ECU if any of DTC is stored other than the following. (P0263, P0269, P0272, P0275, P0278)

Judgment	Other DTC is stored → YES
	No other than P0263, P0269, P0272, P0275, P0278 is stored → NO

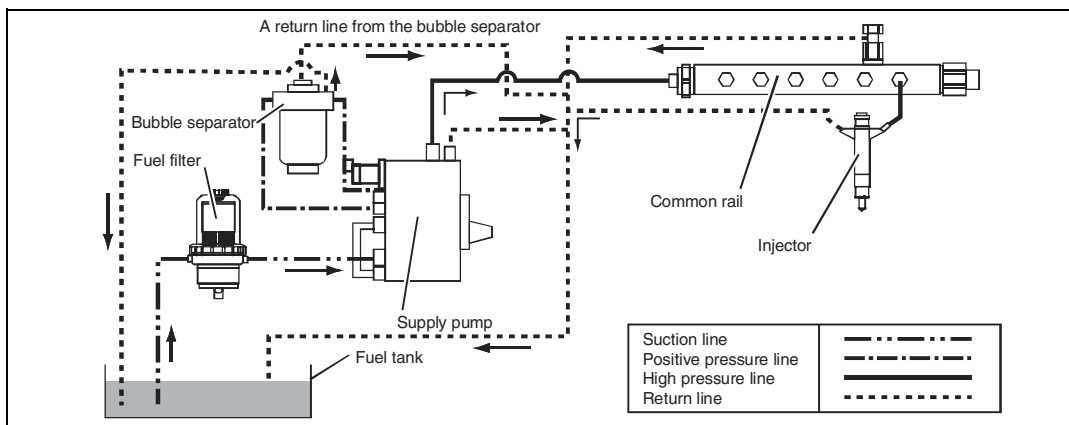
YES

Go to diagnostic procedure of a relevant DTC.

NO

2	Fuel line confirmation
----------	-------------------------------

- 1 Confirm that the fuel line is free of fuel leakage and clogging.

**<Main confirmation locations>**

- Entry of foreign matter into the fuel tank
- Fuel hose breakage, collapsing, looseness
- High-pressure pipe breakage, collapsing, looseness

Judgment

Fuel leakage, clogging, etc. → YES

No fuel leakage, clogging, etc. → NO

YES

Repair the faulty locations.

NO

3 Fuel filter inspection**1 Confirm that the fuel filter is not dirty or clogged.**

Judgment

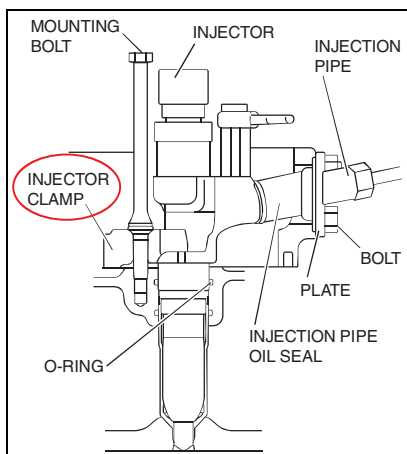
Fuel leakage, clogging, etc. → YES

No abnormality → NO

YES

Replace the fuel filter.

NO

4 Injector clamp confirmation

saph011060700056

1 Confirm that there is no loosening of the injector clamp.**2 Confirm that there is no "insufficient engagement" of the injector clamp claw.**

Judgment

Looseness etc. → YES

No abnormality → NO

YES

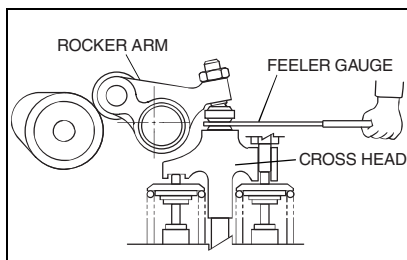
Repair the faulty locations.

NO

DN02-266

FUEL CONTROL (J08E)

5 Valve clearance confirmation



shfts011060100009

- 1 Confirm that the valve clearance of each cylinder is within the standard value.
(Confirm all valves.)

Valve clearance standard value (when cold)

Intake valve	0.3 mm (0.0118 in)
Exhaust valve	0.45 mm (0.0177 in)

	Cylinder			1		2		3		4		5		6	
	Valve			IN	EX	IN	EX	IN	EX	IN	EX	IN	EX	IN	EX
With No.1 piston at T.D.C. on compression stroke	Cam-shaft gear condition		Two drill holes and camshaft housing is horizontal. The rest of drill hole is visible. #1	○	○		○	○			○	○			
With No.6 piston at T.D.C. on compression stroke			Two drill holes and camshaft housing is horizontal. The rest of drill hole is invisible. #1			○			○	○			○	○	○

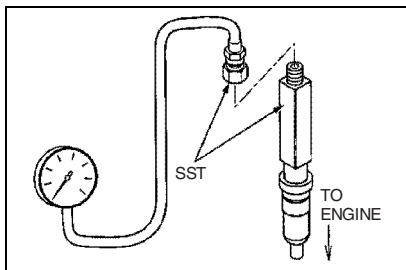
- #1= View from rear side of camshaft housing
- OMark: Possible to check valve clearance
- Firing order: 1-4-2-6-3-5
- T.D.C.: Top Dead Center

Judgment	Specified value → YES
	NOT specified value → NO

YES

Adjust the valve clearance.

NO

6 Compression confirmation

P0278-6

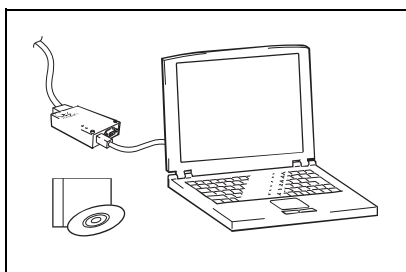
- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Remove the air cleaner.
- 3 Remove the cylinder head cover.
- 4 Remove the all injectors.
- 5 Set the special service tool (SST) and measure the compression.
- 6 Check whether the compression value is exceeded the limit.
Engine speed 150 r/min

Item	Compression: Unit MPa {kg/cm ² }
Standard value	3.2 - 3.4 {33 - 35}
Limit value	2.3 {24}

Judgment	Reach to the limit → YES
	No abnormality → NO

YES → Engine overhaul

NO

7 Cylinder cut-off test

saph161060200038

- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Connect Hino-DX to the vehicle and select the engine.
- 3 Use the cruise function to run the engine at 1500 r/min.
- 4 Confirm the engine sound at the time of normal operation.
- 5 Use the "active test" of the Hino-DX to perform a cut-off test.
(For details, refer to the cut-off test procedure after injection quantity and timing (#1cyl).)

<Cylinder cut-off test>

By stopping the fuel inject session for any one cylinder of an engine normally running with six or four cylinders, this method can judge combustion abnormalities by means of the different sound.

Judgment	There is NO difference in sound or performance when the injection is cut off → YES
	There is a clear difference in sound or performance when the injection is cut-off → NO

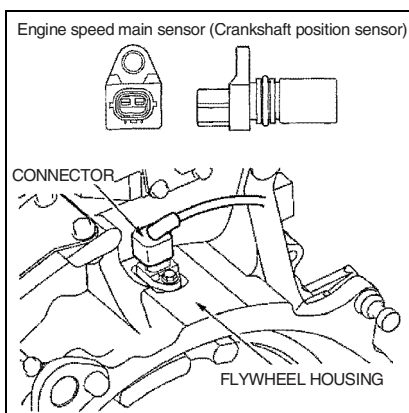
DN02-268

FUEL CONTROL (J08E)

YES

Replace the injector
(Replace the failed injector detected by the cut-off
test not the injector noted in the DTC.)

NO

8 Engine speed sensor confirmation

- 1 Confirm the installation condition of the engine speed main sensor. (Crankshaft position sensor)
- 2 Confirm the installation condition of the engine speed main sensor connector.

Judgment

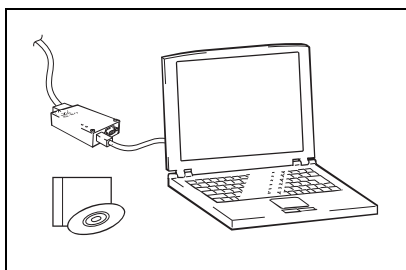
Defective installation → YES

No abnormality → NO

YES

Repair the faulty locations.

NO

9 DTC confirmation

- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Stop the engine.
- 3 Connect Hino-DX to the vehicle.
- 4 Start the "Engine ECU".
- 5 Check if the DTC P0266 is stored.

Judgment

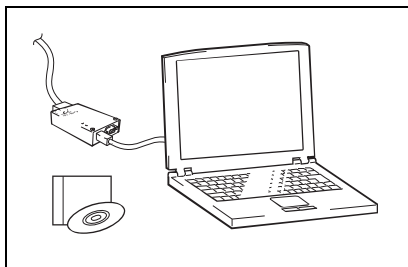
DTC is stored → YES → Replace the common rail assembly.

No DTC is stored → NO

NO

Completed

YES

10 DTC confirmation (After common rail assembly replacement)

saph161060200038

- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Stop the engine.
- 3 Connect Hino-DX to the vehicle.
- 4 Start the engine.
- 5 Select the "engine ECU" and confirm the DTC.

Judgment

DTC is stored → YES

No DTC is stored → NO

YES

Inspect the crankshaft, connecting rods, flywheel, and other parts of the drive system

NO

Completed

DTC:P0269 (Check sheet)

EN1610602F200093

DTC:P0269 Injection quantity and timing (#3cyl)**1. Technical description**

- The engine speed main sensor (Crankshaft position sensor) monitors the speed of the #3 cylinder.
- For control, it increases or reduces the compensation of the injection quantity of the #3 cylinder to make constant the speed of each cylinder.
- If the speed of the #3 cylinder is found abnormal, diagnostic judgment will take place.

2. DTC set condition**(1) Check conditions**

All the following conditions continue for more than 30 seconds.

- The engine speed is in the range of 250 to 900 r/min.
- The fuel injection quantity is within 0 to 50 mm³/st.cyl.
- The exhaust brake and PTO are inactive.

(2) Judgment criteria

1. All the following conditions continue for more than 10 seconds.
- The engine speed is within the table below.

Engine speed (rpm)

	MT	AMT	AT
D range	N/A	695-745	725-775
N range	725-775	725-775	725-775
P range	N/A	725-775	725-775

Note.

MT; Manual transmission

AMT; Automated manual transmission

AT; Automatic transmission

- Gear position unchanged
 - The fuel injection quantity is less than 50 mm³/st.cyl.
 - The coolant temperature is above 60°C {140°F}.
 - The accelerator opening is 0%.
 - The vehicle speed is 0 mile/h.
 - The exhaust brake and PTO are inactive.
 - Other DTC judgments have not been detected (system normal).
2. If the speed of the #3 cylinder measured by the engine speed main sensor continues to be abnormal for more than 20 seconds, a DTC judgment will be detected.
1 and 2 must be established continuously.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Fuel injection pipe: Breakage, crack, fuel leakage

Cylinder: Compression leakage

Common rail: Malfunction of flow damper

Injector: Clogging, keeping injecting

DTC:P0269	Injection quantity and timing (#3cyl)	Inspection Procedure
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Step	Parts	Description	Judgment	Action		
				Check (YES/NO)	YES	NO
1	DTC confirmation	Check Engine ECU if any other DTC is stored other than the following. (P0263, P0266, P0272, P0275, P0278)	DTC is stored → YES NO DTC is stored → NO		Go to the diagnostic procedure of a relevant DTC	Go to Step 2
2	Fuel line	Confirm that the fuel line has no leaks or clogging.	Fuel leakage, clogging, etc. → YES No abnormalities → NO		Repair or replace leaking or clogged fuel line	Go to Step 3
3	Fuel filter	Check the fuel filter for dirt and clogging.	Clogging, dirt, etc. → YES No abnormalities → NO		Replace the fuel filter	Go to Step 4
4	Injector clamp	Check the injector clamp for loosening.	Loosening, installation abnormalities → YES No abnormalities → NO		Repair the faulty locations	Go to Step 5
5	Valve	Valve clearance confirmation.	Excessive clearance → YES Within the standard value → NO		Adjust the valve clearance	Go to Step 6
6	Cylinder	Compression measuring.	Out of standard or reach the limit → YES No abnormalities → NO		Repair the faulty locations	Go to Step 7
7	Cylinder	Cylinder cut off test.	There is NO difference in sound or performance when the injection is cut off → YES There is a clear difference in sound or performance when the injection is cut-off → NO		Replace the injector (Replace the failed injector detected by the cut-off test not the injector noted in the DTC.)	Go to Step 8
8	Engine speed main sensor (Crankshaft position sensor)	Confirmation of the sensor installation status.	Abnormalities → YES No abnormalities → NO		Repair the faulty locations	Go to Step 9
9	DTC confirmation	Check if the DTC P0269 is stored.	P0269 is stored → YES P0269 is not stored → NO		After common rail assembly replacement, go to Step 10	Completed
10	DTC confirmation	Check if the DTC P0269 is stored.	P0269 is stored → YES P0269 is not stored → NO		Inspect the engine drive system components	Completed

DN02-272

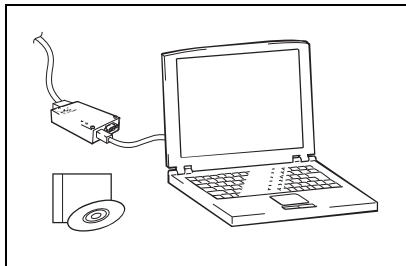
FUEL CONTROL (J08E)

DTC:P0269

EN16Z0702F200001

DTC	P0269	Injection quantity and timing (#3cyl)
-----	-------	---------------------------------------

1	DTC confirmation
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- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Stop the engine.
- 3 Connect Hino-DX to the vehicle.
- 4 Check engine ECU if any of DTC is stored other than the following. (P0263, P0266, P0272, P0275, P0278)

Judgment	Other DTC is stored → YES
	No other than P0263, P0266, P0272, P0275, P0278 is stored → NO

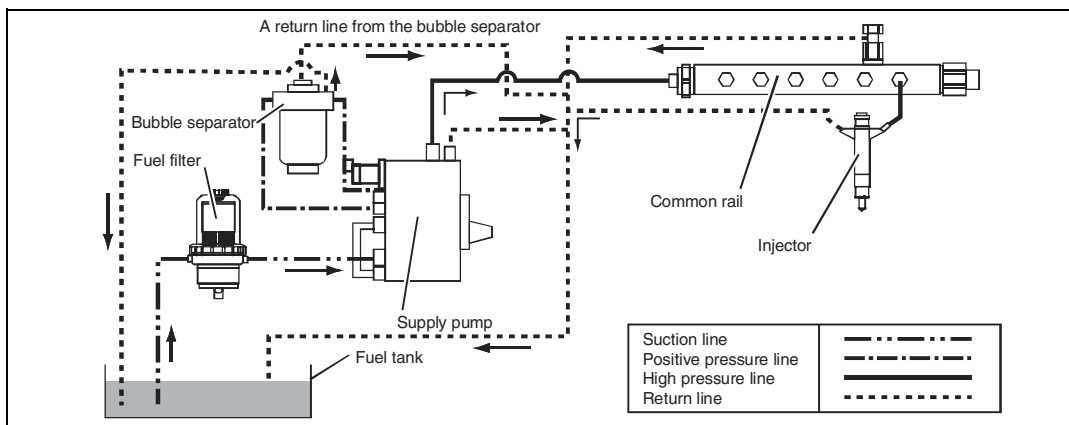
YES

Go to diagnostic procedure of a relevant DTC.

NO

2	Fuel line confirmation
----------	-------------------------------

- 1 Confirm that the fuel line is free of fuel leakage and clogging.

**<Main confirmation locations>**

- Entry of foreign matter into the fuel tank
- Fuel hose breakage, collapsing, looseness
- High-pressure pipe breakage, collapsing, looseness

Judgment

Fuel leakage, clogging, etc. → YES

No fuel leakage, clogging, etc. → NO

YES

Repair the faulty locations.

NO

3 Fuel filter inspection**1 Confirm that the fuel filter is not dirty or clogged.**

Judgment

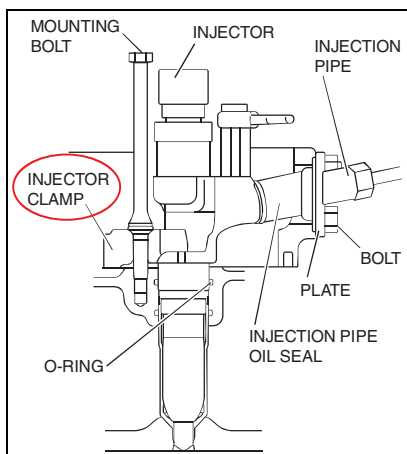
Fuel leakage, clogging, etc. → YES

No abnormality → NO

YES

Replace the fuel filter.

NO

4 Injector clamp confirmation**1 Confirm that there is no loosening of the injector clamp.****2 Confirm that there is no "insufficient engagement" of the injector clamp claw.**

Judgment

Looseness etc. → YES

No abnormality → NO

YES

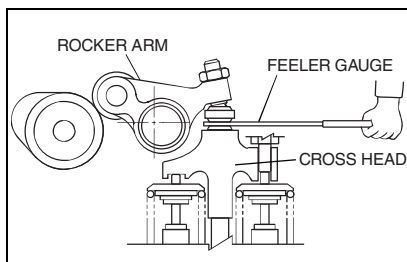
Repair the faulty locations.

NO

DN02-274

FUEL CONTROL (J08E)

5 Valve clearance confirmation



shfts011060100009

- 1 Confirm that the valve clearance of each cylinder is within the standard value.
(Confirm all valves.)

Valve clearance standard value (when cold)

Intake valve	0.3 mm (0.0118 in)
Exhaust valve	0.45 mm (0.0177 in)

	Cylinder			1		2		3		4		5		6	
	Valve			IN	EX	IN	EX	IN	EX	IN	EX	IN	EX	IN	EX
With No.1 piston at T.D.C. on compression stroke	Cam-shaft gear condition		Two drill holes and camshaft housing is horizontal. The rest of drill hole is visible. #1	○	○		○	○			○	○			
With No.6 piston at T.D.C. on compression stroke			Two drill holes and camshaft housing is horizontal. The rest of drill hole is invisible. #1			○			○	○			○	○	○

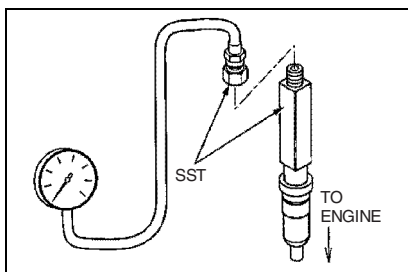
- #1= View from rear side of camshaft housing
- OMark: Possible to check valve clearance
- Firing order: 1-4-2-6-3-5
- T.D.C.: Top Dead Center

Judgment	Specified value → YES
	NOT specified value → NO

YES

Adjust the valve clearance.

NO

6 Compression confirmation

P0278-6

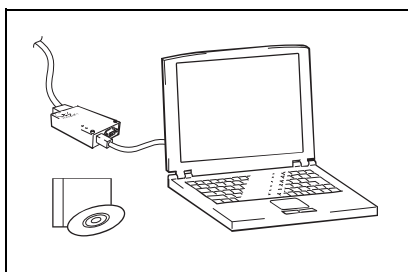
- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Remove the air cleaner.
- 3 Remove the cylinder head cover.
- 4 Remove the all injectors .
- 5 Set the special service tool (SST) and measure the compression.
- 6 Check whether the compression value is exceeded the limit.
Engine speed 150 r/min

Item	Compression: Unit MPa {kg/cm ² }
Standard value	3.2 - 3.4 {33 - 35}
Limit value	2.3 {24}

Judgment	Reach to the limit → YES
	No abnormality → NO

YES → Engine overhaul

NO

7 Cylinder cut-off test

saph161060200038

- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Connect Hino-DX to the vehicle and select the engine.
- 3 Use the cruise function to run the engine at 1500 r/min.
- 4 Confirm the engine sound at the time of normal operation.
- 5 Use the "active test" of the Hino-DX to perform a cut-off test.
(For details, refer to the cut-off test procedure after injection quantity and timing (#1cyl).)

<Cylinder cut-off test>

By stopping the fuel inject session for any one cylinder of an engine normally running with six or four cylinders, this method can judge combustion abnormalities by means of the different sound.

Judgment	There is NO difference in sound or performance when the injection is cut off → YES
	There is a clear difference in sound or performance when the injection is cut-off → NO

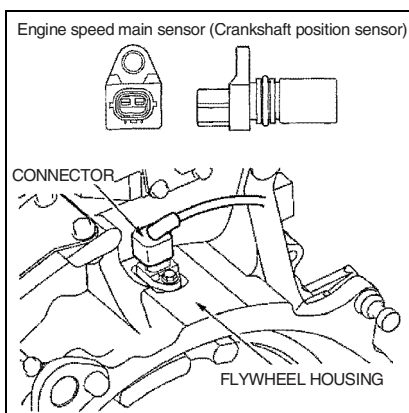
DN02-276

FUEL CONTROL (J08E)

YES

Replace the injector
(Replace the failed injector detected by the cut-off
test not the injector noted in the DTC.)

NO

8 Engine speed sensor confirmation

- 1 Confirm the installation condition of the engine speed main sensor. (Crankshaft position sensor)
- 2 Confirm the installation condition of the engine speed main sensor connector.

Judgment

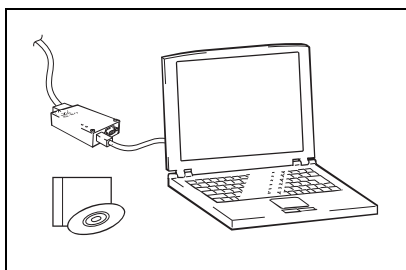
Defective installation → YES

No abnormality → NO

YES

Repair the faulty locations.

NO

9 DTC confirmation

- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Stop the engine.
- 3 Connect Hino-DX to the vehicle.
- 4 Start the "Engine ECU".
- 5 Check if the DTC P0269 is stored.

Judgment

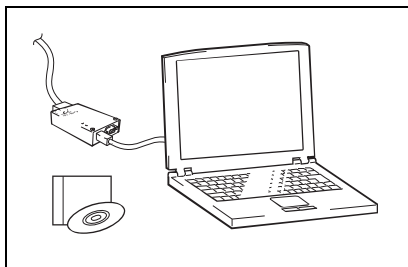
DTC is stored → YES → Replace the common rail assembly.

No DTC is stored → NO

NO

Completed

YES

10 DTC confirmation (After common rail assembly replacement)

saph161060200038

- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Stop the engine.
- 3 Connect Hino-DX to the vehicle.
- 4 Start the engine.
- 5 Select the "engine ECU" and confirm the DTC.

Judgment

DTC is stored → YES

No DTC is stored → NO

YES

Inspect the crankshaft, connecting rods, flywheel, and other parts of the drive system

NO

Completed

DTC:P0272 (Check sheet)

EN1610602F200093

DTC:P0272 Injection quantity and timing (#4cyl)**1. Technical description**

- The engine speed main sensor (Crankshaft position sensor) monitors the speed of the #4 cylinder.
- For control, it increases or reduces the compensation of the injection quantity of the #4 cylinder to make constant the speed of each cylinder.
- If the speed of the #4 cylinder is found abnormal, diagnostic judgment will take place.

2. DTC set condition**(1) Check conditions**

All the following conditions continue for more than 30 seconds.

- The engine speed is in the range of 250 to 900 r/min.
- The fuel injection quantity is within 0 to 50 mm³/st.cyl.
- The exhaust brake and PTO are inactive.

(2) Judgment criteria

1. All the following conditions continue for more than 10 seconds.
- The engine speed is within the table below.

Engine speed (rpm)

	MT	AMT	AT
D range	N/A	695-745	725-775
N range	725-775	725-775	725-775
P range	N/A	725-775	725-775

Note.

MT; Manual transmission

AMT; Automated manual transmission

AT; Automatic transmission

- Gear position unchanged
 - The fuel injection quantity is less than 50 mm³/st.cyl.
 - The coolant temperature is above 60°C {140°F}.
 - The accelerator opening is 0%.
 - The vehicle speed is 0 mile/h.
 - The exhaust brake and PTO are inactive.
 - Other DTC judgments have not been detected (system normal).
2. If the speed of the #4 cylinder measured by the engine speed main sensor continues to be abnormal for more than 20 seconds, a DTC judgment will be detected.
1 and 2 must be established continuously.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Fuel injection pipe: Breakage, crack, fuel leakage

Cylinder: Compression leakage

Common rail: Malfunction of flow damper

Injector: Clogging, keeping injecting

DTC:P0272	Injection quantity and timing (#4cyl)	Inspection Procedure
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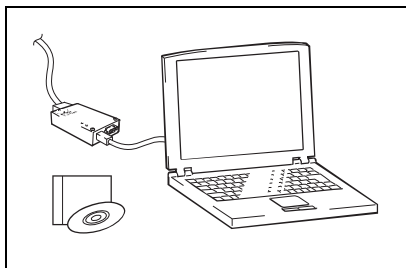
Step	Parts	Description	Judgment	Action		
				Check (YES/NO)	YES	NO
1	DTC confirmation	Check Engine ECU if any other DTC is stored other than the following. (P0263, P0266, P0269, P0275, P0278)	DTC is stored → YES NO DTC is stored → NO		Go to the diagnostic procedure of a relevant DTC	Go to Step 2
2	Fuel line	Confirm that the fuel line has no leaks or clogging.	Fuel leakage, clogging, etc. → YES No abnormalities → NO		Repair or replace leaking or clogged fuel line	Go to Step 3
3	Fuel filter	Check the fuel filter for dirt and clogging.	Clogging, dirt, etc. → YES No abnormalities → NO		Replace the fuel filter	Go to Step 4
4	Injector clamp	Check the injector clamp for loosening.	Loosening, installation abnormalities → YES No abnormalities → NO		Repair the faulty locations	Go to Step 5
5	Valve	Valve clearance confirmation.	Excessive clearance → YES Within the standard value → NO		Adjust the valve clearance	Go to Step 6
6	Cylinder	Compression measuring.	Out of standard or reach the limit → YES No abnormalities → NO		Repair the faulty locations	Go to Step 7
7	Cylinder	Cylinder cut off test.	There is NO difference in sound or performance when the injection is cut off → YES There is a clear difference in sound or performance when the injection is cut-off → NO		Replace the injector (Replace the failed injector detected by the cut-off test not the injector noted in the DTC.)	Go to Step 8
8	Engine speed main sensor (Crankshaft position sensor)	Confirmation of the sensor installation status.	Abnormalities → YES No abnormalities → NO		Repair the faulty locations	Go to Step 9
9	DTC confirmation	Check if the DTC P0272 is stored.	P0272 is stored → YES P0272 is not stored → NO		After common rail assembly replacement, go to Step 10	Completed
10	DTC confirmation	Check if the DTC P0272 is stored.	P0272 is stored → YES P0272 is not stored → NO		Inspect the engine drive system components	Completed

DTC:P0272

EN16Z0702F200001

DTC	P0272	Injection quantity and timing (#4cyl)
-----	-------	---------------------------------------

1	DTC confirmation
----------	-------------------------



- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Stop the engine.
- 3 Connect Hino-DX to the vehicle.
- 4 Check engine ECU if any of DTC is stored other than the following. (P0263, P0266, P0269, P0275, P0278)

Judgment	Other DTC is stored → YES
	No other than P0263, P0266, P0269, P0275, P0278 is stored → NO

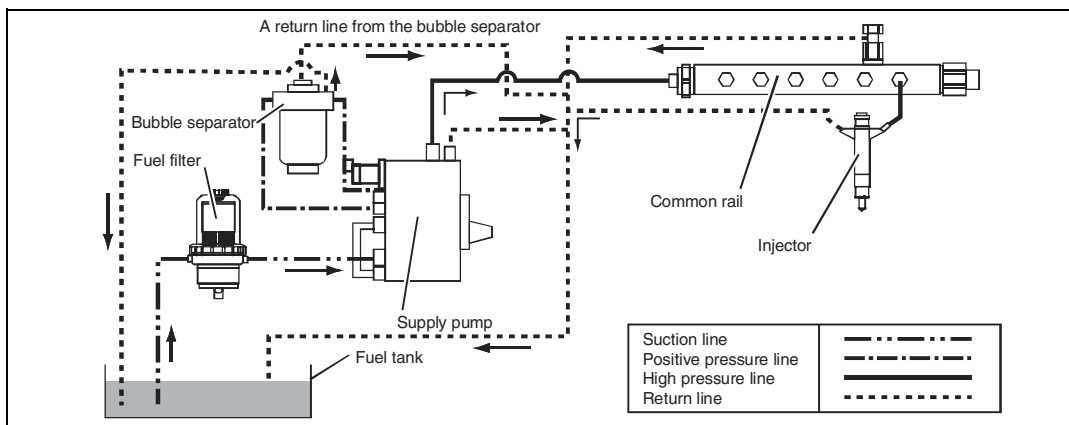
YES

Go to diagnostic procedure of a relevant DTC.

NO

2	Fuel line confirmation
----------	-------------------------------

- 1 Confirm that the fuel line is free of fuel leakage and clogging.

**<Main confirmation locations>**

- Entry of foreign matter into the fuel tank
- Fuel hose breakage, collapsing, looseness
- High-pressure pipe breakage, collapsing, looseness

Judgment

Fuel leakage, clogging, etc. → YES

No fuel leakage, clogging, etc. → NO

YES

Repair the faulty locations.

NO

3 Fuel filter inspection**1 Confirm that the fuel filter is not dirty or clogged.**

Judgment

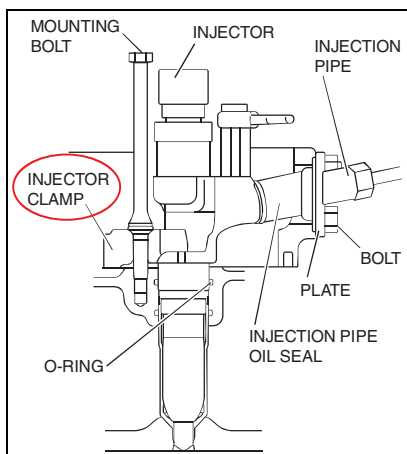
Fuel leakage, clogging, etc. → YES

No abnormality → NO

YES

Replace the fuel filter.

NO

4 Injector clamp confirmation

saph011060700056

1 Confirm that there is no loosening of the injector clamp.**2 Confirm that there is no "insufficient engagement" of the injector clamp claw.**

Judgment

Looseness etc. → YES

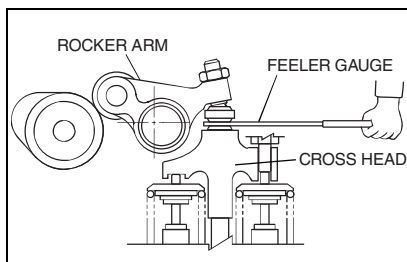
No abnormality → NO

YES

Repair the faulty locations.

NO

5 Valve clearance confirmation



shts011060100009

- 1 Confirm that the valve clearance of each cylinder is within the standard value.
(Confirm all valves.)

Valve clearance standard value (when cold)

Intake valve	0.3 mm (0.0118 in)
Exhaust valve	0.45 mm (0.0177 in)

	Cylinder			1		2		3		4		5		6	
	Valve			IN	EX	IN	EX	IN	EX	IN	EX	IN	EX	IN	EX
With No.1 piston at T.D.C. on compression stroke	Cam-shaft gear condition		Two drill holes and camshaft housing is horizontal. The rest of drill hole is visible. #1	○	○		○	○			○	○			
With No.6 piston at T.D.C. on compression stroke			Two drill holes and camshaft housing is horizontal. The rest of drill hole is invisible. #1			○			○	○			○	○	○

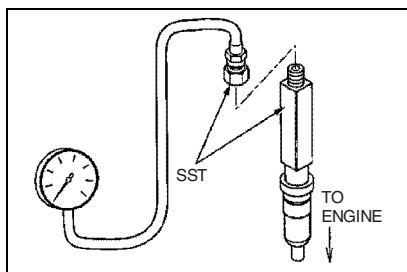
- #1= View from rear side of camshaft housing
- OMark: Possible to check valve clearance
- Firing order: 1-4-2-6-3-5
- T.D.C.: Top Dead Center

Judgment	Specified value → YES
	NOT specified value → NO

YES

Adjust the valve clearance.

NO

6 Compression confirmation

P0278-6

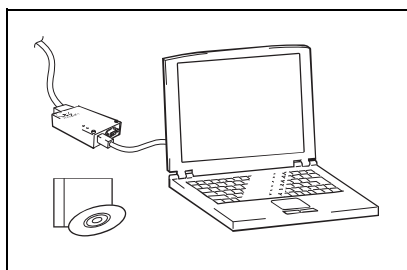
- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Remove the air cleaner.
- 3 Remove the cylinder head cover.
- 4 Remove the all injectors .
- 5 Set the special service tool (SST) and measure the compression.
- 6 Check whether the compression value is exceeded the limit.
Engine speed 150 r/min

Item	Compression: Unit MPa {kg/cm ² }
Standard value	3.2 - 3.4 {33 - 35}
Limit value	2.3 {24}

Judgment	Reach to the limit → YES
	No abnormality → NO

YES → Engine overhaul

NO

7 Cylinder cut-off test

saph161060200038

- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Connect Hino-DX to the vehicle and select the engine.
- 3 Use the cruise function to run the engine at 1500 r/min.
- 4 Confirm the engine sound at the time of normal operation.
- 5 Use the "active test" of the Hino-DX to perform a cut-off test.
(For details, refer to the cut-off test procedure after injection quantity and timing (#1cyl).)

<Cylinder cut-off test>

By stopping the fuel inject session for any one cylinder of an engine normally running with six or four cylinders, this method can judge combustion abnormalities by means of the different sound.

Judgment	There is NO difference in sound or performance when the injection is cut off → YES
	There is a clear difference in sound or performance when the injection is cut-off → NO

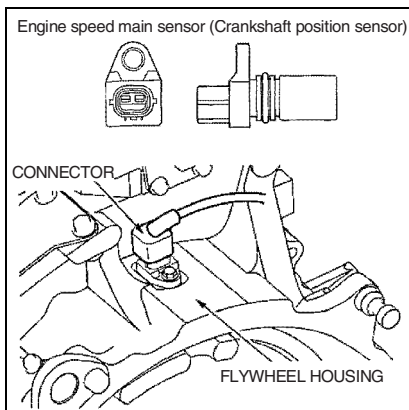
DN02-284

FUEL CONTROL (J08E)

YES

Replace the injector
(Replace the failed injector detected by the cut-off
test not the injector noted in the DTC.)

NO

8 Engine speed sensor confirmation

- 1 Confirm the installation condition of the engine speed main sensor. (Crankshaft position sensor)
- 2 Confirm the installation condition of the engine speed main sensor connector.

Judgment

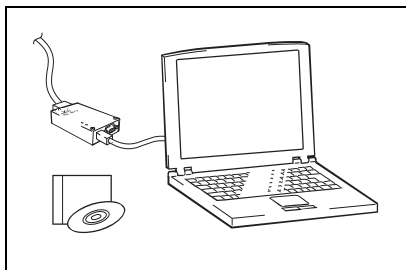
Defective installation → YES

No abnormality → NO

YES

Repair the faulty locations.

NO

9 DTC confirmation

- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Stop the engine.
- 3 Connect Hino-DX to the vehicle.
- 4 Start the "Engine ECU".
- 5 Check if the DTC P0272 is stored.

Judgment

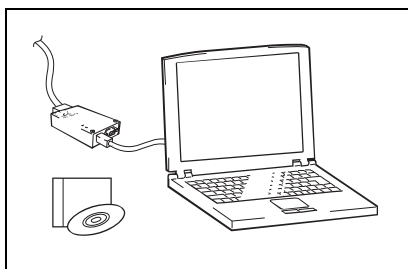
DTC is stored → YES → Replace the common rail assembly.

No DTC is stored → NO

NO

Completed

YES

10 DTC confirmation (After common rail assembly replacement)

saph161060200038

- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Stop the engine.
- 3 Connect Hino-DX to the vehicle.
- 4 Start the engine.
- 5 Select the "engine ECU" and confirm the DTC.

Judgment

DTC is stored → YES

No DTC is stored → NO

YES

Inspect the crankshaft, connecting rods, flywheel, and other parts of the drive system

NO

Completed

DTC:P0275 (Check sheet)

EN1610602F200093

DTC:P0275 Injection quantity and timing (#5cyl)**1. Technical description**

- The engine speed main sensor (Crankshaft position sensor) monitors the speed of the #5 cylinder.
- For control, it increases or reduces the compensation of the injection quantity of the #5 cylinder to make constant the speed of each cylinder.
- If the speed of the #5 cylinder is found abnormal, diagnostic judgment will take place.

2. DTC set condition**(1) Check conditions**

All the following conditions continue for more than 30 seconds.

- The engine speed is in the range of 250 to 900 r/min.
- The fuel injection quantity is within 0 to 50 mm³/st.cyl.
- The exhaust brake and PTO are inactive.

(2) Judgment criteria

1. All the following conditions continue for more than 10 seconds.
- The engine speed is within the table below.

Engine speed (rpm)

	MT	AMT	AT
D range	N/A	695-745	725-775
N range	725-775	725-775	725-775
P range	N/A	725-775	725-775

Note.

MT; Manual transmission

AMT; Automated manual transmission

AT; Automatic transmission

- Gear position unchanged
 - The fuel injection quantity is less than 50 mm³/st.cyl.
 - The coolant temperature is above 60°C {140°F}.
 - The accelerator opening is 0%.
 - The vehicle speed is 0 mile/h.
 - The exhaust brake and PTO are inactive.
 - Other DTC judgments have not been detected (system normal).
2. If the speed of the #5 cylinder measured by the engine speed main sensor continues to be abnormal for more than 20 seconds, a DTC judgment will be detected.
1 and 2 must be established continuously.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Fuel injection pipe: Breakage, crack, fuel leakage

Cylinder: Compression leakage

Common rail: Malfunction of flow damper

Injector: Clogging, keeping injecting

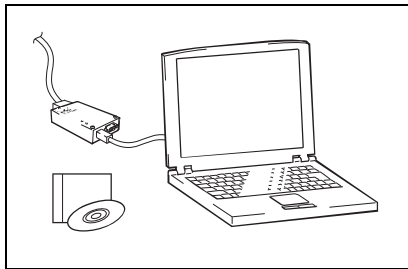
DTC:P0275	Injection quantity and timing (#5cyl)	Inspection Procedure
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Step	Parts	Description	Judgment	Action		
				Check (YES/NO)	YES	NO
1	DTC confirmation	Check Engine ECU if any other DTC is stored other than the following. (P0263, P0266, P0269, P0272, P0278)	DTC is stored → YES NO DTC is stored → NO		Go to the diagnostic procedure of a relevant DTC	Go to Step 2
2	Fuel line	Confirm that the fuel line has no leaks or clogging.	Fuel leakage, clogging, etc. → YES No abnormalities → NO		Repair or replace leaking or clogged fuel line	Go to Step 3
3	Fuel filter	Check the fuel filter for dirt and clogging.	Clogging, dirt, etc. → YES No abnormalities → NO		Replace the fuel filter	Go to Step 4
4	Injector clamp	Check the injector clamp for loosening.	Loosening, installation abnormalities → YES No abnormalities → NO		Repair the faulty locations	Go to Step 5
5	Valve	Valve clearance confirmation.	Excessive clearance → YES Within the standard value → NO		Adjust the valve clearance	Go to Step 6
6	Cylinder	Compression measuring.	Out of standard or reach the limit → YES No abnormalities → NO		Repair the faulty locations	Go to Step 7
7	Cylinder	Cylinder cut off test.	There is NO difference in sound or performance when the injection is cut off → YES There is a clear difference in sound or performance when the injection is cut-off → NO		Replace the injector (Replace the failed injector detected by the cut-off test not the injector noted in the DTC.)	Go to Step 8
8	Engine speed main sensor (Crankshaft position sensor)	Confirmation of the sensor installation status.	Abnormalities → YES No abnormalities → NO		Repair the faulty locations	Go to Step 9
9	DTC confirmation	Check if the DTC P0275 is stored.	P0275 is stored → YES P0275 is not stored → NO		After common rail assembly replacement, go to Step 10	Completed
10	DTC confirmation	Check if the DTC P0275 is stored.	P0275 is stored → YES P0275 is not stored → NO		Inspect the engine drive system components	Completed

DTC:P0275

EN16Z0702F200001

DTC	P0275	Injection quantity and timing (#5cyl)
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1 DTC confirmation

saph161060200038

- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Stop the engine.
- 3 Connect Hino-DX to the vehicle.
- 4 Check engine ECU if any of DTC is stored other than the following. (P0263, P0266, P0269, P0272, P0278)

Judgment	Other DTC is stored → YES
	No other than P0263, P0266, P0269, P0272, P0278 is stored → NO

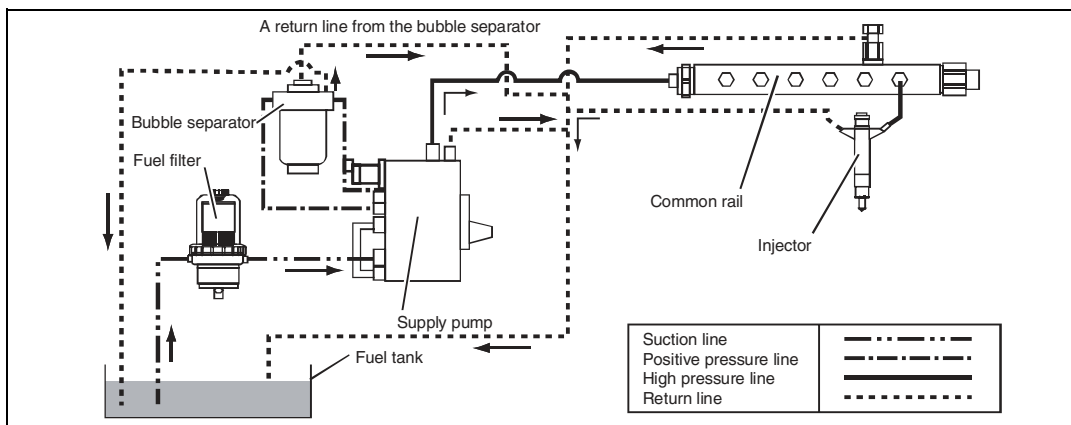
YES

Go to diagnostic procedure of a relevant DTC.

NO

2 Fuel line confirmation

- 1 Confirm that the fuel line is free of fuel leakage and clogging.



P0278-8

<Main confirmation locations>

- Entry of foreign matter into the fuel tank
- Fuel hose breakage, collapsing, looseness
- High-pressure pipe breakage, collapsing, looseness

Judgment

Fuel leakage, clogging, etc. → YES

No fuel leakage, clogging, etc. → NO

YES

Repair the faulty locations.

NO

3 Fuel filter inspection**1 Confirm that the fuel filter is not dirty or clogged.**

Judgment

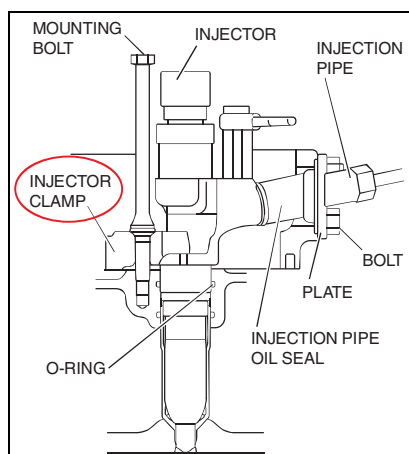
Fuel leakage, clogging, etc. → YES

No abnormality → NO

YES

Replace the fuel filter.

NO

4 Injector clamp confirmation**1 Confirm that there is no loosening of the injector clamp.****2 Confirm that there is no "insufficient engagement" of the injector clamp claw.**

Judgment

Looseness etc. → YES

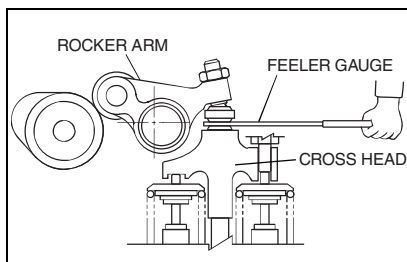
No abnormality → NO

YES

Repair the faulty locations.

NO

5 Valve clearance confirmation



shts011060100009

- 1 Confirm that the valve clearance of each cylinder is within the standard value.
(Confirm all valves.)

Valve clearance standard value (when cold)

Intake valve	0.3 mm (0.0118 in)
Exhaust valve	0.45 mm (0.0177 in)

	Cylinder			1		2		3		4		5		6	
	Valve			IN	EX	IN	EX	IN	EX	IN	EX	IN	EX	IN	EX
With No.1 piston at T.D.C. on compression stroke	Cam-shaft gear condition		Two drill holes and camshaft housing is horizontal. The rest of drill hole is visible. #1	○	○		○	○			○	○			
With No.6 piston at T.D.C. on compression stroke			Two drill holes and camshaft housing is horizontal. The rest of drill hole is invisible. #1			○			○	○			○	○	○

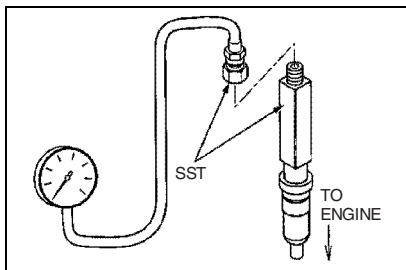
- #1= View from rear side of camshaft housing
- OMark: Possible to check valve clearance
- Firing order: 1-4-2-6-3-5
- T.D.C.: Top Dead Center

Judgment	Specified value → YES
	NOT specified value → NO

YES

Adjust the valve clearance.

NO

6 Compression confirmation

P0278-6

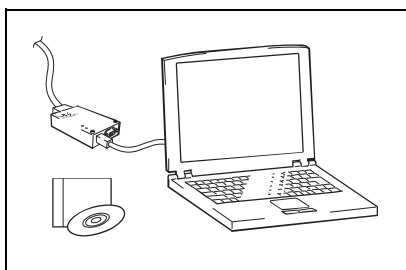
- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Remove the air cleaner.
- 3 Remove the cylinder head cover.
- 4 Remove the all injectors .
- 5 Set the special service tool (SST) and measure the compression.
- 6 Check whether the compression value is exceeded the limit.
Engine speed 150 r/min

Item	Compression: Unit MPa {kg/cm ² }
Standard value	3.2 - 3.4 {33 - 35}
Limit value	2.3 {24}

Judgment	Reach to the limit → YES
	No abnormality → NO

YES → Engine overhaul

NO

7 Cylinder cut-off test

saph161060200038

- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Connect Hino-DX to the vehicle and select the engine.
- 3 Use the cruise function to run the engine at 1500 r/min.
- 4 Confirm the engine sound at the time of normal operation.
- 5 Use the "active test" of the Hino-DX to perform a cut-off test.
(For details, refer to the cut-off test procedure after injection quantity and timing (#1cyl).)

<Cylinder cut-off test>

By stopping the fuel inject session for any one cylinder of an engine normally running with six or four cylinders, this method can judge combustion abnormalities by means of the different sound.

Judgment	There is NO difference in sound or performance when the injection is cut off → YES
	There is a clear difference in sound or performance when the injection is cut-off → NO

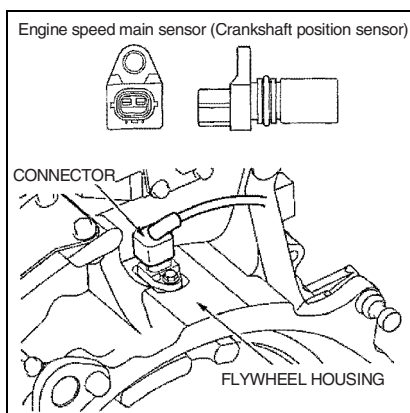
DN02-292

FUEL CONTROL (J08E)

YES

Replace the injector
(Replace the failed injector detected by the cut-off
test not the injector noted in the DTC.)

NO

8 Engine speed sensor confirmation

- 1 Confirm the installation condition of the engine speed main sensor. (Crankshaft position sensor)
- 2 Confirm the installation condition of the engine speed main sensor connector.

Judgment

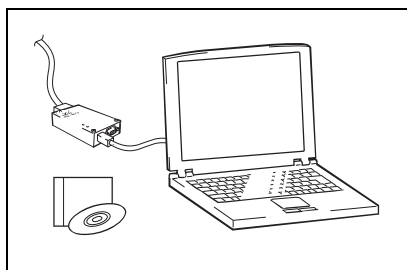
Defective installation → YES

No abnormality → NO

YES

Repair the faulty locations.

NO

9 DTC confirmation

- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Stop the engine.
- 3 Connect Hino-DX to the vehicle.
- 4 Start the "Engine ECU".
- 5 Check if the DTC P0275 is stored.

Judgment

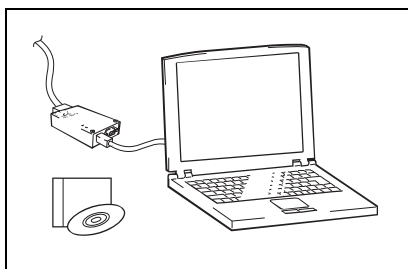
DTC is stored → YES → Replace the common rail assembly.

No DTC is stored → NO

NO

Completed

YES

10 DTC confirmation (After common rail assembly replacement)

saph161060200038

- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Stop the engine.
- 3 Connect Hino-DX to the vehicle.
- 4 Start the engine.
- 5 Select the "engine ECU" and confirm the DTC.

Judgment

DTC is stored → YES

No DTC is stored → NO

YES

Inspect the crankshaft, connecting rods, flywheel, and other parts of the drive system

NO

Completed

DTC:P0278 (Check sheet)

EN1610602F200093

DTC:P0278 Injection quantity and timing (#6cyl)**1. Technical description**

- The engine speed main sensor (Crankshaft position sensor) monitors the speed of the #6 cylinder.
- For control, it increases or reduces the compensation of the injection quantity of the #6 cylinder to make constant the speed of each cylinder.
- If the speed of the #6 cylinder is found abnormal, diagnostic judgment will take place.

2. DTC set condition**(1) Check conditions**

All the following conditions continue for more than 30 seconds.

- The engine speed is in the range of 250 to 900 r/min.
- The fuel injection quantity is within 0 to 50 mm³/st.cyl.
- The exhaust brake and PTO are inactive.

(2) Judgment criteria

1. All the following conditions continue for more than 10 seconds.
- The engine speed is within the table below.

Engine speed (rpm)

	MT	AMT	AT
D range	N/A	695-745	725-775
N range	725-775	725-775	725-775
P range	N/A	725-775	725-775

Note.

MT; Manual transmission

AMT; Automated manual transmission

AT; Automatic transmission

- Gear position unchanged
 - The fuel injection quantity is less than 50 mm³/st.cyl.
 - The coolant temperature is above 60°C {140°F}.
 - The accelerator opening is 0%.
 - The vehicle speed is 0 mile/h.
 - The exhaust brake and PTO are inactive.
 - Other DTC judgments have not been detected (system normal).
2. If the speed of the #6 cylinder measured by the engine speed main sensor continues to be abnormal for more than 20 seconds, a DTC judgment will be detected.
1 and 2 must be established continuously.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Fuel injection pipe: Breakage, crack, fuel leakage

Cylinder: Compression leakage

Common rail: Malfunction of flow damper

Injector: Clogging, keeping injecting

DTC:P0278	Injection quantity and timing (#6cyl)	Inspection Procedure
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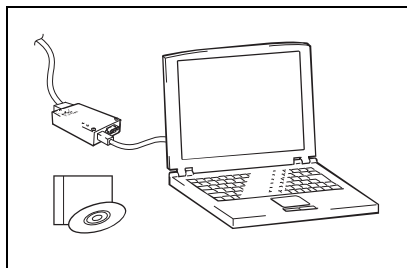
Step	Parts	Description	Judgment	Action		
				Check (YES/NO)	YES	NO
1	DTC confirmation	Check Engine ECU if any other DTC is stored other than the following. (P0263, P0266, P0269, P0272, P0275)	DTC is stored → YES No DTC is stored → NO		Go to the diagnostic procedure of a relevant DTC	Go to Step 2
2	Fuel line	Confirm that the fuel line has no leaks or clogging.	Fuel leakage, clogging, etc. → YES No abnormalities → NO		Repair or replace leaking or clogged fuel line	Go to Step 3
3	Fuel filter	Check the fuel filter for dirt and clogging.	Clogging, dirt, etc. → YES No abnormalities → NO		Replace the fuel filter	Go to Step 4
4	Injector clamp	Check the injector clamp for loosening.	Loosening, installation abnormalities → YES No abnormalities → NO		Repair the faulty locations	Go to Step 5
5	Valve	Valve clearance confirmation.	Excessive clearance → YES Within the standard value → NO		Adjust the valve clearance	Go to Step 6
6	Cylinder	Compression measuring.	Out of standard or reach the limit → YES No abnormalities → NO		Repair the faulty locations	Go to Step 7
7	Cylinder	Cylinder cut off test.	There is NO difference in sound or performance when the injection is cut off → YES There is a clear difference in sound or performance when the injection is cut-off → NO		Replace the injector (Replace the failed injector detected by the cut-off test not the injector noted in the DTC.)	Go to Step 8
8	Engine speed main sensor (Crankshaft position sensor)	Confirmation of the sensor installation status.	Abnormalities → YES No abnormalities → NO		Repair the faulty locations	Go to Step 9
9	DTC confirmation	Check if the DTC P0278 is stored.	P0278 is stored → YES P0278 is not stored → NO		After common rail assembly replacement, go to Step 10	Completed
10	DTC confirmation	Check if the DTC P0278 is stored.	P0278 is stored → YES P0278 is not stored → NO		Inspect the engine drive system components	Completed

DTC:P0278

EN16Z0702F200001

DTC	P0278	Injection quantity and timing (#6cyl)
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1	DTC confirmation
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saph161060200038

- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Stop the engine.
- 3 Connect Hino-DX to the vehicle.
- 4 Check engine ECU if any of DTC is stored other than the following. (P0263, P0266, P0269, P0272, P0275)

Judgment	Other DTC is stored → YES
	No other than P0263, P0266, P0269, P0272, P0275 is stored → NO

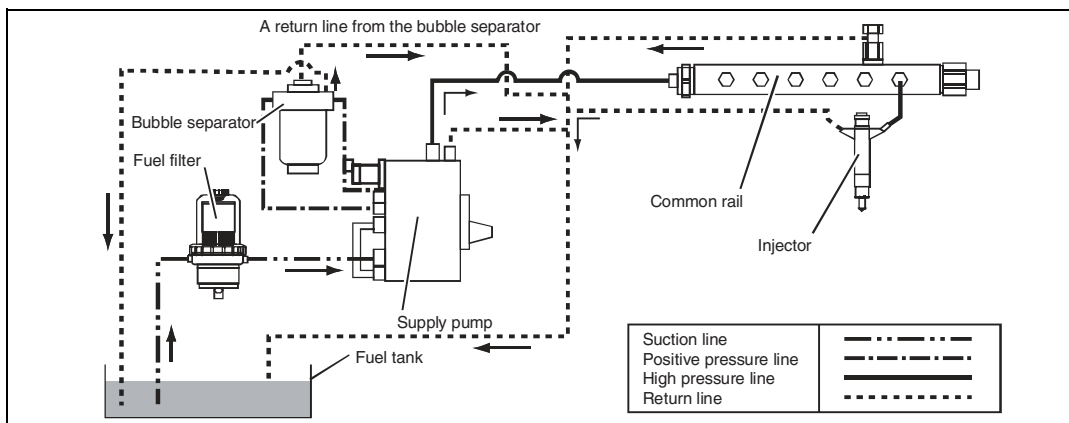
YES

Go to diagnostic procedure of a relevant DTC.

NO

2	Fuel line confirmation
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- 1 Confirm that the fuel line is free of fuel leakage and clogging.



P0278-8

<Main confirmation locations>

- Entry of foreign matter into the fuel tank
- Fuel hose breakage, collapsing, looseness
- High-pressure pipe breakage, collapsing, looseness

Judgment

Fuel leakage, clogging, etc. → YES

No fuel leakage, clogging, etc. → NO

YES

Repair the faulty locations.

NO

3 Fuel filter inspection**1 Confirm that the fuel filter is not dirty or clogged.**

Judgment

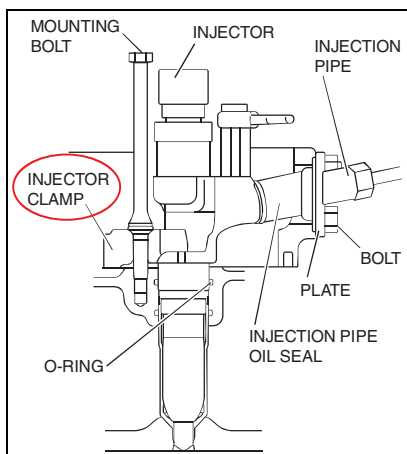
Fuel leakage, clogging, etc. → YES

No abnormality → NO

YES

Replace the fuel filter.

NO

4 Injector clamp confirmation**1 Confirm that there is no loosening of the injector clamp.****2 Confirm that there is no "insufficient engagement" of the injector clamp claw.**

Judgment

Looseness etc. → YES

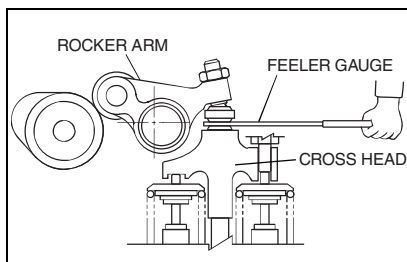
No abnormality → NO

YES

Repair the faulty locations.

NO

5 Valve clearance confirmation



shfts011060100009

- 1 Confirm that the valve clearance of each cylinder is within the standard value.
(Confirm all valves.)

Valve clearance standard value (when cold)

Intake valve	0.3 mm (0.0118 in)
Exhaust valve	0.45 mm (0.0177 in)

	Cylinder			1		2		3		4		5		6	
	Valve			IN	EX	IN	EX	IN	EX	IN	EX	IN	EX	IN	EX
With No.1 piston at T.D.C. on compression stroke	Cam-shaft gear condition		Two drill holes and camshaft housing is horizontal. The rest of drill hole is visible. #1	○	○		○	○			○	○			
With No.6 piston at T.D.C. on compression stroke			Two drill holes and camshaft housing is horizontal. The rest of drill hole is invisible. #1			○			○	○			○	○	○

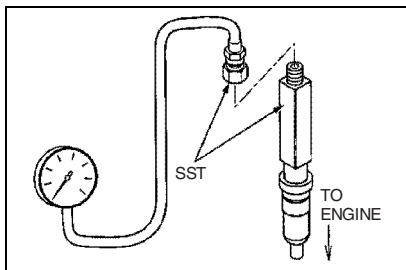
- #1= View from rear side of camshaft housing
- OMark: Possible to check valve clearance
- Firing order: 1-4-2-6-3-5
- T.D.C.: Top Dead Center

Judgment	Specified value → YES
	NOT specified value → NO

YES

Adjust the valve clearance.

NO

6 Compression confirmation

P0278-6

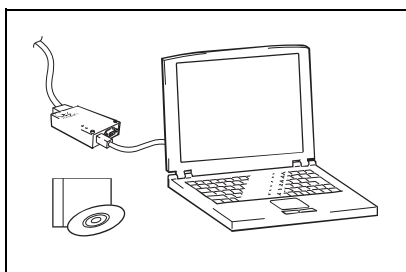
- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Remove the air cleaner.
- 3 Remove the cylinder head cover.
- 4 Remove the all injectors .
- 5 Set the special service tool (SST) and measure the compression.
- 6 Check whether the compression value is exceeded the limit.
Engine speed 150 r/min

Item	Compression: Unit MPa {kg/cm ² }
Standard value	3.2 - 3.4 {33 - 35}
Limit value	2.3 {24}

Judgment	Reach to the limit → YES
	No abnormality → NO

YES → Engine overhaul

NO

7 Cylinder cut-off test

saph161060200038

- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Connect Hino-DX to the vehicle and select the engine.
- 3 Use the cruise function to run the engine at 1500 r/min.
- 4 Confirm the engine sound at the time of normal operation.
- 5 Use the "active test" of the Hino-DX to perform a cut-off test.
(For details, refer to the cut-off test procedure after injection quantity and timing (#1cyl).)

<Cylinder cut-off test>

By stopping the fuel inject session for any one cylinder of an engine normally running with six or four cylinders, this method can judge combustion abnormalities by means of the different sound.

Judgment	There is NO difference in sound or performance when the injection is cut off → YES
	There is a clear difference in sound or performance when the injection is cut-off → NO

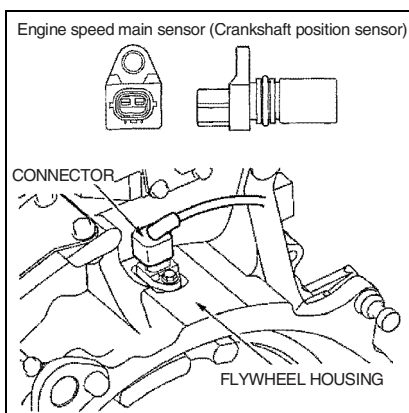
DN02-300

FUEL CONTROL (J08E)

YES

Replace the injector
(Replace the failed injector detected by the cut-off
test not the injector noted in the DTC.)

NO

8 Engine speed sensor confirmation

- 1 Confirm the installation condition of the engine speed main sensor. (Crankshaft position sensor)
- 2 Confirm the installation condition of the engine speed main sensor connector.

Judgment

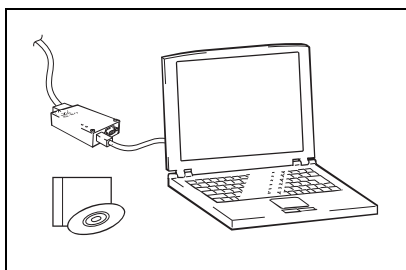
Defective installation → YES

No abnormality → NO

YES

Repair the faulty locations.

NO

9 DTC confirmation

- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Stop the engine.
- 3 Connect Hino-DX to the vehicle.
- 4 Start the "Engine ECU".
- 5 Check if the DTC P0278 is stored.

Judgment

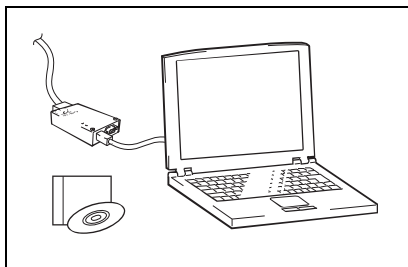
DTC is stored → YES → Replace the common rail assembly.

No DTC is stored → NO

NO

Completed

YES

10 DTC confirmation (After common rail assembly replacement)

saph161060200038

- 1 Perform engine warm-up. (Water temperature: 60°C {140°F} or more)
- 2 Stop the engine.
- 3 Connect Hino-DX to the vehicle.
- 4 Start the engine.
- 5 Select the "engine ECU" and confirm the DTC.

Judgment

DTC is stored → YES

No DTC is stored → NO

YES

Inspect the crankshaft, connecting rods, flywheel, and other parts of the drive system

NO

Completed

DN02-302

FUEL CONTROL (J08E)

DTC:P0299 (Check sheet)

EN1610602F200095

DTC:P0299

Underboost

1. Technical description

- The VNT moves the nozzle vane steplessly by the REA (Rotary Electric Actuator) to control the turbo speed and boost pressure. It compares the target boost pressure and actual boost pressure to check if the actual pressure is lower than the target pressure.

2. DTC set condition**(1) Check conditions**

While the engine is in operation - Always

(2) Judgment criteria

- Compare the target boost pressure and actual boost pressure....10 - 64kPa

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Abnormality in air intake system
- Malfunction of boost pressure sensor
- Malfunction of air flow sensor
- Malfunction of VNT
- Malfunction of EGR valve

DTC : P0299	Underboost	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Air intake system	Inspection of air intake system (leakage, clogging, bent hose, etc.).			
2	Boost pressure sensor	Inspection of boost pressure sensor			
3	Air flow sensor	Inspection of air flow sensor			
4	VNT	Inspection of VNT			
5	EGR valve	Inspection of EGR valve			

DN02-304

FUEL CONTROL (J08E)

DTC:P0299

EN1610602F200096

DTC	P0299	Underboost
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1. CHECK FOR LEAK.
2. CHECK THE INTAKE SYSTEM BETWEEN THE INTAKE DUCT AND THE AIR CLEANER AND BETWEEN THE AIR CLEANER AND THE TURBO COMPRESSOR FOR CLOGGING.
3. INSPECT THE BURNER SYSTEM (Proceed to P141F).
4. INSPECT THE VNT TURBO (Proceed to P0045).



FUEL CONTROL (J08E)

DN02-305



DN02-306

FUEL CONTROL (J08E)

DTC:P0301 (Check sheet)

EN1610602F200097

DTC:P0301

Continuously misfiring (#1cyl)

1. Technical description

- The main speed sensor monitors the speed of the #1 cylinder.
- For control, it increases or reduces the compensation of the injection quantity of the #1 cylinder to make constant the speed of each cylinder.
- If the speed of the #1 cylinder is found abnormal, diagnostic judgment will take place.

2. DTC set condition**(1) Check conditions**

All the following conditions continue for more than 30 seconds.

- The engine speed is in the range of 250 to 900 r/min.
- The fuel injection quantity is within 0 to 50 mm³/st.cyl.
- The exhaust brake and PTO are inactive.

(2) Judgment criteria

1. All the following conditions continue for more than 10 seconds.

- The engine speed is within the table below.

Engine speed (rpm)

	MT	AMT	AT
D range	N/A	695-745	725-775
N range	725-775	725-775	725-775
P range	N/A	725-775	725-775

Note.

MT; Manual trans mission

AMT; Automated manual trans mission

AT; Automatic transmission

- Gear position unchanged
 - The fuel injection quantity is less than 50 mm³/st.cyl.
 - The coolant temperature is above 60°C {140°F}.
 - The accelerator opening is 0%.
 - The vehicle speed is 0 mile/h.
 - The exhaust brake and PTO are inactive.
 - Other diagnostic judgments have not been made (system normal).
2. If all the following conditions continue for more than 10 seconds, diagnostic judgment will take place.
- The fuel injection quantity is above 40 mm³/st.cyl.
 - The speed of the #1 cylinder measured by crankshaft position sensor (the engine main revolution sensor) becomes abnormal.
1. and 2. must be established continuously.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Fuel injection pipe: Breakage, crack, fuel leakage**Cylinder:** Compression leakage**Common rail:** Malfunction of flow damper**Injector:** Clogging, keeping injecting

DTC:P0301		Continuously misfiring (#1cyl)		Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Fuel injection pipe between common rail and injector	Check the injection pipe for fuel leakage due to breakage, crack or looseness of connected portions.			Replace the fuel injection pipe.
2	Cylinder	<ul style="list-style-type: none"> Check the #1 cylinder for compression leakage. In the active test for the Hino DX (stop of injection), stop the #1 cylinder and check if a change occurs in engine vibrations. 			Replace the part with the cause.
3	Flow damper of common rail	<ul style="list-style-type: none"> Check if the flow damper malfunctions to stop fuel. (Check if fuel is fed from the common rail to the injector of the #1 cylinder.) In the active test for the Hino DX (stop of injection), stop the #1 cylinder and check if a change occurs in engine vibrations. 			Replace the common rail assembly.
4	Engine	Compression test	More than 340 psi		Overhaul
5	Injector	<ul style="list-style-type: none"> Check the injector for clogging and keeping injecting. In the active test for the Hino DX (stop of injection), stop the #1 cylinder and check if a change occurs in engine vibrations. 			Replace the injector.

DN02-308

FUEL CONTROL (J08E)

DTC:P0302 (Check sheet)

EN1610602F200098

DTC:P0302

Continuously misfiring (#2cyl)

1. Technical description

- The main speed sensor monitors the speed of the #2 cylinder.
- For control, it increases or reduces the compensation of the injection quantity of the #2 cylinder to make constant the speed of each cylinder.
- If the speed of the #2 cylinder is found abnormal, diagnostic judgment will take place.

2. DTC set condition**(1) Check conditions**

All the following conditions continue for more than 30 seconds.

- The engine speed is in the range of 250 to 900 r/min.
- The fuel injection quantity is within 0 to 50 mm³/st.cyl.
- The exhaust brake and PTO are inactive.

(2) Judgment criteria

1. All the following conditions continue for more than 10 seconds.

- The engine speed is within the table below.

Engine speed (rpm)

	MT	AMT	AT
D range	N/A	695-745	725-775
N range	725-775	725-775	725-775
P range	N/A	725-775	725-775

Note.

MT; Manual transmission

AMT; Automated manual transmission

AT; Automatic transmission

- Gear position unchanged
 - The fuel injection quantity is less than 50 mm³/st.cyl.
 - The coolant temperature is above 60°C {140°F}.
 - The accelerator opening is 0%.
 - The vehicle speed is 0 mile/h.
 - The exhaust brake and PTO are inactive.
 - Other diagnostic judgments have not been made (system normal).
2. If all the following conditions continue for more than 10 seconds, diagnostic judgment will take place.
- The fuel injection quantity is above 40 mm³/st.cyl.
 - The speed of the #2 cylinder measured by crankshaft position sensor (the engine main revolution sensor) becomes abnormal.
1. and 2. must be established continuously.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Fuel injection pipe: Breakage, crack, fuel leakage**Cylinder:** Compression leakage**Common rail:** Malfunction of flow damper**Injector:** Clogging, keeping injecting

DTC:P0302		Continuously misfiring (#2cyl)		Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Fuel injection pipe between common rail and injector	Check the injection pipe for fuel leakage due to breakage, crack or looseness of connected portions.			Replace the fuel injection pipe.
2	Cylinder	<ul style="list-style-type: none"> Check the #2 cylinder for compression leakage. In the active test for the Hino DX (stop of injection), stop the #2 cylinder and check if a change occurs in engine vibrations. 			Replace the part with the cause.
3	Flow damper of common rail	<ul style="list-style-type: none"> Check if the flow damper malfunctions to stop fuel. (Check if fuel is fed from the common rail to the injector of the #2 cylinder.) In the active test for the Hino DX (stop of injection), stop the #2 cylinder and check if a change occurs in engine vibrations. 			Replace the common rail assembly.
4	Engine	Compression test	More than 340 psi		Overhaul
5	Injector	<ul style="list-style-type: none"> Check the injector for clogging and keeping injecting. In the active test for the Hino DX (stop of injection), stop the #2 cylinder and check if a change occurs in engine vibrations. 			Replace the injector.

DTC:P0303 (Check sheet)

EN1610602F200099

DTC:P0303

Continuously misfiring (#3cyl)

1. Technical description

- The main speed sensor monitors the speed of the #3 cylinder.
- For control, it increases or reduces the compensation of the injection quantity of the #3 cylinder to make constant the speed of each cylinder.
- If the speed of the #3 cylinder is found abnormal, diagnostic judgment will take place.

2. DTC set condition**(1) Check conditions**

All the following conditions continue for more than 30 seconds.

- The engine speed is in the range of 250 to 900 r/min.
- The fuel injection quantity is within 0 to 50 mm³/st.cyl.
- The exhaust brake and PTO are inactive.

(2) Judgment criteria

1. All the following conditions continue for more than 10 seconds.

- The engine speed is within the table below.

Engine speed (rpm)

	MT	AMT	AT
D range	N/A	695-745	725-775
N range	725-775	725-775	725-775
P range	N/A	725-775	725-775

Note.

MT; Manual transmission

AMT; Automated manual transmission

AT; Automatic transmission

- Gear position unchanged
 - The fuel injection quantity is less than 50 mm³/st.cyl.
 - The coolant temperature is above 60°C {140°F}.
 - The accelerator opening is 0%.
 - The vehicle speed is 0 mile/h.
 - The exhaust brake and PTO are inactive.
 - Other diagnostic judgments have not been made (system normal).
2. If all the following conditions continue for more than 10 seconds, diagnostic judgment will take place.
- The fuel injection quantity is above 40 mm³/st.cyl.
 - The speed of the #3 cylinder measured by crankshaft position sensor (the engine main revolution sensor) becomes abnormal.

1. and 2. must be established continuously.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Fuel injection pipe: Breakage, crack, fuel leakage**Cylinder:** Compression leakage**Common rail:** Malfunction of flow damper**Injector:** Clogging, keeping injecting

DTC:P0303		Continuously misfiring (#3cyl)		Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Fuel injection pipe between common rail and injector	Check the injection pipe for fuel leakage due to breakage, crack or looseness of connected portions.			Replace the fuel injection pipe.
2	Cylinder	<ul style="list-style-type: none"> Check the #3 cylinder for compression leakage. In the active test for the Hino DX (stop of injection), stop the #3 cylinder and check if a change occurs in engine vibrations. 			Replace the part with the cause.
3	Flow damper of common rail	<ul style="list-style-type: none"> Check if the flow damper malfunctions to stop fuel. (Check if fuel is fed from the common rail to the injector of the #3 cylinder.) In the active test for the Hino DX (stop of injection), stop the #3 cylinder and check if a change occurs in engine vibrations. 			Replace the common rail assembly.
4	Engine	Compression test	More than 340 psi		Overhaul
5	Injector	<ul style="list-style-type: none"> Check the injector for clogging and keeping injecting. In the active test for the Hino DX (stop of injection), stop the #3 cylinder and check if a change occurs in engine vibrations. 			Replace the injector.

DTC:P0304 (Check sheet)

EN1610602F200100

DTC:P0304

Continuously misfiring (#4cyl)

1. Technical description

- The main speed sensor monitors the speed of the #4 cylinder.
- For control, it increases or reduces the compensation of the injection quantity of the #4 cylinder to make constant the speed of each cylinder.
- If the speed of the #4 cylinder is found abnormal, diagnostic judgment will take place.

2. DTC set condition**(1) Check conditions**

All the following conditions continue for more than 30 seconds.

- The engine speed is in the range of 250 to 900 r/min.
- The fuel injection quantity is within 0 to 50 mm³/st.cyl.
- The exhaust brake and PTO are inactive.

(2) Judgment criteria

1. All the following conditions continue for more than 10 seconds.

- The engine speed is within the table below.

Engine speed (rpm)

	MT	AMT	AT
D range	N/A	695-745	725-775
N range	725-775	725-775	725-775
P range	N/A	725-775	725-775

Note.

MT; Manual transmission

AMT; Automated manual transmission

AT; Automatic transmission

- Gear position unchanged
 - The fuel injection quantity is less than 50 mm³/st.cyl.
 - The coolant temperature is above 60°C {140°F}.
 - The accelerator opening is 0%.
 - The vehicle speed is 0 mile/h.
 - The exhaust brake and PTO are inactive.
 - Other diagnostic judgments have not been made (system normal).
2. If all the following conditions continue for more than 10 seconds, diagnostic judgment will take place.
- The fuel injection quantity is above 40 mm³/st.cyl.
 - The speed of the #4 cylinder measured by crankshaft position sensor (the engine main revolution sensor) becomes abnormal.
1. and 2. must be established continuously.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Fuel injection pipe: Breakage, crack, fuel leakage**Cylinder:** Compression leakage**Common rail:** Malfunction of flow damper**Injector:** Clogging, keeping injecting

DTC:P0304		Continuously misfiring (#4cyl)		Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Fuel injection pipe between common rail and injector	Check the injection pipe for fuel leakage due to breakage, crack or looseness of connected portions.			Replace the fuel injection pipe.
2	Cylinder	<ul style="list-style-type: none"> Check the #4 cylinder for compression leakage. In the active test for the Hino DX (stop of injection), stop the #4 cylinder and check if a change occurs in engine vibrations. 			Replace the part with the cause.
3	Flow damper of common rail	<ul style="list-style-type: none"> Check if the flow damper malfunctions to stop fuel. (Check if fuel is fed from the common rail to the injector of the #4 cylinder.) In the active test for the Hino DX (stop of injection), stop the #4 cylinder and check if a change occurs in engine vibrations. 			Replace the common rail assembly.
4	Engine	Compression test	More than 340 psi		Overhaul
5	Injector	<ul style="list-style-type: none"> Check the injector for clogging and keeping injecting. In the active test for the Hino DX (stop of injection), stop the #4 cylinder and check if a change occurs in engine vibrations. 			Replace the injector.

DN02-314

FUEL CONTROL (J08E)

DTC:P0305 (Check sheet)

EN1610602F200101

DTC:P0305

Continuously misfiring (#5cyl)

1. Technical description

- The main speed sensor monitors the speed of the #5 cylinder.
- For control, it increases or reduces the compensation of the injection quantity of the #5 cylinder to make constant the speed of each cylinder.
- If the speed of the #5 cylinder is found abnormal, diagnostic judgment will take place.

2. DTC set condition**(1) Check conditions**

All the following conditions continue for more than 30 seconds.

- The engine speed is in the range of 250 to 900 r/min.
- The fuel injection quantity is within 0 to 50 mm³/st.cyl.
- The exhaust brake and PTO are inactive.

(2) Judgment criteria

1. All the following conditions continue for more than 10 seconds.

- The engine speed is within the table below.

Engine speed (rpm)

	MT	AMT	AT
D range	N/A	695-745	725-775
N range	725-775	725-775	725-775
P range	N/A	725-775	725-775

Note.

MT; Manual transmission

AMT; Automated manual transmission

AT; Automatic transmission

- Gear position unchanged
 - The fuel injection quantity is less than 50 mm³/st.cyl.
 - The coolant temperature is above 60°C {140°F}.
 - The accelerator opening is 0%.
 - The vehicle speed is 0 mile/h.
 - The exhaust brake and PTO are inactive.
 - Other diagnostic judgments have not been made (system normal).
2. If all the following conditions continue for more than 10 seconds, diagnostic judgment will take place.
- The fuel injection quantity is above 40 mm³/st.cyl.
 - The speed of the #5 cylinder measured by crankshaft position sensor (the engine main revolution sensor) becomes abnormal.
1. and 2. must be established continuously.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Fuel injection pipe: Breakage, crack, fuel leakage**Cylinder:** Compression leakage**Common rail:** Malfunction of flow damper**Injector:** Clogging, keeping injecting

DTC:P0305		Continuously misfiring (#5cyl)		Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Fuel injection pipe between common rail and injector	Check the injection pipe for fuel leakage due to breakage, crack or looseness of connected portions.			Replace the fuel injection pipe.
2	Cylinder	<ul style="list-style-type: none"> Check the #5 cylinder for compression leakage. In the active test for the Hino DX (stop of injection), stop the #5 cylinder and check if a change occurs in engine vibrations. 			Replace the part with the cause.
3	Flow damper of common rail	<ul style="list-style-type: none"> Check if the flow damper malfunctions to stop fuel. (Check if fuel is fed from the common rail to the injector of the #5 cylinder.) In the active test for the Hino DX (stop of injection), stop the #5 cylinder and check if a change occurs in engine vibrations. 			Replace the common rail assembly.
4	Engine	Compression test	More than 340 psi		Overhaul
5	Injector	<ul style="list-style-type: none"> Check the injector for clogging and keeping injecting. In the active test for the Hino DX (stop of injection), stop the #5 cylinder and check if a change occurs in engine vibrations. 			Replace the injector.

DN02-316

FUEL CONTROL (J08E)

DTC:P0306 (Check sheet)

EN1610602F200102

DTC:P0306

Continuously misfiring (#6cyl)

1. Technical description

- The main speed sensor monitors the speed of the #6 cylinder.
- For control, it increases or reduces the compensation of the injection quantity of the #6 cylinder to make constant the speed of each cylinder.
- If the speed of the #6 cylinder is found abnormal, diagnostic judgment will take place.

2. DTC set condition**(1) Check conditions**

All the following conditions continue for more than 30 seconds.

- The engine speed is in the range of 250 to 900 r/min.
- The fuel injection quantity is within 0 to 50 mm³/st.cyl.
- The exhaust brake and PTO are inactive.

(2) Judgment criteria

1. All the following conditions continue for more than 10 seconds.

- The engine speed is within the table below.

Engine speed (rpm)

	MT	AMT	AT
D range	N/A	695-745	725-775
N range	725-775	725-775	725-775
P range	N/A	725-775	725-775

Note.

MT; Manual transmission

AMT; Automated manual transmission

AT; Automatic transmission

- Gear position unchanged
 - The fuel injection quantity is less than 50 mm³/st.cyl.
 - The coolant temperature is above 60°C {140°F}.
 - The accelerator opening is 0%.
 - The vehicle speed is 0 mile/h.
 - The exhaust brake and PTO are inactive.
 - Other diagnostic judgments have not been made (system normal).
2. If all the following conditions continue for more than 10 seconds, diagnostic judgment will take place.
- The fuel injection quantity is above 40 mm³/st.cyl.
 - The speed of the #6 cylinder measured by crankshaft position sensor (the engine main revolution sensor) becomes abnormal.
1. and 2. must be established continuously.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Fuel injection pipe: Breakage, crack, fuel leakage**Cylinder:** Compression leakage**Common rail:** Malfunction of flow damper**Injector:** Clogging, keeping injecting

DTC:P0306		Continuously misfiring (#6cyl)		Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Fuel injection pipe between common rail and injector	Check the injection pipe for fuel leakage due to breakage, crack or looseness of connected portions.			Replace the fuel injection pipe.
2	Cylinder	<ul style="list-style-type: none"> Check the #6 cylinder for compression leakage. In the active test for the Hino DX (stop of injection), stop the #6 cylinder and check if a change occurs in engine vibrations. 			Replace the part with the cause.
3	Flow damper of common rail	<ul style="list-style-type: none"> Check if the flow damper malfunctions to stop fuel. (Check if fuel is fed from the common rail to the injector of the #6 cylinder.) In the active test for the Hino DX (stop of injection), stop the #6 cylinder and check if a change occurs in engine vibrations. 			Replace the common rail assembly.
4	Engine	Compression test	More than 340 psi		Overhaul
5	Injector	<ul style="list-style-type: none"> Check the injector for clogging and keeping injecting. In the active test for the Hino DX (stop of injection), stop the #6 cylinder and check if a change occurs in engine vibrations. 			Replace the injector.

DTC:P0301/P0302/P0303/P0304/P0305/P0306

EN1610602F200103

DTC	P0301	Continuously misfiring (#1cyl)
DTC	P0302	Continuously misfiring (#2cyl)
DTC	P0303	Continuously misfiring (#3cyl)
DTC	P0304	Continuously misfiring (#4cyl)
DTC	P0305	Continuously misfiring (#5cyl)
DTC	P0306	Continuously misfiring (#6cyl)

1. Check the cylinder piston, for which diagnosis has been indicated, for compression leakage.
2. Check the cylinder piston, for which diagnosis has been indicated, for seizure.

YES
NO

Defective cylinder

3. When there is a cylinder whose cylinder contribution is larger than other cylinders (the engine behavior will not change even if fuel injection is stopped by active test for the cylinder), the cylinder will not contribute to the engine rotation.
 - Inspecting the injector harness (disconnection)
 - Checking the piston for compression leakage
4. When there is a cylinder whose cylinder contribution is smaller than other cylinders, the contribution of the cylinder to the engine rotation is excessive.
 - Inspecting the injector harness (+B short circuit)



FUEL CONTROL (J08E)

DN02-319



DN02-320

FUEL CONTROL (J08E)

DTC:P0335 (Check sheet)

EN1610602F200104

DTC:P0335	Crankshaft position sensor - disconnection
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1. Technical description

- The crankshaft position sensor (engine speed main sensor) consistently measures pulses from the crankshaft position sensor (engine speed main sensor).
- <Description of malfunction>
- Pulses from the crankshaft position sensor (engine speed main sensor) cannot be sensed.
Malfunction of the sensor or failure in the harness is likely to have occurred.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- Engine speed of 0 r/min or more

(2) Judgment criteria

- With the engine running, the main revolution sensor does not detect pulses for continuous 0.8 seconds or longer. (at 750 r/min)

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Crankshaft position sensor (engine speed main sensor):

- Irregular contact (disconnection or poor fit of connector)
- Abnormal resistance of sensor

Engine harness: Harness disconnection or short-circuit

DTC:P0335		Crankshaft position sensor - disconnection		Inspection Procedure		
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Crankshaft position sensor (engine speed main sensor)	Check whether the sensor connector is loose/disconnected or poorly fit.	Secure fitting		Proceed to Step 2.	Connect
2	Crankshaft position sensor (engine speed main sensor)	Check that the sensor harness and harness connector are in normal condition. (Voltage, irregular contact, non-continuity, disconnection, short-circuit or the like)	Check voltage. 4.5 to 5.5V Check the harness and/or connector.		Proceed to Step 3.	Repair or replace the harness and/or connector.
3	Crankshaft position sensor (engine speed main sensor)	Check that resistance of the sensor is proper. (The resistance may vary depending on temperature.) * Use a signal check harness.	Resistance 108.5 Ω to 142.5 Ω (20°C {68°F})		Proceed to Step 4.	Proceed to Step 5.
4	DTC	Delete the DTC by Hino-DX and re-load. (Confirm no DTC is stored)	No DTC		Normal	Replace the ECU, or repair or replace the harness.
5	Crankshaft position sensor (engine speed main sensor)	Check that resistance of the engine main revolution sensor is proper. (The resistance may vary depending on temperature.)	Resistance 108.5 Ω to 142.5 Ω (20°C {68°F})		Repair or replace the harness.	Replace the sensor.

DN02-322

FUEL CONTROL (J08E)

DTC:P0340 (Check sheet)

EN1610602F200105

DTC:P0340	Camshaft position sensor - disconnection
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1. Technical description

- The camshaft position sensor (engine speed sub sensor) consistently measures pulses from the camshaft position sensor (engine speed sub sensor).

<Description of malfunction>

- Pulses from the camshaft position sensor (engine speed sub sensor) cannot be sensed.
Malfunction of the sensor or failure in the harness is likely to have occurred.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- Engine speed of 0 r/min or more

(2) Judgment criteria

- With the engine running, the camshaft position sensor (engine speed sub sensor) does not detect pulses for continuous 0.8 seconds or longer. (at 750 r/min)

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Camshaft position sensor (engine speed sub sensor):

- Irregular contact (disconnection or poor fit of connector)
- Abnormal resistance of sensor

Engine harness: Harness disconnection or short-circuit

DTC:P0340	Camshaft position sensor - disconnection	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Camshaft position sensor (engine speed sub sensor)	Check whether the sensor connector is loose/disconnected or poorly fit.	Secure fitting		Proceed to No. 2.	Connect
2	Camshaft position sensor (engine speed sub sensor)	Check that the harness and harness connector are in normal condition. (Voltage, irregular contact, non-continuity, disconnection, short-circuit or the like)	Check voltage. 4.5 to 5.5 V Check the harness and/or connector.		Proceed to No. 3.	Repair or replace the harness and/or connector.
3	Camshaft position sensor (engine speed sub sensor)	Check voltage of the connector terminal on the harness side.	Check voltage. 4.5 to 5.5 V		Replace the sensor.	Replace the ECU, or repair or replace the harness.

DN02-324

FUEL CONTROL (J08E)

DTC:P0335/P0340

EN1610602F200106

DTC	P0335	Crankshaft position sensor - disconnection
DTC	P0340	Camshaft position sensor - disconnection

1. **MAKE SURE TO INSPECT IT IN ACCORDANCE WITH THE CONTENTS OF DTC P0335 AND P0340.**



FUEL CONTROL (J08E)

DN02-325



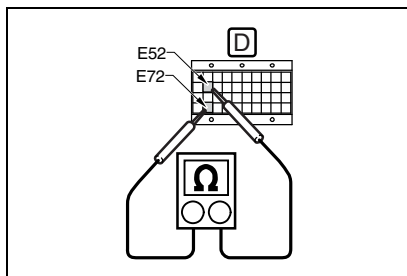
DN02-326

FUEL CONTROL (J08E)

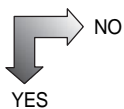
DTC:P0335

EN1610602F200108

DTC	P0335	Crankshaft position sensor - disconnection
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**1. MEASURING RESISTANCE BETWEEN TERMINALS.**

- (1) Set the starter switch to "LOCK" and connect the signal check harness.
- (2) Disconnect the signal check harness connector on the engine ECU side.
- (3) Measure the resistance between NE1+ (E52) and NE1- (E72) terminals.

Standard value: 108.5-142.5 Ω at 20°C {68°F}

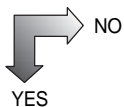
NO

YES

Proceed to 3

2. RECHECK THE DTC.

- (1) Connect the signal check harness connector on the engine ECU side.
- (2) Erase the DTC.
- (3) No DTC code must be output again.

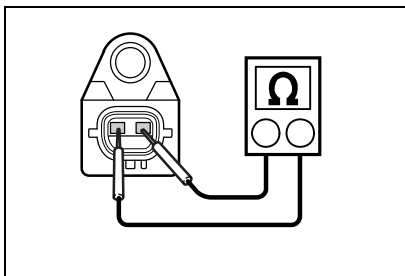


NO

YES

- Bad contact of ECU connectors
- Fault in engine ECU
- Malfunction of harness (Short circuit)

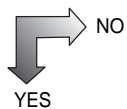
Clear and recheck the DTC.



SAPH161060200181

3. CHECK THE ENGINE SPEED MAIN SENSOR.

- (1) Disconnect the connectors of engine speed main sensor.
- (2) Measure the resistance between terminals of crankshaft position sensor (engine speed main sensor).

Standard value: 108.5-142.5 Ω at 20°C {68°F}

Faulty in crankshaft position sensor (engine speed main sensor)

- Harness disconnection
- Bad contact of connectors

DTC:P0336 (Check sheet)

EN1610602F200109

DTC:P0336**Crankshaft position sensor - rationality****1. Technical description**

- The crankshaft position sensor (engine speed main sensor) consistently measures pulses from the crankshaft position sensor (engine speed main sensor).

<Description of malfunction>

- Pulses from the crankshaft position sensor (engine speed main sensor) cannot be correctly sensed.
Check the pulser.

2. DTC set condition

(1) Check conditions

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- Engine speed of 500 r/min or more

(2) Judgment criteria

- Make a judgment when the abnormal number of the main revolution sensor pulses (not 56 pulses) per engine revolution is continuously detected.
For example, 50 seconds at 750 r/min

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Crankshaft position sensor (engine speed main sensor):

- Irregular contact (disconnection or poor fit of connector)
- Abnormal resistance of sensor
- Improper pulses
- Lift of engine revolution sensor

Engine harness: Harness disconnection or short-circuit

DTC:P0336		Crankshaft position sensor - rationality			Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Crankshaft position sensor (engine speed main sensor)	Check whether the sensor connector is loose/disconnected or poorly fit.	Secure fitting		Proceed to No. 2.	Connect
2	Crankshaft position sensor (engine speed main sensor)	Check that the sensor harness and harness connector are in normal condition. (Voltage, irregular contact, non-continuity, disconnection, short-circuit or the like)	Check voltage. 4.5 to 5.5V Check the harness and/or connector.		Proceed to No. 3.	Repair or replace the harness and/or connector.
3	Crankshaft position sensor (engine speed main sensor)	Check that the number of pulses from the sensor is proper. * Use a signal check harness.	Number of pulses 56 pulses		Proceed to No. 4.	Replace the sensor.
4	Crankshaft position sensor (engine speed main sensor)	Check that resistance is proper between the sensor harness terminals. (Check resistance on both positive and negative sides.) * Use a signal check harness.	Resistance 2 Ω or less		Proceed to No. 5.	Repair or replace the harness.
5	Crankshaft position sensor (engine speed main sensor)	Check that the number of pulses from the sensor is proper.	Number of pulses 56 pulses		Repair or replace the harness and/or connector.	Replace the sensor.

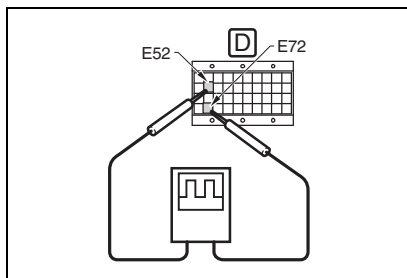
DN02-330

FUEL CONTROL (J08E)

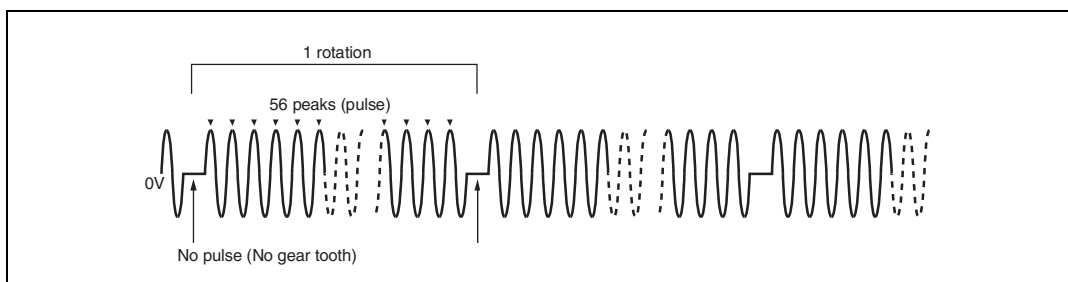
DTC:P0336

EN1610602F200110

DTC	P0336	Crankshaft position sensor - rationality
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**1. CHECK THE INPUT PULSE GENERATION TO ENGINE ECU.**

- (1) Set the starter switch to "LOCK" and connect the signal check harness.
- (2) Start the engine.
- (3) Measure the pulse generation between NE1+ (E52) and NE1- (E72) terminals using an oscilloscope.

Standard: 56 pulse

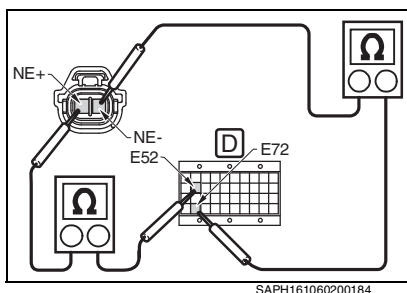
- (4) After measurement, stop the engine.



NO

Proceed to 2.

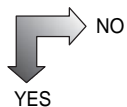
- Fault in engine ECU
- Malfunction of ECU connectors.



2. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS.

- (1) Connector of crankshaft position sensor (engine speed main sensor) remains connected.
- (2) Measure the resistance between NE- main sensor connector (engine sub harness side) and signal check harness NE1- (E72). In same way, measure the resistance between NE+ main sensor connector (engine sub harness side) and signal check harness NE1+ (E52).

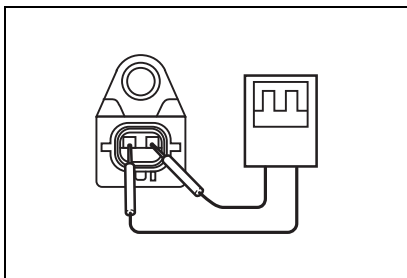
Standard value: Less than 2 Ω



NO

Faulty in harness.

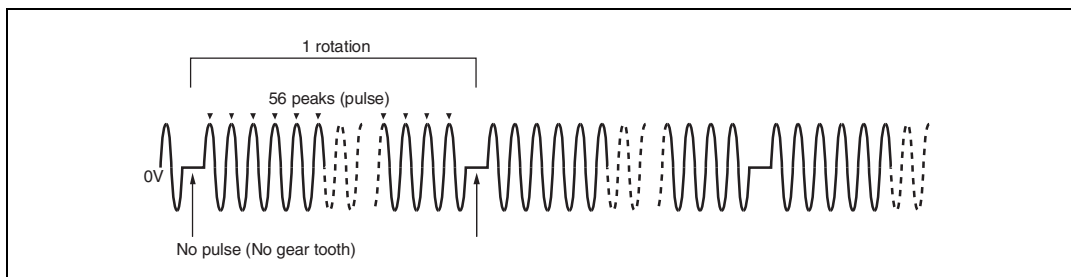
YES



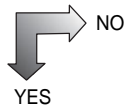
3. CHECK THE OUTPUT PULSE GENERATION FROM SENSOR.

- (1) Connector of crankshaft position sensor (engine speed main sensor) remains connected.
- (2) Start the engine.
- (3) Measure the pulse generation between terminals using an oscilloscope.

Standard: 56 pulse



- (4) After measurement, stop the engine.



NO

- Crankshaft position sensor (engine speed main sensor) malfunction.
- Flywheel signal hole abnormal.

YES

Bad contact of connector.

DN02-332

FUEL CONTROL (J08E)

DTC:P0340 (Check sheet)

EN1610602F200111

DTC:P0340	Camshaft position sensor - disconnection
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1. Technical description

- The camshaft position sensor (engine speed sub sensor) consistently measures pulses from the camshaft position sensor (engine speed sub sensor).

<Description of malfunction>

- Pulses from the camshaft position sensor (engine speed sub sensor) cannot be sensed.
Malfunction of the sensor or failure in the harness is likely to have occurred.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- Engine speed of 0 r/min or more

(2) Judgment criteria

- With the engine running, the camshaft position sensor (engine speed sub sensor) does not detect pulses for continuous 0.8 seconds or longer. (at 750 r/min)

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Camshaft position sensor (engine speed sub sensor):

- Irregular contact (disconnection or poor fit of connector)
- Abnormal resistance of sensor

Engine harness: Harness disconnection or short-circuit

DTC:P0340		Camshaft position sensor - disconnection			Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Camshaft position sensor (engine speed sub sensor)	Check whether the sensor connector is loose/disconnected or poorly fit.	Secure fitting		Proceed to No. 2.	Connect
2	Camshaft position sensor (engine speed sub sensor)	Check that the sensor harness and harness connector are in normal condition. (Voltage, irregular contact, non-continuity, disconnection, short-circuit or the like)	Check voltage. 4.5 to 5.5 V Check the harness and/or connector.		Proceed to No. 3.	Repair or replace the harness and/or connector.
3	Camshaft position sensor (engine speed sub sensor)	Check voltage of the connector terminal on the harness side.	Check voltage. 4.5 to 5.5 V		Replace the sensor.	Replace the ECU, or repair or replace the harness.

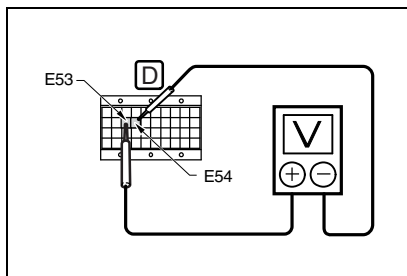
DN02-334

FUEL CONTROL (J08E)

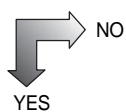
DTC:P0340

EN1610602F200112

DTC	P0340	Camshaft position sensor - disconnection
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**1. MEASURING VOLTAGE BETWEEN TERMINALS.**

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness on the engine side.
- (3) Disconnect the connector on the engine sub harness side.
- (4) Set the starter switch to "ON" position.
- (5) Measure voltage between the terminals CGND (E54) and GVCC (E53).

Standard value: 4.5-5.5 V

- Bad contact of ECU connectors
- Fault in engine ECU

Faulty in camshaft position sensor (engine speed sub sensor)



FUEL CONTROL (J08E)

DN02-335



DN02-336

FUEL CONTROL (J08E)

DTC:P0341 (Check sheet)

EN1610602F200113

DTC:P0341	Camshaft position sensor - rationality
------------------	--

1. Technical description

- The camshaft position sensor (engine speed sub sensor) consistently measures pulses from the camshaft position sensor (engine speed sub sensor).
- <Description of malfunction>
- Pulses from the sub revolution sensor cannot be correctly sensed.
Check the pulser.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- Engine speed of 500 r/min or more

(2) Judgment criteria

- Make a judgment when the abnormal number of the camshaft position sensor (engine speed sub sensor) pulses (not 7 pulses) per engine revolution is continuously detected.
For example, 100 seconds at 750 r/min

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Camshaft position sensor (engine speed sub sensor):

- Irregular contact (disconnection or poor fit of connector)
- Abnormal resistance of sensor

Engine harness: Harness disconnection or short-circuit

DTC:P0341		Camshaft position sensor - rationality			Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Camshaft position sensor (engine speed sub sensor)	Check whether the sensor connector is loose/disconnected or poorly fit.	Secure fitting		Proceed to No. 2.	Connect
2	Camshaft position sensor (engine speed sub sensor)	Check that the sensor harness and harness connector are in normal condition. (Voltage, irregular contact, non-continuity, disconnection, short-circuit or the like)	Check voltage. 4.5 to 5.5 V Check the harness and/or connector.		Proceed to No. 3.	Repair or replace the harness and/or connector.
3	Camshaft position sensor (engine speed sub sensor)	Check voltage of the connector terminal on the harness side.	Check voltage. 4.5 to 5.5 V		Proceed to No. 4.	Repair or replace the harness.
4	Camshaft position sensor (engine speed sub sensor)	Check that resistance is proper between the sensor harness terminals. * Use a signal check harness.	Resistance 2 Ω or less		Proceed to No. 5.	Repair or replace the harness.
5	Camshaft position sensor (engine speed sub sensor)	Check that the number of pulses is proper between the sensor harness terminals. * Use a signal check harness.	Number of pulses 7 pulses		Replace the ECU.	Proceed to No. 6.
6	Camshaft position sensor (engine speed sub sensor)	Check that the number of pulses from the sensor is proper.	Number of pulses 7 pulses		Repair or replace the harness and/or connector.	Replace the sensor.

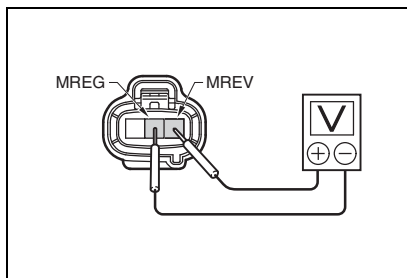
DN02-338

FUEL CONTROL (J08E)

DTC:P0341

EN1610602F200114

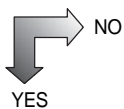
DTC	P0341	Camshaft position sensor - rationality
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SAPH161060200188

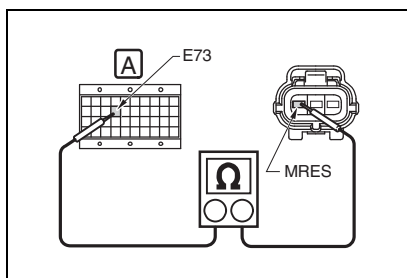
1. CHECK THE VOLTAGE BETWEEN SENSOR TERMINALS.

- (1) Set the starter switch to "LOCK".
- (2) Disconnect the connector of the camshaft position sensor (engine speed sub sensor).
- (3) Set the starter switch to "ON" (The engine is stopped)
- (4) Measure the voltage generation between MREV and MREG terminals of the engine speed sub sensor connector (engine sub harness side).

Standard value: 4.5-5.5 V

Proceed to 2.

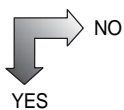
Proceed to 3.



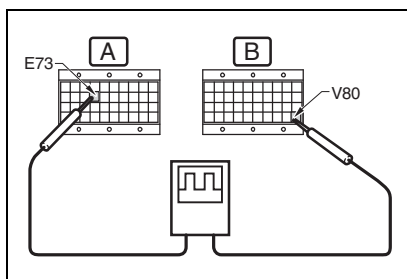
SAPH161060200189

2. CHECK THE RESISTANCE BETWEEN RELAY TERMINALS.

- (1) Connect the signal check harness.
- (2) Connector of camshaft position sensor (engine speed sub sensor) remain connected.
- (3) Measure the resistance between MRES terminal of the camshaft position sensor (engine speed sub sensor) connector (engine sub harness side) and G3 + (E73) terminal.

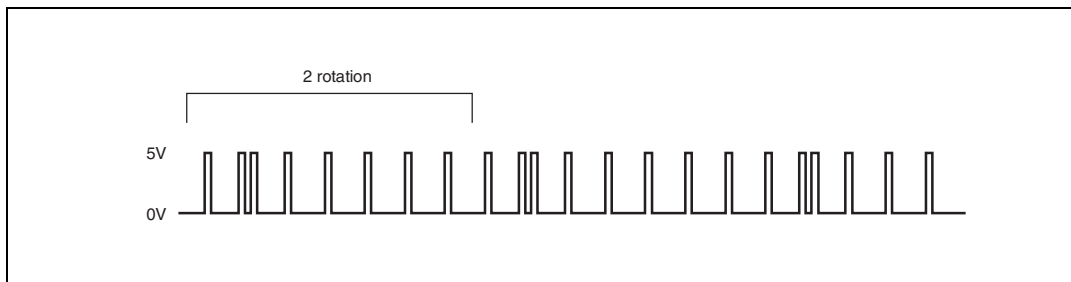
Standard value: Less than 2 Ω**NOTICE****This figure is viewed from the coupling surface side.**

Faulty in harness.

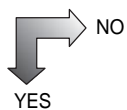
**3. CHECK THE INPUT PULSE GENERATION TO ENGINE ECU.**

- (1) Connector of camshaft position sensor (engine speed sub sensor) remain connected.
- (2) Start the engine.
- (3) Measure the pulse generation between terminals G3 + (E73) and PGD4 (V80) terminals using an oscilloscope.

Standard: 7 pulse (Including extra signal pin)



- (4) After measurement, stop the engine.

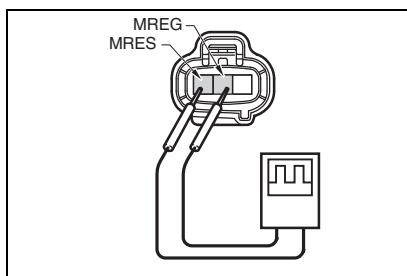


Proceed to 4.

- Fault in engine ECU
- Malfunction of ECU connectors.

DN02-340

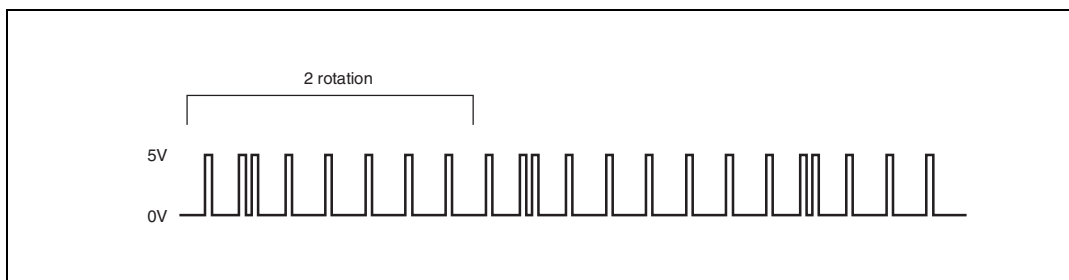
FUEL CONTROL (J08E)



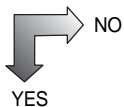
SAPH161060200192

4. CHECK THE OUTPUT PULSE GENERATION FROM SENSOR.

- (1) Connector of camshaft position sensor (engine speed sub sensor) remain connected.
- (2) Start the engine.
- (3) Measure the pulse generation between MREG and MRES terminals using an oscilloscope.

Standard: 7 pulse (Including extra signal pin)

SAPH161060200193



- Camshaft position sensor (engine speed sub sensor) malfunction.
- Camshaft gear signal pin abnormal.

Bad contact of connector.



FUEL CONTROL (J08E)

DN02-341



DTC:P0381 (Check sheet)

EN1610602F200115

DTC:P0381	Glow light (wait-to-start light) - circuit
------------------	--

1. Technical description

- The light will light up when the glow light is in drive status or light out when it is in non-drive status.
- <Description of malfunction>
- Disconnection, +B short-circuit or GND short-circuit is likely to have occurred in the glow light circuit.

2. DTC set condition**(1) Check conditions**

- <Glow light in non-drive status>
- The starter switch is ON.
 - Glow light in non-drive status
 - Battery voltage is in the 10 - 16 V range.
 - The engine has stopped (stalled) or runs at 500 r/min or higher for continuous 5 seconds.
- <Glow light in drive status>
- The starter switch is ON.
 - Glow light in drive status
 - Battery voltage is in the 10 - 16 V range.
 - The engine has stopped (stalled) or runs at 500 r/min or higher for continuous 5 seconds.

(2) Judgment criteria

- <Glow light in non-drive status>
- Voltage of the glow light circuit remains at 7 V or lower for 10 seconds or longer.
- <Glow light in drive status>
- Voltage of the glow light circuit remains at 8.4 V or higher for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Meter light:

- Malfunction of light
- Fault in harness and/or connector
- GND short-circuit of harness
- Disconnection or short-circuit in sensor harness

Engine ECU:

- Malfunction (no output) of sensor power supply in the engine ECU
- GND short-circuit in engine ECU internal power supply
- Malfunction of engine ECU internal sensor power supply

DTC:P0381	Glow light (wait-to-start light) - circuit	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Harness	Check voltage. * Use a signal check harness.	Check voltage. 7 V or less		Proceed to No. 2.	Proceed to No. 6.
2	Harness	Check that the glow light circuit is properly connected.	Check connection.		Proceed to No. 3.	Connect correctly.
3	Light	Check that no disconnection has occurred inside the glow light.	Check the light.		Proceed to No. 4.	Replace the light.
4	Harness	Disconnect the connector on the engine ECU side and check that power is supplied by the battery.	Check the harness.		Proceed to No. 5.	Replace the harness.
5	ECU	Connect the connector on the engine ECU side and use the signal check harness to check that power is supplied by the battery. * Use a signal check harness.	Check the ECU.		Replace the harness.	Replace the ECU.
6	GND	Check that the ECU ground is not lifted.	Check the GND		Replace the harness.	Replace the ECU.

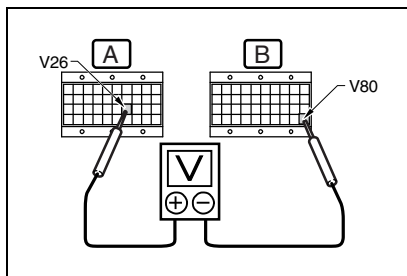
DN02-344

FUEL CONTROL (J08E)

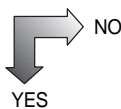
DTC:P0381

EN1610602F200116

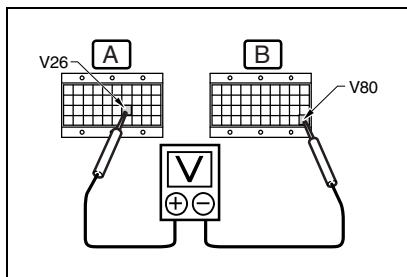
DTC	P0381	Glow light (wait-to-start light) - circuit
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**1. MEASURING VOLTAGE BETWEEN TERMINALS**

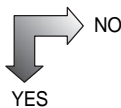
- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness.
- (3) Measure voltage between the terminals GLOW (V26) and PGD (V80).
Standard value: 7 V or less



Faulty combination meter circuit

**2. MEASURING VOLTAGE BETWEEN TERMINALS**

- (1) Set the starter switch to "ON" position.
- (2) Measure voltage between the terminals GLOW (V26) and PGD (V80).
Standard value: 10 V or more



Faulty combination meter circuit

Fault in engine ECU



FUEL CONTROL (J08E)

DN02-345



DN02-346

FUEL CONTROL (J08E)

DTC:P0401 (Check sheet)

EN1610602F200117

DTC:P0401

EGR low flow

1. Technical description

- Calculate a EGR rate based on actual measurements taken by the air flow sensor, boost pressure sensor and intake air temperature sensor and compare it with a forecasted EGR rate to find an abnormality.

2. DTC set condition**(1) Check conditions**

The conditions described below are met (both).

1. The starter switch is ON.
2. The conditions described below are met (either).
 - (1) Battery voltage is in the 10 - 16 V range.
 - (2) The engine has stalled or runs at 500 r/min or higher for continuous 5 seconds or longer.
 - (3) Engine speed falls within a range from 1,000 to 1,750 r/min and a fuel injection rate falls within a range from 0 to 40 mm²/st.
 - (4) A target EGR valve opening is 30% or greater.

(2) Judgment criteria

- Monitor a coolant temperature sensor reading to detect excessively high temperature. (15 to 27% or lower for continuous 30 seconds or longer)

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

EGR cooler gas passage: Blockage caused by soot or contaminants at the gas passage inlet and outlet of the EGR cooler
EGR valve: Blockage caused by soot or contaminants in the EGR valve passage
Air flow sensor: Check the air flow sensor.
Boost sensor: Check the boost pressure sensor.
Intake air temperature sensor: Check the intake air temperature sensor.

DTC:P0401	EGR low flow	Inspection Procedure
------------------	---------------------	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Temperature sensor	Disconnection, play, looseness, contamination, clogging or damage	Must be free from the items at left.		Connect correctly or replace if damaged.
2	Temperature sensor	Resistance	Must be free from the items at left.		Remove contaminants. Replace if damaged.
3	Temperature sensor	Contamination, clogging or damage in the sensing area	Must be free from the items at left.		Remove contaminants. Replace if damaged.
4	Air flow sensor	Contamination, clogging or damage in the sensing area	Must be free from the items at left.		Remove contaminants. Replace if damaged.
5	Air flow sensor	Presence of abnormal characteristics of the sensor	Follow the air flow sensor check procedures to check that no abnormalities are present.		Replace the air flow sensor.
6	Boost pressure sensor	Contamination, clogging or damage in the sensing area	Must be free from the items at left.		Remove contaminants. Replace if damaged.
7	Boost pressure sensor	Presence of abnormal characteristics of the sensor	Follow the boost sensor check procedures to check that no abnormalities are present.		Replace the boost pressure sensor.
8	Coolant circuit	LLC level in the reservoir tank	In between the upper and lower lines		Add coolant.
9	Coolant circuit	Check the coolant circuit.	No failures or malfunctions (blockage and coolant leakage)		Correct or replace the coolant circuit.
10	EGR cooler	Blockage caused by soot at the gas passage inlet and outlet of the EGR cooler	No blockage		Remove soot from the gas passage inlet and outlet.

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FUEL CONTROL (J08E)

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
11	EGR cooler	Contaminants in the coolant passage of the EGR cooler	No contaminants		Remove clogging from the coolant inlet and outlet.
12	EGR cooler	Coolant leakage from EGR cooler	No coolant leakage		Replace the EGR cooler.
13	EGR cooler	Blockage caused by deformation or the like in the coolant passage of the EGR cooler	No blockage		Replace the EGR cooler.
14	SCV	Free acceleration test	Following target rail pressure		SCV Replace
15	EGR Valve	Check EGR valve (connection condition of connectors by Hino-DX active test)			Replace EGR valve
16	Diesel throttle valve	Check for abnormal opening angle or the valve being stuck closed.			Replace the D throttle valve.

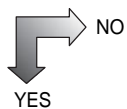
DTC:P0401

EN1610602F200118

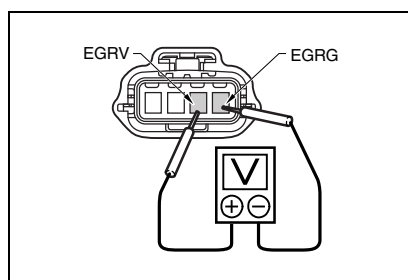
DTC	P0401	EGR low flow
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1. CHECK FOR EGR VALVE LINK.

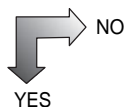
- (1) Remove the EGR valve and check for any foreign matters.



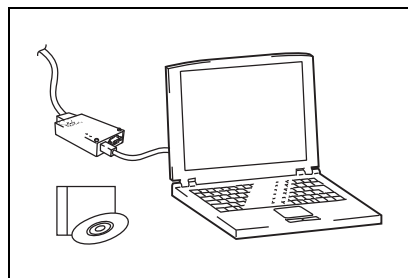
- Remove foreign matters, if any.
- Faulty EGR valve



SAPH161060200196



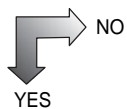
- Faulty in harness
- Faulty battery



SAPH161060200197

3. USE THE Hino-DX TO INSPECT THE EGR VALVE.

- (1) Connect Hino-DX to the vehicle.
(2) Set the starter switch "ON" position.
(3) Functional check
(4) Inspect the EGR.
(5) For the forcibly driven item, check the data monitor value to see if the opening of the EGR valve is driven as indicated by the specified value.



Faulty EGR valve

- Faulty in harness
- Fault in engine ECU

DTC:P0402 (Check sheet)

EN1610602F200119

DTC:P0402

EGR high flow

1. Technical description

The EGR valve is of the butterfly type.
The EGR valve opening is controlled according to the engine revolution and intake air volume.
The EGR valve opening is adjusted through CAN communication with the engine ECU.
The EGR valve does not operate while the coolant temperature is low. ($\leq 40^{\circ}\text{C}$ { 104°F })

2. DTC set condition**(1) Check conditions**

Battery voltage is in the 10 - 16 V range.
There must be no disconnection in the harness connecting to the EGR valve.
The engine is at above idling and in an operating state.

(2) Judgment criteria

A state, in which the EGR feedback (= theoretical EGR rate – actual EGR rate) is more than the threshold value, has continued for more than 30 seconds.
The above content will be judged from the intake manifold temperature, intake air volume, fuel injection quantity, and engine speed.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Defective intake air temperature sensor (intake manifold)
Defective air flow sensor
Defective injector
Defective engine speed sensor
Defective engine ECU

DTC:P0402	EGR high flow	Inspection Procedure
------------------	----------------------	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	EGR valve	Abnormal adhesion of soot in gas passage Jammed foreign object	There must be no malfunction code with the external diagnostic device.		Remove the soot and foreign object
2	Intake air temperature sensor (intake manifold)	Output value of sensor	Must be free from abnormal conditions.		Replace the sensor.
3	Air flow sensor	Output value of sensor	Must be free from abnormal conditions.		Replace the sensor.
4	Engine speed sensor	Output value of sensor	Must be free from abnormal conditions.		Replace the sensor.
5	Injector	Injector function	Must be free from abnormal conditions.		Replace the injector.
6	EngECU	ECU functions	Must be free from abnormal conditions.		Replace the ECU.

DTC:P1459 (Check sheet)

EN1610602F200120

DTC:P1459**EGR actuator malfunction 2****1. Technical description**

The EGR valve is of the butterfly type.
The EGR valve opening is controlled according to the engine revolution and intake air volume.
The EGR valve opening is adjusted through CAN communication with the engine ECU.
The EGR valve does not operate while the coolant temperature is low. ($\leq 40^{\circ}\text{C}$ { 104°F })
This error occurs when a malfunction message is received from the EGR actuator unit.

2. DTC set condition**(1) Check conditions**

Battery voltage is in the 10 - 16 V range.
There must be no disconnection in the harness connecting to the EGR valve.
Detected with starter switch ON. (Not related to engine revolution)

(2) Judgment criteria

P1459 is established in the following cases.

1. The position sensor in the EGR valve actuator has malfunctioned (malfunction of IC or damaged magnet).
2. The actual temperature of the actuator has continued to be more than 150°C { 302°F } for 0.6 second.
3. The actuator stored data cannot be read normally (malfunction of actuator).
4. The temperature sensor in the EGR valve actuator has malfunctioned.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Conduct an inspection of the breakdown or failure using the external diagnostic device when the engine room is at room temperature.
If the malfunction code is still issued even if the above operation is performed, the EGR valve actuator is at fault. Replace the EGR valve.

FUEL CONTROL (J08E)

DN02-353

DTC:P1459	EGR actuator malfunction 2	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	EGR valve	Check if there is any foreign object to reduce the temperature around the actuator.	No DTC is stored at normal temperature.		Replace the EGR valve.

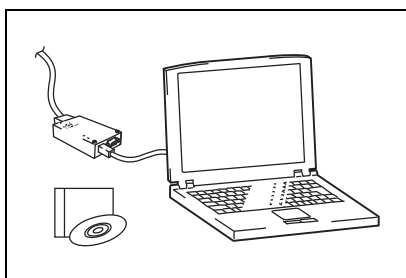
DN02-354

FUEL CONTROL (J08E)

DTC:P0402/P1459

EN1610602F200121

DTC	P0402	EGR high flow
DTC	P1459	EGR actuator malfunction 2

**1. USE THE Hino-DX TO INSPECT THE EGR VALVE.**

- (1) Connect Hino-DX to the vehicle.
- (2) Set the starter switch to "ON" position.
- (3) Functional check
- (4) Inspect the EGR.
- (5) For the forcibly driven item, check the data monitor value to see if the opening of the EGR valve is driven as indicated by the specified value.

NO
YES

Faulty EGR valve

- Faulty in harness
- Fault in engine ECU



FUEL CONTROL (J08E)

DN02-355



DN02-356

FUEL CONTROL (J08E)

DTC:P041B (Check sheet 1)

EN1610602F200122

DTC:P041B	EGR gas temperature sensor - rationality
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1. Technical description

- The EGR cooler outlet temperature sensor consistently measures temperature at the outlet of the EGR cooler.

2. DTC set condition**(1) Check conditions**

- Engine speed of 890 r/min or lower and injection rate of 35 mm³/st. or lower
- Engine coolant temperature is in the range of -30°C {-22°F} to 35°C {95°F} .
- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

The parameters described above are counted for at least 40 seconds and an average EGR temperature is 70°C {158°F} or higher.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Loose/disconnected sensor or failure in sensing area (contamination or clogging)
- Abnormal resistance of sensor
EGR cooler outlet gas temperature has been incorrectly sensed due to a sensor failure.
- Malfunction of engine ECU sensor power supply

FUEL CONTROL (J08E)

DN02-357

DTC:P041B		EGR gas temperature sensor - rationality		Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check the connector and/or harness between the ECU and the sensor.			Repair the harness.
2	EGR gas temperature sensor	Check sensor resistance.	Resistance 20°C {68°F}: 7.336 to 5.794 kΩ 50°C {122°F}: 2.435 to 2.41 kΩ		Replace the sensor.
3	ECU	Check the ECU sensor power supply and others.			Replace the ECU.

DTC:P041B (Check sheet 2)

EN1610602F200123

DTC:P041B	EGR gas temperature sensor - rationality
------------------	--

1. Technical description

- Calculated EGR cooler efficiency and calculated intake manifold gas temperature is used for judgement to compare with each calculation consistency.

2. DTC set condition**(1) Check conditions****for 2011, 2012 model year**

- Engine speed of 1,750 r/min or higher and injection rate of 50 mm³/st. or higher
- Target EGR opening of 30% or greater and engine coolant temperature of 60°C {140°F} or higher
- Battery voltage is in the 10 - 16 V range.

for 2013 model year

- (1) Intercooler outlet temperature sensor rationality check is completed.
- (2) Engine speed and a fuel injection rate fall within the ranges specified below respectively.
 - Engine speed: more than 2000 r/min
 - Injection rate: more than 40 mm³/st.
 - Barometric pressure: more than 81 kPa
 - Δ Engine speed: less than 20 r/min|calc
 - Δ Injection rate: less than 10 mm³/st.|calc
 - Exhaust brake: deactivated
 - EGR flow: more than 36 kg/h
 - Continues: 40 sec
 - Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria**for 2011, 2012 model year**

EGR temperature remains at 50°C {122°F} or lower for 30 seconds or longer.

for 2013 model year

Calculated EGR cooler efficiency >= 105% or <= 80%
and
|(Calculated - Actual) Intake manifold gas temperature| <= 30°C {86°F}
2 drive cycles

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Loose/disconnected sensor or failure in sensing area (contamination or clogging)
- Abnormal resistance of sensor
EGR cooler outlet gas temperature has been incorrectly sensed due to a sensor failure.
- Malfunction of engine ECU sensor power supply

FUEL CONTROL (J08E)

DN02-359

DTC:P041B	EGR gas temperature sensor - rationality	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check the connector and/or harness between the ECU and the sensor.			Repair the harness.
2	EGR gas temperature sensor	Check sensor resistance.			Replace the sensor.
3	ECU	Check the ECU sensor power supply and others.			Replace the ECU.

DN02-360

FUEL CONTROL (J08E)

DTC:P041B

EN1610602F200124

DTC	P041B	EGR gas temperature sensor - rationality
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1. CHECK THE EGR GAS TEMPERATURE SENSOR.

- (1) Check that the EGR gas temperature sensor is normally installed.
- (2) Check the EGR gas temperature sensor measurement portion for dirt and foreign matters.
- (3) Check the EGR cooler and EGR piping for clogging and leakage.



NO

Improper installation of the sensor.

YES

2. CHECK INSTALLATION OF THE CONNECTOR.

- (1) Check that the EGR gas temperature sensor connector is properly installed.



NO

Improper connection of connector

YES

3. CHECK WHETHER THE SENSOR IS IN NORMAL CONDITION.

- (1) Troubleshoot the P041C and P041D and check whether the EGR gas temperature sensor is in normal condition.



NO

Fault in EGR gas temperature sensor

YES

4. CHECK WHETHER OTHER ARE IN NORMAL CONDITION.

- (1) If the GND terminal is shared in use, disconnect all sensor connectors that use the GND terminal and check whether condition is normal.



NO

Fault in engine ECU

YES

Fault in other sensors



FUEL CONTROL (J08E)

DN02-361



DN02-362

FUEL CONTROL (J08E)

DTC:P041C (Check sheet)

EN1610602F200125

DTC:P041C

EGR gas temperature sensor - out of range (Out of range low)

1. Technical description

- The installed EGR cooler outlet temperature sensor consistently measures temperature at the outlet of the EGR cooler.

2. DTC set condition**(1) Check conditions**

- Engine speed of 500 r/min or higher and injection rate of 40 mm³/st. or lower
Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- Output of the sensor remains at 0.06 V or less (230°C {446°F} or higher) for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Irregular contact of connectors
- GND short-circuit of harness
- Short-circuit in the sensor
- Malfunction of sensor power supply in the engine ECU

DTC:P041C	EGR gas temperature sensor - out of range (Out of range low)	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check the connector and/or harness between the ECU and the sensor.			Repair the harness.
2	Harness	Check the harness GND.			Replace the sensor.
3	EGR gas temperatre sensor	Check the sensor harness.			Replace the sensor.

DN02-364

FUEL CONTROL (J08E)

DTC:P041D (Check sheet)

EN1610602F200126

DTC:P041D

EGR gas temperature sensor - out of range (Out of range high)

1. Technical description

- The installed EGR cooler outlet temperature sensor consistently measures temperature at the outlet of the EGR cooler.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range and engine speed of 500 r/min or higher
A reading taken by the intake air temperature sensor built in the air flow sensor is -20°C {-4°F} or higher.
No malfunction

(2) Judgment criteria

- Output of the sensor remains at 4.87 V or higher (-20°C {-4°F} or lower) for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Irregular contact of connectors
- GND short-circuit of harness
- Short-circuit in the sensor
- Malfunction of sensor power supply in the engine ECU

DTC:P041D	EGR gas temperature sensor - out of range (Out of range high)	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check the connector and/or harness between the ECU and the sensor.			Repair the harness.
2	Harness	Check the harness GND.			Replace the sensor.
3	EGR gas temperature sensor	Check the sensor harness.			Replace the sensor.

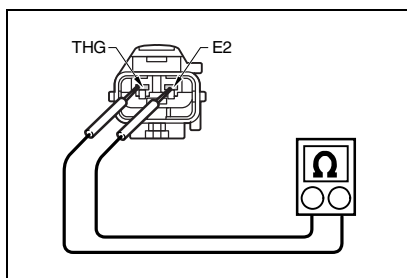
DN02-366

FUEL CONTROL (J08E)

DTC:P041C/P041D

EN1610602F200127

DTC	P041C	EGR gas temperature sensor - out of range (Out of range low)
DTC	P041D	EGR gas temperature sensor - out of range (Out of range high)

**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the EGR gas temperature sensor connector.
- (3) Measure resistance between the terminals THG and E2 of the EGR gas temperature sensor connector.

HINT

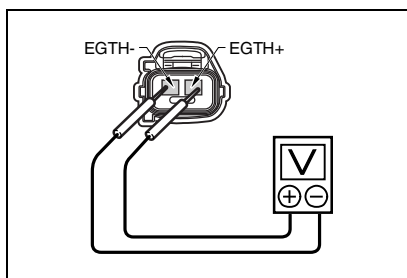
If it is difficult to check only the sensor, proceed to Step 3.

Standard value:**2.02 k Ω (50°C {122°F})****508.1 Ω (100°C {212°F})****160.4 Ω (150°C {302°F})**

NO

Faulty EGR gas temperature sensor

YES

**2. MEASURING VOLTAGE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "ON" position.
- (2) Measure voltage between the terminals EGTH+ and EGTH- of the EGR gas temperature sensor connector (engine sub harness side).

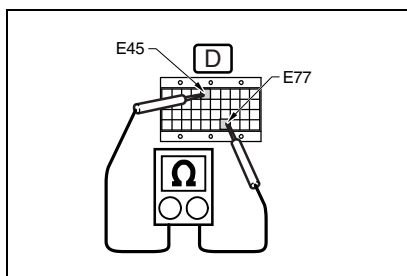
Standard: 4.5-5.5 V

NO

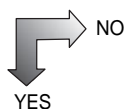
Proceed to 3.

YES

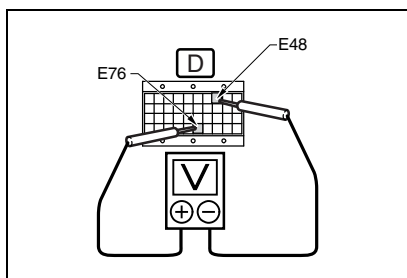
Bad contact of connectors

**3. MEASURING RESISTANCE BETWEEN TERMINALS**

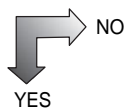
- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness on the engine side.
- (3) Disconnect the connector on the engine ECU side.
- (4) Set the starter switch to "ON" position.
- (5) Measure resistance between the terminals ETH2 (E45) and AGD4 (E77).

Standard:**2.02 k Ω (50°C {122°F})****508.1 k Ω (100°C {212°F})****160.4 Ω (150°C {302°F})**

- Faulty in harness
- Faulty EGR gas temperature sensor

**4. MEASURING VOLTAGE BETWEEN TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the connector on the engine ECU side.
- (3) Disconnect the connector on the engine sub harness side.
- (4) Set the starter switch to "ON" position.
- (5) Measure voltage between the terminals THF+ (E48) and AGD2 (E76).

Standard: 4.5-5.5 V

- Fault in engine ECU
- Faulty ECU connector

Bad contact of connectors

DTC:P0420 (Check sheet)

EN1610602F200128

DTC:P0420	Catalyst located downstream of PM filter
------------------	--

1. Technical description

- The oxidation catalyst positioned on the upstream of the SCR catalyst controls the ratio of NO and NO₂ and ensure a certain level of NO_x purification rate for the SCR catalyst.
- After regeneration of DPR, ECU detects oxidizability of DPR and DOC and monitor oxidization performance necessary for NO_x purification.

2. DTC set condition**(1) Check conditions**

- Judged while the engine is running and after regeneration of DPR completes.
- Properly operating status of SCR after NO_x sensor
- Average catalyst temperature of 250°C {482°F} or higher after DEF injection

(2) Judgment criteria

- The specified temperature rise (oxidization performance) does not occur when post injection for raising temperature of the SCR catalyst is performed after regeneration completes.
- Calculated thermal capacity at the timing of post injection between DPF and DOC deviates from the actual measurement value for 10 seconds.
(Threshold: deviation of 35% or lower)

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Low-grade fuel (high-sulfur fuel with 15 ppm or more sulfur) or B20 or higher biodiesel blends are used.
Catalyst has been deteriorated by the low-grade fuel.
- High-temperature gas has been generated due to abnormal combustion of the engine or burner and so the catalyst has been deteriorated.
(Malfunction codes of the burner system should also exist.)
- Excessive soot deposit caused excessive rise in the temperature at regeneration and so the catalyst has been deteriorated.
(Abnormally-high temperature of DPR or abnormal emission smoke: Engine side should also be judged.)

[Confirmation points for judgment]

Check the injector characteristics.

- Check that the post injection volume is sufficient to obtain the specified rise in the temperature.

Exhaust temperature sensor (DOC inlet)

Check for misjudgment due to deviations in the exhaust temperature characteristics.

DTC:P0420	Catalyst located downstream of PM filter	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Fuel	Check the color and odor.	NG: black		Replace the fuel Clean DOC.
2	Engine	Use a ENG basic check sheet in inspection.			Repair or replace the part which the failure is detected.
3	Exhaust temperature sensor (DOC inlet)	Check the connector fitting. Check sensor resistance.			Replace the sensor.
4	Burner	Inspect the burner system.	P141F must not be present.		Proceed to detailed analysis for Burner sys- tem

DN02-370

FUEL CONTROL (J08E)

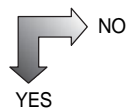
DTC:P0420

EN1610602F200129

DTC	P0420	Catalyst located downstream of PM filter
-----	-------	--

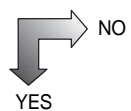
1. CHECK THE DPR.

- (1) Remove the DPR.
- (2) Check for soot leakage.

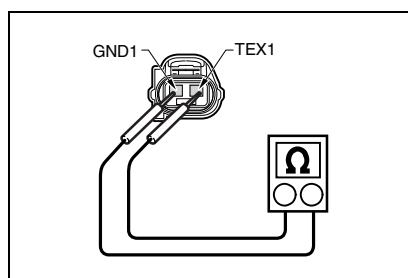


Replace the DPR.

- (3) Blow air against the DPR.
- (4) Perform a forced regeneration and check that regeneration is completed.



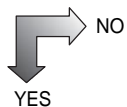
Inspect the burner system.



SAPH161060200203

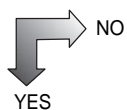
2. MEASURE RESISTANCE BETWEEN SENSOR TERMINALS.

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the exhaust gas temperature sensor (DOC inlet) connector.
- (3) Measure resistance between the terminals TEX1 and GND1 of the exhaust gas temperature sensor (DOC inlet).

Standard:**9.75 kΩ (50° {122°F})****3.77 kΩ (100° {212°F})****1.80 kΩ (150° {302°F})**

NO

Faulty exhaust gas temperature sensor (DOC inlet)

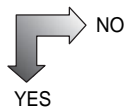


NO

Inspect the engine.

4. INSPECT THE FUEL.

- (1) Check that the fuel is not abnormally black.



NO

Replace fuel.

Clean or replace the DOC.

DTC:P0500 (Check sheet)

EN1610602F200130

DTC:P0500

Vehicle speed sensor - low

1. Technical description

- The vehicle speed sensor consistently measures pulses from the vehicle sensor.

<Description of malfunction>

- Pulses from the vehicle speed sensor cannot be sensed.
Malfunction of the sensor or failure in the harness is likely to have occurred.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
The conditions described below remain for 5 seconds or longer.
- Engine speed is 1,200 r/min or more.
- Gears are engaged.
- The fuel injection quantity is 60 mm³/st.cyl or more.
- Engine coolant temperature is 50°C {122°F} or higher.
- Battery voltage is in the 10 - 16 V range.
- The monitor disable DTC table can be referred to.

(2) Judgment criteria

- Output of the vehicle speed sensor remains at a vehicle speed of 0 km/h for 5 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Vehicle speed sensor:

- Irregular contact (disconnection or poor fit of connector)
- Abnormal resistance of sensor
- Malfunction of pulse modulator

Engine harness: Harness disconnection or short-circuit

DTC:P0500		Vehicle speed sensor - low			Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Vehicle speed sensor	Check whether the vehicle speed sensor connector is loose/disconnected or poorly fit.	Secure fitting		Proceed to No. 2.	Connect
2	Vehicle speed sensor	Check that the vehicle speed sensor harness and harness connector are in normal condition. (Voltage, irregular contact, non-continuity, disconnection, short-circuit or the like)	Check pulse wave-shape by 12-0 V. Check the harness and/or connector.		Proceed to No. 3.	Repair or replace the harness and/or connector.
3	Vehicle speed sensor	Check voltage of the vehicle sensor power supply and ground. * Use a signal check harness.	Check pulse wave-shape by 12-0 V.		Repair or replace the harness and/or connector.	Proceed to No. 4.
4	Vehicle speed sensor	Check resistance at the power supply and at the ground terminal of the connector on the sensor harness side. * Use a signal check harness.	Check resistance value. 1 Ω or less		Proceed to No. 5.	Repair or replace the harness and/or connector.
5	Vehicle speed sensor	Check resistance at the power supply and at the ground of the connector on the sensor harness side. * Use a signal check harness.	Check resistance value.		Replace the vehicle speed sensor.	Correct the vehicle speed circuit.

DTC:P0501 (Check sheet)

EN1610602F200131

DTC:P0501

Vehicle speed sensor - high

1. Technical description

- The vehicle speed sensor consistently measures pulses from the vehicle sensor.
- <Description of malfunction>
- Pulses from the vehicle speed sensor are improper.
Malfunction of the sensor or failure in the harness is likely to have occurred.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Engine speed is 0 r/min or more.
- The fuel injection quantity is 0 mm³/st.cyl or less.
- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- Vehicle speed pulse frequency remains at 256 Hz or higher (112 miles/h) for 5 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Vehicle speed sensor:

- Irregular contact (disconnection or poor fit of connector)
- Abnormal resistance of sensor
- Malfunction of pulse modulator (vibration in the installation location)
- Noise

Engine harness: Harness disconnection or short-circuit

DTC:P0501		Vehicle speed sensor - high			Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Vehicle speed sensor	Check whether the vehicle speed sensor connector is loose/disconnected or poorly fit.	Secure fitting		Proceed to No. 2.	Connect
2	Vehicle speed sensor	Check that the vehicle speed sensor harness and harness connector are in normal condition. (Voltage, irregular contact, non-continuity, disconnection, short-circuit or the like)	Check pulse wave-shape by 12 - 0 voltage Check the harness and/or connector.		Proceed to No. 3.	Repair or replace the harness and/or connector.
3	Vehicle speed sensor	Check voltage of the vehicle sensor power supply and ground. * Use a signal check harness.	Check pulse wave-shape by 12-0 V		Repair or replace the harness and/or connector.	Proceed to No. 4.
4	Vehicle speed sensor	Check resistance at the power supply and at the ground terminal of the connector on the sensor harness side. * Use a signal check harness.	Check resistance value. 1 Ω or less		Proceed to No. 5.	Repair or replace the harness and/or connector.
5	Vehicle speed sensor	Check resistance at the power supply and at the ground terminal of the connector on the sensor harness side. * Use a signal check harness.	Check resistance value.		Replace the vehicle speed sensor.	Correct the vehicle speed circuit.

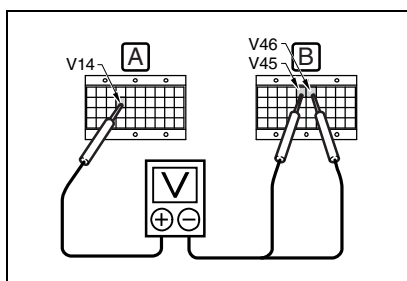
DN02-376

FUEL CONTROL (J08E)

DTC:P0500/P0501

EN1610602F200132

DTC	P0500	Vehicle speed sensor - low
DTC	P0501	Vehicle speed sensor - high

**1. CHECK THE VOLTAGE BETWEEN TERMINALS.**

- (1) Set the starter switch to "LOCK" and connect the signal check harness.
- (2) Start the engine.
- (3) Prepare the voltage measurement between VS (V14) and CGD (V45 and V46) terminals.
- (4) Measure the voltage while the vehicle starts to run at the speed of 10 km/h {6.2 miles/h}.

⚠ WARNING**Start the vehicle with caution to surroundings.****Standard: Pulse wave-shape by 12-0 V**

- (5) Stop the vehicle.



NO

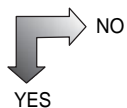
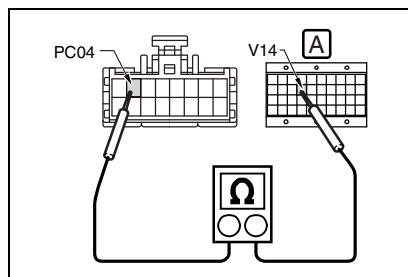
Proceed to 2

- Malfunction of ECU
- Bad contact of harness connector

2. CHECK THE CONTINUITY BETWEEN TERMINALS.

- (1) Set the starter switch to "LOCK" and disconnect the connectors of engine ECU side.
- (2) For vehicle equipped with EATON transmission and ALLISON automatic transmission.

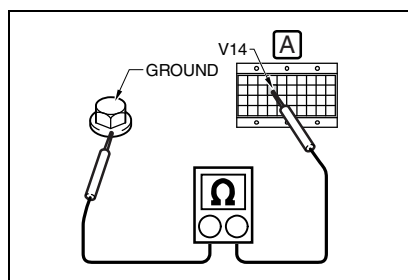
- a. Disconnect the connectors of pulse converter.
- b. Measure the resistance between VS (V14) and PC04 terminal.
Standard: Less than 1 Ω



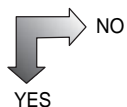
NO

Harness disconnection of vehicle speed sensor circuit

YES



- (3) Set the starter switch to "LOCK" position.
- (4) Engine ECU side connectors remain connected.
- (5) Measure the resistance between VS (V14) terminal and ground.
Standard: $\infty \Omega$



NO

Short circuit due to vehicle speed sensor circuit connection to ground

YES

Malfunction of vehicle speed sensor (The vehicle speed sensor should be solely checked. Erase the DTC and if displayed again the same code on the screen after testing, ECU should be replaced with a new one.)

DN02-378

FUEL CONTROL (J08E)

DTC:P0504 (Check sheet)

EN1610602F200133

DTC:P0504**Brake Switch Correlation****1. Technical description**

- The brake switch detects brake input during deceleration.
- <Description of malfunction>
- Malfunction of the brake switch caused by disconnection has been detected.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- Absence of input of the brake switch is detected during deceleration.

(2) Judgment criteria

- Absence of input of the brake switch remains for 3 seconds or longer during deceleration.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Brake switch:

- Irregular contact (disconnection or poor fit of connector)
- Abnormal resistance of sensor

CAN signal: Noise**Engine harness:** Harness disconnection or short-circuit

DTC:P0504		Brake Switch Correlation			Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Brake switch	Connect HinoDX for communication and check that the brake pedal signals are correctly sensed. (brake pedal depressed = 1, brake pedal not depressed = 0)	Check communication.		Normal	After checking the harness and brake switch, proceed to No. 2.
2	Brake switch Stop light switch	Check that voltages of the brake switch and stop light switch are proper respectively. (Brake switch: Brake pedal depressed = 0 V, unchanged = 10 V or higher Stop light switch: Brake pedal depressed = 10 V or higher, unchanged = 0 V) * Use a signal check harness.	Check voltage.		Replace the ECU.	Proceed to No. 3.
3	Brake switch Stop light switch	Check that resistances of the brake switch and stop light switch are proper respectively. (Brake switch: Brake pedal depressed = 0 Ω , unchanged = 2 Ω or lower Stop light switch: Brake pedal depressed = 2 Ω or lower, unchanged = 0 Ω)	Check resistance value. 2 Ω or less		Repair or replace the harness.	Replace the switch.

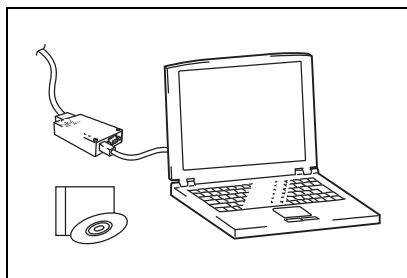
DN02-380

FUEL CONTROL (J08E)

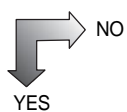
DTC:P0504

EN1610602F200134

DTC	P0504	Brake Switch Correlation
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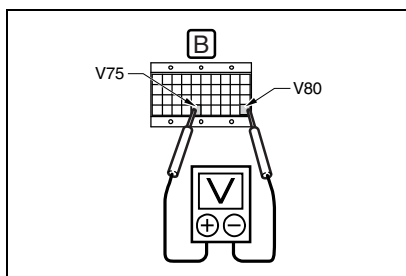
**1. CHECK THE BRAKE SWITCH USING THE PC DIAGNOSIS TOOL (HINO-DX).**

- (1) Connect Hino-DX to the vehicle.
- (2) Set the starter switch to "ON" position.
- (3) Confirm that no other DTC is displayed. If another DTC is displayed, repair that trouble and confirm that the DTC No. P0504 is displayed again.
- (4) Carry out diagnosis of brake switch and stop light switch.
- (5) Operate the brake pedal, and confirm the each signals are ON and OFF.
Depress the brake pedal: 1
Release the brake pedal: 0



Proceed to 2

Clear and recheck the DTC.



SAPH161060200208

2. MEASURING VOLTAGE BETWEEN TERMINALS.

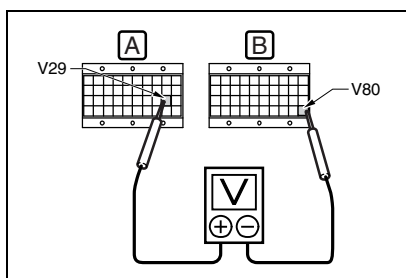
- (1) Set the starter switch to "LOCK" position and connect the signal check harness on the vehicle side.
- (2) Set the starter switch to "ON" position.
- (3) Measure the voltage between terminals.
Brake switch: between BSW2 (V75) and PGD4(V80)
Stop light switch: between BSW1 (V29) and PGD4 (V80)

Standard value:**Brake switch**

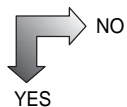
More than 10 V: Relies the brake pedal
0 V: Depress the brake pedal

Stop light switch

More than 10 V: Depress the brake pedal
0 V: Relies the brake pedal

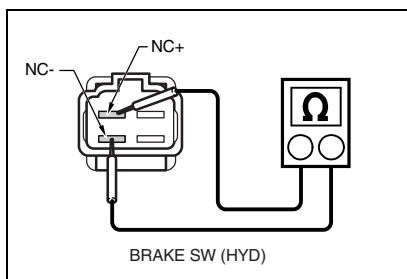


SAPH161060200209

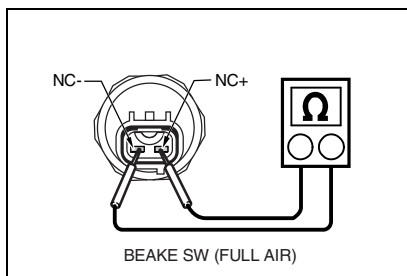


Proceed to 3

Faulty in engine ECU



SAPH161060200210



SAPH161060200211

3. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS.

- (1) Set the starter switch to "LOCK".
- (2) Disconnect the connectors of brake switch and stop light switch.
- (3) Measure the resistance of terminals.

Standard value:

Brake switch

Less than 2 Ω : Relies the brake pedal

inf Ω : Depress the brake pedal

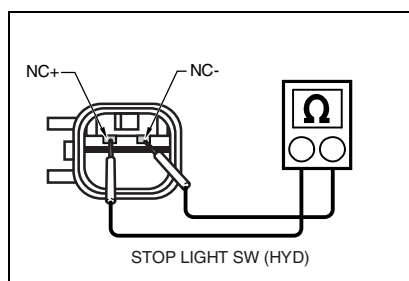
Stop light switch

Less than 2 Ω : Depress the brake pedal

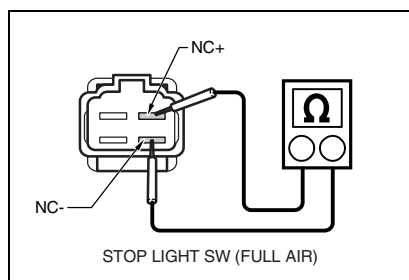
inf Ω : Relies the brake pedal

FUEL CONTROL (J08E)

DN02-383



SAPH161060200212



SAPH161060200213

YES
NO

Faulty in brake switch or stop light switch

Faulty in harness

DN02-384

FUEL CONTROL (J08E)

DTC:P0519 (Check sheet)

EN1610602F200135

DTC:P0519

Idle speed control system

1. Technical description

- A difference between a target speed and an actual speed is detected during idling.
<Description of malfunction>
- A difference between a target speed and an actual speed has been detected during idling.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
The conditions described below remain for 10 seconds or longer.
- Accelerator pedal opening = 0% (not depressed)
- Engine coolant temperature is 60°C {140°F} or higher.
- Vehicle speed is 0 km/h.
- The monitor disable DTC table can be referred to.

(2) Judgment criteria

- A difference between a target speed and an actual speed remains at 25 r/min or higher for 15 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Increase in injector injection rate
Dragging/interference with transmission
Failure in air compressor
Failure in power steering pump

DTC:P0519	Idle speed control system	Inspection Procedure
------------------	---------------------------	----------------------

No	Parts	Check contents	Judge	Check (Pass/ Fail)	If OK	If fail
1	Injector	Check a possible increase in injection rate of the injector. (standard 8 to 12 injection rate during idling)	Check an injection rate.		Proceed to No. 2.	Replace the injector.
2	Air compressor	Check the air compressor for failure.	Check parts.		Proceed to No. 3.	Replace the air compressor.
3	Power steering pump	Check the power steering pump for failure.	Check parts.		Normal	Replace the power steering pump.

DN02-386

FUEL CONTROL (J08E)

DTC:P0519

EN1610602F200136

DTC	P0519	Idle speed control system
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1. Check for dragging/interference with the transmission or failures in the air compressor and power steering pump. Check that no excessive load is applied to the engine at 0% accelerator opening or at the neutral position of P.T.O.
2. CONNECT THE PC DIAGNOSIS TOOL (Hino-DX).
3. The injection rate of the injector may have increased.
Standard: 8 to 12 (idle injection rate)



FUEL CONTROL (J08E)

DN02-387



DN02-388

FUEL CONTROL (J08E)

DTC:P0524 (Check sheet)

EN1610602F200137

DTC:P0524

Engine oil pressure Too Low

1. Technical description

A drop in engine oil pressure is sensed by the oil pressure switch.

2. DTC set condition**(1) Check conditions**

While the engine is in operation - Always

(2) Judgment criteria

The oil pressure switch continues to be ON for more than 30 seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Drop in oil pan oil quantity: Drop in pressure due to air suction

Malfunction of hydraulic circuit: Drop in pressure due to oil leakage

Malfunction of oil pressure switch: Correct oil pressure cannot be sensed.

GND short-circuit of harness: The sensing result of the oil pressure switch becomes invalid.

DTC:P0524	Engine oil pressure Too Low	Inspection Procedure
------------------	-----------------------------	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Check of oil pan oil quantity	Check the oil quantity with the oil level gauge.	Must be above the lower level.		Add oil.
2	Check for oil leakage.	Check the joints for oil leakage.	Must be no oil leakage.		Replace the part or retighten the joints.
3	Check the oil filter.	Check the oil filter for clogging.	Must be free from clogging.		Replace the filter.
4	Oil pressure switch	Function	Must operate normally.		Replace
5	Harness	Connection, with or without disconnection	Must be free from irregular contact and disconnection.		Clean or replace the connector contact.
6	ECU	Function	The switch state must be detected correctly.		Replace

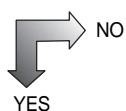
DN02-390

FUEL CONTROL (J08E)

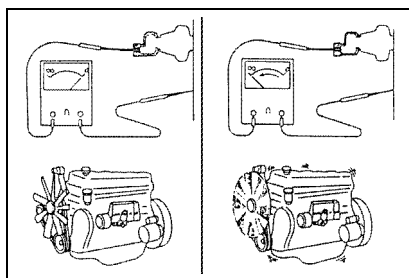
DTC:P0524

EN1610602F200138

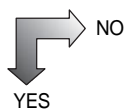
DTC	P0524	Engine Oil Pressure Too Low
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1. CHECK THE ENGINE OIL LEVEL.

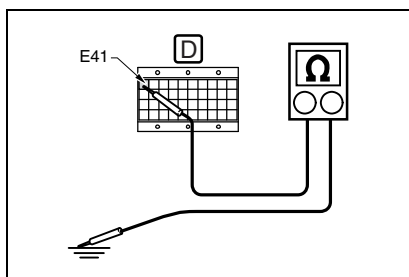
Check oil leakage and add oil

**2. CHECK THE OPERATION OF THE OIL PRESSURE SWITCH.**

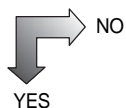
- (1) Disconnect the connector.
- (2) Using an ohmmeter, check the continuity between the terminal and ground with the engine stopped ($0\ \Omega$) and with the engine running ($\infty\ \Omega$).



Faulty in oil pressure switch

**3. CHECK THE CONTINUITY BETWEEN TERMINALS.**

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness on the engine side.
- (3) Measure the resistance between OLSW (E41) terminal and engine GND.

Standard value: $\infty\ \Omega$ 

Faulty harness

Fault in engine ECU



FUEL CONTROL (J08E)

DN02-391



DN02-392

FUEL CONTROL (J08E)

DTC:P0562 (Check sheet)

EN1610602F200139

DTC:P0562

Sensor supply voltage - out of range (out of range low)(out of range high)

1. Technical description

- Excessively low voltage has been detected in the ECU power supply.

2. DTC set condition**(1) Check conditions**

- No malfunction

(2) Judgment criteria

- Sensor supply voltage < 4.5V
- Failure timer >= 0.5sec

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Fusible Link, FUSE: Fusing, irregular contact, partial engagement**Connectors, harnesses and terminals:** Disconnection, irregular contact, looseness**Battery:** Overdischarge, service life**Alternator:** Power generation failure**ECU:** Malfunction

DTC:P0562	Sensor supply voltage - out of range (out of range low)(out of range high)	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Fusible Link, FUSE	Check whether fusing has occurred. Check engagement.	No fusing No play		Replace
2	Connectors, harnesses and terminals	Check continuity between the battery and the ECU and between the battery and the alternator.	Must be conducting. No partial engagement No looseness		Repair or Replace
3	Battery	Check voltage. (with engine stopped)	12.5 V or higher		Charge or Replace
4	Alternator	Check power generation voltage. (at no electrical load of vehicle)	13.5 V or higher		Replace
5	ECU				Replace

DN02-394

FUEL CONTROL (J08E)

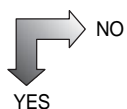
DTC:P0562

EN1610602F200140

DTC	P0562	Sensor supply voltage - out of range (Out of range low)
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1. CHECK THE FUSE AND FUSIBLE LINK.

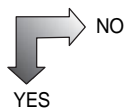
(1) Check whether the alternator is in normal condition.



NO

- Replace the fuse.
- Replace the fusible link.

YES

2. CHECK FOR CONTINUITY BETWEEN THE BATTERY AND ECU AND BETWEEN THE BATTERY AND ALTERNATOR.

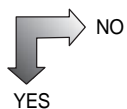
NO

Repair the trouble

YES

3. CHECK VOLTAGE.

(1) Check battery voltage.

Standard value: 12.5 V or more

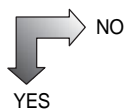
NO

Faulty battery

YES

4. CHECK THE ALTERNATOR.

(1) Check the generated voltage of the alternator.

Standard value: 13.5 V or more

NO

Faulty alternator

YES

Fault in engine ECU



FUEL CONTROL (J08E)

DN02-395



DN02-396

FUEL CONTROL (J08E)

DTC:P0563 (Check sheet)

EN1610602F200141

DTC:P0563

Sensor supply voltage - out of range (out of range high)

1. Technical description

- Excessively high voltage has been detected in the ECU power supply.

2. DTC set condition**(1) Check conditions**

- No malfunction

(2) Judgment criteria

- Sensor supply voltage > 5.3V
- Failure timer >= 0.5sec

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Fusible Link, FUSE: Fusing, irregular contact, partial engagement**Connectors, harnesses and terminals:** Disconnection, irregular contact, looseness**Alternator:** Unadjusted**ECU:** Malfunction

DTC:P0563	Sensor supply voltage - out of range (out of range high)	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Fusible Link, FUSE	Check whether fusing has occurred. Check engagement.	No fusing No play		Replace
2	Connectors, harnesses and terminals	Check continuity between the battery and the alternator.	Must be conducting. No partial engagement No looseness		Repair or Replace
3	Alternator	Check power generation voltage. (at no electrical load of vehicle)	14.6 V or higher		Replace
4	ECU				Replace

DN02-398

FUEL CONTROL (J08E)

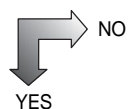
DTC:P0563

EN1610602F200142

DTC	P0563	Sensor supply voltage - out of range (Out of range high)
-----	-------	--

1. CHECK THE FUSE AND FUSIBLE LINK.

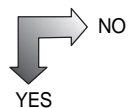
(1) Check whether the alternator is in normal condition.



NO

- Replace the fuse.
- Replace the fusible link.

YES

2. CHECK FOR CONTINUITY BETWEEN THE BATTERY AND ALTERNATOR.

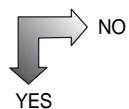
NO

Repair the trouble

YES

3. CHECK THE ALTERNATOR.

(1) Check the generated voltage of the alternator.

Standard value: 14.6 V or less

NO

Faulty alternator

YES

Fault in engine ECU



FUEL CONTROL (J08E)

DN02-399



DTC:P05F1 (Check sheet)

EN1610602F200143

DTC:P05F1

Crankcase ventilation system - disconnection between the CV valve and the intake manifold

1. Technical description

If an abnormality occurs in the closed breather circuit and air is taken in from the abnormal part, it will be detected by the air flow meter.

2. DTC set condition**(1) Check conditions**

In engine idling
Air compressor not operating

(2) Judgment criteria

A state, in which the intake air volume decreases by more than 100 mg/cyl from the normal value (learned value), continues for more than three seconds (two drive cycles).

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- **The hose between the ventilator and air intake pipe is disconnected or damaged:**
The intake volume decreases from the air cleaner due to the flow of air from the disconnected hose or damaged part.
- **The path between the air cleaner and turbo is damaged:**
The intake volume decreases from the air cleaner due to the flow of air from the damaged part.
- **Clogged air cleaner element:** The intake volume passing through the air cleaner decreases.
- **Damaged sensor connection harness:** The detected value of the air flow meter cannot be processed correctly.
- **Uncleanliness or malfunction of air flow meter:** The air flow cannot be detected correctly.
* The air flow meter is a sensor which detects the air flow having passed through the air cleaner.

DTC:P05F1	Crankcase ventilation system - disconnection between the CV valve and the intake manifold	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Connection hose between ventilator and intake pipe	Check the hose between the ventilator and intake pipe for disconnection and damage.	Must be free from disconnection and damage.		Assemble if disconnected and replace if damaged.
2	Air cleaner, air intake hose, intake pipe, Turbo connection hose	Check the air cleaner, air intake hose, intake pipe and turbo connection hose for path disconnection and damage.	Must be free from disconnection and damage.		Assemble if disconnected and replace if damaged.
3	Air cleaner element	Clogged condition of element	Must be free from clogging.		Replace if clogged.
4	Air flow meter	Function of air flow meter	The correct detected value must be generated.		Clean if dirty. Replace if faulty.
5	Sensor connection harness	With or without damage to sensor connection harness	Must be free from damage.		Replace if damaged.
6	ECU	ECU functions	The correct detected value must be generated.		Replace if faulty.

DN02-402

FUEL CONTROL (J08E)

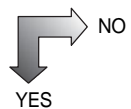
DTC:P05F1

EN1610602F200144

DTC	P05F1	Crankcase ventilation system - disconnection between the CV valve and the intake manifold
-----	-------	---

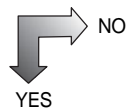
1. CHECK THE BREATHER.

- (1) Check the breather hose for connection and break.



Faulty breather hose

- (2) Check that no break is present in the area between the air cleaner and the turbo.



Trouble in the area between the air cleaner and the turbo

Fault in air flow sensor



FUEL CONTROL (J08E)

DN02-403



DN02-404

FUEL CONTROL (J08E)

DTC:P0610 (Check sheet)

EN1610602F200145

DTC:P0610

VIN data error

1. Technical description

- Receiving of vehicle information (VIN) is detected.
<Description of malfunction>
- It is likely that vehicle information has not been received or been incorrect.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- The engine has stopped (stalled) or runs at 500 r/min or higher for continuous 5 seconds or longer.

(2) Judgment criteria

- No vehicle information has been written.
 - Vehicle information has been changed.
 - Vehicle information has not been accepted.
 - Vehicle information is invalid (use of other than codes).
- The conditions described above remain for 5 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Vehicle control ECU: Malfunction**Engine ECU:** Malfunction

DTC:P0610	VIN data error	Inspection Procedure
------------------	----------------	----------------------

No	Parts	Check contents	Judge	Check (Pass/ Fail)	If OK	If fail
1	Vehicle control ECU	Check communication with the vehicle control ECU.	Check communi- cation.		Proceed to No. 2.	Replace the vehicle con- trol ECU.
2	Vehicle control ECU	Check that vehicle information written into the vehicle control ECU is correct.	Check vehicle information.		Proceed to No. 3.	Replace the vehicle con- trol ECU.
3	Vehicle control ECU	Check whether the vehicle control ECU has been replaced from another vehicle.	Check the ECU.		Proceed to No. 4.	Replace the vehicle con- trol ECU.
4	Vehicle control ECU	Delete diagnosis and turn ON/OFF to check that recovery is done.	Check diagnosis.		Normal	Replace the engine ECU.

DN02-406

FUEL CONTROL (J08E)

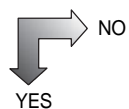
DTC:P0610

EN1610602F200146

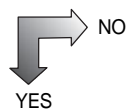
DTC	P0610	VIN data error
-----	-------	----------------

1. FAILURE IN COMMUNICATION WITH VEHICLE CONTROL ECU.

- (1) If U1001 and U110A have occurred at the same time, also diagnose U1001 and U110A.

2. CHECK WHETHER VIN STORED IN THE ENGINE ECU AND REPROGRAM SERVER IS SAME.

Reprogram in vehicle control ECU replacement mode.

3. CHECK WHETHER THE VEHICLE CONTROL ECU HAS BEEN REPLACED FROM ANOTHER VEHICLE OR WHETHER THE ENGINE ASSEMBLY HAS BEEN INSTALLED IN ANOTHER VEHICLE.

Fault in engine ECU

Delete DTC and turn the starter switch "OFF" to "ON" for restoration.



FUEL CONTROL (J08E)

DN02-407



DN02-408

FUEL CONTROL (J08E)

DTC:P0617 (Check sheet)

EN1610602F200147

DTC:P0617

Starter switch - rationality

1. Technical description

- A starter signal is detected during engine running.
(signal of start position)
<Description of malfunction>
- +B short-circuit has occurred in the starter switch.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- Engine speed is 1,100 r/min or more.

(2) Judgment criteria

- The starter switch remains ON for 30 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Starter switch:**Engine harness:** Harness disconnection or short-circuit

DTC:P0617	Starter switch - rationality	Inspection Procedure
------------------	-------------------------------------	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Starter switch	Check whether the starter switch connector is loose/disconnected or poorly fit.	Secure fitting		Proceed to No. 2.	Connect
2	Starter switch	Check that the starter switch sensor harness and harness connector are in normal condition. (Voltage, irregular contact, non-continuity, disconnection, short-circuit or the like)	Check voltage. 4.5 to 5.5 V Check the harness and/or connector.		Proceed to No. 3.	Repair or replace the harness and/or connector.
3	Starter switch	Check the starter switch for malfunction.	Check the switch.		Proceed to No. 4.	Replace the starter switch.
4	Starter switch	Measure voltage of the starter switch. (12 V with starter switch ON 0 V with starter switch OFF) * Use a signal check harness.	Check voltage.		Replace the ECU.	Repair or replace the harness and/or connector.

DN02-410

FUEL CONTROL (J08E)

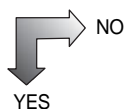
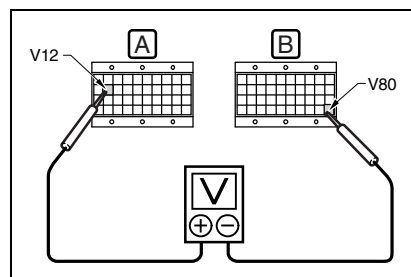
DTC:P0617

EN1610602F200148

DTC	P0617	Starter switch - rationality
-----	-------	------------------------------

1. MEASURING VOLTAGE BETWEEN TERMINALS.**⚠ WARNING****Make sure that transmission is in neutral position.**

- (1) Set the starter switch to "LOCK" position and connect the signal check harness.
- (2) Disconnect the connector on the engine ECU side.
- (3) Measure the voltage between ST (V12) and PGD4 (V80) terminals.

Standard value:**Starter switch "LOCK": 0 V****Starter switch "START": 12 V**

NO

Faulty in harness

- Fault in engine ECU
- Malfunction of ECU connectors
- Bad contact of ECU connectors



FUEL CONTROL (J08E)

DN02-411



DN02-412

FUEL CONTROL (J08E)

DTC:P0628 (Check sheet)

EN1610602F200149

DTC:P0628

Suction control valve for fuel supply pump - circuit (Circuit low)

1. Technical description

- The supply pump controls a fuel delivery rate to control common rail pressure.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
- The engine has stopped or runs at 500 r/min or higher.
- The injectors and injector driver circuits have started running.
The conditions described above remain for 5 seconds.

(2) Judgment criteria

- SCV (suction control valve) drive current remains less than 500 mA for 2.1 seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Fault in harness and/or connector
- Malfunction of solenoid valve of SCV
- Malfunction of ECU

DTC:P0628	Suction control valve for fuel supply pump - circuit (Circuit low)	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check the connector and/or harness between the ECU and the sensor.			Repair the harness.
2	Solenoid valve of SCV	Check the GND of the solenoid valve.			Replace the SCV.

DN02-414

FUEL CONTROL (J08E)

DTC:P0629 (Check sheet)

EN1610602F200150

DTC:P0629

Suction control valve for fuel supply pump - circuit (Circuit high)

1. Technical description

- The supply pump controls a fuel delivery rate to control common rail pressure.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
- The engine has stopped or runs at 500 r/min or higher.
- The injectors and injector driver circuits have started running.
The conditions described above remain for 5 seconds.

(2) Judgment criteria

- SCV (Suction control valve) drive current remains higher than 1,900 mA for 2.1 seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Fault in harness and/or connector
- Malfunction of solenoid valve of SCV
- Malfunction of ECU

FUEL CONTROL (J08E)

DN02-415

DTC:P0629	Suction control valve for fuel supply pump - circuit (Circuit high)	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check the connector and/or harness between the ECU and the sensor.			Repair the harness.
2	Solenoid valve of SCV	Check the power supply to the solenoid valve.			Replace the SCV.

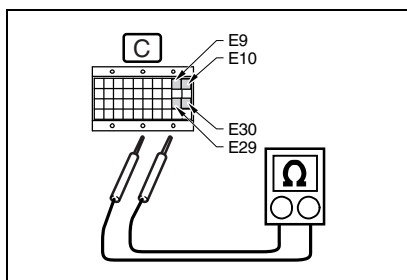
DN02-416

FUEL CONTROL (J08E)

DTC:P0628/P0629

EN1610602F200151

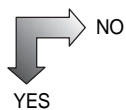
DTC	P0628	Suction control valve for fuel supply pump - circuit (Circuit low)
DTC	P0629	Suction control valve for fuel supply pump - circuit (Circuit high)

**1. MEASURING RESISTANCE BETWEEN TERMINALS.**

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness of the engine side.
- (3) Disconnect the connector on the engine ECU side.
- (4) Measure resistance between the terminals.

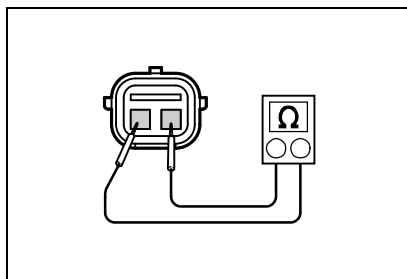
Standard value: 1.6-2.6 Ω (20°C {68°F})

Terminals to measure the resistance
SPV1 (E9) \leftrightarrow SP2S (E30)
SPV1 (E9) \leftrightarrow SPV2 (E10)
SP1S (E29) \leftrightarrow SP2S (E30)
SP1S (E29) \leftrightarrow SPV2 (E10)



Proceed to 2.

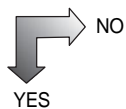
Proceed to 4.

**2. CHECK THE RESISTANCE OF SCV.**

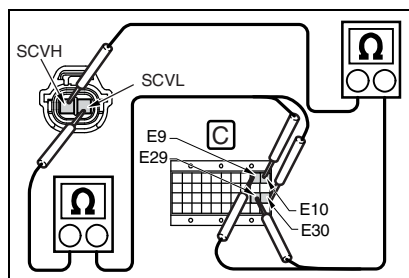
- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the harness of the SCV of the supply pump.
- (3) Measure the resistance between the terminals of SCV connector (SCV side).

Standard value: 1.6-2.6 Ω at 20°C {68°F}

- (4) Measure the resistance of insulation between terminals and SCV body.

Standard value: more than 100 M Ω at 20°C {68°F}

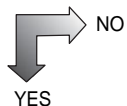
Faulty in SCV



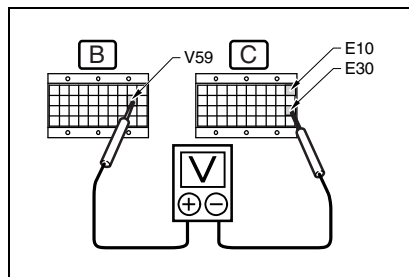
3. CHECK THE CONTINUITY BETWEEN TERMINALS.

- (1) Set the starter switch to "LOCK" and connect the signal check harness.
- (2) Disconnect the signal check harness connector on the ECU side.
- (3) Measure the resistance between SP1S (E29), SPV1 (E9) terminal and SCVH terminal of SCV connectors (engine sub harness side). In the same way, measure the resistance between SP2S (E30), SPV2 (E10) terminal of ECU connector and SCVL terminal of SCV connector.

Standard value: Less than 1 Ω



- Harness disconnection
- Bad contact of harness connector



4. MEASURING VOLTAGE BETWEEN TERMINALS.

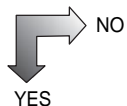
- (1) Connectors of signal check harness on the engine ECU side.
- (2) Set the starter switch to "ON" (The engine is stopped).
- (3) Measure the voltage between PGD2 (V59) terminal and SPV2 (E10), SP2S (E30) terminals.

Standard: Pulse wave-shape by 12 V-0 V

(After measurement, turn the starter switch to "LOCK" position.)

NOTICE

Measure the voltage within 40 seconds after starter switch "ON".



Malfunction of ECU connectors

Fault in engine ECU

DN02-418

FUEL CONTROL (J08E)

DTC:P0642 (Check sheet)

DTC:P0642	ECU sensor supply 1 failure (Low)
------------------	-----------------------------------

1. Technical description

- | |
|---|
| <ul style="list-style-type: none">Power is supplied to the sensor supply 1 circuit.
(Accelerator sensor 1, common rail pressure sensor (sub), PTO accelerator sensor, differential pressure sensor) <p><Description of malfunction></p> <ul style="list-style-type: none">Excessively low voltage has been detected in the sensor power supply. |
|---|

2. DTC set condition**(1) Check conditions**

- | |
|---|
| <ul style="list-style-type: none">The starter switch is ON.The monitor disable DTC table can be referred to. |
|---|

(2) Judgment criteria

- | |
|--|
| <ul style="list-style-type: none">0.5 V or lower voltage remains at the A/D converter for 0.5 seconds or longer. |
|--|

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Power supply harness: Engine ECU:
--

DTC:P0642	ECU sensor supply 1 failure (Low)	Inspection Procedure
------------------	--	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Individual sensors	Remove individual sensors and check whether diagnosis can be deleted.	Check diagnosis.		Malfunction of removed sensors	Proceed to No. 2.
2	Harness	Connect the signal check harness and measure resistance to check whether GND short-circuit has occurred in individual power supply harnesses. * Use a signal check harness.	Check the harness. Check resistance value.		Replace the ECU.	Replace the harness.

DN02-420

FUEL CONTROL (J08E)

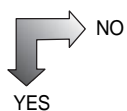
DTC:P0642

DTC	P0642	ECU sensor supply 1 failure (low)
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1. Common rail pressure sensor 2 connector, Accelerator sensor 1 connector, Differential pressure sensor connector, P.T.O. accelerator sensor connector by removing each of one, P0642 fault code disappears things check.

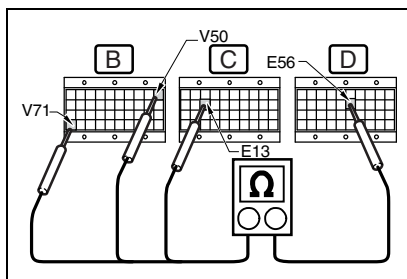
HINT

When sensor power supply 1 fails, the trouble code of P1198, P1428, P2122 occurs other than a trouble code of P0642.



Proceed to 2.

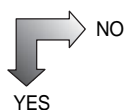
Faulty sensor fault code disappears when remove

**2. MEASURE THE CONTINUITY BETWEEN TERMINALS.**

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness.
- (3) Disconnect the connector on the engine sub harness side.
- (4) Measure the resistance between the terminals AVC1 (E13), AVC3 (V50), AVC5 (V71) and AGD1 (E56).

Standard value: $\infty \Omega$

Terminal to measure the resistance	
+ Side	- Side
AVC1 (E13)	AGD1 (E56)
AVC3 (V50)	
AVC5 (V71)	



Faulty harness

Fault in engine ECU



FUEL CONTROL (J08E)

DN02-421



DN02-422

FUEL CONTROL (J08E)

DTC:P0643 (Check sheet 1)

EN1610602F200154

DTC:P0643

ECU sensor supply 1 failure (High)

1. Technical description

- Sensor voltage supply system detects errors based on the circuit voltage and signals in BCU.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.

(2) Judgment criteria**DTC : P0643**

- A/D converter input sensor supply voltage > 1.9V for more than 0.5sec

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Atomizer:

- Malfunction in atomizer
- Abnormal voltage of atomizer

Harness: Disconnection or short-circuit in harness between atomizer and BCU

DTC:P0643	ECU sensor supply 1 failure (High)	Inspection Procedure
------------------	------------------------------------	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Disconnect the BCU connector and measure resistance between the BCU harness terminals.	40 k Ω or higher 4 V or lower		Harness Repair
2	Atomizer	Disconnect the atomizer master air valve connector and measure resistance between the terminals.	40 k Ω or higher 4 V or lower		Atomizer Replace
3	BCU	Check that no malfunctions occur after the starter switch is turned ON. NG: Replace BCU.	No malfunction		Check again

DN02-424

FUEL CONTROL (J08E)

DTC:P0643 (Check sheet 2)

EN1610602F200155

DTC:P0643	ECU sensor supply 1 failure (High)
------------------	------------------------------------

1. Technical description

- | |
|---|
| <ul style="list-style-type: none">- Power is supplied to the sensor supply 1 circuit.
(boost pressure sensor, diesel throttle opening sensor 1, diesel throttle opening sensor 2, common rail pressure sensor (main), accelerator sensor 2, cam position sensor) <p><Description of malfunction></p> <ul style="list-style-type: none">- Excessively high voltage has been detected in the sensor power supply. |
|---|

2. DTC set condition**(1) Check conditions**

- | |
|---|
| <ul style="list-style-type: none">- The starter switch is ON.- The monitor disable DTC table can be referred to. |
|---|

(2) Judgment criteria

- | |
|--|
| <ul style="list-style-type: none">- A/D converter input sensor supply voltage > 1.9V- Failure timer >= 0.5sec |
|--|

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Power supply harness: Engine ECU:
--

DTC:P0643	ECU sensor supply 1 failure (High)	Inspection Procedure
------------------	---	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/ Fail)	If OK	If fail
1	Harness	Check whether abnormal voltage is applied on the sensor power supply.	Check voltage.		Proceed to No. 2.	Replace the harness.
2	Individual sensors	Connect the signal check harness and disconnect the connector on the ECU side. Check voltage of individual sensor power supplies. * Use a signal check harness.	Check voltage. 4.9 to 5.1 V		Replace the ECU.	Replace the harness.

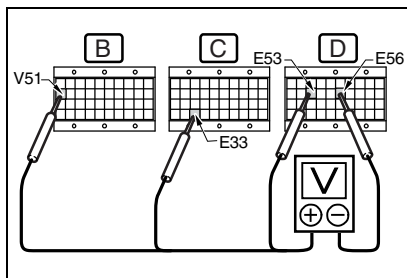
DN02-426

FUEL CONTROL (J08E)

DTC:P0643

EN1610602F200156

DTC	P0643	ECU sensor supply 1 failure (high)
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**1. MEASURE THE VOLTAGE.**

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness.
- (3) Set the starter switch to "ON" position.
- (4) Measure the voltage between the terminals AVC2 (E33), GVCC (E53), AVC4 (V51) and AGD1 (E56).

Standard value: 4.9-5.1 V

Terminal to measure the voltage	
+ Side	- Side
AVC2 (E33)	AGD1 (E56)
GVCC (E53)	
AVC4 (V51)	

NO
YES

Faulty harness

Fault in engine ECU



FUEL CONTROL (J08E)

DN02-427



DN02-428

FUEL CONTROL (J08E)

DTC:P064C (Check sheet)

EN1610602F200157

DTC:P064C

Glow controller - Battery for glow plug open, GND short
Glow controller - Over temperature

1. Technical description

- Controlled by GCU.
- The indicator in the meter lights up when a failure (malfunction caused by short circuit or disconnection) occurs in the glow system.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- Starter deactivated

(2) Judgment criteria

- | Battery voltage (Glow controller)- Battery voltage (Glow plug)| > 2V
or
- Glow controller temperature> 120-150°C {248-302°F}
- Failure timer >= 0.3sec

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

(1) Failure in power supply:

- Check that a fuse is not blown.

(2) Abnormality in harness:

- Check continuity between the fuse and the GCU.
- Check continuity between the GCU and the engine ECU (2 terminals).
- Check continuity between the GCU and the earth.

(3) Earth potential difference:

- Check a potential difference between the engine ECU and the GCU (must not exceed 400 mV).

DTC:P064C

Glow controller - Battery for glow plug open, GND short
Glow controller - Over temperature

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	FUSE (GCU(M))	Check whether fusing has occurred. Check engagement.	No fusing No play		Replace
2	Connectors, harnesses and terminals	Check continuity between the fuse and the GCU. Check continuity between the GCU and the engine ECU (2 terminals). Check continuity between the GCU and the GND.	Must be conducting. No partial engagement No looseness		Replace
3	Earth potential	Check an earth potential difference between the engine ECU and the GCU.	Must not exceed 400 mV.		Repair the earth circuit
4	GCU		Check No. 1 through 3. If OK, replace parts.		Replace

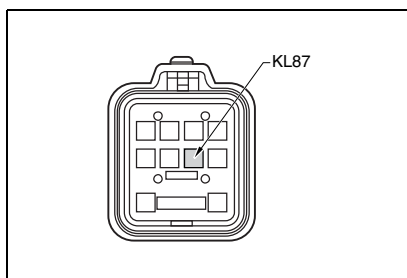
DN02-430

FUEL CONTROL (J08E)

DTC:P064C

EN1610602F200158

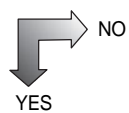
DTC	P064C	Glow controller - Battery for glow plug open, GND short Glow controller - Over temperature
-----	-------	---



SAPH161060200223

1. CHECK THE CONTINUITY OF HARNESS.

- (1) Check the GCU power supply line (KL87) for disconnection and/or short-circuit.



Fault in engine ECU

Faulty in harness



FUEL CONTROL (J08E)

DN02-431



DN02-432

FUEL CONTROL (J08E)

DTC:P0652 (Check sheet)

EN1610602F200152

DTC:P0652	ECU sensor supply 2 failure (Low)
------------------	-----------------------------------

1. Technical description

- | |
|--|
| <ul style="list-style-type: none">- Power is supplied to the sensor supply 2 circuit.
(boost pressure sensor, diesel throttle opening sensor 1, diesel throttle opening sensor 2, common rail pressure sensor (main), accelerator sensor 2, cam position sensor) <p><Description of malfunction></p> <ul style="list-style-type: none">- Excessively low voltage has been detected in the sensor power supply. |
|--|

2. DTC set condition**(1) Check conditions**

- | |
|---|
| <ul style="list-style-type: none">- The starter switch is ON.- The monitor disable DTC table can be referred to. |
|---|

(2) Judgment criteria

- | |
|--|
| <ul style="list-style-type: none">- A/D converter input sensor supply voltage < 0.5V- Failure timer >= 0.5sec |
|--|

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Individual sensors and harnesses Engine ECU
--

DTC:P0652	ECU sensor supply 2 failure (Low)	Inspection Procedure
------------------	--	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/ Fail)	If OK	If fail
1	Individual sensors	Remove individual sensors and check whether diagnosis can be deleted.	Check diagnosis.		Malfunction of removed sensors	Proceed to No. 2.
2	Harness	Connect the signal check harness and measure resistance to check whether GND short-circuit has occurred in individual power supply harnesses. * Use a signal check harness.	Check the harness. Check resistance value.		Replace the ECU.	Replace the harness.

DN02-434

FUEL CONTROL (J08E)

DTC:P0652

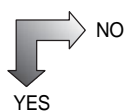
EN1610602F200153

DTC	P0652	ECU sensor supply 2 failure (low)
-----	-------	-----------------------------------

1. Boost pressure sensor connector, Intake throttle valve position sensor 1 connector, Intake throttle valve position sensor 2 connector, Common rail pressure sensor 1 connector, Accelerator sensor 2 connector, Camshaft position sensor connector by removing each of one, P0652 fault code disappears things check.

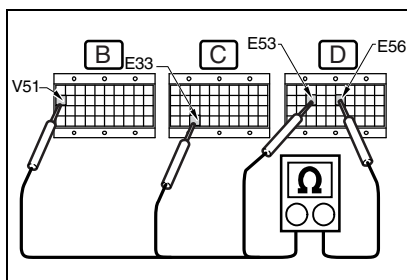
HINT

When sensor power supply 2 fails, the trouble code of P0122, P0193, P0222, P0237, P0340, P2127 occurs other than a trouble code of P0652.



Proceed to 2.

Faulty sensor fault code disappears when remove



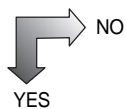
SAPH161060200224

2. MEASURE THE CONTINUITY BETWEEN TERMINALS.

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness.
- (3) Disconnect the connector on the engine sub harness side.
- (4) Measure the resistance between the terminals AVC2 (E33), GVCC (E53), AVC4 (V51) and AGD1 (E56).

Standard value: $\infty \Omega$

Terminal to measure the voltage	
+ Side	- Side
AVC2 (E33)	AGD7 (E56)
GVCC (E53)	
AVC4 (V51)	



Faulty harness

Fault in engine ECU



FUEL CONTROL (J08E)

DN02-435



DN02-436

FUEL CONTROL (J08E)

DTC:P0653 (Check sheet)

EN1610602F200161

DTC:P0653

ECU sensor supply 2 failure (High)

1. Technical description

- Excessively high voltage has been detected in the sensor power supply.
- Power is supplied to the sensor supply 2 circuit.

2. DTC set condition**(1) Check conditions**

- No other diagnosis codes are present (the monitor disable DTC table can be referred to).

(2) Judgment criteria

- 1.9 V or higher voltage remains at the A/D converter for 0.5 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Faulty harness
- Malfunction of ECU

DTC:P0653	ECU sensor supply 2 failure (High)	Inspection Procedure
------------------	---	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check whether abnormal voltage is applied on the sensor power supply.	Voltage		Replace the harness.
2	Individual sensors	Connect the signal check harness and disconnect the connector on the ECU side. Turn the key ON and measure voltage of the sensor power supply to check that it is 5 + 0.1 V.	Voltage		Replace the harness.
3	ECU	Check the ECU body for degradation/deterioration or malfunction.	ECU voltage 10 to 16 V		Replace the ECU.
4	Battery	Check whether the battery has degraded/deteriorated or malfunctioned.	Battery voltage 10 to 16 V		Replace the battery.

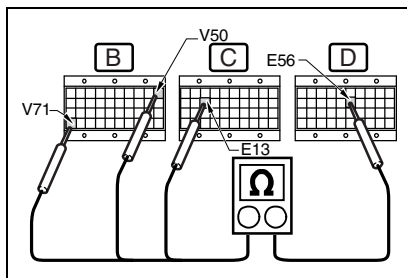
DN02-438

FUEL CONTROL (J08E)

DTC:P0653

EN1610602F200162

DTC	P0653	ESU sensor supply 2 failure (low)
-----	-------	-----------------------------------

**1. MEASURE THE VOLTAGE.**

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness.
- (3) Set the starter switch to "ON" position.
- (4) Measure the voltage between the terminals AVC1 (E13), AVC3 (V50), AVC5 (V71) and AGD1 (E56).

Standard value: 4.9-5.1 V

Terminal to measure the voltage	
+ Side	- Side
AVC1 (E13)	AGD1 (E56)
AVC3 (V50)	
AVC5 (V71)	

NO
YES

Faulty harness

Fault in engine ECU



FUEL CONTROL (J08E)

DN02-439



DN02-440

FUEL CONTROL (J08E)

DTC:P0671 (Check sheet)

EN1610602F200163

DTC:P0671

Glow plug (Circuit low) (#1cyl)
Glow plug (Circuit high) (#1cyl)

1. Technical description

- Controlled by GCU.
- The indicator in the meter lights up when a failure (malfunction caused by short circuit or disconnection) occurs in the glow system.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- Starter deactivated

(2) Judgment criteria

- Glow plug drive current < 0.5-0.9A
or
- Glow plug drive current > 21-36A
- Failure timer >= 0.3sec

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

(1) Failure in power supply:

- Check that Fusible Link (STA/GLOW) is not blown.

(2) Abnormality in harness:

- Check continuity between the Fusible Link (STA/GLOW) and the GCU.
- Check continuity between the GCU and each glow plug.

(3) Failure in glow plug:

FUEL CONTROL (J08E)

DN02-441

DTC:P0671	Glow plug (Circuit low) (#1cyl) Glow plug (Circuit high) (#1cyl)	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Fusible Link (STA/ GLOW)	Check whether fusing has occurred. Check engagement.	No fusing No play		Replace
2	Connectors, har- nesses and terminals	Check continuity between the Fusible Link and the GCU. Check continuity between the GCU and each glow plug.	Must be conduct- ing. No partial engagement No looseness		Replace
3	Glow plug		Check No. 1 and 2. If OK, replace parts.		Replace

DN02-442

FUEL CONTROL (J08E)

DTC:P0672 (Check sheet)

EN1610602F200164

DTC:P0672	Glow plug (Circuit low) (#2cyl) Glow plug (Circuit high) (#2cyl)
------------------	---

1. Technical description

- Controlled by GCU.
- The indicator in the meter lights up when a failure (malfunction caused by short circuit or disconnection) occurs in the glow system.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- Starter deactivated

(2) Judgment criteria

- Glow plug drive current < 0.5-0.9A
or
- Glow plug drive current > 21-36A
- Failure timer >= 0.3sec

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

(1) Failure in power supply:

- Check that Fusible Link (STA/GLOW) is not blown.

(2) Abnormality in harness:

- Check continuity between the Fusible Link (STA/GLOW) and the GCU.
- Check continuity between the GCU and each glow plug.

(3) Failure in glow plug:

DTC:P0672	Glow plug (Circuit low) (#2cyl) Glow plug (Circuit high) (#2cyl)	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Fusible Link (STA/ GLOW)	Check whether fusing has occurred. Check engagement.	No fusing No play		Replace
2	Connectors, har- nesses and terminals	Check continuity between the Fusible Link and the GCU. Check continuity between the GCU and each glow plug.	Must be conduct- ing. No partial engagement No looseness		Replace
3	Glow plug		Check No. 1 and 2. If OK, replace parts.		Replace

DN02-444

FUEL CONTROL (J08E)

DTC:P0675 (Check sheet)

EN1610602F200165

DTC:P0675	Glow plug (Circuit low) (#5cyl) Glow plug (Circuit high) (#5cyl)
------------------	---

1. Technical description

- Controlled by GCU.
- The indicator in the meter lights up when a failure (malfunction caused by short circuit or disconnection) occurs in the glow system.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- Starter deactivated

(2) Judgment criteria

- Glow plug drive current < 0.5-0.9A
or
- Glow plug drive current > 21-36A
- Failure timer >= 0.3sec

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

(1) Failure in power supply:

- Check that Fusible Link (STA/GLOW) is not blown.

(2) Abnormality in harness:

- Check continuity between the Fusible Link (STA/GLOW) and the GCU.
- Check continuity between the GCU and each glow plug.

(3) Failure in glow plug:

DTC:P0675	Glow plug (Circuit low) (#5cyl) Glow plug (Circuit high) (#5cyl)	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Fusible Link (STA/ GLOW)	Check whether fusing has occurred. Check engagement.	No fusing No play		Replace
2	Connectors, har- nesses and terminals	Check continuity between the Fusible Link and the GCU. Check continuity between the GCU and each glow plug.	Must be conduct- ing. No partial engagement No looseness		Replace
3	Glow plug		Check No. 1 and 2. If OK, replace parts.		Replace

DN02-446

FUEL CONTROL (J08E)

DTC:P0676 (Check sheet)

EN1610602F200166

DTC:P0676	Glow plug (Circuit low) (#6cyl) Glow plug (Circuit high) (#6cyl)
------------------	---

1. Technical description

- Controlled by GCU.
- The indicator in the meter lights up when a failure (malfunction caused by short circuit or disconnection) occurs in the glow system.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- Starter deactivated

(2) Judgment criteria

- Glow plug drive current < 0.5-0.9A
or
- Glow plug drive current > 21-36A
- Failure timer >= 0.3sec

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

(1) Failure in power supply:

- Check that Fusible Link (STA/GLOW) is not blown.

(2) Abnormality in harness:

- Check continuity between the Fusible Link (STA/GLOW) and the GCU.
- Check continuity between the GCU and each glow plug.

(3) Failure in glow plug:

DTC:P0676	Glow plug (Circuit low) (#6cyl) Glow plug (Circuit high) (#6cyl)	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Fusible Link (STA/ GLOW)	Check whether fusing has occurred. Check engagement.	No fusing No play		Replace
2	Connectors, har- nesses and terminals	Check continuity between the Fusible Link and the GCU. Check continuity between the GCU and each glow plug.	Must be conduct- ing. No partial engagement No looseness		Replace
3	Glow plug		Check No. 1 and 2. If OK, replace parts.		Replace

DN02-448

FUEL CONTROL (J08E)

DTC:P0671/P0672/P0675/P0676

EN1610602F200167

DTC	P0671	Glow plug (Circuit low) (#1cyl) Glow plug (Circuit high) (#1cyl)
DTC	P0672	Glow plug (Circuit low) (#2cyl) Glow plug (Circuit high) (#2cyl)
DTC	P0675	Glow plug (Circuit low) (#5cyl) Glow plug (Circuit high) (#5cyl)
DTC	P0676	Glow plug (Circuit low) (#6cyl) Glow plug (Circuit high) (#6cyl)

1. REPLACE THE GLOW PLUG



FUEL CONTROL (J08E)

DN02-449



DN02-450

FUEL CONTROL (J08E)

DTC:P0683 (Check sheet)

EN1610602F200168

DTC:P0683	Glow controller - Battery for glow controller open, GND short Glow controller - Glow control signal Glow controller - Diagnosis signal
------------------	--

1. Technical description

- Controlled by GCU.
- The indicator in the meter lights up when a failure (malfunction caused by short circuit or disconnection) occurs in the glow system.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- Starter deactivated

(2) Judgment criteria

- Glow controller : Deactivated (and no response)
or
- Glow control signal voltage < 1V
or
- Glow control signal voltage > 6.6V
or
- Glow controller diagnosis signal : No signal
- Failure timer >= 4.4sec

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

(1) Failure in power supply:

- Check that a fuse is not blown.

(2) Abnormality in harness:

- Check continuity between the fuse and the GCU.
- Check continuity between the GCU and the engine ECU (2 terminals).
- Check continuity between the GCU and the earth.

(3) Ground potential difference:

- Check a potential difference between the engine ECU and the GCU (must not exceed 400 mV).

DTC:P0683	Glow controller - Battery for glow controller open, GND short Glow controller - Glow control signal Glow controller - Diagnosis signal	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	FUSE (GCU(M))	Check whether fusing has occurred. Check engagement.	No fusing No play		Replace
2	Connectors, harnesses and terminals	Check continuity between the fuse and the GCU. Check continuity between the GCU and the engine ECU (2 terminals). Check continuity between the GCU and the GND.	Must be conducting. No partial engagement No looseness		Replace
3	Ground potential	Check ground potential difference between the engine ECU and the GCU.	Must not exceed 400 mV.		Repair the earth circuit
4	GCU		Check No. 1 through 3. If OK, replace parts.		Replace

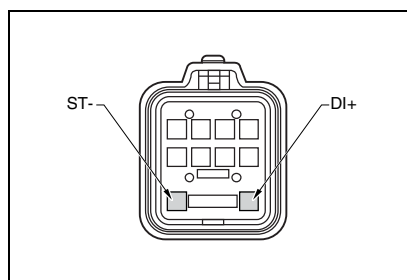
DN02-452

FUEL CONTROL (J08E)

DTC:P0683

EN1610602F200169

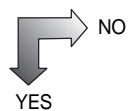
DTC	P0683	Glow controller - Battery for glow controller open, GND short Glow controller - Glow control signal Glow controller - Diagnosis signal
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SAPH161060200225

1. CHECK THE CONTINUITY OF HARNESS.

- (1) Check the ST-/DI+ signal line for disconnection and/or short-circuit.



Fault in engine ECU

Faulty in harness



FUEL CONTROL (J08E)

DN02-453



DN02-454

FUEL CONTROL (J08E)

DTC:P0686 (Check sheet)

EN1610602F200170

DTC:P0686

ECM/PCM Power Relay Control Circuit high

1. Technical description

- The main relay cannot be turned OFF.
- The main relay supplies power from the battery to the ECU.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- With the main relay in OFF position, 8 V or higher power supply voltage remains for 60 seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Faulty harness
- Faulty ECU connector
- Malfunction of ECU
- Malfunction of relay

DTC:P0686		ECM/PCM Power Relay Control Circuit high			Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Main relay	Check whether the main relay is loose/disconnected.	Relay connection		Proceed to No. 2.	Connect
2	Main relay	Check whether a sensing area of the main relay is contaminated, clogged or damaged.	Check the relay.		Proceed to No. 3.	Remove all contaminants and clogging. Replace if damaged.
3	Main relay	Check that the main relay harness and harness connector are in normal condition. (Irregular contact, non-continuity, disconnection, short-circuit or the like)	Check the harness and/or connector.		Proceed to No. 4.	Repair or replace the harness and/or connector.
4	Main relay	Connect the signal check harness and check that main relay voltage is 10 V or higher.	Check voltage.		Replace the ECU.	Proceed to No. 5.
5	Main relay	Disconnect the main relay and check resistance.	Check the harness.		Replace the harness.	Replace the main relay.
6	ECU	Check the ECU body for degradation/deterioration or malfunction.	ECU voltage 10 to 16 V		Normal Proceed to No. 7.	Replace the ECU.
7	Battery	Check whether the battery has degraded/deteriorated or malfunctioned.	Battery voltage 10 to 16 V		Normal	Replace the battery.

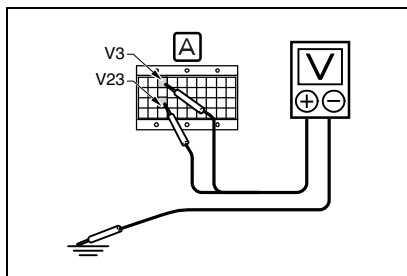
DN02-456

FUEL CONTROL (J08E)

DTC:P0686

EN1610602F200171

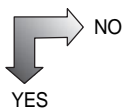
DTC	P0686	ECM/PCM Power Relay Control Circuit high
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SAPH161060200226

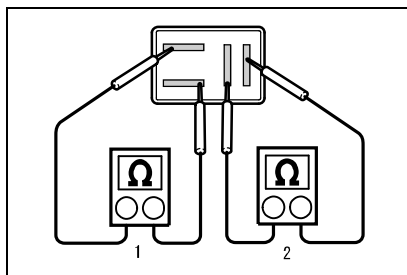
1. MEASURING VOLTAGE BETWEEN TERMINALS.

- (1) Set the starter switch to "LOCK" and connect the signal check harness.
- (2) Set the starter to "ON" position.
- (3) Measure the voltage between MRL1 (V3), MRL2 (V23) terminals and Chassis GND.

Standard value: More than 10 V

Proceed to 2

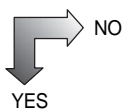
- Fault in engine ECU
- Malfunction of ECU connectors



SAPH161060200227

2. CHECK THE RESISTANCE BETWEEN RELAY TERMINALS.

- (1) Set the starter switch to "LOCK" and remove the main relay.
- (2) Measure the resistance between terminals.

Standard value:**1. 320 Ω** **2. $\infty \Omega$** 

Faulty in main relay

Faulty in harness



FUEL CONTROL (J08E)

DN02-457



DN02-458

FUEL CONTROL (J08E)

DTC:P06D3 (Check sheet)

EN1610602F200172

DTC:P06D3	Air flow sensor power supply failure Short to GND
------------------	---

1. Technical description

- Excessively low voltage has been detected in the air flow sensor power supply.
- The air flow sensor installed to the air cleaner consistently measures an intake air volume.

2. DTC set condition**(1) Check conditions**

- Engine speed of 500 r/min or more
- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- Voltage of the air flow sensor power supply circuit remains at 5.6 V or lower for 4 msec.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Faulty harness
- Malfunction of sensor
- Malfunction of ECU

DTC:P06D3	Air flow sensor power supply failure Short to GND	Inspection Procedure
------------------	--	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Air flow sensor	Check whether the air flow sensor is loose/disconnected.	Sensor connection		Connect the sensor.
2	Air flow sensor	Check whether a sensing area of the air flow sensor is contaminated, clogged or damaged.	Sensor condition		Remove all contaminants and clogging. Replace if damaged.
3	Air flow sensor	Check that sensor resistance of the air flow sensor is proper.	Check resistance value.		Replace the sensor.
4	Harness	Check whether irregular contact has occurred in the air flow sensor harness and harness connector.	Check continuity.		Repair or replace the harness and/or connector.
5	Harness	Check the air flow sensor harness for disconnection or short-circuit.	Check continuity.		Repair or replace the harness.
6	ECU	Check the ECU body for degradation/deterioration or malfunction.	ECU voltage 10 to 16 V		Replace the ECU.
7	Battery	Check the battery for degradation/deterioration and/or malfunction.	Battery voltage 10 to 16 V		Replace the battery.

DN02-460

FUEL CONTROL (J08E)

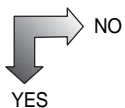
DTC:P06D3

EN1610602F200173

DTC	P06D3	Air flow sensor power supply failure Short to GND
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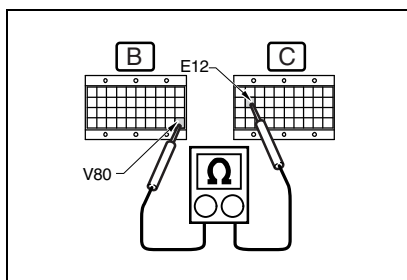
1. CHECK A MALFUNCTION CODE.

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the air flow sensor connector.
- (3) Set the starter switch to "ON" position.
- (4) Check that P06D3 is no longer present.



Proceed to 2.

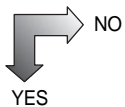
Faulty air flow sensor



SAPH161060200228

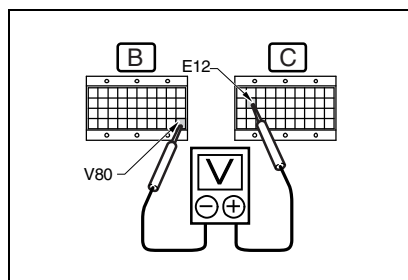
2. CHECK THE CONTINUITY IN HARNESS.

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness.
- (3) Measure the resistance between the terminals AFVB (E12) and PGD4 (V80).

Standard value: $\infty \Omega$ 

Proceed to 3.

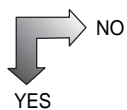
Faulty harness



3. MEASURE THE VOLTAGE BETWEEN TERMINALS.

- (1) Set the starter switch to "ON" position.
- (2) Measure the voltage between the terminals AFVB (E12) and PGD4 (V80).

Standard value: 11.5-13.5 V



Fault in engine ECU

- Faulty ECU connector
- Faulty harness

DN02-462

FUEL CONTROL (J08E)

DTC:P06D4 (Check sheet)

EN1610602F200174

DTC:P06D4

Air flow sensor power supply failure (High)

1. Technical description

- Excessively high voltage has been detected in the air flow sensor power supply.
- The air flow sensor installed to the air cleaner consistently measures an intake air volume.

2. DTC set condition**(1) Check conditions**

- Engine speed of 500 r/min or more
- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- Voltage of the air flow sensor power supply circuit remains at 5.6 V or lower for 4 msec.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Faulty harness
- Malfunction of sensor
- Malfunction of ECU

DTC:P06D4	Air flow sensor power supply failure (High)	Inspection Procedure
------------------	--	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Air flow sensor	Check whether the air flow sensor is loose/disconnected.	Sensor connection		Connect the sensor.
2	Air flow sensor	Check whether a sensing area of the air flow sensor is contaminated, clogged or damaged.	Sensor condition		Remove all contaminants and clogging. Replace if damaged.
3	Air flow sensor	Check that sensor resistance of the air flow sensor is proper.	Check resistance value.		Replace the sensor.
4	Harness	Check whether irregular contact has occurred in the air flow sensor harness and harness connector.	Check continuity.		Repair or replace the harness and/or connector.
5	Harness	Check the air flow sensor harness for disconnection or short-circuit.	Check continuity.		Repair or replace the harness.
6	ECU	Check the ECU body for degradation/deterioration or malfunction.	ECU voltage 10 to 16 V		Replace the ECU.
7	Battery	Check the battery for degradation/deterioration and/or malfunction.	Battery voltage 10 to 16 V		Replace the battery.

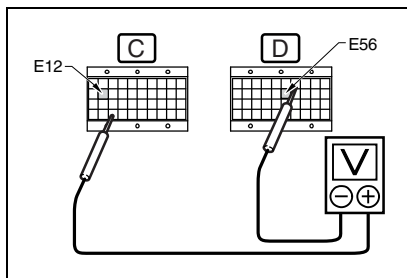
DN02-464

FUEL CONTROL (J08E)

DTC:P06D4

EN1610602F200175

DTC	P06D4	Air flow sensor power supply failure (high)
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**1. MEASURE THE VOLTAGE BETWEEN TERMINALS.**

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness on the engine side.
- (3) Set the starter switch to "ON" position.
- (4) Measure the voltage between the terminals AFVB (E12) and AGD1 (E56).

Standard value: 11.5-13.5 V

NO
YES

Proceed to 2.

Fault in engine ECU

2. CHECK THE BATTERY

- (1) Check the battery voltage.

Standard value: 10 V or more

NO
YES

Proceed to 3.

Fault in engine ECU

3. CHECK THE ALTERNATOR.



FUEL CONTROL (J08E)

DN02-465



DN02-466

FUEL CONTROL (J08E)

DTC:P0704 (Check sheet)

EN1610602F200176

DTC:P0704**Clutch Switch Input Circuit****1. Technical description**

- The clutch switch cannot be correctly sensed.
- Presence of input of clutch switch signals is sensed by the ECU through the clutch switch.

2. DTC set condition**(1) Check conditions**

- Vehicle speed is 50 km/h or higher.
- Vehicle with manual transmission

(2) Judgment criteria

- This will be detected if presence or absence of input of clutch switch signals cannot be sensed after 5 or more cycles of vehicle stop (vehicle speed = 0 km/h) -> run -> stop.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Faulty harness
- Malfunction of switch
- Malfunction of ECU

DTC:P0704	Clutch Switch Input Circuit	Inspection Procedure
------------------	------------------------------------	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Switch	Check whether the clutch switch is loose/disconnected.	Switch connection		Connect the switch.
2	Switch	Check that the clutch switch sensor harness and harness connector are in normal condition. (Voltage, irregular contact, non-continuity, disconnection, short-circuit or the like)	Check voltage. 4.5 to 5.5 V Check the harness and/or connector.		Repair or replace the harness and/or connector.
3	Switch	Check the starter switch for malfunction.	Check the switch.		Replace the starter switch.
4	Switch	Measure voltage of the starter switch. (12 V with starter switch ON 0 V with starter switch OFF) * Use a signal check harness.	Check voltage.		Repair or replace the harness and/or connector.
5	ECU	Check the ECU for degradation/deterioration or malfunction.	ECU voltage 10 to 16 V		Replace the ECU.
6	Battery	Check whether the battery has degraded/deteriorated or malfunctioned.	Battery voltage 10 to 16 V		Replace the battery.

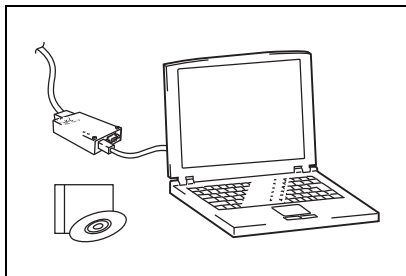
DN02-468

FUEL CONTROL (J08E)

DTC:P0704

EN1610602F200177

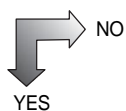
DTC	P0704	Clutch Switch Input Circuit
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SAPH161060200231

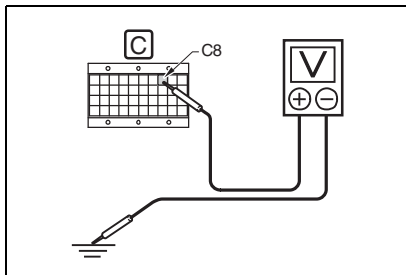
1. CHECK THE FUEL CUT RELAY USING THE PC DIAGNOSIS TOOL (HINO-DX).

- (1) Connect Hino-DX to the vehicle.
- (2) Set the starter switch to "ON" position.
- (3) Turn on and off the clutch pedal and check that the signal switches.

HINT**If you drive with the foot on the clutch, judgment may take place.**

Proceed to 2.

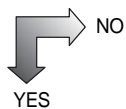
Clear and recheck the DTC.



SAPH161060200232

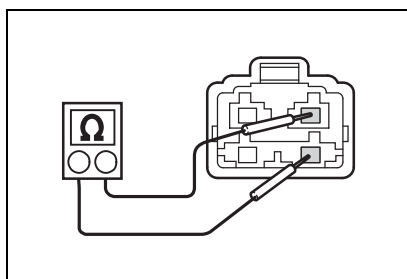
2. MEASURING VOLTAGE BETWEEN TERMINALS AND GND.

- (1) Set the starter switch to "LOCK" position and connect the signal check harness.
- (2) Set the starter switch to "ON" position.
- (3) Measure the voltage between CLSW (C8) terminal and cab GND.

Standard value:**More than 10 V (Clutch pedal released)****0 V (Clutch pedal pressed)**

Proceed to 3.

Fault in engine ECU



SAPH161060200233

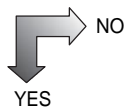
3. CHECK THE CLUTCH SWITCH.

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the clutch switch connector.
- (3) Measure the resistance between clutch switch terminals.

Standard value:

$\infty \Omega$ (Clutch switch not pressed)

Less than 1Ω (Clutch switch pressed)



NO

Faulty in clutch switch.

YES

Faulty in harness.

DTC:P073D (Check sheet)

EN1610602F200178

DTC:P073D**Transmission information - rationality (AT model)****1. Technical description**

- Information sent from the transmission ECU is incorrect.
- Transmission information is transferred through CAN communication.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
- No other diagnosis codes are present (the monitor disable DTC table can be referred to).
- Compare the parameters listed below.
Neutral switch
Neutral information
Lockup information

(2) Judgment criteria

P073D (incorrect transmission information) is detected under the conditions described below. (Numbers (1) through (3) represent the order of priority.)

1. Lockup information is incorrect.
2. While non-neutral status is sensed as neutral information, the neutral switch senses neutral status for continuous 10 seconds.
3. While lockup information is sensed, neutral status is sensed as neutral information for continuous 10 seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Faulty harness
- CAN communication blackout
- Malfunction of AT-ECU
- For an Allison 2200 or an Allison 2500 transmission, when a PTO is mounted
The PTO switch input data are supplied to the Allison ECU, and a customization function for lock-up even during PTO is provided. When this customization is performed, the P073D diagnostic occurs, so that input of the PTO switch is also requested from the engine ECU.

DTC:P073D

Transmission information - rationality (AMT model)

4. Technical description

- Transmission information is transferred through CAN communication.

5. DTC set condition

(1) Check conditions

- Battery voltage is in the 10 - 16 V range.
- No other diagnosis codes are present (the monitor disable DTC table can be referred to).
- Compare the parameters listed below.
Neutral information
Drive engagement information

(2) Judgment criteria

P073D (incorrect transmission information) is detected under the conditions described below. (Numbers (1) and (2) represent the order of priority.)

1. Drive engagement information is incorrect.
2. While drive engagement information is sensed, neutral status is sensed as neutral information for continuous 10 seconds.

6. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Faulty harness
- CAN communication blackout
- Malfunction of AMT-ECU

DN02-472

FUEL CONTROL (J08E)

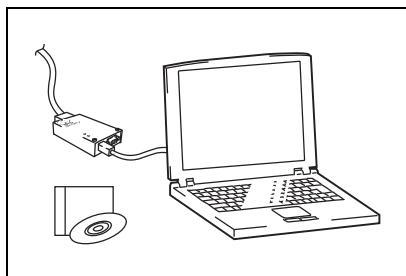
DTC:P073D	Transmission information - rationality (AT and AMT models)	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Neutral switch circuit (harness)	Check that the engine ECU correctly senses a neutral switch signal when the transmission lever is shifted to the N or P range.	Signal sensing		Repair the harness.
2	Between vehicle ECU and transmission ECU	Troubleshoot the vehicle ECU and check that CAN communication with the transmission ECU is proper.	CAN communication		Replace the harness. (CAN circuit)
3	Transmission ECU	Check the transmission ECU for any failures.	Check the ECU.		Replace the ECU.

DTC:P073D

EN1610602F200179

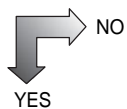
DTC	P073D	Transmission information - rationality
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SAPH161060200234

1. USE THE Hino-DX TO CONDUCT AN INSPECTION.

- (1) Connect Hino-DX to the vehicle.
- (2) Set the starter switch to "ON" position.
- (3) Select the "Neutral switch" and check that the engine ECU properly identifies a neutral switch signal when the transmission lever is shifted to the "N" or "D" range.

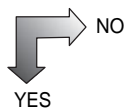


Proceed to 2.

Check the neutral switch circuit

2. VEHICLE CONTROL ECU FAILURE TO CONDUCT A DIAGNOSIS

- (1) Check the transmission controller and vehicle control.
(Refer to the chapter "VEHICLE CONTROL" DN01-001)



Proceed to 3.

Faulty CAN circuit

3. CHECK THE TRANSMISSION ECU FOR MALFUNCTIONS OR TROUBLES.

DN02-474

FUEL CONTROL (J08E)

DTC:P081A (Check sheet)

EN1610602F200180

DTC:P081A

Starter Disable Circuit Low

1. Technical description

- The starter cut relay prevents further rotations of the starter when the starter switch is turned after start of the engine.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Engine speed of 500 r/min or more
- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- Output of the starter block relay remains at 10 V or less for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Faulty harness
- Faulty ECU connector
- Malfunction of ECU
- Malfunction of relay

DTC:P081A		Starter Disable Circuit Low			Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Starter cut relay	Check whether the starter cut relay is loose/disconnected.	Relay connection		Proceed to No. 2.	Connect
2	Starter cut relay	Check whether a sensing area of the starter cut relay is contaminated, clogged or damaged.	Check the relay.		Proceed to No. 3.	Remove all contaminants and clogging. Replace if damaged.
3	Starter cut relay	Check that the starter cut relay harness and harness connector are in normal condition. (Irregular contact, non-continuity, disconnection, short-circuit or the like)	Check the harness and/or connector.		Proceed to No. 4.	Repair or replace the harness and/or connector.
4	Starter cut relay	Disconnect the starter cut relay and check that the diagnosis code P081A is no longer present. (The diagnosis code P081B will be active.)	Check diagnosis.		Replace the starter block relay.	Proceed to No. 5.
5	Starter cut relay	Connect the signal check harness and check that there is no continuity between the starter block relay terminal and the GND terminal.	Check the harness.		Proceed to No. 6.	With continuity Repair or replace the harness.
6	ECU	Check the ECU for degradation/deterioration or malfunction.	ECU voltage 10 to 16 V		Normal Proceed to No. 7.	Replace the ECU.
7	Battery	Check whether the battery has degraded/deteriorated or malfunctioned.	Battery voltage 10 to 16 V		Normal	Replace the battery.

DN02-476

FUEL CONTROL (J08E)

DTC:P081A

EN1610602F200181

DTC	P081A	Starter Disable Circuit Low
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1. CHECK A MALFUNCTION CODE.

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the starter cut relay.
- (3) Set the starter switch to "ON" position.
- (4) Check that P081A is no longer present.

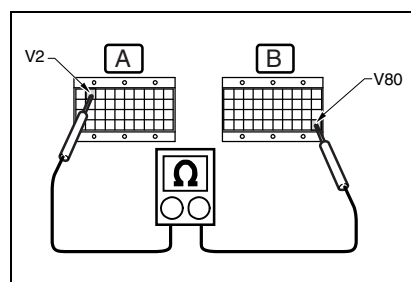


NO

Proceed to 2.

YES

Faulty starter cut relay



SAPH161060200235

2. CHECK THE CONTINUITY IN HARNESS.

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness on the vehicle side.
- (3) Measure the resistance between the terminals STCR (V2) and PGD4 (V80).

Standard value: ∞ Ω

NO

Faulty harness

YES

Fault in engine ECU



FUEL CONTROL (J08E)

DN02-477



DN02-478

FUEL CONTROL (J08E)

DTC:P081B (Check sheet)

EN1610602F200182

DTC:P081B

Starter Disable Circuit High

1. Technical description

- The starter cut relay prevents further rotations of the starter when the cell is turned after start of the engine.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Engine speed of 500 r/min or more
- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- Output of the starter block relay remains at 0 V or higher for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Faulty harness
- Faulty ECU connector
- Malfunction of ECU
- Malfunction of relay

DTC:P081B		Starter Disable Circuit High			Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Starter cut relay	Check whether the starter cut relay is loose/disconnected.	Relay connection		Proceed to No. 2.	Connect
2	Starter cut relay	Check whether a sensing area of the starter cut relay is contaminated, clogged or damaged.	Check the relay.		Proceed to No. 3.	Remove all contaminants and clogging. Replace if damaged.
3	Starter cut relay	Check the starter cut relay to see that the energized circuit is open.	Check the harness and relay.		Replace the starter block relay.	Proceed to No. 4.
4	Starter cut relay	Connect the signal check harness and check that voltage is less than 3 V at the starter cut relay terminal and the GND terminal.	Check harness voltage.		Proceed to No. 5.	Repair or replace the harness.
5	ECU	Check the ECU for degradation/deterioration or malfunction.	ECU voltage 10 to 16 V		Normal Proceed to No. 6.	Replace the ECU.
6	Battery	Check whether the battery has degraded/deteriorated or malfunctioned.	Battery voltage 10 to 16 V		Normal	Replace the battery.

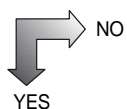
DN02-480

FUEL CONTROL (J08E)

DTC:P081B

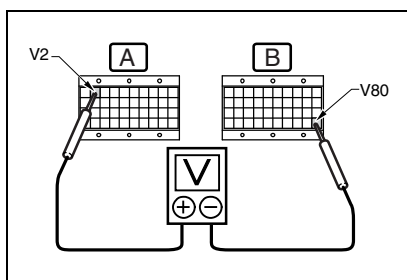
EN1610602F200183

DTC	P081B	Starter Disable Circuit High
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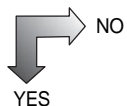
1. CHECK WHETHER THE ENERGIZED SIDE CIRCUIT OF THE STARTER CUT RELAY IS OPEN.

Proceed to 2.

Faulty starter cut relay

**2. MEASURE THE VOLTAGE BETWEEN TERMINALS.**

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness on the vehicle side.
- (3) Set the starter switch to "ON" position.
- (4) Measure the voltage between the terminals STCR (V2) and PGD4 (V80).

Standard value: 3 V or less

Faulty harness

- Fault in engine ECU
- Faulty ECU connector



FUEL CONTROL (J08E)

DN02-481



DN02-482

FUEL CONTROL (J08E)

DTC:P0850 (Check sheet)

EN1610602F200184

DTC:P0850

Neutral switch - rationality

1. Technical description

- The neutral switch cannot correctly sense.
- Through the neutral switch, the ECU senses neutral signals when the transmission lever is in the P or N range.

2. DTC set condition**(1) Check conditions**

- After the starter switch is set to ON position, the status described below remains for 10 seconds.
- Vehicle speed is 31.25 miles/h or higher.
- Battery voltage is in the 10 - 16 V range.
- After that, vehicle speed is 0 miles/h.

(2) Judgment criteria

- The neutral switch cannot be switched twice.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Faulty harness or connector
- Malfunction of neutral switch
- Malfunction of ECU

DTC:P0850		Neutral switch - rationality			Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Neutral switch	Check whether the neutral switch is loose/disconnected.	Switch connection		Proceed to No. 2.	Connect the switch.
2	Neutral switch	Check whether a sensing area of the neutral switch is contaminated, clogged or damaged.	Check the switch.		Proceed to No. 3.	Remove all contaminants and clogging. Replace if damaged.
3	Neutral switch	Check that the neutral switch harness and harness connector are in normal condition. (Irregular contact, non-continuity, disconnection, short-circuit or the like)	Check the harness and/or connector.		Proceed to No. 4.	Repair or replace the harness and/or connector.
4	Neutral switch	Connect the signal check harness and check neutral switch voltage. 8 V or higher (T/M: Neutral position) 0.5 V or lower (T/M: Not in the neutral position)	Check voltage.		Proceed to No. 5.	Repair or replace the harness and/or connector.
5	ECU	Check the ECU for degradation/deterioration or malfunction.	ECU voltage 10 to 16 V		Normal Proceed to No. 6.	Replace the ECU.
6	Battery	Check whether the battery has degraded/deteriorated or malfunctioned.	Battery voltage 10 to 16 V		Normal	Replace the battery.

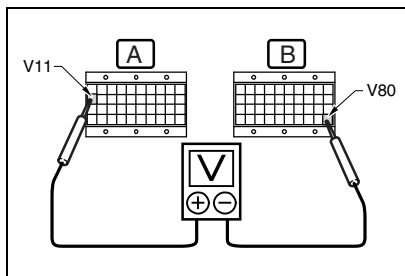
DN02-484

FUEL CONTROL (J08E)

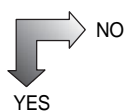
DTC:P0850

EN1610602F200185

DTC	P0850	Neutral switch - rationality
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**1. MEASURING VOLTAGE BETWEEN TERMINALS AND GND.**

- (1) Set the starter switch to "LOCK" position and connect the signal check harness.
- (2) Disconnect the signal check harness connector on the engine ECU side.
- (3) Set the starter switch "ON" position.
- (4) Measure the voltage between the terminals NUSW (V11) and PGD4 (V80).

Standard value:**8 V or more (Transmission: Neutral position)****0.5 V or less (Transmission: Not neutral position)**

- Faulty in harness
- Faulty in neutral switch

Fault in engine ECU



FUEL CONTROL (J08E)

DN02-485



DN02-486

FUEL CONTROL (J08E)

DTC:P1133 (Check sheet)

EN1610602F200186

DTC:P1133

P.T.O. accelerator sensor (Hi)

1. Technical description

- The operational accelerator sensor cannot correctly sense.
- +B short-circuit is likely to have occurred.
- The operational accelerator sensor measures accelerator opening if PTO (power take off) is used. (This applies only to PTO-equipped vehicles.)

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- Sensor voltage remains at 4.82 V or higher for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Faulty harness
- Malfunction of sensor
- Malfunction of ECU

DTC:P1133		P.T.O. accelerator sensor (Hi)		Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	P.T.O. accelerator sensor	Check whether the operational accelerator sensor is loose/disconnected.	Sensor connection		Connect the sensor.
2	P.T.O. accelerator sensor	Check whether a sensing area of the operational accelerator sensor is contaminated, clogged or damaged.	Sensor condition		Remove all contaminants and clogging. Replace if damaged.
3	P.T.O. accelerator sensor	Check that sensor resistance of the operational accelerator sensor is proper.	Check resistance value.		Replace the sensor.
4	Harness	Check whether irregular contact has occurred in the operational accelerator sensor harness and harness connector.	Check continuity.		Repair or replace the harness and/or connector.
5	Harness	Check the operational accelerator sensor harness for disconnection or short-circuit.	Check continuity.		Repair or replace the harness.
6	ECU	Check the ECU for degradation/deterioration or malfunction.	ECU voltage 10 to 16 V		Replace the ECU.
7	Battery	Check the battery for degradation/deterioration and/or malfunction.	Battery voltage 10 to 16 V		Replace the battery.

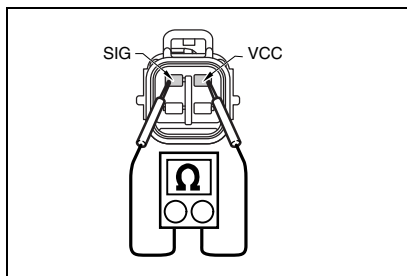
DN02-488

FUEL CONTROL (J08E)

DTC:P1133

EN1610602F200187

DTC	P1133	P.T.O accelerator sensor (Hi)
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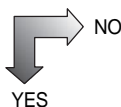
**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the P.T.O. accelerator sensor connector.
- (3) Measure resistance between the terminals VCC and SIG of the P.T.O. accelerator sensor connector.

HINT

If it is difficult to check only the sensor, proceed to Step 4.

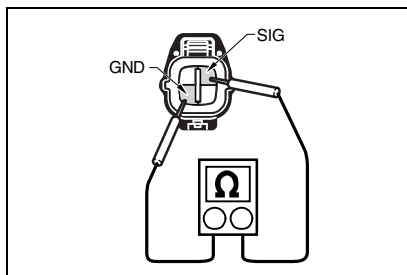
Standard value: 2 Ω or more



NO

Faulty P.T.O. accelerator sensor

YES

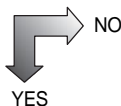
**2. MEASURING RESISTANCE BETWEEN TERMINALS**

- (1) Measure resistance between the terminals SIG and GND of the P.T.O. accelerator sensor connector (engine sub harness side).

HINT

If it is difficult to check only the sensor, proceed to Step 5.

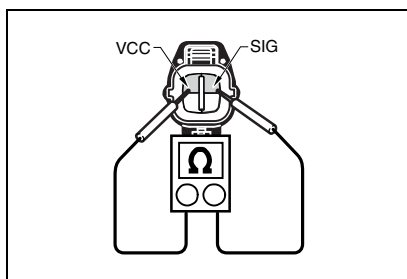
Standard value: 740-760 k Ω



NO

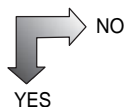
- Faulty in harness
- Irregular contact of connectors

YES

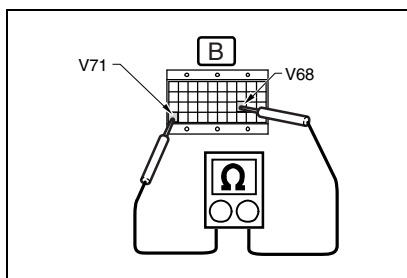
**3. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Measure resistance between the terminals VCC and SIG of the P.T.O. accelerator sensor connector (engine sub harness side).

Standard value: $\infty \Omega$

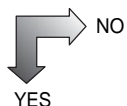


Faulty in harness

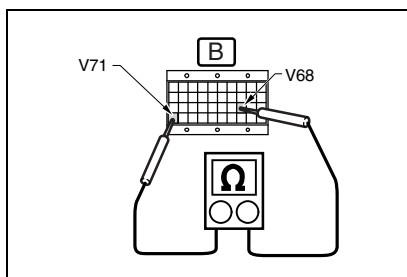
**4. MEASURING RESISTANCE BETWEEN TERMINALS**

- (1) Connect the signal check harness on the vehicle side.
(2) Disconnect the connector on the engine ECU side.
(3) Measure resistance between the terminals ASCS (V68) and AVC5 (V71).

Standard value: $\infty \Omega$

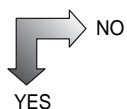


Faulty in harness

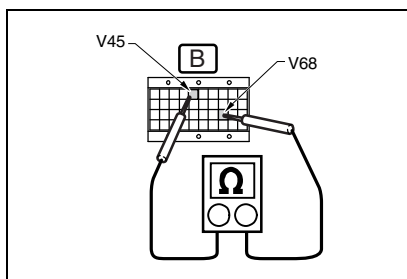
**5. MEASURING RESISTANCE BETWEEN TERMINALS**

- (1) Connect the P.T.O. accelerator sensor connector.
(2) Measure resistance between the terminals ASCS (V68) and AVC5 (V71).

Standard value: 2Ω or more

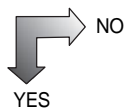


Fault in P.T.O. accelerator sensor

**6. MEASURING RESISTANCE BETWEEN TERMINALS**

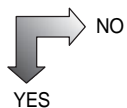
- (1) Measure resistance between the terminals ADG7 (V45) and ASCS (V68).

Standard value: 2 Ω or more



NO

- Faulty in harness
- Irregular contact of connectors



NO

Fault in engine ECU

Clear and recheck the DTC.



FUEL CONTROL (J08E)

DN02-491



DTC:P1197 (Check sheet)

EN1610602F200188

DTC:P1197	Fuel rail pressure sensor (sub) - out of range (Out of range low)
------------------	---

1. Technical description

- Common rail pressure cannot be correctly sensed.
- Malfunction of common rail pressure sensor or harness GND short-circuit is likely to have occurred.
- The common rail pressure sensor consistently measures common rail pressure.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
- The engine has stalled or runs at 500 r/min or higher for continuous 5 seconds.

(2) Judgment criteria

- Voltage of the common rail pressure sensor remains at 0.89 V (-33 MPa) or lower for 0.2 seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Common rail pressure sensor (main):

- Irregular contact (disconnection or poor fit of connector)
- Abnormal resistance of sensor

Engine harness: Harness disconnection or short-circuit**Engine ECU:** Malfunctions of ECU

DTC:P1197	Fuel rail pressure sensor (sub) - out of range (Out of range low)	Inspection Procedure
------------------	--	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Battery	Check the battery for degradation/deterioration and/or malfunction.	Battery voltage 10 to 16 V		Proceed to No. 2.	Replace the battery.
2	Sensor	Check whether the common rail pressure connector is loose/disconnected.	Connection of connector		Proceed to No. 3.	Connect the connector.
3	Sensor	Check whether the common rail pressure sensor terminals and harness terminals are contaminated, clogged, damaged or worn.	Condition of terminals		Proceed to No. 4.	Remove all contaminants and clogging. Replace if damaged.
4	Common rail pressure sensor	<ul style="list-style-type: none"> Check resistance between the sensor power supply terminal and the GND. Check resistance between the sensor signal terminal and the power supply. 	Check resistance.		Proceed to No. 5.	Replace the common rail assembly.
5	Harness	<ul style="list-style-type: none"> Check that there is no continuity between the sensor power supply terminal of the engine harness connector and the ECU GND terminal. Check that there is no continuity between the sensor signal terminal of the engine harness connector and the ECU GND terminal. 	Check resistance. $\infty \Omega$		Proceed to No. 6.	Repair or replace the harness.
6	Harness	<ul style="list-style-type: none"> Check that there is no continuity between the sensor power supply terminal of the signal check harness and the ECU GND terminal. Check that there is no continuity between the sensor signal terminal of the signal check harness and the ECU GND terminal. 	Check resistance. $\infty \Omega$		Proceed to No. 7.	Repair or replace the harness.
7	Harness	Check resistance between the sensor power supply line and (engine side) the sensor ground line (engine side) of the signal check harness.	Check resistance. 2 Ω or more		Proceed to No. 8.	Repair or replace the harness.
8	Harness	Check resistance between the sensor signal line and (engine side) the sensor ground line (engine side) of the signal check harness.	Check resistance. 2 Ω or more		Proceed to No. 9.	Repair or replace the harness.

DN02-494

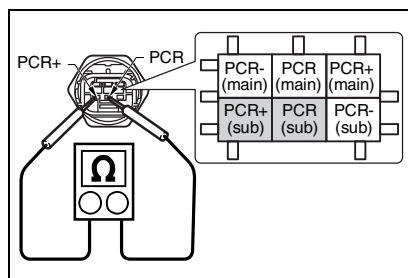
FUEL CONTROL (J08E)

No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
9	ECU	Check resistance between the sensor signal terminal (ECU side) and the sensor power supply (ECU side) of the signal check harness. * Use a signal check harness.	Check resistance. 200 to 250 k Ω		Proceed to No. 10.	Replace the ECU connector and/or ECU.
10	ECU	Check whether common rail sensor supply voltage is proper.	Check voltage. 4.5 to 5.5 V Check the harness and/or connector.		Replace the rail assembly. Harness	Replace the ECU connector and/or ECU.

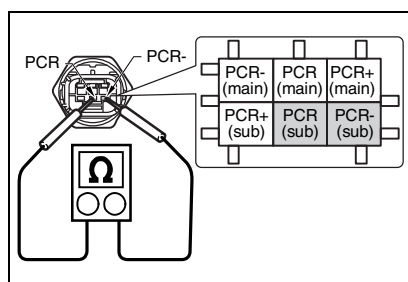
DTC:P1197

EN1610602F200189

DTC	P1197	Fuel rail pressure sensor (sub) - out of range (Out of range low)
-----	-------	---

**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the common rail pressure sensor connector.
- (3) Check continuity between the terminals PCR+ and PCR of the common rail pressure sensor (sub) connector.

Standard value: 1.05-3.55 k Ω 

- (4) Check continuity between the terminals PCR and PCR- of the common rail pressure sensor (sub) connector.

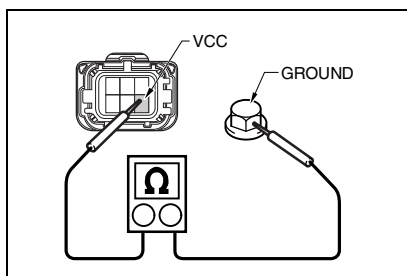
Standard value: 6.7-18.7 k Ω

YES
NO

Fault in common rail pressure sensor

DN02-496

FUEL CONTROL (J08E)



SAPH161060200246

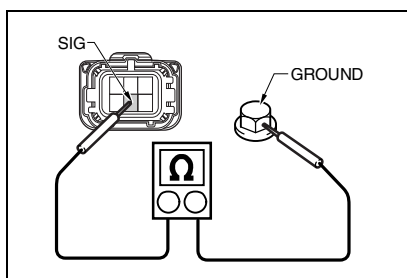
2. CHECK THE CONTINUITY OF HARNESS.

- (1) Disconnect the engine ECU connector.
- (2) Check continuity between the terminals ECU GND and VCC of the common rail pressure sensor (sub) connector on the harness side.

HINT

If it is difficult to check only the sensor, proceed to step 3.

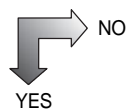
Standard value: $\infty \Omega$



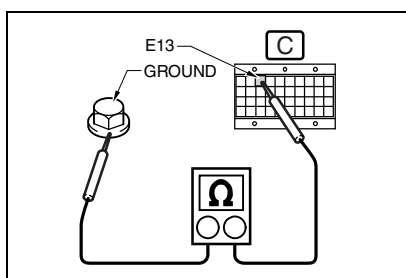
SAPH161060200247

- (3) Check continuity between the terminals ECU GND and SIG of the common rail pressure sensor (sub) connector on the harness side.

Standard value: $\infty \Omega$



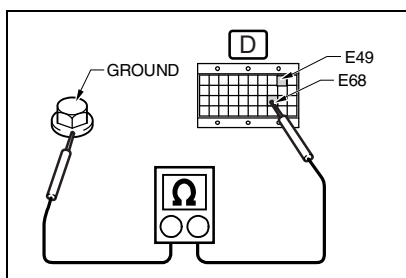
Faulty in harness



SAPH161060200248

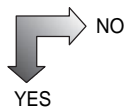
3. MEASURING RESISTANCE BETWEEN TERMINALS

- (1) Set the starter key to "LOCK" position and connect the signal check harness on the engine ECU.
- (2) Disconnect the signal check harness connector on the engine ECU side.
- (3) Measure resistance between the terminals AVC1 (E13) and ECU GND.

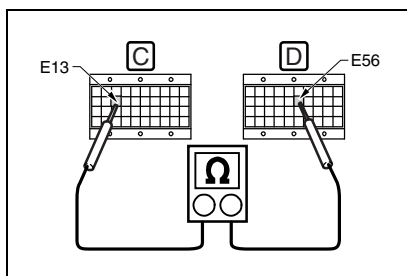
Standard value: $\infty \Omega$ 

SAPH161060200249

- (4) Measure resistance between the terminals PCR1 (E49), PCR2 (E68) and ECU GND.

Standard value: $\infty \Omega$ 

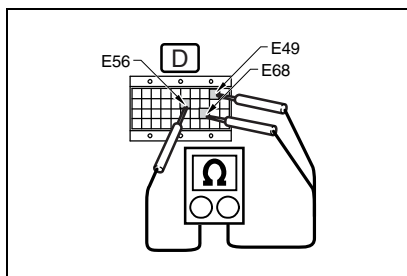
Faulty in harness



SAPH161060200250

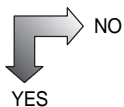
4. MEASURING RESISTANCE BETWEEN TERMINALS

- (1) Connect the signal check harness on the engine side.
- (2) Disconnect the connector on the engine ECU side.
- (3) Connect the common rail pressure sensor connector.
- (4) Measure resistance between the terminals AVC1 (E13) and AGD1 (E56).

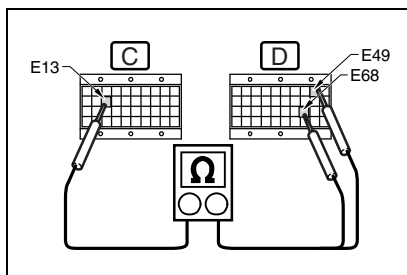
Standard value: 2 Ω or more

SAPH161060200251

- (5) Measure resistance between the terminals PCR1 (E49), PCR2 (E68) and AGD1 (E56).

Standard value: 2 Ω or more

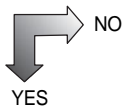
Faulty common rail pressure sensor



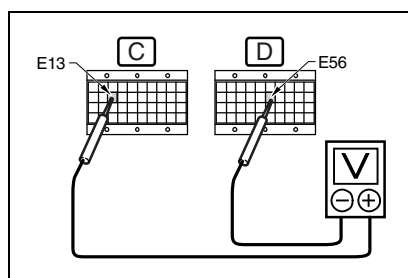
SAPH161060200252

5. MEASURING RESISTANCE BETWEEN TERMINALS

- (1) Also connect the signal check harness on the engine ECU side.
- (2) Measure resistance between the terminals AVC1 (E13), PCR1 (E49) and PCR2 (E68).

Standard value: 200-250 k Ω 

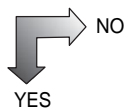
Fault in engine ECU (ECU connector)



SAPH161060200253

6. MEASURING VOLTAGE BETWEEN TERMINALS

- (1) Set the starter switch to "ON" position.
- (2) Measure voltage between the terminals AVC1 (E13) and AGD1 (E56).

Standard value: 4.5-5.5 V

Fault in engine ECU (ECU connector)

Replace the engine ECU

DTC:P1198 (Check sheet)

EN1610602F200190

DTC:P1198

Fuel rail pressure sensor (sub) - out of range (Out of range high)

1. Technical description

- Common rail pressure cannot be correctly sensed.
- Malfunction of common rail pressure sensor, harness disconnection or +B short-circuit is likely to have occurred.
- The common rail pressure sensor consistently measures common rail pressure.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
- The engine has stalled or runs at 500 r/min or higher for continuous 5 seconds.

(2) Judgment criteria

- Voltage of the common rail pressure sensor remains at 4.82 V (248 MPa) or higher for 0.2 seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Common rail pressure sensor (main):

- Irregular contact (disconnection or poor fit of connector)
- Abnormal resistance of sensor

Engine harness: Harness disconnection or short-circuit**Engine ECU:** Malfunctions of ECU

FUEL CONTROL (J08E)

DN02-501

DTC:P1198	Fuel rail pressure sensor (sub) - out of range (Out of range high)	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Battery	Check the battery for degradation/deterioration and/or malfunction.	Battery voltage 10 to 16 V		Proceed to No. 2.	Replace the battery.
2	Sensor	Check whether the common rail pressure connector is loose/disconnected.	Connection of connector		Proceed to No. 3.	Connect the connector.
3	Sensor	Check whether the common rail pressure sensor terminals and harness terminals are contaminated, clogged, damaged or worn.	Condition of terminals		Proceed to No. 4.	Remove all contaminants and clogging. Replace if damaged.
4	Fuel tank	Check whether the breather path is not blocked or crushed.	Appearance check		Proceed to No. 5.	Remove all contaminants and clogging. Replace if damaged.
5	Fuel path	Check for clogging, crush or fuel leak.	Appearance check		Proceed to No. 6.	Remove all contaminants and clogging. Replace if damaged.
6	Fuel filter	Check for clogging, contamination or crush	Appearance check		Proceed to No. 7.	Replace the filter.
7	SCV	Check whether a target rail pressure is followed.	Use HinoDX to check.		Proceed to No. 8.	Replacement
8	Common rail pressure sensor	<ul style="list-style-type: none"> Check resistance between the sensor power supply terminal and the GND terminal. Check resistance between the sensor signal terminal and the power supply terminal. 	Check resistance value.		Proceed to No. 9.	Replace the common rail assembly.
9	Connector	<ul style="list-style-type: none"> Check voltage of the sensor power supply terminal and GND terminal of the engine harness connector. 	Check voltage. 4.5 to 5.5 V Check the harness and/or connector.		connect the connector	Proceed to No. 10.
10	Harness	Check resistance between the sensor power supply line and (engine side) the sensor ground line (engine side) of the signal check harness.	Check resistance 2 Ω or more		Proceed to No. 11.	Repair or replace the harness.

DN02-502

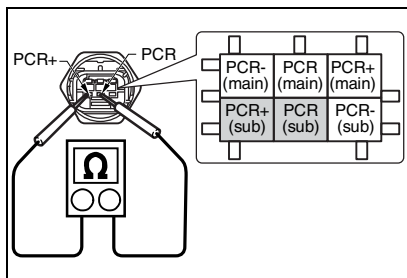
FUEL CONTROL (J08E)

No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
11	Harness	Check resistance between the sensor signal line and (engine side) the sensor ground line (engine side) of the signal check harness.	Check resistance 2 Ω or more		Proceed to No. 12.	Repair or replace the harness.
12	ECU	Check resistance between the sensor signal terminal (ECU side) and the sensor power supply (ECU side) of the signal check harness. * Use a signal check harness.	Check resistance value. 200 to 250 k Ω		Proceed to No. 13.	Replace the ECU.
13	ECU	<ul style="list-style-type: none">Check voltage of the power supply (C-E33) and ground (D-E76).Check voltage of the signal (D-E64 or E65) and ground (D-E76). * Use a signal check harness.	Check voltage. 4.5 to 5.5 V Check the harness and/or connector.		Replace the rail assembly. Harness	Replace the ECU.

DTC:P1198

EN1610602F200191

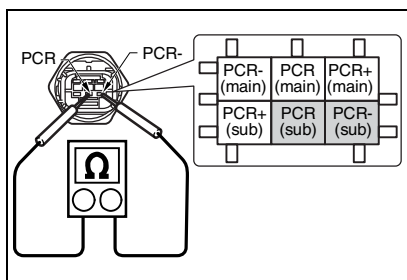
DTC	P1198	Fuel rail pressure sensor (sub) - out of range (Out of range high)
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SAPH161060200254

1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the common rail pressure sensor connector.
- (3) Check continuity between the terminals PCR+ and PCR of the common rail pressure sensor (sub) connector.

Standard value: 1.05-3.55 k Ω 

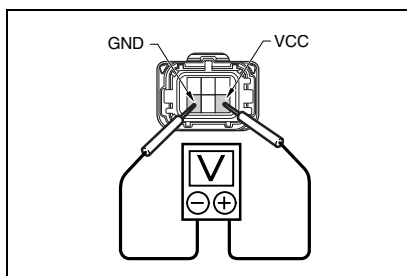
SAPH161060200255

- (4) Check continuity between the terminals PCR- and PCR of the common rail pressure sensor (sub) connector.

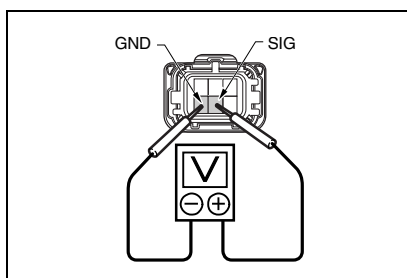
Standard value: 6.7-18.7 k Ω

YES
NO

Faulty common rail pressure sensor



SAPH161060200256

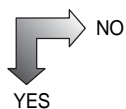


SAPH161060200257

2. MEASURING VOLTAGE BETWEEN SENSOR TERMINALS

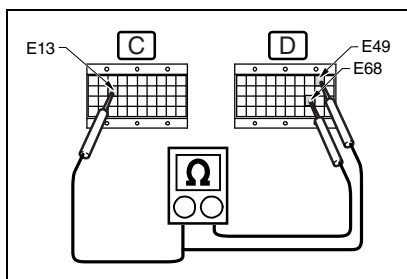
- (1) Set the starter switch to "ON" position.
- (2) Check voltage between the terminals VCC and GND of the common rail pressure sensor (sub) connector on the engine sub harness side.
Standard value: 4.5V-5.5 V

- (3) Check voltage between the terminals SIG and GND of the common rail pressure sensor (sub) connector on the engine sub harness side.
Standard value: 4.5V-5.5 V



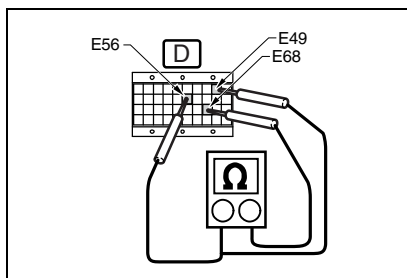
Proceed to 3.

Improper connection of connector

**3. MEASURING RESISTANCE BETWEEN TERMINALS**

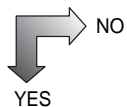
- (1) Connect the signal check harness on the engine side.
- (2) Disconnect the connector on the engine ECU side.
- (3) Measure resistance between the terminals AVC1 (E13) and PCR1 (E49).

Standard value: 2 Ω or more



- (4) Measure resistance between the terminals AGD1 (E56) and PCR2 (E68).

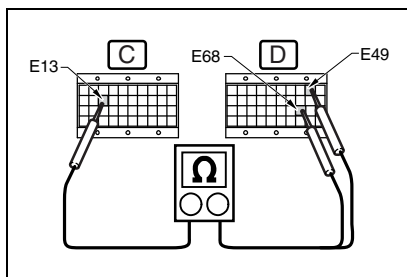
Standard value: 2 Ω or more



NO

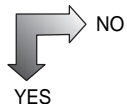
- Improper connection of connector
- Faulty in harness

YES

**4. MEASURING RESISTANCE BETWEEN TERMINALS**

- (1) Connect the signal check harness connector on the engine ECU side and disconnect the engine sub harness side connector.
- (2) Measure voltage between the terminals AVC1 (E13) and PCR1 (E49).

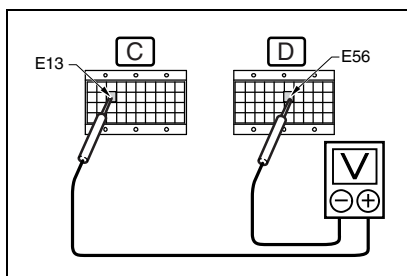
Standard value: 200-250 k Ω



NO

Fault in engine ECU

YES

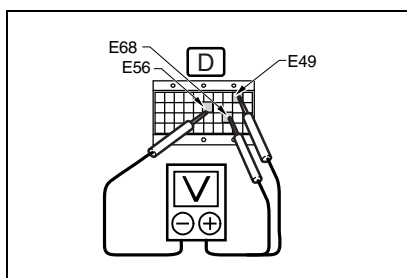


SAPH161060200261

5. MEASURING VOLTAGE BETWEEN TERMINALS

- (1) Set the starter switch to "ON" position.
- (2) Measure voltage between the terminals AVC1 (E13) and AGD1 (E56).

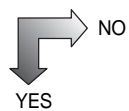
Standard value: 4.5-5.5 V



SAPH161060200262

- (3) Measure voltage between the terminals PCR2 (E68), PCR1 (E49) and AGD1 (E56).

Standard value: 4.5-5.5 V



Fault in engine ECU (ECU connector)

Replace the engine ECU



FUEL CONTROL (J08E)

DN02-507



DN02-508

FUEL CONTROL (J08E)

DTC:P119F (Check sheet)

EN1610602F200192

DTC:P119F

Fuel rail pressure sensor - rationality

1. Technical description

- Common rail pressure cannot be correctly sensed.
- Malfunction is likely to have occurred in the common rail pressure sensor.
- The common rail pressure sensor consistently measures common rail pressure.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
- The engine has stalled or runs at 500 r/min or higher for continuous 5 seconds.
- Common rail pressure is 220 MPa or less.
- No other diagnosis codes are present (the monitor disable DTC table can be referred to).

(2) Judgment criteria

P119F (abnormal characteristics of common rail pressure sensor) is detected under the conditions described below. (1) and 2) represent the order of priority.)

1. A difference in voltage remains higher than 1.06 V for 3 seconds or longer.
2. A difference in voltage remains less than 0.04 V for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Faulty harness
- Malfunction of common rail pressure sensor
- Malfunction of ECU

FUEL CONTROL (J08E)

DN02-509

DTC:P119F		Fuel rail pressure sensor - rationality			Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	DTC confirmation	Check that P0192, 0193, 1197 and 1193 are present.			Proceed to No. 2.	If present, perform troubleshooting for an applicable code.
2	Battery	Check the battery for degradation/deterioration and/or malfunction.	Battery voltage 10 to 16 V		Proceed to No. 3.	Replace the battery.
3	Common rail pressure sensor	Check whether the common rail pressure sensor connector is loose/disconnected.	Connection of connector		Proceed to No. 4.	Connect the connector.
4	Common rail pressure sensor	Check whether the common rail pressure sensor terminals and harness terminals are contaminated, clogged, damaged or worn.	Condition of terminals.		Proceed to No. 5.	Remove all contaminants and clogging. Replace if damaged.
5	Common rail pressure sensor	Check whether voltage between terminals is proper. * Use a signal check harness.	Check voltage 0.3 to 0.7V		Proceed to No. 6.	Replace the common rail assembly.
6	ECU	Check whether common rail sensor supply voltage is proper. * Use a signal check harness.	Check voltage 4.5 to 5.5V		Replace the rail assembly. Harness	Replace the ECU.

DN02-510

FUEL CONTROL (J08E)

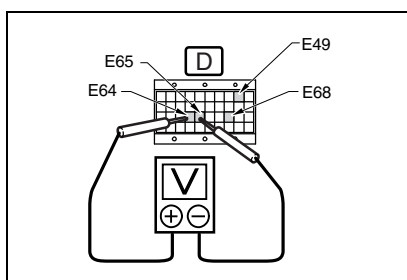
DTC:P119F

EN1610602F200193

DTC	P119F	Fuel rail pressure sensor - rationality
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1. **CHECK THAT NO OTHER MALFUNCTION CODES (P0192, P0193, P1197 AND P1193)EXIST.**

2. **DISCONNECT THE BOOST PRESSURE SENSOR, INTAKE THROTTLE OPENING SENSOR, FUEL TEMPERATURE SENSOR, INTAKE MANIFOLD TEMPERATURE SENSOR CONNECTORS AND OBSERVE THAT A TROUBLE REMAINS.**



3. **MEASURING VOLTAGE BETWEEN TERMINALS**

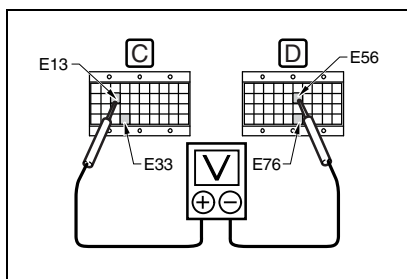
- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness.
- (3) Set the starter switch to "ON" position.
- (4) Measure a difference in voltage between the terminals of signal check harness.

Standard value: 0.3-0.7 V

Terminal to measure the voltage
PCR1 (E49) ↔ PCR3 (E64)
PCR1 (E49) ↔ PCR4 (E65)
PCR2 (E68) ↔ PCR3 (E64)
PCR2 (E68) ↔ PCR4 (E65)

NO
YES

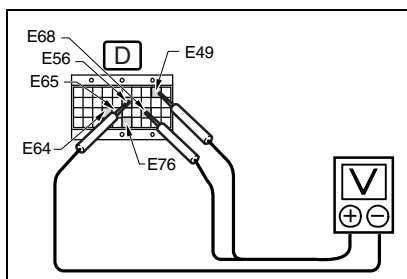
Fault in common rail pressure sensor

**4. MEASURING VOLTAGE BETWEEN TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the common rail pressure sensor connector.
- (3) Set the starter switch to "ON" position.
- (4) Measure the voltage between the terminals of the signal check harness.

Standard value: 4.5-5.5 V

Terminal to measure the voltage
AVC1 (E13) ↔ AGD1 (E56)
PCR1 (E49) ↔ AGD1 (E56)
PCR2 (E68) ↔ AGD1 (E56)
AVC2 (E33) ↔ AGD2 (E76)
PCR3 (E64) ↔ AGD2 (E76)
PCR4 (E65) ↔ AGD2 (E76)



NO
YES

Fault in engine ECU (ECU connector)

Replace the engine ECU

DN02-512

FUEL CONTROL (J08E)

DTC:P1211 (Check sheet)

EN1610602F200194

DTC:P1211

Fuel injector driver circuit 1 - circuit (Circuit low)

1. Technical description

- The injector drive system circuit 1 (for No. 1 - No. 3 injector) is not properly functioning.
- Short-circuit is likely to have occurred in the negative harness.
- An injection quantity is controlled to a valve opening duration of the injector.
- The valve opening duration of the injector is adjusted by the solenoid valve.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
- The injector is active.
- Engine speed is higher than 0 r/min.

(2) Judgment criteria

- It is detected when voltage of the injector drive system circuit 1 remains lower than 0.9 V until full fail count.
(0.6 seconds at engine speed of 750 r/min)
* This duration varies depending on the engine speed.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Faulty harness
Faulty connector
- Disconnected coil in the injector
- Malfunction of ECU

DTC:P1211		Fuel injector driver circuit 1 - circuit (Circuit low)		Inspection Procedure		
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Battery	Check the battery for degradation/deterioration and/or malfunction.	Battery voltage 10 to 16 V		Proceed to No. 2.	Replace the battery.
2	Connector	Check whether terminals are contaminated, clogged, damaged or worn.	Condition of terminals		Proceed to No. 3.	Remove all contaminants and clogging. Replace if damaged.
3	Harness	Check resistance of the harness between the ECU and the sensor. * Use a signal check harness.	Check resistance $\infty\Omega$		Proceed to No. 4.	Proceed to No. 5
4	ECU	Set the starter switch to LOCK and then START position and perform a diagnosis check.	Check the DTC		Proceed to No. 5.	Replace the ECU.
5	Harness	Check that there is no continuity between the INJ harness connector and the ECU GND.	Check resistance $\infty\Omega$		Proceed to No. 6.	Replace the engine harness.
6	Harness	Check the INJ harness connector located in the head cover. Check whether terminals are contaminated, clogged, damaged or worn.	Condition of terminals		Proceed to No. 7.	Remove all contaminants and clogging. Replace if damaged.
7	INJ Harness	Check of the harness and GND located in the head resistance.	Check resistance $\infty\Omega$		Replace the INJ.	Replace the harness.

DN02-514

FUEL CONTROL (J08E)

DTC:P1214 (Check sheet)

EN1610602F200195

DTC:P1214

Fuel injector driver circuit 2 - circuit (Circuit low)

1. Technical description

- The injector drive system circuit 2 (for No. 4 - No. 6 injector) is not properly functioning.
- Short-circuit is likely to have occurred in the negative harness.
- An injection quantity is controlled to a valve opening duration of the injector.
- The valve opening duration of the injector is adjusted by the solenoid valve.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
- The injector is active.
- Engine speed is higher than 0 r/min.

(2) Judgment criteria

- It is detected when voltage of the injector drive system circuit 2 remains lower than 0.9 V until full fail count.
(0.6 seconds at engine speed of 750 r/min)
* This may vary depending on the engine speed.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Faulty harness
Faulty connector
- Disconnected coil in the injector
- Malfunction of ECU

DTC:P1214		Fuel injector driver circuit 2 - circuit (Circuit low)		Inspection Procedure		
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Battery	Check the battery for degradation/deterioration and/or malfunction.	Battery voltage 10 to 16 V		Proceed to No. 2.	Replace the battery.
2	Connector	Check whether terminals are contaminated, clogged, damaged or worn.	Condition of terminals		Proceed to No. 3.	Remove all contaminants and clogging. Replace if damaged.
3	Harness	Check resistance of the harness between the ECU and the sensor. * Use a signal check harness.	Check resistance $\infty\Omega$		Proceed to No. 4.	Proceed to No. 5
4	ECU	Set the starter switch to LOCK and then START position and perform a diagnosis check.	Check the DTC		Proceed to No. 5.	Replace the ECU.
5	Harness	Check that there is no continuity between the INJ harness connector and the ECU GND.	Check resistance $\infty\Omega$		Proceed to No. 6.	Replace the engine harness.
6	Harness	Check the INJ harness connector located in the head cover. Check whether terminals are contaminated, clogged, damaged or worn.	Condition of terminals		Proceed to No. 7.	Remove all contaminants and clogging. Replace if damaged.
7	INJ Harness	Check of the harness and GND located in the head resistance.	Check resistance $\infty\Omega$		Replace the INJ.	Replace the harness.

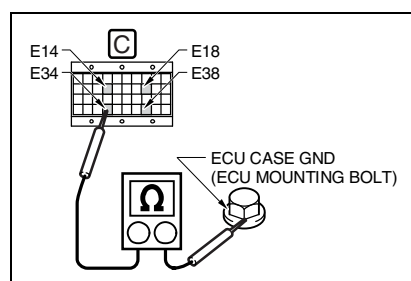
DN02-516

FUEL CONTROL (J08E)

DTC:P1211/P1214

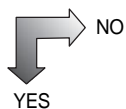
EN1610602F200196

DTC	P1211	Fuel injector driver circuit 1 - circuit (Circuit low)
DTC	P1214	Fuel injector driver circuit 2 - circuit (Circuit low)

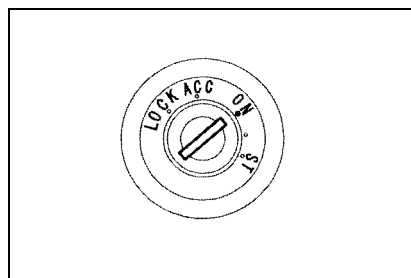
**1. MEASURING RESISTANCE BETWEEN TERMINALS.**

- (1) Set the starter switch to "LOCK" and connect the signal check harness.
- (2) Disconnect the signal check harness connector on the engine ECU side.
- (3) Measure the resistance between the terminals of ECU connector.

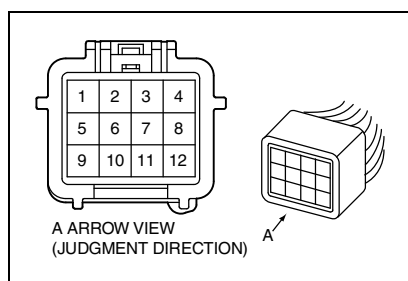
DTC NO.	Resistance measurement	
	+ side	- side
P1211	IJ1+ (E14)	ECU case GND
	I1+S (E34)	
P1214	IJ2+ (E18)	ECU case GND
	I2+S (E38)	

Standard value: $\infty \Omega$ 

Proceed to (7)



- (4) Set the starter switch to "LOCK" position. Reconnect all the connectors.
- (5) Start the engine and erase the DTC.
- (6) If the same DTC is displayed, replace ECU. If no DTC is displayed, a temporary failure would have occurred.
- (7) Set the starter switch to "LOCK" position (with all connectors of ECU disconnected).
- (8) Tilt the hood. Disconnect the injector connector that is located on the front side of the cam housing.



(9) Measure the resistance between the pins of injector connector (engine sub harness side) and ECU case GND.

NOTICE

Measure the voltage of this connector from the connector terminals (female).

NOTICE

Do not damage the connector terminals.

DTC NO.	Failure position (breaking position)	Resistance measurement	
		+ side	- side
P1211	No.1 injector	11	ECU case GND
		12	
	No.2 injector	3	
		4	
	No.3 injector	5	
		6	
P1214	No.4 injector	7	ECU case GND
		8	
	No.5 injector	1	
		2	
	No.6 injector	9	
		10	

Standard value: $\infty \Omega$

NO
YES

Faulty in harness
(It is defective the harness which resistance value is out of the standard.)

Check the harness in the head cover.
(A short-circuit would occur between the harness in the head cover and the GND line.)

DN02-518

FUEL CONTROL (J08E)

DTC:P1212 (Check sheet)

EN1610602F200197

DTC:P1212

Fuel injector driver circuit 1 - circuit (Circuit high)

1. Technical description

- The injector drive system circuit 1 (for No. 1 - No. 3 injector) is not properly functioning.
- Short-circuit is likely to have occurred in the positive harness.
- An injection quantity is controlled to a valve opening duration of the injector.
- The valve opening duration of the injector is adjusted by the solenoid valve.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
- The injector is active.
- Engine speed is higher than 0 r/min.

(2) Judgment criteria

- Full fuel count is detected when voltage of the injector drive system circuit 1 remains higher than 9 V until full fail count.
(0.6 seconds at engine speed of 750 r/min)
* This duration varies depending on the engine speed.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Faulty harness
Faulty connector
- Disconnected coil in the injector
- Malfunction of ECU

DTC:P1212		Fuel injector driver circuit 1 - circuit (Circuit high)		Inspection Procedure		
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Battery	Check the battery for degradation/deterioration and/or malfunction.	Battery voltage 10 to 16 V		Proceed to No. 2.	Replace the battery.
2	Connector	Check whether terminals are contaminated, clogged, damaged or worn.	Condition of terminals		Proceed to No. 3.	Remove all contaminants and clogging. Replace if damaged.
3	Harness	Check resistance of the harness between the ECU and the sensor. * Use a signal check harness.	Check voltage 8 V or lower		Proceed to No. 4.	Proceed to No. 5
4	ECU	Set the starter switch to LOCK and then START position and perform a diagnosis check.	Check the DTC		Proceed to No. 5.	Replace the ECU.
5	Harness	Check voltage of the INJ harness connector and the ECU GND.	Check voltage 8 V or lower		Proceed to No. 6.	Replace the engine harness.
6	Harness	Check the INJ harness connector located in the head cover. Check whether terminals are contaminated, clogged, damaged or worn.	Condition of terminals		Proceed to No. 7.	Remove all contaminants and clogging. Replace if damaged.
7	INJ	Check voltage of the ECU GND and the harness located in the head cover.	Check voltage 8 V or lower		Replace the INJ.	Replace the harness.

DN02-520

FUEL CONTROL (J08E)

DTC:P1215 (Check sheet)

EN1610602F200198

DTC:P1215

Fuel injector driver circuit 2 - circuit (Circuit high)

1. Technical description

- The injector drive system circuit 2 (for No. 4 - No. 6 injector) is not properly functioning.
- Short-circuit is likely to have occurred in the positive harness.
- An injection quantity is controlled to a valve opening duration of the injector.
- The valve opening duration of the injector is adjusted by the solenoid valve.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
- The injector is active.
- Engine speed is higher than 0 r/min.

(2) Judgment criteria

- It is detected when voltage of the injector drive system circuit 2 remains higher than 9 V until full fail count.
(0.6 seconds at engine speed of 750 r/min)
* This duration varies depending on the engine speed.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Faulty harness
Faulty connector
- Disconnected coil in the injector
- Malfunction of ECU

FUEL CONTROL (J08E)

DN02-521

DTC:P1215		Fuel injector driver circuit 2 - circuit (Circuit high)		Inspection Procedure		
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Battery	Check the battery for degradation/deterioration and/or malfunction.	Battery voltage 10 to 16 V		Proceed to No. 2.	Replace the battery.
2	Connector	Check whether terminals are contaminated, clogged, damaged or worn.	Condition of terminals		Proceed to No. 3.	Remove all contaminants and clogging. Replace if damaged.
3	Harness	Check resistance of the harness between the ECU and the sensor. * Use a signal check harness.	Check voltage 8 V or lower		Proceed to No. 4.	Proceed to No. 5
4	ECU	Set the starter switch to LOCK and then START position and perform a diagnosis check.	Check the DTC		Proceed to No. 5.	Replace the ECU.
5	Harness	Check voltage of the INJ harness connector and the ECU GND.	Check voltage 8 V or lower		Proceed to No. 6.	Replace the engine harness.
6	Harness	Check the INJ harness connector located in the head cover. Check whether terminals are contaminated, clogged, damaged or worn.	Condition of terminals		Proceed to No. 7.	Remove all contaminants and clogging. Replace if damaged.
7	INJ	Check voltage of the ECU GND and the harness located in the head cover.	Check voltage 8 V or lower		Replace the INJ.	Replace the harness.

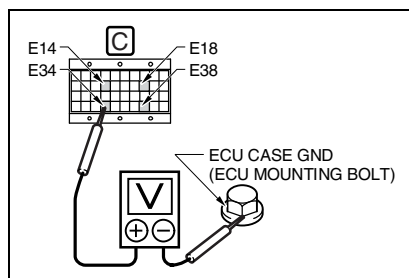
DN02-522

FUEL CONTROL (J08E)

DTC:P1212/P1215

EN1610602F200199

DTC	P1212	Fuel injector driver circuit 1 - circuit (Circuit high)
DTC	P1215	Fuel injector driver circuit 2 - circuit (Circuit high)

**1. MEASURING VOLTAGE BETWEEN TERMINALS.**

- (1) Set the starter switch to "LOCK" position and connect the signal check harness.
- (2) Set the starter switch to "ON" position.
- (3) Measure the voltage between the terminals of ECU connector and ECU case GND.

DTC NO.	Voltage measurement	
	+ side	- side
P1212	IJ1+ (E14)	ECU case GND
	I1+S (E34)	
P1215	IJ2+ (E18)	ECU case GND
	I2+S (E38)	

Standard value: Less than battery voltage x 3/4 V**⚠ CAUTION**

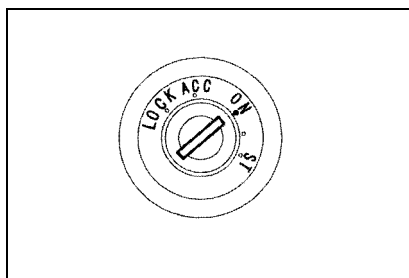
Make sure that failure code which is concerned with engine ECU is not output.



NO

Proceed to (7)

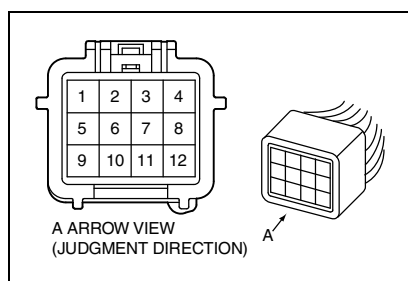
YES



- (4) Set the starter switch to "LOCK" position. Reconnect all the connectors.
- (5) Start the engine and erase the DTC.
- (6) If the same DTC is displayed, replace ECU. If no DTC is displayed, a temporary failure would have occurred.
- (7) Set the starter switch to "LOCK" position.
- (8) Tilt the hood. Disconnect the injector connector that is located on the front side of the cam housing. Set the starter switch to "ON" position.

FUEL CONTROL (J08E)

DN02-523



(9) Measure the voltage between the pins of injector connector (engine sub harness side) and ECU case GND.

NOTICE

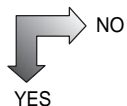
Measure the voltage of this connector from the connector terminals (female).

NOTICE

Do not damage the connector terminals.

DTC NO.	Failure position (breaking position)	Voltage measurement	
		+ side	- side
P1212	No.1 injector	11	ECU case GND
	No.2 injector	3	
	No.3 injector	6	
P1215	No.4 injector	7	ECU case GND
	No.5 injector	2	
	No.6 injector	10	

Standard value: Less than 8 V



Faulty in harness
(It is defective the harness which voltage value is out of the standard.)

Check the harness in the head cover.
(A short-circuit would occur between the harness in the head cover and the power source line.)

DN02-524

FUEL CONTROL (J08E)

DTC:P141F (Check sheet)

EN1610602F200200

DTC:P141F

Burner system malfunction

1. Technical description

– Malfunction in the burner system is diagnosed by BCU.

2. DTC set condition

(1) Check conditions

–

(2) Judgment criteria

–

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

–

DTC:P141F	Burner system malfunction	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Burner system	Check for DTC's stored in the "BCU".			

DTC:P141F

EN1610602F200201

DTC	P141F	Burner system malfunction
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- BURNER SYSTEM MALFUNCTION**
(Refer to the chapter "BURNER" DN02-003)

DN02-526

FUEL CONTROL (J08E)

DTC:P1426 (Check sheet)

EN1610602F200202

DTC:P1426

Differential pressure sensor - rationality

1. Technical description

- It detects a difference between pressure at the inlet of the muffler and atmospheric pressure and monitors any failure or malfunction of the DPR.

2. DTC set condition**(1) Check conditions**

- Elapse of at least 2 seconds after engine stop
- No other DTCs are present.

(2) Judgment criteria

- Differential pressure remains less than -2 kPa or higher than +2 kPa for 2 seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Loose/disconnected sensor and failure in sensing area (contamination or clogging)
- Abnormality in resistance of sensor
- Malfunction of engine ECU sensor power supply

DTC:P1426	Differential pressure sensor - rationality	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check the connector and/or harness between the ECU and the sensor.			Repair the harness.
2	Sensing area	Clean the sensing area.			Replace the sensor.
3	Sensor	Check resistance of the sensor.			Replace the sensor.

DN02-528

FUEL CONTROL (J08E)

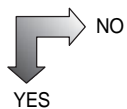
DTC:P1426

EN1610602F200203

DTC	P1426	Differential pressure sensor - rationality
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1. CHECK INSTALLATION OF THE CONNECTOR.

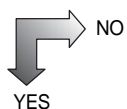
- (1) Check that the differential pressure sensor connector is properly installed.



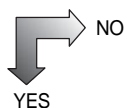
Improper connection of connector

2. CHECK WHETHER THE SENSOR IS IN NORMAL CONDITION.

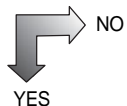
- (1) Troubleshoot the P1427 and P1428 and check whether the differential pressure sensor is in normal condition.



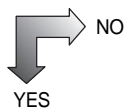
Fault in differential pressure sensor

3. CHECK THE DIFFERENTIAL PRESSURE HOSE FOR DAMAGE.

Replacement of the differential pressure hose

4. CHECK WHETHER THE CLAMP IS IN NORMAL CONDITION.

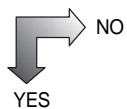
Replacement of the clamp

5. CHECK THAT THE DIFFERENTIAL PRESSURE PIPE IS INTERNALLY CLOGGED.

Internal cleaning of the differential pressure pipe

6. CHECK WHETHER OTHER ARE IN NORMAL CONDITION.

- (1) If the GND terminal is shared in use, disconnect all sensor connectors that use the GND terminal and check whether condition is normal.



Fault in engine ECU

Fault in other sensors



FUEL CONTROL (J08E)

DN02-529



DN02-530

FUEL CONTROL (J08E)

DTC:P1427 (Check sheet)

EN1610602F200204

DTC:P1427

Differential pressure sensor - out of range (Out of range low)

1. Technical description

- It detects a difference between pressure at the inlet of the muffler and atmospheric pressure and monitors any failure or malfunction of the DPR.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
- The engine has stopped or runs at 500 r/min or higher for continuous 5 seconds.

(2) Judgment criteria

- Output of the sensor remains less than 0.5 V (-6.41 kPa) for 3 seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Fault in harness and/or connector
- Malfunction of sensor
- Malfunction of engine ECU

DTC:P1427	Differential pressure sensor - out of range (Out of range low)	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check the connector and/or harness between the ECU and the sensor.			Repair the harness.
2	Sensing area	Clean the sensing area.			Replace the sensor.
3	Sensor	Check resistance of the sensor.			Replace the sensor.

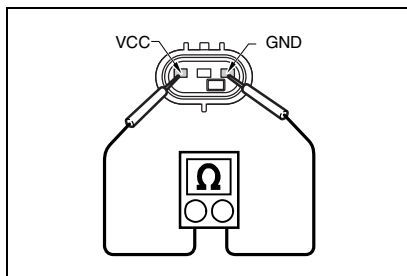
DN02-532

FUEL CONTROL (J08E)

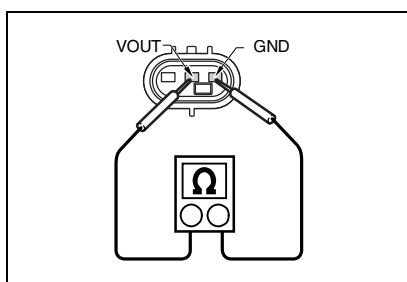
DTC:P1427

EN1610602F200205

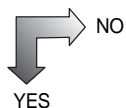
DTC	P1427	Differential pressure sensor - out of range (Out of range low)
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**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

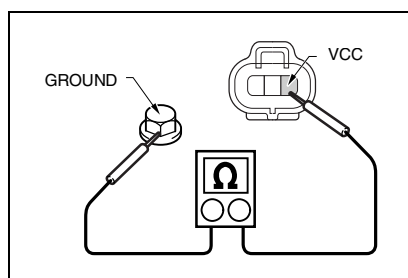
- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the differential pressure sensor connector.
- (3) Check continuity between the terminals VCC and GND of the differential pressure sensor connector.

Standard value: 2-15 kΩ

- (4) Check continuity between the terminals VOUT and GND of the differential pressure sensor connector.

Standard value: 2-15 kΩ

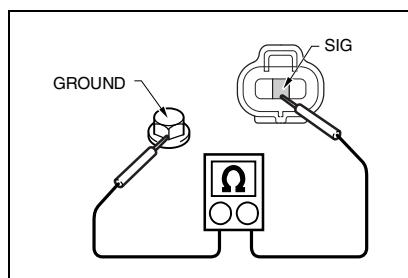
Faulty differential pressure sensor



SAPH161060200273

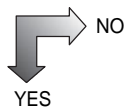
2. CHECK THE CONTINUITY OF HARNESS.

- (1) Disconnect the engine ECU connector.
- (2) Check continuity between the terminals ECU GND and VCC of the differential pressure sensor connector on the engine sub harness side.

Standard value: $\infty \Omega$ 

SAPH161060200274

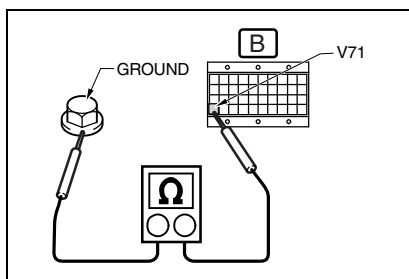
- (3) Check continuity between the terminals ECU GND and SIG of the differential pressure sensor connector on the engine sub harness side.

Standard value: $\infty \Omega$ 

Faulty in harness

DN02-534

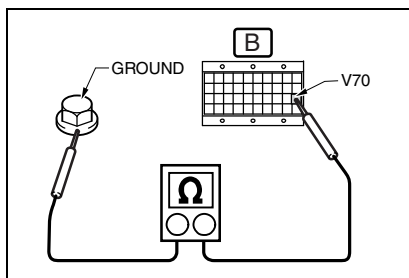
FUEL CONTROL (J08E)



3. MEASURING RESISTANCE BETWEEN TERMINALS

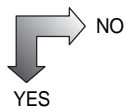
- (1) Connect the signal check harness on the vehicle side.
- (2) Measure resistance between the terminals AVC5 (V71) and ECU GND.

Standard value: $\infty \Omega$

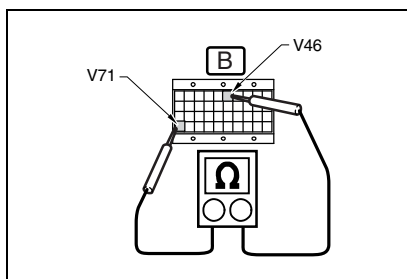


- (3) Measure resistance between the terminals EXPS (V70) and ECU GND.

Standard value: $\infty \Omega$



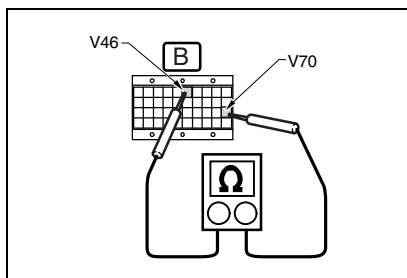
Faulty in harness



SAPH161060200277

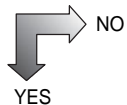
4. MEASURING RESISTANCE BETWEEN TERMINALS

- (1) Disconnect the connector on the engine ECU side.
- (2) Disconnect the differential pressure sensor.
- (3) Measure resistance between the terminals AVC5 (V71) and ADG9 (V46).

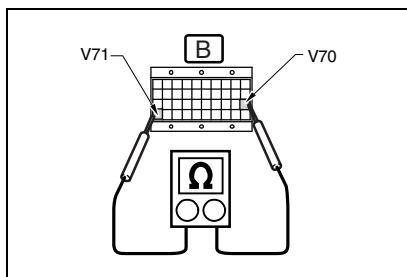
Standard value: $\infty \Omega$ 

SAPH161060200278

- (4) Measure resistance between the terminals EXPS (V70) and AGD9 (V46).

Standard value: $\infty \Omega$ 

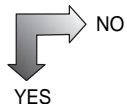
- Faulty in harness
- Irregular contact of connector.



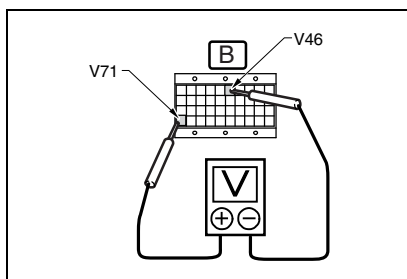
SAPH161060200279

5. MEASURING RESISTANCE BETWEEN TERMINALS

- (1) Set the starter switch to "LOCK" position
- (2) Also connect the signal check harness on the engine ECU side.
- (3) Disconnect the differential pressure sensor connector.
- (4) Measure resistance between the terminals AVC5 (V71) and EXPS (V70).

Standard value: 200-250 k Ω 

Fault in engine ECU

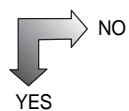


SAPH161060200280

6. MEASURING VOLTAGE BETWEEN TERMINALS

- (1) Set the starter switch to "ON" position.
- (2) Measure voltage between the terminals AVC5 (V71) and AGD9 (V46).

Standard value: 4.5-5.5 V



NO

Fault in engine ECU

YES

Clear and recheck the DTC.



FUEL CONTROL (J08E)

DN02-537



DN02-538

FUEL CONTROL (J08E)

DTC:P1428 (Check sheet)

EN1610602F200206

DTC:P1428

Differential pressure sensor - out of range (Out of range high)

1. Technical description

- It detects a difference between pressure at the inlet of the muffler and atmospheric pressure and monitors any failure or malfunction of the DPR.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
- The engine has stopped or runs at 500 r/min or higher for continuous 5 seconds.

(2) Judgment criteria

- Output of the sensor remains greater than 4.46 V (95.1 kPa) for 3 seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Fault in harness and/or connector
- Malfunction of sensor
- Malfunction of engine ECU

DTC:P1428	Differential pressure sensor - out of range (Out of range high)	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check the connector and/or harness between the ECU and the sensor.			Repair the harness.
2	Sensing area	Clean the sensing area.			Replace the sensor.
3	Sensor	Check resistance of the sensor.			Replace the sensor.

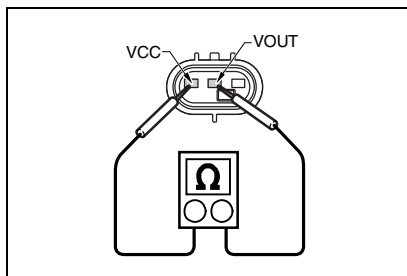
DN02-540

FUEL CONTROL (J08E)

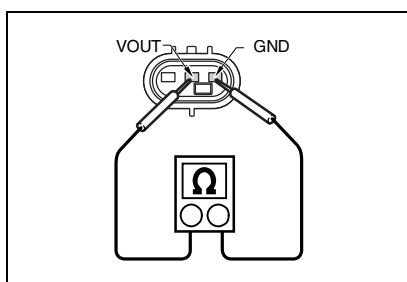
DTC:P1428

EN1610602F200207

DTC	P1428	Differential pressure sensor - out of range (Out of range high)
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**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the differential pressure sensor connector.
- (3) Check continuity between the terminals VCC and VOUT of the differential pressure sensor connector.

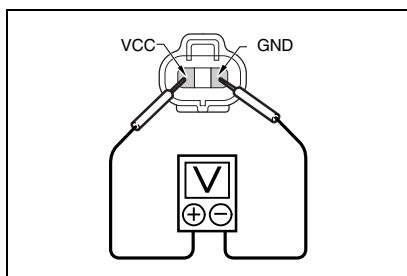
Standard value: 2-15 k Ω 

- (4) Check continuity between the terminals VOUT and GND of the differential pressure sensor connector.

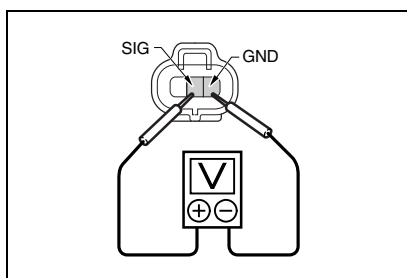
Standard value: 2-15 k Ω

YES
NO

Faulty differential pressure sensor



SAPH161060200283

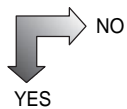


SAPH161060200284

2. MEASURING VOLTAGE BETWEEN SENSOR TERMINALS

- (1) Set the starter switch to "ON" position.
- (2) Check voltage between the terminals VCC and GND of the differential sensor connector on the engine sub harness side.
Standard value: 4.5-5.5 V

- (3) Check voltage between the terminals SIG and GND of the differential sensor connector on the engine sub harness side.
Standard value: 4.5-5.5 V

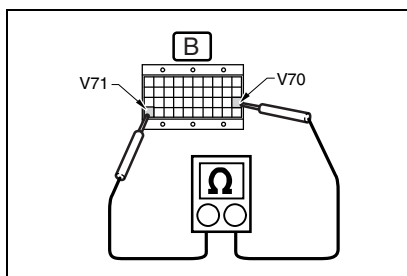


NO

Proceed to 3.

YES

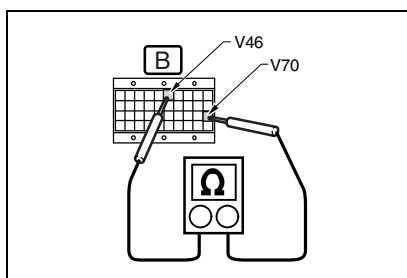
Improper connection of connector



SAPH161060200285

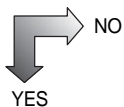
3. MEASURING RESISTANCE BETWEEN TERMINALS

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness on the vehicle side.
- (3) Disconnect the connector on the engine ECU side.
- (4) Measure resistance between the terminals AVC5 (V71) and EXPS (V70).

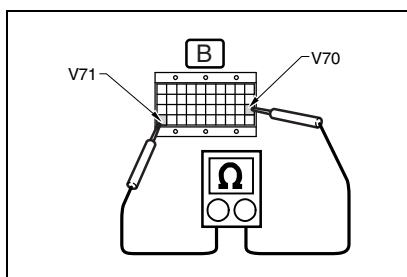
Standard value: $\infty \Omega$ 

SAPH161060200286

- (5) Measure resistance between the terminals AGD9 (V46) and EXPS (V70).

Standard value: $\infty \Omega$ 

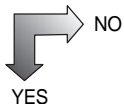
- Improper connection of connector
- Faulty in harness



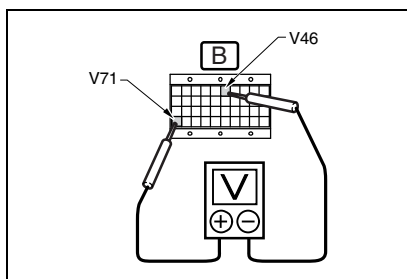
SAPH161060200287

4. MEASURING RESISTANCE BETWEEN TERMINALS

- (1) Disconnect the connector on the engine sub harness side and connect the engine ECU side.
- (2) Measure resistance between the terminals AVC5 (V71) and EXPS (V70).

Standard value: 200-250 k Ω 

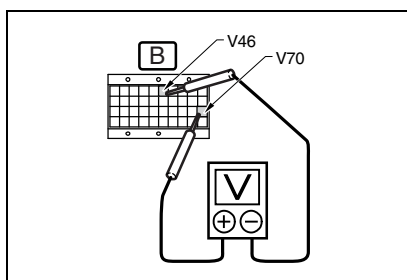
Fault in engine ECU



SAPH161060200288

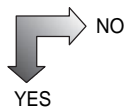
5. MEASURING VOLTAGE BETWEEN TERMINALS

- (1) Set the starter switch to "ON" position.
- (2) Measure voltage between the terminals AVC5 (V71) and AGD9 (V46).
Standard value: 4.5-5.5 V



SAPH161060200289

- (3) Measure voltage between the terminals EXPS (V70) and AGD9 (V46).
Standard value: 4.5-5.5 V



Fault in engine ECU

Clear and recheck the DTC.

DTC:P1458 (Check sheet)

EN1610602F200208

DTC:P1458

Valve position control failure - DC motor out of range, functional

1. Technical description

The EGR valve is of the butterfly type.
The EGR valve opening is controlled according to the engine revolution and intake air volume.
The EGR valve opening is adjusted through CAN communication with the engine ECU.
The EGR valve does not operate while the coolant temperature is low. ($\leq 40^{\circ}\text{C}$ { 104°F })
This error occurs when a malfunction message is received from the EGR actuator unit.
With starter switch OFF, wiping of full opening to full closing is performed as an operation to remove soot on the EGR valve surface.

2. DTC set condition**(1) Check conditions**

Battery voltage 8V to 16V DC
There must be no disconnection in the harness connecting to the EGR valve.
Detected with starter switch ON. (Not related to engine revolution)

(2) Judgment criteria

P1458 is established in the following cases.

1. Abnormal power-on time: The motor is overloaded because of a delayed operation of the valve or the link of the EGR valve, and a drive ratio of 40 % or more has continued for 2 seconds.
2. Abnormality in power supply voltage: The power supply voltage has continued to be below 7V for 60 ms.
3. Wiping error: When the variable angle learning value (operating range during normal operation) exceeds 10Å as the result of wiping (valve opening and closing with key OFF to remove soot), a disengaged link is the likely cause.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Check the battery power.
Disconnected EGR link, foreign object jammed in link
Adhesion of soot in EGR valve gas passage, hard foreign object jammed
(Sometimes caused by hard carbon falling out of the EGR cooler on the upper stream side of the EGR valve)
* If there are no problems in the above, it is suspected that a foreign matter was jammed when the check light was turned on but the foreign object is now off and the normal state has been restored.
* This malfunction code may be output due to internal freezing of the EGR valve when the outside temperature is low. The normal state will be restored when it melts.

DTC:P1458	Valve position control failure - DC motor out of range, functional	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Battery	Voltage	The EGR valve harness is on more than 8V.		Check the harness, fuse and relay.
2	EGR valve	Disconnected link connecting the actuator and EGR valve, foreign object jammed	No disconnected link, no foreign object		Remove the foreign object.
3	EGR valve	Abnormal adhesion of soot in gas passage Jammed foreign object	There must be no malfunction code with the external diagnostic device.		Remove the soot and foreign object
4	EGR cooler	Internal clogging of EGR cooler Abnormal accumulation of soot	No clogging, no abnormal accumulation		Remove the soot. Replace the EGR cooler.
5	EGR valve	Forcibly drive the EGR valve with Hino-DX activation function and check its operation.	It must operate as directed and there must be no divergence between the reading and actual value.		Replace the EGR valve.

DTC:P240F (Check sheet)

EN1610602F200209

DTC:P240F**EGR flow slow response****1. Technical description****for 2011, 2012 model year**

The EGR valve is of the butterfly type.
 The EGR valve opening is controlled according to the engine revolution and intake air volume.
 The EGR valve opening is adjusted through CAN communication with the engine ECU.
 The EGR valve does not operate while the coolant temperature is low. ($\leq 40^{\circ}\text{C}$ {104°F})

for 2013 model year

The EGR valve is of the butterfly type.
 The EGR valve opening is controlled according to the engine revolution and intake air volume.
 The EGR valve opening is adjusted through CAN communication with the engine ECU.
 The EGR valve does not operate while the coolant temperature is low. ($\leq 40^{\circ}\text{C}$ {104°F})
 EGR flow slow response is monitored by measuring time from commanding valve close to reach actual EGR ratio nothing

2. DTC set condition**(1) Check conditions****for 2011, 2012 model year**

Battery voltage 10V to 16V DC
 There must be no disconnection in the harness connecting to the EGR valve.
 The engine is at above idling and in an operating state.

for 2013 model year

Battery voltage 10V to 16V DC
 There must be no disconnection in the harness connecting to the EGR valve.
 The engine is at above idling and in an operating state.
 Target EGR valve position full close from open.
 Exhaust brake deactivated.

(2) Judgment criteria**for 2011, 2012 model year**

The sum of differences between theoretical EGR rate and actual EGR rate exceeds the threshold value.
 The above content will be judged from the intake manifold temperature, intake air volume, fuel injection quantity, and engine speed.

for 2013 model year

EGR flow response time more than 64 sec from valve close commanding to reach EGR ratio nothing at starting 40% of EGR rate sea level.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Defective intake manifold temperature sensor
 Defective air flow sensor
 Defective engine speed sensor
 Defective injector
 Defective engine ECU

DTC:P240F	EGR flow slow response	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	EGR valve	Abnormal adhesion of soot in gas passage Jammed foreign object	There must be no malfunction code with the external diagnostic device.		Remove the soot and foreign object
2	Intake air temperature sensor (intake manifold)	Output value of sensor	Must be free from abnormal conditions.		Replace the sensor.
3	Air flow sensor	Output value of sensor	Must be free from abnormal conditions.		Replace the sensor.
4	Engine speed sensor	Output value of sensor	Must be free from abnormal conditions.		Replace the sensor.
5	Injector	Injector function	Must be free from abnormal conditions.		Replace the injector.
6	Engine ECU	ECU functions	Must be free from abnormal conditions.		Replace the ECU.

DN02-548

FUEL CONTROL (J08E)

DTC:P1458/P240F

EN1610602F200210

DTC	P1458	Valve position control failure - DC motor out of range, functional Valve link failure Low battery voltage
DTC	P240F	EGR flow slow response

1. CHECK THE EGR VALVE LINK.

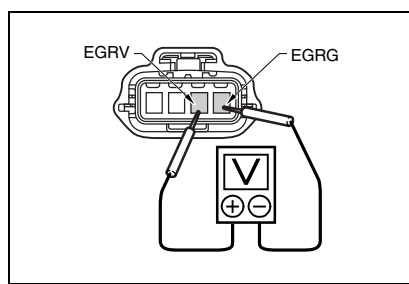
- (1) Remove the EGR valve and check for any foreign matters



NO

- Remove foreign matters, if any.
- Faulty EGR valve

YES

**2. MEASURING VOLTAGE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "LOCK" position.
(2) Disconnect the EGR valve connector.
(3) Measure voltage between the terminals EGRV and EGRG of the EGR valve connector (engine sub harness side).

HINT

If it is difficult to check only the sensor, proceed to step 3.

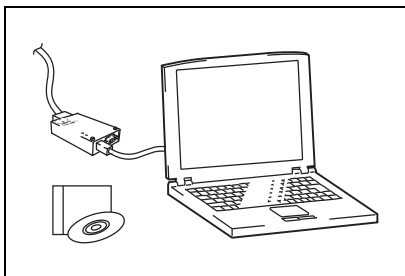
Standard value: 8-16 V



NO

- Faulty in harness
- Faulty battery

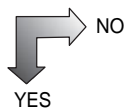
YES



SAPH161060200291

3. INSPECT THE EGR VALVE.

- (1) Connect Hino-DX to the vehicle.
- (2) Set the starter switch to "ON" position.
- (3) Functional check
- (4) Inspect the EGR.
- (5) For the forcibly driven item, check the data monitor value to see if the opening of the EGR valve is driven as indicated by the specified value.



NO

Faulty EGR valve

YES

- Faulty in harness
- Fault in engine ECU

DTC:P1515 (Check sheet)

EN1610602F200211

DTC:P1515

Charge air undercooling

1. Technical description

- Compare the intake air temperature with the inter cooler outlet temperature to detect a drop in efficiency.
- Measure the intake air temperature with the air flow sensor.

2. DTC set condition**(1) Check conditions**

- The engine must not be stopped.

(2) Judgment criteria**P1515 is established under either of the following conditions.**

The inter cooler outlet temperature is above 74°C {165.2°F} when the intake air temperature is -15°C {5°F}

The inter cooler outlet temperature is above 146°C {294.8°F} when the intake air temperature is 65°C {149°F}

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

1. Insufficient cooling air
 - Intercooler outer fin section clogged with foreign matters
 - Radiator outer fin section clogged with foreign matters
 - Intercooler outer fin section deformed and clogged
 - Radiator outer fin section deformed and clogged
 - Vehicle front air intake port clogged with foreign matters
2. (1) Malfunction of Intercooler
 - Abnormally expanded tube, cracked tube(2) Faulty part other than Intercooler
 - Malfunction of cooling fan
 - Malfunction of fan clutch
 - Clogged air cleaner

DTC:P1515	Charge air undercooling	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Air cleaner	Appearance check	With or without clogging of air cleaner		Clean or replace.
2	Cooling fan	Appearance check	With or without damage to blades		Replace the cooling fan.
3	Fan clutch	Appearance check	With or without silicon oil leakage		Replace the fan clutch.
4	Intercooler	Appearance check of Intercooler outer fins	With or without clogging with foreign matters or deformation		Clean up or replace.
5	Intercooler	Appearance check of Intercooler tube	With or without abnormal expansion or cracking		Replace the Intercooler.
6	Radiator	Appearance check of radiator outer fins	With or without clogging with foreign matters or deformation		Clean up or replace.

DN02-552

FUEL CONTROL (J08E)

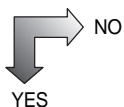
DTC:P1515

EN1610602F200212

DTC	P1515	Charge air undercooling
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1. CHECK THE APPEARANCE OF THE AIR CLEANER.

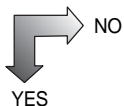
- (1) Check the air cleaner for clogging.



Clean or replace the air cleaner element.

2. CHECK THE APPEARANCE OF THE COOLING FAN.

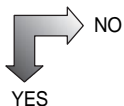
- (1) Check the blades of the cooling fan for damage.



Replace the cooling fan.

3. CHECK THE APPEARANCE OF THE FAN CLUTCH.

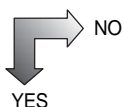
- (1) Check for silicon oil leakage.



Replace the fan clutch.

4. CHECK THE APPEARANCE OF THE OUTER FINS OF THE INTER-COOLER.

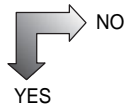
- (1) Check the outer fins of the intercooler for foreign matters, clogging and deformation.



Clean or replace

5. CHECK THE APPEARANCE OF THE INTERCOOLER TUBE.

- (1) Check the intercooler tube for abnormal expansion and cracking.

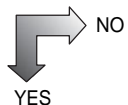


NO

Replace the intercooler

6. CHECK THE INTERCOOLER TEMPERATURE SENSOR.

- (1) Check the outer fins of the radiator for foreign matters, clogging and deformation.



NO

Clean or replace

Clear and recheck the DTC.

DN02-554

FUEL CONTROL (J08E)

DTC:P1530 (Check sheet)

EN1610602F200213

DTC:P1530

Engine stop switch malfunction

1. Technical description

- The engine stop switch cannot correctly sense.
- Malfunction or short-circuited wiring is likely to have occurred in the engine stop switch.
- Through the engine stop switch, the ECU senses engine stop signals.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- At a vehicle speed of 30 km/h, the stop switch remains in ON position for 1 second or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Faulty harness or connector
- Malfunction of switch
- Malfunction of ECU

DTC:P1530		Engine stop switch malfunction			Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Engine stop switch	Check whether the engine stop switch is loose/disconnected.	Switch connection		Proceed to No. 2.	Connect
2	Engine stop switch	Check whether a sensing area of the engine stop switch is contaminated, clogged or damaged.	Check the switch.		Proceed to No. 3.	Remove all contaminants and clogging. Replace if damaged.
3	Engine stop switch	Check that the engine stop switch harness and harness connector are in normal condition. (Irregular contact, non-continuity, disconnection, short-circuit or the like)	Check the harness and/or connector.		Proceed to No. 4.	Repair or replace the harness and/or connector.
4	Engine stop switch	Remove the engine stop switch and check resistance.	Check resistance.		Proceed to No. 5.	Replace the engine stop switch.
5	Engine stop switch	Connect the signal check harness and check that engine stop switch voltage falls within a range from 0 to 1 V.	Check voltage.		Proceed to No. 6.	Replace the harness.
6	ECU	Check the ECU malfunction.	ECU voltage 10 to 16 V		Normal Proceed to No. 7.	Replace the ECU.
7	Battery	Check whether the battery has degraded/deteriorated or malfunctioned.	Battery voltage 10 to 16 V		Normal	Replace the battery.

DN02-556

FUEL CONTROL (J08E)

DTC:P1530

EN1610602F200214

DTC	P1530	Engine stop switch malfunction
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1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS

- (1) Disconnect the engine stop switch connector.
- (2) Measure resistance between the terminals of the engine stop switch connector.

HINT

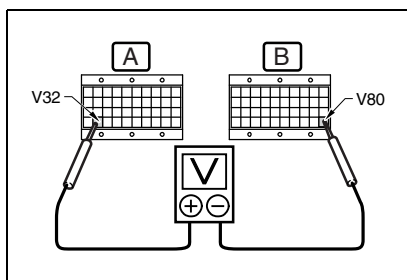
It varies according to the coach building.

Standard value: $\infty \Omega$ 

NO

Fault in engine stop switch

YES

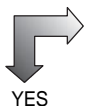


SAPH161060200292

2. MEASURING VOLTAGE BETWEEN TERMINALS

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness on the vehicle side.
- (3) Set the starter switch to "ON" position.
- (4) Measure voltage between the terminals STOP (V32) and PGD4 (V80).

Standard value: 0-1 V



NO

Faulty in harness

Fault in engine ECU



FUEL CONTROL (J08E)

DN02-557



DN02-558

FUEL CONTROL (J08E)

DTC:P1601 (Check sheet)

EN1610602F200216

DTC:P1601

Fuel injector adjustment data error

1. Technical description

- Injector calibration data is not proper.
- An injection quantity is controlled to a valve opening duration of the injector.
- The valve opening duration of the injector is adjusted by the solenoid valve.

2. DTC set condition**(1) Check conditions**

- Calibration data (QR codes) are not written.
- Calibration data are 127 or more.
- Calibration data are -128 or less.
- Improper checksum of calibration data
- EEPROM memory failure

(2) Judgment criteria

- Either of these conditions described above remains for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Inconsistent with calibration data (QR codes) stored in the server.
- Malfunction of ECU

DTC:P1601	Fuel injector adjustment data error	Inspection Procedure
------------------	-------------------------------------	----------------------

No	Parts	Check contents	Judge	Check (Pass/ Fail)	If OK	If fail
1	-	Check whether there is a history of injector replacement.	If none, proceed to No. 2. If yes or unknown, proceed to No. 3.		If yes or unknown, proceed to No. 3.	If none, proceed to No. 2.
2	-	Read QR codes stored in the server.	Diagnosis check		DONE	Proceed to No. 3.
3	ECU	Read INJ QR codes.	Diagnosis check		DONE	Replace the ECU.

DN02-560

FUEL CONTROL (J08E)

DTC:P1601

EN1610602F200217

DTC	P1601	Fuel injector adjustment data error
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1. CHECK INJECTOR REPLACED RECORD

- (1) Check injector replaced record.

Standard**No replace record : Go to YES****Replaced record was found, or not clear : Go to NO**

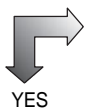
NO

Proceed to 3

YES

2. INSPECTION OF QR CODE

- (1) Re-input the registration QR code date of the service server.
(2) Erase the DTC memory, and recheck DTC code. Confirm that DTC code P1601 is not stored.

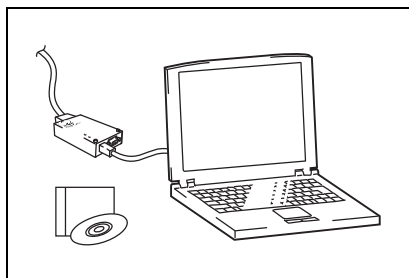
Standard**Not stored**

NO

Proceed to 3

YES

Normal



SAPH161060200291

3. INSPECTION OF QR CODE

- (1) Read the QR code date of the injectors using HinoDX, re-input QR code date.
(2) Erase the DTC memory, and recheck DTC code. Confirm that DTC code P1601 is not stored.

Standard**Not stored**

NO

Replace engine ECU

YES

Normal



FUEL CONTROL (J08E)

DN02-561



DTC:P1676 (Check sheet)

EN1610602F200215

DTC:P1676

Fuel cut relay (For Eaton UltraShift)

1. Technical description

- The fuel cut relay is out of order. (Eaton AMT, failsafe circuit)
- It is likely that gear shifting is obstructed by malfunction.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- Engine running or starter OFF

(2) Judgment criteria

- It is detected that voltage of the fuel cut relay circuit keeps decreasing for 1 second or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Malfunction of fuel cut relay circuit (faulty harness or connector)
- Malfunction of Eaton AMT ECU
- Malfunction of ECU

DTC:P1676		Fuel cut relay (For Eaton UltraShift)			Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	Check (Pass/Fail)	If fail
1	Engine ECU	Replace the ECU.	When turning the key ON, the mal-function recurs.		Replace the faulty engine ECU.	Proceed to No. 2.
2	Eaton ECU	After replacing an old engine ECU, replace the Eaton ECU.	When turning the key ON, the mal-function recurs.		Replace the faulty Eaton ECU.	Proceed to No. 3.
3	Harness	After replacing an old Eaton ECU, replace the harness.	When turning the key ON, the mal-function recurs.		Replace the faulty harness.	After replacing an old harness, report to Development Department.

DN02-564

FUEL CONTROL (J08E)

DTC:P1681 (Check sheet)

EN1610602F200218

DTC:P1681

Exhaust brake - Circuit (circuit low)

1. Technical description

- The exhaust brake solenoid valve is not properly functioning.
- Malfunction or GND short-circuit is likely to have occurred in the solenoid valve.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- The exhaust brake is active.

(2) Judgment criteria

- Exhaust brake magnetic valve circuit voltage $\leq 2.8V$
- Failure timer $\geq 3\text{sec}$

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- GND short-circuit has occurred in the exhaust brake drive signal line.
- The exhaust brake solenoid valve is out of order.
- The engine ECU malfunction.

DTC:P1681	Exhaust brake - Circuit (circuit low)	Inspection Procedure
------------------	--	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Exhaust brake solenoid valve	Replace the exhaust brake solenoid valve.	When turning the starter switch ON to activate the exhaust brake, the malfunction recurs.		Replace the faulty exhaust brake solenoid valve.	Proceed to No. 2.
2	Harness	After replacing an old exhaust brake solenoid valve, replace the harness.	When turning the starter switch ON to activate the exhaust brake, the malfunction recurs.		Replace harness.	Proceed to No. 3.
3	Engine ECU	After replacing an old harness, replace the engine ECU.	When turning the starter switch ON to activate the exhaust brake, the malfunction recurs.		Replace the faulty ECU.	After replacing an old ECU, report to Development Department.

DN02-566

FUEL CONTROL (J08E)

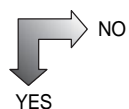
DTC:P1681

EN1610602F200219

DTC	P1681	Exhaust brake - circuit (Circuit low)
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1. CHECK THE CONTINUITY OF HARNESS.

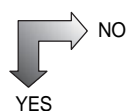
- (1) Check the exhaust brake solenoid valve for ground short-circuit.



Faulty exhaust brake solenoid valve

2. CHECK THE CONTINUITY OF HARNESS.

- (1) Set the starter switch "LOCK" position.
(2) Connect the signal check harness.
(3) Check the harness itself for ground short-circuit.



Faulty in harness

Fault in engine ECU



FUEL CONTROL (J08E)

DN02-567



DN02-568

FUEL CONTROL (J08E)

DTC:P1682 (Check sheet)

EN1610602F200220

DTC:P1682

Exhaust brake - Circuit (circuit high)

1. Technical description

- The exhaust brake solenoid valve is not properly functioning.
- Malfunction or +B short-circuit/disconnection is likely to have occurred in the solenoid valve.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- Exhaust brake:Deactivated

(2) Judgment criteria

- Exhaust brake magnetic valve circuit voltage $\geq 3V$
- Failure timer $\geq 3\text{sec}$

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- +B short-circuit/disconnection has occurred in the exhaust brake drive signal line.
- The exhaust brake solenoid valve is out of order.
- The engine ECU is out of order.

DTC:P1682	Exhaust brake - Circuit (circuit high)	Inspection Procedure
------------------	---	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Exhaust brake solenoid valve	Replace the exhaust brake solenoid valve.	When turning the starter switch ON, the malfunction recurs.		Replace the faulty exhaust brake solenoid valve.	Proceed to No. 2.
2	Harness	After replacing an old exhaust brake solenoid valve, replace the harness.	When turning the starter switch ON, the malfunction recurs.		Replace harness.	Proceed to No. 3.
3	Engine ECU	After replacing an old harness, replace the engine ECU.	When turning the starter switch ON, the malfunction recurs.		Replace the faulty ECU.	After replacing an old ECU, report to Development Department.

DN02-570

FUEL CONTROL (J08E)

DTC:P1682

EN1610602F200221

DTC	P1682	Exhaust brake - circuit (Circuit high)
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1. CHECK THE CONTINUITY OF HARNESS.

- (1) Check that the exhaust brake solenoid valve connector is securely connected.



Faulty connector

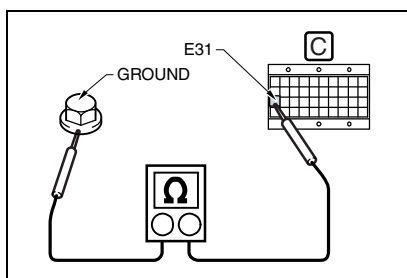
2. CHECK THE CONTINUITY OF HARNESS.

- (1) Switch over from the positive to negative sides and vice versa of the probe and measure resistance of the exhaust brake solenoid valve twice.

Standard value: 0Ω and 8.3-18.3 Ω (20°C {68°F}): Outside air temperature



Faulty exhaust brake solenoid valve

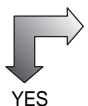


SAPH161060200293

3. CHECK THE CONTINUITY OF HARNESS.

- (1) Set the starter switch "LOCK" position.
(2) Connect the signal check harness on the engine side.
(3) Check the harness itself for battery short-circuit.
(4) Check continuity between the terminals EBMV (E31) and ground.

Standard value: 8.3-18.3 Ω (20°C {68°F}): Outside air temperature



Faulty in harness

Fault in engine ECU



FUEL CONTROL (J08E)

DN02-571



DTC:P200C (Check sheet)

EN1610602F200222

DTC:P200C

DPF over temperature

1. Technical description

- ECU constantly calculate and accumulate the amount of soot deposit from the engine.
The burner will start increasing temperature of the DPR filter when the regeneration mode is selected based on this value to start regeneration.
If an excessively high temperature is detected by the exhaust temperature sensor located in the downstream of DPR, it will be judged as an error.

2. DTC set condition

(1) Check conditions

- The engine must not be stopped.

(2) Judgment criteria

- P200C (DPR abnormal temperature) is set when either of the following conditions is met.
Judge a reading taken by the DPR downstream (DOC inlet) exhaust temperature sensor by referencing to a value specified below.
Immediately judge when 965°C {1,769°F} is exceeded for continuous 5 minutes.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- (If malfunction in the burner system also exists)
- Abnormal control of the burner system temperature
- Judged by the abnormal temperature rise at regeneration due to excessive soot emission.
Injector: Characteristic abnormality of injection volume
SCV: Faulty control of common rail pressure
EGR valve: Faulty control of EGR opening angle
Diesel throttle valve: Faulty control of Diesel throttle valve opening angle
Turbocharger: Faulty control of VNT
Refer to "ENG basic inspection sheet" (chapter "FUEL CONTROL (J08E)" page DN02-38 on manual no. S7-UNAE09* for above inspection.

[Confirmation points for judgment]

- Fault in DPR downstream (DOC inlet) exhaust temperature sensor
Exhaust temperature sensor:
Check whether the abnormal temperature is detected due to falsely-recognized by the sensor, or not.

DTC:P200C	DPF over temperature	Inspection Procedure
------------------	----------------------	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Engine	Check excessive black smoke, or engine oil leaking into the exhaust gas. Perform a basic engine inspection by using "Engine basic inspection sheet" (refer to chapter "FUEL CONTROL (J08E)" page DN02-38 on manual no.S7-UNAE09*).	No excessive black smoke/Engine oil leakage		Repair or replace the part which the failure is detected
2	Exhaust temperature sensor, DPR downstream (DOC inlet)	Check resistance value of the sensor. Check for DTCs related to the exhaust temperature sensor (P242C, P242D, P242B).	9.75 k Ω (50 °C {122 °F}) 3.77 k Ω (100 °C {212 °F}) 1.80 k Ω (150 °C {302 °F})		Replace the sensor
3	DPR	Check the rear end surface of DPR.	No soot leakage (soot on the end surface)		Replace the DPR
4	Burner	Inspect the burner system.	P141F must not be detected		Proceed to detailed analysis for BCU

DN02-574

FUEL CONTROL (J08E)

DTC:P200C

EN1610602F200223

DTC	P200C	DPF over temperature
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1. INSPECT THE ENGINE.

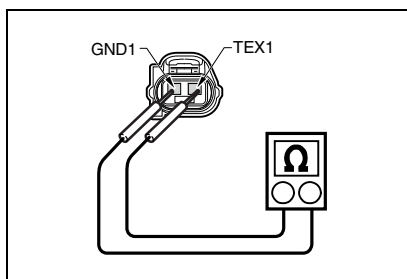
- (1) Check the engine for black smoke or oil leakage.

Standard:**No excessive black smoke, No engine oil leakage.**

NO

Perform a basic engine inspection.
Refer to "Engine basic inspection sheet (chapter
"FUEL CONTROL (J08E)" page DN02-38 on Man-
ual No. S7-UNAE09").

YES

**2. MEASURE RESISTANCE BETWEEN SENSOR TERMINALS.**

- (1) Set the starter switch to "LOCK" position.
(2) Disconnect the exhaust gas temperature sensor (DOC inlet) connector.
(3) Measure resistance between the terminals TEX1 and GND1 of the exhaust gas temperature sensor (DOC inlet).

Standard:**9.75 kΩ (50°C {122°F})****3.77 kΩ (100°C {212°F})****1.80 kΩ (150°C {302°F})**

NO

Faulty exhaust gas temperature sensor (DOC inlet)

YES

3. CHECK THE DPR.

- (1) Check for soot leakage.

Standard:**No soot leakage is allowed.**

NO

Replace the DPR.

YES

- (2) Blow air against the DPR.
(3) Perform a forced regeneration and check that regeneration is completed.

Standard:**Regeneration must be completed.**

NO

Inspect the burner system.

YES

Delete the error and see how it works.



FUEL CONTROL (J08E)

DN02-575



DN02-576

FUEL CONTROL (J08E)

DTC:P203F (Check sheet)

EN1610602F200226

DTC:P203F

Empty reductant tank

1. Technical description

- Detects that the remaining amount of DEF in the DEF tank has become less than 5%.
- The remaining amount of DEF is sensed by the water level sensor until it becomes 10%, and by calculating the additive amount of DEF in the ECU when it becomes less than 10% to 0%.

2. DTC set condition**(1) Check conditions**

DEF tank level (from DCU) ≤ 10%

(2) Judgment criteria

Remaining DEF level (=DEF tank level (from DCU) - (Calculated Accumulated
DEF dosing amount (=Σ(DEF dosing quantity (from DCU)))/DEF tank volume)) ≤ 5%

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

DEF tank: Low DEF remaining level**DEF level sensor:** Malfunction of sensor

FUEL CONTROL (J08E)

DN02-577

DTC:P203F	Empty reductant tank	Inspection Procedure
------------------	----------------------	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	DEF tank	Supply DEF to the full position.	The DEF indicator should indicate 100%.		Next
2	DEF water level sensor	Check if the float moves.	No sticking		Replace the sensor.

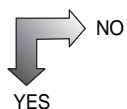
DN02-578

FUEL CONTROL (J08E)

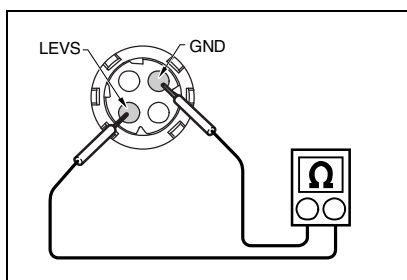
DTC:P203F

EN1610602F200227

DTC	P203F	Empty reductant tank
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1. CHECK AN AMOUNT REMAINING IN THE DEF TANK.

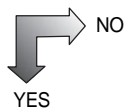
Refill with at least 5 liters of DEF.



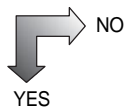
SAPH161060200298

2. CHECK THE RESISTANCE BETWEEN TERMINALS.

- (1) Disconnect the sensor from the tank and check that the float is not stuck.
- (2) Clean the float and sensor.
- (3) Move the float and measure resistance between the terminals LEVS and GND of the DEF sensor connector.

Standard: 132-140 Ω (20°C {68°F}): When filled to the full line

Faulty DEF level sensor

3. CHECK THAT OTHER MALFUNCTION CODES EXIST SIMULTANEOUSLY.

Proceed to other malfunction codes.

4. After repair, turn the starter switch "ON" and check that no error will occur.



FUEL CONTROL (J08E)

DN02-579



DTC:P204F (Check sheet)

EN1610602F200228

DTC:P204F**Reductant System Performance****1. Technical description**

- P204F is the DTC related to the DEF-SCR system.
The DEF-SCR system is diagnosed by the DCU.

2. DTC set condition**(1) Check conditions**

—

(2) Judgment criteria

—

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Select DCU on Hino-DX and diagnose the DTC is detected.

Note:

When a malfunction of the DEF-SCR system has occurred repeatedly, "P204F" may not extinguish when executing a standard DTC Clear, even when a normal fault recovery has been performed.

In such a case, perform a DTC Clear after setting "Release repeat offense" in "Activation test" to "Release".

DTC:P204F	Reductant System Performance	Inspection Procedure
------------------	-------------------------------------	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	DEF-SCR System	<p>– DCU relative DTC. Select DCU on Hino-DX and diagnose the DTC is detected.</p> <p>Note: When a malfunction of the DEF-SCR system has occurred repeatedly, "P204F" may not extinguish when executing a standard DTC Clear, even when a normal fault recovery has been performed. In such a case, perform a DTC Clear after setting "Release repeat offense" in "Activation test" to "Release".</p>			

DTC:P204F

EN1610602F200229

DTC	P204F	Reductant System Performance
-----	-------	------------------------------

- 1. DEF SCR MALFUNCTION**
(Refer to the chapter DEF SCR DN02-002)

DTC:P207F (Check sheet)

EN1610602F200230

DTC:P207F

Improper reductant

1. Technical description

- Judge deterioration of DEF by observing a drop in purification efficiency.
- Use the NOx sensors installed in the upstream and downstream of the SCR catalyst to calculate purification efficiency.

2. DTC set condition**(1) Check conditions**

Conditions below continues 60sec
 500kg/h <= Exhaust gas flow < 1,000kg/h
 280°C {536°F} <= SCR catalyst temp. < 320°C {608°F}
 0ppm <= NOx concentration (upstr.) < 200ppm
 (NOx (SCR upstr) stable, and NOx (SCR downstr) stable)
 Burner deactivated
 Barometric pressure >= 83kPa

(2) Judgment criteria

1. Calculate Average NOx conversion efficiency from NOx sensor (upstr.) and (downstr.) and Exhaust gas mass flow
 Target NOx conversion efficiency (from DCU)- Average NOx conversion efficiency >= 0.46
2. Catalyst heat up (NH3 slip monitoring)
 Average NOx conversion efficiency (during catalyst heat up) > 0

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

A drop in purification efficiency may be caused by hardware deterioration/degradation or an increase or a decrease in DEF dose due to a deviation of the sensors.

DEF: Improper reductant

NOx sensor: Sensor malfunction

A/F

SCR inlet temperature sensor:

DTC:P207F	Improper reductant	Inspection Procedure
------------------	---------------------------	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	DEF	Measure DEF concentration.	32.5±2.5%		Replace
2	-	Perform initial inspection.			-
3	Mass air flow sensor	Using HinoDX, compare the NMR with a new sensor. * Refer to P0101.	Difference between old and new sensor less than 10%		MAF Replace
4	SCR inlet temperature sensor	Immerse the sensor in hot water and check resistance. Check the value during the DPR forced regeneration on HinoDX. Coupler check * Refer to P2483.	Within criteria Contiguous		Replace
5	DEF pipe (pump ↔ injector)	DEF piping (pressure line) Appearance check	No crush, breakage or bend		Replace
6	DEF injector	Remove the DEF injector from the muffler and perform a DEF addition test (added quantity pattern x 3).	The metered quantity of additive shall be within each standard.		NG: Replace DEF injector and go to step 7. * OK results prove that clogging caused by crystallized DEF is no longer present.
7	DEF injector	After replacement of the DEF injector, again perform a urea solution addition test (added quantity pattern x 3).	The metered quantity of additive shall be within each standard.		OK: Leave the new DEF injector installed. NG: Replace the DEF piping (pump ↔ injector). * Re-install the previous DEF injector.
8	NOx sensor (upstream and downstream)	Replace the upstream and downstream NOx sensors.			
9	SCR catalyst	Replace the SCR catalyst. (After replacement, delete the malfunction from HinoDX and perform a forced regeneration.)			
-	-	Driving is required to some extent to check that the normal state is restored. Once return it to the driver and see how it works.			

(*1) When a DEF quality failure occurs, set the starter SW to ON position, drain DEF from the DEF tank drain cock and add at least 5 liters of DEF.

Then check that the same malfunction does not recur during running.

DN02-584

FUEL CONTROL (J08E)

DTC:P207F

EN1610602F200231

DTC	P207F	Improper reductant
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1. DRAIN ALL FOREIGN MATTERS.

- (1) With the starter switch kept in the "ON" position, open the DEF tank cap and drain all foreign matters through the drain located at the bottom of the tank.

2. IF A FOREIGN MATTER IS WATER OR DILUTE DEF

- (1) With the starter switch kept in the "ON" position, supply at least 5 liters of normal DEF.

3. IF A FOREIGN MATTER IS DIESEL OIL OR UNKNOWN

- (1) Remove the aqueous urea solution tank and aqueous urea solution sensor and thoroughly clean the sensor and inside the tank.
- (2) Replace the DEF piping, DEF pump and DEF injector.

4. SUPPLY DEF.

- (1) With the starter switch kept in the "ON" position, supply at least 5 liters of normal DEF.

5. AFTER REPAIR, CHECK THAT NO ERROR WILL RECUR IN DRIVING.



FUEL CONTROL (J08E)

DN02-585



DN02-586

FUEL CONTROL (J08E)

DTC:P20EE (Check sheet)

EN1610602F200232

DTC:P20EE

NOx converting catalyst conversion efficiency

1. Technical description

- Judge degradation/deterioration of the SCR catalyst by observing a drop in purification efficiency.
- Use the upstream and downstream NOx sensors to calculate purification efficiency.

2. DTC set condition**(1) Check conditions**

Conditions below continue for 60sec
 500kg/h <= Exhaust gas mass flow < 1,000kg/h
 280°C {536°F} <= SCR catalyst temp < 320°C {608°F}, and
 0ppm <= NOx (SCR upstream) < 200ppm
 (NOx sensor (SCR upstream) stable and NOx sensor (SCR downstream) stable)
 Burner deactivated
 Barometric pressure >= 83kPa

(2) Judgment criteria

- Calculate Average NOx conversion efficiency from NOx sensor (upstr.) and (downstr.) and Exhaust gas mass flow
 Target NOx conversion efficiency (from DCU)- Average NOx conversion efficiency
 >= 1.0 (at SCR catalyst temp = 200°C {392°F}) or 1.2 (at SCR catalyst temp = 240°C {464°F})

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

A drop in purification efficiency may be caused by hardware deterioration/degradation, a deviation in NH3 absorption, or an increase or a decrease in DEF dose due to a deviation of the sensors.

DEF: Improper reductant

NOx sensor:

- Disconnection or short-circuiting of sensor harness
- Sensor malfunction

A/F

SCR inlet temperature sensor:

SCR catalyst:

- Deviation in absorption calculation
- Poisoned by HC

DTC:P20EE		NOx converting catalyst conversion efficiency		Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	-	Perform initial inspection.	-		-
2	DEF	Measure DEF concentration.	32.5±2.5%		Replace
3	Mass air flow sensor	Using HinoDX, compare the NMR with a new sensor. * Refer to P0101.	Difference between old and new sensor less than 10%		MAF Replace
4	SCR inlet temperature sensor	Immerse the sensor in hot water and check resistance. Check the value during the DPR forced regeneration on HinoDX. Coupler check * Refer to P2483.	Within criteria Contiguous		Replace
5	DEF pipe (pump ↔ injector)	DEF piping (pressure line) Appearance check	No crush, breakage or bend		Replace
6	DEF injector	Remove the DEF injector from the muffler and perform DEF addition test (added quantity pattern x 3).	The metered quantity of additive shall be within each standard.		NG: Replace DEF injector and go to step 7. * OK results prove that clogging caused by crystalized DEF is no longer present.
7	DEF injector	After replacement of the DEF injector, again perform "Urea addition test" (added quantity pattern x 3).	The metered quantity of additive shall be within each standard.		OK: Leave the new DEF injector installed. NG: Replace the DEF piping (pump ↔ injector). * Re-install the previous DEF injector.
8	DPR	Check platinum leak caused by melting or erosion. Visually check the tail pipe.	No soot deposit is allowed on the tail pipe.		Replace the DPR and SCR catalyst.
9	NOx sensor (upstream and downstream)	Replace the upstream and downstream NOx sensors.			
10	SCR catalyst	Replace the SCR catalyst. (After replacement, delete the malfunction from HinoDX and perform a forced regeneration.)			
	-	Driving is required to some extent to check that the normal state is restored. Once return it to the driver and see how it works.			

DN02-588

FUEL CONTROL (J08E)

DTC:P20EE

EN1610602F200233

DTC	P20EE	NOx converting catalyst conversion efficiency
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1. CHECK DEF QUALITY.

NO
YES

DEF quality defect

2. CHECK VALIDITY NOx SENSOR.

(1) Forced regeneration

NO
YES

Faulty NOx sensor

3. CHECK A DEF INJECTION RATE

NO
YES

Leak from DEF

4. CHECK THE CATALYST.

- (1) After catalyst temperature rises, evaluate a purification rate.
(2) Check that no error will recur in driving.

NO
YES

Faulty catalyst

Clear and recheck the DTC.



FUEL CONTROL (J08E)

DN02-589



DN02-590

FUEL CONTROL (J08E)

DTC:P2100 (Check sheet)

EN1610602F200234

DTC:P2100

DC motor for intake throttle valve - circuit (Open circuit (circuit low))

1. Technical description

The diesel throttle (intake throttle) is of the butterfly type by DC motor driving.

2. DTC set condition**(1) Check conditions**

Battery voltage is in the 8 - 16 V range.

There must be no disconnection in the harness connecting to the diesel throttle (intake throttle).

(2) Judgment criteria

The diesel throttle (intake throttle) drive current has continued to be below 0.3A for six seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Malfunction of battery or relay

Looseness or unsteady movement of diesel throttle (intake throttle) connector

Abnormality in harness connecting to diesel throttle (intake throttle)

For reference: You can check the diesel throttle (intake throttle) for mechanical damage by checking if the diesel throttle (intake throttle valve) is actuated when starter switch is turned ON and then OFF without starting the engine.

FUEL CONTROL (J08E)

DN02-591

DTC:P2100	DC motor for intake throttle valve - circuit (Open circuit (circuit low))	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Diesel throttle (intake throttle)	Damaged diesel throttle (intake throttle)	To operate as directed with Hino-DX connected.		Replace the diesel throttle (intake throttle).
2	Battery	Voltage	8V to 16V		Charge or replace the battery.
3	Relay	Check the voltage with the check harness.	8V to 16V		Replace the relay.
4	Harness connector	Check the connector voltage on the engine harness side.	8V to 16V		Repair of harness
5	Harness connector	Disconnection, unsteady movement, looseness, damage	Must be free from the items at left.		Connect correctly or replace if damaged.

DTC:P2103 (Check sheet)

EN1610602F200235

DTC:P2103	DC motor for intake throttle valve - circuit (Short circuit (circuit high))
------------------	---

1. Technical description

The diesel throttle (intake throttle) is of the butterfly type by DC motor driving.

2. DTC set condition**(1) Check conditions**

Battery voltage is in the 8 - 16 V range.
There must be no disconnection in the harness connecting to the diesel throttle (intake throttle).

(2) Judgment criteria

The diesel throttle (intake throttle) drive current has continued to be more than 12A for 112 ms.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Overvoltage applied to diesel throttle (intake throttle)
Abnormality in battery voltage
Abnormality in harness connecting to diesel throttle (water intrusion)
Check if extra electronic hardware is connected.
For reference: You can check the diesel throttle for mechanical damage by checking if the diesel throttle (intake throttle valve) is actuated when starter switch is turned ON and then OFF without starting the engine.

FUEL CONTROL (J08E)

DN02-593

DTC:P2103	DC motor for intake throttle valve - circuit (Short circuit (circuit high))	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Diesel throttle (intake throttle)	Damaged diesel throttle (intake throttle)	To operate as directed with Hino-DX connected.		Replace the diesel throttle (intake throttle).
2	Battery	Voltage	8 to 16 V		Charge or replace the battery.
3	Relay	Check the voltage with the check harness.	8 to 16 V		Replace the relay.
4	Harness connector	Check the connector voltage on the engine harness side.	8 to 16 V		Repair of harness
5	Harness connector	Disconnection, unsteady movement, looseness, damage, water dropping	Must be free from the items at left.		Connect correctly, remove water or replace if damaged.

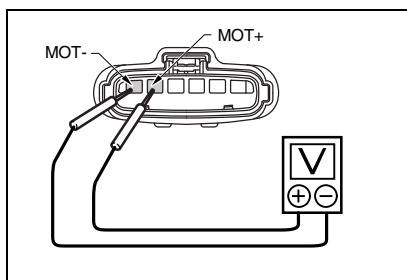
DN02-594

FUEL CONTROL (J08E)

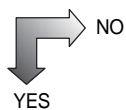
DTC:P2100/P2103

EN1610602F200236

DTC	P2100	DC motor for intake throttle valve - circuit (Open circuit (circuit low))
DTC	P2103	DC motor for intake throttle valve - circuit (Short circuit (circuit high))

**1. MEASURING VOLTAGE BETWEEN SENSOR TERMINALS**

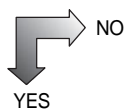
- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the connector of diesel throttle (intake throttle valve).
- (3) Set the starter switch to "ON" position.
- (4) Measure voltage between the terminals MOT+ and MOT- of the diesel throttle (intake throttle valve) connector (engine sub harness side).

Standard value: 8-16 V

Faulty in harness

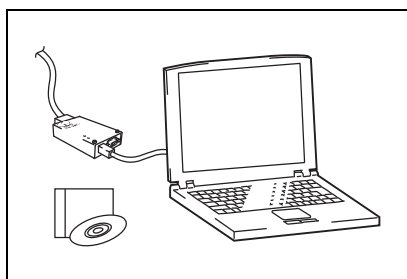
2. CHECK THE INTAKE THROTTLE VALVE.

- (1) Disconnect the diesel throttle (intake throttle) from the intercooler so that the intake throttle valve will be visible.
- (2) Check the diesel throttle (intake throttle valve) for dragged foreign matters.
- (3) Remove all foreign matters if any.
- (4) Set the starter switch to "ON" position. (The engine does not start running.)
- (5) Set the starter switch to "LOCK" position and check that the diesel throttle (intake throttle valve) functions.



Proceed to 3.

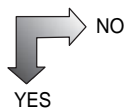
Clear and recheck the DTC.



SAPH161060200300

3. INSPECT THE INTAKE THROTTLE VALVE.

- (1) Connect Hino-DX to the vehicle.
- (2) Set the starter switch to "ON" position.
- (3) Inspect the intake throttle valve.



Faulty diesel throttle (intake throttle valve)

- Faulty in harness
- Fault in engine ECU

DN02-596

FUEL CONTROL (J08E)

DTC:P2101 (Check sheet 1)

EN1610602F200237

DTC:P2101

Intake throttle valve - functional

1. Technical description

The diesel throttle (intake throttle) is of the butterfly type by DC motor driving.

2. DTC set condition**(1) Check conditions**

Battery voltage is in the 8 - 16 V range.

There must be no disconnection in the harness connecting to the diesel throttle (intake throttle).

(2) Judgment criteria

A difference between the read opening and actual opening of the diesel throttle (intake throttle) has continued to be more than 10% for 30 seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Adhesion of foreign matters in air intake passage in diesel throttle (intake throttle) (oil, soot, etc.)

Foreign object jammed diesel throttle (intake throttle valve)

(In this case, it may be difficult to reproduce the problem if the foreign object jammed at the time of inspection has already been removed for some reason.)

Valve jammed in diesel throttle (intake throttle) air intake passage due to lost motion of diesel throttle (intake throttle valve)

FUEL CONTROL (J08E)

DN02-597

DTC:P2101		Intake throttle valve - functional		Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Diesel throttle (intake throttle)	Adhesion of foreign matters in air intake passage (oil, soot, etc.)	Must be free from adhesion.		Remove the foreign object.
2	Diesel throttle (intake throttle)	Foreign object jammed in diesel throttle (intake throttle valve)	Must be free from jamming.		Remove the foreign object and check No. 5 to 8.
3	Diesel throttle (intake throttle)	Check between the valve and shaft for looseness.	Must be free from looseness.		Replace the diesel throttle (intake throttle).
4	Diesel throttle (intake throttle)	Valve jammed in diesel throttle (intake throttle) air intake passage	The valve must move when it is pushed by hand with no power connected.		Replace the diesel throttle (intake throttle).
5	Intake pipe	With or without adhesion of hard soot	Must be free from adhesion.		Remove
6	Intake manifold	With or without adhesion of hard soot	Must be free from adhesion.		Remove
7	EGR valve	With or without adhesion of hard soot	Must be free from adhesion.		Remove
8	EGR cooler	With or without adhesion of hard soot, clogging	Must be free from adhesion and clogging.		Remove or replace.

DN02-598

FUEL CONTROL (J08E)

DTC:P2101 (Check sheet 2)

EN1610602F200238

DTC:P2101

Intake throttle valve stick

1. Technical description

- Increase temperature during DPR automatic regeneration by throttling intake air utilizing diesel throttle (intake throttle)
- Assist engine stop by closing when key is off

2. DTC set condition**(1) Check conditions**

- Stable operational condition
 - Engine revolution fluctuation range less than 20rpm
 - Engine injection quantity fluctuation range less than 2mm³/st.cyl
- Normal diesel throttle (intake throttle) circuit
- Continuation of the above condition for 10sec

(2) Judgment criteria

- Difference between Actual and Target is more than +/- 10% for 80sec

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Air cleaner: Restricted**Air hose:**

- Collapsed
- Loose or leaking

Body of throttle:






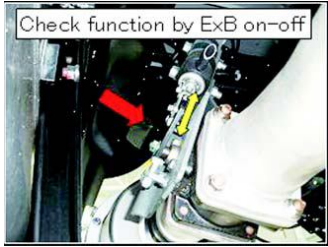
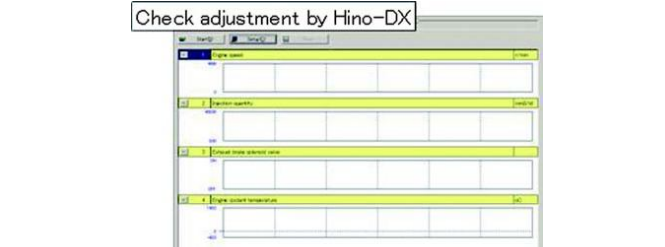
- Excessive dirt inside body of diesel throttle (intake throttle)
- Throttle valve malfunction

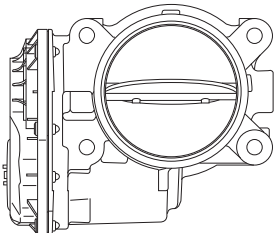
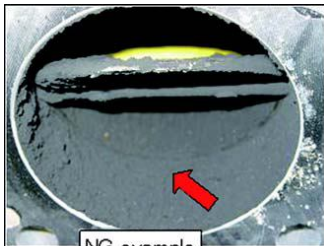

Battery: Decrease in voltage**Harnesses:**

- Decrease in source voltage
- Short to GND

DTC:P2101	Intake throttle valve stick	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Air Filter	Check restriction or contamination of the air cleaner element (Detail on next page A)	No restriction Genuine parts		Change filter
2	Air hoses	Visually check (Detail on next page B)	No bending No leaking		Fix Replace
3	Exhaust pipe	Visually check	No restriction No contamination		Fix
4	Exh. Brake	Visually check Open and close butterfly valve (Detail on next page C)	No sticking No seizing		ExB Replace
5	Intake throttle	Visually check Activation test by Hino-DX (Detail on next page D)	No excessive dirt inside Following target		Replace intake throttle

A	Air Filter Visually check		
			
B	Air hoses Visually check		
			
C	Exh. Brake valve check		
			

D	Diesel throttle (intake throttle) Visually check		
		Check 3 holes (only J08E), no excessive dirt inside of throttle body and no movement between butterfly valve and shaft	
D	Diesel throttle (intake throttle) activation test		
		System fix ↓ Check function ↓ Diesel throttle (intake throttle valve) check	<ol style="list-style-type: none">1. Park vehicle with parking brake set, and chock wheels.2. When click [Intake throttle UP/ Intake throttle DOWN] button, the directed diesel throttle (intake throttle valve) position changes from 0% to 90% by 10% step. Confirm actual diesel throttle (intake throttle valve) position is followed directed intake throttle valve.

DN02-602

FUEL CONTROL (J08E)

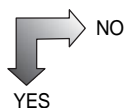
DTC:P2101

EN1610602F200239

DTC	P2101	Intake throttle valve - functional
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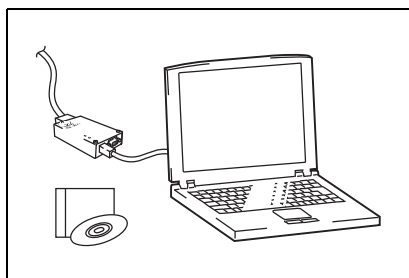
1. CHECK THE DIESEL THROTTLE (INTAKE THROTTLE VALVE).

- (1) Disconnect the diesel throttle (intake throttle) from the intercooler so that the diesel throttle (intake throttle valve) will be visible.
- (2) Check the diesel throttle (intake throttle valve) for dragged foreign matters.
- (3) Remove all foreign matters if any.
- (4) Set the starter switch to "ON" position. (The engine does not start running.)
- (5) Set the starter switch to "LOCK" position and check that the intake throttle valve functions.



Proceed to 2.

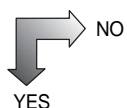
Clear and recheck the DTC.



SAPH161060200301

2. INSPECT THE DIESEL THROTTLE (INTAKE THROTTLE VALVE).

- (1) Connect Hino-DX to the vehicle.
- (2) Set the starter switch to "ON" position.
- (3) Inspect the diesel throttle (intake throttle valve).



Faulty diesel throttle (intake throttle valve)

- Faulty in harness
- Fault in engine ECU



FUEL CONTROL (J08E)

DN02-603



DN02-604

FUEL CONTROL (J08E)

DTC:P2120 (Check sheet)

EN1610602F200240

DTC:P2120

Throttle/Pedal Position Sensor/Switch "D" Circuit

1. Technical description

- Neither of accelerator sensors are properly functioning.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- Engine running or starter OFF

(2) Judgment criteria

- Both sensors are out of order at the same time.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Malfunction of both sensors
- Malfunction of engine ECU
- Malfunction of harness

DTC:P2120		Throttle/Pedal Position Sensor/Switch "D" Circuit		Inspection Procedure		
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Accelerator sensor	Replace the accelerator sensor.	When turning the starter switch ON, the malfunction recurs.		Replace the faulty accelerator sensor.	Proceed to No. 2.
2	Harness	After replacing an old accelerator sensor, replace the harness.	When turning the starter switch ON, the malfunction recurs.		Replace harness.	Proceed to No. 3.
3	Engine ECU	After replacing an old harness, replace the engine ECU.	When turning the starter switch ON, the malfunction recurs.		Replace the faulty ECU.	After replacing an old ECU, report to Development Department.

DN02-606

FUEL CONTROL (J08E)

DTC:P2122 (Check sheet)

EN1610602F200241

DTC:P2122

Accelerator pedal position sensor 1 - out of range (Out of range low)

1. Technical description

- The accelerator sensor 1 cannot correctly sense.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- The engine has stopped (stalled) or runs at 500 r/min or higher for continuous 5 seconds or longer.

(2) Judgment criteria

- Accelerator pedal position sensor 1 voltage $\leq 0.6V$ (-15.4%)
- Failure timer $\geq 1\text{sec}$

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Malfunction of sensor 1
- Malfunction of engine ECU
- Malfunction of harness

DTC:P2122	Accelerator pedal position sensor 1 - out of range (Out of range low)	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/ Fail)	If OK	If fail
1	Accelerator sensor	Replace the accelerator sensor.	When turning the starter switch ON, the malfunction recurs.		Replace the faulty accelerator sensor.	Proceed to No. 2.
2	Harness	After replacing an old accelerator sensor, replace the harness.	When turning the starter switch ON, the malfunction recurs.		Replace harness.	Proceed to No. 3.
3	Engine ECU	After replacing an old harness, replace the engine ECU.	When turning the starter switch ON, the malfunction recurs.		Replace the faulty ECU.	After replacing an old ECU, report to Development Department.

DN02-608

FUEL CONTROL (J08E)

DTC:P2123 (Check sheet)

EN1610602F200242

DTC:P2123

Accelerator pedal position sensor 1 - out of range (Out of range high)

1. Technical description

- The accelerator sensor 1 cannot correctly sense.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- Accelerator pedal position sensor 1 voltage $\geq 4.1V$ (147%)
- Failure timer $\geq 1sec$

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Malfunction of sensor 1
- Malfunction of engine ECU
- Malfunction of harness

DTC:P2123	Accelerator pedal position sensor 1 - out of range (Out of range high)	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/ Fail)	If OK	If fail
1	Accelerator sensor	Replace the accelerator sensor.	When turning the starter switch ON, the malfunction recurs.		Replace the faulty accelerator sensor.	Proceed to No. 2.
2	Harness	After replacing an old accelerator sensor, replace the harness.	When turning the starter switch ON, the malfunction recurs.		Replace harness.	Proceed to No. 3.
3	Engine ECU	After replacing an old harness, replace the engine ECU.	When turning the starter switch ON, the malfunction recurs.		Replace the faulty ECU.	After replacing an old ECU, report to Development Department.

DN02-610

FUEL CONTROL (J08E)

DTC:P2127 (Check sheet)

EN1610602F200243

DTC:P2127

Accelerator pedal position sensor 2 - out of range (Out of range low)

1. Technical description

- The accelerator sensor 2 cannot correctly sense.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- The engine has stopped (stalled) or runs at 500 r/min or higher for continuous 5 seconds or longer.

(2) Judgment criteria

- Accelerator pedal position sensor 2 voltage $\leq 1.4V$ (-15.4%)
Failure timer $\geq 1\text{sec}$

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Malfunction of sensor 2
- Malfunction of engine ECU
- Malfunction of harness

DTC:P2127	Accelerator pedal position sensor 2 - out of range (Out of range low)	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/ Fail)	If OK	If fail
1	Accelerator sensor 2	Replace the accelerator sensor.	When turning the starter switch ON, the malfunction recurs.		Replace the faulty accelerator sensor.	Proceed to No. 2.
2	Harness	After replacing an old accelerator sensor, replace the harness.	When turning the starter switch ON, the malfunction recurs.		Replace harness.	Proceed to No. 3.
3	Engine ECU	After replacing an old harness, replace the engine ECU.	When turning the starter switch ON, the malfunction recurs.		Replace the faulty ECU.	After replacing an old ECU, report to Development Department.

DN02-612

FUEL CONTROL (J08E)

DTC:P2128 (Check sheet)

EN1610602F200244

DTC:P2128

Accelerator pedal position sensor 2 - out of range (Out of range high)

1. Technical description

- The accelerator sensor 2 cannot correctly sense.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- Accelerator pedal position sensor 1 voltage $\geq 4.9V$ (147%)
- Failure timer $\geq 1\text{sec}$

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Malfunction of sensor 2
- Malfunction of engine ECU
- Malfunction of harness

DTC:P2128	Accelerator pedal position sensor 2 - out of range (Out of range high)	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/ Fail)	If OK	If fail
1	Accelerator sensor 2	Replace the accelerator sensor.	When turning the starter switch ON, the malfunction recurs.		Replace the faulty accelerator sensor.	Proceed to No. 2.
2	Harness	After replacing an old accelerator sensor, replace the harness.	When turning the starter switch ON, the malfunction recurs.		Replace harness.	Proceed to No. 3.
3	Engine ECU	After replacing an old harness, replace the engine ECU.	When turning the starter switch ON, the malfunction recurs.		Replace the faulty ECU.	After replacing an old ECU, report to Development Department.

DTC:P2120/P2122/P2123/P2127/P2128

EN1610602F200245

DTC	P2120	Throttle/Pedal Position Sensor/Switch "D" Circuit
DTC	P2122	Accelerator pedal position sensor 1 - out of range (Out of range low)
DTC	P2123	Accelerator pedal position sensor 1 - out of range (Out of range high)
DTC	P2127	Accelerator pedal position sensor 2 - out of range (Out of range low)
DTC	P2128	Accelerator pedal position sensor 2 - out of range (Out of range high)

- 1. MAKE SURE TO INSPECT IT IN ACCORDANCE WITH THE CONTENTS OF DTC P2120, P2122, P2123, P2127 AND P2128.**

DN02-614

FUEL CONTROL (J08E)

DTC:P2122 (Check sheet)

EN1610602F200246

DTC:P2122

Accelerator pedal position sensor 1 - out of range (Out of range low)

1. Technical description

- The accelerator sensor 1 cannot correctly sense.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- The engine has stopped (stalled) or runs at 500 r/min or higher for continuous 5 seconds or longer.

(2) Judgment criteria

- Accelerator pedal position sensor 1 voltage $\leq 0.6V$ (-15.4%)
- Failure timer $\geq 1\text{sec}$

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Malfunction of sensor 1
- Malfunction of engine ECU
- Malfunction of harness

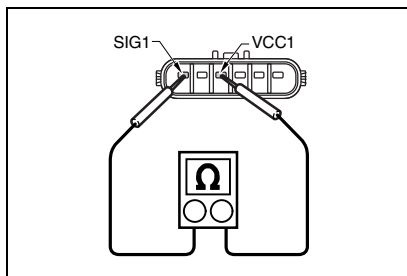
DTC:P2122	Accelerator pedal position sensor 1 - out of range (Out of range low)	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/ Fail)	If OK	If fail
1	Accelerator sensor 1	Replace the accelerator sensor.	When turning the starter switch ON, the malfunction recurs.		Replace the faulty accelerator sensor.	Proceed to No. 2.
2	Harness	After replacing an old accelerator sensor, replace the harness.	When turning the starter switch ON, the malfunction recurs.		Replace harness.	Proceed to No. 3.
3	Engine ECU	After replacing an old harness, replace the engine ECU.	When turning the starter switch ON, the malfunction recurs.		Replace the faulty ECU.	After replacing an old ECU, report to Development Department.

DTC:P2122

EN1610602F200247

DTC	P2122	Accelerator pedal position sensor 1 - out of range (Out of range low)
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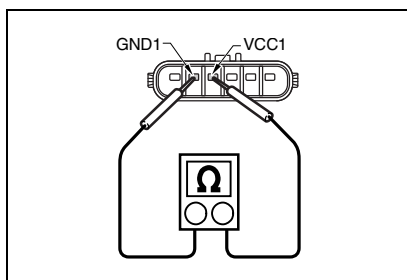
**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the accelerator sensor 1 connector.
- (3) Check continuity between the terminals VCC1 and SIG1 of the accelerator sensor 1 connector.

HINT

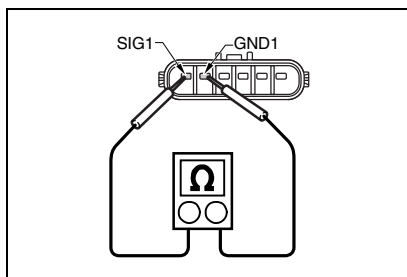
If it is difficult to check only the sensor, proceed to Step 4.

Standard value: 2 Ω or more



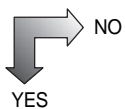
- (4) Check continuity between the terminals VCC1 and GND1 of the accelerator sensor 1 connector.

Standard value: 2 Ω or more

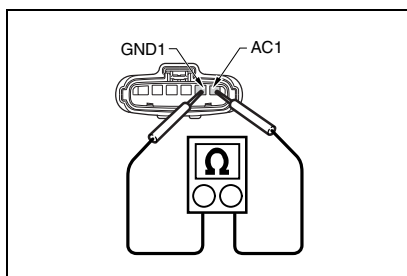


- (5) Check continuity between the terminals SIG1 and GND1 of the accelerator sensor 1 connector.

Standard value: 2 Ω or more



Fault in accelerator sensor 1

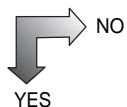


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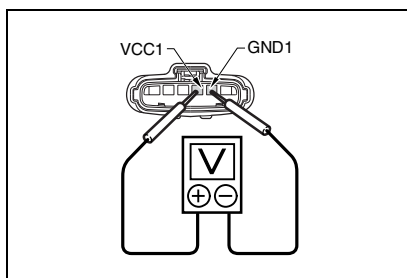
2. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS

- (1) Measure resistance between the terminals AC1 and GND1 of the accelerator sensor 1 connector (engine sub harness side).

Standard value: 25-35 k Ω



- Faulty in harness
- Irregular contact of connectors

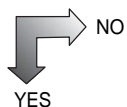


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3. MEASURING VOLTAGE BETWEEN SENSOR TERMINALS

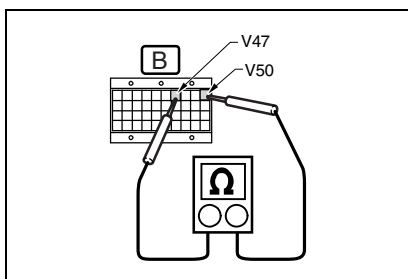
- (1) Set the starter switch to "ON" position.
(2) Measure voltage between the terminals VCC1 and GND1 of the accelerator sensor 1 connector (engine sub harness side).

Standard value: 4.5-5.5 V



- Faulty in harness
- Irregular contact of connectors

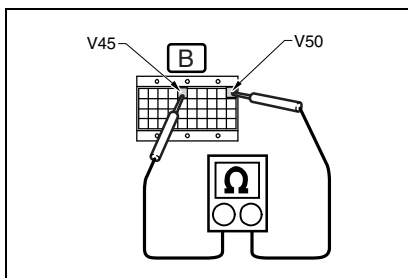
Bad contact of connectors



SAPH161060200307

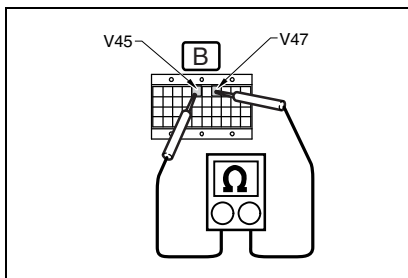
4. MEASURING RESISTANCE BETWEEN TERMINALS

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness on the vehicle side.
- (3) Disconnect the connector on the engine ECU side.
- (4) Measure resistance between the terminals AVC3 (V50) and ACS1 (V47).

Standard value: 2 Ω or more

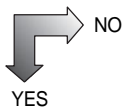
SAPH161060200308

- (5) Measure resistance between the terminals AVC3 (V50) and ADG7 (V45).

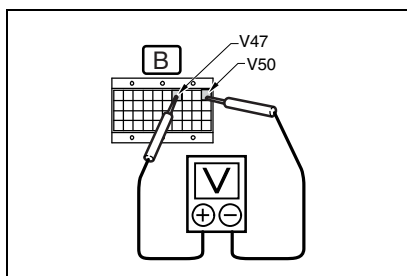
Standard value: 2 Ω or more

SAPH161060200309

- (6) Measure resistance between the terminals ACS1 (V47) and ADG9 (V45).

Standard value: $\infty \Omega$ 

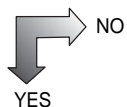
- Faulty in harness
- Faulty in accelerator sensor 1



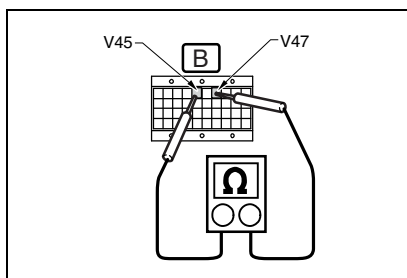
SAPH161060200310

5. MEASURING VOLTAGE BETWEEN TERMINALS

- (1) Connect the connectors on the engine ECU side.
- (2) Disconnect the connector on the engine sub harness side.
- (3) Set the starter switch to "ON" position.
- (4) Measure voltage between the terminals AVC3 (V50) and ACS1 (V47).

Standard value: 4.5-5.5 V

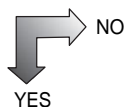
- Fault in engine ECU
- Faulty ECU connector



SAPH161060200311

6. MEASURING RESISTANCE BETWEEN TERMINALS

- (1) Measure resistance between the terminals ACS1 (V47) and ADG7 (V45).

Standard value: 25-35 kΩ

- Fault in engine ECU
- Faulty ECU connector

Bad contact of connectors

DTC:P2123 (Check sheet)

EN1610602F200248

DTC:P2123

Accelerator pedal position sensor 1 - out of range (Out of range high)

1. Technical description

- The accelerator sensor 1 cannot correctly sense.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- Accelerator pedal position sensor 1 voltage $\geq 4.1V$ (147%)
- Failure timer $\geq 1sec$

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Malfunction of sensor 1
- Malfunction of engine ECU
- Malfunction of harness

DTC:P2123	Accelerator pedal position sensor 1 - out of range (Out of range high)	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/ Fail)	If OK	If fail
1	Accelerator sensor 1	Replace the accelerator sensor.	When turning the starter switch ON, the malfunction recurs.		Replace the faulty accelerator sensor.	Proceed to No. 2.
2	Harness	After replacing an old accelerator sensor, replace the harness.	When turning the starter switch ON, the malfunction recurs.		Replace harness.	Proceed to No. 3.
3	Engine ECU	After replacing an old harness, replace the engine ECU.	When turning the starter switch ON, the malfunction recurs.		Replace the faulty ECU.	After replacing an old ECU, report to Development Department.

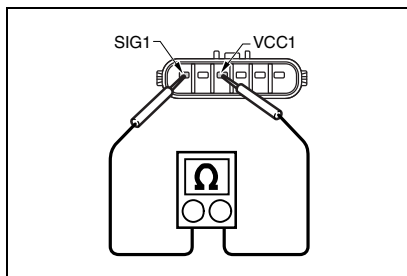
DN02-622

FUEL CONTROL (J08E)

DTC:P2123

EN1610602F200249

DTC	P2123	Accelerator pedal position sensor 1 - out of range (Out of range high)
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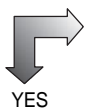
**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the accelerator sensor 1 connector.
- (3) Measure resistance between the terminals VCC1 and SIG1 of the accelerator sensor 1 connector.

HINT

If it is difficult to check only the sensor, proceed to Step 5.

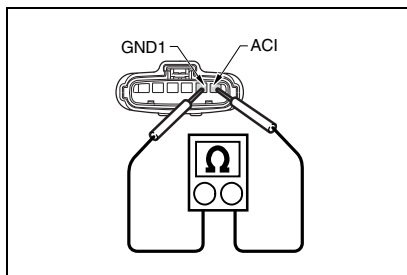
Standard value: 2 Ω or more



NO

Fault in accelerator sensor 1

YES

**2. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Measure resistance between the terminals AC1 and GND1 of the accelerator sensor 1 connector (engine sub harness side).

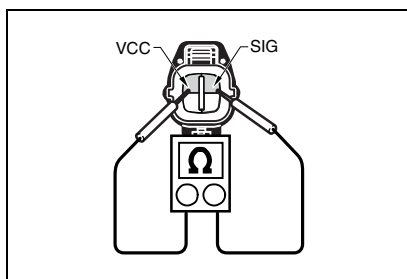
Standard value: 25-35 k Ω



NO

- Faulty in harness
- Irregular contact of connectors

YES

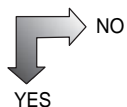


SAPH161060200240

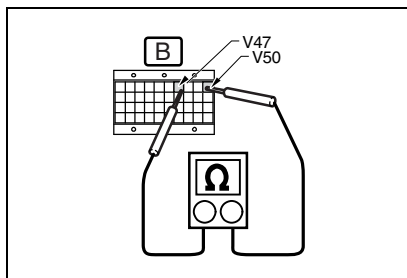
3. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS

- (1) Measure resistance between the terminals VCC1 and AC1 of the accelerator sensor 1 connector (engine sub harness side).

Standard value: 31 k Ω



- Faulty in harness
- Irregular contact of connectors

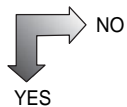


SAPH161060200314

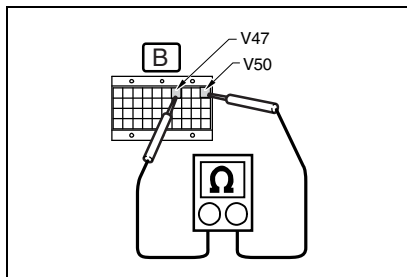
4. MEASURING RESISTANCE BETWEEN TERMINALS

- (1) Connect the signal check harness on the vehicle side.
 (2) Disconnect the connector on the engine sub harness side.
 (3) Measure resistance between the terminals AVC3 (V50) and ACS1 (V47).

Standard value: $\infty \Omega$



Faulty in engine ECU

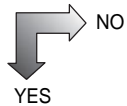


SAPH161060200315

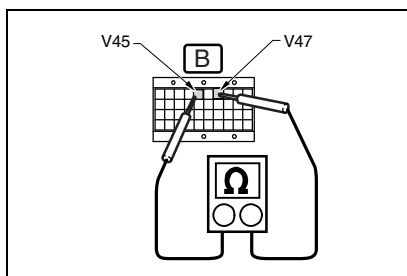
5. MEASURING RESISTANCE BETWEEN TERMINALS

- (1) Connect the accelerator sensor 1 connector.
 (2) Connect the connector on the engine sub harness side.
 (3) Disconnect the connector on the engine ECU side
 (4) Measure resistance between the terminals AVC3 (V50) and ACS1 (V47).

Standard value: 2 Ω or more



- Faulty in harness
- Fault in accelerator sensor 1

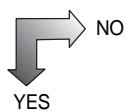


SAPH161060200316

6. MEASURING RESISTANCE BETWEEN TERMINALS

- (1) Measure resistance between the terminals ADG7 (V45) and ACS1 (V47).

Standard value: 2 Ω or more



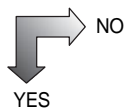
NO

- Faulty in harness
- Irregular contact of connectors

YES

7. CHECK A MALFUNCTION CODE.

- (1) Connect the connector on the engine ECU side.
(2) Disconnect the accelerator sensor 1 connector.
(3) Set the starter switch to "ON" position.
(4) Make sure that the malfunction code P2122 is present.



NO

Fault in engine ECU

YES

Clear and recheck the DTC.



FUEL CONTROL (J08E)

DN02-625



DN02-626

FUEL CONTROL (J08E)

DTC:P2127 (Check sheet)

EN1610602F200250

DTC:P2127

Accelerator pedal position sensor 2 - out of range (Out of range low)

1. Technical description

- The accelerator sensor 2 cannot correctly sense.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- The engine has stopped (stalled) or runs at 500 r/min or higher for continuous 5 seconds or longer.

(2) Judgment criteria

- Accelerator pedal position sensor 2 voltage $\leq 1.4V$ (-15.4%)
Failure timer $\geq 1\text{sec}$

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Malfunction of sensor 2
- Malfunction of engine ECU
- Malfunction of harness

DTC:P2127	Accelerator pedal position sensor 2 - out of range (Out of range low)	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/ Fail)	If OK	If fail
1	Accelerator sensor 2	Replace the accelerator sensor.	When turning the starter switch ON, the malfunction recurs.		Replace the faulty accelerator sensor.	Proceed to No. 2.
2	Harness	After replacing an old accelerator sensor, replace the harness.	When turning the starter switch ON, the malfunction recurs.		Replace harness.	Proceed to No. 3.
3	Engine ECU	After replacing an old harness, replace the engine ECU.	When turning the starter switch ON, the malfunction recurs.		Replace the faulty ECU.	After replacing an old ECU, report to Development Department.

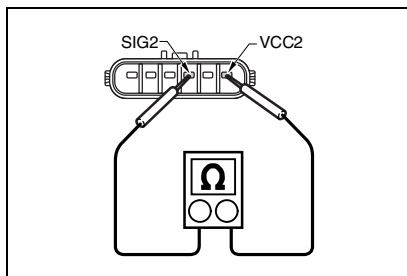
DN02-628

FUEL CONTROL (J08E)

DTC:P2127

EN1610602F200251

DTC	P2127	Accelerator pedal position sensor 2 - out of range (Out of range low)
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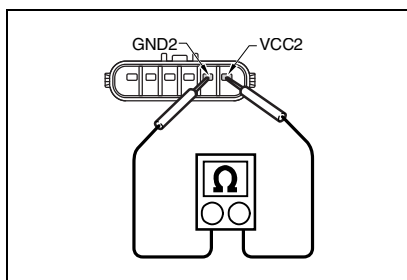
**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the accelerator sensor 2 connector.
- (3) Check continuity between the terminals VCC2 and SIG2 of the accelerator sensor 2 connector.

HINT

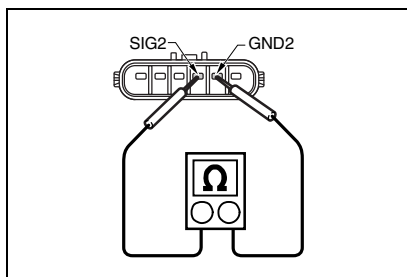
If it is difficult to check only the sensor, proceed to Step 4.

Standard value: 2 Ω or more



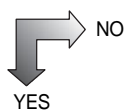
- (4) Check continuity between the terminals VCC2 and GND2 of the accelerator sensor 2 connector.

Standard value: 2 Ω or more

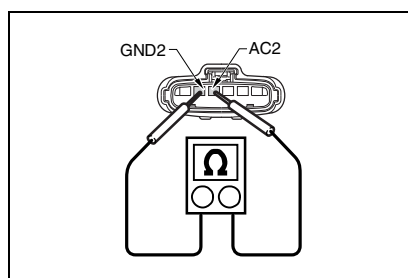


- (5) Check continuity between the terminals SIG2 and GND2 of the accelerator sensor 2 connector.

Standard value: 2 Ω or more



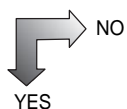
Fault in accelerator sensor 2



SAPH161060200320

2. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS

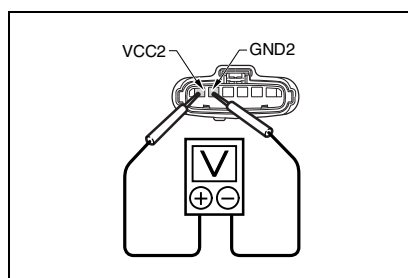
- (1) Measure resistance between the terminals AC2 and GND2 of the accelerator sensor 2 connector (engine sub harness side).

Standard value: 25-35 kΩ

NO

- Faulty in harness
- Irregular contact of connectors

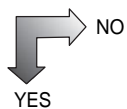
YES



SAPH161060200321

3. MEASURING VOLTAGE BETWEEN SENSOR TERMINALS

- (1) Set the starter switch to "ON" position.
(2) Measure voltage between the terminals VCC2 and GND2 of the accelerator sensor 2 connector (engine sub harness side).

Standard value: 4.5-5.5 V

NO

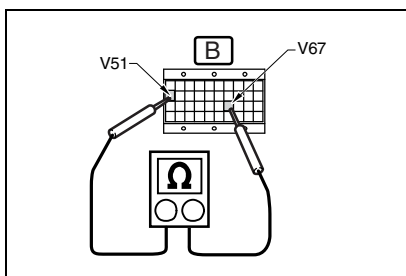
- Faulty in harness
- Irregular contact of connectors

YES

Bad contact of connectors

DN02-630

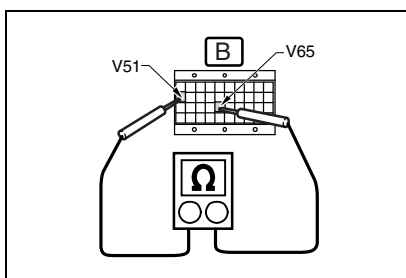
FUEL CONTROL (J08E)



SAPH161060200322

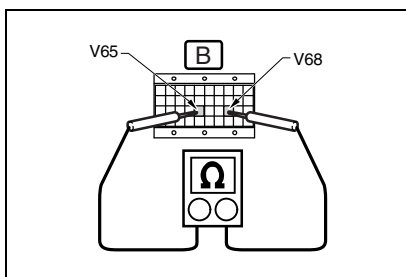
4. MEASURING RESISTANCE BETWEEN TERMINALS

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness on the vehicle side.
- (3) Disconnect the connector on the engine ECU side.
- (4) Measure resistance between the terminals AVC4 (V51) and ACS2 (V67).

Standard value: 2 Ω or more

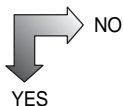
SAPH161060200323

- (5) Measure resistance between the terminals AVC4 (V51) and ADG8 (V65).

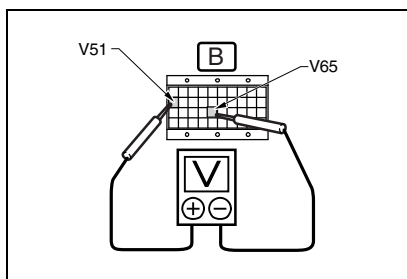
Standard value: 2 Ω or more

SAPH161060200324

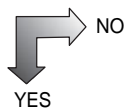
- (6) Measure resistance between the terminals ADG8 (V65) and ASCS (V68).

Standard value: $\infty \Omega$ 

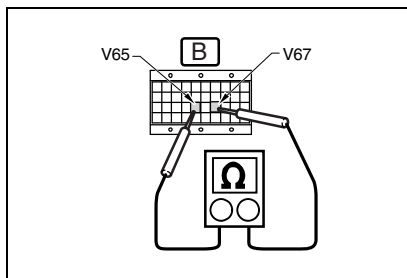
- Faulty in harness
- Fault in accelerator sensor 2

**5. MEASURING VOLTAGE BETWEEN TERMINALS**

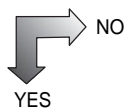
- (1) Connect the signal check harness connectors to the engine ECU side.
- (2) Disconnect the connector on the engine sub harness side.
- (3) Set the starter switch to "ON" position.
- (4) Measure voltage between the terminals AVC4 (V51) and ADG8 (V65).

Standard value: 4.5-5.5 V

- Fault in engine ECU
- Faulty ECU connector

**6. MEASURING RESISTANCE BETWEEN TERMINALS**

- (1) Measure resistance between the terminals ACS2 (V67) and ADG8 (V65).

Standard value: 25-35 kΩ

- Fault in engine ECU
- Faulty ECU connector

Bad contact of connectors

DN02-632

FUEL CONTROL (J08E)

DTC:P2128 (Check sheet)

EN1610602F200252

DTC:P2128

Accelerator pedal position sensor 2 - out of range (Out of range high)

1. Technical description

- The accelerator sensor 2 cannot correctly sense.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- Accelerator pedal position sensor 1 voltage $\geq 4.9V$ (147%)
- Failure timer $\geq 1\text{sec}$

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Malfunction of sensor 2
- Malfunction of engine ECU
- Malfunction of harness

DTC:P2128	Accelerator pedal position sensor 2 - out of range (Out of range high)	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/ Fail)	If OK	If fail
1	Accelerator sensor 2	Replace the accelerator sensor.	When turning the starter switch ON, the malfunction recurs.		Replace the faulty accelerator sensor.	Proceed to No. 2.
2	Harness	After replacing an old accelerator sensor, replace the harness.	When turning the starter switch ON, the malfunction recurs.		Replace harness.	Proceed to No. 3.
3	Engine ECU	After replacing an old harness, replace the engine ECU.	When turning the starter switch ON, the malfunction recurs.		Replace the faulty ECU.	After replacing an old ECU, report to Development Department.

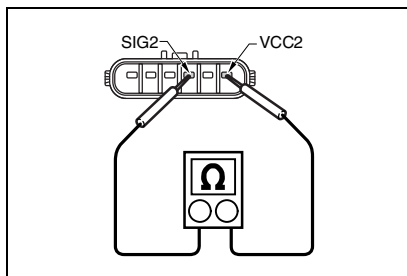
DN02-634

FUEL CONTROL (J08E)

DTC:P2128

EN1610602F200253

DTC	P2128	Accelerator pedal position sensor 2 - out of range (Out of range high)
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**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the accelerator sensor 2 connector.
- (3) Measure resistance between the terminals VCC2 and SIG2 of the accelerator sensor 2 connector.

HINT

If it is difficult to check only the sensor, proceed to Step 5.

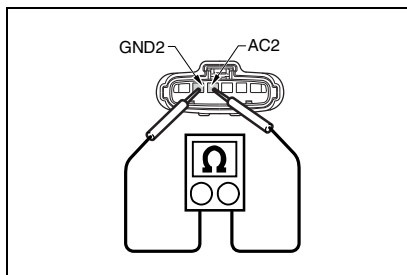
Standard value: 2 Ω or more



NO

Fault in accelerator sensor 2

YES

**2. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Measure resistance between the terminals AC2 and GND2 of the accelerator sensor 2 connector (engine sub harness side).

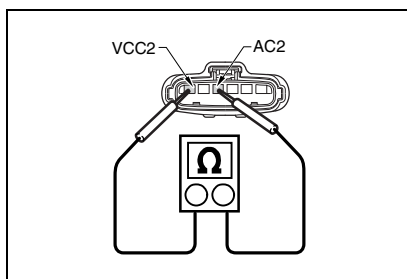
Standard value: 25-35 kΩ



NO

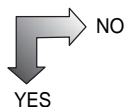
- Faulty in harness
- Irregular contact of connectors

YES

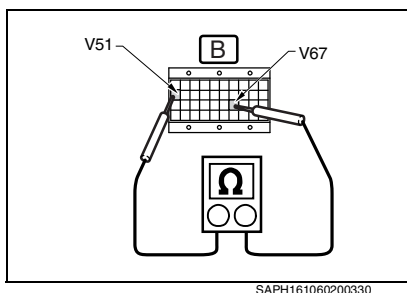
**3. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Measure resistance between the terminals VCC2 and AC2 of the accelerator sensor 2 connector (engine sub harness side).

Standard value: $\infty \Omega$

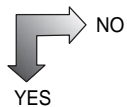


- Faulty in harness
- Irregular contact of connectors

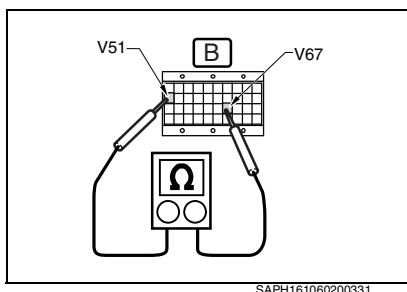
**4. MEASURING RESISTANCE BETWEEN TERMINALS**

- (1) Connect the signal check harness on the vehicle side.
(2) Disconnect the connector on the engine sub harness side.
(3) Measure resistance between the terminals AVC4 (V51) and ACS2 (V67).

Standard value: $\infty \Omega$

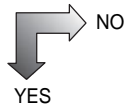


Faulty in engine ECU

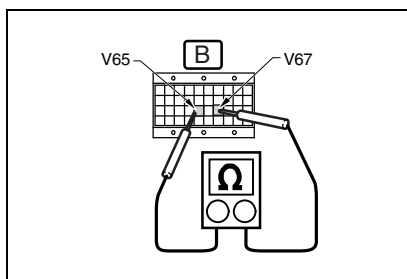
**5. MEASURING RESISTANCE BETWEEN TERMINALS**

- (1) Connect the accelerator sensor 2 connector.
(2) Connect the signal check harness on the engine sub harness side.
(3) Disconnect the connector on the engine ECU side.
(4) Measure resistance between the terminals AVC4 (V51) and ACS2 (V67).

Standard value: 2Ω or more

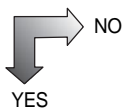


- Faulty in harness
- Fault in accelerator sensor 2

**6. MEASURING RESISTANCE BETWEEN TERMINALS**

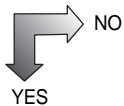
- (1) Measure resistance between the terminals ADG8 (V65) and ACS2 (V67).

Standard value: 2 Ω or more



NO

- Faulty in harness
- Irregular contact of connectors



NO

Fault in engine ECU

Clear and recheck the DTC.



FUEL CONTROL (J08E)

DN02-637



DN02-638

FUEL CONTROL (J08E)

DTC:P2135 (Check sheet)

EN1610602F200254

DTC:P2135

Intake throttle valve position sensor - rationality

1. Technical description

- The diesel throttle (intake throttle) controls throttle valves steplessly to control boost pressure and intake air volume. Inside the diesel throttle (intake throttle), a sensor designed to detect a travel of the valve consistently monitors an actual opening to compare with command value.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
The engine has stopped or runs at 500 r/min or higher for continuous 5 seconds.

(2) Judgment criteria

- A difference between throttle position sensors 1 and 2 remains at 5 degrees or greater for 3 seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Abnormal resistance of sensor
- Fault in harness and/or connector
- Malfunction of engine ECU sensor power supply

DTC:P2135	Intake throttle valve position sensor - rationality	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check for disconnection between the sensor and the ECU.			Replace harness.
2	Diesel throttle (intake throttle) position sensor	Check that sensor resistance meets a standard value.			Replace the sensor.

DN02-640

FUEL CONTROL (J08E)

DTC:P2135

EN1610602F200255

DTC	P2135	Intake throttle valve position sensor - rationality
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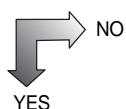
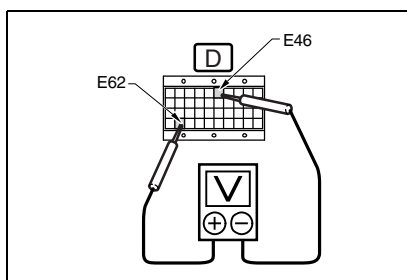
1. **CHECK THE INTAKE THROTTLE VALVE POSITION SENSORS 1 AND 2 FOR MALFUNCTIONS OR TROUBLES.**

2. **DISCONNECT THE BOOST PRESSURE SENSOR AND COMMON RAIL PRESSURE SENSOR CONNECTORS AND OBSERVE THAT A TROUBLE REMAINS.**

3. **MEASURING VOLTAGE BETWEEN TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness.
- (3) Set the starter switch to "ON" position.
- (4) Measure a difference in voltage between the terminals DTS1 (E62) and DTS2 (E46).

Standard value: Approximately 0.2V

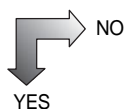
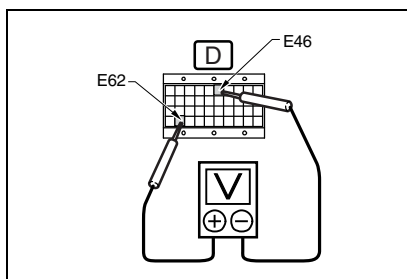


Faulty intake throttle valve position sensor

4. **MEASURING VOLTAGE BETWEEN TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the intake throttle valve position sensor connector.
- (3) Set the starter switch to "ON" position.
- (4) Measure voltage at DTS1 (E62) and DTS2 (E46).

Standard value: 0 V



Fault in engine ECU

Clear and recheck the DTC.



FUEL CONTROL (J08E)

DN02-641



DN02-642

FUEL CONTROL (J08E)

DTC:P2138 (Check sheet)

EN1610602F200256

DTC:P2138

Accelerator pedal position sensor - rationality

1. Technical description

- Abnormal characteristics or stuck sensing of accelerator sensor

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.
- The engine has stopped (stalled) or runs at 500 r/min or higher for continuous 5 seconds or longer.

(2) Judgment criteria

Comparison of sensor voltage between sensor 1 and sensor 2

- Accelerator pedal position sensor 2 voltage – Accelerator pedal position sensor 1 voltage.
≤ 0V or ≥ 1.6V
- Failure timer ≥ 3sec

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Malfunction of accelerator sensor
- Malfunction of engine ECU
- Malfunction of harness

DTC:P2138		Accelerator pedal position sensor - rationality			Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Accelerator sensor	Replace the accelerator sensor.	When turning the starter switch ON, the malfunction recurs.		Replace the faulty accelerator sensor.	Proceed to No. 2.
2	Harness	After replacing an old accelerator sensor, replace the harness.	When turning the starter switch ON, the malfunction recurs.		Replace harness.	Proceed to No. 3.
3	Engine ECU	After replacing an old harness, replace the engine ECU.	When turning the key ON, the malfunction recurs.		Replace the faulty ECU.	After replacing an old ECU, report to Development Department.

DN02-644

FUEL CONTROL (J08E)

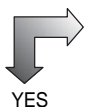
DTC:P2138

EN1610602F200257

DTC	P2138	Accelerator pedal position sensor - rationality
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1. INSPECT.

- (1) Check the accelerator sensor 1 or 2 for malfunctions or troubles.

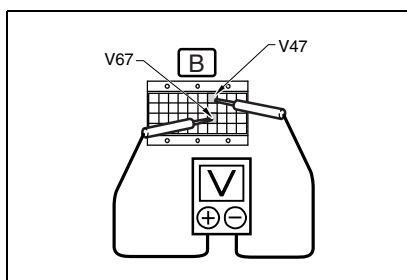


Troubleshoot individual sensors.

- (2) Check that no improper wiring is used in the GND harness of the P.T.O. accelerator sensor.



- Faulty P.T.O. accelerator sensor connector
- Faulty in harness

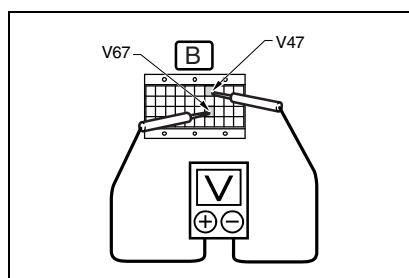
**2. MEASURING VOLTAGE BETWEEN TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness (blue).
- (3) Set the starter switch to "ON" position.
- (4) While depressing the accelerator pedal 0 to 100%, measure a difference in voltage between the terminals ACS1 (V47) and ACS2 (V67).

Standard value: 0.4-1.2 V



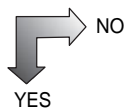
Fault in accelerator sensor



SAPH161060200336

3. MEASURING VOLTAGE BETWEEN TERMINALS

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the accelerator sensor connector.
- (3) Set the starter switch to "ON" position.
- (4) Check that voltage is 0 V at the terminals ACS1 (V47) and ACS2 (V67).



Fault in engine ECU

Clear and recheck the DTC.

DN02-646

FUEL CONTROL (J08E)

DTC:P2214 (Check sheet)

CHDBFEGD

DTC:P2214

Abnormal characteristics of downstream NOx sensor

1. Technical description

- With DEF dosing stopped and without NOx purification through the SCR catalyst, compare a reading taken by the downstream NOx sensor with a reading taken by the upstream NOx sensor to check likelihood of the sensors.

2. DTC set condition**(1) Check conditions**

- After DPR regeneration or at SCR catalyst temperature of 450°C (842°F) or higher
- Total 2200 mg or higher NOx emission from the engine after stop of DEF injection
- Sum of upstream and downstream NOx sensor readings (100seconds)

(2) Judgment criteria

- $0.5 < \text{sum of downstream NOx sensor readings} / \text{sum of upstream NOx sensor readings} < 1.5$

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Downstream NOx sensor: Abnormal NOx measurement characteristics
- Upstream NOx sensor: Abnormal NOx measurement characteristics
DEF dose Excessively high dose of DEF

DTC:P2214	Abnormal characteristics of downstream NOx sensor	Inspection Procedure
------------------	--	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	-	Perform initial inspection.	-		-
2	DEF	Measure DEF concentration.	$32.5 \pm 2.5\%$		Replace
3	Exhaust system	Check for gas leakage.	No leakage is allowed.		Reassemble
4	Mass air flow sensor	Using Hino-DX, compare the NMR with a new sensor. * Refer to P0101.	Difference between old and new sensor less than 10%		MAF Replace
5	SCR inlet temperature sensor	Immerse the sensor in hot water and check resistance. Check the value during the DPR forced regeneration on Hino-DX. Coupler check * Refer to P2483.	Within criteria Contiguous		Replace
6	Exhaust gas temperature sensor (DOC outlet)	Immerse the sensor in hot water and check resistance. Check the value during the DPR forced regeneration on Hino-DX. Coupler check * Refer to P246F.	Within criteria Contiguous		Replace
7	Ambient air temperature sensor	Check resistance. Coupler check * Refer to P0071.	Within criteria Contiguous		Replace
8	DEF pipe (pump ↔ injector)	DEF piping (pressure line) Appearance check	No crush, breakage or bend		Replace
9	DEF injector	Remove the DEF injector from the muffler and perform a urea solution addition test (added quantity pattern x 3).	The metered quantity of additive shall be within each standard.		NG: Replace DEF injector and go to step 10. * OK results prove that clogging caused by crystallized DEF is no longer present.
10	DEF injector	After replacement of the DEF injector, again perform a urea solution addition test (added quantity pattern x 3).	The metered quantity of additive shall be within each standard.		OK: Leave the new DEF injector installed. NG: Replace the DEF piping (pump ↔ injector). * Re-install the previous DEF injector.

DN02-648

FUEL CONTROL (J08E)

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
11	NOx sensor (upstream and down- stream)	Replace the upstream and downstream NOx sensors.			
-		Driving is required to some extent to check that the normal state is restored. Once return it to the driver and see how it works.			



FUEL CONTROL (J08E)

DN02-649



DN02-650

FUEL CONTROL (J08E)

DTC:P2227 (Check sheet)

EN1610602F200258

DTC:P2227

Barometric pressure sensor - rationality

1. Technical description

- Atmospheric pressure cannot be correctly sensed.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Engine stop (stall)
- No abnormal characteristics of boost pressure sensor

(2) Judgment criteria

- | Average boost pressure - Average barometric pressure | \geq 18kPa
- Failure timer \geq 3sec

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

ECU: Malfunction of ECU

FUEL CONTROL (J08E)

DN02-651

DTC:P2227	Barometric pressure sensor - rationality	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	ECU	1. Turn the starter switch OFF from ON and wait until the ECU main relay turns off. 2. Turn the starter switch ON again. If the relay does not turn on, replace ECU.			ECU Replace

DN02-652

FUEL CONTROL (J08E)

DTC:P2228 (Check sheet)

EN1610602F200259

DTC:P2228

Barometric pressure sensor - out of range (out of range low)

1. Technical description

- The atmospheric pressure sensor (inside the ECU) is not properly functioning.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range, and
Engine stall, or
Engine speed ≥ 500 r/min for 5sec

(2) Judgment criteria

- Barometric pressure sensor voltage < 1.9 V(43.3kPa)
- Failure timer ≥ 3 sec

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

ECU: Malfunction of ECU

FUEL CONTROL (J08E)

DN02-653

DTC:P2228	Barometric pressure sensor - out of range (out of range low)	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	ECU	1. Turn the starter switch OFF from ON and wait until the ECU main relay turns off. 2. Turn the starter switch ON again. If the relay does not turn on, replace ECU.			ECU Replace

DN02-654

FUEL CONTROL (J08E)

DTC:P2229 (Check sheet)

EN1610602F200260

DTC:P2229

Barometric pressure sensor - out of range (out of range high)

1. Technical description

- The atmospheric pressure sensor (inside the ECU) is not properly functioning.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range, and
Engine stall, or
Engine speed ≥ 500 r/min for 5sec

(2) Judgment criteria

- Barometric pressure sensor voltage > 4.2 V (120 kPa)
- Failure timer ≥ 3 sec

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

ECU: Malfunction of ECU

FUEL CONTROL (J08E)

DN02-655

DTC:P2229	Barometric pressure sensor - out of range (out of range high)	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	ECU	1. Turn the starter switch OFF from ON and wait until the ECU main relay turns off. 2. Turn the starter switch ON again. If the relay does not turn on, replace ECU.			ECU Replace

DTC:P2227/P2228/P2229

EN1610602F200261

DTC	P2227	Barometric pressure sensor - rationality
DTC	P2228	Barometric pressure sensor - out of range (Out of range low)
DTC	P2229	Barometric pressure sensor - out of range (Out of range high)

1. CHECK THAT NO OTHER DIAGNOSIS CODES EXIST.
2. AFTER THE STARTER SWITCH IS POSITIONED ON THE "LOCK" ONCE, IT SHOULD BE TURNED TO "ON" POSITION AGAIN.
3. AFTER ERASING THE DTC, CHECK THAT THE SAME CODE IS DISPLAYED AGAIN.

NO
YES

Fault in engine ECU

Normal
(Temporary malfunction because of radio interference noise)

DN02-656

FUEL CONTROL (J08E)

DTC:P2269 (Check sheet)

EN1610602F200262

DTC:P2269	Water in Fuel Condition
------------------	-------------------------

1. Technical description

- Water trapped in the fuel filter has been detected.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.
- Battery voltage is in the 10 - 16 V range.

(2) Judgment criteria

- Fuel filter water level sensor switch is ON.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Water has been trapped in the fuel filter.

FUEL CONTROL (J08E)

DN02-657

DTC:P2269		Water in Fuel Condition			Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Fuel filter	Drain water from the fuel filter.	When turning the starter switch ON, the fuel filter water level sensor switch will be ON or OFF. OFF → OK ON → Fail		This step will end.	Proceed to No. 2.
2	Fuel filter	Check the fuel filter water level sensor.	Standard value: 0V (Without water) Less than 0.7 V and greater than 0.6 V (With water present between the WIF probe rods)		Proceed to No. 4.	Proceed to No. 3.
3	Fuel filter	Replace the fuel filter water level sensor.	When turning the starter switch ON, the fuel filter water level sensor switch will be ON or OFF. OFF → OK ON → Fail		This step will end.	Proceed to No. 4.
4	Harness	Replace the harness.	When turning the starter switch ON, the fuel filter water level sensor switch will be ON or OFF. OFF → OK ON → Fail		This step will end.	Proceed to No. 5.
5	Engine ECU	Replace the engine ECU.	When turning the starter switch ON, the fuel filter water level sensor switch will be ON or OFF. OFF → OK ON → Fail		This step will end.	Report to Development Department.

DN02-658

FUEL CONTROL (J08E)

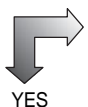
DTC:P2269

EN1610602F200263

DTC	P2269	Water in Fuel Condition
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1. CHECK THE FUEL FILTER.

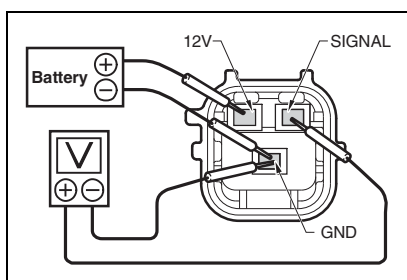
- (1) Confirm that the water is not accumulated in the fuel filter.



NO

Drain the water.

YES



SAPH161060200337

2. CHECK THE FUEL FILTER WATER LEVEL SENSOR.

- (1) Disconnect the connector of the fuel filter water level sensor.
(2) Connect power leads and digital multi meter (DMM) leads as shown.
(3) Measure voltage between the ground terminal and the signal terminal (filter side connector).

Standard value:**0 V (Without water)****Less than 0.7 V and greater than 0.6 V (With water present between the WIF probe rods)**

NO

Faulty in fuel filter water level sensor.

YES

- Fault in engine ECU
- Malfunction of ECU connectors
- Malfunction of harness (Short)



FUEL CONTROL (J08E)

DN02-659



DN02-660

FUEL CONTROL (J08E)

DTC:P226C (Check sheet)

EN1610602F200264

DTC:P226C

VNT slow response

1. Technical description

- The VNT moves the nozzle vane steplessly by the REA (Rotary Electric Actuator) to control the turbo speed and boost pressure.
- The REA has a sensor to detect the movement of the actuator, always monitoring the reading and actual value of the nozzle vane opening.

2. DTC set condition**(1) Check conditions**

- While the engine is in operation - Always

(2) Judgment criteria

- When the read opening changes more than 4%, a divergence of more than 4% between the read opening and actual opening continues for four seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Deterioration or sticking due to rust, etc. of VNT link rod
- Irregular contact of connector to REA
- Disconnection or short-circuiting of harness

DTC:P226C	VNT slow response	Inspection Procedure
------------------	--------------------------	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	VNT link	Manually check the VNT link operation.	Must be moved manually.		Application of grease
2	VNT	Check the VNT using the HINO-DX.	Delay in opening response to be within two seconds		Delayed more than two seconds: Replace the turbo. Not moved: Go to step 3
3	VNT controller	Measure the power supply voltage of the controller.	More than 8V		Check of supply circuit
4	VNT REA	Measure the resistance of the REA side terminal.	$2.1\Omega \pm 0.3\Omega$		Replace the turbo ASSY.
5	VNT REA	Check the terminal between the controller and REA for continuity.	Must be conducting.		Repair of harness

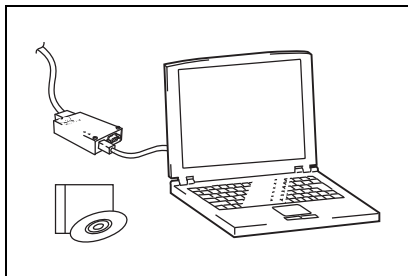
DN02-662

FUEL CONTROL (J08E)

DTC:P226C

EN1610602F200265

DTC	P226C	VNT slow response
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**1. INSPECT THE VNT.**

- (1) Connect Hino-DX to the vehicle.
- (2) Set the starter switch to "ON" position.
- (3) Delete the DTC code.

Standard value: No DTC code will be output again.

NO
YES

- Faulty VNT controller
- Faulty turbocharger

Check the harness (Proceed to P0045)



FUEL CONTROL (J08E)

DN02-663



DTC:P242B (Check sheet 1)

EN1610602F200266

DTC:P242B

Exhaust gas temperature sensor (DOC inlet) - rationality

1. Technical description

- The temperature sensor consistently detects exhaust gas temperature.
- A reading taken by the exhaust gas temperature sensor is used to control DPR regeneration.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
- Engine speed remains at 500 r/min or higher for 5 seconds or longer.
- Within 10 seconds after start
- A difference between a coolant temperature and an intake air temperature falls within +/- 8°C {46.4°F}.
- A difference between a BCU exhaust gas temperature sensor reading and an exhaust gas temperature sensor reading (DOC outlet) falls within +/- 30°C {86°F}.
- Coolant temperature and intake air temperature of -10°C {14°F} or higher
- BCU exhaust gas temperature sensor reading of 30°C {86°F} or lower
- No other DTCs are present.

(2) Judgment criteria

- A temperature difference from a BCU exhaust gas temperature sensor reading remains at +/- 70°C {158°F} or more for 1 second or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Exhaust gas temperature sensor (DOC inlet):

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormal resistance of sensor
- Failure in engine ECU sensor power supply

DTC:P242B	Exhaust gas temperature sensor (DOC inlet) - ratio-nality	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check whether the exhaust gas tempera-ture sensor (DOC inlet) is loose/discon-nected.			Connect the sensor prop-erly.
2	Exhaust gas temper-ature sensor (DOC inlet)	Check whether a sensing area of the exhaust gas temperature sensor (DOC inlet) is contaminated, clogged or damaged.			Remove contami-nants. Replace if damaged.
3	Exhaust gas temper-ature sensor (DOC inlet)	Check whether sensor resistance of the exhaust gas temperature sensor (DOC inlet) is proper.			Replace the sensor.

DTC:P242B (Check sheet 2)

EN1610602F200267

DTC:P242B

Exhaust gas temperature sensor (DOC inlet) - rationality

1. Technical description

- The temperature sensor consistently detects exhaust gas temperature.
- A reading taken by the exhaust gas temperature sensor is used to control DPR regeneration.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
 - Engine speed remains at 500 r/min or higher for 5 seconds or longer.
 - After elapse of 10 seconds from start
 - Accumulated exhaust gas flow (intake air volume + fuel injection rate) of 3 kg or more
- The conditions described above are met and the conditions described below remain for 10 seconds or longer.
- A difference of coolant temperature and intake air temperature is +/- 15°C {59°F} or more.
 - Stable for 10 seconds or longer
 - A change in engine speed falls within +/- 30 r/min.
 - A change in injection rate falls within +/- 10 mm³/st.cyl.
 - Vehicle speed is 18.8 miles/h or higher.
 - No other DTCs are present.

(2) Judgment criteria

- A temperature difference from a BCU exhaust gas temperature sensor reading remains at +/- 50°C {122°F} or more for 3 second or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Exhaust gas temperature sensor (DOC inlet):

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormal resistance of sensor
- Failure in engine ECU sensor power supply

DTC:P242B	Exhaust gas temperature sensor (DOC inlet) - ratio-nality	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Harness	Check whether the exhaust gas tempera-ture sensor (DOC inlet) is loose/discon-nected.			Connect the sensor prop-erly.
2	Exhaust gas temper-ature sensor (DOC inlet)	Check whether a sensing area of the exhaust gas temperature sensor (DOC inlet) is contaminated, clogged or damaged.			Remove contami-nants. Replace if damaged.
3	Exhaust gas temper-ature sensor (DOC inlet)	Check whether sensor resistance of the exhaust gas temperature sensor (DOC inlet) is proper.			Replace the sensor.

DN02-668

FUEL CONTROL (J08E)

DTC:P242B

EN1610602F200268

DTC	P242B	Exhaust gas temperature sensor (DOC inlet) - rationality
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1. CHECK THE EXHAUST GAS TEMPERATURE SENSOR.

- (1) Check that the exhaust gas temperature sensor is normally installed.
- (2) Check the exhaust gas temperature sensor measurement portion for dirt and foreign matters.
- (3) Check the DPR and muffler for clogging and leakage.



NO

Improper installation of the sensor.

YES

2. CHECK INSTALLATION OF THE CONNECTOR.

- (1) Check that the exhaust gas temperature sensor (DOC inlet) connector is properly installed.



NO

Improper connection of connector

YES

3. CHECK WHETHER THE SENSOR IS IN NORMAL CONDITION.

- (1) Troubleshoot the P242C and P242D and check whether the sensor is in normal condition.



NO

Fault in exhaust gas temperature sensor (DOC inlet)

YES

4. CHECK WHETHER OTHER ARE IN NORMAL CONDITION.

- (1) If the GND terminal is shared in use, disconnect all sensor connectors that use the GND terminal and check whether condition is normal.



NO

Fault in engine ECU

YES

Fault in other sensors



FUEL CONTROL (J08E)

DN02-669



DTC:P242C (Check sheet)

EN1610602F200269

DTC:P242C	Exhaust gas temperature sensor (DOC inlet) - out of range (Out of range low)
------------------	--

1. Technical description

- The temperature sensor consistently detects exhaust gas temperature.
- A reading taken by the exhaust gas temperature sensor is used to control DPR regeneration.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
- The engine has stopped or runs at 500 r/min or higher for continuous 5 seconds.

(2) Judgment criteria

- Voltage of the exhaust gas temperature sensor (DOC inlet) remains less than 0.0057 V (1,240°C {2,264°F}) for 3 seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Exhaust gas temperature sensor (DOC inlet):

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormal resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact

DTC:P242C	Exhaust gas temperature sensor (DOC inlet) - out of range (Out of range low)	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Exhaust gas temperature sensor (DOC inlet)	Check whether the exhaust gas temperature sensor (DOC inlet) is loose/disconnected.			Install the sensor.
2	Exhaust gas temperature sensor (DOC inlet)	Check whether a sensing area of the exhaust gas temperature sensor (DOC inlet) is contaminated, clogged or damaged.			Remove all contaminants and clogging. Replace if damaged.
3	Exhaust gas temperature sensor (DOC inlet)	Check whether sensor resistance of the exhaust gas temperature sensor (DOC inlet) is proper.	Resistance		Replace the sensor.
4	Exhaust gas temperature sensor (DOC inlet)	Check whether irregular contact of the sensor harness or harness connector has occurred in the exhaust gas temperature sensor (DOC inlet).			Repair or replace the harness and/or connector.
5	Exhaust gas temperature sensor (DOC inlet)	Check whether the exhaust gas temperature sensor (DOC inlet) harness is disconnected or short-circuited.	Check continuity.		Repair or replace the harness.
6	Exhaust gas temperature sensor (DOC inlet)	Check whether the sensor itself has electrical continuity.			Replace the sensor.
7	Sensor	Check whether a failure or malfunction has occurred in the sensors that use the same power supply or GND (ECU internal power supply).	Battery voltage: 10 to 16 V		Replace faulty sensors.

DTC:P242D (Check sheet)

EN1610602F200270

DTC:P242D	Exhaust gas temperature sensor (DOC inlet) - out of range (Out of range high)
------------------	---

1. Technical description

- The temperature sensor consistently detects exhaust gas temperature.
- A reading taken by the exhaust gas temperature sensor is used to control DPR regeneration.

2. DTC set condition**(1) Check conditions**

- Intake air temperature is -20°C {-4°F} or higher.
- Battery voltage is in the 10 - 16 V range.
- The engine has stopped or runs at 500 r/min or higher for continuous 5 seconds.
- No other DTCs are present.

(2) Judgment criteria

- Voltage of the exhaust gas temperature sensor (DOC inlet) remains at 4.958 V or higher (-46°C {-50.8°F} or lower) for 3 seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Exhaust gas temperature sensor (DOC inlet):

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormal resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact
- Short-circuit in the sensor

DTC:P242D	Exhaust gas temperature sensor (DOC inlet) - out of range (Out of range high)	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Exhaust gas temperature sensor (DOC inlet)	Check whether the exhaust gas temperature sensor (DOC inlet) is loose/disconnected.			Install the sensor properly.
2	Exhaust gas temperature sensor (DOC inlet)	Check whether a sensing area of the exhaust gas temperature sensor (DOC inlet) is contaminated, clogged or damaged.			Remove all contaminants and clogging. Replace if damaged.
3	Exhaust gas temperature sensor (DOC inlet)	Check whether sensor resistance of the exhaust gas temperature sensor (DOC inlet) is proper.	Resistance		Replace the sensor.
4	Exhaust gas temperature sensor (DOC inlet)	Check whether irregular contact of the sensor harness or harness connector has occurred in the exhaust gas temperature sensor (DOC inlet).			Repair or replace the harness and/or connector.
5	Exhaust gas temperature sensor (DOC inlet)	Check whether the exhaust gas temperature sensor (DOC inlet) harness is disconnected or short-circuited.	Check continuity.		Repair or replace the harness.
6	Exhaust gas temperature sensor (DOC inlet)	Check whether the sensor itself has electrical continuity.			Replace the sensor.
7	Sensor	Check whether a failure or malfunction has occurred in the sensors that use the same power supply or GND (ECU internal power supply).	Battery voltage: 10 to 16 V		Replace faulty sensors.

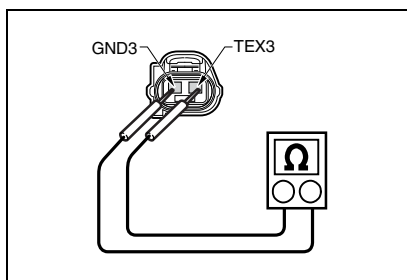
DN02-674

FUEL CONTROL (J08E)

DTC:P242C/P242D

EN1610602F200271

DTC	P242C	Exhaust gas temperature sensor (DOC inlet) - out of range (Out of range low)
DTC	P242D	Exhaust gas temperature sensor (DOC inlet) - out of range (Out of range high)

**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the exhaust gas temperature sensor (DOC inlet) connector.
- (3) Measure resistance between the terminals TEX3 and GND3 of the exhaust gas temperature sensor (DOC inlet).

HINT

If it is difficult to check only the sensor, proceed to Step 3.

Standard value:

9.75 kΩ (50°C {122°F})

3.77 kΩ (100°C {212°F})

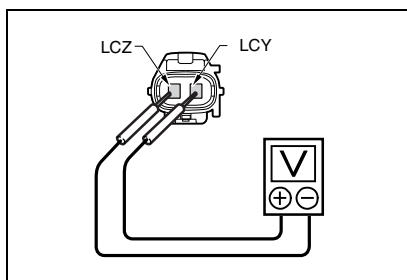
1.80 kΩ (150°C {302°F})



NO

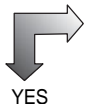
Faulty exhaust gas temperature sensor (DOC inlet)

YES

**2. MEASURING VOLTAGE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "ON" position.
- (2) Measure voltage between the terminals LCY and LCZ of the exhaust gas temperature sensor (DOC inlet) connector (engine sub harness side).

Standard: 4.5-5.5 V

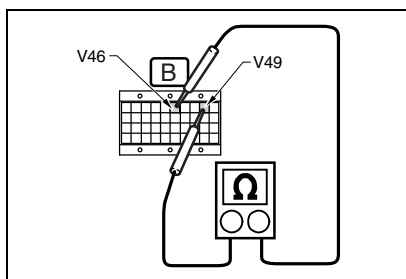


NO

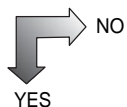
Proceed to 4.

YES

Bad contact of connectors

**3. MEASURING RESISTANCE BETWEEN TERMINALS**

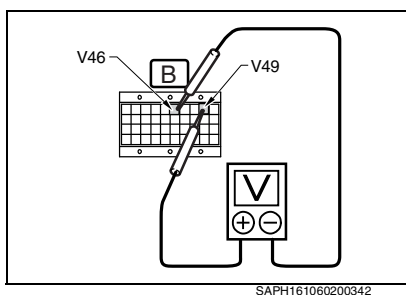
- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness on the vehicle side.
- (3) Disconnect the connector on the engine ECU side.
- (4) Measure resistance between the terminals ET2+ (V49) and ADG9 (V46).

Standard value:**9.75 k Ω (50°C {122°F})****3.77 k Ω (100°C {212°F})****1.80 k Ω (150°C {302°F})**

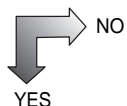
NO

- Faulty exhaust gas temperature sensor (DOC inlet)
- Faulty in harness
- Faulty sensor connector

Fault in engine ECU

**4. MEASURING VOLTAGE BETWEEN TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness on the vehicle side.
- (3) Set the starter switch to "ON" position.
- (4) Measure voltage between the terminals ET2+ (V49) and ADG9 (V46).

Standard: 4.5-5.5 V

NO

- Fault in engine ECU
- Faulty ECU connector

Faulty in harness

DTC:P244A (Check sheet 1)

EN1610602F200272

DTC:P244A	Filtering performance (missing substrate)
------------------	---

1. Technical description

- ECU constantly calculate and accumulate the amount of soot emission from the engine.
- Moreover, based on the values of the differential pressure sensor and the DPR temperature sensor, ECU detects clogging and erosion of the DPR.

2. DTC set condition**(1) Check conditions**

- The engine must not be stopped.
- Before automatic regeneration
- Burner in inactive status
- Calculated exhaust gas flow rate of 205 L/s or higher

(2) Judgment criteria

P244A (abnormal drop in DPR differential pressure) is set when the following condition is met.
 Judge when a differential pressure value is equal to or lower than a differential pressure threshold (MAP value) defined by calculated exhaust gas flow rate and differential pressure, for 15 seconds.
 (Example: At an exhaust gas flow rate of 800 L/s, differential pressure is equal to or lower than 2 kPa for 15 seconds.)

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- DPR filter
Check for intended filter tampering or damage on the rear end surface.
 - Abnormal control of the temperature at regeneration
Burner system failure: Excessively high burner outlet temperature
 - Filter damage due to abnormally-high temperature at regeneration due to excessive soot emission.
Injector: Characteristic abnormality of injection volume
SCV: Faulty control of common rail pressure
EGR valve: Faulty control of EGR opening angle
Diesel throttle valve: Faulty control of diesel throttle valve opening angle
Refer to "ENG basic inspection".
- [Confirmation points for judgment]
- Fault in the differential pressure sensor system
Check for misjudgment due to fault in the differential pressure sensor, damage or incorrect connection of the hose.
Check for misjudgment due to clogging, hole or fault in the differential sensor pipe.
 - Fault in the air flow meter
Check for misjudgment due to abnormal air volume for gas flow rate calculation.
 - Exhaust gas temperature sensor
Check for misjudgment due to characteristic abnormality of the temperature for gas flow rate calculation.

DTC:P244A		Filtering performance (missing substrate)		Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Engine body	Use a main body check sheet in inspection.			Inspect the body.
2	Differential pressure sensor	Check resistance between terminals of the differential pressure sensor.			Replace the sensor.
3	Differential pressure pipe	Inside clogging, cracks or crush			Remove clogging.
4	Differential pressure hose	Damage or cracks			Replace
5	Air flow meter	Check the connector fitting. Check characteristics. (Replace with a new air flow meter and check that a deviation in characteristics does not exceed 10%.)	10% or higher		Replace
6	Exhaust gas temperature sensor	Check the connector fitting. Check sensor resistance.			Replace the sensor.
7	DPR filter	Soot leaks on the rear end surface Intended removal			Replace
8	Burner	Inspect the burner system.	P141F must not be present.		Proceed to detailed analysis. (DX-BCU)

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FUEL CONTROL (J08E)

DTC:P244A (Check sheet 2)

EN1610602F200273

DTC:P244A

Breakage of DPF

1. Technical description

- ECU constantly calculate and accumulate the amount of soot emission from the engine.
- Moreover, based on the values of the differential pressure sensor and the DPR temperature sensor, ECU detects clogging and erosion of the DPR.

2. DTC set condition**(1) Check conditions**

- The engine is not stopped.

(2) Judgment criteria

P244A (abnormal drop in DPR differential pressure) is set when the following condition is met.
The differential pressure value is equal to or lower than the differential pressure threshold at the specified exhaust gas flow rate (MAP value) obtained from the two-dimensional map of the engine speed and the fuel injection volume for 15 seconds.
(Example: At the exhaust gas flow rate of 800 L/s, the differential pressure is equal to or lower than 2 kPa for 15 seconds.)

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- DPR filter
Check for intended filter tampering or damage on the rear end surface.
- Abnormal control of the temperature at regeneration
Burner system failure: Abnormally-high burner outlet temperature
- Filter damage due to abnormally-high temperature at regeneration due to excessive soot emission.
Injector: Characteristic abnormality of injection volume
SCV: Faulty control of common rail pressure
EGR valve: Faulty control of EGR opening angle
Diesel throttle valve: Faulty control of diesel throttle valve opening angle

[Confirmation points for judgment]

- Fault in the differential pressure sensor system
Check for misjudgment due to fault in the differential pressure sensor, damage or incorrect connection of the hose.
Check for misjudgment due to clogging, hole or fault in the differential sensor pipe.
- Fault in the air flow meter
Check for misjudgment due to abnormal air volume for gas flow rate calculation.
- Exhaust gas temperature sensor
Check for misjudgment due to characteristic abnormality of the temperature for gas flow rate calculation.

DTC:P244A		Breakage of DPF		Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	HinoDX report	History data of the temperature sensor before DPR	950°C {1,742°F} or higher history data		Check the filter.
2	Differential pressure sensor	Check resistance between terminals of the differential pressure sensor.			Replace the sensor.
3	Differential pressure pipe	Inside clogging, cracks or crush			Remove clogging.
4	Differential pressure hose	Damage or cracks			Replace the hose.
5	DPR filter	Soot leaks on the rear end surface Intended removal			Replace the filter.
6	Exhaust gas temperature sensor	Check the connector fitting. Check sensor resistance.			Replace the sensor.
7	Burner system	Check for P141F. (P141F: Malfunction in burner system)	Check for history data indicating abnormally-high temperature. (P****)		Inspect the burner.
8	EGR Valve	Check EGR valve (connection condition of connectors by Hino-DX active test)	While the valve is commanded to be fully closed, "abnormal opening angle"(P1458) is set or 5% or more delay in opening occurs.		Replace EGR valve
9	Turbocharger	Check the VGT position tracking ability (To be able by active check on Hino-DX)	Abnormal opening angle (P0045/ P226C) A delay of 2 seconds or more in opening occurs.		Replace turbocharger
10	Diesel throttle valve	Check for abnormal opening angle or the valve being stuck closed.			Replace the valve.
11	SCV	Free acceleration test	Following target rail pressure		SCV Replace

DN02-680

FUEL CONTROL (J08E)

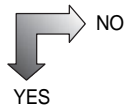
DTC:P244A

EN1610602F200274

DTC	P244A	Filtering performance (missing substrate)
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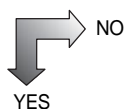
1. CHECK THE DPR.

- (1) Remove the DPR.
- (2) Check for soot leakage, damage and cracking.

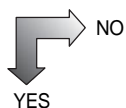


Replace the DPR.

- (3) Blow air against the DPR.
- (4) Perform a forced regeneration and check that regeneration is completed.



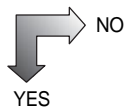
Inspect the burner system.

2. INSPECT DIFFERENTIAL PRESSURE OF THE DPR.

- Check the differential pressure sensor and differential pressure pipe for clogging.
- Check the hose for damage.

3. CHECK FOR EXHAUST GAS LEAKAGE.

- (1) Check the muffler body and flange surface for gas leakage.



Inspection or replacement of the exhaust gas pipe

Delete the error and see how it works.



FUEL CONTROL (J08E)

DN02-681



DN02-682

FUEL CONTROL (J08E)

DTC:P244B

EN16Z0702F200003

DTC	P244B	Incomplete regeneration / DPF clogged
-----	-------	---------------------------------------

P244B has two types of DTC detection conditions. The inspection method differs according to the detection conditions. Perform inspection according to the inspection method matching the detection conditions.

Refer to the Hino DX report and confirm the soot accumulation quantity.

When the soot accumulation quantity is less than 5.0 g/L, refer to sheet 1.

When the soot accumulation quantity is 5.0 g/L or more, refer to sheet 2.

0	Confirmation of the DPR soot accumulation quantity
---	--

1. Confirmation of the DX report "PM amount of piling up"

2. Is "PM amount of piling up" less than 5.0g/L?

Judgment	Less than 5.0g/L → YES
	5.0g/L or more → NO

NO

Check sheet 2

YES

Check sheet 1

DTC:P244B (Check sheet 1)

EN16Z0702F200002

DTC:P244B	Incomplete regeneration
------------------	-------------------------

1. Technical description

- The ECU always calculates and integrates the soot discharge quantity from the engine.
- The ECU detects DPR clogging based on the value of the differential pressure sensor.

2. DTC set condition**(1) Check conditions**

- Engine is running.
- After automatic regeneration completion.
- Burner not operating.
- Calculated total flowed exhaust gas mass is 50 kg or more.
- Calculated exhaust gas flow volume 205 L/s or more.

(2) Judgment criteria

P244B (incomplete regeneration) is established under the following conditions.

- Differential pressure value after operation of the catalyst deterioration judgment logic subsequent to the completion of registration within a soot accumulation quantity of 0.5 g/L., and detection of the specified differential pressure value or higher in the map of the calculated exhaust gas flow volume and the differential pressure for at least 15 seconds.
An error is generated when this is repeated six times.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Differential pressure between upstream and downstream of the DPR is too high, caused by extreme soot accumulation in the filter because of an excessive soot discharge quantity.

Diesel-throttle	Diesel-throttle opening control defective
Injector	Injection quantity characteristic abnormal
SCV	Common rail pressure control defective
EGR valve	EGR opening control defective
Turbocharger	VNT opening control defective
Exhaust brake	Stuck on the closed side

Confirmation points for erroneous judgment:

When the cause is an abnormality of the DPR differential pressure sensor

- Defective differential pressure sensor system
Check for erroneous recognition of the differential pressure value because of a defective differential pressure sensor, hose damage, or incorrect connection.
Check for erroneous recognition because of a defective differential pressure sensor pipe, a clogged pipe, or holes.
- Defective air flow meter
Check for a deviation in the regeneration quantity because of erroneous sensor temperature recognition based on the gas flow quantity calculation.
- Exhaust gas temperature sensor
Check for erroneous recognition of an abnormal temperature characteristic based on the gas flow quantity calculation.

DN02-684

FUEL CONTROL (J08E)

DTC:P244B	Incomplete regeneration (Check sheet 1)	Inspection Procedure
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Step	Parts	Description	Judgment	Action		
				Check (YES/NO)	YES	NO
0	Confirmation of the DX report "PM amount of piling up"	"PM amount of piling up" is less than 5.0g/L?	Less than 5.0 g/L → YES 5.0 g/L or more → NO		Go to Step 1	Go to check sheet 2
1	DPR filter	DPR filter inspection. Check for soot leaking at the rear edge, damage, etc.	Abnormality → YES No abnormality → NO		Go to Step 5 after DPR filter replacement	Go to Step 2
2	Differential pressure sensor	Connector part engagement inspection. Differential pressure sensor terminal resistance measuring. (Refer to P1427 or P1428 inspection) No abnormality of the differential pressure sensor?	Abnormality → YES No abnormality → NO		Replace the differential pressure sensor	Go to Step 3
3	Differential pressure sensor pipe	Differential pressure sensor pipe inspection. No clogging, cracks, or other abnormalities?	Abnormality → YES No abnormality → NO		Correct clogging and repair damage	Go to Step 4
4	Differential pressure sensor hose	Differential pressure sensor hose inspection. No cracks or other damage?	Abnormality → YES No abnormality → NO		Repair or replace the differential pressure sensor hose and completion after implementation of DPR forced regeneration	Completion after implementation of DPR forced regeneration
5	Engine	Conduct Engine basic inspection (Refer to "ENG basic inspection sheet on chapter "FUEL CONTROL(J08E)" page DN02-38 on Manual no.S7-UNAE09") No abnormalities?	Abnormality → YES No abnormality → NO		Repair or replace the failure part	Go to Step 6
6	Air flow sensor	Connector engagement inspection. Air flow sensor characteristic inspection. Is the error within 10 %? (No abnormalities?)	Abnormality → YES No abnormality → NO		Replace the air flow sensor	Go to Step 7

FUEL CONTROL (J08E)

DN02-685

Step	Parts	Description	Judgment	Action		
				Check (YES/NO)	YES	NO
7	Exhaust gas tem- perature sensor	Connector engagement inspection. Exhaust gas temperature sensor resistance measur- ing. (Refer to P0545-P0546-P2032-P2033 inspection) No abnormalities of the exhaust gas temperature sensor?	Abnormality → YES No abnormality → NO		Completion after exhaust gas temperature sensor replace- ment, implemen- tation of DPR forced regenera- tion	Completion after imple- mentation of DPR forced regeneration

DN02-686

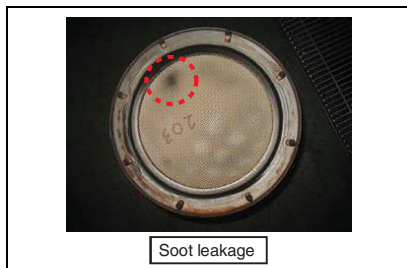
FUEL CONTROL (J08E)

DTC:P244B (Check sheet 1)

EN16Z0702F200004

DTC	P244B	Incomplete regeneration
-----	-------	-------------------------

1	DPR filter inspection
---	-----------------------



P244B-01

- 1 Check that there is no soot leaking at the rear edge of the DPR filter, no damage, and no other abnormality.



P244B-02

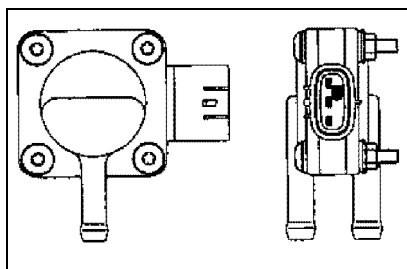
Judgment	No abnormality → NO
	Abnormality → YES

YES

Go to Step 5 after DPR filter replacement.

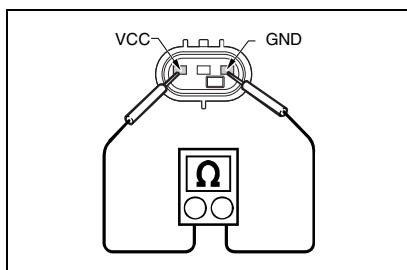
NO

2	Differential pressure sensor inspection
---	---



P244B-03

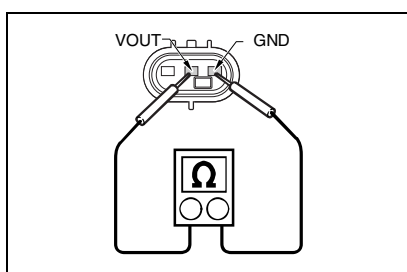
- 1 Set the starter switch to the "LOCK" position.
- 2 Disconnect the differential pressure sensor connector.



SAPH161060200271

- 3 Check continuity between the terminals VCC and GND of the sensor connector.

Standard value: 2-15 kΩ



SAPH161060200272

- 4 Check continuity between the terminals VOUT and GND of the sensor connector.

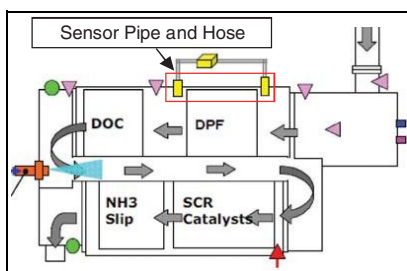
Standard value: 2-15 kΩ

Judgment	No abnormality → NO
	Abnormality → YES

YES	Replace the differential pressure sensor.
-----	---

NO

3 Differential pressure sensor pipe inspection



P244B-04

- 1 Check the differential pressure sensor pipe for clogging, cracks, and other damage.

Judgment	No abnormality → NO
	Abnormality → YES

YES	Repair or correction of differential pressure sensor pipe clogging.
-----	---

NO

DN02-688

FUEL CONTROL (J08E)

4 Inspection of the differential pressure sensor hose

- 1 Inspect the differential pressure sensor hose for cracks and other damage.

Judgment	No abnormality → NO
	Abnormality → YES

YES

Repair or replace the differential pressure sensor hose and completion after implementation of DPR forced regeneration.

NO

Completion after implementation of DPR forced regeneration.

5 Basic engine inspection

- 1 Conduct Engine basic inspection (Refer to "ENG basic inspection sheet on chapter "FUEL CONTROL(J08E)" page DN02-38 on Manual no.S7-UNAE09")

Judgment	No abnormality → NO
	Abnormality → YES

YES

Repair or replace the failure part.

NO

6 Air flow sensor inspection

- 1 Check the connector engagement.
- 2 Inspection of the air flow sensor characteristic (Replace with a new air flow sensor and use the Hino-DX data monitor to confirm that the air flow sensor characteristic error does not exceed 10 %.)

Judgment	No abnormality → NO
	Abnormality → YES

YES

Air flow sensor replacement.

NO

7 Exhaust gas temperature sensor inspection

- 1 Check the connector engagement.**
- 2 Measure the exhaust gas temperature sensor resistance. For details, referred to P0545, 0546, 2032, 2033 inspection.**

Judgment	No abnormality → NO
	Abnormality → YES

YES

Completion after exhaust gas temperature sensor replacement, implementation of DPR forced regeneration.

NO

Completion after implementation of DPR forced regeneration.

DTC:P244B (Check sheet 2)

EN16Z0702F200005

DTC:P244B	DPF clogged
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1. Technical description

- The ECU always calculates and integrates the soot discharge quantity from the engine.
- The ECU decides the DPR regeneration mode based on the soot accumulation quantity.
- The soot accumulation quantity has exceeded the allowable regeneration quantity.

2. DTC set condition**(1) Check conditions**

- Starter switch ON.

(2) Judgment criteria

P244B (defective DPR switch operation) is established under the following conditions.

- When the soot accumulation quantity detected by the ECU has reached the alarm level judgment value (5.2 g/L) (Automatic regeneration does not complete for some reason, and after the DPR light started blinking, but manual regeneration has not been performed or manual regeneration has been performed, but because the vehicle has continued to run, manual regeneration has not started.)

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- The DPR light has continued to blink, but manual regeneration has not been performed.
- The DPR indicator light does not blink.
- Check for a defective meter bulb (with the starter switch set to the "ON" (engine stopped), the indicator lamp in the meter must light).
- Regeneration has not completed because the burner system did not operate (DTC is stored).

Confirmation points for erroneous judgment:

- The DPR light has continued to blink, but manual regeneration has not been performed. Check the following items, because the regeneration conditions (in the idling status) may not have been met.
 1. Inspection of neutral switch, accelerator switch, and vehicle speed sensor.
 2. Inspection for a wire break of the DPR switch.
 3. No response of the PTO ON signal or the external accelerator signal.

DTC:P244B	Incomplete regeneration (Check sheet 2)	Inspection Procedure
------------------	---	----------------------

Step	Parts	Description	Judgment	Action		
				Check (YES/NO)	YES	NO
0	Confirmation of the DX report "PM amount of piling up"	"PM amount of piling up" is 5.0g/L or more? HINT With 5.0 g/L or more, there is a problem with part failure or with the DPR regeneration method, so that DPR regeneration has not been performed correctly, and then this DTC has been detected.	5.0 g/L or more → YES Less than 5.0 g/L → NO		Go to Step 1	Go to check sheet 1
1	DTC confirmation	Check for DTCs stored in BCU	DTC is stored → YES No DTC is stored → NO		Go to diagnostic procedure of a relevant DTC	Go to Step 2
2	Burner system	Event log acquisition by DX report. In the log, is there "FAILED_IGNITION (MIS-FIRE)", "LOST_FLAME", "CANNOT_REACH_TEMP" after the newest (last) "EECU_REQUEST_START_AUTO_REGEN"? HINT If there is a "FAILED_IGNITION (MIS-FIRE)", "LOST_FLAME", "CANNOT_REACH_TEMP", regeneration has not been performed because of a burner defect in the automatic regeneration region (soot bar: 3 to 5 elements).	Yes, there is → YES No, there is not → NO		Go to diagnostic procedure of P2030	Go to Step 3 HINT Automatic regeneration has not been completed in the automatic regeneration region (soot bar: 3 to 5 elements) because of exhaust brake operation, stop the vehicle, PTO operation, engine stop, or use of reverse gear during automatic regeneration operation. As combustion air is not supplied to the burner during exhaust brake operation, the burner operation stops

Step	Parts	Description	Judgment	Action		
				Check (YES/ NO)	YES	NO
3	Burner system	In the log, is there "EECU_REQUEST_STAR T_MANUAL_REGEN" after the newest (last) "EECU_REQUEST_STAR T_AUTO_REGEN"? HINT If there is an "EECU_REQUEST_STA RT_MANUAL_REGEN", the DPR manual regen- eration request has been emitted correctly from the ECU, and it has been received correctly by the BCU.	Yes, there is → YES No, there is not → NO		Go to Step 4	Go to step 6 HINT The DPR manual regeneration request signal is not being transmitted correctly to the ECU (the DPR button has not been pressed, or failure of the electrical system of the DPR button)
4	Burner system	In the log, is there "EECU_REQUEST_EME RGENCY_STOP" After the newest (last) "ECU_REQUEST_START _MANUAL_REGEN"? HINT If there is an "EECU_REQUEST_EME RGENCY_STOP", the DPR outlet temperature is abnormally high and regeneration has not been completed.	Yes, there is → YES No,there is not → NO		Go to diagnostic proce- dure of P200C	Go to Step 5

Step	Parts	Description	Judgment	Action		
				Check (YES/ NO)	YES	NO
5	Burner system	In the log, is there "FAILED_IGNITION (MIS-FIRE)", "LOST_FLAME", "CANNOT_REACH_TEM P" after the last (newest) "ECU_REQUEST_START _MANUAL_REGEN"? HINT If there is a "FAILED_IGNITION (MIS-FIRE)", "LOST_FLAME", "CANNOT_REACH_TEM P", regeneration has not been performed because of a burner defect, although the DPR manual regeneration request has been received correctly by the BCU.	Yes, there is → YES No, there is not → NO		Go to diagnostic procedure of P2030	Completion after DPR replacement and execution of DPR manual regeneration HINT Manual regeneration is not being completed because manual regeneration has not been executed correctly For safety, and to protect the parts, manual regeneration is stop when the accelerator pedal is depressed during manual regeneration, in case of PTO operation, or when gear shift, pressing the DPR button twice, or starting to drive is detected
6	DPR switch inspection	DPR switch inspection. Is there abnormal connector engagement, harness wire break, or another abnormality?	Abnormality → YES No abnormality → NO		Repair the abnormalities or replace the switch Completion after DPR replacement and execution of DPR manual regeneration	Go to Step 7
7	Inspection of the DPR indicator light	Check DPR indicator light system, bulb Is there abnormal connector engagement, a harness wire break, or another abnormality?	Abnormality → YES No abnormality → NO		Abnormality correction or replacement Completion after DPR replacement and execution of DPR manual regeneration	Go to Step 8
8	Neutral switch	Neutral switch inspection. Is there abnormal connector engagement, a wire break, another abnormality, or is the switch defect?	Abnormality → YES No abnormality → NO		Abnormality correction or switch replacement Completion after DPR replacement and execution of DPR manual regeneration	Go to Step 9
9	Accelerator switch	Accelerator switch inspection. Is there abnormal connector engagement, a wire break, another abnormality, or is the switch defect?	Abnormality → YES No abnormality → NO		Abnormality correction or switch replacement Completion after DPR replacement, execution of DPR manual regeneration	Go to Step 10

DN02-694

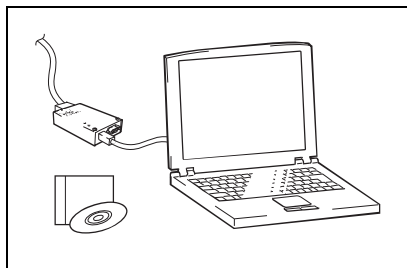
FUEL CONTROL (J08E)

Step	Parts	Description	Judgment	Action		
				Check (YES/ NO)	YES	NO
10	PTO signal	PTO signal input inspection. Is there an abnormal signal input, abnormal connector engagement, a harness wire break, or another abnormality, or is the switch defect?	Abnormality → YES No abnormality → NO		Signal inspection and correction or switch replacement Completion after DPR replacement and execution of DPR manual regeneration	Go to Step 11
11	External accelerator	External accelerator signal input inspection. Is the signal emitted correctly?	Abnormality → YES No abnormality → NO		Sensor correction or replacement Completion after DPR replacement and execution of DPR manual regeneration	Completion after DPR replacement and execution of DPR manual regeneration, because the DPR switch has not been pressed properly

DTC:P244B (Check sheet 2)

EN16Z0702F200001

DTC	P244B	DPF clogged
-----	-------	-------------

1 DTC confirmation

saph161060200038

- 1 Set the starter switch to the "LOCK" position.
- 2 Connect Hino-DX to the vehicle.
- 3 Set the starter switch to the "ON" position.
- 4 Select Burner and confirm the DTC output.

Judgment	No DTC is stored → NO
	DTC is stored → YES

NO

Go to diagnostic procedure of a relevant DTC.

YES

2 Burner system inspection

- 1 Burner event log collection with DX.
- 2 Confirm the newest (last) "EECU REQUEST START AUTO REGEN" in the acquired logs.
- 3 Is there "FAILED_IGNITION (MISFIRE)", "LOST FLAME", "CANNOT REACH TEMP" after the last "EECU REQUEST START AUTO REGEN"?

No	Event #	TR hours	Event	Flame temp
	857	1228:24:36	EECU_REQUEST_START_AUTO_REGEN	202
	858	1228:24:58	IGNITION_SUCCESS	196
	859	1228:25:17	EECU_REQUEST_STOP_REGEN	496

Yes	Event #	TR hours	Event	Flame temp
	574	1866:23:18	EECU_REQUEST_START_AUTO_REGEN	244
	575	1866:23:48	FAILED_IGNITION (MISFIRE)	213

Yes	Event #	TR hours	Event	Flame temp
	934	1254:47:38	EECU_REQUEST_START_AUTO_REGEN	246
	935	1254:47:59	IGNITION_SUCCESS	223
	936	1254:50:01	CANNOT_REACH_TEMP	132
	937	1254:50:01	EECU_REQUEST_STOP_REGEN	132

DN02-696

FUEL CONTROL (J08E)

Yes	Event #	TR hours	Event	Flame temp
	948	1258:33:04	EECU_REQUEST_START_AUTO_REGEN	266
	949	1258:33:26	IGNITION_SUCCESS	232
	950	1258:33:49	LOST_FLAME	197

Judgment

No, there is not → NO

Yes, there is → YES

YES

Go to diagnostic procedure of P2030.

NO

3 Burner system inspection

- 1 In the acquired logs, is there "EECU REQUEST START MANUAL REGEN" after the newest (last) "EECU REQUEST START AUTO REGEN"?

Yes	Event #	TR hours	Event	Flame temp
	959	1262:38:05	EECU_REQUEST_START_AUTO_REGEN	260
	960	1262:43:21	IGNITION_SUCCESS	241
	961	1262:43:24	EECU_REQUEST_STOP_REGEN	337
	963	1262:46:54	EECU_REQUEST_START_MANUAL_REGEN	630
	964	1262:47:18	IGNITION_SUCCESS	510
	965	1262:56:29	EECU_REQUEST_STOP_REGEN	911

Judgment

No, there is not → NO

Yes, there is → YES

NO

Go to Step 6.

YES

4 Burner system inspection

- 1 In the acquired logs, is there "EECU REQUEST EMERGENCY STOP" after the newest (last) "EECU REQUEST START MANUAL REGEN"?

	Event #	TR hours	Event	Flame temp
Yes	741	1208:26:21	EECU_REQUEST_START_MANUAL_REGEN	104
	742	1208:26:43	IGNITION_SUCCESS	104
	743	1208:41:29	EECU_REQUEST_EMERGENCY_STOP	943

Judgment

No, there is not → NO

Yes, there is → YES

YES

Go to diagnostic procedure of P200C.

NO

5 Burner system inspection

- 1 In the acquired logs, is there "FAILED IGNITION (MISFIRE)", "LOST FLAME", "CANNOT REACH TEMP" after the newest (last) "EECU REQUEST START MANUAL REGEN"?

	Event #	TR hours	Event	Flame temp
No	857	1228:24:36	EECU_REQUEST_START_MANUAL_REGEN	202
	858	1228:24:58	IGNITION_SUCCESS	196
	859	1228:25:17	EECU_REQUEST_STOP_REGEN	496

	Event #	TR hours	Event	Flame temp
Yes	574	1866:23:18	EECU_REQUEST_START_MANUAL_REGEN	244
	575	1866:23:48	FAILED_IGNITION (MISFIRE)	213

	Event #	TR hours	Event	Flame temp
Yes	934	1254:47:38	EECU_REQUEST_START_MANUAL_REGEN	246
	935	1254:47:59	IGNITION_SUCCESS	223
	936	1254:50:01	CANNOT_REACH_TEMP	132
	937	1254:50:01	EECU_REQUEST_STOP_REGEN	132

	Event #	TR hours	Event	Flame temp
Yes	948	1258:33:04	EECU_REQUEST_START_MANUAL_REGEN	266
	949	1258:33:26	IGNITION_SUCCESS	232
	950	1258:33:49	LOST_FLAME	197

DN02-698

FUEL CONTROL (J08E)

Judgment

No, there is not → NO

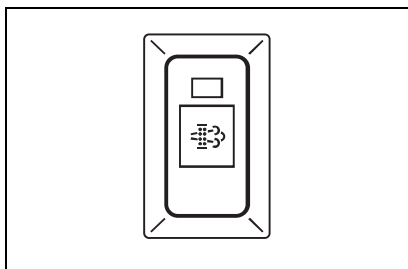
Yes, there is → YES

YES

Go to diagnostic procedure of P2030.

NO

The cause is cancellation of manual regeneration by depressing the accelerator pedal, gear shift change, PTO operation, or pressing the DPR button twice during manual regeneration.
Completion after DPR replacement and DPR manual regeneration.

6 DPR switch inspection

P244B-05

1 Inspection of the DPR switch system for connector engagement, harness wire breaks, or short-circuits.**2 Inspection of the switch function.**

Judgment

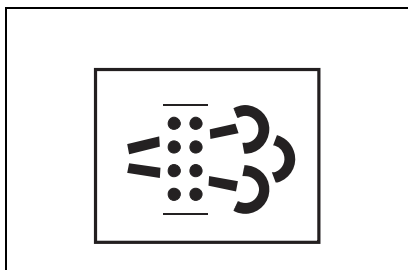
No abnormality → NO

Abnormality → YES

YES

Repair the abnormalities or replace the switch.
Completion after DPR replacement and execution of DPR manual regeneration.

NO

7 Inspection of DPR indicator light

P244B-06

1 Inspection of the indicator lamp system in the instrument cluster for connector engagement, harness wire breaks, or short-circuits.**2 Inspect the bulb.****3 Inspect any other abnormalities.**

Judgment

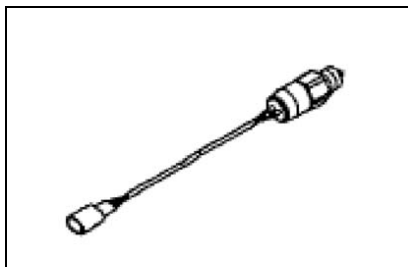
No abnormality → NO

Abnormality → YES

YES

Repair the abnormality or replace the failure part.
Completion after DPR replacement and execution of DPR manual regeneration.

NO

8 Neutral switch inspection

P244B-07

1 Neutral switch system inspection for connector engagement, harness wire breaks, or short-circuits.

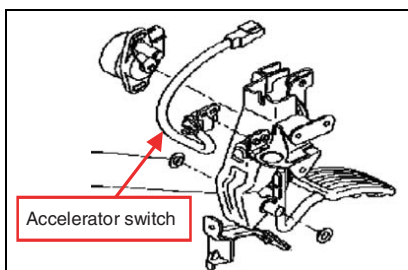
2 Inspection of the switch function.

Judgment	No abnormality → NO
	Abnormality → YES

YES

Repair the abnormalities or replace the switch.
Completion after DPR replacement and execution of DPR manual regeneration.

NO

9 Accelerator switch inspection

P244B-08

1 Accelerator switch system inspection for connector engagement, harness wire breaks, or short-circuits.

2 Inspection of the switch function.

Judgment	No abnormality → NO
	Abnormality → YES

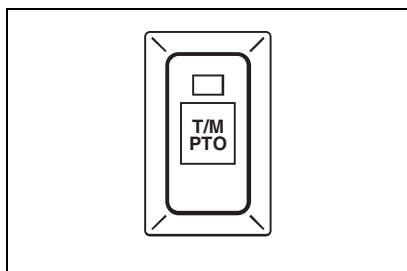
YES

Repair the abnormalities or replace the switch.
Completion after DPR replacement and execution of DPR manual regeneration.

NO

DN02-700

FUEL CONTROL (J08E)

10 PTO signal inspection

P244B-10

1 Confirm no PTO signal input.

Check for connector engagement, harness wire breaks, or short-circuits, inspection of the PTO switch function.

Judgment**No abnormality → NO****Abnormality → YES****YES**

Signal inspection and correction or switch replacement.

Completion after DPR replacement and execution of DPR manual regeneration.

NO**11 External accelerator signal inspection****1 Confirm no external accelerator signal input at the external accelerator 0% position.**

(No signal output of 5 % or more at the 0 % position of the external accelerator signal.)

Judgment**No abnormality → NO****Abnormality → YES****YES**

Repair or replace the external accelerator.

Completion after DPR replacement and execution of DPR manual regeneration.

NO

The DPR switch has not been pressed properly.

Completion after DPR replacement and execution of DPR manual regeneration.



FUEL CONTROL (J08E)

DN02-701



DTC:P2457 (Check sheet)

EN1610602F200277

DTC:P2457

EGR COOLER efficiency low
EGR cooler performance

1. Technical description

- Calculated EGR cooler efficiency and calculated intake manifold gas temperature is used for judgement to compare with each calculation consistency.

2. DTC set condition**(1) Check conditions**

The conditions described below are met (all of them).

1. The starter switch is ON.
2. The conditions described below are met (either).
 - (1) Battery voltage is in the 10 - 16 V range.
 - (2) The engine has stalled or runs at 500 r/min or higher for continuous 5 seconds or longer.

for 2011, 2012 model year

(3) Engine speed and a fuel injection rate fall within the ranges specified below respectively.

Engine speed = 1,000 to 1,250 r/min, injection rate = 80 mm³/st. or higher
 or Engine speed = 1,250 to 1,500 r/min, injection rate = 40 mm³/st. or higher
 or Engine speed = 1,500 to 1,750 r/min, injection rate = 30 mm³/st. or higher
 or Engine speed = 1,750 to 2,000 r/min, injection rate = 10 mm³/st. or higher
 or Engine speed = 2,000 to 2,500 r/min, injection rate = 10 to 50 mm³/st.
 or Engine speed = 2,500 to 2,750 r/min, injection rate = 10 to 40 mm³/st.

(4) A target EGR valve opening is 30% or greater.

for 2013 model year

(3) Intercooler outlet temperature sensor rationality check is completed.

(4) Engine speed and a fuel injection rate fall within the ranges specified below respectively.

- Engine speed: more than 2000 r/min
 - Injection rate: more than 40 mm³/st.
 - Barometric pressure: more than 81 kPa
 - Δ Engine speed: less than 20 r/min|calc
 - Δ Injection rate: less than 10 mm³/st.|calc
 - Exhaust brake: deactivated
 - EGR flow: more than 36 kg/h
 - Continues: 40 sec.

3. No failures have occurred in the EGR cooler outlet gas temperature sensor.

(2) Judgment criteria**for 2011, 2012 model year**

Excessively high temperature is detected from an EGR cooler outlet gas temperature sensor reading.
 (270°C {518°F} or higher for continuous 2 seconds or longer. 2 drive cycles.)

for 2013 model year

Calculated EGR cooler efficiency <= 60%
 and
 |(Calculated - Actual) Intake manifold gas temperature| <= 30°C {86°F}
 2 drive cycles.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

EGR cooler outlet gas temperature sensor:

- Malfunction of temperature sensor

Coolant circuit to EGR cooler:

- Coolant leakage from coolant circuit
- Air inclusion caused by improper air bleeding

EGR COOLER:

- Air inclusion caused by improper air bleeding
- Coolant leakage from EGR cooler
- Deformed coolant passage in the EGR cooler
- Blockage caused by soot at the inlet and outlet of the gas passage in the EGR cooler
- Blockage caused by contaminants in the coolant passage in the EGR cooler

DN02-704

FUEL CONTROL (J08E)

DTC:P2457	EGR COOLER efficiency low EGR cooler performance	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	EGR gas temperature sensor	Disconnection, play, looseness, contamination, clogging or damage	Must be free from the items at left.		Connect correctly or replace if damaged.
2	EGR gas temperature sensor	Resistance	Standard value: 2.02 k Ω (50°C {122°F}) 508.1 Ω (100°C {212°F}) 160.4 Ω (150°C {302°F})		Replace the sensor.
3	EGR gas temperature sensor	Contamination, clogging or damage in the sensing area	Must be free from the items at left.		Remove contaminants. Replace if damaged.
4	Coolant circuit	LLC level in the reservoir tank	In between the upper and lower lines		Add coolant.
5	Coolant circuit	Check the coolant circuit.	No failures or malfunctions (blockage and coolant leakage)		Correct or replace the coolant circuit.
6	EGR cooler	Blockage caused by soot at the gas passage inlet and outlet of the EGR cooler	No blockage		Remove soot from the gas passage inlet and outlet.
7	EGR cooler	Contaminants in the coolant passage of the EGR cooler	No contaminants		Remove clogging from the coolant inlet and outlet.
8	EGR cooler	Coolant leakage from EGR cooler	No coolant leakage		Replace the EGR cooler.
9	EGR cooler	Blockage caused by deformed coolant passage in the EGR cooler	No blockage		Replace the EGR cooler.
10	SCV	Free acceleration test	Following target rail pressure		Replace the SCV
11	EGR Valve	Check EGR valve (connection condition of connectors by Hino-DX active test)			Replace the EGR valve
12	Diesel throttle valve	Check for abnormal opening angle or the valve being stuck closed.			Replace the diesel throttle valve

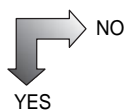
DTC:P2457

EN1610602F200278

DTC	P2457	EGR cooler performance
-----	-------	------------------------

1. CHECK FOR COOLANT LEAK.

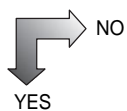
- (1) Check that coolant does not leak from the coolant circuit to the EGR cooler.



Faulty coolant circuit

2. INSPECT THE EGR COOLER.

- (1) Check for leakage of coolant from the EGR COOLER.
(2) Check that the coolant passage of the EGR COOLER is not blocked due to deformation, etc.
(3) Check that the gas passage outlet/inlet of the EGR COOLER is not blocked with soot.
(4) Check that foreign matters are not adhered to the coolant passage of the EGR COOLER.



Fault in EGR cooler

Fault in engine ECU

DTC:P2459 (Check sheet)

EN1610602F200279

DTC:P2459

Frequent regeneration

1. Technical description

- ECU constantly calculate and accumulate the amount of soot deposit from the engine.
- Moreover, based on the accumulated amount, the regeneration interval is determined.

2. DTC set condition**(1) Check conditions**

- The engine must not be stopped.

(2) Judgment criteria

P2459 (abnormal frequency of DPR regeneration) is set when the following condition is met.
Judge it as an error if the normally-calculated soot deposit amount deviates from the calculated soot deposit amount for comparison.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Abnormality in the soot calculation area, such as the atmospheric pressure sensor, within ECU is suspected.

FUEL CONTROL (J08E)

DN02-707

DTC:P2459	Frequent regeneration	Inspection Procedure
------------------	-----------------------	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	ECU	Inside abnormality			Replace the ECU

DTC:P2459

EN1610602F200280

DTC	P2459	Frequent regeneration
-----	-------	-----------------------

1. CHECK WHETHER THE ATMOSPHERIC PRESSURE SENSOR OF THE ENGINE ECU IS IN NORMAL CONDITION.

NO
YES

Replace ECU.

Delete the error.

DTC:P2463**DTC:P2463**

DPF clogged

1. Technical description

- ECU constantly calculate and accumulate the amount of soot emission from the engine.
- Moreover, based on the accumulated amount, the regeneration mode is determined.

NOTICE

If soot amount on DPR is less than 5.2g/L, manual regeneration can be performed (if soot amount on DPR reaches 5.2g/L, manual regeneration cannot be allowed due to there is a risk of DPR melt, in this case P244B should be appeared, to proceed the diagnosis procedure for "P244B check sheet 2"). Therefore, perform DPR manual regeneration first by pushing the DPR button if soot amount is less than 5.2g/L. If manual regeneration becomes fail, to proceed the diagnosis procedure for "P244B check sheet 2". If manual regeneration becomes completed, the cause of this DTC is misoperation in manual regeneration.

2. DTC set condition**(1) Check conditions**

- Engine key in ON position

(2) Judgment criteria

P2463 (faulty operation of DPR SW) is set when the following condition is met.
 Judge when soot deposit accumulated by ECU reaches the warning level judgment value (5.0 g/L).
 (Automatic regeneration was not completed for some reason. Then, the DPR light blinked, but manual regeneration was not performed. Or manual regeneration was attempted, but the regeneration did not start and the vehicle continued to be driven.)

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- The DPR light continued to blink, but manual regeneration was not performed.
 - The DPR light did not blink.
 - Check for a burned-out meter bulb. (OK if the indicator illuminates when the switch is turned ON while the engine is not running with the key ON.)
 - The burner conditions were not met and regeneration was not completed. (DTC codes are present.)
1. Air pressure too low (P2431)
 2. Misfire(Failed last ignition)/Lost Flame (P2030)
(No DTC codes are present.)
 3. Key off during regeneration, Engine speed too low during regeneration
 4. Exhaust Outlet Overtemperature (OT1)
(Judge at 580°C {1,076°F} or higher at the DPF inlet. At 580°C {1,076°F} or lower, the abort OFF will be immediately enabled to be ready for regeneration.)
- [Confirmation points for judgment]
- The DPR light continued to blink, but manual regeneration was not performed.
Since the regeneration condition (idle condition) may not be met, check the following:
 - Inspect the neutral SW, accelerator SW system and vehicle speed sensor system.
 - Check for disconnection in the DPR SW.
 - PTO signal ON or unresponsive return of external accelerator.



FUEL CONTROL (J08E)

DN02-709



DTC:P246F (Check sheet 1)

EN1610602F200283

DTC:P246F

Exhaust gas temperature sensor (DOC outlet) - rationality

1. Technical description

- The DPR increases exhaust gas temperature and runs PM regeneration.
- And, DPR regeneration is controlled based on a reading taken by the exhaust gas temperature sensor.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
 - Engine speed remains at 500 r/min or higher for 5 seconds or longer.
 - Within 10 seconds after start
 - A difference between a coolant temperature and an intake air temperature is +/- 8°C{17.6°F} or less.
 - A difference between a BCU exhaust gas temperature sensor reading and a DOC inlet temperature sensor reading falls within +/- 70°C {-94°F}.
 - Coolant temperature and intake air temperature of -10°C {14°F} or higher
 - BCU exhaust gas temperature sensor reading of less than 30°C {86°F}
 - No other DTCs are present.
- The conditions described above remain for 5 seconds.

(2) Judgment criteria

- A temperature difference between a BCU exhaust gas temperature sensor reading and a DOC outlet temperature sensor reading remains at +/- 70°C {158°F} or more for 1 second.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Exhaust gas temperature sensor (DOC outlet):

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormal resistance of sensor
- Failure in engine ECU sensor power supply

DTC:P246F	Exhaust gas temperature sensor (DOC outlet) - ratio-nality	Inspection Procedure
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No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Exhaust gas temper-ature sensor (DOC outlet) harness	Check whether the exhaust gas temperature sensor (DOC outlet) is loose/disconnected.			Connect the sensor prop-erly.
2	Exhaust gas temper-ature sensor (DOC outlet)	Check whether a sensing area of the exhaust gas temperature sensor (DOC outlet) is con-taminated, clogged or damaged.			Remove contami-nants. Replace if damaged.
3	Exhaust gas temper-ature sensor (DOC outlet)	Check whether sensor resistance of the exhaust gas temperature sensor (DOC outlet) is proper.			Replace the sensor.

DN02-712

FUEL CONTROL (J08E)

DTC:P246F (Check sheet 2)

EN1610602F200284

DTC:P246F

Exhaust gas temperature sensor (DOC outlet) - rationality

1. Technical description

- The temperature sensor consistently detects exhaust gas temperature.
- A reading taken by the exhaust gas temperature sensor is used to control DPR regeneration.

2. DTC set condition**(1) Check conditions**

- After elapse of 10 seconds from start
- Accumulated exhaust gas flow of 3 kg or more
- Accumulated exhaust gas flow of 50 kg or more with burner in inactive status

Followed by

- Battery voltage is in the 10 - 16 V range.
- Engine speed of 500 r/min or more
- A difference of coolant temperature and intake air temperature is less than +/- 8°C {17.6°F}.
- Exhaust gas flow rate of 230 kg/h or more

The conditions described above remain for 5 seconds. Also,

- A change in engine speed falls within +/- 30 r/min.
 - A change in fuel injection rate falls within +/- 10 mm³/st.cyl.
 - Vehicle speed is 18.8 miles/h or higher.
 - The fuel injection quantity is +/- 0 mm³/st.cyl or more.
- No other DTCs are present.
The conditions described above remain for 10 seconds.

(2) Judgment criteria

- A difference between a calculated DOC outlet temperature and an actual measurement reading is 100°C {212°F} or greater.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Exhaust gas temperature sensor (DOC outlet):

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormal resistance of sensor
- Failure in engine ECU sensor power supply

DTC:P246F	Exhaust gas temperature sensor (DOC outlet) - ratio-nality	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Exhaust gas temper-ature sensor (DOC outlet) harness	Check whether the exhaust gas temperature sensor (DOC outlet) is loose/disconnected.			Connect the sensor prop-erly.
2	Exhaust gas temper-ature sensor (DOC outlet)	Check whether a sensing area of the exhaust gas temperature sensor (DOC outlet) is con-taminated, clogged or damaged.			Remove contami-nants. Replace if damaged.
3	Exhaust gas temper-ature sensor (DOC outlet)	Check whether sensor resistance of the exhaust gas temperature sensor (DOC outlet) is proper.			Replace the sensor.

DN02-714

FUEL CONTROL (J08E)

DTC:P246F

EN1610602F200285

DTC	P246F	Exhaust gas temperature sensor (DOC outlet) - rationality
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1. CHECK THE EXHAUST GAS TEMPERATURE SENSOR.

- (1) Check that the exhaust gas temperature sensor is normally installed.
- (2) Check the exhaust gas temperature sensor measurement portion for dirt and foreign matters.
- (3) Check the DPR and muffler for clogging and leakage.



NO

Improper installation of the sensor.

YES

2. CHECK INSTALLATION OF THE CONNECTOR.

- (1) Check that the exhaust gas temperature sensor (DOC outlet) connector is properly installed.



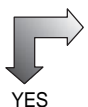
NO

Improper connection of connector

YES

3. CHECK WHETHER THE SENSOR IS IN NORMAL CONDITION.

- (1) Troubleshoot the P2470 and P2471 and check whether the exhaust gas temperature sensor (DOC outlet) is in normal condition.



NO

Fault in exhaust gas temperature sensor (DOC outlet)

YES

4. CHECK WHETHER OTHER ARE IN NORMAL CONDITION.

- (1) If the GND terminal is shared in use, disconnect all sensor connectors that use the GND terminal and check whether condition is normal.



NO

Fault in engine ECU

YES

Fault in other sensors



FUEL CONTROL (J08E)

DN02-715



DN02-716

FUEL CONTROL (J08E)

DTC:P2470 (Check sheet)

EN1610602F200286

DTC:P2470	Exhaust gas temperature sensor (DOC outlet) - out of range (Out of range low)
------------------	---

1. Technical description

- The temperature sensor consistently detects exhaust gas temperature.
- A reading taken by the exhaust gas temperature sensor is used to control DPR regeneration.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
- The engine has stopped or runs at 500 r/min or higher for continuous 5 seconds or longer.

(2) Judgment criteria

- Voltage of the exhaust gas temperature sensor (DOC outlet) remains less than 0.0057 V (1,240°C {2,264°F}) for 3 seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Exhaust gas temperature sensor (DOC outlet):

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormal resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact
- Short-circuit in the sensor

DTC:P2470	Exhaust gas temperature sensor (DOC outlet) - out of range (Out of range low)	Inspection Procedure
------------------	---	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Exhaust gas temperature sensor (DOC outlet)	Check whether the exhaust gas temperature sensor (DOC outlet) is loose/disconnected.			Install the sensor properly.
2	Exhaust gas temperature sensor (DOC outlet)	Check whether a sensing area of the exhaust gas temperature sensor (DOC outlet) is contaminated, clogged or damaged.			Remove all contaminants and clogging. Replace if damaged.
3	Exhaust gas temperature sensor (DOC outlet)	Check whether sensor resistance of the exhaust gas temperature sensor (DOC outlet) is proper.	Resistance		Replace the sensor.
4	Exhaust gas temperature sensor (DOC outlet)	Check whether irregular contact of the sensor harness or harness connector has occurred in the exhaust gas temperature sensor (DOC outlet).			Repair or replace the harness and/or connector.
5	Harness	Check whether the exhaust gas temperature sensor (DOC outlet) harness is disconnected or short-circuited.	Check continuity.		Repair or replace the harness.
6	Exhaust gas temperature sensor (DOC outlet)	Check whether the sensor itself has electrical continuity.			Replace the sensor.
7	Sensors	Check whether a failure or malfunction has occurred in the sensors that use the same power supply or GND (ECU internal power supply).	Battery voltage: 10 to 16 V		Replace faulty sensors.

DN02-718

FUEL CONTROL (J08E)

DTC:P2471 (Check sheet)

EN1610602F200287

DTC:P2471	Exhaust gas temperature sensor (DOC outlet) - out of range (Out of range high)
------------------	--

1. Technical description

- The temperature sensor consistently detects exhaust gas temperature.
- A reading taken by the exhaust gas temperature sensor is used to control DPR regeneration.

2. DTC set condition**(1) Check conditions**

- Intake air temperature is -20°C {-4°F} or higher.
- Battery voltage is in the 10 - 16 V range.
- The engine has stopped or runs at 500 r/min or higher for continuous 5 seconds or longer.
- No other DTCs are present.

(2) Judgment criteria

- Voltage of the exhaust gas temperature sensor (DOC outlet) remains at 4.958 V or higher (-46°C {-50.8°F} or lower) for 3 seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

Exhaust gas temperature sensor (DOC outlet):

- Loose/disconnected sensor or failure in sensing area (contamination, clogging or breakage)
- Abnormal resistance of sensor
- Failure in engine ECU sensor power supply
- Disconnection or short-circuit in sensor harness
- Irregular contact
- Short-circuit in the sensor

DTC:P2471	Exhaust gas temperature sensor (DOC outlet) - out of range (Out of range high)	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Exhaust gas temperature sensor (DOC outlet)	Check whether the exhaust gas temperature sensor (DOC outlet) is loose/disconnected.			Install the sensor properly.
2	Exhaust gas temperature sensor (DOC outlet)	Check whether a sensing area of the exhaust gas temperature sensor (DOC outlet) is contaminated, clogged or damaged.			Remove all contaminants and clogging. Replace if damaged.
3	Exhaust gas temperature sensor (DOC outlet)	Check whether sensor resistance of the exhaust gas temperature sensor (DOC outlet) is proper.	Resistance		Replace the sensor.
4	Exhaust gas temperature sensor (DOC outlet)	Check whether irregular contact of the sensor harness or harness connector has occurred in the exhaust gas temperature sensor (DOC outlet).			Repair or replace the harness and/or connector.
5	Harness	Check whether the exhaust gas temperature sensor (DOC outlet) harness is disconnected or short-circuited.	Check continuity.		Repair or replace the harness.
6	Exhaust gas temperature sensor (DOC outlet)	Check whether the sensor itself has electrical continuity.			Replace the sensor.
7	Sensors	Check whether a failure or malfunction has occurred in the sensors that use the same power supply or GND (ECU internal power supply).	Battery voltage: 10 to 16 V		Replace faulty sensors.

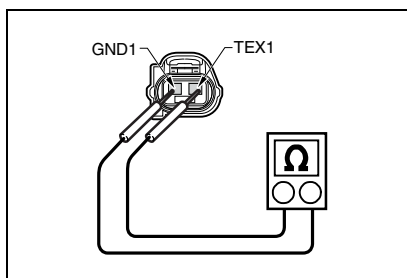
DN02-720

FUEL CONTROL (J08E)

DTC:P2470/P2471

EN1610602F200288

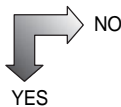
DTC	P2470	Exhaust gas temperature sensor (DOC outlet) - out of range (Out of range low)
DTC	P2471	Exhaust gas temperature sensor (DOC outlet) - out of range (Out of range high)

**1. MEASURING RESISTANCE BETWEEN SENSOR TERMINALS**

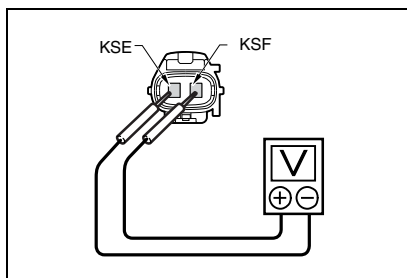
- (1) Set the starter switch to "LOCK" position.
- (2) Disconnect the exhaust gas temperature sensor (DOC outlet) connector.
- (3) Measure resistance between the terminals TEX1 and GND1 of the exhaust gas temperature sensor (DOC outlet).

HINT

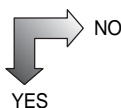
If it is difficult to check only the sensor, proceed to Step 3.

Standard value:**7.4-19.6 k Ω (50°C {122°F})****3.0-6.2 k Ω (100°C {212°F})****1.5-2.6 k Ω (150°C {302°F})**

Faulty exhaust gas temperature sensor (DOC outlet)

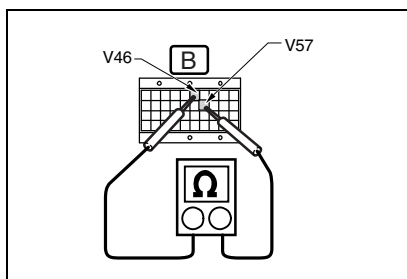
**2. MEASURING VOLTAGE BETWEEN SENSOR TERMINALS**

- (1) Set the starter switch to "ON" position.
- (2) Measure voltage between the terminals KSF and KSE of the exhaust gas temperature sensor (DOC outlet) connector (engine sub harness side).

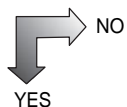
Standard: 4.5-5.5 V

Proceed to 4.

Bad contact of connectors

**3. MEASURING RESISTANCE BETWEEN TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the signal check harness on the vehicle side.
- (3) Disconnect the connector on the engine ECU side.
- (4) Measure resistance between the terminals ET4+ (V57) and ADG9 (V46).

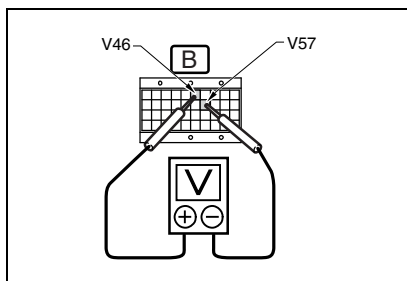
Standard value:**7.4-19.6 k Ω (50°C {122°F})****3.0-6.2 k Ω (100°C {212°F})****1.5-2.6 k Ω (150°C {302°F})**

NO

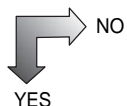
YES

- Faulty exhaust gas temperature sensor (DOC outlet)
- Faulty in harness
- Faulty sensor connector

Faulty in engine ECU

**4. MEASURING VOLTAGE BETWEEN TERMINALS**

- (1) Set the starter switch to "LOCK" position.
- (2) Connect the connector on the engine ECU side.
- (3) Disconnect the connector on the engine sub harness side.
- (4) Set the starter switch to "ON" position.
- (5) Measure voltage between the terminals ET4+ (V57) and ADG9 (V46).

Standard: 4.5-5.5 V

NO

YES

- Fault in engine ECU
- Faulty ECU connector

Faulty in harness

DTC:P2635 (Check sheet)

EN1610602F200289

DTC:P2635	Fuel Pump Low Flow/Performance
------------------	---------------------------------------

1. Technical description

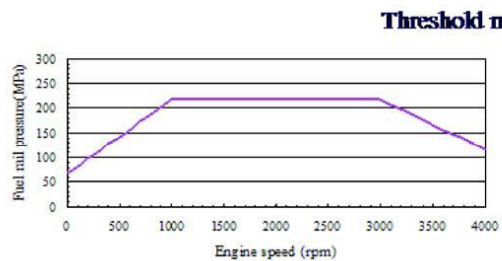
- Excessively high common rail pressure (this duration varies depending on the engine speed) is detected.

2. DTC set condition**(1) Check conditions**

- Battery voltage is in the 10 - 16 V range.
- Fuel rail pressure sensor; no malfunction

(2) Judgment criteria

- Fuel rail pressure \geq threshold map
- 60sec continue

**3. Troubleshooting hints**

(The most likely causes for this code to be set are ;)

Supply pump: ECU:

DTC:P2635		Fuel Pump Low Flow/Performance		Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If fail
1	Fuel filter	Visually check ; water in fuel	No water No restriction		Drain the water
2	Fuel filter	Element clogging, genuine part element Fuel level at high idle	One inch or more from the collar Element upper level or below Fuel level shall not keep decreasing at high idle.		Go to 3 after replacing the element.
3	Fuel line	Visually check	No bending No restriction		Clean Replace
4	Fuel tank	Visually check ; Breather hose Contaminations, rust	No restriction No excessive debris		Clean
5	Supply pump	Visually check	No leak or crack		Replace
6	SCV	Connector check	Fully seated		Fix
7	Common rail pressure sensor	Voltage, Resistance check Connector check	Within criteria Fully seated		Fix Replace
8	Supply pump	FINAL VALUE OF PUMP CURRENT TARGET test with Hino-DX	Average: 1,740±80mA Fluctuation<80mA		Relearning, before replace SCV
9	SCV	Free acceleration test	Following target rail pressure Refer to previous page		SCV Replace
10	Common rail pressure limiter	Free acceleration test	Following target rail pressure Refer to previous page		Common rail assembly Replace
11	Common rail pressure sensor	Free acceleration test	Following target rail pressure Refer to previous page		Common rail assembly Replace
12	Supply pump	Free acceleration test	Following target rail pressure Refer to previous page		Pump Replace
13	Crankshaft position sensor, camshaft position sensor (NE sensor, G sensor)	Resistance, Voltage DX-monitor ; NE active & G active	Within criteria Both Active		Replace

DN02-724

FUEL CONTROL (J08E)

DTC:P2635

EN1610602F200290

DTC	P2635	Fuel Pump Low Flow/Performance
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1. CHECK THE SUPPLY PUMP.

- (1) Set the starter switch to "LOCK" and stop the engine.
- (2) Wait for about 30 seconds and then start the engine.
- (3) Perform warm-up until the coolant temperature become 60°C {140°F} of higher. And erase the DTC.
- (4) Confirm that the same DTC is displayed again when raising engine revolution up to "No load max revolution" or racing engine.

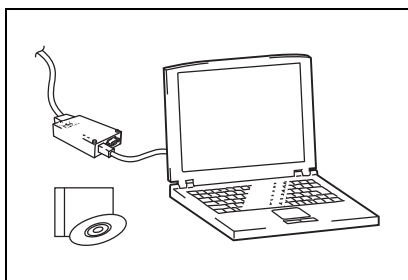


NO

Replace supply pump.

2. CHECK THE DTC.

- (1) Confirm that no other DTC is displayed. If another DTC is displayed repair that trouble and confirm that the DTC No.P2635 is displayed again. Especially in case of display DTC in regard to engine speed sensor (main and sub) system, perform repair so that these DTC are not displayed.
- (2) If the above check shows no abnormalities, erase the DTC and start the engine. If the same DTC is displayed again, malfunction of supply pump and malfunction ECU can be assumed.



SAPH161060200348



FUEL CONTROL (J08E)

DN02-725



DN02-726

FUEL CONTROL (J08E)

DTC:U0073 (Check sheet)

EN1610602F200291

DTC:U0073

Engine ECU CAN communication bus for Emission control system - bus off

1. Technical description

- Abnormal engine CAN communication

2. DTC set condition**(1) Check conditions**

- 11 V < ECU power supply voltage < 16 V
- The starter switch is ON.

(2) Judgment criteria

- The bus remains OFF for 96 ms or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Malfunction of CAN circuit (engine CAN)
- Malfunction of its controller
- Malfunction of harness

DTC:U0073	Engine ECU CAN communication bus for Emission control system - bus off	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	ECU	Replace	When turning the starter switch ON, the malfunction recurs.		Replace the faulty ECU.	After replacing an old ECU, proceed to No. 2.
2	Harness	Replace	When turning the starter switch ON, the malfunction recurs.		Proceed to No. 3.	Proceed to No. 4.
3	Terminal resistor for CAN 3 incorporated in the harness	Replace	When turning the starter switch ON, the malfunction recurs.		Replace the terminal resistor.	Replace the harness.
4	Other communication units	After replacing an old harness, replace the VNT, DCU, EGR, BCU and NOx for CAN 3 respectively and then check.	When turning the starter switch ON, the malfunction recurs.		Replace if a replaced communication unit malfunctions.	Report to Development Department.

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FUEL CONTROL (J08E)

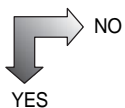
DTC:U0073

EN1610602F200292

DTC	U0073	Engine ECU CAN communication bus for Emission control system - bus off
-----	-------	--

1. CHECK THE TERMINATION RESISTOR.

- (1) Check that it is installed.
- (2) Check that the resistance is as much as 120Ω.
- (3) Check that the connectors have no poor contact.



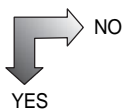
Repair the trouble

2. CHECKING EACH ECU

- (1) Remove the EGR, VNT, NOx sensors 1, 2, BCU and DCU and check the diagnosis of U0073 is restored.

HINT

Before detaching the ECU, turn the key OFF.



Proceed to the communication blackout diagnostic flow of each ECU.
If abnormalities are still not found, replace each ECU.

Replace the ECU.



DTC:U010E (Check sheet)

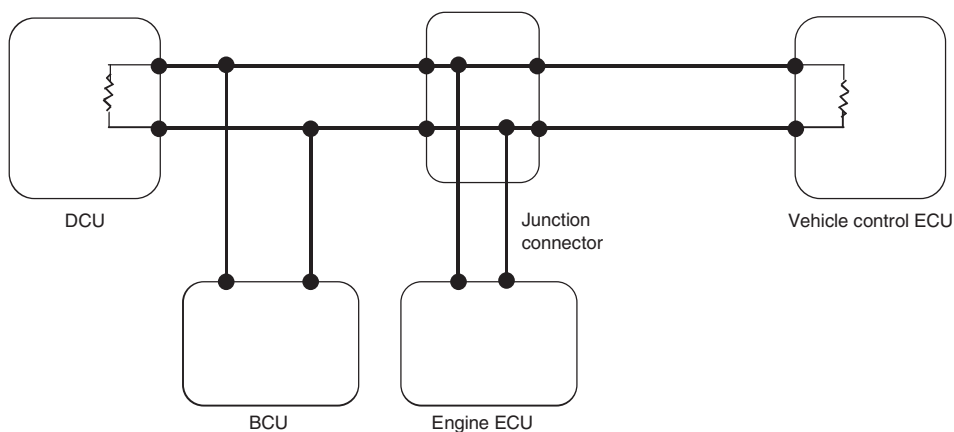
EN1610602F200293

DTC:U010E	Engine ECU CAN communication (DeNOx ECU)
------------------	--

1. Technical description

- CAN communication with the DCU controller has lost

Diagram

**2. DTC set condition****(1) Check conditions**

- 11 V < ECU power supply voltage < 16 V
- Starter switch ON

(2) Judgment criteria

- CAN message from DeNOx ECU: Not received
- Failure timer ≥ 3 sec

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Malfunction of CAN circuit (engine CAN)
- Malfunction of DCU controller
- Malfunction of harness

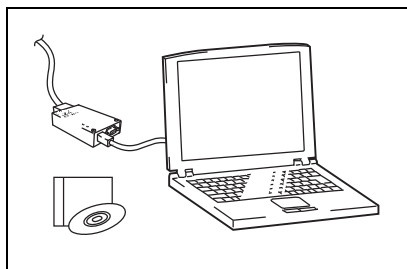
DTC:U010E	Engine ECU CAN communication (DeNOx ECU)	Inspection Procedure
------------------	---	-----------------------------

Step	Parts	Description	Judgment	Action		
				Check (YES/NO)	YES	NO
1	DTC confirmation	Check the BCU and vehicle control ECU if any of following DTC is stored. (U0038, U0100, U0101, U0104, U0105, U0121, U0132, U0155, U0293)	DTC is stored → YES No DTC is stored → NO		If DTC U0101, U0104, U0105, U0121, U0132, U0155, U0293 exists, go to Step 2 If DTC U0038, U0100 exists, go to Step 3	Go to Step 4
2	Vehicle control ECU	Check connector engagement status, terminal status, terminating resistance.	The terminating resistance value is within the standard value (110 - 130 Ω) → YES Half engagement, terminal damage Terminating resistance value outside the standard value → NO		Go to Step 4	Repair or Replace
3	BCU	Check connector engagement status, terminal status.	Incomplete engagement, terminal damage → YES No problem → NO		Repair or Replace	Go to Step 4
4	Harness between DCU — junction connector	Harness short-circuit, wire break. DCU connector, junction connector, engine - chassis harness connection, terminal status.	Harness resistance value within standard value {Below 1 Ω (between H-H/L-L lines)} → YES Incomplete engagement, terminal damage Harness resistance value is outside of the standard value → NO		Go to Step 5	Repair or Replace
5	Harness between junction connector — engine ECU	Harness short-circuit, wire break. Engine ECU connector, junction connector, engine - chassis harness connection, terminal status.	Harness resistance value within standard value {Below 1 Ω (between H-H/L-L lines)} → YES Incomplete engagement, terminal damage Harness resistance value is outside of the standard value → NO		Go to Step 6	Repair or Replace
6	DCU	Power supply voltage confirmation.	Voltage is within standard range (9 - 16 V) → YES Voltage is NOT within the standard range → NO		Replace the DCU	Repair the power supply circuit

DTC:U010E

EN1610602F200294

DTC	U010E	Engine ECU CAN communication (DeNOx ECU)
-----	-------	--

1 Other system DTC confirmation

saph161060200038

- 1 Set the starter switch to the "LOCK" position.
- 2 Connect Hino-DX to the vehicle.
- 3 Set the starter switch to the "ON" position.
- 4 Confirm the DTC of the BCU, vehicle control ECU.

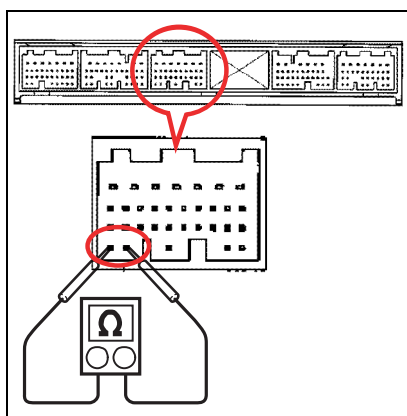
Judgment	U0101, U0104, U0105, U0121, U0132, U0155, U0293 exists → YES1
	U0038, U0100 exists → YES2
	No DTC output → NO

YES1 → Go to Step 2.

YES2 → Go to Step 3.

NO

Go to Step 4.

2 Inspection of the vehicle control ECU

U010E-1

- 1 Set the starter switch to the "LOCK" position.
- 2 Confirm the connector engagement status.
- 3 Disconnect the vehicle control ECU connector (32 P).
- 4 Confirm that the connector terminal is not damaged.
- 5 Use the circuit tester and measure the vehicle control ECU terminating resistance.

Judgment	Terminating resistance within the standard value (110 - 130 Ω) → YES
	Incomplete engagement, terminal damage exists. Terminating resistance outside the standard value → NO

NO → Connector repair, harness replacement, vehicle control ECU replacement.

YES

Go to Step 4.

3 BCU inspection

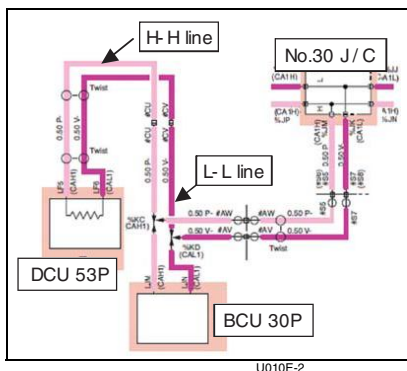
- 1 Confirm the connector engagement status, and that the terminal is not damaged.

Judgment	Incomplete engagement, terminal damage exists → YES
	No problem → NO

YES → Connector repair, harness replacement.

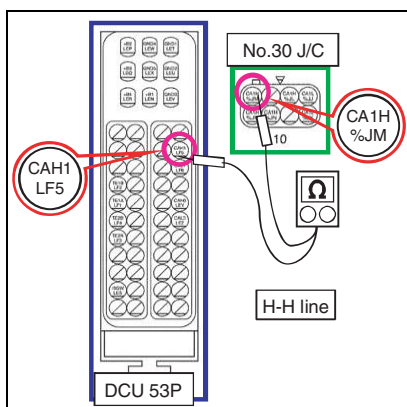
NO

4 DCU — junction connector harness inspection



U010E-2

- 1 Confirm the engagement status of DCU connector, junction harness connector.
- 2 Disconnect the DCU 53 P, No. 30 J/C. BCU 30 P connector.
- 3 Confirm that the terminals of each connector are not damaged.



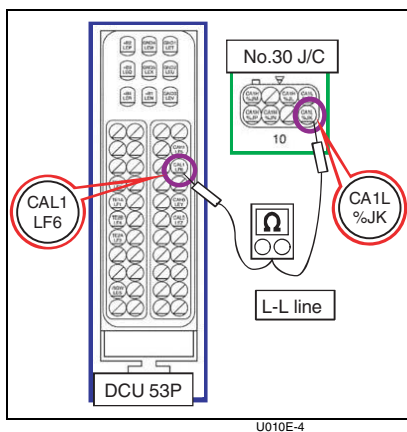
U010E-3

- 4 Use the circuit tester and measure the harness H-H line.

- Resistance value
- GND short-circuit

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FUEL CONTROL (J08E)



5 Use the circuit tester and measure the harness L-L line.

- Resistance value
- GND short-circuit

6 Confirm line short-circuit between H/L lines.

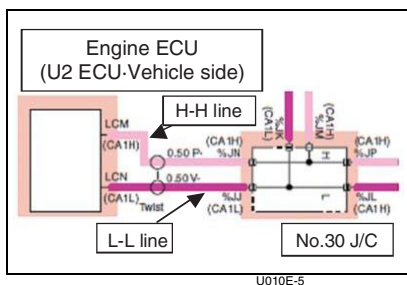
Judgment	Harness resistance value within standard value Below 1 Ω (H-H/L-L lines) → YES
	Incomplete engagement, terminal damage exists. Harness resistance value outside standard value → NO

NO

Connector repair, harness replacement.

YES

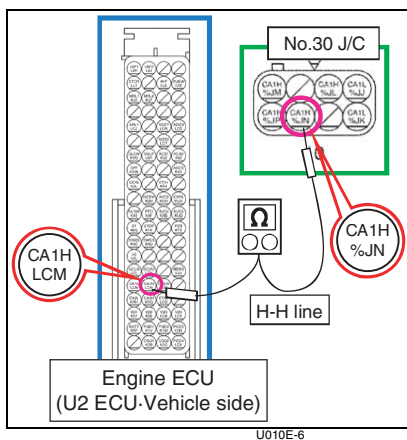
5 Junction connector harness — Engine ECU harness inspection



1 Confirm the engagement status of engine ECU connector, junction connector.

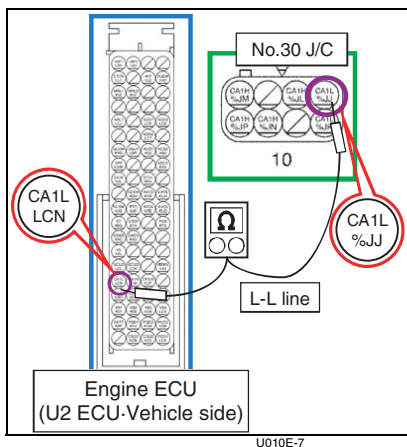
2 Disconnect the engine ECU, No. 30 J/C connector.

3 Confirm the terminals of each connector are not damaged.



4 Use the circuit tester and measure the harness H-H line.

- Resistance value
- GND short-circuit



5 Use the circuit tester and measure the harness L-L line.

- Resistance value
- GND short-circuit

6 Confirm line short-circuit between H/L lines.

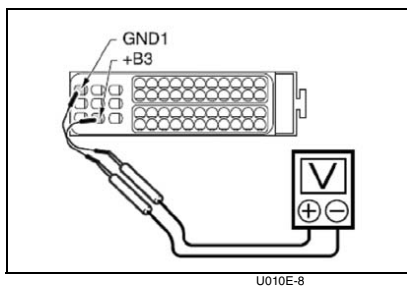
Judgment	Harness resistance value within standard value Below 1 Ω (H-H/L-L lines) → YES
	Incomplete engagement, terminal damage exists. Harness resistance value outside the standard value → NO

NO

Connector repair, harness replacement.

YES

6 DCU power supply inspection



1 Disconnect the DCU 53P connector.

2 Connect the signal check harness.

3 Measure the voltage between the terminals GND1 and +B3 of the DCU 53P connector on the harness side.

Judgment	Power supply voltage between 9 V - 16 V → YES
	Power supply voltage outside the above range → NO

NO

Repair of the power supply system.

YES

Replace the DCU.

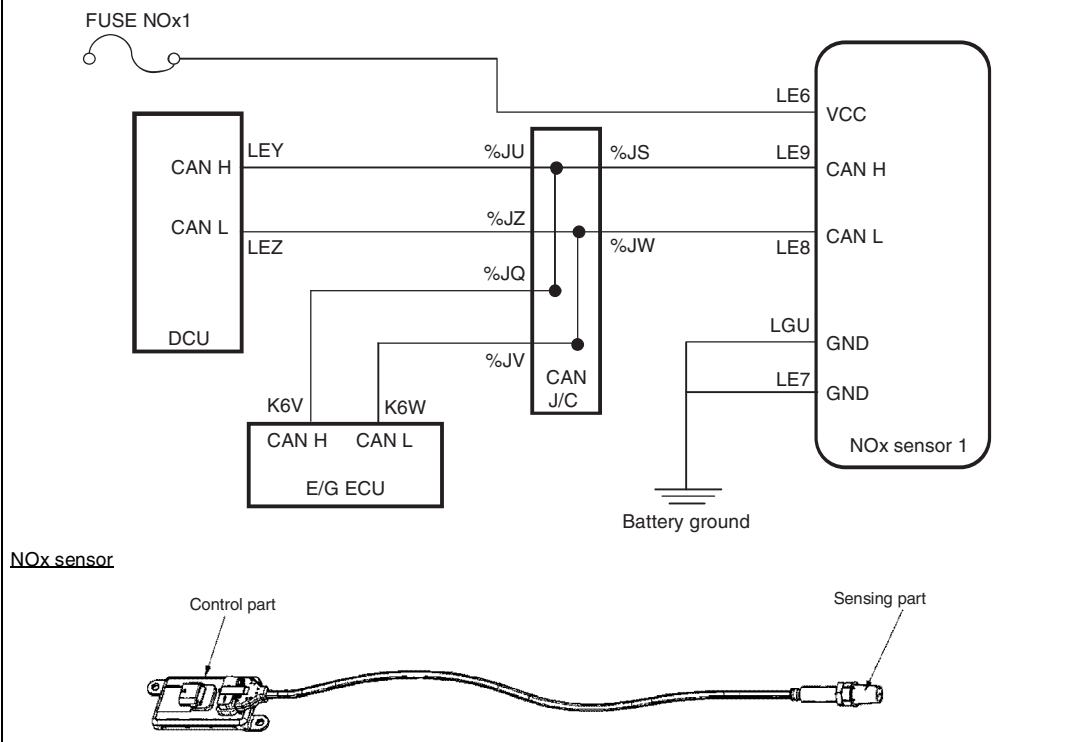
DTC:U029D (Check sheet)

EN1610602F200093

DTC:U029D	Engine ECU CAN communication (NOx sensor ECU (SCR upstream))
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1. Technical description

- The NOx sensor 1 (control part) is responsible for the CAN communication with the DCU.



2. DTC set condition

- 11 V < ECU power supply voltage < 16 V
- Starter switch ON.

(1) Judgment criteria

- CAN message from NOx sensor 1 (SCR upstream): Not received.
- Failure timer \geq 3 seconds.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- CAN circuit failure (DCU CAN).
- NOx sensor controller failure.
- Harness failure.
- Controller power supply abnormal.

DTC:U029D	Engine ECU CAN communication (NOx sensor ECU (SCR upstream))	Inspection Procedure
------------------	--	----------------------

Step	Parts	Description	Judgment	Action		
				Check (YES/NO)	YES	NO
1	NOx sensor	NOx sensor 1 connector check.	Connector disconnected or loose Connector pins damaged or rusted → YES Connector not disconnected or loose Connector pins not damaged or rusted → NO		Connector disconnected or loose → Reconnect the connector Connector pins damaged or rusted → Replace damaged parts	Go to Step 2
2	GND	NOx sensor ground check 1. (GND LE7 terminal - Battery minus terminal)	The voltage value between the harnesses is within the standard value [below 1 V] → YES The voltage value between the harnesses is outside the standard value [1 V or more] → NO		Go to Step 3	Repair or replace the ground circuit (harness)
3	GND	NOx sensor ground check 2. (GND LGU terminal - Battery minus terminal)	The voltage value between the harnesses is within the standard value [below 1 V] → YES The voltage value between the harnesses is outside the standard value [1 V or more] → NO		Go to Step 4	Repair or replace the ground circuit (harness)
4	Power supply	NOx sensor power supply voltage check.	Voltage is within standard range [9-16 V] → YES Voltage is NOT within standard range [9-16 V] → NO		Go to Step 5	Repair or replace the power supply circuit (harness, fuse, etc.)
5	CAN harness between DCU and NOx controller	Harness check between DCU and NOx controller (CANL LE8 terminal - CAH0 LEZ terminal).	The harness resistance value is within the standard value [below 1 Ω] → YES The harness resistance value is outside the standard value [1 to ∞ Ω] → NO		Go to Step 6	Repair or replace the CAN harness between DCU and NOx controller
6	CAN harness between DCU and NOx controller	Harness check between DCU and NOx controller (CANH LE9 terminal - CAH0 LEY terminal).	The harness resistance value is within the standard value [below 1 Ω] → YES The harness resistance value is outside the standard value [1 to ∞ Ω] → NO		Go to Step 7	Repair or replace the CAN harness between DCU and NOx controller

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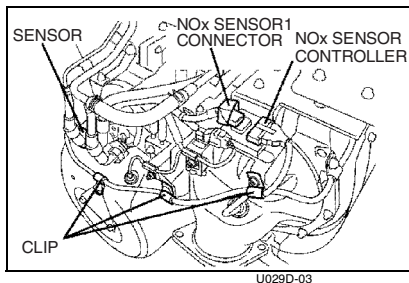
FUEL CONTROL (J08E)

Step	Parts	Description	Judgment	Action		
				Check (YES/ NO)	YES	NO
7	NOx sensor	Failure code check when the NOx sen- sor 1 and the NOx sensor 2 have been switched *Only when U029E and U029D are not detected simulta- neously.	U029E is stored → YES U029E is not stored → NO		Replace the NOx sensor 1	Replace the DCU

DTC:U029D

EN16Z0702F200001

DTC	U029D	Engine ECU CAN communication (NOx sensor ECU (SCR upstream))
-----	-------	--

1 NOx sensor 1 connector check

- 1 Set the starter switch to the "LOCK" position.
- 2 Check for NOx sensor connector looseness.
- 3 Disconnect the NOx sensor connector and check the connector pins for damage and rust.

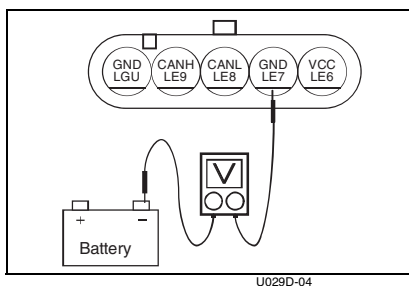
Judgment	Connector disconnected or loose. Connector pins damaged or rusted. → YES
	Connector not disconnected or loose. Connector pins not damaged or rusted. → NO

YES

Connector disconnected or loose.
→ Reconnect the connector.

Connector pins damaged or rusted.
→ Replace damaged parts.

NO

2 NOx sensor ground check

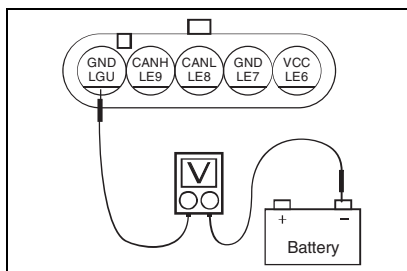
- 1 Set the starter switch to the "LOCK" position.
- 2 Disconnect the NOx sensor connector.
- 3 Set the starter switch to the "ON" position.
- 4 Measure the voltage between GND LE7 (chassis side of the NOx sensor connector) and the minus terminal of the battery with a circuit tester.

Judgment	Below 1 V → YES
	1 V or more → NO

NO

Repair or replace of the ground circuit (harness).

YES

3 NOx sensor ground check

U029D-05

- 1 Set the starter switch to the "LOCK" position.
- 2 Disconnect NOx sensor connector.
- 3 Set the starter switch to the "ON" position.
- 4 Measure the voltage between GND LGU (chassis side of the NOx sensor connector) and the minus terminal of the battery with a circuit tester.

Judgment

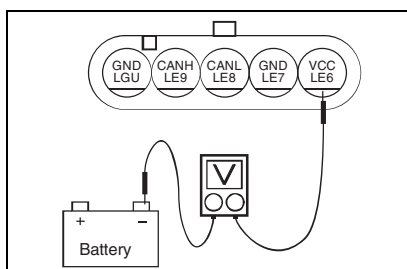
Below 1 V → YES

1 V or more → NO

NO

Repair or replace of the ground circuit (harness).

YES

4 NOx sensor power supply voltage check

U029D-06

- 1 Set the starter switch to the "LOCK" position.
- 2 Disconnect NOx sensor connector.
- 3 Set the starter switch to the "ON" position.
- 4 Measure the voltage between VCC LE6 (chassis side of the NOx sensor connector) and the minus terminal of the battery with a circuit tester.

Judgment

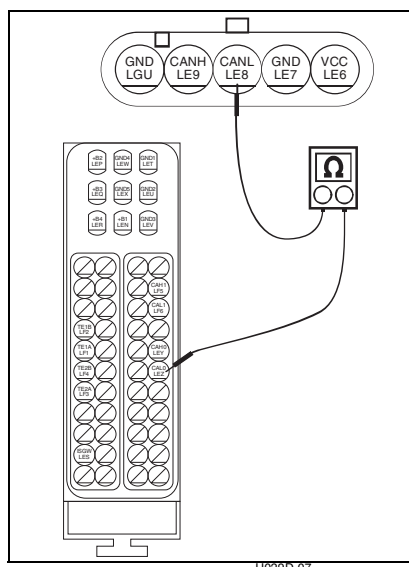
9 - 16 V → YES

Not 9 - 16 V → NO

NO

Repair or replace of the power supply circuit (harness, fuse, etc.).

YES

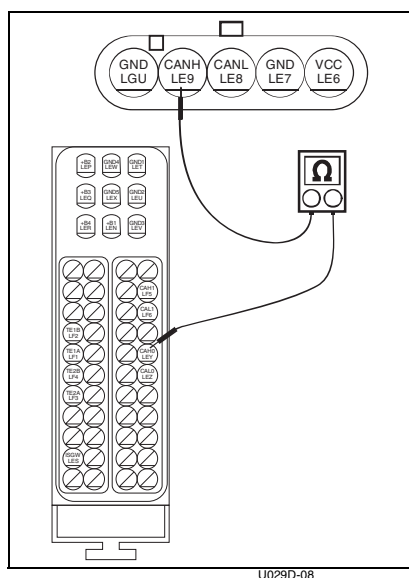
5 Harness check between DCU and NOx controller (CANL line)

- 1 Set the starter switch to the "LOCK" position.
- 2 Disconnect NOx sensor connector.
- 3 Disconnect the connector of the DCU.
- 4 Measure the resistance between CANL LE8 (chassis side of the NOx sensor connector) and CAH0 LEZ (chassis side of the DCU connector) with a circuit tester.

Judgment	Below 1 Ω → YES
	Between 1 Ω and ∞ → NO

NO → Repair or replace of the CAN harness between DCU and NOx controller.

YES

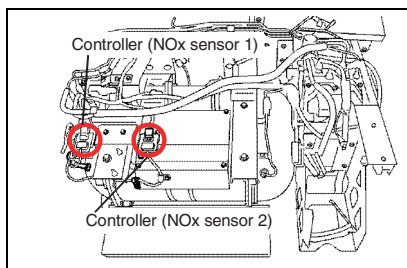
6 Harness check between DCU and NOx controller (CANH line)

- 1 Set the starter switch to the "LOCK" position.
- 2 Disconnect NOx sensor connector.
- 3 Disconnect the connector of the DCU.
- 4 Measure the resistance between CANH LE9 (chassis side of the NOx sensor connector) and CAH0 LEY (chassis side of the DCU connector) with a circuit tester.

Judgment	Below 1 Ω → YES
	Between 1 Ω and ∞ → NO

NO → Repair or replace of the CAN harness between DCU and NOx controller.

YES

7 DTC check when the NOx sensor 1 and the NOx sensor 2 have been switched

U029D-10

- 1 Set the starter switch to the "LOCK" position.
- 2 Disconnect the connectors of NOx sensor 1 and sensor 2.
- 3 Switch the arrangement of sensor 1 and sensor 2.
- 4 Set the starter switch to the "ON" position.
- 5 Connect Hino-DX to the vehicle.
- 6 Select "DCU".
- 7 After the DTC has been cleared, read the DTC again.

Judgment

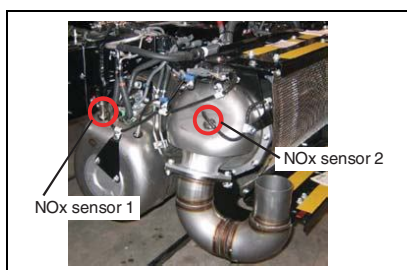
Only U029E is stored → YES

U029E is not stored → NO

* When the DTC U029E and U029D are detected simultaneously, perform steps from 5 to 6 again.

NO

Replace the DCU.



U029D-09

YES

Replace the NOx sensor 1.



FUEL CONTROL (J08E)

DN02-743



DTC:U029E (Check sheet)

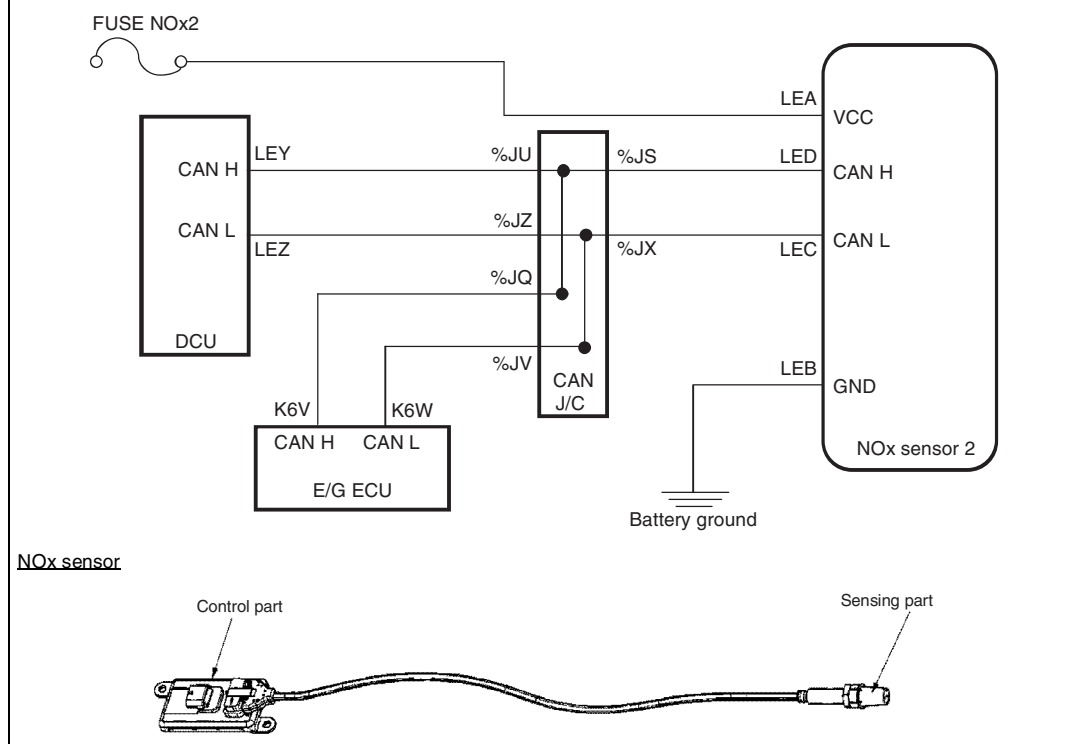
EN1610602F200093

DTC:U029E

Engine ECU CAN communication (NOx sensor ECU (SCR downstream))

1. Technical description

- The NOx sensor 2 (control part) is responsible for the CAN communication with the DCU.

**2. DTC set condition**

- 11 V < ECU power supply voltage < 16 V
- The starter switch ON.

(1) Judgment criteria

- CAN message from NOx sensor 2 (SCR downstream): Not received
- Failure timer \geq 3 seconds

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- CAN circuit failure (DCU CAN)
- NOx sensor controller failure
- Harness failure
- Controller power supply abnormal

DTC:U029E	Engine ECU CAN communication (NOx sensor ECU (SCR downstream))	Inspection Procedure
------------------	--	----------------------

Step	Parts	Description	Judgment	Action		
				Check (YES/NO)	YES	NO
1	NOx sensor	NOx sensor 2 connector check.	Connector disconnected or loose Connector pins damaged or rusted → YES Connector not disconnected or loose Connector pins not damaged or rusted → NO		Connector disconnected or loose → Reconnect the connector Connector pins damaged or rusted → Replace damaged parts	Go to Step 2
2	GND	NOx sensor ground check. (GND LEB terminal - Battery minus terminal)	The voltage value between the harnesses is within the standard value [below 1 V] → YES The voltage value between the harnesses is outside the standard value [1 V or more] → NO		Go to Step 3	Repair or replace the ground circuit (harness)
3	Power supply	NOx sensor power supply voltage check.	Voltage is within standard range [9-16 V] → YES Voltage is NOT within standard range [9-16 V] → NO		Go to Step 4	Repair or replace the power supply circuit (harness, fuse, etc.)
4	CAN harness between DCU and NOx controller	Harness check between DCU and NOx controller. (CANH LEC terminal - CAH0 LEZ terminal)	The harness resistance value is within the standard value [below 1 Ω] → YES The harness resistance value is outside the standard value [1 to ∞ Ω] → NO		Go to Step 5	Repair or replace the CAN harness between DCU and NOx controller
5	CAN harness between DCU and NOx controller	Harness check between DCU and NOx controller. (CANH LED terminal - CAH0 LEY terminal)	The harness resistance value is within the standard value [below 1 Ω] → YES The harness resistance value is outside the standard value [1 to ∞ Ω] → NO		Go to Step 6	Repair or replace the CAN harness between DCU and NOx controller
6	NOx sensor	DTC check when the NOx sensor 1 and the NOx sensor 2 have been switched *Only when U029D and U029E are not detected simultaneously.	U029D is stored → YES U029D is not stored → NO		Replace the NOx sensor 2	Replace the DCU

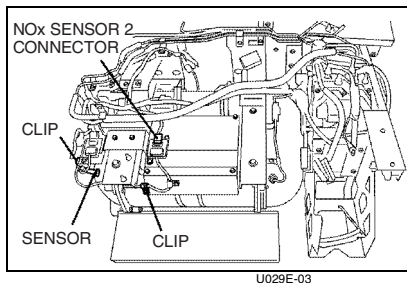
DN02-746

FUEL CONTROL (J08E)

DTC:U029E

EN16Z0702F200001

DTC	U029E	Engine ECU CAN communication (NOx sensor ECU (SCR downstream))
-----	-------	--

1 NOx sensor 2 connector check

- 1 Set the starter switch to the "LOCK" position.
- 2 Check for NOx sensor connector looseness.
- 3 Disconnect the NOx sensor connector and check the connector pins for damage and rust.

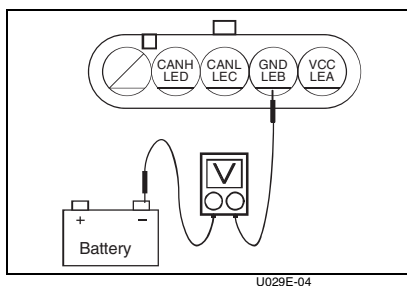
Judgment	Connector disconnected or loose. Connector pins damaged or rusted. → YES
	Connector not disconnected or loose. Connector pins not damaged or rusted. → NO

YES

Connector disconnected or loose.
→ Reconnect the connector.

Connector pins damaged or rusted.
→ Replace damaged parts.

NO

2 NOx sensor ground check

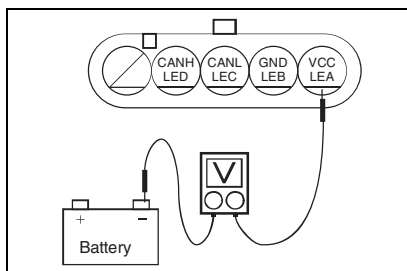
- 1 Set the starter switch to the "LOCK" position.
- 2 Disconnect the NOx sensor connector.
- 3 Set the starter switch to the "ON" position.
- 4 Measure the voltage between GND LEB (chassis side of the NOx sensor connector) and the minus terminal of the battery with a circuit tester.

Judgment	Below 1 V → YES
	1 V or more → NO

NO

Repair or replace of the ground circuit (harness).

YES

3 NOx sensor power supply voltage check

- 1 Set the starter switch to the "LOCK" position.
- 2 Disconnect the NOx sensor connector.
- 3 Set the starter switch to the "ON" position.
- 4 Measure the voltage between VCC LEA (chassis side of the NOx sensor connector) and the minus terminal of the battery with a circuit tester.

Judgment

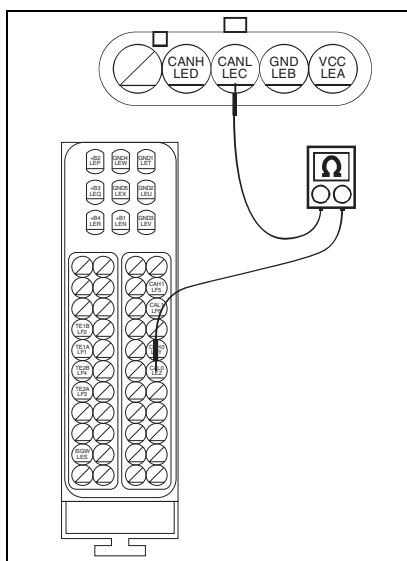
9 - 16 V → YES

Not 9 - 16 V → NO

NO

Repair or replace of the power supply circuit (harness, fuse, etc.).

YES

4 Harness check between DCU and NOx controller (CANL line)

- 1 Set the starter switch to the "LOCK" position.
- 2 Disconnect NOx sensor connector.
- 3 Disconnect the connector of the DCU.
- 4 Measure the resistance between CANL LEC (chassis side of the NOx sensor connector) and CANH0 LEZ (chassis side of the DCU connector) with a circuit tester.

JudgmentBelow 1 Ω → YESBetween 1 Ω and ∞ → NO

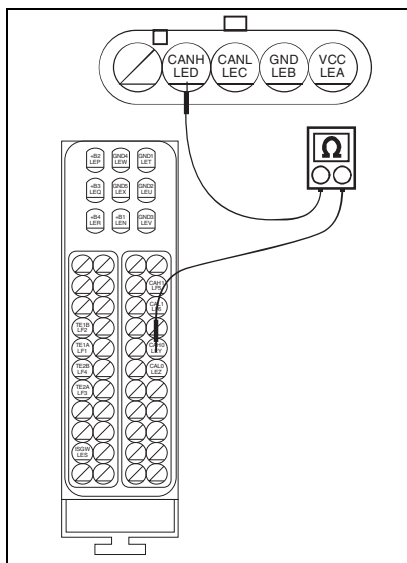
NO

Repair or replace of the CAN harness between DCU and NOx controller.

YES

DN02-748

FUEL CONTROL (J08E)

5 Harness check between DCU and NOx controller (CANH line)

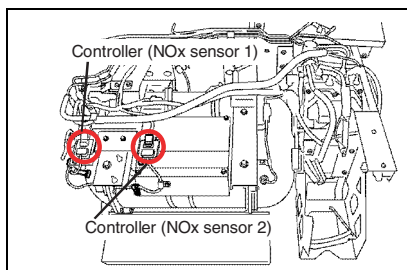
- 1 Set the starter switch to the "LOCK" position.
- 2 Disconnect the NOx sensor connector.
- 3 Set the starter switch to the "ON" position.
- 4 Measure the resistance between CANH LED (chassis side of the NOx sensor connector) and CAH0 LEY (chassis side of the DCU connector) with a circuit tester.

Judgment	Below 1 Ω → YES
	Between 1 Ω and ∞ → NO

NO

Repair or replace the CAN harness between DCU and NOx controller.

YES

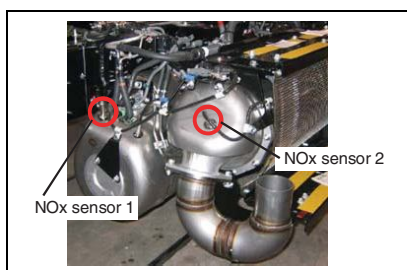
6 DTC check when the NOx sensor 1 and the NOx sensor 2 have been switched

U029E-08

- 1 Set the starter switch to the "LOCK" position.
- 2 Disconnect the connectors of NOx sensor 1 and sensor 2.
- 3 Switch the arrangement of sensor 1 and sensor 2.
- 4 Set the starter switch to the "ON" position.
- 5 Connect Hino-DX to the vehicle.
- 6 Select "DCU".
- 7 After the DTC has been cleared, read the DTC again.

Judgment	Only U029D is stored → YES
	U029D is not stored → NO

* When the DTC U029E and U029D are detected simultaneously, perform steps from 4 to 5 again.



U029E-09

NO

Replace the DCU.

YES

Replace the NOx sensor 2.

DN02-750

FUEL CONTROL (J08E)

DTC:U0301 (Check sheet)

CHDFHFEA

DTC:U0301

Software Incompatibility With DeNOx ECU

1. Technical description

- A suitable data set in the DCU is selected according to the data set No. sent from the engine ECU via CAN.
- The data set No. selected by the DCU is received, and a confirmation is issued that it is the same as the transmitted No.

2. DTC set condition**(1) Check conditions**

- The starter switch is ON.

(2) Judgment criteria

- Transmitted data set No. \neq received data set No.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- DCU fault

DTC:U0301		Software Incompatibility With DeNOx ECU		Inspection Procedure		
No	Parts	Check contents	Judge	Check (Pass/ Fail)	If OK	If fail
1	DCU	1. Set the starter key to “LOCK”, and after 1 minute, set the starter key to “ON”. 2. After deleting the past faults in the ECU with Hino-DX, read the fault codes again.	Fault code “U0301” will not be displayed			Replace DCU
When the fault code “U0301” is not displayed again, there is no problem with the present state. Wait and see.						

DN02-752

FUEL CONTROL (J08E)

DTC:U1001 (Check sheet)

EN1610602F200298

DTC:U1001

Engine ECU CAN communication bus for vehicle control bus off

1. Technical description

- Abnormal vehicle CAN communication

2. DTC set condition**(1) Check conditions**

- $11\text{ V} < \text{ECU power supply voltage} < 16\text{ V}$
- The starter switch is ON.

(2) Judgment criteria

- The bus remains OFF for 96 ms or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Malfunction of CAN circuit (vehicle CAN)
- Malfunction of vehicle ECU
- Malfunction of harness

DTC:U1001	Engine ECU CAN communication bus for vehicle control bus off	Inspection Procedure
------------------	--	----------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Vehicle ECU	Replace	When turning the key ON, the malfunction recurs.		Replace the faulty vehicle ECU.	After replacing an old vehicle ECU, proceed to No. 2.
2	Engine ECU	Replace	When turning the key ON, the malfunction recurs.		Replace the faulty ECU.	After replacing an old DCU, proceed to No. 3.
3	Harness	Replace	When turning the key ON, the malfunction recurs.		Replace harness.	Proceed to No. 4.
4	Other communication units	After replacing an old harness, replace meters, DCU and BCU for CAN 1.	When turning the key ON, the malfunction recurs.		Replace if a replaced communication unit malfunctions.	Report to Development Department.

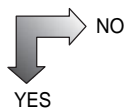
DTC:U1001

EN1610602F200299

DTC	U1001	Engine ECU CAN communication bus for Vehicle control - bus off
-----	-------	--

1. CHECKING EACH ECU

- (1) Remove the vehicle control ECU, combination meter, BCU and DCU and check the diagnosis of U1001 is restored.



Proceed to the communication blackout diagnostic flow of each ECU.
If abnormalities are still not found, replace each ECU.

Replace the engine ECU

DN02-754

FUEL CONTROL (J08E)

DTC:U110A (Check sheet)

EN1610602F200300

DTC:U110A	Can Bus-Line Open EEC2 From Vehicle
------------------	-------------------------------------

1. Technical description

- | |
|---|
| – CAN communication with the vehicle control ECU has blacked out. |
|---|

2. DTC set condition**(1) Check conditions**

- | |
|--|
| – 11 V < ECU power supply voltage < 16 V |
| – The starter switch is ON. |

(2) Judgment criteria

- | |
|---|
| – CAN data have not been sent from the vehicle control ECU for 3 seconds or longer. |
|---|

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- | |
|--|
| – Malfunction of CAN circuit (vehicle CAN) |
| – Malfunction of vehicle ECU |
| – Malfunction of harness |

DTC:U110A		Can Bus-Line Open EEC2 From Vehicle			Inspection Procedure	
No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	Vehicle ECU	Replace	When turning the key ON, the malfunction recurs.		Replace the faulty vehicle ECU.	After replacing an old vehicle ECU, proceed to No. 2.
2	ECU	Replace	When turning the key ON, the malfunction recurs.		Replace the faulty ECU.	After replacing an old DCU, proceed to No. 3.
3	Harness	Replace	When turning the key ON, the malfunction recurs.		Replace harness.	Proceed to No. 4.
4	Other communication units	After replacing an old harness, check malfunction codes of communication blackout in association with DCU, BCU and meters for CAN 1.	When turning the key ON, the malfunction recurs.		If other malfunctions caused by communication blackout are found, replace individual units and check.	If no remedy or improvement is seen, report to Development Department.

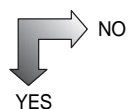
DN02-756

FUEL CONTROL (J08E)

DTC:U110A

EN1610602F200301

DTC	U110A	Engine ECU CAN communication (vehicle control ECU)
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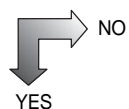
1. CHECK THE POWER SUPPLY CIRCUIT OF THE VEHICLE CONTROL ECU.

NO

Check the vehicle control ECU main relay and fuse power supply circuit.

2. CHECK A MALFUNCTION CODE.

- (1) Refer to the section **MALFUNCTION CODES IN CASE OF DISRUPTION OF CAN COMMUNICATION**" (DN02-36).



NO

Check the CAN harness

Replace the vehicle control ECU.



FUEL CONTROL (J08E)

DN02-757



DTC:U111E (Check sheet)

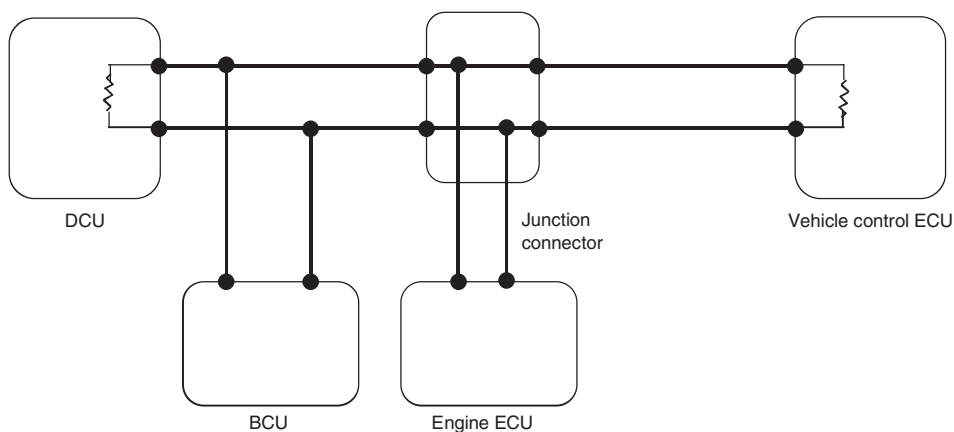
EN1610602F200302

DTC:U111E	Engine ECU CAN communication (Burner ECU)
------------------	---

1. Technical description

- CAN communication with the BCU controller has lost.

Diagram

**2. DTC set condition****(1) Check conditions**

- 11 V < ECU power supply voltage < 16 V
- Starter switch "ON"

(2) Judgment criteria

- CAN data have not been sent from the BCU for 20 seconds or longer

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Malfunction of CAN circuit (engine CAN)
- Malfunction of BCU controller
- Malfunction of harness

DTC:U111E	Engine ECU CAN communication (Burner ECU)	Inspection Procedure
------------------	--	-----------------------------

Step	Parts	Description	Judgment	Action		
				Check (YES/NO)	YES	NO
1	DTC confirmation	Check the DCU and vehicle control ECU if any of following DTC is stored. (U0029, U0038, U0101, U0104, U0105, U0121, U0132, U0155, U0293)	DTC is stored → YES No DTC is stored → NO		If DTC U0029, U0038 exists, go to Step 2 If DTC U0101, U0104, U0105, U0121, U0132, U0155, U0293 exists, go to Step 3	Go to Step 4
2	DCU	Check connector engagement status, terminal status, terminating resistance.	The terminating resistance value is within the standard value (110 - 130 Ω) → YES Incomplete engagement, terminal damage Terminating resistance value outside the standard value → NO		Go to Step 4	Repair or Replace
3	Vehicle control ECU	Check connector engagement status, terminal status, terminating resistance.	The terminating resistance value is within the standard value (110 - 130 Ω) → YES Incomplete engagement, terminal damage Terminating resistance value outside the standard value → NO		Go to Step 4	Repair or Replace
4	Harness between BCU — junction connector	Harness short-circuit, wire break. BCU connector, junction connector, engine — chassis harness connection, terminal status.	Harness resistance value within standard value {Below 1 Ω (between H-H/L-L lines)} → YES Incomplete engagement, terminal damage Harness resistance value outside the standard value → NO		Go to Step 5	Repair or Replace
5	Harness between junction connector — engine ECU	Harness short-circuit, wire break. Engine ECU connector, junction connector, engine — chassis harness connection, terminal status.	Harness resistance value within standard value {Below 1 Ω (between H-H/L-L lines)} → YES Incomplete engagement, terminal damage Harness resistance value outside the standard value → NO		Go to Step 6	Repair or Replace
6	BCU	Power supply voltage confirmation	Voltage is within the standard range (9 - 16 V) → YES Voltage is NOT within the standard range → NO		Replace the BCU	Repair the power supply circuit

DN02-760

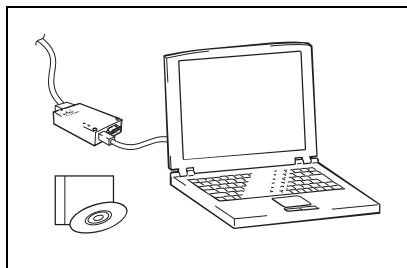
FUEL CONTROL (J08E)

DTC:U111E

EN1610602F200303

DTC	U111E	Engine ECU CAN communication (Burner ECU)
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1	Other system DTC confirmation
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- 1 Set the starter switch to the "LOCK" position.
- 2 Connect Hino-DX to the vehicle.
- 3 Set the starter switch to the "ON" position.
- 4 Confirm the DTC of the DCU.
- 5 Confirm the DTC of the vehicle control ECU.

Judgment	U0029, U0038 are stored → YES1
	U0101, U0104, U0105, U0121, U0132, U0155, U0293 are stored → YES2
	No DTC is stored → NO

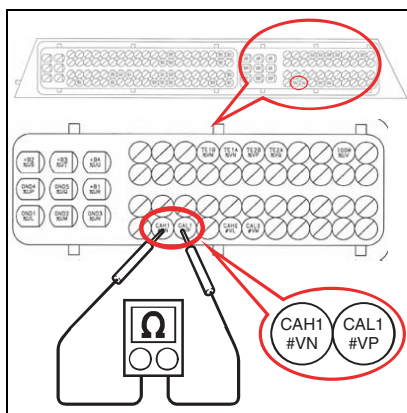
YES1 → Go to Step 2.

YES2 → Go to Step 3.

NO

Go to Step 4.

2	DCU inspection
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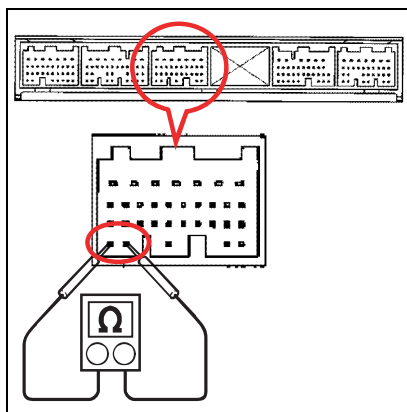
- 1 Set the starter switch to the "LOCK" position.
- 2 Confirm the connector engagement status.
- 3 Disconnect the DCU 53 P connector.
- 4 Confirm that the connector terminals are not damaged.
- 5 Use a circuit tester and measure the DCU terminating resistance. (Refer to the figure on the left for the measuring terminal positions.)

Judgment	DCU terminating resistance value within the standard value (110 - 130 Ω) → YES
	Incomplete engagement, terminal damage exists. Terminating resistance outside the standard value → NO

NO → Connector repair, harness replacement, DCU replacement.

YES

3 Inspection of the vehicle control ECU



U111E-2

- 1 Set the starter switch to the "LOCK" position.
- 2 Confirm the connector engagement status.
- 3 Disconnect the vehicle control ECU connector (32 P).
- 4 Confirm that the connector terminals are not damaged.
- 5 Use the circuit tester and measure the vehicle control ECU terminating resistance.

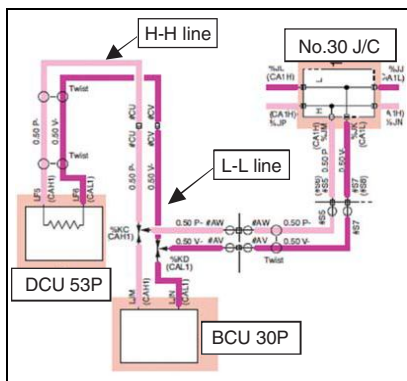
Judgment	Vehicle control ECU terminating resistance value within the standard value (110 - 130 Ω) → YES
	Incomplete engagement, terminal damage exists. Terminating resistance outside the standard value → NO

NO

Connector repair, harness replacement, vehicle control ECU replacement.

YES

4 BCU — junction connector harness inspection

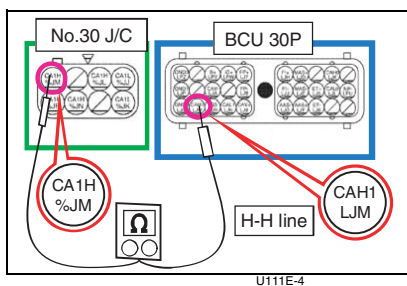


U111E-3

- 1 BCU connector, junction harness connector engagement status confirmation.
- 2 Disconnect the BCU 30 P, No. 30 J/C, DCU 53 P connector.
- 3 Confirm that the terminals of each connector are not damaged.

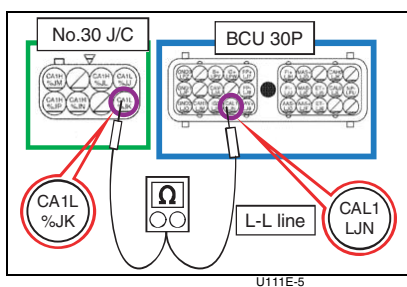
DN02-762

FUEL CONTROL (J08E)



4 Use the circuit tester and measure the harness H-H line.

- Resistance value
- GND short-circuit



5 Use the circuit tester and measure the harness L-L line.

- Resistance value
- GND short-circuit

6 Check for a line short-circuit between the H/L lines.

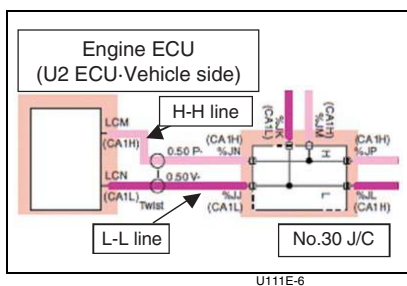
Judgment	Harness resistance value is within standard value (Below 1 Ω (H-H/L-L lines)) → YES
	Incomplete engagement, terminal damage exists. Harness resistance value outside standard value GND, line short-circuit exists → NO

NO

Connector repair, harness replacement.

YES

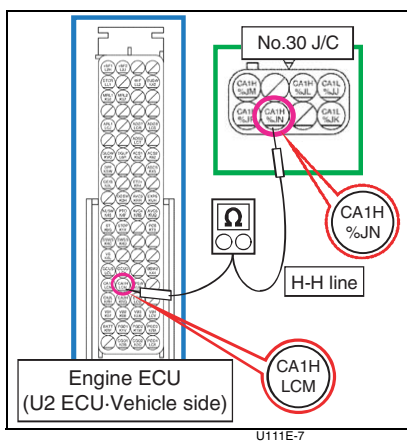
5 Junction connector — Engine ECU harness inspection



1 Engine ECU connector, junction connector engagement status confirmation.

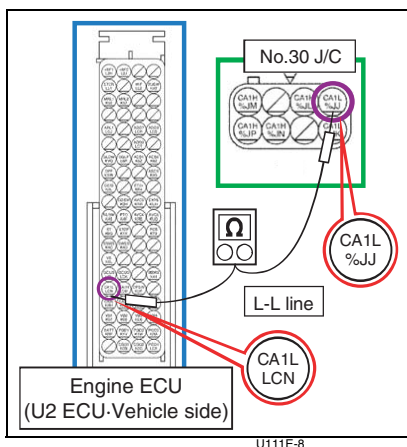
2 Disconnect the engine ECU, No. 30 J/C connector.

3 Confirm that the terminals of each connector are not damaged.



4 Use the circuit tester and measure the harness H-H line.

- Resistance value
- GND short-circuit



5 Use the circuit tester and measure the harness L-L line.

- Resistance value
- GND short-circuit

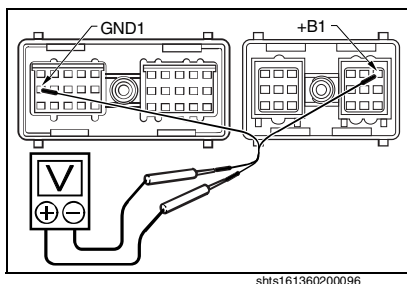
6 Check for a line short-circuit between the H/L lines.

Judgment	Harness resistance value is within standard value (Below 1 Ω (H-H/L-L lines)) → YES
	Incomplete engagement, terminal damage exists. Harness resistance value outside standard value GND, line short-circuit exists → NO

NO → Connector repair, harness replacement.

YES

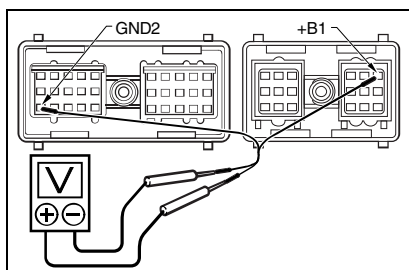
6 BCU power supply inspection



- 1 Set the starter switch to the "LOCK" position.
- 2 Disconnect the BCU 18P and 30P connector.
- 3 Connect the signal check harness.
- 4 Set the starter switch to the "ON" position.
- 5 Measure the voltage between the terminals of +B1 on the BCU 18P and GND1 of the BCU 30P connector on the harness side.

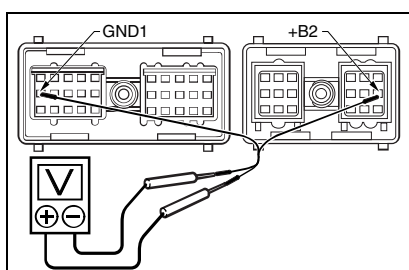
DN02-764

FUEL CONTROL (J08E)



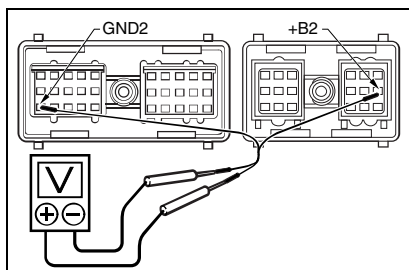
shits161360200097

- 6 Measure the voltage between the terminals of +B1 on the BCU 18P and GND2 of the BCU 30P connector on the harness side.



shits161360200098

- 7 Measure the voltage between the terminals of +B2 on the BCU 18P and GND1 of the BCU 30P connector on the harness side.



shits161360200099

- 8 Measure the voltage between the terminals of +B2 on the BCU 18P and GND2 of the BCU 30P connector on the harness side.

Judgment	Each power supply voltage is within 9 V - 16 V → YES
	Power supply voltage is outside the above range → NO

NO

Repair of the power supply system.

YES

Replace the BCU.



FUEL CONTROL (J08E)

DN02-765



DTC:U1122 (Check sheet)

EN1610602F200304

DTC:U1122

Engine ECU CAN communication (EGR valve control)

1. Technical description

- CAN communication with the EGR controller has blacked out.

2. DTC set condition**(1) Check conditions**

- 11 V < ECU power supply voltage < 16 V
- The starter switch is ON.

(2) Judgment criteria

- CAN data have not been sent from the EGR for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Malfunction of CAN circuit (engine CAN)
- Malfunction of EGR controller
- Malfunction of harness

DTC:U1122	Engine ECU CAN communication (EGR valve control)	Inspection Procedure
------------------	---	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	EGR	Replace	When turning the key ON, the malfunction recurs.		Replace the faulty EGR.	After replacing an old EGR, proceed to No. 2.
2	ECU	Replace	When turning the key ON, the malfunction recurs.		Replace the faulty ECU.	After replacing an old DCU, proceed to No. 3.
3	Harness	Replace	When turning the key ON, the malfunction recurs.		Proceed to No. 4.	Proceed to No. 5.
4	Terminal resistor for CAN 3 incorporated in the harness	Replace	When turning the key ON, the malfunction recurs.		Replace the terminal resistor.	Replace the harness.
5	Other communication units	After replacing an old harness, check malfunction codes of communication blackout in association with VNT, NOx, BCD and DCU for CAN 3.			If other malfunctions caused by communication blackout are found, replace individual units and check.	If only U1122 is present, report to Development Department.

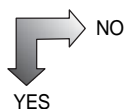
DN02-768

FUEL CONTROL (J08E)

DTC:U1122

EN1610602F200305

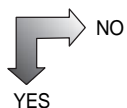
DTC	U1122	Engine ECU CAN communication (EGR valve controller)
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1. CHECK THAT THE ACTUATOR RELAY HAS NO MALFUNCTION.

Check the actuator relay and fuse circuit.

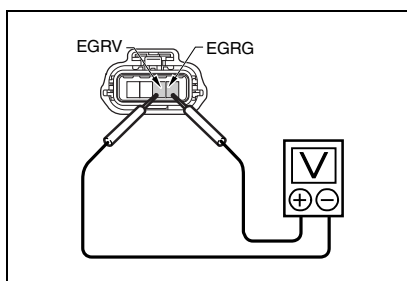
2. CHECK A MALFUNCTION CODE.

- (1) Refer to the section "MALFUNCTION CODES IN CASE OF DISRUPTION OF CAN COMMUNICATION" (DN02-36).



Check the CAN harness

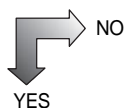
Clear and recheck the DTC.



SAPH161060200350

3. Measure voltage of the EGR actuator.

- (1) Set the starter switch to "LOCK" position.
(2) Disconnect the EGR actuator connector.
(3) Measure voltage between the terminals EGRV and EGRG of the EGR actuator connector (engine sub harness side).

Standard value: 8-16 V

Faulty in harness

Faulty EGR actuator



FUEL CONTROL (J08E)

DN02-769



DTC:U1123 (Check sheet)

EN1610602F200306

DTC:U1123

Engine ECU CAN communication (VNT controller)

1. Technical description

- CAN communication with the VNT controller has blacked out.

2. DTC set condition**(1) Check conditions**

- $11\text{ V} < \text{ECU power supply voltage} < 16\text{ V}$
- The starter switch is ON.

(2) Judgment criteria

- CAN data have not been sent from the VNT controller for 3 seconds or longer.

3. Troubleshooting hints

(The most likely causes for this code to be set are ;)

- Malfunction of CAN circuit (engine CAN)
- Malfunction of VNT controller
- Malfunction of harness

DTC:U1123	Engine ECU CAN communication (VNT controller)	Inspection Procedure
------------------	--	-----------------------------

No	Parts	Check contents	Judge	Check (Pass/Fail)	If OK	If fail
1	VNT	Replace	When turning the key ON, the malfunction recurs.		Replace the faulty VNT.	After replacing an old VNT, proceed to No. 2.
2	ECU	Replace	When turning the key ON, the malfunction recurs.		Replace the faulty ECU.	After replacing an old DCU, proceed to No. 3.
3	Harness	Replace	When turning the key ON, the malfunction recurs.		Proceed to No. 4.	Proceed to No. 5.
4	Terminal resistor for CAN 3 incorporated in the harness	Replace	When turning the key ON, the malfunction recurs.		Replace the terminal resistor.	Replace the harness.
5	Other communication units	After replacing an old harness, check malfunction codes of communication blackout in association with EGR, NOx, BCD and DCU for CAN 3.			If other malfunctions caused by communication blackout are found, replace individual units and check.	If only U1123 is present, report to Development Department.

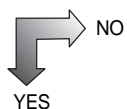
DN02-772

FUEL CONTROL (J08E)

DTC:U1123

EN1610602F200307

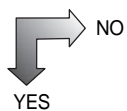
DTC	U1123	Engine ECU CAN communication (VNT controller)
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1. CHECK THAT THE ACTUATOR RELAY HAS NO MALFUNCTION.

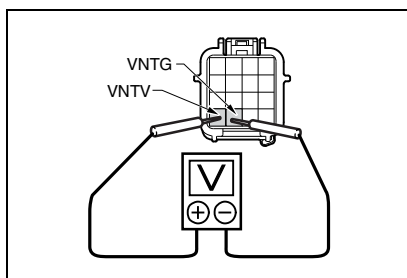
Check the actuator relay and fuse circuit.

2. CHECK A MALFUNCTION CODE.

- (1) Refer to the section "MALFUNCTION CODES IN CASE OF DISRUPTION OF CAN COMMUNICATION" (DN02-36)

Standard value: 8-16 V

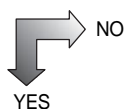
Check the CAN harness



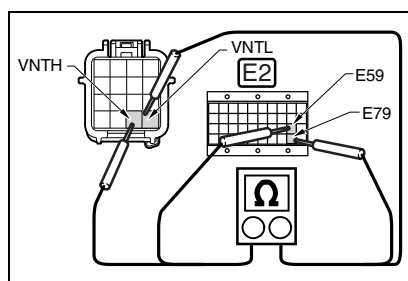
SAPH161060200349

3. MEASURING VOLTAGE BETWEEN SENSOR TERMINALS

- (1) Set the starter switch to "LOCK" position.
(2) Connect the signal check harness.
(3) Disconnect the VNT controller connector.
(4) Set the starter switch to "ON" position.
(5) Check voltage between the terminals VNTV and VNTG of the VNT controller connector.

Standard value: 8-16 V

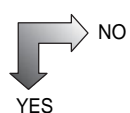
Faulty in harness

**4. CHECK THE CONTINUITY OF HARNESS.**

- (1) Check continuity between the terminals VNTH and VNTL of the VNT controller connector and the terminals CA1H (E59) and CA1L (E79) of the signal check harness respectively.

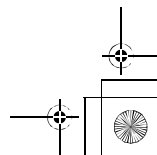
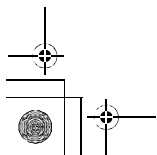
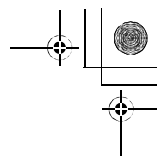
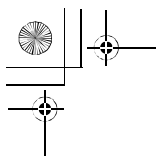
Terminals to measure the resistance	
VNT controller side	Signal check harness side
VNTH	CA1H
VNTL	CA1L

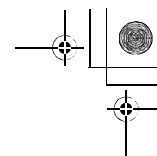
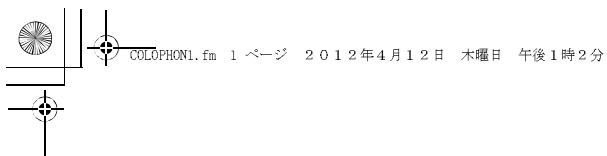
Standard value: $2\ \Omega$ or less



Faulty in harness

Faulty VNT controller





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