

AIRMAN

PG

SERVICE MANUAL

SCREW COMPRESSOR

PDSH850S-4B1

PDSJ 750S-4B1

Preface

This service manual explains about the cautions for maintenance jobs and is to serve a guide for the electric system, and troubleshooting for service personnel.

In this book the fundamental matters and other things already mentioned in the “Instruction Manual” and the “Parts Catalogue” are omitted to avoid duplication.

Therefore, for the operation and handling of this unit, we request you to refer to the instruction manual and caution plates, and further for the structure and components of the unit, please refer to the “Parts Catalogue” separately to be supplied with the unit.

If you should find any description which does not coincide with the instruction manual and parts catalog, we request you to make sure to start the job after clarifying it.

Service personnel is required to safely take quick and proper countermeasures as well as to use correct technology of maintenance in case of field services and periodical maintenance.

It is important that service personnel should have proper and sufficient knowledge about the structure and function of the unit and should be well familiar with such technique mentioned in them.

Copies of this service manual are intended to be distributed to limited numbers of our customers. The unauthorized reproduction or distribution of this service manual is prohibited.

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1. Specification

1.1 Specifications

Item	unit	PDSJ750S-4B1	PDSH850S-4B1
●Weight · Mass			
Overall length with drawbar folded up	mm	4300	←
Overall length bonnet only	mm	4000	←
Overall width	mm	2000	←
Overall height	mm	2445	←
Tire		7.5-16 10PR	←
Turning radius	mm	6100	←
Net dry mass	kg	5050	←
Operating mass	kg	5650	←
●Compressor			
Free air delivery	m ³	21.2	24.0
Working pressure	MPa	2.07	1.72
Pressure of pressure control valve	MPa	1.37	←
Burst pressure of safety valve	MPa	2.45	←
Ambient conditions: temperature	°C	-15 to +40	←
Ambient conditions: altitude	m	less than 1500	←
●Engine			
Type		MITSUBISHI 6D24-TLEA2	
Rated output	kW/min ⁻¹	235	238
Fuel consumption	g/kW·h	232	247
Rated RPM	min ⁻¹	2000	2200
RPM at unload conditions	min ⁻¹	1100	←
Net dry mass	kg	1050	←
●Lubricating oils			
Engine oil capacity (high level)	L	45	←
Compressor oil capacity (including receiver tank and oil cooler etc.)	L	84	←
Compressor oil capacity to be filled		Ambient temperature 5°C to 40°C : MOBIL ; RARUS 425 -15°C to 40°C : MOBIL ; RARUS SHC 1025	
Coolant capacity	L	45	←
Fuel tank capacity	L	560	←
●Emergency stop devices			
Actuating pressure of oil pressure switch	MPa	0.078	←
Actuating temperature of water temperature switch	°C	more than 101	←
Actuating temperature of discharge air temperature switch	°C	more than 130	←
Actuating temperature of separator outlet temperature switch	°C	more than 130	←
Actuating speed of engine speed down switch	min ⁻¹	less than 900	←
Fuel residual level drop		Quantity of residual oil about 45L	
●Fuel consumption ratio			
At full load (for reference only)	L/Hr	62.0	←
At 70% load (for reference only)	L/Hr	37.5	←
At 50% load (for reference only)	L/Hr	30.0	←
At no load (for reference only)	L/Hr	17.0	←

1. Specification

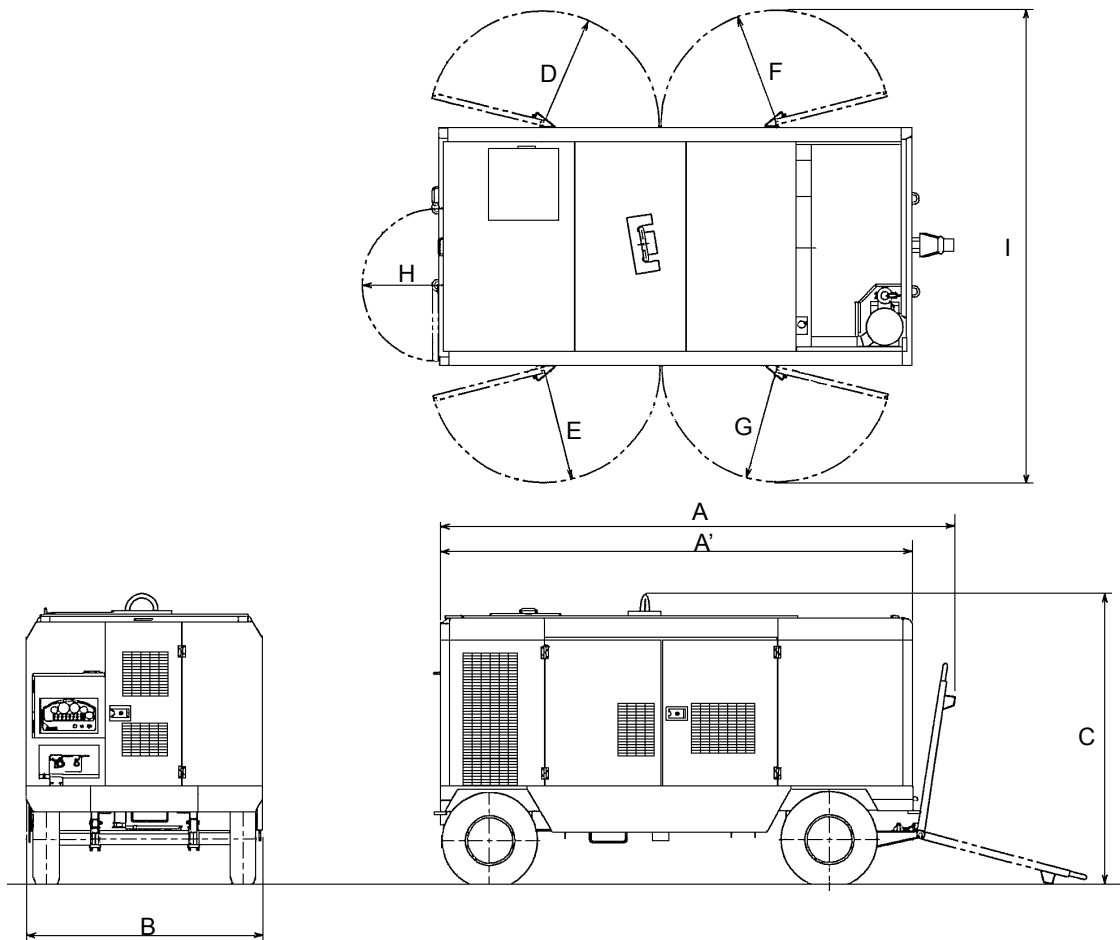
1.2 Set Value

Item	unit	PDSJ750S-4B1	PDSH850S-4B1
Specifications of working pressure	MPa (kgf/cm ²)	1.40/2.07 (14.3/21.1)	1.40/1.72 (14.3/17.5)
●Safety devices			
Discharge air temperature (separator)	°C	130	←
Discharge air temperature (high pressure stage)	°C	130	←
Engine oil pressure	MPa (kgf/cm ²)	0.078 (0.8)	←
Engine coolant temperature	°C	101	←
Engine speed down	min ⁻¹ (rpm)	900	←
Fuel residual level	%	8% (less than about 45L)	←
●Set pressure			
Air filter differential pressure switch	kPa (mmAq)	6.23 (635)	←
Compressor oil filter differential pressure switch	MPa (kgf/cm ²)	0.12 (1.26)	←
Oil separator differential pressure switch	MPa (kgf/cm ²)	0.15 (1.5)	←
Pressure control valve	MPa (kgf/cm ²)	1.37 (14.0)	←
Actuating pressure of safety valve	MPa (kgf/cm ²)	2.45 (25.0)	←
Unload starting pressure	MPa (kgf/cm ²)	2.07 (21.1)	1.72 (17.5)
●Engine RPM			
Rated RPM	min ⁻¹ (rpm)	2000	2200
RPM at unload	min ⁻¹ (rpm)	1100	←
●Indications of gauges or instruments during operation			
Discharge pressure gauge (at full load)	MPa (kgf/cm ²)	1.37-2.07 (14.0-21.1)	1.37-1.72 (14.0-17.5)
Discharge pressure gauge (at no load)	MPa (kgf/cm ²)	2.19-2.45 (22.3-25.0)	1.82-2.07 (18.5-21.1)
Discharge air temperature gauge	°C	95-120	←
Engine coolant temperature gauge	°C	75-95	←

1. Specification

1.3 Outline Drawing

PDSJ750S/PDSH850S-4B1

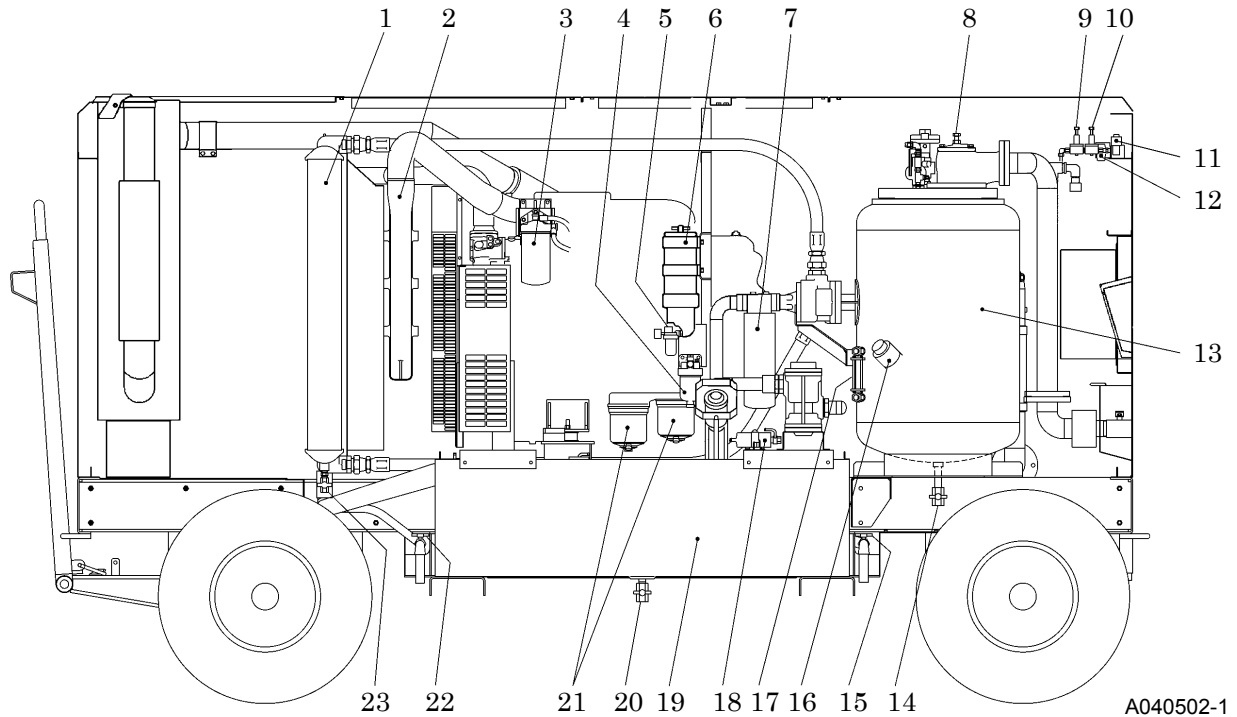


Item	unit	PDSJ750S/PDSH850S-4B1	
● Outlined dimensions			
Overall length	A	mm	4350
Overall length	A'	mm	4000
Overall width	B	mm	2000
Overall height	C	mm	2445
● Door dimensions			
Door	D	mm	975
Door	E	mm	975
Door	F	mm	975
Door	G	mm	975
Door	H	mm	640
Door	I	mm	3950

1. Specification

1.4 Internal Components and Part Names

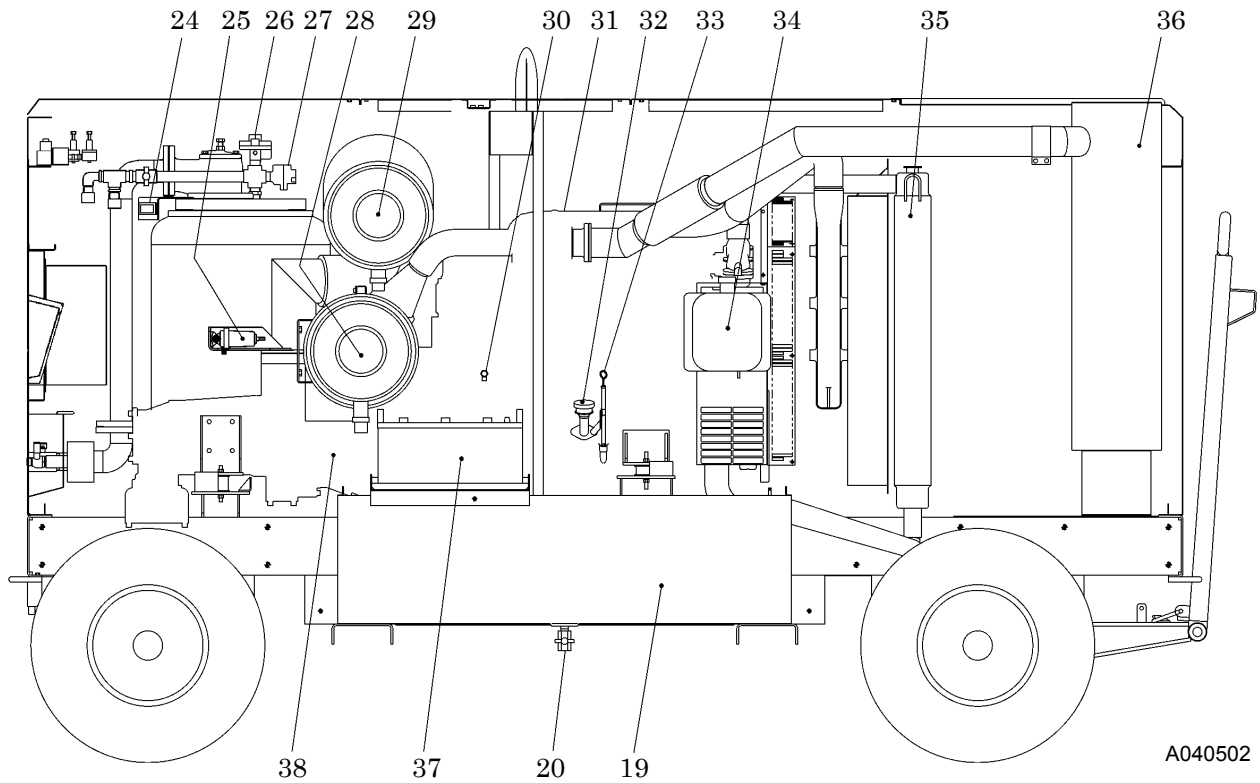
PDSJ750S/PDSH850S-4B1



- | | |
|--|--|
| 1. Oil cooler | 13. Separator receiver tank |
| 2. Inter cooler | 14. Separator receiver tank drain valve |
| 3. Fuel filter | 15. Engine oil drain valve |
| 4. Sedimenter | 16. Compressor oil filler |
| 5. Fuel air-bleeding electromagnetic pump filter | 17. Compressor oil level gauge |
| 6. Pre-filter (option) | 18. Fuel air-bleeding electromagnetic pump |
| 7. Compressor oil filter | 19. Fuel tank |
| 8. Pressure control valve | 20. Fuel tank drain valve |
| 9. Regulator for low pressure | 21. Engine oil filter |
| 10. Regulator for high pressure | 22. Coolant drain valve (radiator) |
| 11. Solenoid valve for starting unloader | 23. Oil cooler drain valve |
| 12. Solenoid valve for selection rated pressure | |

1. Specification

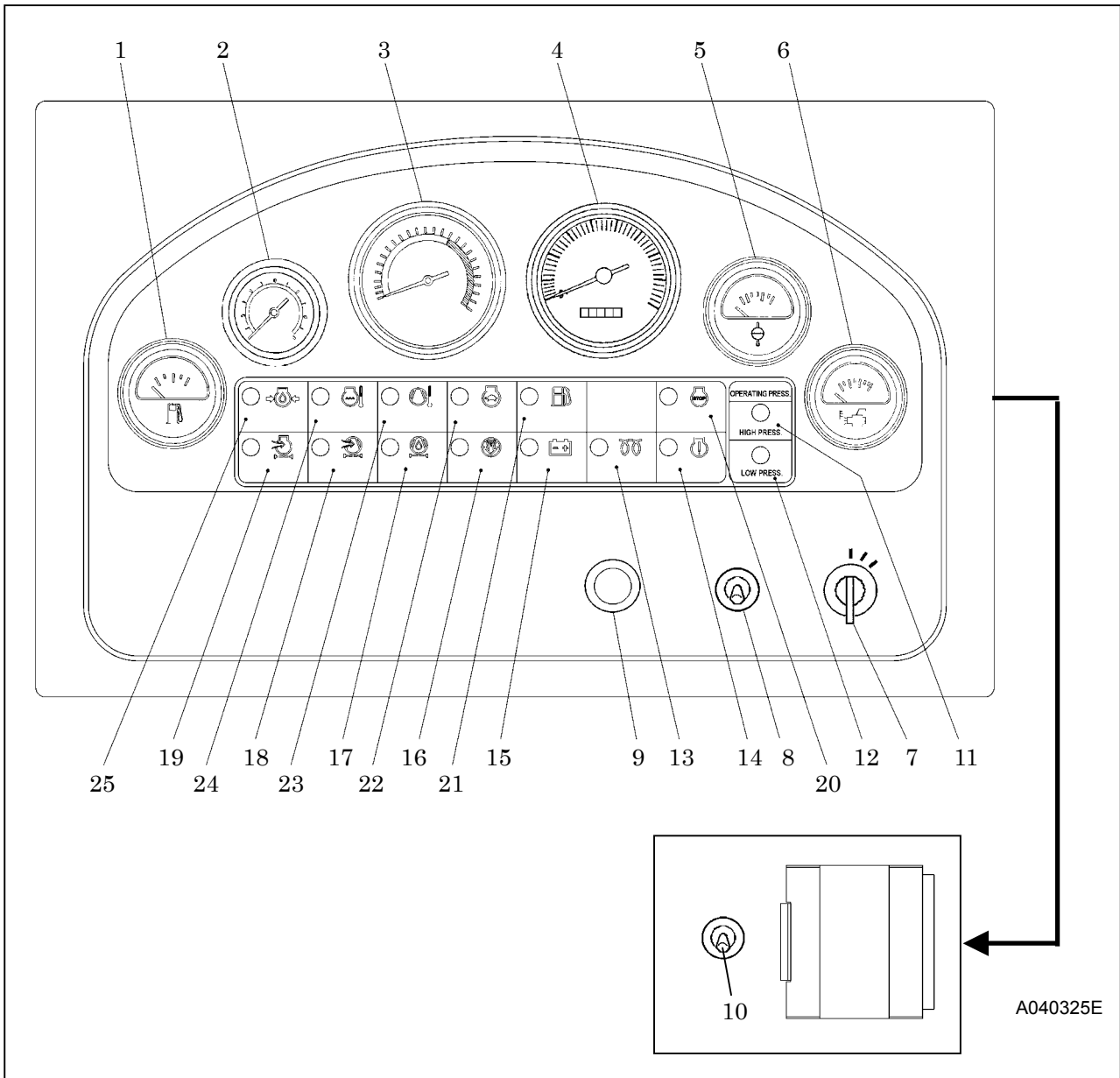
PDSJ750S/PDSH850S-4B1



- | | |
|---|----------------------------|
| 24. Oil separator differential pressure gauge | 32. Engine oil filler |
| 25. Unloader regulator | 33. Engine oil level gauge |
| 26. Vacuum relief valve | 34. Reserve tank |
| 27. Auto-relief valve | 35. Radiator |
| 28. Air filter element (engine) | 36. Exhaust muffler |
| 29. Air filter element (compressor) | 37. Battery |
| 30. Coolant drain plug (engine) | 38. Air-end |
| 31. Engine | |

1. Specification




1.5 Instrument Panel



- | | | |
|---------------------------------------|------------------------------------|-------------------------------|
| 1. Fuel level gauge | <Indicator lamp> | <Emergency stop lamp> |
| 2. Interstage pressure gauge | 11. High pressure | 20. Engine stop |
| 3. Discharge air pressure gauge | 12. Low pressure | 21. Fuel residual level |
| 4. Tachometer (with hourmeter) | 13. Preheating | 22. Engine speed down |
| 5. Coolant temperature gauge | <Warning lamp> | 23. Discharge air temperature |
| 6. Discharge air temperature gauge | 14. Engine trouble | 24. Coolant temperature |
| 7. Starter switch | 15. Charging | 25. Engine oil pressure |
| 8. Starting unloader switch | 16. Oil separator clogging | |
| 9. Emergency stop button | 17. Compressor oil filter clogging | |
| 10. Selector switch of rated pressure | 18. Compressor air filter clogging | |
| | 19. Engine air filter clogging | |







1. Specification

Indicator lamp

Item		Trouble	Monitor
PDSH850S	Low pressure	Rated pressure 1.72MPa Rated RPM 2,200min ⁻¹	 LOW PRESS.
PDSJ750S	High pressure	Rated pressure 2.07MPa Rated RPM 2,000min ⁻¹	 HIGH PRESS.
Preheating		Press starter switch "ON" and the lamp goes on and after preheating is finished, the lamp will be off.	

Warning lamp

When the lamp goes on, take appropriate measures to recover the situation swiftly.

Item	Trouble	Measures	Monitor
Engine trouble	Engine continues unloaded operation without stopping and will not recover to full load operation. (RPM 1,100 min ⁻¹ constant.)	Contact engine distributor or us directly	
Charging	Lamp goes on when alternator is not charging.	Check wiring Check alternator	
Oil separator	Lamp goes on when separator gets clogged and differential pressure increases. Actuating resistance is more than 0.15MPa.	Replace	
Compressor oil filter	Lamp goes on when the differential pressure increases due to oil filter clogging. The function pressure is than 0.12MPa.	Replace	
Compressor air filter	Lamp goes on when air filter gets clogged and suction resistance increases.	Clean Replace	
Engine air filter	Actuating resistance is more than 6.23kPa.		







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Emergency stop lamp

The compressor stops when the emergency stop lamp goes on.

(※ It stops only after 15 seconds elapses in case of engine speed down.)

Be sure to follow the measures shown below before starting the unit again.

Item	Trouble	Measures	Monitor
Engine stop	Lamp goes on when such serious trouble as engine overrunning and reverse revolution etc occurs.	Contact engine distributor or us directly.	
Fuel residual level	When the level of fuel in fuel tank drops and it becomes necessary to feed fuel, it goes on.	Replenish tank with fuel.	
※ Engine speed down	Lamp goes on when engine speed drops below 900min ⁻¹ . (Engine stops within 15 seconds.)	See "Troubleshooting"	
Discharge air temperature	Lamp goes on when the air temperature at the outlet of the air-end reaches the set temperature of 130°C.		
Coolant temperature	Lamp goes on when coolant temperature reaches 101°C.		
Engine oil pressure	Lamp goes on when engine oil pressure drops. The function pressure is below 78kPa.		

1. Specification

1.6 Operation

1.6.1 Normal operation

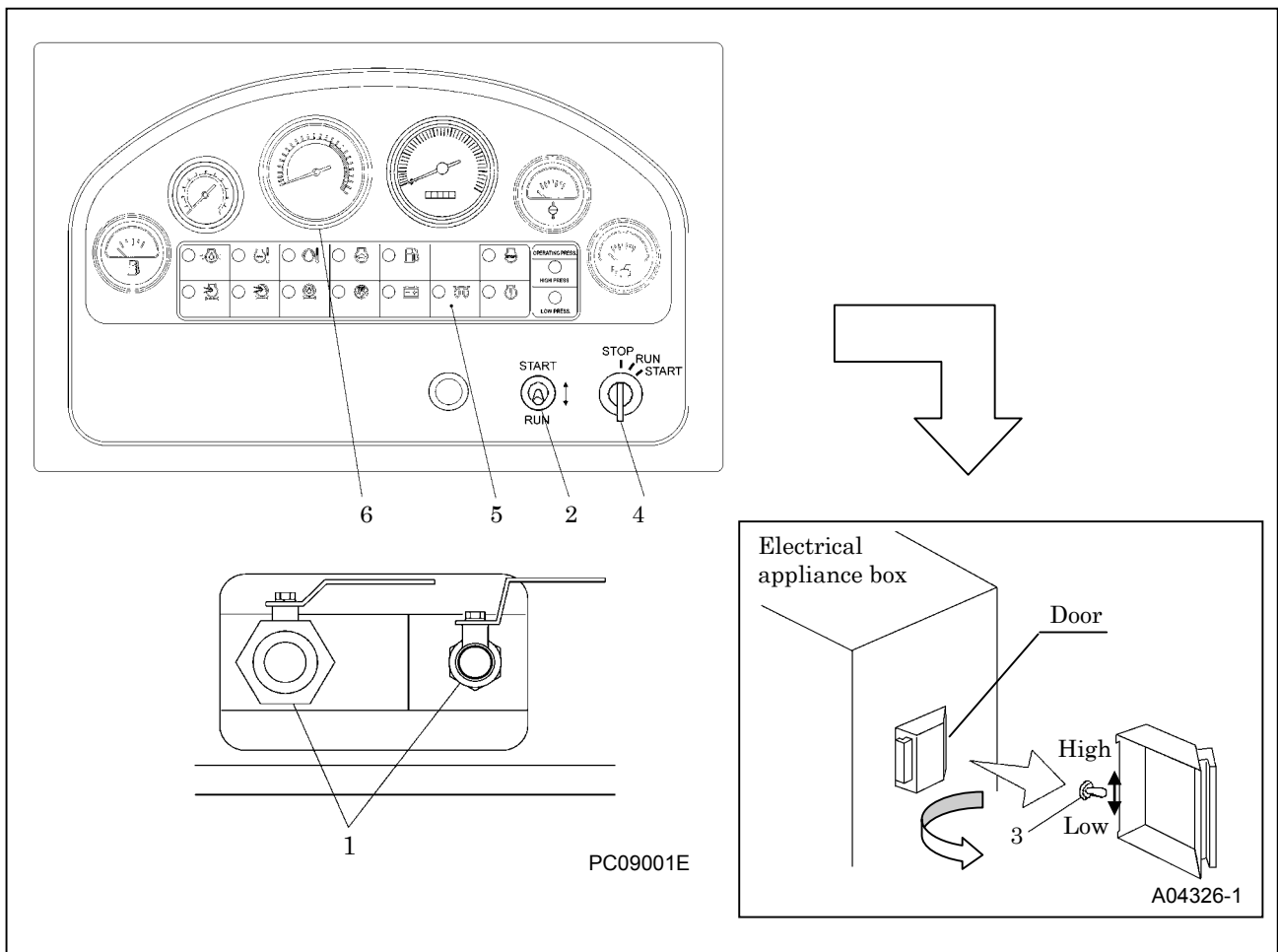
<Procedures>

- ① Close fully service valves “1” .
- ② Set the starting unloader switch “2” to “START” position.
- ③ Set the selector switch “3” to “High pressure” or “Low pressure” in accordance with your pressure required for your job.

The switch “3” is fitted on the wall of the side door beside the operation panel.

Selection of discharge pressure	PDSH850S	PDSJ750S
	Low pressure	High pressure
Working pressure	1.72MPa	2.07MPa
Free air delivery	24.0m ³ /min	21.2m ³ /min

- ④ Turn the starter switch “4” to “RUN” position, and the preheating lamp “5” goes on.
 - ⑤ As soon as the preheating lamp “5” has gone out, turn the starter switch “4” fully clockwise to start up the engine.
 - ⑥ Once the engine has started up, leave it running to warm-up for 5 minutes. The discharge air pressure gauge “6” in this condition ranges from 0.4 to 0.5MPa.
 - ⑦ After warm-up of the unit, put the starting unloader switch “2” back to its “RUN” position, and open the service valve the unit is now ready to operate.
- Be sure to turn the starting unloader valve “2” to “RUN” position prior to work. The discharge pressure does not increase as long as the starting unloader valve stays at “START” position.



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1.6.2 Operating procedures when engine fails to start up on first attempt

When the engine fails to start up even after performing the startup procedures ① to ⑤, do not keep the starter running, but set the starter switch back to "STOP" and wait about 30 seconds. Then, repeat the startup procedure once again.

- If the repeated procedure does not allow the engine to run, the following causes are suspected.

Therefore, check the following:

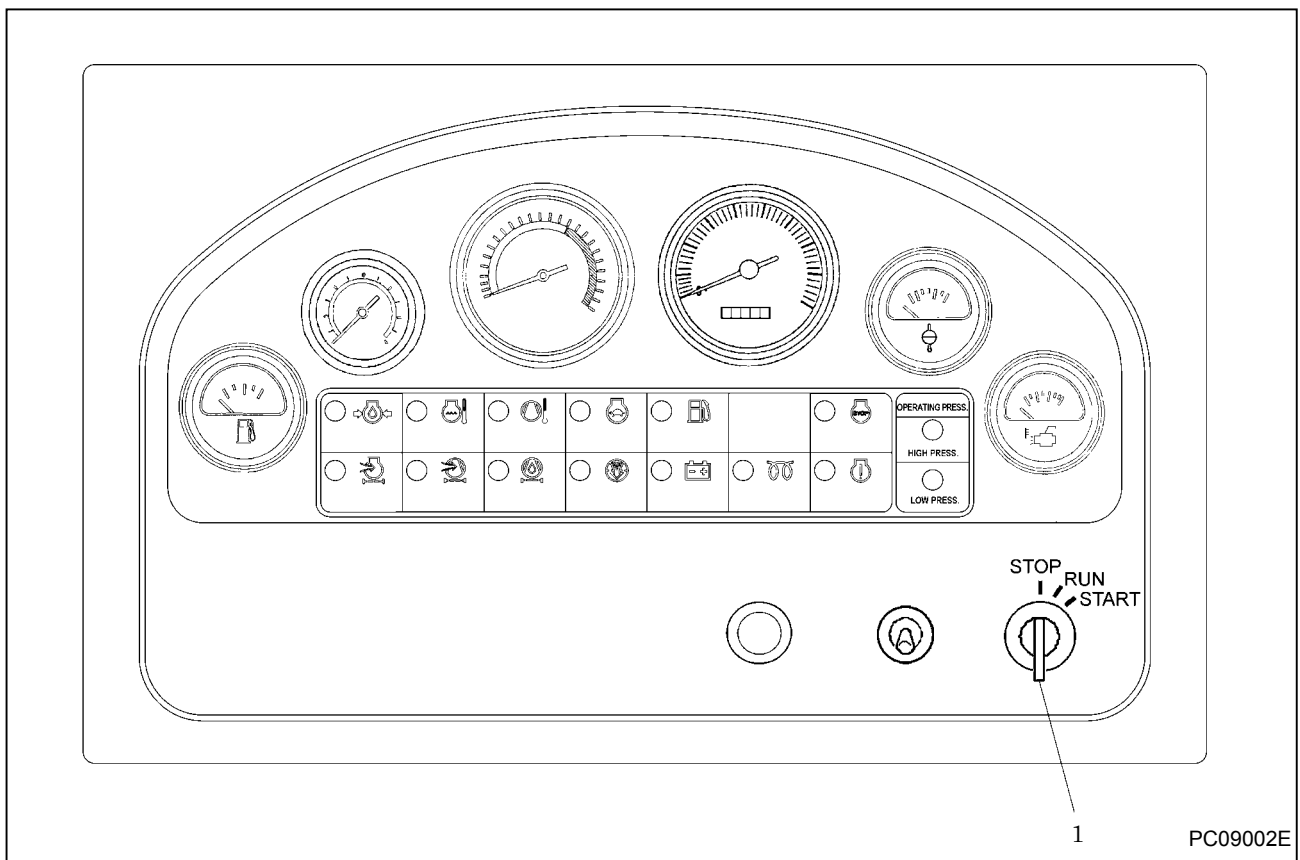
- No fuel
- Clogging of fuel filter
- Clogging of filter inside the fuel air-bleeding electromagnetic pump
- Discharge of battery (Low cranking speed)

1.6.3 Fuel air bleeding device

In case that condensate is drained from sedimenter or fuel system, air bleeding operation is performed automatically with the electromagnetic pump fitted as an attachment.

<Procedures>

- ① Turning the key of starter switch "1" to "RUN" position, the electromagnet pump starts to bleed air in the fuel piping system automatically.
- ② Air bleeding will be completed about 1 minute.
- ③ Start the machine following the starting procedures mentioned in 1.6.1. If starting fails one time, repeat the abovementioned procedures.



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1.6.4 How to start the unit at low temperature

IMPORTANT

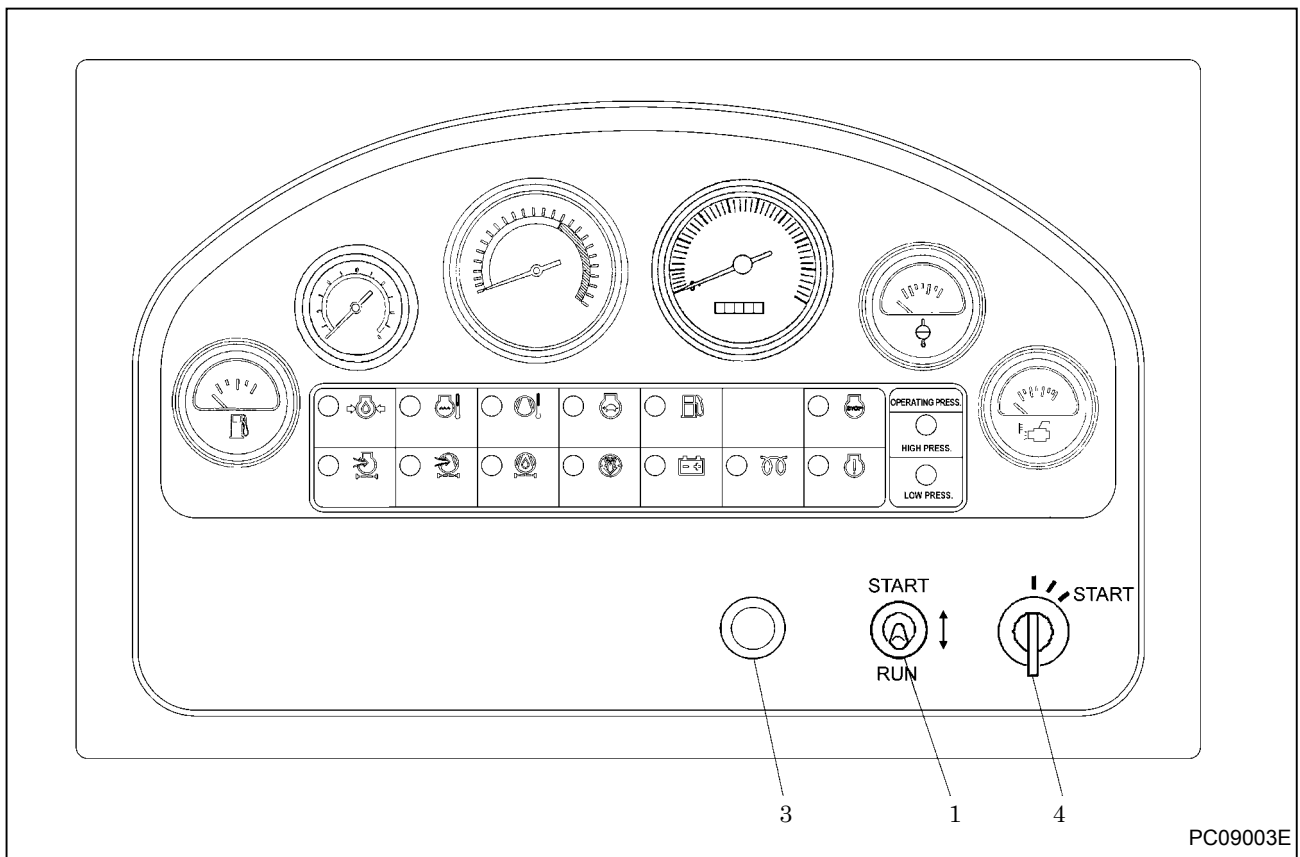
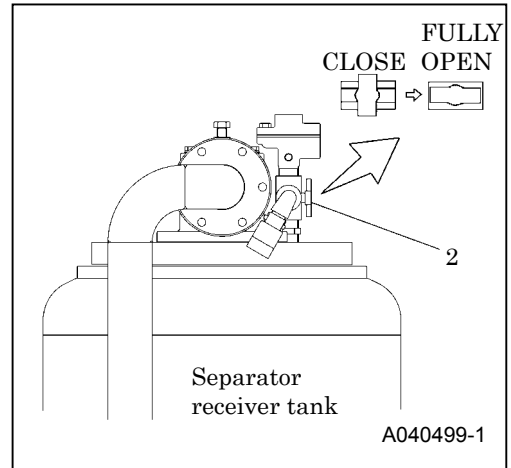
Operation under Cold Weather Conditions below -5°C

- Use SAE10W-30 (CD class) for the engine oil.
- Use LLC (antifreeze). Use correct amount to provide freeze protection, according to the ambient temperature.
- Battery should always be kept fully charged.

When it is difficult to start engine in cold weather, take the following measures.

<Procedures>

- ① Close all the service valves and set the starting unloader switch "1" to "START" position.
- ② Fully open the relief valve "2" just in front of a separator receiver tank.
- ③ Repeat the cranking operation two or three times by turning the starter switch "4" fully to the right, pushing the emergency stop button "3".
- ④ Perform usual starting operation. When the engine starts, gradually close a relief valve "2", watching engine revolution rise. In the state after the valve is fully closed, perform warming-up operation.



















1. Specification

1.6.5 Gauge indication while operating






IMPORTANT

- During operation, keep the discharge air pressure gauge indicating higher pressure than 1.37MPa (for PDSH850S/PDSJ750S)
 - Continuing equipment operation at a lower pressure than the above pressure may cause overheating, since it affects the separation of lubricating oil inside the oil separator and reduces the oil flow to the compressor air-end, resulting in temperature rise.
 - Make sure that RPM is higher than $1,100\text{min}^{-1}$ at no load (or low load) operation. Long continuous operation at the lower speed than $1,100\text{min}^{-1}$ could cause damage to each part by vibration. When the speed becomes lower than $1,100\text{min}^{-1}$, stop the machine soon.
- Be sure to check at times to see if gauges or each component of the unit are properly working, or if there is any air-leak, oil-leak, water-leak or fuel-leak etc.
 - During normal operation, each indication of instruments is shown in the table below. Refer to the table for daily checks.
 - The above table gives standard values. They may vary slightly depending on the operating conditions and other factors.

Protection device		Emergency stop lamp					
		Engine stop	Fuel residual level	Engine speed down	Discharge air temperature	Coolant temperature	Engine oil pressure
Monitor							
Starting	Starter switch set to "RUN" position	 ON	● OFF	● OFF	● OFF	● OFF	 ON
In operation		— ● — OFF					

Protection device		Warning lamp					
		Engine trouble	Charging	Oil separator	Compressor oil filter	Compressor air filter	Engine air filter
Monitor							
Starting	Starter switch set to "RUN" position	 ON	 ON	● OFF	● OFF	● OFF	● OFF
In operation		— ● — OFF					

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		Indicator lamp		
		High pressure	Low pressure	Preheating
Monitor		 HIGH PRESS.	 LOW PRESS.	
Starting	Starter switch set to "RUN" position	● OFF	● OFF	※1 ● OFF
	In operation	※2  Orange coloured lamp ON	※2  Green coloured lamp ON	● OFF

Note)※1: Lamp goes off after preheating completed.

※2: Each lamp glows, according to the selection of rated pressure.

		Model	Pressure selector switch	Discharge air pressure gauge	Discharge air temperature gauge	Coolant temperature gauge
In operation	At unload	PDSH850S-4B1	Low pressure	1.82~2.07MPa	95~120°C	75~95°C
		PDSJ750S-4B1	High pressure	2.19~2.45MPa		
	At full load	PDSH850S-4B1	Low pressure	1.37~1.72MPa	95~120°C	75~95°C
		PDSJ750S-4B1	High pressure	1.37~2.07MPa		

2. Maintenance

2.1 Cautions for Overhauling

2.1.1 Precautions before starting work

(1) Work to be performed

It is very important to always plan in advance what facilities, tools, instruments, materials, oil, etc. you will need to use; the exact locations and methods of performing inspection, adjustment, or disassembly; and the key points of any repair work to be performed.

(2) Care not to spill oil

Use a pan to collect used compressor oil, engine oil when changing the oil or attaching or detaching an oil line. If a large volume of oil is expected to flow out make, sure to drain any accumulated oil from the reserve tank, engine oil pan in advance.

(3) Care when detaching parts

When disassembling a complicated part, put a matching mark to indicate the position of detached parts for future reference. Make sure that the negative cable is detached from the battery terminals before starting repair work.

(4) Tools to be prepared

- ① Measuring instruments (e. g. tester, insulation resistance gauge etc.)
- ② Tools
- ③ Torque wrenches
- ④ Jigs and specialized tools
- ⑤ Sealing tape
- ⑥ Molybdenum sulfide (tube type)
- ⑦ Lithium extreme pressure type grease (CALTEX MULTIFAK EP1)
- ⑧ Diesel oil
- ⑨ Compressor oil
- ⑩ Cleaning cloths
- ⑪ Literatures (such as manuals etc.)

2. Maintenance

2.1.2 Disassembly and assembly

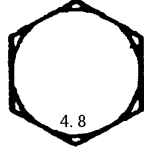
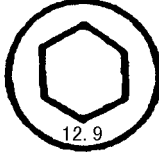
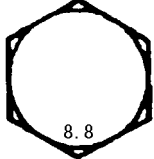
- ① Before removing nylon tubes, hydraulic/fuel hoses, it is necessary to clean the inside of machine to prevent from entrance of dirt and foreign matters.
- ② Perform disassembly work in a dust-free location whenever possible.
- ③ When disassembling parts, wash their outer surfaces and place them on a clean sheet of paper or cloth, taking care not to contaminate or damage them.
- ④ Wash disassembled parts with diesel oil (cleaning solvent) after checking for contamination or discoloration. However, do not wash rubber parts with diesel oil.
- ⑤ Be careful not to damage disassembled parts, they are precision built.
- ⑥ Replace consumables such as oil seals, O-rings, filters, oil, etc. with new items when reassembling parts.
- ⑦ Install O-ring and oil seal which should be coated with clean lithium extreme pressure type grease (CALTEX MULTIFAK EP1).
- ⑧ When reassembling parts, place each part in the order of assembly and take care that no parts are missing or misassembled.
- ⑨ When reassembling an assembled part (set part), be sure to replace it as an assembly.
- ⑩ Contamination or rusting may occur due to dust or humidity if parts are left in disassembled or partly disassembled condition for a long time. Therefore, be careful to prevent dust or rust from affecting parts if you have to leave the repair incomplete for a long period of time.
- ⑪ Check tightening torque and clearance when assembling parts.
- ⑫ Check the direction of rotation, speed, and oil leakage after assembly.
- ⑬ Before starting the machine after disassembly, run it at low idle to check for unusual noises, etc. to prevent engine or generator damage.

2. Maintenance

2.2 Tightening Torque

General bolts and nuts tightening torque

Fasten all the bolts and nuts with the specified tightening torque when assembling.

Kind Strength and sorting Width of across flat Tightening torque Bolt diameter (mm)	Low or Middle carbon steel bolt (SS400B etc...)		High tensile strength bolt (SCM435 etc...)		
	Hexagon bolts	Tightening torque N·m (kgf·cm)	Socket bolts	Hexagon bolts	Tightening torque N·m (kgf·cm)
	4.6~6.8 (4T~6T)  4.8		 12.9	 8.8	
	Hexagon bolts Width of across flat (mm)		Socket bolts Width of across flat (mm)	Hexagon bolts Width of across flat (mm)	
6	10	5 (51)	5	10	10 (100)
8	13	12 (124)	6	13	25 (245)
10	17	25 (245)	8	17	49 (485)
12	19	43 (425)	10	19	85 (845)
14	22	68 (675)	12	22	135 (1350)
16	24	106 (1055)	14	24	210 (2100)
18	27	145 (1450)	14	27	290 (2900)
20	30	205 (2050)	17	30	410 (4100)
22	32	280 (2800)	17	32	560 (5600)
24	36	345 (3450)	19	36	710 (7100)
Applied sections	For general sections such as bonnet and frame.		For specified sections.		

IMPORTANT

- Generally, the abovementioned tightening torques should be followed, but in some points different torque is specified. So use the tightening torque without fail. (See following pages.)
- Make sure to remove rust and dust before tightening.

2. Maintenance

2.3 How to Adjust Regulator and How to Replace Diaphragm

2.3.1 Method of adjustment



Operation with compressed air supply port opened is prohibited

- When adjusting regulator system, install a silencer to the air delivery port and wear earplugs for protection of hearing damage.



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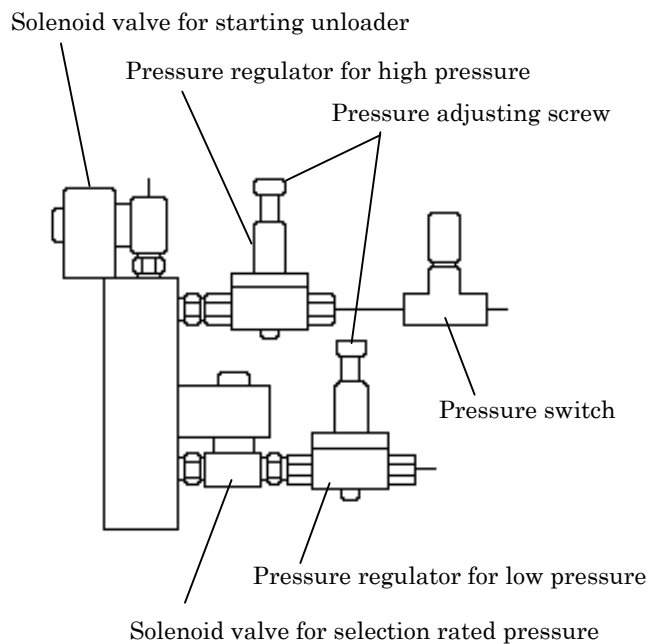
- The speed regulator is already adjusted prior to delivery ex.works. Never change the setting of the regulator by turning bolt and rod recklessly.

<Adjustment procedure>

After finishing operation, arrange it so that when pressure exceeds the under-mentioned pressures in the following table, engine controller starts functioning and fix the pressure adjusting screw at the point where engine speed begins to lower. (Tightening the screw causes pressure to rise and loosening it lowers the pressure.)

Set-up values of pressure regulator

For low pressure	1.72 MPa
For high pressure	2.07 MPa



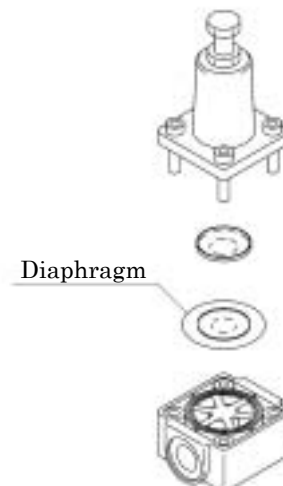
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2.3.2 Change diaphragm

Pressure regulator

<Procedure>

- ① Remove pressure regulator and disassemble it.
- ② Replace the diaphragm with a new one.



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2. Maintenance

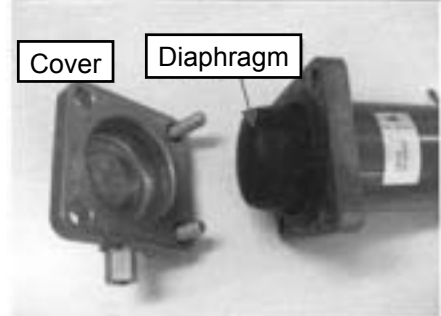
Unloader regulator

<Procedure>

- ① Remove unloader regulator.
- ② Put a driver or the like into 4 holes of the rod and hold the tension of the inside spring.
- ③ Remove the cover after removing 4 pieces (M8) of locking bolts.
Remove diaphragm.
- ④ Clean all the surfaces of flange, slotted portion and of piston before installing diaphragm.
- ⑤ Install diaphragm in accordance with installation slots.
※It is not necessary to be coated with any lubrication oil for installation.
- ⑥ 4 pieces locking bolts should be tightened equally.
Tighten torque: $15\text{N}\cdot\text{m}$ ($150\text{kgf}\cdot\text{cm}$)



The diaphragm should be installed in the direction of coating side of the piston.



PC07013

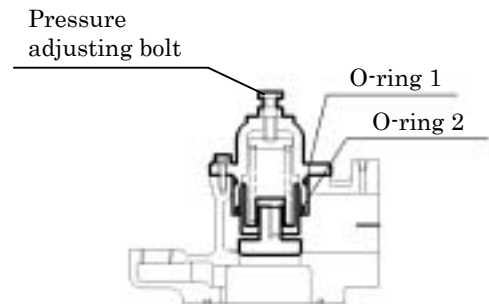
2. Maintenance

2.4 Change O-ring of Pressure Control Valve

- When discharge pressure is apt to be lower than the set pressure of pressure control valve even if the pressure control valve is adjusted, it may be due to deterioration or hardening of O-ring. Replace it even before the replacement schedule comes.

<Procedure>

- ① Disassemble the upper part of the pressure control valve and change O-ring with a new one. (When installing O-ring, O-ring and sliding face should be coated with lithium extreme pressure base grease [CALTEX MULTIFAK EP1].)
- ② Check performance while running the unit after replacement.

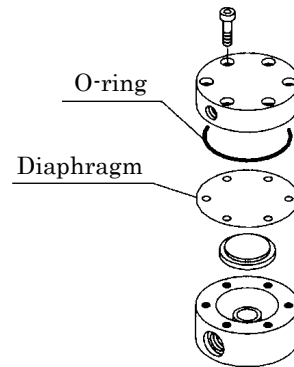


TR0264

2.5 Change Diaphragm and O-ring of Auto-relief Valve

<Procedure>

- ① Remove auto-relief valve and disassemble it.
- ② Replace O-ring and diaphragm with new ones.

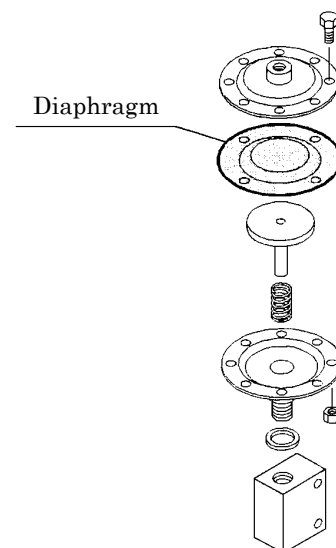


TR0627

2.6 Change Diaphragm and O-ring of Vacuum Relief Valve

<Procedure>

- ① Remove vacuum relief valve and disassemble it.
- ② Replace the diaphragm with a new one.

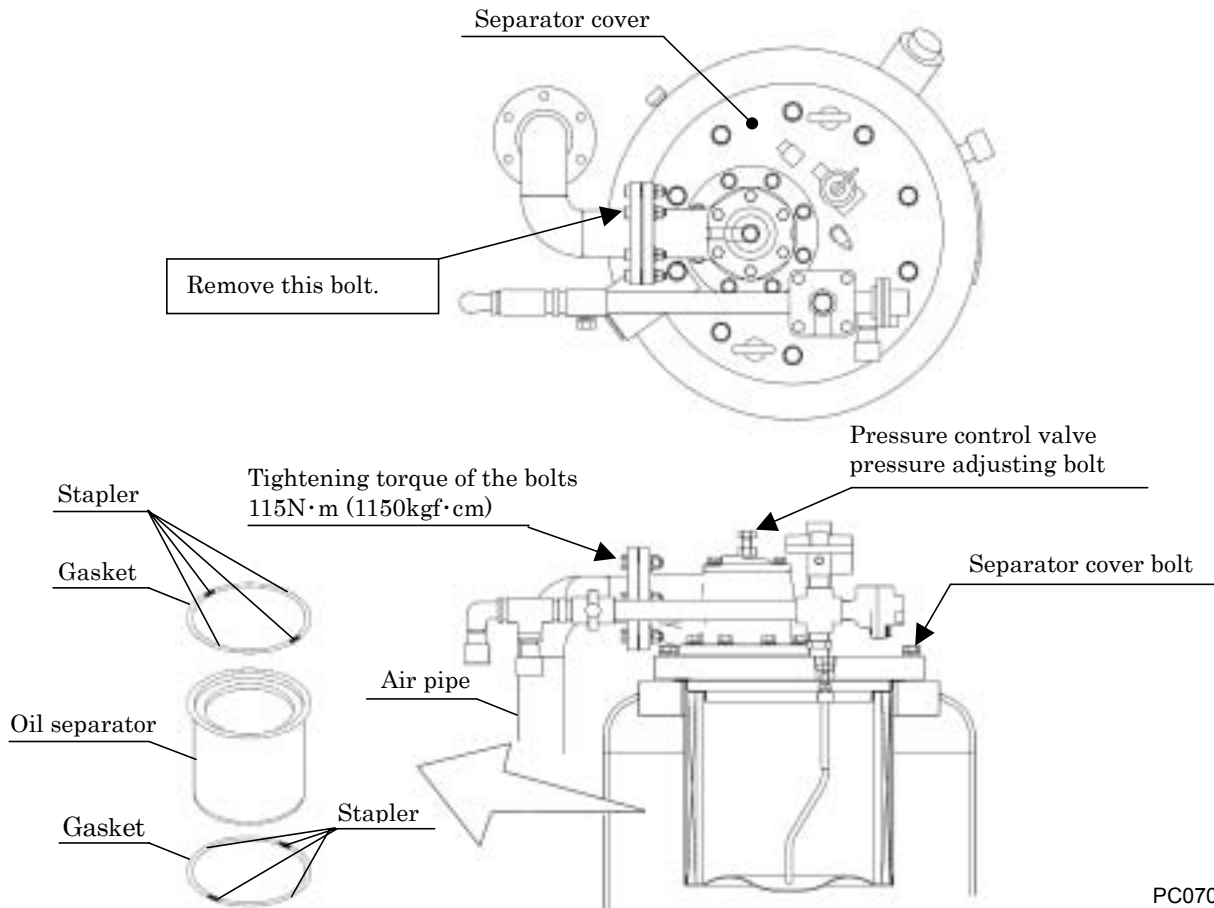


TR0628

2. Maintenance

2.7 Change Oil Separator

- If even before scheduled interval of 2,000 hours operation, consumption of compressor oil is unusually high and the differential pressure gauge of the oil separator reaches Red range, change the oil separator. But note that the differential pressure gauge shows correct indication only in full load operation and minimum pressure.
- When replacing oil separator, do not fail to replace gasket also.



PC07014

<Procedure>

- ① Remove the separator change cover fitted at the top of bonnet.
- ② Remove the nylon tubes fitted on the piping of separator cover, using a spanner etc.
- ③ Remove the air pipe connected to pressure control valve and then remove the pressure control valve. (Pressure control valve is so heavy as about 30 kg. In order to remove the valve, unscrew the pressure adjusting valve fitted on the top of the valve and install a lifting bolt (M16) instead. It is necessary to remove the valve by a crane or the like.)
- ④ Remove all the fixing bolts of separator cover.

2. Maintenance

- ⑤ Remove separator cover.
Mark the separator cover and separator receiver tank for reassembling them before removing it.
- ⑥ Clean and degrease the connecting portion between separator cover and separator receiver tank and check and confirm that there are no damages nor abnormalities.
- ⑦ Replace the oil separator and gaskets (2 pieces) by new ones.
- ⑧ For prevention of static electricity, rivet staples on four points of gaskets (in diagonal line) and install the gaskets so that staple riveted portions can not be installed one above the other.
- ⑨ Tighten the fixing bolts of separator cover according to the specified torque. (Tighten the bolts diagonally and after tightening all the bolts, ultimately tighten them again in full circumference.)
Bolt size:M12 / Tightening torque for separator cover: 115N·m (1150kgf·cm)
- ⑩ Replace the O-rings by new ones which are provided among pressure control valve, separator cover and air pipe. Install O-rings should be installed coated with lithium extreme pressure grease (CALTEX MULTIFAK EP1).
- ⑪ Connect air pipe to pressure control valve and re-assemble the pipes which were removed from the top of separator cover.
- ⑫ Install pressure adjusting bolt and adjust it.

2. Maintenance

2.8 Drain Check in Pre-filter

When fuel system lamp goes on, drain water.

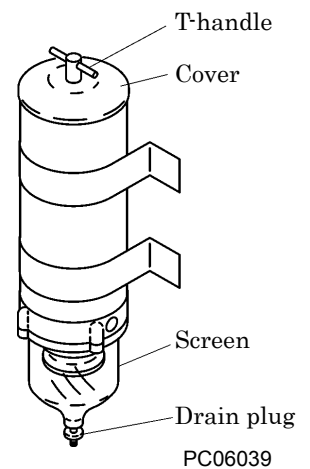
<Draining procedure>

- ① Loosen the drain plug and drain out condensed water inside.
 - ② After draining condensed water, close the drain plug without fail.
 - ③ When any dust or clogging is found in the inside screen, take the screen up and wash it in diesel fuel oil or clean it by air blow.
- Drain the condensate in container, and then dispose of condensate according to the designated regulations.

2.9 Change Element of Pre-filter

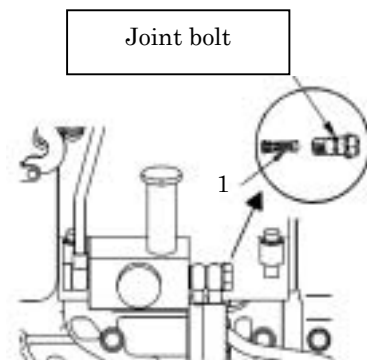
<Procedure>

- ① Take out the cover and element inside the pre-filter by turning T-handle.
- ② Install a new element by pressing it up to the fuel shut-off valve at the bottom.
- ③ Install the cover, and then tighten it by turning T-handle.



2.10 Clean the Strainer Provided Inside the Engine Feed Pump

- Periodically remove the strainer “1” inside the feed pump, and clean it.
- Remove the strainer “1” by loosening the joint bolt and clean it with diesel fuel oil, and also using high air pressure blow. At this time be sure to replace gasket. Then after finishing all cleaning jobs, install it again in reverse steps.

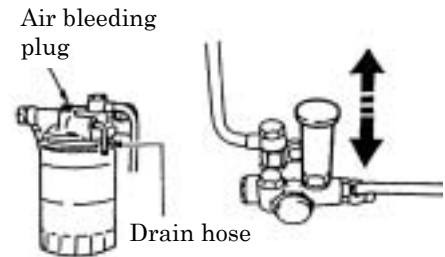
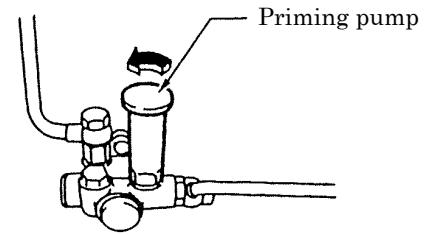


2. Maintenance

2.11 Manual Air Bleeding Method for Fuel Line System

<Procedure>

- ① Continue turning to the left till priming pump of feed pump automatically springs up.
- ② After loosening air bleeding plug of fuel filter, move priming pump up and down to feed fuel oil.
- ③ Tighten the air bleeding plug soon after fuel oil comes out without babble mixed.
- ④ Move again priming pump up and down 5 to 6 times and then tighten it fully to the right after confirming that the piston pressed downward can be smoothly screwed in.
- ⑤ After finishing air bleeding operation, wipe out the spilled fuel oil and start engine to check for any fuel leakage.



(In order to drain condensate from sedimenter and/or to bleed air in piping when fuel filter is replaced, electromagnet pump attached automatically performs this function.)

2.12 Clean Inside of Fuel Tank

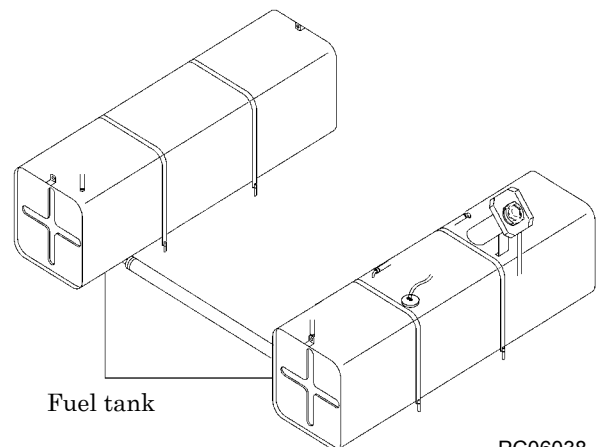
- Condensate is caused and accumulated at the bottom of fuel tank, owing to churning of dust or dirt mixed when fuel oil is fed and water drop caused while fuel oil tank is used for a long time. When any condensate is found afloat and fuel filter gets clogged too fast, fuel oil tank should be cleaned after condensate is removed from fuel oil tank even before the specified cleaning interval time.

IMPORTANT

- Some models are equipped with 2 tanks at both right and left sides and both tanks provided under the machines are connected through fuel pipe. When removing them, make sure that the pipes provided under the machine are Off.

<Procedure>

- ① Open drain valve to remove fuel oil from fuel tank.
- ② Dismantle the right and left doors and side covers of bonnet.
- ③ Remove fuel pipes and wires connected to fuel tank.
- ④ Remove belt holding fuel tank and remove tank.
- ⑤ Insert cleansing nozzle through fuel filler port or drain port for cleaning tank.
- ⑥ After cleaning job is finished, install fuel tank from which water or the like should be completely removed.



2. Maintenance

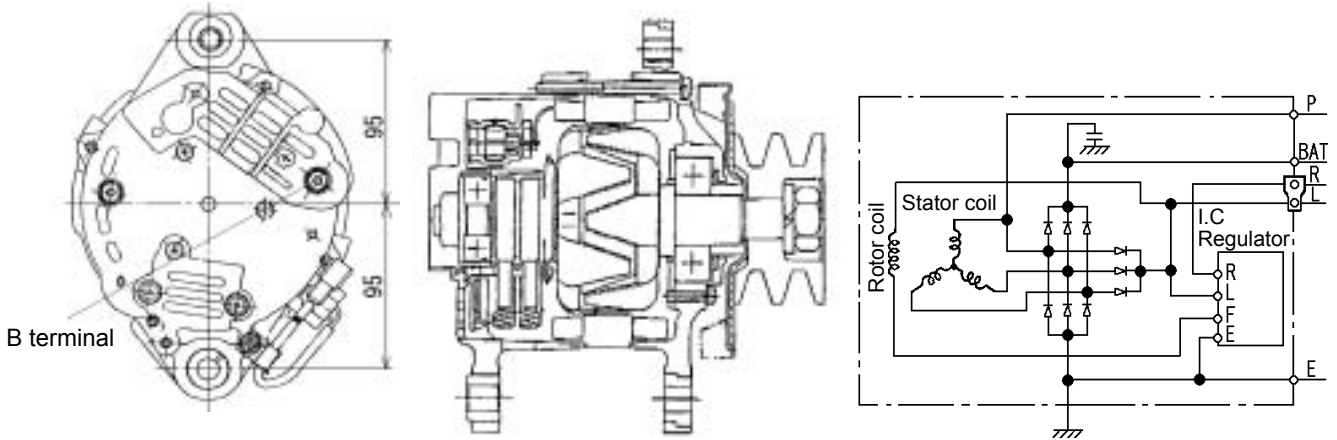
2.13 Values of Various Adjustments of Engine

Item		unit	PDSJ750S/PDSH850S-4B1	
Engine model			MITSUBISHI FUSO TRUCK & BUS CORPORATION 6D24-TLE2A	
Tightening torque of head bolts		N·m (kg·m)	First time	175(18)
			Second time	90° ~110° (angle tightening)
Valve clearance	Air intake	mm	0.40 (in cold season)	
	Discharge	mm	0.60 (in cold season)	
Firing order			1-5-3-6-2-4	
Injection timing (BTDC)		°	Electronic control unit (2°before top dead center when injection pump is installed)	
Nozzle injection pressure		MPa (kgf/cm ²)	15.7 (160)	
Compression	Standard	MPa (kgf/cm ²)	2.75(28) (Rotation speed 200min ⁻¹)	
	Working limit	MPa (kgf/cm ²)	Limited value	1.96(20)
			Each cylinder limit value	0.39(4)
Thermostat	Temperature for start of release	°C	74.5~78.5	
	Full open temperature	°C	90	
	Valve lift	mm	10	

3. Electric System

3.1 Engine Electric Appliances

3.1.1 Alternator



(1) List of functions

Pin No.	Line color	Connection	Remark
B	W	Battery relay	Power for charging voltage.
R	R/W	20A Fuse	Detect output voltage from alternator and adjust the current flowing to rotor coil.
L	Y	Battery charging warning lamp	Outputting generating voltage to battery charging warning lamp. During normal operation, both poles of battery charging warning lamps are at same level, warning lamp will not light. When voltage is not outputted from alternator L terminal, current is sent to L terminal to make battery charging warning lamp light on.
		Tachometer (with hourmeter) No.3 terminal	Signal output for hourmeter.
		Safety relay L terminal	Generator signal output.
		Fuel air-bleeding electromagnetic pump relay (R10) No.1 terminal	Generator signal output. When generating signal is outputted to fuel air-bleeding electromagnetic pump relay (R10) No.1 terminal, electromagnetic pump is electrically disconnected and electromagnetic pump stops functioning.
※ P	W/Y	Safety relay P terminal	For separating starter motor. When the frequency of P terminal exceeds 110 ± 10 Hz, safety relay contact changes and separates starter motor.
E	B	Safety relay E terminal	Earth

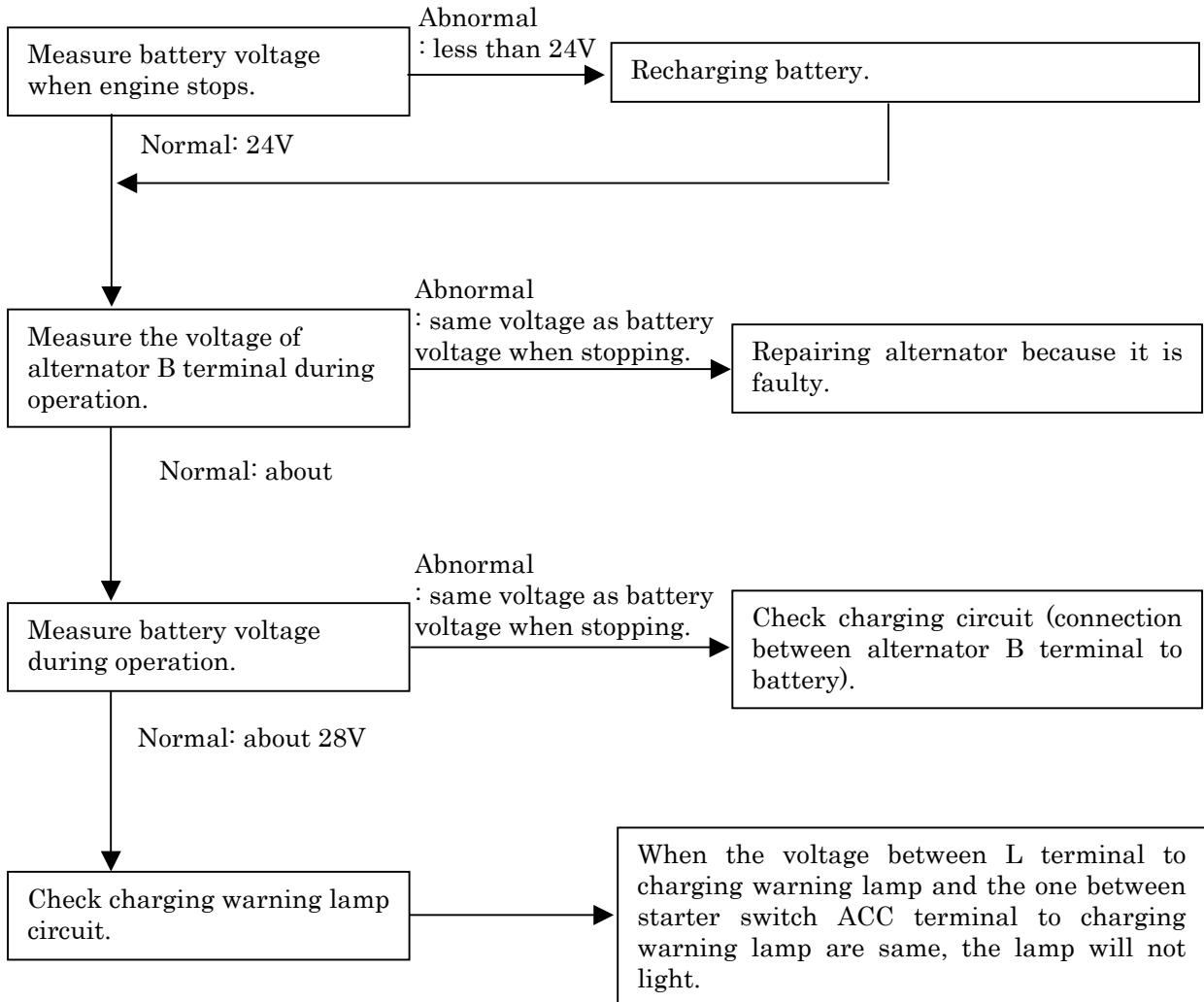
※:For diagnosing P terminal, check the generating voltage between P-E terminals and it is normal if the voltage detected is about DC30V.

(2) How to check

Checking method by measuring battery terminal at full load operation	Normal value
Measure the battery terminal voltage at full load operation.	$28.5 \pm 0.5V$

3. Electric System

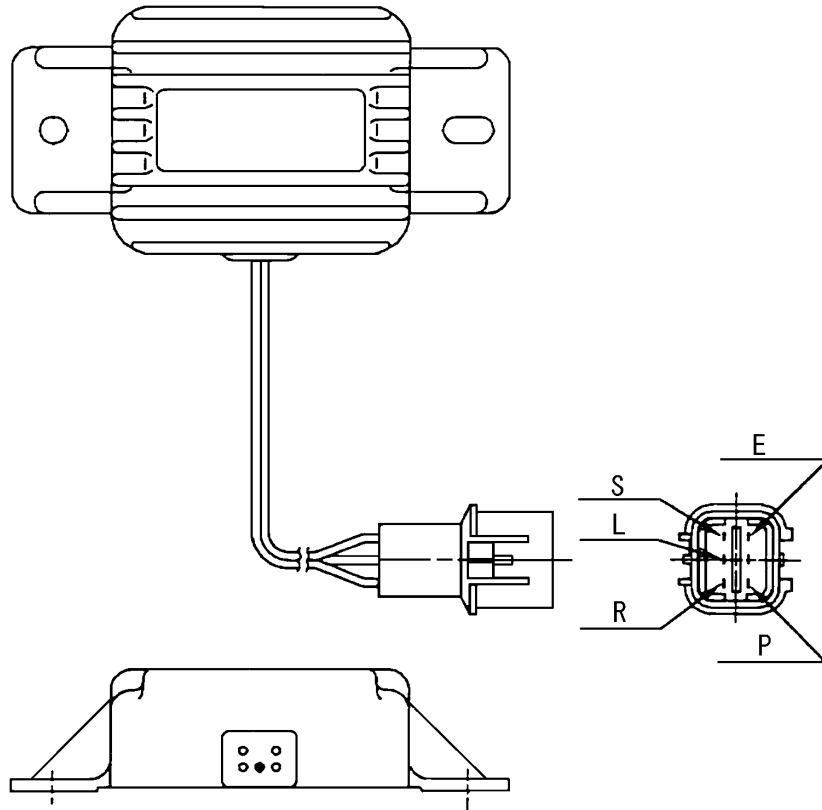
(3) Diagnosing when battery charging warning lamp lights



3. Electric System

3.1.2 Safety relay

HOKUETSU part number:44324 05200



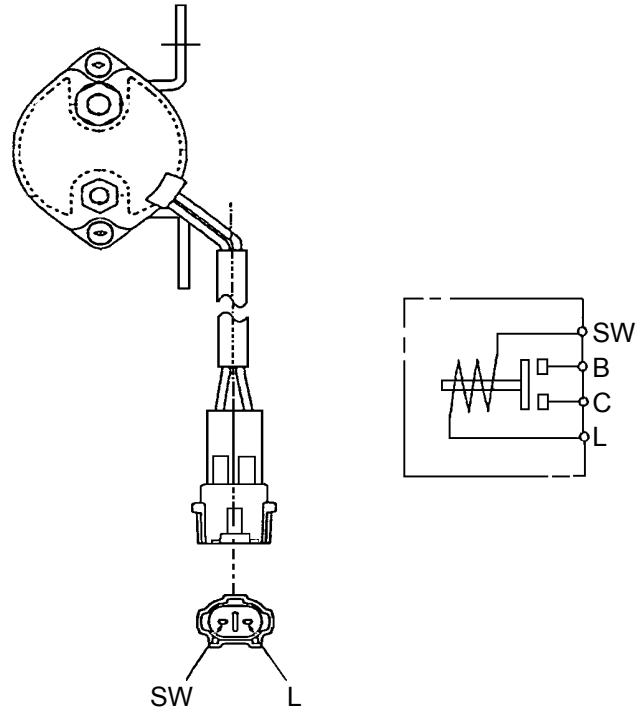
A040592

List of functions

Pin No.	Line color	Connection	Remark
S	W/L	Starter relay L terminal	Protection circuit for starter motor. Internal contact between S-E terminals is "ON" at start, and when starter switch is placed to "START" position, exciting current is made to flow between SW-L terminals to start starter motor. Engine starts and when alternator generator signal is inputted to L terminal or the alternator frequency inputted to P terminal exceeds $110 \pm 10\text{Hz}$, internal contact between S-E terminals becomes "OFF" and it separates starter motor.
L	Y	Alternator L terminal	Generator signal input. When generator signal is inputted from alternator, internal contact between S-E terminals becomes "OFF" and it separates starter motor.
R	R/B	20A Fuse	Power supply
E	B	Earth	
P	W/Y	Alternator P terminal	Detection of alternator frequency. Detecting the alternator frequency, and when it exceeds $110 \pm 10\text{Hz}$, internal contact between S-E terminals becomes "OFF" and it separates starter motor.

3. Electric System

3.1.3 Starter relay (starter motor attachment)



(1) List of functions

Pin No.	Line color	Connection	Remark
SW	B/W	Starter switch C terminal	Input of exciting current.
L	W/L	Safety relay S terminal	Output of exciting current.

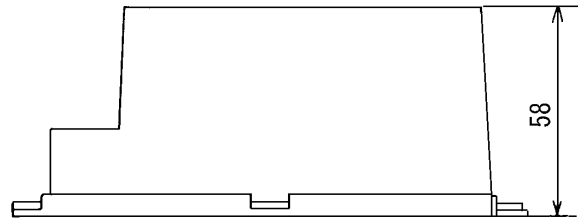
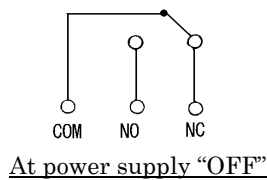
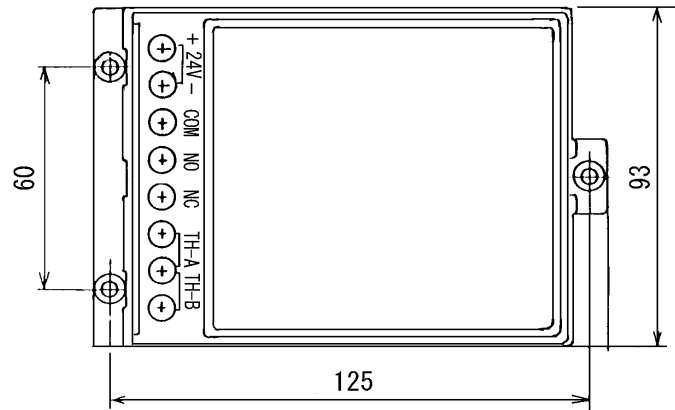
(2) Functions

Starter switch is placed to “START” position, exciting current is made to flow between SW-L terminals to start starter motor.

3. Electric System

3.1.4 Discharge air temperature switch (Discharge air temperature thermistor amplifier)

HOKUETSU part number:44334 13801



Range of emergency stop set temperature

Pin No.	Temperature detected	Range of set temperature (°C)	
		Set value	Return value
TH-A	Low pressure stage discharge air temp. sensor	-15°C,130°C	-15~127°C
TH-B	High pressure stage discharge air temp. sensor	-15°C,130°C	-15~127°C

IMPORTANT

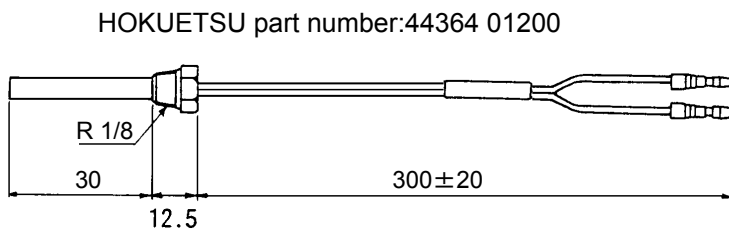
- When engine stops due to the function of discharge air temperature thermister amplifier, it is impossible to start again unless power supply is turned "OFF" even if the temperature of sensor sensitive portion drops.
- Even if voltage is applied to power supply of discharge air temperature thermister amplifier in case that sensor is disconnected, contact will not select from COM-NC to COM-NO.

3. Electric System

List of functions

Pin No.	Line color	Connection	Remark
+	R/W	20A Fuse	Power supply
-	B	Earth	
COM	R/W	20A Fuse Discharge air temperature thermistor amplifier + terminal	Power supply for outputting to NO and NC terminal.
NO	W/R	Relay for engine speed down No.3 terminal	When voltage is applied to plus (+) terminal, contact between COM-NO becomes "ON", it applies voltage to engine speed down relay No.3 terminal. When conductivity is "OFF", engine makes emergency stop.
NC	Y/L	Discharge air temperature rises warning lamp	No conductivity during normal operation. When either low pressure stage discharge air temperature or high pressure stage discharge air temperature exceeds set temperature, contact is switched from COM-NO to COM-NC to make warning lamp light and output voltage to engine speed down relay No.3 to make emergency stop of engine.
TH-A	G/B	Discharge air temperature sensor (Low pressure stage)	For detecting discharge air temperature.
(COM)	G/W	Discharge air temperature sensor (Low pressure stage) Discharge air temperature sensor (High pressure stage)	For detecting discharge air temperature.
TH-B	G/L	Discharge air temperature sensor (High pressure stage)	For detecting discharge air temperature.

3.1.5 Discharge air temperature sensor (for discharge air temperature switch)



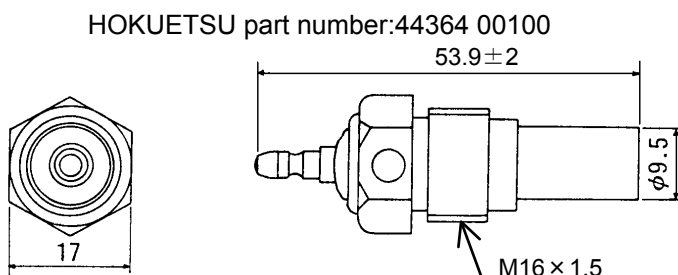
《Note》 Take care not to tighten excessively.
Less than 2N·m(20kgf·cm)

Characteristic of temperature resistance

Temperature (°C)	Resistance (kΩ)	Permissible value (%)
35	23.25	±2.94
80	5.24	±0.31
113	(2.15)	-
115	2.04	±0.08
120	1.80	±0.08
130	1.42	±0.08

() marked: reference value

3.1.6 Thermo sensor for water temperature gauge and discharge air temperature gauge



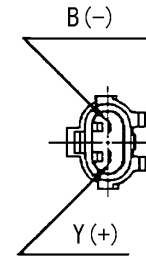
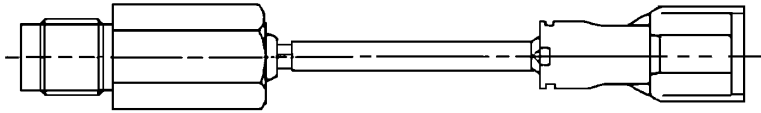
Characteristic of temperature resistance

Temperature (°C)	Resistance (kΩ)	Permissible value (%)
35	670.0	±80.0
80	118.0	±6.0
105	54.5	±2.7
115	42.0	±2.5

3. Electric System

3.1.7 Tachosensor

mitsubishi part number:ME867505



Generating voltage between terminals

During unload operation	During full load operation	Remark
About 6V	About 12V	Digital testa ACV range

(The above-mentioned values are generally inclined ones, so they vary upon change of RPM.)

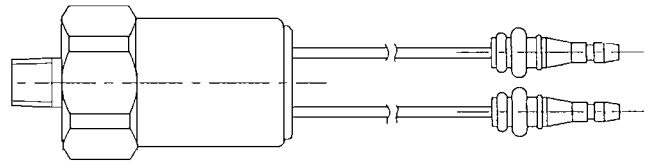
3.1.8 Engine oil pressure · water temperature switch

1. Engine oil pressure switch (for emergency stop)

mitsubishi part number:ME049297

Specification

Setting pressure	0.078MPa(0.8kgf/cm ²)
Contact type	A contact switch (When exceeding set pressure, contact is "ON".)

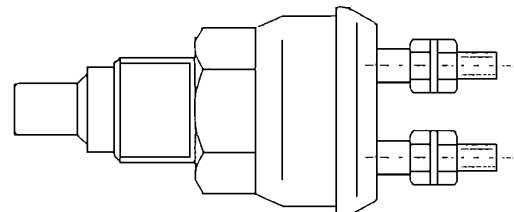


2. Engine water temperature switch (for emergency stop)

mitsubishi part number:ME049269

Specification

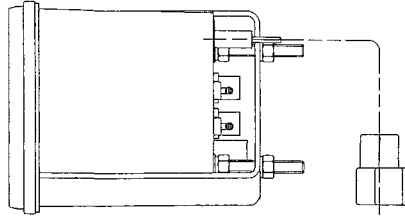
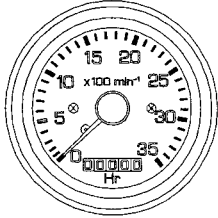
Setting temp.	OFF	101 ± 2°C
	ON (Return)	94 ± 2°C
Contact type	B contact switch (When exceeding set temperature, contact is "OFF".)	



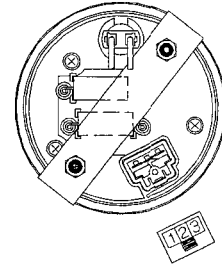
3. Electric System

3.1.9 Tachometer

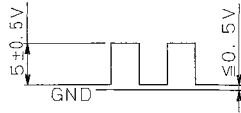
HOKUETSU part number:36146 08400



For lighting



For tachometer



Tachometer input signal

PC06041

(1) Specification

Operation voltage	20~30V
Revolutions ratio (pulse type)	1 revolution / 6 pulses
Lamp output	3W

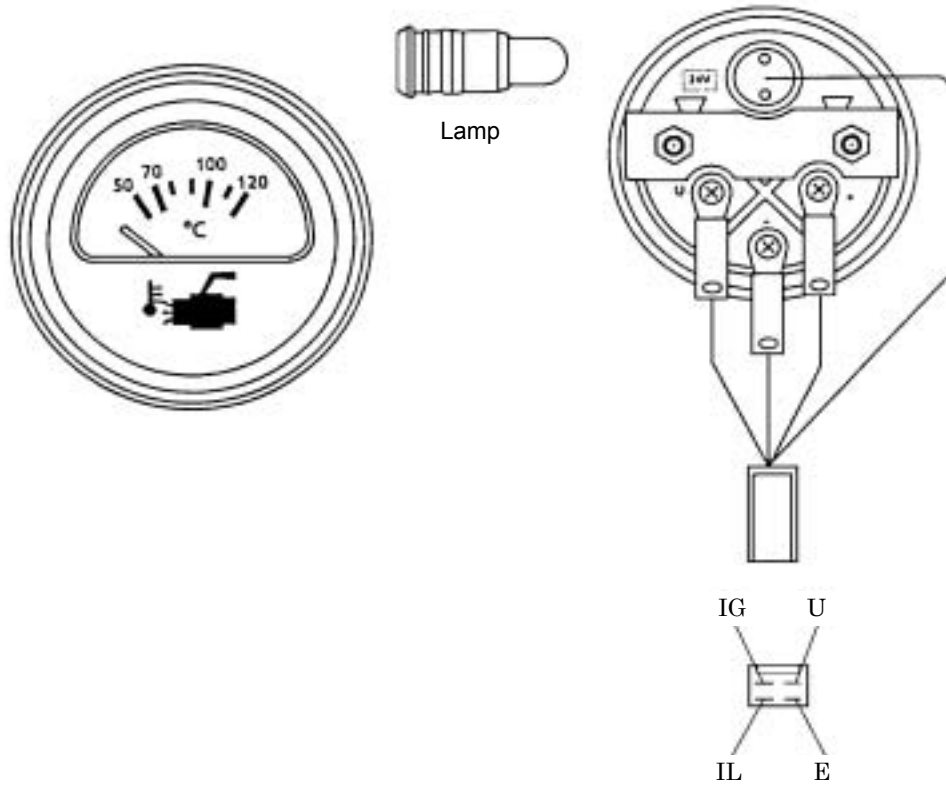
(2) List of functions

Pin No.	Line color	Connection	Remark	
For tachometer	1	B	Earth	
	2	Y/R	Engine speed controller (EUC) No.66 terminal Pressure controller NE OUT terminal	Detection of engine revolutions
		3	Y	
For lighting	1	B	Earth	For lighting
	2	R/W	20A Fuse	Power supply for lighting

3. Electric System

3.1.10 Discharge air temperature gauge

HOKUETSU part number:36144 04000



(1) Specification

Operation voltage	DC 24V
Lamp output	3W

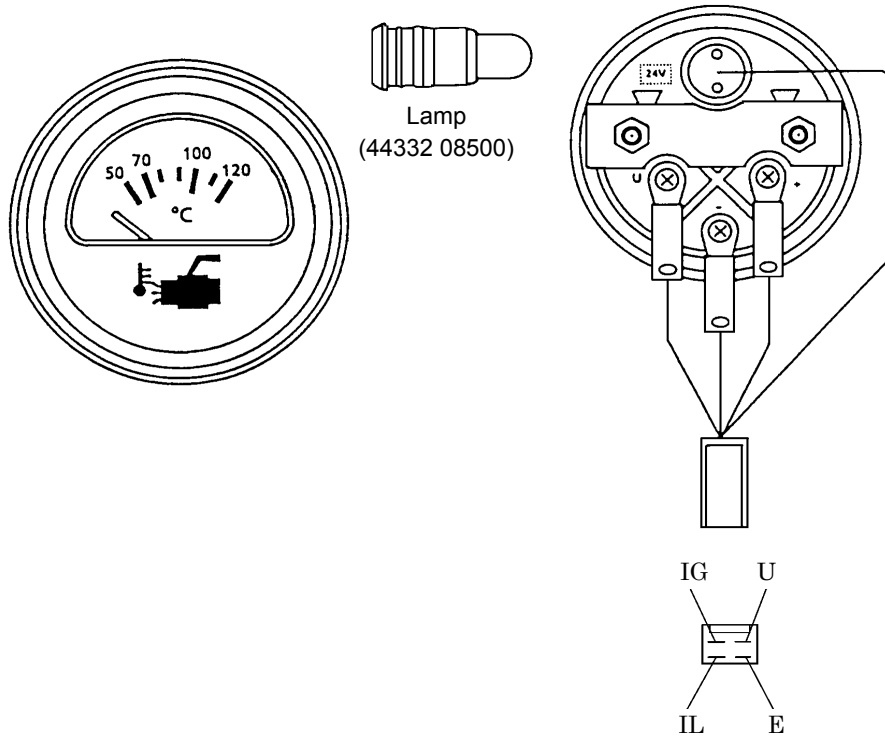
(2) List of functions

Pin No.	Line color	Connection	Remark
IG	R/W	20A Fuse	Power supply
U	L/B	Discharge air temperature sensor	Detection of discharge air temperature
IL	R/W	20A Fuse	Power supply for lighting
E	B	Earth	

3. Electric System

3.1.11 Coolant temperature gauge

HOKUETSU part number:36145 05101



(1) Specification

Operation voltage	DC 24V
Lamp output	3W

(2) List of functions

Pin No.	Line color	Connection	Remark
IG	R/W	20A Fuse	Power source for water temperature gauge
U	G/R	Water temperature sensor	Detection of water temperature
IL	R/W	20A Fuse	Power supply for lighting
E	B	Earth	

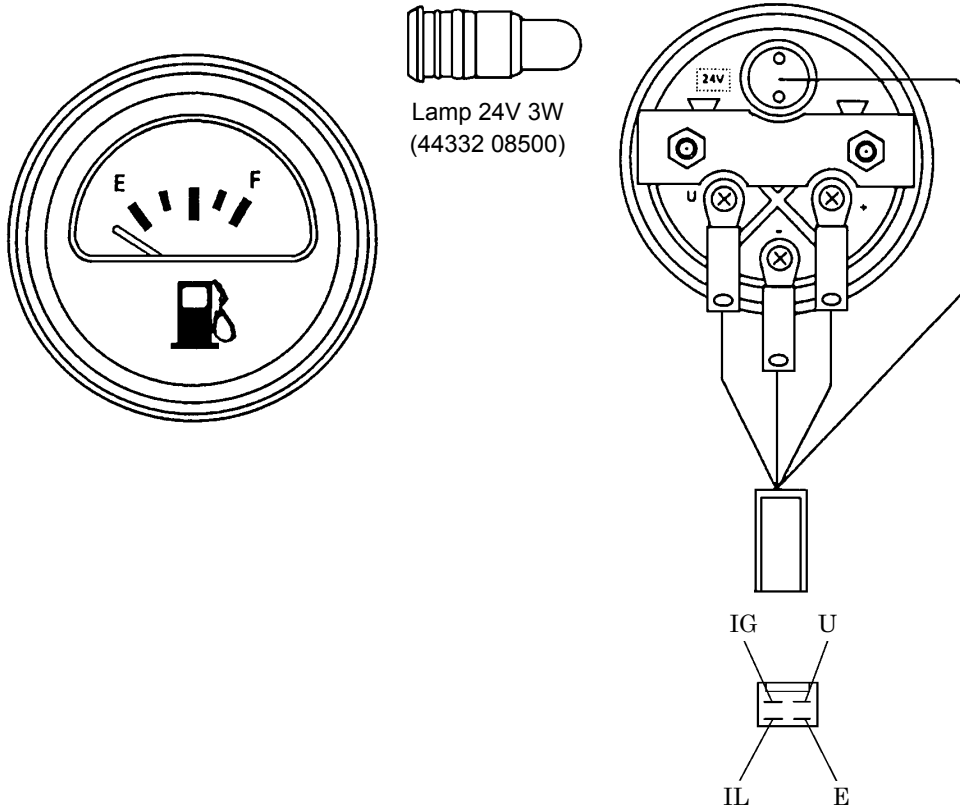
(3) Temperature range and resistance value of sensor

Temperature range	Sensor resistance value
50°C ~ 70°C	350 Ω ~ 170 Ω
70°C ~ 100°C	170 Ω ~ 63.5 Ω
100°C ~ 120°C	63.5 Ω ~ 36.2 Ω

3. Electric System

3.1.12 Fuel level gauge

HOKUETSU part number:36158 00801



(1) Position of meter pointer

Pointer position	Resistance (Ω)	Remaining fuel (L)
E	95	※1 (95)
1/2	32.5	276.5
F	7	※1 (500)

Remaining fuel marked ※1 is reference value.

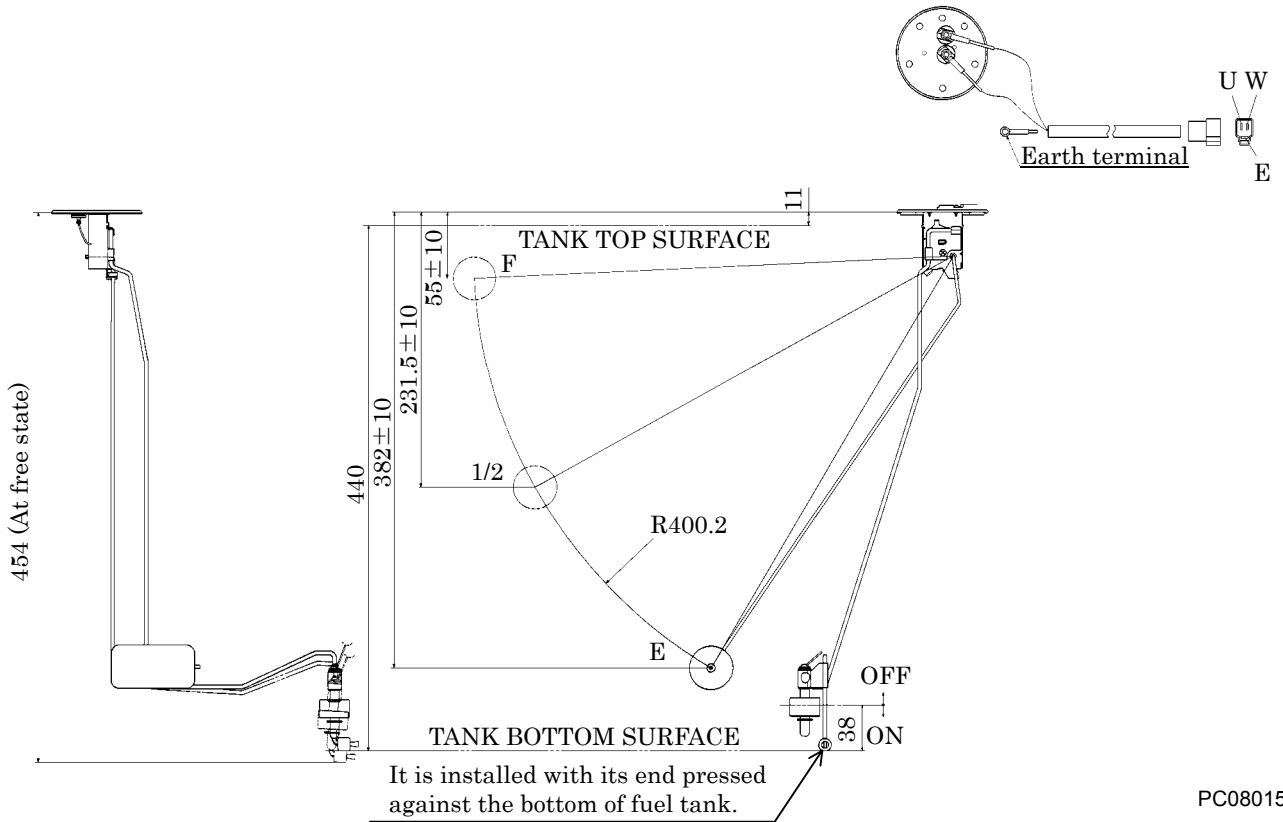
(2) List of functions

Pin No.	Line color	Connection	Remark
IG	R/W	20A Fuse	Power source for fuel gauge
U	G/Y	Sending unit	Detector for remaining fuel
IL	R/W	20A Fuse	Power source for lighting
E	B	Earth	

3. Electric System

3.1.13 Sending unit (With fuel level switch)

HOKUETSU part number:36159 03800

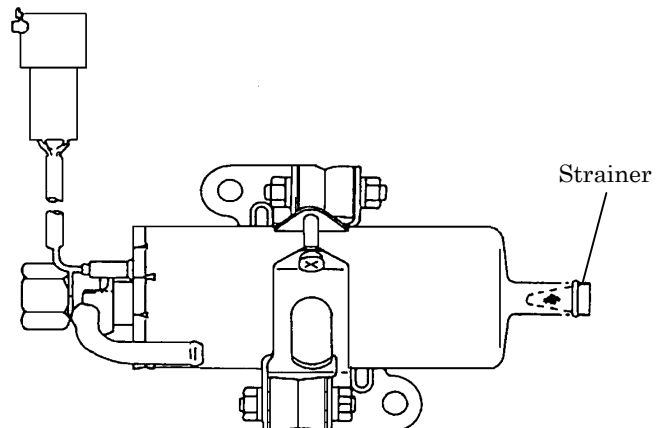


Pointer position	Resistance (Ω)	Remaining fuel (L)
E	110 ± 7	84
1/2	32.5 ± 4	276.5
F	3 ± 2	502

3.1.14 Electromagnetic pump (Strainer built-in type)

HOKUETSU part number:43650 01200

Rated voltage	24V
Operating current	4A (MAX)
Delivery capacity	2L/min (MIN)

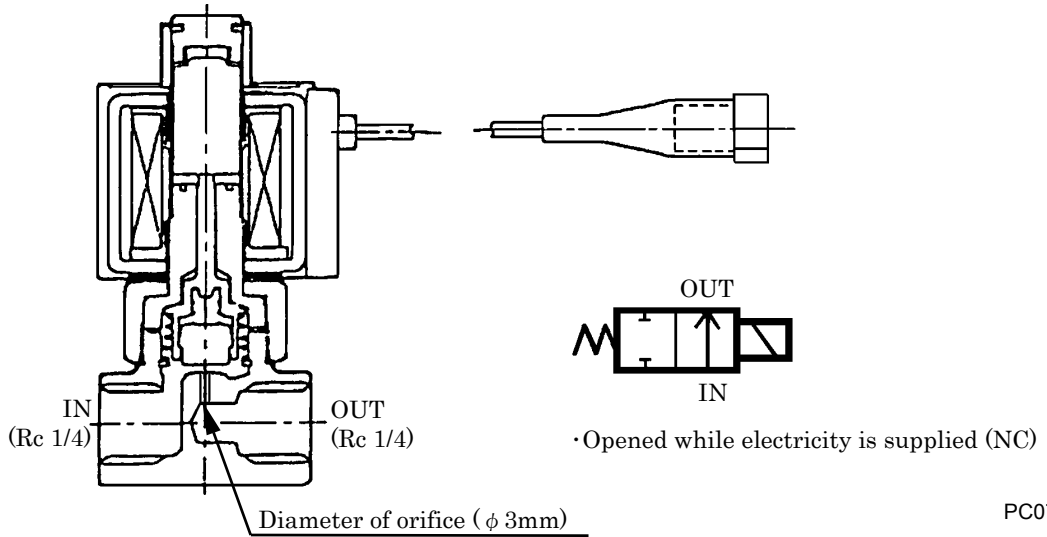


3. Electric System

3.1.15 Solenoid valve

For low pressure selection:SV1 For starting unloader:SV2

HOKUETSU part number:46811 22100



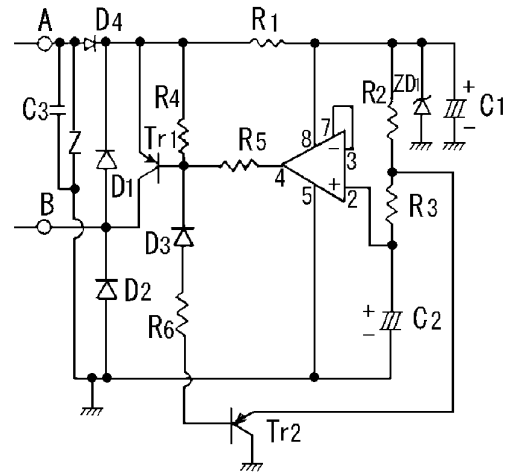
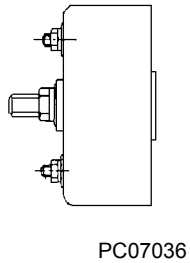
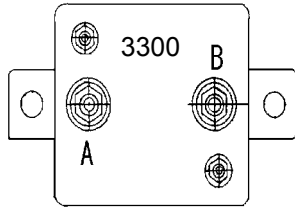
●Functions

<p>Solenoid valve (SV1) for low pressure selection</p>	<p>Solenoid valve (SV1) opens during electrical connection and it activates low pressure regulator.</p> <p>●Operation of compressor Pressure selection switch at the side of electrical apparatus box is turned to low pressure side, low pressure selection solenoid valve (SV1) is electrically connected, and valve opens to activate low pressure regulator.</p>
<p>Solenoid valve (SV2) for starting unloader</p>	<p>While electrically connected, open solenoid valve (SV2) to perform starting unloader operation.</p> <p>●Operation of compressor When starting unloader switch is placed to “START” position, starting unloader solenoid valve (SV2) is electrically connected to open valve to activate unloader regulator to close unloader valve and to perform starting unloader operation.</p>

3. Electric System

3.1.16 Stop button signal maintaining timer (T1)

HOKUETSU part number:44327 03300



Cable connection PC07039E

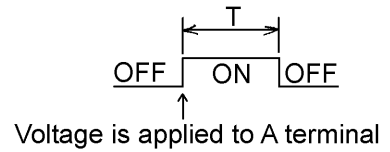
(1) Specification

Range of voltage in use	DC20~30V
Stop button signal maintaining time (T)	3~8 sec

(2) Functions

When power is supplied to A terminal, B terminal keeps outputting maintaining signal about 3~8 seconds.

Timer function mode

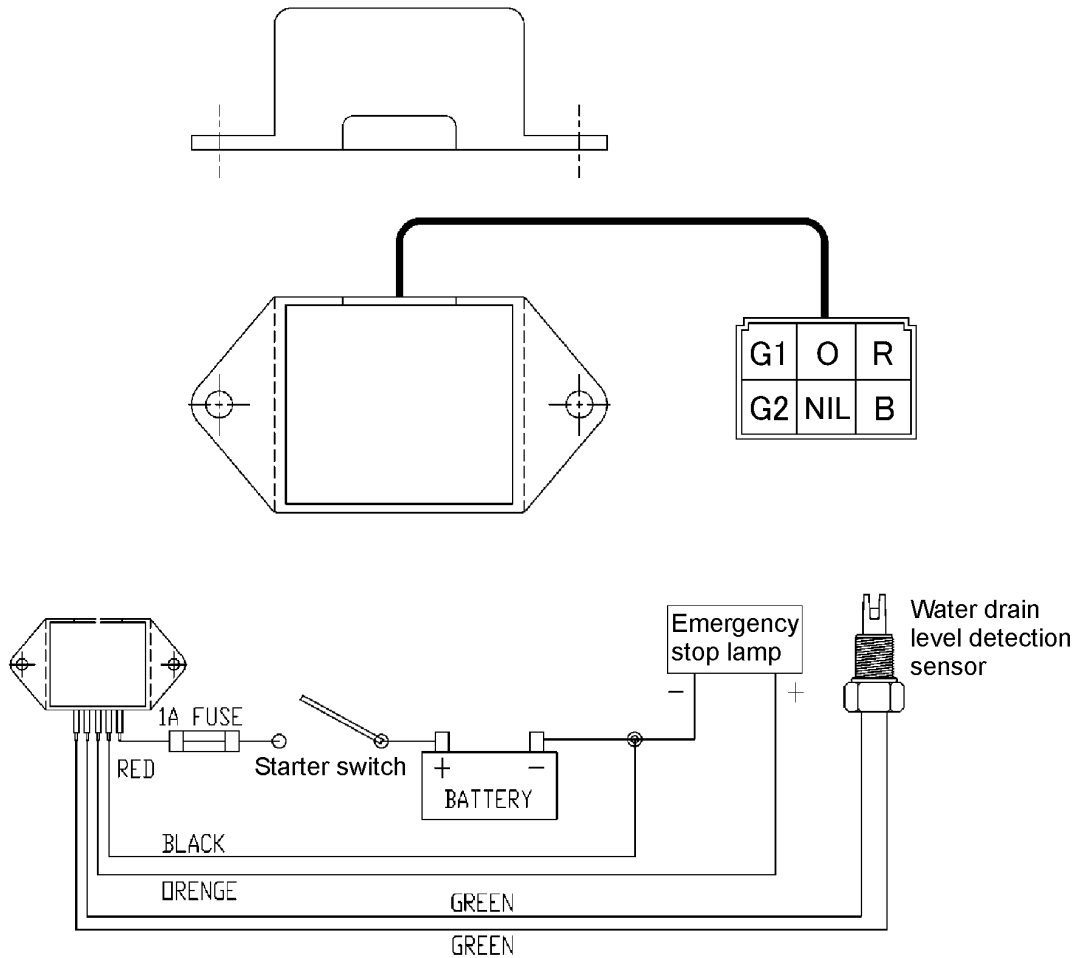


PC07040E

3. Electric System

3.1.17 Controller for water drain filter

HOKUETSU part number:46870 42600



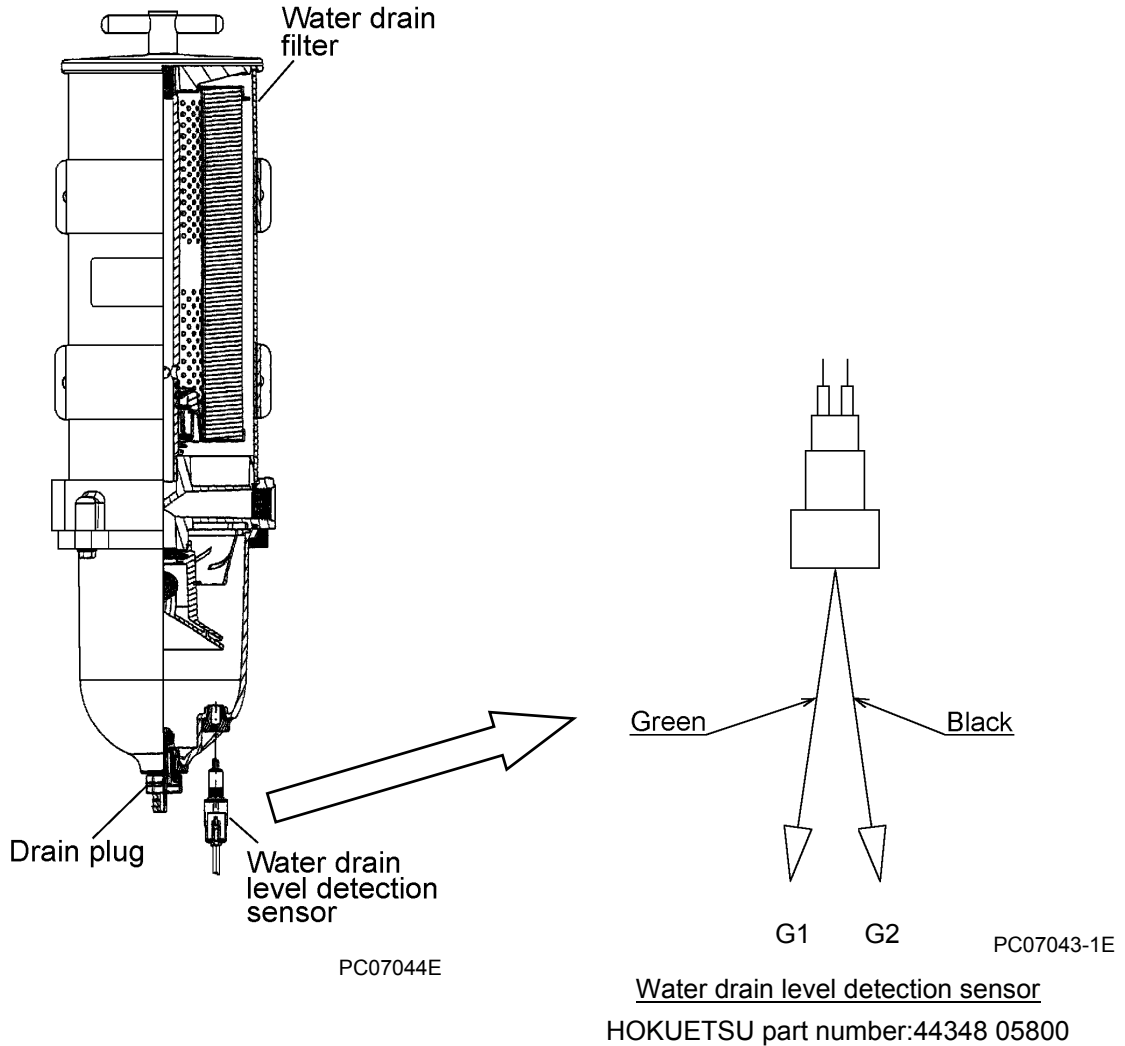
PC07042E

List of functions

Pin No.	Line color	Connection	Remark
R	R	1A Fuse	Power supply
B	B	Earth	
O	O	Fuel water drain relay (R9) (Through diode)	During normal operation, it is not electrically supplied. When water drain level detecting sensor detects rise of water level in water drain filter, and electricity is supplied between G1-G2 terminals, internal contact between R-O terminals becomes "ON". Thus fuel water drain relay (R9) functions, and power between No.2 and 4 terminals of water temperature relay (emergency stop relay) (R3) is cut, and then the contact point between No.1 and 3 terminals becomes "ON". It stops engine as emergency stop.
NIL			
G1	G	Water drain sensor	During normal operation electricity is not supplied between G1-G2 terminals. When water drain level detection sensor detects rise of water level inside water drain filter, electricity is supplied between G1-G2 terminals.
G2	G	Water drain sensor	

3. Electric System

3.1.18 Water drain level detection sensor



●Functions

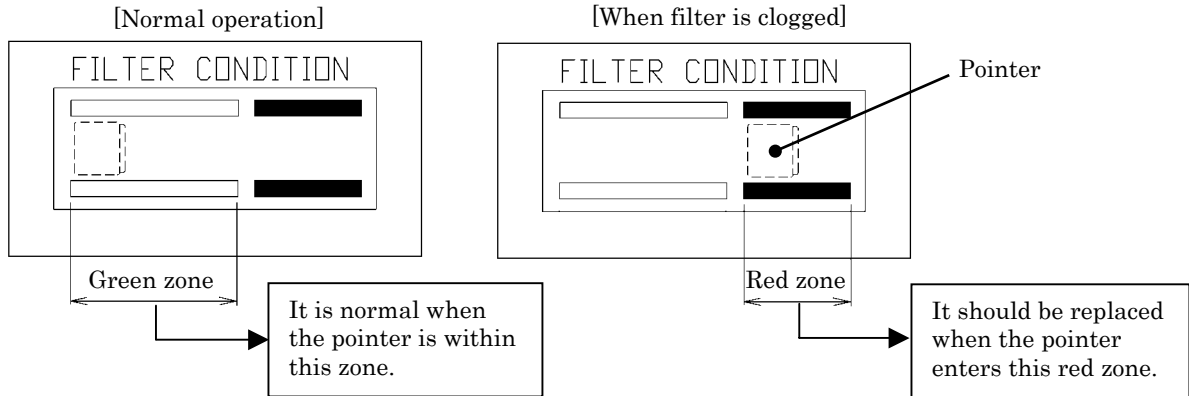
During normal operation, it is not electrically supplied.

When water drain level detection sensor detects rise of water level inside water drain filter, and electricity is supplied between G1-G2 terminals, internal contact between R-O terminals becomes "ON". Thus fuel water drain relay (R9) functions to cut power supply to water temperature relay (R3) and engine makes emergency stop.

3. Electric System

3.1.19 Check clogging in oil separator

When the differential pressure gauge of oil separator shows red range, replace the oil separator. However, check the indication of differential pressure of oil separator by opening service valves after full load operation. The gauge is staying at green zone during no load operation.

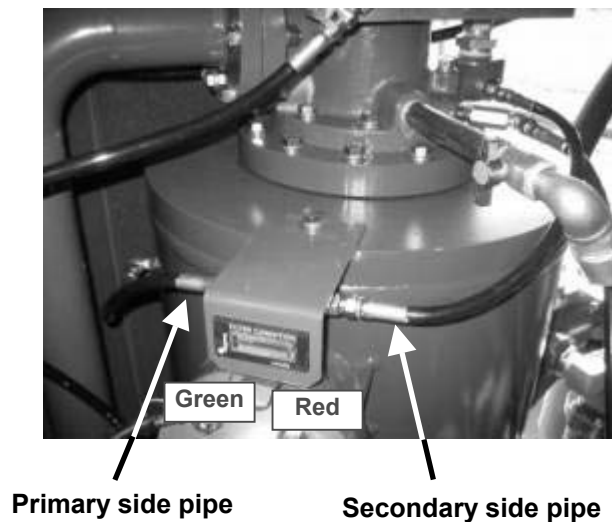


H000476

Cautions when installing a differential pressure gauge

When removing a differential pressure gauge or the differential pressure gauge pipe, make sure not to make a mistake in installing it.

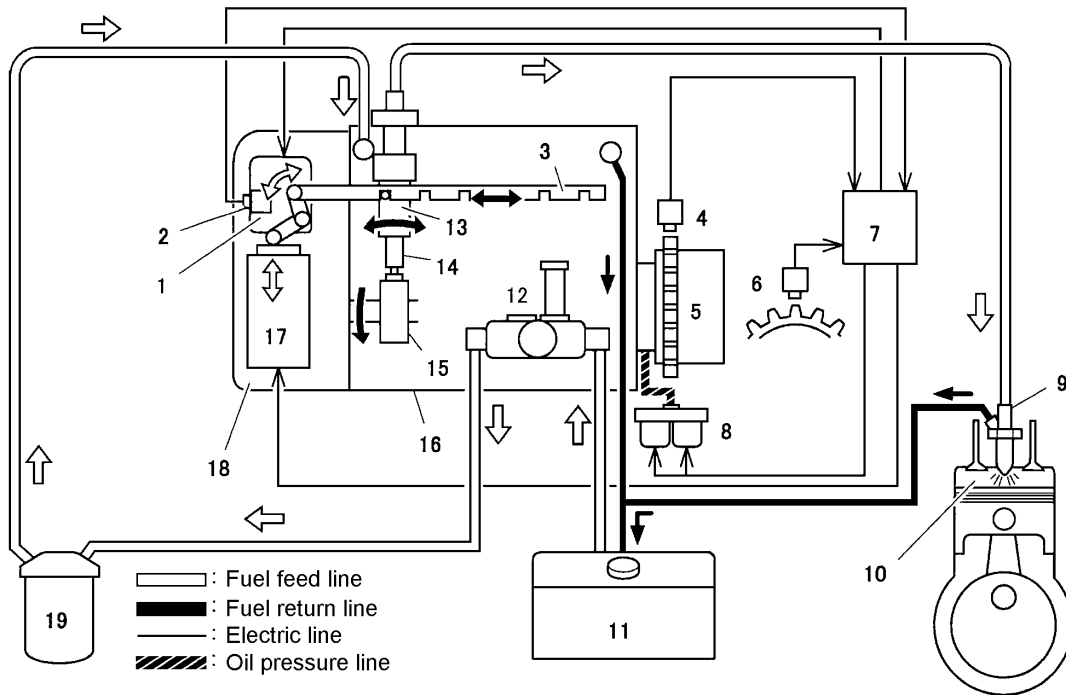
- ① Connect the green side of differential pressure gauge to first stage side of separator receiver tank.
- ② Connect the red side of differential pressure gauge to secondary stage of separator receiver tank.



3. Electric System

3.2 Electronic Control Injection Pump System (Electron governor)

Electronic control injection pump system is to perform proper arrangement for fuel injection timing and fuel injection ratio by electronic control of injection pump assembly and of timer.



PC06002E

- | | | |
|--|----------------------------|----------------------------------|
| 1. RED-4 internal circuit | 7. Engine controller (ECU) | 14. Plunger |
| 2. Control rack position sensor | 8. Timer control valve | 15. Camshaft |
| 3. Control rack | 9. Injection nozzle | 16. Injection pump |
| 4. Engine speed sensor-2
[Backup NE sensor (Tachsensor)] | 10. Combustion chamber | 17. Linear DC motor |
| 5. Electronic timer | 11. Fuel tank | 18. Electronic governor actuator |
| 6. Engine speed sensor-1
[Main NE sensor (Timing sensor)] | 12. Feed pump | 19. Fuel filter |
| | 13. Control sleeve | |

<Control of the system>

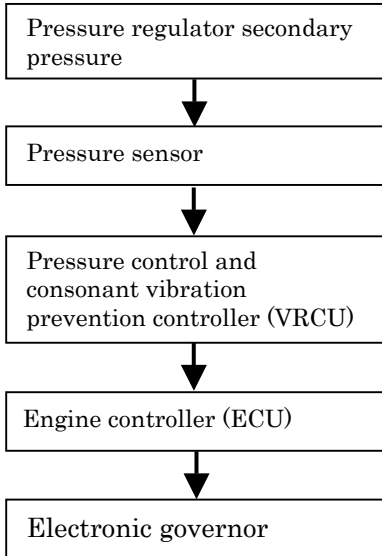
Control rack position signal calculated by RED-4 internal circuit which is built-in electronic governor actuator (18) and "Revolution speed signal" detected by engine speed sensor (4)(6) and also "Engine accelerator signal" converted into engine control voltage by pressure control and consonant vibration prevention controller (VRCU) are outputted to engine controller (ECU)(7). Engine controller (ECU) counts them and it outputs them to timer control valve (8) and linear DC motor (17) and it activates electronic governor system under the proper fuel injection time and fuel injection ratio.

- Timer control valve (8) controls oil pressure sent to electronic timer (5) and adjust fuel injection timing.
- Linear DC motor (17) increases and reduces fuel injection volume by moving control rack (3).
- Engine revolution speed is detected by engine speed sensor-1 (6) and engine speed sensor-2 (4), and if either is defective, it is backed up.

3. Electric System

3.2.1 Function of electronic control injection pump (Electronic governor) mounted model

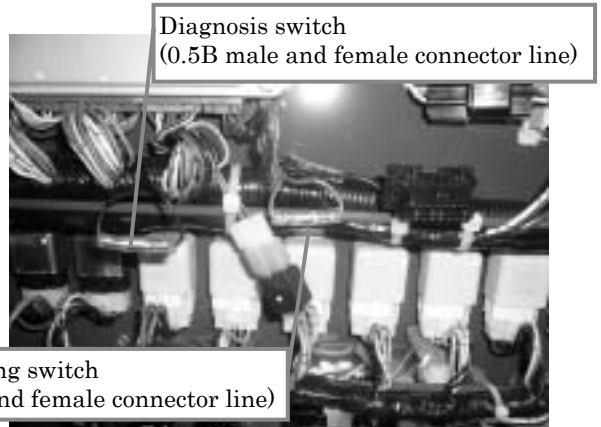
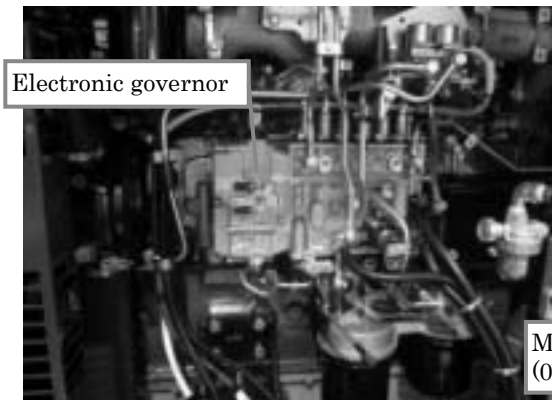
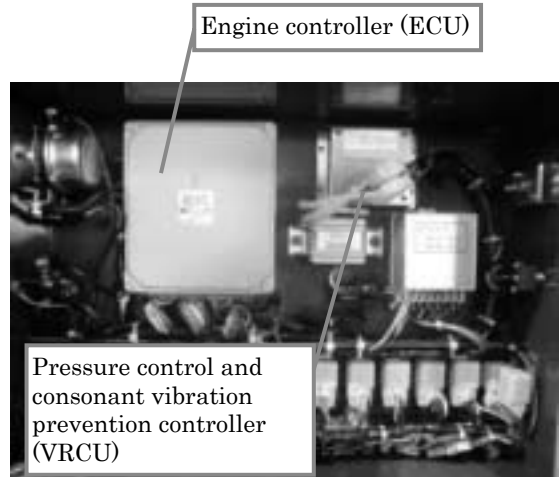
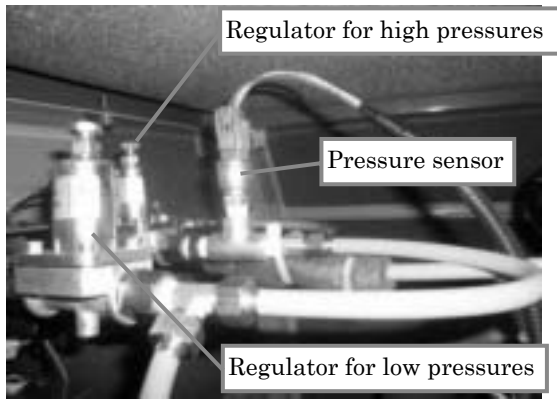
Engine controller (ECU) receives information signal from each sensor and arranges to activate electronic governor and electronic timer adequately. Regarding old type machine speed regulator controls governor lever according to air delivery, but electric signal outputted from pressure sensor is received by pressure control and consonant vibration prevention controller (VRCU) and output it to engine controller (ECU).



Outputting voltage which secondary side pressure of pressure regulator is converted into.

Outputting for engine controller (ECU) voltage which the inputted voltage is converted into.

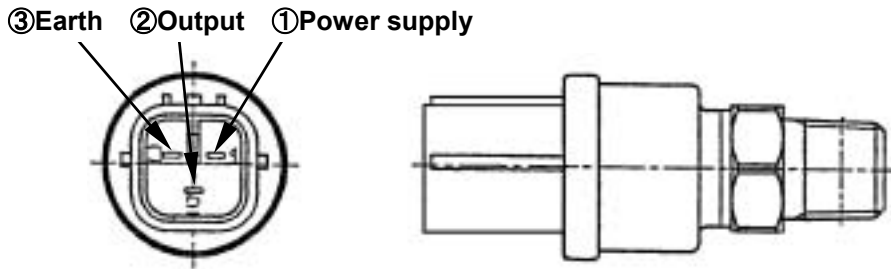
Outputting control signal which the inputted voltage is converted into.



3. Electric System

3.2.2 Pressure sensor

HOKUETSU part number:44328 01800



S_M133

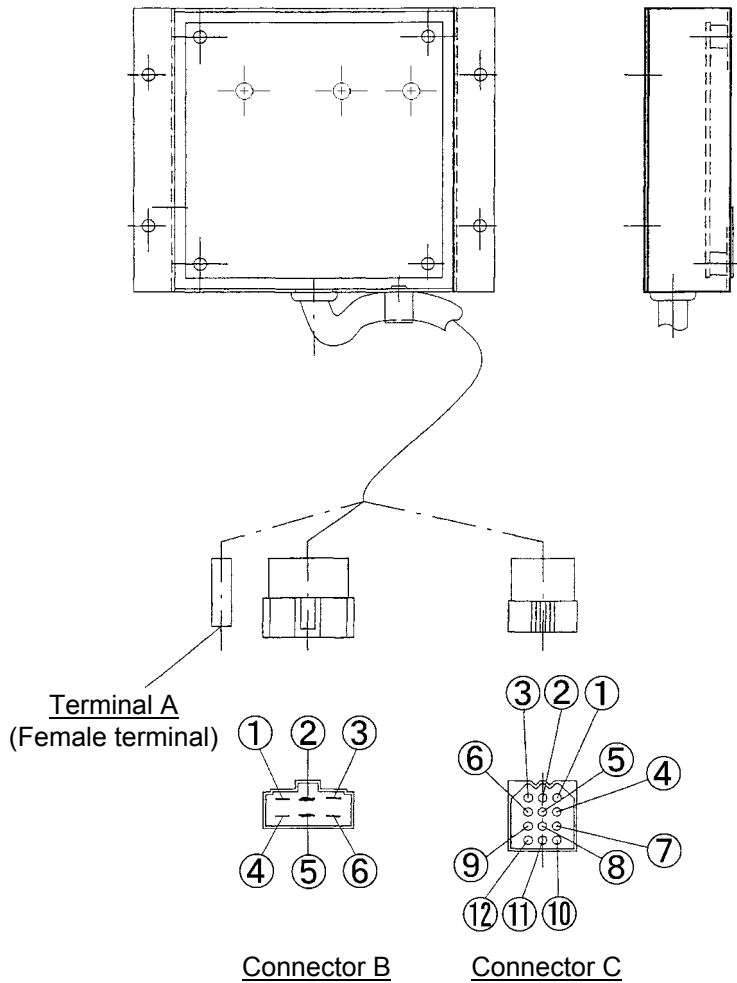
Pin No.	Line color	Connection	Signal
① VC	R/G	Pressure control and consonant vibration prevention controller (VRCU) C-7 terminal	Power supply (5V)
② VOUT	Y/W	Pressure control and consonant vibration prevention controller (VRCU) C-8 terminal	Range of output (DC0.5~4.5V) (For pressure and output voltage, see 3.2.4) <Reference> Pressure 0MPa(0kgf/cm ²) DC0.5V Pressure 0.1MPa(1kgf/cm ²) DC0.9V Pressure 0.6MPa(6kgf/cm ²) DC2.9V Pressure 0.69MPa(7kgf/cm ²) DC3.3V Pressure 0.98MPa(10kgf/cm ²) DC4.5V
③ GND	Y/G	Pressure control and consonant vibration prevention controller (VRCU) C-9 terminal	Earth

When checking output voltage of each component, measure the voltage between ②—③ terminals.

3. Electric System

3.2.3 Pressure control and consonant vibration prevention controller (VRCU)

HOKUETSU part number:46870 34100



PC06004-1

List of functions

	Pin No.	Line color	Connection	Remark
Terminal A	Female terminal (NE OUT (SIG))	Y/R	Tachometer No.2 terminal	Detection of engine RPM.
			Engine controller (ECU) No.66 terminal	
Connector B	1 (BATT(+))	R/W	20A Fuse	Power supply
	2 (Consonant vibration LED)	W	Emergency stop lamp for engine RPM drop	When engine RPM drops down lower than 900min ⁻¹ , emergency stop lamp for engine RPM drop goes on.
	3	—	NIL	
	4 (GND)	B	Earth	
	5	—	NIL	
	6 (RPM drop stop output)	L/G	Emergency stop relay for engine RPM drop (R5) No.2 terminal	When engine RPM drops down lower than 900min ⁻¹ , voltage is applied to emergency stop relay No.2 terminal.

3. Electric System

List of functions

Pin No.	Line color	Connection	Remark	
Connector C	1 (+5V-1)	R/B Engine controller (ECU) No.62 terminal (Accelerator sensor-1) Engine controller (ECU) No.63 terminal (Accelerator sensor-2)	Power supply for accelerator sensor-1, 2 (DC5V).	
	2 (SIG-1)	R/W ※ Engine controller (ECU) No.73 terminal (Accelerator sensor-1)	Based on input voltage of No.8 (OUTPUT) terminal, it outputs engine accelerator opening angle to engine controller No.73 terminal. (Engine accelerator opening angle is adjusted according to regulator 2nd stage pressure.)	
	3 (GND-1)	B/Y Engine controller (ECU) No.83 terminal (Accelerator sensor-1) Engine controller (ECU) No.84 terminal (Accelerator sensor-2)	Earth	
	4 (+5V-2)	—	NIL	
	5 (SIG-2)	O/W ※ Engine controller (ECU) No.50 terminal (Accelerator sensor-2)	Based on input voltage of No.8 (OUTPUT) terminal, it outputs engine accelerator opening angle to engine controller No.50 terminal. (Engine accelerator opening angle is adjusted according to regulator 2nd stage pressure.)	
	6 (GND-2)	—	NIL	
	7 (+5V)	R/G	Pressure sensor No.1 terminal	Power supply for pressure sensor (DC5V)
	8 (OUTPUT)	Y/W	Pressure sensor No.2 terminal	Detection of 2nd stage pressure. (Input DC voltage meeting regulator 2nd stage pressure.)
	9 (COMMON)	Y/G	Pressure sensor No.3 terminal	Earth
	10 (Pressure selector SW)	R/W	Pressure selector switch Low pressure operation indicating lamp Solenoid valve No.2 terminal for selection rated pressure	Switching engine rated RPM. ON : Engine rated RPM 2,200min ⁻¹ (LP operation) OFF : Engine rated RPM 2,000min ⁻¹ (HP operation)
	11 (Starting unloader SW)	R/B	Starting unloader switch Solenoid valve No.2 terminal for starting unloader	When starting unloader switch is "ON", unloader RPM signal (voltage) is outputted to No.50 and No.73 terminals of engine controller (ECU).
	12	—	NIL	

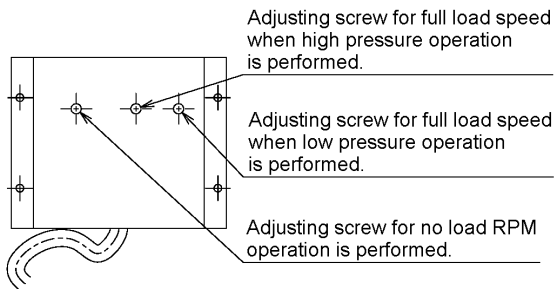
※:Inputting of accelerator opening degree signal to engine controller (ECU) is double-assured for higher reliability. In ordinary case, considering safety, it selects smaller value, but in case that either becomes faulty, it selects normal value.

3. Electric System

- When replacing pressure control consonant vibration prevention controller (VRCU), check and confirm engine function. If engine RPM is found different from specified RPM, perform following adjustments.

How to adjust engine RPM.

1. Before adjusting full load speed, check which rating selection switch is set to High pressure operation or low pressure operation.
2. Adjust the adjusting portion of pressure control and consonant vibration prevention controller (VRCU) by turning it with a plus (+) screw driver in accordance with each pressure specification. Turning to right raises speed while turning to left lowers speed.
3. Adjust no load operation speed when it is set to low pressure operation.



At high pressure operation

Delivery pressure:

2.07MPa (PDSJ750S)

Full load speed: 2,000 ± 50 min⁻¹

No load speed : 1,100 ⁺⁵⁰ min⁻¹

At low pressure operation

Delivery pressure:

1.72MPa (PDSH850S)

Full load speed: 2,200 ± 50 min⁻¹

No load speed : 1,100 ⁺⁵⁰ min⁻¹

PC06005E

3. Electric System

3.2.4 Pressure/voltage conversion table

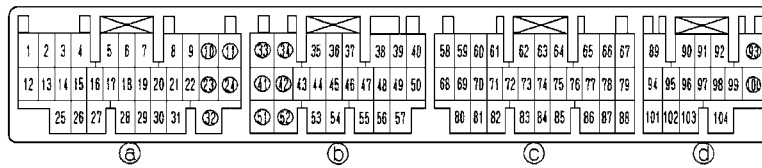
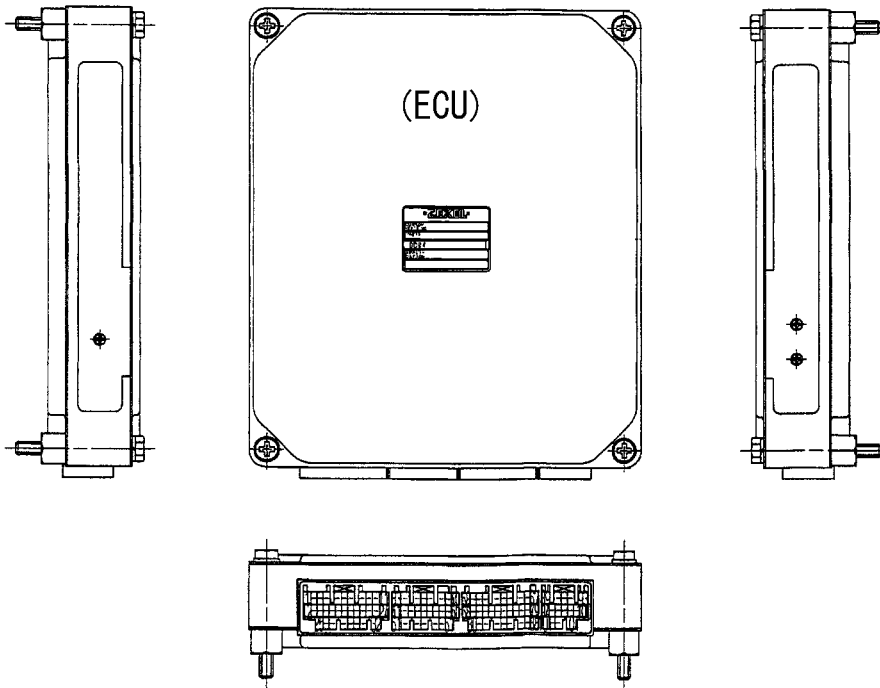
The voltage values in the following table are standard reference ones. They are different a little from actual ones during operation.

Pressure sensor		Pressure control and consonant vibration prevention controller (VRCU)						
		PDSH850S-4B1 (Low pressure : 1.72MPa)			PDSJ750S-4B1 (High pressure : 2.07MPa)			
2nd stage pressure		Output voltage	Output voltage	Accelerator	Engine RPM	Output voltage	Accelerator	Engine RPM
kgf/cm ²	MPa	V	V	%	min ⁻¹	V	%	min ⁻¹
0	0.00	0.50	4.00	100	2,200	3.67	86	2,048
0.4	0.04	0.66	3.43	77	1,942	3.27	70	1,868
0.8	0.08	0.81	2.86	53	1,683	2.87	53	1,688
1.0	0.10	0.89	2.58	41	1,554	2.68	45	1,598
1.2	0.12	0.97	2.30	30	1,425	2.48	37	1,508
1.4	0.14	1.05	2.01	18	1,294	2.28	29	1,416
1.6	0.16	1.13	1.72	6	1,165	2.08	21	1,326
1.7	0.17	1.17	1.58	0	1,100	1.98	16	1,281
1.8	0.18	1.21				1.88	12	1,236
2.0	0.20	1.28				1.68	4	1,145
2.1	0.21	1.32				1.58	0	1,100
2.2	0.22	1.36						

3. Electric System

3.2.5 Engine controller (ECU)

HOKUETSU part number:46870 34200



Position of connector

PC06003-1

List of functions

Pin No.	Line color	Connection	Remark
1	W/L	Heater auxiliary relay (HR1) No.4 terminal	When preheating, connected to controller ground.
4 ※1	W	Engine speed sensor-1 (Tachosensor) No.1 terminal (+)	Detection of engine speed between No.4 and 15 terminals.
5 ※1	W	Engine speed sensor-2 (Timing sensor) No.4 terminal (SIG)	Detection of engine speed between No.5 and 17 terminals.
6	R	Boost sensor No.4 terminal	Power supply for boost sensor (DC5V).
9	W/Y	Electronic governor actuator (RED4) No.8 terminal	Outputting engine stop signal.
15 ※2	B	Engine speed sensor-1 (Tachosensor) No.2 terminal (-)	Detection of engine speed between No.4 and 15 terminals.
17 ※2	B	Electronic governor actuator (RED4) No.14 terminal (GND) Engine speed sensor-2 (Timing sensor) No.3 terminal (GND)	Detection of engine speed between No.5 and 17 terminals.
18	G/W	Boost sensor No.3 terminal (SIG)	Detection of boost pressure of engine intake air, which passes through intercooler. (Inputting DC voltage corresponding to the boost pressure.)

3. Electric System

List of functions

Pin No.	Line color	Connection	Remark
22	Y	Electronic governor actuator (RED4) No.10 terminal	Outputting emergency operation signal. (In case that engine is in trouble, engine speed is constantly kept at 1,100min ⁻¹ .)
25	W/B	Timer control valve (TCV RTD) No.4 terminal	Power supply for solenoid valve at internal pump side inside timer control valve.
26	W/G	Timer control valve (TCV ADV) No.2 terminal	Power supply for solenoid valve at release side inside timer control valve.
27	Y/B	Water temperature sensor No.2 terminal (GND)	Detection of engine cooling water temperature between No.75 and 27 terminals.
28	G/Y	Boost sensor No.5 terminal (GND)	Grounding for boost sensor.
33 ※3	L/G	Electronic governor actuator (RED4) No.1 terminal	Power supply for linear DC motor inside electronic governor actuator. (VB-1)
34 ※3	L/G	Electronic governor actuator (RED4) No.11 terminal	Power supply for linear DC motor inside electronic governor actuator. (VB-2)
35 ※4	Y/G	Electronic governor actuator (RED4) No.3 terminal	Outputting required fuel injection. (PWM-SOL-1)
36 ※5	Y/L	Electronic governor actuator (RED4) No.5 terminal	Power supply for electronic governor actuator internal circuit. [SV (VVC)-1]
37	G	Q tone resistance sensor (SIG) No.1 terminal	Detection of Q tone resistance between No.37 and 46 terminals and correction of fuel injection volume.
40	L/G	Engine trouble alarm lamp	When following troubles occur to engine, it connects engine controller grounding connector and makes engine trouble alarm lamp go on. (Engine speed is constantly kept at 1,100 min ⁻¹ .) <ul style="list-style-type: none"> ● Electronic timer control system trouble ● Disconnection and short circuit of timer control valve ● Timing sensor trouble ● Tachosensor trouble ● Accelerator sensor-1, 2 trouble at same time ● Abnormal pressure of boost pressure ● Disconnection and short circuit of heater relay
42	B	Earth	
43	W	Electronic governor actuator (RED4) No.4 terminal	Inputting actual fuel injection volume.
44 ※4	Y/W	Electronic governor actuator (RED4) No.13 terminal	Outputting required fuel injection volume. (PWM-SOL-2)
45 ※5	L/Y	Electronic governor actuator (RED4) No.15 terminal	Power supply (5V) for electronic governor actuator internal circuit. [SV (VVC)-2]
46	G	Q tone resistance sensor No.2 terminal (GND)	Detection of Q tone resistance between No.37 and 46 terminals and correction of fuel injection volume.

3. Electric System

List of functions

Pin No.	Line color	Connection	Remark
49	G/L	Water temperature relay (Emergency stop relay) (R3) No.3 terminal	Electricity is not supplied during ordinary operation: "OFF". Delivery air temperature rise, engine speed drop, remaining fuel shortage, cooling water temperature rise, fuel pre-filter (option) water drain level, all these activate each engine emergency stop relay to cut No.2 and 4 terminals of water temperature relay (R3) and to connect contact "ON" between No.1 and 3 terminals. Thus engine makes emergency stop.
50 ※6	O/W	Pressure control and consonant vibration prevention controller No.5 terminal (SIG-2)	Inputting engine accelerator opening degree. (Adjusting engine accelerator opening degree, according to delivery pressure.)
51 ※7	GY/B	Electronic governor actuator (RED4) No.2 terminal	Grounding connection for linear DC motor inside electronic governor actuator. (GND-1)
52 ※7	GY/B	Electronic governor actuator (RED4) No.12 terminal	Grounding connection for linear DC motor inside electronic governor actuator. (GND-2)
53	R/L	Electronic governor actuator (RED4) No.6 terminal	Grounding connection for electronic governor actuator internal circuit.
54	—	Shield	
56	L/R	MUT- II (Multi-use tester) No.7 terminal	Multi-use tester connector terminal (K-LINE). Outputting detection value of defective portions and sensor and switch.
58	G/B	MUT- II (Multi-use tester) No.1 terminal	Multi-use tester connector terminal (DCT). Outputting detection value of defective portions and sensor and switch.
60	W/R	Stop maintaining relay (RB) No.1 terminal (Through 5A Fuse)	Inputting "ACC" signal of starter switch. Electricity is not supplied to No.60 terminal "OFF" and then engine stop signal is outputted to electronic governor actuator (RED4) No.8 terminal from No.9 terminal.
61	W/R	Stop maintaining relay (RB) No.1 terminal (Through 5A Fuse)	Inputting "ACC" signal of starter switch. Electricity is not supplied to No.60 terminal "OFF" and then engine stop signal is outputted to electronic governor actuator (RED4) No.8 terminal from No.9 terminal.
62	R/B	Pressure control and consonant vibration prevention controller No.1 terminal (+5V-1)	Power supply (DC5V) for accelerator sensor-1.
63	R/B	Pressure control and consonant vibration prevention controller No.1 terminal (+5V-1)	Power supply (DC5V) for accelerator sensor-2.
65	B/W	Starter switch C terminal (Through 5A Fuse)	Inputting starting signal.
66	Y/R	Tachometer No.2 terminal	Outputting engine speed.
		Pressure control and consonant vibration prevention controller female terminal (NE OUT (SIG))	

3. Electric System

List of functions

Pin No.	Line color	Connection	Remark
71	B	Diagnosis switch (0.5B wire male and female connector)	<p>● Trouble diagnosis function</p> <p>When diagnosis switch (0.5B wire male and female connector) is disconnected with starter switch “ON”, “Engine trouble lamp” or “Engine stop lamp” shows trouble points by blinking times (diagnosis code [trouble diagnosis code]). (For details, refer to 4.1 “Engine trouble diagnosis function”.)</p>
73 ※6	R/W	Pressure control and consonant vibration prevention controller No.2 terminal (SIG-1)	Inputting engine accelerator opening degree. (Adjusting engine accelerator opening degree according to delivery pressure.)
75	B/R	Water temperature sensor No.1 terminal (SIG)	Detection of engine cooling water temperature between No.75 and 27 terminals.
82	R/Y	Memory clear switch (0.5R/Y wire male and female connector)	<p>● Display and deletion of trouble memory</p> <p>When diagnosis switch (0.5B wire male and female connector) and memory clear switch connected to No.82 terminal (0.5R/Y wire male and female connector) are disconnected with starter switch “ON”, “Engine trouble lamp” or “Engine stop lamp” shows past trouble points by blinking times (diagnosis code [trouble diagnosis code]).</p> <p>When memory clear switch (0.5R/Y wire male and female connector) is disconnected with starter switch “ON”, and when it is connected again, all diagnosis codes recorded on engine controller are deleted.</p> <p>(After starter switch is switched “OFF” temporarily, and memory clear switch (0.5R/Y wire male and female connector) is connected again, diagnosis codes (trouble diagnosis code) will not be deleted. (For details, refer to 4.1 “Engine trouble diagnosis function”.)</p>
83	B/Y	Pressure control and consonant vibration prevention controller No.3 terminal (GND-1)	Earth
84	B/Y	Pressure control and consonant vibration prevention controller No.3 terminal (GND-1)	Earth
85	L	Preheating lamp	When preheating, connected to controller ground and to make preheating lamp go on.
86	G/R	Engine oil pressure drop emergency stop relay (R1) No.3 terminal	<p>During normal operation, it is electrically supplied.</p> <p>When engine oil pressure drops below set pressure, contact between No.3 and 5 terminals of engine oil pressure drop emergency stop relay (R1) becomes “OFF” to make engine emergency stop.</p> <p>● Actuating oil pressure: below 78kPa(0.8kgf/cm²)</p>
87	B	Earth	

3. Electric System

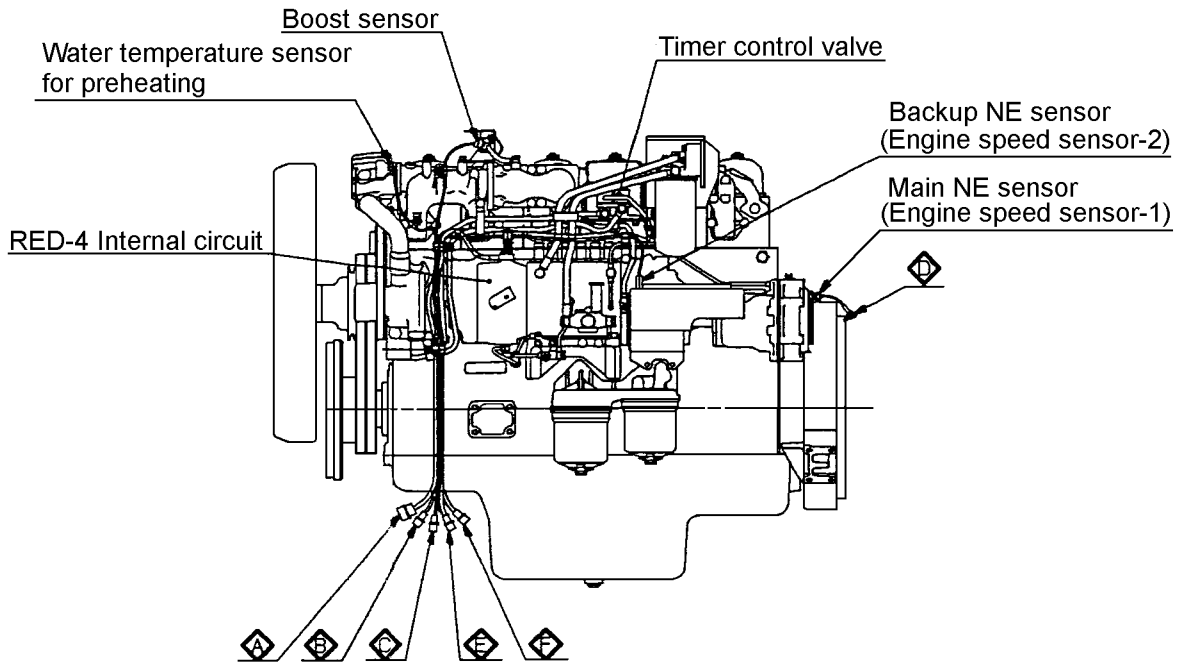
List of functions

Pin No.	Line color	Connection	Remark
91	L/B	Engine stop lamp	When following troubles occur to engine, it connects engine controller grounding connector and makes engine trouble alarm lamp go on. <ul style="list-style-type: none"> ● Engine overrunning ● Engine reverse turning ● Governor servo trouble ● Rack sensor trouble ● Tachosensor and timing sensor trouble at same time ● System error <ul style="list-style-type: none"> ● Microcomputer check error ● CPU mutual checking error ● Excessive protection of interruption ● Cooling water temperature rise ● Engine oil pressure drop
92	R/Y	Engine controller relay (ECU) No.5 terminal	Power supply
93	R/Y	Engine controller relay (ECU) No.5 terminal	Power supply
98	R/G	Engine controller relay (ECU) No.4 terminal	When "ACC" signal is inputted to No.60 and 61 terminals of starter switch, No.98 and 104 terminals are connected to grounding connection of engine controller and excite engine controller relay (ECU). When electrical supply stops to No.60 and 61 terminals, internal contact between No.98 and 104 terminals becomes "OFF" and releases excitation to engine controller relay (ECU).
99	B	Earth	
100	B	Earth	
104	R/G	Engine controller relay (ECU) No.4 terminal	When "ACC" signal is inputted to No.60 and 61 terminals of starter switch, No.98 and 104 terminals are connected to grounding connection of engine controller and excite engine controller relay (ECU). When electrical supply stops to No.60 and 61 terminals, internal contact between No.98 and 104 terminals becomes "OFF" and releases excitation to engine controller relay (ECU).

Connection terminals marked ※1~※7 are double-provided for higher reliability. In ordinary case, smaller input/output value is selected, considering safety. But when either gets troubled, normal one is selected.

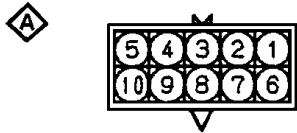
3. Electric System

3.2.6 Engine accessories and others



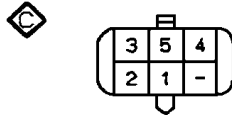
PC07026E

RED-4 Internal circuit connector



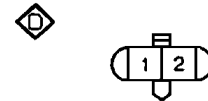
PC07027-1

Water temp. sensor for preheating and boost sensor connector



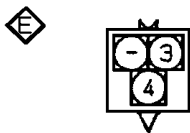
PC07027-2

Main NE sensor (Engine speed sensor-1) connector



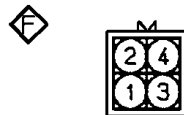
PC07027-3

Backup NE sensor (Engine speed sensor-2) connector



PC07027-4

Timer control valve connector



PC07027-5

3. Electric System

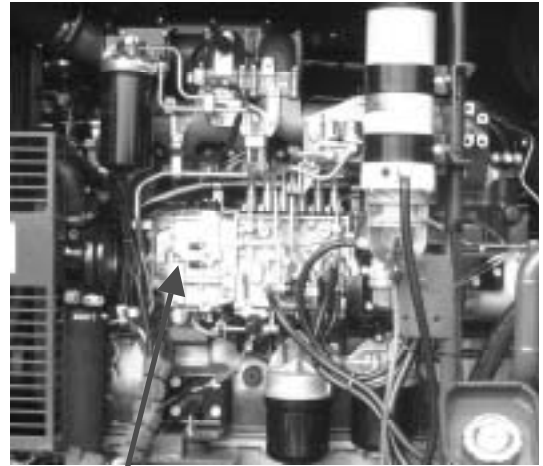
(1) RED-4 Internal circuit

Internal circuit which is built in electronic governor actuator.

RED-4 internal circuit treats control rack position signal (control fuel injection volume signal) outputted from engine controller (ECU) No.35 terminal (main terminal) and No.44 terminal (sub terminal) and it activates linear DC motor. Thus control rack is activated and to control fuel injection volume.

Further, based on the signal outputted from control rack position sensor, actually calculated value is fed back to engine controller (ECU).

When there is an error found between rack position required and actual rack position directed by engine controller (ECU) and RED-4 internal circuit, it corrects movement of linear DC motor, according to direction of engine controller (ECU).



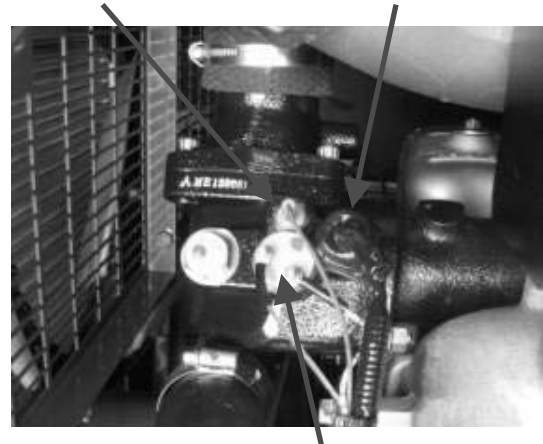
RED-4 Internal circuit

(2) Water temperature sensor for preheating

When engine cooling water temperature is lower than set temperature by detecting engine cooling temperature, internal contact between engine controller (ECU) No.1 terminal and No.99, 100 (grounding connection) terminals are switched "ON" to perform preheating operation.

Water temperature sensor for water thermometer

Water temperature sensor for preheating

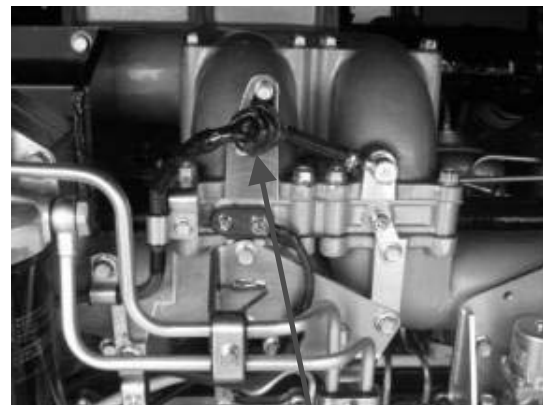


Water temperature switch for emergency stop

(3) Boost sensor

Detecting engine boost pressure (supercharging pressure).

Detecting boost pressure between engine controller (ECU) No.18 and 28 terminals.



Boost sensor

3. Electric System

(4) Main NE sensor (Engine speed sensor -1)

Detecting engine speed with tachosensor.

Detecting engine speed between engine controller (ECU) No.4 and 15 terminals.

Main NE sensor
(Engine speed sensor -1)

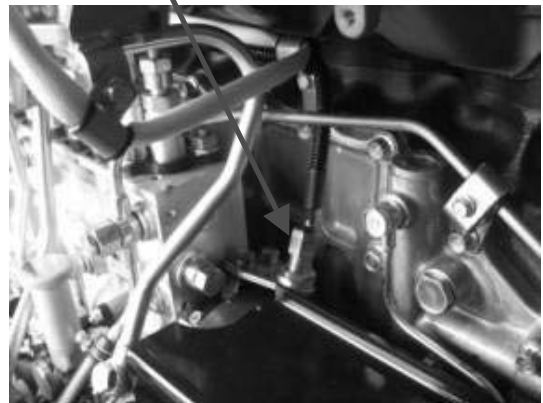


(5) Backup NE sensor (Engine speed sensor -2)

Detecting engine speed with timing sensor.

Detecting engine speed between engine controller (ECU) No.5 and 17 terminals.

Backup NE sensor
(Engine speed sensor -2)



(6) Timer control valve

Timer control valve controls oil pressure (engine oil) to activate electronic timer, and adjust fuel injection timing.

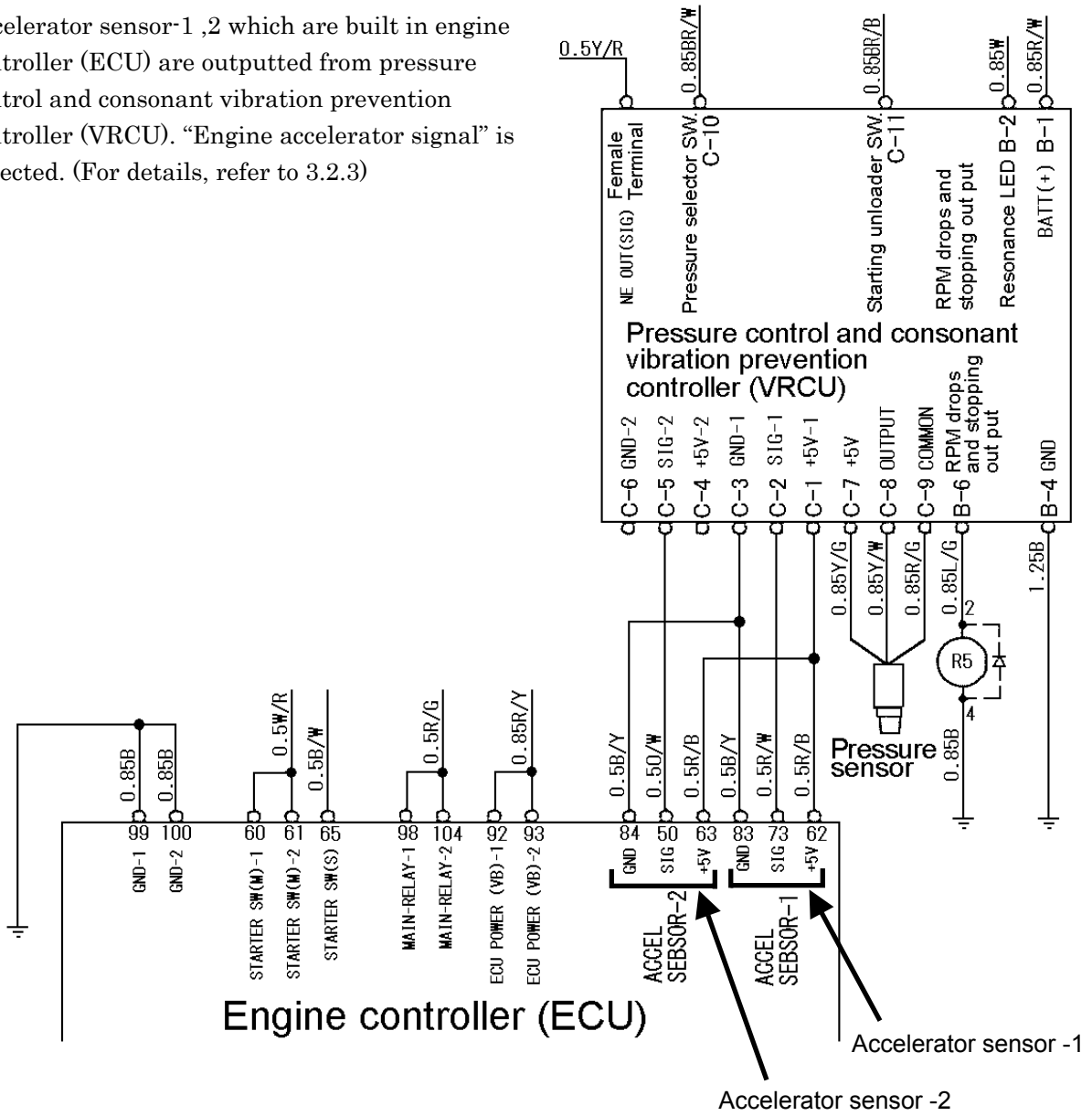


Timer control valve

3. Electric System

(7) Accelerator sensor -1 and accelerator sensor -2

Accelerator sensor-1 ,2 which are built in engine controller (ECU) are outputted from pressure control and consonant vibration prevention controller (VRCU). “Engine accelerator signal” is detected. (For details, refer to 3.2.3)



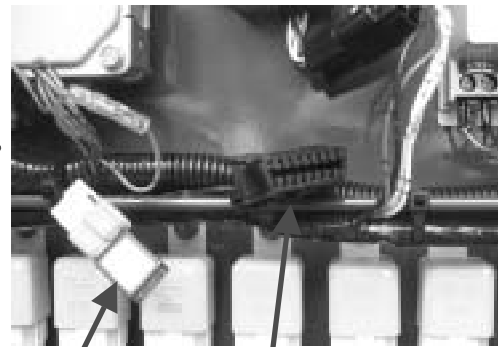
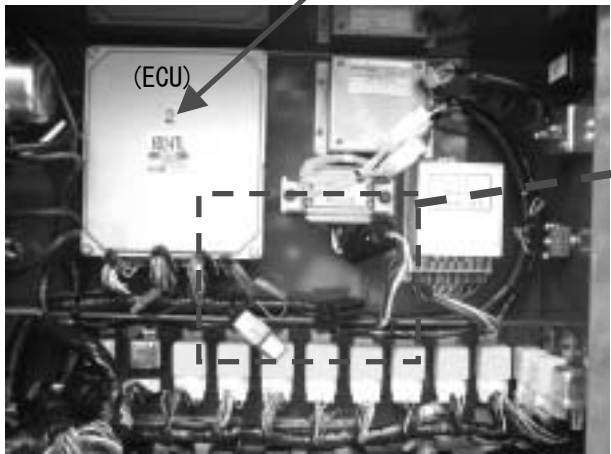
(8) Atmospheric pressure sensor

Atmospheric pressure sensor is a sensor which is built in engine controller (ECU) and it detects atmospheric pressure.

For trouble diagnosis, refer to 4.1.2 and 4.1.6.

3. Electric System

Q tone resistor meeting ECU number (Fuel injection volume adjustment resistance)



MUT- II connection connector

Q tone resistor
(Fuel injection volume adjusting resistance)

(9) Q tone resistor (Fuel injection volume adjusting resistance)

Q tone resistor (fuel injection adjusting resistance) is to adjust full rack position to match engine injection pump and fuel injection volume into most suitable conditions.

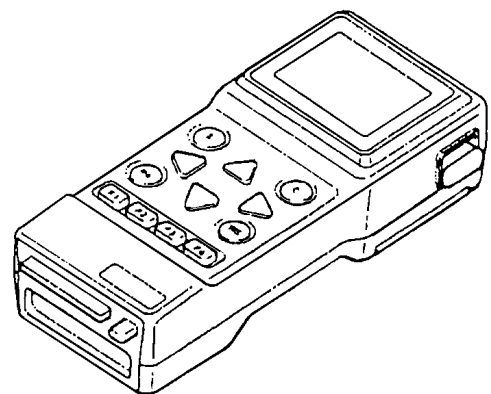
IMPORTANT

This resistance selected from 8 kinds ($270 \Omega \sim 15,000 \Omega$) is to determine fuel injection volume (control rack position) finally. So never replace it by other one.



(10) MUT- II (Multi-use tester)

Engine controller (ECU) can display each kind information in LCD which engine controller (ECU) is memorizing, with serial communication with MUT- II. (For details, refer to 4.2.1~4.2.6.)

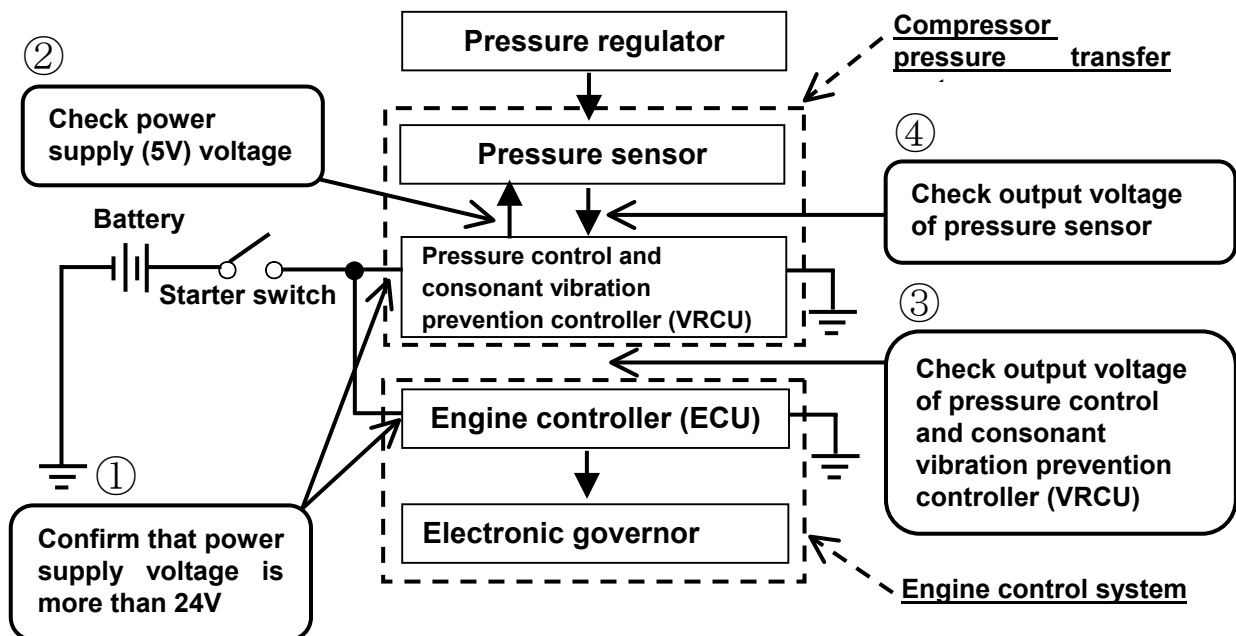


3. Electric System

3.3 In case of Engine Trouble

In case that any trouble happens to engine and also it is impossible to adjust revolution speed even by turning RPM speed adjusting screw of pressure control and consonant vibration prevention controller (VRCU), at first check fuel line and system. When anything abnormal is found nowhere in fuel line system, it may be caused due to power supply voltage drop or defective electronic control system. Check pressure control and consonant vibration controller (VRCU), engine controller (ECU) and each pressure sensors for abnormal power supply voltage. In case that power supply voltage is found normal, check input/output voltage of power supply of pressure control and consonant vibration prevention controller (VRCU). Further locate which compressor pressure transfer system or engine controller (ECU) the trouble comes from.

Trouble diagnosis points in case of engine trouble

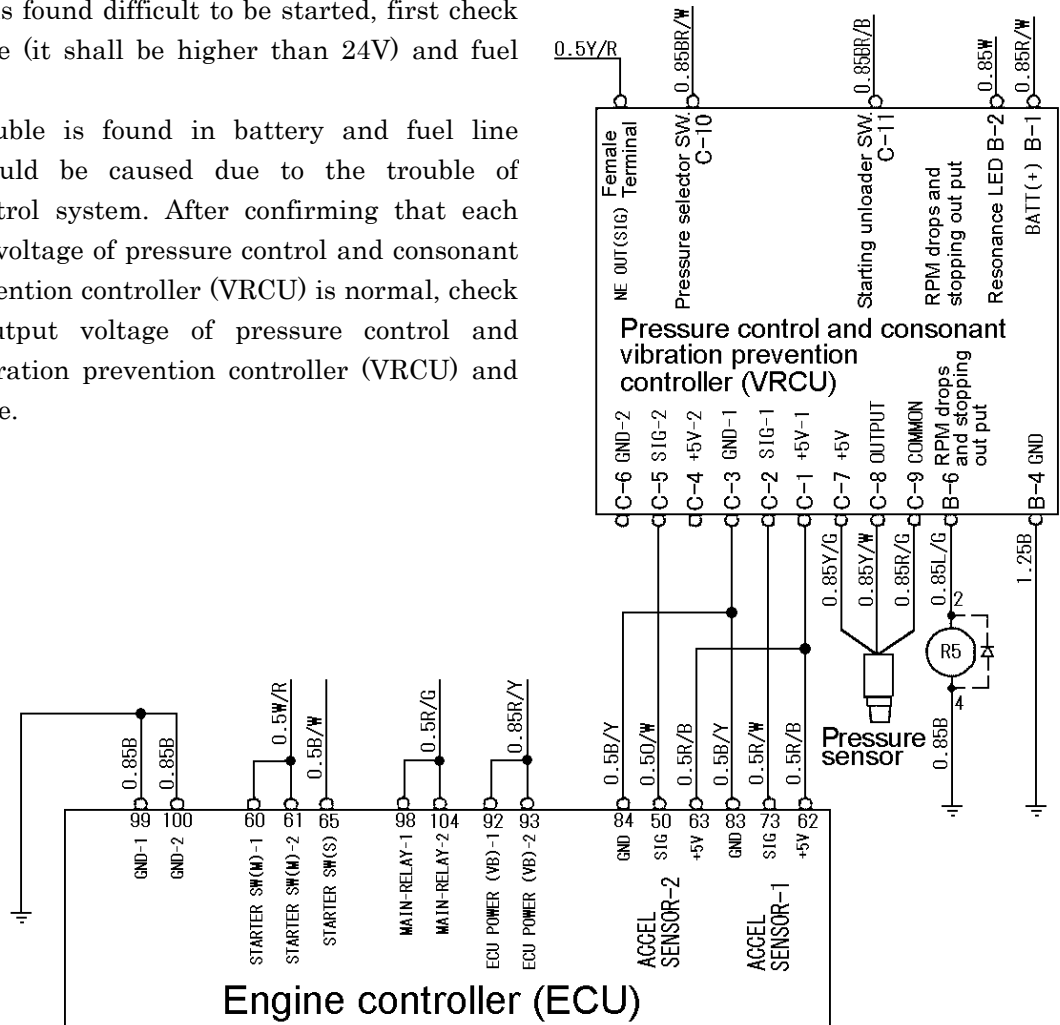


3. Electric System

(1) Diagnosis method in case of difficulty in starting

When engine is found difficult to be started, first check battery voltage (it shall be higher than 24V) and fuel line system.

When no trouble is found in battery and fuel line system, it could be caused due to the trouble of electronic control system. After confirming that each power supply voltage of pressure control and consonant vibration prevention controller (VRCU) is normal, check input and output voltage of pressure control and consonant vibration prevention controller (VRCU) and find out trouble.



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Check input and output voltage of pressure control and consonant vibration prevention controller (VRCU)

Position of operation switch	Check points	Terminals to be checked	Judgment
• Starter switch 「ON」 (Engine stop)	① Power supply voltage of pressure control and consonant vibration prevention controller (VRCU)	Between pressure control and consonant vibration prevention controller (VRCU) B-1 and B-4 terminals	Voltage standard : More than 24V
	① Power supply voltage of engine controller (ECU)	Between engine controller (ECU) No.92 and 99 terminals and No.93 and 100 terminals	Voltage standard : More than 24V
	② Power supply voltage of pressure sensor	Between pressure control and consonant vibration prevention controller (VRCU) C-7 and C-9 terminals	Voltage standard : 5.0V

3. Electric System

Position of operation switch	Check points	Terminals to be checked	Judgment
· Starter switch 「ON」 · Starting unloader switch 「ON」 ※2 (Engine stop)	③ ※1 Output voltage to engine controller (ECU)	Between pressure control and consonant vibration prevention controller (VRCU) C-2 and C-3 terminals or between C-5 and C-3 terminals (Output voltage between C-2, C-3 and C-5, C-3 is normal, when either voltage is outputted because it outputs same signal)	Voltage standard : 1.58V (In case that voltage is different from proper one, it is due to defective pressure control and consonant vibration prevention controller (VRCU).)
	④ ※1 Input voltage from pressure sensor	Between pressure control and consonant vibration prevention controller (VRCU) C-8 and C-9 terminals	Voltage standard : 0.5V (In case that voltage is different from proper one, it is due to defective pressure sensor or defective cable connection.)

● **In case that all of above-mentioned input and output voltages are normal and voltage is applied to engine controller (ECU) 60,61,65,92,93,98,104 terminals, engine controller (ECU) or electronic governor could be defective. When no voltage is applied to engine controller (ECU), it could be due to blow of fuse or disconnection of cable.**

● <Note>Voltage is standard reference voltage at 24V. Each machine, revolutions of which have been adjusted prior to delivery from works, is a little different in voltage.

● Measurement of voltage shall be done by high accurate digital tester.

● For output voltage according to load conditions, refer to “Pressure and voltage conversion table”.

※1:Input and output voltage of “Pressure control and consonant vibration prevention controller (VRCU)” and “Pressure sensor” are to be measured at the connector of pressure control and consonant vibration prevention controller (VRCU). Measurement at the engine controller (ECU) side is difficult because the connector is small.

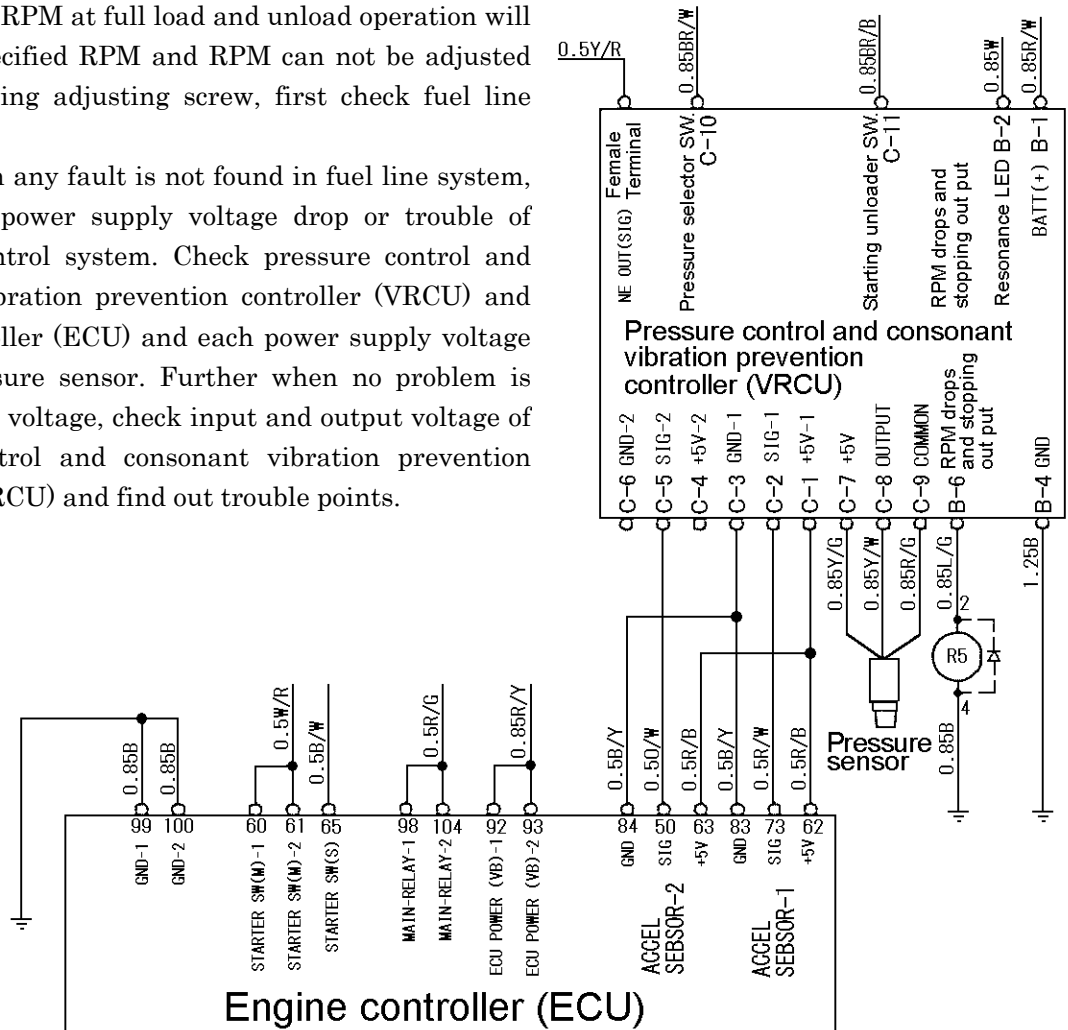
※2:When starting unloader switch is “ON”, output voltage to pressure control and consonant vibration prevention controller (VRCU) is switched to the voltage for unload operation.

3. Electric System

(2) How to check in case that engine RPM will not reach specified RPM

When engine RPM at full load and unload operation will not reach specified RPM and RPM can not be adjusted even by turning adjusting screw, first check fuel line system.

Further when any fault is not found in fuel line system, it is due to power supply voltage drop or trouble of electronic control system. Check pressure control and consonant vibration prevention controller (VRCU) and engine controller (ECU) and each power supply voltage of each pressure sensor. Further when no problem is found in such voltage, check input and output voltage of pressure control and consonant vibration prevention controller (VRCU) and find out trouble points.



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Checking input and output voltage of pressure control and consonant vibration prevention controller (VRCU)

Position of operation switch	Check points	Terminals to be checked	Judgment
<ul style="list-style-type: none"> • Starter switch 「ON」 • Starting unloader switch 「OFF」 	① Power supply voltage of pressure control and consonant vibration prevention controller (VRCU)	Between pressure control and consonant vibration prevention controller (VRCU) B-1 and B-4 terminals	When engine stops Voltage standard : More than 24V At full load operation Voltage standard : 28.5 ± 0.5V
	① Power supply voltage of engine controller (ECU)	Between engine controller (ECU) No.92 and 99 terminals and No.93 and 100 terminals	When engine stops Voltage standard : More than 24V At full load operation Voltage standard : 28.5 ± 0.5V
	② Power supply voltage of pressure sensor	Between pressure control and consonant vibration prevention controller (VRCU) C-7 and C-9 terminals	When engine stops Voltage standard : 5.0V At full load operation Voltage standard : 5.0V

3. Electric System

Position of Operation switch	Check points	Terminals to be checked	Judgment
• Starter switch 「ON」 • <u>Starting unloader switch 「OFF」</u> (Engine operation)	③ ※1 Output voltage to engine controller (ECU)	Between pressure control and consonant vibration prevention controller (VRCU) C-2 and C-3 terminals or between C-5 and C-3 terminals (Output voltage between C-2, C-3 and C-5, C-3 is normal, when either voltage is outputted because it outputs same signal)	Voltage standard at full load PDSH850S-4B1: 4.00V PDSJ750S-4B1: 3.67V Voltage standard at unload operation PDSH850S-4B1: 1.58V PDSJ750S-4B1: 1.58V (In case that voltage is different from proper one, it is due to defective pressure control and consonant vibration prevention controller (VRCU).)
• Starter switch 「ON」 • <u>Starting unloader switch 「OFF」</u> (Engine operation)	④ ※1 Input voltage from pressure sensor	Between pressure control and consonant vibration prevention controller (VRCU) C-8 and C-9 terminals	Voltage standard at full load PDSH850S-4B1: 0.5V PDSJ750S-4B1: 0.5V Voltage standard at unload operation PDSH850S-4B1: 1.17V PDSJ750S-4B1: 1.32V (In case that voltage is different from proper one, it is due to defective pressure sensor or defective cable connection.)

- <Note>Voltage is standard reference voltage at 24V. Each machine, revolutions of which have been adjusted prior to delivery from works, is a little different in voltage.
- Measurement of voltage shall be done by high accurate digital tester.
- For output voltage according to load conditions, refer to “Pressure and voltage conversion table”.
- ※1:Input and output voltage of “Pressure control and consonant vibration prevention controller (VRCU)” and “Pressure sensor” is to be measured at the connector of pressure control and consonant vibration prevention controller (VRCU). Measurement at the engine controller (ECU) side is difficult because the connector is small.

4. Troubleshooting

4.1 Engine Trouble Diagnosis Function

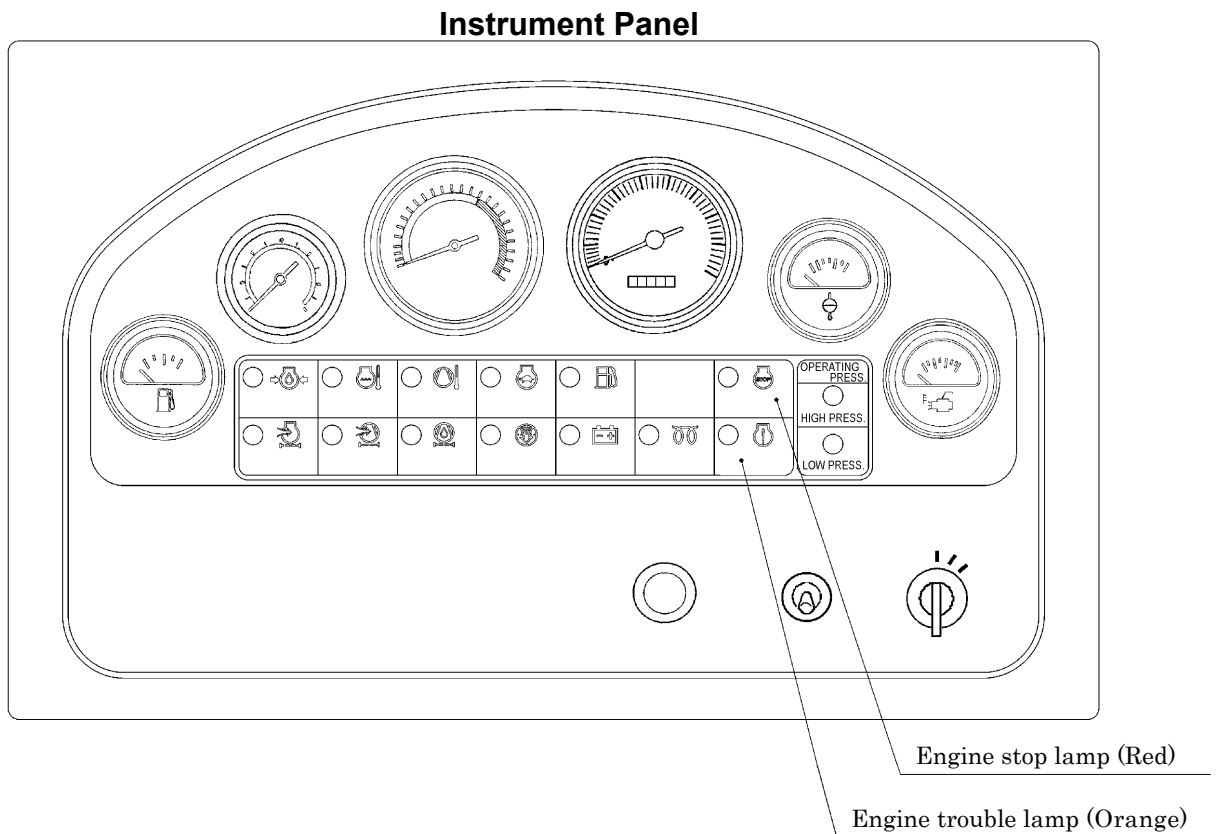
4.1.1 Trouble diagnosis function for engine controller unit (ECU)

Engine controller (ECU) keeps diagnosing whether each sensor of engine is working normally while starter switch is “ON”. When any trouble is found, it advises operator to stop operation by lighting “Engine stop lamp” or “Engine trouble lamp” and at the same time it records the trouble points in memory to be transferred to backup mode.

Such recorded points can be displayed with diagnosis codes (trouble diagnosis code) or multi-use tester MUT- II (option).

4.1.2 Indication of trouble points

Indication of trouble points by diagnosis codes (trouble diagnosis code) is performed by opening or short-circuiting diagnosis switch (0.5B wire male and female connector) connected to No.71 terminal and memory clear switch (0.5R/Y wire male and female connector) connected to No.82 terminal, showing trouble points at present and in the past in “Engine stop lamp” or “Engine trouble lamp” in code.



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4. Troubleshooting

Trouble items and backup modes

Diagnosis code	Trouble	Judgment	Diagnosis lamp	Backup mode	Operation Yes or No (*1)	Recovery judge
01	Normal	—	—	—	○	—
07	Engine overrun	Engine RPM \geq Engine overrun judge RPM	Red	Engine stopped by pull down mode (*2)	×	Engine RPM \leq Engine overrun recovery judge RPM
45	Engine turn reverse	Starter SW (S):OFF Engine slowest speed	Red	Engine stopped by pull down mode	×	Starter SW (S):ON or engine RPM=0min ⁻¹
11	Governor servo system	Difference between ECU indicated vale and feed back value	Red	Engine stopped by pull down mode (Engine restarts)	Δ (*3)	ECU power supply OFF
22	Rack sensor	0.5V \geq Rack sensor \geq 4.4V	Red	Engine stopped by pull down mode (Engine restarts)	Δ (*3)	ECU power supply OFF
17	Electronic timer system	Difference between ECU indicated vale and feed back value	Orange	Operation with injection timing constant (Injection timing control stopped)	Δ	ECU power supply OFF
23	Timer control valve	Detection of disconnection	Orange	Operation with injection timing constant (Injection timing control stopped)	Δ	No detection of disconnection
		Detection of short circuit				ECU power supply OFF
14	Timing sensor	Cross check with NE sensor	Orange	Operation with injection timing constant (Injection timing control stopped)	Δ	Timing sensor pulse restored
15	NE sensor	Cross check with timing sensor	Orange	Operation with injection timing constant (Injection timing control stopped)	Δ	NE sensor pulse restored
14+15	Both RPM sensors	Starter SW (S):ON No pulse on both RPM sensors	Red	Engine stopped by pull down mode	×	Starter SW (S):OFF or either of RPM sensor pulse restored
24	Accelerator sensor -1	0.2V > Accelerator sensor -1 > 4.8V	—	Controlled by accelerator sensor -2	○	0.2V \leq Accelerator sensor -1 \leq 4.8V
16	Accelerator sensor -2	0.2V > Accelerator sensor -2 > 4.8V	—	Controlled by accelerator sensor -1	○	0.2V \leq Accelerator sensor -2 \leq 4.8V
24+16	Accelerator sensor -1, 2 In trouble at same time	0.2V > Accelerator sensor -1, 2 > 4.8V	Orange	Operation at 1,100min ⁻¹	Δ	0.2V \leq Accelerator sensor -1, 2 \leq 4.8V
32	Boost sensor	0.5V \geq Boost sensor \geq 4.8V	Orange	Fixing boost pressure at 0kPa(relative ratio)	Δ	0.5V < Boost sensor < 4.8V
21	Water temp. sensor	Water temp. sensor \geq 4.9V	—	Fix water temp. at 80°C (At engine start, fixed at -20°C)	○	Water temp. sensor < 4.9V
19	Atmospheric pressure sensor	1.89V \geq Atmospheric pressure sensor > 5.0V	—	Fixed at atmospheric pressure 101kPa	○	1.89V < Atmospheric pressure sensor < 5.0V
34	Q tone resistance	0.1V \geq Q tone resistance \geq 4.6V	—	Fixing injection correction value at minimum value	○	0.1V < Q tone resistance < 4.6V
78	Heater relay	Detection of disconnection	Orange	Air heater control stopped	\circ (*4)	No detection of disconnection
		Detection of short circuit				ECU power supply OFF

4. Troubleshooting

Diagnosis code	Trouble	Judgment	Diagnosis lamp	Backup mode	Operation Yes or No (*1)	Recovery judge
33	System error	<ul style="list-style-type: none"> · Error in microcomputer check · Error in CPU watching · Excessive treatment for interruption 	Red	Engine stopped by pull down mode	×	ECU power supply OFF
81	Water temp. rise	Entered into water temp. rise mode	Red	Engine stopped by pull down mode	×	ECU power supply OFF
82	Oil pressure drop	Entered into oil pressure drop mode	Red	Engine stopped by pull down mode	×	ECU power supply OFF

*1 ○: Operation YES, △: Backup mode YES (But YES for repairing), ×: Operation No.

*2 Pull down function: this means function to pull back rack, to protect engine by pulling rack to no injection direction when engine overruns or it is in heavy trouble.

*3 When engine restarts, limp form mode enables backup operation.

Limp form mode: when governor servo system or rack sensor gets out of order and actual rack position can not be fed back, this device is a backup mode. [When it is on limp form mode, diagnosis lamp (orange) lights.]

*4 Generally, it is possible to perform operation, but ins cold season or area, it could be impossible to do it.

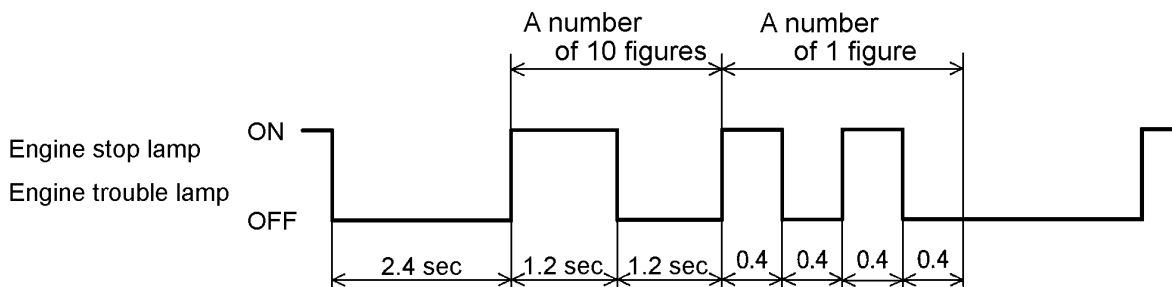
4. Troubleshooting

4.1.3 Diagnosis codes (trouble diagnosis code) display system

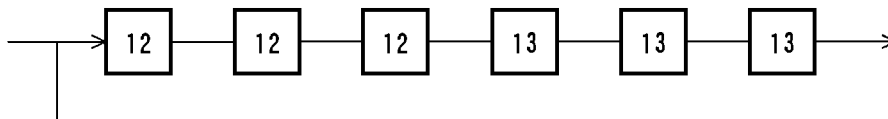
When either “Engine stop lamp” or “Engine trouble lamp” goes on during operation, it is possible to check and confirm diagnosis codes (trouble diagnosis code) according to the following procedures.

- ① Switch on starter switch “ON” after stopping machine temporarily and then when releasing diagnosis switch (0.5B wire male and female connector) more than 1 second, it displays diagnosis codes (trouble diagnosis code) after the lamp stopping about 2.4 seconds.
- ② The codes are displayed in 2 digits, a number of 10 figures lights on 1.2 seconds and 1.2 seconds off, a number of one figure 0.4 seconds on and 0.4 seconds off. (The code in which a number of 10 figures begins from 0 displays a number of 1 figure only.)
- ③ It is displayed repeatedly 3 times per 1 code. When no new code is available, it returns to the first code.

EX.1) In the case of cord 12



EX.2) When more than 2 codes are at present (code 12 and 13)



- ④ When diagnosis switch (0.5B wire male and female connector) connected to engine controller No.71 terminal is connected, engine controller immediately stops (finishes) displaying codes.

※:If diagnosis switch (0.5B wire male and female connector) is left released longer than 1 second when engine is running in order, “Engine stop lamp” goes off and on repeatedly every about 2.4 seconds.

4. Troubleshooting

4.1.4 How to call and delete diagnosis codes (trouble diagnosis code)

(1) Present diagnosis codes (trouble diagnosis code)

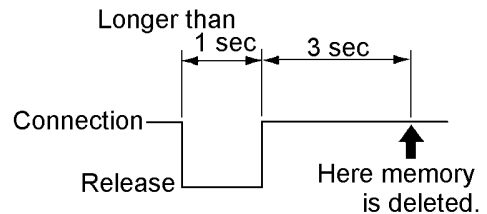
- ① Switch "ON" starter switch.
- ② Remove diagnosis switch (0.5B wire male and female connector) connected to engine controller No.71 terminal.
- ③ Diagnosis codes (trouble diagnosis code) are displayed in lighting ON/OFF of "Engine stop lamp" or "Engine trouble lamp" of diagnosis codes (trouble diagnosis code) on operation control panel.

(2) Diagnosis codes (trouble diagnosis code) in the past

- ① When memory clear switch (0.5R/Y wire male and female connector) connected to engine controller No.82 terminal is also removed after present diagnosis codes (trouble diagnosis code) is read (in a condition in which diagnosis switch remains released), "Engine stop lamp" or "Engine trouble lamp" starts again to flicker.
- ② This flickering displays past diagnosis codes (trouble diagnosis code) and checks troubled points by code recognition.

(3) Deletion of diagnosis codes (trouble diagnosis code)

When starter switch remains at the condition of "ON", memory clear switch (0.5B wire male and female connector) is removed once and it is installed again. Thus all the past memory of diagnosis code memorized is deleted.



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CAUTION :

- Memorized diagnosis codes (trouble diagnosis code) can be easily deleted with a release and connection of memory clear switch (0.5R/Y wire male and female connector) and so special care should be taken for prevention.
- After displaying diagnosis codes (trouble diagnosis code), if memorized data will not be deleted, first switch "OFF" starter switch with memory clear switch (0.5R/Y wire male and female connector) being released and connect memory clear switch (0.5R/Y wire male and female connector).
- If you want to change combination between injection pump and engine controller (ECU), it is necessary to re-write pump data.

For this purpose, be sure to delete diagnosis codes (trouble diagnosis code) without fail.

4.1.5 Check for any disconnection of engine stop lamp and engine trouble lamp

Engine controller allows "Engine stop lamp" and "Engine trouble lamp" to glow and to check engine for any failure.

<Conditions for checking any disconnection of lamps> the following ones are required.

- Engine RPM=0min⁻¹
- Starter switch : ON
- Diagnosis switch (0.5B wire male and female connector) of engine controller No.71 terminal : Short-circuited
- Such a failure as engine stop lamp and engine trouble lamp flickering has not been found out

In the normal case, when key switch is turned on upon when stopping, both "Engine stop lamp" and "Engine trouble lamp" go on.

4. Troubleshooting

4.1.6 Cause of occurrence of diagnosis codes (trouble diagnosis code) and inspection items

(1) List of diagnosis codes (trouble diagnosis code)

MUT- II display	
Diagnosis code	Message
07	Overrun
11	Governor servo
14	Backup NE sensor (Engine speed sensor-2)
15	Main NE sensor (Engine speed sensor-1)
16	Accelerator sensor-2
17	Timer feedback
19	Atmospheric pressure sensor
21	Water temperature sensor
22	Rack sensor

MUT- II display	
Diagnosis code	Message
23	Timer CONT. valve
24	Accelerator sensor-1
32	Boost sensor (Pressure charging sensor)
33	System error
34	Q tone resistance (Fuel injection volume adjusting resistance)
45	Engine reverse turning
78	Heater relay
81	Water temp. rise
82	Oil pressure drop

(2) Conditions for occurrence of diagnosis codes (trouble diagnosis code) and inspection items

Maintenance works should be performed according to conditions of diagnosis codes (trouble diagnosis code) and causes guessed.

07 Overrun		
Conditions of codes occurrence 【Recovery conditions】	Diagnosis code (trouble diagnosis code) 07 is to check whether engine has ever run excessively. If ever, it displays the data. 【When engine speed returns within engine specified speed, it returns to normal recovery】	
Remedy by ECU	Governor stops	
Causes to be guessed and inspection items	Malfunction of control sleeve of injection pump assembly ●Malfunction of ECU	Inspection of injection pump assembly

11 Governor servo		
Conditions of codes occurrence 【Recovery conditions】	Diagnosis code (trouble diagnosis code) 11 displays code when difference between aimed control rack position and actual control rack position is more than specified one. 【No conditions for restoration】	
Remedy by ECU	Governor stops	
Causes to be guessed and inspection items	●Malfunction of control rack position sensor ●Malfunction of ECU	●Inspection by MUT- II service data (See 4.2.5) No.09: Measuring aimed rack position No.0A: Measuring actual rack position ●Checking control rack position sensor (Inspection job is to be performed by bosh automotive system service station)

4. Troubleshooting

14 Backup NE sensor (Injection pump side)		
Conditions of codes occurrence 【Recovery conditions】	Diagnosis code (trouble diagnosis code) 14 displays code when pulse number of engine speed sensor-2 (injection pump side) is less than engine speed sensor-1 (flywheel housing side). 【When engine speed sensor-1 is normal, and engine speed sensor-2 returns normal, it returns to normal recovery】	
Remedy by ECU	<ul style="list-style-type: none"> ● Usually controlled only by engine speed sensor-1 ● When engine speed sensor-1 also fails, governor stops 	
Causes to be guessed and inspection items	<ul style="list-style-type: none"> ● Disconnection and short circuit of harness between ECU and engine speed sensor-2 ● Malfunction of engine speed sensor-2 ● Malfunction of ECU 	<ul style="list-style-type: none"> ● Inspection by MUT- II service data (See 4.2.5) No.02: Measuring engine RPM ● Checking ECU connection (See 4.1.7) <01> Measuring engine speed sensor-2 resistance ● Checking engine speed sensor-2 See 4.1.8: electrical apparatus [200] ● Checking circuit between ECU and engine speed sensor-2

14 Backup NE sensor (Injection pump side) 15 Main NE sensor (Flywheel housing side)		
Conditions of codes occurrence 【Recovery conditions】	When both engine speed sensor-1 (flywheel housing side) and engine speed sensor-2 (injection pump side) is in trouble, diagnosis codes (trouble diagnosis code) 14 and 15 are displayed. 【After engine starts again, it returns normal when pulse is inputted by either engine speed sensor-1, 2】	
Remedy by ECU	Fuel injection timing controlling is stopped and governor stops	
Causes to be guessed and inspection items	<ul style="list-style-type: none"> ● Disconnection and short circuit of harness between ECU and engine speed sensor-1, 2 ● Malfunction of engine speed sensor-1, 2 ● Malfunction of ECU 	<ul style="list-style-type: none"> ● Inspection by MUT- II service data (See 4.2.5) No.02: Measuring engine RPM ● Checking ECU connection (See 4.1.7) <01> Measuring engine speed sensor-2 resistance ● <02> Measuring engine speed sensor-1 resistance ● Checking engine speed sensor-1, 2 See 4.1.8: electrical apparatus [200] ● Checking circuit between ECU and engine speed sensor-1, 2

4. Troubleshooting

15 Main NE sensor (Flywheel housing side)		
Conditions of codes occurrence 【Recovery conditions】	Diagnosis code (trouble diagnosis code) 15 displays code when pulse number of engine speed sensor-1 (flywheel housing side) is less than engine speed sensor-1 (injection pump side). 【When engine speed sensor-2 is normal, and engine speed sensor-1 returns normal, it returns to normal recovery】	
Remedy by ECU	<ul style="list-style-type: none"> ● Usually controlled only by engine speed sensor-2 ● When engine speed sensor-2 also fails, governor stops 	
Causes to be guessed and inspection items	<ul style="list-style-type: none"> ● Disconnection and short circuit of harness between ECU and engine speed sensor-1 ● Malfunction of engine speed sensor-1 ● Malfunction of ECU 	<ul style="list-style-type: none"> ● Inspection by MUT- II service data (See 4.2.5) No.02: Measuring engine RPM ● Checking ECU connection (See 4.1.7) <02> Measuring engine speed sensor-1 resistance ● Checking engine speed sensor-1 See 4.1.8: electrical apparatus [200] ● Checking circuit between ECU and engine speed sensor-1

16 Accelerator sensor -2		
Conditions of codes occurrence 【Recovery conditions】	Diagnosis code (trouble diagnosis code) 16 displays code when accelerator position sensor-2 voltage exceeds specified value. Further, when diagnosis code (trouble diagnosis code) 16 takes place, check diagnosis code (trouble diagnosis code) 24. 【When voltage of accelerator position sensor-2 returns within specified range, it returns to normal recovery】	
Remedy by ECU	<ul style="list-style-type: none"> ● Usually controlled by proper accelerator position sensor ● When all accelerator position sensor are out of order, it will be controlled by 2 stages, by pressing accelerator pedal and then pedal released 	
Causes to be guessed and inspection items	<ul style="list-style-type: none"> ● Disconnection and short circuit of harness between ECU and accelerator position sensor-2 ● Malfunction and maladjustment of accelerator position sensor-2 ● Malfunction of ECU 	<ul style="list-style-type: none"> ● Inspection by MUT- II service data (See 4.2.5) No.03, 04: Measuring open angle of accelerator position sensor ● No.05: Measuring output voltage of accelerator position sensor ● Checking accelerator position sensor body ● Checking circuit between ECU and accelerator position sensor-2

4. Troubleshooting

17 Timer feedback		
Conditions of codes occurrence 【Recovery conditions】	Diagnosis code (trouble diagnosis code) 17 displays code when difference between aimed timer position and actual timer position is more than specified one. 【After it returns normal, it turns normal by turning starter switch “OFF” and “ON”】	
Remedy by ECU	Fuel injection timing controlling is stopped	
Causes to be guessed and inspection items	<ul style="list-style-type: none"> ●Malfunction of timer control valve ●Malfunction of electronic timer ●Abnormality in engine oil pressure system ●Malfunction of ECU 	<ul style="list-style-type: none"> ●Inspection by MUT- II service data (See 4.2.5) No.12: Measuring timer angle difference ●Checking ECU connection (See 4.1.7) <05> Measuring timer control valve resistance ●Checking timer control valve body See 4.1.8: electrical apparatus [400] ●Checking engine oil pressure system ●Checking electronic timer (Inspection job is to be performed by Bosch automotive system service station)

19 Atmospheric pressure sensor		
Conditions of codes occurrence 【Recovery conditions】	Diagnosis code (trouble diagnosis code) 19 displays code when atmospheric pressure sensor (incorporated in ECU) voltage exceeds specified value. 【When voltage of atmospheric pressure sensor returns within specified range, it returns to normal recovery】	
Remedy by ECU	Atmospheric pressure controlled based on 100kPa{760mmHg}	
Causes to be guessed and inspection items	<ul style="list-style-type: none"> ●Malfunction of atmospheric pressure sensor ●Malfunction of ECU 	<ul style="list-style-type: none"> ●Inspection by MUT- II service data (See 4.2.5) No.18: Measuring atmospheric pressure

21 Water temperature sensor		
Conditions of codes occurrence 【Recovery conditions】	Diagnosis code (trouble diagnosis code) 21 displays code when water temperature sensor voltage exceeds specified value. 【When voltage of water temperature sensor returns within specified range, it returns to normal recovery】	
Remedy by ECU	When starting engine, it should be controlled at water temperature of -20℃, and during operation, it should be controlled at 80℃	
Causes to be guessed and inspection items	<ul style="list-style-type: none"> ●Disconnection and short circuit of harness between ECU and water temperature sensor ●Malfunction of water temperature sensor ●Malfunction of ECU 	<ul style="list-style-type: none"> ●Inspection by MUT- II service data (See 4.2.5) No.16: Measuring engine water temperature ●Checking ECU connection (See 4.1.7) <03> Measuring water temperature sensor resistance ●Checking water temperature sensor body See 4.1.8: electrical apparatus [100] ●Checking circuit between ECU and water temperature sensor

4. Troubleshooting

22 Rack sensor		
Conditions of codes occurrence	Diagnosis code (trouble diagnosis code) 22 displays code when control rack position sensor out put voltage exceeds specified value.	
【Recovery conditions】	【No conditions for restoration】	
Remedy by ECU	Stopping governor once temporarily (After engine starts again, feedback is controlled)	
Causes to be guessed and inspection items	<ul style="list-style-type: none"> ●Malfunction of control rack position sensor ●Defective sliding of control rack ●Defective link of governor actuator ●Malfunction of ECU 	<ul style="list-style-type: none"> ●Inspection by MUT- II service data (See 4.2.5) No.0A: Measuring actual rack position ●Checking control rack position sensor and control rack (Inspection job is to be performed by Bosch automotive system service station)

23 Timer CONT. valve		
Conditions of codes occurrence	Diagnosis code (trouble diagnosis code) 23 displays code according to the following conditions.	
【Recovery conditions】	①When ECU gives “OFF” signal to timer control valve while timer control valve is short-circuited. 【When timer control valve returns normal, it is restored】 ②When ECU gives “ON” signal to timer control valve in case of disconnection of timer control valve. 【When disconnection is repaired, it will be restored by starter switch “OFF” and “ON”】	
Remedy by ECU	Fuel injection timing controlling is stopped	
Causes to be guessed and inspection items	<ul style="list-style-type: none"> ●Disconnection and short circuit of harness between ECU and timer control valve ●Malfunction of timer control valve ●Malfunction of ECU 	<ul style="list-style-type: none"> ●Inspection by MUT- II service data (See 4.2.5) No.12: Measuring timer angle difference ●Checking ECU connection (See 4.1.7) <05> Measuring timer control valve resistance ●Checking timer control valve body See 4.1.8: electrical apparatus [400] ●Checking circuit between ECU and timer control valve

4. Troubleshooting

24 Accelerator sensor-1			
Conditions of codes occurrence 【Recovery conditions】	<p>Diagnosis code (trouble diagnosis code) 24 displays code when accelerator position sensor-1 voltage exceeds specified value.</p> <p>Further, when diagnosis code (trouble diagnosis code) 24 takes place, check diagnosis code (trouble diagnosis code) 16.</p> <p>【When voltage of accelerator position sensor-1 returns within specified range, it returns to normal recovery】</p>		
Remedy by ECU	<ul style="list-style-type: none"> ● Usually controlled by proper accelerator position sensor ● When all accelerator position sensor are out of order, it will be controlled by 2 stages, by pressing accelerator pedal and then pedal released 		
Causes to be guessed and inspection items	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> ● Disconnection and short circuit of harness between ECU and accelerator position sensor-1 ● Malfunction and maladjustment of accelerator position sensor-1 ● Malfunction of ECU </td> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> ● Inspection by MUT- II service data (See 4.2.5) No.03, 04: Measuring open angle of accelerator position sensor No.05: Measuring output voltage of accelerator position sensor ● Checking accelerator position sensor body ● Checking circuit between ECU and accelerator position sensor-1 </td> </tr> </table>	<ul style="list-style-type: none"> ● Disconnection and short circuit of harness between ECU and accelerator position sensor-1 ● Malfunction and maladjustment of accelerator position sensor-1 ● Malfunction of ECU 	<ul style="list-style-type: none"> ● Inspection by MUT- II service data (See 4.2.5) No.03, 04: Measuring open angle of accelerator position sensor No.05: Measuring output voltage of accelerator position sensor ● Checking accelerator position sensor body ● Checking circuit between ECU and accelerator position sensor-1
<ul style="list-style-type: none"> ● Disconnection and short circuit of harness between ECU and accelerator position sensor-1 ● Malfunction and maladjustment of accelerator position sensor-1 ● Malfunction of ECU 	<ul style="list-style-type: none"> ● Inspection by MUT- II service data (See 4.2.5) No.03, 04: Measuring open angle of accelerator position sensor No.05: Measuring output voltage of accelerator position sensor ● Checking accelerator position sensor body ● Checking circuit between ECU and accelerator position sensor-1 		

32 Boost sensor			
Conditions of codes occurrence 【Recovery conditions】	<p>Diagnosis code (trouble diagnosis code) 32 displays code when boost pressure sensor voltage exceeds specified value.</p> <p>【When voltage of boost pressure sensor returns within specified range, it returns to normal recovery】</p>		
Remedy by ECU	Boost pressure sensor controlled based on 0kPa{0mmHg}		
Causes to be guessed and inspection items	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> ● Disconnection and short circuit of harness between ECU and boost pressure sensor ● Malfunction of boost pressure sensor ● Malfunction of ECU </td> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> ● Inspection by MUT- II service data (See 4.2.5) No.2D: Measuring boost pressure ● Checking boost pressure sensor body See 4.1.8: electrical apparatus [300] ● Checking circuit between ECU and boost pressure sensor </td> </tr> </table>	<ul style="list-style-type: none"> ● Disconnection and short circuit of harness between ECU and boost pressure sensor ● Malfunction of boost pressure sensor ● Malfunction of ECU 	<ul style="list-style-type: none"> ● Inspection by MUT- II service data (See 4.2.5) No.2D: Measuring boost pressure ● Checking boost pressure sensor body See 4.1.8: electrical apparatus [300] ● Checking circuit between ECU and boost pressure sensor
<ul style="list-style-type: none"> ● Disconnection and short circuit of harness between ECU and boost pressure sensor ● Malfunction of boost pressure sensor ● Malfunction of ECU 	<ul style="list-style-type: none"> ● Inspection by MUT- II service data (See 4.2.5) No.2D: Measuring boost pressure ● Checking boost pressure sensor body See 4.1.8: electrical apparatus [300] ● Checking circuit between ECU and boost pressure sensor 		

33 System error			
Conditions of codes occurrence 【Recovery conditions】	<p>Diagnosis code (trouble diagnosis code) 33 displays code when there is any trouble in counting and remedy and RAM.</p> <p>【No conditions for restoration】</p>		
Remedy by ECU	Governor stops		
Causes to be guessed and inspection items	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">Malfunction of ECU</td> <td style="width: 50%; text-align: center;">—</td> </tr> </table>	Malfunction of ECU	—
Malfunction of ECU	—		

4. Troubleshooting

34 Q tone resistance		
Conditions of codes occurrence 【Recovery conditions】	Diagnosis code (trouble diagnosis code) 34 displays code when injection volume adjusting resistance voltage exceeds specified value. 【When voltage of injection volume adjusting resistance returns within specified range, it returns to normal recovery】	
Remedy by ECU	It is controlled based on No.1 value of additional volume	
Causes to be guessed and inspection items	<ul style="list-style-type: none"> ● Disconnection and short circuit of harness between ECU and injection volume adjusting resistance ● Malfunction of injection volume adjusting resistance ● Malfunction of ECU 	<ul style="list-style-type: none"> ● Inspection by MUT- II service data (See 4.2.5) No.14: Confirming resistance number of injection volume adjusting resistance ● Checking ECU connection (See 4.1.7) <04> Measuring injection volume adjusting resistance ● Checking injection volume adjusting resistance body See 4.1.8: electrical apparatus [500] ● Checking circuit between ECU and injection volume adjusting resistance

45 Engine reverse turning		
Conditions of codes occurrence 【Recovery conditions】	Diagnosis code (trouble diagnosis code) 45 displays code when it detects engine RPM (which is lower than engine cranking speed) with starter switch “OFF”. 【In case that engine speed is not be detected with starter switch “OFF” conditions, it will be restored with starter switch being placed “ON”】	
Remedy by ECU	Governor stops	
Causes to be guessed and inspection items	<ul style="list-style-type: none"> ● Defective operation when engine starts ● Defective connection of attachment ● Malfunction of ECU 	—

78 Heater relay		
Conditions of codes occurrence 【Recovery conditions】	Diagnosis code (trouble diagnosis code) 78 displays code according to the following conditions. ① When ECU gives “OFF” signal to heater relay in case of short circuit of heater relay. 【When heater relay e returns normal, it is restored】 ② When ECU gives “ON” signal to heater relay in case of disconnection of heater relay. 【No conditions for restoration】	
Remedy by ECU	Stopping pre-heat control	
Causes to be guessed and inspection items	<ul style="list-style-type: none"> ● Disconnection and short circuit of harness between ECU and heater relay ● Malfunction of heater relay ● Malfunction of ECU 	<ul style="list-style-type: none"> ● Inspection by MUT- II service data (See 4.2.5) No.92: Checking heater relay ● Testing actuator with MUT- II (See 4.2.6) No.BC: Checking heater relay ● Checking heater relay body ● Checking circuit between ECU and heater relay

4. Troubleshooting

81 Water temp. rise			
Conditions of codes occurrence 【Recovery conditions】	Diagnosis code (trouble diagnosis code) 81 displays code when engine coolant temperature abnormally rises and ECU enters coolant temperature rising mode. 【When engine coolant temperature drops and coolant temperature rising mode is released, it will be restored】		
Remedy by ECU	Stopping engine with pull-down function		
Causes to be guessed and inspection items	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none; vertical-align: top;"> <ul style="list-style-type: none"> ●Overheat ●Engine coolant level too low ●Engine coolant leaking ●Malfunction of ECU </td> <td style="width: 50%; border: none; vertical-align: top;"> <ul style="list-style-type: none"> ●Checking thermostat ●Checking engine cooling system for leakage ●Cleaning and washing engine cooling system </td> </tr> </table>	<ul style="list-style-type: none"> ●Overheat ●Engine coolant level too low ●Engine coolant leaking ●Malfunction of ECU 	<ul style="list-style-type: none"> ●Checking thermostat ●Checking engine cooling system for leakage ●Cleaning and washing engine cooling system
<ul style="list-style-type: none"> ●Overheat ●Engine coolant level too low ●Engine coolant leaking ●Malfunction of ECU 	<ul style="list-style-type: none"> ●Checking thermostat ●Checking engine cooling system for leakage ●Cleaning and washing engine cooling system 		

82 Oil pressure drop			
Conditions of codes occurrence 【Recovery conditions】	Diagnosis code (trouble diagnosis code) 82 displays code when engine oil pressure system abnormally drops and ECU has oil pressure drop mode. 【When oil pressure of engine oil pressure system rises and oil pressure drop mode is stopped, it returns to normal recovery】		
Remedy by ECU	Stopping engine with pull-down function		
Causes to be guessed and inspection items	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none; vertical-align: top;"> <ul style="list-style-type: none"> ●Engine oil level is too low ●Engine oil leaking ●Engine lubrication system clogging ●Malfunction of ECU </td> <td style="width: 50%; border: none; vertical-align: top;"> <ul style="list-style-type: none"> ●Checking for engine oil leakage ●Checking engine lubrication system for clogging ●Checking oil pressure </td> </tr> </table>	<ul style="list-style-type: none"> ●Engine oil level is too low ●Engine oil leaking ●Engine lubrication system clogging ●Malfunction of ECU 	<ul style="list-style-type: none"> ●Checking for engine oil leakage ●Checking engine lubrication system for clogging ●Checking oil pressure
<ul style="list-style-type: none"> ●Engine oil level is too low ●Engine oil leaking ●Engine lubrication system clogging ●Malfunction of ECU 	<ul style="list-style-type: none"> ●Checking for engine oil leakage ●Checking engine lubrication system for clogging ●Checking oil pressure 		

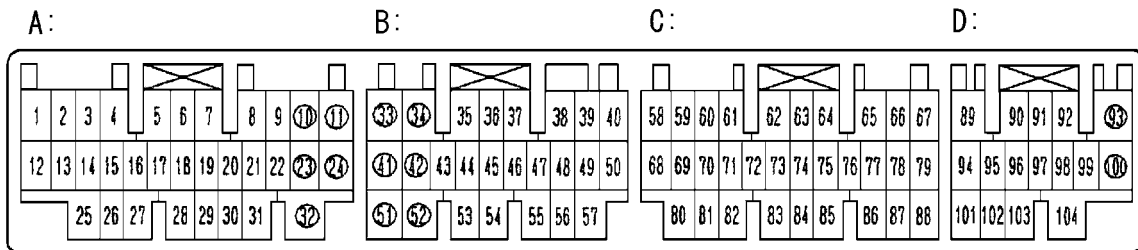
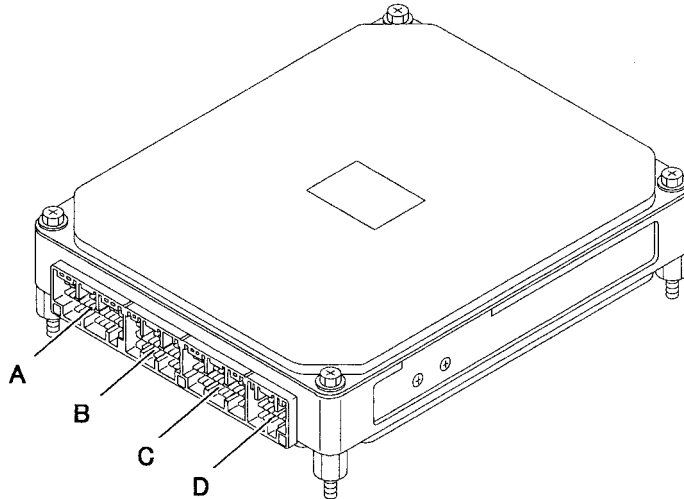
4. Troubleshooting

4.1.7 Inspection of ECU connection

This inspection is to check whether all ECU indicators are working properly to transfer each signal via engine harness, connectors to help troubleshooting.

And also the figures <01><02> ... are to be applicable to the calling numbers which are referred to in 4.1.6 “Cause of occurrence of diagnosis codes (trouble diagnosis code) and inspection items”.

(1) Engine controller (ECU) terminal line



PC06017

No.	Item	Remarks
<01>	Resistance for engine speed sensor-2	See (2) inspection procedures
<02>	Resistance for engine speed sensor-1	
<03>	Resistance for water temperature sensor	
<04>	Resistance for injection volume adjusting resistance	
<05>	Resistance for timer control valve	

4. Troubleshooting

(2) Inspection procedures

⚠ CAUTION :

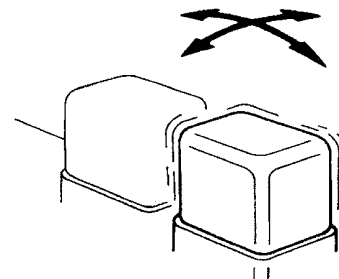
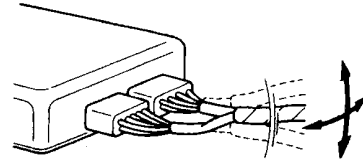
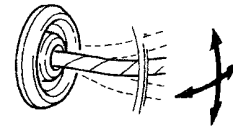
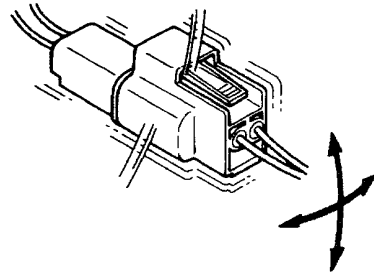
- Care shall be taken for inspection; inspection with connectors removed or with connectors fastened.
- Never touch any other terminals except those to be inspected.
- Be careful not to make a mistake in selection if inspection terminals.

Items to be checked	Measuring method																								
<p><01> Resistance for engine speed sensor-2</p>	<p>【Conditions】</p> <ul style="list-style-type: none"> ● Starter switch OFF ● Checking with connector removed, using engine side harness <p>【Criteria for judgment】</p> <ul style="list-style-type: none"> ● Between terminals: between No.5 and 17 terminals 2.1~2.5 Ω 																								
<p><02> Resistance for engine speed sensor-1</p>	<p>【Conditions】</p> <ul style="list-style-type: none"> ● Starter switch OFF ● Checking with connector removed, using engine side harness <p>【Criteria for judgment】</p> <ul style="list-style-type: none"> ● Between terminals: between No.4 and 15 terminals 2.1~2.5 Ω 																								
<p><03> Resistance for water temperature sensor</p>	<p>【Conditions】</p> <ul style="list-style-type: none"> ● Starter switch OFF ● Checking with connector removed, using engine side harness <p>【Criteria for judgment】</p> <ul style="list-style-type: none"> ● Between terminals: between No.27 and 75 terminals at 20°C:2.3~2.6 Ω at 80°C:0.30~0.34k Ω 																								
<p><04> Resistance for injection volume adjusting resistance</p>	<p>【Conditions】</p> <ul style="list-style-type: none"> ● Starter switch OFF ● Checking with connector removed, using injection volume adjusting resistance side harness <p>【Criteria for judgment】</p> <ul style="list-style-type: none"> ● Between terminals: between No.37 and 46 terminals <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>No.</th> <th>Resistance</th> <th>No.</th> <th>Resistance</th> <th>No.</th> <th>Resistance</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>270 Ω</td> <td>4</td> <td>1300 Ω</td> <td>7</td> <td>5600 Ω</td> </tr> <tr> <td>2</td> <td>510 Ω</td> <td>5</td> <td>2000 Ω</td> <td>8</td> <td>15000 Ω</td> </tr> <tr> <td>3</td> <td>820 Ω</td> <td>6</td> <td>3300 Ω</td> <td style="border: none;"></td> <td style="border: none;"></td> </tr> </tbody> </table>	No.	Resistance	No.	Resistance	No.	Resistance	1	270 Ω	4	1300 Ω	7	5600 Ω	2	510 Ω	5	2000 Ω	8	15000 Ω	3	820 Ω	6	3300 Ω		
No.	Resistance	No.	Resistance	No.	Resistance																				
1	270 Ω	4	1300 Ω	7	5600 Ω																				
2	510 Ω	5	2000 Ω	8	15000 Ω																				
3	820 Ω	6	3300 Ω																						
<p><05> Resistance for timer control valve</p>	<p>【Conditions】</p> <ul style="list-style-type: none"> ● Starter switch OFF ● Checking with connector removed, using engine side harness <p>【Criteria for judgment】</p> <ul style="list-style-type: none"> ● Between terminals: between No.60 and 26 terminals <ADV>, between No.60 and 25 terminals <RTD>, 21.9~24.1 Ω 																								

4. Troubleshooting

4.1.8 How to remedy temporary failure

- This failure often takes place under certain specific situations. It is easy to locate its cause by checking such situations. In order to find out why this failure occurred, first check such situations as weather conditions, frequency of the failure and the phenomena of the failure with customers or users and ask them to make the reproduction of failure phenomena.
- Next find out its cause is due to vibration, temperature or other causes by judging all the information collected from customers.
- If it can be due to vibration, check each connector according to the following items.
- Shake connector lightly up and down and also left and right.
- Shake wiring harness lightly up and down and also left and right.
- Shake each sensor and instrument lightly by hand.
- Shake each wiring harness fitted at such moving portion as suspension.
- Inspect each cause of malfunction to be guessed by diagnosis codes (trouble diagnosis code) and each connector or the like which is found during inspection process.

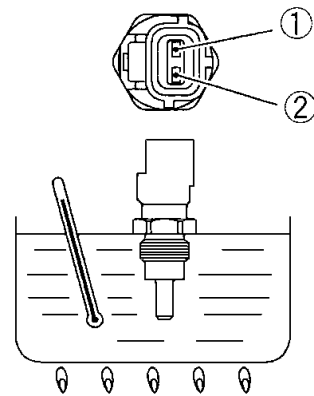


PC06018

4. Troubleshooting

[100] Check water temperature sensor

- ① Put water temperature sensor in a container filled with engine oil.
 - ② Raise oil temperature up to each specified level and stir it fully.
 - ③ Measure resistance between terminals ① and ②.
- | | | |
|----------|------|-------------|
| Standard | 20°C | 2.3~2.6kΩ |
| | 80°C | 0.30~0.34kΩ |
- ④ In case measured values are found out of standard, such sensors should be replaced.

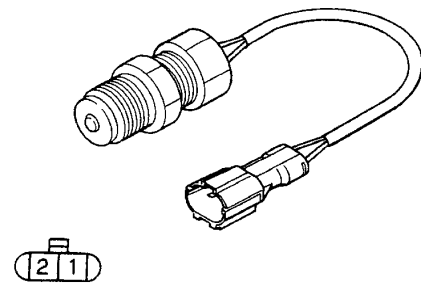


PC06019

[200] Check engine speed sensor

<Engine speed sensor -1>

- ① Measure resistance between terminals ① and ②.
- | | |
|----------|-----------|
| Standard | 2.1~2.5kΩ |
|----------|-----------|
- ② In case measured values are found out of standard, such sensors should be replaced.



PC06020

CAUTION :

In case tightening torque used is not sufficient, sometimes no signals are displayed.

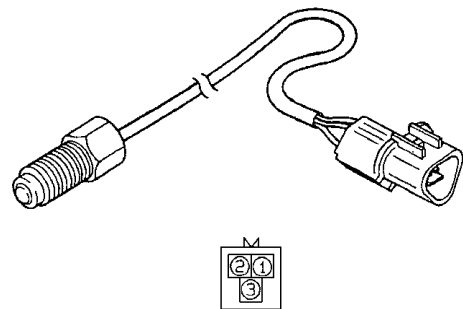
<Engine speed sensor -2>

[Check]

Perform the following inspection, and if any abnormality is found, such sensor should be replaced.

- (1) Resistance measurement
 - Measure resistance between terminals ① and ③.

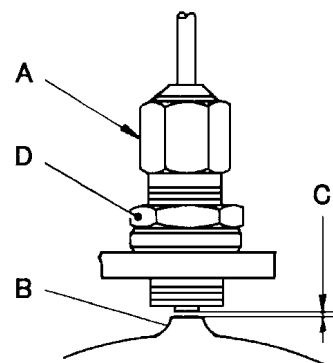
Standard	2.1~2.5kΩ
----------	-----------
- (2) Conductance inspection
 - Check for electrical conductance between ① and ② and then between ② and ③.



PC06021

[Installation]

- ① Tighten engine speed sensor-2 "A" until it reaches timer flange "B".
- ② After it touches "B", turn it back by 0.8 - 1.0 turns to ensure clearance "C" (1.2 - 1.5 mm) between flange "B" and engine speed sensor-2 "A".
- ③ Fix firmly lock nut "D" of engine speed sensor-2 "A".



PC06022

4. Troubleshooting

[300] Check boost pressure sensor

CAUTION :

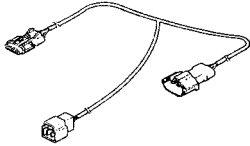
Boost pressure depends upon both cases: when MUT- II is used and when it is not used. Accordingly, standard value changes because of different inspection conditions.

<In case MUT- II is used>

See 4.2.5 chapter “2D”.

<In case MUT- II is not used>

- ① Disconnect the wiring harness between boost pressure sensor “A” and engine side harness “B” and connect inspection harness “E” between them.

Tool and its firm	Part Number
	MC854336

- ② Install a pressure gauge “C” (for measurement of boost pressure).

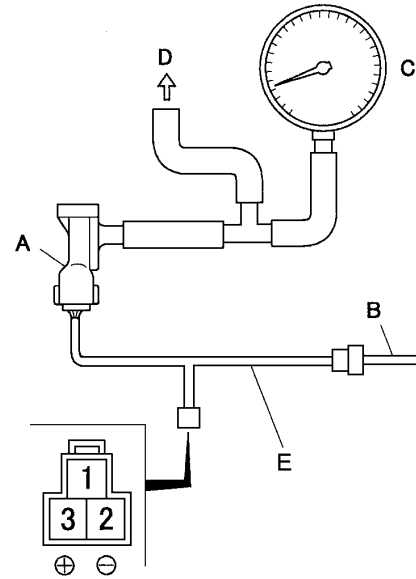
D : To inlet manifold

- ③ Connect a tester for measuring voltage between terminals ③ and ②.

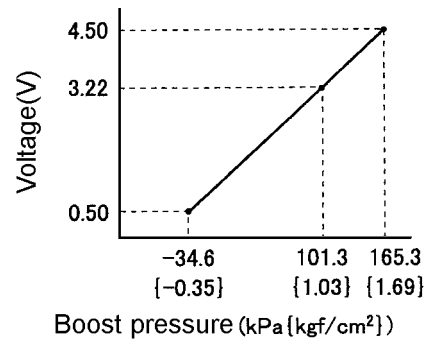
- ④ Start engine.

- ⑤ Vary engine RPM and check that the relation between voltage and boost pressure coincides with the output features in the right fig.

- ⑥ If any abnormality found, boost pressure sensor “A” should be replaced.



PC06024



PC06025E

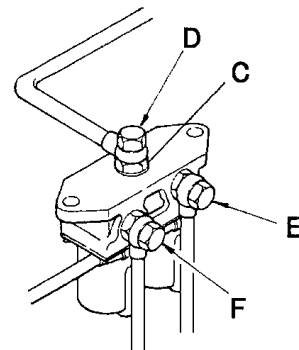
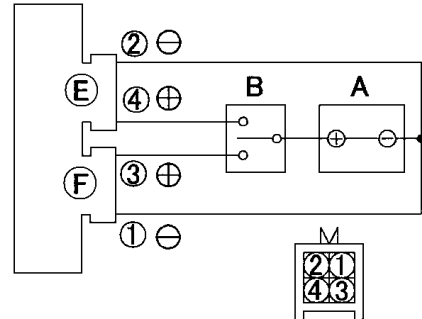
4. Troubleshooting

[400] Check timer control valve

Following inspection should be carried out, and if any troubles are found, change timer control valve.

(1) Inspection of working conditions

- Remove connector of timer control valve and change it for power supply "A" (DC24V) and set up switch "B".
- Loosen eyebolt "D" of port "C" slightly.
- Run engine idling.
- Place selection switch "B" to port "E" side and check and confirm that oil is leaking from port "C".
- Place selection switch "B" to port "F" side and check and confirm that oil leaking is stopped from port "C".
- After confirming it, tighten eyebolt "D" with $20\text{-}25\text{N}\cdot\text{m}$ { $2\text{-}2.5\text{kgf}\cdot\text{m}$ }.



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(2) Checking resistance and electrical conductance

1. Measuring resistance

- Check and confirm that each resistance between each terminal ① and ③, ② and ④ is same as standard one.

Standard	21.9~24.1 Ω
----------	-------------

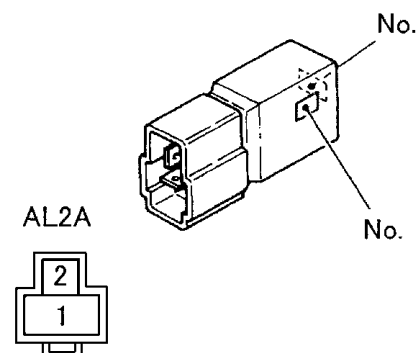
2. Inspection electrical conductance

- Check and confirm that electricity is supplied among each terminal ③ and ④, ③ and body, ④ and body.

[500] Inspection injection volume adjusting resistance

- Measure resistance marked on injection volume adjusting resistance.

Standard (20°C)	Resistance No.	1	270 Ω
		2	510 Ω
		3	820 Ω
		4	1300 Ω
		5	2000 Ω
		6	3300 Ω
		7	5600 Ω
		8	15000 Ω



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- Replace injection volume adjusting resistance which is found out of standard one.

⚠ CAUTION :

- As the injection volume adjusting resistance is set to match injection pump, and so use the same resistance having same number.
- The injection volume adjusting resistance to be used when injection pump is replaced shall be Number 6.

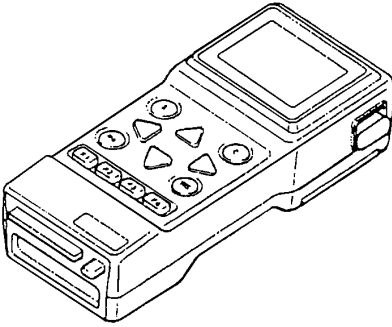
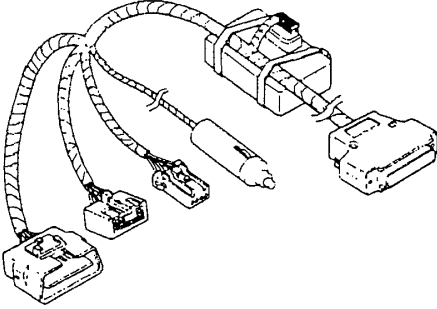
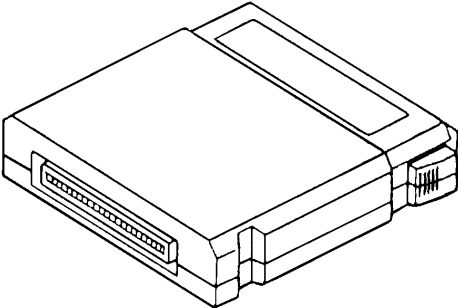
4. Troubleshooting

4.2 MUT- II (Multi-use tester)

4.2.1 MUT- II (Multi-use tester) communication function

Engine controller (ECU) can display on MUT- II side various data (information) which engine controller memorizes.

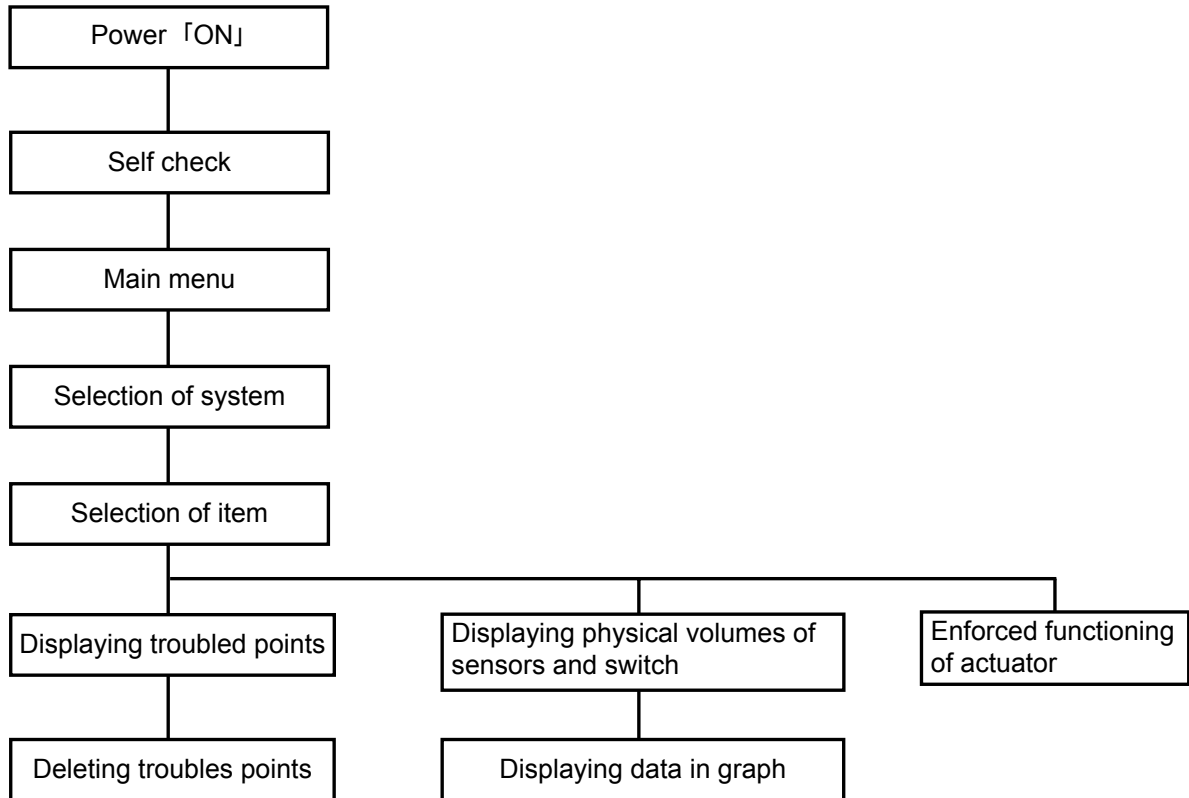
List of MUT- II component

	Form	Remark
MUT- II body		
Test harness		Connector at engine controller (ECU) and middle sub-harness connecting MUT- II body.
ROM PACK		<p>Engine controller (ECU) dedicated data is memorized and this can be used by insertion of this data into MUT- II body.</p> <p>Japanese version: MK369391 English version :MK369392</p>

※:For method of operation, see 4.2.2 to 4.2.4 chapters.

4. Troubleshooting

4.2.2 Stage level of MUT- II operation

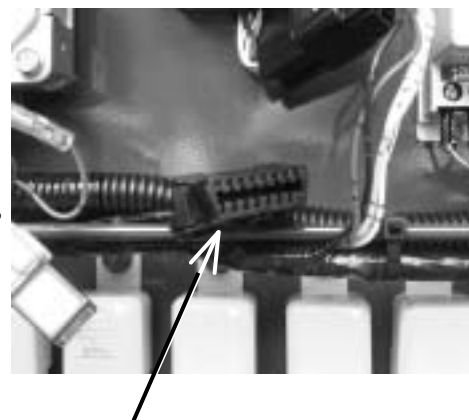
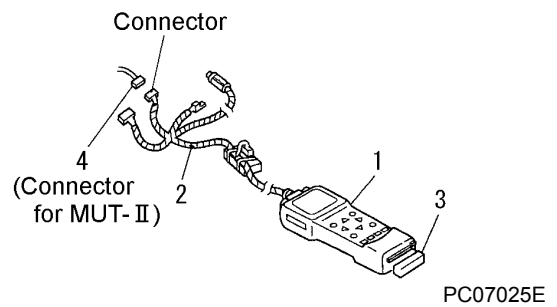


For operation method and specifications of MUT- II , see MUT- II operation manual.

4. Troubleshooting

4.2.3 Connection of MUT- II

- ① Switch "OFF" starter switch.
- ② Connect MUT- II (1) and MUT- II harness (2) connector and insert ROM pack (3).
- ③ Connect connector (4) for harness MUT- II connected to engine controller (ECU) and connector of MUT- II harness (2).



Connector for MUT- II

CAUTION : For operation procedures of MUT- II , see MUT- II operation manual.

4.2.4 Calling diagnosis codes (trouble diagnosis code) by means of MUT- II and deleting

- (1) Preset diagnosis codes (trouble diagnosis code)
 - ① Check and confirm that diagnosis switch (0.5B wire male and female connector) is connected.
 - ② Switch "ON" starter switch.
 - ③ Display the present diagnosis codes (trouble diagnosis code) which takes place at present and understand the trouble points.
- (2) Diagnosis codes (trouble diagnosis code) in the past
 - ① Switch "ON" starter switch.
 - ② Remove memory clear switch (0.5R/Y wire male and female connector) connected to engine controller No.82 terminal.
 - ③ Display diagnosis codes (trouble diagnosis code) by operating MUT- II which took place in the past, and understand trouble points.
- (3) Deletion of diagnosis codes (trouble diagnosis code)
 - ① Switch "ON" starter switch.
 - ② Deleting all diagnosis codes (trouble diagnosis code) memorized in engine controller by means of MUT- II.

4. Troubleshooting

4.2.5 MUT- II service data

MUT- II screen display			Conditions on inspection	Judgment criteria
No.	Item	Data		
01	Power supply voltage	■■■. ■■■V	Idling	20~30V
02	Engine RPM	■■■■■. rpm	Racing (engine turning)	Synchronizing to tachometer
03	Accelerator guide (FIL)	■■■■. ■%	Accelerator pedal release	0%
			Stepping in gradually accelerator	Gradually rising
			Stepping accelerator pedal	100%
04	Accelerator guide	■■■■■. %	Accelerator pedal release	0%
			Stepping in gradually accelerator	Gradually rising
			Stepping accelerator pedal	100%
05	Accelerator voltage	■. ■■■■V	Gradually push in accelerator pedal from released conditions	Gradually rising
06	Idle volume	■. ■■■■V	Gradually raising engine speed from idling speed by adjusting idling volume	Depending on various specifications
09	Aimed rack position	■■. ■■mm	Starter SW ON	3mm
0A	Actual rack position	■■. ■■mm	Starter SW ON	3mm
12	Timer angle difference	■■. ■■°CA	Idling	Less than 5°CA
14	Q resistance No.	■■■■■.	—	It coincides with number marked on injection adjustment resistance
16	Water temperature	■■■■. ■°C	While engine is cold	Corresponding to ambient temp
			While engine is warming up	Gradually rising
			Engine stops after warming up	Gradually dropping
18	Atmospheric pressure	■■■■■. kPa	Altitude 0m	101kPa
			Altitude 600m	95kPa
			Altitude 1200m	88kPa
1A	Vehicle speed	■■■■. ■km/h	Running	Synchronizing to speed meter
2D	Boost sensor	■■■■■. kPa	Highly idling	Depending on various specifications
2F	Aimed RPM	■■■■■. rpm	Depending on various specifications	
30	DLOOP variation	■. ■■■■	Depending on various specifications	
4F	Diagnosis SW	ON/OFF	Diagnosis SW ON (connector connected)	ON
			Diagnosis SW OFF (separating connector)	OFF
51	Diagnosis lamp (U)	ON/OFF	Starter SW ON position (Do not start engine)	ON
			Starter SW OFF position	OFF
52	Diagnosis lamp (R)	ON/OFF	Starter SW ON position (Do not start engine)	ON
			Starter SW OFF position	OFF

4. Troubleshooting

MUT- II screen display			Conditions on inspection	Judgment criteria	
No.	Item	Data			
56	Starter SW (M)	ON/OFF	Starter SW ON position	ON	
			Other position than starter SW ON position	OFF	
59	Air conditioning SW	ON/OFF	Cooler compressor on operation ON	ON	
			Cooler compressor stopping OFF	OFF	
5A	Cold start SW	ON/OFF	Cold start system on operation ON	ON	
			Cold start system stopping OFF	OFF	
62	Memory clear SW	ON/OFF	Memory clear SW ON (connector connected)	ON	
			Memory clear SW OFF (separating connector)	OFF	
67	RED4 pull-down	ON/OFF	Normal condition	OFF	
			Abnormal condition (controlled by pull-down)	ON	
69	Accelerator SW	ON/OFF	Stepping accelerator pedal	ON	
			Accelerator pedal release	OFF	
73	Starter SW (S)	ON/OFF	While engine is cranking with starter SW (starter SW START position)	ON	
			Other position than starter SW START position	OFF	
91	Pre-heat lamp	ON/OFF	Starter SW ON	When coolant temp. level too low	ON
				When coolant temp. level too high	OFF
92	Heater relay	ON/OFF	Starter SW ON	When coolant temp. level too low	ON
				When coolant temp. level too high	OFF
93	NE limitation SW-1	ON/OFF	Depending on various specifications	ON	
				OFF	
94	NE limitation SW-2	ON/OFF	Depending on various specifications	ON	
				OFF	
95	Supplementary SW-2	ON/OFF	Depending on various specifications	ON	
				OFF	
96	Supplementary SW-3	ON/OFF	Depending on various specifications	ON	
				OFF	
97	Supplementary SW-4	ON/OFF	Depending on various specifications	ON	
				OFF	
98	Supplementary SW-7	ON/OFF	Depending on various specifications	ON	
				OFF	

4. Troubleshooting

MUT- II screen display			Conditions on inspection	Judgment criteria
No.	Item	Data		
99	Supplementary SW-8	ON/OFF	Depending on various specifications	ON
				OFF
9A	Supplementary SW-12	ON/OFF	Depending on various specifications	ON
				OFF
9B	Supplementary SW-15	ON/OFF	Depending on various specifications	ON
				OFF
9C	Supplementary SW-19	ON/OFF	Depending on various specifications	ON
				OFF
9D	Supplementary SW-21	ON/OFF	Depending on various specifications	ON
				OFF
9E	Supplementary SW-22	ON/OFF	Depending on various specifications	ON
				OFF

4.2.6 Testing actuator by using MUT- II

MUT- II screen display		How to check function
No.	Item	
AC	Diagnosis lamp (U)	<ul style="list-style-type: none"> ●Checking how warning lamp is lighting. ●Checking engine speed : 0 vehicle movement at 0. ●Checking diagnosis lamp by repeating lighting up and out every 1 second 5 times.
AD	Diagnosis lamp (R)	<ul style="list-style-type: none"> ●Checking how warning lamp is lighting. ●Checking engine speed : 0 vehicle movement at 0. ●Checking diagnosis lamp by repeating lighting up and out every 1 second 5 times.
AF	Air conditioning signal	Depending on various specifications
BB	Pre-heat lamp	<ul style="list-style-type: none"> ●Checking lighting of indicator lamp. ●Checking engine speed : 0 vehicle movement at 0. ●Checking diagnosis lamp by repeating lighting up and out every 1 second 5 times.
BC	Heater relay	<ul style="list-style-type: none"> ●Checking air heater function. ●Checking engine speed : 0 vehicle movement at 0. ●Repeating 1 second working and 1 second deactivate 5 times acting.

5. References

5.1 Comparison between Consumable Parts and Electrical Appliances

Item	PDSJ750S-401	PDSJ750S-4B1 PDSH850S-4B1	PDSJ750S-4B2 PDSH850S-4B2	Remarks
●Element				
Air filter ASS'Y (comp. side)	32100 30600	32100 43600	←	
Air filter ASS'Y (engine side)	32100 34000	32100 43600	←	
Element (outer)	32143 08200	32143 16000	←	P812559
Element (inner)	32143 08100	32143 15900	←	P836913
Oil separator	34220 10701	34220 14900	←	
Gasket for oil separator	34235 06900×2	←	←	
Compressor oil filter ASS'Y	37400 11300	←	←	
Oil filter cartridge	37438 04600	←	←	
Engine oil filter element (main)	HINO: 15607-1561	mitsubishi: ME121788	←	Set No. (main, by-pass) mitsubishi: ME180514
Engine oil filter element (by-pass)	HINO: 15607-1580	mitsubishi: ME165370	←	
Fuel filter cartridge	HINO: 23401-1390	mitsubishi: ME150631	43541 00900 (mitsubishi: ME056670)	
Fuel pre-filter ASS'Y	43540 07100 (RACOR 900FH)	43540 07000 (RACOR 1000FH)	←	
Fuel pre-filter element	43541 01500	43541 01400	←	
Filter for fuel air-bleeding electromagnetic pump	43541 00100	←	—	
Gasket for fuel feed pump	—	43531 00700×3	←	
●Air control				
Speed regulator	36400 21700	—	36400 20401	
Diaphragm thicker one : secondary side	36436 00300	—	36436 00300	Speed adjustment
Diaphragm thinner one : secondary side	36437 00100	—	36437 00100	Speed adjustment
Pressure regulator	36400 12200	←	←	Used for both low pressure and high pressure
Diaphragm	36437 01600	←	←	
Unloader regulator	36400 15301	36400 21000	36400 20600	Unloader open-close
Diaphragm	36437 01700	←	←	
Auto-relief valve	36600 02900	←	36600 04400	
Diaphragm	36622 01000	←	←	
Vacuum relief valve	36800 01100	←	←	
Diaphragm	36437 01800	←	←	
●Instruments on panel				
Starter switch	44322 07200	←	44322 06000	
Pressure gauge High pressure	36141 13302	←	36141 12802	
Interstage pressure	36141 13401	←	36141 11103	
Tachometer	36146 07100	36146 08400	36146 07400	
Discharge air temp. gauge	36144 04000	←	←	
Coolant temp. gauge	36145 05101	←	←	
Fuel level gauge	36158 00801	←	←	
Oil separator differential pressure gauge	32148 01902	←	←	

5. References

Item	PDSJ750S-401	PDSJ750S-4B1 PDSH850S-4B1	PDSJ750S-4B2 PDSH850S-4B2	Remarks
●Oil line				
By-pass valve ASS'Y	37200 08200	37200 10200	←	
Pellet	37231 02700	37231 03300	←	
Seal	37227 00800	←	←	
Oil check valve	37600 10301	←	←	
O-ring	03402 25044	←	←	
●Electrical appliances				
Battery relay (BR)	44362 00400	44362 00200	←	
Safety relay (SR)	— (controller)	44324 05200	←	
Solenoid relay (SLR)	44346 07800	— (ECU controller)	44326 02500	
Heater relay 1 【HR1】	—	44346 15000	—	
Heater relay 2 (HR) 【HR2】	Engine accessory	44346 14600	←	
ECU main relay 【ECU】	—	44346 15000	—	
Engine controller (ECU)	44390 00400	46870 34200	—	
Pressure control · consonant vibration prevention controller 【VRCU】	—	46870 34100	—	
Eng. speed down controller (Consonant vibration prevention controller)	46870 04602	—	46870 10001	
Water draining controller	—	46870 42600	←	
Discharge air temp. switch (Discharge air temp. thermistor amplifier)	44334 13801	←	←	
R1~R8 Relay	44346 07800	44346 15000	←	
Fuel relay (R9) 【R6】	—	44346 15000	44346 04700	
Fuel drop relay (R10)	—	—	44346 11700	
Water draining relay 【R9】	—	44346 11500	—	
EFPA relay 【R10】	—	44346 11500	—	
Stop button signal maintaining timer (Time relay)	44327 03300	←	—	
Off-delay timer (OFDT)	—	—	44327 06900	
Delay timer 1 (Totally enclosed start release timer)	—	—	44327 05200	
Delay timer 2 (Starting unloader release timer)	—	—	44327 06500	
Delay timer 3 Prevention of fuel level switch malfunction	—	—	44327 05200	
Mini-compressor	—	—	20000 41100	
Fuse 1A	—	46934 04500	←	
Fuse 5A	—	46934 05000	—	
Fuse 10A	46934 02300	46934 03200	←	
Fuse 15A	46934 01700	—	—	
Fuse 20A	—	46934 03300	←	

5. References

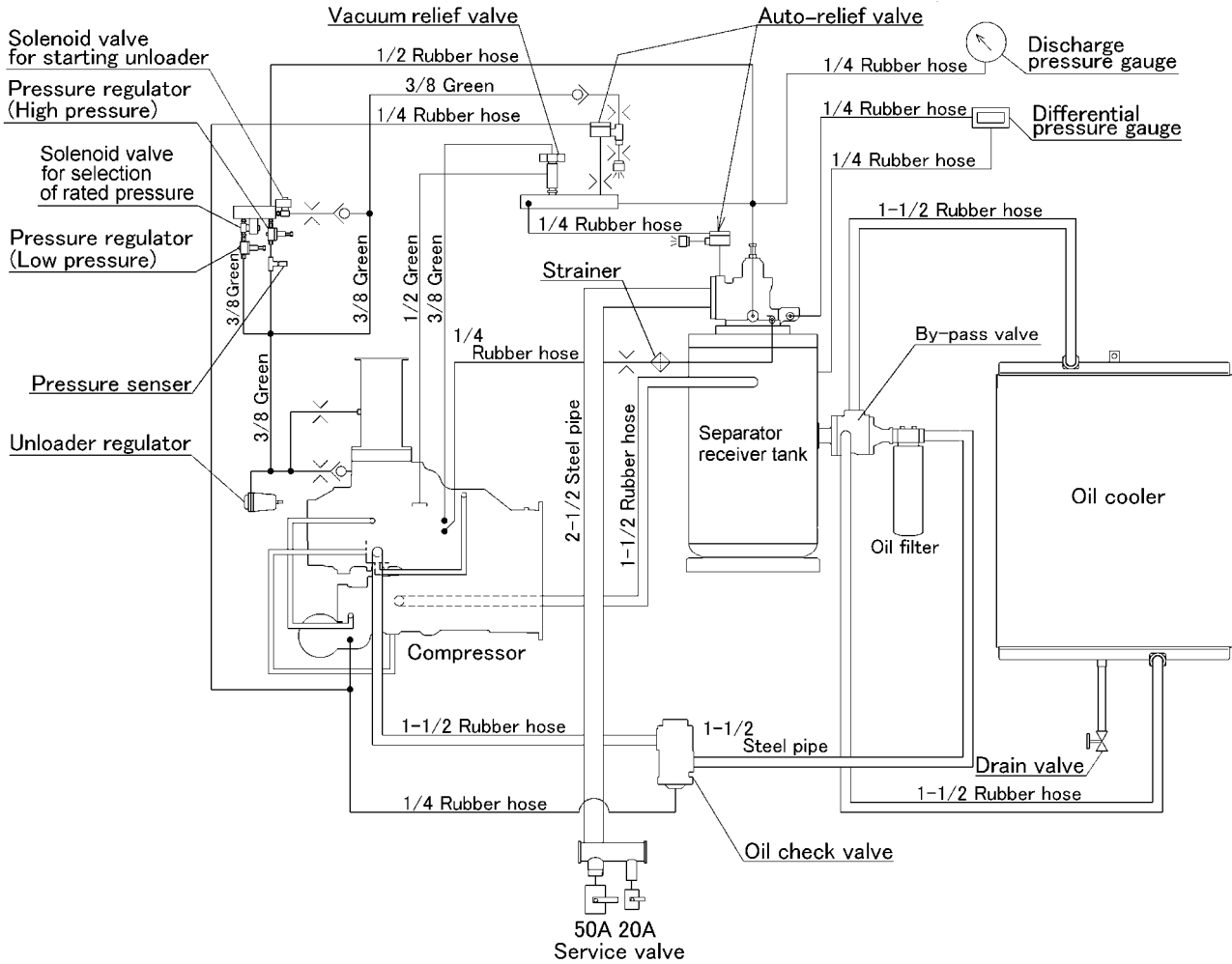
Item	PDSJ750S-401	PDSJ750S-4B1 PDSH850S-4B1	PDSJ750S-4B2 PDSH850S-4B2	Remarks
Discharge air temp. sensor	44364 01200	←	←	
Discharge air temp. gauge sensor	44364 00100	←	←	
Oil pressure switch	44328 14100	MITSUBISHI: ME049297	MITSUBISHI: ME049260	
Coolant temp. switch	44334 12700	MITSUBISHI: ME049269	←	
Sending unit	36159 00200	36159 03800	←	

Electric appliances in the parenthesis are used only for PDSJ750S-4B1/PDSH850S-4B1.

5. References

5.2 Piping Diagram

PDSJ750S/PDSH850S-4B1

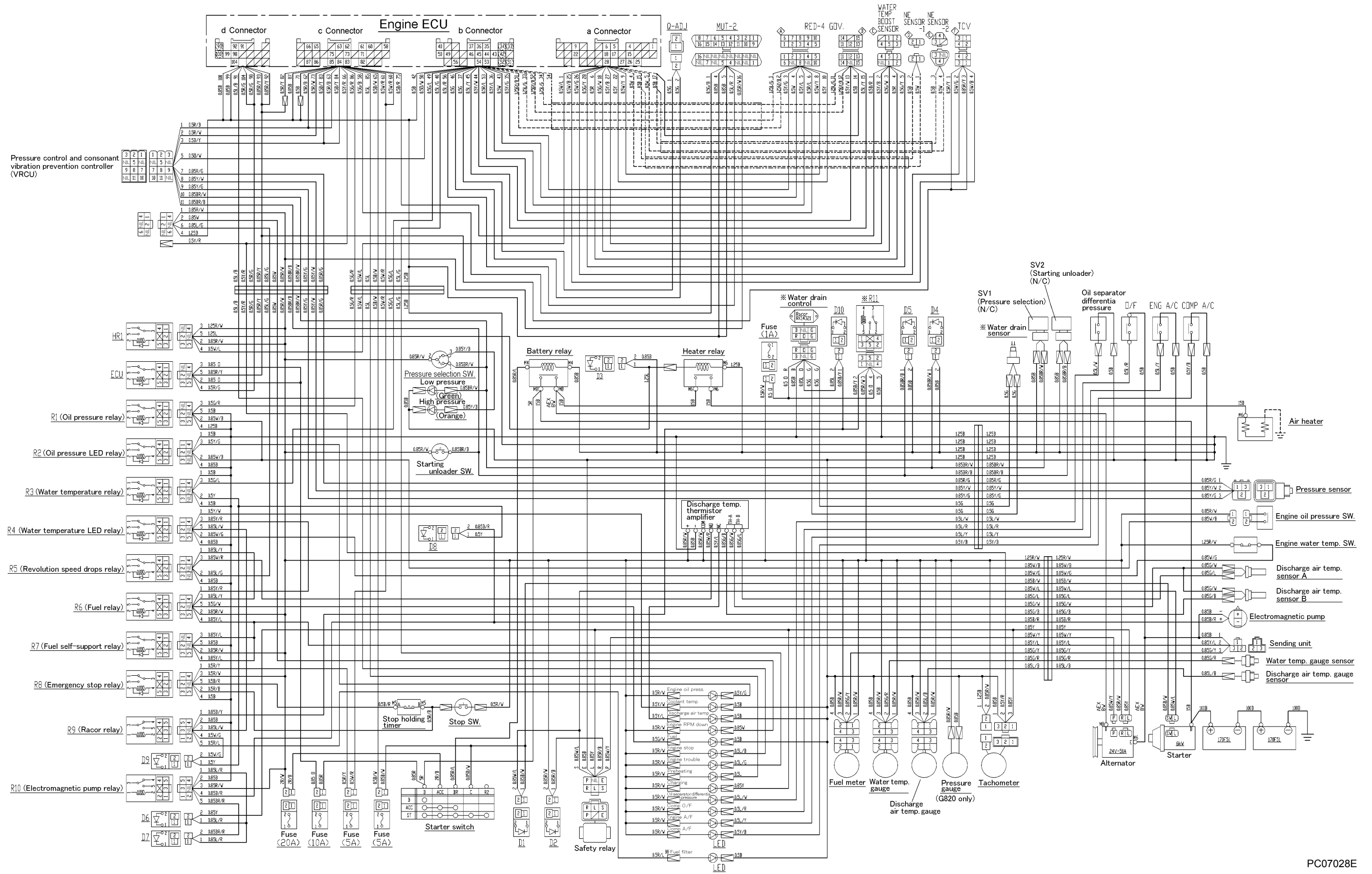


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5. References

5.3 Engine Wiring Diagram

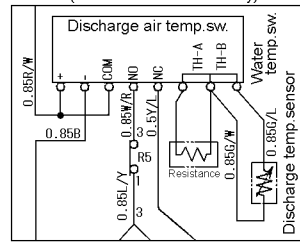
PDSJ750S/PDSH850S-4B1



5. References

PDSJ750S/PDSH850S-4B1 (Sequence)

Discharge air temperature sw. and circuit change
(For PDSG820S-4B1 only)

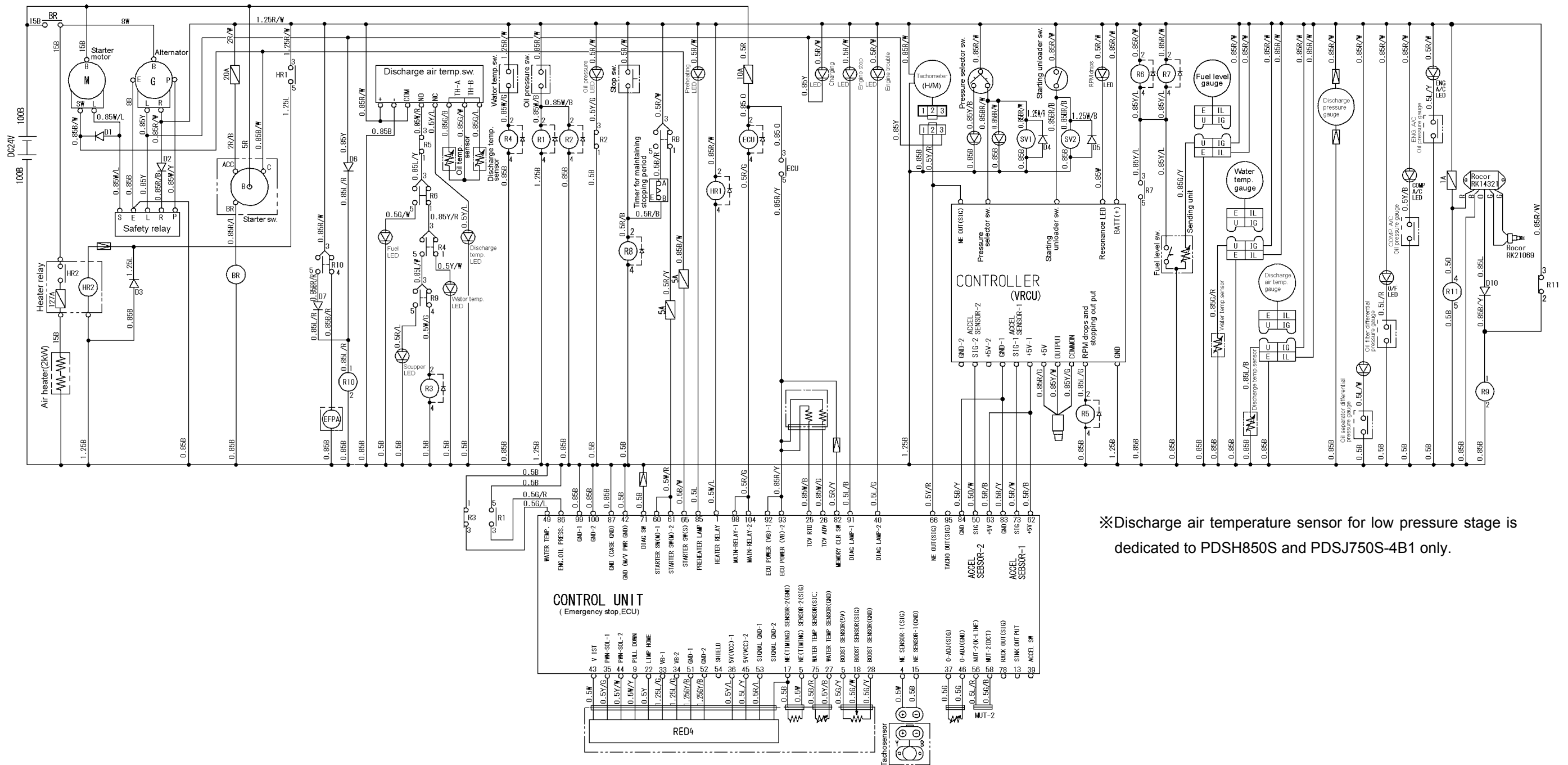
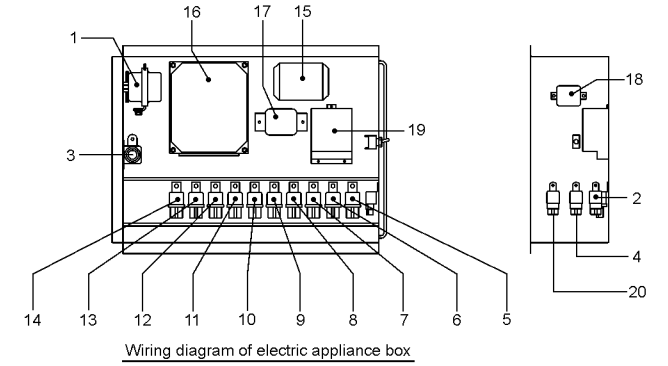


Connection position of starter switch

	B	R1	ACC	BR	C
OFF	○				
R1	○	○			
ACC	○		○		
ST	○			○	

NO.	Mark	Part Name	Part No.	Type
1	BR	Battery relay	44362 00200	mitsubishi 30890-03201
2	HR1	Heater relay (1)	44346 15000	mitsubishi MC898884
3	HR2	Heater relay (2)	44346 14600	mitsubishi ME072890
4	ECU	ECU Main relay	44346 15000	mitsubishi MC898884
5	R1	Oil pressure relay	44346 15000	mitsubishi MC898884
6	R2	Oil pressure LED relay	44346 15000	mitsubishi MC898884
7	R3	Water temp. relay	44346 15000	mitsubishi MC898884
8	R4	Water temp. LED relay	44346 15000	mitsubishi MC898884
9	R5	Relay for RPM decrease	44346 15000	mitsubishi MC898884
10	R6	Fuel relay	44346 15000	mitsubishi MC898884

NO.	Mark	Part Name	Part No.	Type
11	R7	Fuel maintaining relay	44346 15000	mitsubishi MC898884
12	R8	Emergency stop relay	44346 15000	mitsubishi MC898884
13	R9	Racor relay(1)	44346 11500	
14	R10	EFPA relay	44346 11500	
15	-	Controller(VRCU)	46870 34100	
16	-	Controller(ECU)	46870 34200	
17	-	Safety relay	44324 05200	mitsubishi ME049239
18	-	Time relay	44237 03300	
19	-	Discharge air temp. sw.	44334 13800	PDSJ750S-4B1
			44334 11300	PDSG820S-4B1
20	R11	Racor relay(2)	44346 05300	mitsubishi ME048132



※Discharge air temperature sensor for low pressure stage is dedicated to PDSH850S and PDSJ750S-4B1 only.

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