

Hitachi R390LC-9 Preview

**This single sample file
contains samples for**

Hitachi R390LC-9 Operators - 206 pages

Hitachi R390LC-9 Workshop manual - 541 pages

Cummins QSC8.3, QSL9 Engine Ops & Maint - 363 pages

Ops = operators manual

WSM = workshop manual

[*p] = *** pages**

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FOREWORD

This manual contains a number of instructions and safety recommendations regarding driving, handling, lubrication, maintenance, inspection and adjustment of the excavator.

The manual is to promote safety maintenance and enhance machine performance.

Keep this manual handy and have all personnel read it periodically.

If you sell the machine, be sure to give this manual to the new owners.

This machine complies with EC directive "2006/42/EC".

1. **Read** and **understand** this manual before operating the machine.

This operator's manual may contain attachments and optional equipment that are not available in your area. Please consult your local Hyundai distributor for those items you require.

Improper operation and maintenance of this machine can be hazardous and could result in serious injury or death.

Some actions involved in operation and maintenance of the machine can cause a serious accident, if they are not done in a manner described in this manual.

The procedures and precautions given in this manual apply only to intended uses of the machine.

If you use your machine for any unintended uses that are not specifically prohibited, you must be sure that it is safe for you and others. In no event should you or others engage in prohibited uses of actions as described in this manual.

2. **Inspect** the jobsite and **follow** the safety recommendations in the **safety hints** section before operating the machine.

3. Use **genuine Hyundai spare parts** for the replacement of parts.

We expressly point out that Hyundai will not accept any responsibility for defects resulting from non-genuine parts or non workmanlike repair.

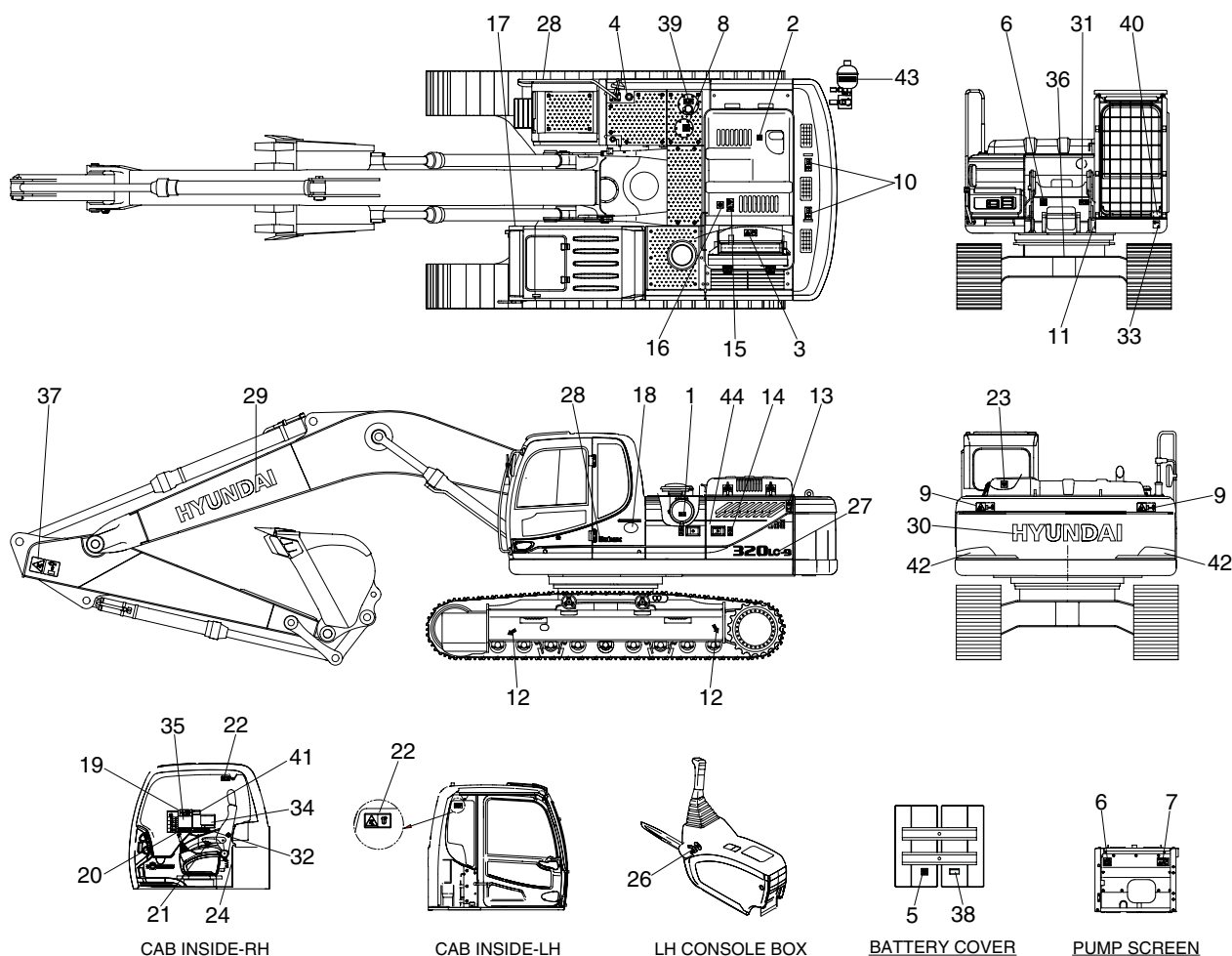
In such cases Hyundai cannot assume liability for any damage.

Continuing improvements in the design of this machine can lead to changes in detail which may not be reflected in this manual. Consult Hyundai or your Hyundai distributor for the latest available information for your machine or for questions regarding information in this manual.

SAFETY LABELS

1. LOCATION

Always keep these labels clean. If they are lost or damaged, attach them again or replace them with a new label.



32090SL01

- | | | |
|-------------------------|--------------------------------------|------------------------|
| 1 Air cleaner filter | 16 No step engine hood | 32 Locking-clamp |
| 2 Turbocharger cover | 17 Transporting | 33 Noise level LWA |
| 3 Radiator cap | 18 Low emission engine | 34 Service instruction |
| 4 Fueling | 19 Control ideogram | 35 Lifting chart |
| 5 Battery accident | 20 Ref operator manual-Cab RH pillar | 36 Tie |
| 6 High pressure hose | 21 Hammer | 37 Keep clear-Boom/arm |
| 7 Hydraulic oil level | 22 Safety front window | 38 ECU connector |
| 8 Hydraulic oil lub | 23 Alternate exit | 39 Falling |
| 9 Keep clear-rear | 24 Air conditioner filter | 40 FOPS FOG plate |
| 10 Lifting eye | 26 Safety lever | 41 Turbocharger |
| 11 Name plate | 27 Model name | 42 Reflecting |
| 12 Sliding ideogram | 28 Logo (ROBEX) | 43 Accumulator |
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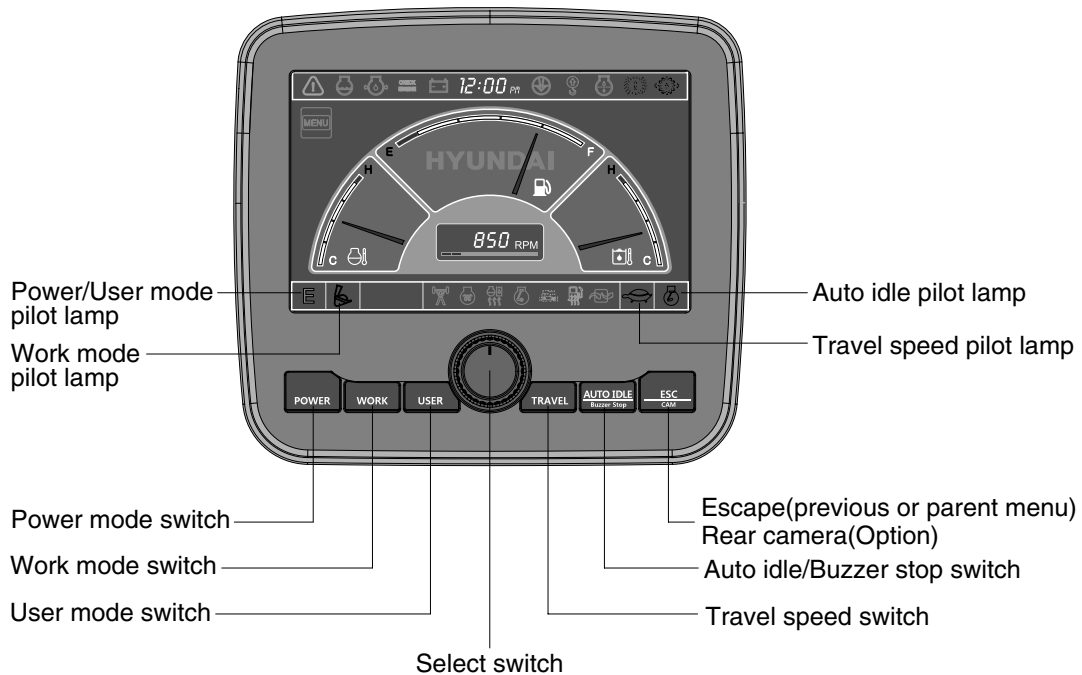
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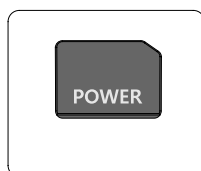
5) SWITCHES



21093CD45

※ When the switches are selected, the pilot lamps are displayed on the LCD. Refer to the page 3-7 for details.

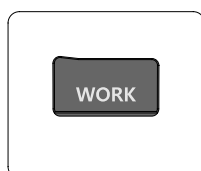
(1) Power mode switch



21093CD45A

- ① This switch is to select the machine power mode and selected power mode pilot lamp is displayed on the pilot lamp position.
 - P : Heavy duty power work.
 - S : Standard power work.
 - E : Economy power work.
- ② The pilot lamp changes E → S → P → E in order.

(2) Work mode switch



21093CD45C

- ① This switch is to select the machine work mode, which shifts from general operation mode to optional attachment operation mode.
 -  : General operation mode
 -  : Breaker operation mode (if equipped)
 -  : Crusher operation mode (if equipped)
 - Not installed : Breaker or crusher is not installed.

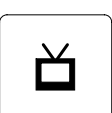
※ Refer to the page 4-6 for details.

6) MAIN MENU



※ Please refer to select switch, page 3-10 for selection and change of menu and input value.

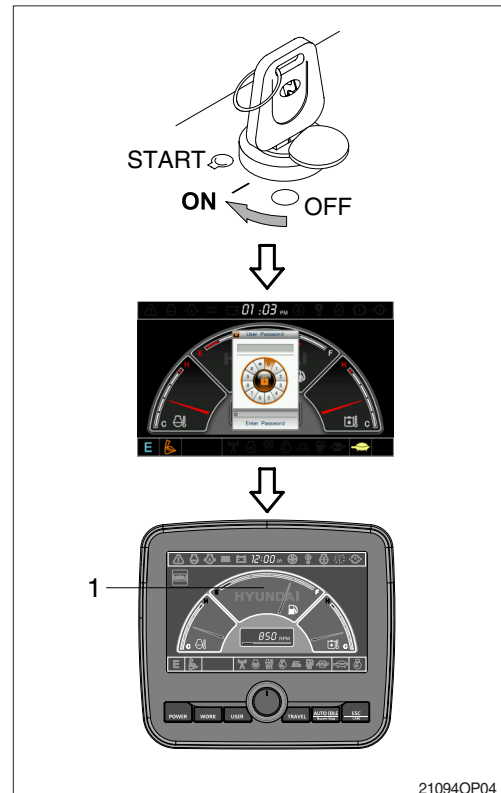
(1) Structure

No	Main menu	Sub menu	Description
1	 Mode 21093CD64D	Work tool U mode power Boom/Arm speed Auto power boost Initial mode Cluster switch (back up)	Breaker, Crusher, Not installed User mode only Boom speed, Arm speed Enable, Disable Default, U mode Switch function
2	 Monitoring 21093CD64E	Active fault Logged fault Delete logged fault Monitoring (analog) Monitoring (digital) Operating hours	MCU, Engine ECM MCU, Engine ECM All logged fault delete, Initialization canceled Machine information Switch status, Output status Operating hours for each mode
3	 Management 21093CD64F	Maintenance information Machine security Machine Information A/S phone number Service menu	Replacement, Change interval oils and filters ESL mode setting, Password change Cluster, MCU, Engine, Machine A/S phone number, A/S phone number change Power shift, Hourmeter start, Replacement history, Update
4	 Display 21093CD64G	Display item Clock Brightness Unit Language Screen type	Engine speed, Tripmeter A, Tripmeter B, Tripmeter C Clock Manual, Auto Temperature, Pressure, Flow, Date format Korean, English, Chinese A type, B type
5	 Utilities 21093CD64H	Tripmeter DMB Entertainment Camera setting Message box	3 kinds (A, B, C) DMB select, DAB select, Channel scan, Exit Play MP4, codec. Basic direction, Display switching, Full screen Record for fault, attachment etc.

3. STARTING AND STOP THE ENGINE

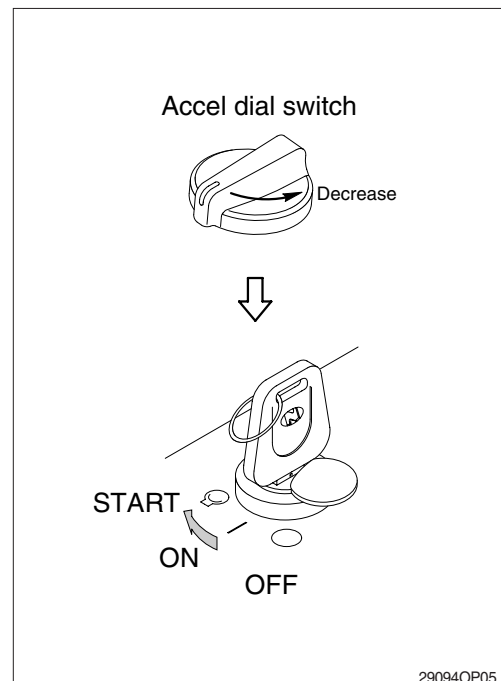
1) CHECK INDICATOR LIGHTS

- (1) Check if all the operating levers are in the neutral position.
- (2) Turn the starting switch to the ON position.
Buzzer sounding for 4 seconds with HYUNDAI logo on cluster.
- ※ If the ESL mode is set to the enable, enter the password to start engine.
- ※ If the password has failed 5 times, please wait 30 minutes before re-attempting to enter the password.
- ※ Refer to page 3-17 for ESL mode.
- (3) After initialization of cluster, the operating screen is displayed on LCD (1).
Also, self-diagnostic function is carried out.



2) STARTING ENGINE IN NORMAL TEMPERATURE

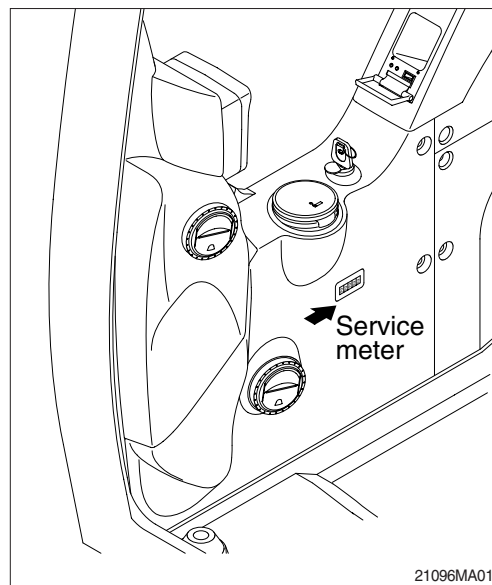
- ※ Sound the horn to warn the surroundings after checking if personnel or obstacles are in the area.
- (1) Turn the accel dial switch to low idle position.
 - (2) Turn the starting switch to START position to start the engine.
 - ※ Do not hold the starting switch in the START position for longer than 20 seconds.
The start system may be seriously damaged.
 - ※ If the engine does not start, allow the stator to cool for about 2 minutes before re-attempting to start the engine again.
 - (3) Release the starting switch instantly after the engine starts to avoid possible damage to the starting motor.



1. INSTRUCTION

1) INTERVAL OF MAINTENANCE

- (1) You may inspect and service the machine by the period as described at page 6-11 based on hour meter at control panel.
- (2) Shorten the interval of inspect and service depending on site condition. (such as dusty area, quarry, sea shore and etc.)
- (3) Practice the entire related details at the same time when the service interval is doubled.
For example, in case of 100hours, carry out all the maintenance 「Each 100hours, each 50 hours and daily service」 at the same time.



2) PRECAUTION

- (1) Start to maintenance after you have the full knowledge of machine.
- (2) The monitor installed on this machine does not entirely guarantee the condition of the machine.
Daily inspection should be performed according to clause 4, maintenance check list.
- (3) Engine and hydraulic components have been preset in the factory.
Do not allow unauthorized personnel to reset them.
- (4) Ask to your local dealer or Hyundai for the maintenance advice if unknown.
- (5) Drain the used oil and coolant in a container and handle according to the method of handling for industrial waste to meet with regulations of each province or country.

34) REPLACEMENT OF BUCKET

⚠ When knocking the pin in with a hammer, metal particles may fly and cause serious injury, particularly if they get into your eyes. When carrying out this operation, always wear goggles, helmet, gloves, and other protective equipment.

- ※ When the bucket is removed, place it in a stable condition.
- ※ When performing joint work, make sure signals to each other and work carefully for safety's sake.

(1) Lower the bucket on the ground as the picture shown in the right.

(2) Lock the safety lever to the LOCK position and stop the engine.

(3) Remove the stopper bolts (1) and nuts (2), then remove pins (3, 4) and remove the bucket.

※ When removing the pins, place the bucket so that it is in light contact with the ground.

※ If the bucket is lowered strongly to the ground, the resistance will be increased and it will be difficult to remove the pins.

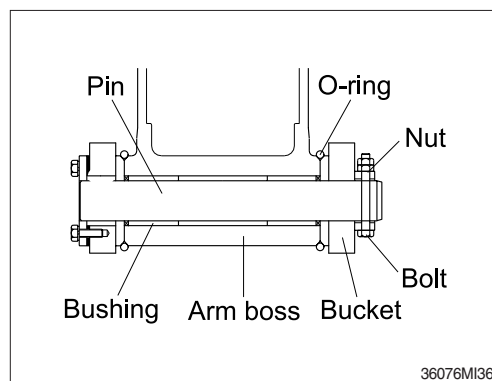
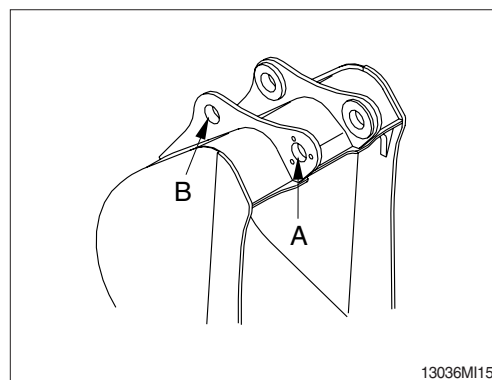
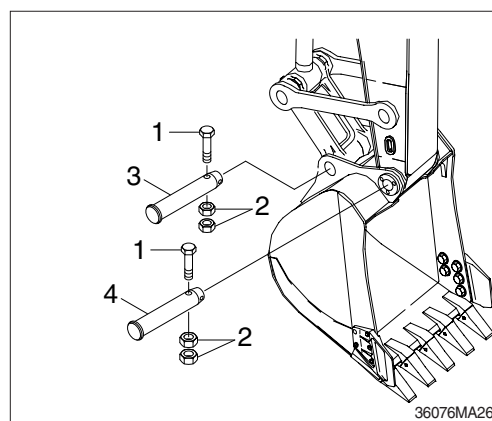
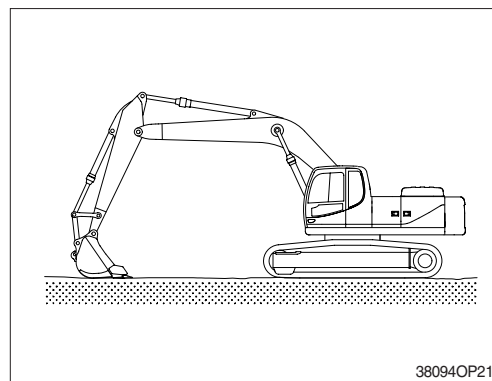
※ After remove the pins, make sure that they do not become contaminated with sand or mud and that the seals of bushing on both sides do not become damaged.

(4) Align the arm with holes (A) and the link with holes (B), then coat with grease and install pins(3, 4)

※ When installing the bucket, the O-rings are easily damaged, so fit the O-rings on the boss of the bucket as shown in the picture.

After knocking the pin, move the O-ring down to the regular groove.

(5) Install the stopper bolt (1) and nuts (2) for each pin, then grease the pin.



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1. STRUCTURE

This service manual has been prepared as an aid to improve the quality of repairs by giving the serviceman an accurate understanding of the product and by showing him the correct way to perform repairs and make judgements. Make sure you understand the contents of this manual and use it to full effect at every opportunity.

This service manual mainly contains the necessary technical information for operations performed in a service workshop.

For ease of understanding, the manual is divided into the following sections.

SECTION 1 GENERAL

This section explains the safety hints and gives the specification of the machine and major components.

SECTION 2 STRUCTURE AND FUNCTION

This section explains the structure and function of each component. It serves not only to give an understanding of the structure, but also serves as reference material for troubleshooting.

SECTION 3 HYDRAULIC SYSTEM

This section explains the hydraulic circuit, single and combined operation.

SECTION 4 ELECTRICAL SYSTEM

This section explains the electrical circuit, monitoring system and each component. It serves not only to give an understanding electrical system, but also serves as reference material for trouble shooting.

SECTION 5 MECHATRONICS SYSTEM

This section explains the computer aided power optimization system and each component.

SECTION 6 TROUBLESHOOTING

This section explains the troubleshooting charts correlating **problems** to **causes**.

SECTION 7 MAINTENANCE STANDARD

This section gives the judgement standards when inspecting disassembled parts.

SECTION 8 DISASSEMBLY AND ASSEMBLY

This section explains the order to be followed when removing, installing, disassembling or assembling each component, as well as precautions to be taken for these operations.

SECTION 9 COMPONENT MOUNTING TORQUE

This section shows bolt specifications and standard torque values needed when mounting components to the machine.

The specifications contained in this shop manual are subject to change at any time and without any advance notice. Contact your HYUNDAI distributor for the latest information.

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SECTION 1 GENERAL

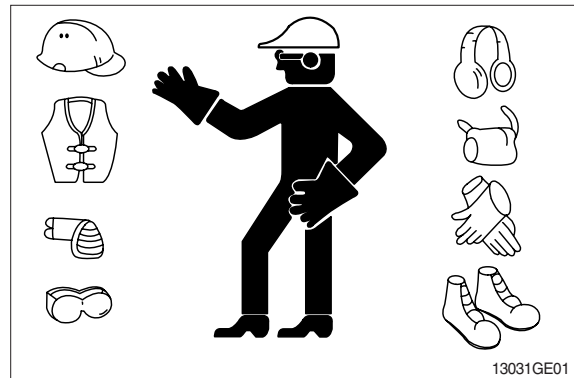
GROUP 1 SAFETY

FOLLOW SAFE PROCEDURE

Unsafe work practices are dangerous. Understand service procedure before doing work; Do not attempt shortcuts.

WEAR PROTECTIVE CLOTHING

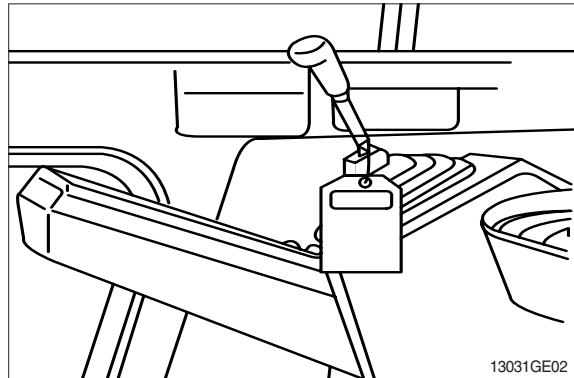
Wear close fitting clothing and safety equipment appropriate to the job.



WARN OTHERS OF SERVICE WORK

Unexpected machine movement can cause serious injury.

Before performing any work on the excavator, attach a 「Do Not Operate」 tag on the right side control lever.



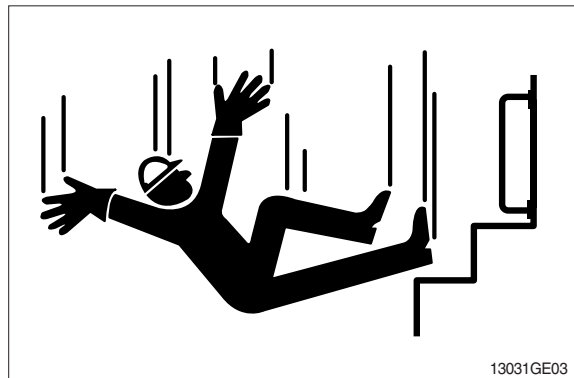
USE HANDHOLDS AND STEPS

Falling is one of the major causes of personal injury.

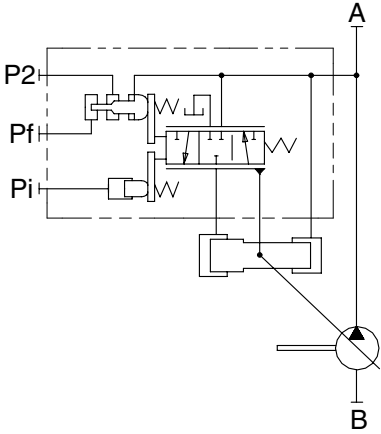
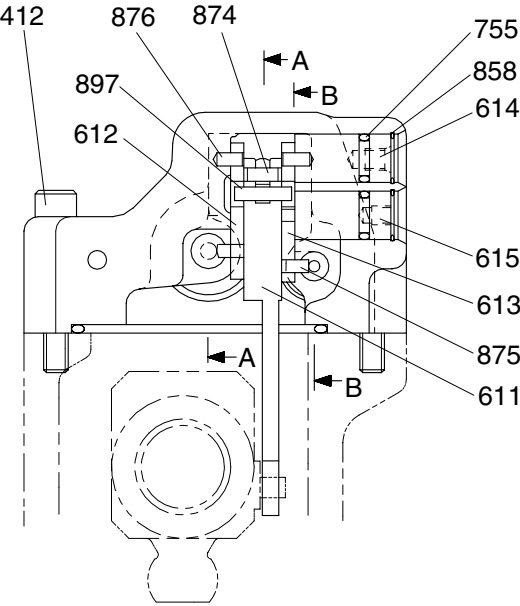
When you get on and off the machine, always maintain a three point contact with the steps and handrails and face the machine. Do not use any controls as handholds.

Never jump on or off the machine. Never mount or dismount a moving machine.

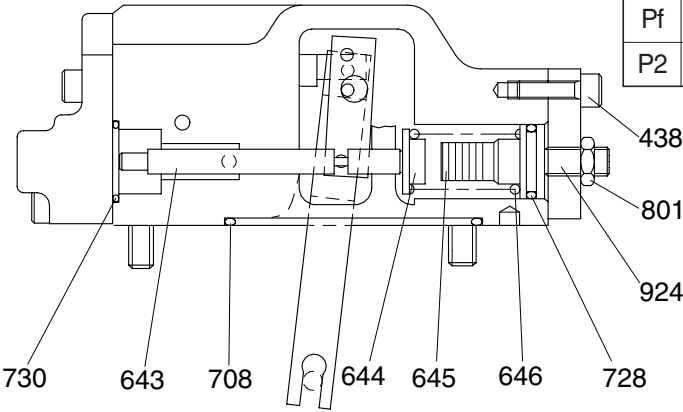
Be careful of slippery conditions on platforms, steps, and handrails when leaving the machine.



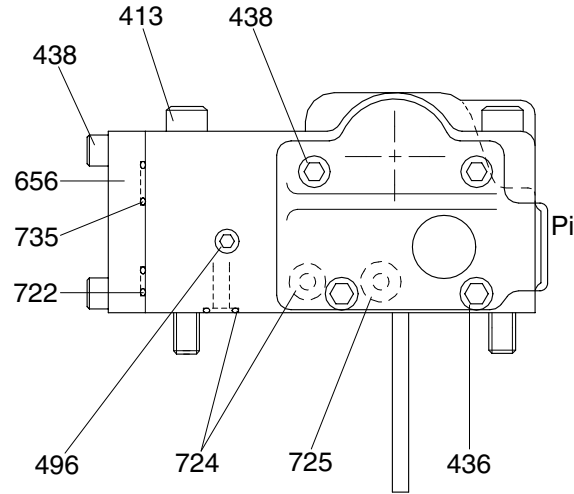
2) REGULATOR (1/2)



Port	Port name	Port size
A	Delivery port	1"
B	Suction port	3"
Pi	Pilot port	PF 1/4-15
Pf	Power shift pressure	-
P2	Companion delivery pressure	-



SECTION B-B



VIEW C

32092MP04

SECTION 5 MECHATRONICS SYSTEM

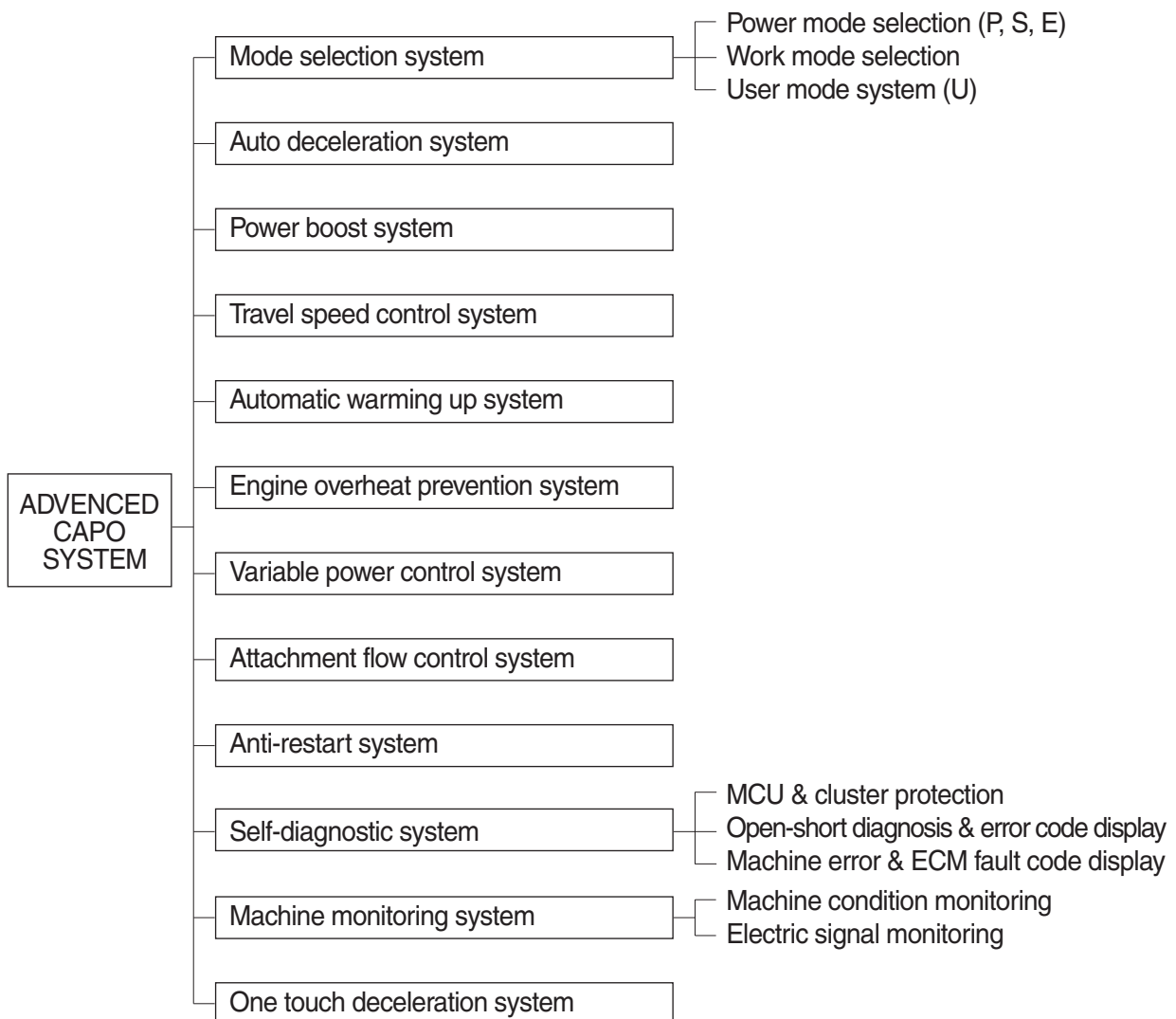
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SECTION 5 MECHATRONICS SYSTEM

GROUP 1 OUTLINE

The ADVANCED CAPO (Computer Aided Power Optimization) system controls engine and pump mutual power at an optimum and less fuel consuming state for the selected work by mode selection, auto-deceleration, power boost function, etc. It monitors machine conditions, for instance, engine speed, coolant temperature, hydraulic oil temperature, and hydraulic oil pressure, etc.

It consists of a MCU, a cluster, an ECM, EPPR valves, and other components. The MCU and the cluster protect themselves from over-current and high voltage input, and diagnose malfunctions caused by short or open circuit in electric system, and display error codes on the cluster.



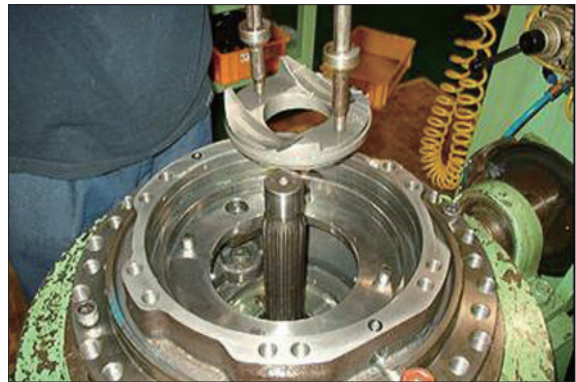
Fault code J1939 SPN J1939 FMI	Reason	Effect (only when fault code is active)
1117 627 2	Power supply lost with ignition on - Data erratic, intermittent, or incorrect. Supply voltage to the ECM fell below 6.2 volts momentarily, or the ECM was not allowed to power down correctly (retain battery voltage for 30 seconds after key OFF).	Engine will shut down.
1633 625 2	OEM datalink cannot transmit - Data erratic, intermittent, or incorrect. Communications within the OEM datalink network is intermittent.	Engine will only idle.
2185 520197 3	Sensor supply 4 circuit - Voltage above normal, or shorted to high source. High voltage detected at +5 volt sensor supply circuit to the accelerator pedal position sensor.	Possibly hard to start, low power, or engine smoke.
2186 520197 4	Sensor supply 4 circuit - Voltage below normal, or shorted to low source. Low voltage detected at +5 volt sensor supply circuit to the accelerator pedal position sensor.	None or possible engine noise associated with higher injection pressure (especially at idle or light load)
2249 157 1	Injector metering rail 1 pressure - Data valid but below normal operational range - Most severe level. The ECM has detected that fuel pressure is lower than commanded pressure.	Engine may be difficult to start.
2265 1075 3	Electric lift pump for engine fuel supply circuit - Voltage above normal, or shorted to high source. High voltage or open detected at the fuel lift pump signal circuit.	Possible low power.
2266 1075 4	Electric lift pump for engine fuel supply circuit - Voltage below normal, or shorted to low source. Low signal voltage detected at the fuel lift pump circuit.	Engine may exhibit misfire as control switches from the primary to the backup speed sensor. Engine power is reduced while the engine operates on the backup speed sensor.
2311 633 31	Electronic fuel injection control valve circuit - Condition exists. Fuel pump actuator circuit resistance too high or too low.	Possible low power.
2321 190 2	Engine crankshaft speed/position - Data erratic, intermittent, or incorrect. crankshaft engine speed sensor intermittent synchronization.	Engine power derate.
2322 723 2	Engine camshaft speed / position sensor - Data erratic, intermittent, or incorrect. Camshaft engine speed sensor intermittent synchronization.	Engine power derate.
2345 103 10	Turbocharger 1 Speed - Abnormal rate of change. The turbocharger speed sensor has detected an erroneous speed value.	Engine power derate.
2346 2789 15	Turbocharger turbine inlet temperature (Calculated) - Data valid but above normal operational range - Least severe level. Turbocharger turbine inlet temperature has exceeded the engine protection limit.	Engine brake on cylinders 1, 2, and 3 can not be activated or exhaust brake will not operate.
2347 2790 15	Turbocharger compressor outlet temperature (Calculated) - Data valid but above normal operational range - Least severe level.	Engine brake on cylinders 4, 5 and 6 can not be activated or exhaust brake will not operate.
2377 647 3	Fan control circuit - Voltage above normal, or shorted to high source. Open circuit or high voltage detected at the fan control circuit.	Variable geometry turbocharger will go to the open position.

(9) Disassemble swash plate (16).



300072TM28

(10) After put M12 into support (15), disassemble support.



300072TM29

(11) Disassemble piston swash (10) and stopper (7).



300072TM30

(12) In order to making the turning axis (11) faced upward, put it way from shaft casing tapping the bottom of the turning axis with hammer, after rotating jig up to 90° in disassembling and assembling.

※ Try to deal with roller bearing (13) without any damage.



300072TM31

9) Remove motor ring

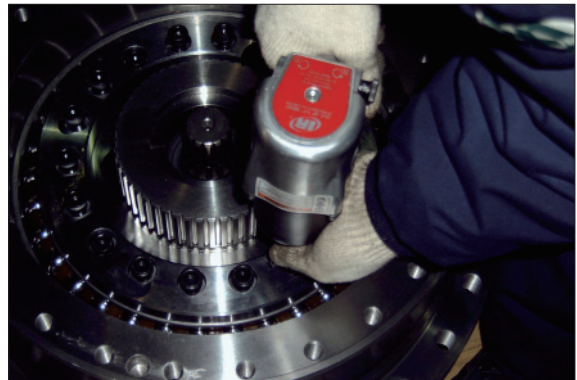
- (1) Remove motor ring using hand.



300078RD12

10) Removing retainer & shim

- (1) Remove hexagon socket (M12) head bolts that retainer and motor.
- (2) Remove retainer & shim.



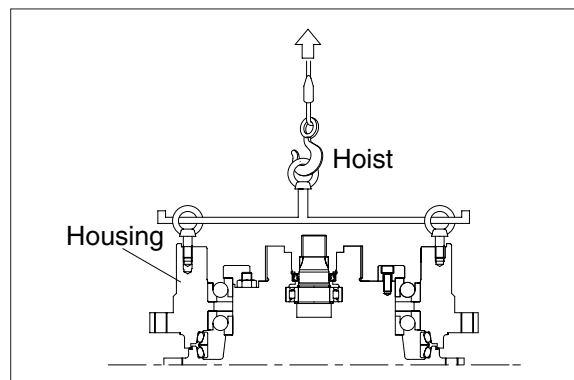
300078RD13

11) Removing housing sub assy

- (1) Screw eye bolt (M14) in housing and lift up housing assembly including angular bearing and floating seal.

12) Removing floating seal

- (1) Lift up a piece of floating seal of motor side.



2907A8RD05

13) Disassembling housing assembly

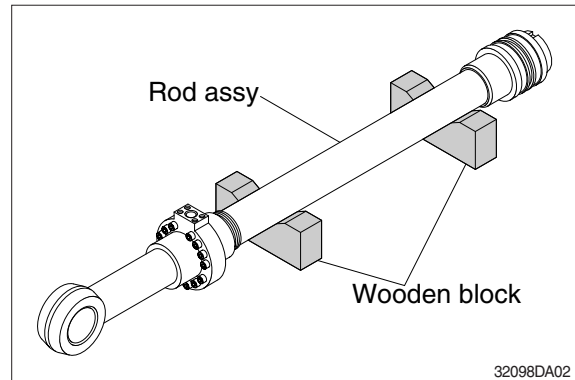
- (1) After turning housing, lift up a piece of floating seal from housing and then remove it.
- ※ Don't disassemble angular bearing.



300078RD15

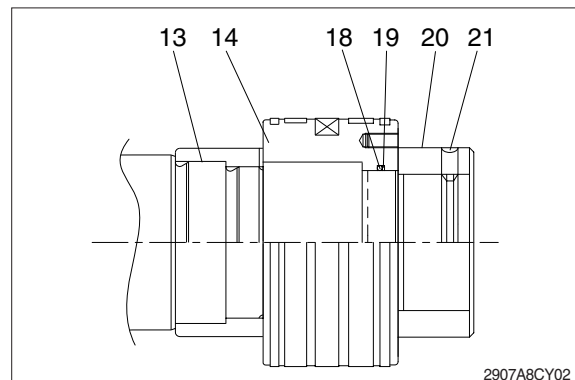
Note that the plated surface of rod assembly (2) is to be lifted. For this reason, do not use a wire sling and others that may damage it, but use a strong cloth belt or a rope.

- ⑤ Place the removed rod assembly on a wooden V-block that is set level.
- ※ Cover a V-block with soft rag.

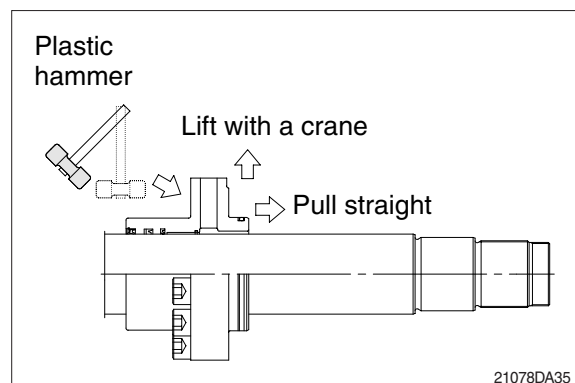


(2) Remove piston and cylinder head

- ① Loosen sochet set screw (21) and remove lock nut (20).
- ※ Since lock nut (20) is tightened to a high torque, use a hydraulic and power wrench that utilizes a hydraulic cylinder, to remove the lock nut (20).
- ② Remove piston assembly (14), back up ring (19), and O-ring (18).

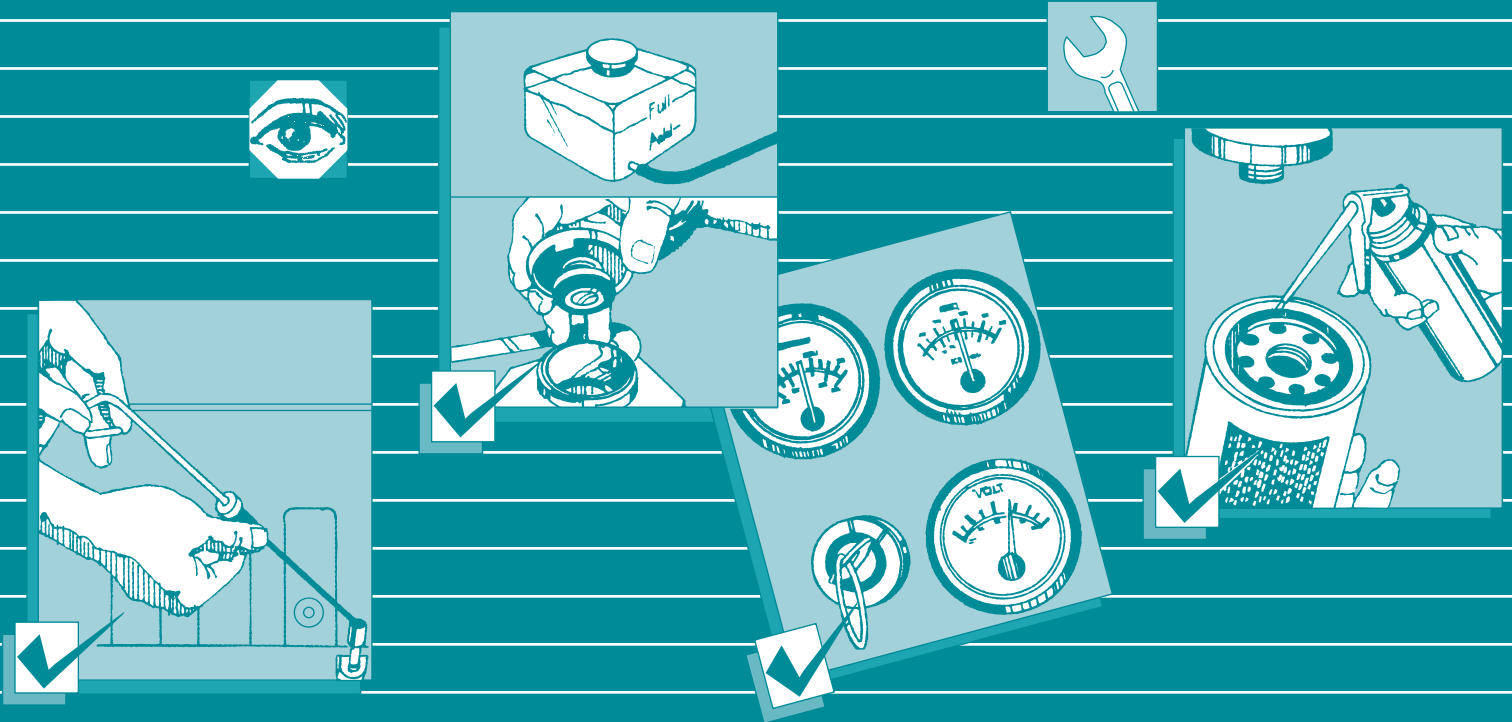


- ③ Remove the cylinder head assembly from rod assembly (2).
 - ※ If it is too heavy to move, move it by striking the flanged part of cylinder head with a plastic hammer.
 - ※ Pull it straight with cylinder head assembly lifted with a crane.
- Exercise care so as not to damage the lip of rod bushing (4) and packing (5,6,7,8,9,10) by the threads of rod assembly (2).





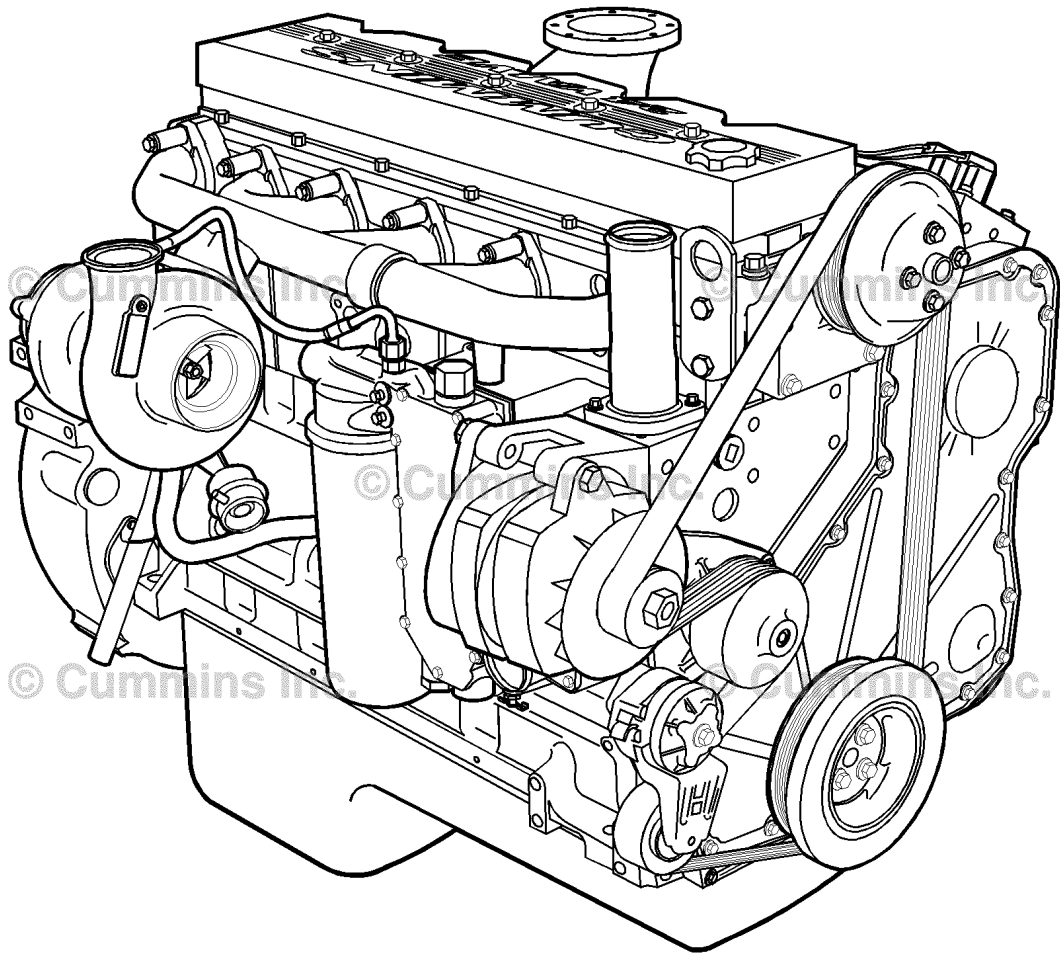
Operation and Maintenance Manual QSC8.3 and QSL9 Engine



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Operation and Maintenance Manual QSC8.3 and QSL9 Engine



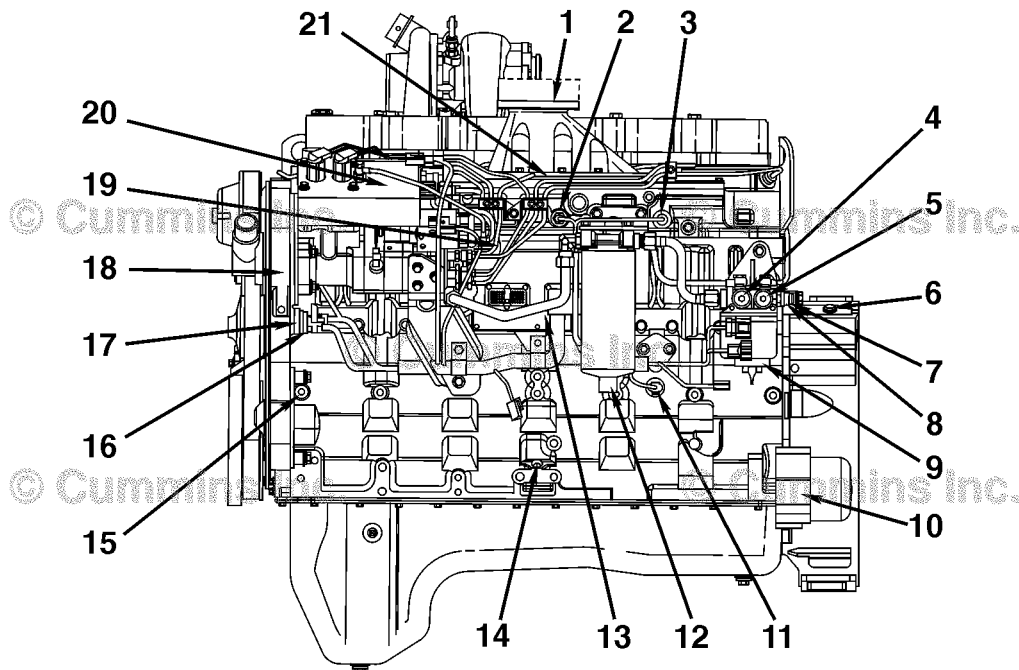
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Engine Diagrams

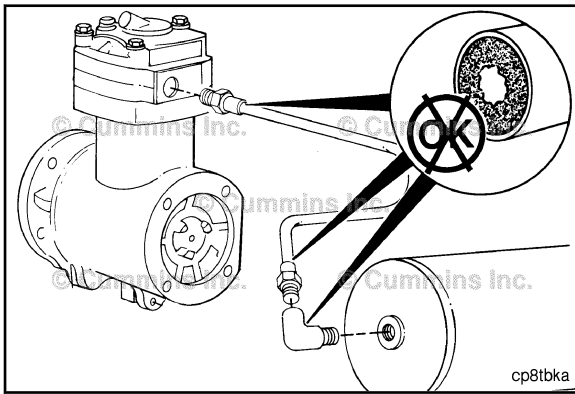
Engine Views



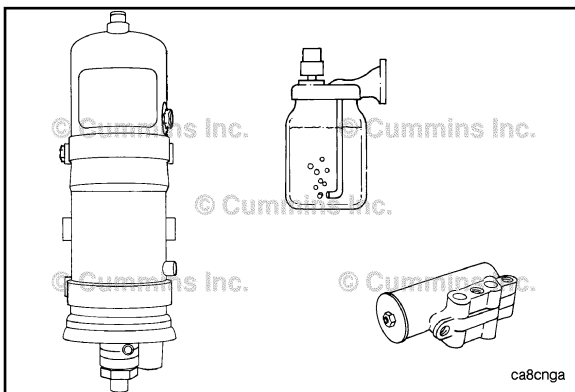
Fuel Pump Side View (CAPS Fuel System)

00900118

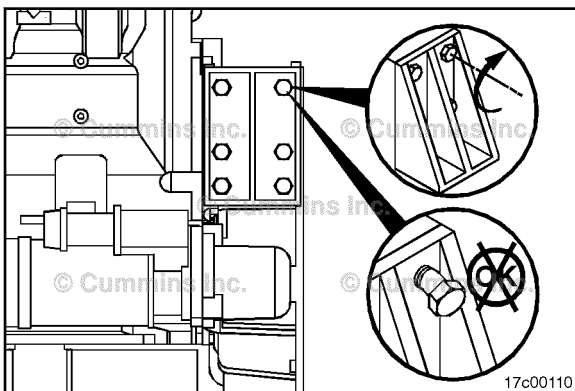
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- 3 Intake manifold temperature sensor
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- 5 M10 (STOR) fuel pressure before-lift pump
- 6 Magnetic pickup location 3/4-16 UNF
- 7 Fuel return connection
- 8 Fuel inlet connection
- 9 Fuel lift pump
- 10 Starter mounting flange
- 11 Oil pressure sensor
- 12 Fuel filter/water separator
- 13 Electronic control module (ECM)
- 14 Dipstick location
- 15 M10 (STOR) oil pressure port
- 16 Engine position sensor (EPS) - (inboard)
- 17 Engine speed sensor (ESS) - (outboard)
- 18 Engine dataplate
- 19 High-pressure fuel lines
- 20 Cummins® Accumulator Pump System (CAPS) injection pump
- 21 Intake air heater.



If the total carbon deposit exceeds specifications, continue checking the air discharge line connections up to the first tank until total carbon deposit is less than 2 mm [1/16 in]. Clean or replace any lines or connections that exceed this specification.



Inspect any air driers, splitter valves, pressure relief valves, and alcohol injectors for carbon deposits or malfunctioning parts. Inspect for air leaks. Maintain and repair the parts according to the manufacturer's specifications.



Engine Mounting Bolts Maintenance Check

⚠CAUTION⚠

Damaged engine mounts and brackets can cause engine misalignment. Driveline component damage can result in vibration complaints.

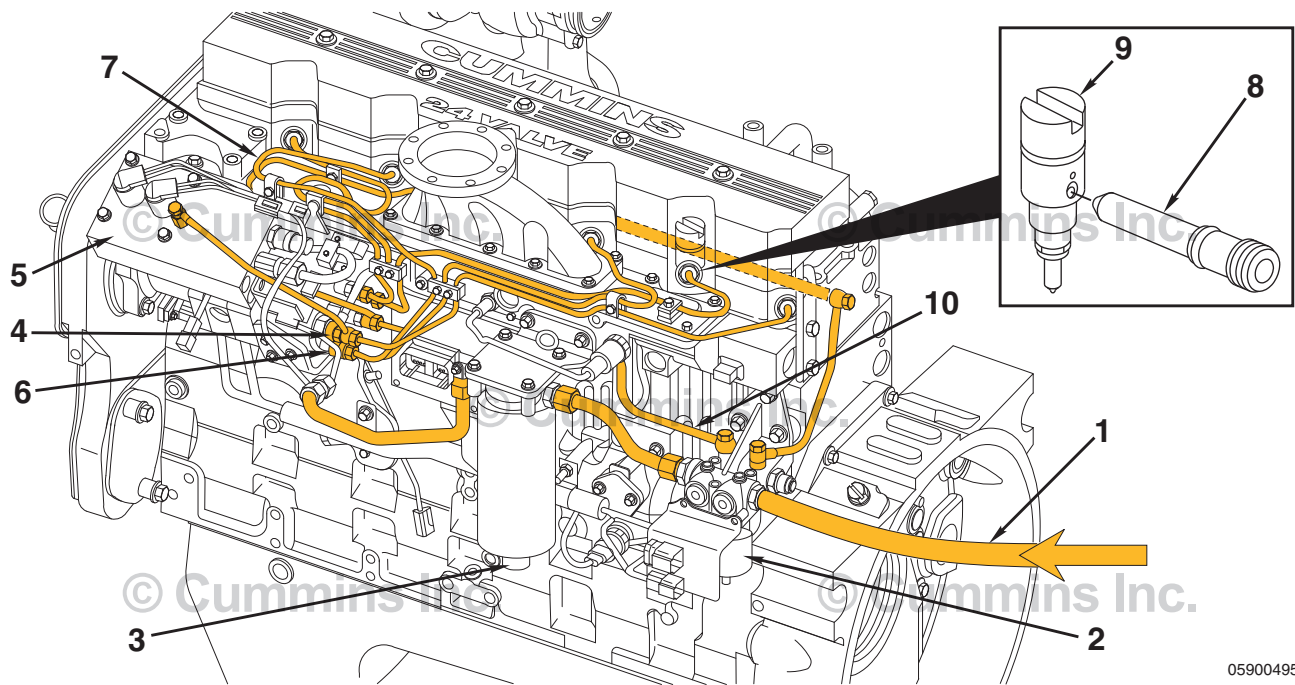
Inspect all rubber-cushioned mounts for cracks or damage.

Inspect all mounting brackets for cracks or damaged bolt holes.

Check the torque on the engine-mounting nuts and bolts. Tighten any that are loose. Refer to the equipment manufacturer for torque specifications.

Flow Diagram, Fuel System

General Information



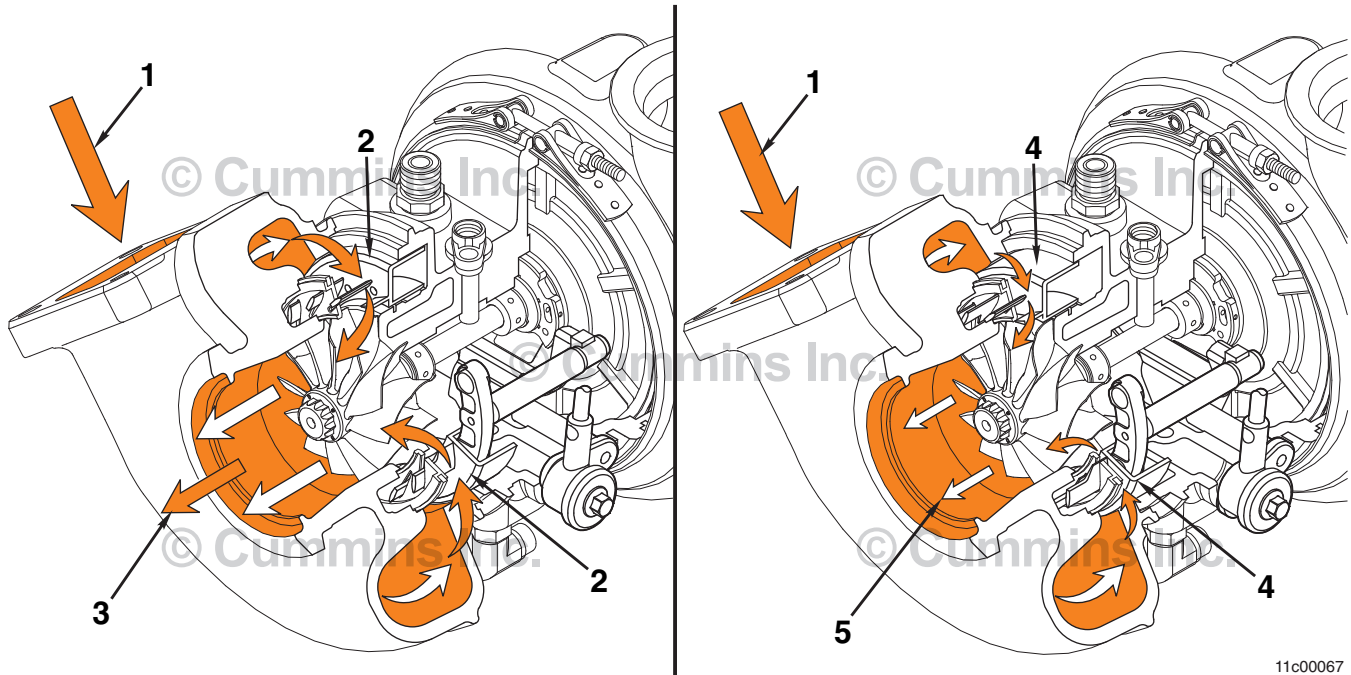
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CAPS Fuel System

- 1 Fuel from supply tank
- 2 Electronic lift pump
- 3 Fuel filter and water separator
- 4 Fuel drain line
- 5 CAPS injection pump
- 6 Distributor outlet fitting
- 7 High-pressure supply lines
- 8 Fuel connector
- 9 Injectors
- 10 Fuel return to supply tank

Flow Diagram, Exhaust System

General Information



Variable Geometry Turbocharger

- 1 Exhaust in
- 2 Sliding nozzle open
- 3 Exhaust gas low velocity flow
- 4 Sliding nozzle closed
- 5 Exhaust gas high velocity flow

Intake Manifold Air Temperature Above Specification

Cause

Correction

STEP 1

Fan drive belt is broken

Check the fan drive belt. Replace the belt, if necessary. Refer to Procedure 008-036.

OK

Go To Next Step

STEP 2

Fan drive belt is loose

Check the belt tension and tighten if necessary.

OK

Go To Next Step

STEP 3

Cold weather radiator cover or winterfront is closed

Open the cold weather radiator cover or the winterfront. Maintain a minimum of 387 cm² [60 in²] of opening at all times. Refer to Procedure 101-004.

OK

Go To Next Step

STEP 4

Charge air cooler fins, radiator fins, or air conditioner condenser fins are damaged or obstructed with debris

Inspect the charge air cooler, air conditioner condenser, and radiator fins. Clean, if necessary. Refer to Procedure 010-027 and the OEM service manual.

OK

Go To Next Step

STEP 5

Intake manifold temperature gauge is malfunctioning, if equipped

Test the temperature gauge. Refer to the OEM service manual.

OK

Go To Next Step

STEP 6

Electronic fault codes are active

For instructions on how to read active fault codes, refer to Diagnostic Fault Codes, Procedure 101-007. If fault codes are active, contact a Cummins Authorized Repair Facility.

OK

Go To Next Step

STEP 7

Programmable parameters or selected features are **not** correct

Check the programmable parameters and the selected features with an electronic service tool. Set the parameters and features again if necessary. Refer to a Cummins Authorized Repair Facility.

OK

Go To Next Step

STEP 8

Fan drive or fan controls are malfunctioning

Check the fan drive and controls. Refer to the OEM service manual.

OK

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