DOOSAN

01256ETRAV
September 2016

WHEEL LOADER

Shop Manual

DL300-5TRAV (NEW YORK BID-21CT)

Serial Number 10001 and Up

DANGER

DANGER - This signal word is used on safety messages and safety labels and indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING - This signal word is used on safety messages and safety labels and indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION - This signal word is used on safety messages and safety labels and indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

Other Signal Words

In addition to safety signal words, the following signal words are used to indicate proper and effective use of machine.

IMPORTANT

This signal word identifies procedures which must be followed to avoid damage to machine.

NOTE: *The word "NOTE" identifies information for effective use.*

1. Turn battery disconnect switch to "ON" position.
2. Close battery compartment door.

Seat Belt

Check seat belt daily for correct function.

Inspect seat belt system more often if machine is exposed to severe environmental conditions or applications. Conduct the following inspections and replace seat belt system as necessary:

1. Check webbing. If system is equipped with a retractor, pull webbing completely out and inspect full length of webbing. Look for cuts, wear, fraying, dirt and stiffness.
2. Check buckle and latch for correct operation.
3. Make sure latch plate is not excessively worn, deformed or buckle is not damaged or casing is broken.
4. Check retractor web storage device (if equipped) by extending webbing and checking that it spools out and retracts correctly.
5. Check webbing in areas exposed to ultraviolet (UV) rays from sun or extreme dust or dirt. If original color of webbing in these areas is extremely faded and/or webbing is packed with dirt, webbing strength may be reduced.

   NOTE: *Contact your DOOSAN distributor for seat belt system replacement parts.*

WARNING

AVOID DEATH OR SERIOUS INJURY

Failure to properly inspect and maintain seat belt and seat belt system can cause lack of operator restraint and can result in death or serious injury.

Before fastening seat belt, check that there is no problem in belt mounting bracket. If it is worn or damaged, replace seat belt immediately. Fasten seat belt so it is not twisted.

Always wear seat belt when operating machine.

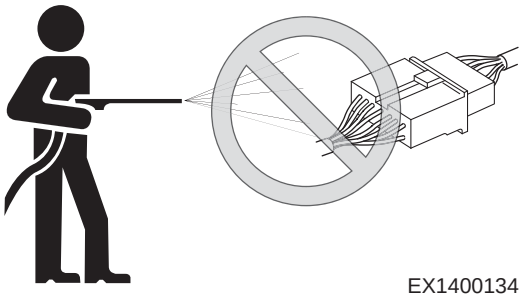
Cleaning

Clean machine before performing inspection and maintenance.

If inspection and/or maintenance are done when machine is dirty, it will become more difficult to locate problems, and this increases the risk of serious injury from slipping on steps and/or the work platform areas.

When washing machine, do the following:

- Wear shoes with nonslip soles to prevent slipping and falling.
- Wear safety goggles and protective clothing when washing machine with high-pressure steam or water.
- Do not spray water directly on electrical components (sensors and connectors). If water gets into electrical system, it can cause operation problems.
- Pick up any tools or hammers that are laying in workplace. Wipe up any grease or oil to prevent slippery surfaces, that can cause tripping or slipping.
- When cleaning cabin top window which is made of polycarbonate material, use tap water. Avoid use of organic solvents for cleaning, such as benzene, toluene or methanol. These solvents can cause a chemical reaction that will dissolve and damage the window.



EX1400134

Figure 33

Proper Tools and Clothing

Only use tools that are intended for the type of service to be done. Metal pieces from low quality or damaged tools, such as chisels or hammers, can break off and cause death or serious injury.

Disassembling Precautions

When using a hammer to remove pins, pins can fly out or metal particles may break off. Always do the following:

- Hitting hard metal pins, bucket teeth, cutting edges or bearings with a hammer, can cause metal pieces to break or fly off resulting in serious injury. Always wear safety goggles and leather gloves. Keep personnel and bystanders away.

ENVIRONMENT AND CIRCUMSTANCES

Work Site Areas Requiring Extra Caution

- Do not operate too close to edge of a quay, ramp, etc.
- Do not operate too close to edge of a steep slope or drop-off. Use caution when working in a place where machine may tip over.
- Do not operate on soft ground or near riverbank that could collapse or where ground may not support weight of machine.
- Observe changes in ground and traction conditions after a rain or other changes in weather.

Digging Under an Overhang

Do not dig work face under an overhang. This can cause overhang to collapse and fall on top of the machine, resulting in death or serious injury.

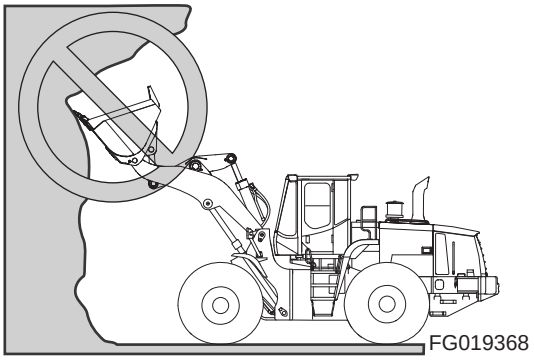


Figure 45

Deep Digging

Do not perform deep digging under front of machine. The ground under machine may collapse and cause machine to fall resulting in death or serious injury.

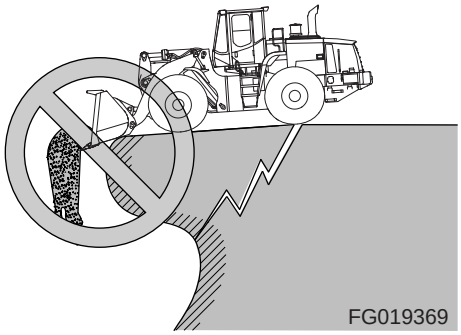


Figure 46

Drop-off or Edge

When working near or at an edge of a drop-off, the machine could tip over, which can result in death or serious injury. Always fasten your seat belt. Check ground conditions of work site before operating to prevent the machine from falling or rollover, and to prevent ground, stockpiles, or banks from collapsing.

Do not travel too close to edge of a drop-off. When working on or from top of buildings or other structures, check if structure can support weight of machine and attachment. If a building structure collapses, this can cause death or serious injury.

MEMO

Item			Unit	Performance Standard	Remarks	Reference Page	Clearance
Front Settlement (Standard Boom, Empty Bucket)	None LIS	Boom Cylinder (Max Reach)	mm/ 5 min	10			Below
		Bucket Cylinder (Max Reach)	mm/ 5 min	5			Below
Front Settlement (Standard Boom, Weight Bucket)		Boom Cylinder (Max Reach)	mm/ 5 min	10			Below
		Bucket Cylinder (Max Reach)	mm/ 5 min	5			Below
Front Settlement (Standard Boom, Empty Bucket)	LIS	Boom Cylinder (Max Reach)	mm/ 5 min	20			Below
		Bucket Cylinder (Max Reach)	mm/ 5 min	5			Below
Front Settlement (Standard Boom, Weight Bucket)		Boom Cylinder (Max Reach)	mm/ 5 min	20			Below
		Bucket Cylinder (Max Reach)	mm/ 5 min	5			Below
Front Settlement (Highlift Boom, Empty Bucket)	None LIS	Boom Cylinder (Max Reach)	mm/ 5 min	20			Below
		Bucket Cylinder (Max Reach)	mm/ 5 min	5			Below
Front Settlement (Highlift Boom, Weight Bucket)		Boom Cylinder (Max Reach)	mm/ 5 min	20			Below
		Bucket Cylinder (Max Reach)	mm/ 5 min	5			Below
Front Settlement (Highlift Boom, Empty Bucket)	LIS	Boom Cylinder (Max Reach)	mm/ 5 min	30			Below
		Bucket Cylinder (Max Reach)	mm/ 5 min	5			Below
Front Settlement (Highlift Boom, Weight Bucket)		Boom Cylinder (Max Reach)	mm/ 5 min	30			Below
		Bucket Cylinder (Max Reach)	mm/ 5 min	5			Below

MEMO

Fatigue Spalling

Flaking of surface metal resulting from fatigue.

Replace bearing - clean all related parts.

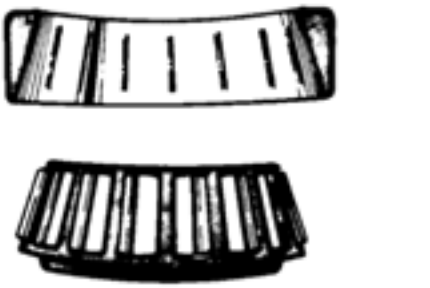
HASA530S

Figure 10

Brinelling

Surface indentations in raceway caused by rollers either under impact loading or vibration while the bearing is not rotating.

Replace bearing if rough or noisy.



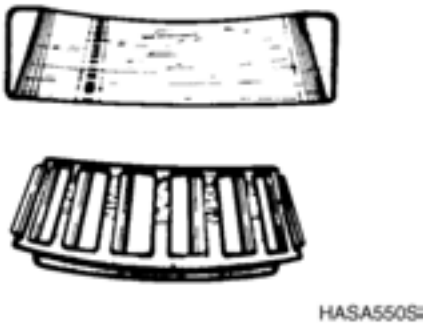
HASA540S

Figure 11

Cage Wear

Wear around outside diameter of cage and roller pockets caused by abrasive material and inefficient lubrication.

Replace bearings - check seals.



HASA550S

Figure 12

TORQUE WRENCH EXTENSION TOOLS

Very large diameter, high-grade fasteners (nuts, bolts, cap screws, etc.) require a great deal of turning force to achieve recommended tightening torque values.

Common problems that could occur as a result are:

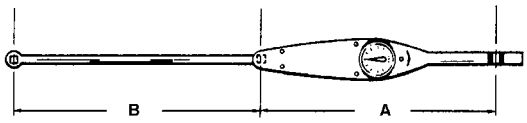
- Recommended torque exceeds the measuring capacity of the torque wrench.
- Specialized sockets do not fit the adapter on the front end (nose) of the torque wrench.
- Generating adequate force on the back end (handle) of the wrench is difficult or impossible.
- Restricted access or an obstruction may make use of the torque wrench impossible.
- A unique application requires fabrication of an adapter or other special extension.

Most standard torque wrenches can be adapted to suit any one of the proceeding needs or situations, if the right extension tool is used or fabricated.

Torque Multiplication

A wrench extension tool can be used to increase the tightening force on a high capacity nut or bolt.

For example, doubling the distance between the bolt and the back (handle) end of the torque wrench doubles the tightening force on the bolt. It also halves the indicated reading on the scale or dial of the torque wrench. To accurately adjust or convert indicated scale or dial readings, use the following formula:



0552A

Figure 1

I = A x T/A + B where:

I = Indicated force shown on the torque wrench scale or dial.

T = Tightening force applied to the nut or bolt (actual Torque).

A = Length of the torque wrench (between the center of the nut or bolt and the center of the handle).

B = Length of the extension.

As an example, if a 12" extension is added to a 12" torque wrench, and the indicated torque on the dial reads "150 ft lb", the real force applied to the bolt is 300 ft lb:

$$I = \frac{A \times T}{A + B} = \frac{12 \times 300}{12 + 12} = \frac{3600}{24} = 150$$

INSPECTION

Cleaning the Engine

The engine must be cleaned before starting work.

Clean with water and use a hot wash. Also use a degreasing agent, if necessary.

Avoid spraying water on the engine control unit, see illustration. Clean the components that are inside the marked area.

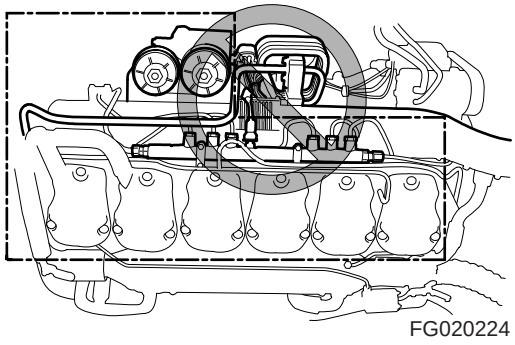


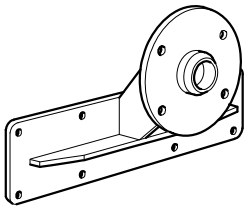
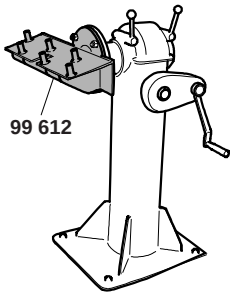
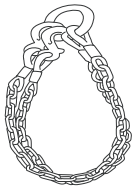
Figure 2

CAUTION

AVOID INJURY

Wear personal protective equipment (PPE) when cleaning engine with hot pressurized water.

SPECIAL TOOLS

Number	Designation	Picture	Tool Board
99 331	Fixture	 FG020229	A
587 692	Universal Stand	 FG020230	
98 094	Lifting Chain	 FG020233	

TIGHTENING TORQUES

Normal Tightening Torque

The specifications in the tables below show the normal tightening torque for screws, nuts and unions. The values are to be used unless other values are specified in the inspection information. Always check whether there are special tightening torques given in the descriptions for the respective areas in the inspection information before using the general values for normal and special tightening torques respectively.

The following conditions apply:

- A tolerance of ±15 % applies to all values unless otherwise specified.
- All contact surfaces are to be clean and free of paint.
- Bolts and nuts are normally not lubricated regardless of surface treatment. All exceptions are specified in the inspection information.

Union Assemblies

The specified values apply with a tolerance of **±5** %. The values apply to tightening with a counterhold.

Thread Inserts

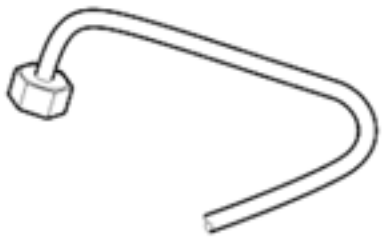
The specified tightening torques also apply to bolted joints with a thread insert (Heli-Coil).

Thread inserts often provide greater strength compared to a directly screwed thread. This generates a stronger bolted joint in aluminum or the like.

NOTE: *When a damaged thread is repaired with a thread insert, the normal screw and prescribed tightening torque are to be maintained. Install the thread insert as instructed in the inspection information.*

Pressure Pipe

- Nut (M20): 38 Nm
- Nut (M16): 38 Nm
- Nut (M18 x 1.5): 35 ±5 Nm

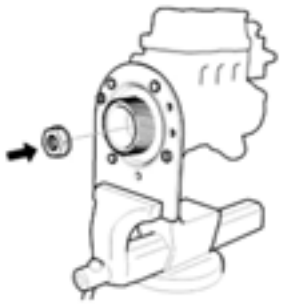


Accumulator

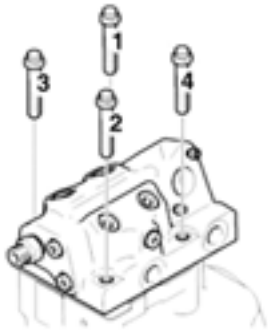
- End connection: 27 Nm + 90°
- Safety valve: 27 Nm + 90°
- Pressure sensor: 47 Nm

High-pressure Pump

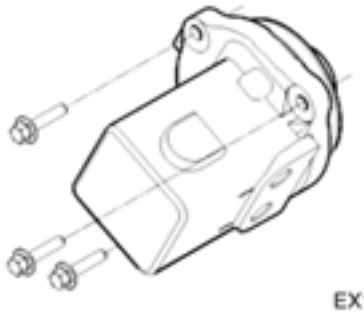
- Pump gear: 300 Nm



- High-pressure pump, cylinder head bolt: 68 Nm



- Screw for feed pump: 25 Nm



CYLINDER

Cylinder Head

Specifications

Intake Valve	
Oversize Valve Seat, Outer Diameter	46.254 - 46.265 mm
Valve Seat Position, Outer Diameter	46.200 - 46.216 mm
Valve Seat Position, Deep	11.25 - 11.35 mm
Exhaust Valve Seat	
Oversize Valve Seat, Outer Diameter	44.281 - 44.292 mm
Valve Seat Position, Outer Diameter	44.200 - 44.216 mm
Valve Seat Position, Deep	11.25 - 11.35 mm

- Remove cylinder head according to the work description Operation & Maintenance Manual.
- Remove inlet and exhaust valves according to the work description Operation & Maintenance Manual.

Overview

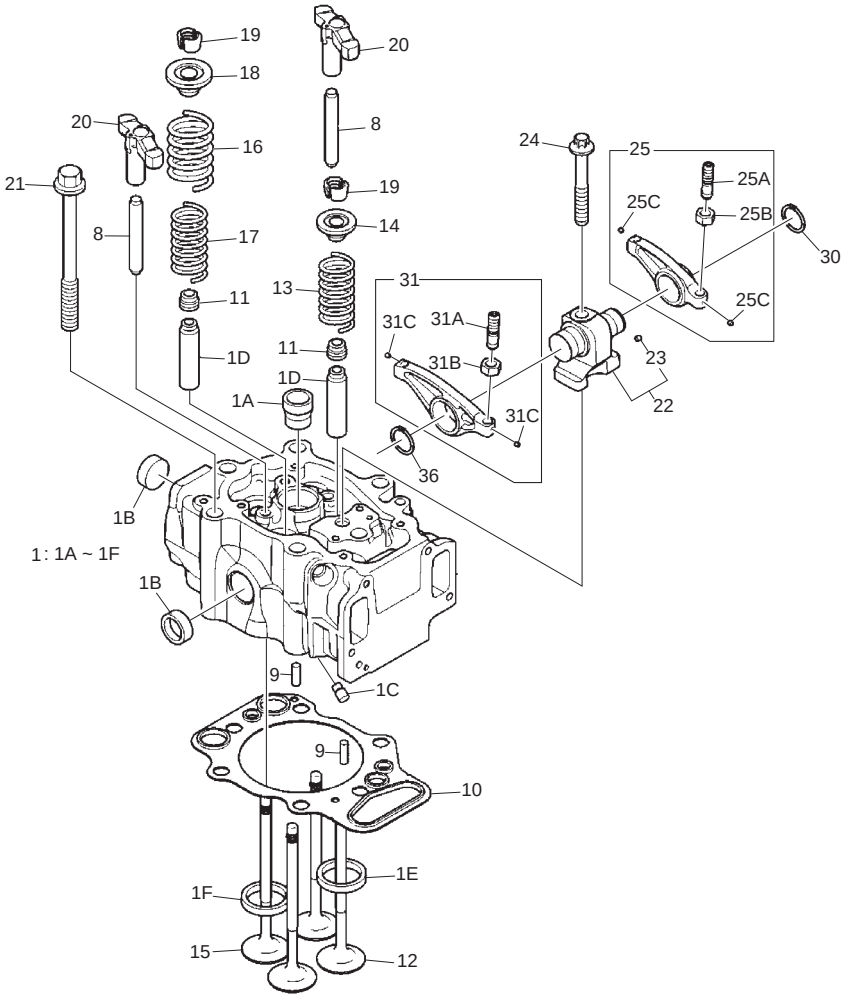


Figure 28

EX1302147

8. When the sealing surface of the valve seat insert has been machined, reduce the cutting pressure by turning 2 - 3 revolutions without any feed. Continue turning clockwise while turning the screw counterclockwise until cutter is free.

   Disconnect the solenoid by briefly pressing switch position 2.

9. Continue with the next valve seat insert as described in the steps above.

Height Check Valve Seat Insert

1. Make sure that cylinder head is clean.

   NOTE: *Use the same exhaust valve for the measurement below to avoid measurement errors.*

2. Install the exhaust valve in the first valve guide. Measure the height of the exhaust valve.

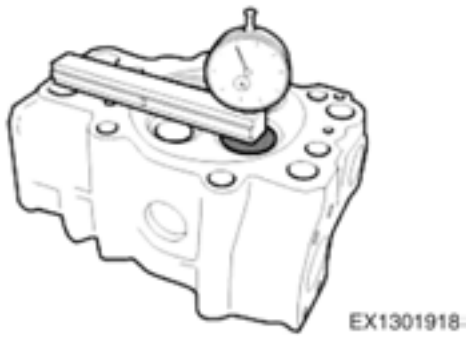


Figure 66

3. Install the same exhaust valve in the second valve guide. Measure the height of the exhaust valve.

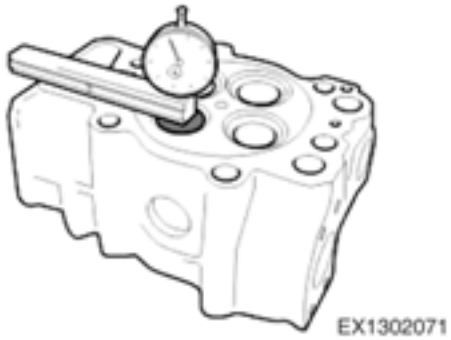


Figure 67

4. The height tolerance between exhaust valves is ±0.05 mm. If the difference is greater, machine the valve seat insert which is highest until height tolerance is obtained.

   Also check that distance between the valve disk and the bottom of the cylinder head is not less than 0.71 mm as shown in the illustration.

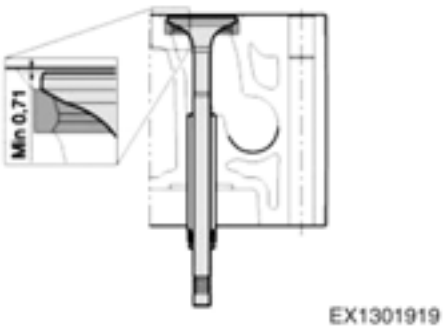
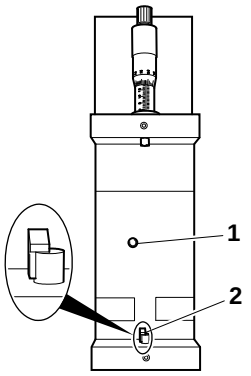


Figure 68

IMPORTANT

Measure the lower cylinder liner diameter to make sure the cylinder liner mounted in the cylinder block is 139 mm (5.47 in) or 140 mm (5.51 in).

Reference Number	Description
1	Pin
2	Loose Stop Lug

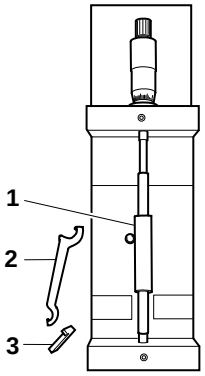


FG020334

Figure 107

1. Check the fixture. Insert the gauge and check that micrometer indicates 0.00 mm. The loose stop lug must be removed to use the gauge. Install the loose stop lug after checking and adjusting if required.

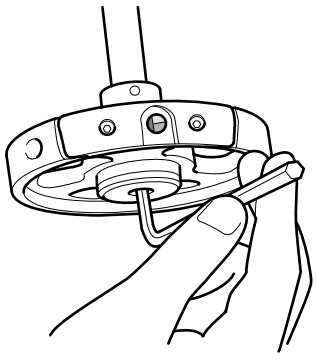
Reference Number	Description
1	Gauge
2	Key
3	Loose Stop Lug



FG020335

Figure 108

2. Remove hexagon socket screw in the center of the cutting head.

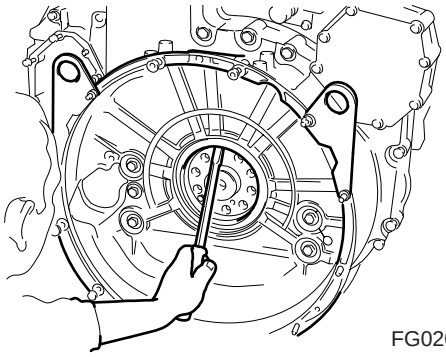


FG020336

Figure 109

Replacing the Rear Crankshaft Seal

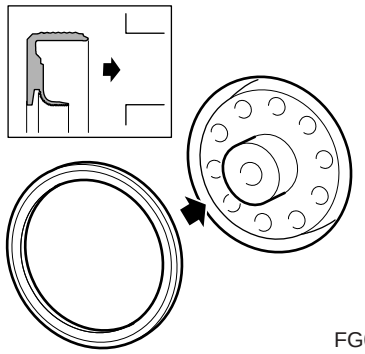
1. Remove flywheel according to instructions.
2. Remove crankshaft seal using a screwdriver. Take care not to scratch the sealing surfaces on the crankshaft and the flywheel housing. Alternatively a self tapping screw can be screwed into the crankshaft seal so the crankshaft seal can be pulled out with a slide hammer.



FG020374

Figure152

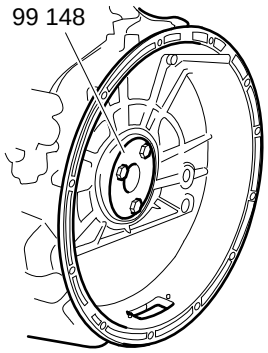
NOTE: *The crankshaft seal must be installed dry and must not be lubricated. The sleeve in the seal must be left in place. Do not touch the sealing lip with your fingers.*



FG020375

Figure 153

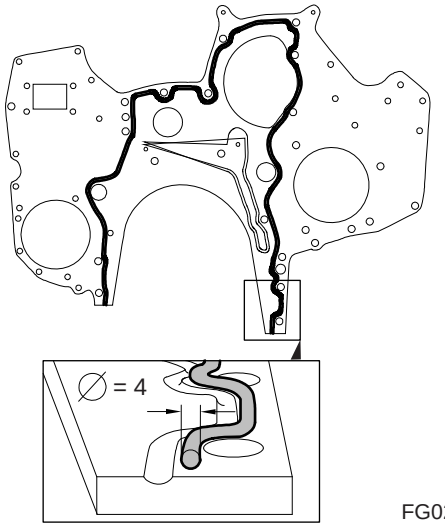
3. Install a new crankshaft seal using tool 99 148. Place the crankshaft seal on the tool and fasten the tool with the bolts.
4. Tighten the bolts alternately until tool stops against the cover. Then remove tool and the protection ring of the crankshaft seal.
5. Clean the flywheel sealing surface using degreasing agent and wipe it dry before assembly.
6. Install the flywheel according to instructions.



FG020376

Figure 154

6. Apply sealant to the timing gear plate using nozzle 584 118. The sealant must be placed outside the milled grooves as illustrated. The diameter of the bead must be approximately 4 mm.



FG020396

Figure 183

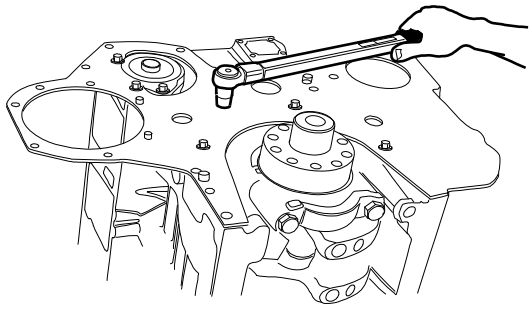
IMPORTANT

Ensure that you apply sealant inside the screw holes, but without allowing sealant into the crankcase. The sealant may block channels and nozzles. This is particularly important to bear in mind around oilways, where the flow of oil to the air compressor or injection pump can be blocked.

IMPORTANT

Assembly must be completed within 25 minutes of starting to apply the sealant.

7. Install the timing gear plate onto the cylinder block. Tighten the screws.
8. Install the intermediate gear as instructed in the work description "Installing Intermediate Gears" on page 4-1-154.
9. Ensure that markings on the camshaft gear point towards the center of the intermediate gear.
10. Install the camshaft gear and tighten the screws.
11. Install the flywheel housing as described in the work description "Installing the Flywheel Housing" on page 4-1-97.
12. Install the flywheel as described in the work description "Installing the Flywheel" on page 4-1-130l.
13. Install all components that were removed from the engine side: High-pressure pump, fuel filter housing with holder, engine control unit.
14. Remove all old sealing compound on the cylinder block and the sealing surface on the front camshaft cover. Clean off any oil and grease from the sealing surfaces using an alcohol based detergent.



FG020397

Figure 184

IMPORTANT

Clean thoroughly, as the sealing surfaces must be completely free of grease.

6. Install the left-hand and right-hand rear adjustable stays (the longer model) on the front sliding bracket. Use 2 anti-slip devices on each stay.

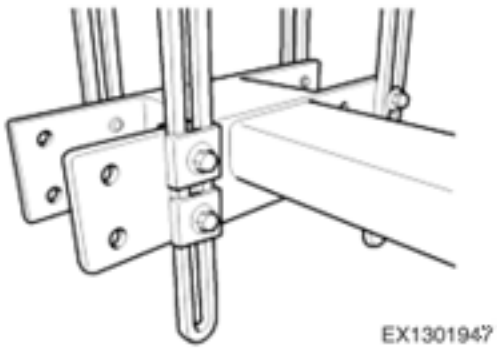


Figure 221 Left

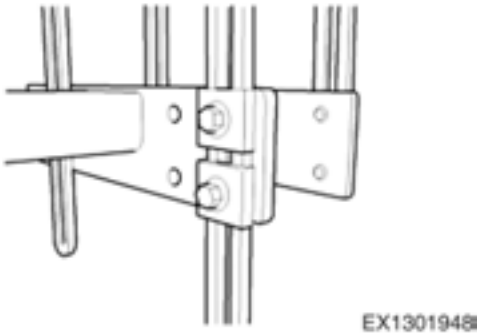


Figure 223 Right-hand Rear Stay

7. Install the 2 upper rollers

   Turn the narrow groove on the roller towards the clutch.

   Install screws and support sleeves between the adjustable stays.

   Tighten the screws of the rollers and the rear adjustable stays to the sliding bracket.

   A. Turn the narrow groove on the roller towards the clutch.

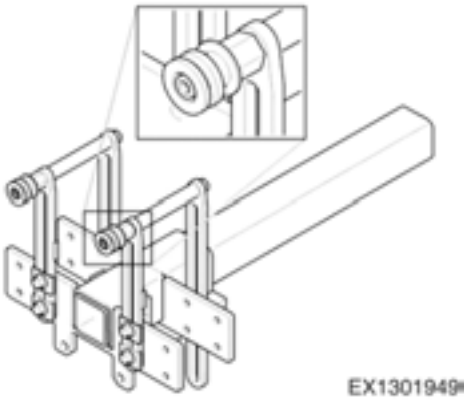


Figure 224

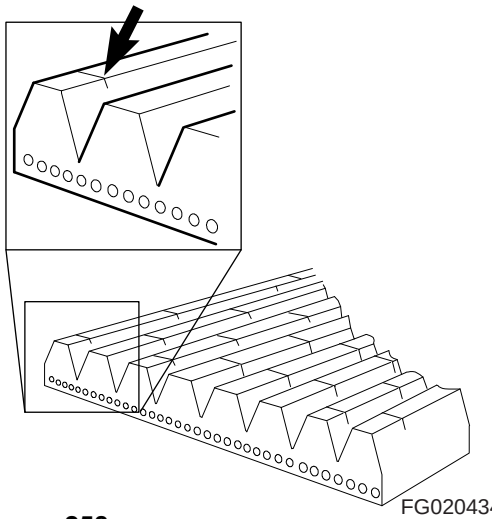
IMPORTANT

The belt tensioner should only be moved in the direction which releases belt transmission tension. The belt tensioner can be damaged if the belt tensioner is tightened in the wrong direction.

7. Check that poly-V-belt is correctly routed on all pulleys and idler rollers.

Checking the Poly-V-Belt

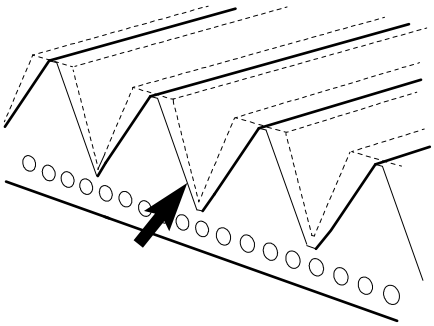
Check poly-V-belt for cracks and wear as follows:



FG020434

Figure 258

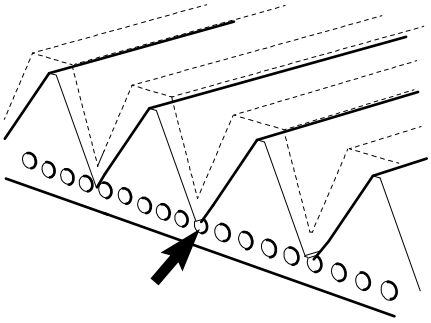
NOTE: *The poly-V-belt has cracks and must be replaced.*



FG020435

Figure 259

NOTE: *Poly-V-belt beginning to show signs of wear. The Poly-V-belt may be reinstalled.*



FG020436

Figure 260

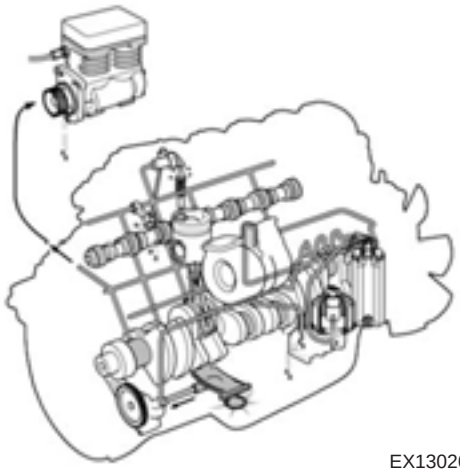
The oil pump draws lubrication oil from the oil sump by the oil strainer.

After the oil pump, the lubricating oil passes a safety valve. If the oil pressure exceeds 9.5 bar, the safety valve opens and feeds the lubricating oil back to the oil sump. If the oil pressure is too high, the oil pump and other lubrication system components may be exposed to severe stress.

The lubrication oil then passes through the oil cooler. Some of the lubrication oil is passed through the centrifugal oil cleaner. After cleaning, the oil is fed back to the oil sump.

The rest of the lubrication oil passes through a relief valve which regulates the pressure in the oil system. Excess lubricating oil is drained back to the oil sump.

The lubrication oil passes on to the oil filter for cleaning.



EX1302096

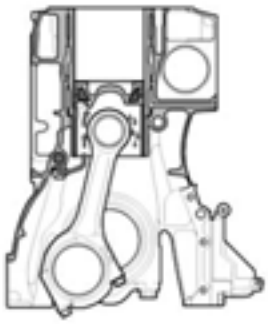
Figure 292

Lubrication oil reaches the camshaft bearings and crankshaft main bearing by ducts in the cylinder block.

Ducts in the crankshaft lead the lubrication oil to the connecting rod bearings.

A duct leading from the main duct takes lubrication oil to the rocker arms.

The channel is constantly pressurized. The oil is fed to the roller tappet shafts by grooves in the camshaft bearing. The roller tappet shafts have drilled ducts for lubricating the roller tappets.



EX1302097

Figure 293

The pistons are cooled by the lubrication oil. Oil is sprayed up under the piston crown through special nozzles, one for each cylinder.

The piston cooling valve opens at 1.7 - 2.2 bar.

There is no piston cooling at low speed (Idling).

EX1302098

Figure 294

Troubleshooting

If chips are discovered, for example, in the engine oil, oil sump, engine oil filter, centrifugal oil cleaner or on the drain plug, there is a fault in the engine. Chips act as an internal abrasive and will ruin the engine. Always determine the cause of chips found inside the engine. Clean the parts that are to be reused and rectify any faults.

Magnetic chips are metal particles caused by excessive wear in, for example, gears, shafts, pistons and cylinder liners.

Because chips from bearings are not magnetic, they do not get caught by the magnetic drain plug.

A failed ceramic rod inside the high-pressure pump will result in white ceramic material appearing among the metal chips.

IMPORTANT

When checking the oil filter: Remove complete oil filter housing to stop any chips from entering the clean side. Lift out the filter housing cover with filter. Detach the old filter and check for chips on the inside and the outside of the filter. If there is only a small amount of chips, clean the oil filter housing and install a new oil filter.

See the components in the lubrication system in the illustration below.

NOTE: *high-pressure fuel pump and crankcase ventilation centrifugal oil separator are not part of the illustration.*

Reference Number	Description
1	Oil Strainer
2	Oil Pump
3	Safety Valve (Located in the Oil Pump)
4	Oil Cooler
5	Centrifugal Oil Cleaner
6	Relief Valve (Located in the Oil Cleaner Housing)
7	Oil Filter
8	Piston Cooling Valve (Located in the Oil Cooler Housing)
9	Oil Pressure Sensor (Located in the Oil Filter Housing)

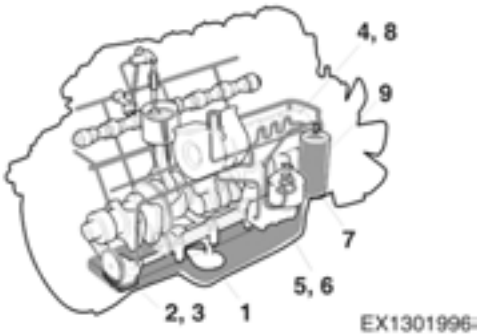


Figure 328

Outline Diagram of the Oil Circulation in the Lubrication System

NOTE: *high-pressure fuel pump and crankcase ventilation centrifugal oil separator are not part of the illustration.*

- The exhaust gases are treated in several steps before being released by the tailpipe. These steps are based on the combustion control mode of the engine control unit.
- Through engine control unit (EMS) regulation, the exhaust gases are monitored and treated several steps before being released by the end pipe. The concentration of NOx is measured by the NOx sensor (8) and the EEC control unit transmits the value to the engine control unit. The exhaust gases then pass the oxidation catalytic converter (13) where the NO2 rate of the exhaust gases increases and any surplus diesel is burned.
- The exhaust gases pass the evaporator (6), where reductant is injected. In order for the process to work, the exhaust gas temperature must have reached 200 - 250°C. The exhaust gas temperature is measured by the temperature sensor (10) and the value read by the EEC control unit and sent to the engine control unit. If the temperature is too low or too high the engine control unit adjusts its combustion control mode.
- The EEC control unit controls the amount of reductant from the reductant tank (1) by activating and indicating the pump speed to the reductant pump (11) and the dose to the reductant doser (12). The values from the NOx sensors, exhaust gas temperature sensor and the combustion control mode of the engine control unit form the basis of the volume of reductant to be metered.
- When reductant has been mixed with the exhaust gases (evaporation), the exhaust gases pass the SCR catalytic converter (9), where the NOx is converted into water and nitrogen. In a last step the exhaust gases pass an ammonia slip catalytic converter (positioned in the SCR catalytic converter) that reduces any ammonia slip.
- Before the exhaust gases are released the NOx concentration is measured by NOx sensor (7). The value is read off by the EEC control unit and transmitted to the engine control unit. The value is compared to the NOx concentration from NOx sensor (8) and forms the basis of the combustion control mode of the engine control unit and any adjustment of the exhaust temperature or reductant dose.
- **Shutdown**
- When the engine is switched off after being subject to heavy loading and heat release, the reductant pump (11) continues for a set period to deliver reductant to the reductant doser (12). However, reductant is not injected into the evaporator (6) but is returned to the reductant tank (1) and has the purpose of cooling the reductant doser (12). Do not switch off the battery master switch during cooling, otherwise the reductant doser may be damaged by the radiated heat from the exhaust system.

IMPORTANT

The SCR system may need up to 30 minutes to cool the reductant doser in extreme conditions. The battery master switch must not be switched off before then.

Checking Reductant Pick-up Unit

Method for checking the reductant pick-up unit.

Fault codes EMS 8255 (low level within limit)

1. Top up with reductant.
2. Go to the next step if a fault code is still registered.

Preparations to check other EMS fault codes (8252/8253/8285/8284)

NOTE: *Remember to shut off the recirculation of coolant from the reductant pick-up unit before removal.*

1. Remove reductant pick-up unit from the tank.
2. Reconnect the cable harness.

Fault codes EMS 8252 or EMS 8253 (level outside limits)

1. Clean the float pipe of crystals.
2. Clean the suction pipe and the return pipe using compressed air and lukewarm water.

IMPORTANT

It takes approximately 3 minutes before ICL indicates the correct level. Wait for the value to stabilize. It is possible to check the reductant level in checking tool.

3. Position the float in the lowest position (1) and check the level on ICL or checking tool.
4. Position the float in the middle position (2) and check the level on ICL or checking tool.
5. Position the float in the uppermost position (3) and check the level on ICL or checking tool.
6. Replace the reductant pick-up unit if it shows the wrong temperature.

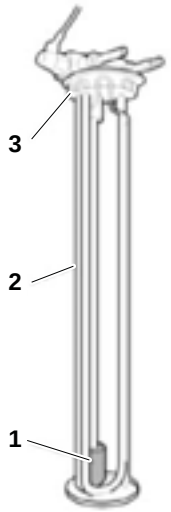


Figure 365 EX1302195

Fault codes EMS 8285 or EMS 8284 (temperature outside limits)

NOTE: *Incorrect temperature in the reductant pick-up unit can cause low consumption of urea.*

NOTE: *It is also possible to measure the resistance manually instead of using checking tool. Measure between pin 2 and pin 3 on sensor T116. The resistance must be approximately 2.2 kohm at 20°.*

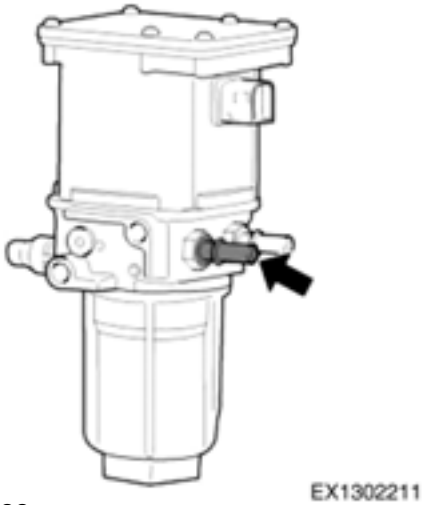
1. Check that temperature for T116 in checking tool is stable.
2. Compare the temperature according to T116 with the temperature according to T27 in checking tool.
3. Replace the reductant pick-up unit if it shows the wrong temperature.

4. Remove pump.

IMPORTANT

Blow the new pump's suction nipple with compressed air (approximately 6 bar) for at least 3 seconds before installing the pump.

5. Install a new pump.
6. Install the electrical connection to the pump.
7. Install the hoses to the pump. Use soapy water or distilled water with a 3% urea mixture if required.
8. Remove clamps from the coolant hoses.
9. Perform a system check of the check tool system using checking tool to bleed and function test the system.



EX1302211

Figure 388

Replacing Reductant Filter

EX1302212

Figure 389

EX1302213

Figure 390

Removing the Reductant Tank

1. If necessary, empty the reductant tank by sucking out the fluid or opening the nipple.

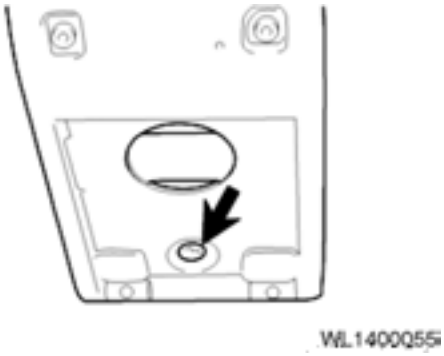


Figure 415

2. Undo the screws and remove straps.

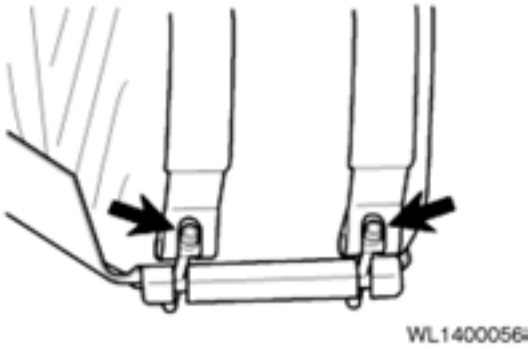


Figure 416

3. Clamp the coolant hose using a welding clamp to stop the coolant flow.

WARNING

AVOID DEATH OR SERIOUS INJURY

The hose contains coolant from the engine. Open the coolant fill cap first to relieve any pressure.

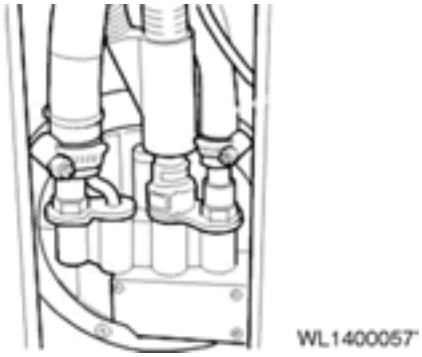


Figure 417

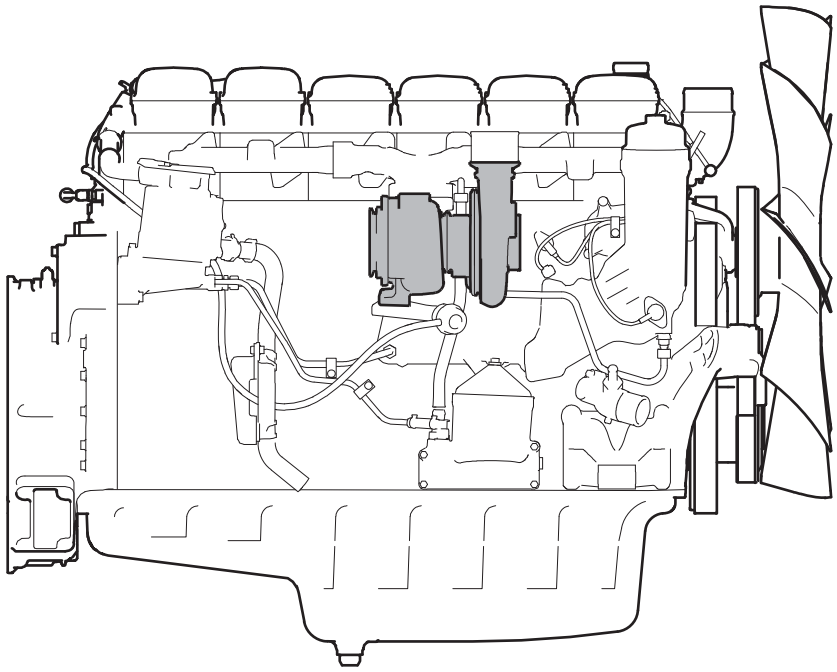
4. Pull out the hoses. These connections may be tight.

5. Remove reductant tank. If there is a lot of fluid in the tank, to make it easier you can pull a strap through the opening in the reductant tank and pull it out on a trolley.

Figure 418

Variable Geometry Turbocharger

Location



FG020504

Figure 454

Function

Variable geometry turbocharger

Like the fixed geometry turbocharger, the variable geometry turbocharger consists of a turbine and a compressor. The turbine is driven by the engine exhaust gases and the compressor compresses the air going into the engine. The compressor impeller and turbine wheel are located on the same shaft. The bearing housing is situated between the compressor and the turbine.

There is an axially movable nozzle ring in the turbocharger which is used to control the width in the turbine intake. When the nozzle ring is moved so gap is reduced, a higher exhaust back pressure is obtained. A higher exhaust back pressure increases the speed of the exhaust gases, which produces a higher turbine rotation speed and therefore a greater airflow into the engine.

The movement of the nozzle ring is controlled by an electric motor which is controlled by the engine control unit. The variable geometry turbocharger then differs here from the conventional one, in which the volume of air going into the engine is directly dependent on the power output without any special regulating system.

The electric motor changes the position of the nozzle ring after receiving a CAN message from the engine control unit. There is

WARNING

AVOID DEATH OR SERIOUS INJURY

Risk of crush injuries. The actuator can be activated automatically when supplied with voltage. Caution!

1. Drain the coolant.
2. Remove cable bracket (A).
3. Remove contact housing (B).

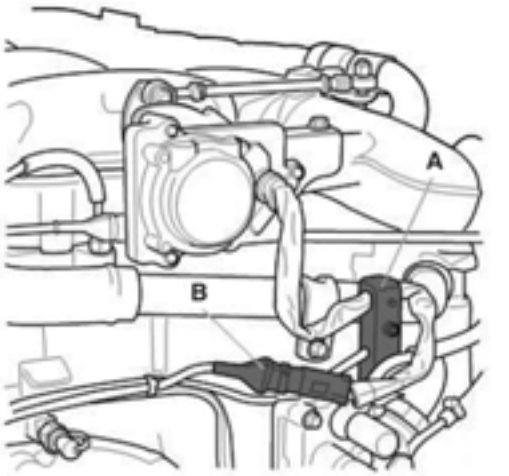


Figure 473

4. Remove nut on the rear to detach the link arm from the actuator.

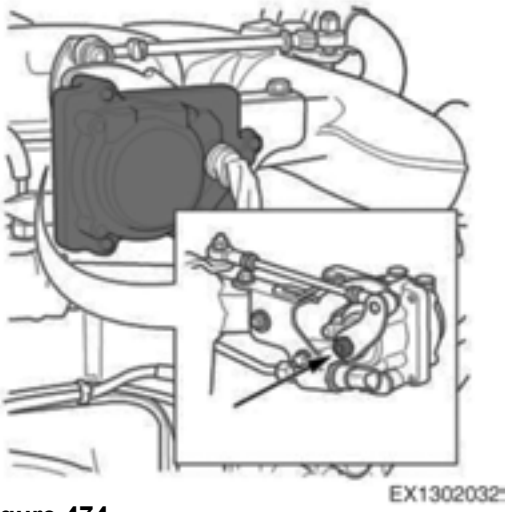


Figure 474

Function

The charge air pressure sensor detects the absolute pressure in the intake manifold, i.e. the atmospheric pressure plus the positive pressure provided by the turbocharger.

The signal from the sensor is directly proportional to the charge air pressure. A high-pressure gives a high voltage and vice versa.

The engine control unit uses the information from the charge air pressure sensor to control the relationship between the intake air and EGR gases going to the engine.

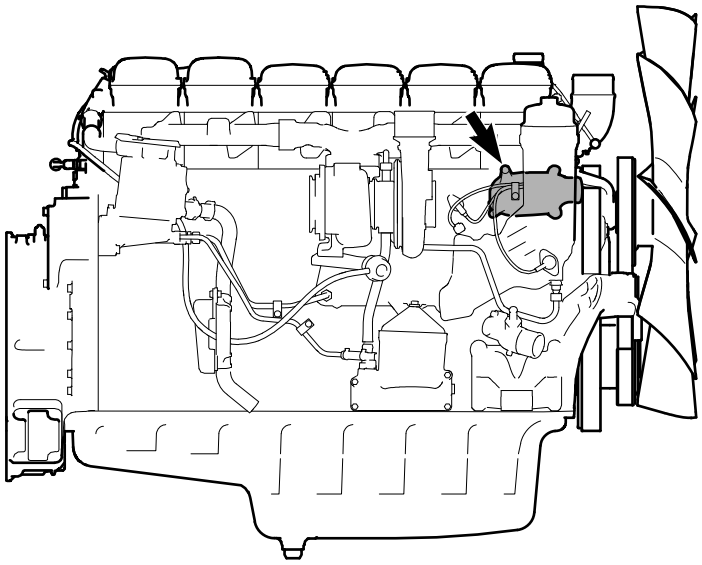
Depending on the factors that requested the acceleration, engine speed, engine acceleration and charge air temperature, the engine control unit will expect a certain charge air pressure. Should there be a fault in the signal, the engine control unit will work to a preset pressure value. At the same time, the engine torque will be limited and a fault code will be generated.

Thermostat

Description

The thermostat is used to regulate the amount of coolant which passes through the radiator.

Location

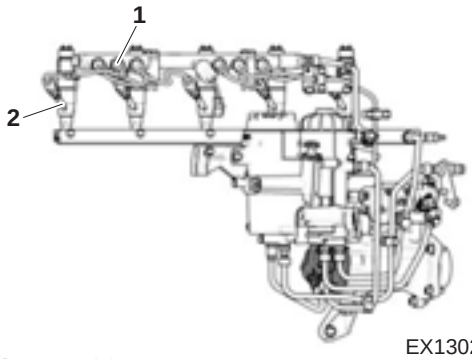


FG020519

Figure 501

NOTE: *Replace coolant hoses if there is clear damage to the coolant hoses which were removed.*

2. Place a rag over the high-pressure pipe cap nut 1 (at the accumulator) of the cylinder in question. Then carefully undo the nut.
3. Undo the cap nut in the other end of the high-pressure pipe and remove pipe.
4. Undo the cap nut at connection 2. Hold tight so the connection is not turned when the cap nut is undone. There is a pin on the connection which can be damaged.



EX1302181

Figure 520

IMPORTANT

Make sure that it is clean around the connection before it is drawn out from the engine. Dirt must not enter the fuel system.

IMPORTANT

A high-pressure pipe that has been loosened or removed, must never be reinstalled but must be replaced by a new one.

5. Pull out the connection from the cylinder head. If it jams and is difficult to pull out, you can replace the cap nut with a nut with part number 812 889 and break carefully with a crow bar.

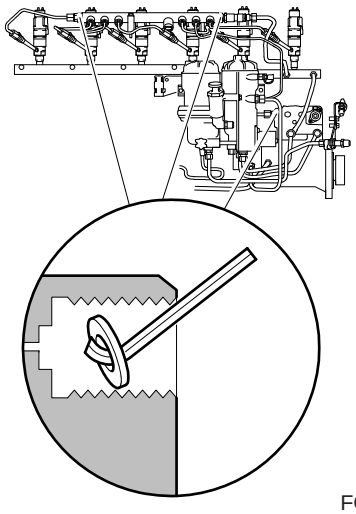

FG020531

Figure 521 When removing unions and safety valve

Several unions and the safety valve in the system are sealed with a sealing washer which must be replaced if the parts have been disassembled. There is a plug at the accumulator end on 5 cylinder engines. This is sealed with the same type of washer. The old washer is often stuck and can be difficult to remove without damaging the sealing surface.

Injector

WARNING

AVOID DEATH OR SERIOUS INJURY

The fuel system has a very high fuel pressure of up to 3,000 bar.

The system should always be treated as pressurized, even when the engine is switched off.

Wear protective gloves and goggles.

IMPORTANT

The fuel system is very sensitive to dirt. It is therefore very important that everything is as clean as possible when work is done on the fuel system.

Compressed air must not be used to blow components clean if the fuel system is open.

When cleaning, cloths or paper which shed fibers must not be used. Use lint-free cloths.

Clean tools before use.

Do not use worn chrome-plated tools as flakes of chrome may come off.

Cover connections of removed components with a lint-free cloth and tape.

IMPORTANT

The holes in the injection nozzles are very small and must not be cleaned with any kind of cleaning tool because it will damage them.

Function

There is one injector for each cylinder. The injector is controlled electrically by the engine control unit.

The injector operates in two phases. One phase is when no power is supplied to the injector and it is closed. The other phase is when power is supplied to the injector and it is open.

The injector consists of a piston, injection nozzle needle, spring and an electromagnetically controlled fuel valve.

The fuel enters the injector by the connection. The injector is continuously pressurized to a maximum of 2,400 bar. When the

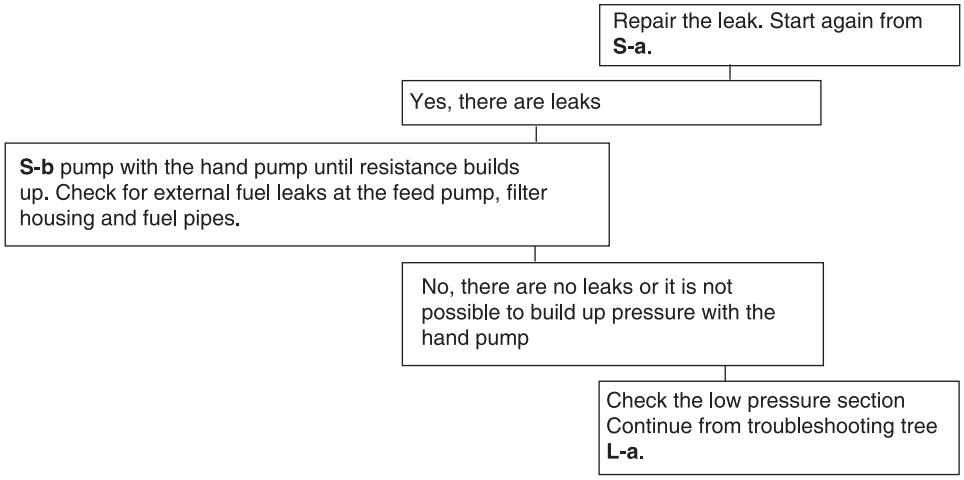


Figure 570

L - Low-pressure Check

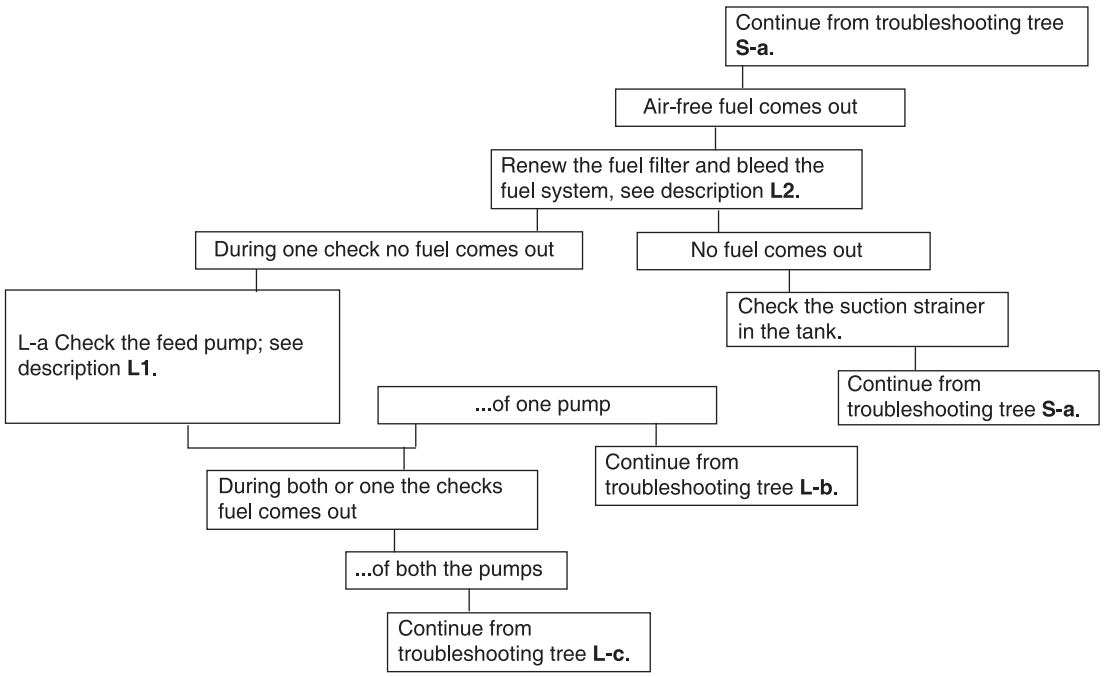


Figure 571

flow of air and exhaust gases into the engine is controlled by the variable or fixed geometry turbocharger, throttle and/or EGR valve.

You can read more about this process in the descriptions covering these components.

Exhaust Brake

If the engine control unit receives a request for exhaust braking, it sends a signal to the exhaust brake proportional valve. The proportional valve then distributes compressed air to the exhaust brake control cylinder. The control receives feedback on the back pressure that exhaust brake creates.

Industrial engines use an electrically controlled damper for the exchange of gases. By controlling the damper position, the exhaust gases are restricted thus creating a back pressure. Apart from enhancing the engine braking action, the back pressure created also warms up the engine more rapidly and keeps the exhaust gas aftertreatment system warm.

Interaction with Other Systems

Functions involving the interaction of the engine control unit with other systems are described below. A more detailed description is provided under the relevant user function.

Request for Torque

The control units for the gearbox management system, GMS, and brake management system, BMS, can, if necessary, request torque by the engine control unit when changing gear and for traction control. The system concerned may request maximum torque for a short period, then the torque is limited to approximately 70% for a further period. If the time limit is exceeded, the engine control unit resumes control.

If both systems request control over torque at the same time, the GMS request has the highest priority.

Request for Limited Torque

The control units for the gearbox management system, GMS, and brake management system, BMS, can, if necessary, request limited torque. The engine control unit then limits the fuel volume according to the system which requests the lowest torque. If required, the fuel injection can be switched off completely. The function is not accessible under start. If the torque is limited so much when idling there is a risk of the engine stopping, the idle speed control will intervene and increase the fuel volume so engine speed is maintained.

Request for Exhaust Brake During Rapid Warm-up and When Using the White Smoke Limiter

During rapid warm-up and when using the white smoke limiter, the engine control unit receives a request from the coordinator

Control Unit Pin	Task	Signal Type	Source/Destination
B15			
B16	Grounding of Reductant Pump	Grounding (0V)	Reductant Pump (V183)
B17	Reductant Pump Speed	Input Signal, PWM Signal	Reductant Pump (V183)
B18			
B19			
B20			
B21			
B22			
B23			
B24			
B25			
B26			
B27			
B28			
B29			
B30	Measuring the Exhaust Gas Temperature Downstream of the Particulate Filter	Grounding (0V)	Temperature Sensor Downstream of the Particulate Filter (T113)
B31	Measuring the Exhaust Gas Temperature Downstream of the Particulate Filter	Input Signal	Temperature Sensor Downstream of the Particulate Filter (T113)
B32	Heating the Reductant Injection Nozzle	Output Signal, PWM Signal	Reductant Injection Nozzle (V117)
B33	Heating the Reductant Injection Nozzle	Grounding (0V)	Reductant Injection Nozzle (V117)
B34			
B35			
B36	Heating the Reductant Pickup Unit	Output Signal, PWM Signal	Reductant Pick-up Unit (V118)
B37	Heating the Reductant Pickup Unit	Grounding (0V)	Reductant Pick-up Unit (V118)
B38	Measuring Reductant Temperature	Input Signal	The Reductant Tank Level and Temperature Sensor (T116) Deviations can occur
B39	Measuring Reductant Temperature and Level	Grounding (0V)	The Reductant Tank Level and Temperature Sensor (T116) Deviations can occur
B40	Measuring Reductant Level	Input Signal	The Reductant Tank Level and Temperature Sensor (T116) Deviations can occur
B41	Heating the Reductant Hose 1 (Option)	Grounding (0V)	Reductant Hose 1 (H25)
B42	Heating the Reductant Hose 1 (Option)	Output Signal, PWM Signal	Reductant Hose 1 (H25)
B43	Heating the Reductant Hose 2 (Option)	Grounding (0V)	Reductant Hose 2 (H26)
B44	Heating the Reductant Hose 2 (Option)	Output Signal, PWM Signal	Reductant Hose 2 (H26)
B45			
B46			

P3, Alternator

Description

The alternator supplies components with current and charges the batteries.

Location

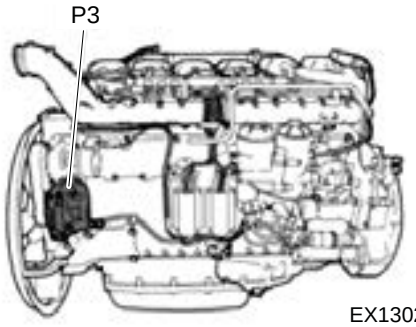


Figure 628

Specification

	100 A
Designation	28V 40/100A
Power at 6,000 rpm	2,800 W
Resistance in rotor	8.5 ohm ±5%
Brush length	> 1 mm

Engine speed (rpm)	**100 A**
500	40
600	60
800	80
1,500	100

Function

The engine control unit determines when the alternator is activated. The engine speed must be sufficient, i.e. approximately 400 rpm, to ensure that activation takes place. The engine control unit receives signals from the alternator if it is active and if charging is taking place. If the engine control unit registers a fault in charging from the alternator, a fault code is generated and the charging light on the instrument panel comes on. After checking the cable harness and connectors, it is advisable to perform a check on the alternator.

The alternator is driven by the engine's poly-V-belt. When the engine speed increases, the alternator speed also increases resulting in a higher alternator voltage.

A charge regulator installed on the alternator is used to ensure that alternator voltage does not become too high when the engine speed increases. It is a transistor type charge regulator and regulation takes place by grounding pin number 2 (L) on the charge regulator.

Connector C4001

Overview

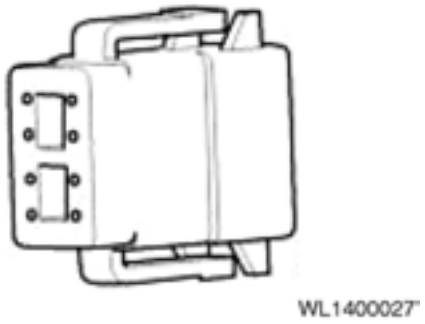


Figure 659

Connection

Pin	Signal
1	Voltage U30 to the Engine Control Unit
2	U31, Ground
3	Voltage U15 to the Engine Control Unit
4	Voltage U30 to the Engine Control Unit
5	U31, Ground
6	CAN Signal High
7	CAN Signal Low
8	Engine Running, + 24 V

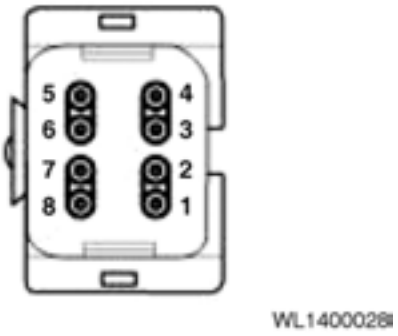


Figure 660

Location

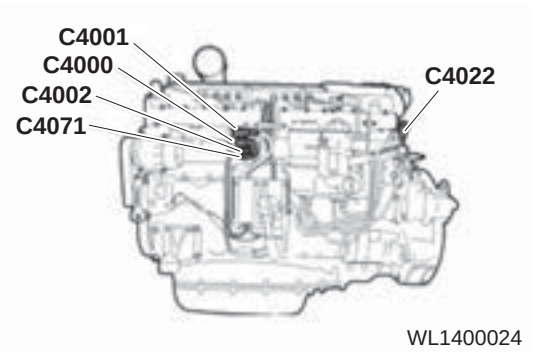


Figure 661

Drivetrain

The oil which is streaming out of the impeller, enters the turbine wheel and is there reversed in the direction of flow.
According to the rate of reversion, the turbine wheel and with it also the output shaft is receiving a more or less high reaction torque.

The stator (reaction member), the following the turbine, has the task to reverse the oil streaming out of the turbine once more and to deliver it under the suitable discharge direction to the impeller.

Due to the reversion, the stator is receiving a reaction torque.
The relation turbine torque/pump torque is called torque multiplication. This is the higher, the greater the speed difference of impeller and turbine wheel will be.

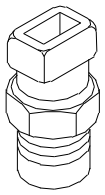
Therefore, the maximum torque multiplication is created at stationary turbine wheel.
With increasing output speed, the torque multiplication is decreasing. The adaption of the output speed to a certain required output torque will be infinitely variable and automatically achieved by the torque converter.

When the turbine speed is reaching about 80% of the pump speed, the torque multiplication becomes 1,0 i.e. the turbine torque becomes equal to that of the pump torque.
From this point on, the converter is working similar to a fluid clutch.

A stator freewheel serves to improve the efficiency in the upper driving range, in the torque multiplication range it is backing-up the torque upon the housing, and is released in the clutch range. In this way, the stator can rotate freely.

Engine Pickup Sensor

1. Detects revolution of gear array in engine side.
2. Specification
   - Resistance: 1050Ω ±10% (at 20°C)
   - Fasten torque: 3.06 kg.m (22 ft lb)
   - Gap: 0.5 + 0.3 mm (0.0197 - 0.0118 in)
   - Output: 4 Pulse/Rev.

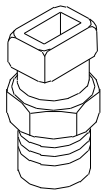


AJS0230L

Figure 19

Central Gear Pickup Sensor

1. Detects revolution of central gear array.
2. Specification
   - Resistance: 1050Ω ±10% (at 20°C)
   - Fasten torque: 3.06 kg.m (22 ft lb)
   - Gap: 0.5 + 0.3 mm (0.0197 + 0.0118 in)
   - Output: 91 Pulse/Rev.

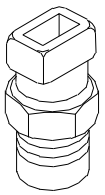


AJS0240L

Figure 20

Turbine Pickup Sensor

1. Detects revolution of gear array in turbine side.
2. Specification
   - Resistance: 1050Ω ±10% (at 20°C)
   - Fasten torque: 3.06 kg.m (22 ft lb)
   - Gap: 0.5 + 0.3 mm (0.0197 + 0.0118 in)
   - Output: 59 Pulse/Rev.

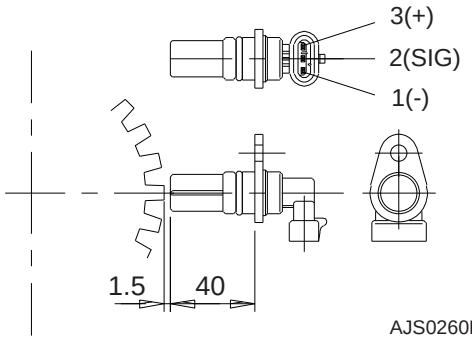


AJS0250L

Figure 21

Output Speed Sensor

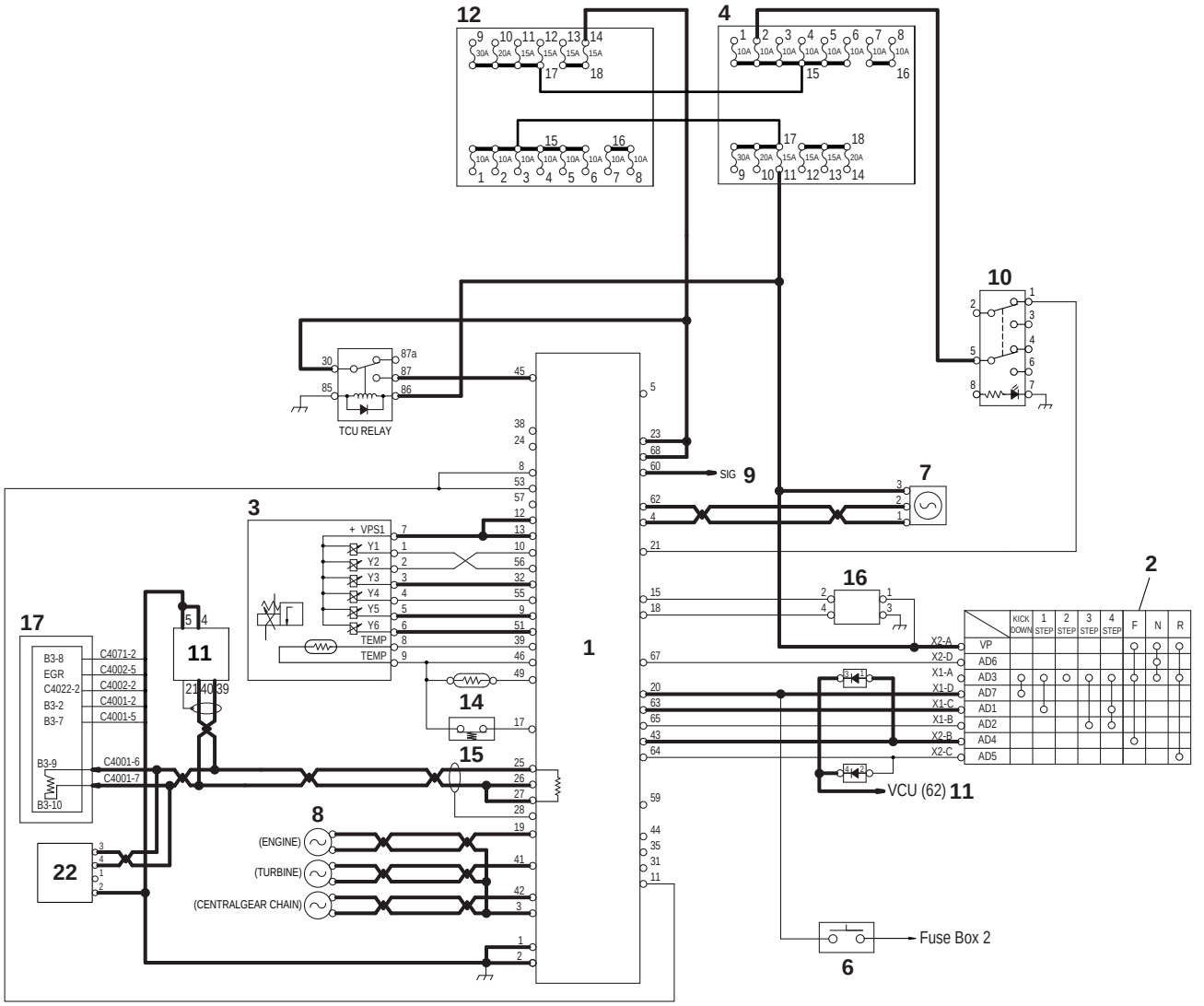
1. Detects revolution of gear array in transmission output side.
2. Specification
   - Voltage Supply: 20 V - 32 V
   - Operation Frequency: 2 Hz - 5 KHz
   - Fasten torque (M8): 2.35 kg.m (17 ft lb)
   - Gap: 0.5 + 0.3 mm (0.0197 + 0.0118 in)
   - Output: 60 Pulse/Rev.



AJS0260L

Figure 22

Kick-down: Forward Second Gear to Forward First Gear
(T/M Shift Switch MAN- Manual Mode)



WL1400345

Figure 45

Reference Number	Description
1	T/M Controller
2	T/M Selector Switch
3	T/M Control Valve
4	Fuse Box 1
6	Downshift Switch
7	Output Speed Sensor
8	Speed Pickup Sensor 3
9	Speedometer

Reference Number	Description
10	Parking Brake Switch
11	Vehicle Controller
12	Fuse Box 2
14	T/M Oil Temperature Sensor
15	Bypass Filter Switch
16	Diagnostic Connector (T/M)
17	ECU
22	Keypad (T/M Shift Switch)

9. Remove retaining clamp (1, Figure 64).

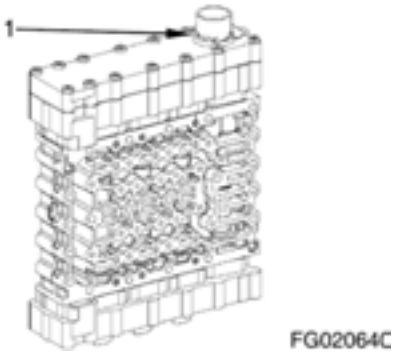


Figure 64

10. Loosen torx screws (1, Figure 65) and remove cover (2, Figure 65). Remove opposite cover (3, Figure 65) in the same way.

    (S) Socket wrench TX-27 5873 042 002

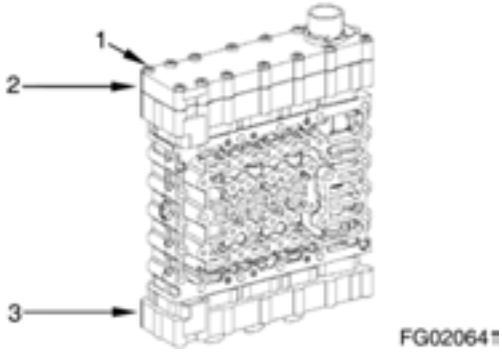


Figure 65

11. Remove wiring harness (1, Figure 66).

    Loosen cylindrical screws (3, Figure 66), remove fixing plates and remove pressure controllers (2, Figure 66).

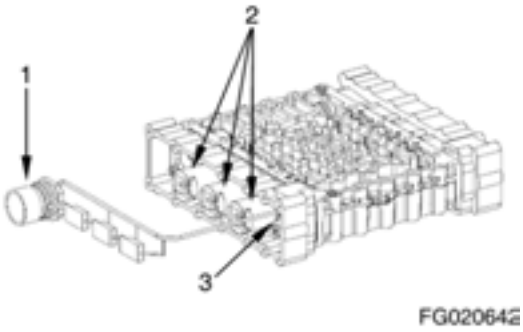


Figure 66

12. Loosen torx screws, remove fixing plates and remove pressure controllers (1, Figure 67) on opposite side.

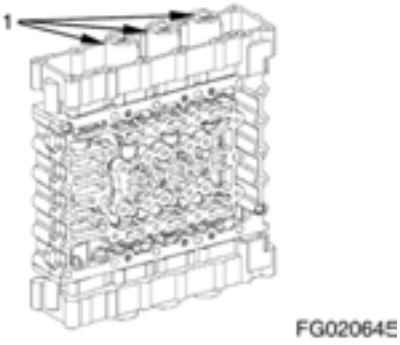


Figure 67

4. Pull clutch (1, Figure 116) off the shaft.

   NOTE: *Disassembly clutch (1, Figure 116) see Figure 122 - Figure 127.*

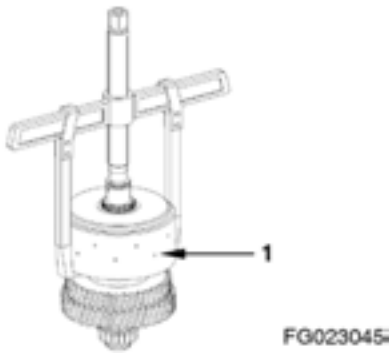


Figure 116

5. Remove idler gear (1, Figure 117) using cut-off device and pull it off the clutch shaft.

   (S) Cut-off device 5870 300 024

   (S) Puller 5870 300 033

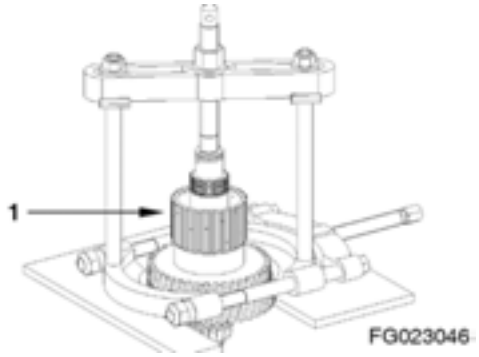


Figure 117

6. Snap retaining ring (2, Figure 118) out of the idler gear (1, Figure 118) and remove ball bearing (3, Figure 118).

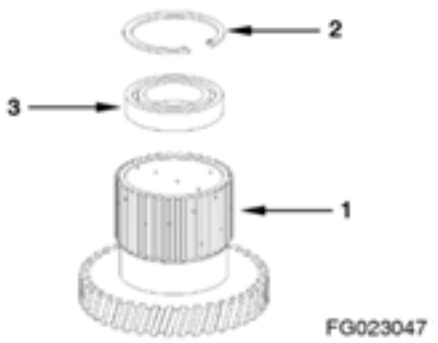


Figure 118

7. Remove needle cage (1, Figure 119) from the shaft (2, Figure 119).

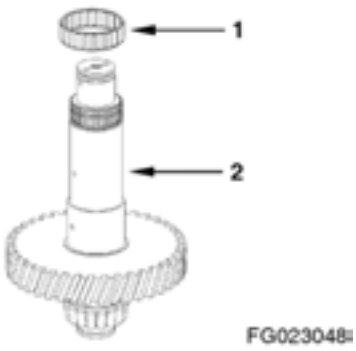


Figure 119

K3 Clutch

1. Snap out piston ring (1, Figure 171).

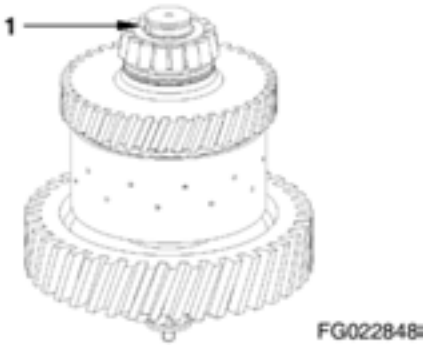


Figure 171

2. Pull tapered roller bearing (inner ring) off the shaft.

   (S) Forcing device 5870 026 100

   (S) Grab sleeve 5873 001 059

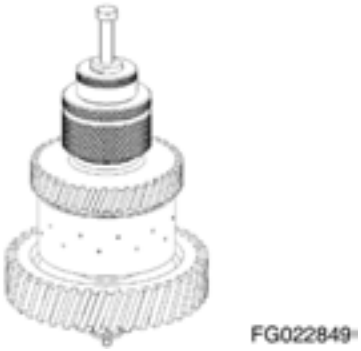


Figure 172

3. Remove axial bearing assembly (1, Figure 173).

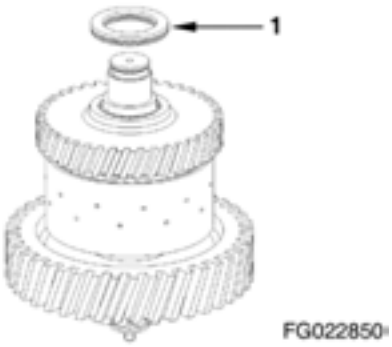


Figure 173

4. Take off idler gear (1, Figure 174), remove needle cage (2, Figure 174) and axial bearing assembly (3, Figure 174).

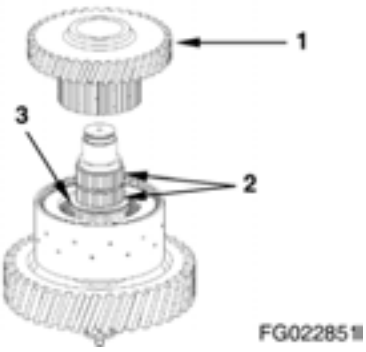


Figure 174

3. Mount needle cage 60 x 68 x 20 (1, Figure 229) onto the shaft and oil it.

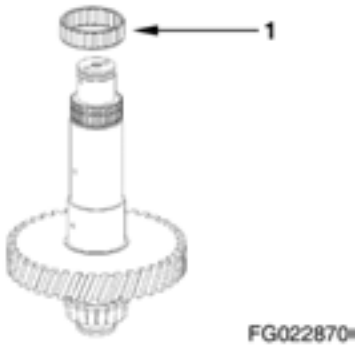


Figure 229

4. Install ball bearing 50x90x18 (2, Figure 230) into the idler gear (1, Figure 230) until contact is obtained and attach it using retaining ring 90x3 (3, Figure 230).

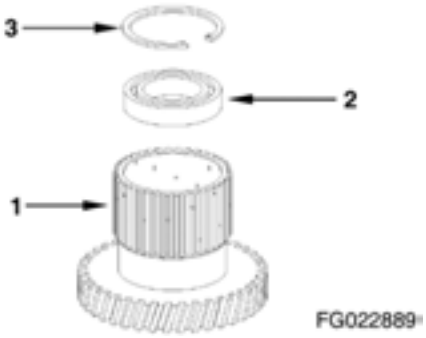


Figure 230

5. Press in preassembled idler gear (1, Figure 231) onto the shaft until contact is obtained.

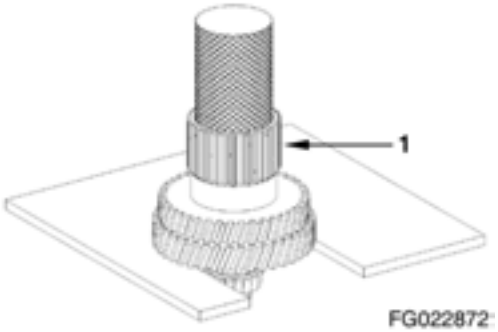


Figure 231

6. Place both O-rings (1 and 2, Figure 232) into the piston grooves and oil them.

Reference Number	Description
1	75 x 3
2	142 x 3

NOTE: *Check function of the drain valve (see arrow). There must be no jamming of the ball.*

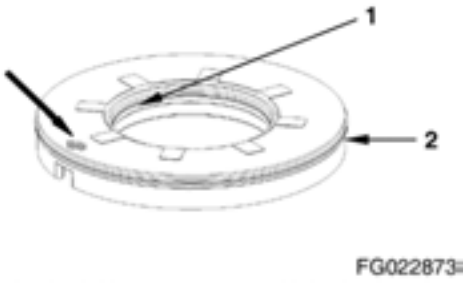


Figure 232

12. Heat up clutch inner diameter (approximately 120°C (248°F)).

FG022882

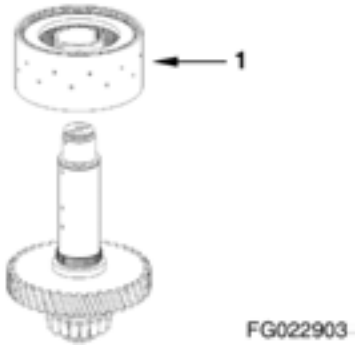
Figure 286

13. Mount clutch (1, Figure 287) until contact is obtained.

CAUTION

AVOID INJURY

Wear protective gloves.

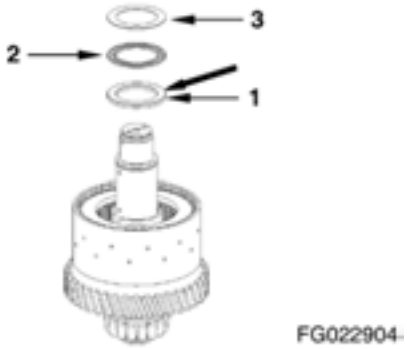


FG022903

Figure 287

14. Mount running disk 55x78x5 (1, Figure 288), axial cage 55x78x3 (2, Figure 288) and axial washer 55x78x1 (3, Figure 288) and oil it.

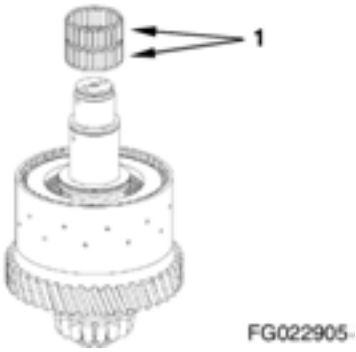
NOTE: *Install chamfer (see arrow) of running disk (1, Figure 288) showing towards the axial cage.*



FG022904

Figure 288

15. Mount needle cage 55x63x50 (1, Figure 289) and oil it.



FG022905

Figure 289

2. Secure drive gear using retaining ring 100x3 (1, Figure 344).

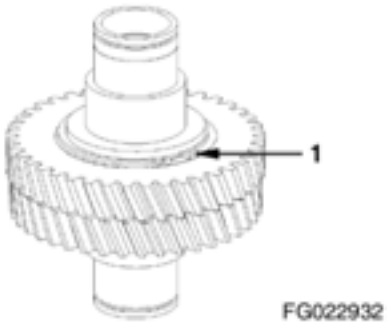


Figure 344

3. Heat up bearing inner ring (approximately 120°C (248°F)).

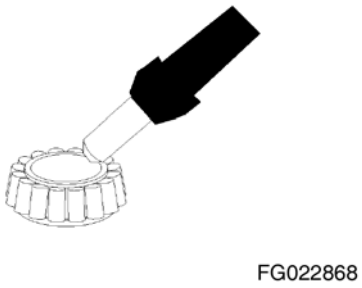


Figure 345

4. Mount bearing inner ring (1, Figure 346) until contact is obtained.

CAUTION

AVOID INJURY

Wear protective gloves.

NOTE: *Adjust bearing inner ring after cooling down.*

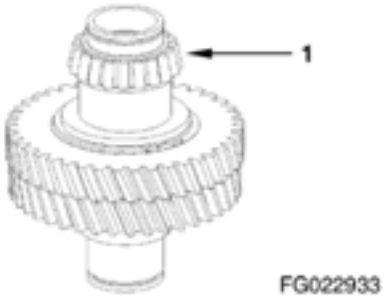


Figure 346

5. Heat up bearing inner ring (approximately 120°C (248°F)).

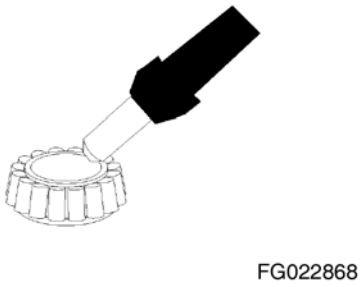


Figure 347

Engine Connection, Oil Pressure Pump, Converter Back-pressure Valve and Temperature Sensor (Measuring Point "63" After the Converter)

Converter Back-pressure Valve

1. The figure shows the single parts of the converter back pressure valve.

Reference Number	Description
1	Oil Feed Housing
2	Piston
3	Compression Spring
4	Pressure Plate
5	Locking Plate

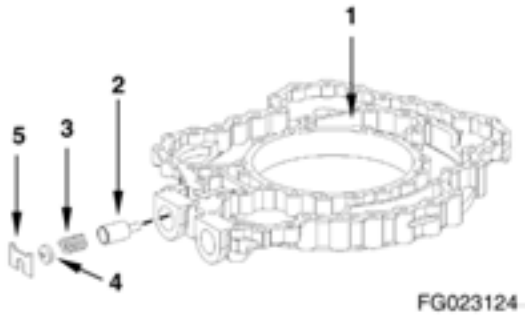


Figure 398

NOTE: *Install pressure plate (4, Figure 398), with the pin (Ø6 mm) showing to the locking plate (5, Figure 398).*

2. Assemble single parts, preload them with assembly aid (S, Figure 399) and attach them using locking plate (1, Figure 399).

   (S) Assembly aid 5870 345 107

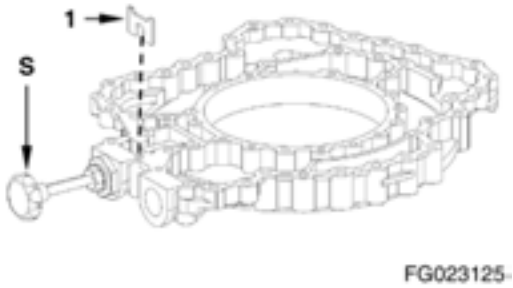


Figure 399

3. Mount temperature sensor (1, Figure 400) with O-ring 11x2.

   Tightening torque M_A = 25 N.m

   NOTE: *Version without temperature sensor: Install a screw plug (1) with O-ring 11x2.*

   Tightening torque (M14x1.5) M_A = 25 N.m

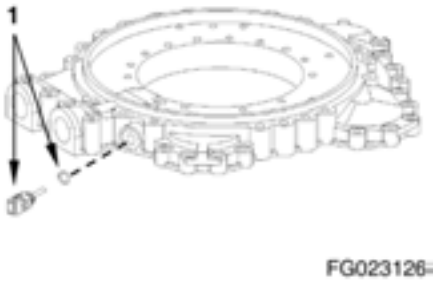


Figure 400

FAILURE CODE

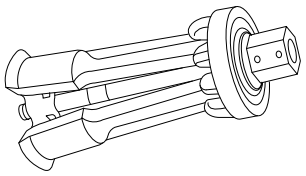
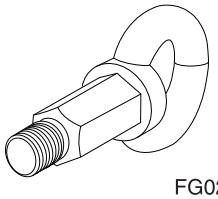
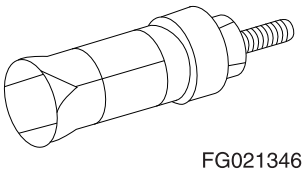
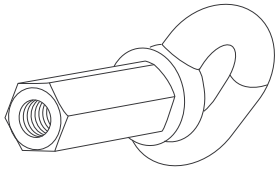
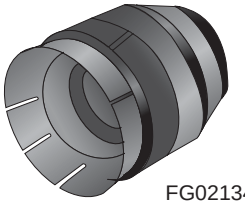
The fault codes shown in this table are a complete list of codes that are common to more than one version of the transmission. Some of the versions are four speed and five speed.

NOTE: *Refer to "Failure Code at Transmission Side" on page 11-1-107.*

NOTE: *This failure code table is applied to both of 4WG and 5WG transmission.*

Fault Code (Hex)	Meaning of the Fault Code (Possible Reason for Fault Detection.)	Reaction of the TCU	Possible Steps to Repair	Remarks
10	Logical error at direction select signal 3rd shift lever. TCU detected a wrong signal combination for the direction. • Cable from shift lever 3 to TCU is broken. • Cable is defective and is contacted to battery voltage or machine ground. • Shift lever is defective.	TCU shifts transmission to neutral if selector active. OP-Mode: transmission shut down if selector active.	• Check cables from TCU to shift lever 3. • Check signal combinations of shift lever positions F-N-R. • If shift lever is a CAN shift lever check CAN cable/shifter/device.	Fault is cleared if TCU detects a valid neutral signal for the direction at the shift lever.
11	Logical error at gear range signal. TCU detected a wrong signal combination for the gear rang. • Cable from shift lever to TCU is broken. • Cable is defective and is contacted to battery voltage or machine ground. • Shift lever is defective.	TCU shifts transmission to neutral. OP-Mode: transmission shut down.	• Check cables from TCU to shift lever. • Check signal combinations of shift lever positions F-N-R.	Fault is taken back if TCU detects a valid signal for the position.
12	Logical error at direction select signal. TCU detected a wrong signal combination for the direction. • Cable from shift lever to TCU is broken. • Cable is defective and is contacted to battery voltage or machine ground.	TCU shifts transmission to neutral. OP-Mode: transmission shut down.	• Check the cable from TCU to shift lever. • Check signal combinations of shift lever positions F-N-R.	Fault is taken back if TCU detects a valid signal for the direction at the shift lever.
13	Logical error at engine derating device. TCU detected no reaction of engine while derating device active	After selecting neutral, TCU changes to OP-Mode limp home	• Check engine derating device.	This fault is reset after power up of TCU.
14	Logical error at parkbrake status. Parkbrake-status-signal measured by TCU and parkbrake-status-signal send by CAN don't fit. • One of the cables from status-switch to electronic box is broken • One of the status-switches is defective.	TCU shifts transmission to DCO-state. OP-Mode: normal	• Check the cables from electronic boxes to status switches. • Check signals of the status switches.	

Fault Code (Hex)	Meaning of the Fault Code (Possible Reason for Fault Detection.)	Reaction of the TCU	Possible Steps to Repair	Remarks
95	S.C. to battery voltage at relay starter interlock. TCU detected a wrong voltage at the output pin, that looks like a s.c. to battery voltage. • Cable is defective and is contacted to battery voltage. • Starter interlock relay has an internal defect. • Connector pin is contacted to battery voltage.	No reaction. OP-Mode: normal	• Check the cable from TCU to the starter interlock relay. • Check the connectors from starter interlock relay to TCU. • Check the resistance of starter interlock relay.	
96	O.C. at relay starter interlock. TCU detected a wrong voltage at the output pin, that looks like a O.C. for this output pin. • Cable is defective and has no connection to TCU. • Starter interlock relay has an internal defect. • Connector has no connection to TCU.	No reaction. OP-Mode: normal	• Check the cable from TCU to the starter interlock relay. • Check the connectors from starter interlock relay to TCU. • check the resistance of starter interlock relay.	
9A	S.C. to ground at converter lock up clutch solenoid. TCU detected a wrong voltage at the output pin, that looks like a S.C. to machine ground. • Cable is defective and is contacted to machine ground. • Converter clutch solenoid has an internal defect. • Connector pin is contacted to machine ground.	Converter lock up clutch solenoid connected at ADMX: TCU switch off VPS2 Op-Mode: normal. Converter lock up clutch solenoid connected at AIP7: TCU switch off VPS2 Op-Mode: normal.	• Check cable from TCU to the converter clutch solenoid. • Check the connectors from converter clutch solenoid to TCU. • Check resistance of converter clutch solenoid.	
9B	O.C. at converter lock up clutch solenoid. TCU detected a wrong voltage at the output pin, that looks like a O.C. for this output pin. • Cable is defective and has no connection to TCU. • Converter clutch solenoid has an internal defect. • Connector has no connection to TCU.	Converter clutch always open, retarder not available. Op-Mode: normal.	• Check cable from TCU to the converter clutch solenoid. • Check the connectors from converter clutch solenoid to TCU. • Check resistance of converter clutch solenoid.	

Disassembly	Reassembly	Subject-No.	Designation / Application Special Tools (S)
See Figure 28		5870 350 113	Fixture
See Figure 32	See Figure 187	5870 300 019	Inner extractor (MT-L-3085 II)  FG022230
See Figure 32	See Figure 187	5870 204 073	Eyebolt (MT-L-3085 II)  FG022231
See Figure 40	See Figure 187	5870 300 017	Inner extractor  FG021346
See Figure 32	See Figure 187	5870 204 076	Eye nut  FG021347
See Figure 33 See Figure 45		5873 014 016 5873 014 013	Rapid grip  FG021348

15. Lift the disk package out of the brake housing.

Figure 37

16. Loosen hexagon screws, remove releasing cover and cup spring.

Figure 38

17. Mount breather valve and press piston out of the brake housing using compressed air.

Figure 39

18. If necessary, remove guide ring, backup rings and grooved rings out of the annular grooves of the brake housing (see arrows).

IMPORTANT

For the installation position of the single parts, refer to the following sketch.

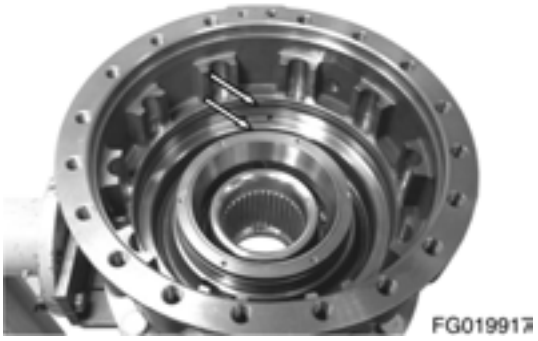


Figure 40

9. Mount two adjusting screws (S) and insert the housing cover until contact with the differential housing is obtained.

   (S) Locating pins 5870 204 040

   Preload the differential using the press and bolt with new locking screws.

   Tightening torque (M16/12.9) M_A = 400 N.m

Figure 96

10. Install compression spring onto the sliding sleeve.

Figure 97

11. Insert the premounted sliding sleeve into the housing cover.

    Preload the compression spring using the press and engage the retaining ring into the annular groove of the sliding sleeve.

Figure 98

12. Setting of disk package

    Premount single parts according to the adjacent sketch.

Reference Number	Description
1	Housing Cover
2	Pressure Piece
3	Cage
4	Lever (12x)
5	Disk Carrier
6	Pressure Ring
7	Inner Disks
8	Outer Disks (Optional)
9	Retaining Ring

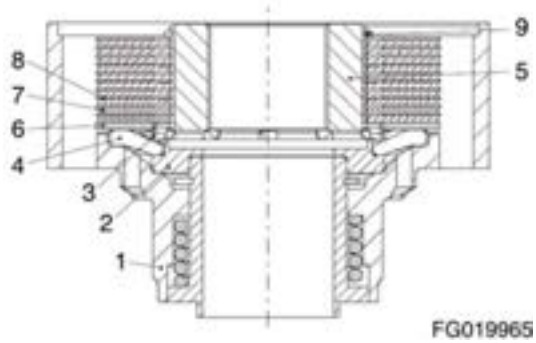


Figure 99

1. Insert the determined shim (e.g. s = 1.0 mm) into the hole of the axle housing and adjust the bearing outer ring (see arrow) until contact is obtained.

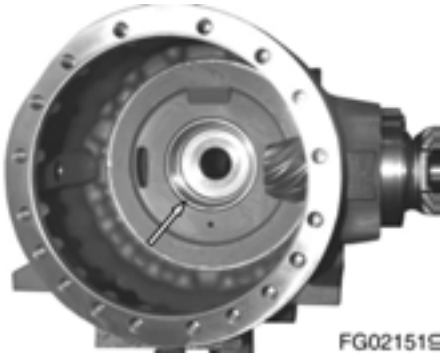


Figure 148

2. Cover some drive and coast flanks of the crown wheel with marking ink.

   Then insert the premounted differential into the axle drive housing.

   (S) Load carrying device 5870 281 083

Figure 149

3. Insert the determined shim (e.g. s = 1.1 mm) into the hole of the axle housing and adjust the bearing outer ring (Figure 148) until contact is obtained.

Figure 150

4. Mount two locating pins (S) and bring the axle housing into contact position with the axle drive housing using the lifting device.

   (S) Locating pins 5870 204 024

   Then preliminarily fix the axle housing with 4 hexagon screws.

   Tightening torque (M20/10.9) M_A = 560 N.m

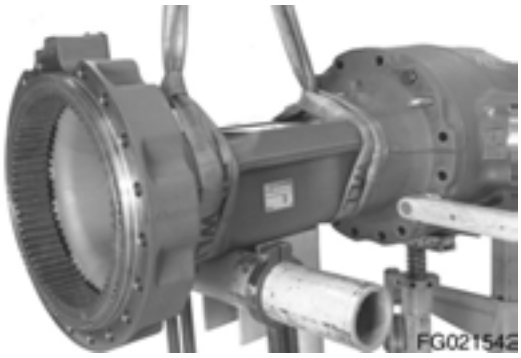


Figure 151

IMPORTANT

Preliminarily mount the axle housing without O-ring.

32. Insert sun gear shaft into the planetary carrier.

Figure 199

33. Insert determined shim(s) e.g. s = 1.60 mm with grease into the sun gear shaft.

Figure 200

34. Install O-ring with grease into the countersink of the brake housing.

Figure 201

35. Grease O-ring (see arrow) and install it to the axle housing.

Figure 202

Tightening Torques for Screws

Tightening Torques for Screws (in N.m) According to Standard

0.12 for screws and nuts without subsequent treatment, and for phosphated nuts.

Unless otherwise specified, the tightening torques can be taken from the following chart:

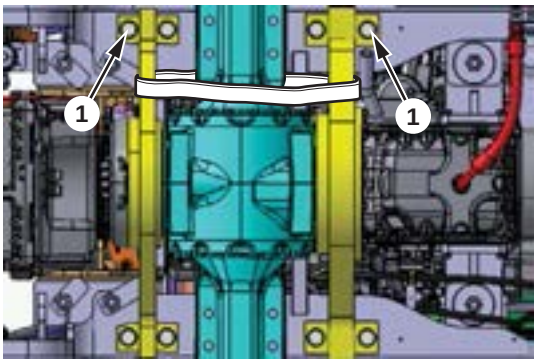
Metric ISO-Standard Thread DIN 13				Metric ISO-Fine Thread DIN 13			
Size	8.8	10.9	12.9	Size	8.8	10.9	12.9
M 4	2.8	4.1	4.8	M 8 x 1	24	36	43
M 5	5.5	8.1	9.5	M 9 x 1	36	53	62
M 6	9.5	14	16.5	M 10 x 1	52	76	89
M 7	15	23	28	M 10 x 1.25	49	72	84
M 8	23	34	40	M 12 x 1.25	87	125	150
M 10	46	68	79	M 12 x 1.5	83	120	145
M 12	79	115	135	M 14 x 1.5	135	200	235
M 14	125	185	215	M 16 x 1.5	205	300	360
M 16	195	280	330	M 18 x 1.5	310	440	520
M 18	280	390	460	M 18 x 2	290	420	490
M 20	390	560	650	M 20 x 1.5	430	620	720
M 22	530	750	880	M 22 x 1.5	580	820	960
M 24	670	960	1,100	M 24 x 1.5	760	1,100	1,250
M 27	1,000	1,400	1,650	M 24 x 2	730	1,050	1,200
M 30	1,350	1,900	2,250	M 27 x 1.5	1,100	1,600	1,850
M 33	1,850	2,600	3,000	M 27 x 2	1,050	1,500	1,800
M 36	2,350	3,300	3,900	M 30 x1.5	1,550	2,200	2,550
M 39	3,000	4,300	5,100	M 30 x 2	1,500	2,100	2,500
				M 33 x 1.5	2,050	2,900	3,400
				M 33 x 2	2,000	2,800	3,300
				M 36 x 1.5	2,700	3,800	4,450
				M 36 x 3	2,500	3,500	4,100
				M 39 x 1.5	3,450	4,900	5,700
				M 39 x 3	3,200	4,600	5,300

19. Tie the rear axle with rope to remove it

Figure 20 WL1400561

20. Remove bolts and washers (1, Figure 21) (4 ea) from the axle support.
    - Tool: 46 mm ( )
    - Torque: 1,667 N.m (170 kg.m, 1,229 ft lb)

    NOTE: *Bind the axle, front support and rear support together after removing their bolts.*

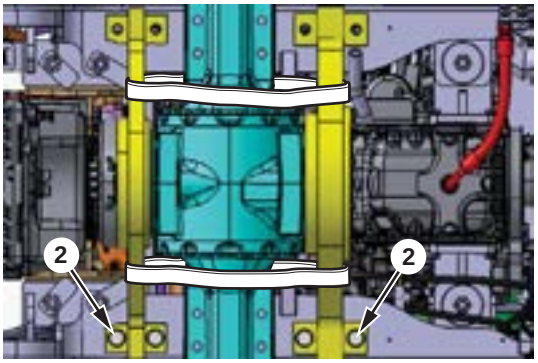


WL1400891

Figure 21 Bottom of the Rear Frame

21. Remove bolts and washers (2, Figure 22) (4 ea) from the axle support.
    - Tool: 46 mm ( )
    - Torque: 1,667 N.m (170 kg.m, 1,229 ft lb)

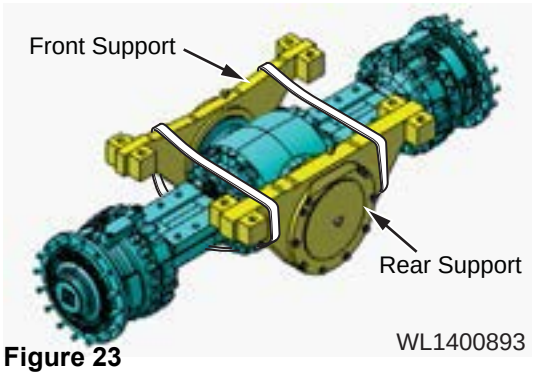
    NOTE: *Bind the axle, front support and rear support together after removing their bolts.*



WL1400892

Figure 22 Bottom of the Rear Frame

22. Move the rear axle slowly and carefully.
    - Weight:
      - Axle: about 1,085 kg (2,392 lb) (with Oil)
      - Front support: about 110 kg (243 lb)
      - Rear support: about 210 kg (463 lb)
      - Total: about 1,405 kg (3,097 lb)



WL1400893

Figure 23

Disassembly Differential

1. Pull both tapered roller bearings from the differential.

   (S) Grab sleeve 5873 012 016

   (S) Basic tool 5873 002 001

Figure 75

2. Preload the differential using the press, loosen the hexagon screws and remove releasing housing cover.

Figure 76

3. Preload the differential using the press, loosen locking screws and housing cover.

Figure 77

4. Remove axle bevel gear with thrust washers from the differential housing.

Figure 78

IMPORTANT

Any deviation from the required installation clearance is to be corrected with corresponding outer disks (s = 2.7, s = 2.9, s = 3.0, s = 3.1, s = 3.2, s = 3.3 or s = 3.5 mm), taking care that difference in thickness between the left and the right disk package must only be 0.1 mm at maximum.

12. Attach the thrust washers into the housing cover using grease.

FG019982

Figure 132

13. Mount two adjusting screws (S) and insert the housing cover until contact with the differential housing is obtained.

    (S) Locating pins 5870 204 040

    Preload the differential using the press and bolt with new locking screws.

    Tightening torque (M16/12.9) M_A = 400 Nm

FG019983

Figure 133

14. Heat both tapered roller bearings and insert until contact is obtained.

CAUTION

AVOID INJURY

Adjust tapered roller bearing after letting it cool.

FG019984

Figure 134

12. Insert disk and cup spring with the convex side showing upwards into the piston.

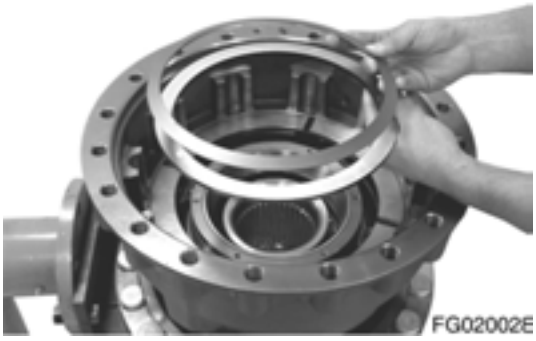


Figure 181

13. Insert cover and attach it using hexagon screws.

    Tightening torque (M8/10.9) M_A = 34 Nm

Figure 182

14. Mount outer and inner disks.

IMPORTANT

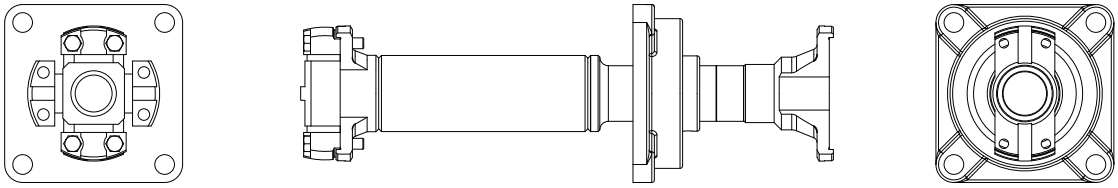
For the number of disks and the disk arrangement please refer to the relating spare parts list.

Figure 183

15. Insert end plate.

Figure 184

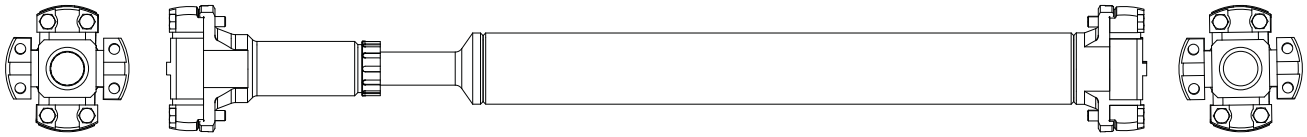
Front Driveshaft



WL1400253

Figure 2

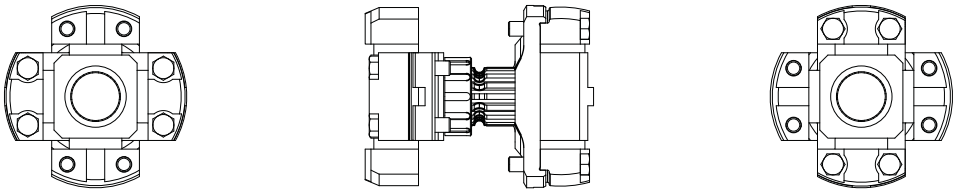
Center Driveshaft



WL1400254

Figure 3

Rear Driveshaft



WL1400255

Figure 4

Theory of Operation

Neutral Operation

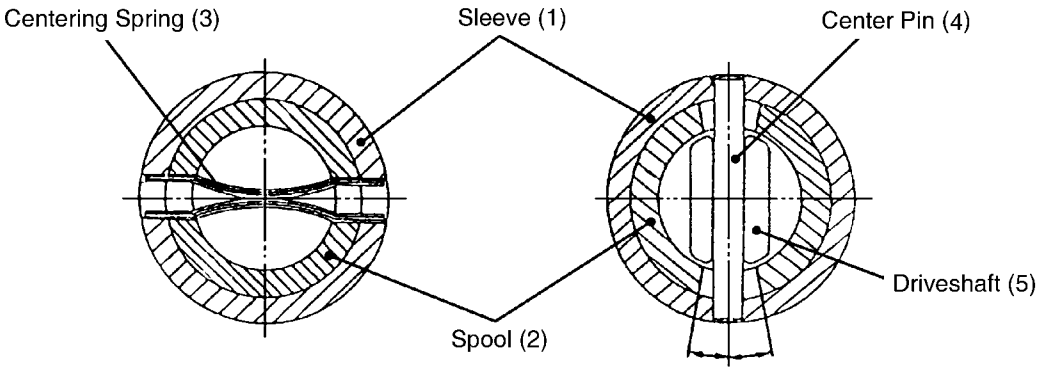


Figure 4

WL1300659

With the steering wheel in the neutral position (wheels turned neither right nor left), the spool (2, Figure 4) and sleeve (1) are stationary at the position where the center pin (4) becomes centered in the spool space by the centering springs (3). Oil flow through the load sensing line (LS), port L, port R, and port T are bypassed to the tank line and the oil supply (P) is blocked by the directional spool in the steering unit. Even if an external force is applied to the steering cylinder, the steering unit is protected because the oil path is blocked by the directional spool.

Right Turn

The spool (2, Figure 4) is engaged with the spline of the steering shaft. When the steering wheel is turned to the right, the spool turns. The sleeve (1) is connected to the spool (2) by centering springs (3). When spool turns, the sleeve turns. The sleeve turning angle is about 10° less than the spool turning angle.
This allows the longitudinal slots in the spool to align with the ports in the sleeve. Oil from port P on the steering unit travels through the control spool and is directed to port R which directs the oil to the steering cylinders. The amount of flow metered to port R is controlled by the amount of steering wheel rotation. Excess oil flow through port P that is not metered to port R, is directed by the spool to port T and is then directed through the oil cooler and into the tank.

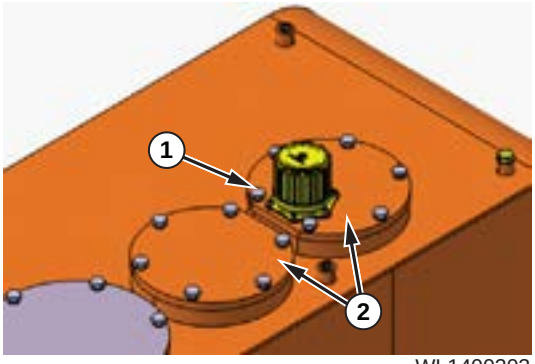
Left Turn

The spool (2, Figure 4) is engaged with the spline of the steering shaft. When the steering wheel is connected to the spool (2) by centering springs (3). When the spool turns, the sleeve turns. The sleeve turning angle is about 10° less than the spool turning angle. This allows the longitudinal slots in the spool to align with the ports in the sleeve. When the steering wheel is turned to the left, oil from port P on the steering unit is directed through the control spool in the steering unit, out port L and into the steering cylinders. The amount of oil flow metered to port L is controlled by the amount of steering wheel rotation. Excess oil flow through port P that is not metered to port L, is directed by the spool to port T and is then directed through the oil cooler and into the tank.

9. Oil drain method

A. Remove bolts (1, Figure 10) (6 ea) with cover (2) on oil tank, drain hydraulic oil using oil pump.

- Tool: 17 mm ( )
- Torque: 63.7 N.m (6.5 kg.m, 47 ft lb)

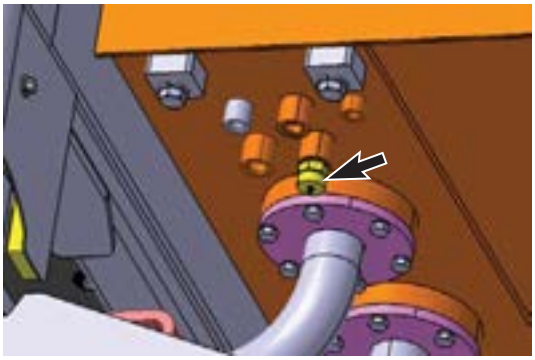


WL1400203

Figure 10

B. Drain hydraulic fluid using drain plug (unscrew). (without oil pump) (Figure 11)

- Hydraulic oil tank volume:
  - (Full): 173 L
- Center of level gauge: 117 L

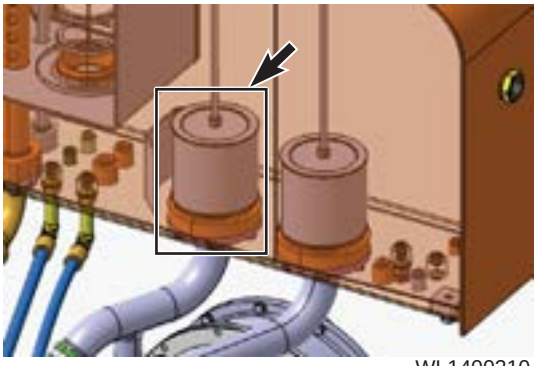


WL1400204

Figure 11

C. Plug the filter cap to location of suction filter. (Figure 12)

Item	Part Number
Filter Cap	2188-1008



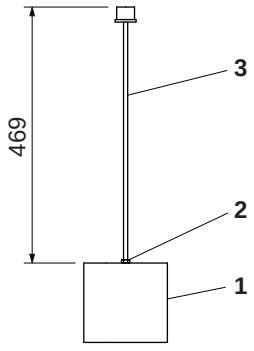
WL1400210

Figure 12

Reference Number	Description
1	Suction Filter
2	Nut
3	Rod

When installing. (Figure 13)

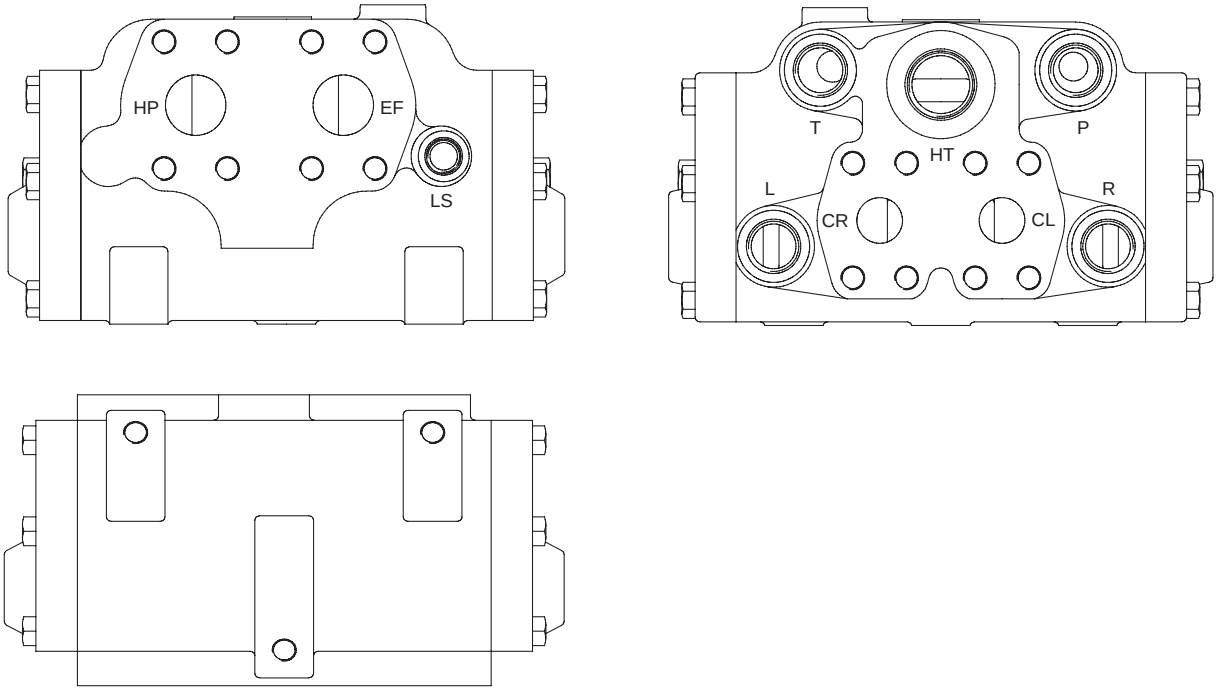
- Torque (2 nut): 88.2 N.m (9 kg.m, 65.1 ft lb)



WL1400200

Figure 13

Port and Hydraulic Circuit

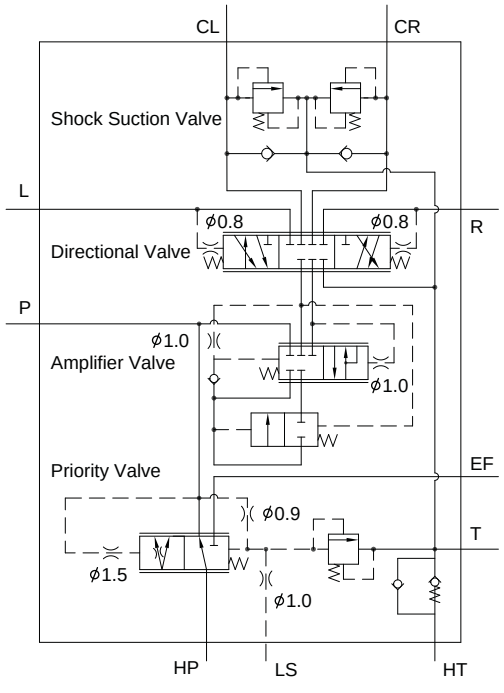


WL1400286

Figure 1

Port Size

Port	Size
HP, EF	1 in SAE Flange
CL, CR, HT	3/4 in SAE Flange
HT	PF 3/4 O-ring Boss
P, T, L, R	PF 1/2 O-ring Boss
LS	PF 1/4 O-ring Boss



WL1400287

Figure 2

25. Remove LS orifice.
    - Tool: 4 mm ( )

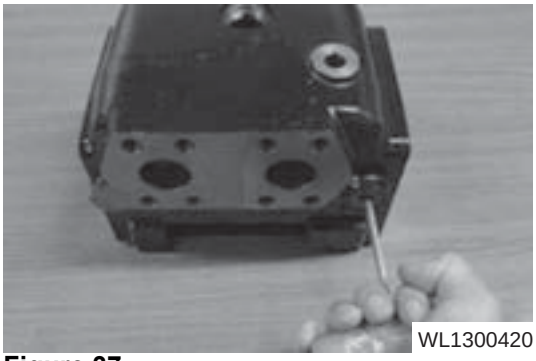

WL1300420

Figure 37

26. Remove orifice.
    - Tool: 4 mm ( )


WL1300421

Figure 38

Body and Cover Parts

27. This is the completely disassembled cover part.

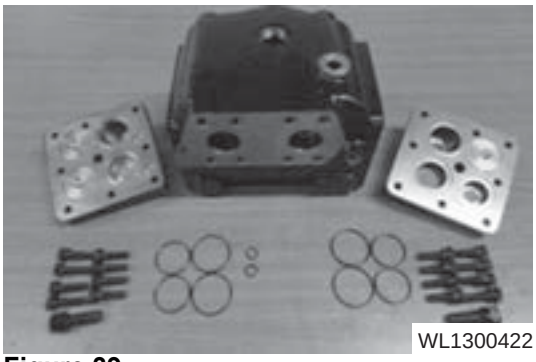

WL1300422

Figure 39

24. Insert the pin.

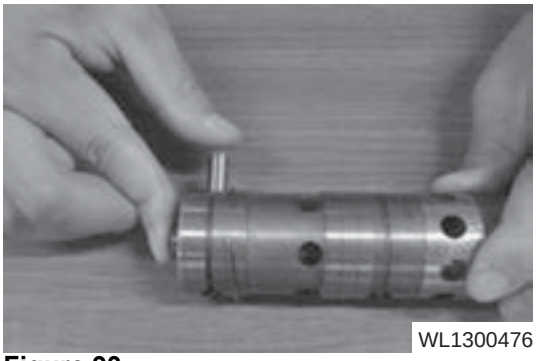

WL1300476

Figure 93

25. Place the stop ring in the groove.

    NOTE: *Do not place the end of the stop ring in the hole.*

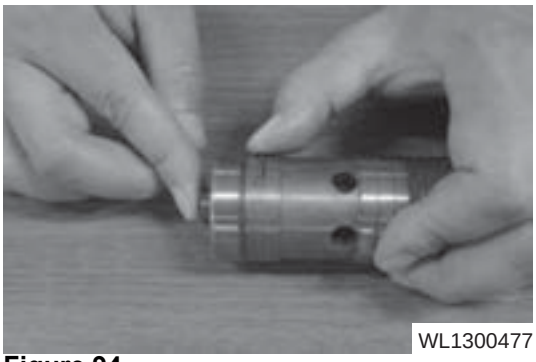

WL1300477

Figure 94

Direction Valve Part

26. Tighten the orifice to clamp it. (Right and left, 2 places)
    - Tool: 4 mm (), ø 2.3 (mandrel)
    - Torque: 4.9 N.m (0.5 kg.m, 3.6 ft lb)

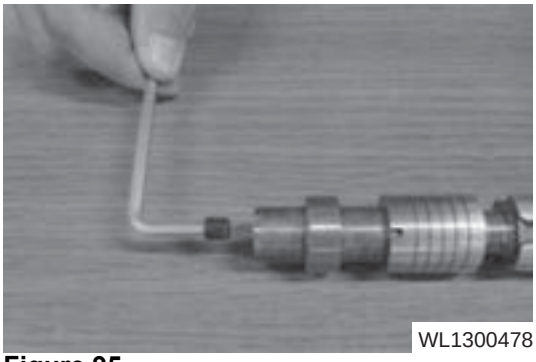

WL1300478

Figure 95

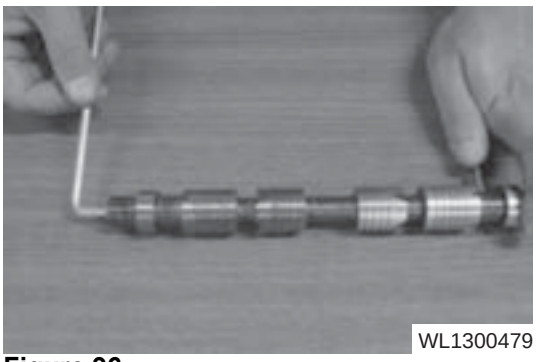
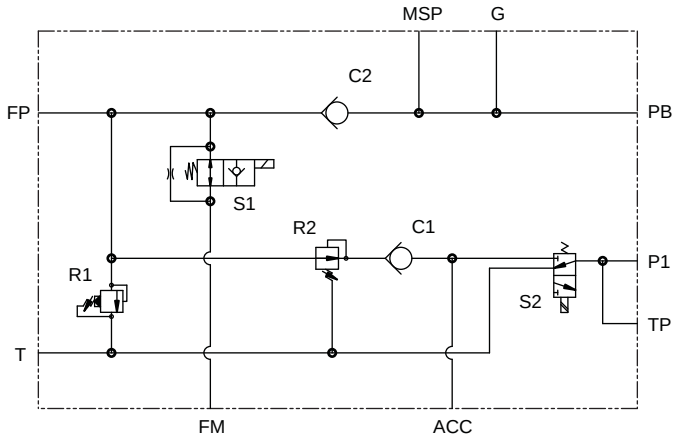

WL1300479

Figure 96

Hydraulic Circuit



WL1300515

Figure 2

Reference Number	Description	Pressure Setting
C1, C2	Check Valve	
R1	Relief Valve	214 ±2 kg/cm² (210 ±2 bar)
R2	Pilot Reducing Valve	31 +2 kg/cm² (30 +2 bar)
S1	Brake Charge Solenoid Valve	
S2	Pilot Cut-off Solenoid Valve	
FP	from Fan Pump	
G	Brake Charging Sensor	
MSP	to Charging Block	
P1	to Pilot Control	
FM	to Fan Motor	
ACC	Accumulator for Pilot	
TP	Pressure Check	

Functions

- Brake charging for service and parking brake (Charged pressure range, 100 - 160 bar)
- Supply pilot pressure, 30 +2 bar
- Variable fan speed control according to temp. of coolant and transmission oil
- Reverse fan (Auto, Manual)

When the pressure of brake charging line (after C2) goes down under 100 bar,

- S1 solenoid valve activates
- The fan pump makes max flow and pressure.

Then the pressure reaches up to 160 bar, brake charging finishes.

Brake charging function by main pump during working and 2 accumulators are added.

2. Release the parking brake by application of the required release pressure (min. 130 bar).
3. Rotate the screw cap in a counterclockwise direction and unscrew it.
4. Release the locknut (1, Figure 6) of the setting screw (2, Figure 6).
5. Rotate the setting screw (2, Figure 6) in an counterclockwise direction until pressure bolt (3, Figure 6) can be pushed completely into the piston (4, Figure 6).
6. Unscrew (lever) the pressure bolt (3, Figure 6) with a suitable screwdriver until it contacts the piston (4, Figure 6).

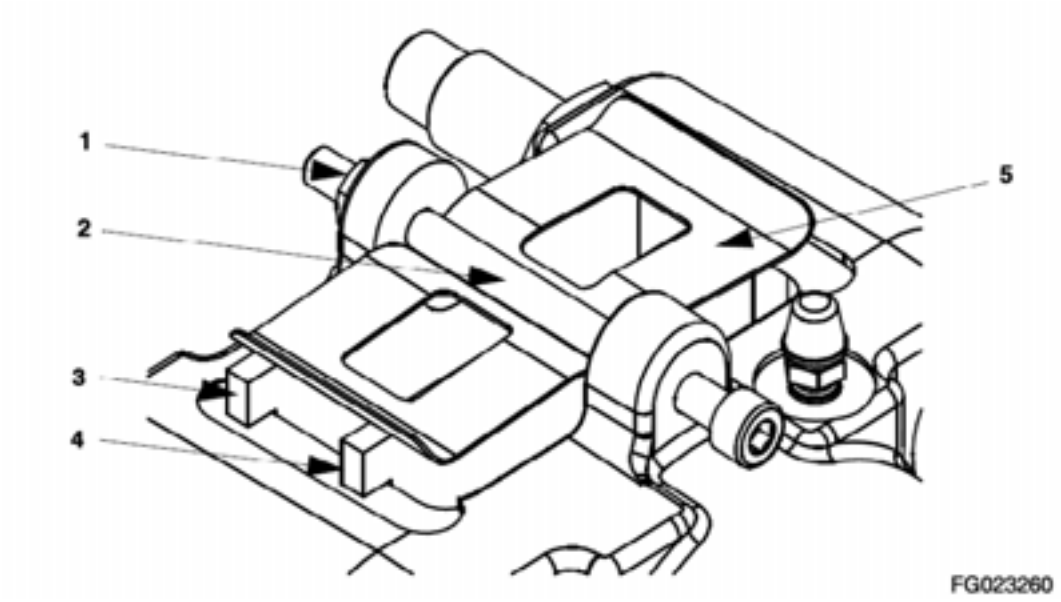


Figure 7

Reference Number	Description
1	Counter Nut 1
2	Adjusting Screw
3	Lining Pad

Reference Number	Description
4	Lining Pad
5	Lining Spring

7. Release the counter nut (1, Figure 7) and unscrew the setting screw (2, Figure 7) from the brake housing.

IMPORTANT

The lining spring (5, Figure 7) is pre-tensioned. The lining spring (5, Figure 7) must be held in position with a suitable tool while removing the setting screw (2, Figure 7).

8. Remove lining spring (5, Figure 7).

Table of Contents

Cooling System

Parts List

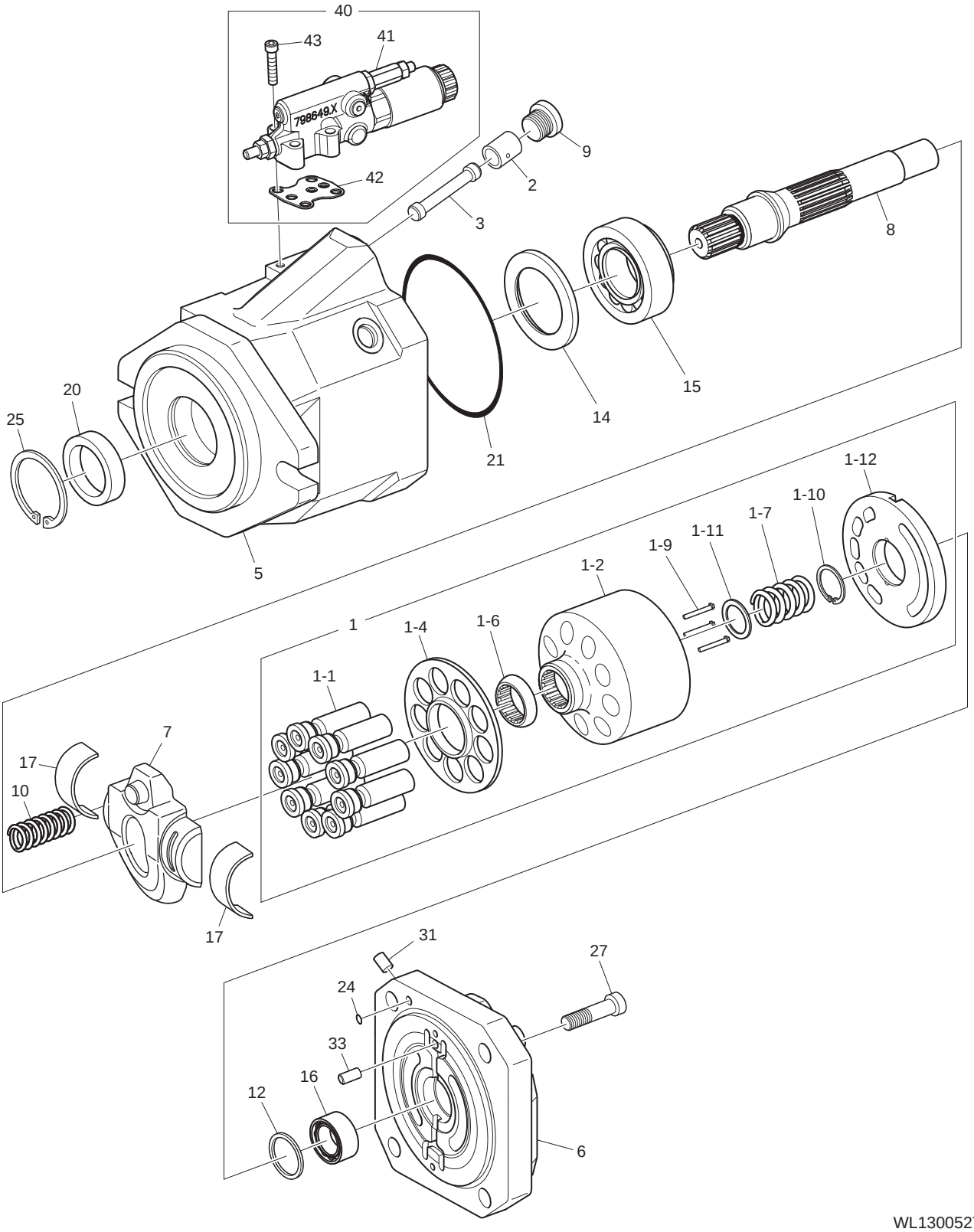
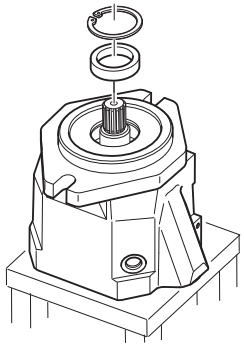


Figure 4

5. Assembly shaft seal.

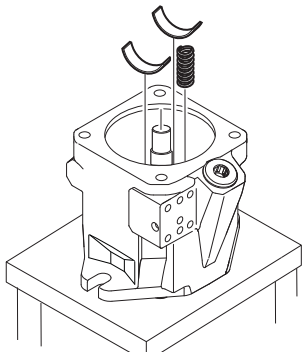


WL1300561

Figure 40

6. Install in bearing shells and spring.

   Insert with grease.



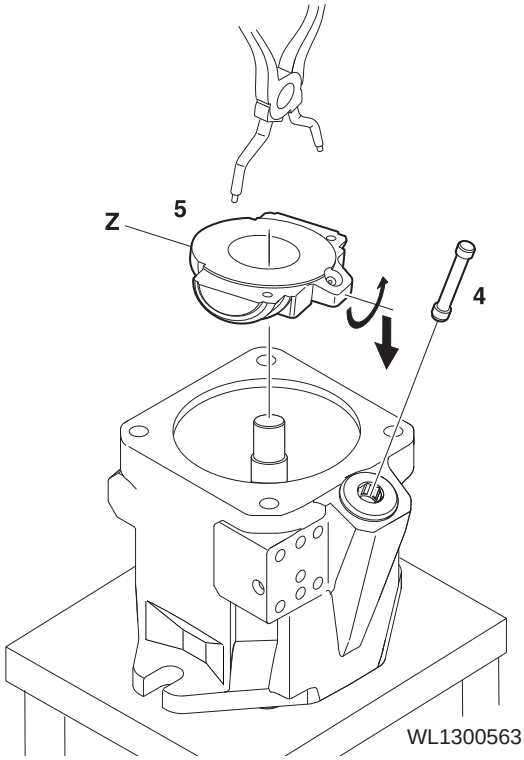
WL1300562

Figure 41

7. Assemble swash plate (5, Figure 42) and piston rod (4, Figure 43) into pump.

   Spring guide pin in correct position.

   Check correct position of the spring.



WL1300563

Figure 42

MEMO

Main Pump

Edition 1

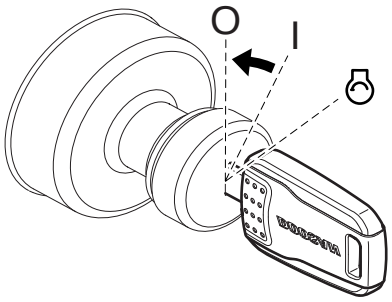
4. Turn starter switch to "I" (ON) position.

WARNING

AVOID DEATH OR SERIOUS INJURY

If engine must be running while performing maintenance, always use extreme caution. Always have one person in the cabin at all times. Never leave the cabin with engine running.

5. Fully stroke work levers (joysticks) in all directions to relieve any pressure in piping.
6. Turn key to "O" (OFF) position and remove from starter switch.
7. Turn battery disconnect switch to "OFF" position. (Figure 10)



FG018156

Figure 9

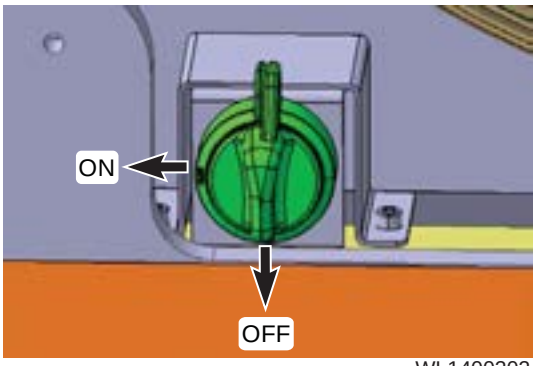


Figure 10 Rear Frame

WL1400202

WARNING

AVOID DEATH OR SERIOUS INJURY

Release any pressure in the hydraulic oil tank before doing any work.

8. Loosen the oil tank air breather slowly to release the pressure inside the hydraulic oil tank.

   Pulling the breather cap upward, the check valve 0.46 kg/cm^2 (0.45 bar) opens, and the air is discharged to the atmosphere from the top of the hydraulic oil tank.

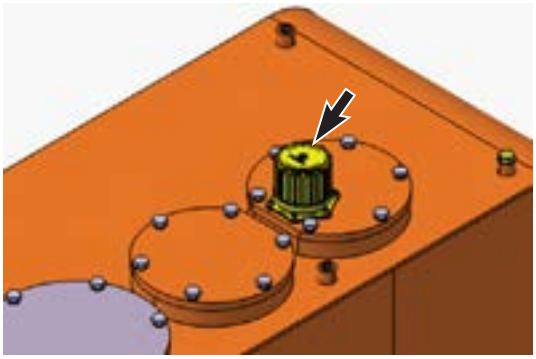


Figure 11

WL1400201

Table of Contents

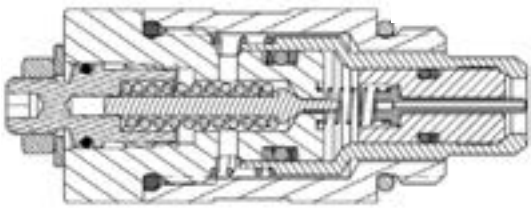
Main Control Valve

3. Main relief valve

The main relief valve is installed on the inlet section of the control valve and it is designed to set the maximum operating pressure of the system.

When abnormal pressure is built in the system so the oil pressure rises up to the setting pressure, this relief valve opens to send oil to the tank. When the pressure drops below the setting level, it closes to maintain the circuit pressure below the setting pressure to protect the circuit.

- Setting pressure: 280 bar



WL1400376

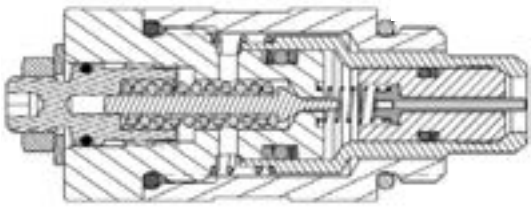
Figure 12

4. Port relief valve

It is installed in parallel with the control valve actuator line. When abnormally high-pressure is built in the actuator because of irregular external load, it is used to send oil to the tank line to keep the pressure in the actuator below the setting pressure to protect the circuit.

It is installed to the boom head, bucket head and rod line. In case of 3 spool, it is also installed to the auxiliary head and rod.

- Setting pressure (Boom head): 310 bar
- Setting pressure (Bucket head, rod): 280 bar
- Setting pressure (Aux head, rod): 280 bar

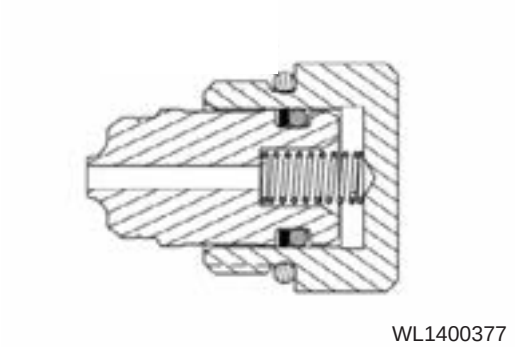


WL1400376

Figure 13

5. Anticavitation valve

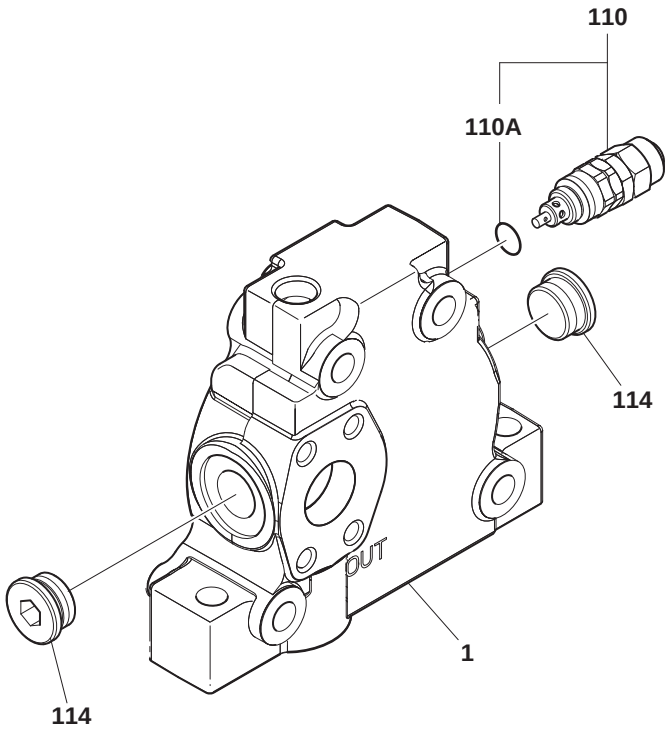
During the boom down operation, the check valve supplies oil to the boom cylinder rod to compensate for insufficient oil flow because of the boom's sudden drop to prevent cavitation (makeup function).



WL1400377

Figure 14

Outlet Section

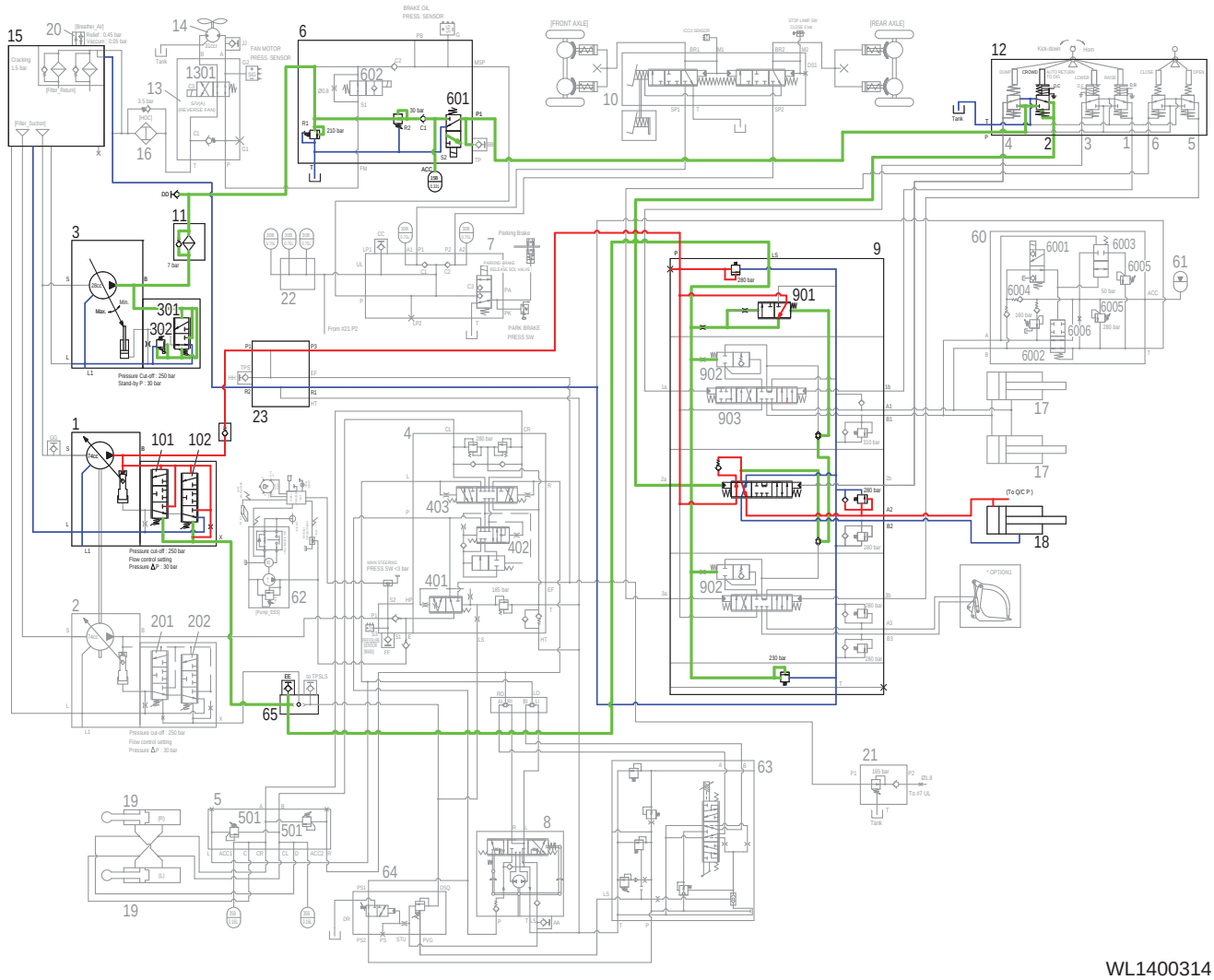


WL1400386

Figure 34

Reference Number	Description	Torque		
		N.m	kg.m	ft lb
1	Housing			
110	Load Sense Relief Valve	44.7 ±4.7	4.56 ±0.48	33 ±3.5
110A	O-ring			
114	Plug	100.3 ±10.8	10.2 ±1.1	74 ±8

BUCKET CROWD OPERATION



WL1400314

Figure 9

The oil in the hydraulic tank (15) is supplied to the main pump (1) and the pilot pump (3) by the suction filter.

The oil supplied to the fan pump (3) flows to the brake pilot supply valve (6) by the brake pilot filter (11), and is supplied to the joystick valve (12).

The joystick valve (12) supplies oil to move the spool on the bucket crowd side of the main control valve (9), and the oil supplied from the main pump (1) is supplied to the bucket cylinder (18) head by the check valve.

When the oil flow to the bucket cylinder (18) is cut off, the bucket spool of the control valve is in neutral, and the oil paths are closed to stop the movement of the bucket.

When the micromotion of the bucket spool of the main control valve (9) causes a small motion, a pressure difference occurs between the main pump (1) outlet oil and actuator inlet oil, and under these circumstances, the flow control valve (102) controls the oil flow of the main pump (1) according to the load signal drain valve (901).

Does Not Work the Boom Floating

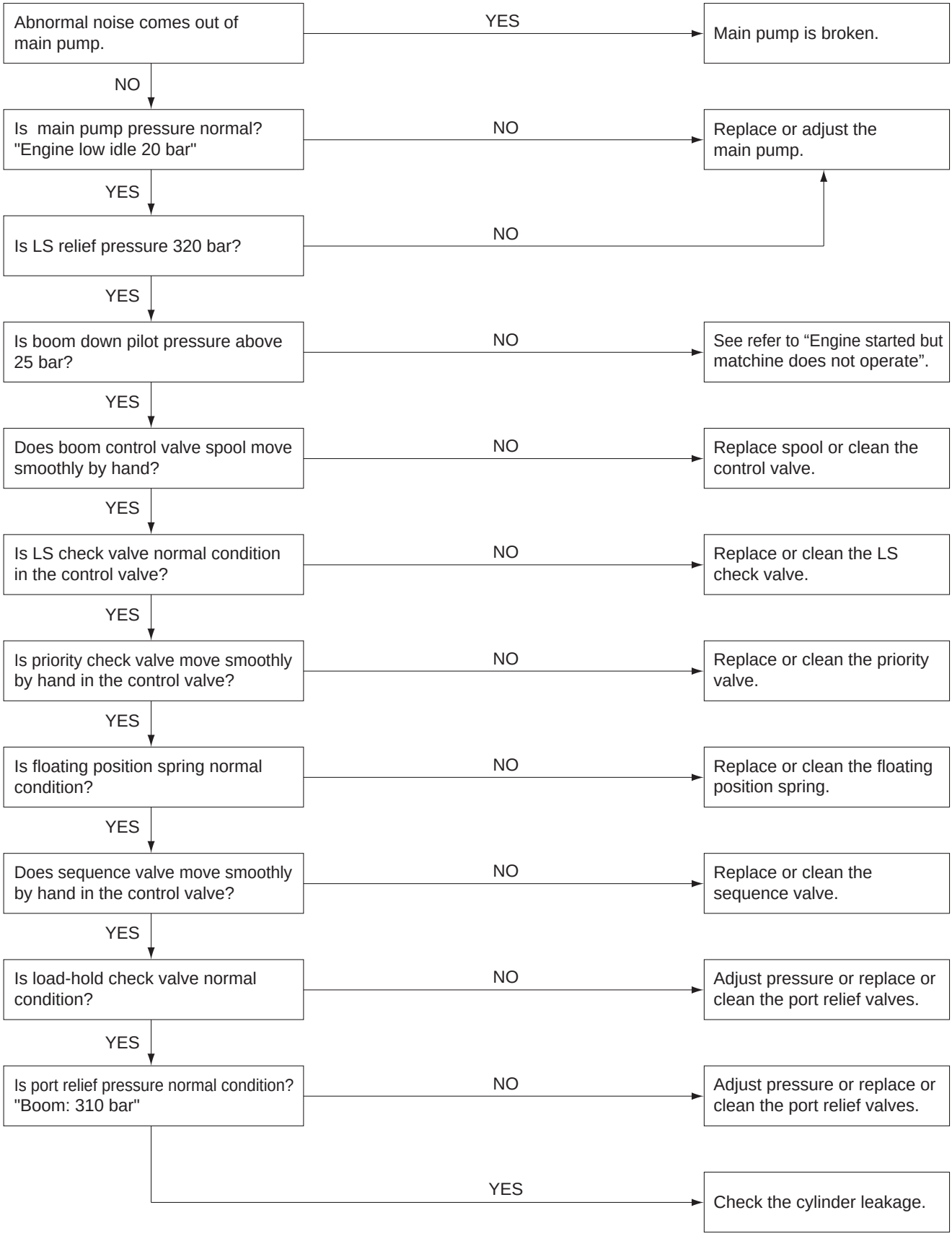


Table of Contents

Cabin

Fuel Tank

Edition 1

Lift Cylinder

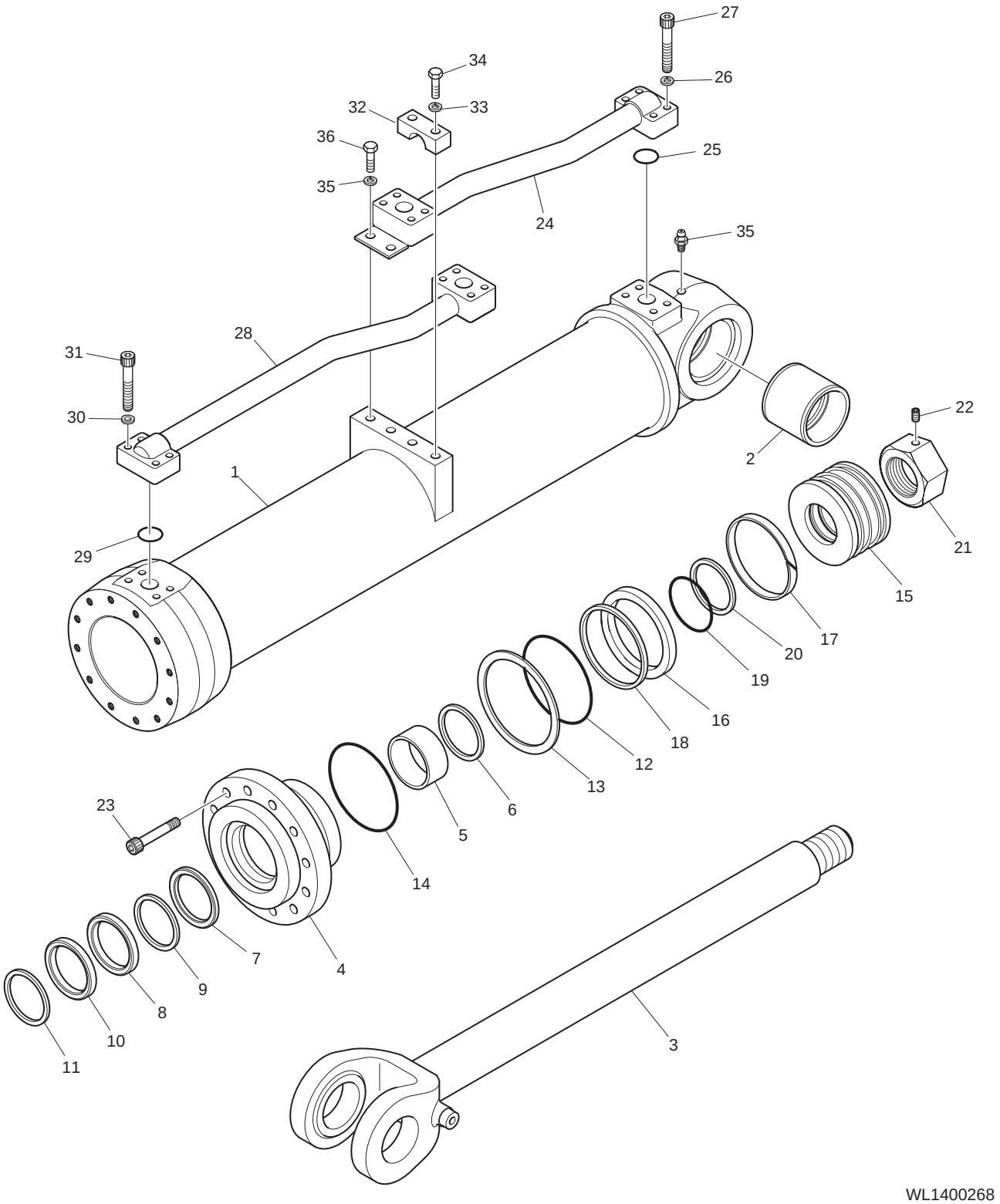
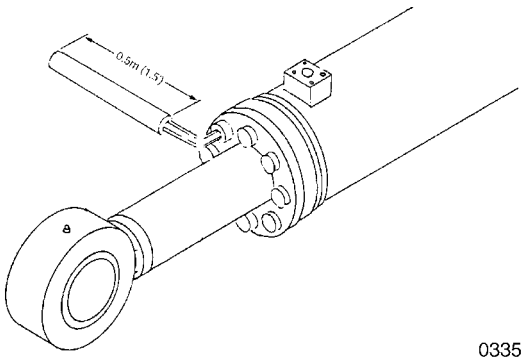


Figure 2

3. Remove bolts (27) on the end of cylinder.

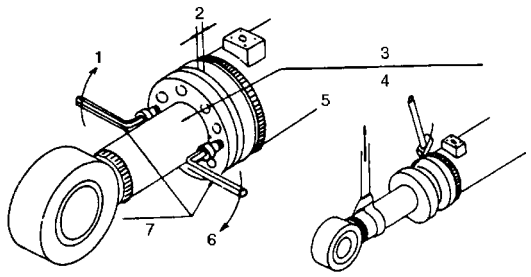
   NOTE: *Wrap a cloth or other protective material around piston rod, to avoid possibility of accidentally scratching or scoring rod surface while fasteners are being loosened and removed. Component parts (numbered in parentheses) are keyed to Figure 3.*



0335

Figure 18

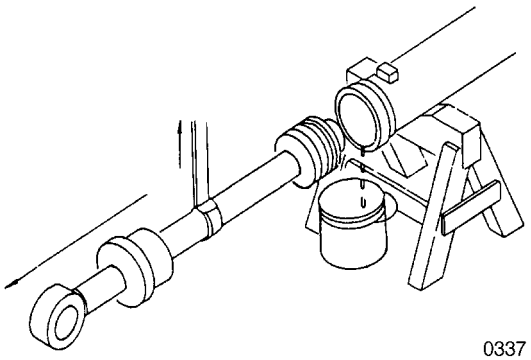
4. Tap two bolts into cover of cylinder head, 180° apart. Tighten them in a staggered, even sequence, to back off piston rod end cover from edge of cylinder wall. Look for adequate clearance between cover and end of cylinder wall before using a plastic or other soft faced hammer for final disassembly.



HAOF610S

Figure 19

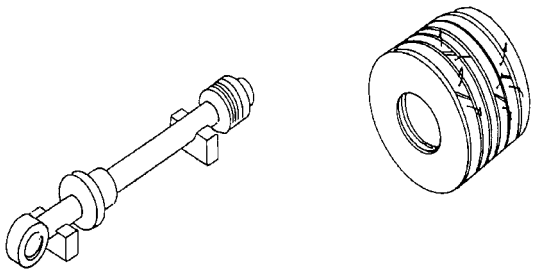
5. Begin withdrawing piston rod assembly, away from cylinder. Attach a lifting support when final 1/3 of rod is still inside barrel of cylinder. Prepare support blocks for piston rod before it has been completely withdrawn.



0337

Figure 20

6. Lower piston rod to support blocks and detach wear ring (outer surface) (19) from end of rod.



HAOF620S

Figure 21

Electric MCV Control

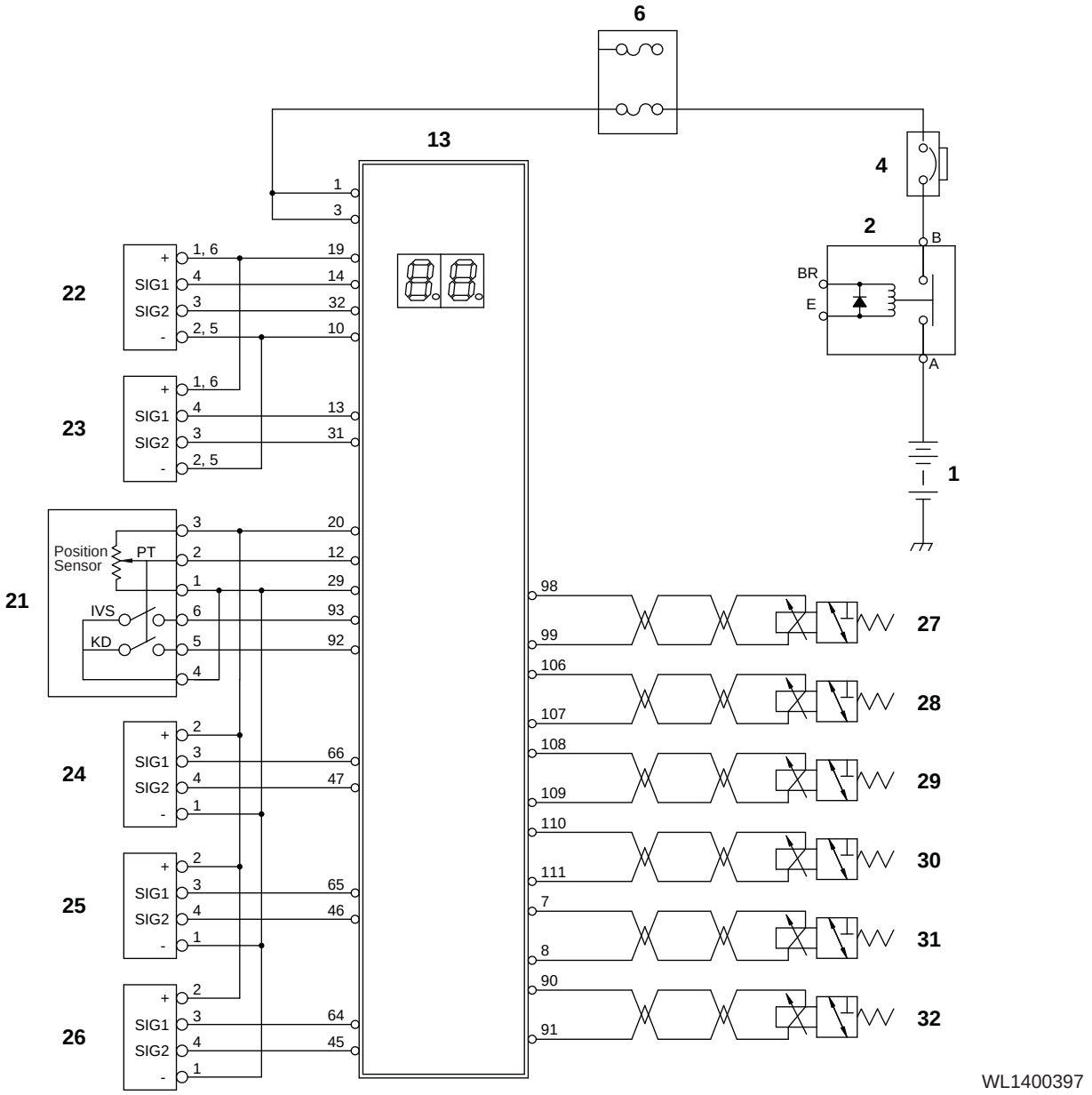
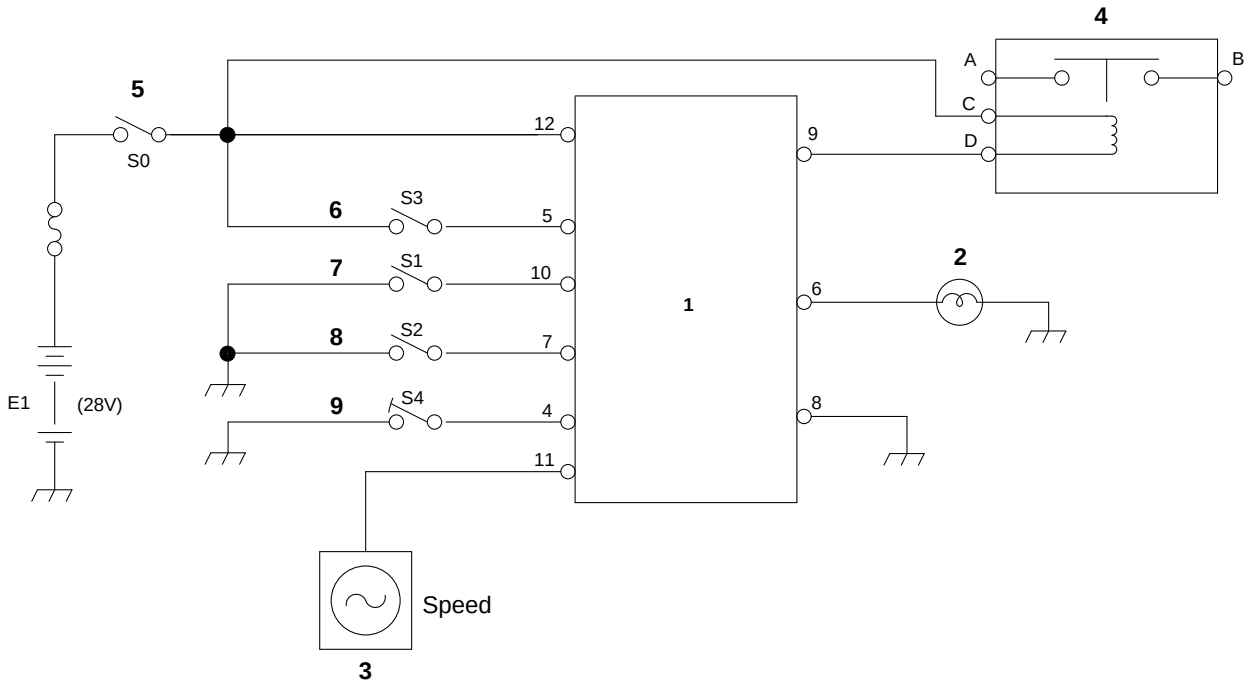


Figure 14

Reference Number	Description
1	Battery
2	Battery Relay
4	Circuit Breaker
6	Fuse Box
13	Vehicle Controller
21	Accelerator Pedal
22	Angle sensor (Boom)
23	Angle sensor (Bucket)
24	Electric Joystick (Boom)

Reference Number	Description
25	Electric Joystick (Bucket)
26	Electric Joystick (Option)
27	Proportional Valve (Raise)
28	Proportional Valve (Float)
29	Proportional Valve (Crowd)
30	Proportional Valve (Dump)
31	Proportional Valve (Option 1)
32	Proportional Valve (Option 2)

Emergency Steering Timer Circuit



WL1300777

Figure 33

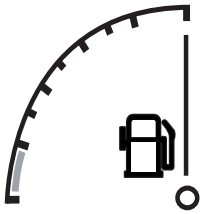
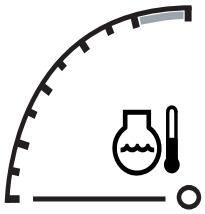
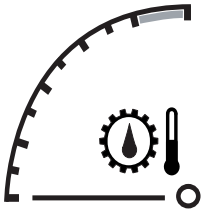
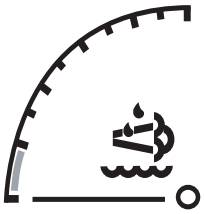
Reference Number	Description
1	Emergency Steering Timer
2	Emergency Steering Indicator
3	Transmission Controller (TCU)
4	Emergency Steering Pump
5	Starter Switch "ON"

Reference Number	Description
6	Starter Switch "START"
7	Main Steering Pressure Switch
8	Emergency Steering Pressure Switch
9	Emergency Steering Switch

Test Mode before Emergency Steering Start

Input Condition			Output	
S0	**S3**	**S4**	**Emergency Steering Pump**	**Light**
OFF → ON	OFF	OFF	Will be operated only one time for 3 seconds and stop.	Will be turned "ON" only Once for 3 seconds. Will be turned off when S2 is "ON". Will be blinking regularly when S2 is "OFF".
OFF → ON	ON	OFF	OFF	Turned off
OFF → ON	-	ON	Pump will be operated equally with S4 "ON" time.	Light will be turned "ON" equally with S4 "ON" time.

Multifunction Display

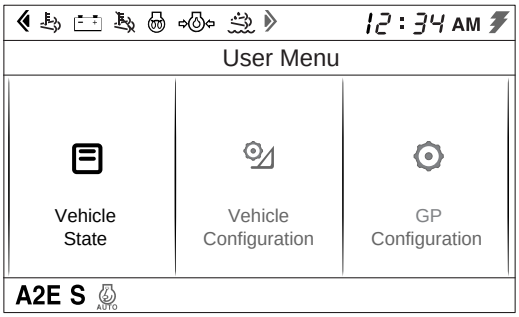
Function	Display	Sensor Specification	
		Input Terminal	Input Specification
Fuel Level Gauge		(Output Terminal) CN3-13 CN3-14	Full → 0.6 ±5% kΩ 3/4 → 1.2 ±5% kΩ 1/2 → 2.19 ±5% kΩ 1/4 → 3.9 ±5% kΩ 1/5 → 4.42 ±5% kΩ → Red Zone Empty → 4.8 kΩ
Coolant Temperature		ECU-CAN Communication	40°C → Min. 103°C → Red Zone 110°C → Max.
Transmission Oil Temperature Gauge		TCU-CAN Communication	50°C → Min. 120°C → Red Zone 150°C → Max.
DEF (AdBlue®) Level Gauge		ECU-CAN Communication	5% → Min. 20% → Red Zone 96% → Max.
Transmission Gear		TCU-CAN Communication	N = Neutral PN = Parking Brake 1F-5F = Forward 1st - 5th Gear 1R-3R = Reverse 1st - 3rd Gear

3. GP Configuration

This menu is used to set up; password, brightness, default screen and time, and to input service phone number. Press UP (▲) or DOWN (▼) button and move cursor to see a reversed display on desired menu. Then, press SELECTION (↵) button to select menu.

Password Setting ↔ Screen Brightness Setting ↔ Default Screen Setting ↔ Time Setting ↔ Service Phone Number Setting ↔ Unit Setting ↔ Language Setting ↔ Notification Setting

Press ESC button to return to previous screen.



FG021925

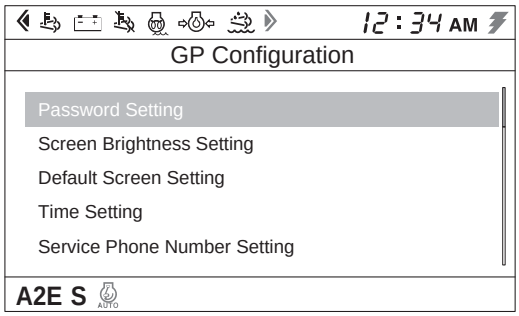
Figure 65

A. Password Setting

On "GP Setup" screen, when cursor is placed on "Password Setting", press SELECTION (↵) button to display screen brightness setting.

This function is used to set up a user password.

If password setting function is used, password must be correctly input to operate vehicle normally.



WL1300781

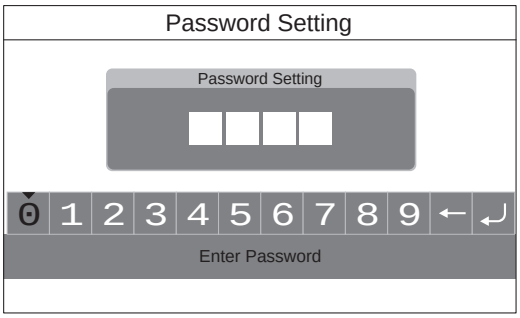
Figure 66

On "Password Setting" screen, when cursor is placed on password setting, press SELECTION (↵) button to display password input screen that was set up at factory. The initial password is set to "1111".

If you have changed the password, you should input the new password you have chosen.

IMPORTANT

If password input errors have been made three (3) times in a row, screen will move to default screen. After that, starting will be locked for 10 minutes.



FG019188

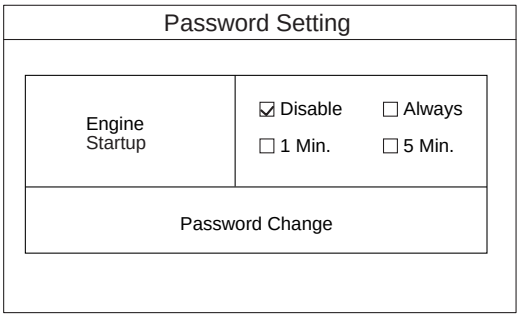
Figure 67

How to Input Password:

– Press UP (▲) or DOWN (▼) button and select numbers of 0 - 9 at bottom. Then, press SELECTION (↵) button and input a password.

– If you erroneously input a password, select (←) key at right bottom and press SELECTION (↵) button to delete input password.

– On Password Setting screen, input a password to display a screen to select application of



FG019189

Figure 68

User Selection Data View

User Data	User Data
1. Alternator	25. EMCV P/V Option 1
2. Battery	26. EMCV P/V Option 2
3. Fan Control P/V	27. E/G Speed
4. Main Pressure	28. Per. Load Cur. Speed
5. Steer Pressure	29. Intake Manifold Temp.
6. Brake Oil Pressure	30. Fuel Rate
7. Fan Motor Pressure	31. Total Used Fuel
8. Boom Cylinder Pressure	32. Coolant Temp.
9. Accel Pedal	33. E/G Oil Pressure
10. TMS Voltage Input	34. Boost Pressure
11. Angle Sensor Boom	35. DEF (AdBlue®) Level
12. Angle Sensor Bucket	36. Torque Converter Oil Temp.
13. Fuel Level Sensor	37. Sump Oil Temp.
14. Water In Fuel	38. Differential Lock Auto S/W
15. Hydraulic Temp.	39. Differential Lock Manual S/W
16. Elec. Steering Lever	40. Clutch CutOff S/W
17. Estimated Flow	41. Parking Brake S/W
18. EMCV Lever Boom	42. LIS S/W
19. EMCV Lever Bucket	43. FNR 2nd Gear Engaged
20. EMCV Lever Option	44. Differential Lock Engaged
21. EMCV P/V Raise	45. Torque Converter LockUp Engaged
22. EMCV P/V Float	46. BackUp Relay
23. EMCV P/V Crowd	47. LIS Relay
24. EMCV P/V Dump	

GP Display Code	DTC Code		FMI	GP Display Description	Severity	Light Status	Remarks
	HEX	DEC					
E000110-10	110	6E	10	Engine Coolant temperature (T33) is not plausible.	3	Yellow	
E000110-16	110	6E	16	Engine Coolant Water Temperature Too High.	0	None	
E000110-17	110	6E	17	Engine temp sensor1 (T_ENG1), temp below normal or VGT-temp above normal.	3	Yellow	
E000110-18	110	6E	18	Engine temp sensor1 (T_ENG1), temp above normal or VGT-temp below normal.	3	Yellow	
E000110-20	110	6E	20	Engine Coolant Water Temperature Too High. No Action.	3	Yellow	
E000110-21	110	6E	21	Coolant Temperature Below Thermostat Regulating Temperature	0	None	
E000111-01	111	6F	1	Engine coolant level too low. No action.	3	Yellow	
E000111-03	111	6F	3	Scania engines coolant level sensor, short circuit to battery	0	None	
E000111-04	111	6F	4	Engine Coolant Level Sensor/Switch Circuit Low, Short Circuit to Ground	3	Yellow	
E000131-02	131	83	2	Exhaust pressure (T125) not plausible	0	None	
E000131-03	131	83	3	Exhaust press sensor, short circuit to +24V	3	Yellow	
E000131-04	131	83	4	Exhaust pressure sensor, short circuit to ground or open load	3	Yellow	
E000131-07	131	83	7	Correlation error, EXP higher than MAP	0	None	
E000131-08	131	83	8	Correlation error, EXP higher than Intercooler pressure	0	None	
E000131-09	131	83	9	Exhaust pressure sensor Stuck.	3	Yellow	
E000131-10	131	83	10	Correlation error, EXP higher than AAP	0	None	
E000131-15	131	83	15	Exhaust pressure, high exhaust pressure during normal fueling	3	Yellow	
E000131-16	131	83	16	Exhaust pressure, high exhaust pressure during motoring, no fueling	3	Yellow	
E000131-18	131	83	18	Exhaust pressure, low exhaust pressure during exhaust brake	0	None	
E000131-20	131	83	20	Plausibility error. EXP too high	3	Yellow	
E000131-21	131	83	21	Plausibility error, EXP too low	3	Yellow	
E000132-00	132	84	0	Mass flow sensor (DM_EGR), short circuit to +24V	3	Yellow	
E000132-01	132	84	1	Mass flow sensor (DM_EGR), short circuit to ground or open load	3	Yellow	
E000132-02	132	84	2	Mass flow sensor (DM_EGR), faulty	3	Yellow	
E000132-03	132	84	3	Mass flow sensor (DM_EGR), supply	3	Yellow	
E000132-04	132	84	4	Mass Flow Sensor Adaptation Under Low Threshold	3	Yellow	
E000132-05	132	84	5	Mass Flow Sensor Adaptation Over High Threshold.	3	Yellow	
E000132-07	132	84	7	Mass flow sensor (DM_EGR), stuck	3	Yellow	
E000156-00	156	9C	0	Fuel Rail pressure is excessively above command	3	Yellow	
E000156-01	156	9C	1	Fuel Rail pressure is excessively below command with engine on	3	Yellow	
E000156-02	156	9C	2	Fuel Rail press sensor (P_RAIL), faulty	3	Yellow	
E000156-03	156	9C	3	Fuel Rail press sensor (P_RAIL), short circuit to +24V or open load	3	Yellow	
E000156-04	156	9C	4	Fuel Rail press sensor (P_RAIL), short circuit to ground	3	Yellow	
E000156-08	156	9C	8	Fuel Rail press sensor (P_RAIL), stuck	3	Yellow	
E000156-09	156	9C	9	Fuel rail pressure is lagging.	0	None	
E000156-18	156	9C	18	Fuel Rail pressure is too low during cranking	3	Yellow	
E000167-02	167	A7	2	Alternator actuator (altU15Act), faulty	3	Yellow	

GP Display Code	FMI	DTC Code		Failure Code (Hex)	Description
		SPN (Dec)	SPN (Hex)		
T005560	5	5560	15B8	93	O.C. at relay reverse warning alarm: Current below normal
T005570	4	5570	15C2	94	S.C. to ground at relay starter interlock
T005570	3	5570	15C2	95	S.C. to battery voltage at relay starter interlock
T005570	5	5570	15C2	96	O.C. at relay starter interlock
T005590	4	5590	15D6	9A	S.C. to ground at converter lock up clutch solenoid: Voltage below normal
T005590	3	5590	15D6	9B	O.C. at converter lock up clutch solenoid: Voltage above normal
T005590	5	5590	15D6	9C	S.C. to battery voltage at converter lock up clutch solenoid: Current below normal
T005620	4	5620	15F4	A4	S.C. to ground at warning signal output
T005620	5	5620	15F4	A5	O.C. at warning signal output: Voltage above normal
T005620	3	5620	15F4	A6	S.C. to battery voltage at warning signal output: Voltage above normal
T005630	4	5630	15FE	A7	S.C. to ground at LIS output: Voltage below normal
T005630	3	5630	15FE	A8	S.C. to battery voltage at LIS output: Voltage above normal
T005630	5	5630	15FE	A9	O.C. at LIS output: Current below normal
T005660	2	5660	161C	B1	Slippage at clutch K1: Incorrect signal
T005665	2	5665	1621	B2	Slippage at clutch K2: Incorrect signal
T005670	2	5670	1626	B3	Slippage at clutch K3: Incorrect signal
T005675	2	5675	162B	B4	Slippage at clutch K4: Incorrect signal
T005680	2	5680	1630	B5	Slippage at clutch KV: Incorrect signal
T005685	2	5685	1635	B6	Slippage at clutch KR: Incorrect signal
T005700	0	5700	1644	B7	Overtemp sump: Above normal range
T005730	0	5730	1662	BA	Differential pressure oil filter: Above normal range
T005740	2	5740	166C	BB	Slippage at converter lockup clutch: Incorrect signal
T005745	15	5745	1671	BC	Overspeed output: DATA VALID BUT BELOW NORMAL OPERATIONAL RANGE - LEAST SEVERE LEVEL
T005751	0	5751	1677	C0	Engine torque or engine power: Above normal range
T005752	0	5752	1678	C1	Transmission output torque overload: Above normal range
T005755	15	5755	167B	C2	Transmission input torque overload: DATA VALID BUT BELOW NORMAL OPERATIONAL RANGE - LEAST SEVERE LEVEL
T005760	0	5760	1680	C3	Overtemp converter output
T005770	4	5770	168A	C4	S.C. to ground at joystick status indicator: Voltage below normal
T005770	3	5770	168A	C5	S.C. to battery voltage at joystick status indicator: Voltage below normal
T005770	5	5770	168A	C6	O.C. at joystick status indicator: Voltage below normal
T005780	4	5780	1694	C7	S.C. to ground at overtemp neutral indicator: Voltage below normal
T005780	3	5780	1694	C8	S.C. to battery voltage at overtemp neutral indicator: Voltage above normal
T005780	5	5780	1694	C9	O.C. at overtemp neutral indicator: Current below normal
T005810	3	5810	16B2	D1	S.C. to battery voltage at power supply for sensors: Voltage above normal
T005810	4	5810	16B2	D2	S.C. to ground at power supply for sensors: Voltage below normal
T005820	4	5820	16BC	D3	Low voltage at battery: Voltage below normal
T005820	3	5820	16BC	D4	High voltage at battery: Voltage above normal

Air-conditioning System Layout

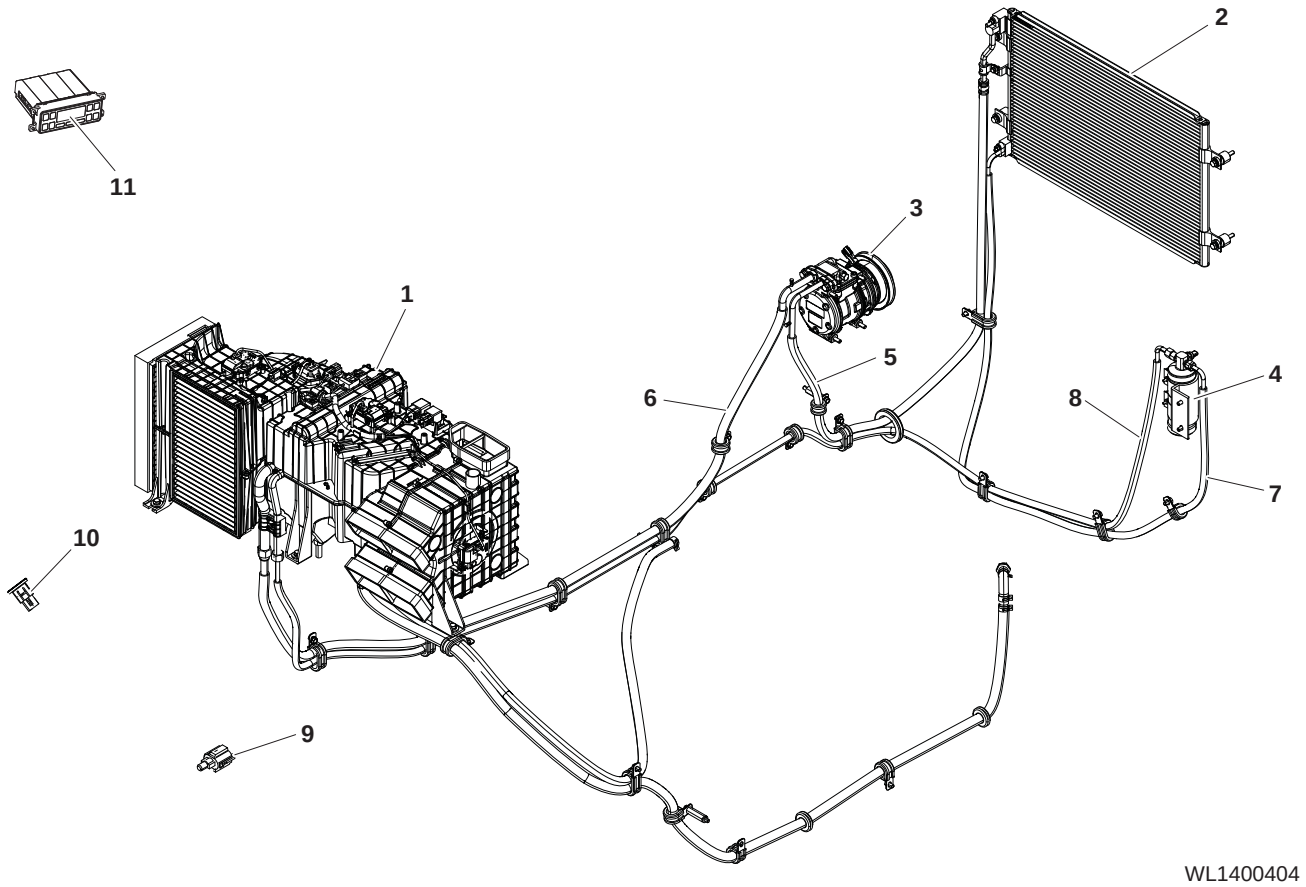


Figure 5

Reference Number	Description
1	Air Conditioner/heater Unit
2	Condenser
3	Compressor
4	Receiver Dryer
5	Discharge Hose
6	Suction Hose

Reference Number	Description
7	Liquid Hose (1)
8	Liquid Hose (2)
9	Ambient Temperature Sensor
10	Sun Sensor
11	Control Panel

Compressor

Categories	Specifications
Output	155.3 cc/rev
Oil Level	120 cc (ND-OIL8)
Refrigerant	R134a
Rated Voltage	24V
Relief Valve	Open: 35 - 42.2 kg/cm^{2}G Close: 28.1 kg/cm^{2}G

Compressor sucks in refrigerant which evaporates completely in the evaporator and discharges it to the condenser.

Refrigerant undergoes repeated status change in the order of liquid, gas, and liquid in the freezing cycle, and the compressor makes evaporated refrigerant a high temperature and high-pressured gas to freeze it in the condenser.

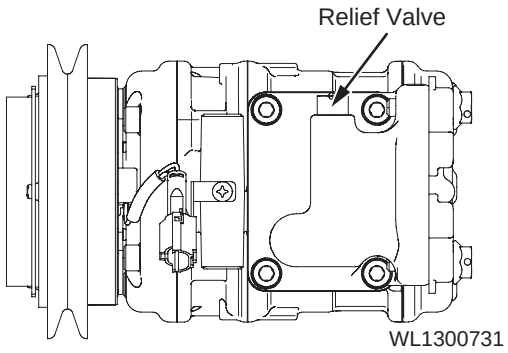


Figure 22

Receiver Dryer

The receiver dryer reserves refrigerant enough to ensure smooth freezing cycle responding immediately to the change of level in the freezing cycle.

As liquid refrigerant from the condenser may contain refrigerant gas with bubbles whose presence in the expansion valve decreases the freezing power excessively, it separates liquid and gas and sends liquid only to the expansion valve.

Water in refrigerant shall be eliminated with dryer and through filter.

- Weight of refrigerant: 800 ±20 grams

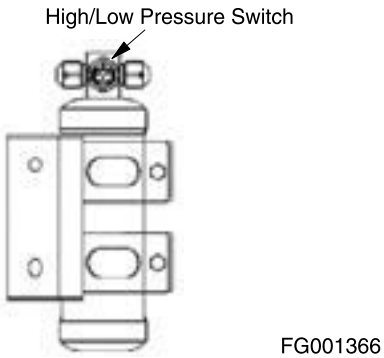


Figure 23

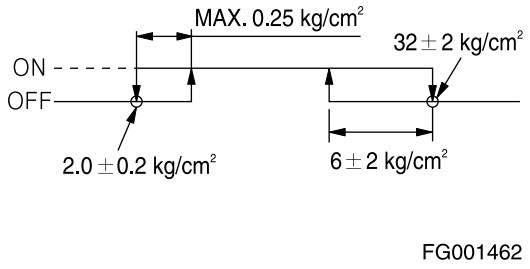


Figure 24

MEMO