950106-00228E
April 2012

EXCAVATOR

Shop Manual

DX380LC-3

Serial Number 10001 and Up

Doosan Infracore
Construction Equipment

Track Excavator Maintenance Safety

Edition 3

Correction of Machine Problems

If any machine problems are found during operation and maintenance (noise, vibration, smell, incorrect gauges, smoke, oil leakage, etc.), or if any abnormal warming alerts are displayed on display monitor, stop the machine and take the necessary corrective actions. Do not operate machine until problem has been corrected.

Crushing and Cutting

Keep objects away from moving fan blades. Fan blades can throw and cut objects.

Do not use a wire rope that is kinked or frayed, or a wire rope with any loss of diameter. Wear leather gloves when handling a wire rope.

When striking a loose retainer pin, it can fly out and can cause a serious injury. Make sure that area is clear of personnel when striking a retainer pin. To avoid injury to your eyes, wear safety goggles when striking a retainer pin.

Do not put your hand, arm or any other part of your body between movable parts. If going between movable parts is necessary, always position and secure work equipment so it cannot move. Properly support equipment before performing any work or maintenance under raised equipment.

If control levers are operated, clearance between machine and work equipment will change and this may lead to serious damage or can result in death or serious injury. Stay clear of areas that may have a sudden change in clearance with machine movement or equipment movement. Stay clear of all rotating and moving parts. Unless instructed, never attempt adjustments while machine is moving or while engine is running.

Do not depend on hydraulic cylinders to support raised equipment. Equipment can fall if a control is moved, or if a hydraulic line breaks or is loosened or disconnected.

If it is necessary to remove guards to perform maintenance, always install guards after maintenance is completed.

HDO1010L

Figure 5

- When driving up or down ramps, the center of gravity of machine will change suddenly causing the tracks to drop down to the ramps or trailer. This will occur at the joint between the ramps and trailer. Travel slowly over this point.
- For machines equipped with a cabin, always lock door after loading machine to prevent door from suddenly opening during transportation.

Transporting Machine

When transporting machine on a trailer or truck, do the following:

- The weight, transportation height, and overall length of machine may change depending on work equipment attached to it. Always check the machine dimensions and work equipment's dimensions before transporting.
- When passing over bridges or structures on private land, check that structure is strong enough to support weight of machine. Before traveling on public roads, check with appropriate authorities and follow their instructions.

Never turn starter switch to "O" (OFF) position when traveling. This can lead to a loss of steering control.

Do not operate attachments while traveling.

Do not change selected travel mode (FAST/SLOW) while traveling.

Never travel over obstacles or excessive slopes that will cause machine to tilt severely. Avoid any slope or obstacle that can cause machine to tilt 10° or more to right or left, or 30° or more from front to rear.

Do not operate steering controls suddenly. Work equipment can hit ground and this can damage machine or structures in area.

When traveling on rough ground, travel at low speed, and avoid sudden changes in direction.

Always operate within permissible water depth. Permissible water depth is up to centerline of upper track roller(s).

When passing over bridges or structures on private land, check that structure is strong enough to support weight of machine. Before traveling on public roads, check with appropriate authorities and follow their instructions.

Never exceed maximum permitted load for bridges.

Always operate machine with idler wheels to front under cabin and drive sprockets to rear.

Know permitted ground pressure. Ground pressure of the machine may change depending on attachment and load.

Keep height and length of attachment in mind.

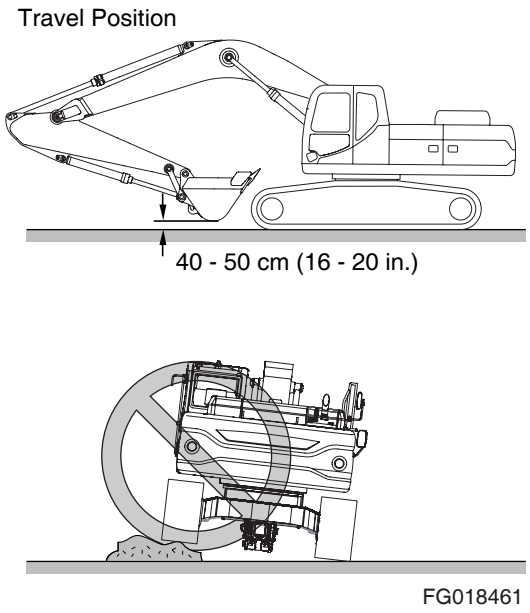

Figure 27

- When performing maintenance of engine and you are exposed to engine noise for long periods of time, wear hearing protection while working.
- If noise from the machine is too loud, it can cause temporary or permanent hearing problems.
- Do not smoke when you service an air conditioner or if refrigerant gas is present.
- Inhaling fumes either from a flame or gas from a cigarette that has contacted air conditioner refrigerant can cause death or serious injury.
- Never put maintenance fluids into glass containers. Drain all liquids into a suitable containers.
- Unless instructed otherwise, perform maintenance with equipment in servicing position. Refer to this manual for procedure for placing equipment in servicing position.

Accumulator

The pilot control system is equipped with an accumulator. For a short period of time after engine has been stopped, accumulator will store a pressure charge that allow hydraulic controls to be activated. Activation of any controls will allow selected functions to operate under force of gravity.

When performing maintenance on pilot control system, release hydraulic pressure in system as described in Operation and Maintenance Manual.

The accumulator is charged with high-pressure nitrogen gas. If it is improperly handled it can explode causing death or serious injury. Always observe the following precautions:

- Do not drill or punch holes in accumulator or expose it to any flames, fire or external heat source.
- Do not weld on accumulator.
- When performing disassembly or maintenance of accumulator, or when disposing of accumulator, charged nitrogen gas must be properly released. Contact your DOOSAN distributor for assistance.
- Wear safety goggles and leather gloves when working on an accumulator. Hydraulic oil under pressure can penetrate skin and result in death or serious injury. If fluid enters skin or eyes, get immediate medical attention from a physician familiar with this injury.

FG018458

Figure 45

Compressed Air

- When cleaning filters, radiator or other components with compressed air, there is a hazard of flying particles that can result in serious injury.
- Always wear safety goggles, dust mask, leather gloves, and other protective devices.

8. An extra outer air filter must be kept in operator's cabin to replace element that could become iced and cause restricted airflow to engine.

9. Clean off all mud, snow and ice to prevent freezing. Cover machine with a tarp if possible, keep ends of tarp from freezing to ground.

Operation in Extreme Heat

Continuous operation of machine in high temperatures can cause machine to overheat. Monitor engine and hydraulic system temperatures and stop machine to let it cool, when necessary.

1. Make frequent inspections and services of fan and radiator. Check coolant level in radiator. Check grilles and radiator fins for accumulation of dirt, debris and insects which could block cooling passages.

    - Formation of scale and rust in cooling system occurs more rapidly in extremely high temperatures. Change antifreeze each year to keep corrosion inhibitor at full strength.

    - If necessary, flush cooling system periodically to keep passages clear. Avoid use of water with a high alkali content which increases scale and rust formation.

2. Check level of battery electrolyte daily. Keep electrolyte above plates to prevent damage to batteries. Use a slightly weaker electrolyte solution in hot climates. Batteries self-discharge at a higher rate if left standing for long periods at high temperatures. If machine is to stand for several days, remove batteries and store in a cool place.

IMPORTANT

Do not store acid type storage batteries near stacks of tires. Acid fumes can damage rubber.

3. Service fuel system as directed in Operation and Maintenance Manual and Operation and Maintenance Manual, of this manual. Check for water content before filling fuel tank. High temperatures and cooling off cause condensation in storage drums.

4. Lubricate as specified in Operation and Maintenance Manual, in this manual or Lubrication Decal on machine.

5. Do not park machine in sun for long periods of time. If possible, park machine under cover to protect it from sun, dirt and dust.

    A. Cover machine if no suitable shelter is available. Protect engine compartment and hydraulics from dirt and debris.

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Specification for DX380LC-3

DIM.	Boom	6.5 m (21' 4")		
	Arm	**3.2 m (10' 6")**	**2.6 m (8' 6")**	**3.95 m (13' 0")**
	Bucket Type (PCSA)	**1.61 m^3 (2.11 yd^3)**	**1.83 m^3 (2.39 yd^3)**	**1.25 m^3 (1.63 yd^3)**
A	Max. Digging Reach	11,170 mm (36' 8")	10,585 mm (34' 9")	11,930 mm (39' 2")
B	Max. Digging Reach (Ground)	10,955 mm (35' 11")	10,360 mm (33' 12")	11,730 mm (38' 6")
C	Max. Digging Depth	7,460 mm (24' 6")	6,860 mm (22' 6")	8,220 mm (26' 12")
D	Max. Loading Height	7,250 mm (23' 9")	6,940 mm (22' 9")	7,710 mm (25' 3")
E	Min Swing Radius	4,455 mm (14' 7")	4,480 mm (14' 8")	4,515 mm (14' 10")
F	Max. Digging Height	10,390 mm (34' 1")	10,040 mm (32' 11")	10,890 mm (35' 9")
G	Max. Bucket Pin Height	8,950 mm (29' 4")	8,640 mm (28' 4")	9,410 mm (30' 10")
H	Max. Vertical Wall Depth	5,815 mm (19' 1")	5,020 mm (16' 6")	6,815 mm (22' 4")
I	Max. Radius Vertical	7,720 mm (25' 4")	7,710 mm (25' 3")	7,780 mm (25' 6")
J	Max. Depth to 2.5 m Line	7,275 mm (23' 10")	6,630 mm (21' 9")	8,070 mm (26' 6")
K	Min. Radius 2.5 m Line	3,315 mm (10' 10")	3,270 mm (10' 9")	3,385 mm (11' 1")
L	Min. Digging Reach	610 mm (2' 0")	2100 mm (6' 11")	-400 mm -(1' -4")

Travel Deviation

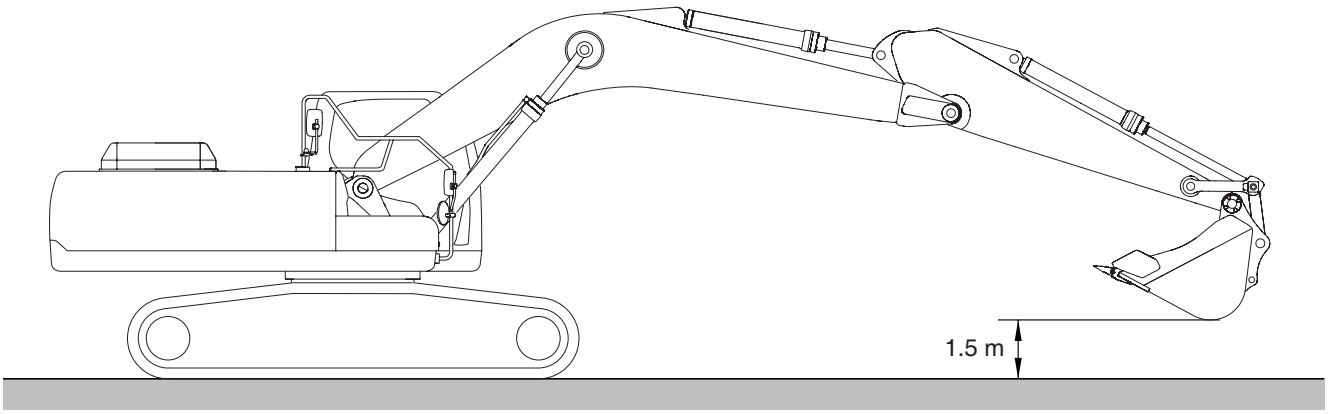
To check steering deviation (travel motor balance), use a long tape or rope, or the edge of a straight road or curb or other marker to verify side to side travel motor uniformity.

Deviation distance should always be measured at the 20 m (65' 7-1/2") "finish line." Repeat the test in reverse to measure in both directions, with starting point becoming the finish line, and vice versa. (Figure 6)

A greater amount of deviation is allowed with the travel control set for high-speed.

Swing Speed and Deceleration Force Test

Swing Speed Test



FG018736

Figure 7

Extend the bucket cylinder completely and retract the arm cylinder, as shown in Figure 7, to test swing speed. The lowest point of the bucket will be approximately 1.5 m (3') off the ground.

Use paint marks at the same point on the upper structure and undercarriage, or select alternate measuring locations and use a stopwatch to time three (3) full 360° rotations. The time required for three (3) revolutions must be between 15.5 and 17.5 seconds in Standard Mode, 15.5 and 17.5 seconds in Power Mode.

SAFETY INSTRUCTIONS

WARNING

AVOID DEATH OR SERIOUS INJURY

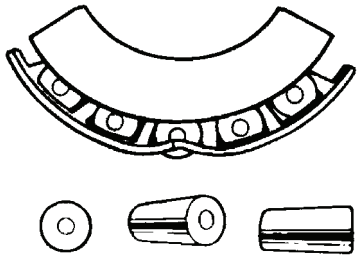
Instructions are necessary before operating or servicing machine. Read and understand the Operation and Maintenance Manual and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments repairs or service. Untrained operators and failure to follow instructions can cause death or serious injury.

APPLICABLE MODELS

The contents of this section apply to the following models and serial number ranges.

MODEL	SERIAL NUMBER RANGE
ALL MODELS	ALL RANGES

Replace bearing.



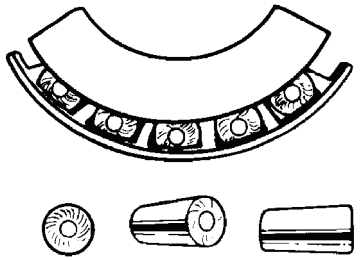
HASA470S

Figure 4

Galling

Metal smears on roller ends because of overheat, lubricant failure or overload.

Replace bearing - check seals and check for proper lubrication.



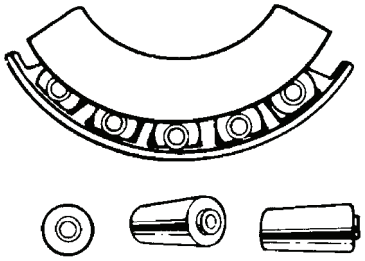
HASA480S

Figure 5

Abrasive Step Wear

Pattern on roller ends caused by fine abrasives.

Clean all parts and housings, check all parts and housings, check seals and bearings and replace if leaking, rough or noisy.



HASA490S

Figure 6

SAFETY INSTRUCTIONS

WARNING

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APPLICABLE MODELS

The contents of this section apply to the following models and serial number ranges.

MODEL	SERIAL NUMBER RANGE
ALL MODELS	ALL RANGES

I. "Loctite" Fastener Adhesives

Product	Application	Color	Removal	Breakaway Cure Strength (in lb) of Sealer Alone
222	Low strength for 6 mm (1/4") or smaller fasteners.	Purple	Hand tools	45
242 or 243	Medium strength for 6 mm (1/4") and larger fasteners.	Blue	Hand tools	80
262	High strength for high-grade fasteners subject to shock, stress and vibration.	Red	Heat/260°C (500°F) Remove HOT (NO solvent)	160
271	Extra high strength for fine thread fasteners up to 25 mm (1") diameter.	Red	Heat/260°C (500°F) Remove HOT	160
272	High temperature/high strength for hostile environments to 232°C (450°F).	Red	Heat/316°C (600°F) Remove HOT	180
277	Extra high strength for coarse thread fasteners 25 mm (1") diameter and larger.	Red	Heat/260°C (500°F) Remove HOT	210

II. "Loctite" Pipe Thread Sealant

Product	Application	Color	Removal	Required Setup
545	"No-filler/nonclog" formula for high-pressure hydraulic systems. Over application will not restrict or foul system components.	Purple	Hand tools	4 Hours (or 1/2 hour with Locquic "T" Primer)
656	Solvent resistant, higher viscosity tapered thread sealer.	White	Hand tools	4 Hours (or 1/2 hour with Locquic "T" Primer)

III. "Loctite" gasket/flange sealer

Product	Application	Color	Notes
518	Gasket eliminator specifically made for aluminum flanges/surfaces. For hydraulic systems to 34,475 kPa (5,000 psi).	Red	Use Locquic "N" primer for fast (1/2 - 4 hours) setup. Unprimed setup 4 - 24 hours.
504	Low-pressure/wide-gap gasket eliminator compound. Fills gaps to 0.0012 mm (0.030"), cures to rigid seal.	Orange	Use Locquic "N" primer for faster (1/2 - 4 hours) setup. Unprimed setup 4 - 24 hours.
515	General purpose, fast setup, flexible-cure gasket eliminator. For nonrigid assemblies subject to shock, vibration or deflection.	Purple	Use Locquic "N" primer for faster (1/4 - 2 hours) setup. Unprimed setup 1 - 12 hours.

ROPS Certification

This DOOSAN excavator has an operator's cabin that meets ROPS requirements. The seat belt must be worn for rollover protection.

The ROPS certification plate is found on the left side of the cabin on most models. It may vary slightly in its location on some models.

Check the ROPS cabin, mounting, and hardware for damage.

Never modify the ROPS cabin. Replace the cabin and hardware if damaged. See your DOOSAN dealer for parts.

ROPS – Rollover Protective Structure complies with ISO 12117-2:2008.

WARNING

AVOID DEATH OR SERIOUS INJURY

Never modify the operator cabin by welding, grinding, drilling holes or adding attachments unless instructed in writing by DOOSAN. Changes to the cabin can cause loss of operator protection from rollover and falling objects, and can result in death or serious injury.

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Counterweight

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Fuel Tank

6. If equipped, connect components to fuel filler pump port (22, Figure 15) on side of fuel tank (1).

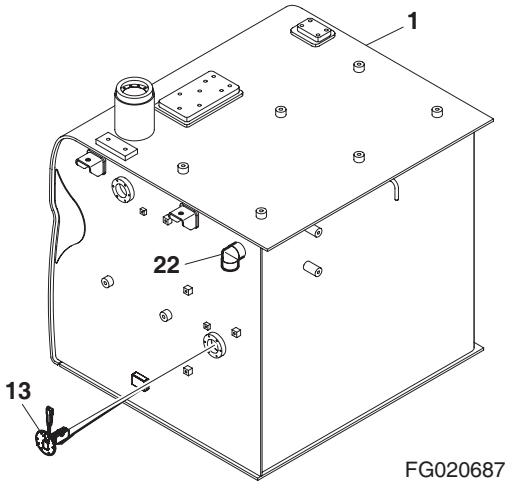

Figure 15

7. Connect as tagged, fuel supply line (21, Figure 16) and fuel return line (19) to fuel tank (1).
8. Install clamp (20, Figure 16) to hold fuel return line (19) to tank (1).

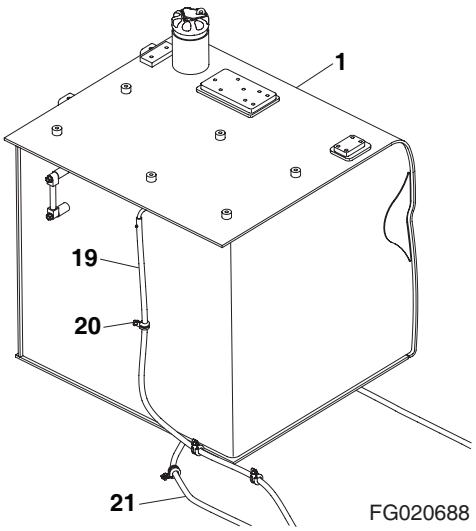

Figure 16

The fuel pump consists of a motor, pump, switch, and hose assembly.

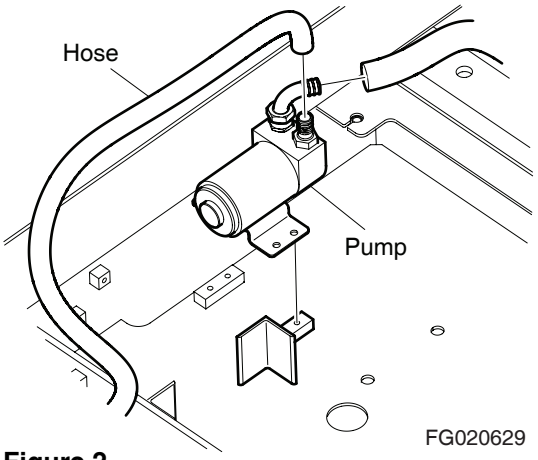

Figure 2

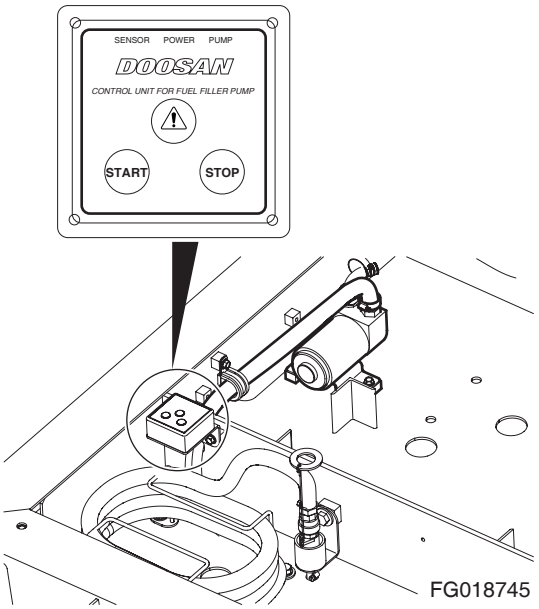

Figure 3

Swing Bearing Basic Operation

The swing bearing, which connects the upper structure with the lower structure, consists of a inner ring, outer ring and ball bearings. During swing movement, power from the swing motor is transferred to the pinion by planetary gears connected to gears on the inner ring, which is fixed in the undercarriage. Ball bearings turn the outer ring.

Reference Number	Description
1	Outer Ring
2	Inner Ring
3	Tapered Pin
4	Plug
5	Ball
6	Retainer
7	Seal

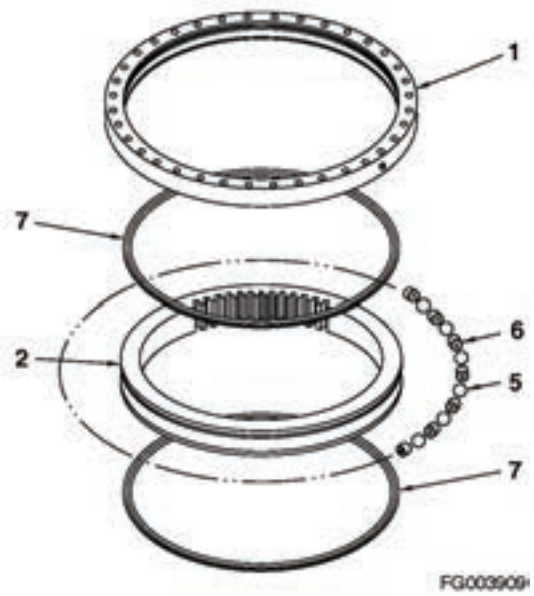

Figure 2

Disassembly

1. Remove tip of tapered pin (3, Figure 3) using grinder and tap lightly to remove debris.

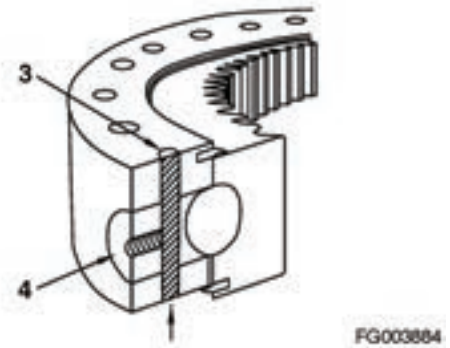

Figure 3

2. Remove plug (4, Figure 4) using a M10 x P 1.5 bolt.

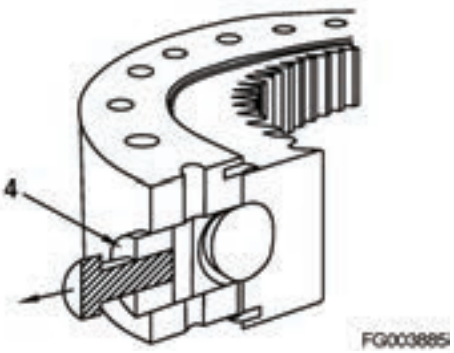

Figure 4

SAFETY INSTRUCTIONS

WARNING

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APPLICABLE MODELS

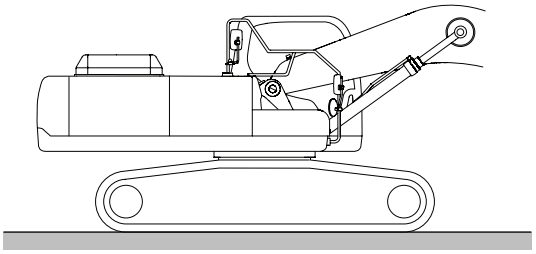
The contents of this section apply to the following models and serial number ranges.

MODEL	SERIAL NUMBER RANGE
DX380LC-3	10001 and Up

TRACK SHOES AND LINKS

Track Removal

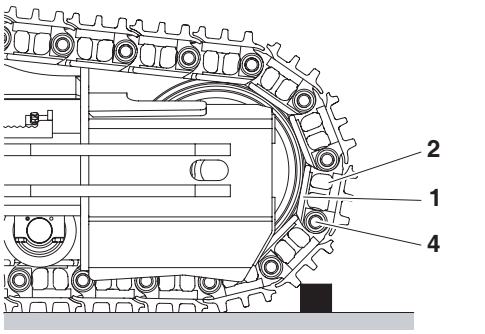
1. Position machine on a smooth level surface with adequate room for forward and reverse travel.



FG019247

Figure 8

2. Move machine until master link (4, Figure 9) is positioned at approximately 4 o'clock from top position on front idle roller.
3. Put a wooden block under track shoes, as shown.



FG025869

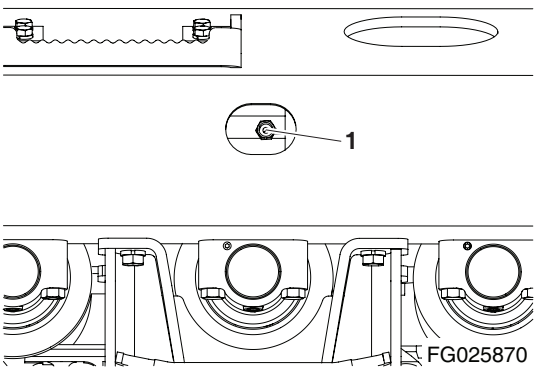
Figure 9

4. Loosen grease valve (1, Figure 10) for track adjuster to drain grease out. Use socket wrench 27 mm

WARNING

AVOID DEATH OR SERIOUS INJURY

The track adjusting mechanism is under very high-pressure. NEVER release grease pressure too fast. The track tension grease valve should never be loosened more than one (1) complete turn from the fully tightened down position. Bleed off grease pressure slowly. Keep your body away from the valve always. Always wear eye and face protection when adjusting track tension.

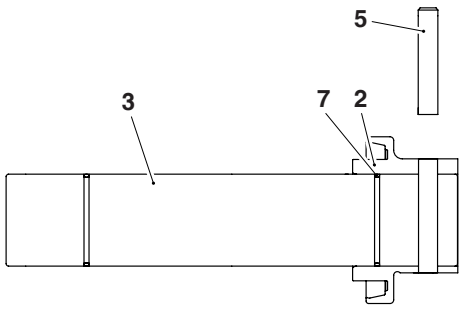


FG025870

Figure 10

5. Remove four nuts and bolts (1 and 2, Figure 9) holding shoe to link. Remove enough shoes to make access to master pin.
6. Remove master pin from master link by hammer or press. Remove pin after detaching shoe.

2. Apply grease to the O-rings (7, Figure 31) and insert into shaft.
3. Align collar (2, Figure 31) and shaft (3) pinholes and pin (5) the collar.



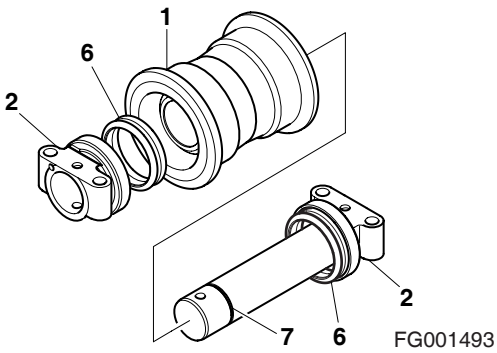
FG001492

Figure 31

4. Insert floating seals (6, Figure 32) into the roller (1) and collar (2).

   NOTE: *Apply clean gear oil to the joint side of the floating seal. Apply grease to the floating seal O-ring.*

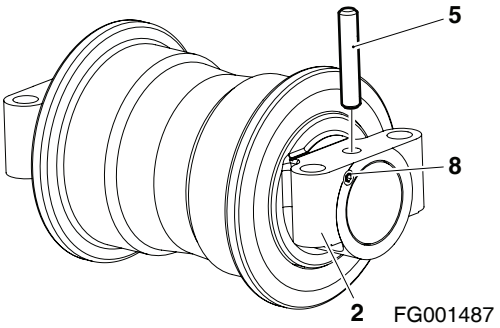
5. Slide the shaft inside the roller.



FG001493

Figure 32

6. Install the collar (2, Figure 33), O-ring (7), and pin (5) on the remaining side.
7. Fill with clean gear oil (ISO VG 220 EP/VI 130) with approximately 480 cc (16.2 oz).
8. Install plug (8, Figure 33) on the collar.



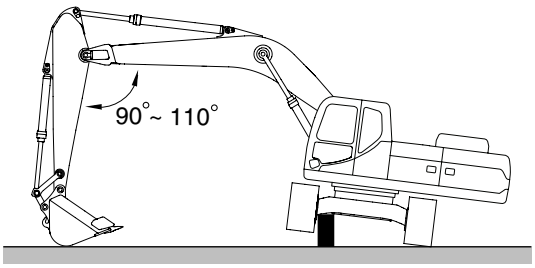
FG001487

Figure 33

Lower Roller Installation

1. Install four bolts to hold lower roller assembly to track frame.

   NOTE: *To gain access to some rollers a link guard may have to be removed. Remove four spring washers and bolts to remove guard.*



FG018383

Figure 34

Engine Coolant Heater (Option)

Edition 2

Changing the Combustion Air Fan

Removal

1. Remove heater.
2. Disconnect the electrical connections.
3. Remove screws (2, Figure 3).
4. Pull the combustion air fan (1, Figure 3) off the burner head (4, Figure 3) and remove with the shaped sealing ring (3, Figure 3).

   NOTE: *Remove control unit if necessary from the Thermo 90 S/Thermo 90 ST heater with flange mounted control unit.*

5. Complete the work on stripped-down components.

Installation

NOTE: *Insert the shaped seal (3, Figure 3) correctly and grease it (e.g. with Vaseline). Take care not to squash it.*

1. Install the new shaped sealing ring (3, Figure 3) onto the combustion air fan (1, Figure 3). Bring the fan into the assembly position and secure it with screws (2, Figure 3).
2. Tighten the screws (2, Figure 3) to 3 Nm ±10%.

   NOTE: *Install the control unit if necessary on the Thermo 90 S/Thermo 90 ST heater with flange mounted control unit.*

3. Connect the electrical connections.
4. Install the heater.

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Drive Coupling (Main Pump)

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Hydraulic System Troubleshooting, Testing and Adjustment

Forward Travel Circuit

When the right and left travel control levers are pushed forward, output from both of the main pumps is directed through the control valve, through the upper works center joint, to the travel motors on each side of the machine.

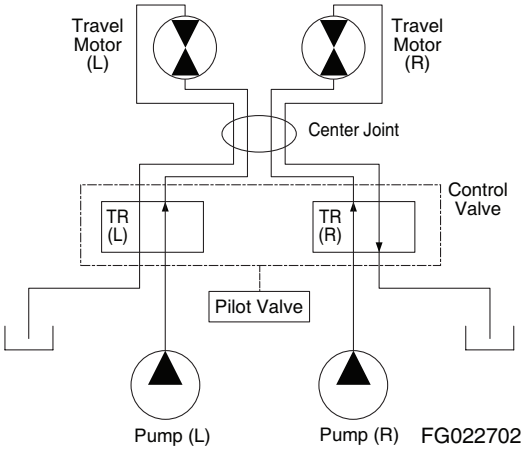


Figure 10

Reverse Travel Circuit

When the right and left travel control levers are pushed backward, output from both main pumps is directed through the control valve, through the upper works center joint, to the travel motors.

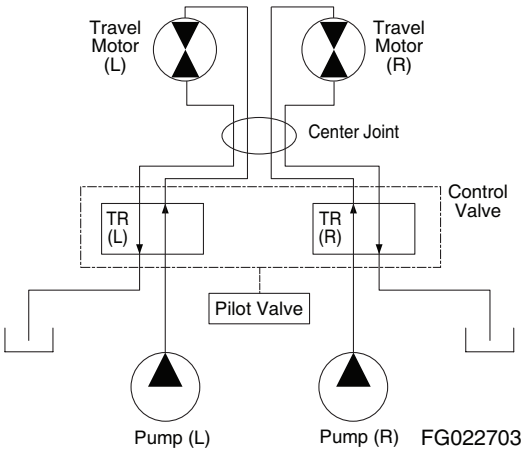


Figure 11

Swing Relief Valve Checking and Adjustment

Make a check of operating pressures through the swing relief valve if:

- The swing motor fails to turn.
- Swings in one direction only.
- Swings but continues to coast.
- There is drifting on a slope.

1. Check operation by connecting:

   A. Two 500 kg/cm^2 (7,112 psi) pressure gauges to the inlet and outlet measuring ports on top of the swing motor.

      Pressure must be between 290 and 300 kg/cm^2 (4,124 psi and 4,267 psi), with both swing locks engaged. With swing locks released, during full acceleration and deceleration, pressure should approach 295 kg/cm^2 (4,196 psi) in each direction.

   B. Connect a 100 kg/cm^2 (1,422 psi) pressure gauge at the "SH" port of the hydraulic brake.

      Pressure should always stay at or above 13 kg/cm^2 (185 psi) when operating swing, boom or arm.

   C. Connect a 10 kg/cm^2 (142 psi) gauge at the motor makeup valve.

      Pressure should stay consistently above 2.5 kg/cm^2 (36 psi). If pressure falls below the recommended minimum level, forceful acceleration of the swing motor could lead to cavitation of the circuit and stalling, slowed rotation, noise and possible damage.

2. If main inlet and outlet pressures were off in the preceding tests in Step 1, adjust swing relief valve pressure.

   Following adjustment, repeat the operating pressure tests (with gauges connected to the inlet and outlet test ports on top of the swing motor) and check pressures with the swing locks engaged and released.

   If pressure adjustment fails to restore adequate performance, proceed to the Troubleshooting – Swing table.

3. If pressure tests were at recommended levels through the main inlet and outlet ports, and through the "SH" port of the swing brake, the causes of poor swing performance could include a faulty swing motor, drivetrain overloading or gearbox defect, or a problem in the brake assembly or swing control valve. Proceed to the troubleshooting information in the next procedure.

   If pressure through the "SH" port was tested below the minimum 13 kg/cm^2 (185 psi) level, check the shuttle valve in the rear compartment behind cabin. When pressure through the port is at the recommended level, the brake release valve should disengage the swing brake, allowing the swing motor to rotate the excavator. If pressure adjustment to the valve has been restored but the brake still

TROUBLESHOOTING – TRAVEL CONTROL VALVE

Problem	Possible Cause	Remedy
Secondary pressure does not increase.	Low primary pressure.	Check primary pressure.
	Broken spring.	Replace spring.
	Spool sticking.	Clean, repair or replace.
	Excess spool to casing clearance.	Replace spool casing.
	Worn or loose universal joint (handle) subassembly.	Repair or replace U-joint subassembly.
Secondary pressure too high.	Dirt, other interference between valve parts.	Clean, repair or replace.
	Return line pressure too high.	Redirect return line.
Secondary pressure does not hold steady.	Dirt, other interference between valve parts, or worn spool sticking intermittently.	Clean, repair or replace.
	Interference or binding on spool return spring.	Clean, repair or replace.
	Interference, restriction or unsteady pressure in tank return line.	Repair or reroute tank return line.
	Air bubbles in piping (temporary) or air leak.	Vent air, or repair leak.
NOTE: *Look for evidence of leaking oil.*		

Center Joint (Swivel)

Edition 2

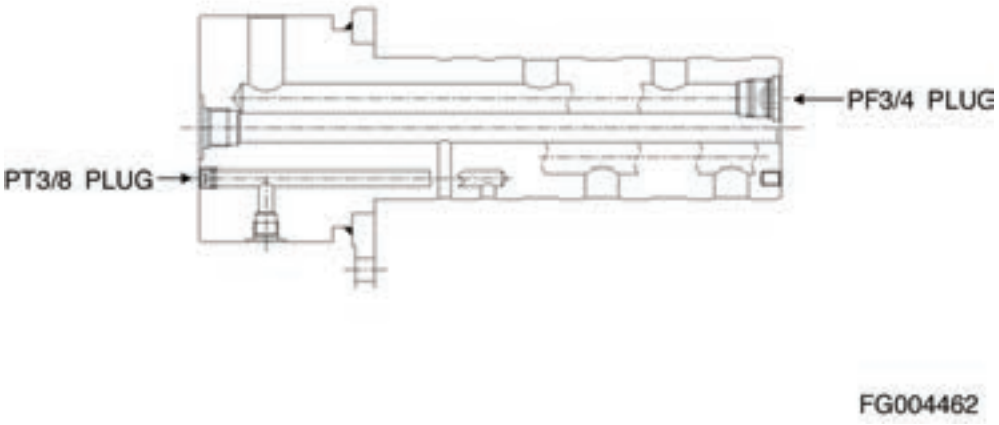


Figure 7

8. Remove foreign substance at every pieces disassembled and wash them out.
9. Replace disassembled O-rings and slipper seals with new ones, for they cannot be reused.

IMPORTANT

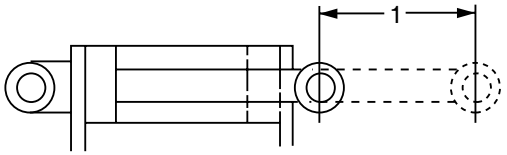
The inside of the hub must be air washed and rustproof treated after washing it to prevent rusting.

Because the volume of oil needed to lengthen the cylinder rod (Q1) is greater than the volume of oil required to retract the cylinder rod, it takes more time to extend a cylinder than it does to retract it.

$$Q_1 = S \times \frac{\pi(D^2)}{4}$$

$$Q_2 = S \times \frac{\pi(D^2-R^2)}{4}$$

$Q_1 > Q_2$



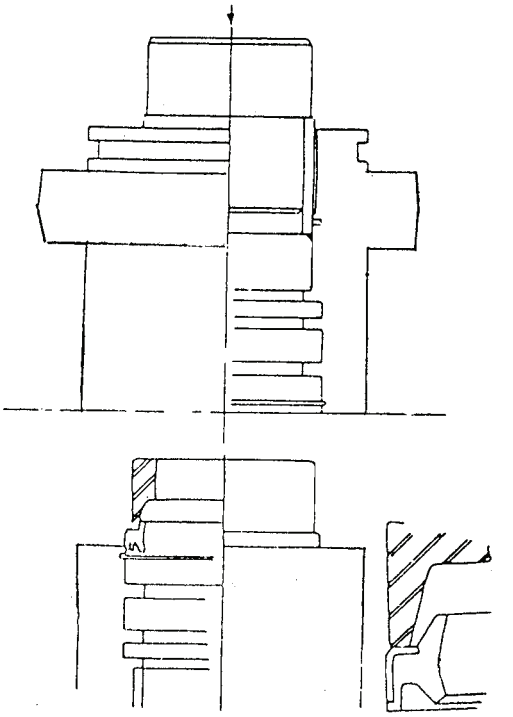
FG001459

Figure 3

Model	Cylinder	A (±0.1)	øB	øC	øD	Model (Cylinder)
DX140LC-3	Boom	80.0 mm (3.15 in)	11.0 mm (0.43 in)	58.0 mm (2.28 in)	110.0 mm (4.33 in)	
	Arm	90.0 mm (3.54 in)	11.0 mm (0.43 in)	67.0 mm (2.64 in)	115.0 mm (4.53 in)	
	Bucket	75.0 mm (2.95 in)	11.0 mm (0.43 in)	53.0 mm (2.09 in)	100.0 mm (3.94 in)	
	Arti	110.0 mm (4.33 in)	13.0 mm (0.51 in)	76.0 mm (2.99 in)	140.0 mm (5.51 in)	
DX140W-3	Boom	80.0 mm (3.15 in)	11.0 mm (0.43 in)	58.0 mm (2.28 in)	110.0 mm (4.33 in)	
	Arm	90.0 mm (3.54 in)	11.0 mm (0.43 in)	67.0 mm (2.64 in)	115.0 mm (4.53 in)	
	Bucket	70.0 mm (2.76 in)	11.0 mm (0.43 in)	53.0 mm (2.09 in)	95.0 mm (3.74 in)	
	Arti	110.0 mm (4.33 in)	13.0 mm (0.51 in)	76.0 mm (2.99 in)	140.0 mm (5.51 in)	
DX180LC-3	Boom	90.0 mm (3.54 in)	11.0 mm (0.43 in)	67.0 mm (2.64 in)	115.0 mm (4.53 in)	
	Arm	90.0 mm (3.54 in)	13.0 mm (0.51 in)	75.0 mm (2.95 in)	125.0 mm (4.92 in)	
	Bucket	80.0 mm (3.15 in)	11.0 mm (0.43 in)	58.0 mm (2.28 in)	110.0 mm (4.33 in)	
	Arti	120.0 mm (4.72 in)	13.0 mm (0.51 in)	80.0 mm (3.15 in)	160.0 mm (6.30 in)	
DX190W-3	Boom	90.0 mm (3.54 in)	13.0 mm (0.51 in)	67.0 mm (2.64 in)	120.0 mm (4.72 in)	
	Arm	90.0 mm (3.54 in)	13.0 mm (0.51 in)	75.0 mm (2.95 in)	125.0 mm (4.92 in)	
	Bucket	80.0 mm (3.15 in)	11.0 mm (0.43 in)	58.0 mm (2.28 in)	110.0 mm (4.33 in)	
	Arti	120.0 mm (4.72 in)	13.0 mm (0.51 in)	80.0 mm (3.15 in)	160.0 mm (6.30 in)	
DX225LC-3	Boom	90.0 mm (3.54 in)	13.0 mm (0.51 in)	75.0 mm (2.95 in)	125.0 mm (4.92 in)	
	Arm	110.0 mm (4.33 in)	13.0 mm (0.51 in)	85.0 mm (3.35 in)	140.0 mm (5.51 in)	
	Bucket	90.0 mm (3.54 in)	13.0 mm (0.51 in)	67.0 mm (2.64 in)	120.0 mm (4.72 in)	
	Arti	120.0 mm (4.72 in)	13.0 mm (0.51 in)	90.0 mm (3.54 in)	150.0 mm (5.91 in)	
DX255LC-3	Boom	96.0 mm (3.78 in)	13.0 mm (0.51 in)	69.0 mm (2.72 in)	130.0 mm (5.12 in)	
	Arm	110.0 mm (4.33 in)	13.0 mm (0.51 in)	85.0 mm (3.35 in)	140.0 mm (5.51 in)	
	Bucket	100.0 mm (3.94 in)	11.0 mm (0.43 in)	67.0 mm (2.64 in)	125.0 mm (4.92 in)	
	Arti	130.0 mm (5.12 in)	13.0 mm (0.51 in)	90.0 mm (3.54 in)	160.0 mm (6.30 in)	
DX300LC-3	Boom	110.0 mm (4.33 in)	13.0 mm (0.51 in)	85.0 mm (3.35 in)	140.0 mm (5.51 in)	
	Arm	120.0 mm (4.72 in)	13.0 mm (0.51 in)	95.0 mm (3.74 in)	150.0 mm (5.91 in)	
	Bucket	105.0 mm (4.13 in)	13.0 mm (0.51 in)	80.0 mm (3.15 in)	135.0 mm (5.31 in)	
DX340LC-3/ DX350LC-3	Boom	120.0 mm (4.72 in)	13.0 mm (0.51 in)	90.0 mm (3.54 in)	150.0 mm (5.91 in)	
	Arm	135.0 mm (5.31 in)	13.0 mm (0.51 in)	105.0 mm (4.13 in)	170.0 mm (6.70 in)	
	Bucket	120.0 mm (4.72 in)	13.0 mm (0.51 in)	90.0 mm (3.54 in)	150.0 mm (5.91 in)	

Model	Cylinder	ø$A^{+0.2}_{+0.1}$	$B^{+0.2}_{+0.1}$	Model (Cylinder)
DX380LC-3	Boom	160.0 mm (6.30 in)	34.5 mm (1.36 in)	
	Arm	170.0 mm (6.69 in)	41.5 mm (1.63 in)	
	Bucket	150.0 mm (5.91 in)	34.5 mm (1.36 in)	
DX420LC-3	Boom	170.0 mm (6.69 in)	34.5 mm (1.36 in)	
	Arm	180.0 mm (7.09 in)	41.5 mm (1.63 in)	
	Bucket	160.0 mm (6.30 in)	34.5 mm (1.36 in)	
DX490LC-3/ DX530LC-3	Boom	170.0 mm (6.69 in)	34.5 mm (1.36 in)	
	Arm	190.0 mm (7.48 in)	41.5 mm (1.63 in)	
	Bucket	170.0 mm (6.69 in)	34.5 mm (1.36 in)	

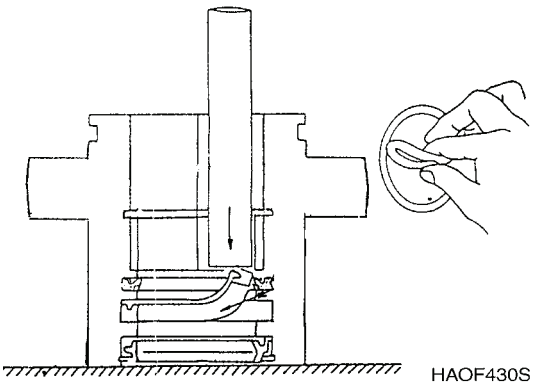
2. Following reassembly of rod cover components, install the dust wiper (11) and rod bushing (6) to the rod cover (5). Insert retaining rings (7 and 12).



HAOF440S

Figure 31

3. Prelubricate O-rings and seals before reassembly (Figure 32).



HAOF430S

Figure 32

4. Before starting to rebuild piston assembly, heat slipper seal for 5 minutes in an oil bath warmed to 150° - 180°C (302° - 356°F). Use special slipper seal jig (third item in list of specialized tools at the beginning of this procedure) to attach seal. Cool seal by pushing a retracting jig against seal for several minutes. Apply a strip of clean, see-through sealing tape around slipper seal to keep it free of dust.

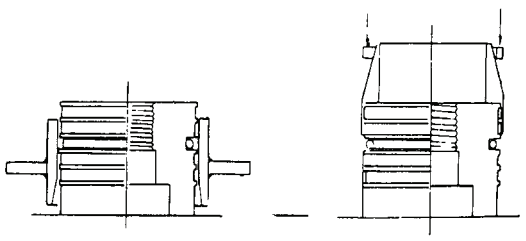


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Figure 33

Reference Number	Description
T1	Casing
T2	Valve Casing
T3	Driveshaft
T4	Roller Bearing
T5	Roller Bearing
T6	Oil Seal
T7	Shoe Plate
T8	Plate Retainer
T10	Piston Assembly
T11	Thrust Ball
T12	Cylinder Spring
T13	Cylinder Block
T14	Friction Plate
T15	Mating Plate
T16	Brake Piston
T17	Brake Spring
T18	Valve Plate
T19	Plunger

Reference Number	Description
T20	Spring
T21	Plug
T22	Pin
T23	O-ring
T24	O-ring
T25	O-ring
T28	Socket Bolt
T29	Socket Bolt
T30	Socket Bolt
T31	Plug
T33	O-ring
T34	Plug
T35	O-ring
T36	Retaining Ring
T37	Relief V/V
T38	Brake V/V
T39	Swing Reactionless Valve

External Load at the End of Shaft

In principle, the end of the motor shaft must be free of any external radial or thrust load.

Hydraulic Oil and Temperature Range

1. Oil type

   The recommended oil is mineral type hydraulic oil added with extreme pressure additive, foam suppressor, antioxidant, and desiccant, having high viscosity index.

2. Optimal viscosity and temperature range of hydraulic oil (Figure 10)

   Maximum viscosity range is 10 - 1000cSt, however, recommended range is 10 - 200cSt to obtain optimal efficiency.
   Temperature range is restricted between -25°C - 100°C to protect oil seals and O-rings. The highest recommended temperature is 60°C or lower to prevent degeneration of the oil and seals.

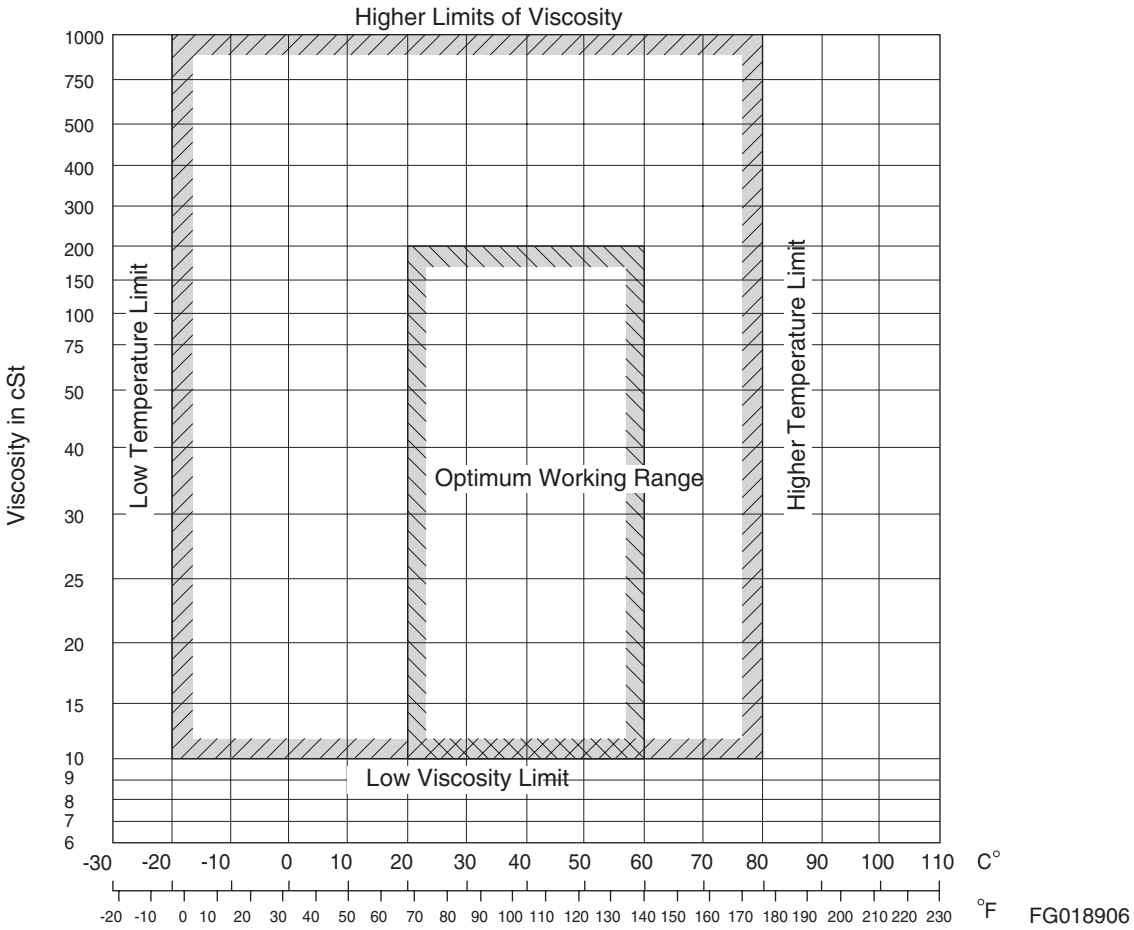


Figure 10 Optimum Viscosity and Temperature Range

3. Other types of oils than mineral oils

   Please contact us to use phosphoric acid ester, water-glycol, or fatty acid ester oils.

3. Loosen the nut (10, Figure 16).
   - : 27 mm
4. Remove the tee (11, Figure 16).
   - : 41 mm

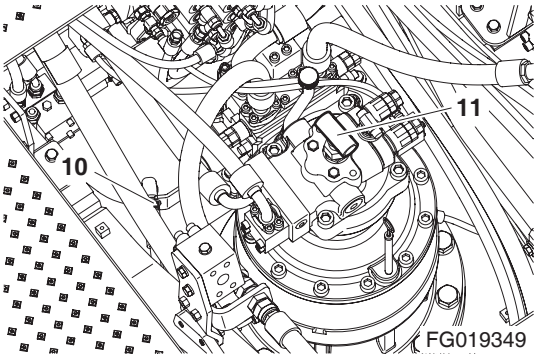


Figure 16

5. Install eyebolt in "a" (M12 x 1.5).
6. Attach a nylon sling onto the eyebolt (12, Figure 17).

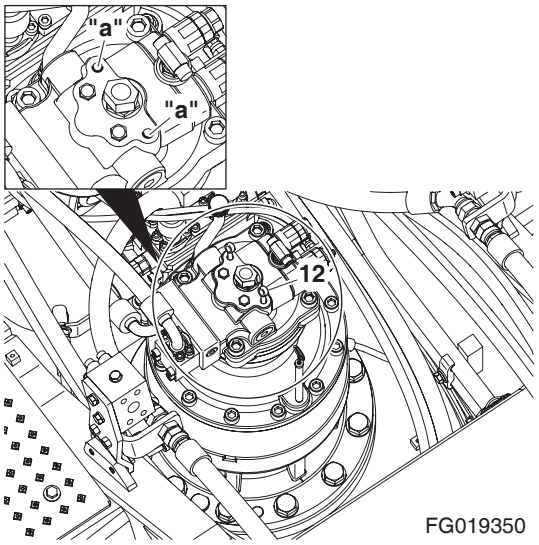


Figure 17

7. Remove bolts (13, Figure 18) (12 used).
   - : 36 mm

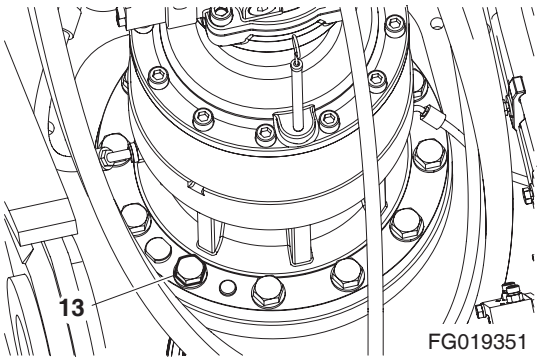


Figure 18

7. Insert the 9 cylinder block springs (T12) to the cylinder block (T13).

   Confirming that 9 cylinder block springs are assembled, assemble the thrust call (T11).

   After assembling the thrust ball (T11), assemble the retainer (T8) and piston assembly (T9, T10).

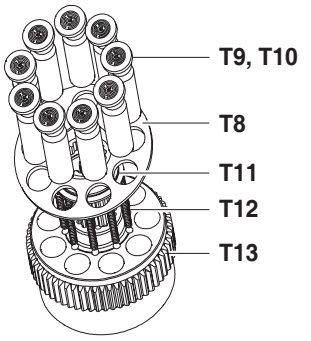


Figure 50

8. Lay the motor horizontally and install the cylinder block (T13), piston assembly (T9, T10), retainer (T8), thrust ball (T11) and shoe plate (T7).

   During the assembly work, take care not to damage the sliding surfaces of the cylinder block (T13), thrust ball (T11) and shoe.

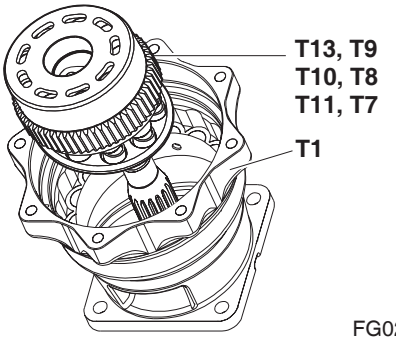


Figure 51

9. Install 3 friction plates (T14) and 4 separation plates (T15) with the casing (T1).

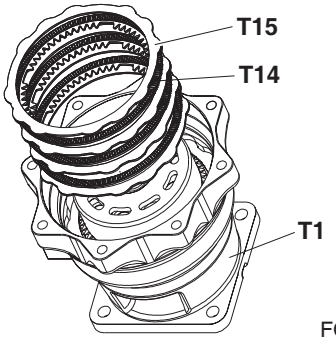


Figure 52

10. Apply grease to the O-rings (T25, T23) thinly and install them with the valve casing (T2).

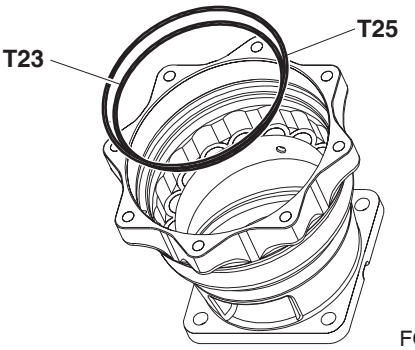


Figure 53

8. Checking the position pin (R31), assemble the ring gear (R7) with the casing (R1).

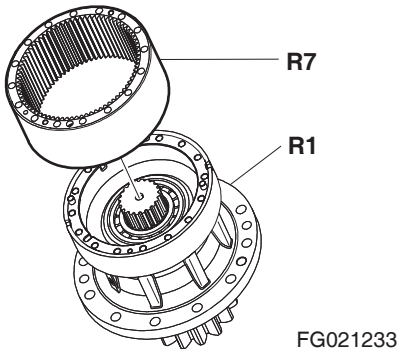


Figure 86

9. Tighten the hex socket head bolts (R31) (2 used).
   - ⌐ : 8 mm
   - Torque: 6.5 kg•m (64 Nm, 47 lb•ft)

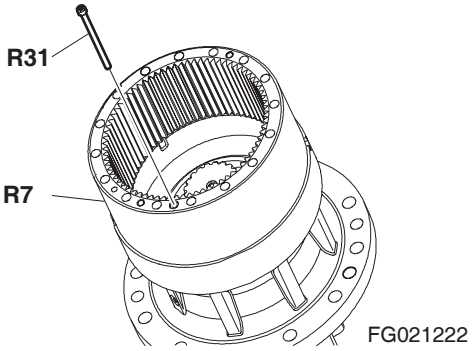


Figure 87

10. Temporarily assemble the bushing (R13), planet gear (R15) and washer (R19).

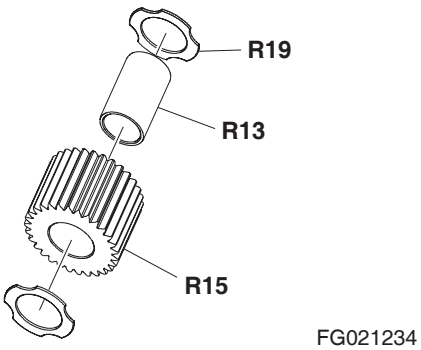


Figure 88

11. Install the thrust washer (R10) and then insert the temporarily assembled planet gear (R15) into the carrier No.2 (R8), and assemble No. 2 pin (R11).

    Through these procedures, assemble the 4 planet gears.

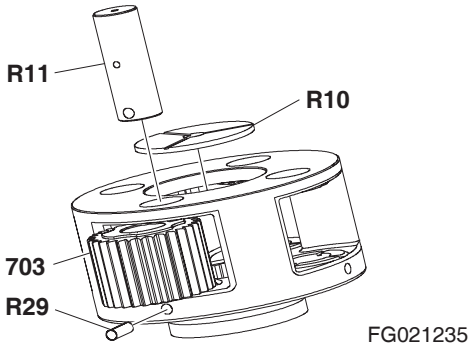


Figure 89

Table of Contents

Travel Device

Hydraulic Motor (Brake Valve, Parking Brake, High-Low 2-Stage Switching Mechanism)

Function

1. Function of the hydraulic motor

   The hydraulic motor is a swash plate type axial piston motor, which converts the power of the pressurized oil from the pump into rotational motion.

2. Function of the brake valve

   The brake valve included in the hydraulic motor performs four functions as follows:

   A. When the motor stops, brake the motor to control the moment of inertia and stop the motor smoothly.

   B. The function of a check valve is to prevent cavitation of hydraulic motor.

   C. To function as a relief valve which controls the brake pressure of the hydraulic motor and anticavitation valve to prevent cavitation.

   D. While the TM motor operates, it opens the port which releases the parking brake, and when the motor stops, it close the port.

3. Function of high-low speed 2-stage switching mechanism:

   Using the switching valve and control piston, the swivel angle of the swash plate can be switched between high-speed low torque and low-speed high torque stages.

4. Function of parking brake

   The parking brake prevents the excavator from moving when parked on a slope by using a friction plate type brake mechanism. The brake is integrated with the hydraulic motor.

Lubricant

The reduction gear is filled with lubricant (gear oil) at the time of shipping, however, check the oil level before operation.

1. Selecting gear oil

   Use the gear oil with SAE #90 of equivalent extreme pressure additive (API Classification GL-4 Grade or better).

2. Replacement period of gear oil

   A. First replacement (first time after starting operation): 500 hr

   B. Second and later replacement: 1,000 hr or 1 year

      However, if gear oil reduces fast than normal, find out and correct the cause before refilling oil.

3. Replacement volume of gear oil: 6.3ℓ

4. Replacement method of gear oil

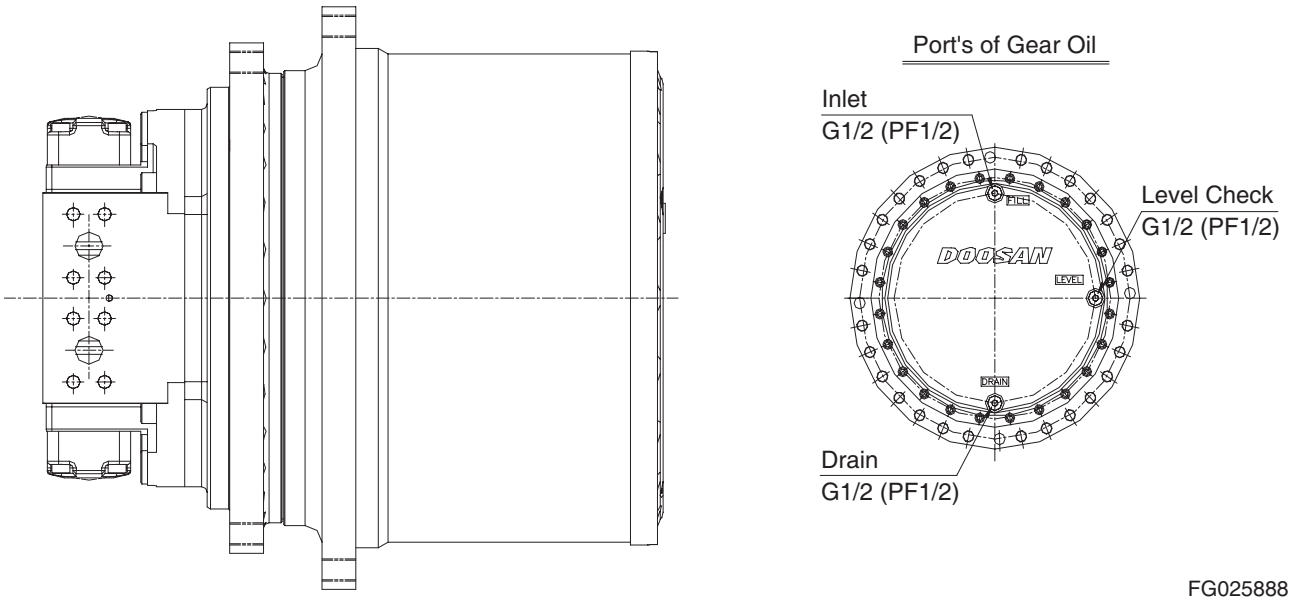


Figure 12

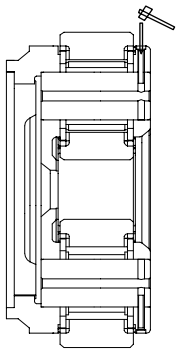
Added or replaced oil must be of the same kind. Do not mix with a different type or grade of oil.

A. Let the oil refill port and drain port be perpendicular to the horizontal plane.

B. For replacement, unplug the two ports and drain the gear oil.

C. Refill gear oil until oil overflows from oil level check port.

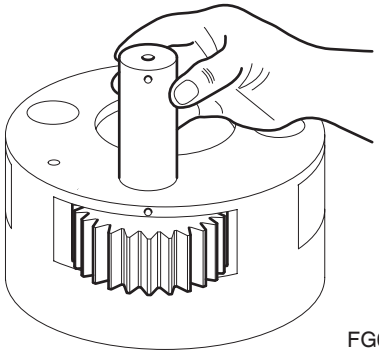
D. Wind Teflon or thread tape on the plug before plugging the ports again.



FG018769

Figure 26

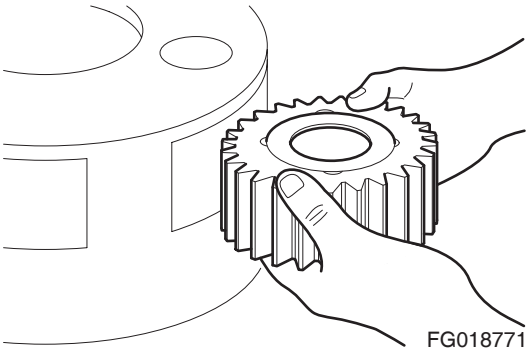
12. Remove the 4 shaft bearings (F) (133).



FG018770

Figure 27

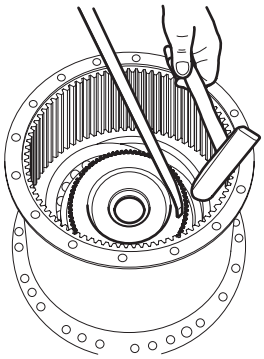
13. Disassemble thrust washer (F) (136), planetary gear (F) (131), needle bearing (132), and floating bushing (134) from the carrier No. 2 (130) in that order.



FG018771

Figure 28

14. Hit the separated surface with a tool and a hammer to remove the shim plate (110).



FG018772

Figure 29

11. Install the spindle (101) cylinder block sub-assembly (CB1).

    NOTE: *Apply hydraulic oil to the swash plate (203) and shoe (262).*

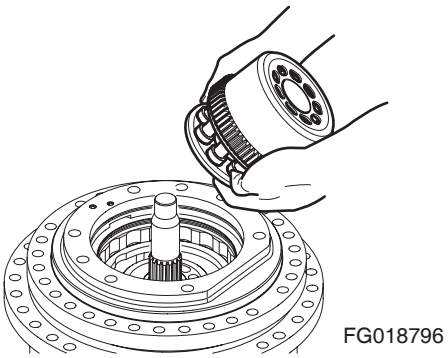


Figure 62

12. Install four friction plates (215) and three mating plates (216) into the spindle (101) and cylinder block (204).

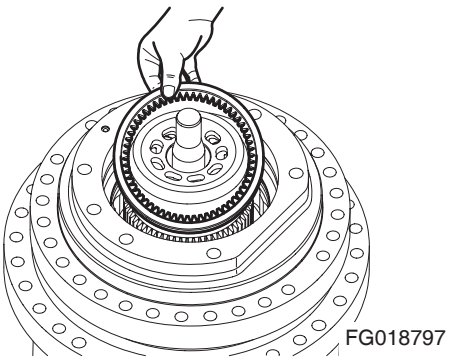


Figure 63

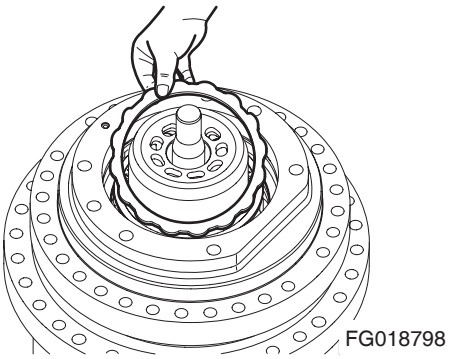


Figure 64

13. Install the O-ring (233) (P8) into the spindle (101).

    NOTE: *Do not reuse the O-ring.*

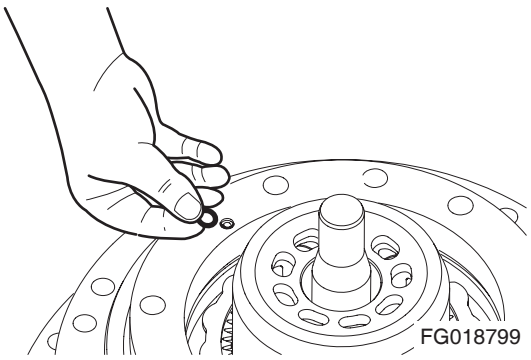


Figure 65

9. Install the spring pin (135) on the carrier No. 2 (130).

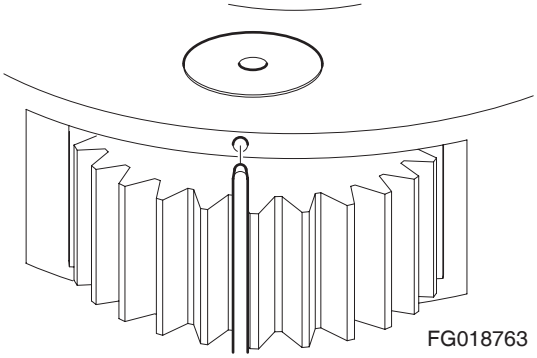


Figure 101

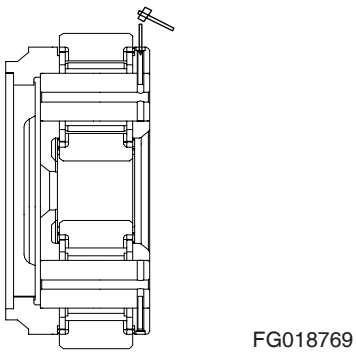


Figure 102

10. Install the carrier No. 2 assembly with the hub (102).

    NOTE: *Install M10 eyebolts and disassemble the unit using a crane.*

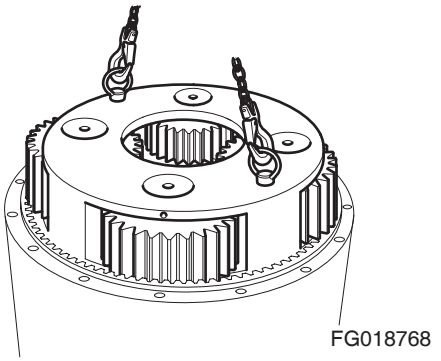


Figure 103

11. Install the sun gear (160).

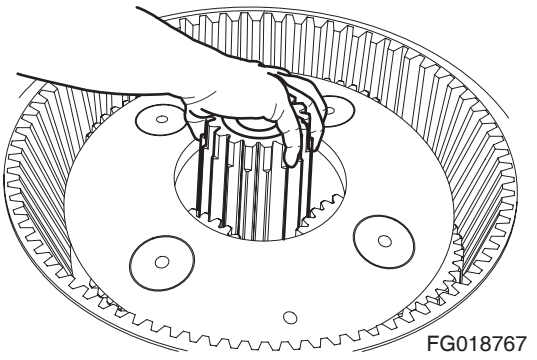


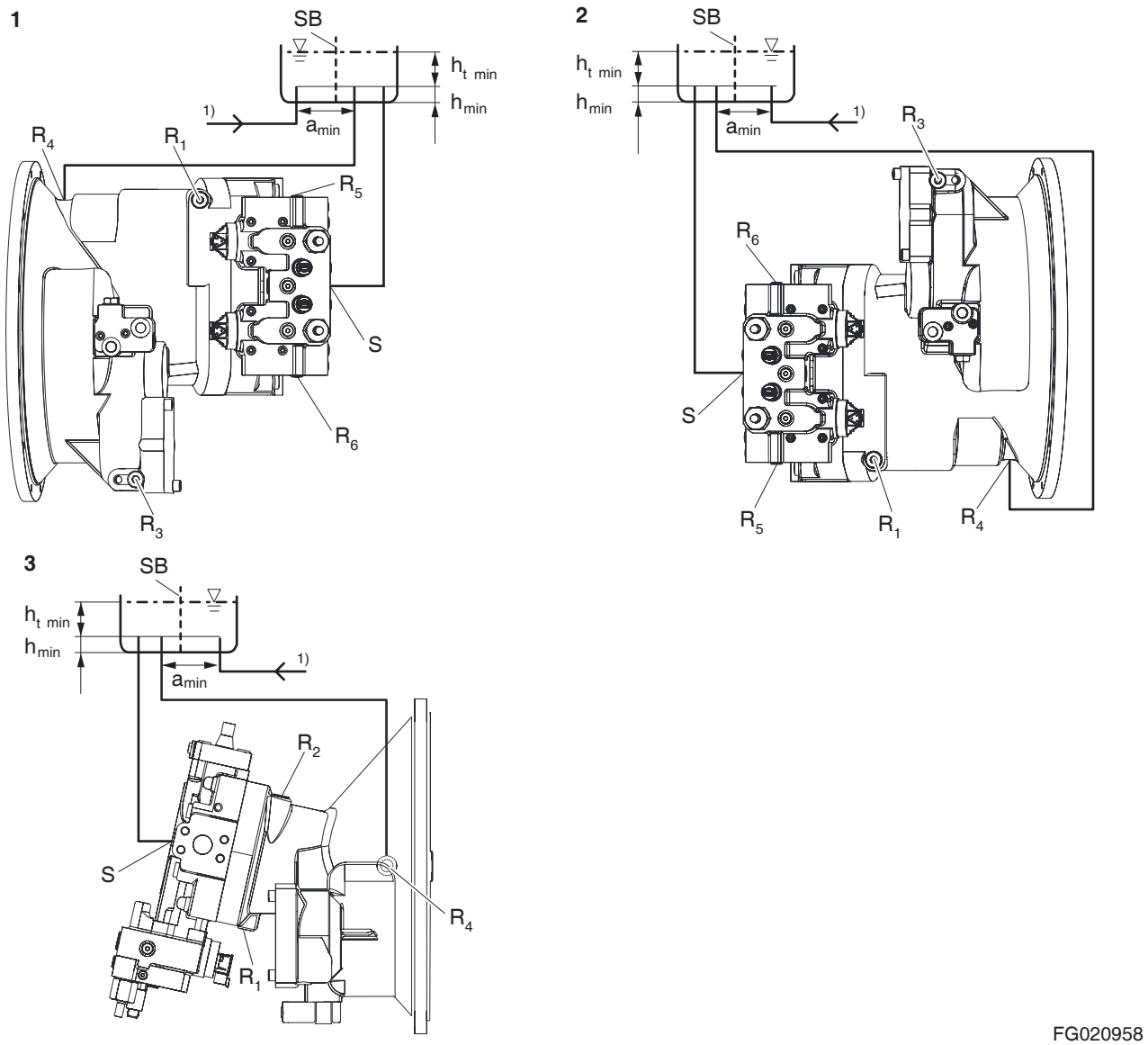
Figure 104

Table of Contents

Main Pump

Reference Number	Description
1	Driveshaft
2	Retaining Ring
3	Backup Plate
4	Shaft Seal Ring
5	Retaining Ring (Bearing)
6	Backup Plate
7	Shim
8	Gear Pump (Auxiliary Pump)
9	Driveshaft Bearing
10	Pressure Relief Valve
11	Case
12	Angle Position Sensor
13	Pressure Reducing Valve, Electric

Reference Number	Description
14	Pressure Controller
15	Stroke Piston
16	Sealing Nut (Covered with Protective Cap)
17	Lens Plate
18	Cylinder
19	Piston
20	Retaining Plate
21	Service Line Port
22	Suction Port
23	Power Take-off (Sealed with Cover)



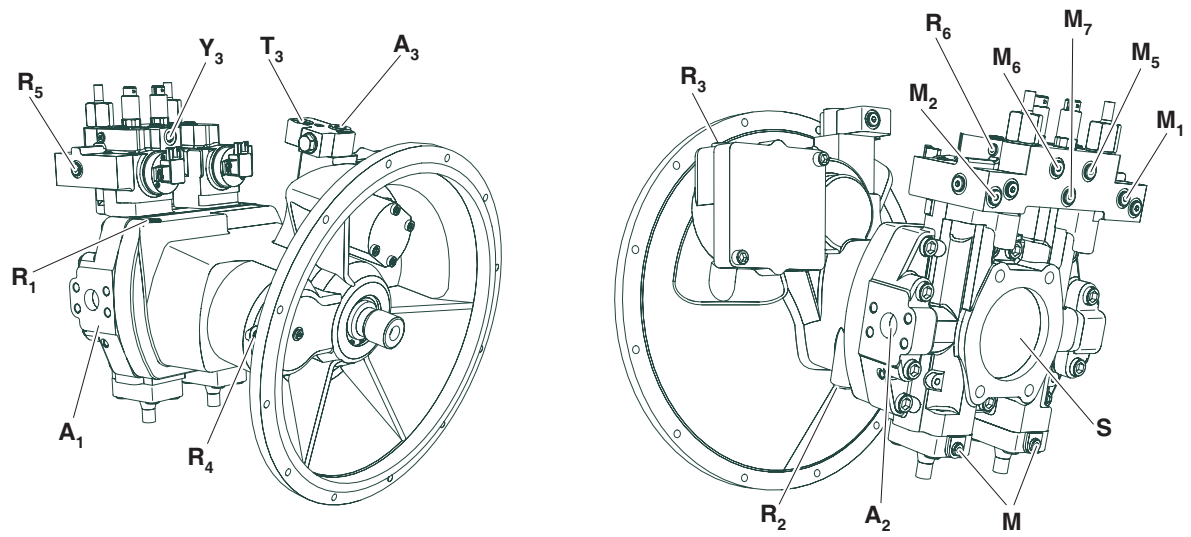
FG020958

Figure 10

Reference Number	Description
R_1, R_3	Port for Air Bleeding
R_2	Port for Oil Draining
R_4	Flush Line
R_5, R_6	Port for Air Bleed (DRE)
S	Suction Port
SB	Baffle (Baffle Plate)
$h_{t\ min}$	Minimum Necessary Immersion Depth (200 mm)

Reference Number	Description
h_{min}	Minimum Necessary Spacing from Suction Port fo Reservoir Base (100 mm)
a_{min}	When Designing the Reservoir, Ensure Adequate Distance between the Suction Line and the Case Drain Line. This Prevents the Heated, Return Flow from being Drawn Directly Back Into the Suction Line.

Port Overview



FG020961

Figure 13

Designation	Port for	Standard	Maximum Pressure [bar][1)]	State
A_1, A_2	Service Line Fixing Thread A1/A2	SAE J518[2)] DIN 13	400	O
S	Suction Line Fixing Thread S	SAE J518[2)] DIN 13	1.5	O
A	Service Line for Auxiliary Pump	DIN 3852[3)]	70	O
T	Tank Line	DIN 3852[3)]	1.5	O
R_1, R_3	Air Bleed	DIN 3852[3)]	1.5	X[4)]
R_2	Oil Drain	DIN 3852[3)]	1.5	X[4)]
R_4	Flush Line	ISO 11926[3)]	1.5	O[5)]
R_5, R_6	Air Bleed	DIN 3852[3)]	1.5	X[4)]
M	Measurement of Stroking Chamber Pressure	DIN 3852[3)]	400	X
M_1	Pressure Measurement A1	DIN 3852[3)]	400	X
M_2	Pressure Measurement A2	DIN 3852[3)]	400	X
M_5, M_6	Measurement for Pressure Controller Override	DIN 3852[3)]	30	O
M_7	Measurement for Auxiliary Pressure	DIN 3852[3)]	70	X
Y_3	Auxiliary Pressure	DIN 3852[3)]	70	O

[1)] Short term pressure spikes may occur depending on the application.
Keep this in mind when selecting measuring devices and fittings.

[2)] Only dimensions in accordance with SAE J518, metric fixing thread deviating from the standard.

[3)] The countersink may be deeper that specified in the standard.

[4)] Open port R only for filling and air-bleeding.

[5)] Flush oil for cooling and lubrication of the bearings is drawn by way of port R4.
It is essential that port R4 be directly connected to the reservoir.

O = Must be connected (plugged on delivery)

X = Plugged (in normal operation)

Cleaning and Care

IMPORTANT

Damage to the surface caused by solvents and aggressive detergents!

Aggressive detergents may damage the seals on the axial piston unit and reduce their service lift.

- **Never use solvents or aggressive detergents.**

IMPORTANT

Damage to the hydraulic system and the seals!

A high-pressure cleaner's water pressure could damage the electronics and the seals of the axial piston unit.

- **Do not point the high-pressure cleaner at sensitive components, e.g. shaft seal ring, electrical connections and electrical components.**

For cleaning and care of the axial piston unit, observe the following:

1. Plug all openings with suitable protective caps/devices.
2. Check whether all seals and fittings on the connections are securely seated to ensure that no moisture can penetrate into the axial piston unit during cleaning.
3. Use only water and, if necessary, a mild detergent to clean the axial piston unit.
4. Remove coarse dirt from the outside of the machine and keep sensitive components such as solenoids, valves, indicators and sensors clean.

Procedure

To replace the shaft seal:

1. Mask the driveshaft (4) to prevent damage to the shaft seal.

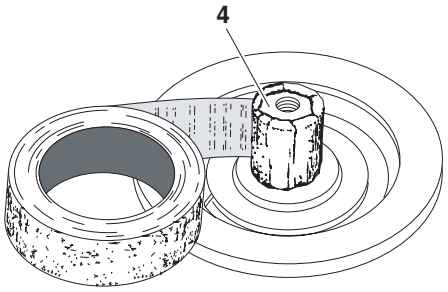
WARNING

AVOID DEATH OR SERIOUS INJURY

Risk of injury!

When removing, the retaining ring it can suddenly release, hit you or a bystander and cause injury.

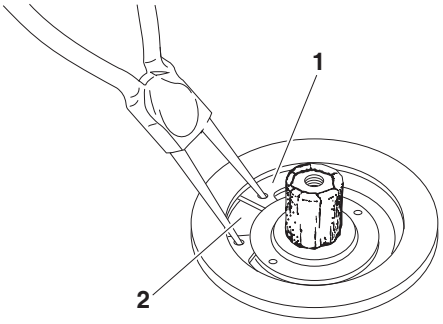
- **Wear safety glasses.**



FG020963

Figure 15

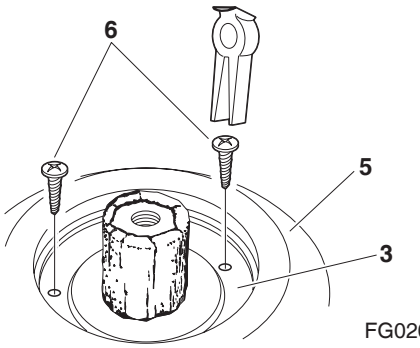
2. Remove the retaining ring (1) and the backup plate (2) from the case.



FG020964

Figure 16

3. Turn two tapping screws (6) into the rubber-filled holes of the shaft seal (3). Pull the shaft seal out of the case with a gripper (5).



FG020965

Figure 17

Replacing the Angle Position Sensor

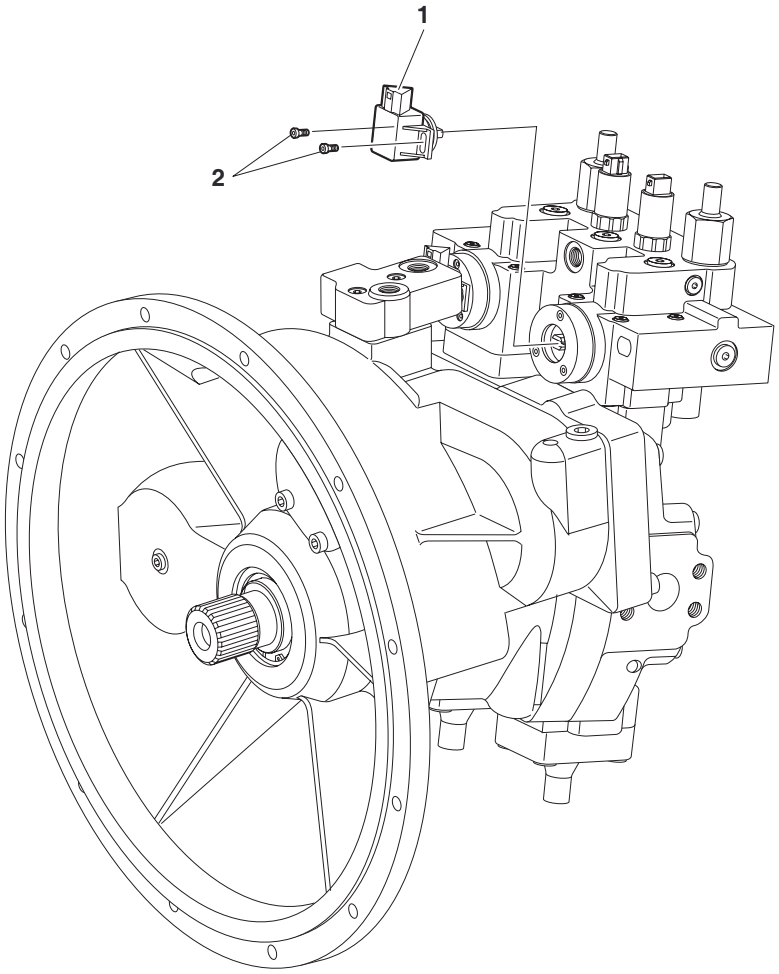
This section explains how to replace the angle position sensor.

IMPORTANT

No special tools are required for the following work steps.

IMPORTANT

To replace and readjust the angle position sensor, the rotary group of the variable pump must be set to $V_{g\ max}$.



FG021149

Figure 28

Reference Number	Description
1	Angle Position Sensor

Reference Number	Description
2	Fixing Screws

SAFETY INSTRUCTIONS

WARNING

AVOID DEATH OR SERIOUS INJURY

Instructions are necessary before operating or servicing machine. Read and understand the Operation and Maintenance Manual and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments repairs or service. Untrained operators and failure to follow instructions can cause death or serious injury.

APPLICABLE MODELS

The contents of this section apply to the following models and serial number ranges.

MODEL	SERIAL NUMBER RANGE
DX340LC-3	1001 and Up, 10001 and Up
DX350LC-3	1001 and Up, 10001 and Up
DX380LC-3	10001 and Up
DX420LC-3	10001 and Up
DX490LC-3	10001 and Up
DX530LC-3	10001 and Up

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Fan Motor for Oil Cooler

Fan Pump

Edition 1

SEALING CONTROL VALVE

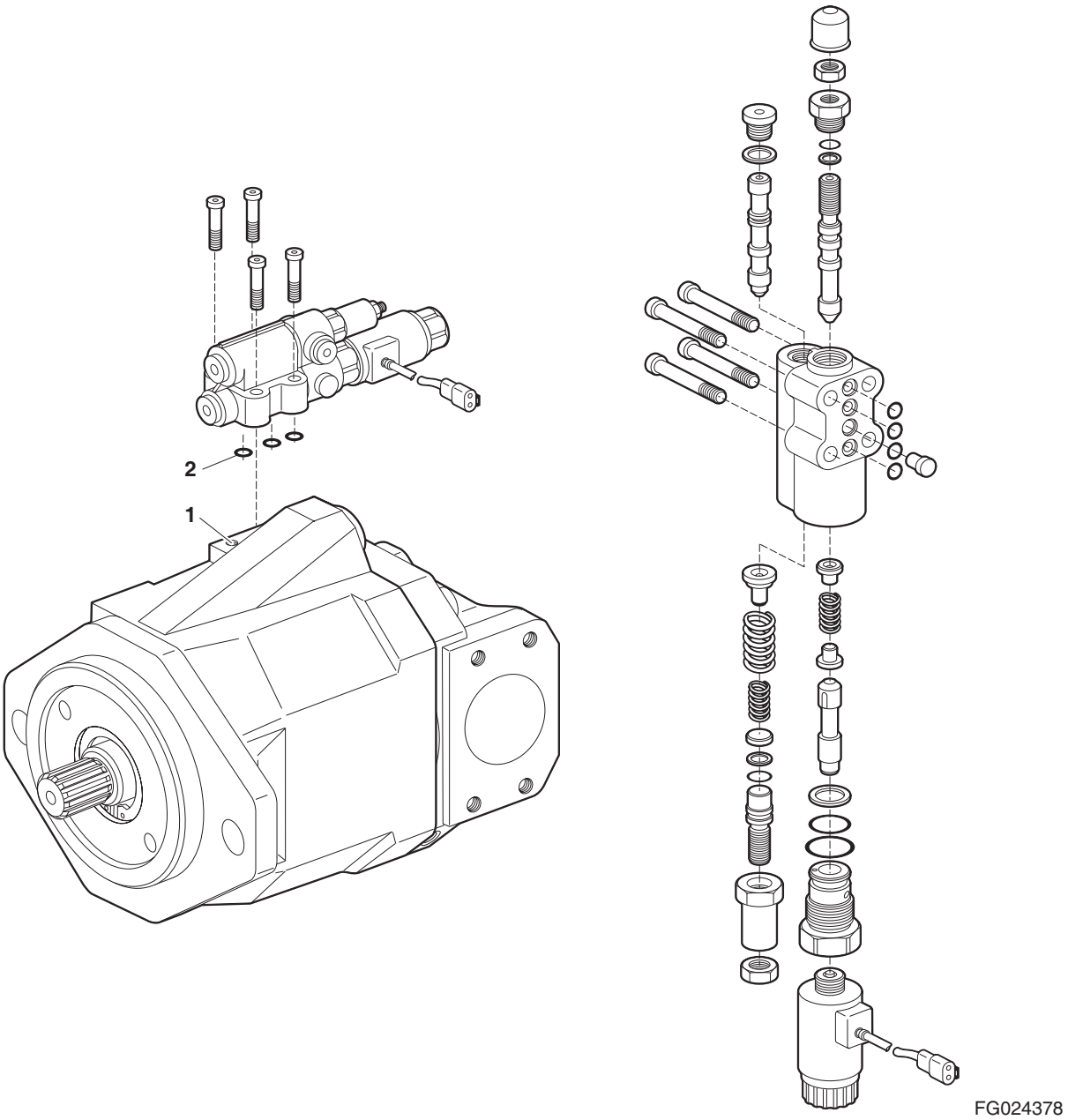


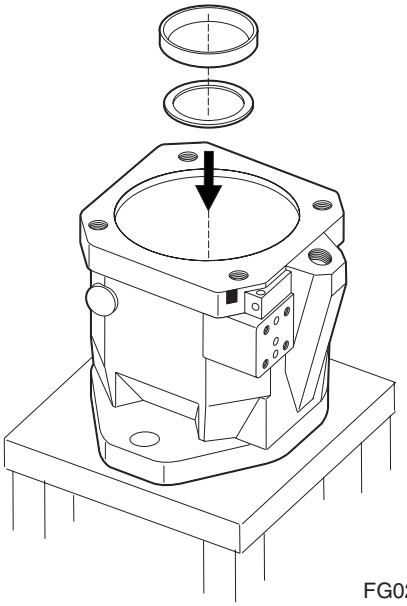
Figure 14

NOTE: *Remove control valve Measure dimension * and note down.*

1. Check sealing surface (1).
2. Check O-rings (2).

PUMP ASSEMBLY

NOTE: *Press in distance ring and outer racer with tool.*

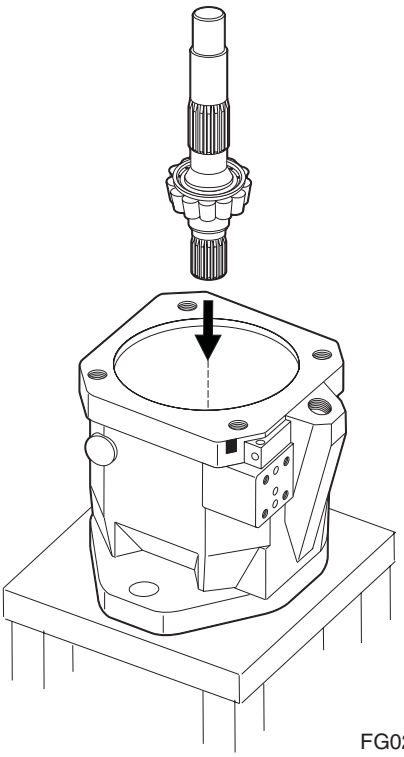


FG024404

Figure 40

1. Assemble shaft in correct position in pump housing.

   NOTE: *Do not cut shaft seal!*



FG024405

Figure 41

Main Control Valve

Edition 1

Function

General

The individual sections (S1 to S7) of the M9-25 control block operate according to the 6/3-way principle. This means all sections (S) are supplied by way of the neutral gallery (NG) of pump 1 (P1) or pump 2 (P2). In addition, the sections can be connected by way of a parallel channel (PC). The (Figure 4) displays an example of a consumer section.

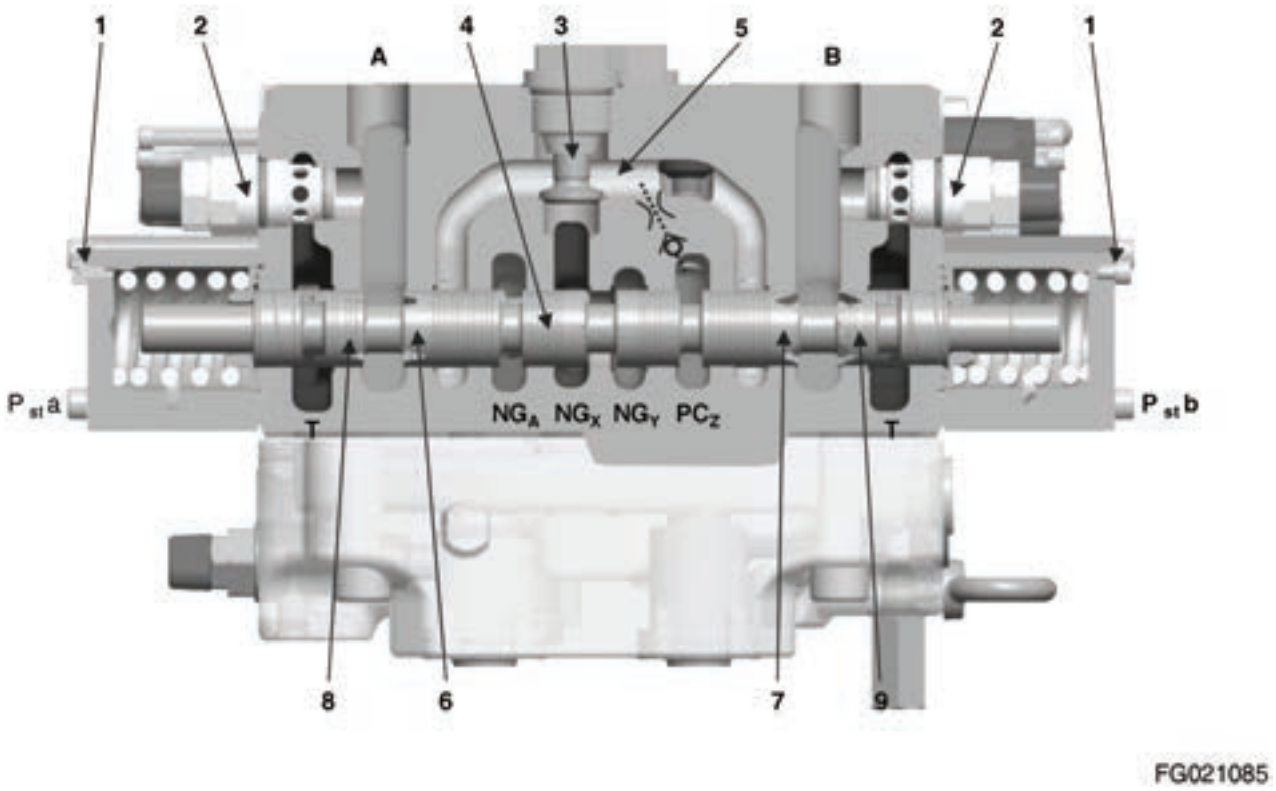


Figure 4

Reference Number	Description
1	Control Cover with Spring Plate, Control Spring and Stroke Stop
2	Pressure Relief Valve and Anticavitation Valve
3	Load-holding Valve
4	Control Piston S
5	Clip Connection for the Supply Orifice

Reference Number	Description
6	Supply Orifice Clip →Consumer A
7	Supply Orifice Clip →Consumer B
8	Outflow Orifice Consumer A → Tank
9	Outflow Orifice Consumer B → Tank

2. Arm In (Retraction)

In single operation, the arm extension function (S1) is supplied by way of the NG10, NG11 and NG12 neutral gallery by pump 1 (P1). For the summation of both pump flows P1 and P2 form arm out it is necessary to activate the arm summation spool (S13) by way of the AB port (“Summing and Cut Valves” on page 15) in parallel to the spool S1. The oil from pump 2 (P2) is then added into the clip of the arm section by way of the NG20/NG21/NG22/NG23/NG24 neutral gallery and the PC25 parallel channel.

The clip (5) of the arm section (S1) can also be supplied by way of an orifice within the parallel channel PC12. The PC12 parallel channel is fed from the NG11 neutral gallery once the pressure in the NG11/NG12 neutral circulation has reached the respective arm load pressure.

If the boom and/or bucket are activated at the same time as the arm, the supply from NG24 to PC25 by way of the summing piston (S13) (Figure 6) is interrupted. The parallel groove from PC21 to PC25 in the sum piston (S13) (Figure 6) can also be used to provide the arm function for corresponding load pressures with an additional supply through a partial flow from pump 2 (P2) by way of NG20/NG21/PC21 and the PC25 channel.

If the travel section (S4) is at maximum control, no oil can flow to the arm by way of the parallel nut (Figure 6) in the summing piston (S13).

The function of the pilot-controlled check valve is described in section "Check Function (Supply)"

Both the rod side (A) and the piston side (B) can be secured by way of a combined pressure anticavitation valve (2).

The check valve (“Pilot-controlled Check Valve (Antidrift Valve)” on page 46), which is integrated into the rod side feed from the arm ensures a leak-free shut-off and prevents the arm being retracted at the neutral position of the piston (S1).

When the arm is retracted, in addition to the piston (S1) being activated by way of Pstb1, the pilot-controlled check valve (10) (“Pilot-controlled Check Valve (Antidrift Valve)” on page 46) is controlled at the same time so that return oil can flow from the cylinder rod side to the tank.

The function of the pilot-controlled check valve is described in section "Check Function (Supply)"

Both the rod side (A) and the piston side (B) can be secured by way of a combined pressure anticavitation valve (2).

Raising the Boom

In single operation, the supply for raising the boom (S5) (B5 consumer terminal) is provided by pump 2 (P2) by way of the NG20 and NG21 neutral circulation. For the summation of both pump flows P1 and P2 form boom raising it is necessary to activate the boom summation spool (S11) by way of the BB port (“Summing and Cut Valves” on page 15) in parallel to the spool S5. The oil from pump 1 (P1) is then added directly into the boom bottom side by way of the NG10/NG11/NG12/NG13 neutral circulation and the PC14 parallel channel. The function of the pilot-controlled check valve is described in "Check Function (Supply)"

If other sections are actuated, which are supplied by pump 1 (P1), at the same time as raising the boom, the supply from NG13 to PC14 by way of the summing piston (S11) (Figure 6) is interrupted. The parallel groove from PC11 to PC14 in the sum piston (S11) can also be used to provide the boom raising function for corresponding load pressures with an additional supply through a partial flow from pump 1 (P1) by way of NG10/ NG11/PC11 and the PC14 parallel channel.

If the travel section (S4) is proportionally operated to full output at the same time as the boom section (S5), the supply by way of the neutral gallery NG 21 is reduced for section S5. In the opposite direction, the supply for S5 by way of the parallel channel PC21 by pump 2 (P2) increases because the connection between P2 and PC21 opens in proportion by way of the straight travel valve (S10) (Figure 7). At the same time the supply of section S4 will be taken over by pump 1 (P1) through the connection of P1 and NG20 which is opened by the straight travel valve (S10), also. The necessary pressure in the pump circuit (P1) is established by closing the cut valve (S14).

The pilot-controlled check valve (10) “Pilot-controlled Check Valve (Antidrift Valve)” on page 46 which is integrated into the boom supply, ensures a leak-free boom shut-off against undesirable lowering while the S5 piston is in neutral.

Both the rod side (A) and the piston side (B) are protected by a combined pressure anticavitation valve (2) (“Additional Functions” on page 40).

Primary Pressure Relief Valve

The pilot-operated primary pressure relief valve is screwed into the side of the control block, and limits the maximum pump (system) pressure to the set value as a safety valve. Pressure peaks in the pump line can occur if the volume flow requested by way of the orifices is used up more quickly than the volume flow requested by the pump or if an error occurs in the system. When the system is delivered, the pressure setting is set according to the project, and must not be changed.

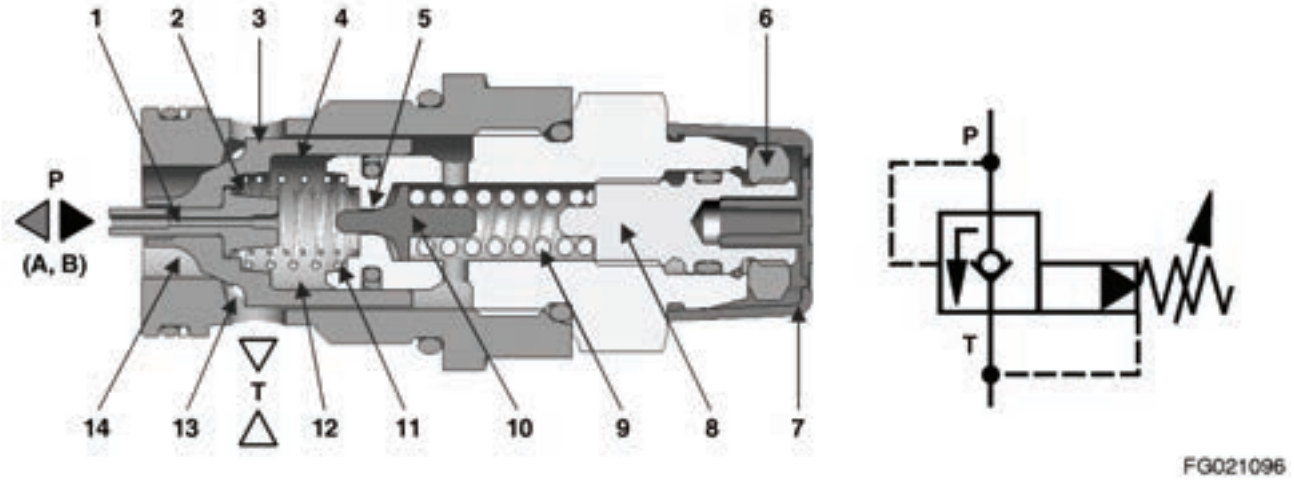


Figure 29

Reference Number	Description
1	D1 Restrictor
2	Spring 1
3	Main Poppet
4	A2 Surface
5	D2 Restrictor
6	Counternut
7	Protective Cap

Reference Number	Description
8	Adjusting Spindle
9	Pressure Setting Spring
10	Pilot Poopet
11	Spring 2
12	Volume C
13	A3 Surface
14	A1 Surface

The primary pressure relief valve and the secondary pressure relief valves are identical in design and function. The system pressure p is available by way of the restrictor D1 (1) in chamber C (12). Since the A2 surface (4) is larger than A1 (14), the main poppet remains closed. The spring 1 (2) in room C (12) ensures a stable installation position. The valve remains closed as long as the system pressure p is less than the value set by way of the spindle (8) and compression spring (9). If the pressure p exceeds the set value, the pilot poppet (10) opens and the oil volume from room C (12) flows to the tank by way of the D2 restrictor (5). The pressure in room C (12) drops because the supply by way of the smaller section of the D1 restrictor (1) is less than the outflow by way of the opened pilot poppet (10). The higher pressure p on the surface A1 (14) opens the main poppet against the spring 1 (2), and connects the pump line/demand

Reference Number	Description
100	Housing
113	Plate
120	S.H.C.S
130	Spare Part M9-25
132	Plug Screw
135	Check Valve
136	Check Valve
140	Check Valve
141	Check Valve
161	Throttle Check Valve
200	Plug Screw
202	Port Relief/Anticavitation valve
210	Pilot Control Valve

Reference Number	Description
220	Plate MH4WH 25
221	S.H.C.S
222	Main Relief/Anticavitation valve
111	O-ring
133	O-ring
150	O-ring
159	Usit Ring
180	O-ring
195	O-ring
196	O-ring
372	O-ring

Flange surfaces and sealing surfaces

1. Adhesion forces may act between the flange areas in the disassembly.
2. Remove contamination using a whetstone and clean the surface using an oil-soaked cleaning cloth.
3. Surfaces with punch marks or signs of wear in the sealing surface must no longer be used.
4. Any reprocessing of the sealing surfaces is not admissible.

Bench vise

Protective brackets with hard rubber are to be used. Sealing and flange surfaces must not be damaged.

Required tools

1. Oil-soaked cleaning cloth
2. Whetstone
3. You need only commercially available tools to mount the control block.

- Fit cover (155) with hexagon wrench. Tightening torque M_T = 25 Nm.

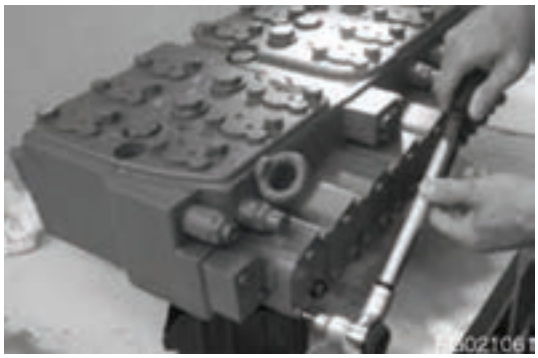


Figure 72

Replace Pilot Shuttle Valve (Item 163)

1. Required tools
   - Screw tap 3 mm or 4 mm
   - Magnet gripper
2. Removing pilot shuttle valve
   - Screw in a screw tap into the pilot shuttle valve and pull it out. According to mounting position use a screw tap of 3 mm or 4 mm.

IMPORTANT

The pilot shuttle valve will be destroyed during disassembly and must be replaced.

Take care to remove all parts of the pilot shuttle valve!

REASSEMBLY

WARNING

AVOID DEATH OR SERIOUS INJURY

HIGH-PRESSURE OIL HAZARD

- **Make sure the relevant system component is not under pressure before assembling the product or when connecting and disconnecting plugs.**
- **Protect the system component against unintended switching on.**

ELECTRICAL SHOCK HAZARD

- **Switch off power supply to the relevant system component before assembling the product or when connecting and disconnecting plug-in connectors.**
- **Connect control block solenoids only if no voltage is applied.**
- **Protect the system component against unintended switching on.**

WARNING

AVOID DEATH OR SERIOUS INJURY

TRIPPING HAZARD

- **Lay the cables and lines so that they cannot be damaged and no one can trip over them.**

ELECTRICAL SHOCK HAZARD

- **Always connect the ground connections of the control block with the appropriate ground system in your installation.**
- **Only use a power pack with electrical isolation.**
- **Always comply with the applicable laws and regulations.**

ACCIDENTAL MOVEMENT OF MACHINE

Avoid injury caused by incorrect pin assignment or mixed up cable plugs due to unintended consumer motions.

- **Make sure that all pipes and/or hoses are applied at the correct control block connection.**
- **After the completion of the connection work you must check the correct assembly of the cable plugs to each control block solenoid.**

WARNING

AVOID DEATH OR SERIOUS INJURY

- **Regularly check the safety devices - if any - for correct functionality.**
- **Accomplish any maintenance work at due date, correctly and completely and document it.**
- **Adequately secure the maintenance area before starting maintenance works.**
- **Pay attention to cleanliness in order to avoid malfunctions caused by dirt. Paint residues on sealing surfaces must be removed before assembly. Make sure that paint residues do not enter block openings. Otherwise you risk malfunctions.**
- **Operate the hydraulic product in maintenance mode possibly requiring the disassembly of certain protective covers with high alertness. Switch off the hydraulic product and secure it against unintended switching on.**
- **The user is not allowed to change the set values of safety valves. New adjustments may only be accomplished by authorized testing authorities.**
- **Wear protective goggles, protective gloves and safety boots. Depressurize the hydraulic product and professionally relieve available pressure accumulators, if any.**
- **Let system sections and pressure lines which can be opened cool down before starting commissioning works.**
- **Slowly open segments which must still be pressurized.**
- **Please observe that, if there are check valves in the pressure lines above the pumps, the hydraulic system might still be pressurized after it has been disconnected from the actual pressure supply. Move all cylinders to the safe end position.**
- **Lower any load. Provide support devices if the load cannot be lowered. Never conduct maintenance work on lifted units without using proper support devices.**

Table of Contents

Remote Control Valve (Work Lever / Joystick)

9. Remove joint assembly (19) from case (1).

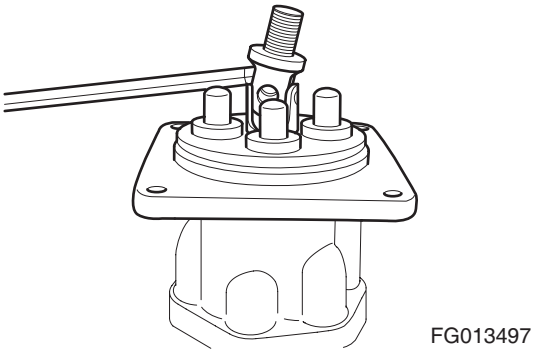


Figure 11

10. Install lead wire terminal into connector terminal pressing them together.

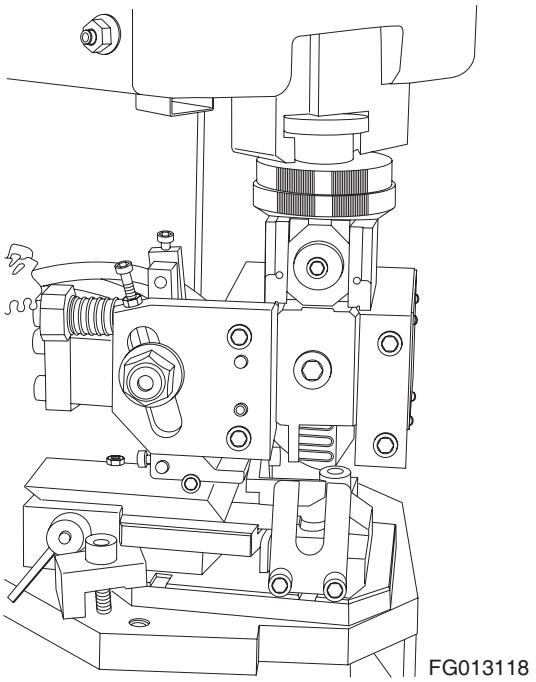


Figure 12

11. Assemble connector assembly (30), and connect it to lead wire terminal, and properly route wiring.

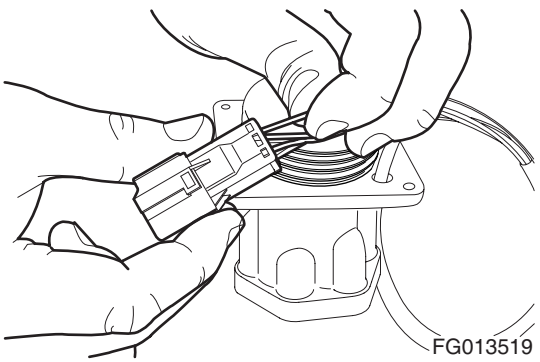


Figure 13

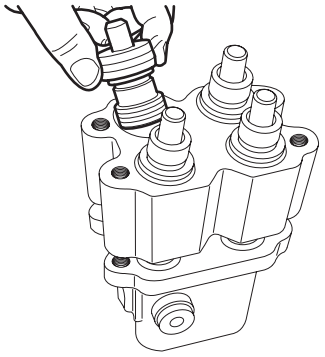
Travel Control Valve (with Damper)

Edition 3

Reference Number	Description
1	Body (1)
2	Body (2)
3	Plug
4	Plug
5	Spring Seat
6	Spring
7	Shim
8	Spool
9	Stopper
10	Spring
11	Spring Pin
12	O-ring
13	Push Rod
14	Spring Pin
15	Seal
16	Steel Ball
17	Spring
18	Plate
19	Retaining Ring
20	Plug

Reference Number	Description
21	O-ring
22	Rod Seal
23	Dust Seal
24	Cover
25	Hex Socket Head Bolt
26	Cam
27	Bushing
28	Camshaft
29	Set Screw
30	Set Screw
31	Hex Nut
32	Bellows
33	Piston
34	O-ring
35	O-ring
36	Expand
37	Spool Kit
38	Plug Kit
39	Cam Kit

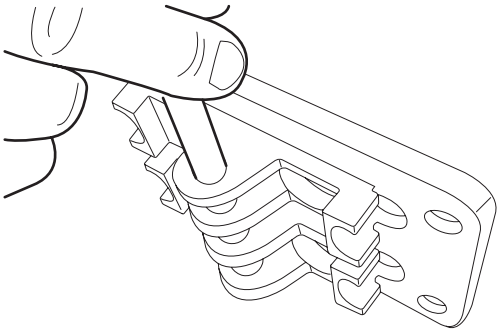
8. Install push rod assembly into body (2).



FG013552

Figure 33

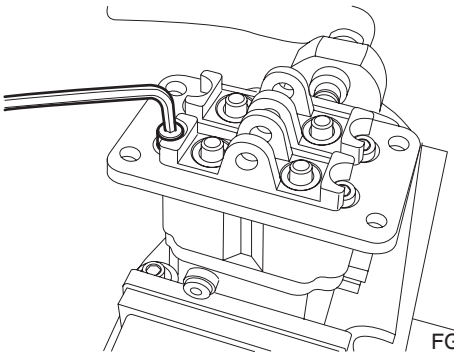
9. Install bushing (27) in cover (24) using jig.



FG013553

Figure 34

10. Assemble cover (24) onto each body (1 and 2) and install hex socket head bolt (25) using torque wrench.



FG013554

Figure 35

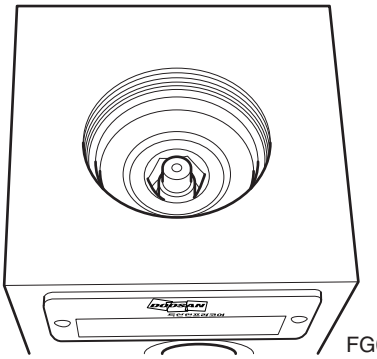
Table of Contents

Solenoid Valve Assembly

Breaker EPPR Valve (Option)

Edition 3

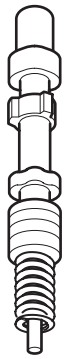
2. Assemble the spool, the spring, and the pin.



FG003695

Figure 10

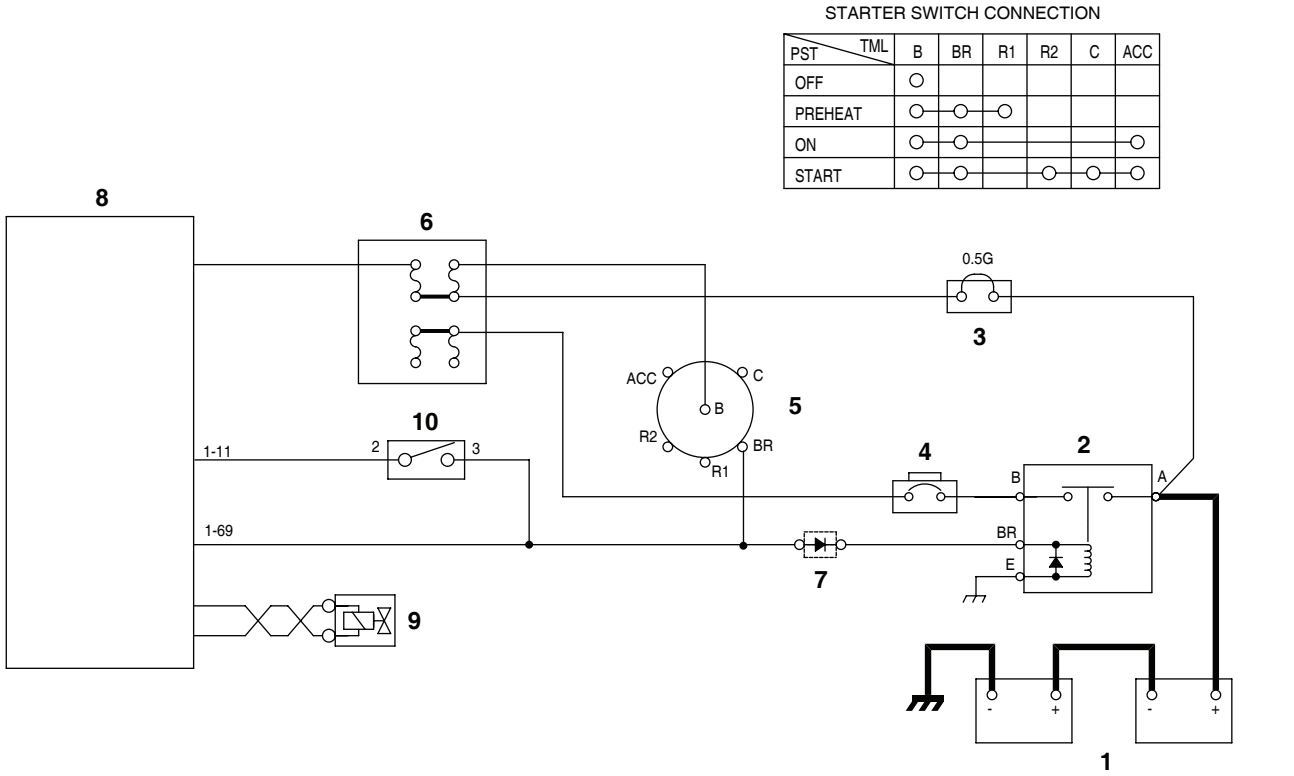
- Make sure the spring and the pin do not fall off.



FG003696

Figure 11

Electrical System

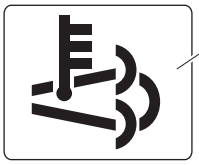
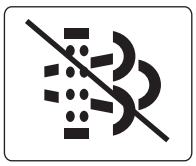
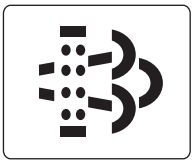
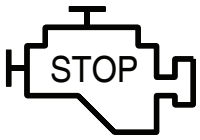
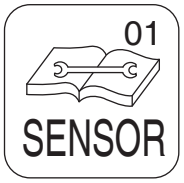


FG018843

Figure 7 Engine Stop Circuit

Reference Number	Description
1	Battery
2	Battery Relay
3	Fusible Link
4	Circuit Breaker
5	Starter Switch

Reference Number	Description
6	Fuse Box
7	Diode
8	Engine Controller
9	Injector Solenoid
10	Emergency Stop Switch

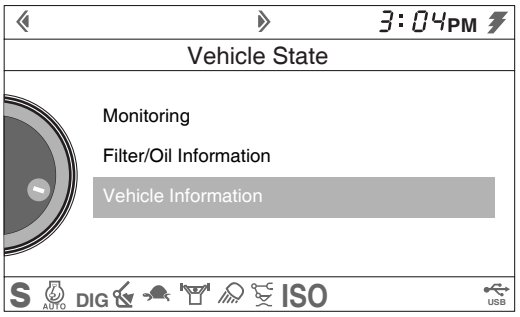
Description	Symbol	Input Terminal	Operation	Remarks
Work Light	 HB4O2003	CN1-74	This symbol appears when work light turns "ON" (24 V applied).	
HEST	 FG018852	ECU-CAN Communication	This symbol appears in case of DPF manual regeneration or DPF automatic regeration	Green -> DPF automatic regeration Amber -> DPF manual regeneration
DPF Inhibit	 FG018854	ECU-CAN Communication	This symbol appear when the operator inhibits regeneration	
DPF	 FG018853	ECU-CAN Communication	This symbol appears in case of the need of a manual regeneration	The symbol don't blink -> Required manual regeneration The symbol blink -> Required manual regeneration urgently
Engine Stop	 FG019003	ECU-CAN Communication	This symbol appears in case of fault in DPF regeneration	If manual regeneration is not performed despite requirement/alarm for manual regeneration, the symbol can appear.
Pump Angle Sensor Failure	 FG020681	5-9, 5-10, 5-19, 5-20	This symbol appears in case of failure in pump angle sensor.	Emergency operation mode select pop up appears at the same time.

C. Vehicle Information

This is used to check the machine name, engine type and attachment options.

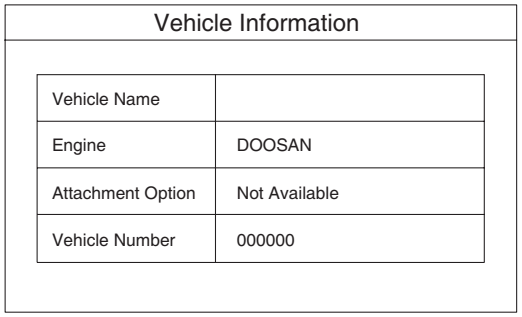
At the vehicle state, if the cursor is placed on the vehicle information, click the jog switch to access the vehicle information screen.

Click the ESC button to return to the previous screen.



FG018482

Figure 25



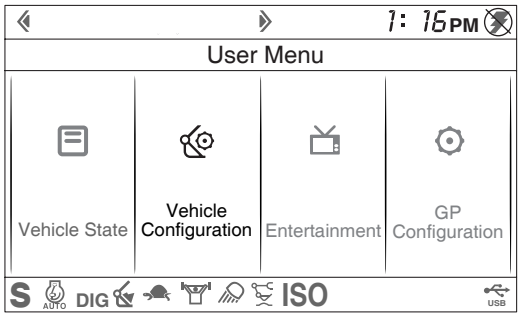
FG024557

Figure 26

2. Vehicle Configuration

This is used when selecting the functions such as attachment select, attachment setting, camera setting, and jog shuttle for dial.

Turn the jog switch and move the cursor to see an reversed display on the desired menu. Then, click the jog switch to select the menu.

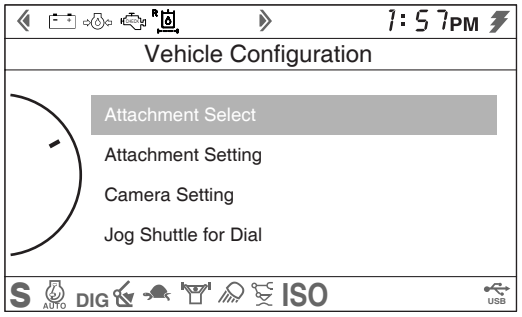


FG018488

Figure 27

Attachment Select ↔ Attachment Setting ↔ Camera Setting ↔ Jog Shuttle for Dial

Press the ESC button to return to the previous screen.



FG018489

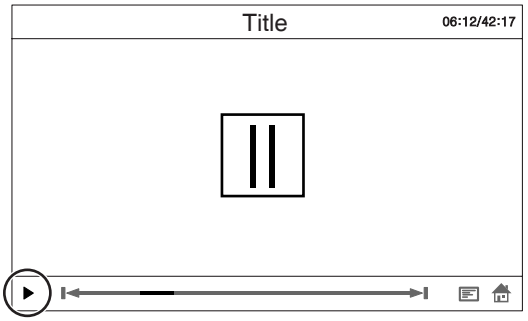
Figure 28

Play/Pause

Locate the cursor on the play/pause symbol and click on the jog switch to execute the video's play/pause functions.

With the play being on, click on the jog switch to display the pause symbol at the center of the screen, thus allowing the video to pause.

With the pause being on, click on the jog switch to cause the pause symbol at the center of the screen to disappear, resuming the video playing.

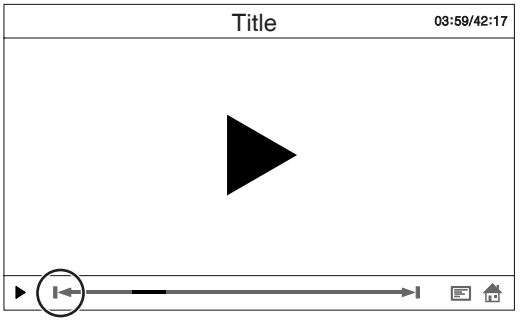


FG020117

Figure 58

Replay the Previous File

Locate the cursor at the replay the previous file symbol and click on the jog switch to replay the previous file.



FG020118

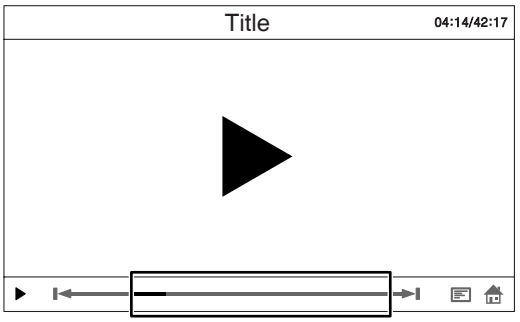
Figure 59

Locate the cursor at the video progress bar and click on the jog switch to convert into the fast forward/ rewinding mode.

On the fast forward/rewinding mode, operate the jog switch clockwise/counterclockwise to conduct fast winding/rewinding.

Fast forward/rewinding can be conducted at an interval of 30 seconds per click during which the jog switch is turned.

On the fast forward/rewinding mode, press the ESC button to disable the fast forward/rewinding mode.

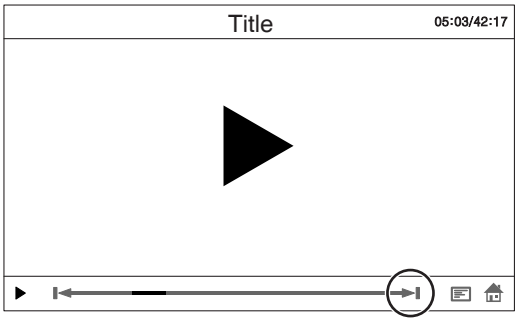


FG020119

Figure 60

Replay the Next File

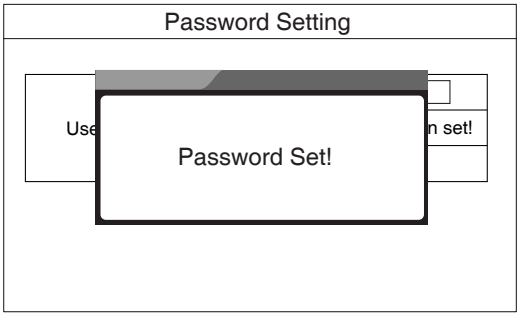
Locate the cursor at the replay the next file symbol and click on the jog switch to replay the next file.



FG020120

Figure 61

If the user password is changed successfully, the "Password Set!" popup message will appear.



FG020179

Figure 92

b) Item Setting

"Item Setting" enables the user to select the use of Engine Start-up, Attachment Setting, and Entertainment Use Setting.

The user can set the item only when the owner assign the right. (See “Owner Password Setting” on page -55.)

Engine Start-up

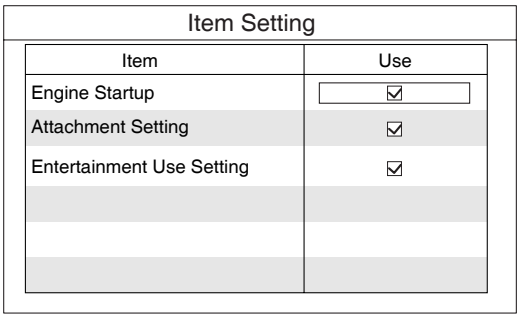
The password input function can be set for equipment start-up.

Attachment Setting

The password input function can be set for attachment setting.

Entertainment Use Setting

The password input function can be set for entertainment (video/MP3) use setting.



FG020180

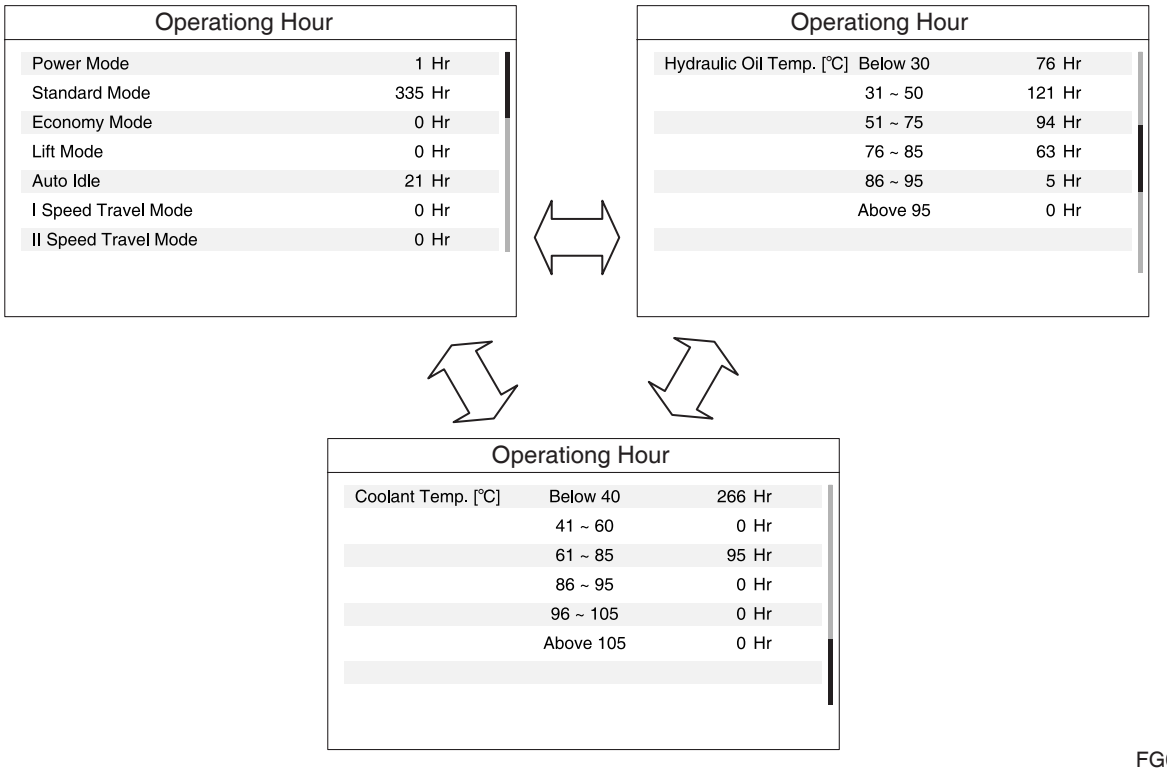
Figure 93

Vehicle Analog Description

Analog Items	Display	Remark
1. Front Pump Press.	bar	Front Pump Pressure
2. Rear Pump Press.	bar	Rear Pump Pressure
3. Boom Cylinder Press.	bar	Boom Cylinder Head Pressure
4. Alternator Volt.	V	Indicating Alternator voltage
5. Battery Voltage	V	Indicating Batttery voltage
6. Engine Dial Volt.	mV	Indicating Dial voltage
7. Flow Control Lever LH Volt.	mV	Indicating LH Joystick Thumbwheel Switch Voltage
8. Flow Control Lever RH Volt.	mV	Indicating RH Joystick Thumbwheel Switch Voltage
9. Fuel Level	%	Fuel Residual Quantity Radio of Fuel Tank
10. Hydraulic Oil Temp.	°C	Hydraulic Oil Temperature
11. Boom Up Press.	bar	Boom Up Pilot Pressure
12. Boom Down Press.	bar	Boom Down Pilot Pressure
13. Arm In Pressure	bar	Arm In Pilot Pressure
14. Arm Out Pressure	bar	Arm Out Pilot Pressure
15. Bucket Crowd Press.	bar	Bucket Crowd Pilot Pressure
16. Bucket Dump Press.	bar	Bucket Dump Pilot Pressure
17. Travel Press. (RH)	bar	Travel Pilot Pressure (RH)
18. Travel Press. (LH)	bar	Travel Pilot Pressure (LH)
19. Swing Pressure	bar	Swing Pilot Pressure
20. Option 1 Pressure	bar	Option 1 Pilot Pressure
21. Option 2 Pressure	bar	Option 2 Pilot Pressure
22. Option 3 Pressure	bar	Option 3 Pilot Pressure
23. F.Pump Angle Volt.	mV	Indicating Front Pump Angle Sensor Voltage
24. R.Pump Angle Volt.	mV	Indicating Rear Pump Angle Sensor Voltage
25. Power Shift P/V 1	mA	Current in Front Pump Proportional Valve
26. Power Shift P/V 2	mA	Current in Rear Pump Proportional Valve
27. Coolant Fan Control P/V	mA	Current in Coolant Fan Control Proportional Valve
28. Flow Control P/V	mA	Current in Flow Control Proportional Valve
29. Two-way P/V (Open)	mA	Current in Two-way (open) Flow Control Proportional Valve
30. Two-way P/V (Close)	mA	Current in Two-way (close) Flow Control Proportional Valve
31. Rotating P/V (CW)	mA	Current in Rotating (CW) Flow Control Proportional Valve
32. Rotating P/V (CCW)	mA	Current in Rotating (CCW) Flow Control Proportional Valve
33. Pressure Control P/V 1	mA	Current in 1 Way Pressure Proportional Valve
34. Pressure Control P/V 2	mA	Current in 2 Way Pressure Proportional Valve
35. Travel Straight P/V	mA	Current in Travel Straight Flow Control Proportional Valve

GP Display Code	GP Display Description	Measuring Point	Correct Value		Remarks
			Active	Passive	
V000230	Reverse S/V (H)	CN1-1, CN2-107	V = V_volt		
V000231	2 Pump Select S/V (I)	CN1-1, CN1-8	V = V_volt		
V000232	Bypass Cut Off S/V (J)	CN1-1, CN3-4	V = V_volt		
V000233	Swing Brake Release S/V (K)	CN1-1, CN3-12	V = V_volt		
V000234	Starter Relay	CN1-1, CN2-96	V = V_volt		
V000235	Back Buzzer Relay	CN1-1, CN2-99	V = V_volt		
V000236	Pilot Relay	CN1-1, CN2-98	V = V_volt		
V000237	Front Pump Press. Sensor	CN1-19, CN1-37	V = 1 V		It has to be measured in engine stop state.
V000238	Rear Pump Press. Sensor	CN1-18, CN1-36	V = 1 V		
V000239	OWD Press. Sensor	CN1-20, CN1-38	V = 1 V		
V000240	Px (Front) Press. Sensor	CN1-22, CN1-40	V = 1 V		
V000241	Py (Travel) Press. Sensor	CN1-23, CN1-41	V = 1 V		
V000242	Parking Brake Press. Sensor	CN1-24, CN1-42	V = 1 V		
V000243	Boom Up Press. Sensor	CN5-4, CN5-14	V = 1 V		
V000244	Boom Down Press. Sensor	CN5-2, CN5-12	V = 1 V		
V000245	Bucket CR Press. Sensor	CN5-3, CN5-13	V = 1 V		
V000246	Bucket Dump Press. Sensor	CN5-1, CN5-11	V = 1 V		
V000247	Arm In Press. Sensor	CN4-1, CN4-7	V = 1 V		
V000248	Arm Out Press. Sensor	CN4-2, CN4-8	V = 1 V		
V000249	Travel Left Press. Sensor	CN4-3, CN4-9	V = 1 V		
V000250	Travel Right Press. Sensor	CN4-4, CN4-10	V = 1 V		
V000251	Swing Press. Sensor	CN4-5, CN4-11	V = 1 V		
V000252	Att (Option) Press. Sensor	CN4-6, CN4-12	V = 1 V		

Example of Machine Operation Info Screen



FG018879

Figure 141

2. Power Mode, Standard Mode, Economy Mode

Power Mode, Standard Mode or Economy Mode is selected on the work. When the standard/economy mode is selected it will reduce noise and fuel consumption in comparison with Power Plus Mode. The EPOS controller compares the target engine speed with the actual engine speed and controls the signal to the EPPR valve which in turn varies the pump output quantity and it is the same method with power volume.

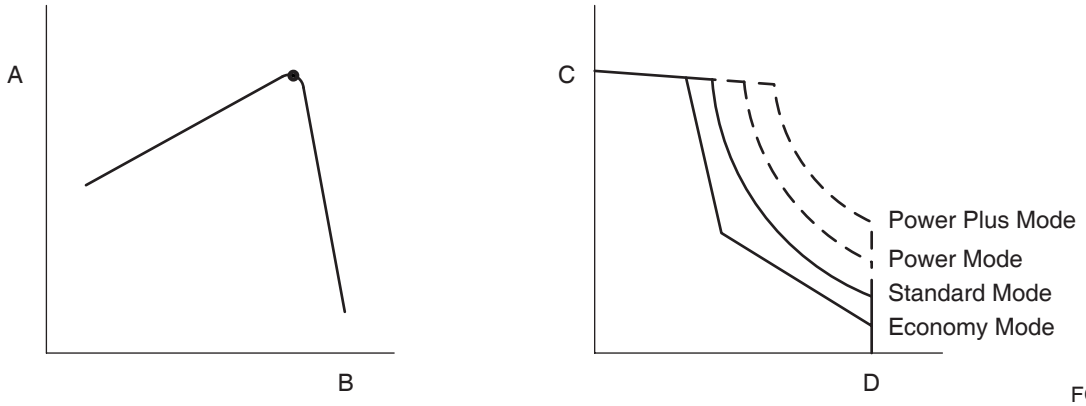


Figure 160

Reference Number	Description
A	Engine Horsepower (hp)
B	Engine Speed (rpm)

Reference Number	Description
C	Pump Discharge Volume (lpm)
D	Pump Discharge Pressure (kg/cm^2)

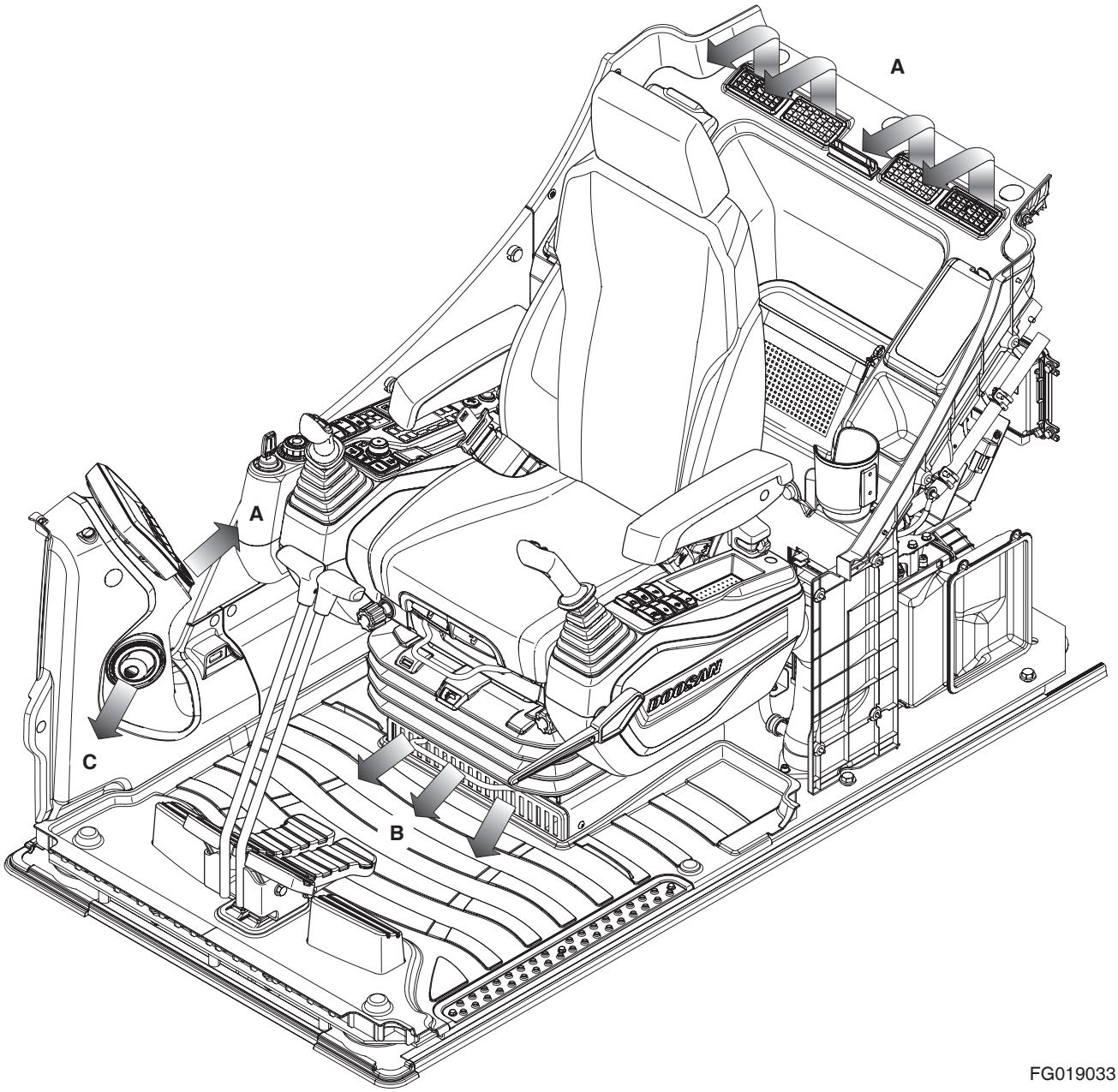
When the engine coolant temperature increases to over 107°C (225°F), the engine controller detects it from the sensor mounted in the coolant line and will send a signal to the EPOS controller. The EPOS controller sends a overheat signal to the instrument panel turning "ON" the warning light and buzzer simultaneously.

Also, the EPOS controller returns an overheat signal to the engine controller and changes power mode to standard mode. The engine speed is then set to a low speed by the engine controller.

When coolant temperature falls below 95°C (203°F), normal operation will resume.

AIR CONDITIONER SYSTEM

Outline



FG019033

Figure 172

Solid-type heater and air conditioner are installed in the cover behind the operator's seat.

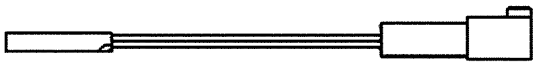
Temperature of the operator's cabin is adjusted automatically to the temperature set by operator.

(Please refer to the Operation and Maintenance Manual for detailed full automatic control.

Vent mode selects the direction of discharged air.

Coolant Temperature Gauge Sensor: It senses the temperature of coolant water in the heater core.

Temperature (°C)	Resistance (KΩ)
-10	55.8 ±1.7
0	32.9 ±0.9
15	15.76 ±0.5
25	10.0 ±0.3
35	6.5 ±0.2

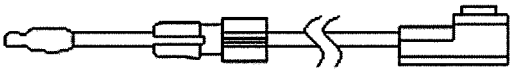


FG001060

Figure 186

Internal Air Temperature Sensor: Built in the internal air filter, it senses the internal temperature.

Temperature (°C)	Resistance (KΩ)
-15	218.2 ±7.5
0	97.83 ±0.9
15	47.12 ±0.7
25	30.0 ±0.36
35	19.60 ±0.3



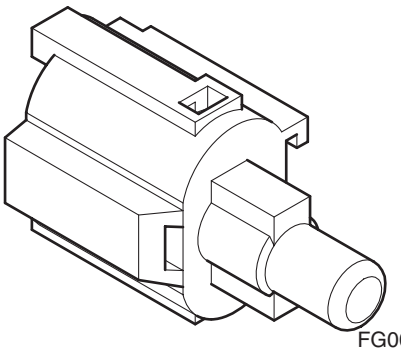
FG001061

Figure 187

Ambient Air Temperature Sensor

Built at the bottom of the cockpit, it senses the temperature of external air.

Temperature (°C)	Resistance (KΩ)
-10	163 ±4.9
0	96.9 ±2.9
10	59.4 ±1.8
20	37.4 ±1.1
25	30 ±0.9
30	24.2 ±0.7

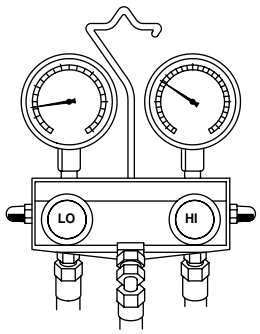


FG001064

Figure 188

Refrigerant Pressure Check

1. Open all doors and windows.
2. Install manifold gauge set.
3. Start engine and maintain engine speed at 1,800 - 2,000 rpm.



HDA6074L

Figure 196

4. Check high / low-pressure of refrigerant.

1	**High-pressure: 8.0 - 10.0 kg/cm² (114 - 142 psi)** **Low-pressure: Approximately 1.0 kg/cm² (14 psi)**		
Possible Cause: Low Refrigerant Level			
Step	**Inspection Item**		**Remedy**
1	Check for traces of refrigerant oil.	Yes	Reassemble using correct tightening torque.
		No	Go to next step.
2	Using a leak detection device or soapy water check for refrigerant leakage at all major components and joints.	Yes	Repair leaking component.
		No	Recharge system to correct pressure.

2	**High-pressure: Over 23 kg/cm² (327 psi)** **Low-pressure: Approximately 2.5 - 3.0 kg/cm² (36 - 43 psi)**		
Possible Cause: Overcharge, Frost on condenser			
Step	**Inspection Item**		**Remedy**
1	Check for condenser pin damage or contamination.	Yes	Clean, repair or replace condenser.
		No	Refrigerant overcharge.

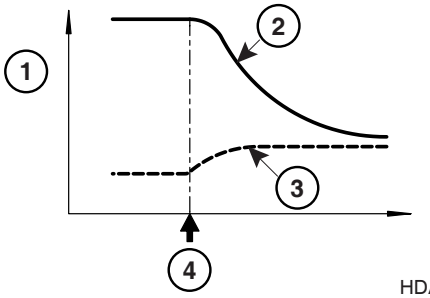
3	**High-pressure: Approximately 20 - 25 kg/cm² (285 - 356 psi)** **Low-pressure: Approximately 2.5 - 3.5 kg/cm² (36 - 50 psi)**
Possible Cause: Air in system.	
1. Recover any remaining refrigerant. 2. Vacuum out system. 3. Recharge system. **NOTE:** *If the system has been exposed to the air for a long period of time, replace the receiver dryer.*	

Inspecting System For Leakage

After completing charging procedures, clean all joints and connections with a clean dry cloth. Using a refrigerant leak detecting device or soapy water, inspect system for leaks starting from the high-pressure side.

NOTE: *When the refrigerant circulation has been stopped the high-pressure will start to decrease and the low-pressure will start to increase until they are equalized. Starting the inspection from the high side will result in an accurate test.*

Reference Number	Description
1	Pressure
2	High-pressure
3	Low-pressure
4	Compressor Stop



HDA6073L

Figure 205

Inspection Procedure

1. High-pressure Side

   Compressor outlet →condenser inlet →receiver dryer inlet →air conditioner unit inlet.

2. Low-pressure side

   Compressor inlet →air conditioner unit outlet.

3. Compressor

   Compressor shaft area, bolt hole area and magnetic clutch area.

4. Receiver dryer

   Pressure switch and plug area.

5. Connection valve area

   Inspect all valve areas.

   Verify all valves are capped to prevent leaking.

   Check for foreign material inside of valve cap.

6. Interior of air-conditioning unit.

   After stopping engine, insert detector probe into drain hose. (Leave inserted for 10 seconds minimum.)

   NOTE: *When inspecting leakage from the air-conditioning unit, perform the inspection in a well ventilated area.*

Electrical Schematic

Edition 1

Attachments

Park the excavator away from obstructions and all traffic on clear, flat, level ground. Extend the arm cylinder and crowd the arm into the boom. Partially retract the boom cylinder so that boom is stretched out in front of the excavator, as low to the ground as possible, with the arm crowded under the boom.

The tip of the arm point must be lowered to secure blocking that will safely support the weight of the arm. Place the blocking directly in front of the excavator and make sure that it will not be unbalanced with an initial weight load that is all to one end, under the arm point.

Shut off the engine and release hydraulic system pressure - move any of the control levers with the engine off to release pressure built up in the accumulator. Manually vent residual hydraulic pressure in the tank by moving the lever near the cap, on top of the reservoir.

WARNING

AVOID DEATH OR SERIOUS INJURY

Secure the swing lock and tag and lock out controls in the operator's cabin to keep anyone from moving or inadvertently starting the engine. Restrict access to the work site while sections of the attachment are in the air, or while they are being supported by the assist crane. The safe lifting capacity of the assist crane or hoist that is used must exceed the weight of the heaviest section of the attachment, the boom (weighs approximately 2,776 kg (6,120 lb), not including the weight of accessories or fixtures).

Before beginning the disassembly of attachment mounting pins, disconnect the arm cylinder hydraulic hose couplings and put a clean plug in the end of each one. Use any and all reasonable precautions necessary to avoid introducing dirt or other contaminants into the hydraulic system. Wipe down coupling points before disconnecting hydraulic lines and use evaporative type solvent spray cleaner. Tag and mark hoses for reassembly, if necessary.

Place a sling under the arm cylinder (the cylinder used to extend and retract the attachment arm, pinned to the top of the boom). Lift the sling so that weight load on the rod end of the arm cylinder (pinned to the ears on the inner end of the arm) is released. Prepare blocking under the arm that will securely support the weight of the arm and arm cylinder.

BUCKET O-RING REPLACEMENT

WARNING

AVOID DEATH OR SERIOUS INJURY

Prevent injury from flying metal objects. Always wear safety helmet, protective gloves and eye protection when changing pins.

1. Inspect the bucket O-rings on a routine basis. If worn or damaged, replacement is necessary.

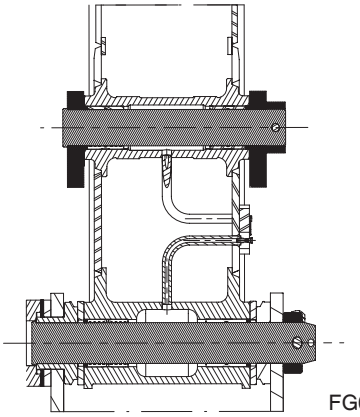


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Figure 4

2. Roll the old O-ring (1, Figure 5) onto the boss (2) around the bucket pin (3). Remove the bucket pin and move the arm or bucket link (4) out of the way.

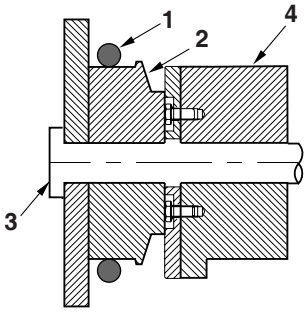

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Figure 5

3. Remove the old O-ring and temporarily install the new O-ring (1, Figure 6) onto the bucket boss (2). Make sure that O-ring groove on both the bucket link (4) and boss have been cleaned.
4. Realign the arm or link with the bucket pinhole and insert the bucket pin (3, Figure 5).

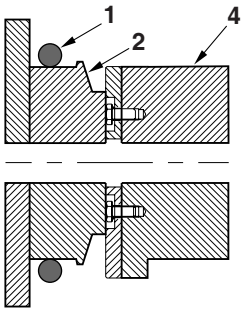

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Figure 6