



950106-01179E  
December 2013

LOG LOADER  
**Shop  
Manual**

**DX300LL-3**

**Serial Number 10001 and Up**

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# Forestry Machine Maintenance Safety

Edition 1

## Fire and Explosion Prevention

All fuels, most lubricants and some coolant mixtures are flammable and can cause a fire resulting in death or serious injury, and property damage. Flammable fluids that are leaking or spilled onto hot surfaces or onto electrical components can cause fire.

Inspect for and remove all flammable materials such as spilled fuel and oil, and debris from machine. Do not allow any flammable materials to accumulate on machine.

Always observe the following:

- Add fuel, oil, antifreeze and hydraulic fluid to machine only in a well ventilated area. Machine must be parked with controls, lights and switches turned "OFF". Engine must be "OFF" and any flames, glowing embers, auxiliary heating units or spark causing equipment must be extinguished, or turned "OFF" and kept well clear of machine.
- Dust that is generated from repairing or grinding nonmetallic hoods or nonmetallic fenders can be toxic, flammable and explosive. Repair these components in a well ventilated area away from flames or sparks and wear dust mask when grinding painted parts.

### Maintenance

The machine and some attachments have components that are at high temperatures under normal operating conditions. The primary source of high temperatures are the engine and exhaust system. If damaged or incorrectly maintained, the electrical system can be a source of arcs or sparks.

Flammable debris (leaves, straw, etc.) must be removed regularly. If flammable debris is allowed to accumulate, it can cause a fire hazard. Clean machine often to avoid this accumulation. Flammable debris in an engine compartment is a potential fire hazard.

The operator's area, engine compartment and engine cooling system must be inspected every day and cleaned. This is necessary to prevent fire hazards and overheating.

### Operation

Do not use machine where exhaust, arcs, sparks or hot components can contact flammable material, explosive dust or gases.

Do not operate machine near any flame.

Exhaust shields (if equipped) protect hot exhaust components from oil spray or fuel spray in case of a break in a line, hose, or seal. Exhaust shields must be correctly installed.



HDO1015I

Figure 8



FG018458

Figure 9

## Mounting/Dismounting

Before getting on or off machine, if there is any oil, grease, or mud on handrails, guardrails, steps, or track shoes, wipe it off immediately. Always keep these parts clean. Repair any damage and tighten any loose bolts.

Never jump on or off machine. In particular, never get on or off a moving machine. These actions can result in death or serious injury.

When getting on or off machine, always face machine. Maintain three-point contact (both feet and one hand or one foot and both hands) with handrails, guardrails, steps, and track shoes to ensure that you support yourself securely.

Never hold onto any control levers when getting on or off machine.

Securely latch door. If you grip handrail inside door when moving on top of track shoes, and door latch is not securely engaged, door may move and cause you to fall.

Use points marked by arrows in diagram when getting on or off machine.

Do not carry tools or supplies when you mount or dismount the machine.

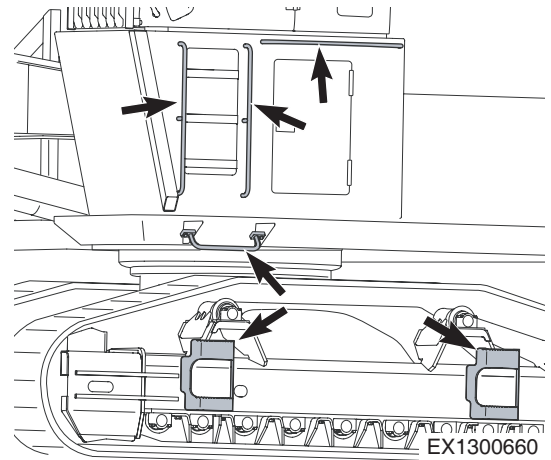


Figure 19

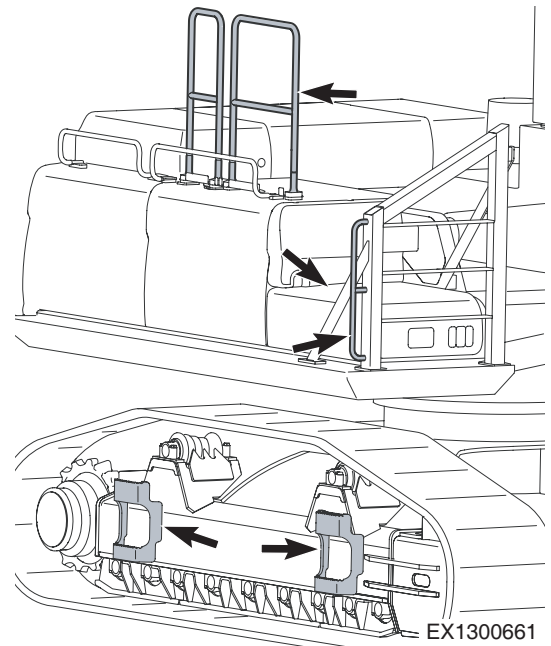


Figure 20

## Towing

To prevent death or serious injury when towing, always do the following:

- Follow the instruction given in this manual.
- When performing preparation work for towing with two or more personnel, determine signals to use and correctly follow these signals.
- Always attach wire rope onto left and right hooks and secure in position.
- If engine on problem machine will not start or there is a failure in brake system, always contact your DOOSAN distributor.
- Never go between towing machine and towed machine during towing operation.
- Do not perform towing on steep slopes, so select a place where slope is gradual. If there is no place where slope is gradual, perform operations to reduce angle of slope before starting towing operation.
- When towing a machine, always use a wire rope with a sufficient towing capacity.
- 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.
- Do not use lightweight towing hook for towing another machine.
- Make sure that towing eyes and towing devices are adequate for towing loads.
- Only connect wire rope to a drawbar or to a hitch.
- Operate the machine slowly and be careful not to apply any sudden load to wire rope.

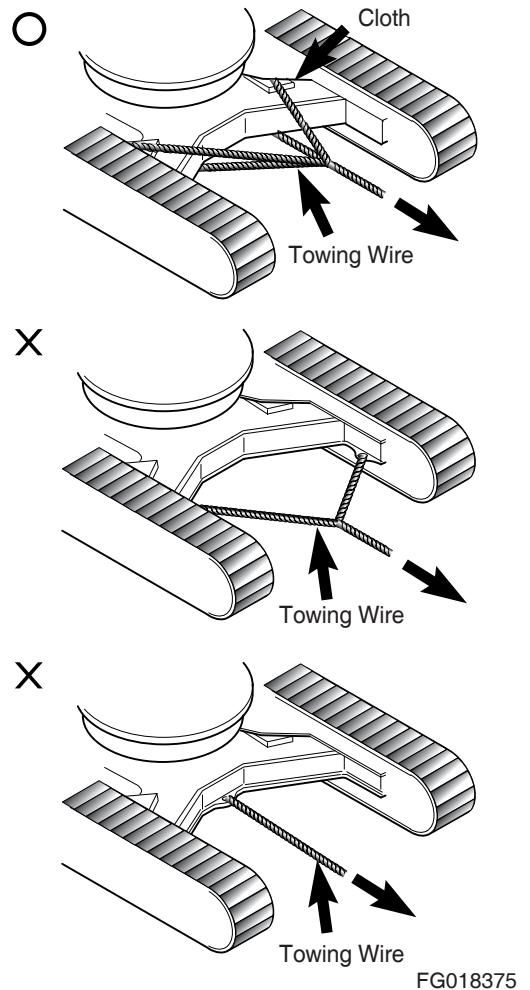


Figure 27

## Use of Lighting

When checking fuel, oil, battery electrolyte, window washer fluid, or coolant, always use proper lighting equipment to prevent arcs or sparks that could cause a fire or explosion resulting in death or serious injury.



Figure 35

HDO1040L

## Fire and Explosion Prevention

Fuels, most lubricants and some coolant mixtures are flammable. Flammable fluids that are leaking or spilled onto hot surfaces or onto electrical components can cause a fire resulting in property damage or death or serious injury.

Store all fuels and all lubricants in properly marked and approved containers and keep away from all unauthorized personnel.

Store oily rags and other flammable material in a protective container.

Tighten all fuel and oil caps.

Do not smoke while you refuel machine or while you are in a refueling area.

Do not smoke in battery charging areas or in areas that contain flammable material.

Clean all electrical connections and tighten all electrical connections. Check electrical wires daily for wires that are loose or frayed. Tighten all loose, and repair or replace all frayed, electrical wires before operating machine.

Remove all flammable materials and debris from the engine compartment, exhaust system components and hydraulic lines.



Figure 36

HDO1015I

# Battery

## Battery Hazard Prevention

Battery electrolyte contains diluted sulfuric acid and generates hydrogen gas. Hydrogen gas is highly explosive, and improper handling can cause death or serious injury, or fire. Do not allow electrolyte to contact skin or eyes. Always wear safety goggles and protective clothing when servicing batteries. Wash hands after touching batteries and connectors. Use of acid-resistant gloves is recommended. Always observe the following precautions.

- Do not smoke or bring any flame near battery.
- When working with batteries, Always wear safety goggles, protective clothing, and acid-resistant gloves.
- If you spill battery electrolyte on yourself or your clothes, immediately flush area with water.
- If battery electrolyte gets into your eyes, flush them immediately with large quantities of water and get immediate medical attention from a physician familiar with this injury.
- If you accidentally drink battery electrolyte, call a poison prevention center immediately and get immediate medical attention from a physician familiar with this injury.
- When cleaning top surface of battery, wipe it with a clean, damp cloth. Never use gasoline, thinner, or any other organic solvent or detergent.
- Tighten battery caps.
- If battery electrolyte is frozen, do not charge battery or start engine with power from another source. This could cause the battery to explode and start a fire.
- When charging battery or starting with power from another source, let battery electrolyte thaw and check that there is no leakage of battery electrolyte before starting operation.
- Always remove battery from machine before charging.
- Do not use or charge battery if battery electrolyte level is below LOW LEVEL line. This can cause an explosion. Periodically check battery electrolyte level and add distilled water to bring electrolyte level to FULL LEVEL line.
- Before maintaining or working with batteries, turn starter switch to "O" (OFF) position.

Since there is a potential hazard that sparks could be generated, always do the following:

- Do not let tools, rings or other metal objects make any contact between battery terminals. Do not leave tools or other metal objects lying near battery.

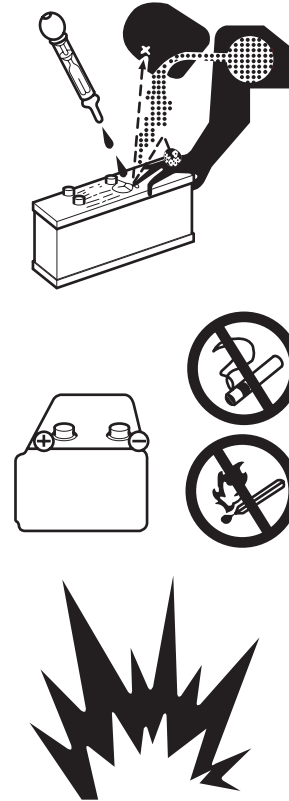


Figure 46

FG018464

## Exhaust Ventilation

Engine exhaust gases can cause unconsciousness, loss of alertness, judgment and motor control. This can result in death or serious injury.

Make sure there is adequate ventilation before starting engine in any enclosed area.

Check for and be aware of any open windows, doors or ductwork where exhaust may be carried, or blown by wind, exposing others to hazardous exhaust gases.

### Ventilation for Enclosed Area

If it is necessary to start engine within an enclosed area, or when handling fuel, flushing oil, or paint; open doors and windows to ensure that adequate ventilation is provided to prevent gas poisoning.

Diesel engine exhaust contains products of combustion which can be harmful to your health.

Always run engine in a well ventilated area. If you are in an enclosed area, vent exhaust to outside.

## Asbestos Information



**WARNING**

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**AVOID DEATH OR SERIOUS INJURY**

**Avoid exposure to dust containing asbestos as it can cause death or serious injury to the lungs and other organs (mesothelioma, lung and other cancers, and asbestosis).**

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Asbestos dust can be HAZARDOUS to your health if it is inhaled. Materials containing asbestos fiber can be present on work sites. Breathing air that contains asbestos fiber can ultimately cause serious or fatal lung damage or diseases such as mesothelioma, lung and other cancers, and asbestosis. To prevent lung damage from asbestos fiber, observe the following precautions:

- Use an approved respirator that is approved for use in an asbestos-laden atmosphere.
- Use water for cleaning to keep down dust.
- Always observe any regulations related to work site and working environment.
- Avoid brushing or grinding materials that contain asbestos.
- A vacuum cleaner that is equipped with a high efficiency particulate air filter can also be used.
- Comply with applicable laws and regulations for workplace.
- Stay away from areas that might have asbestos particles in air.



ARO1770L

Figure 52



ARO1770L

Figure 53

# SAFETY INSTRUCTIONS

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## WARNING

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### AVOID DEATH OR SERIOUS INJURY

Instructions are necessary before operating or servicing machine. Read and understand the Operation & 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.

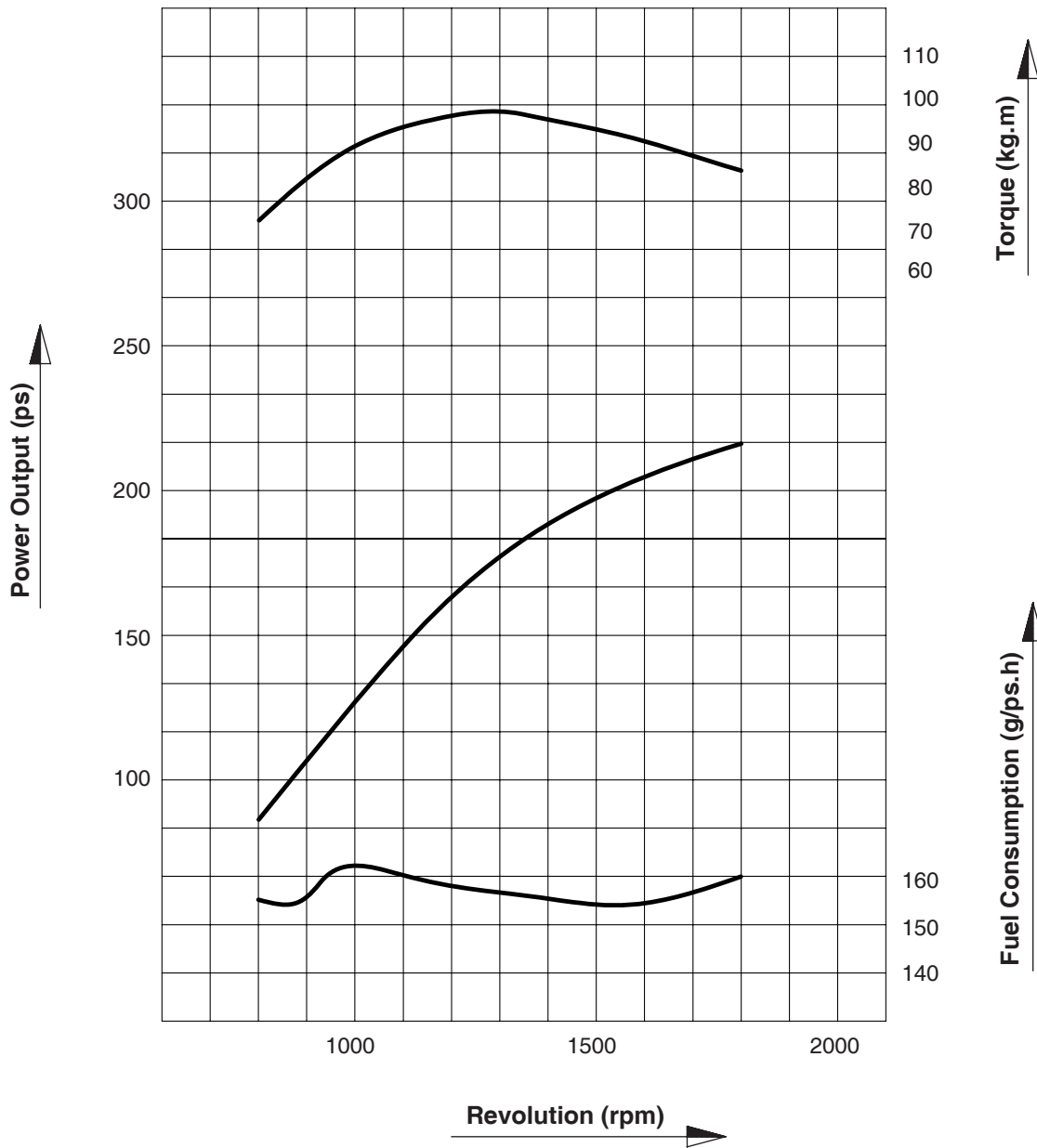
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## APPLICABLE MODELS

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

MODEL	SERIAL NUMBER RANGE
DX300LL-3	10001 and Up

# ENGINE PERFORMANCE CURVES (PER KS-R1004 STANDARD)



FG019245

Figure 3

# General Maintenance

# MAINTENANCE SERVICE AND REPAIR PROCEDURE

## General Precautions

Fluid level and condition should always be checked whenever any other maintenance service or repair is being performed.

**NOTE:** *If the unit is being used in an extreme temperature environment (in subfreezing climates or in high temperature, high humidity tropical conditions), frequent purging of moisture condensation from the hydraulic reservoir drain tap must be a regular and frequent part of the operating routine. In more moderate, temperate climates, draining reservoir sediment and moisture may not be required more than once or twice every few months.*

Inspect drained oil and used filters for signs of abnormal coloring or visible fluid contamination at every oil change. Abrasive grit or dust particles will cause discoloration and darkening of the fluid. Visible accumulations of dirt or grit could be an indication that filters are overloaded (and will require more frequent replacement) or that disintegrating bearings or other component failures in the hydraulic circuit may be imminent or have already occurred. Open the drain plugs on the main pump casings and check and compare drain oil in the pumps. Look for evidence of grit or metallic particles.

Vibration or unusual noise during operation could be an indication of air leaking into the circuit (Refer to the appropriate Troubleshooting section for component or unit for procedures.), or it may be evidence of a defective pump. The gear type pilot pump could be defective, causing low pilot pressure, or a main pump broken shoe or piston could be responsible.

**NOTE:** *If equipped, indicated operating pressure, as shown on the multidisplay digital gauge on the Instrument Panel ("F-Pump" and "R-Pump") will be reduced because of a mechanical problem inside the pump. However, pressure loss could also be because of cavitation or air leakage, or other faults in the hydraulic system.*

Check the exterior case drain oil in the main pumps. If no metallic particles are found, make sure there is no air in the system. Unbolt and remove tank return drain line from the top part of the swing motor, both travel motors and each main pump. If there is air in any one of the drain lines, carefully prefill the assembly before bolting together the drain line piping connections. Run the system at low rpm.

### Fretting

Corrosion set up by small relative movement of parts with no lubrication.

Replace bearing. Clean all related parts. Check seals and check for proper lubrication.

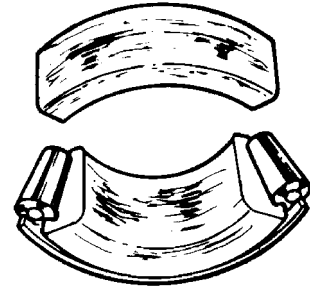


Figure 16

HASA590S

### Heat Discoloration

Heat discoloration can range from faint yellow to dark blue resulting from overload or incorrect lubrication.

Excessive heat can cause softening of races or rollers.

To check for loss of temper on races or rollers, a simple file test may be made. A file drawn over a tempered part will grab and cut metal, whereas a file drawn over a hard part will glide readily with no metal cutting.

Replace bearing if overheating damage is indicated. Check seals and other related parts for damage.



Figure 17

HASA600S

### Stain Discoloration

Discoloration can range from light brown to black caused by incorrect lubrication or moisture.

If the stain can be removed by light polishing or if no evidence of overheating is visible, the bearing can be reused.

Check seals and other related parts for damage.

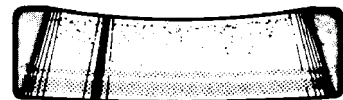


Figure 18

HASA610S

# TYPE 8 PHOSPHATE COATED HARDWARE

This chart provides tightening torque for general purpose applications using original equipment standard hardware as listed in the Parts Manual for the machine involved. **DO NOT SUBSTITUTE.** In most cases, original equipment standard hardware is defined as Type 8, coarse thread bolts, nuts and thru hardened flat washers (Rockwell "C" 38 - 45), all phosphate coated and assembled without supplemental lubrication (as received) condition.

The torques shown below also apply to the following:

1. Phosphate coated bolts used in tapped holes in steel or gray iron.
2. Phosphate coated bolts used with phosphate coated prevailing torque nuts (nuts with distorted threads or plastic inserts).
3. Phosphate coated bolts used with copper plated weld nuts.

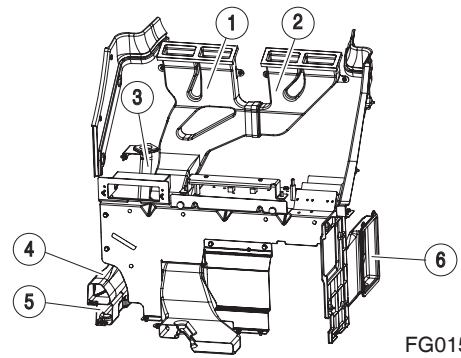
Markings on bolt heads or nuts indicate material grade ONLY and are NOT to be used to determine required torque.

Nominal Thread Diameter	Standard Torque $\pm 10\%$	
	Kilogram-meter (kg·m)	Foot-pounds (ft lb)
1/4"	1.1	8
5/16"	2.2	16
3/8"	3.9	28
7/16"	6.2	45
1/2"	9.7	70
9/16"	13.8	100
5/8"	19.4	140
3/4"	33.2	240
7/8"	53.9	390
1"	80.2	580
1 - 1/8"	113.4	820
1 - 1/4"	160.4	1160
1 - 3/8"	210.2	1520
1 - 1/2"	279.4	2020
1 - 3/4"	347.1	2510
2"	522.8	3780

# Cabin

Edition 1

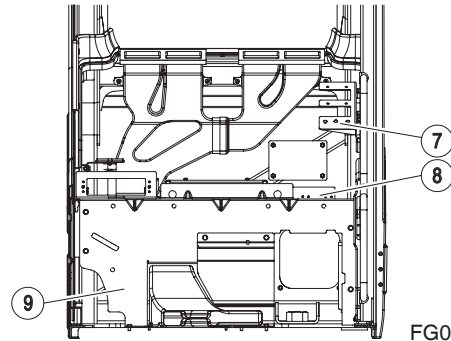
11. Install air ducts (1 thru 5, Figure 14). Install atmospheric air duct (6).



**Figure 14**

FG015893

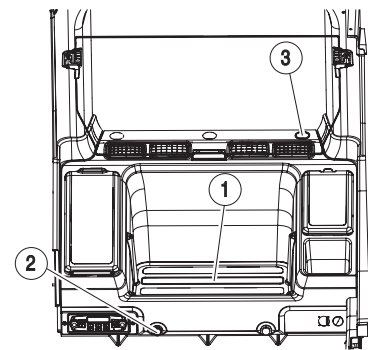
12. Install brackets (7 thru 9, Figure 15) on body of operator's cabin.



**Figure 15**

FG015895

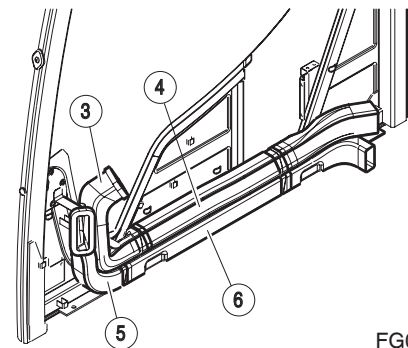
13. Install two bolts (2, Figure 16) and center bolts in center, and three bolts on top to install dashboard cover. Install cap (3, Figure 16) on top of dashboard cover.
14. Install glove box pad (1, Figure 16).
15. Connect washer hose at floor plate bottom.



**Figure 16**

FG015896

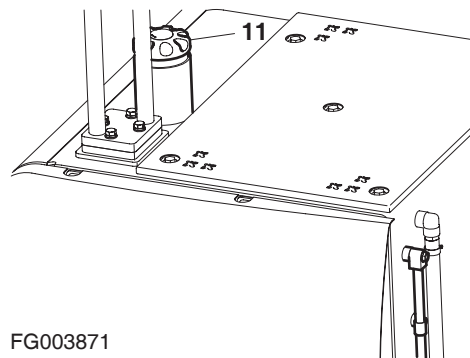
16. Install air ducts (1 thru 4, Figure 17) on right-hand side of cabin.
17. Connect monitor, sun sensor connector, and washer hose.



**Figure 17**

FG015897

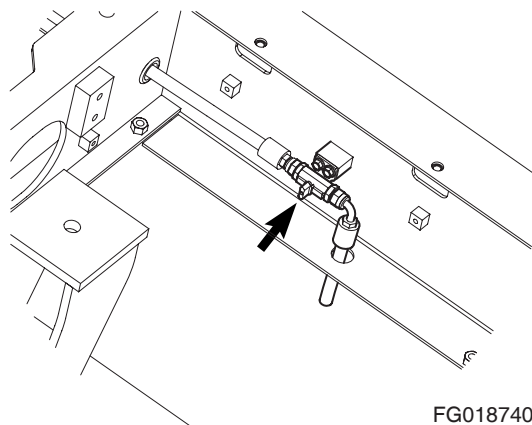
12. Clean area around fuel tank fill cap (11, Figure 5). Open fuel cap.



FG003871

**Figure 5**

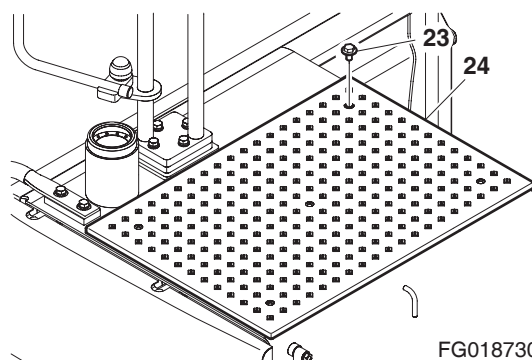
13. Open drain valve (Figure 6) right side door and drain.  
**NOTE:** Fuel tank capacity is 500 liters (132 U.S. gal).



FG018740

**Figure 6**

14. Remove five bolts (23, Figure 7) and cover (24) from fuel tank.



FG018730

**Figure 7**

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# Track Assembly

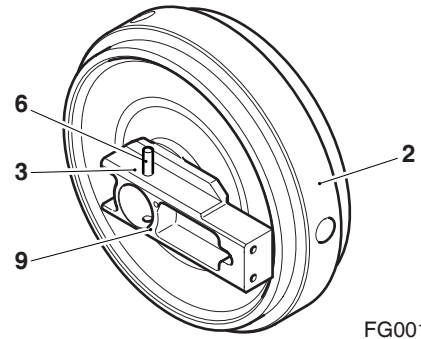
Edition 1

No.	Check Item	Standard Dimension	Recommended Limit for Maintenance		Limit for Use (Repair - P or Replace - R)	
1	Link Pitch	216 mm (8.504")				
2	Bushing Outside Diameter	66.91 mm (2.634")	60 mm (2.362")		57 mm [R] (2.244")	
3	Link Height	116 mm (4.567")	107 mm (4.213")		104 mm [P] (4.094")	
4	Length at Tip	23 mm (0.906")				
5	Height of Tip	49.5 mm (1.949")	28 mm (1.102")		21 mm (0.827")	
6	Interference between bushing and link	Standard Dimension	Tolerance		Standard Interference	Repair Limit
			Shaft	Hole		
		66.5 mm (2.618")	+0.460 +0.410	+0.074 0.0	0.336 - 0.460	
7	Interference between regular pin and link	Standard Dimension	Tolerance		Standard Interference	Repair Limit
			Shaft	Hole		
		44.6 mm (1.756")	+0.235 +0.085	-0.188 -0.250	0.273 - 0.485	
8	Clearance between regular pin and bushing	Standard Dimension	Tolerance		Standard Clearance	Repair Limit
			Shaft	Hole		
		44.6 mm (1.756")	+0.235 +0.085	+1.350 +0.850	0.615 - 1.265	
9	Interference between master pin and link	Standard Dimension	Tolerance		Standard Interference	Repair Limit
			Shaft	Hole		
		44.6 mm (1.756")	+0.030 0	-0.188 -0.250	0.188 - 0.280	
10	Clearance between master pin and bushing	Standard Dimension	Tolerance		Standard Interference	Repair Limit
			Shaft	Hole		
		45.45 mm (1.789")	+0.500 0	+0.500 0	1.100 - 1.700	

5. Install idler (2, Figure 24) on the axle.
6. Install bearing (3, Figure 24) and pin (6) to the axle.

**NOTE:** *Fill the idler assembly with new engine oil with approximately 420 cc (14.2 oz).*

7. Install plug (9, Figure 29) on the bearing.



**Figure 24**

FG001488

# Drive Coupling (Main Pump)

Edition 1

# Hydraulics

from the oil in the system. An 80 mesh, 177 micron reservoir intake strainer also helps maintain system cleanliness and must be cleaned each time hydraulic fluid is drained and replaced. An oil cooler in the hydraulic system helps maintain the operating temperature of the system at approximately 50°C (122°F).

- The arm cylinder operating circuit includes anticavitation valves which protect the hydraulic system from vacuum that could result from external shocks or other unusual conditions. Boom, Arm, and Bucket cylinder circuit are also protected by overload relief valves. Whenever high-pressure is generated because of a shock or overload, excess pressure is dumped to the reservoir return circuit through the relief valve.

A selection valve in the travel circuit can be used to provide constant high torque/low speed travel, or variable speed/variable torque output for travel. To prevent sliding during simultaneous travel and boom/arm/bucket operation, select the high torque/low speed travel position.

# PRESSURE UP VALVE

## Checks and Adjustments

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### **WARNING**

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**This procedure must be done with two people. To reduce the chance of accident or unintended start-up, one person should remain at the operator's control stand while checks and adjustments are made.**

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Vent hydraulic pressure from the reservoir to install an in-line "T-style" adapter and test gauge (60 bar/1,000 psi) at the pilot pump signal port relief valve outlet.

Start the engine and turn the engine speed dial to maximum. When normal operating temperature is reached:

- Check pilot pressure and readjust it, if required:
- Select the Instrument Panel rear pump "pressure display".
- Select Power Mode.
- Stall the boom cylinder (towards the extend side).
- Read rear pump pressure on the Instrument Panel display.

Repeat all tests with and without "pressure up" selected through the console rocker switch and joystick button.

If the two-stage main relief valve was not set correctly and main relief high stage pressure ("pressure up") is outside the tolerance range, begin valve adjustment by loosening the outside (widest diameter) locknut on the relief valve. Turn the adjusting screw clockwise to increase pressure, or counterclockwise to decrease it. Pressure must be 350 bars (5075 psi), or up to 10 bars (145 psi) higher.

Because one adjustment can affect the other, check low stage main relief pressure by repeating the cylinder stall test without "pressure up". Readjust standard relief pressure by turning the innermost (smallest diameter) screw clockwise to increase the setting, or counterclockwise to decrease it. Pressure must be at least 330 bars (4,785 psi), but less than 335 bars (4,858 psi).

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### **IMPORTANT**

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**Pressure adjustments and checks cannot be made if pilot pressure is outside the specified range. Refer to the pilot pump adjustment procedure if required, then proceed with any necessary adjustments to main relief pressure settings.**

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# TROUBLESHOOTING – SWING GEARBOX

Problem	Possible Cause	Remedy
Swing motor fails to operate and:		
Three pressure tests at motor, brake or makeup valve show low reading(s).	Swing relief valve defective Brake release valve defective Motor makeup valve defective.	Adjust pressure to recommended range in affected valve.  OR Disassemble and clean valve assembly. Replace all valve components that show damage.
All three pressure checks are OK but left travel also fails to run.	Exchange front and rear pump inlet and outlet hoses to test pump function.	If swing and left travel are restored but right travel stops working, replace or repair P1 pump.
All three pressure tests are OK, but machine fails to swing at all.	Brake assembly or motor friction plate failing to release.	Check for binding. Disassemble and repair.
	Pilot (control) pressure low or swing control valve stuck.	Disassemble / Repair pilot pressure swing spool (305) and / or swing control valve.
	Swing motor defective.	Test motor drain rate. Replace / Repair motor.
	Gear train defective.	Refer to "Swing Gear Troubleshooting" procedure.
Swing functions but only at reduced rpm.	Causes listed above could also produce dragging swing, OR hot or wrong oil OR worn-out parts.	Check above list; then replace oil, test motor drain rate and check for "03" reading (EPOS self-test).
Left travel speed is also reduced.	Low output at P1 pump or external pilot piping leaks/is clogged.	Clean and repair piping or repair or replace pump P1.
Swing control movement is reversed.	Inlet / outlet piping reversed.	Reset controls or reverse piping.
Machine swings but continues coasting on past stopping point.	Swing control valve spool not centered.	Replace return spring; clean/ repair valve piston and spool.
	Pilot pressure may be outside range.	Disassemble, clean or replace pilot relief valve or pilot valve.
	Swing relief valve may be faulty.	Repair/Replace swing relief valve.
Swing movement is in one direction only.	Check to see that pilot pressure is the same right and left.	If pilot pressure is unequal, clean or repair piping or repair/replace valve.
	Swing control valve spool may be stuck.	Repair/Replace the swing control valve.
	Swing relief valve may be faulty.	Repair/Replace the swing relief valve.
No rotation and:		
Pressure at swing motor inlet increases.	Swing brake not releasing.	Check brake engagement and disengagement; check release pressure.
	Internal damage to gearbox drivetrain.	Replace broken gears and drivetrain assemblies.
	Overload.	Reduce load weight.

# SAFETY INSTRUCTIONS

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## WARNING

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### AVOID DEATH OR SERIOUS INJURY

Instructions are necessary before operating or servicing machine. Read and understand the Operation & 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.

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## APPLICABLE MODELS

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

MODEL	SERIAL NUMBER RANGE
DX140LC-3	1001 and Up, 50001 and Up
DX140W-3	1001 and Up, 50001 and Up
DX170W-3	1001 and Up
DX180LC-3	1001 and Up, 50001 and Up
DX190W-3	1001 and Up
DX225LC-3	1001 and Up, 50001 and Up
DX255LC-3	1001 and Up, 50001 and Up
DX300LC-3	1001 and Up, 50001 and Up
DX300LL-3	10001 and Up
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

# GENERAL DESCRIPTION

The center joint (swivel) is designed to allow hydraulic oil from the upper structure to flow to components in the lower structure.

It is capable of allowing continuous 360° rotation of the upper structure in relationship to the lower structure.

# SAFETY INSTRUCTIONS

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## WARNING

---

### AVOID DEATH OR SERIOUS INJURY

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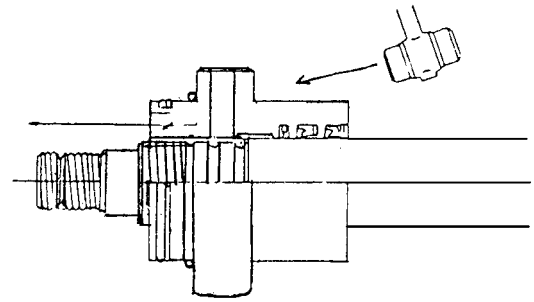
## APPLICABLE MODELS

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

MODEL	SERIAL NUMBER RANGE
DX225LL	5001 and Up
DX300LL	5001 and Up
DX300LL-3	10001 and Up

MODEL	CYLINDER	$\varnothing A_{-0.15}^{-0.05}$	$\varnothing B (\pm 0.1)$	E	$F_{0}^{+0.05}$	Part	MODEL (CYLINDER)
DX225LL	BOOM	80.0 mm (3.15 in)	95.0 mm (3.74 in)	35.0 mm (1.38 in)	6.5 mm (0.26 in)		
	ARM	90.0 mm (3.54 in)	105.0 mm (4.13 in)	40.0 mm (1.58 in)	6.5 mm (0.26 in)		
	BUCKET	65.0 mm (2.56 in)	80.0 mm (3.15 in)	35.0 mm (1.38 in)	6.5 mm (0.26 in)		
DX300LL	BOOM	90.0 mm (3.54 in)	105.0 mm (4.13 in)	40.0 mm (1.58 in)	6.5 mm (0.26 in)		
	ARM	100.0 mm (3.94 in)	115.0 mm (4.53 in)	70.0 mm (2.76 in)	6.5 mm (0.26 in)		
	BUCKET	90.0 mm (3.54 in)	105.0 mm (4.13 in)	40.0 mm (1.58 in)	6.5 mm (0.26 in)		

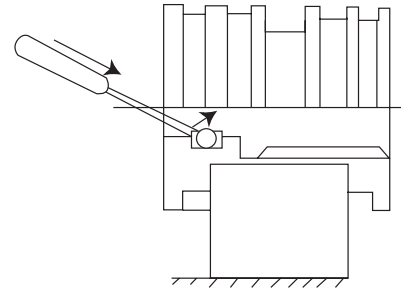
11. Use a plastic hammer to evenly pull off rod cover (5) from end of piston rod. Be careful not to damage rod bushing (6) and dust wiper, U-packing and other seals.



HAOF350S

Figure 22

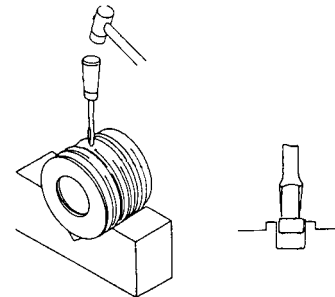
12. Use a dull, rounded tip tool to pry off O-ring (13) and backup ring (14).



HAOF370L

Figure 23

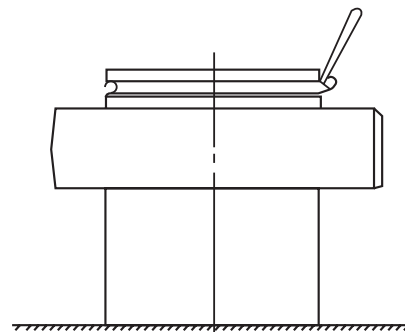
13. Find a screwdriver with an appropriate width tip to facilitate removal of slipper seal (18), wear ring (19) and slide ring (20) from piston (17).



0345

Figure 24

14. Remove O-ring (21) and backup ring (22) from cylinder head.



HAOF380S

Figure 25

# SAFETY INSTRUCTIONS

---



## WARNING

---

### AVOID DEATH OR SERIOUS INJURY

Instructions are necessary before operating or servicing machine. Read and understand the Operation & 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
DX300LL-3	10001 and Up

<b>Problem</b>	<b>Possible Cause</b>	<b>Remedy</b>
Low brake torque.	Wear of friction and/or separation plates.	Replace worn parts.
	Damage of brake spring.	Replace brake spring.
No brake operation.	Sticking of inner brake parts.	Replace parts.
Oil leakage.		
Leakage from oil seal (2).	Oil seal or shaft slidway damaged.	Replace damaged parts and remove any foreign substance.
	High-pressure in case.	Check the drain line.
Leakage from assembled parts.	O-ring damaged.	Replace the O-ring.
	Volt or plug loosened.	Tighten up to specified torque.
Main ways stuck.		
Piston and shoe.	Overload rotation of motor.	Check the operation of the relief valve.
Shoe and swash plate.	Increase of temperature.	Check circuits.
Piston and cylinder.	Insufficient intensity of illumination on slideway.	Repair or replacement of faulty parts.
Cylinder and valve plate.		Replace oil.
Front plate and spherical bushing.	Improper oil or lubrication.	

# REASSEMBLY

## General Cautions

1. Wash and clean each part. Then dry them with compressed air. The friction plate, however, should not be washed with treated oil.
2. Each connecting parts must be tightened according to its assigned torque.
3. Only use a plastic soft faced hammer.

## Assembly

1. Put roll bearing (3) and bushing (39) on a heater and apply heat to their inner race (inlet temperature: 290°C for 2 minutes).

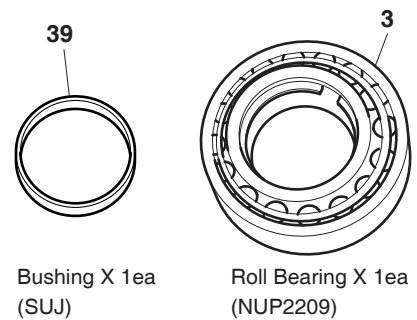


Figure 40

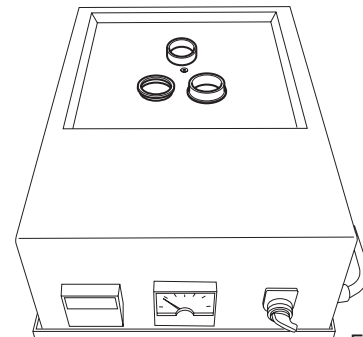
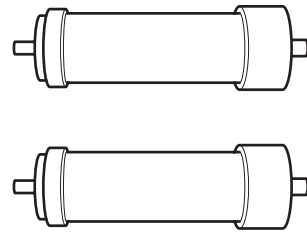
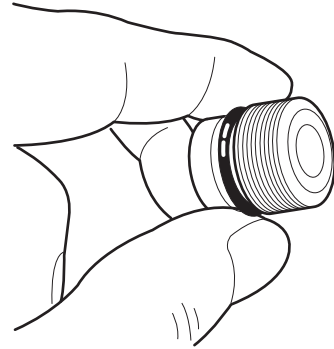


Figure 41



FG000711

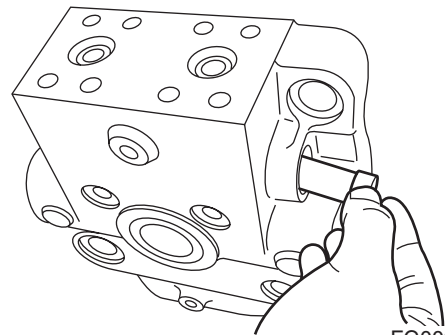
Figure 78



FG000710

Figure 79

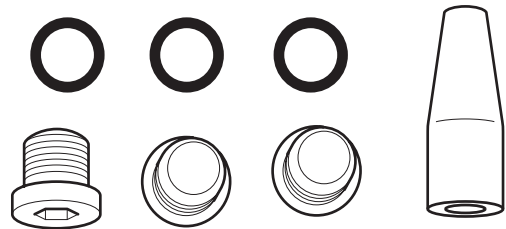
6. Assemble anti-inversion valve set. Assemble anti-inversion valve set and plug assembly (29) into rear cover (19) and tighten them with L wrench.



FG000746

Figure 80

7. Assemble plug assembly (36) into rear cover (19) with L wrench.



FG000747

Figure 81

# SAFETY PRECAUTIONS

---



## WARNING

---

### AVOID DEATH OR SERIOUS INJURY

Instructions are necessary before operating or servicing machine. Read and understand the Operation & 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
DX300LL-3	10001 and Up

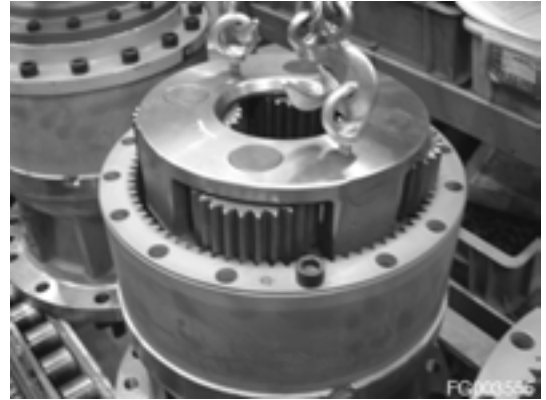


Figure 13

8. Install eyebolts in ring gear and remove it.



## CAUTION

### AVOID INJURY

Care must be taken not to damage mounting surfaces of ring gear and case. Carefully remove all gasket material from mounting surfaces.

---

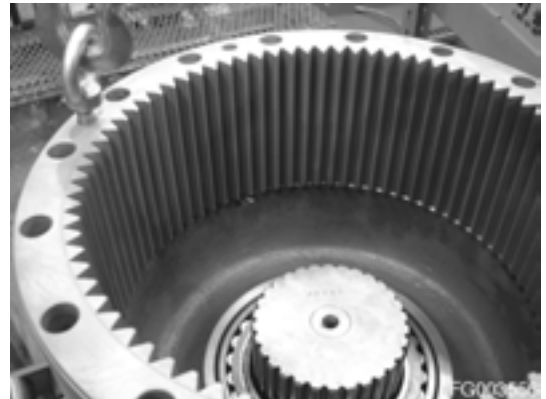


Figure 14

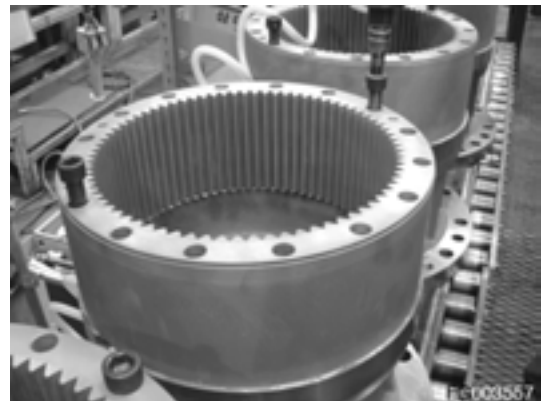
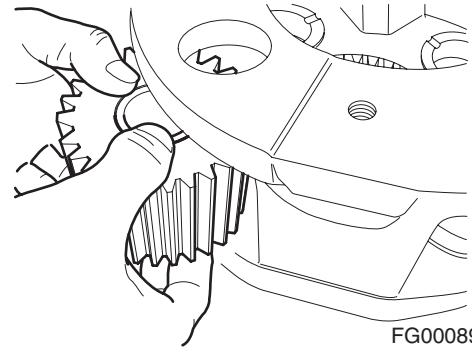


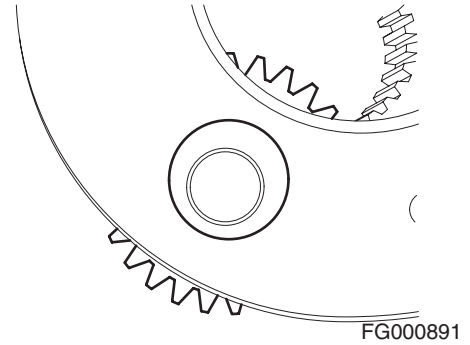
Figure 15

3. Turn over gear assembly and insert it into No. 2 carrier. Align bushing hole with carrier holes.

**NOTE:** *Thrust washer must be on bottom side of gear.*



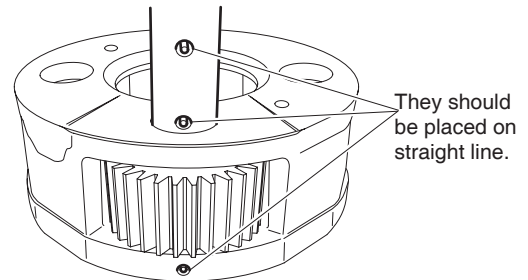
**Figure 42**



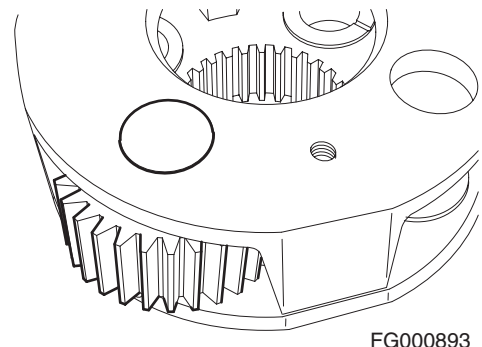
**Figure 43**

4. Align spring pinhole in No. 2 shaft with spring pinhole of No. 2 carrier. Insert shaft into carrier and No. 2 bushing.

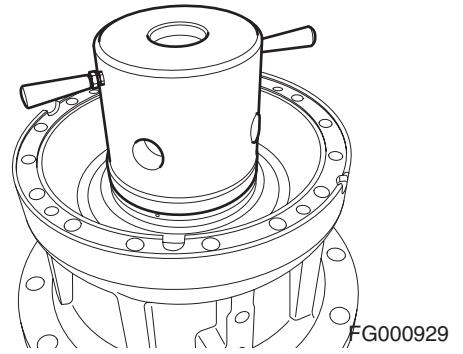
**NOTE:** *Shaft may need to be gently tapped with a soft-faced hammer.*



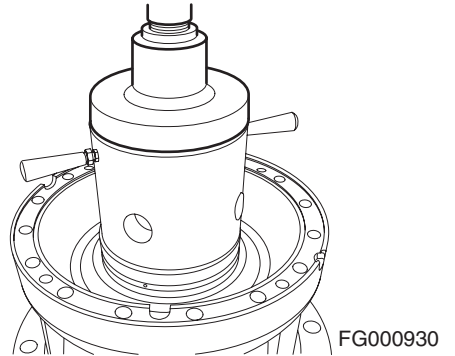
**Figure 44**



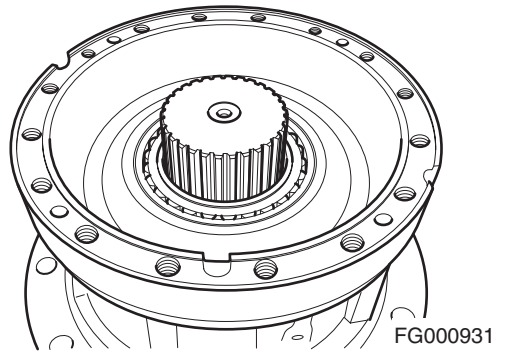
**Figure 45**



**Figure 81**

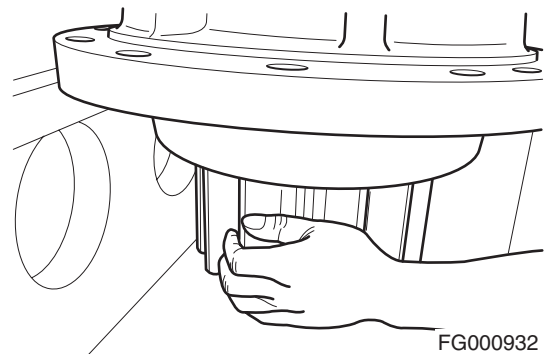


**Figure 82**

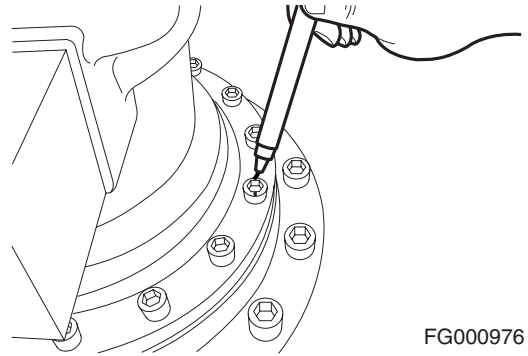


**Figure 83**

5. Rotate pinion by hand and check if it turns properly.

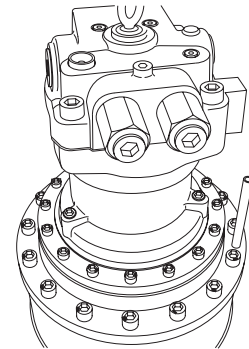


**Figure 84**



**Figure 117**

FG000976

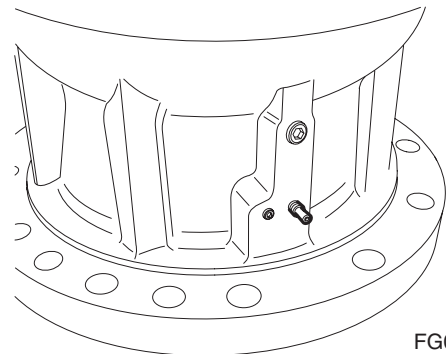


**Figure 118**

FG000977

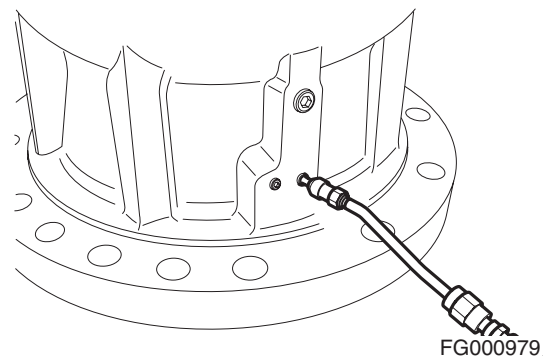
**Supply of Grease**

1. Install grease fitting in grease inlet and add grease through grease until it starts to be discharged from the opposite hole.



**Figure 119**

FG000978



**Figure 120**

FG000979

# GENERAL DESCRIPTION

1. This motor is comprised of a motor section and reduction gear section.
2. Hydraulic motor consists of the following five items.
  - Rotary part generating rotating force
  - Relief valve
  - Brake part
  - Counterbalance valve part
  - Swash tilting part
3. The reduction gear section contains a 3-level planetary gear and differential gear. The symbols used for hydraulic pressure are as follows:

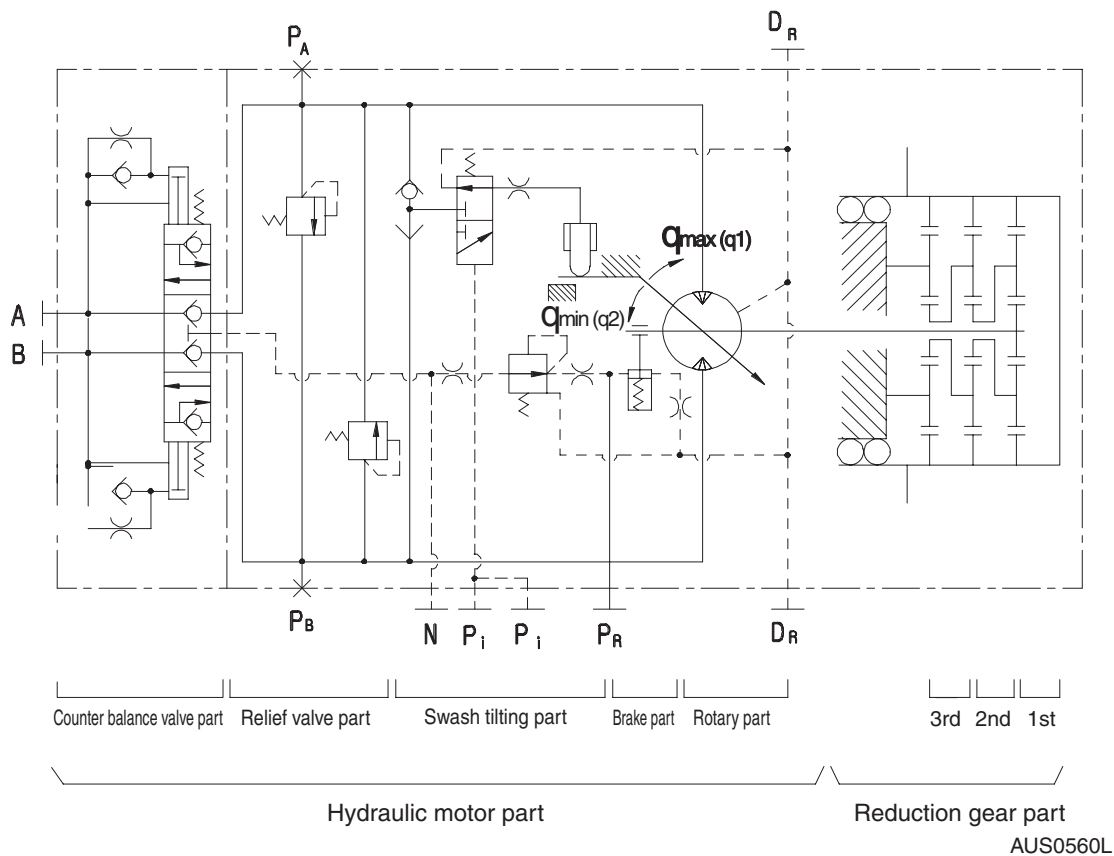


Figure 1

AUS0560L

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Reference Number	Description
11	Cylinder Assembly
12	Piston Assembly
13	Valve Casing Assembly
22	Counter Balance Spool
101	Shaft
102	Roller Bearing
103	Needle Bearing
107	Retaining Ring
113	Spherical Bushing
114	Spring Cylinder
123	Set Plate
131	Valve Plate
201	Swash Plate
272	Shaft Casing
350	Relief Valve
351	Reducing Valve
352	Cover
361	Washer
362	Counter Balance Spring
364	Counter Balance Cover
365	O-ring
366	Socket Bolt
401	Socket Bolt
402	Socket Bolt
435	Retaining Ring
461	Plug
464	Plug
472	O-ring

Reference Number	Description
485	O-ring
491	Oil Seal
502	Piston
503	Shoe
504	Pivot Ball
509	O-ring
531	Tilting Spool
533	Tilting Spring
541	Seat
542	Stopper
543	Steel Ball
545	Orifice
546	Orifice
547	O-ring
564	Plug
567	VP Plug
569	RO Plug
570	O-ring
571	RO Plug
572	O-ring
702	Brake Piston
703	Orifice
705	Brake Spring
707	O-ring
708	O-ring
741	Separator Plate
742	Friction Plate

5. Remove No. 1 sun gear (009).



Figure 12

6. Remove No. 1 carrier (005) with No. 1 planetary gear (012) and No. 2 sun gear (010) assembled.



Figure 13

7. Disassemble No. 1 carrier subassembly.
  - A. Remove retaining ring (044), disassemble side plate (018), No. 1 planetary gear (012), and needle cage (021).

**NOTE:** *If any flaking is found on surface of inner race (024), remove race from No. 1 carrier and replace it with a new one. At same time, replace No. 1 planetary gear and needle cage.*



Figure 14

- B. Remove retaining ring (045), and remove No. 1 carrier (005) from No. 2 sun gear (010).

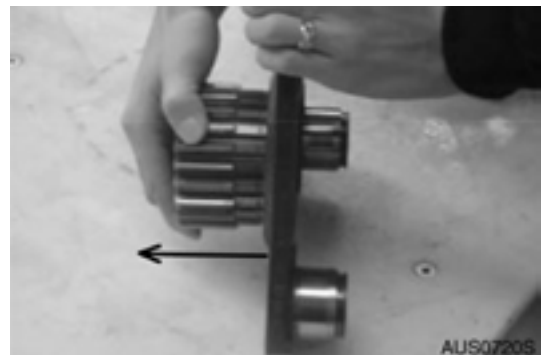


Figure 15

# CLEANING AND INSPECTION (WEAR LIMITS AND TOLERANCES)

For general cleaning and inspection procedures, refer to "General Maintenance Procedures" section.

## Maintenance Standard

Change parts with standard of the following table. If parts have damages of external appearance, change without the following table.

### Changing Standard of Hydraulic Motor Part

Parts name and inspection item		Standard dimension	Recommended value of replacement	Remedy
Clearance (D-d) between piston and cylinder bore		0.52 mm	0.077 mm	Replace
Clearance between piston and shoe ( $\delta$ )		0.1 mm	0.3 mm	
Shoe thickness		5.5 mm	5.3 mm	
Height (H-h) of spherical bushing and retainer place assembly		23.8 mm	23.3 mm	Replace with set
Free length of cylinder spring		40.9 mm	40.3 mm	Replace
Over pin diameter (4.5) of driveshaft	Drive spline	43.91 mm	43.31 mm	Even if one each of recommended value of replacement is not reached, replace.
	Cylinder spline	49.06 mm	48.46 mm	
Over pin diameter (4.5) of spline inside of cylinder and spherical bushing		35.25 mm	35.75 mm	Replace
Thickness of separate plate		1.5 mm	1.3 mm	
Thickness of friction plate		3.9 mm	3.7 mm	
Free length of brake spring		42.4 mm	41.4 mm	
Base tangent length of cylinder outside (7 each)		50.02 mm	49.42 mm	
Over pin diameter (4.5) of inside gear of friction plate		152.97 mm	153.57 mm	
Roughness of sliding surface	Swash plate/shoe	0.4-Z	3-Z	Lap each
	Cylinder block/Valve plate	0.4-Z	3-Z	Joint lapping
Roller bearing/needle bearing				If there are flaking on sliding surface, replace.
O-ring/Oil seal				When disassembling, replace as a rule.
Kinds of bolt				If there are crushing parts, replace.

13. Assemble plug, relief valve (35), and decompression valve (351) into valve casing subassembly to specified torque.

**NOTE:** *Tightening torque:*

*Relief valve (35): 1800 kg•cm*

*Decompression valve (351): 450 kg•cm*



**Figure 80**

14. Install adjustment cover (352).



**Figure 81**

15. Loosen bolts for releasing brake and then assemble plug (564).

**NOTE:** *Tightening torque for plug (564): 220 kg•cm.*



**Figure 82**

3. Efficiency test (for 1-speed)

Capacity efficiency	Machine efficiency	External drain amount
90% or more	82% or more	3.0 l/min or less

4. Capacity efficiency checking test (for 2-speed)

State of switching to 2-speed	Capacity efficiency
Pressure difference: 80 kg/cm <sup>2</sup> rpm: 20 rpm	94% or more

5. Operation test for 2-speed section

If applying 30 kg/cm<sup>2</sup> or more of pressurized oil to 2-speed switching pilot port ("D" port) when performing no-load test in test operation as shown in (A) and (B) above, check to see that 2-speed section shifts from low gear to high gear. It should shift from low gear to high gear.

Also, check to see if it shifts to low gear under pressure of 20 kg/cm<sup>2</sup> or less.

**If on-site performance test is unavoidable as test equipment is not available**

Attach and pipe TM motor to equipment with shoes not attached, conduct test operation, and then perform performance test.

1. Condition for test operation

- A. Rotating it right and left for 1 minute at no-load pressure of 10 rpm.
- B. Rotating it right and left for 1 minute at no-load pressure of 20 rpm, 200 kg/cm<sup>2</sup>.

2. Test conditions

- A. Temperature
  - 1) Working oil - 50 ±5°C
  - 2) Case - 40 - 80°C

3. Driving pressure at no-load (Pressure difference)

1-speed	10 rpm	20 kg/cm <sup>2</sup>
2-speed	20 rpm	30 kg/cm <sup>2</sup>

4. Measurement of oil drain from motor

1-speed, 2-speed	10 rpm	3.0 liter or less
------------------	--------	-------------------

## Theory of Operation

### Construction

This pump assembly consists of two pumps connected by a spline inside 1st gear (116). The two pumps can be driven simultaneously as the rotation of the prime mover (engine) is transferred by the driveshaft (F) (111) on the front side. The suction and discharge ports are integrated at the connecting part of the two pumps; i.e. in valve block (312): The suction port serves both the front pump and the rear pump.

### Function

The pumps may be classified roughly into the rotary group performing a rotary motion and working as the major part of the whole pump function: the swash plate group that varies the delivery rates: and the valve cover group that changes over oil suction and discharge.

#### 1. Rotary Group

The rotary group consists of a driveshaft (F) (111), cylinder block (141), piston shoes (151, 152), set plate (153), spherical bushing (156) and cylinder spring (157). The driveshaft is supported by bearings (123 and 124) at both ends. The shoe is caulked to the piston to form a spherical coupling. It has a pocket to relieve thrust force generated by loading pressure and to take hydraulic balance so it slides lightly over the shoe plate (211). The subgroup is composed of a piston and shoe pressed against the shoe plate by the action of the cylinder spring by a retainer and a spherical bushing.

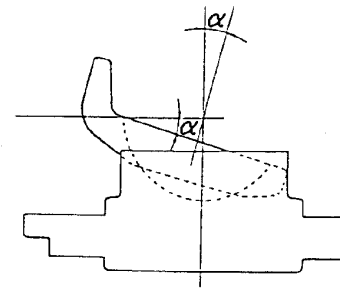
Similarly, the cylinder block is pressed against valve plate (313) by the action of the cylinder spring.

#### 2. Swash Plate Group

The swash plate group consists of swash plate (212), shoe plate (211), swash plate support (251), tilting bushing (214), tilting pin (531) and servo piston (532).

The swash plate is a cylindrical part formed on the opposite side of the sliding surface of the shoe and is supported by the swash support.

The servo piston moves to the right and left as hydraulic oil, controlled by the regulator is transmitted to each hydraulic chamber on both ends of the servo piston. The swash plate slides over the swash plate support by the spherical part of the tilting pin to change the tilting angle ( $\alpha$ ).



ARS0130L

**Figure 2** Swash Plate Group

- Remove hex socket head bolts (406) and seal cover (F) (261).

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## IMPORTANT

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Install bolt into pulling-out tapped hole of seal cover (F), and cover can be removed easily.

Since oil seal is attached on seal cover (F), do not damage it when removing cover.

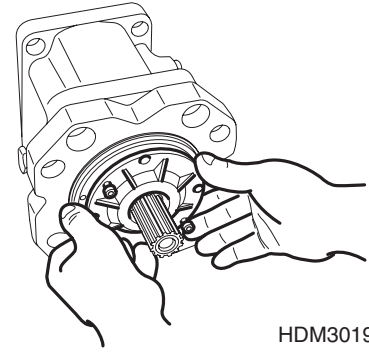
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[In case fitting a gear pump, first, remove gear pump]

- Lightly tapping fitting flange section of swash plate support (251), on its pump casing side, separate swash plate support from pump casing.

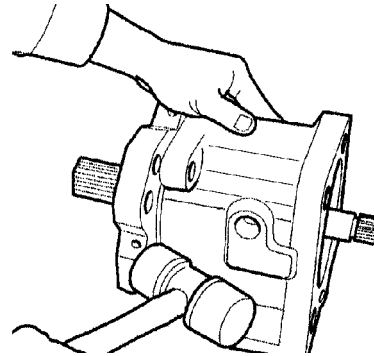
- Remove shoe plate (211) and swash plate (212) from pump casing (271).

- Lightly tapping shaft ends of driveshafts (111 and 113) with plastic hammer, remove driveshafts from swash plate supports.



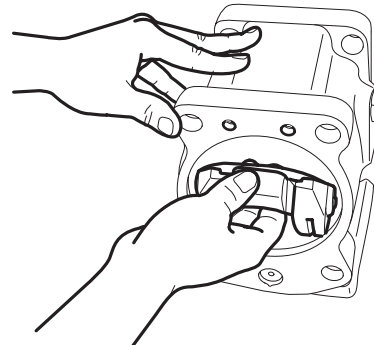
HDM3019L

Figure 9



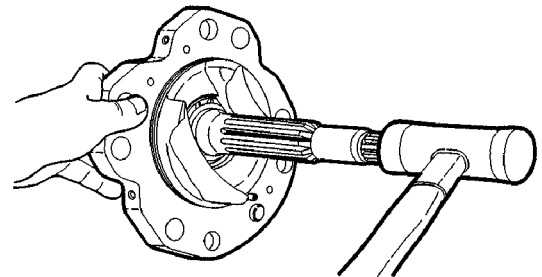
HDM3020P

Figure 10



HDM3021L

Figure 11



HDM3022P

Figure 12

Reference Number	Description
412	Hex Socket Head Screw
413	Hex Socket Head Screw
436	Hex Socket Head Screw
438	Hex Socket Head Screw
496	Plug
531	Tilting Pin
548	Feedback Pin
601	Casing
611	Feedback Lever
612	Lever (1)
613	Lever (2)
614	Fulcrum Plug
615	Adjusting Plug
621	Compensating Piston
622	Piston Case
623	Compensating Rod
624	Spring Seat (C)
625	Outer Spring
626	Inner Spring
627	Adjusting Ring (C)
628	Adjusting Screw (C)
629	Cover (C)
630	Locknut
631	PF Sleeve
641	Pilot Cover
643	Pilot Piston
644	Spring Seat
645	Adjusting Ring (Q)
646	Pilot Spring
651	Sleeve

Reference Number	Description
652	Spool
653	Spring Seat
654	Return Spring
655	Set Spring
656	Block Cover
708	O-ring
722	O-ring
724	O-ring
725	O-ring
728	O-ring
730	O-ring
732	O-ring
733	O-ring
734	O-ring
735	O-ring
755	O-ring
756	O-ring
763	O-ring
801	Nut
814	Retaining Ring
836	Retaining Ring
858	Locking Ring
874	Pin
875	Pin
887	Pin
897	Pin
898	Pin
924	Adjusting Screw
925	Adjusting Screw (QI)

### Outline

The regulator for the K3V Series in-line type axial piston pump has various models to satisfy various kinds of specifications required. Therefore, the customer can select the appropriate model to its intended application.

### Maximum Flow Is Not Available

1. Check that pilot pressure  $P_i$  is normal.
2. The pilot piston (643) is stuck:
  - Disassemble and clean the regulator.
3. The spool (652) is stuck:
  - Disassemble and clean the regulator.
4. The piston QMC stopper (647) and piston (648) are stuck with each other:
  - Disassemble and clean the regulator.
5. The spool (COV) (637) is stuck:
  - Disassemble and clean the regulator.

**NOTE:** *Replace faulty parts that are deeply scored.*  
*(1 and 2) are only for cases of the pilot control.*  
*(4) is only for cases of the two-stage max. flow control.*  
*(5) is only for cases of the cutoff control.*

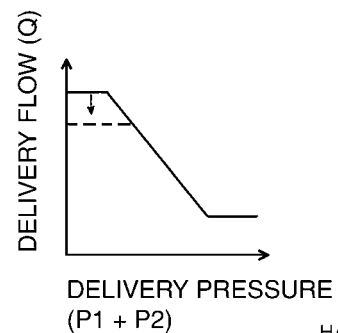
### Adjustment of Maximum and Minimum Flows

The regulator can adjust the maximum and minimum flows with the adjusting screws.

**NOTE:** *Their respective adjustment values are shown in the attached Table. See "Summary of Regulator Adjustment Values" on page 38.*

#### Adjustment of Maximum Flow

Adjust it by loosening the hex nut (809) and by tightening (or loosening) the set screw (954). The maximum flow only is adjusted without changing other control characteristics.



HAAD4150

Figure 34

# Counterweight

Edition 1

# Main Control Valve

Edition 2

## Single Operation

### Travel Spool Shift

When shifting travel spool by increasing pressure of travel (Section 1) pilot port (Pb1 (Pa1)), oil supplied to port (P1) flows through neutral passage (L1) to spool and flows to port (B1 (A1)). Return oil flows through port (A1 (B1)), to spool and returns to tank passage (Ta).

When shifting travel spool by increasing pressure of travel (Section 6) pilot port (Pb6 (Pa6)), oil supplied to port (P2) flows through neutral passage (R1) to spool or passage (S6-1) and flows to port (B6 (A6)). Now, pressure of parallel passage (R3) and passage (S6-1) are equal, so poppet (S6-2) does not open. Return oil flows through port (A6 (B6)) to spool and returns to tank passage (Ta).

When shifting either spool (Section 1 or 6), land (Lc4) or (Rc3) is closed. Oil supplied from port (PP) does not flow into tank passage, so pressure at port (PT) rises.

### Option Spool Shift

When shifting option spool by increasing pressure of option (Section 2) pilot port (Pb2 (Pa2)), neutral passage (L1) is closed. Oil supplied to port (P1) flows through parallel passage (L3), load check valve (S2-2), passage (S2-1), and spool, it then flows to port (B2 (A2)).

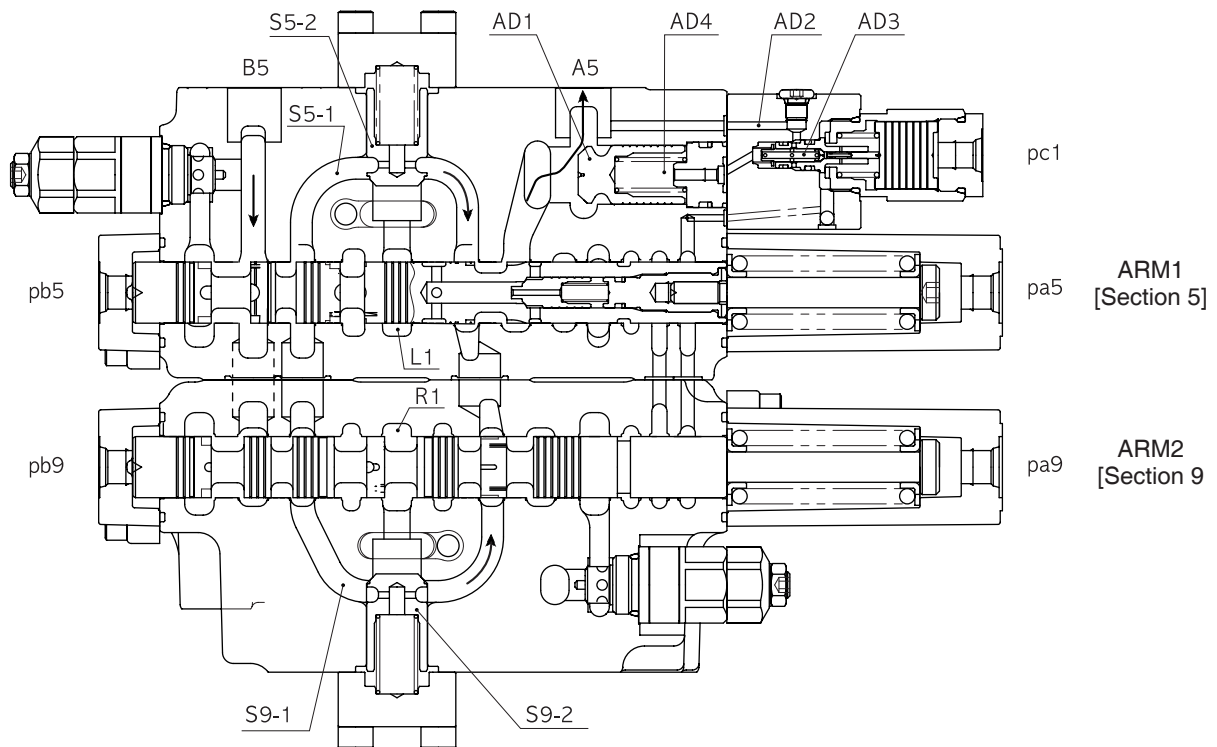
Return oil flows through port (A2 (B2)) to spool and returns to tank passage (Ta).

When oil is also supplied from port (P4), it flows through load check valve (S2-2) and is combined at passage (S-1).

3. Arm out (2-pump confluence)

When arm 1 spool is shifted by increasing pressure of arm 1 (Section 5) pilot port (Pa5), oil supplied to port (P1) flows through neutral passage (L1), load check valve (S5-2), passage (S5-1) and spool and into port (A5).

Oil supplied to port (P2) flows through neutral passage (R1), load check valve (S9-2), passage (S9-1), spool and passage (8) and joins at port (A5). Return oil from port (B5) returns through spool to tank passage (Ta).

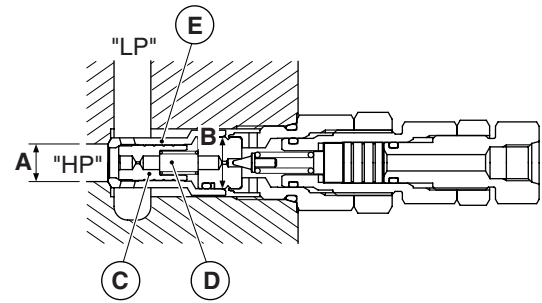


FG001308

Figure 14

## Main Relief Valve

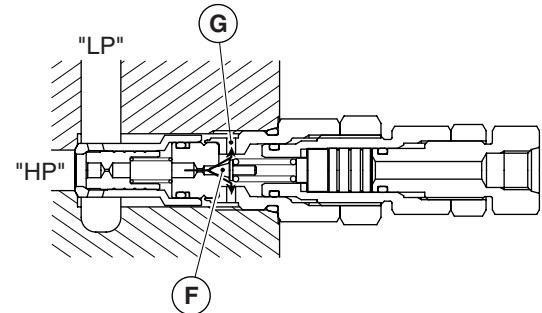
1. The main relief valve is between neutral oil passage (HP, Figure 23) and low-pressure oil passage (LP). Pressurized oil flows into neutral oil passage (HP) through orifice in the main poppet (C) to fill internal cavity (D). Because of the difference in areas between (A and B), on which hydraulic pressure acts, main poppet (C) seats on sleeve (E).



FG000639

Figure 23

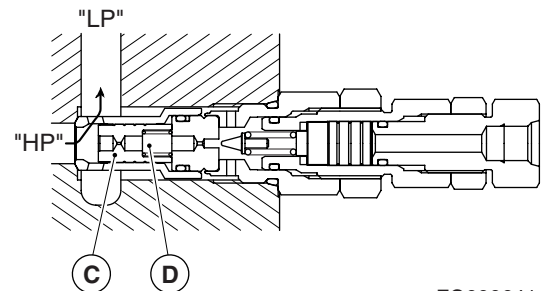
2. When pressure in neutral oil passage (HP) rises and exceeds relief valve setting, pilot poppet (F) opens. Pressurized oil flows through pilot poppet (F) into low-pressure oil passage (LP), passing through hole (G).



FG000640

Figure 24

3. As pilot poppet (F) opens, pressure in internal cavity (D) lowers to move main poppet (C) so pressurized oil flows into neutral oil passage (HP) and directly into low-pressure oil passage (LP).

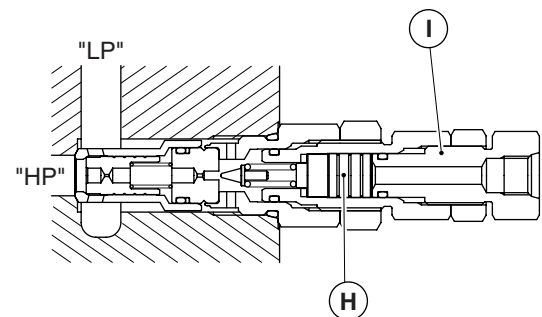


FG000641

Figure 25

4. Pressure up operation

If pressure is applied to pilot port "PH", piston (H) moves to the pressure setting position of plug (I) so the force of spring increases, thus increasing pressure in the neutral oil passage (HP).



FG000642

Figure 26

## Relief Valve

Problem	Possible Cause	Remedy
Press does not increase.	Main poppet, sleeve or pilot poppet are stuck open and valve seat part has dust.	Replace relief valve.
Unstable relief pressure.	The seat part of pilot poppet has groove.	
	Piston or main poppet gets stuck.	
Abnormal relief pressure.	Abrasion of seat part by dust.	Reset pressure and tighten locking screw with regular Torque.
	Locking screw and adjustment equipment are loosened.	
Oil leakage.	Damage to relief valve seat part.	Replace relief valve.
	Each part is stuck with dust.	
	The O-ring is worn out.	Replace adjustment equipment or O-ring of loading part.

## Overall Oil Pressure

Problem	Possible Cause	Remedy
Oil pressure condition is bad or not operate at all.	Breakdown of pump.	Check pressure or replace pump.
	Breakdown of relief valve.	Replace relief valve.
	Breakdown of cylinders.	Repair or replace.
	Pump load pressure is significant.	Check circuit pressure.
	Valve has crevice.	Replace valve assembly.
	Spool does not make full stroke.	Check operation of spool.
	Tank surface is too low.	Add operation oil.
	Filter in circuit is clogged.	Wash or replace filter.
	Circuit pipeline is tightened.	Check pipeline.

## Adjustment of Valves

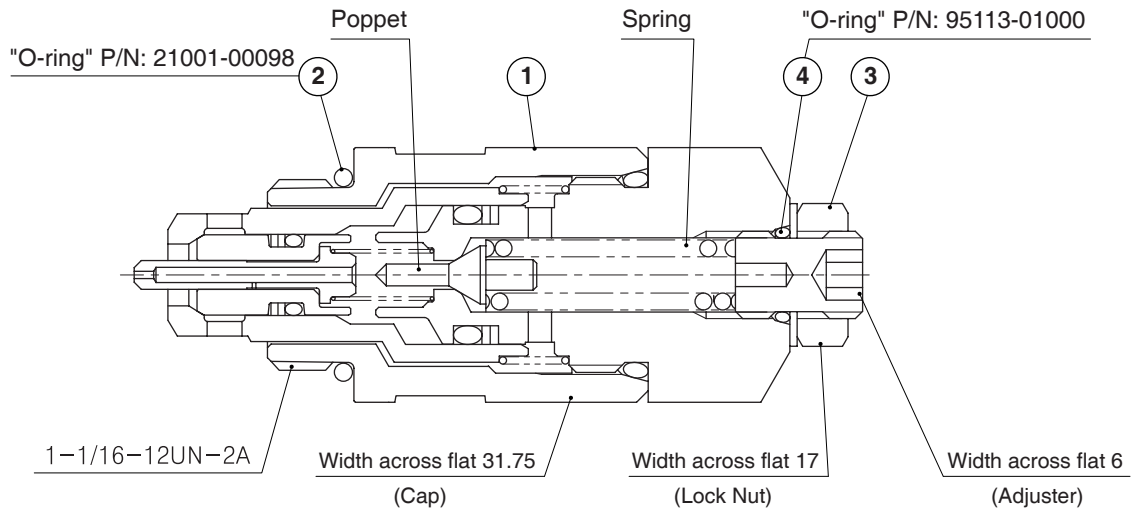
### Main Relief Valve

1. Connect an accurate pressure gauge to inlet port.
2. Start engine and maintain rated pump speed.
3. Shift control valve spool and read pressure gauge from stroke end of cylinder.

**NOTE:** *Shift a spool that actuator pressure setting of the overload relief valve is higher than the pressure of the main relief valve.*

4. High-pressure adjustment (1st stage) (Refer to Figure 39 on page -50.)
  - A. Loosen locknut (7) and tighten plug (8) until piston contacts step (\* mark) of plug (6). Plug (8) must be torque below 2.0 kg•m (15 ft lb). While plug (8) is tightened, plug (6) should not be turned. Distance A (Figure 39 on page -50) must be more than 4.0 mm (0.16 in). Tighten locknut (7).

## Disassembly of Overload Relief Valve



FG001318

**Figure 40**

1. This relief valve must be replaced as an assembly. When replacing it, remove cap (1, width across flats: 32 mm) and O-ring (2). If oil is leaking from nut (4), remove nut (4) and plug (1), and replace O-ring (3). If oil is leaking from nut (7), remove nut (7) and plug (8), and replace O-ring (3).

**NOTE:** *This relief valve must be replaced as an assembly. When replacing it, Remove cap (1, width across flats: 32 mm) and O-ring (2). If oil is leaking from adjusting kit (3), remove adjusting kit (3), and replace O-ring (4).*



### CAUTION

---

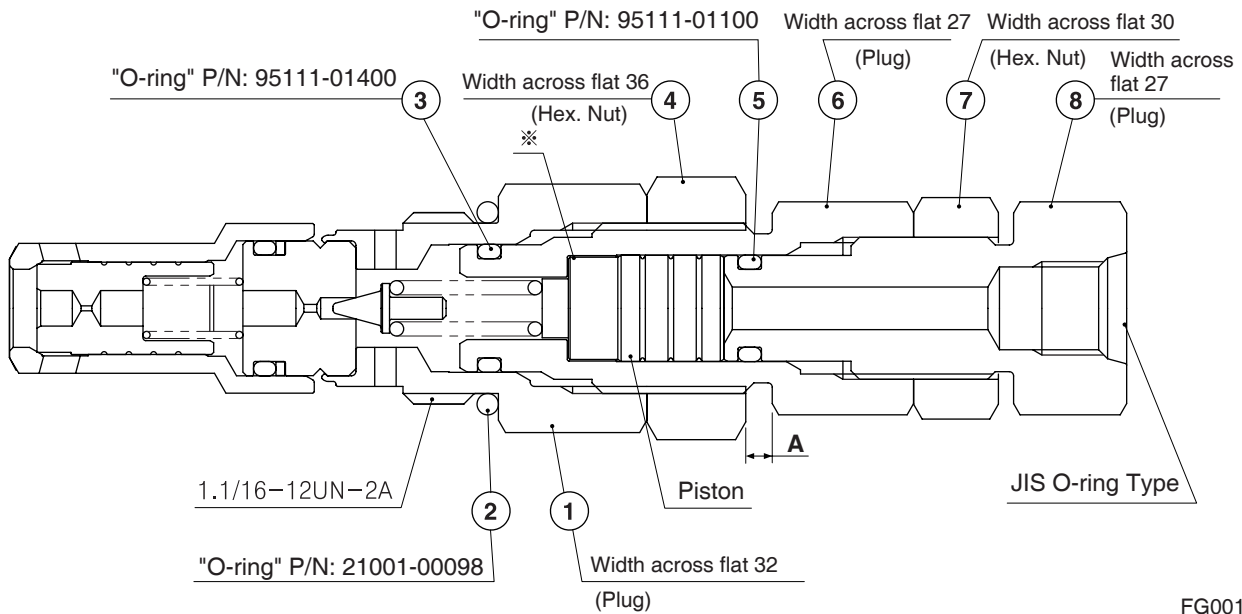
#### AVOID INJURY

When disassembling adjuster kit, be careful not to let parts spring out or lose poppet because of spring force.

---

# Maintenance of Relief Valves

## Reassembly of Main Relief Valve



FG001317

**Figure 42**

1. Check if there is dirt and paint chips around threads of plug (1, 6 and 8) and nut (4 and 7). Replace O-ring with new one. Clean installation portion of relief valve and valve housing. Install valve, and then tighten plug (1, width across flats: 32 mm). Tightening torque: 7.95 - 8.97 kg•m (58 - 65 ft lb).

**NOTE:** The torque values are based on use of lubricated threads.

**NOTE:** If relief valve was disassembled, adjust pressure by referring to "Main Relief Valve" on page 1-41.

# SAFETY INSTRUCTIONS

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## WARNING

---

### AVOID DEATH OR SERIOUS INJURY

Instructions are necessary before operating or servicing machine. Read and understand the Operation & 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.

---

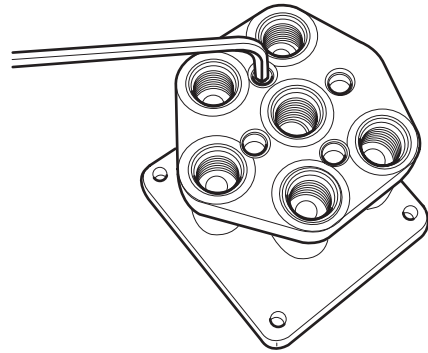
## APPLICABLE MODELS

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

MODEL	SERIAL NUMBER RANGE
DX140LC-3	1001 and Up, 50001 and Up
DX140W-3	1001 and Up, 50001 and Up
DX170W-3	1001 and Up
DX180LC-3	1001 and Up, 50001 and Up
DX190W-3	1001 and Up
DX225LC-3	1001 and Up, 50001 and Up
DX255LC-3	1001 and Up, 50001 and Up
DX300LC-3	1001 and Up, 50001 and Up
DX300LL-3	10001 and Up
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

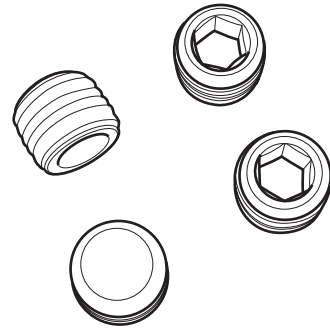
# REASSEMBLY

1. Install four plugs (2) into case (1).



FG013504

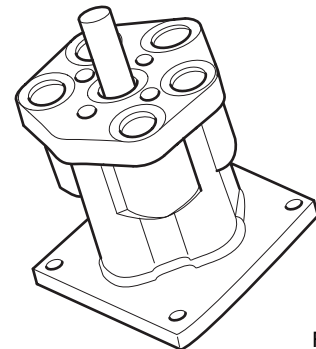
Figure 15



FG013507

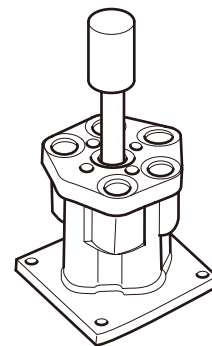
Figure 16

2. Install bushing (3) into case (1) using jig.



FG013506

Figure 17



FG013508

Figure 18

# Table of Contents

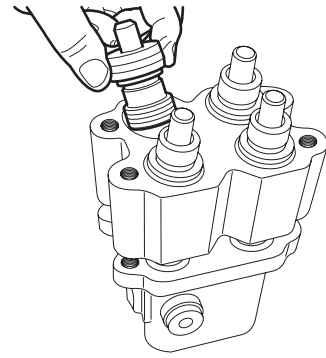
## Pedal Valve (with Damper)

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Applicable Models .....	5
General Description .....	7
Theory of Operation .....	7
Pressure Reducing Valve .....	8
Operating Theory of Damper Mechanism .....	9
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Disassembly .....	18
Cleaning and Inspection (Wear Limits and Tolerances).....	20
Reassembly .....	21
Installation .....	26
Start-up Procedures .....	29

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

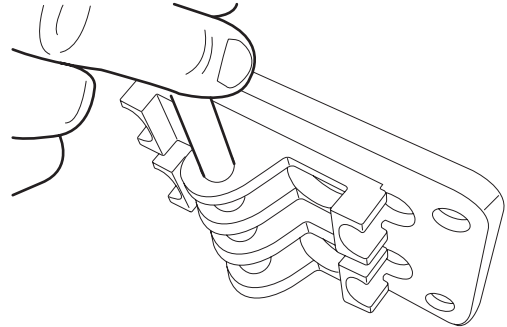
8. Install push rod assembly into body (2).



FG013552

**Figure 33**

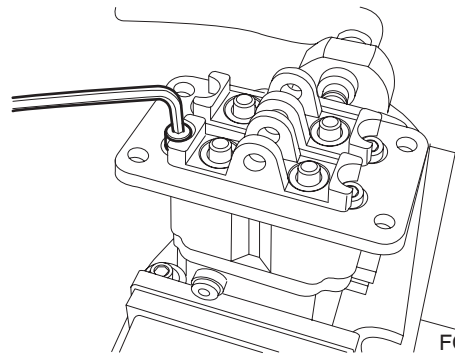
9. Install bushing (27) in cover (24) using jig.



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**

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## Solenoid Valve Assembly

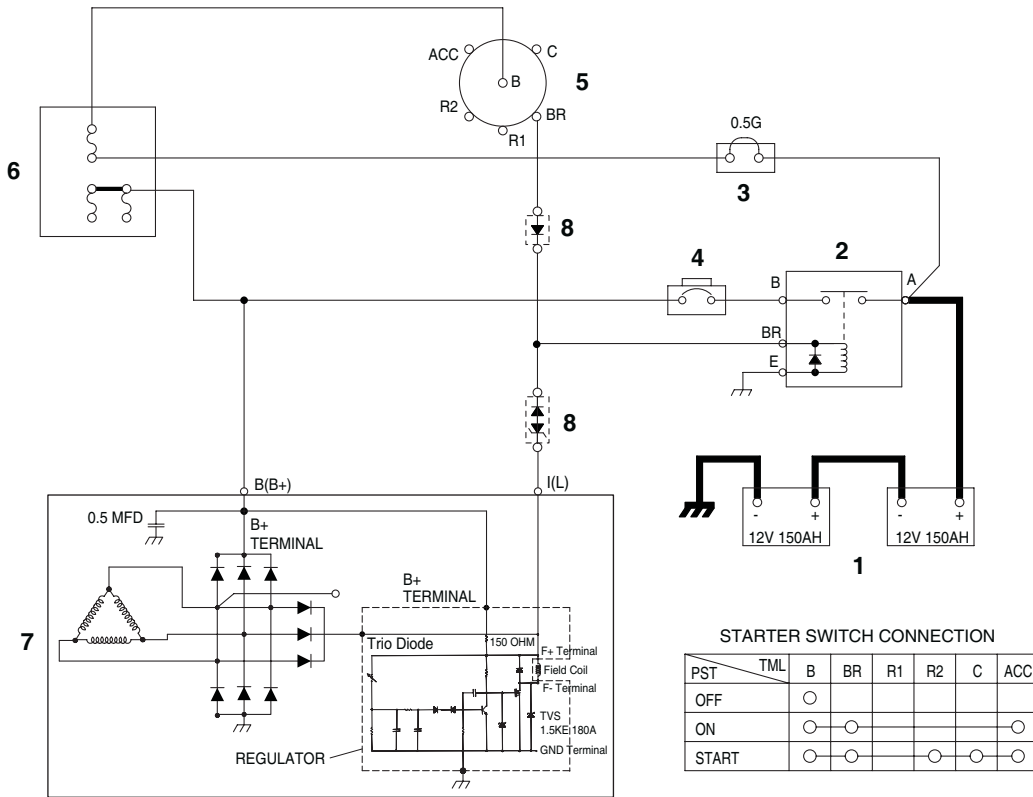
Safety Instructions .....	5
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Functions of 5-Solenoid Valve Assembly	
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Functions of Solenoid Valve Assembly Package .....	7
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Check Points and Solutions for Problems .....	11

# Hydraulic Schematic (DX300LL-3)

Edition 1

# Electrical System

Edition 1



EX1301229

Figure 1 Electric Power Circuit Diagram

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

Reference Number	Description
5	Starter Switch
6	Fuse Box
7	Alternator
8	Diode

# MONITORING SYSTEM

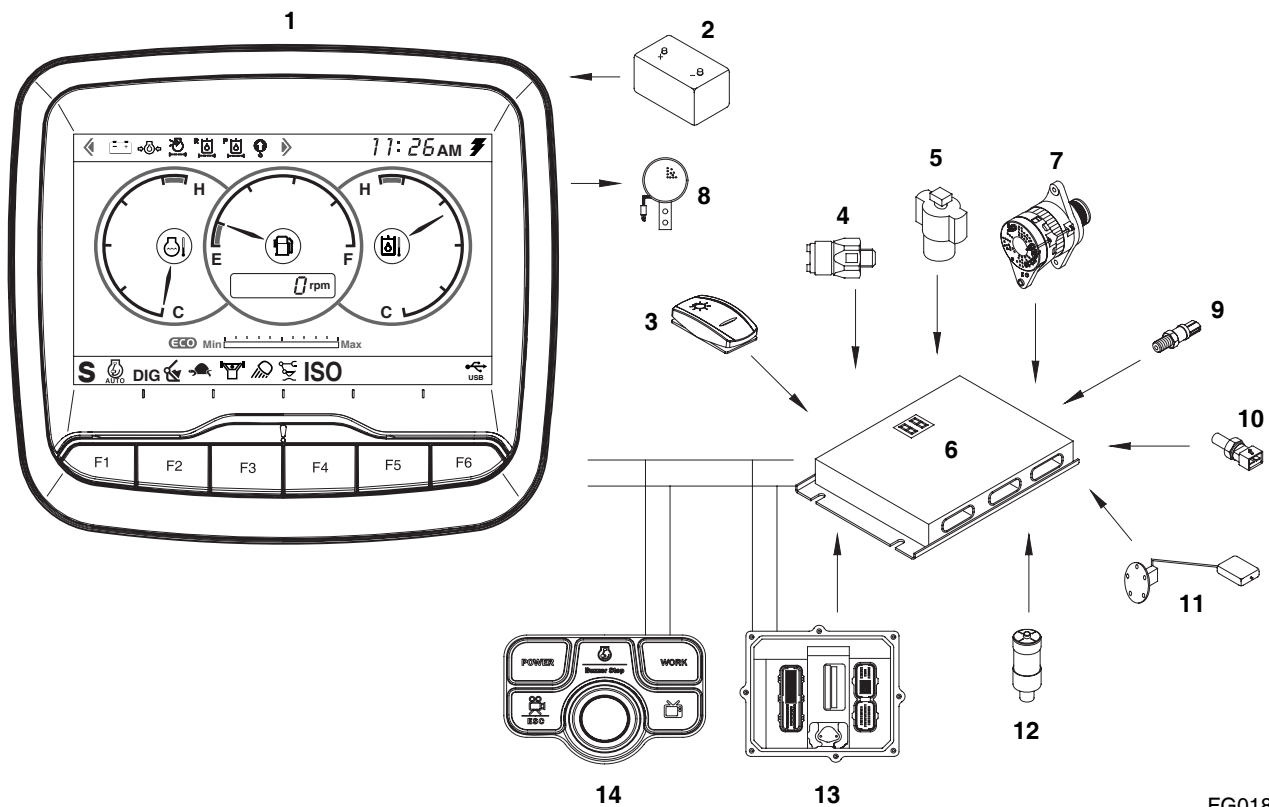


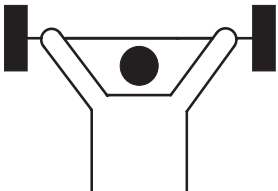

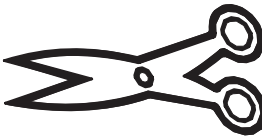
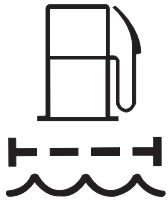
Figure 9

FG018845

Reference Number	Description
1	Instrument Panel
2	Battery
3	Light Switch
4	Return Filter Switch
5	Pilot Filter Switch
6	EPOS Controller
7	Alternator
8	Warning Buzzer

Reference Number	Description
9	Pump Discharge Pressure Sensor
10	Hydraulic Oil Temperature Sensor
11	Fuel Sensor
12	Air Cleaner Indicator
13	Engine Controller
14	Jog Switch Control Panel

The monitoring system displays the various data and warning signals onto the instrument panel by processing the information gathered from the EPOS controller. It displays information selected by the operator.

Boost	 FG000554	Jog Switch CAN Communication	This symbol appears when boost is selected.	
Breaker	 FG001470	Jog Switch CAN Communication	This symbol appears when breaker is selected.	
Shear	 FG001471	Jog Switch CAN Communication	This symbol appears when shear is selected.	
Water Separator	 FG01052i	CN1-21 CN1-39	This symbol appears when the water separator is full. This symbol appears when water separator sensor output voltage is about 1.5V below.	

## INITIAL OPERATION

Item	Input (Terminal)	Output (Operation and Initial Setting Mode)
Initial Operation	When "CN7-2" is applied battery voltage (starter switch) shifts from "OFF" to "ON"	<ul style="list-style-type: none"> <li>• LCD, all of LED and warning lights are turned "ON" and turned "OFF" after about 2 seconds.</li> <li>• Warning buzzer is activated and turned "OFF" after about 2 seconds.</li> <li>• Power mode: When Fuel Saving Mode is disable, the power mode is before mode. When Feul Saving Mode is enable, the power mode is standard mode or economy mode.</li> <li>• Auto Idle: High Output (Activation).</li> <li>• Display: Indicating coolant temperature, Fuel level, Hydraulic oil temperature, Engine speed.</li> <li>• Clock: Current time display.</li> </ul>

**NOTE:** Refer to method for setting clock in operation manual for setting time.

### Max Flow (ATT) / Min Flow (ATT)

The max flow (ATT) /min flow (ATT) can be set up as the max/min flow rate value of the attachment by the user according to the attachment's specifications.

For instance, if the relevant attachment's use capacity is 90 - 120 lpm, the user can set up 120 lpm for the max. flow rate, and 90 lpm for the min. flow rate.

The setup method is the same as the above max. engine limit setup method. The change value by stage in the jog switch operation is 10 lpm.

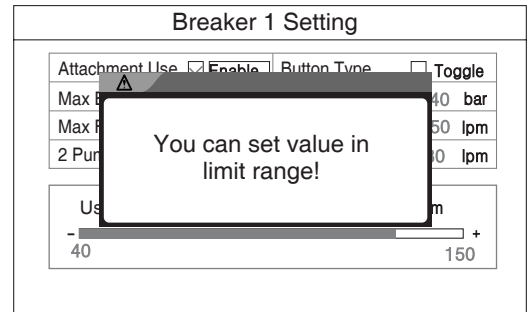
### User Setting Max Flow

The user setting max flow is designed to set up the flow rate segment of the attachment to be used by the user.

Within the above setup max. flow rate (pump), max. flow rate (ATT), and min. flow rate (ATT) scope, the user can set up the max. flow rate value of the attachment to be used.

The setup method is the same as the above max. engine limit setup method. The change value by stage in the jog switch operation is 10 lpm.

When setting up all above items, the setup limits are outlined as follows. If these limits are exceeded, a pop-up window is displayed for 3 seconds, saying "You can set value in limit range!".



FG018498

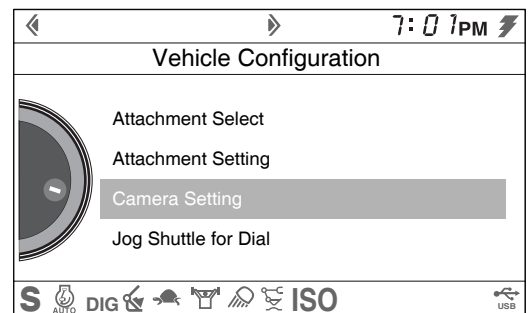
Figure 38

	Max. Limit	Min. Limit
Max E/G Limit	1,500 rpm	1,000 rpm
Max Flow (Pump)	Conforms to the max. engine limit	Conforms to the max. engine limit
Max Flow (ATT)	1,000 lpm	Min. flow rate (ATT) + 10 lpm
Min Flow (ATT)	40 lpm	Of the max. flow rate (pump/ATT), the smaller value - 10 lpm

### C. Camera Setting

The camera setting screen is designed to set up various cameras' ON/OFF and normal/mirror.

From the vehicle configuration, select camera setting to access the camera setting list screen.



FG018499

Figure 39

### Fast Winding/Rewinding

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

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

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

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

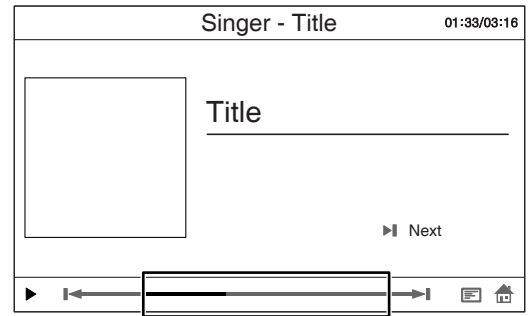
### Replay the Next File

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

### MP3 Files List

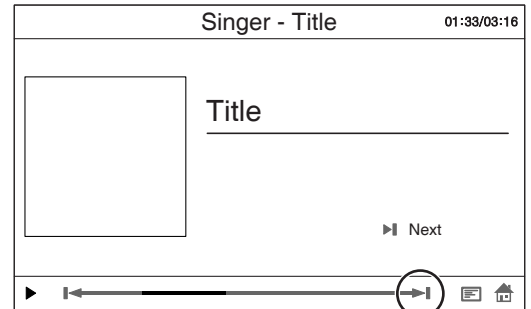
Locate the cursor at the MP3 files list symbol and click on the jog to move to the file list screen.

Select a file and replay the MP3.



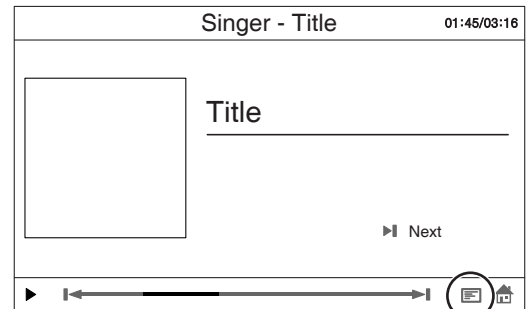
FG020127

Figure 73



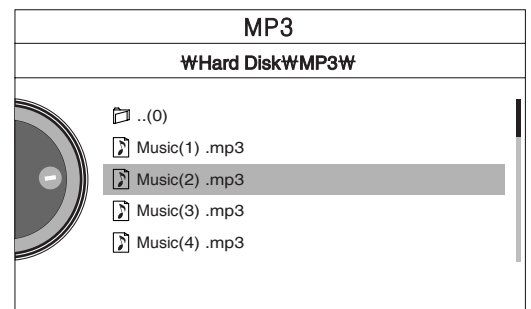
FG020128

Figure 74



FG020129

Figure 75



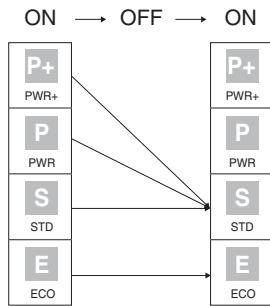
FG018560

Figure 76

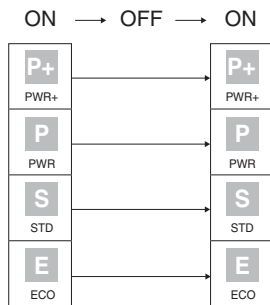
**D. Default Power Mode Setting**

On the GP configuration screen, when the cursor is placed on the default power mode setting, click on the jog switch to access the default power mode setting.

**Fuel Saving Mode is Enable**



**Fuel Saving Mode is Disable**



**E. Time Setting**

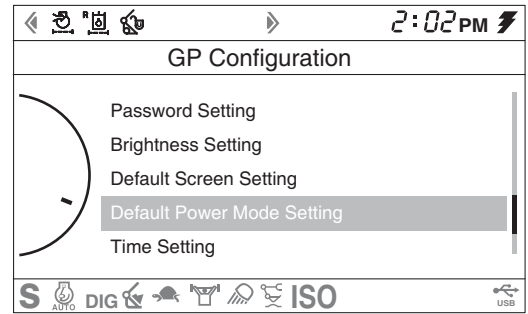
On the GP configuration screen, when the cursor is placed on the time setting, click the jog switch to access the time setting.

Turn the jog switch and locate the cursor at a target of change. Then, click on the jog switch to change the target.

Turn the jog switch to change numbers of each item.

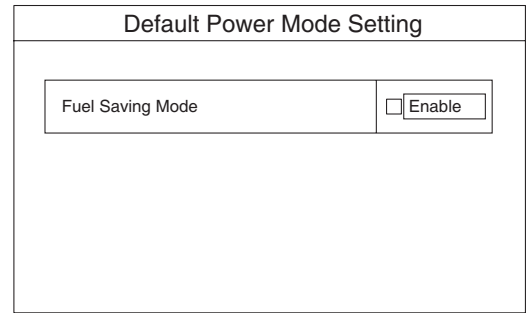
If the setup is completed, click on the jog switch to store the setup details.

Press the ESC button to return to the previous screen.



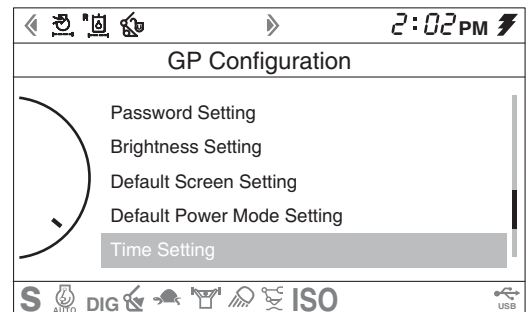
FG022141

**Figure 103**



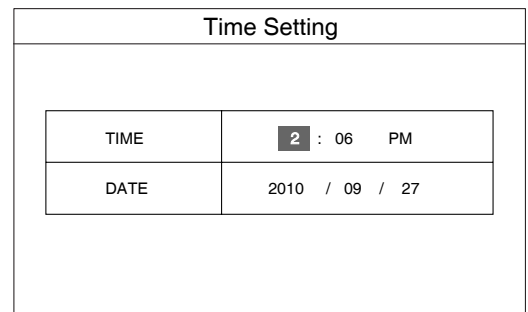
FG022142

**Figure 104**



FG022144

**Figure 105**



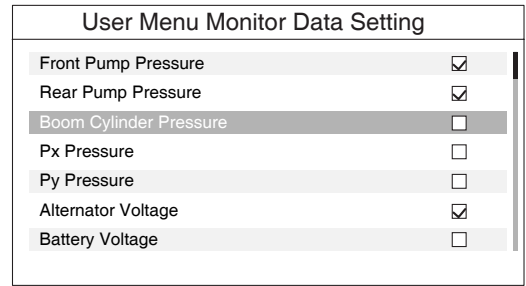
FG018538

**Figure 106**

### User Menu Monitor Data Setting

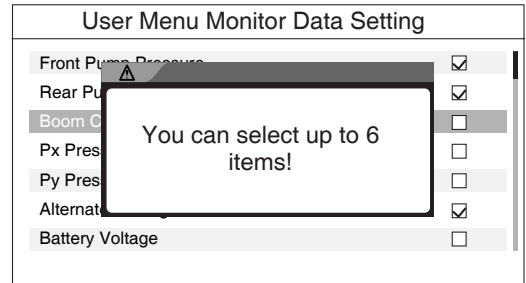
User can be monitor data setting.

The maximum limit of the monitor data setting is 6.



FG018862

**Figure 126**



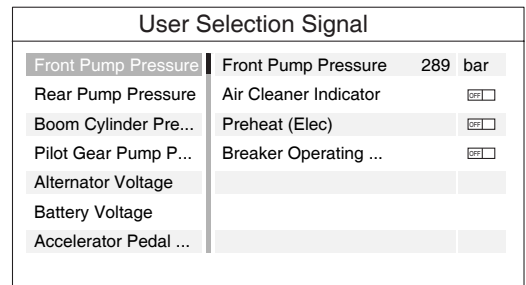
FG018863

**Figure 127**

### User Selection Signal

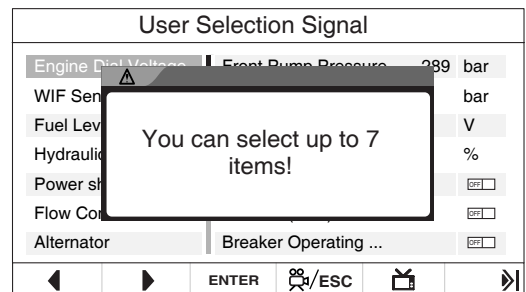
User can select signals of all monitoring items.

The maximum limit of monitoring signal is 7.



FG018864

**Figure 128**



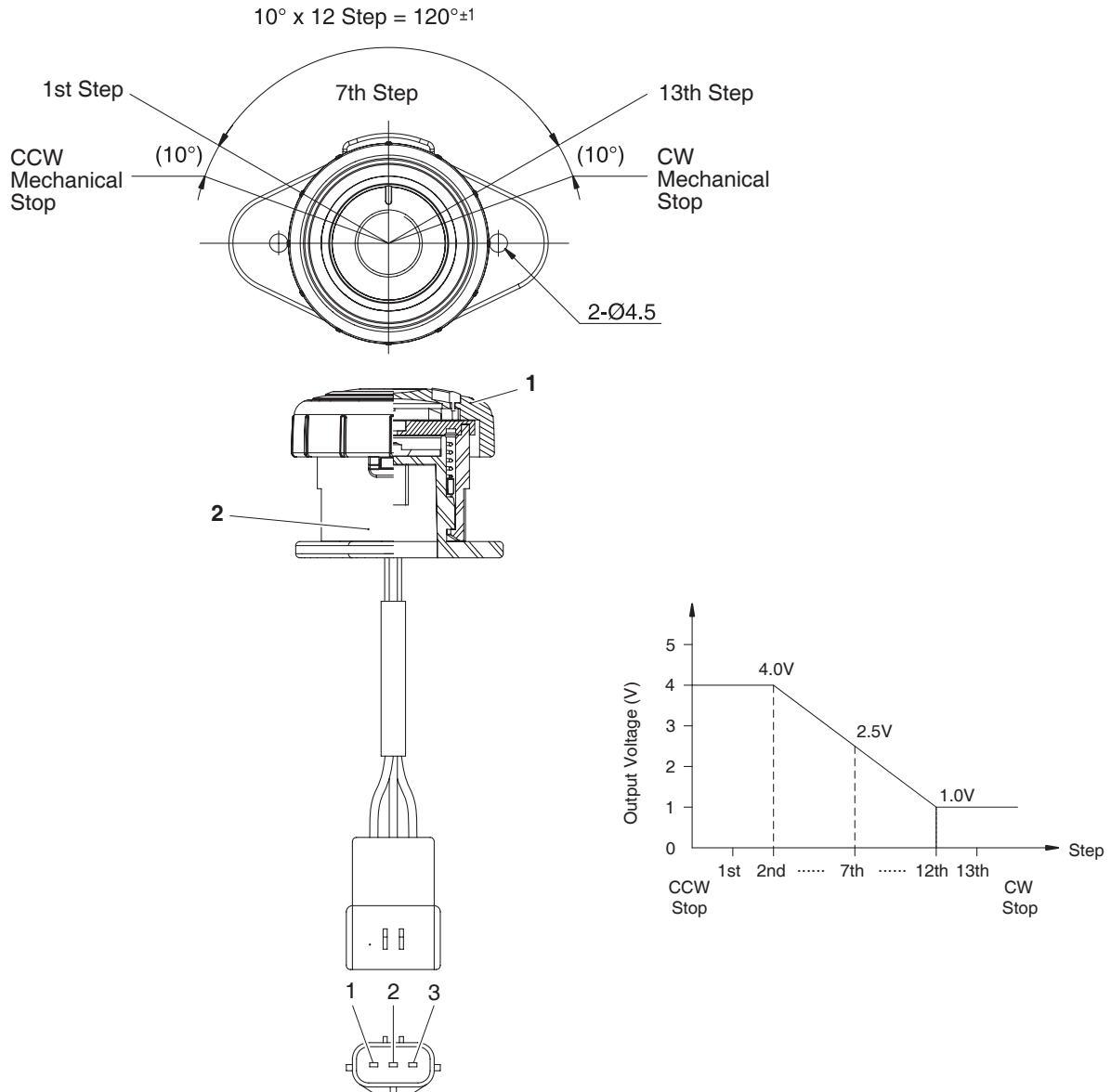
FG018865

**Figure 129**

GP Display Code	GP Display Description	Measuring Point	Correct Value		Remarks
			Active	Passive	
E520203	Monitoring of PRV	2.36, 2.60			Torque limit level = 2
E520206	Time Out Error of CAN Module A	CAN signal			No Torque limit
E520336	Engine Temperature Sensor Plausibility				No Torque limit
E520602	Hydraulic Oil Temperature CAN Time Out	CAN signal			No Torque limit
E520603	Time Out Error of CAN Receive Frame DEC1V	CAN signal			Display Code
E520604	ECU Hardware Chip CY146 Error	Internal fault			No torque limit
E520605	DPM system error	Internal fault			Torque limit level = 3
E520606	Time Out Error of CAN Receive Frame EGR Valve	CAN signal			Air control problem, EGR = 0/ Torque level 1
E520607	EGR Valve Actuator Error	Smart Actuator			EGR = 0, Torque level 1
E520608	Error Message from VGT Actuator	CAN signal			Torque limit level 2
E520609	Air Control Governor Deviation Error	Internal fault			EGR = 0, Torque level 1
E520610	Power Stage for Intake Air Heater	1.83			
E520611	Time Out Error of CAN Receive Frame Vehicle Cutoff Switch	CAN signal			No torque limit
E520612	Accelerator Pedal CAN Max Error	CAN signal			Torque level = 2
E520613	Vehicle Cutoff Switch Error	CAN signal			No torque limit
E520614	Time Out Error of CAN Receive Frame VGT	CAN signal			Torque limit = 1
E520615	Performance Limit Activation	Internal fault			Torque limit level = 3
E520616	ECU Power Stage Test	Internal fault			No Torque limit
E520617	Metering Unit Supply Voltage	DPM pin number			Display code
E520618	Monitoring of ADC	Internal fault			No torque limit
E520619	Monitoring of Communication Module	Internal fault			No torque limit
E520620	Completely Damaged Particulate Filter	Internal fault			No torque limit
E520621	Mon Pressure Differential Characteristics				Torque limit level = 2
E520622	Disconnected DPF Pressure Sensor Hose Line				No torque limit
E520623	MU Differential Pressure MIN	1.90, 1.55			Display Code
E520624	Monitoring of Injection	Internal fault			No torque limit



# ENGINE CONTROL DIAL



FG018941

Figure 163

Reference Number	Description
1	Knob

Reference Number	Description
2	Hall Effect Sensor

The engine control dial has a built in potentiometer. When the control knob is moved the output voltage (through "2 and 3" terminals) will vary from the 5 V supplied from the EPOS controller as shown in the graph.

<b>Reference Number</b>	<b>Description</b>
1	Instrument Panel
3	Engine Controller
4	EPOS Controller
17	Engine Control Dial
24	Battery
25	Battery Relay
26	Fuse
27	Fusible Link

<b>Reference Number</b>	<b>Description</b>
28	Starter Switch
32	Jog Switch Control Panel
34	Circuit Breaker
35	Solenoid Valve (Pressure Up)
36	Power Boost Switch (Top of Right Work Lever)

# Air Conditioner/heater Circuit Diagram

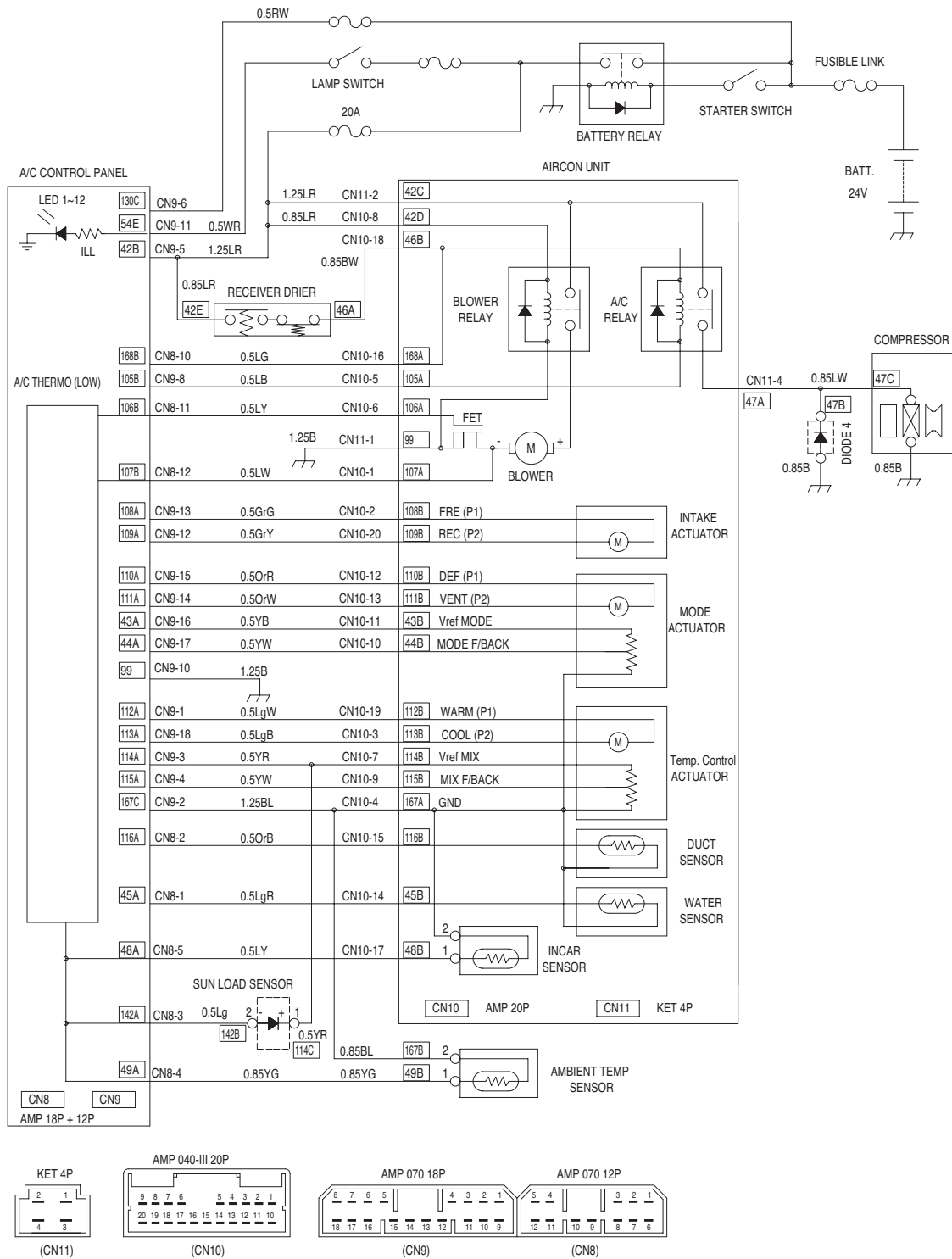


Figure 177

FG001463

Categories	Inputs	System Operation
Starting Control of Cooling	Auto mode Duct sensor	<ol style="list-style-type: none"> <li>1. Prevention of discharge of hot air before discharge temperature drops enough in hot summer weather</li> <li>2. Start conditions (AND condition) <ol style="list-style-type: none"> <li>A. A/C on (AUTO or manual)</li> <li>B. Temperature sensed by the duct sensor is above 30°C</li> <li>C. Airflow: Auto mode</li> </ol> </li> <li>3. One time control in the cycle of engine OFF → engine run</li> <li>4. Initial cooling control is executed when the Auto switch is "ON" in the manual status (A/C "OFF" and manual control of airflow) in 5 seconds after engine run.</li> <li>5. Initial cooling control must be before max cooling.</li> <li>6. Release condition (OR condition) <ol style="list-style-type: none"> <li>A. A/C "OFF"</li> <li>B. Airflow: Manual control</li> <li>C. Release is possible with the "OFF" switch but not allowed within 12 seconds (after Start "ON") while the system is off using the "OFF" switch and during the time of initial cooling control.</li> </ol> </li> </ol>

2. The new refrigerant has improved cooling characteristics than the old type and care must be used not to overcharge the system.
3. Do not over tighten connections when working on refrigerant system.
4. The new refrigerant system standards require new tools, equipment and parts. DO NOT attempt to use equipment use in servicing the old refrigerant system.
5. The new refrigerant oil (PAG type) has a high moisture absorption characteristic. When the refrigerant system vacuum seal has been broken, immediately plug up all openings to prevent moisture from entering the system.
6. When joining unions which use O-ring seals, lightly coat O-rings with refrigerant oil. Be careful not to drip oil on the threads of the nut.
7. Be certain the O-rings are seated properly on the refrigerant line lip. Always use new O-rings when reassembling parts. Do not reuse old O-rings.
8. Use a vacuum pump to evacuate refrigerant system of air.
9. When charging the refrigerant system with the engine running, do not open the high-pressure valve on the manifold gauge as the reverse flow of high-pressure refrigerant will rupture the hose.
10. When releasing the high-pressure hose after completing the charging process, quickly disconnect the hose to minimize refrigerant released to the air.

## Repair and Replacement Procedure

1. Work Procedure
  - A. Before repairing or replacing any refrigerant components first, return all refrigerant oil to the compressor and perform recovery procedures.
2. Operating Condition
  - A. Run engine at maximum engine speed.
  - B. Select 'HI' blower fan speed and select A/C switch to 'ON'.
  - C. Set the temperature control switch for maximum cooling and leave running for approximately 20 minutes.

**NOTE:** *The manifold gauge dial pointer can vary depending on the outdoor temperatures.*



# SAFETY INSTRUCTIONS

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## WARNING

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### AVOID DEATH OR SERIOUS INJURY

Instructions are necessary before operating or servicing machine. Read and understand the Operation & 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.

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## APPLICABLE MODELS

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

MODEL	SERIAL NUMBER RANGE
DX300LL-3	10001 and Up

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