950106-01407E
February 2014

EXCAVATOR

Shop Manual

DX225MH-3

Serial Number 1001 and Up

Doosan Infracore
Construction Equipment

Material Handler Maintenance Safety

Edition 1

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

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

HDO1010L

Figure 5

Hot Coolant and Oils - Burn Prevention

Do not touch any part of an operating engine. Immediately after operations are stopped, coolant, engine oil, and hydraulic oil are at their highest temperatures. The radiator and hydraulic tank are still under pressure. Always wait for temperature to cool down. Attempting to remove caps, drain oil or coolant, or replacing filters may lead to serious burns, if done when hot. Relieve all pressure in air system, hydraulic oil system, lubrication system, fuel system, and cooling system, before any lines, fittings or related items are disconnected.

FG019095

Figure 6

To prevent hot oil or coolant from spraying out, stop engine, wait for oil and coolant to cool. Using gloves, slowly loosen cap to relieve pressure.

FG019096

Figure 7

- 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.
- The material handler may be equipped with a tilting riser or elevating cab. Refer to Operation and Maintenance Manual for information on operation.

Swinging or Traveling

As a machine operator, you should know and follow local, state and federal laws and regulations when operating on public roads or highways.

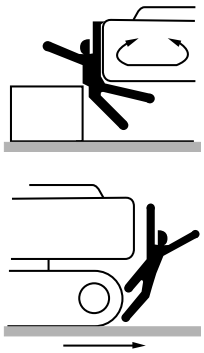
It is important to keep in mind that the machine, in comparison with the rest of traffic, is a slow moving and wide vehicle which can cause traffic delays. Pay attention to traffic behind you and allow traffic to pass you.

Before operating the machine or work equipment, always observe the following precautions to prevent death or serious injury.

- When changing travel direction from forward to reverse or from reverse to forward, reduce speed and stop machine before changing travel direction.
- Sound horn to alert people in area.
- Check that there is no one in area around machine. There are restricted visibility areas behind machine so, if necessary, swing upper structure slowly to check that there is no one behind machine before traveling in reverse.
- When operating in areas with poor visibility, designate a flagman to direct work site traffic.
- Keep unauthorized personnel away from turning radius or travel path of the machine.

Be sure to observe above precautions even if a travel alarm or mirrors are installed.

- Check that travel alarm works properly and that mirrors are clean, not damaged and properly adjusted.
- Always latch door and windows of operator's cabin in position (open or closed).
- On work sites where there is a hazard of flying or falling objects, or of objects entering operator's cabin, check that door and windows are securely closed. Install additional guards, if work site application requires them.



HAOA190L

Figure 31

- Lead-acid batteries produce flammable and explosive gases.
- Keep arcs, sparks, flames and lighted tobacco away from batteries.
- Batteries contain acid which burns eyes or skin on contact.
- Wear protective clothing. If acid contacts body, flush well with water. For eye contact flush well and get immediate medical attention from a physician familiar with this injury.
- The maintenance procedures which are given in this manual can be performed by the owner or operator without any specific technical training. Maintenance procedures which are not in this manual must be performed ONLY BY QUALIFIED SERVICE PERSONNEL. Always use genuine DOOSAN replacement parts.
- Only authorized personnel should service and repair the machine. Do not allow unauthorized personnel into work area.
- Lower work equipment and stop engine before performing maintenance.
- Park machine on firm and level ground.
- Turn starter switch to "ON' position and keep safety lock lever in "UNLOCK" position. Cycle work levers (joysticks) back and forth, left and right at full stroke 2 to 3 times to eliminate remaining internal pressure in hydraulic circuit. Then move safety lock lever to "LOCK" position.
- Check that battery relay is "OFF" and main power is shut off. (Wait for approximately one minute after turning "OFF" engine starter switch key and press horn switch. If horn does not sound, the main power is shut off.)
- Put blocks under track to prevent the machine from moving.
- Put blocks fore and aft of each tire to prevent the machine from moving (Wheel machines only).
- To prevent injury, do not perform maintenance with engine running. If maintenance must be done with engine running, perform maintenance with at least two workers and do the following:
  - One worker must always sit in the operator's seat and be ready to stop engine at any time. All workers must maintain contact with other workers.
  - When maintenance operations are near fan, fan belt, or other rotating parts, there is a potential hazard of being caught in rotating parts. Keep hands and tools away.
- Never drop or insert tools or other objects into rotating fan or fan belt. Parts can break off and hit someone.

Lock Inspection Covers

When performing maintenance with inspection cover open, use lock bar to secure cover and prevent accidental lowering of the cover caused by wind or movement of the machine.

If maintenance work is done with the inspection cover open but not locked, it could suddenly close because of the wind or movement of the machine and cause injury.

Working on Machine

When performing maintenance operations on machine, prevent tripping and falling by keeping area around your feet clean and free of objects and debris. Always do the following:

- Do not spill oil or grease.
- Do not leave tools laying around.
- Watch your step when walking.
- Never jump down from machine. When getting on or off machine, use steps and handrails, and maintain a three-point contact (both feet and one hand or both hands and one foot) to support yourself.
- If job requires it, wear protective clothing.
- To prevent injury from slipping or falling, when working on hood or covers, never stand or walk on areas except areas equipped with nonslip pads.
- If it is necessary to work under raised equipment or the machine, support work equipment and machine securely with blocks and stands strong enough to support weight of work equipment and machine.
- Do not work under the machine if track shoes are lifted off ground and the machine is supported only with work equipment. If any control levers are moved, or there is damage to hydraulic system, work equipment or the machine will suddenly drop causing death or serious injury.

ARO1380L

Figure 50

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. 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 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.

Table of Contents

Specifications

Elevating Cab With One - Piece Boom

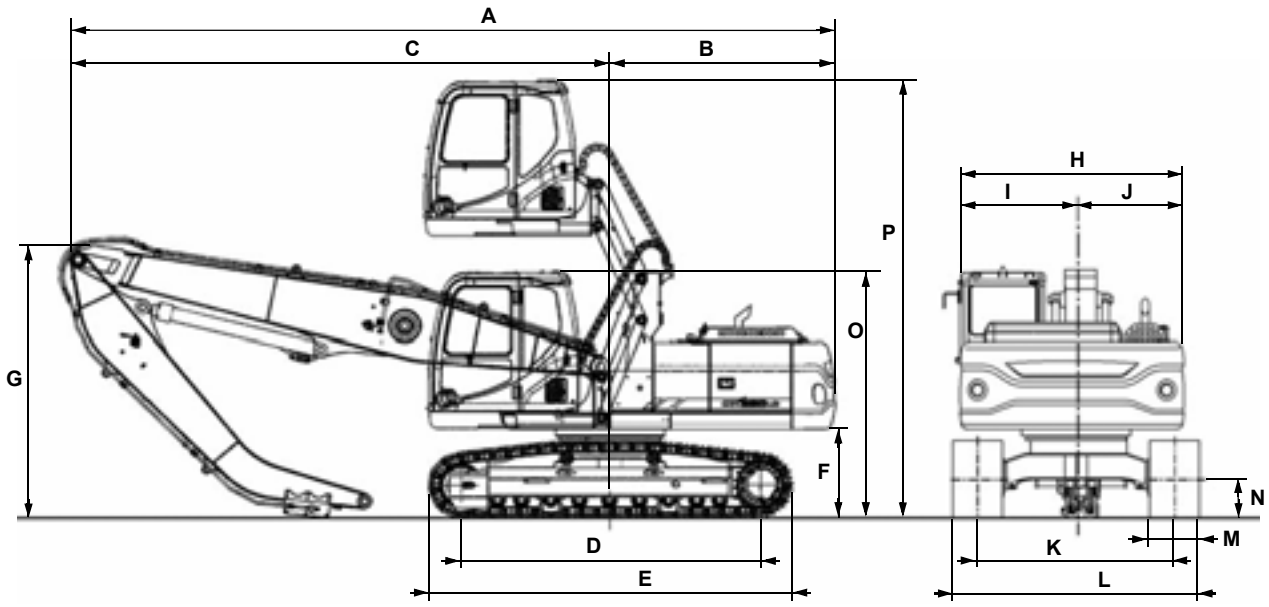


Figure 5

Dimension	6.5 m (21’ 4") Boom 4.5 m (14’ 8") Arm
A	9,480 mm (31' 1")
B	2,790 mm (9' 2")
C	6,730 mm (22' 1")
D	3,650 mm (12' 12")
E	4,445 mm (14' 7")
F	1,010 mm (3' 3")
G	3,450 mm (11' 3")
H	2,710 mm (8' 10")
I	1,400 mm (4' 7")
J	1,310 mm (4' 4")
K	2,390 mm (7' 10")
L	3,190 mm (10' 6")
M	800 mm (2' 8")
N	480 mm (1' 7")
O (Cab Fully Lowered)	3,002 mm (9' 8")
P (Cab Fully Raised)	5,340 mm (17' 5")

Cylinder Performance Tests

NOTE: *All tests are performed with standard boom and arm configuration.*

Boom Cylinders Test

The starting points for the test are with the boom and arm extended away from the material handler. The arm cylinder should be fully extended; boom cylinders must be extended. Test movement in both directions, several times, and average results for both Standard Mode and Power Mode.

Arm Cylinder Test

Start with the boom up and the arm cylinder fully retracted. Test movement in both directions several times, between the "crowd" and "dump" positions, and average the results of both tests, in both Standard Mode and Power Mode.

Hydraulic Cylinder Natural Drop Test

To check boom and arm cylinder tightness against the specified performance standard for new cylinders, move the attachment cylinders so that arm cylinder is retracted 20 - 50 mm (1" - 2") and boom cylinders are retracted the same amount, 20 - 50 mm (1" - 2").

Shut down engine and measure cylinder drift after 5 minutes. The arm and boom cylinders should not drift down more than 10 mm (0.39").

Travel Motor Jack-up Test

Test travel motor operation on each side by painting or chalking a mark on one crawler shoe, with a corresponding mark on the travel frame. Jack and block up one side of the machine and operate the raised travel motor. Record the number of seconds it takes the crawler shoe to make three (3) full rotations, during both high-speed and low speed operation.

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Observe the following safety instructions:

1. **Use adequate safety shielding and keep away from fuel and oil tanks, batteries, hydraulic piping lines or other fire hazards when welding.**
2. **Never weld when the engine is running. Battery cables must be disconnected before the welding procedure is started.**
3. **Never weld on a wet or damp surface. The presence of moisture causes hydrogen embrittlement and structural weakening of the weld.**
4. **If welding procedures are being performed near cylinder rods, operator's cabin window areas or any other assemblies could be damaged by weld spatters. Use adequate shielding protection in front of the assembly.**
5. **During welding equipment setup, always attach ground cables directly to the area or component being welded to prevent arcing through bearings, bushings, or spacers.**
6. **Always use correct welding rods for the type of weld being performed and observe recommended precautions and time constraints. AWS Class E7018 welding rods for low alloy to medium carbon steel must be used within two hours after removal from a freshly opened container. Class E11018G welding rods for T-1 and other higher strength steel must be used within 1/2 hour of removal from a freshly opened container.**

HYDRAULIC SYSTEM - GENERAL PRECAUTIONS

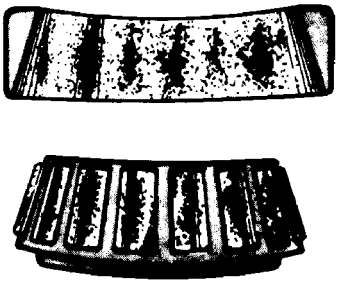
Always maintain oil level in the system at recommended levels. Assemblies that operate under heavy loads, at high-speed, with extremely precise tolerances between moving parts (e.g. pistons and cylinders, or shoes and swash plates), can be severely damaged if oil supply runs dry.

Assemblies can be run dry and damaged severely in a very short time when piping or hoses are disconnected to repair leaks and/or replace damaged components. Hoses that are inadvertently switched during disassembly (inlet for outlet and vice versa), air introduced into the system or assemblies that are low on oil because of neglect or careless maintenance, could all produce sufficient fluid loss to cause damage or improper operation.

Fatigue Spalling

Flaking of surface metal resulting from fatigue.

Replace bearing - clean all related parts.



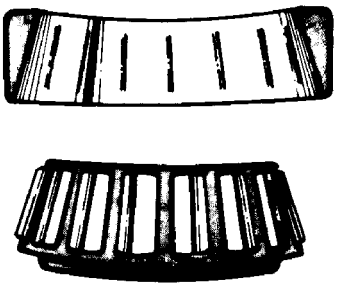
HASA530S

Figure 10

Brinelling

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

Replace bearing if rough or noisy.



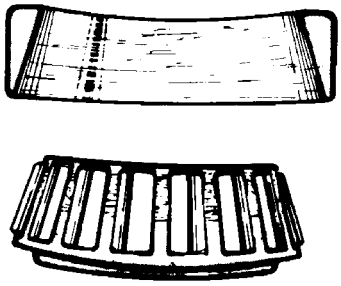
HASA540S

Figure 11

Cage Wear

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

Replace bearings - check seals.



HASA550S

Figure 12

TORQUE VALUES FOR STANDARD U.S. FASTENERS

Type	SAE Grade	Description	Bolt Head Marking
1	1 or 2	WILL HAVE NO MARKINGS IN THE CENTER OF THE HEAD. Low or Medium Carbon Steel Not Heat-treated.	
5	5	WILL HAVE THREE RADIAL LINES. Quenched and Tempered Medium Carbon Steel.	
8	8	WILL HAVE 6 RADIAL LINES. Quenched and Tempered Special Carbon or Alloy Steel.	

Recommended torque, in foot-pounds, for all Standard Application Nuts and Bolts, provided:

1. All thread surfaces are clean and lubricated with SAE-30 engine oil. (See Note.)
2. Joints are rigid, that is, no gaskets or compressible materials are used.
3. When reusing nuts or bolts, use minimum torque values.

NOTE: *Multiply the standard torque by:*

0.65 When finished jam nuts are used.

0.70 When Molykote, white lead or similar mixtures are used as lubricants.

0.75 When Parkerized bolts or nuts are used.

0.85 When cadmium plated bolts or nuts and zinc bolts w/waxed zinc nuts are used.

0.9 When hardened surfaces are used under the nut or bolt head.

NOTE: *When reusing bolts and nuts in service, use minimum torque values.*

Upper Structure

23. Remove air ducts (4 thru 6, Figure 6). Remove atmospheric air duct (7).

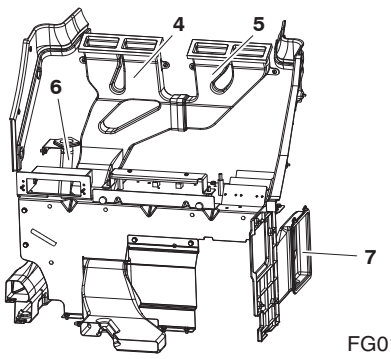


Figure 6

24. Remove all bolts fastening brackets (8 thru 10, Figure 7) to separate brackets from body of operator's cabin.
25. Disconnect connectors on interior lights, speakers and antenna.

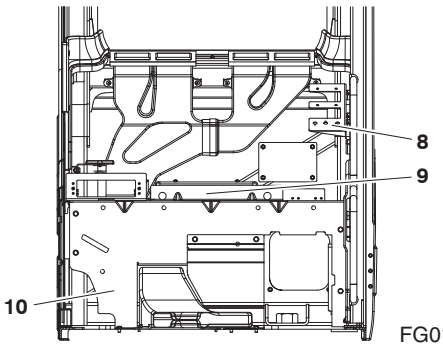


Figure 7

26. Remove four mounting nuts from four corners of cabin floor (2, Figure 8).
27. Remove four bolts (3, Figure 8) from door side of cabin floor.
28. Remove four bolts (1, Figure 8) on right-hand side of floor in operator's cabin.
29. Remove two bolts (4, Figure 8) at front of floor in operator's cabin, and bolt (5, Figure 8) at rear of floor in operator's cabin.

Quantity	Description
4	16 mm nuts at each corner of cabin.
4	12 mm x 1.75 bolts at door side of cabin.
7	12 mm x 1.75 bolts, 4 on right side of cabin and 2 under front window. One bolt is positioned in center of rear part of operator's cabin.

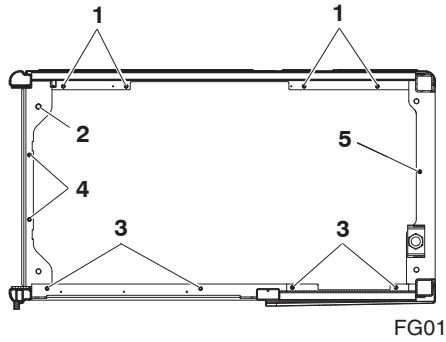


Figure 8

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
DX225LC-3	1001 and Up, 50001 and Up
DX225MH-3	1001 and Up

Table of Contents

Fuel Tank

7. Connect as tagged, fuel supply line (21, Figure 17) and fuel return line (19) to fuel tank (1).
8. Install clamp (20, Figure 17) to hold fuel return line (19) to tank (1).

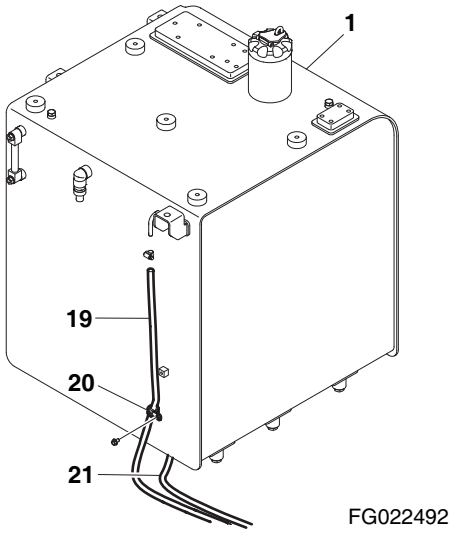


Figure 17

9. Install four bolts (35 and 36, Figure 18) and cover (37) on fuel tank and support.

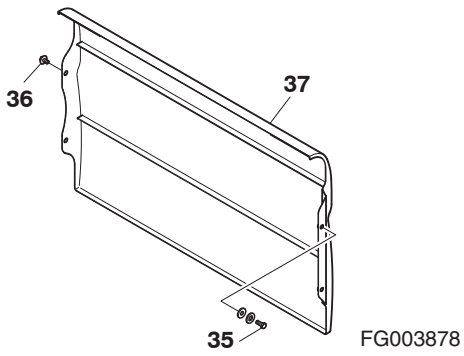


Figure 18

10. Install four bolts (33, Figure 19) and storage box (34) on frame.

    Install two bolts (31) and bracket (32) on fuel tank.

    Install four bolts (28 and 29) and fuel tank cover (30) on fuel tank.

    Install ten bolts (25 and 26) and handrail (27) on fuel tank and frame.

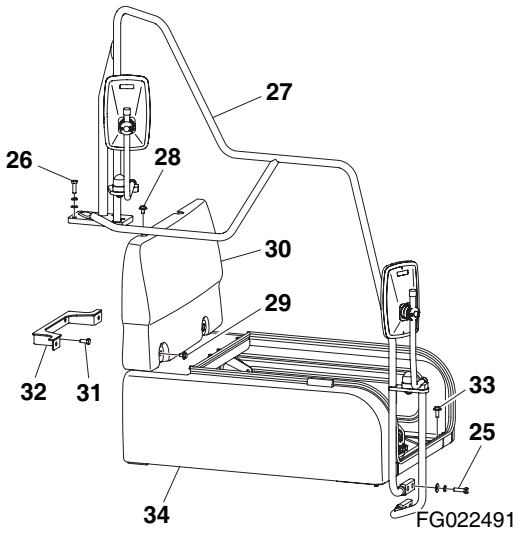


Figure 19

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

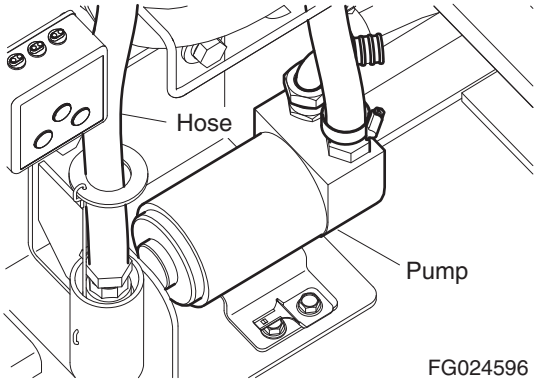


Figure 2

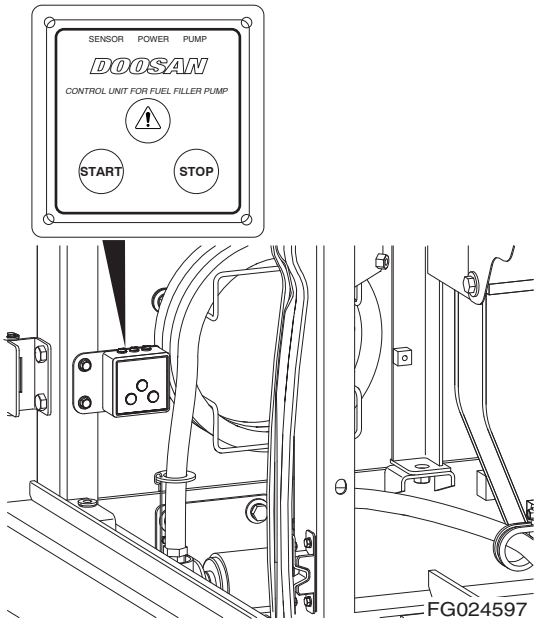


Figure 3

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

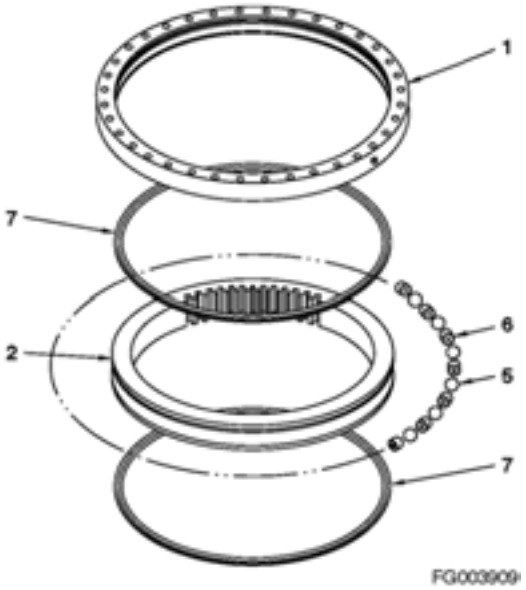


Figure 2

Disassembly

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

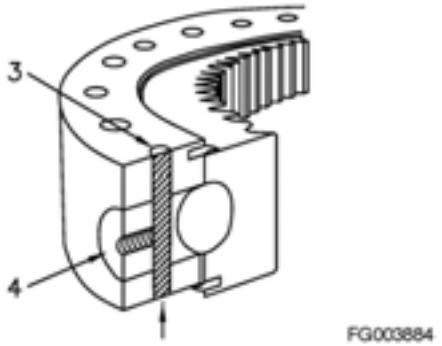


Figure 3

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

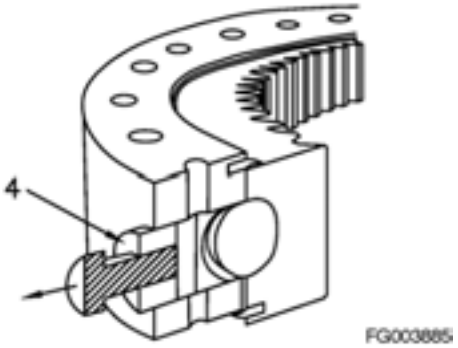


Figure 4

SAFETY INSTRUCTIONS

WARNING

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MODEL	SERIAL NUMBER RANGE
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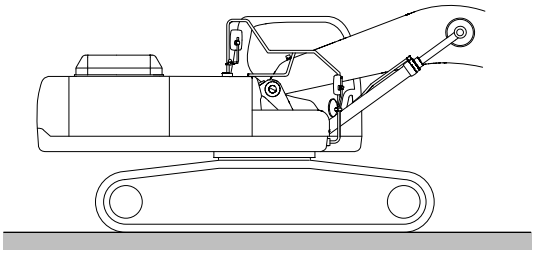
DX225MH-3	1001 and Up

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. Release track tension. Refer to “Track Tension” on page -7 in this section for procedure.
3. Move machine until master link (4, Figure 9) is positioned at approximately 4 o'clock from top position on front idle roller.
4. Put a wooden block under track shoes, as shown.

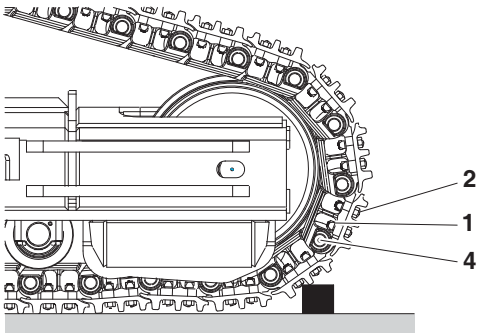


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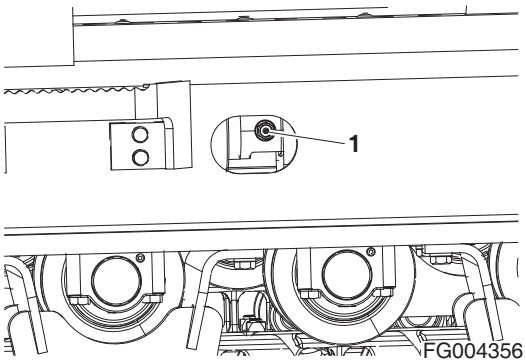
Figure 9

5. 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 at all times. Always wear eye and face protection when adjusting track tension.



FG004356

Figure 10

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

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

   NOTE: *Apply clean gear oil (ISO VG 220EP) to the joint side of the floating seal. Apply grease to the floating seal O-ring.*

5. Slide the axle inside the roller.

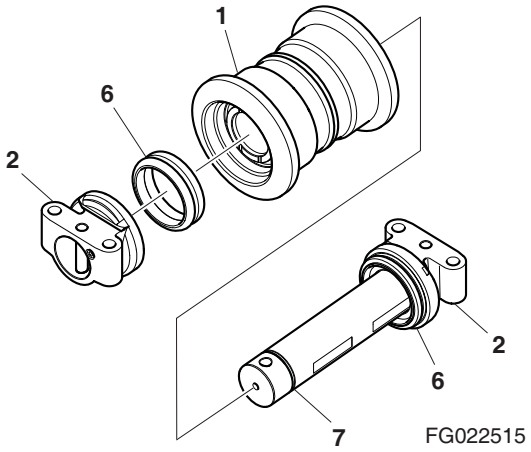


Figure 32

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 220EP) with approximately 280 cc (9.5 oz).
8. Install plug (8, Figure 33) on the collar.

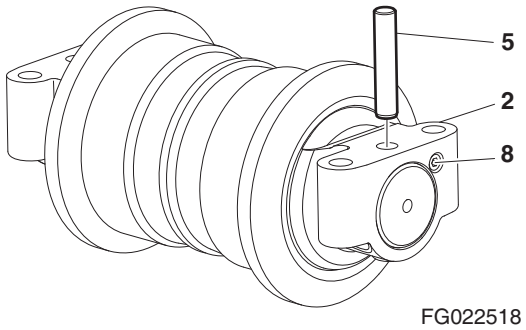


Figure 33

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.*

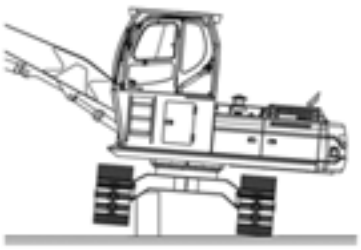


Figure 34

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.

Table of Contents

Drive Coupling (Main Pump)

Hydraulic System Troubleshooting, Testing and Adjustment

Edition 1

Grapple Operating Circuit

The grapple operating circuit includes the left main pump, the left half of the control valve and the grapple cylinder(s). 370 kg/cm^2 (5,265 psi) overload relief valves at BKT and BKTD 1 ports of the control valve protect the circuit and its components from being damaged.

Grapple Close Circuit

When the grapple control lever is placed in the closed position, the grapple control valve spool on the left side of the control valve opens and oil from left main pump flows to the grapple cylinder(s).

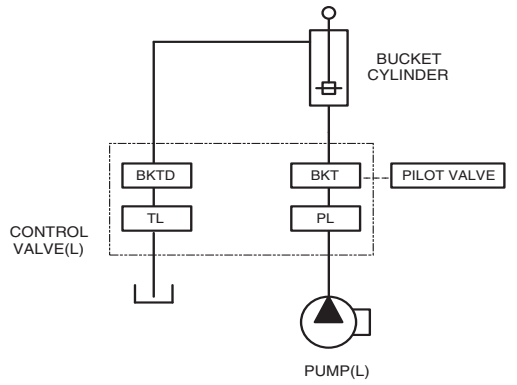


Figure 6

Grapple Open Circuit

When the grapple control lever is put in the open mode, the grapple control valve spool in the left half of the control valve opens to supply oil from the left main pump to the cylinder(s).

Swing Operating Circuit

The swing operating circuit consists of the right main pump in the pump assembly, the right half of the control valve and the swing motor. To keep the upper works from coasting when the swing control is in neutral, an electrical sensor in the control circuit activates a valve to automatically engage a mechanical brake.

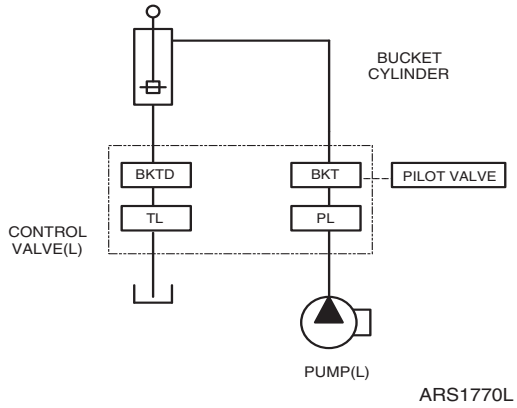
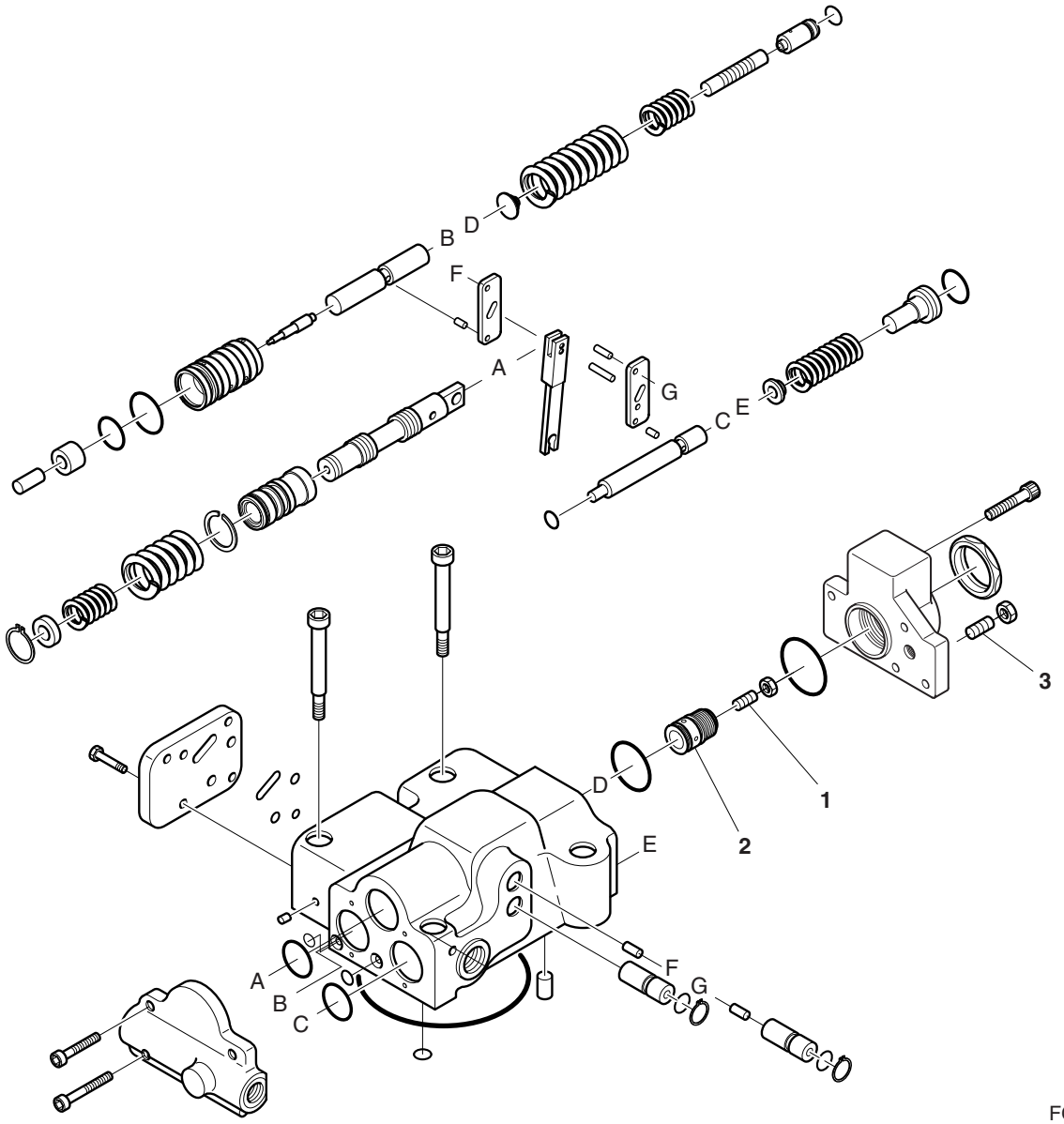


Figure 7

adjustment, the pump which supplies output to the track frame toward which the material handler is veering is weak.



FG000654

Figure 12

Refer to the illustration of the pump regulator control valve (Figure 12) for the location of adjustment screws (1, 2 and 3). There are two different adjustments, with the Negacon, negative control, adjustment screw (3, directly below 1 and 2). Each one of the adjustment procedures could affect the setting of the others.

Check and record the arm dump speed performance test before and after input power adjustment, whether or not a flow meter is used.

NOTE: *Regulator adjustments affect total cumulative horsepower, since each regulator compensates for the output of the other. It is not necessary to adjust both regulators at the same time, but after checking*

TROUBLESHOOTING – CONTROL VALVE

Check control valve problems only after other hydraulic circuit operational tests have been made. Refer to the "Troubleshooting Baseline Recommendations" procedure. Pump flow, pilot pressure, Negacon pressure, main relief pressure, and port relief pressure should all be checked before starting to work on the control valve. Make sure the hydraulic system is refilled up to the required level and free of oil leaks or air in the system that could cause cavitation problems.

Problem	Possible Cause	Remedy
Main relief valve.	Particulate contamination.	Disassemble, clean main poppet.
	Broken or damaged spring.	Replace.
	Adjusting screw loose.	Readjust.
	Main poppet sticking.	Repair/replace.
	Clogged orifice in pilot passage to control valve.	Clean/replace.
Cylinder goes down in spool neutral.	Excessive clearance between casing and spool.	Replace spool or casing.
	Spool does not return to neutral/ sticking spool.	Check secondary pilot pressure.
	Spool does not return to neutral because of dirt or other contaminants.	Clean.
	Broken or damaged spring.	Replace.
	Main relief or port relief not operating properly.	See above.
	Impurities in pilot circuit.	Clean.
Cylinder drops before start at boom up operation.	Rod check valve damaged or clogged.	Clean/replace.
	Poppet sticking.	Clean/replace.
	Broken or damaged spring.	Replace.
Slow operation or response.	Excessive clearance between spool or casing.	Check pilot pressure and/or replace spool or casing.
	Sticking spool.	Clean/replace.
	Broken or damaged spring.	Replace.
	Main or port relief valve damaged.	Check pressure/replace.
Boom and arm cylinders do not perform normally in combined operation.	Priority valve faulty or spool sticking.	Check pilot pressure.
	Broken or deformed spring.	Replace.
	Excess clearance between right and left casing and valve spool.	Clean/replace.
	Clogged spool passage.	Clean/replace, replace filter.
Relief valve malfunctions:		
Pressure does not increase at all.	Main poppet or pilot poppet stuck open.	Clean/replace.

When hydraulic fluid is pushed out the lower valve opening by the pressure of the gas charge on the other side of the diaphragm - and there is no counterpressure from system oil - the valve button on the bottom of the diaphragm eventually seals off the lower oil passage. Just after the needle on the gauge reaches its highest point (when there is 0 bar (0 psi) resistance from hydraulic system pressure) pressure on the gauge will drop sharply to zero, as the accumulator is completely emptied of oil and the diaphragm button closes.

Record the highest gauge reading and compare to the "P1" rated precharge pressure on the accumulator manufacturer's data label. Repeat this test at least once a year to verify proper functioning of the accumulator.

3. As hydraulic system pressure overcomes accumulator precharge pressure, the flexible diaphragm begins to retract upward.

4. When system oil is at highest working pressure and the accumulator fills to maximum reserve capacity, the flexible diaphragm is pushed up into the top of the upper chamber.

   The highest working pressure is sometimes referred to as the "P3" pressure and can also be referenced on the manufacturer's data label on the exterior of the accumulator.

5. If system oil pressure begins to fall off or is momentarily checked or interrupted, the energy stored on the other side of the diaphragm, in the form of compressed gas, pushes oil back out of the lower chamber, maintaining oil pressure of the circuit.

6. With minimal system pressure, an equilibrium point may be reached in which accumulator precharge pressure and hydraulic system oil pressure achieve a rough balance. In this condition a minimal amount of oil is stored in the accumulator.

TROUBLESHOOTING, TESTING AND ADJUSTMENT

Inspection

The center joint should be checked for evidence of external oil leakage every 2,000 operating hours. Leaking or defective O-rings are an indication that dirt and other contaminants could be getting inside the assembly, which will promote accelerated, abnormal wear and can cause early failure of the assembly.

If internal seals or other sliding surface components are worn and there is internal fluid leakage, complete overhaul and repair or replacement of the center joint may be required.

Testing

To check pressure through the center joint, make up a test kit from the following equipment list:

- 700 bar (10,000 psi) pressure gauge.
- Adapters, connectors, piping and flange block off plates conforming to those used in high-pressure piping connections of the material handler.
- A high-pressure relief valve with a setting pressure 1.5 times maximum system pressure.
- A stop valve.
- A manually operated, in-line changeover valve.

Install the changeover valve upstream from one of the stem high-pressure ports. Connect the pressure gauge downstream from one of the body ports. Install the stop valve between the changeover valve and the stem of the center joint. Other components should be installed according to the layout in the block diagram. The test kit is used to pressurize the center swivel above normal working pressure and lock in the higher pressure (as the stop valve is closed manually) for a leak down test.

NOTE: *The same type of kit can also be made up for the drain port (return line) side of the center joint. Use appropriate piping, connectors, test gauges, etc., and follow the same block diagram general layout (Figure 2).*

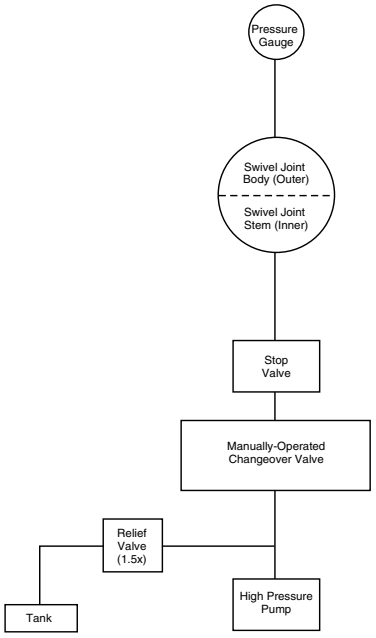


Figure 2

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.

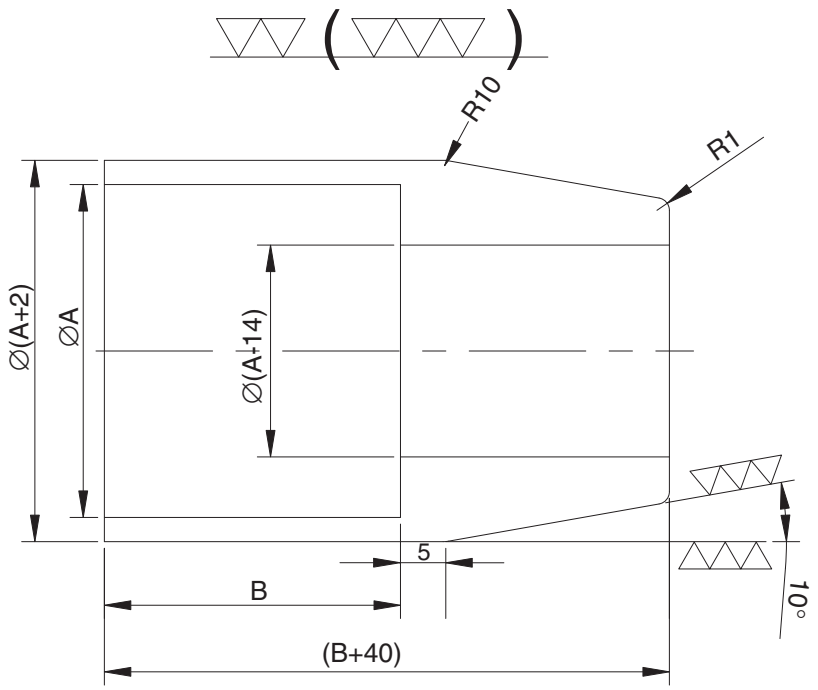
APPLICABLE MODELS

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

MODEL	SERIAL NUMBER RANGE
DX225LC-3	1001 and Up, 50001 and Up
DX225MH-3	1001 and Up

Model	Cylinder	A	Model (Cylinder)
DX140LC-3/ DX140W-3	Boom	Hex 80	
	Arm	Hex 80	
	Bucket	Hex 70	
	Arti	Hex 90	
DX180LC-3/ DX190W-3	Boom	Hex 80	
	Arm	Hex 90	
	Bucket	Hex 80	
	Arti	Hex 100	
DX225LC-3	Boom	Hex 80	
	Arm	Hex 110	
	Bucket	Hex 80	
	Arti	Hex 110	
DX225MH-3	Boom	Hex 80	
	Arm	Hex 110	
DX255LC-3	Boom	Hex 90	
	Arm	Hex 110	
	Bucket	Hex 90	
	Arti	Hex 110	
DX300LC-3	Boom	Hex 110	
	Arm	Hex 110	
	Bucket	Hex 100	
DX300MH-3	Boom	Hex 110	
	Arm	Hex 110	
DX340LC-3/ DX350LC-3	Boom	Hex 110	
	Arm	Hex 130	
	Bucket	Hex 110	
DX380LC-3	Boom	Hex 110	
	Arm	Hex 130	
	Bucket	Hex 110	
DX420LC-3	Boom	Hex 130	
	Arm	Hex 130	
	Bucket	Hex 120	
DX490LC-3/ DX530LC-3	Boom	Hex 130	
	Arm	Hex 140	
	Bucket	Hex 130	

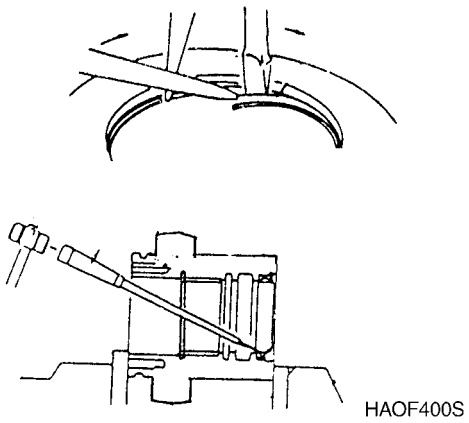
Slipper Seal Jig



ARS4770L

Figure 11

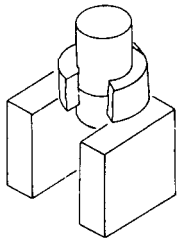
16. Disassemble retaining ring (12) and dust wiper (11). Separate retaining ring (7) and rod bushing (6).



HAOF400S

Figure 28

17. Force out pin bushing (2), (4) from body of cylinder.



0349

Figure 29

SAFETY INSTRUCTIONS

WARNING

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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
DX180LC-3	1001 and Up, 50001 and Up
DX190W-3	1001 and Up
DX225LC-3	1001 and Up, 50001 and Up
DX225MH-3	1001 and Up

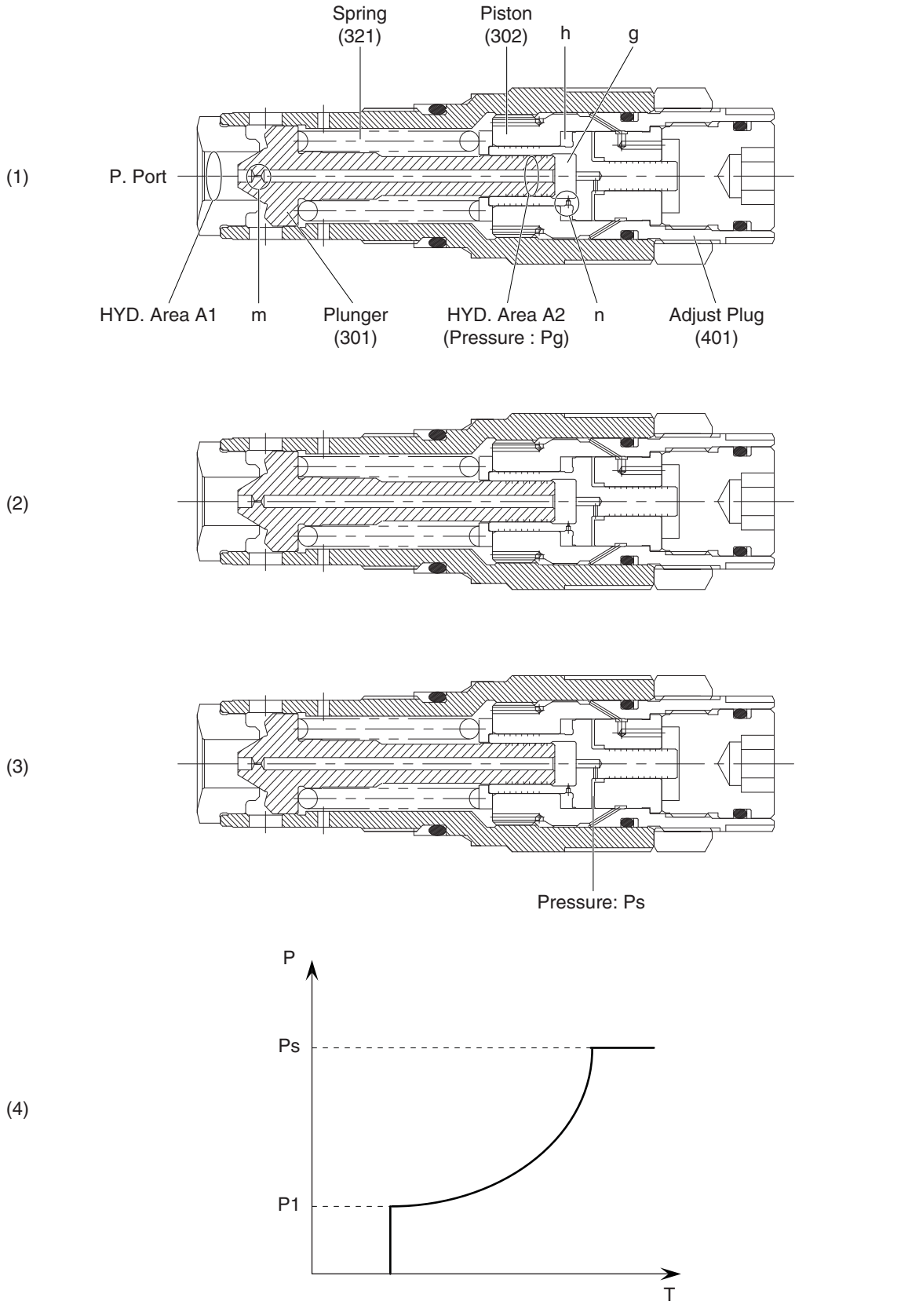


Figure 6 Relief Valve: Operation Diagram of KRD22EK10C

6. Oil leak

1) Oil leak at the oil seal

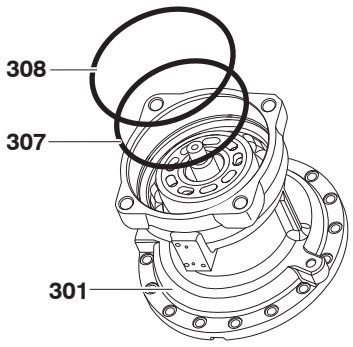
Symptom	Possible Cause	Corrective Action
Oil leak from the oil seal	1. The lip is dirty or damaged.	1. Replace the oil seal.
	2. The shaft may be damaged or worn out.	2. Replace the driving shaft or defective centering of the driving shaft.
	3. Oil seal lip is overturned because of excessively high-pressure in the casing.	3. Repair clogged pipeline. 4. Disassemble and correct it.
	4. The shaft is rusty.	

2) Oil leak at joint surface

Symptom	Possible Cause	Corrective Action
Oil leak from joint surface.	1. O-ring is missing.	1. Insert O-ring.
	2. O-ring is dammaged	2. Replace it.
	3. Seal face is defective.	3. Disassemble and repair.
	4. The bolt is loose or not tightened.	4. Tighten to specified torque or replace the bolt.

11. Mount O-ring (307, 308) to casing (301).

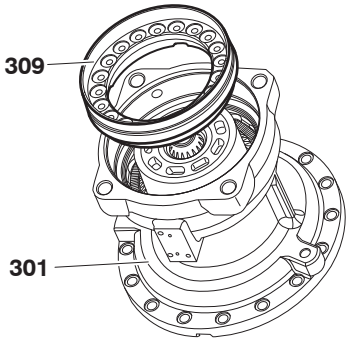
    (Apply grease thinly on the O-rings to prevent being cut during assembling the brake piston.)



FG022424

Figure 40

12. Assemble brake piston (309) to casing (301). If the piston is difficult to assemble because of the restriction of the O-ring; screw in two M8 bolts on the brake piston and tap them gently with plastic hammer.

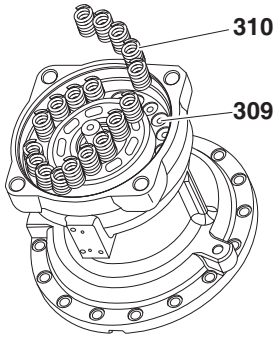


FG022409

Figure 41

13. Assemble brake springs (310) into brake piston (309).

    Confirm the springs are fitted to the brake piston completely.



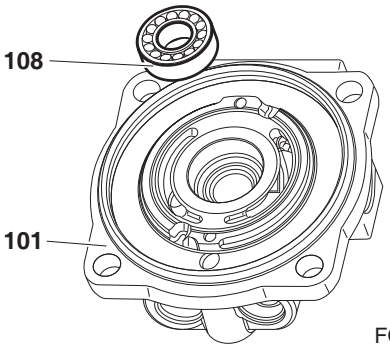
FG022408

Figure 42

14. (This procedure applies when ball bearing (108) was disassembled from the valve casing.)
    Assemble of ball bearing (108). Insert it to valve casing (101) while tapping it lightly.

    Tap evenly on the outer diameter of the outer race with a brass drift until it completely stops.

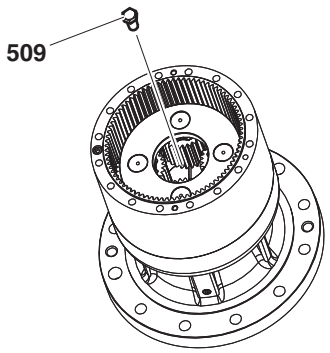
    Do not use a steel punch or bar on the bearing since it can chip or crack the race.



FG022417

Figure 43

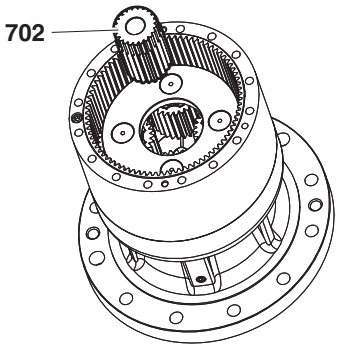
14. After tightening the bolt (509), to attach carrier assembly 2 and use a torque wrench to tighten it up to the standard torque. After checking the torque, bend the longer part of the tongued washer until it sticks to the head of the hexagon bolt (509).



FG022451

Figure 77

15. Install No. 2 sun gear (702) in No. 2 carrier.

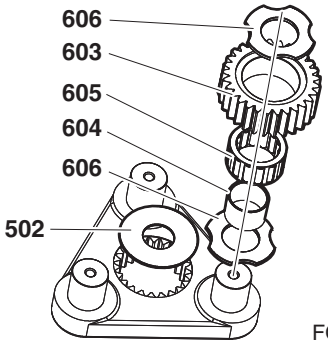


FG022441

Figure 78

16. Assemble the following parts on the carrier No.1.

Reference Number	Description
502	Thrust Washer
603	Planet Gear
604	Innerring
605	Needle Bearing
606	Thrust Washer No.1

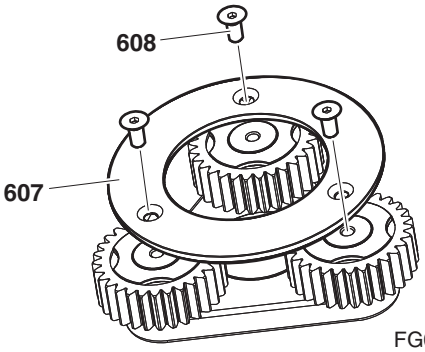


FG022471

Figure 79

17. Assemble the following parts.

Reference Number	Description
607	Thrust Plate
608	Screw



FG022472

Figure 80

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
DX225LC-3	1001 and Up, 50001 and Up
DX225MH-3	1001 and Up

(At High-Speed) - Pilot Pressure is Above 10 kg/cm^2

Without pilot pressure from port (A) (pressure is above 10 kg/cm^2), pilot pressure overcomes the force of spring (266) to move valve (263) to the right side and pressure oil of supply port (B) flows into chamber (C) through valve (263). Oil in chamber (C) presses piston (161) that swash plate (103) touches side (b) of the holder flange and keeps the status. At this time, the minimum tilting degree of swash plate (103) becomes $\theta 2$ and the piston stroke capacity of the hydraulic motor becomes minimum to enable high-speed rotation.

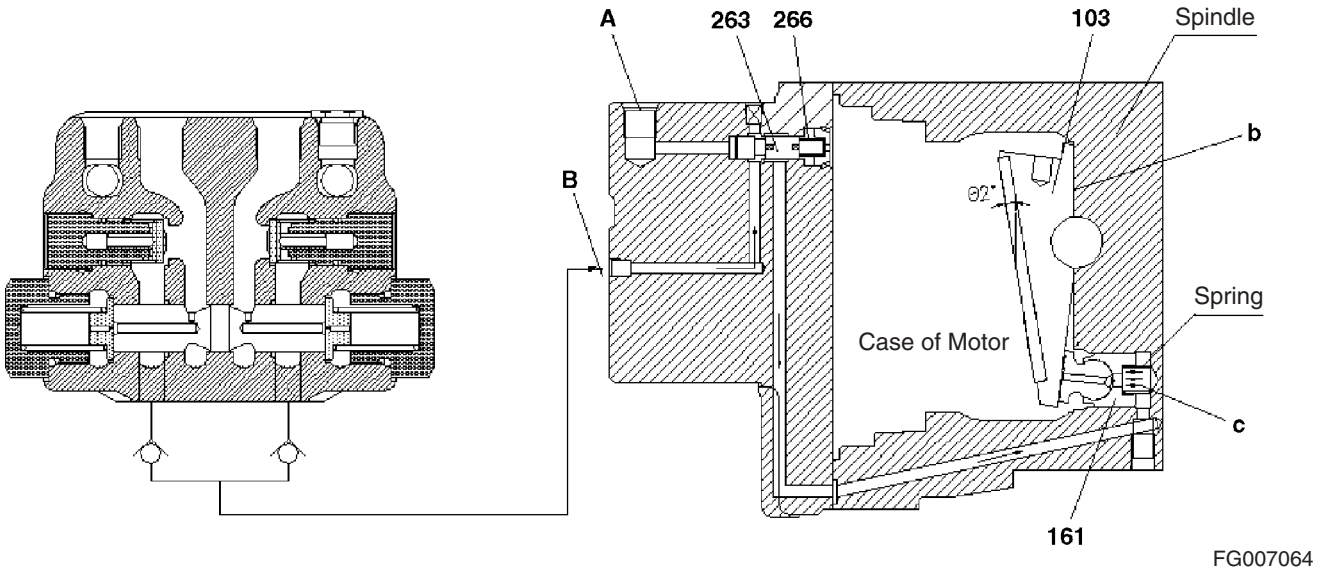


Figure 11

Reference Number	Description
249	Ball Bearing
250	Ball Bearing (HR6206HL1B)
260	Spring (2-speed)
261	Piston (2-speed)
262	Shoe (2-speed)
267	Pivot
275	O-ring
M	Hydraulic Motor Assembly
M-1	Cylinder Block and Piston Kit
M-2	Piston Assembly
M-3	Piston (2-speed) Kit

Reference Number	Description
401	Plunger
402	Piston Seal
403	Body
404	Back up Ring
405	O-ring
406	O-ring
407	Spring Retainer
408	Spring
409	Piston
412	Adjust Plug
413	Locknut

5. Remove the parallel pin (42) from the spindle (101).

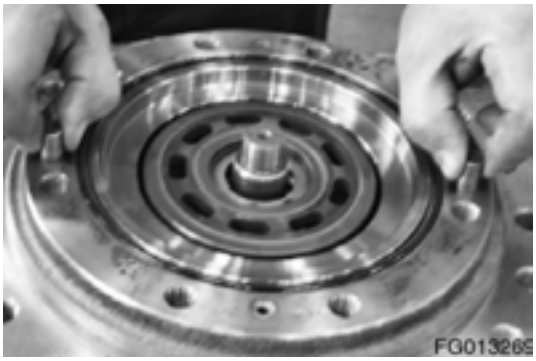


Figure 33

6. Remove the O-ring (126) from the spindle (101).

   Do not reuse the O-ring (126).

   NOTE: *Do not reuse the O-ring (126).*

Figure 34

7. Disassembling the rear flange (1) part

   A. Remove the timing plate (9) from the rear flange (1).

      NOTE: *When removing the timing plate, user can have difficulty of the removal due to the close adhesion of rear flange (1) and oil. Remove it after fitting a rod through the hole which is used when a casting is detached.*

      Be careful to not scratch the surfaces if using a sharp tool or leakage can occur.

Figure 35

   B. Remove the parallel pin (41) from the rear flange (1).

Figure 36

Reassemble the Rear Flange Part (1)

1. Reassemble the check valve

   A. Install O-ring (37) (2 ea) on the plug (26) (2 ea).

      NOTE: *Apply grease to the O-ring (37).*

   B. Install spring (30) and a valve (27) into the plug (26).

      NOTE: *Install a spring (30) and a valve (27) into the plug (26), and then grease the spring (30) and the valve (30) and hand-lock the former.*

   C. Install plug (26) into the rear flange (1).

   D. Install plug (26) in conjunction with the spring (30) and the valve (30) into the rear flange (1), and tighten the plug to the required torque.

      – Tightening torque : 26 ± 4.0 kg•m

      NOTE: *Adapter for hexagon wrench 14/Torque wrench*

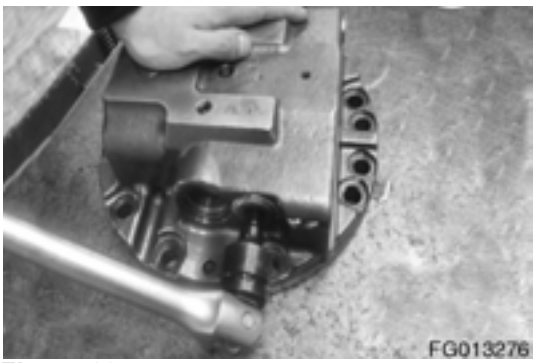


Figure 69

2. Reassemble the spool

   A. Install spool (23) into the rear flange (1).

      NOTE: *Before installing the spool (23), apply hydraulic oil to the spool. Be careful not to damage the spool's surface and the inner of rear flange (1).*

   B. Install O-ring (36) on the plug (24).

   C. Install spring (28) and a stopper (c-3) into the plug (24).

      NOTE: *Apply grease to the O-ring (36).*

      – Tightening torque : 45 ± 9 kg•m

   D. Install plug (24) into the rear flange (1).

      NOTE: *Exchange it as the rear flange KIT if the exchange is necessary, because the rear flange (301), the spool (323) insist of the rear flange KIT.*

      – #41 socket/torque for hexagon wrench

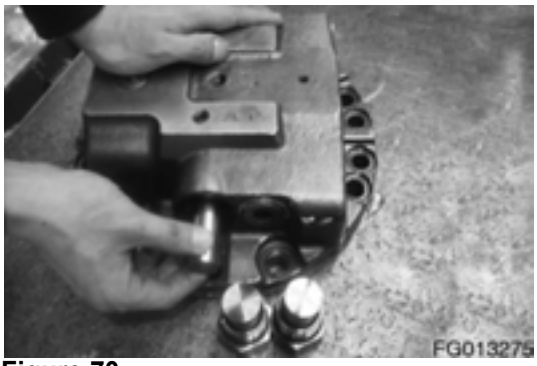


Figure 70

22. Tighten the socket bolt (124) (16 ea) to the specified torque.

    - Tightening torque : 5.9 ± 1.kg•m
    - #8 adapter/torquer wrench for hexagon wrench

    NOTE: *Apply Loctite to the socket bolt (124) and then install it.*

23. Install O-ring (38) on the plug (128).

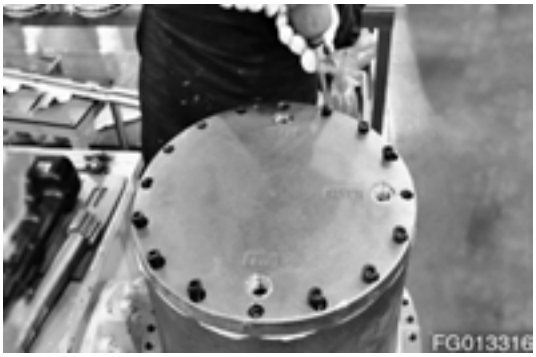


Figure 105

24. Tighten the plug (128) to the specified torque into the cover (123).

    NOTE: *Apply grease to the O-ring (38).*

    - Tightening torque : 10 ± 2 kg•m
    - #10 adapter/torquer wrench for hexagon wrench

Figure 106

Checking Facts After Assembly

1. Air test of reduction gear

   Disassemble plug (32) of reduction gear part, When compressed air (0.3 kg/cm^2) is applyed through the plug hole under water for 2 minutes, there must be no observable air bubble.

   - Gear oil : 3.3 liter

2. Air Test Of Hydraulic Motor

   With one port opened and the other ports closed, compressed air (3 kg/cm^2) is injected under water for 2 minutes, there must be no observable air bubble.

   - Working fluid : 1.0 liter

Reference Number	Description
11	Piston and Shoe Assembly
13	Cylinder Block and Valve (R)
14	Cylinder Block and Valve (L)
30	Swash Plate Assembly
41	Check 1 Assembly
42	Check 2 Assembly
79	Professional Valve
111	Driveshaft
113	Driveshaft
114	Gear
123	Roller Bearing
124	Spacer Bearing
127	Bearing Spacer
153	Push Plate
156	Flexible Bushing
157	Cylinder Spring
158	Spacer
211	Shoe Plate
250	Support Kit
251	Support
261	Seal Cover
271	Pump Casing
312	Valve Block
401	Socket Bolt
406	Socket Bolt
466	Plug

Reference Number	Description
468	Plug
490	Expander
530	Tilted Pin Assembly
532	Piston
534	Stopper
535	Stopper
702	O-ring
710	O-ring
717	O-ring
724	O-ring
725	O-ring
723	O-ring
732	O-ring
774	Oil Seal
789	Backup Ring
792	Backup Ring
806	Nut
808	Nut
824	Retaining Ring
885	Pin
886	Spring Pin
901	Eyebolt
953	Set Screw
954	Adjustment Screw
985	Cover
986	Socket Bolt

6. Install valve block (312) in pump casing (271) and tighten socket bolts (401).

IMPORTANT

1. **Start to reassemble from the rear pump, which facilitates the reassembly.**
2. **Take care not to set valve block in the wrong direction (the ball regulator should be at the top and the suction flange at the right side when observed from the front side).**
3. **Insert gear #1 in valve block and connect it to spool line of the driveshaft.**

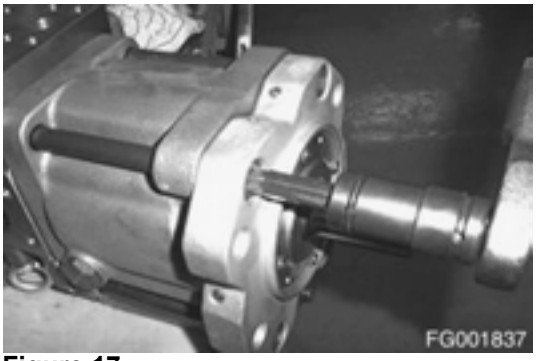


Figure 17

4. Insert feedback pin (548) of tilting pin (531) in the feedback lever of the regulator, connect the regulator and the PTO sub, and tighten socket bolts (412, 413).

IMPORTANT

Do not confuse the front and rear regulators with each other.

Figure 18

5. Install drain plug (468) to complete the reassembly procedure.

DISASSEMBLY

Read this Disassembly instructions throughly before starting to disassemble the PTO server, and follow the procedures below.

Numbers in the parentheses following the parts indicate the reference numbers in the next pump figures.

1. Select a place to disassemble the pump.

   NOTE: *The place should be clean.*
   Put a rubber sheet of cloth on the floor to prevent any damage to parts.

2. Remove dust or rust on the surface of the pump using lubricating oil.

3. Remove oil plug (468) to drain hydraulic oil in the pump casing.

   NOTE: *Drain the oil from both the front and the rear pumps.*

4. Remove the flange socket bolts and then the gear pump.

5. Remove hex socket bolt (414) and then the PTO server.

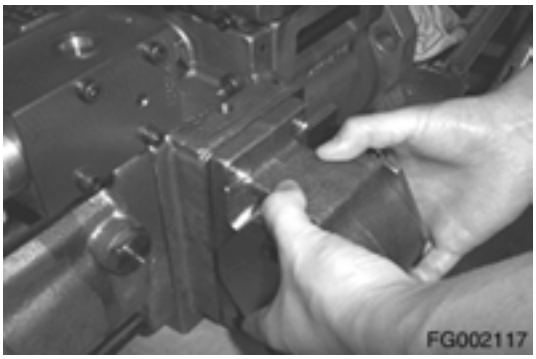


Figure 1

6. Remove retaining ring (827) and disassemble idle shaft (115), and remove the gear 2 (117), roller bearing (126), and bearing space (128).

   NOTE: *Do not remove roller bearing (126) from the gear 2 (117).*

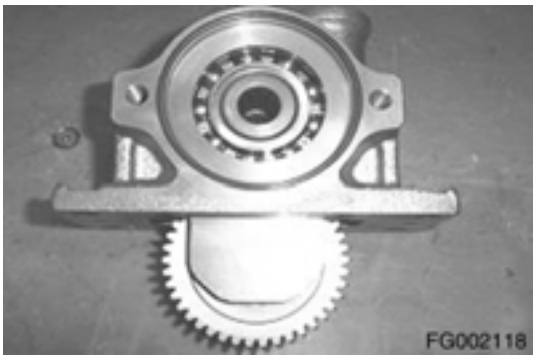


Figure 2

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
DX225LC-3	1001 and Up, 50001 and Up
DX225MH-3	1001 and Up

Table of Contents

Main Control Valve

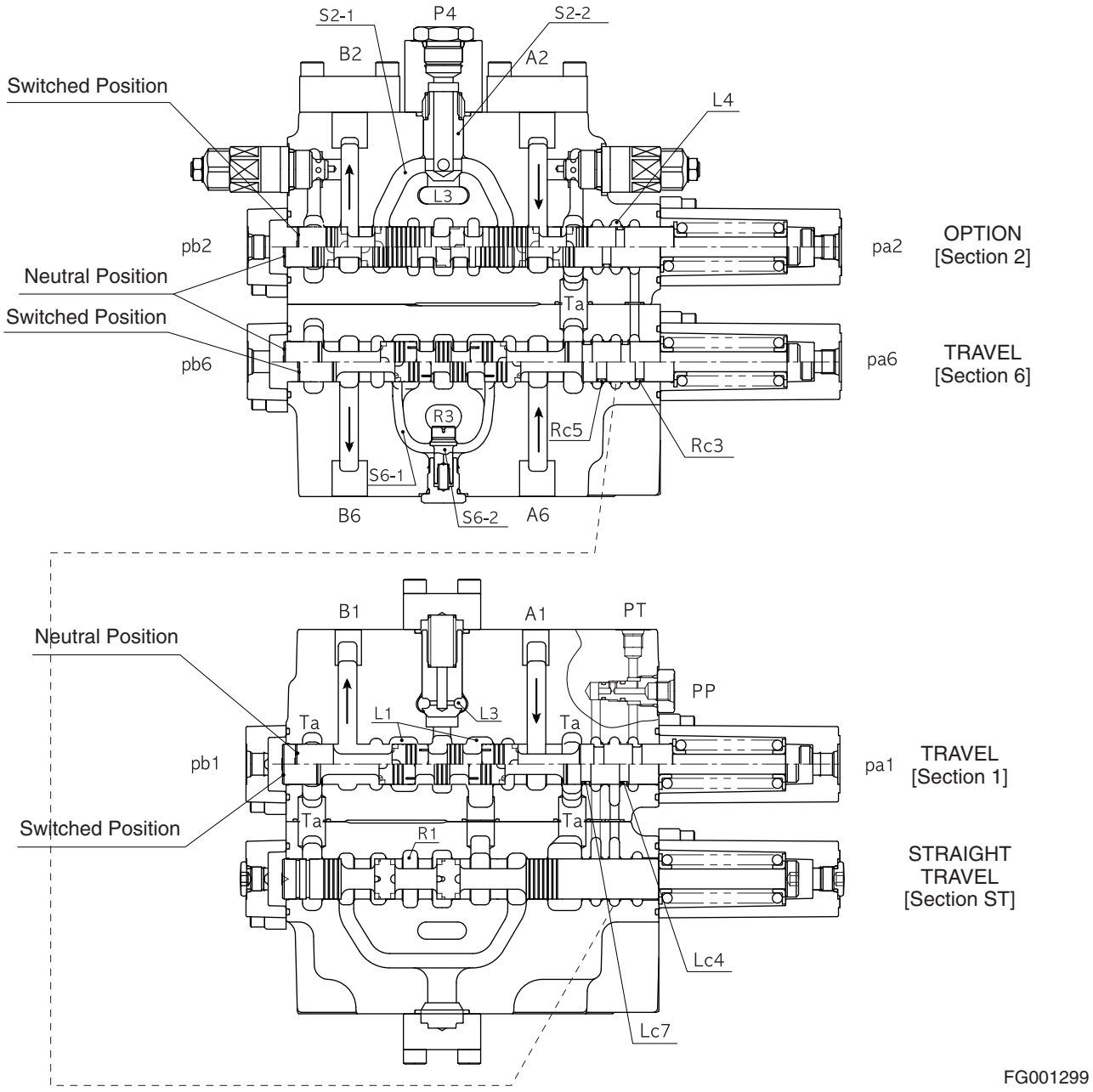

S2-1
P4
S2-2
B2
A2
Switched Position
L4
L3
pb2
pa2
OPTION
[Section 2]
Neutral Position
Switched Position
Ta
pb6
pa6
TRAVEL
[Section 6]
R3
Rc5
Rc3
S6-1
B6
S6-2
A6
B1
A1
PT
Neutral Position
PP
L1
L3
Ta
Ta
pb1
pa1
TRAVEL
[Section 1]
Ta
Ta
Switched Position
R1
STRAIGHT
TRAVEL
[Section ST]
Lc4
Lc7
FG001299

Figure 5

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).

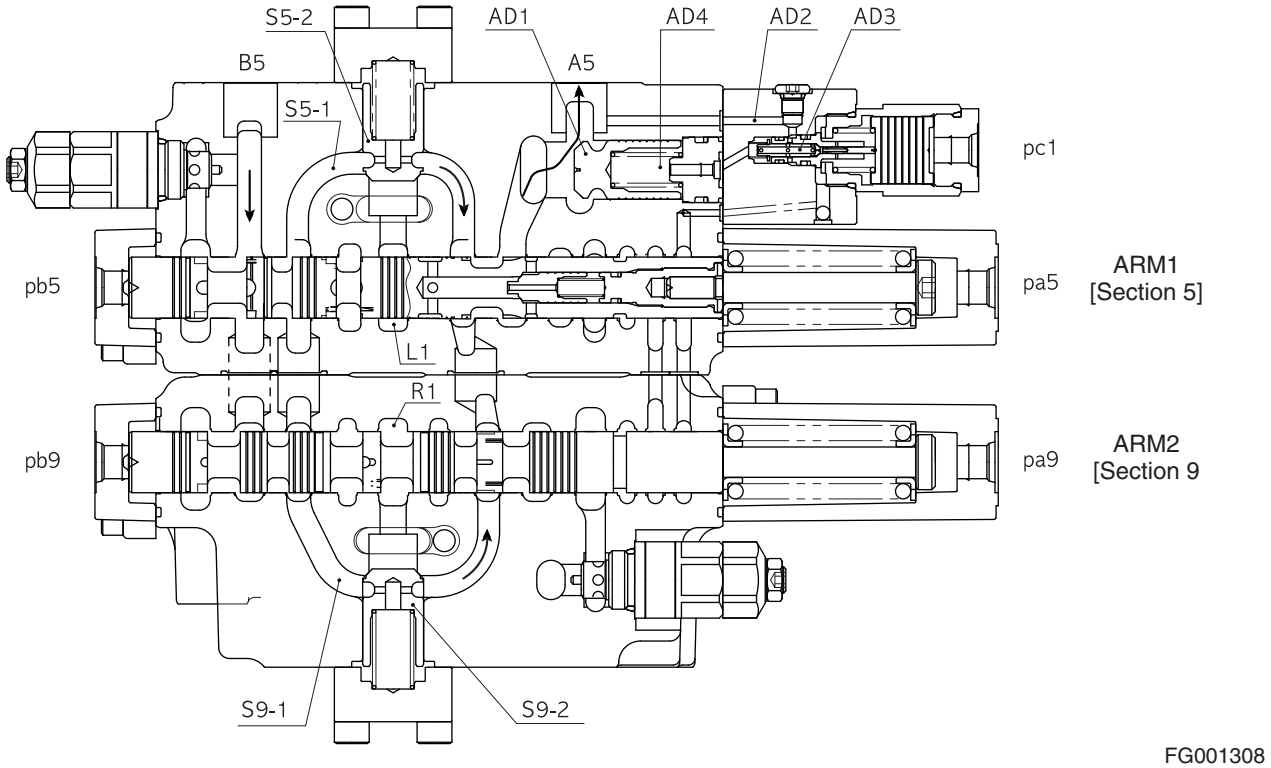
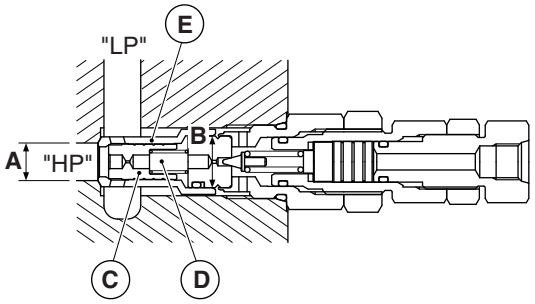


Figure 14

Main Relief Valve

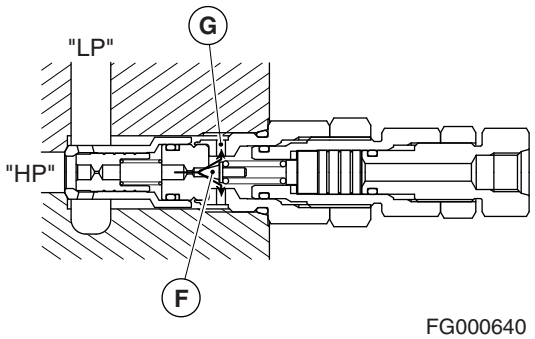
1. The main relief valve is between neutral oil passage (HP, Figure 23) and low-pressure oil passage (LP). Pressurized oil flows into neutral oil passage (HP) through orifice in the main poppet (C) to fill internal cavity (D). Due to the difference in areas between (A and B), on which hydraulic pressure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



FG000639

Figure 23

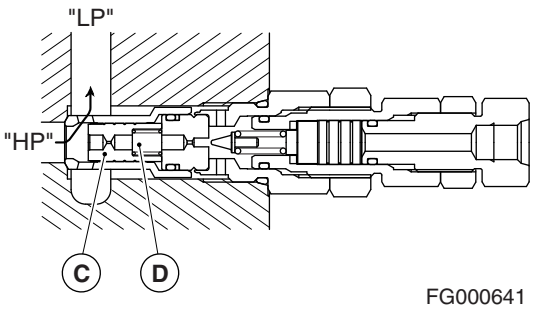
2. When pressure in neutral oil passage (HP) rises and exceeds relief valve setting, pilot poppet (F) opens. Pressurized oil flows through pilot poppet (F) into low-pressure oil passage (LP), passing through hole (G).



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).

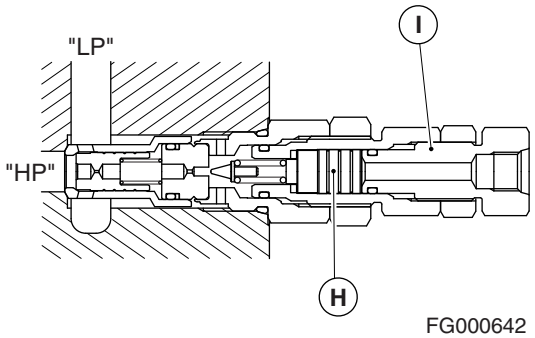


FG000641

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

Reference Number	Description
18	Cap
19A	SP Valve
19	Spool
20	Spring Seat
21	Spring
22	End Spool
23	O-ring
24A	Arm Regeneration Assembly
24	Plug
25	O-ring
26	Spring
27	Spool
30	O-ring
31	Backup Ring
34	Poppet
35	Spring
36	O-ring
37	Flange
38	Poppet
39	Spring
40	Spacer Assembly
41	O-ring
42	O-ring
43	Flange
44	Poppet
45	Spring
46	Plug

Reference Number	Description
47	O-ring
48	Spring
49	Poppet
51	Poppet
52	Flange
53	Spacer
54	O-ring
55	Backup-ring
67	Antidrift Valve Assembly
73	Socket Bolt (M10 x 55L)
75	Socket Bolt (M10 x 40L)
76	Socket Bolt (M10 x 70L)
78	Socket Bolt (M6 x 20L)
92	Plug Assembly
94A	Boom Priority Valve
94	Plug
95	Piston
96	Body
97	Piston
98	Spring
99	Sleeve
100	Poppet Assembly
102	O-ring
103	Backup-ring
104	O-ring
101	Socket Bolt (M10 x 90L)

Specifications

Rated flux: 270 lpm

However, 50 lpm in neutral

Rated pressure: 34.3 MPa

Permitted pressure: Max. pressure of 1.5 MPa or less

Used pressure of 0.5 MPa or less

Permitted use of oil temperature: Normally -20 - 80°C

Highest 100°C

(Use of the rubber for thread.)

Disassembly of Relief Valve

WARNING

AVOID DEATH OR SERIOUS INJURY

Always relieve hydraulic pressure and fully lower bucket (or attachment) to the ground, before disassembly. Failure to follow instructions can cause sudden release of component parts or boom dropping, resulting in death or serious injury.

WARNING

AVOID DEATH OR SERIOUS INJURY

Do not loosen adjusting plug or change pressure setting.

1. Remove overload relief valve (69, six places, width across flats: 32 mm).
2. Remove main relief valve (68, width across flats: 32 mm).
3. Remove relief valve assembly (70, two places, width across flats: 32 mm) and O-ring (70- 5 and 70-6).

Disassembly of Option Section Part

1. Remove socket head bolt (75, width across flats: 8 mm), cap (88, two places) and O-ring (89).

Disassembly of Other Plugs

1. Remove plug assembly (60, width across flats: 27 mm) and O-ring (Section J-J).
2. Remove plug (61, width across flats: 22 mm) and O-ring (62) (Section K-K).
3. Remove orifice plug (63, width across flats: 5 mm) (Section A1-A1).
4. Remove plug assembly (92, width across flats: 36 mm) and O-ring.
5. Remove plug assembly (71, width across flats: 6 mm) and O-ring.
6. Remove plug assembly (72, width across flats: 8 mm) and O-ring.

Assembly of Arm 1 Para-turn Spool

1. Install spool subassembly (19) into valve housing.

IMPORTANT

After inserting spool, check to see if it slides easily.

2. Install O-ring (23) on cap (18) and fasten it in place with socket head bolt (78). Tightening torque: 0.90 - 1.10 kg•m (6.49 - 7.97 ft lb).

Assembly of Main Spool

1. Install O-ring (7, twenty places) on mating surface of valve housing cap.
2. Install spool of subassembly condition (2-6 and 14-17) in same positions that they were remove from during disassembly

IMPORTANT

Align spool with hole and insert it slowly.

After inserting spool, check to see if it slides easily.

If spool is inserted when it is in a poor operating condition with a scratch, it can cause a improper operation of the spool.

3. Install cap (12, ten places) and fasten it in place with socket head bolt (74). Tightening torque: 3.98 - 4.49 kg•m (29 - 32 ft lb).
4. Install cap (8, ten places) and fasten it in place with socket head bolt (74). Tightening torque: 3.98 - 4.49 kg•m (29 - 32 ft lb).
5. Install O-ring on plug assembly (72) and tighten it to two sides of cap of travel straight section (Section H-H). Tightening torque: 3.98 - 4.49 kg•m (29 - 32 ft lb).
6. Install O-ring (62) on plug assembly (91) and install it on long cap of spare section (Section G-G). Install O-ring (62) on plug assembly (105). Install plug assembly on short cap of spare section (Section G-G). Tightening torque: 3.98 - 4.49 kg•m (29 - 32 ft lb).

IMPORTANT

When tightening plug to cap, be careful not to over tighten. If it is over tighten, threads of cap can be damaged.

Table of Contents

Remote Control Valve (Work Lever / Joystick)

9. Remove joint assembly (21) from case (1).

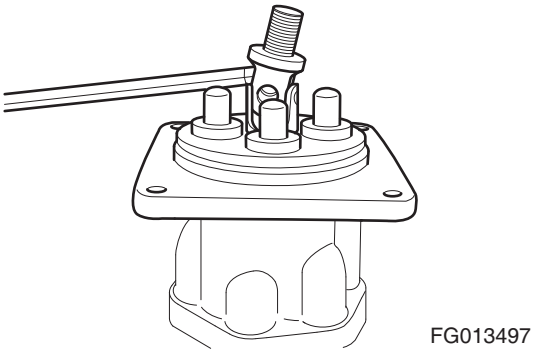


Figure 11

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

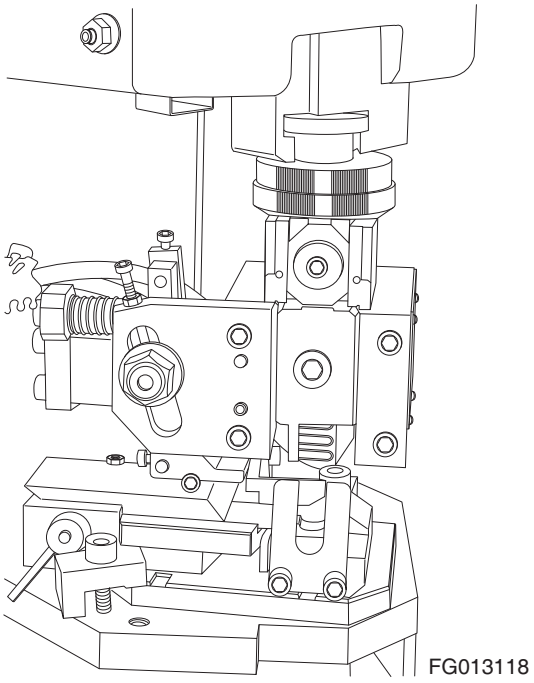


Figure 12

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

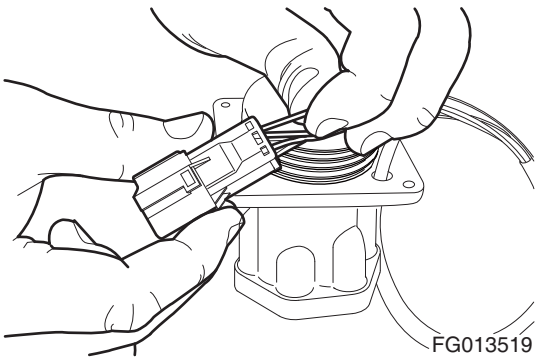


Figure 13

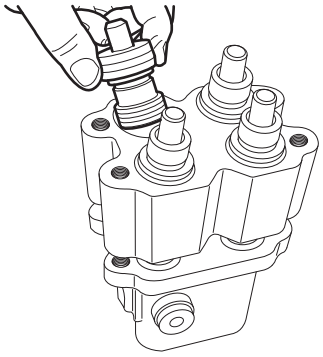
Travel Control Valve (with Damper)

Edition 2

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

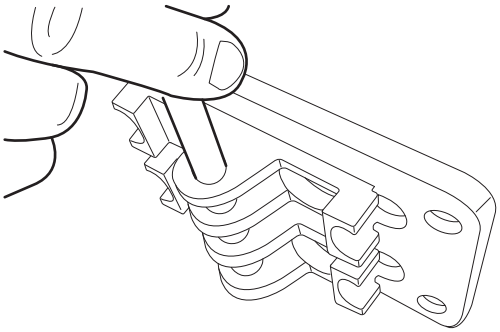
8. Install push rod assembly into body (2).



FG013552

Figure 33

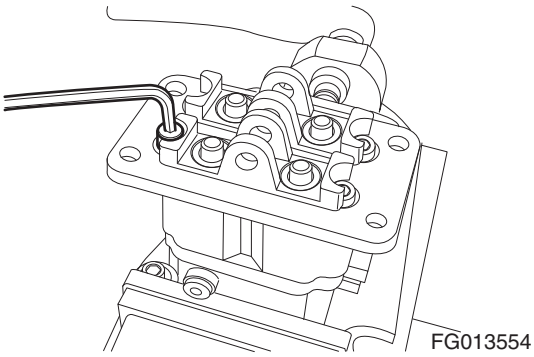
9. Install bushing (27) in cover (24) using jig.



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

Hydraulic Schematic

Edition 1

Electrical System

Edition 2

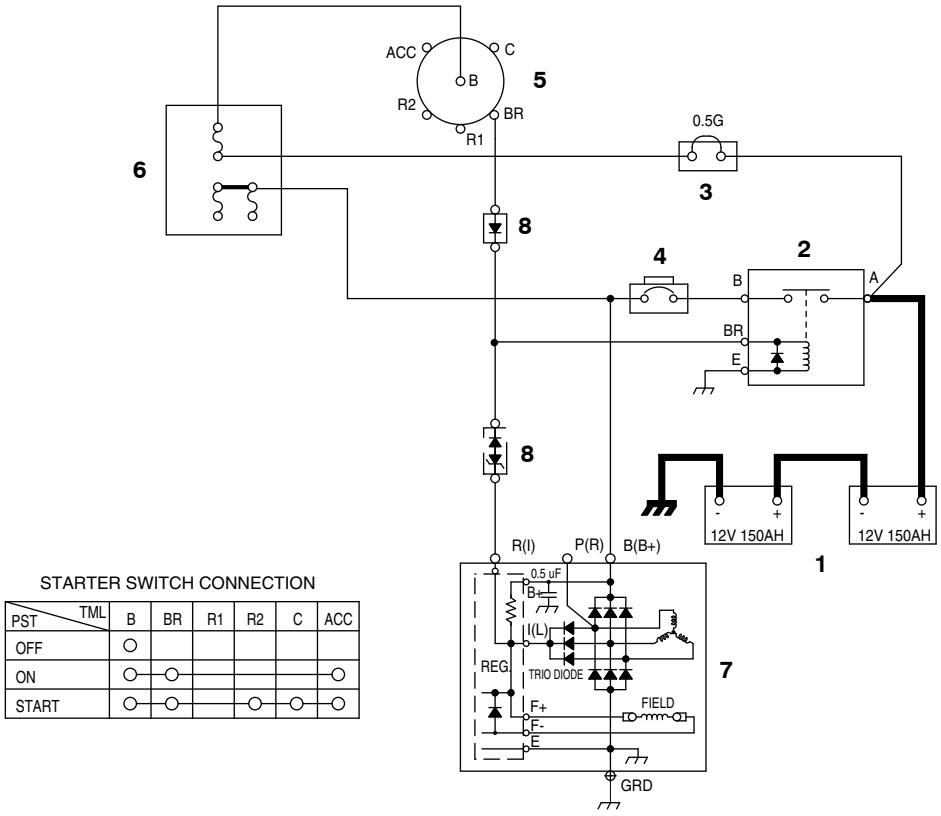


Figure 1 Electric Power Circuit Diagram

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

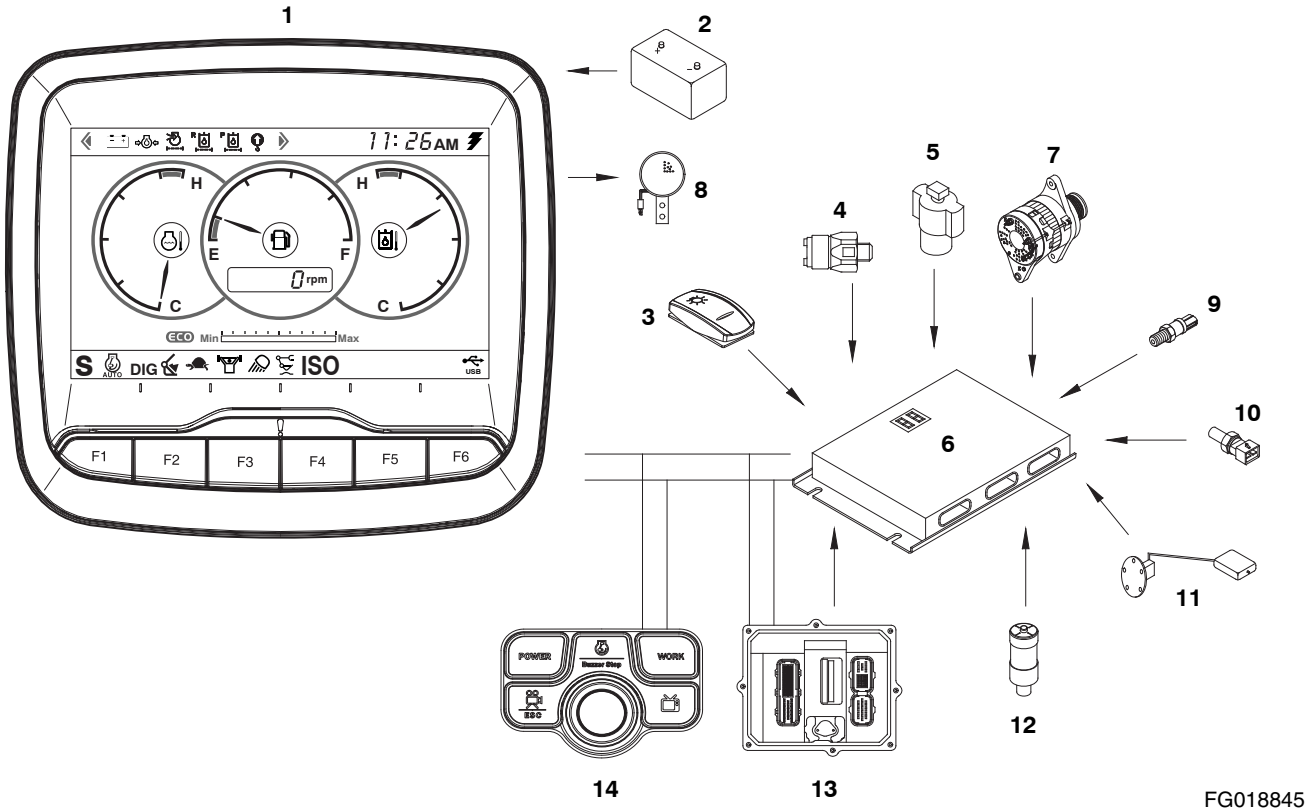
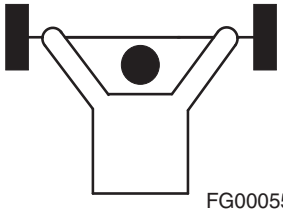
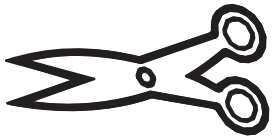
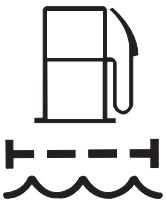


Figure 9

Reference Number	Description
1	Instrument Panel
2	Battery
3	Light Switch
4	Return Filter Switch
5	Pilot Filter Switch
6	e-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 e-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	 FG010521	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"	• LCD, all of LED and warning lights are turned "ON" and turned "OFF" after about 2 seconds. • Warning buzzer is activated and turned "OFF" after about 2 seconds. • Power mode: When Fuel Saving Mode is disabled, the power mode is the previous mode. When Fuel Saving Mode is enable, the power mode is standard mode or economy mode. • Auto Idle: High Output (Activation). • Display: Indicating coolant temperature, Fuel level, Hydraulic oil temperature, Engine speed. • Clock: Current time display.

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.

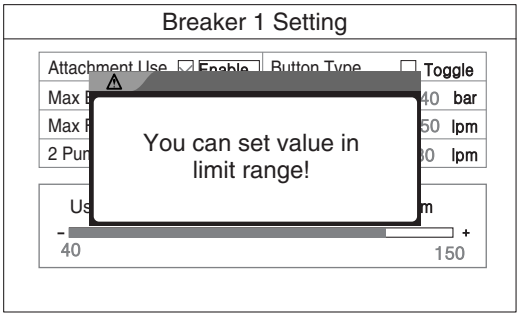
User Setting Max Flow

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

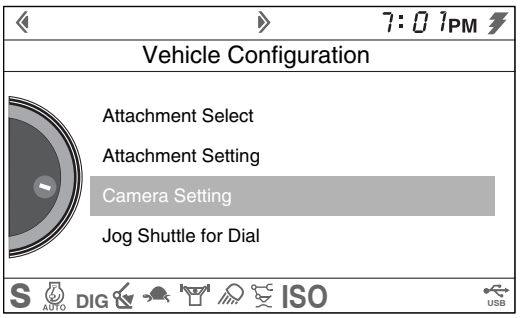
Figure 38

	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

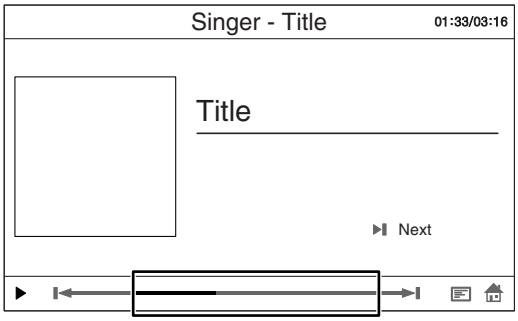
Fast Forward/Rewinding

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 forward/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.

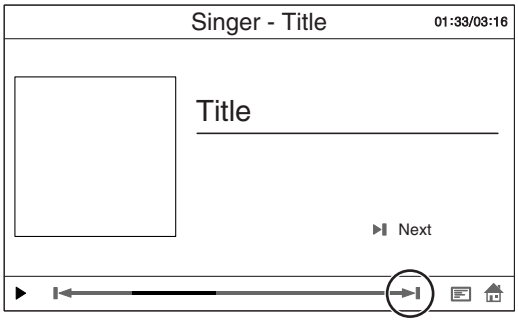


FG020127

Figure 73

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.

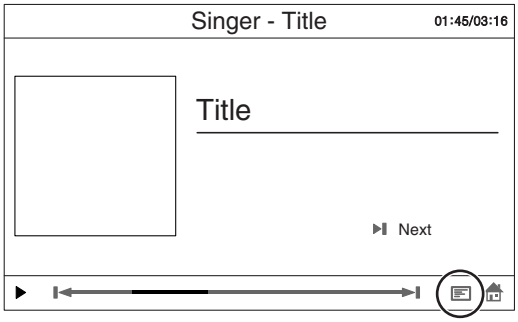


FG020128

Figure 74

MP3 Files List

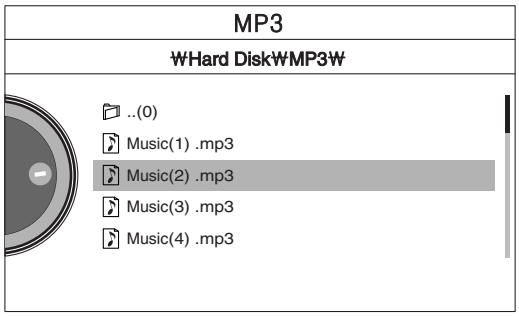
Locate the cursor at the MP3 files list symbol and click on the jog switch to move to the file list screen.



FG020129

Figure 75

Select a file and replay the MP3.



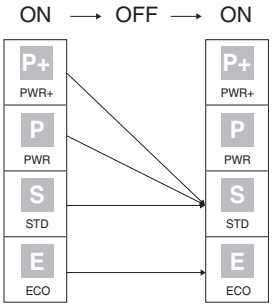
FG018560

Figure 76

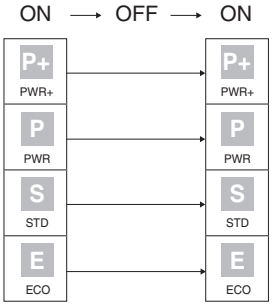
D. Default Power Mode Setting

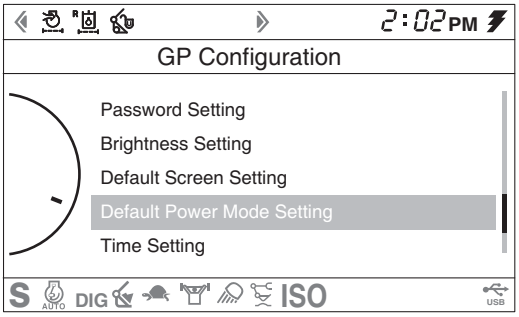
On the GP configuration screen, when the cursor is placed on the default power mode setting, click on the jog switch to access the default power mode setting.

Fuel Saving Mode is Enable



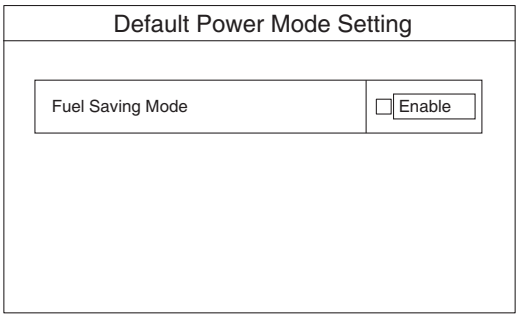
Fuel Saving Mode is Disable





FG022141

Figure 103



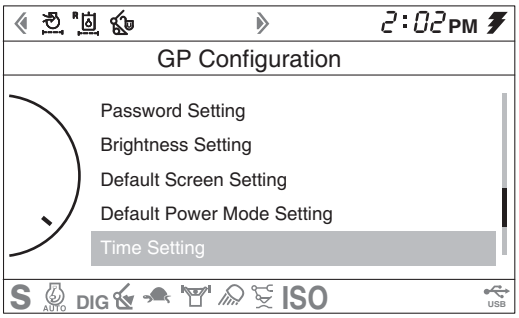
FG022142

Figure 104

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.



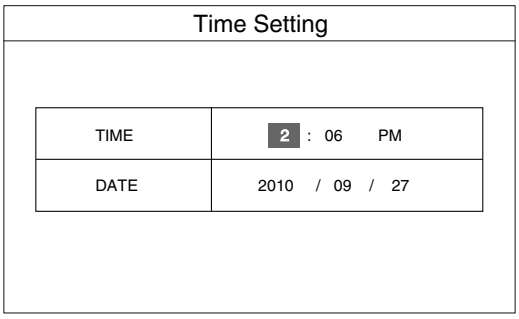
FG022144

Figure 105

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.



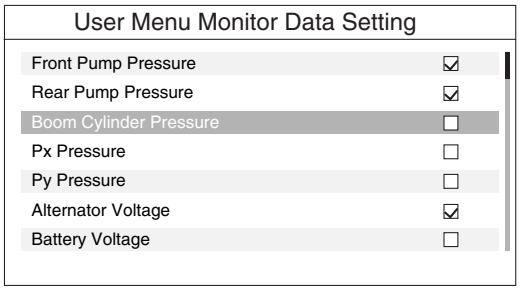
FG018538

Figure 106

User Menu Monitor Data Setting

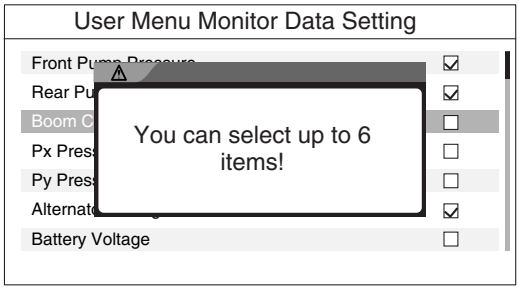
User can be monitor data setting.

The maximum limit of the monitor data setting is 6.



FG018862

Figure 126



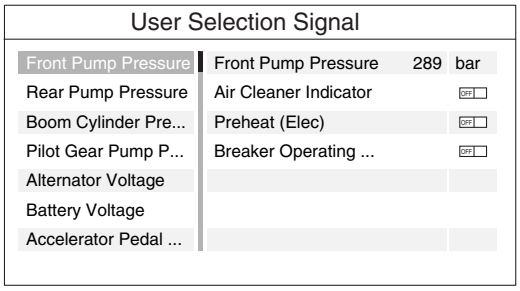
FG018863

Figure 127

User Selection Signal

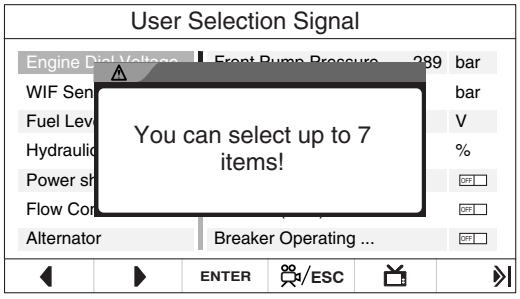
User can select signals of all monitoring items.

The maximum limit of monitoring signal is 7.



FG018864

Figure 128

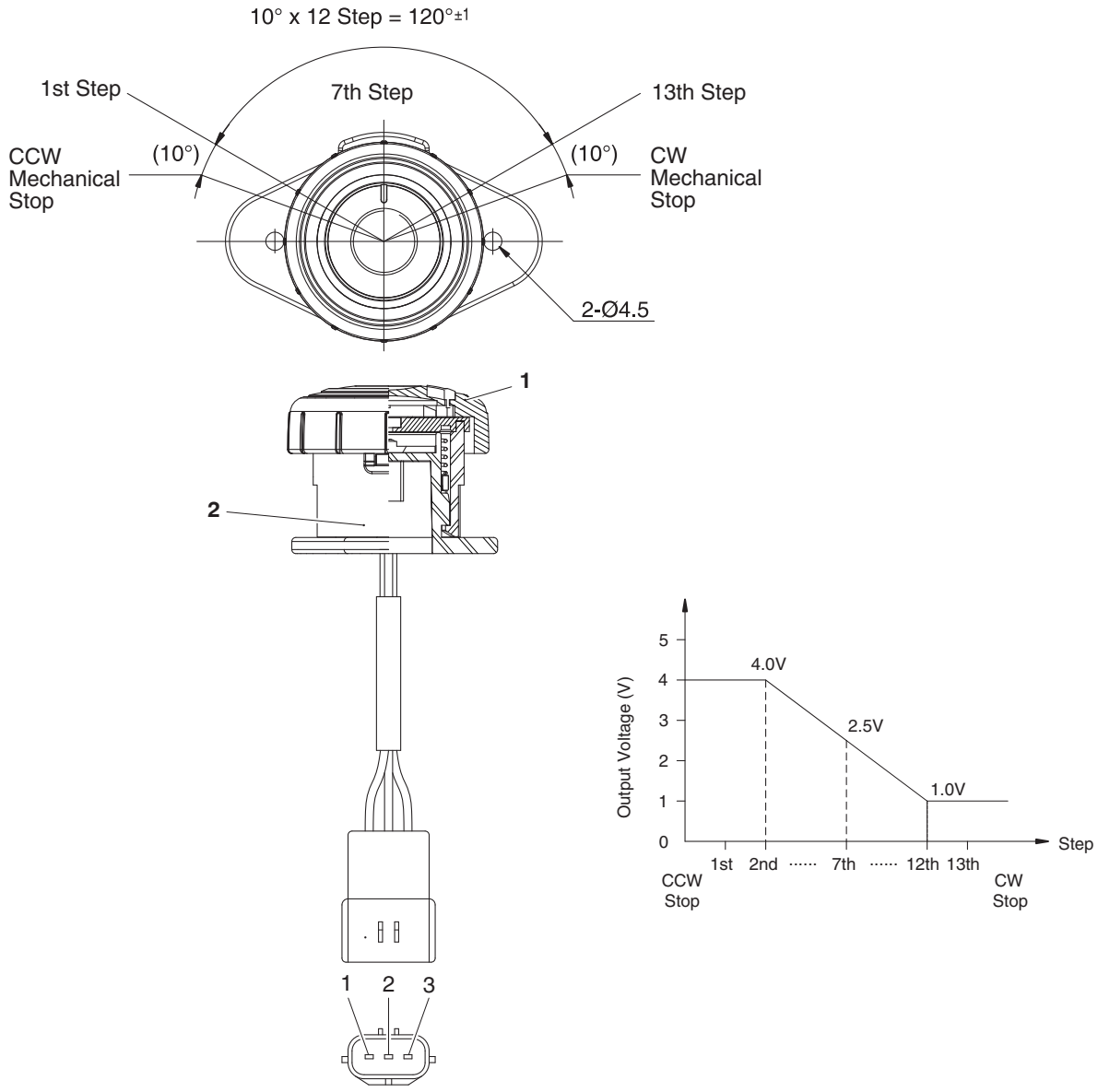


FG018865

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

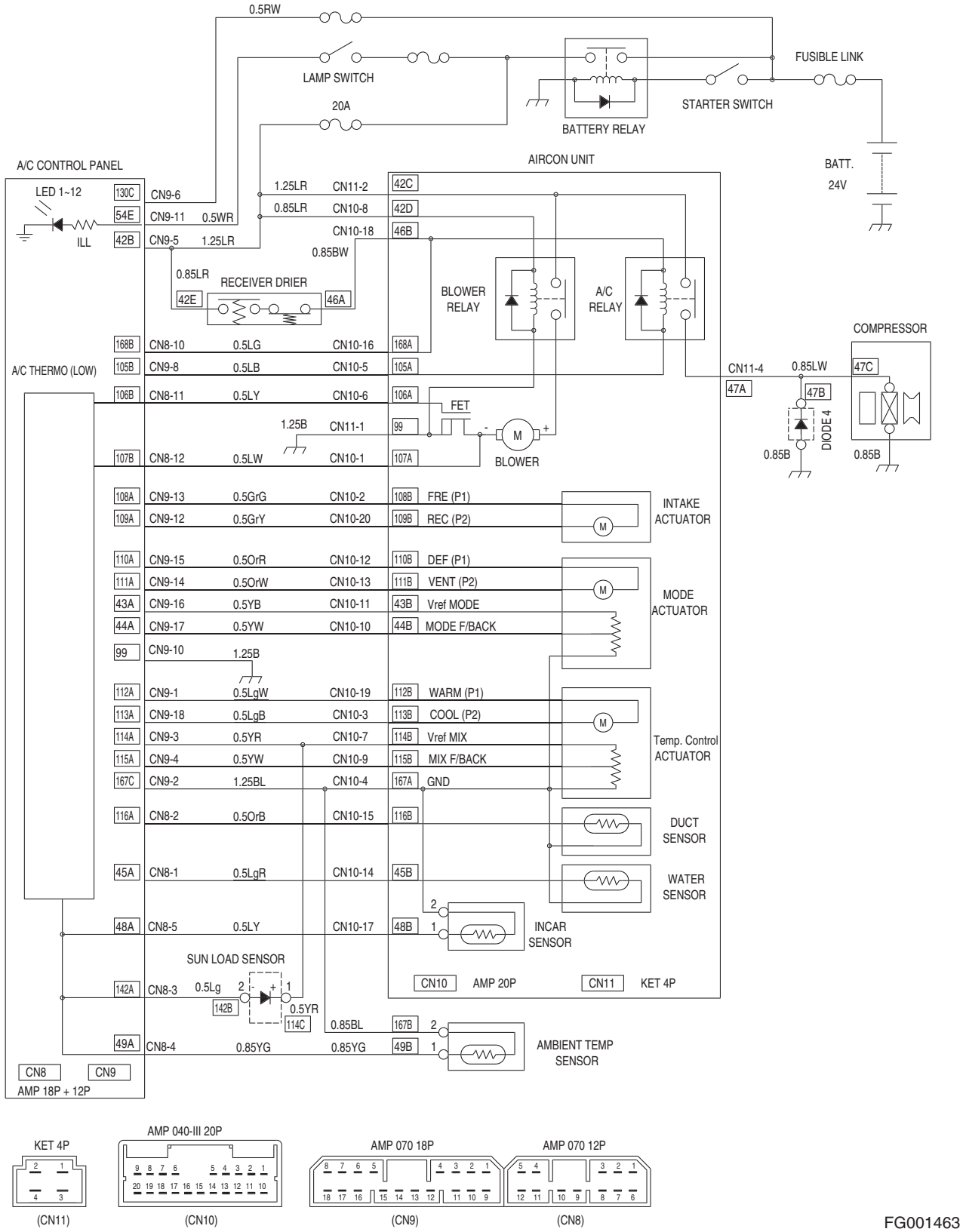
Reference Number	Description
2	Hall Effect Sensor

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 e-EPOS controller as shown in the graph.

Reference Number	Description
1	Instrument Panel
3	Engine Controller
4	e-EPOS Controller
17	Engine Control Dial
24	Battery
25	Battery Relay
26	Fuse
27	Fusible Link

Reference Number	Description
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



FG001463

Figure 177

Categories	Inputs	System Operation
Starting Control of Cooling	Auto mode Duct sensor	1. Prevention of discharge of hot air before discharge temperature drops enough in hot summer weather 2. Start conditions (AND condition) A. A/C on (AUTO or manual) B. Temperature sensed by the duct sensor is above 30°C C. Airflow: Auto mode 3. One time control in the cycle of engine OFF → engine run 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. 5. Initial cooling control should be before max cooling. 6. Release condition (OR condition) A. A/C "OFF" B. Airflow: Manual control 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.

2. The new refrigerant has improved cooling characteristics than the old type and care should 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

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
DX140LC-3	1001 and Up, 50001 and Up
DX180LC-3	1001 and Up, 50001 and Up
DX225LC-3	1001 and Up, 50001 and Up
DX225MH-3	1001 and Up
DX255LC-3	1001 and Up, 50001 and Up

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
DX225LC-3	1001 and Up, 50001 and Up
DX225MH-3	1001 and Up

Boom Removal Procedure

IMPORTANT

When working with hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

IMPORTANT

Contain and dispose of any oil leakage in an environmentally safe manner.

1. Disconnect hydraulic lines (1, Figure 17) and install cap/plugs.

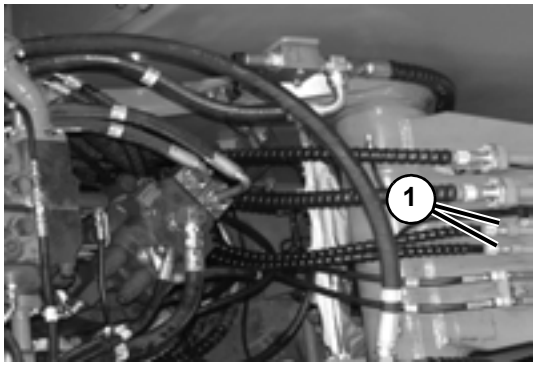

Figure 17

2. Remove bolts and flanges (2, Figure 18) from boom auxiliary hydraulic line.
3. Remove auxiliary hydraulic hose (3, Figure 18) from boom auxiliary hydraulic line.
4. Install cap/plugs to auxiliary hydraulic lines, install flanges and bolts. Tighten flange mounting bolts.
5. Repeat procedure for other auxiliary hydraulic hose.

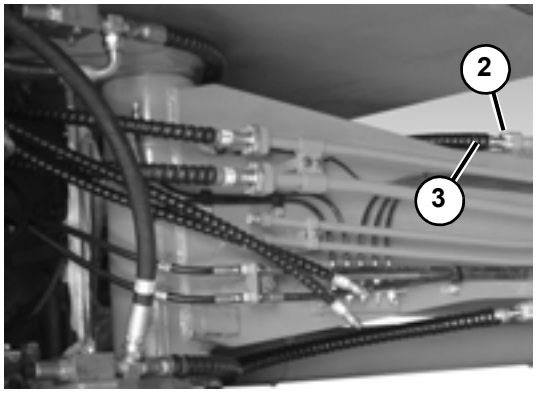

Figure 18

IMPORTANT

When working with hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

IMPORTANT

Contain and dispose of any oil leakage in an environmentally safe manner.

31. Remove upper mounting bolts (1, Figure 43) and flange (2) from both arm cylinder hydraulic lines located on boom.
32. Loosen lower flange bolts (3, Figure 43) on both arm cylinder hydraulic lines.
33. Remove dust plug (4, Figure 43) from both arm cylinder hydraulic lines.

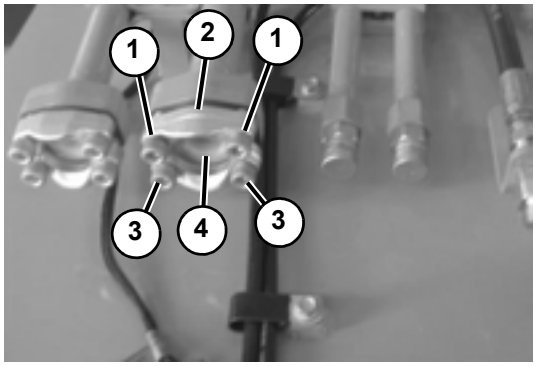

Figure 43

34. Locate machine's arm cylinder hydraulic lines. See the machine's Operation & Maintenance Manual or Shop Manual for detailed information.
35. Connect machine's arm cylinder hydraulic lines (5, Figure 44) to boom arm cylinder hydraulic lines (6).
36. Install upper mounting flange and bolts (7, Figure 44). Tighten flange mounting bolts. See "Standard Torques" in this manual.

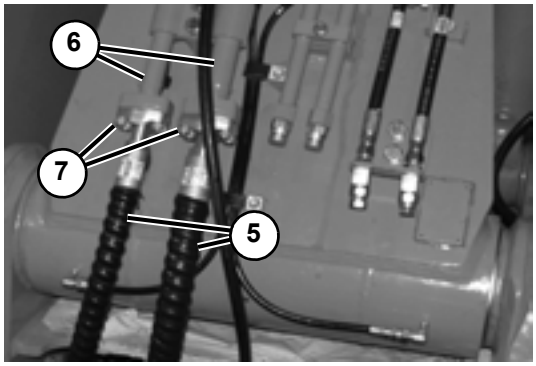

Figure 44