Doosan Infracore

DX300LC

Serial Number 7440 and Up

Shop Manual

K1006409BE

Track Excavator Safety

Edition 1

SUMMARY OF SAFETY PRECAUTIONS FOR LIFTING IN DIGGING MODE

DANGER

Unsafe use of the excavator while making rated lifts could cause serious, potentially fatal injuries or extensive damage to the machine or nearby property. Do not let anyone operate the machine unless they've been properly trained and understand the information in the Operation and Maintenance Manual.

To lift safely while in Digging Mode, the following items must be evaluated by the operator and the work site crew.

- Condition of ground support.
- Excavator configuration and attachments.
- Weight, lifting height and lifting radius.
- Safe rigging of the load.
- Proper handling of the suspended load.

Tag lines on opposite sides of the load can be very helpful in keeping a suspended load secure, if they are anchored safely to control points on the ground.

WARNING

NEVER wrap a tag line around your hands or body.

NEVER rely on tag lines or make rated lifts when wind gusts are more than 48.3 km/h (30 MPH). Be prepared for any wind gust when working with loads that have a large surface area.

Always engage the "Digging Mode" control on the Instrument Panel before using the excavator for lifting work.

WARNING

If you need more information or have any questions or concerns about safe operating procedures or working the excavator correctly in a particular application or in the specific conditions of your individual operating environment, please consult your local *DOOSAN* representative.

BEFORE STARTING ENGINE

Work Site Precautions

Before starting operations, thoroughly check the area for any unusual conditions that could be dangerous.

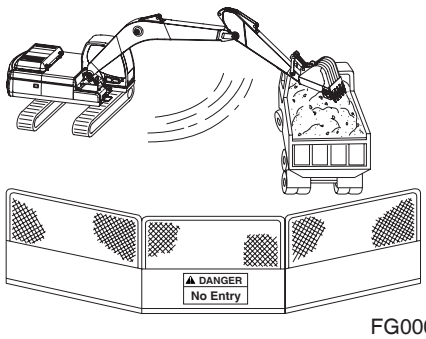
Check the terrain and condition of the ground at the work site, and determine the best and safest method of operation.

Make sure the ground surface is as hard and horizontal as possible before carrying out operations. If there is a lot of dust and sand on the work site, spray water before starting operations.

If you need to operate on a street, protect pedestrians and cars by designating a person for work site traffic duty or by erecting fences and posting "No Entry" signs around the work site.

Erect fences, post "No Entry" signs, and take other steps to prevent people from coming close to or entering the work site. If people come close to a moving machine, they may be hit or caught by the machine, and this may lead to serious personal injury or death.

Waterlines, gas lines, phone lines and high-voltage electrical lines may be buried under the work site. Contact each utility and identify their locations. Be careful not to damage or cut any of these lines.



FG000400

Figure 14

Check the condition of the riverbed, and the depth and flow of the water before operating in water or crossing a river. NEVER work in water that is more than the permissible water depth.

Any object in vicinity of boom could represent a potential hazard, or cause the operator to react suddenly and cause an accident. Use a spotter or signal person when working near bridges, phone lines, work site scaffolds, or other obstructions.

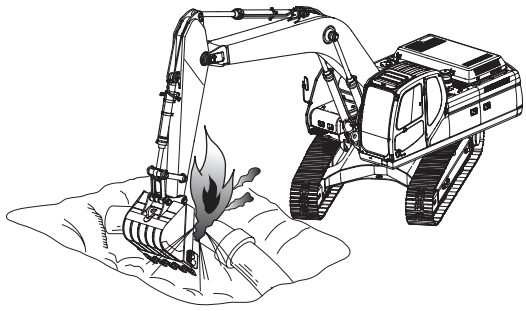


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Figure 15

Minimum levels of insurance coverage, work permits or certification, physical barriers around the work site or restricted hours of operation may be mandated by governing authorities. There may also be regulations, guidelines, standards or restrictions on equipment that may have to be followed for local requirements. There may also be regulations related to performing certain kinds of work. If there is any question about whether your machine and work site complies with the applicable standards and regulations, contact your local authorities and agencies.

Avoid entering soft ground. It will be difficult for the machine to escape.

Avoid operating your machine to close to the edge of cliffs, overhangs, and deep ditches. The ground may be weak in such areas. If the ground collapses, the machine could fall or tip over resulting in serious injury or death.

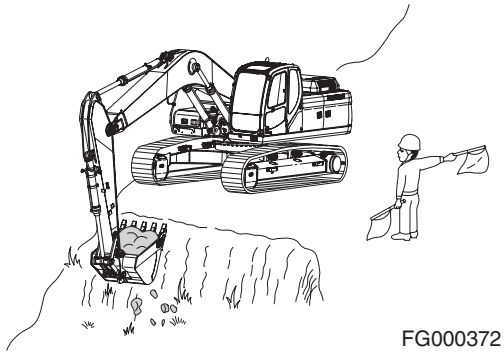

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Figure 16

Operations on Slopes

When working on slopes. there is a danger that machine may lose its balance and turn over, when swinging, or when work equipment is operated. Always carry out these operations carefully.

Do not swing the work equipment from the uphill side to the downhill side when the bucket is loaded. This operation is dangerous.

If the machine has to be used on a slope, pile the soil to make a platform that will keep the machine as horizontal as possible.

In addition, lower the bucket as far as possible, keep it pulled into the front, and keep the swing speed as low as possible.

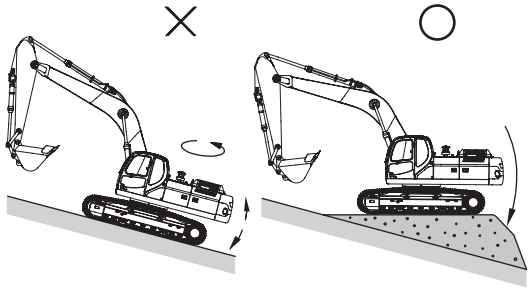

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Figure 28

Parking Machine

Avoid making sudden stops, or parking the machine wherever it happens to be at the end of the workday. Plan so the excavator will be on firm, level ground away from traffic and away from high walls, cliff edges and any area of potential water accumulation or runoff. If parking on inclines is unavoidable, block the crawler tracks to prevent movement. Lower the bucket or other working attachment completely to the ground, or to an overnight support saddle. There should be no possibility of unintended or accidental movement.

When parking on public roads, provide fences, signs, flags, or lights, and put up any other necessary signs to ensure that passing traffic can see the machine clearly. Park the machine so the machine, flags, and fences do not obstruct traffic.

After the front attachment has been lowered to an overnight storage position and all switches and operating controls are in the "OFF" position, the safety lock lever must be set to the "LOCKED" position. This will disable all pilot circuit control functions.

Always close the door of the operator's cabin.

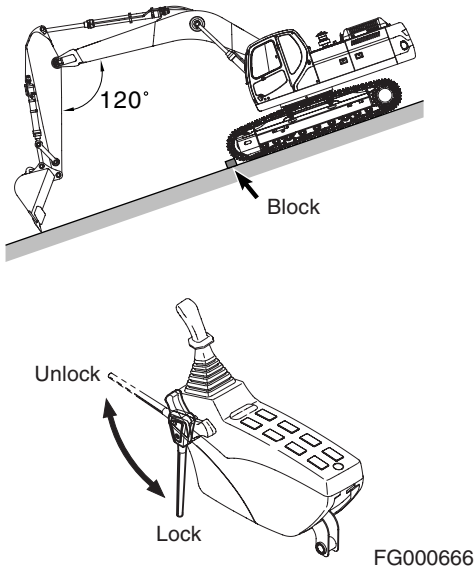

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Figure 29

Never Let Anyone Ride on Attachment

Never let anyone ride on any work attachment, such as the bucket, crusher, grapple, or clamshell (grab bucket). There is a potential danger of the person falling and suffering serious injury.

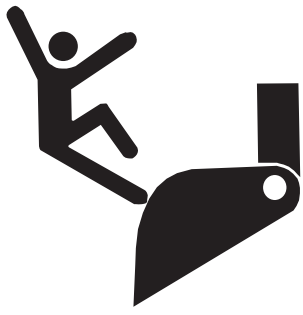

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Figure 30

BATTERY

Battery Hazard Prevention

Battery electrolyte contains diluted sulfuric acid and batteries generate hydrogen gas. Hydrogen gas is highly explosive, and mistakes in handling them can cause serious injury or fire. To prevent problems, always do the following:

- Do not smoke or bring any flame near the battery.
- When working with batteries, ALWAYS wear safety glasses and rubber gloves.
- If you spill battery electrolyte on yourself or your clothes, immediately flush the area with water.
- If battery electrolyte gets into your eyes, flush them immediately with large quantities of water and see a doctor at once.
- If you accidentally drink battery electrolyte, drink a large quantity of water or milk, raw egg or vegetable oil. Call a doctor or poison prevention center immediately.
- When cleaning the top surface of the battery, wipe it with a clean, damp cloth. Never use gasoline, thinner, or any other organic solvent or detergent.
- Tighten the battery caps securely.
- If the battery electrolyte is frozen, do not charge the battery or start the engine with power from another source. There is a danger that battery may catch fire.
- When charging the battery or starting with power from another source, let the battery electrolyte melt and check that there is no leakage of battery electrolyte before starting the operation.
- Always remove battery from the machine before charging.

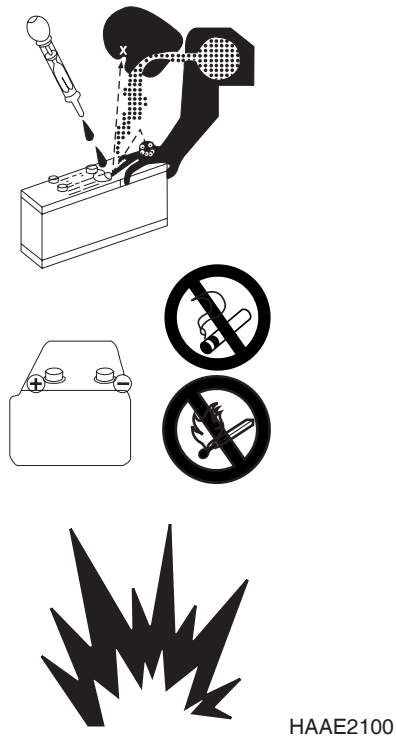

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Figure 46

SAFETY PRECAUTIONS

CAUTION

Follow all safety recommendations and safe shop practices outlined in the front of this manual or those contained within this section.

Always use tools and equipment that are in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

APPLICABLE MODELS

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

MODEL	SERIAL NUMBER RANGE
DX300LC	7440 and Up

Overall Shipping Height (to top of cylinder hose)	3,345 mm (11')
Track Shipping Length	4,940 mm (16' 2")
Transport Trailer Capacity	30 tons (33 short tons), minimum load capacity
Transport Loading Ramp	
Allowable Slope	15° angle **CAUTION:** Refer to Transport Maximum Procedure for Safe Shipping Instructions.

Cylinder Performance Tests

NOTE: *All tests are performed with standard boom, arm and bucket configuration. The bucket should be empty.*

Boom Cylinders Test

The starting points for the test are with the boom and arm extended away from the excavator, and the bucket curled inward. The arm cylinder should be fully retracted; boom and bucket 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 and extra-duty power modes.

Bucket Cylinder Test

Start with the boom up and the teeth of the bucket hanging vertically, 500 mm (1-1/2' - 2') above the ground. Dump and crowd the bucket several times, and average results, for both standard and extra-duty power modes.

Operation	Standard Mode	Power Mode
Boom Up	3.5 - 4.3 sec	3.1 - 3.9 sec
Boom Down	2.7 - 3.3 sec	2.4 - 3.0 sec
Arm Dump	2.8 - 3.4 sec	2.7 - 3.3 sec
Arm Crowd	3.9 - 4.7 sec	3.6 - 4.4 sec
Bucket Dump	2.6 - 3.2 sec	2.6 - 3.2 sec
Bucket Crowd	3.7 - 4.5 sec	3.4 - 4.2 sec

Hydraulic Cylinder Natural Drop Test

To check boom and arm cylinder tightness against the specified performance standard for new cylinders, put a full load of dirt in the bucket and move the attachment cylinders so that the arm cylinder is extended 20 - 50 mm (1" - 2") and boom cylinders are retracted the same amount, 20 - 50 mm (1" - 2"). The top of the bucket should be approximately 2 m (6' - 7') off the ground.

Shut down engine and measure cylinder drop after 5 minutes. Bucket cylinder should not show more than 40 mm (1.57") change, while the arm and boom cylinders should not fall 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. Use the attachment to jack up one side of the machine and operate the raised travel motor. Record the number of seconds it takes the crawler shoe to make 3 full rotations, during both high speed and low speed operation.

Operation	Standard Mode	Power Mode
High Speed	21.8 - 23.8 sec	20.2 - 23.2 sec
Low Speed	37.8 - 40.8 sec	35.3 - 39.3 sec

⚠ CAUTION

Observe the following safety precautions:

1. **Use extra caution and adequate safety shielding when welding near fuel and oil tanks, batteries, hydraulic piping lines or other fire hazards.**
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 that could be damaged by weld spatters, use adequate shielding protection in front of the assembly.**
5. **During 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.**

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 dimensional tolerances between moving parts - pistons and cylinders, or shoes and swash plates, for example - 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 due to neglect or careless maintenance, could all produce sufficient fluid loss to cause damage.

When starting the engine (particularly after long layoff or storage intervals), make sure that all hydraulic controls and operating

Fatigue Spalling

Flaking of surface metal resulting from fatigue.

Replace bearing - clean all related parts.

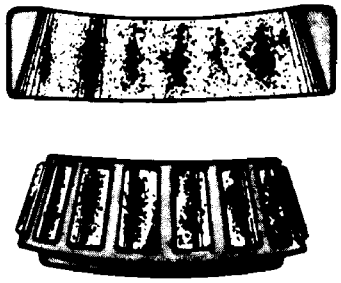

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Figure 10

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.

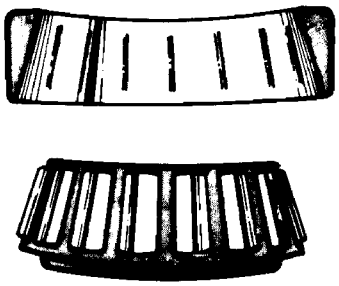

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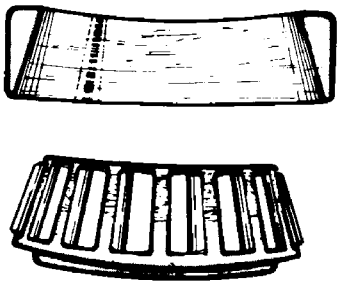
Figure 11

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	S.A.E. 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.
- 0.90 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

20. Remove air ducts (1, 2, 3 and 4, Figure 6) from cabin rear panel.
21. Remove across bar (5, Figure 6) between left and right side of cabin.

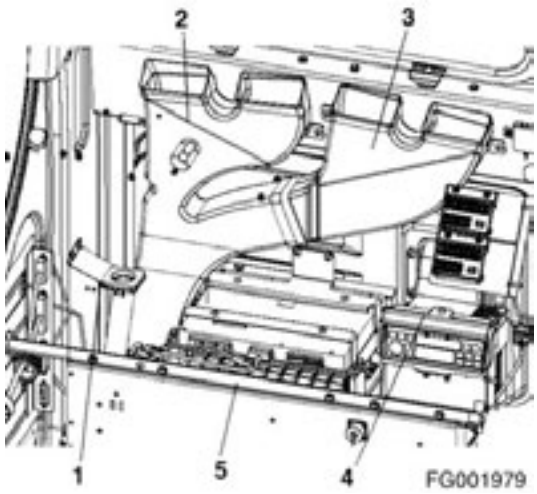


Figure 6

22. Remove air ducts (1, 2, 3, 4 and 5, Figure 7) right side of cabin step by step from the front duct.
23. Disconnect washer hose located at floor plate bottom.
24. Disconnect cabin wiring connectors from main harness.

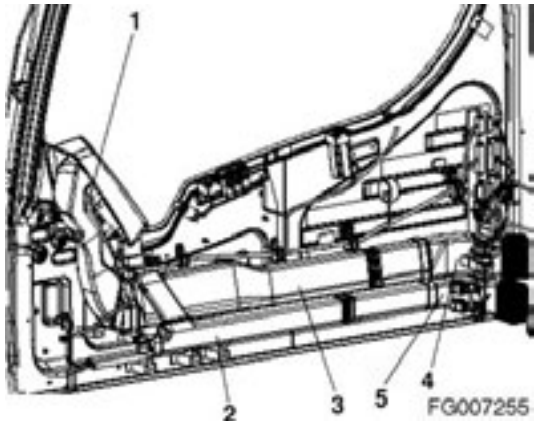


Figure 7

25. Remove four mounting nuts from four corners of cabin floor (1, Figure 8).
26. Remove four M12 hex bolts (2, Figure 8) and two M10 hex bolts (3, Figure 8).

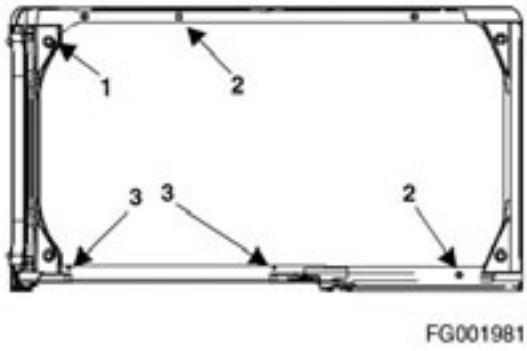


Figure 8

SAFETY PRECAUTIONS

CAUTION

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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	5503 and Up
DX180LC	5209 and Up
DX225LC	5890 and Up
DX225LL	5001 and Up
DX225NLC	5226 and Up
DX255LC	5150 and Up
DX300LC	8340 and Up
DX300LL	5001 and Up
DX340LC	6113 and Up
DX350LC	5980 and Up
DX380LC	5162 and Up
DX420LC	5368 and Up
DX480LC	10022 and Up

Counterweight

Edition 1

Fuel Tank

Edition 1

19. Tag and disconnect wires leading to fuel sender (16, Figure 11) on side of fuel tank (1).

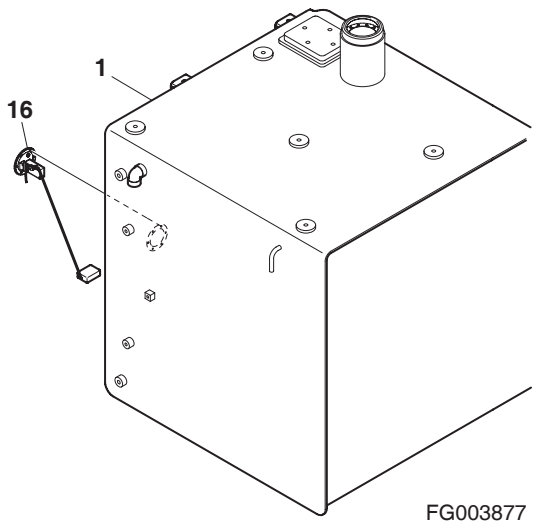

Figure 11

20. Remove four bolts (35 and 36, Figure 12) and cover (37) from fuel tank and support.

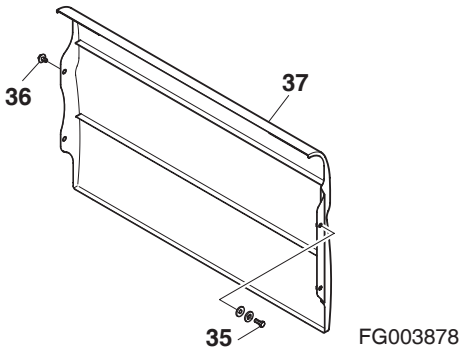

Figure 12

21. Install two 12 mm eyebolts in threaded holes (38 and 39, Figure 13). Using a suitable lifting device, sling eyebolts.

22. Remove six bolts (7) and spacers (13, Figure 13) holding tank (1) to frame. Lift tank 25 mm (1") and make sure it is balanced. Make sure that there are no other electrical wires or hoses connected to tank. Completely remove tank after inspection.

    NOTE: *The clear level gauge on the side of the tank is easily damaged. Be careful of obstacles and wind gusts.*

23. Remove shims (9, Figure 13).

    NOTE: *If tank is to be reused note position and amount of shims used for each mounting bolt location.*

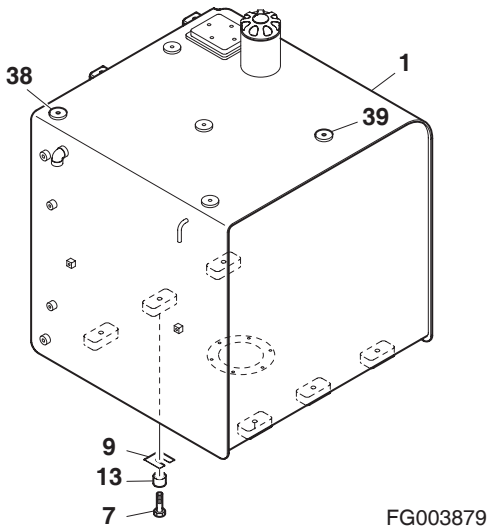

Figure 13

SAFETY PRECAUTIONS

CAUTION

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DX140LC	5001 and Up
DX180LC	5001 and Up
DX225LC	5434 and Up
DX225NLC	5001 and Up
DX255LC	5001 and Up
DX300LC	7440 and Up
DX340LC	5980 and Up
DX350LC	5980 and Up
DX380LC	5109 and Up
DX420LC	5327 and Up

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

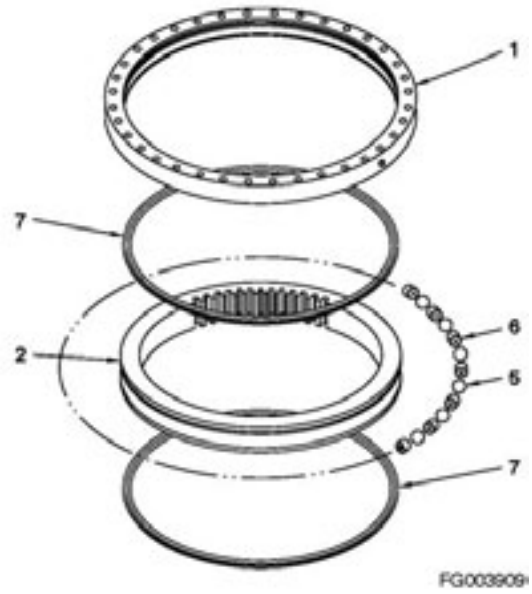


Figure 2

Disassembly

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

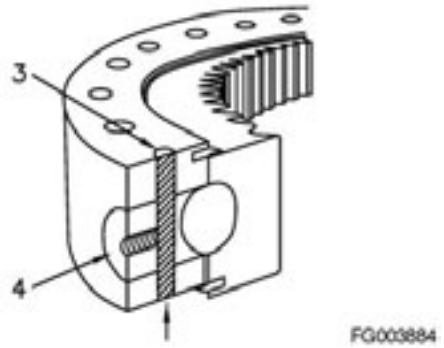


Figure 3

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

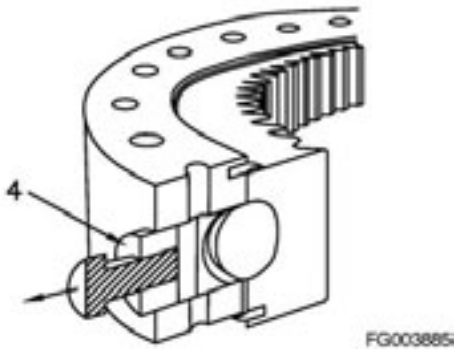


Figure 4

GENERAL DESCRIPTION

Theory of Operation

The swing motor final drive is a two-stage planetary gearbox with two planet gears, two sun gears and two-stage output reduction. The planetary gear engages the ring gear. The pinion gear is connected to the output shaft and spline.

The final drive reduces swing motor rpm in order to increase swing motor output torque. The available maximum swing speed provides a fast turning rate for efficient, rapid work cycling with more than adequate power for good acceleration.

9. Use a rollover machine to turn assembly over, loosen lock wire, bolts and cover.

Figure 19

Figure 20

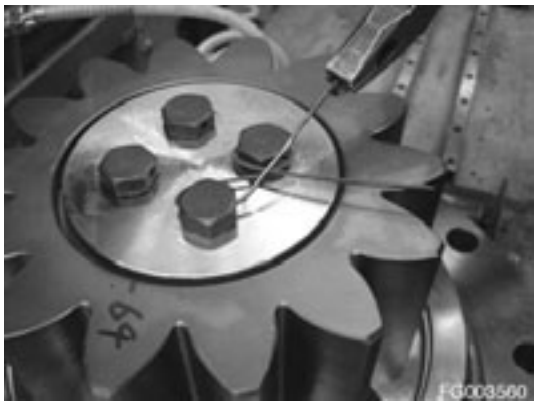


Figure 21

5. Install three remaining No. 2 gears in same manner.

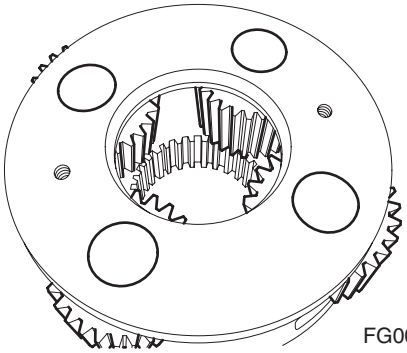


Figure 49

6. After all four shafts are installed, align spring pin with carrier hole and drive it into position using a hammer.

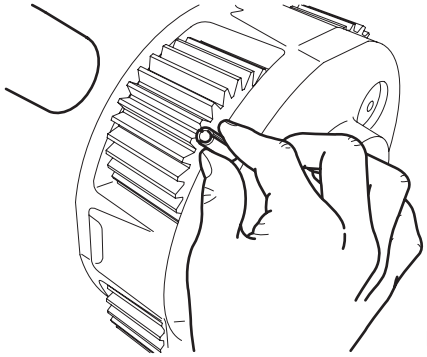


Figure 50

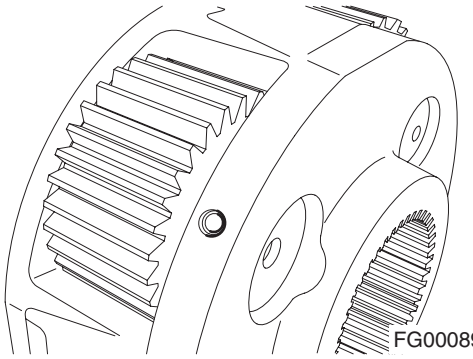


Figure 51

7. Using a hammer and punch, calking spring pin into position.

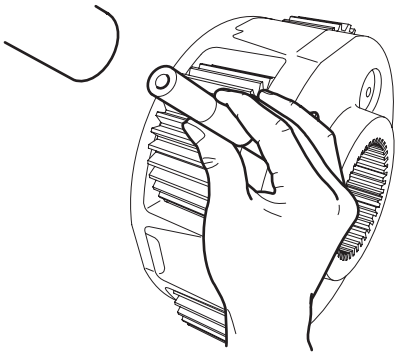


Figure 52

6. Insstall plugs into PT1/2 and PT1/8 drain ports.

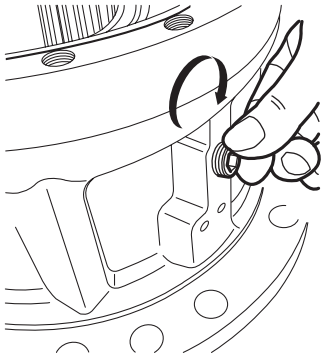


Figure 88

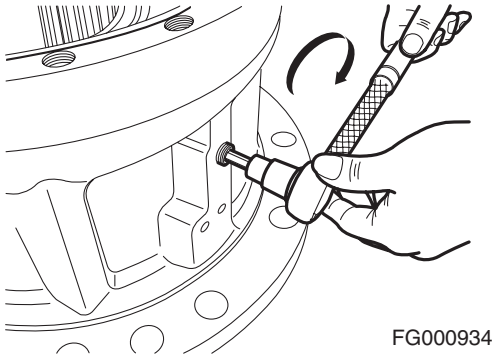


Figure 89

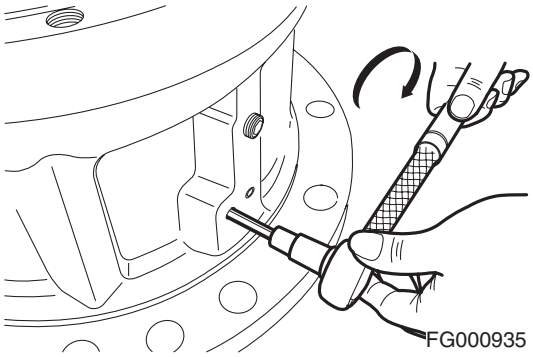


Figure 90

Assembly of Ring Gear

1. Insertion of lock pin.

   Insert four lock pins in four reamed holes of case flange. Tap them into place, by gently hitting them with a soft-face hammer.

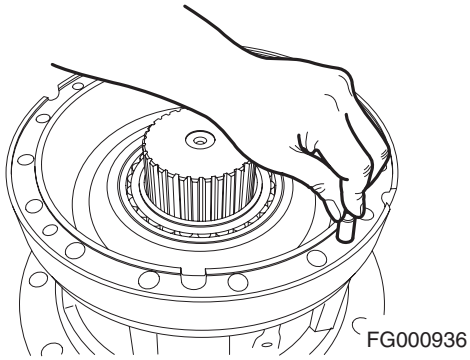


Figure 91

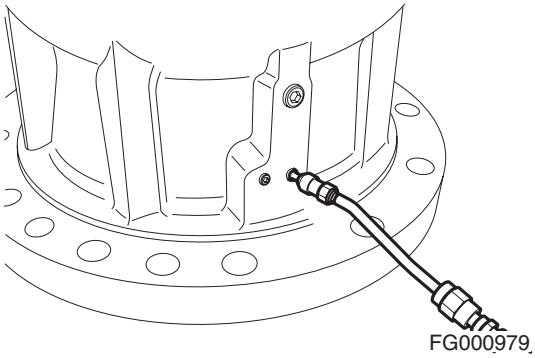


Figure 125

2. Remove grease fitting and install a plastic plug in hole to prvent contamination. A grease hose will be connected during installtion on machine.

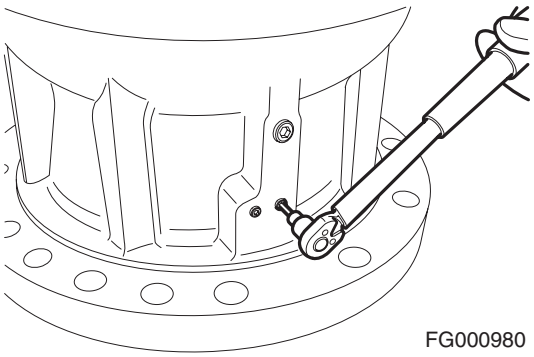


Figure 126

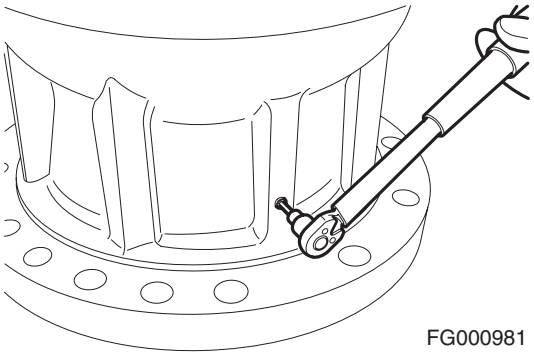


Figure 127

SAFETY PRECAUTIONS

CAUTION

Follow all safety recommendations and safe shop practices outlined in the front of this manual or those contained within this section.

Always use tools and equipment that are in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

APPLICABLE MODELS

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

MODEL	SERIAL NUMBER RANGE
DX300LC	7440 and Up
DX340LC	5980 and Up
DX350LC	5980 and Up

TRACK SHOES AND LINKS

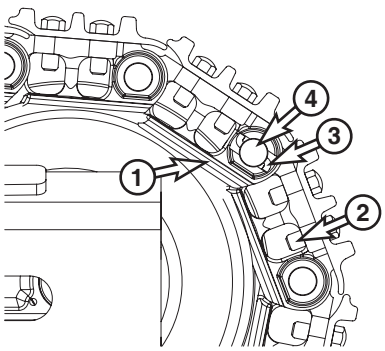
Track Removal

1. Position machine on a smooth level surface with adequate room for forward and reverse travel.
2. Relieve track tension. Refer to "Track Tension" in this section for procedure.
3. Move machine until master link (1, Figure 8) is positioned at approximately 10 o'clock from top position on front idle roller.
4. Remove four nuts and bolts (2, Figure 8) holding shoe to link. Remove enough shoes to make access to lock pin easier.

   NOTE: *Support track shoes with blocking so that when master pin (4*, Figure 8*) is removed track will not fall.*

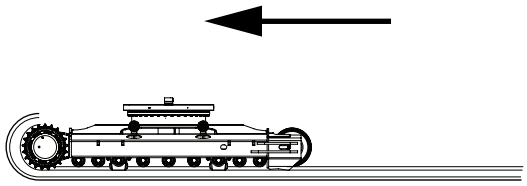
5. Straighten lock pin (3, Figure 8) and remove it from master pin (4). Discard lock pin.
6. Remove master pin from master links.
7. Move unit backward until entire track is laying on ground.

   NOTE: *Do not drive unit off track.*



FG003982

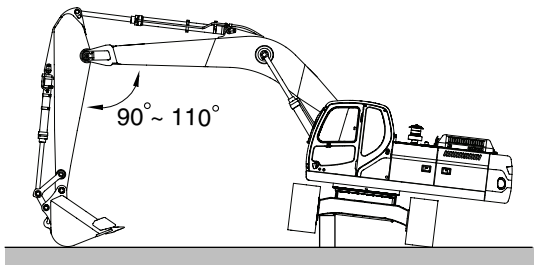
Figure 8



FG003911

Figure 9

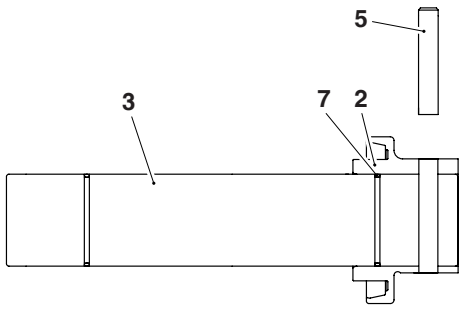
8. Rotate upper structure to 90° from track. Use bucket and boom to raise track frame off track.
9. Position blocking under frame.



FG000345

Figure 10

2. Apply grease to the O-rings (7, Figure 29) and insert into axle.
3. Align collar (2, Figure 30) and axle (3) pin holes and pin (5) the collar.



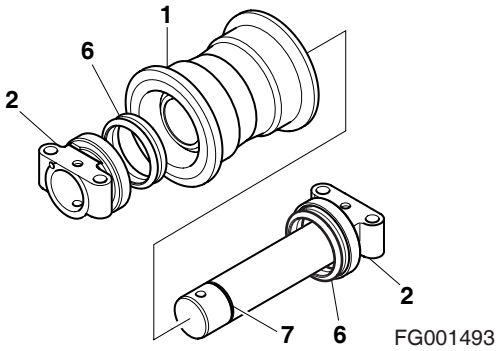
FG001492

Figure 30

4. Insert floating seals (6, Figure 31) into the roller (1) and collar (2).

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

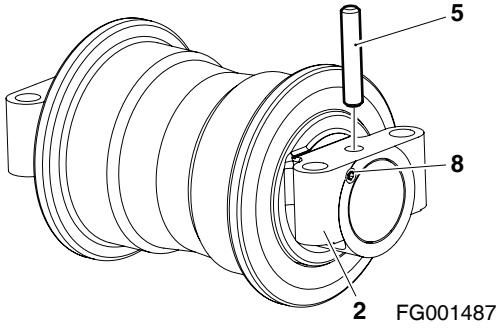
5. Slide the axle inside the roller.



FG001493

Figure 31

6. Install the collar (2, Figure 32), O-ring (7), and pin (5) on the remaining side.
7. Fill with clean engine oil with approximately 480.0 cc (16.2 oz).
8. Install plug (8, Figure 32) on the collar.



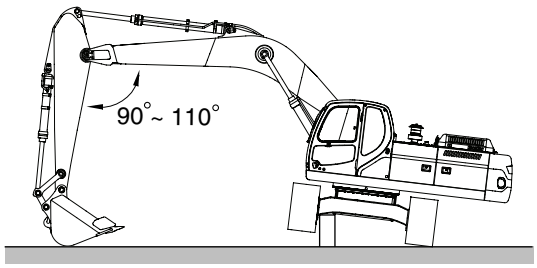
FG001487

Figure 32

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.*



FG000345

Figure 33

Table of Contents

Drive Coupling (Main Pump)

Table of Contents

Hydraulic System Troubleshooting, Testing and Adjustment

Forward Travel Circuit

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

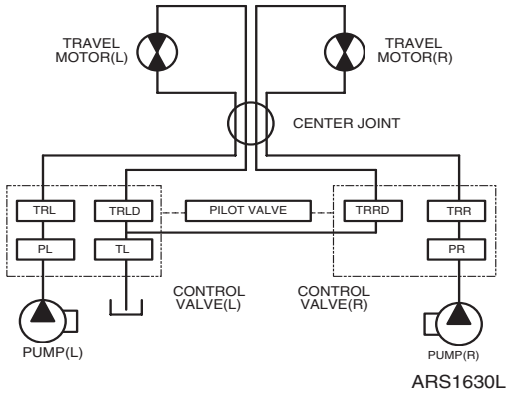


Figure 10

Reverse Travel Circuit

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

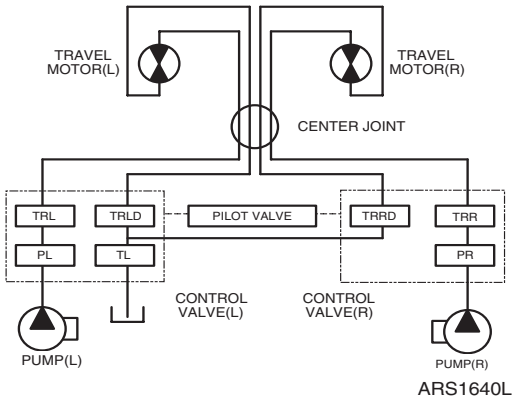


Figure 11

FLOW METER AND FLOW METER KIT INSTALLATION AND TESTING

Checking regulator and pump output, to assess the output balance between the front and rear pumps and to verify operating adjustment of each regulator, will require installation of a flow meter.

The After Sales Service department of the nearest local *DOOSAN* dealer can assist you with these tests or, if you prefer carrying out your own testing, they should be able to help in putting together a hose and fitting kit (or the required dimensions and specifications for hoses and fittings) to allow you to install a flow meter downstream from the main pump assembly.

Installation and Testing Procedure

- Shut down engine and operate controls to release hydraulic pressure from the accumulator.
- Vent the reservoir to release all pressure from the hydraulic system.
- Remove guard panels from around the main pump assembly.
- Disconnect the main pump discharge output line. Install the input flange of the flow meter on the pump end of the output line.
- Cap off the unused (input) end of the pump discharge line with a blocking flange.
- Connect a premeasured length of hydraulic hose, between the output end of the flow meter assembly and the top of the reservoir. Use appropriate fittings and adapter flanges to guarantee a pressure tight seal.

  NOTE: *Be sure to maintain even tightening torque on all flange fittings. Use Loctite brand "PST 545" (or an alternate manufacturer's hydraulic system joint seal) if required, to give an airtight seal.*

- An assistant – who must remain at the operator's control station at all times – should restart the engine and run it long enough (at minimum rpm) to de-aerate the system and warm up the engine and hydraulic system to operating temperature.

Record the values of all test results in three columns, comparing 1) pump pressure (from the instrument panel display) with 2) measured flow, in gallons or liters per minute, from the installed flow meter. The third column of test results should provide a record of engine rpm measured during each of the following tests – with the engine speed control dial set at maximum, the power mode selector at Power Mode and the work mode selector at digging mode:

TROUBLESHOOTING – JOYSTICK CONTROL VALVE

Problem	Possible Cause	Remedy
Secondary pressure does not increase.	Low primary pressure.	Check primary pressure.
	Broken spring.	Replace spring.
	Spool sticking.	Clean, repair or replace.
	Excess spool to casing clearance.	Replace spool casing.
	Worn or loose handle subassembly.	Repair or replace handle subassembly.
Secondary pressure too high.	Dirt, other interference between valve parts.	Clean, repair or replace.
	Return line pressure too high.	Redirect return line.
Secondary pressure does not hold steady.	Dirt, other interference between valve parts, or worn spool sticking intermittently.	Clean, repair or replace.
	Interference or binding on spool return spring.	Clean, repair or replace.
	Unsteady pressure in tank return line.	Redirect return line.
	Air bubbles in piping (temporary) or air leak.	Vent air, or repair leak.
NOTE: *Look for evidence of leaking oil to help locate damaged seals or gaskets that could be the cause of air leaks.*		

Center Joint (Swivel)

Edition 1

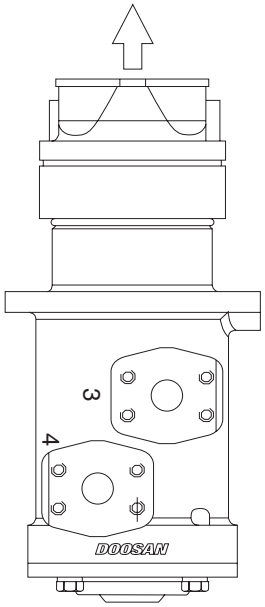
CAUTION

Care should be taken not to make a flaw on the surface of the Shaft when disassembling the Hub of the Shaft assembly.

6. Disassemble the hub from the shaft assembly.

   It can be disassembled easily by fixing the Shaft assembly, tightening at least 2-10mm eye bolts on the Hub, and lifting it with a hoist slowly.

7. If the shaft assembly doesn't separate easily when the thrust plate and retaining ring are removed, use a wooden block and hammer to drive it out of the housing



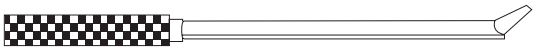
FG013230

Figure 4

8. Separate the Hub into 8ea sliper seals, 1ea O-ring(1BP80), and 1ea Dust seal(LBH80).

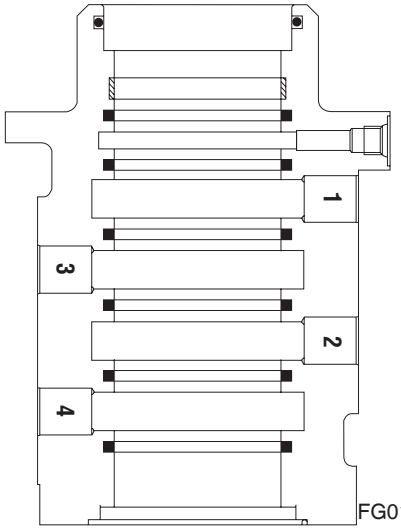
CAUTION

Care should be taken not to damage the inside of the Hub becasuse it is likely to be damaged when disassembling the slipper seal. It may be disassembled more easily with a driver whose tip is bent as shown in the figure below.



FG013231

Figure 5



FG013232

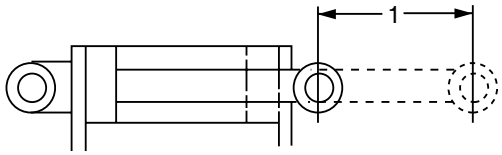
Figure 6

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

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

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

$Q_1 > Q_2$



FG001459

Figure 3

MODEL	CYLINDER	$\varnothing A^{-0.2}_{-0.3}$	$\varnothing B^{-0.2}_{-0.3}$	$C^{0}_{-0.1}$	D	MODEL (CYLINDER)
DX140LC	BOOM	75.0 mm (2.95 in)	89.0 mm (3.50 in)	6.0 mm (0.24 in)	7.0 mm (0.28 in)	
	ARM	80.0 mm (3.15 in)	94.0 mm (3.70 in)	6.0 mm (0.24 in)	7.0 mm (0.28 in)	
	BUCKET	65.0 mm (2.56 in)	79.0 mm (3.11 in)	6.0 mm (0.24 in)	7.0 mm (0.28 in)	
DX180LC	BOOM	80.0 mm (3.15 in)	94.0 mm (4.29 in)	6.0 mm (0.24 in)	7.0 mm (0.28 in)	
	ARM	90.0 mm (3.54 in)	104.0 mm (4.10 in)	6.0 mm (0.24 in)	7.0 mm (0.28 in)	
	BUCKET	75.0 mm (2.95 in)	89.0 mm (3.50 in)	6.0 mm (0.24 in)	7.0 mm (0.28 in)	
DX225LC	BOOM	100.0 mm (3.94 in)	114.0 mm (4.49 in)	6.0 mm (0.24 in)	7.0 mm (2.28 in)	
	ARM	100.0 mm (3.94 in)	114.0 mm (4.49 in)	6.0 mm (0.24 in)	7.0 mm (2.28 in)	
	BUCKET	80.0 mm (3.15 in)	94.0 mm (3.70 in)	6.0 mm (0.24 in)	7.0 mm (2.28 in)	
DX225NLC	BOOM	100.0 mm (3.94 in)	114.0 mm (4.49 in)	6.0 mm (0.24 in)	7.0 mm (2.28 in)	
	ARM	100.0 mm (3.94 in)	114.0 mm (4.49 in)	6.0 mm (0.24 in)	7.0 mm (2.28 in)	
	BUCKET	80.0 mm (3.15 in)	94.0 mm (3.70 in)	6.0 mm (0.24 in)	7.0 mm (2.28 in)	
DX255LC	BOOM	90.0 mm (3.54 in)	104.0 mm (4.10 in)	6.0 mm (0.24 in)	7.0 mm (2.28 in)	
	ARM	100.0 mm (3.94 in)	114.0 mm (4.49 in)	6.0 mm (0.24 in)	7.0 mm (2.28 in)	
	BUCKET	90.0 mm (3.54 in)	104.0 mm (4.10 in)	6.0 mm (0.24 in)	7.0 mm (2.28 in)	
DX300LC	BOOM	95.0 mm (3.74 in)	109.0 mm (4.29 in)	6.0 mm (0.24 in)	7.0 mm (2.28 in)	
	ARM	105.0 mm (4.13 in)	121.0 mm (4.76 in)	6.0 mm (0.24 in)	7.0 mm (2.28 in)	S/ARM
	BUCKET	90.0 mm (3.54 in)	104.0 mm (4.10 in)	6.0 mm (0.24 in)	7.0 mm (2.28 in)	S/BUCKET
DX340LC / DX350LC	BOOM	100.0 mm (3.94 in)	114.0 mm (4.49 in)	6.0 mm (0.24 in)	7.0 mm (2.28 in)	OPT BOOM
	ARM	115.0 mm (4.53 in)	131.0 mm (5.16 in)	6.0 mm (0.24 in)	7.0 mm (2.28 in)	OPT ARM
	BUCKET	100.0 mm (3.94 in)	114.0 mm (4.49 in)	6.0 mm (0.24 in)	7.0 mm (2.28 in)	OPT BUCKET
DX380LC	BOOM	105.0 mm (4.13 in)	121.0 mm (4.76 in)	6.0 mm (0.24 in)	7.0 mm (2.28 in)	
	ARM	115.0 mm (4.53 in)	131.0 mm (5.16 in)	6.0 mm (0.24 in)	7.0 mm (2.28 in)	S / ARM
	BUCKET	100.0 mm (3.94 in)	114.0 mm (4.49 in)	6.0 mm (0.24 in)	7.0 mm (2.28 in)	S / BUCKET
DX420LC	BOOM	115.0 mm (4.53 in)	131.0 mm (5.16 in)	6.0 mm (0.24 in)	7.0 mm (2.28 in)	
	ARM	120.0 mm (4.72 in)	136.0 mm (5.35 in)	6.0 mm (0.24 in)	7.0 mm (2.28 in)	
	BUCKET	110.0 mm (4.33 in)	126.0 mm (4.96 in)	6.0 mm (0.24 in)	7.0 mm (2.28 in)	

REASSEMBLY

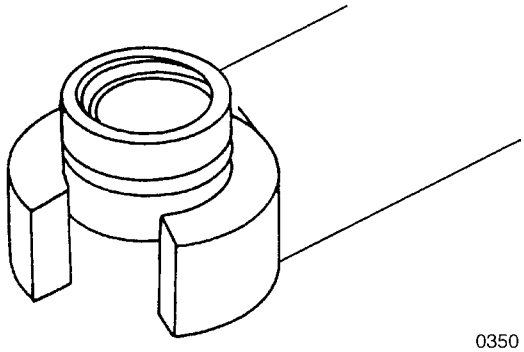
IMPORTANT

Replace any part that shows evidence of damage or excessive wear. Replacement of all O-rings and flexible seals is strongly recommended. Before starting the cylinder reassembly procedure, all parts should be thoroughly cleaned and dried, and/or prelubricated with clean hydraulic fluid. Prepare the work area beforehand to maintain cleanliness during the reassembly procedure.

NOTE: *Reassemble the subassemblies of the cylinder in the following order:*

1. *Body of the cylinder.*
2. *Piston rod.*
3. *Piston assembly.*
4. *Cylinder head assembly.*

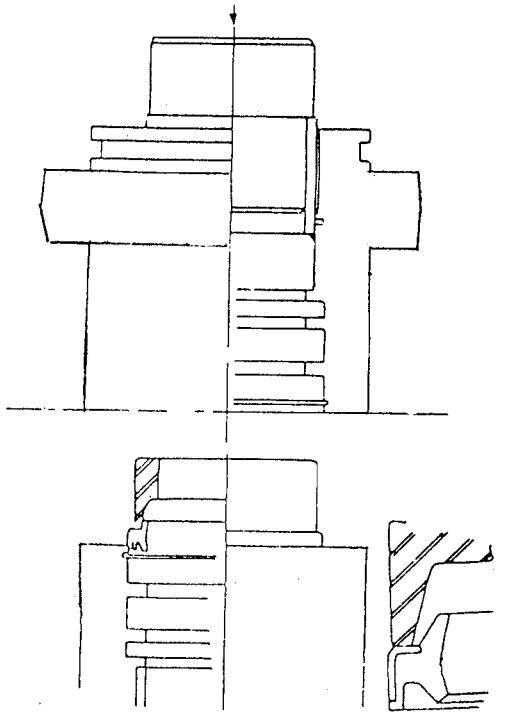
1. Reassemble pin bushing (2), (4) to piston rod and body of cylinder.



0350

Figure 29

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



HAOF440S

Figure 30

Generation of Rotary Power

High-pressure oil from hydraulic pump flows into the cylinder (9) through the valve casing (1) and the valve plate (22). The motor is designed to only let high-pressure oil to flow into one side with relationship to Y-Y axis (the centerline of top and bottom dead centers of piston (13)).

As shown in the Figure 2, the high-pressure oil acts on the piston to generate F1 = P*A (P: supply pressure, A: hydraulic area). F1 is divided into a N1 thrust component and a W1 radial component in relationship to the swash plate with slope of •·. W1 generates a torque T = W1*R1 in relationship to Y-Y, the centerline of top and bottom dead centers of the piston. This torque generates the rotary power through a resultant force (ΣW1*R1) occurring at (4-5) hydraulic pistons by the high-pressure oil. Rotary power and torque, is transferred through the pistons and cylinder (9) via spline to the drive shaft.

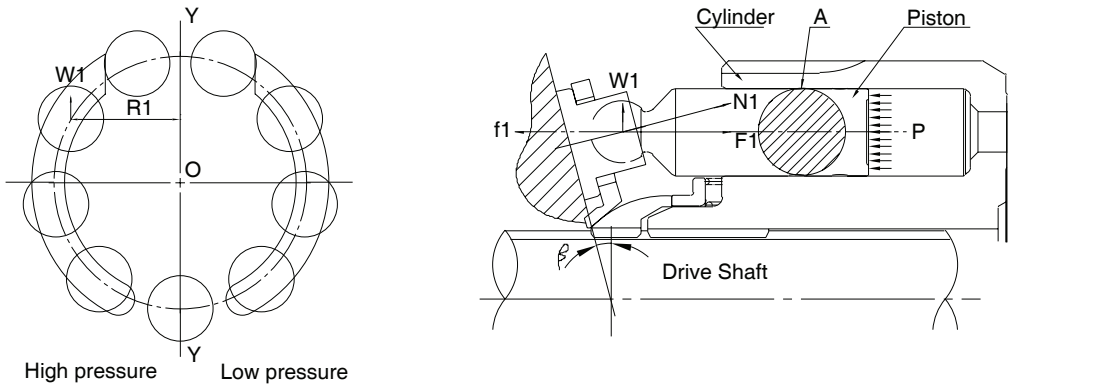
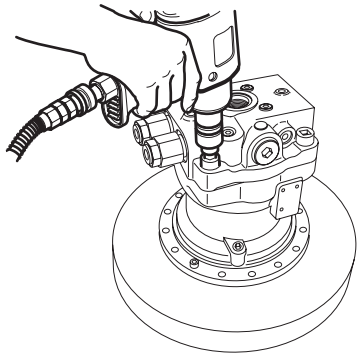


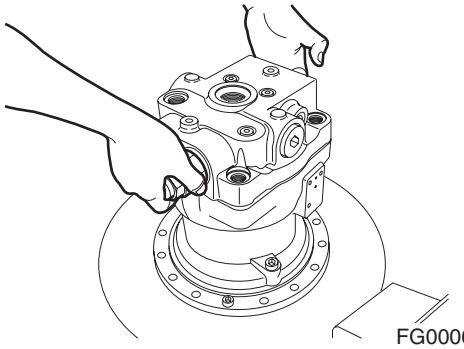
Figure 2

2. Remove rear cover from body (1) by removing hex socket head bolt (23) of its assembly with impact.



FG000685

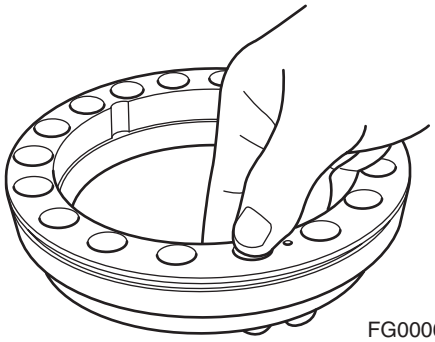
Figure 12



FG000686

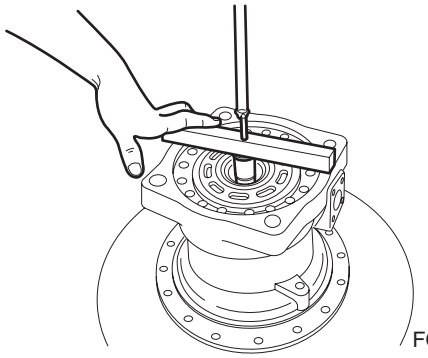
Figure 13

3. Remove brake piston assembly from body (1) using jig.



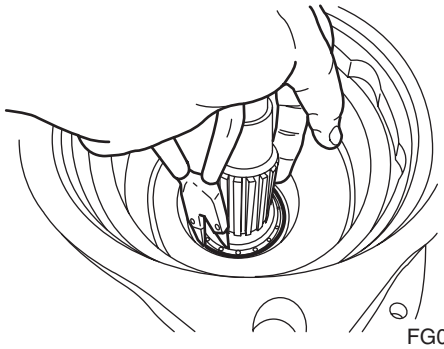
FG000687

Figure 14



FG000688

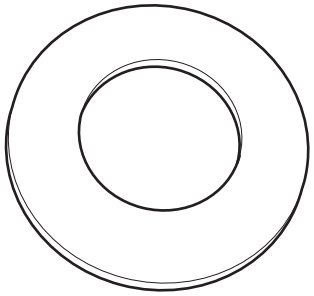
Figure 15



FG000723

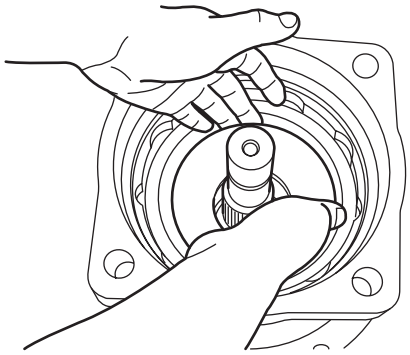
Figure 50

7. Coat shoe plate (8) with grease, and assemble it into body.



FG000724

Figure 51

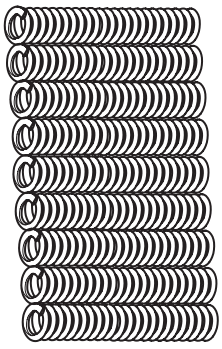


FG000725

Figure 52

Assembly of Cylinder Block Assembly Subassembly

8. Insert nine sets of springs (1 thru 9) in cylinder block (9).



FG000726

Figure 53

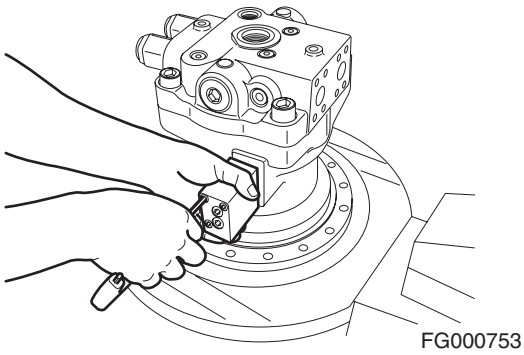


Figure 90

Air Pressure Test

Apply air pressure into assembled motor, dip it in treated oil for one minute and check any leakage from it.

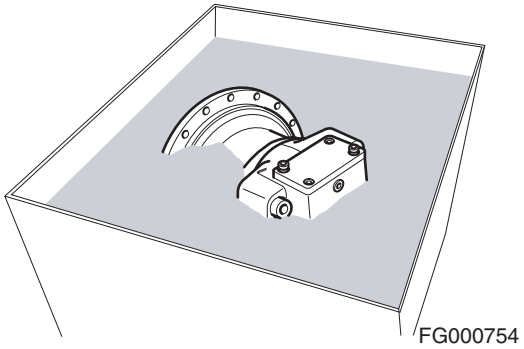


Figure 91

Oil Leakage Check

Wash motor with Color Check No.1, spray No.3, and check for any oil leakage.

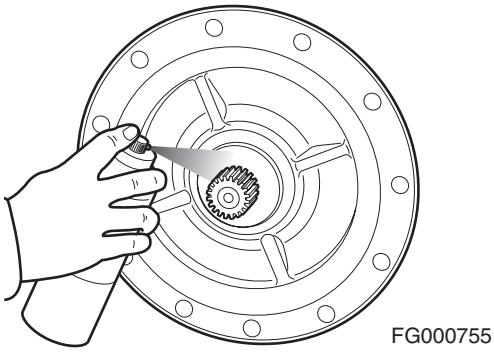
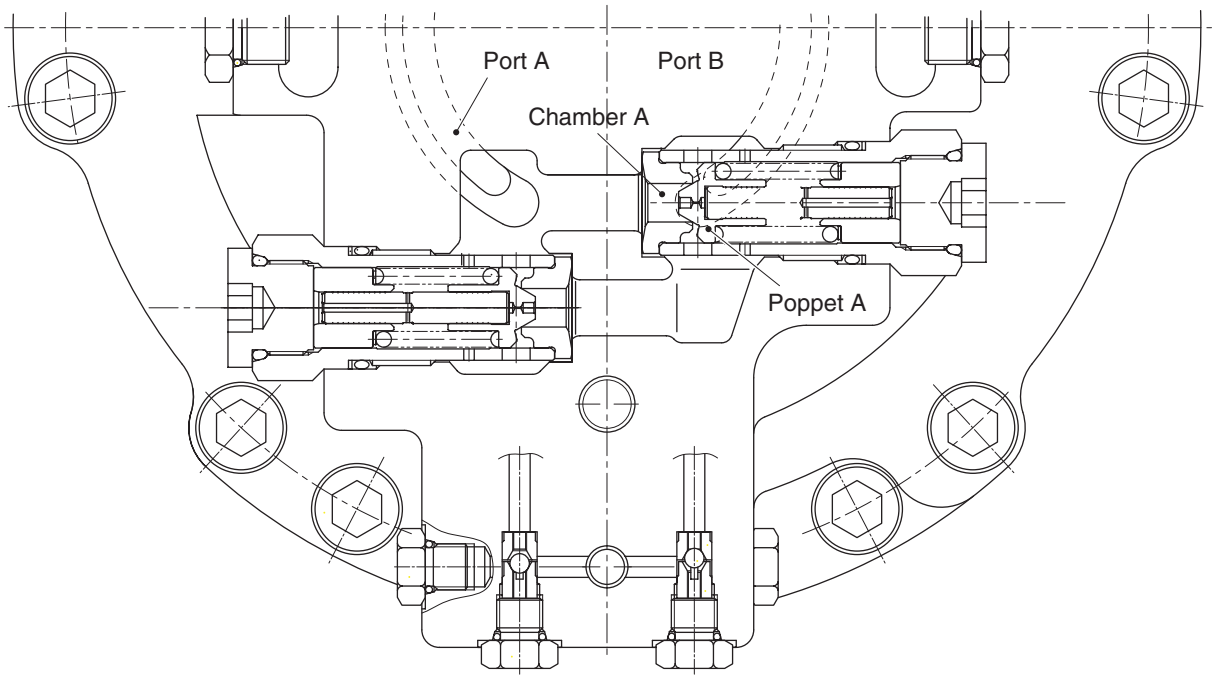


Figure 92

Operation of Relief Valve

The relief valve performs two functions:

1. It maintains uniform pressure when the hydraulic motor starts and bypasses surplus oil at the inlet of the motor to the outlet in relationship with acceleration of the inertia weight.
2. Device is forced to stop by the generation of brake pressure at the discharge side when the inertia weight stops. Chamber A is connected to port A of the motor. Hydraulic oil flows from chamber A to port B because, when the pressure in the port A increases, poppet A is opened; when it is above the spring setting pressure, Poppet A opens and hydraulic flows from chamber A to port B.



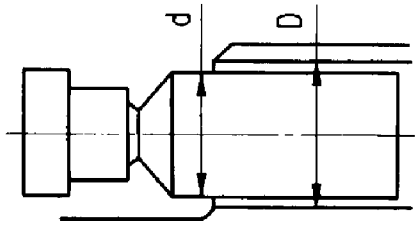
FG001330

Figure 3

Problem	Possible Cause	Remedy
Number of rotation is below specification.		
Insufficient rotation.	Lack of incoming oil.	Check hydraulic circuits up to motor.
	Too high oil temperature.	Decrease oil temperature.
	Too much leakage.	Replace or repair faulty parts.
	Each way worn or broken that tilting angle not switched (small to large angle). - Orifice at small tilting side blocked. - Leakage at small tilting chamber (excessive clearance in shaft casing, swash piston, or stopper L).	Replace or repair faulty parts. - Wash or replace orifice. - Replace faulty parts.
Driving power is below specification.		
Low-pressure.	Low set pressure in relief valve.	Adjust pressure.
Brake released but weak driving force.	Sticking or abnormal wear of slideways.	Replace or repair slideway.
Hard to control brake.		
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.
Tilting angle not switched.		
Tilting angle is not switched.	Orifice at the tilting channel of shaft casing blocked.	Wash or replace orifice.
	Tilting angle adjustment spool (531) and case stuck.	Replace faulty parts.
	Leakage due to excessive clearance among shaft casing, swash piston, and stopper.	
	Outer diameter of swash piston and spheral face stuck.	
	High-pressure select valve in valve casing not operating.	
Oil leakage.		
Leakage from oil seal (491).	Oil seal or shaft slidway damaged.	Replace damaged parts and remove any foreign substance.
	High-pressure in case.	Check drain line.
Leakage from assembled parts.	O-ring damaged.	Replace O-ring.
	Volt or plug loosed.	Tighten with specified torque.
Main ways stuck.		
Piston and shoe. Shoe and swash plate. Piston and cylinder. Cylinder and valve plate. Front plate and spherical bushing.	Overload rotation of motor. Increase of temperature. Insufficient intensity of illumination on slideway. Improper oil or lubrication.	Check the operation of relief valve. Check circuits. Repair or replacement of faulty parts. Replace oil.

Parts name and inspection item	Standard dimension	Recommended value of replacement	Remedy
O-ring/Oil seal			When disassembling, replace as a rule.
Kinds of bolt			If there are crushing parts, replace.
Piston ring			If there are signs of sticking or deforming, replace.

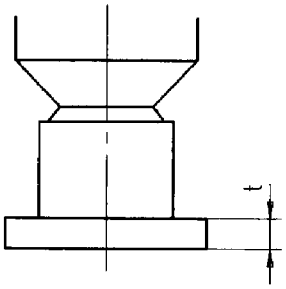
1. Clearance between piston and cylinder bore: D-d



ARS4600S

Figure 39

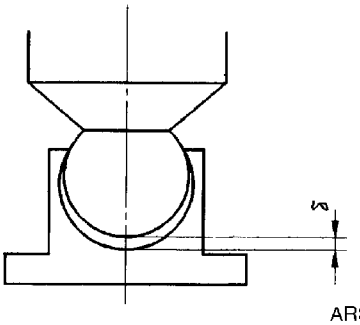
2. Thickness of shoe: t



ARS4610S

Figure 40

3. Vibration of vertical direction of piston and shoe: δ



ARS4620S

Figure 41

4. Insert oil seal (491) in shaft casing (272) using jig. Make sure it is properly seated.

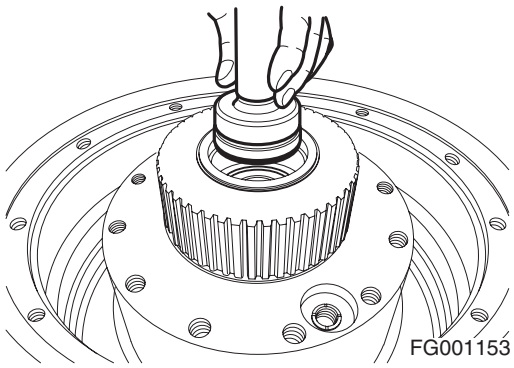


Figure 70

Assembly of Motor Body

1. Connect 5 plugs (461) to shaft casing (303) according to a specified torque.

   NOTE: *Wrap sealing tape around plug, or spread Loctite before starting assembly.*

   NOTE: *Connection torque: 70 - 110 kg•cm (5. - 8 ft lb).*

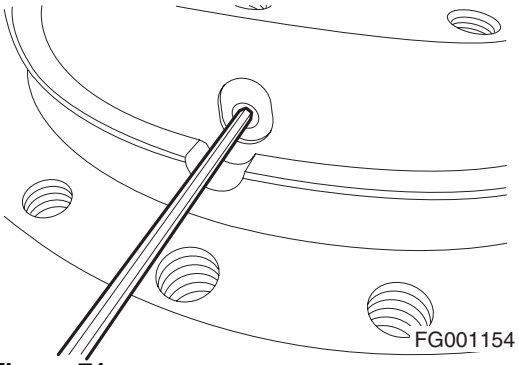


Figure 71

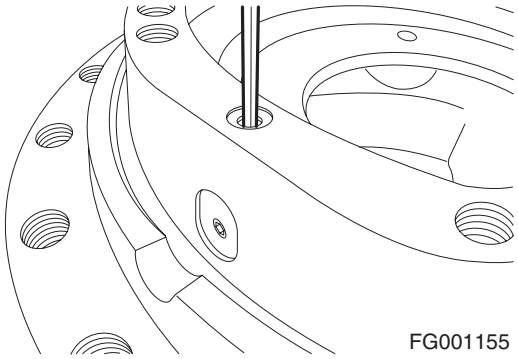


Figure 72

2. Insert pins (452 and 709) using hammer or a round bar.

   NOTE: *Two pins (452: Adjust their height to be 10 mm (0.39 in) above swash plate support surface.*

   NOTE: *Four pins (709): Adjust their height to be 19 mm (0.75 in) above machined shaft casing surface.*

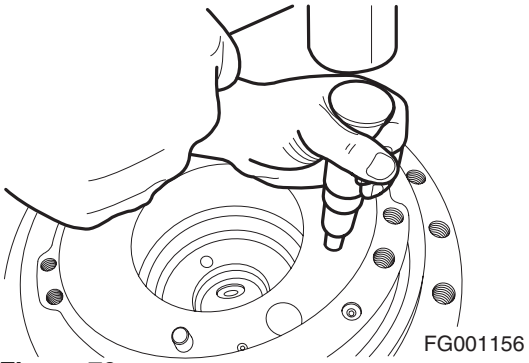


Figure 73

SAFETY PRECAUTIONS

CAUTION

Follow all safety recommendations and safe shop practices outlined in the front of this manual or those contained within this section.

Always use tools and equipment that are in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

APPLICABLE MODELS

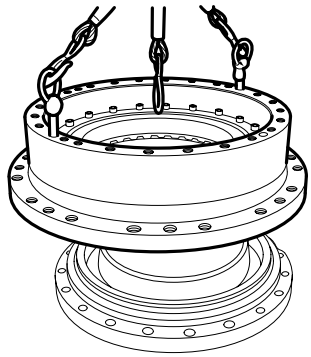
The contents of this section apply to the following models and serial number ranges.

MODEL	SERIAL NUMBER RANGE
DX300LC	7440 and Up

ASSEMBLY OF MOTOR AND HOUSING

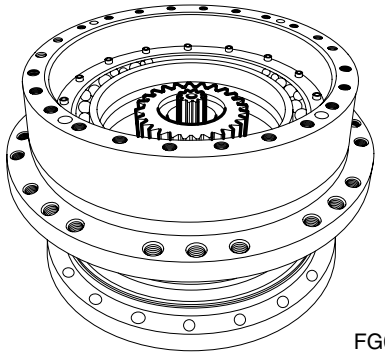
1. Lift housing assembly with hoist, check if installed floating seal are still properly assembled. Position housing assembly on motor assembly (Figure 24).

   NOTE: *Make sure that housing assembly is not tilted when lowering into position.*



FG001196

Figure 24

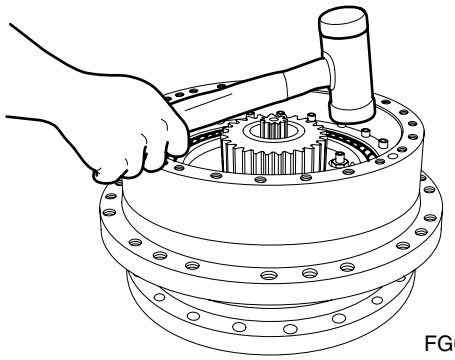


FG001197

Figure 25

2. Angular bearing is a press fit. Install angular bearing in housing by tapping it on opposite sides of outer race with a soft-face (or rubber) hammer.

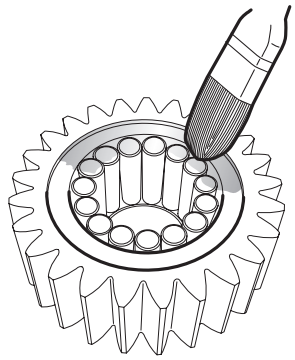
   NOTE: *If practical, a press may be used.*



FG001198

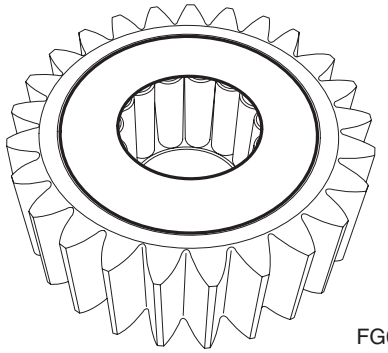
Figure 26

D. Coat side of No. 3 planetary gear with grease, where a thrust washer will be placed. Position a No. 3 thrust washer on gear.



FG001233

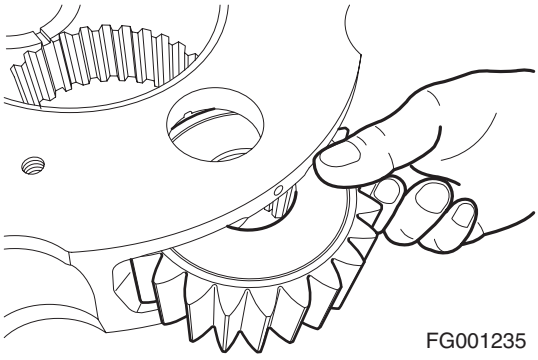
Figure 59



FG001234

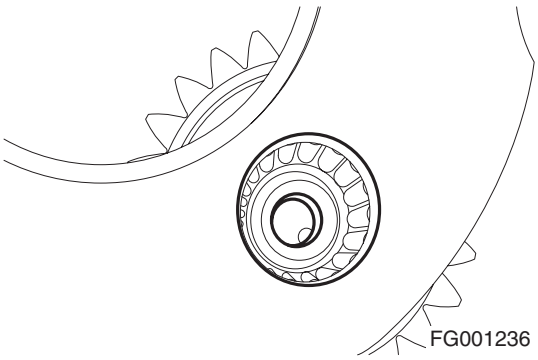
Figure 60

E. Insert No. 3 planetary gear assembly into No. 3 carrier (K1000713) and align holes of carrier and gear.



FG001235

Figure 61



FG001236

Figure 62

5. Cover Assembly

   A. Before installing cover, measure step of upper side of ring gear and No. 4 thrust washer with a special step measuring gauge.

   B. Record measurement. _____

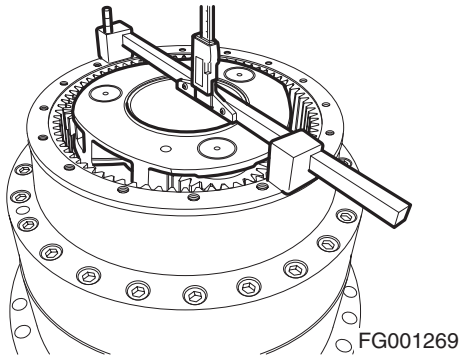
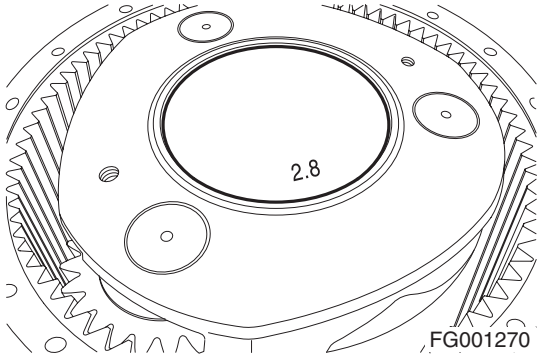

FG001269

Figure 96



FG001270

Figure 97

   C. Measure cover step with a special gauge as shown in Figure 98.

   D. Record measurement. _____

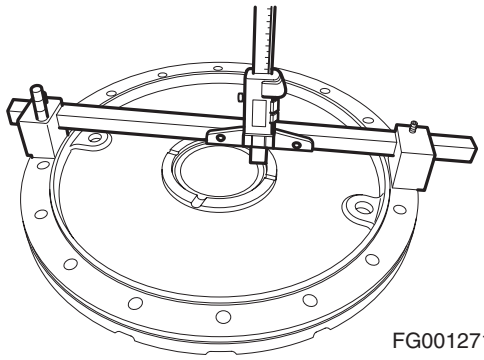

FG001271

Figure 98

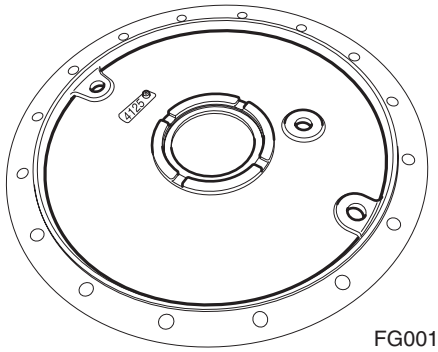

FG001272

Figure 99

Table of Contents

Gear Pump

4. Remove mounting flange taking care to keep flange as straight as possible during removal.

   If mounting flange is stuck, tap around edge with rubber mallet in order to break it away from body.

   NOTE: *Make sure that while removing mounting flange, shaft and other components remain in position.*

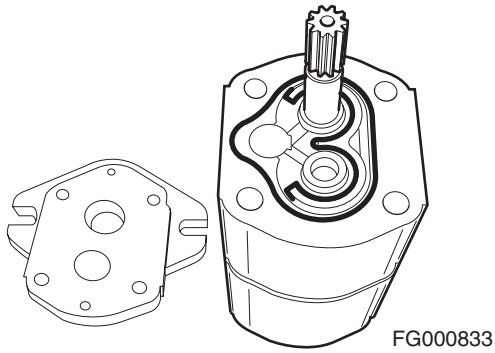

FG000833

Figure 25

5. Remove retaining ring, if replacement is necessary.

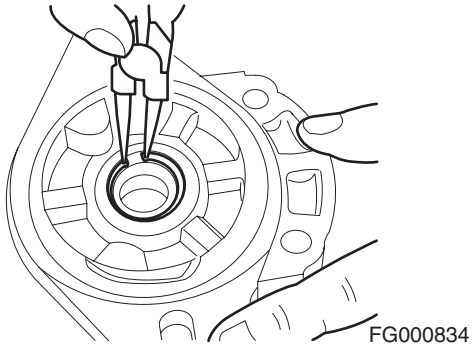

FG000834

Figure 26

6. Remove shaft seal taking care not to damage surface of shaft hole, if replacement is necessary.

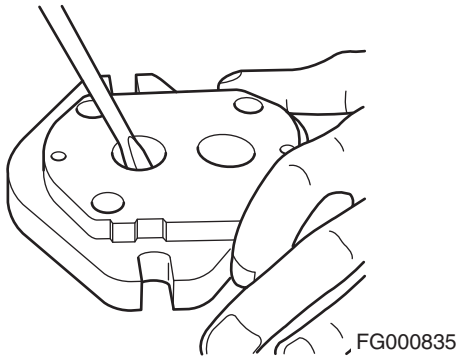

FG000835

Figure 27

7. Pull drive gear up to facilitate removal front plate.

   Remove drive gear, driven gear, rear plate, keeping gears as straight as possible.

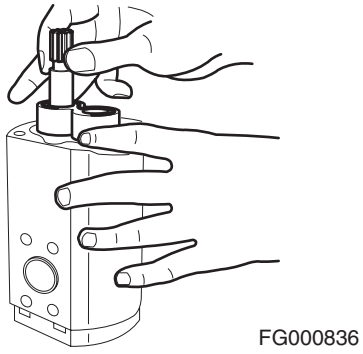

FG000836

Figure 28

SAFETY PRECAUTIONS

CAUTION

Follow all safety recommendations and safe shop practices outlined in the front of this manual or those contained within this section.

Always use tools and equipment that are in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

APPLICABLE MODELS

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

MODEL	SERIAL NUMBER RANGE
DX300LC	7440 and Up

Disassembly

For disassembling the pump, read this section thoroughly and disassemble it in the following sequence. The figures in parentheses after part names show the items in Figure 22 construction of pump.

This maintenance manual describes the disassembling procedures for both the single pump and tandem type double-pump. Disassemble the pump, referring to the contents for its appropriate type.

In addition, for the double-pump, take care not to exchange parts from one pump with the same ones of the other pump.

1. Select place suitable to disassembling.

IMPORTANT

Select a clean place.

Spread a rubber mat or cloth on top of the overhaul workbench to prevent parts from being damaged.

2. Remove dust, rust, etc., from pump surface with cleaning oil or equivalent.
3. Remove drain port plug (468) and drain oil from pump casing.

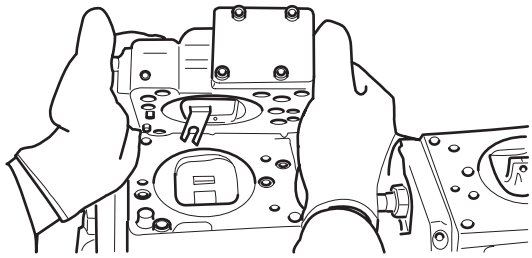
IMPORTANT

For tandem type pump, remove plugs from both front and rear pumps.

4. Remove hex socket head bolts (412 and 413) and regulator.
5. Remove hex socket head bolts (401) which secure swash plate support (251), pump casing (271) and valve block (312).

IMPORTANT

If a gear pump is attached to rear face of pump, remove it before proceeding.



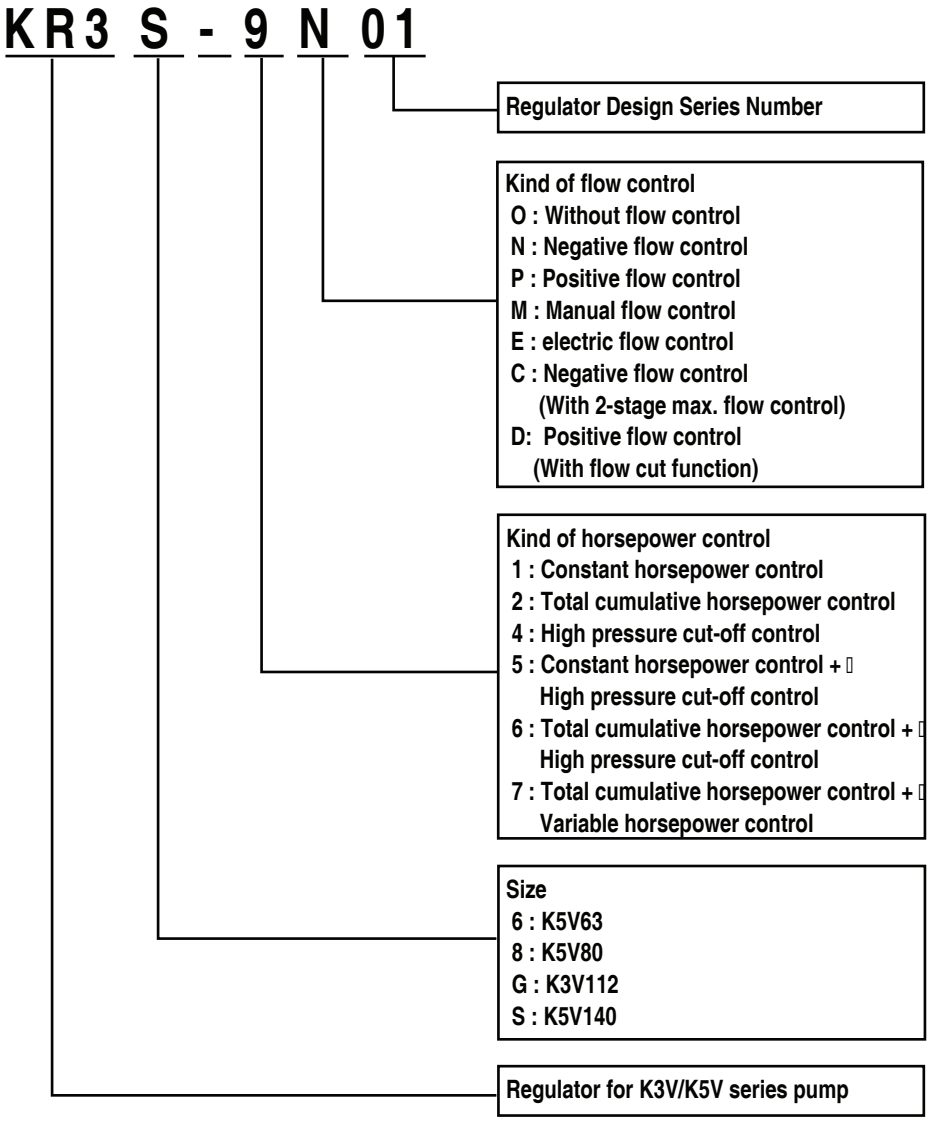
HDM3016P

Figure 5

REGULATOR FOR AXIAL PISTON PUMP

General Description

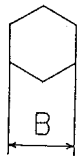
Model Number Designation



FG003923

Figure 23

Tightening Torque

Part Name	Size	Tightening Torque	Tool Name	
Hex socket head bolt (Material: SCM 435)	M 5	70 kg•cm	B = 4	 Allen wrench
	M 6	120 kg•cm	5	
	M 8	300 kg•cm	6	
	M 10	580 kg•cm	7	
	M 12	1,000 kg•cm	8	
	M 14	1,600 kg•cm	10	
	M 16	2,400 kg•cm	12	
	M 18	3,400 kg•cm	14	
	M 20	4,400 kg•cm	17	
PT filling plug (Material: S45C) Wind a seal tape 1 1/2 - 2 turns round the plug.	PT 1/16	70 kg•cm	4	Do.
	PT 1/8	105 kg•cm	5	
	PT 1/4	175 kg•cm	6	
	PT 3/8	350 kg•cm	8	
	PT 1/2	500 kg•cm	10	
PO plug (Material: S35C)	PF 1/4	300 kg•cm	6	Do.
	PF 1/2	1,000 kg•cm	10	
	PF 3/4	1,500 kg•cm	14	
	PF 1	1,900 kg•cm	17	
	PF 1 1/4	2,700 kg•cm	17	
	PF 1 1/2	2,800 kg•cm	17	

12. Insert spring seat (644), pilot spring (646) and adjusting ring (Q) (645) into pilot hole.

13. Install spring seat (624), inner spring (626) and outer spring (625) into compensating hole.

IMPORTANT

When fitting spring seat, do not mistake direction of spring seat.

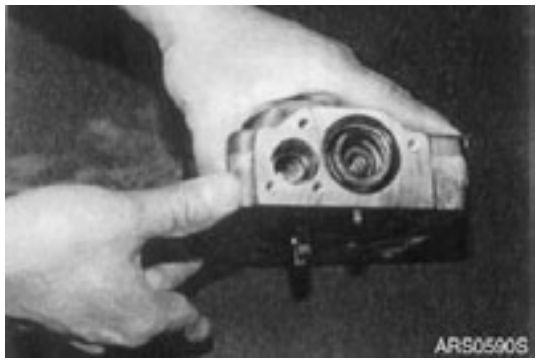


Figure 50

14. Install cover (C) (629) with adjusting screws (628 and 925), adjusting ring (C) (627), lock nut (630), hex nut (801) and adjusting screw (924). Secure them with hex socket head screws (438).

Figure 51

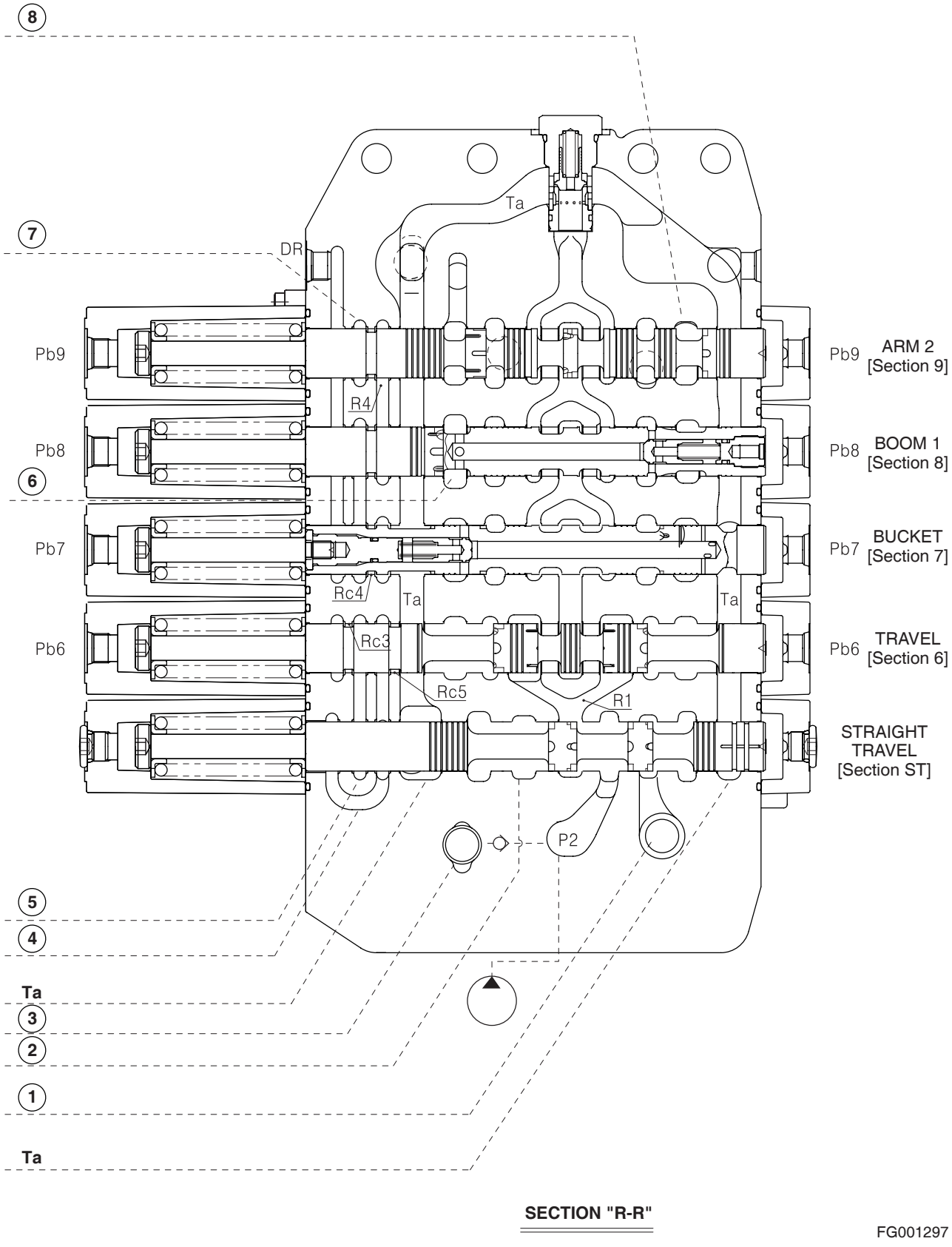

8
7
6
5
4
3
2
1
Ta
DR
Pb9
Pb8
Pb7
Pb6
R4
Rc4
Rc3
Rc5
R1
Ta
Ta
P2
Pb9 ARM 2 [Section 9]
Pb8 BOOM 1 [Section 8]
Pb7 BUCKET [Section 7]
Pb6 TRAVEL [Section 6]
STRAIGHT TRAVEL [Section ST]
Ta
Ta
SECTION "R-R"
FG001297

Figure 3

3. (Boom down (regeneration)

When boom 1 (Section 8) spool is shifted by increasing pressure of boom 1 pilot port (Pb8), neutral passage (R1) is closed. Oil supplied to port (P2) flows through parallel passage (R3) and load check valve (S8-2) to spool and flows into port (B8).

When spool (AD3) of antidrift valve is shifted by increasing pressure of port (P2), poppet (AD1) is opened by decreasing of pressure of spring chamber (AD4), and return oil from port (A8) flows to tank passage. Some return oil opens poppet (S8-3) in boom 1 spool, flows through passage (S8-2), joins at port (B7), and then prevents cavitation of cylinder rod side.

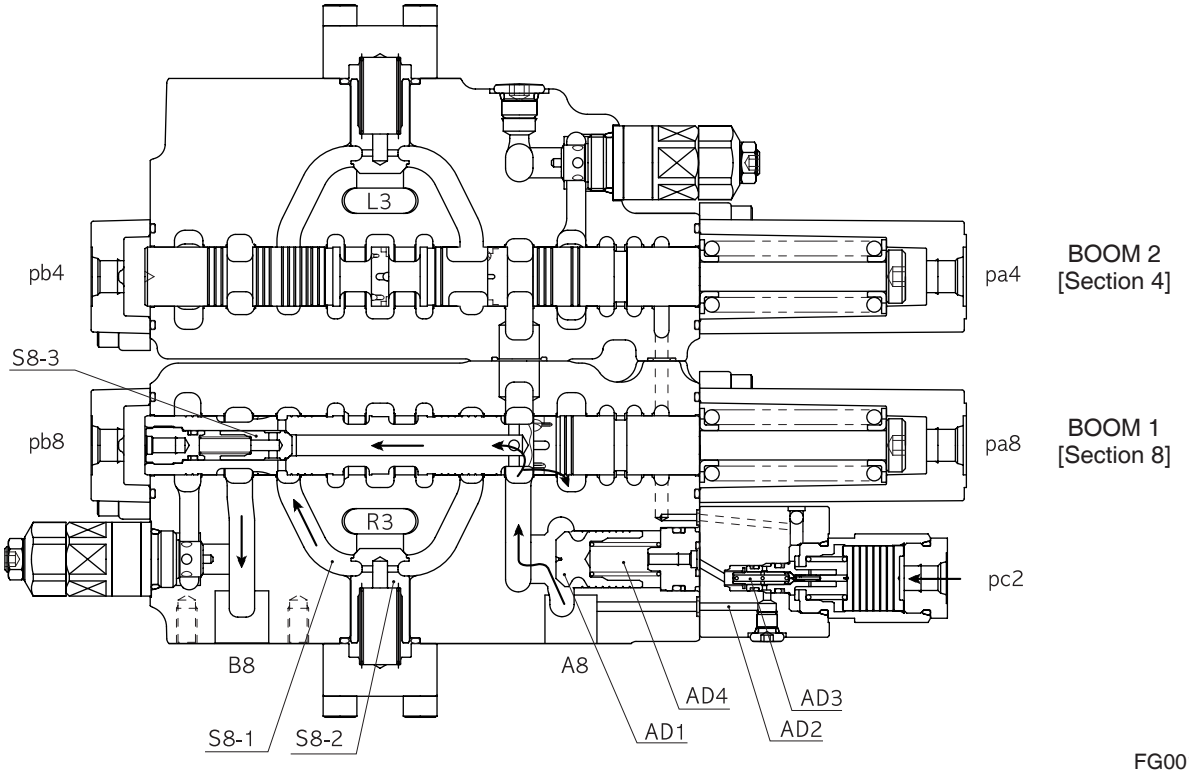


Figure 10

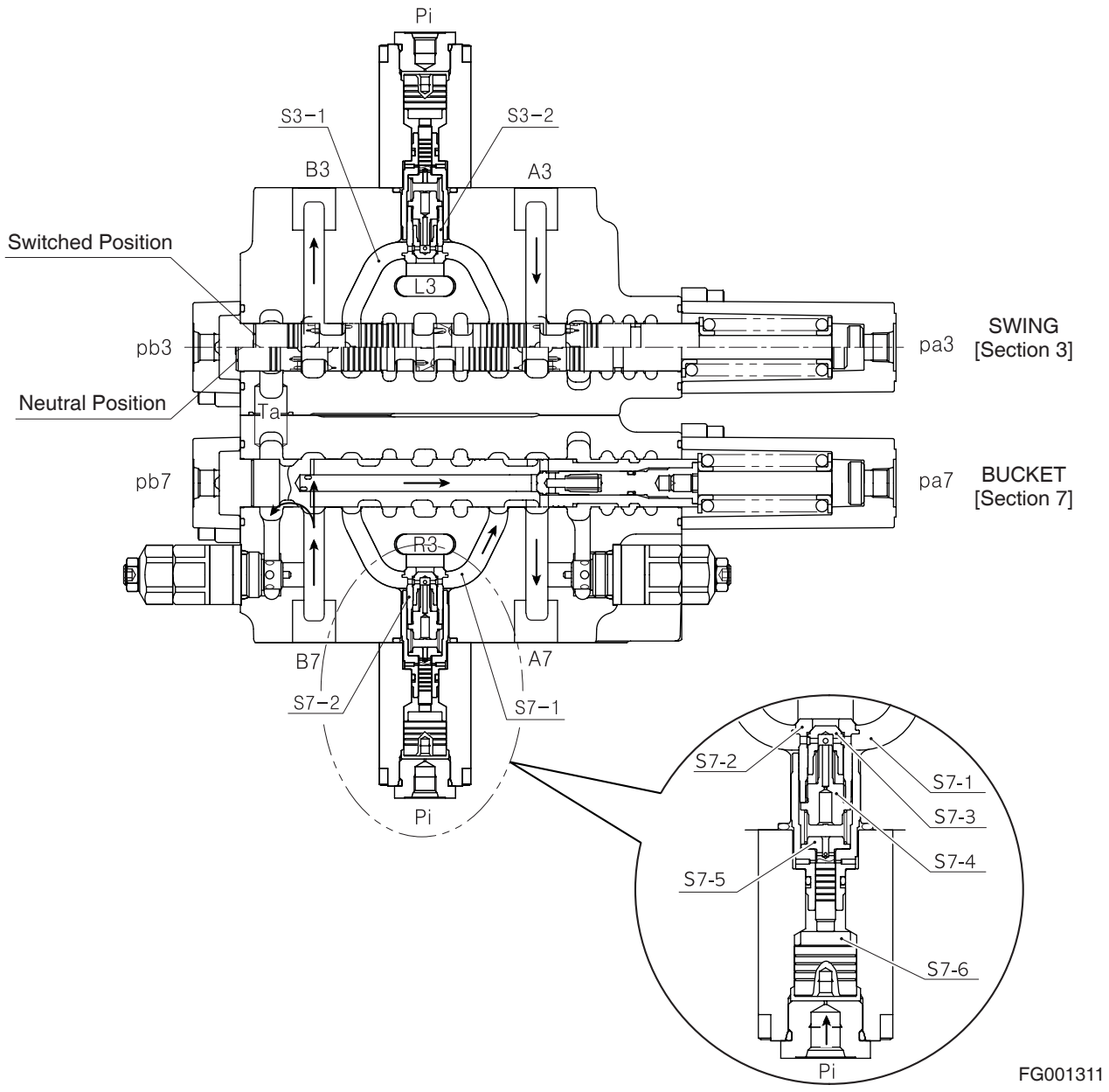

Pi
S3−1
S3−2
B3
A3
Switched Position
L3
pb3
pa3
SWING
[Section 3]
Neutral Position
Ta
pb7
pa7
BUCKET
[Section 7]
R3
B7
A7
S7−2
S7−1
Pi
S7-2
S7-1
S7-3
S7-4
S7-5
S7-6
Pi
FG001311

Figure 18

Reference Number	Description
32	Poppet
33	Spring
57	Spacer
60	Plug Assembly
61	Plug
62	O-ring
68	Main Relief Valve
69	Overload Relief Valve
71	Plug Assembly

Reference Number	Description
72	Plug Assembly
75	Socket Bolt (M10 x40L)
77	Socket Bolt (M16 x130L)
81	Washer
88	Cap
89	O-ring
92	Plug Assembly
93	Plug Assembly

Disassembly of Arm 1 Para-turn Spool Part

1. Remove socket head bolt (78, width across flats: 5 mm) and cap (18).
2. Remove O-ring (23) from cap (18).
3. Remove spool (19) from valve housing under subassembly conditions.
4. Disassembly of spool.

CAUTION

Work with spool gripped in vise with wood (see Figure 37), so as not to scratch outside diameter of spool.

Because Loctite is applied to threaded portion of spool end, heat outside surface of spool with industrial drier to release Loctite.

Heat spool until spool end is easily loosened, and remove immediately after heating it to 200° - 250°C (392° - 482°F).

If it is over heated, replace spring with a new one.

A. Remove spool end (22, width across flats: 5 mm), spring seat (20) and spring (21) from spool (19).

Disassembly of Arm Regeneration Release Valve Part

NOTE: *The part including assembly is shown (assembly number -part number).*

CAUTION

When removing a plug, when pressure is not fully released, or bucket is not lowered to ground, is very dangerous. A part in the valve may spring out and drop the bucket at the same time. Always lower bucket to ground and fully release pressure before disassembling.

1. Remove plug (24, width across flats: 32 mm) and O-ring (25).
2. Remove spring (26) and spool (27-1) from sleeve (27-2).
3. Remove sleeve (27-2) from valve housing.
4. Remove piston (27-3), O-ring (30) and backup ring (31) from sleeve (27-2).

Sequence of Subassembly

CAUTION

Check number of each part, installation position and tools needed before reassembling.

Spool Assembly (Main Spool)

1. Apply Loctite to threaded portion of spool (2-6 and 14-17) and install spring seat, spring and spool end.
2. After gripping spool in vise with wood (that is used when disassembling it), tighten spool end. Tightening torque: 2.04 - 2.24 kg•m (15 - 16 ft lb).

CAUTION

Be careful not to get Loctite into spool by over applying it.

Be careful that spool operation does become deteriorated by over torquing spool end.

When reassembling it and A56, be careful because there are two different types of springs.

Arm 1 Para-turn Spool Assembly

1. Apply Loctite to threaded portion of spool (19) and install spring seat (20), spring (21) and spool end (22).
2. After gripping spool in vise with wood (that is used when disassembling it), tighten spool end. Tightening torque: 1.94 - 2.24 kg•m (14 - 16 ft lb).

CAUTION

Be careful not to get Loctite into spool by over applying it.

Be careful that spool operation does become deteriorated by over torquing spool end.

Remote Control Valve (Work Lever / Joystick)

Edition 1

DISASSEMBLY

1. Remove lead wire from bushing (29).

Figure 3

2. Remove lever assembly from case (1).

Figure 4

3. Remove hex nut (23) and swash plate (22) from case (1).

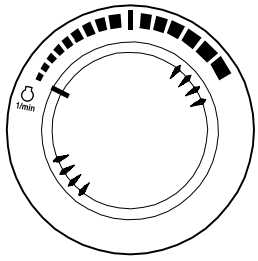
Figure 5

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

Figure 6

START-UP PROCEDURES

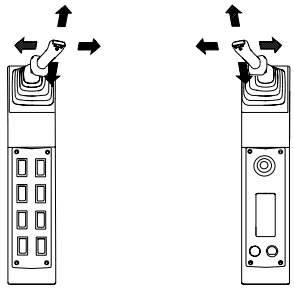
1. Start engine and set throttle at "LOW IDLE."
2. Set safety lever on "UNLOCK" position.



HAOB290L

Figure 40

3. Slowly cycle boom, arm, bucket cylinders and swing motor about five times without a load to vent air from pilot lines. Do this for five minutes.



ARO0470L

Figure 41

Operating Theory of Damper Mechanism

1. Operation When Operating Lever
   When pushing pedal, pushing force pushing push rod and spool presses cylinder, return spring and hydraulic oil in cylinder is compressed, piston coming down with push rod compresses vibration prevention chamber of lower part, oil of vibration prevention chamber of lower part is flowed through orifice to oil pressure vibration prevention chamber of upper part of low pressure, at this time, ball check valve becomes closing condition because high pressure operates to vibration prevention chamber of lower part.
2. Operation When Operating Lever In Neutral Condition
   Climbing restoring force acting on push rod, raises piston in oil pressure prevention chamber and compresses upper oil pressure prevention chamber. This compression operation of upper oil pressure prevention chamber prevents the push rod from quickly rising by restoring spring, and the damping force is generated.

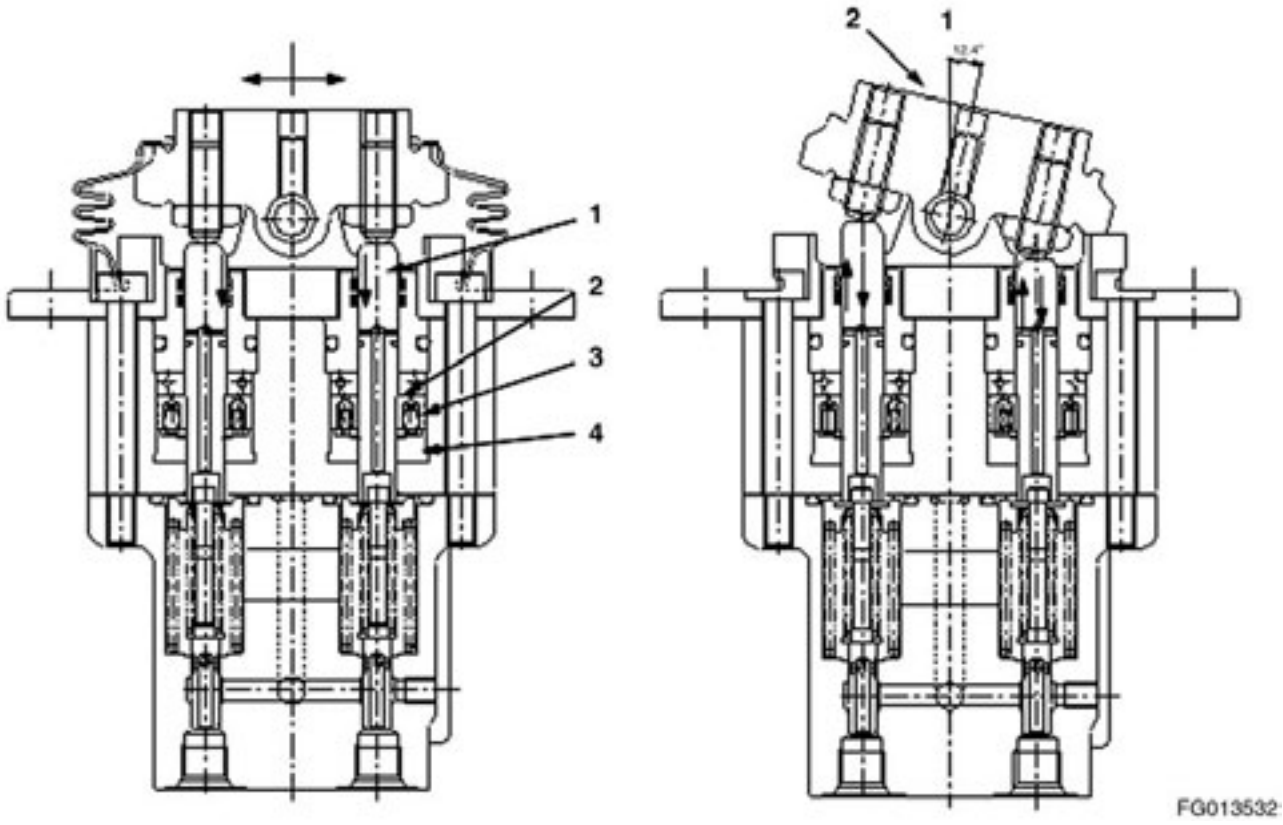


Figure 2

Reference Number	Description
1	Push Rod
2	Orifice
3	Piston
4	Piston Chamber

Reference Number	Description
1	Neutral Position
2	Maximum Operating Angle 12.4"

REASSEMBLY

1. Insert spring (10) into body (1).

Figure 18

2. Assemble in proper order, damper spool (8), shim (7), spring (6), spring seat (5) and stopper (9).

Figure 19

3. Install damper spool assembly into body (1).

Figure 20

4. Assemble body (2) onto body (1).

Figure 21

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Solenoid Valve Assembly

Check Points and Solutions for Problems

Symptoms	Causes	How to Check	Solutions
Malfunction of solenoid valve	Foreign substance, dirt and dust in solenoid valve.	Disassemble the solenoid valve and check if there is any contamination such as a foreign substance and sludge between the case and the spool.	Remove contaminant, wash, and assemble components.
	Tube or retainer of solenoid valve damaged.	Disassemble the solenoid valve and check if there is any deformation (bending or reduction) in the tube or the retainer.	Replace solenoid valve.
	Coil broken, short, or burned.	Disassemble the solenoid valve and check the coil resistance. Spec: 26.7Ω @ 20°C Disconnection: ∞ Short: Low or excessive resistance Disassemble the solenoid valve and check the outside of the coil to see if its casing is burned and melted.	Replace coil.
	Connector terminal ground defect.	Check if the cap housing (where coil lead is attached) and the housing (across its length) are grounded properly.	Replace housing or terminal.
Pilot pressure fails to generate;	Pilot pressure.	Remove plug of the "P5" port, install a pressure gauge, and check the pilot pressure discharged from the pilot pump when operating the pilot cut-off valve (C1).	Refer to "Causes" and "How to Check" of the solenoid valve above.
	Pilot relief valve.	Check if the relief valve installed in the pilot line operates properly. • Check if pressure is bypassing because of the presence of foreign substance.	Remove foreign substance, reassemble, and replace the relief valve.
	Pilot pump.	Check if the pilot pump works properly.	Replace the pilot pump.
	Pilot filter.	Check if the mesh screen of the pilot filter is contaminated by foreign substance.	Wash, reassemble, and replace the filter.
Poor Actuator Performance	Pilot system.	Check any defect of the pilot system considering findings from "Pilot pressure fails to generate;" category.	Repair defect (s) accordingly.
	Solenoid valve.	Install a pressure gauge at each outlet port of the solenoid valve (HO, TR2, PH, and SP ports) and check the pressure value discharged from the pilot pump when operating the solenoid valve.	Refer to "Causes" and "How to Check" of the solenoid valve above.
	Main control valve.	Check if main control valve of each component works properly.	Repair according to findings.
	Other components.	Check if each component works properly.	Repair according to findings.

Checking of Pilot Pressure for Defects

Port where pressure gauge set up	Screw Size	Remark
P1, P3, P4, P5, P6, TR2, PH, HO, SP	PF1/4" O-ring BOSS	Operate the solenoid valve (ON).

SAFETY PRECAUTIONS

CAUTION

Follow all safety recommendations and safe shop practices outlined in the front of this manual or those contained within this section.

Always use tools and equipment that are in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

APPLICABLE MODELS

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

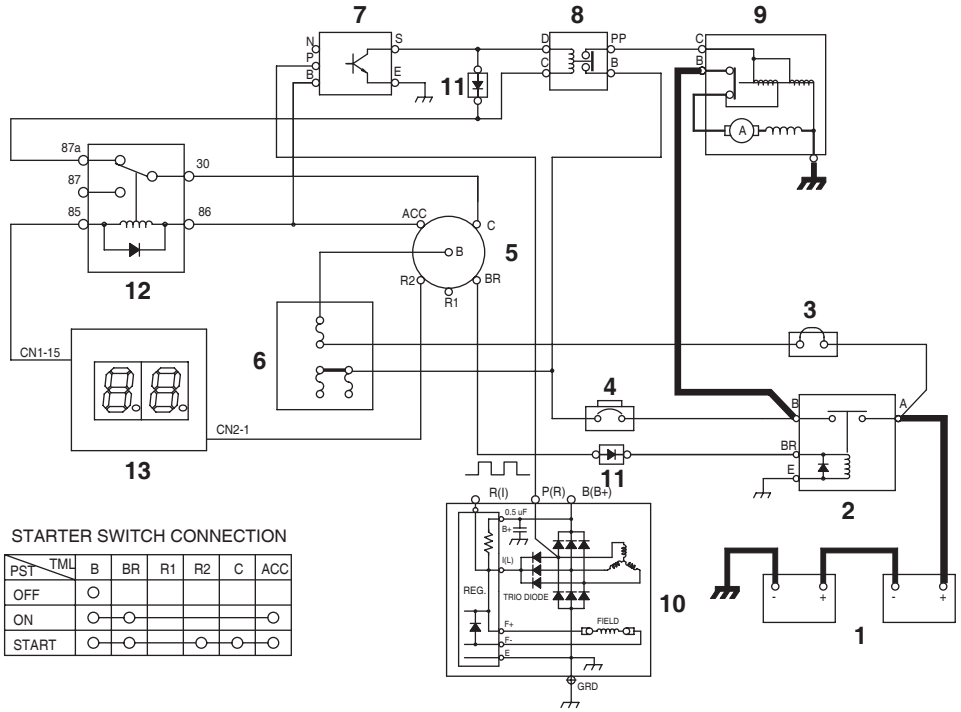
MODEL	SERIAL NUMBER RANGE
DX140LC	5001 and Up
DX140W	5001 and Up
DX160W	5001 and Up
DX180LC	5001 and Up
DX225LC	5434 and Up
DX225NLC	5001 and Up
DX255LC	5001 and Up
DX300LC	7440 and Up
DX340LC	5980 and Up
DX350LC	5980 and Up
DX380LC	5109 and Up
DX420LC	5327 and Up
DX480LC	5221 and Up
DX520LC	5117 and Up

Table of Contents

Hydraulic Schematic (DX300LC)

Table of Contents

Electrical System (NON-ROPS)



FG007237

Figure 4 OPERATION OF START CIRCUIT (2) - IMMEDIATELY AFTER START

Reference Number	Description
1	Battery
2	Battery Relay
3	Fusible Link
4	Circuit Breaker
5	Starter Switch
6	Fuse Box
7	Starter Controller

Reference Number	Description
8	Starter Relay
9	Starter
10	Alternator
11	Diode
12	Starter Relay 2
13	e-EPOS Controller

Reference Number	Description
1	Instrument Panel
2	Pilot Buzzer
3	Light Switch
4	Starter Switch
5	Front Pump Pressure Sensor
6	Rear Pump Pressure Sensor
7	Hydraulic Oil Temperature Sensor
8	Fuel Sensor
9	Pedal Pressure Switch (Optional)
10	Air Cleaner Indicator
11	Pilot Filter Switch

Reference Number	Description
12	Return Filter Switch
13	Alternator
14	e-EPOS Controller
15	Battery
16	Battery Relay
17	Circuit Breaker
18	Fusible Link
19	Fuse Box
20	Check Connector
21	Engine Controller
22	Rearview Camera

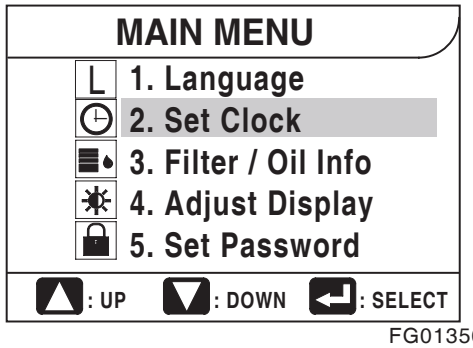
Set Clock

It is used to adjust time of the digital clock.

Pressing the Enter Button (↵, 3 on Figure 12) in the Main Menu after putting cursor on Set Clock brings Set Clock display.

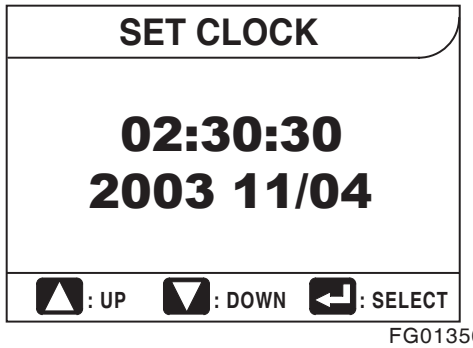
Without pressing a button more than 20 seconds, the default view appears.

Please refer to the Operation Manual for detailed information on Time Setting.



FG013565

Figure 16



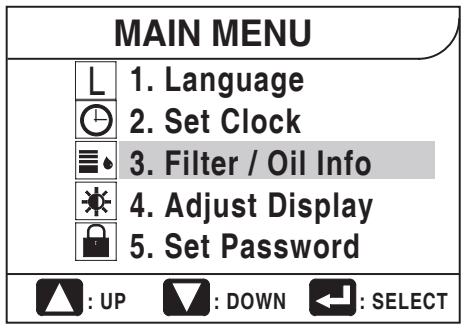
FG013566

Figure 17

Filter/Oil Info

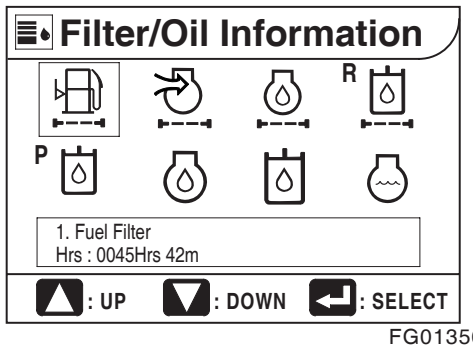
This mode displays total operating hours of filters and oils.

After changing the filter and oil, reset the operating hour and then the operating hours until the next service interval can be easily checked.



FG013567

Figure 18



FG013568

Figure 19

A. Current failure information

Current status of failure is displayed (Failure code, failure contents).

When a number of failures are produced, failure information can be checked using "UP" (▲, 1 on Figure 25) or "DOWN" (▼, 2 on Figure 25) button.

* 1/2: A serial number of current failure/ total quantity of failure.

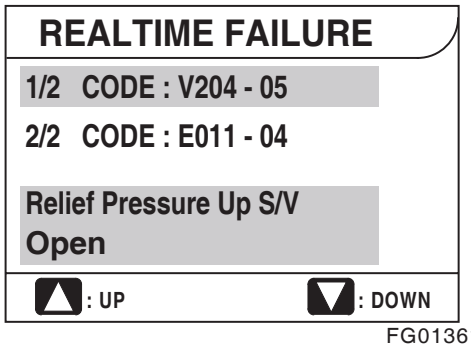
* Vxxx-xx: Vxxx is a unique code and xx is a FMI (Failure Mode Identifier) number.

  - V: Machine related failure code

  - E: Engine related failure code

Refer to the failure information code for unique codes and FMI numbers.

This example shows one of two failures.



FG013615

Figure 35

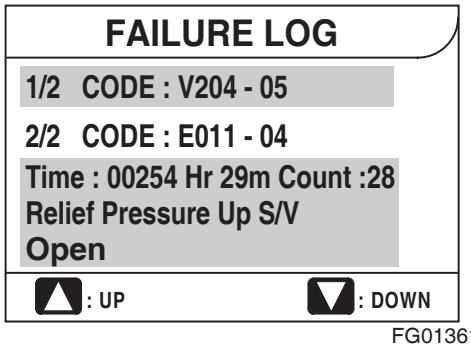
B. Past failure information

Memorized record of past failure is displayed (Failure code, failure contents).

When a number of failures are produced, failure information can be checked using "UP" (▲, 1 on Figure 25) or "DOWN" (▼, 2 on Figure 25) button.

NOTE: *" Number: xxx ": "xxx" means that the totally counted number of the same failure.*

" Period:xxxxxHrxxm ": It indicates the period for which machine has operated until a failure takes place. (For more than two occurrences of the same failure, until the first occurrence time.)



FG013616

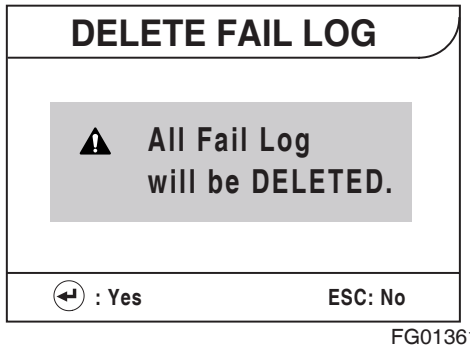
Figure 36

C. Failure record deletion

This mode is used to delete the memorized record of past failure. If this mode is selected, all records will be deleted.

When "YES" (↵, 3 on Figure 25) button is pressed, the memorized record will be deleted.
At this time, deletion signal will be displayed and the screen will move to previous menu after deletion.

This screen will be displayed during 3 seconds.



FG013617

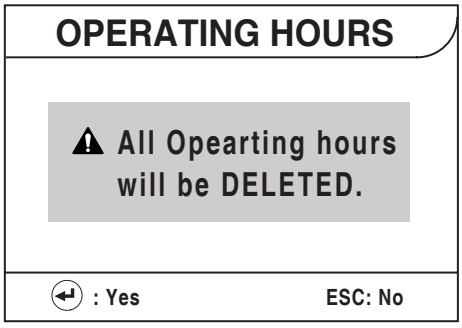
Figure 37

B. Reset screen of operation hour

C. Exiting Sub-menus: If escape button (ESC, 4 on Figure 25) is pressed for more than 1 second, this information screen will be returned to previous screen.

NOTE: *When "YES" (↵, 3 on Figure 25) button is pressed, operation hours will reset.*
At this time, resetting signal will be displayed and the screen will move to previous menu after resetting.

NOTE: *When "NO" (ESC, 4) button is pressed, the screen will recover to previous menu without resetting.*

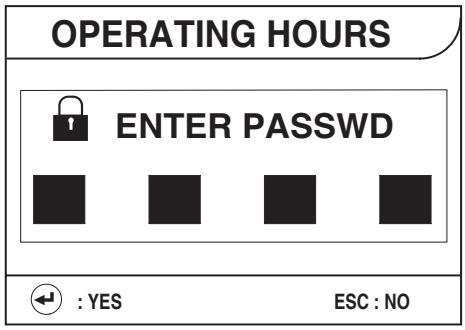


FG013626

Figure 47

Machine Operation Info Screen

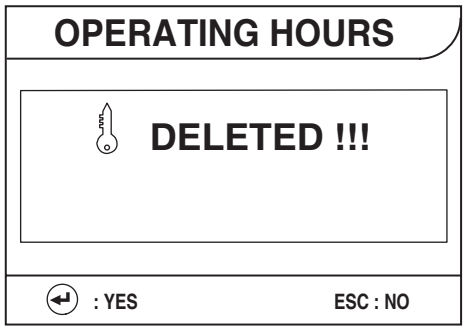
1. If you press the YES" (↵, 3 on Figure 25) button, password entrance screen appears.



FG013627

Figure 48

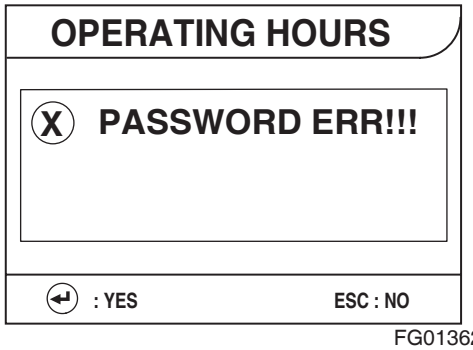
2. When right password is input, machine operation periods will be deleted and Reset Completed screen will appear 3 seconds.



FG013628

Figure 49

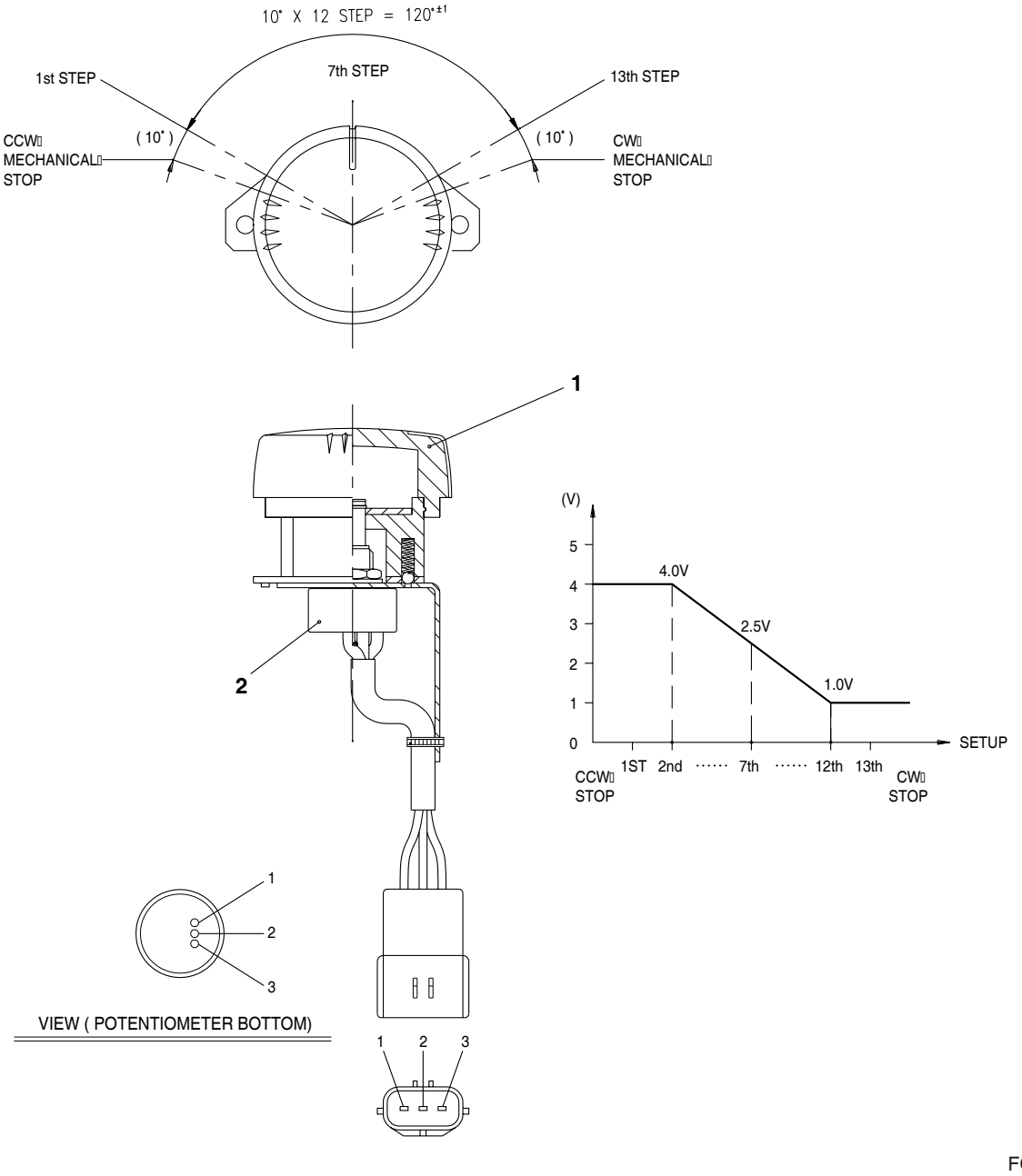
3. If you press the "NO" (ESC, 4) button, the previous screen appears without resetting operation periods.



FG013629

Figure 50

ENGINE CONTROL DIAL



FG000866

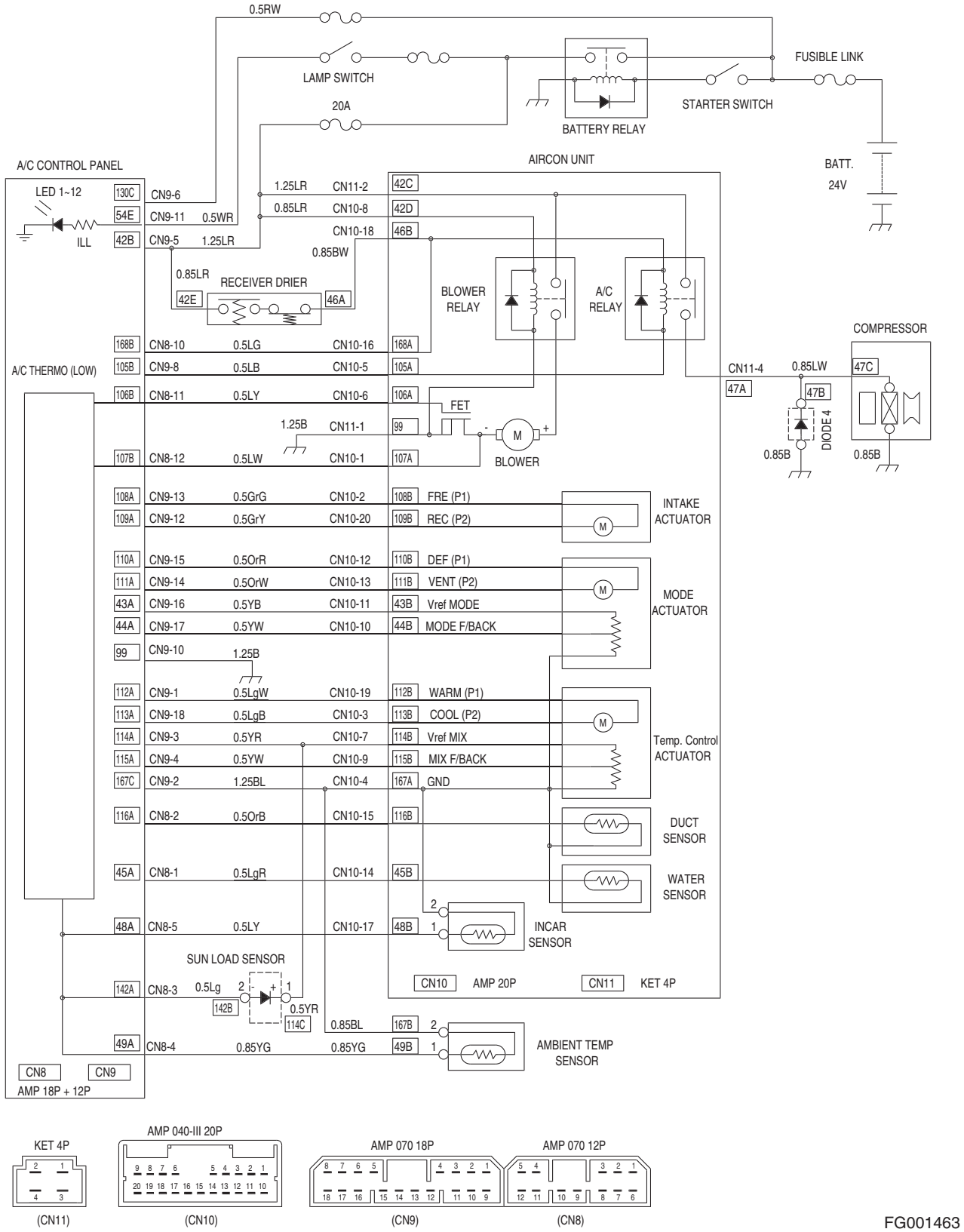
Figure 60

Reference Number	Description
1	Knob

Reference Number	Description
2	Potentiometer (Variable Resistor)

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.

Air Conditioner/heater Circuit Diagram



FG001463

Figure 75

Categories	Inputs	System Operation
Starting control of heating (1)	Water temperature sensor Internal air temperature sensor Auto mode Set Temperature	1. Start condition (AND condition) (1) When wind direction mode is one of the following modes in the Auto or manual control mode - BI-LEVEL, FOOT or FOOT/DEF (2) The Water temperature sensor is stable and the water temperature < 73°C (3) Air flow: Auto mode (4) Set temperature > Internal air temperature + 3°C * Air flow falls gradually up to 12 seconds when operation released.
		2. One time control in the cycle of engine OFF → engine run 3. Initial heating control should be before max heating. 4. Air flow is controlled only when the wind direction is in the manual mode and BI-LEVEL, FOOT, or FOOT/DEF is set. 5. Control through the water temperature sensor for start. 6. Starting control of heating (2) starts in case of fault of the water temperature sensor during controlling. 7. Operation release (OR condition) (1) Only air flow is released if it is selected manually. (2) When handling the wind direction mode switch, only wind direction is released but the air flow control is performed only for the remaining period of the starting control of heater. (3) When Max Cooling (17°C) is selected. (4) Water temperature sensor > 73°C.

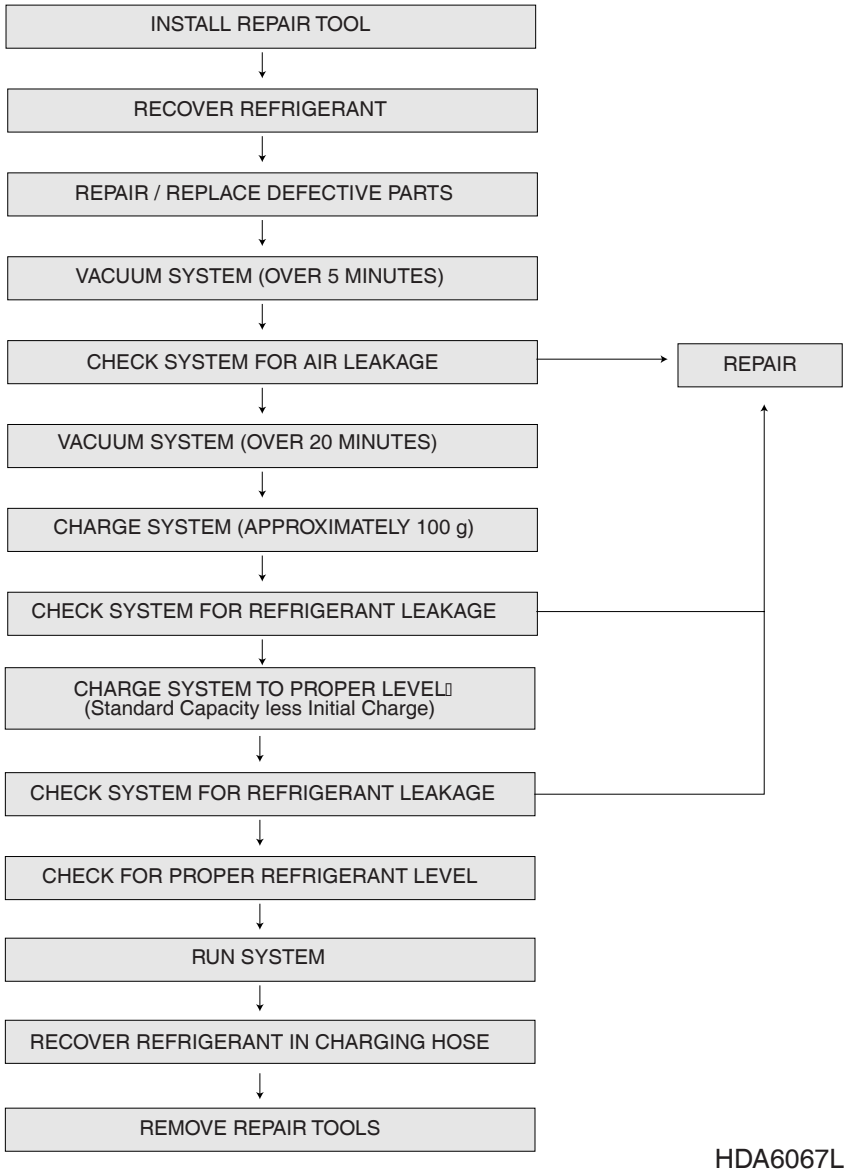

INSTALL REPAIR TOOL
RECOVER REFRIGERANT
REPAIR / REPLACE DEFECTIVE PARTS
VACUUM SYSTEM (OVER 5 MINUTES)
CHECK SYSTEM FOR AIR LEAKAGE
REPAIR
VACUUM SYSTEM (OVER 20 MINUTES)
CHARGE SYSTEM (APPROXIMATELY 100 g)
CHECK SYSTEM FOR REFRIGERANT LEAKAGE
CHARGE SYSTEM TO PROPER LEVEL
(Standard Capacity less Initial Charge)
CHECK SYSTEM FOR REFRIGERANT LEAKAGE
CHECK FOR PROPER REFRIGERANT LEVEL
RUN SYSTEM
RECOVER REFRIGERANT IN CHARGING HOSE
REMOVE REPAIR TOOLS
HDA6067L

Figure 96

Reference Number	Description
1	Battery
2	Battery Relay
3	Fuse Box
4	Light Switch
5	Cabin Light Switch
6	Headlight Relay (Work Light Indicate Light)
7	Work Light Relay
8	Front Cabin Light Relay

Reference Number	Description
9	Front Cabin Light / Rear Work Light Relay
10	Instrument Panel
11	e-EPOS Controller
12	Headlight (2 ea.)
13	Work Light (2 ea.)
14	Front Cabin Light (4 ea.)
15	Rear Cabin Light (2 ea.)
16	Rear Work Light (1 ea.)

NOTE: *The "*" mark are optional parts.*

Kind of Light

The lighting system is consists of headlights, work lights, cabin lights (optional), relays and switches.

Operation

Switch	Position	Connected Terminal of switch	Activated Relay	Lit Light
Light Switch	1	"2-3" Terminal	-	Illumination Light of Switch
	2	"2-3" Terminal	-	Illumination Light of Switch
		"5-6" Terminal	Headlight Relay	Headlight (2 Ea.)
			Work Relay	Work Light (2 Ea.) Symbol Light of Work Light
Cabin Light Switch	1	"2-3" Terminal	Front Cabin Light Relay	Front Cabin Light (2 Ea.) or Front Cabin Light (4 Ea.)
	2	"2-3" Terminal	Front Cabin Light Relay	Front Cabin Light (2 Ea.) or Front Cabin Light (4 Ea.)
		"5-6" Terminal	Rear Cabin Light Relay / Rear Work Light Relay	Rear Cabin Light (2 Ea.) and Rear Work Light (1 Ea.)

INTRODUCTION

The electrical system for this equipment is DC 24 volts. The rated voltage for all electric components is 24 volts with the exception of the stereo and the air-conditioning control actuator. The system contains two 12 volt batteries connected in series and a three phase AC generator with a rectifier. The electric wiring used in the system is easily identifiable by the insulator color. The color symbols used in the electrical system are listed in the following chart.

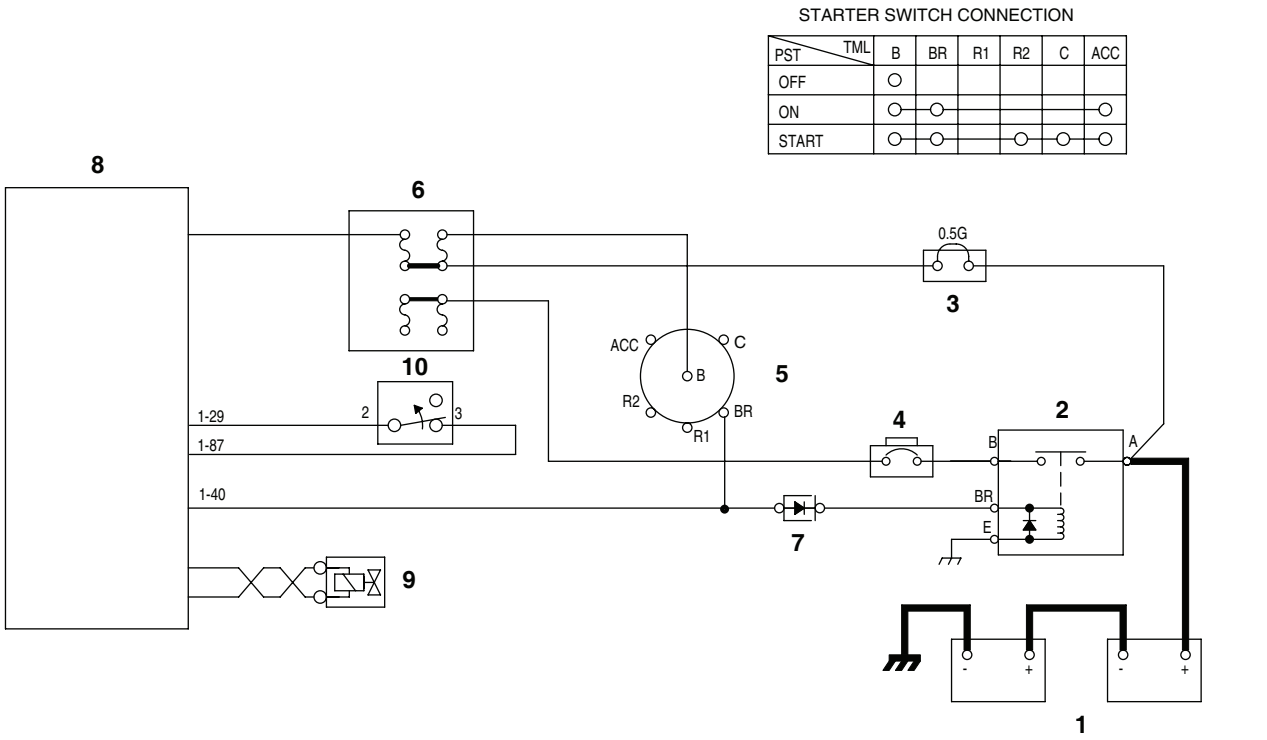
Electric Wire Color

Symbol	Color
W	White
G	Green
Or	Orange
B	Black
L	Blue
Lg	Light green
R	Red
Gr	Gray
P	Pink
Y	Yellow
Br	Brown
V	Violet

NOTE: *RW: Red wire with White stripe*

R - Base Color, W - Stripe Color

NOTE: *0.85G: Nominal sectional area of wire core less insulator = 0.85 mm^2*



FG007138

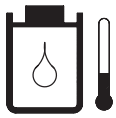
Figure 7 ENGINE STOP CIRCUIT

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

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

Description	Symbol	Input Terminal	Operation	Remarks
Work Light	 HB4O2003	CN2 - 6	This symbol appears when work light turns "ON" (24V applied).	

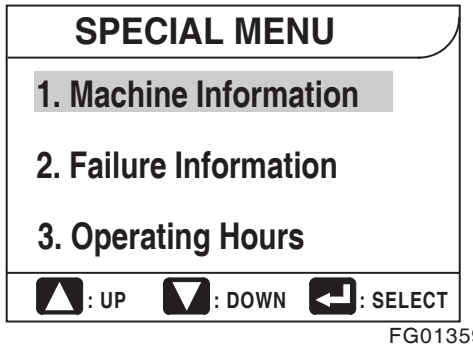
Indication of Multifunction Gauge

Description	Symbol	Input Terminal	Operation	Remarks
Hydraulic Oil Temperature	 FG000056	CN3-9 CN3-10	When hydraulic oil temperature is above about 96°C.	
Fuel Exhausted	 FG000057	CN3-7 CN3-8	When fuel is almost exhausted.	
Air Cleaner	 FG000053	CN2-17	When air cleaner is clogged.	
Return Filter	 FG000054	CN5-3	When return filter pressure is above about 1.50 kg/cm² (21 psi)	

Special Menu Screen

NOTE: *Displayed language on the special menu screen consists of Korean and English.*

If any language except for Korean is selected during language selection mode of main menu, only English will be displayed on special menu screen.



FG013592

Figure 27

Exiting/Escaping Menus

1. If escape button (ESC, 4 on Figure 25) is pressed for more than 1 second, the special menu screen will be returned to the normal mode screen.
2. If this special menu is "ON" without any activity, for more than 20 seconds, it will turn to the normal mode screen.
3. After the turning starter switch to the "OFF" position, turn it back to the "ON" position, and the normal mode screen displayed once again.

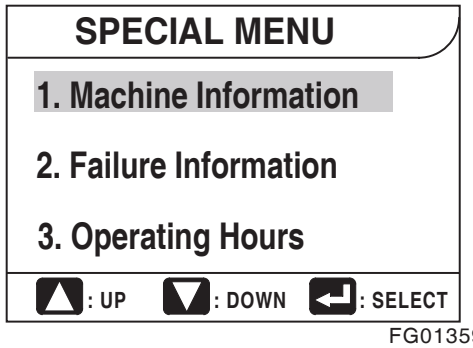
Special Menu Selections

Submenu Selection Method

Various sub-menus can be selected by pressing "Up (▲, 1 on Figure 25)" and "Down (▼, 2 on Figure 25)" button.

Move the cursor to desired menu and a selected menu will be inverse displayed.

When the selected menu is inverse displayed, press the "Enter (↵, 3 on Figure 25)" button for menu selection.

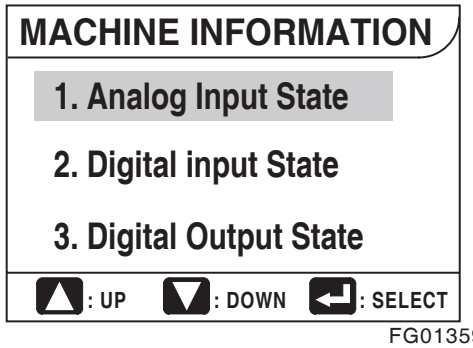


FG013592

Figure 28

Information of Machine Status

1. Entering Sub-menus: When cursor is located on "Machine Info" of special menu screen, press "Enter (↵, 3 on Figure 25)" button and the "Machine Info" will be displayed.
2. Exiting Sub-menus: If escape button (ESC, 4 on Figure 25) is pressed for more than 1 second, display will be turned to previous screen.



FG013593

Figure 29

Failure Information Code at Engine Side

Code	Failure Component	Measuring Points	Current Valve		Remarks
			Active	Passive	
E011	Coolant temperature sensor	2-15 2-26	-	R=186 ± 5 Ω (100°C (212°F))	
E012	Fuel temperature sensor	2-35 2-26	-	R=186 ± 5 Ω (100°C (212°F))	
E013	Boost air temperature sensor	2-36 2-25	-	R=186 ± 5 Ω (100°C (212°F))	
E014	Boost air pressure sensor	2-34 2-33	V = 1,071±58mV (at 23°C (73°F) and absolute pressure 1bar)	-	It has to be measured in engine running state.
E017	E/G oil temperature sensor	2-28 2-24	-	R=186 ± 5 Ω (100°C (212°F))	
E018	E/G oil pressure sensor	2-27 2-32	V = 2,318±80mV (at 23°C (73°F) and absolute pressure 3bar)	-	It has to be measured in engine running state.
E021	Battery voltage	1-03 1-06	V = V_volt (Note 4.)	-	
E022	Fuel pressure sensor	2-14 2-12	V = 1,833±28mV (at 23°C (73°F) and absolute pressure 300bar)	-	It has to be measured in engine running state.
E032	Fuel pressure monitoring MPROP	3-09 3-10	-	R=2.60 ± 3.15 Ω (20°C (68°F))	
E037	CAN - B Line	1-35 1-34	-	R=60 ± 5 Ω (20°C (68°F))	It is a composite resistance of CAN line. This value has to be measured by connected condition of CAN line.
E038	Engine overspeed		-	-	
E039	Main relay SCG (ECU)		-	-	Engine ECU fail.
E041	Redundant shutoff path		-	-	Abnormal engine stop.
E042	E/G speed (Crankshaft)	2-23 2-19	-	R=860 ± 6 Ω (20°C (68°F))	

The power mode switch permits the selection of the appropriate engine power depending on the working condition. One of the two, Power Mode or Standard Mode, setting can be selected. When the engine starter switch is turned "ON," the power mode is automatically defaulted to standard mode. The desired mode can be selected by pressing the selector button on the instrument panel. When the power mode is selected, the indicator light will turn "ON" to display the selected mode.

The quantity of oil discharged by the pump and the engine speed are determined by the mode selected by the operator. The pump output in each mode is determined by the mode selection and is listed in the following table

Mode	Standard Mode	Power Mode
Output (%)	Approximately 85%	100%

If the machine is idling without the controls being operated or is waiting for a dump truck the engine speed is automatically lowered. Once the controls are operated and work is being started the machine will be restored to the previous settings. As a result, noise and fuel consumption will be reduced. This function can be selected or cancelled through the Auto Idle Selector Switch on the instrument panel.

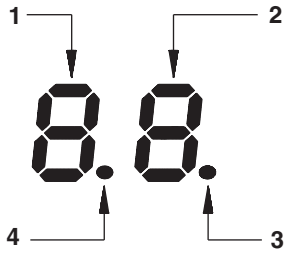
The initial setting at start-up is with this switch in the select position. Approximately 4 seconds after this function is selected, if all work levers are in the neutral position, the e-EPOS controller compares the automatic reduction signal with the signal set by engine control dial. The lower of the two signals is selected, the e-EPOS controller sends a signal to the engine controller to control the engine speed.

The neutral status of the machine is detected by the two pressure switches in the control valve. When the work levers are in the neutral position, the switch is in the "OFF" position.

SELF-DIAGNOSTIC FUNCTION

e-EPOS Controller

The system operation status and malfunction codes can be checked through the display on top of the e-EPOS controller box the rear cover behind the operator's seat.



FG000588

Figure 68

Reference Number	Description
1	Upper Digit
2	Lower Digit
3	Engine Speed Monitor LED (Flash Interval Increases With Engine Speed.)

Reference Number	Description
4	Power Monitor (Stays "ON" While Power Is In Normal Range,)

1. Power Monitor

This LED is turned "OFF" when the input voltage to the e-EPOS controller is below 18.5 ± 1 V or above 32.5 ± 1 V. Stays "ON" while in normal range.

2. Engine Speed Monitor

This LED light flashes according to the engine speed. The flashing interval is proportional to the engine speed.

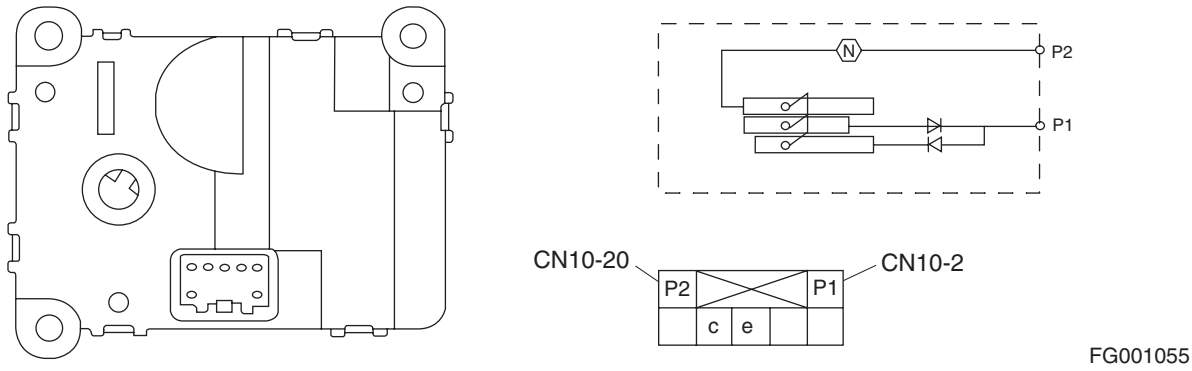


Figure 78

Mode	Output Terminal	Output
Intake	P1(+), P2(-)	Moving of exchange door by selecting intake.
Recirculate	P1(-), P2(+)	Moving of exchange door by selecting recirculate.

Air Flow Control Module

Air flow is controlled through the control of voltage between GATE and SOURCE.

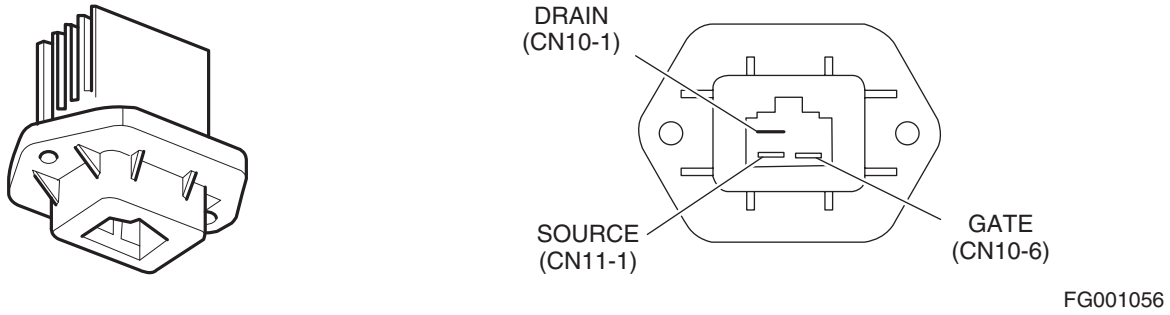


Figure 79

Air flow	Output Terminal		Output
1st	CN11-2	CN10-1	10 ± 0.5V
2nd			12.5 ± 0.5V
3rd			15 ± 0.5V
4th			17.5 ± 0.5V
5th			20.0 ± 0.5V
6th			22.0 ± 0.5V
7th			More than 25V

Input voltage is 27.5V.

The air flow is based on manual set.

Compressor

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

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

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

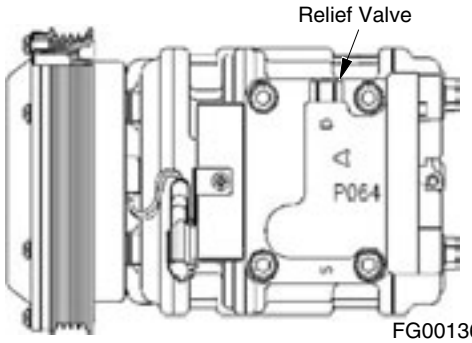


Figure 90

Receiver Dryer

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

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

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

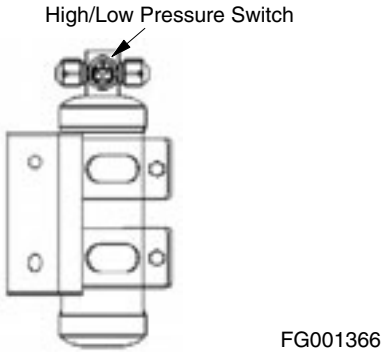


Figure 91

Volume of refrigerant by model

Model	Volume of Refrigerant
DX140LC	800 ± 20 grams
DX180LC	800 ± 20 grams
DX225LC	800 ± 20 grams
DX225NLC	800 ± 20 grams
DX300LC	800 ± 20 grams
DX340LC	800 ± 20 grams
DX420LC	800 ± 20 grams
DX480LC	800 ± 20 grams
DX520LC	800 ± 20 grams

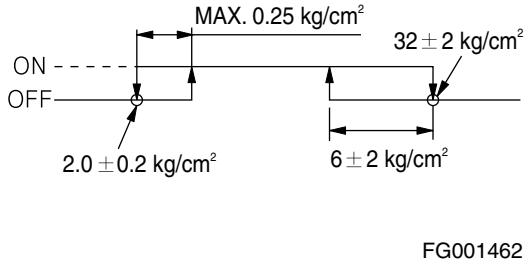


Figure 92

3. If refrigerant does not flow freely into system, try starting engine first before operating air conditioner.

   - Temperature control switch setting: Maximum Cooling

     Blower Speed Setting: Hi (3 step)

     Engine Speed: 1,300 - 1,500 rpm

WARNING

When charging refrigerant system with the engine running:

- **Always keep refrigerant supply container in the upright position.**
- **Never open the high side pressure valve.**

4. Open the manifold gauge low side valve and charge system to standard capacity.

Gauge Dial	Standard Reading
High Side Gauge	13 - 20 kg/cm^2 (185 - 285 psi)
Low Side Gauge	1.5 - 3.5 kg/cm^2 (22 - 50 psi)

NOTE: *These standards are for outside temperatures between 30° - 35°C (86° - 95°F). The gauge readings may vary for extreme temperature conditions.*

WARNING

- **When outside temperature is low, warm the refrigerant supply container with warm water not exceeding 40°C (104°F). Do not allow water to come in contact with the charging adapter valve handle.**
- **When outside temperature is high, cool off refrigerant supply container and condenser to aid the refrigerant charging process.**

5. Close low-pressure side valve.
6. Shut off engine and close refrigerant supply container adapter valve. Disconnect manifold gauge hoses from vehicle.

Electrical Schematic (NON-ROPS)

Edition 1

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Electrical Schematic (ROPS)

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Boom and Arm

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

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

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

⚠ WARNING

Secure the swing lock and tag and lock out controls in the operator's cabin to keep anyone from moving or inadvertently starting the engine. Restrict access to the work site while sections of the attachment are in the air, or while they are being supported by the assist crane. The safe lifting capacity of the assist crane or hoist that is used must exceed the weight of the heaviest section of the attachment, the boom (approximately 2,000 kg [4,400 lb], not including the weight of accessories or fixtures).

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

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