DX480LC
DX520LC

Shop Manual

K1008703E

Serial Number 5001 and Up

Daewoo reserves the right to improve our products in a continuing process to provide the best possible product to the market place. These improvements can be implemented at any time with no obligation to change materials on previously sold products. It is recommended that consumers periodically contact their distributors for recent documentation on purchased equipment.

This documentation may include attachments and optional equipment that is not available in your machine's package. Please call your distributor for additional items that you may require.

Illustrations used throughout this manual are used only as a representation of the actual piece of equipment, and may vary from the actual item.

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
DX420LC	5001 and Up
DX480LC	5001 and Up
DX520LC	5001 and Up

Breathing Masks, Ear Protection May Be Required

Do not forget that some risks to your health may not be immediately apparent. Exhaust gases and noise pollution may not be visible, but these hazards can cause disabling or permanent injuries.

NOTE: *The equivalent continuous A-weighted sound pressure level at the workstation for this machine is given in the operation manual.*

Measurement is obtained on a dynamic machine following the procedures and cabin conditions as described in ISO 6396.

NOTE: *The guaranteed sound power level emitted by the machinery for this machine is given in the operation manual.*

Measurement is obtained on a dynamic machine with the procedures as described in 2000/14/EC.

Vibration Level Information

Hands/Arms: The weighted root mean square acceleration to which the hands/arms are subjected, is less than 2.5 m/s^2.

Whole body: The weighted root mean square acceleration to which the whole body is subjected, is less than 0.5 m/s^2.

Measurements are obtained on a representative machine, using measuring procedures as described in the following standard: ISO 2631/1. ISO 5349, and SAE J1166.

Recommendations for Limiting Vibrations

1. Select the right machine, equipment and attachments for a particular application.
2. Replace any damaged seat by a genuine *DOOSAN* part. Keep the seat maintained and adjusted.
   - Adjust the seat and suspension for the weight and size of the operator.
   - Inspect and maintain the suspension and adjustment mechanisms of the seat regularly.
3. Check that the machine is properly maintained.
   - Tire pressure, brakes, steering, linkages, etc.
4. Steer, brake, accelerate, shift gears, move the attachments and load the attachments smoothly.
5. Adjust the machine speed and travel path to reduce the vibration level.

- Warm up the engine and hydraulic oil before operating machine.
- Before moving the machine, check the position of undercarriage. The normal travel position is with idler wheels to the front under the cabin and the drive sprockets to the rear. When the undercarriage is in the reversed position, the travel controls must be operated in opposite directions.

fluids. Before you weld on pipes or on tubes or before you flame cut on pipes or on tubes, clean the pipes or tubes thoroughly with a nonflammable solvent.

Burn Prevention

When checking the radiator coolant level, shut down engine, let the engine and radiator cool down, then check the coolant recovery tank. If the coolant level in the coolant recovery tank is near the upper limit, there is enough coolant in the radiator.

Loosen the radiator cap gradually to release the internal pressure before removing the radiator cap.

If the coolant level in the coolant recovery tank is below the lower limit, add coolant.

Cooling system conditioner contains alkali. Alkali can cause personal injury. Do not allow alkali to contact the skin, the eyes, or the mouth.

Allow cooling system components to cool before you drain the cooling system.

Hot oil and hot components can cause personal injury. Do not allow hot oil or hot components to contact the skin.

Remove the hydraulic tank filter plug only after the engine has been stopped. Make sure that the hydraulic tank filter plug is cool before you remove it with your bare hand. Remove the hydraulic tank filter plug slowly to relieve pressure.

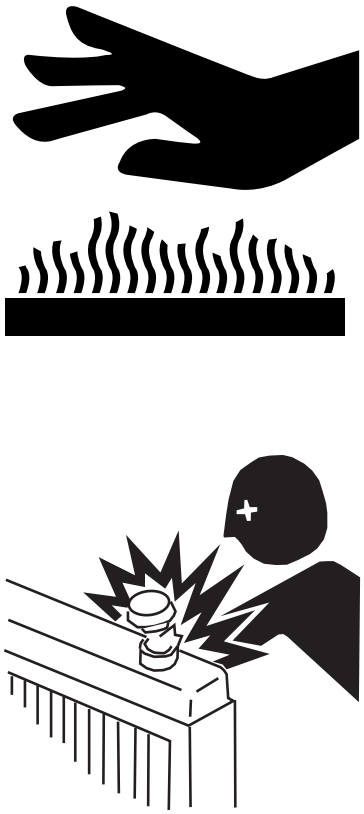
Relieve all pressure in the hydraulic oil system, in the fuel system, or in the cooling system before you disconnect any lines, fittings, or related items.

Batteries give off flammable fumes that can explode.

Do not smoke while you are checking the battery electrolyte levels.

Electrolyte is an acid. Electrolyte can cause personal injury. Do not allow electrolyte to contact the skin or the eyes.

Always wear protective glasses when you work on batteries.



HAAE1980

Figure 35

Welding Repairs

CAUTION!

When you connect or disconnect connectors between ECU and Engine or connector between ECU and the machine, always disconnect the source power to protect damage of the ECU.

If you don't observe this procedure, the ECU would be damaged or the engine would operate abnormally.

SHIPPING AND TRANSPORTATION

Obey State and Local Over-the-Road Regulations

Check state and local restrictions regarding weight, width and length of a load before making any other preparation for transport.

The hauling vehicle, trailer and load must all be in compliance with local regulations governing the intended shipping route.

Partial disassembly or teardown of the excavator may be necessary to meet travel restrictions or particular conditions at the work site. See the Shop Manual for information on partial disassembly.

Refer to the Transportation and Shipping section of this Operation and Maintenance Manual for information on loading, unloading and towing.

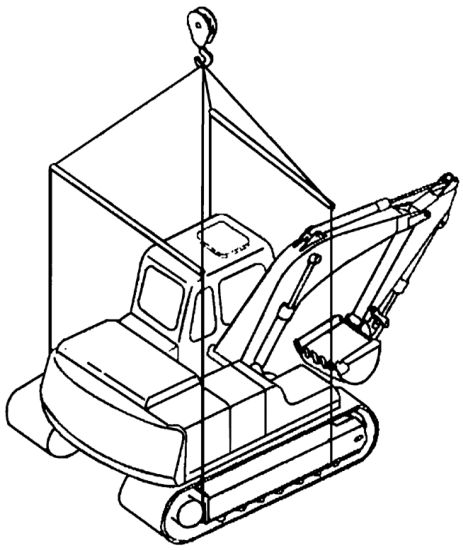
LIFTING WITH SLING

⚠ WARNING!

Improper lifting can allow load to shift and cause injury or damage.

1. Refer to Specification section of Operation and Maintenance Manual for information on weight and dimensions.
2. Use properly rated cables and slings for lifting.
3. Position machine for a level lift.
4. Lifting cables should have a long enough length to prevent contact with the machine. Spreader bars may be required.

If spreader bars are used, be sure that cables are properly secured to them and that the angle of the cables is factored into the lift strength.



HAOJ410L

Figure 48

GENERAL DESCRIPTION

The excavator has three main component sections:

- The Upper Turntable
- The Lower Undercarriage and Track Frames
- The Excavator Front-end Attachment

The following illustration identifies main components and their locations. (See Figure 1 on page -8.)

Transport Dimensions		
Overall Shipping Length (standard boom and arm)		12,130 mm (39' 10")
Overall Shipping Width (standard shoes)	Std Track	3,900 mm (12' 9") Extended (Working) 3,340 mm (10' 11") Retracted (Transport)
	Narrow Track	3,520 mm (12' 9") Extended (Working) 2,990 mm (10' 11") Retracted (Transport)
Overall Shipping Height (to top of cylinder hose)		3,730 mm (12' 3")
Track Shipping Length		5,465 mm (17' 11")
Transport Trailer Capacity		48 tons, minimum load capacity
Transport Loading Ramp Allowable Slope		15° angle **CAUTION:** Refer to Transport Maximum Procedure for Safe Shipping Instructions.

Travel Deviation

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

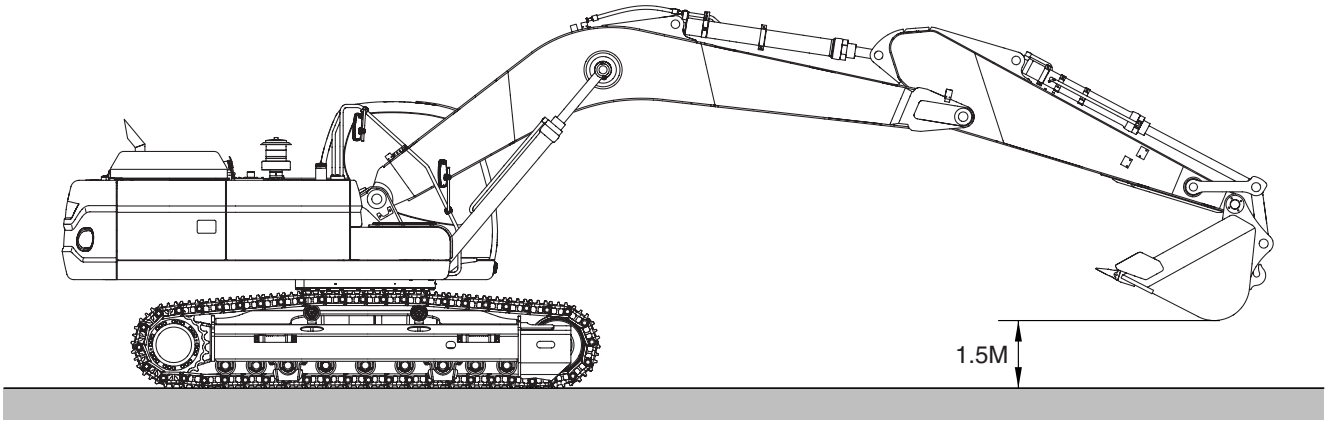
Deviation distance should always be measured at the 20 m (65' 7-1/2") "finish line." Repeat the test in reverse to measure in both directions, with starting point becoming the finish line, and vice versa. (Figure 8)

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

Rate of Travel	Max. Distance
High Speed	150 mm (6 in)
Low Speed	150 mm (6 in)

Swing Speed and Deceleration Force Test

Swing Speed Test



FG000468

Figure 9

Extend the bucket cylinder completely and retract the arm cylinder, as shown in Figure 9, to test swing speed. The lowest point of the bucket will be approximately 1.5 m (3') off the ground.

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

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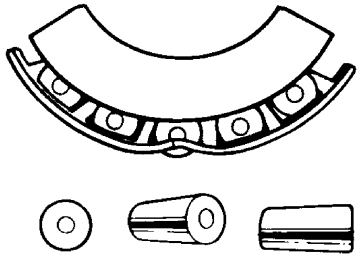
APPLICABLE MODELS

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

MODEL	SERIAL NUMBER RANGE
ALL MODELS	ALL RANGES

Replace bearing.



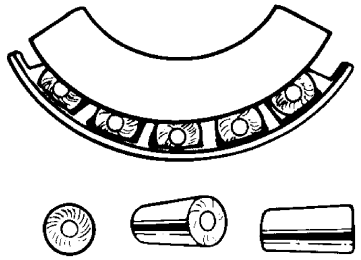
HASA470S

Figure 4

Galling

Metal smears on roller ends due to overheat, lubricant failure or overload.

Replace bearing - check seals and check for proper lubrication.



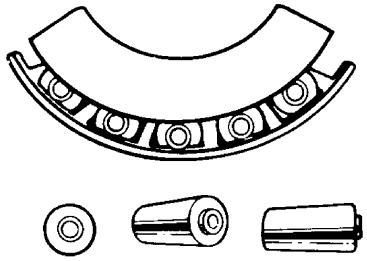
HASA480S

Figure 5

Abrasive Step Wear

Pattern on roller ends caused by fine abrasives.

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



HASA490S

Figure 6

SAFETY PRECAUTIONS

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ALL MODELS	ALL RANGES

I. "Loctite" Fastener Adhesives

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

II. "Loctite" Pipe Thread Sealant

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

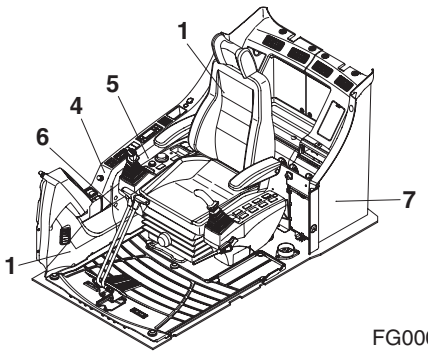
III. "Loctite" gasket/flange sealer

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

12. Remove floor mat.
13. Remove operator's seat (1, Figure 2).

    NOTE: *Be careful not to damage seat covering.*

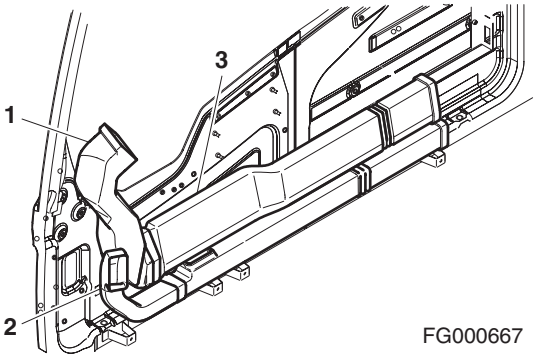
14. Remove duct covers (2, 3 and 4, Figure 2). When removing cover (2) disconnect hour meter connector and cigar lighter connector. Disconnect main harness connector before removing cover (4).
15. Remove pocket (5, Figure 2) before removing side panel (6, Figure 2).



FG000540

Figure 2

16. Remove air duct (1, 2 and 3, Figure 3) at right side of cabin. Disconnect duct wiring connector before removing duct (2).
17. Disconnect washer hose at floor plate bottom.



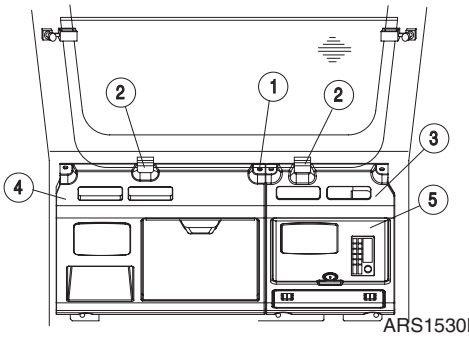
FG000667

Figure 3

18. Remove cover (5, Figure 4) on left side dash cover (3) and bolts (1, Figure 5).

    NOTE: *When removing cover, disconnect speaker wire.*

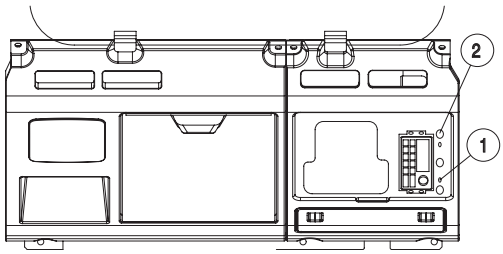
19. Remove two rubber stops (2, Figure 4) used in storing the front lower glass. Remove bolts (1) from the rear left and right dash covers. Remove left side cover (3).
20. Lift right side dash cover (4, Figure 4) and disconnect speaker wire. Remove cover.



ARS1530L

Figure 4

21. Remove three bolts (2, Figure 5) after disconnecting the speaker and antenna wires. Remove stereo assembly.
22. Disconnect cabin light wiring connector.
23. Disconnect cabin ground cable (7, Figure 2).



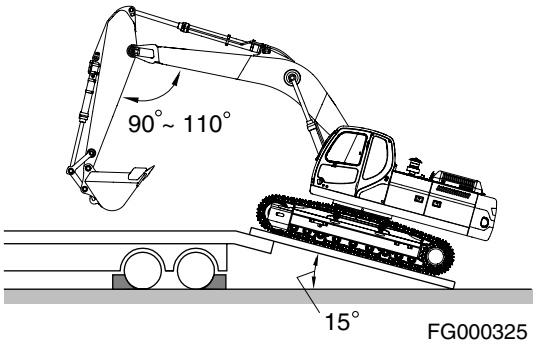
ARS1540L

Figure 5

⚠ WARNING!

If the turntable deck has been unbalanced by removal of weight from one end only, traveling the excavator, swinging the turntable, movement over bumps or sloping and uneven surfaces could cause loss of control and possible accidents or injuries.

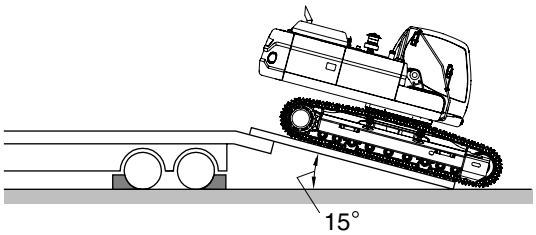
To maintain stability the counterweight should be removed whenever the front attachment is taken off the machine.



FG000325

Figure 1

When loading an excavator (either track or wheeled type) on a trailer for transport after the front attachment has been removed, always go backwards up the loading ramp. The counterweight end of the deck has to get on the trailer first, while the cabin is still going up the ramp (Figure 1).



FG000326

Figure 2

Reference Number	Description
1	Fuel Tank
2	O-ring
3	Cover
4	Bolt
5	Spring Washer
6	Drain Valve
7	Bolt
8	Shim
9	Shim

Reference Number	Description
10	Fuel Strainer
11	Fuel Cap
12	Level Gauge
13	Spacer
14	Bolt
15	Clip
16	Fuel Sender
17	Bolt
18	Spring Washer

Specifications

Fuel tank capacity is 620 liters (164 U.S. gal).

Swing Bearing

Edition 1

Swing Reduction Gear

Edition 1

REMOVAL

1. Park on firm and level ground.
2. Lower front attachment (bucket) to ground.
3. Shut down engine.
4. Set safety lever on "RELEASED" position.
5. Turn starter switch to "I" (ON) position.

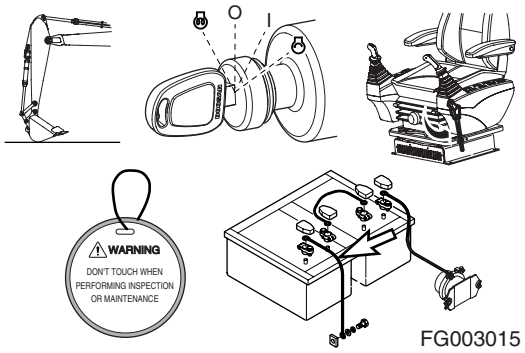


Figure 2

⚠ WARNING!

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

6. Fully stroke work levers (joysticks) in all directions to relieve any pressure from accumulators.
7. Set safety lever on "LOCK" position.
8. Turn key to "O" (OFF) position and remove from starter switch.
9. Hang a maintenance warning tag on controls.
10. Disconnect negative (-) battery cable leading to frame from battery.
11. Tag and disconnect hoses from swing motor (1, Figure 3). Plug and cap hoses and ports to prevent contamination from entering hydraulic system or component.
12. Remove drain plug (3, Figure 3) from elbow (8) and drain oil from reduction gearbox (5, Figure 3).
13. Reassemble drain plug (3) to elbow (8) and disconnect hose (2, Figure 3) from reduction gearbox (5).
14. Disconnect grease lubrication line (7, Figure 3) from reduction gearbox (5).
15. Remove twelve bolts and washers (4, Figure 3) holding swing reduction gearbox (5) to frame.
16. Using a suitable lifting device, sling swing motor (1, Figure 3) and remove swing motor and reduction gearbox (5) as an assembly from unit.

NOTE: *There are two alignment pins (6*, Figure 3*), on reduction gearbox flange.*

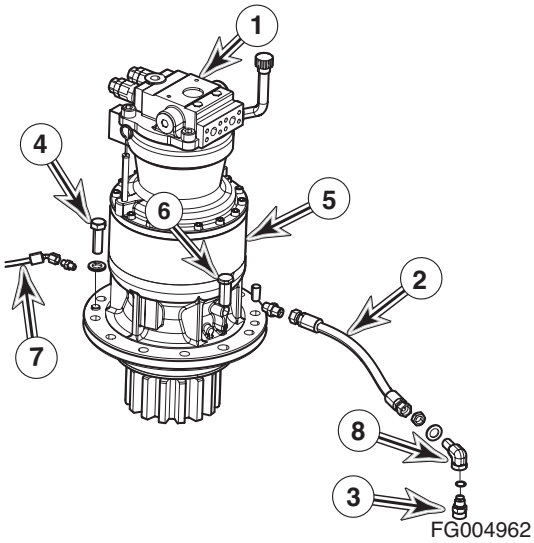


Figure 3

2. Assemble the pin ass'y 1 and the washer into planet gear 1 and arrange it on the pin hole of the carrier 1.

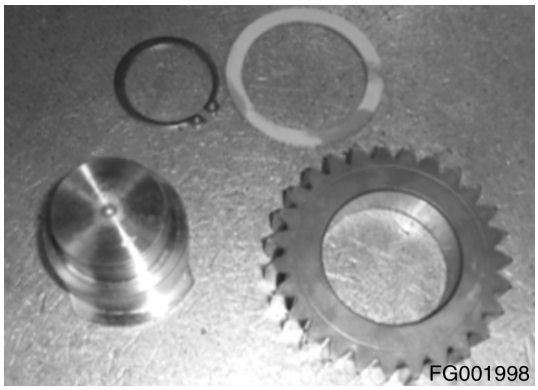


Figure 30

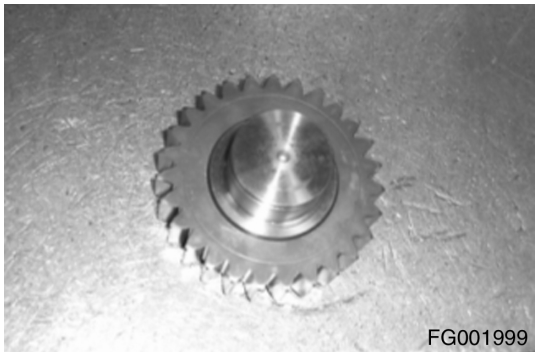


Figure 31

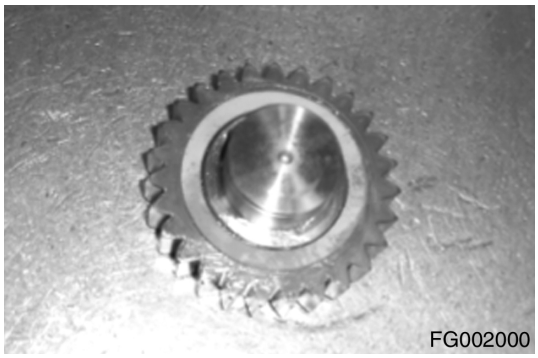


Figure 32

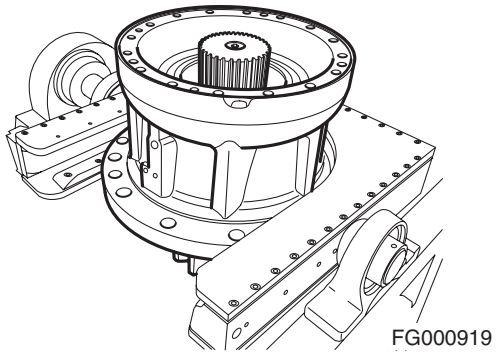

FG000919

Figure 67

2. Make sure that there is no foreign substance left on seal assembly, apply grease to and around lip of oil seal (TC5001300) as in Figure 68 and Loctite #609 to its external part.
3. Using seal installation jig, press seal into case, keeping it level during installation. Make sure that seall is fully seated.

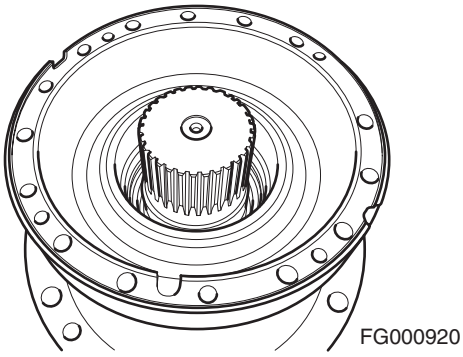

FG000920

Figure 68

⚠ CAUTION!

Make sure that there is no foreign substances on lip area. Use care not to damage seal when inserting it. Chack for proper installation after pressing seal into position.

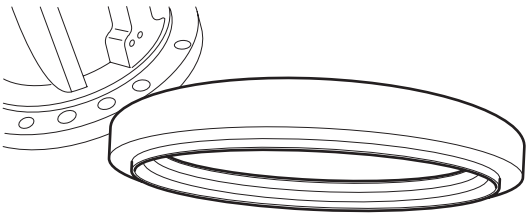

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Figure 69

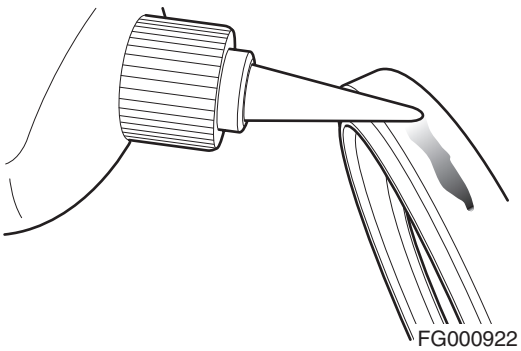
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Figure 70

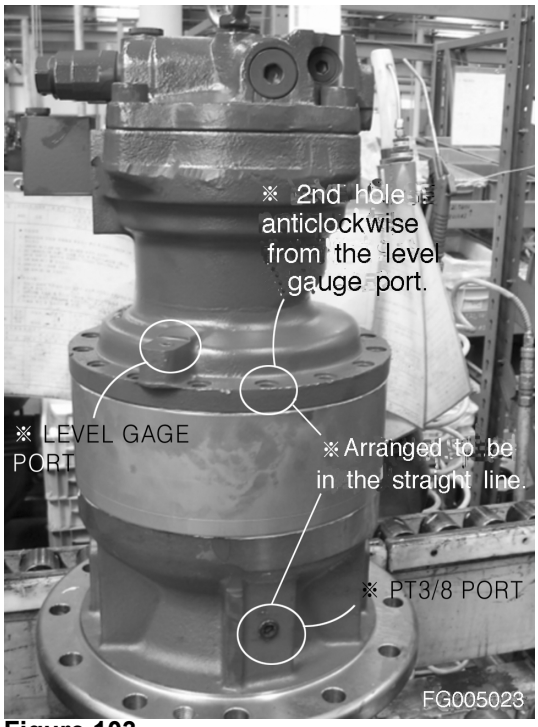


Figure 103

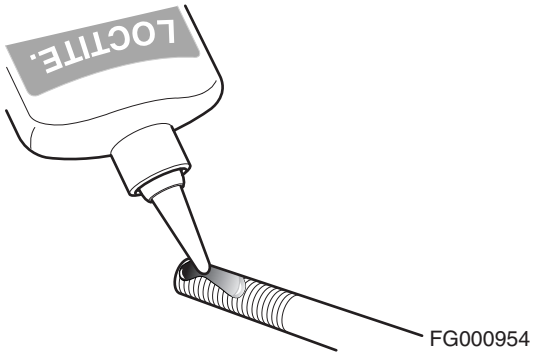


Figure 104

4. Apply Loctite (#2652) to 16 socket bolts (M12x150L, torque: 1,440 kgf.cm), insert into holes, and tighten with an impact wrench.

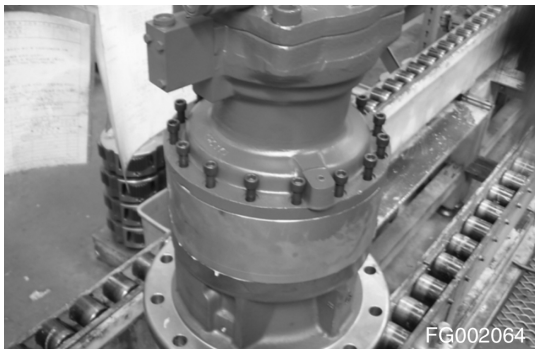


Figure 105

Table of Contents

Track Assembly

Upper Roller

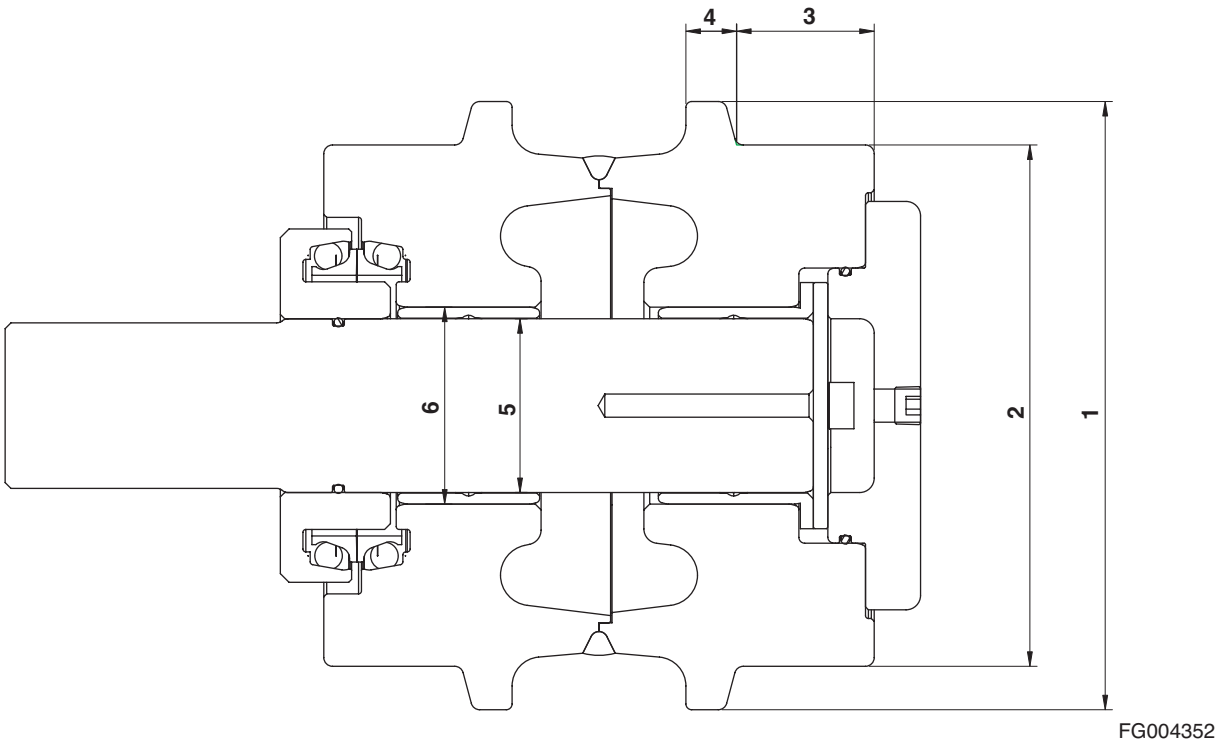


Figure 6

No.	Check Item	Standard Dimension			Recommended Limit for Maintenance	Limit for Use (Repair - P or Replace - R)
1	Outside Diameter of flange	210 mm (8.27")				
2	Outside Diameter of Tread	180 mm (7.09")			171 mm (6.73")	162.5 mm [P] (6.40")
3	Width of Tread	47.5 mm (1.87")				
4	Width of Flange	17.5 mm (0.69")				11.5 mm (0.45")
5	Clearance between shaft and bushing	Standard Dimension	Tolerance		Standard Interference	Repair Limit
			Shaft	Hole		
		60 mm (2.36")	0 -0.05	+0.45 +0.40	0.40 - 0.50	
6	Interference between roller and bushing	Standard Dimension	Tolerance		Standard Interference	Repair Limit
			Shaft	Hole		
		68 mm (2.68")	+0.132 +0.102	+0.035 0.	0.067 - 0.132	

Reference Number	Description
1	Roller
2	Collar
3	Shaft
4	Bushing

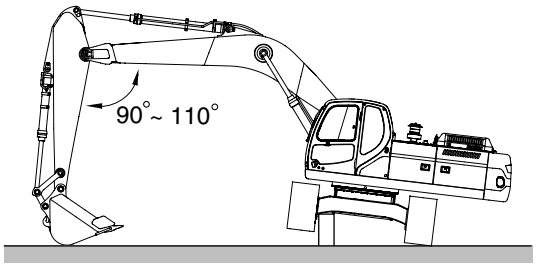
Reference Number	Description
5	Pin
6	Floating Seal
7	O-ring
8	Plug

Lower Roller Removal

1. Relieve track tension. Refer to "Track Tension" in this section for procedure.
2. Swing upper structure at 90° to frame.
3. Using bucket raise track off ground and place blocking under frame.
4. Remove four bolts and lower roller assembly from track frame. There is an alignment pin on each end of lower roller assembly.

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

   NOTE: *If additional track clearance is required, remove upper rollers before raising track.*

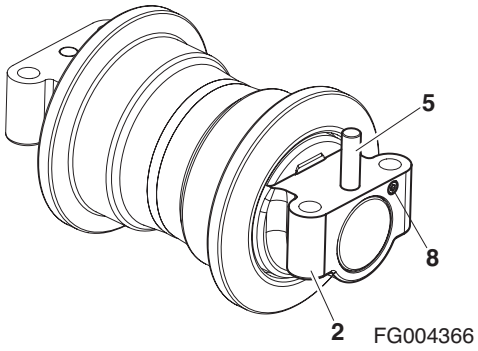


FG000345

Figure 26

Lower Roller Disassembly

1. Remove plug from the collar and drain oil.
2. Pull the pin (5, Figure 27) from the collar.



FG004366

Figure 27

Reference Number	Description
1	Body
2	Bracket
3	Rod
4	Spring
5	Tie Bar
6	Nut
7	Rod Packing
8	Backup Ring

Reference Number	Description
9	Dust Seal
10	Plate
11	Bolt
12	Spring Washer
13	Stopper
14	Spring Pin
15	Body Assembly

UNDER CARRIGE TRACK SPRING

Track Spring Assembly Diagram

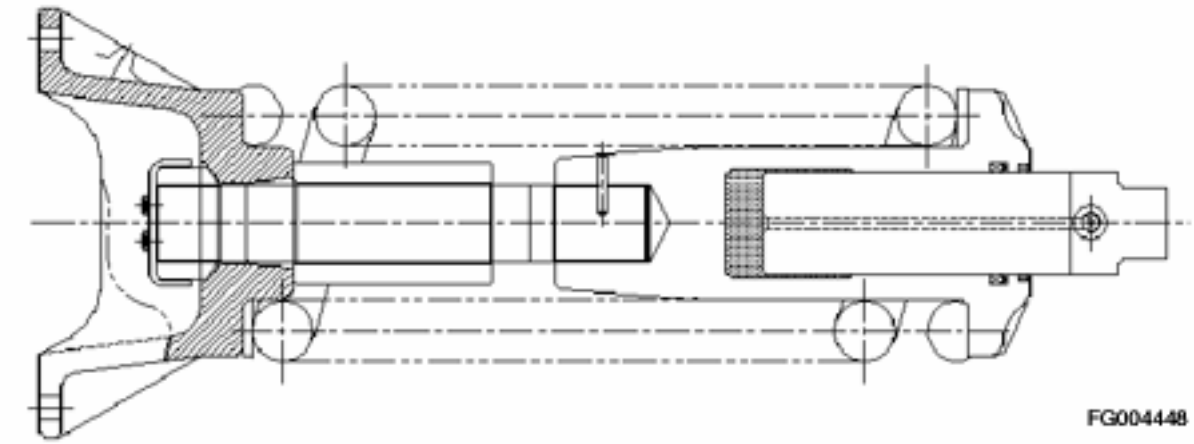


Figure 47

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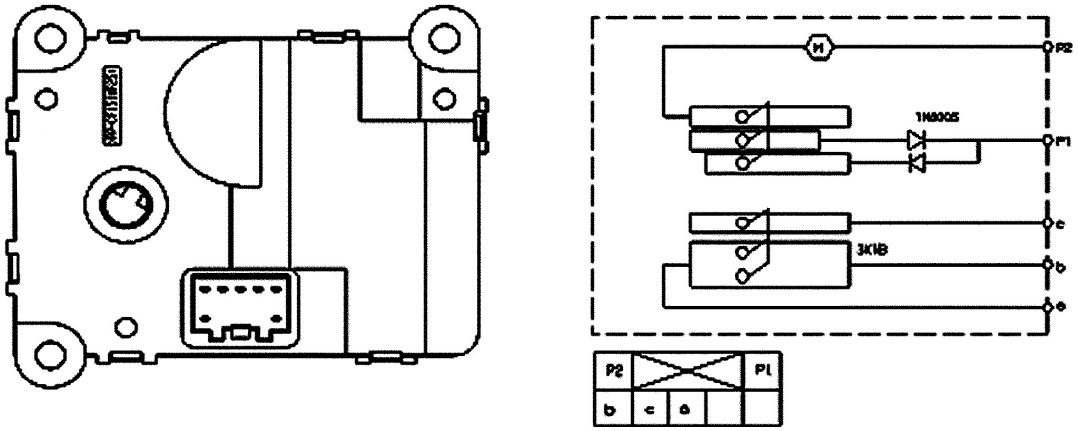
Air Conditioner



FG001361

Figure 10

Actuator - Wind direction control

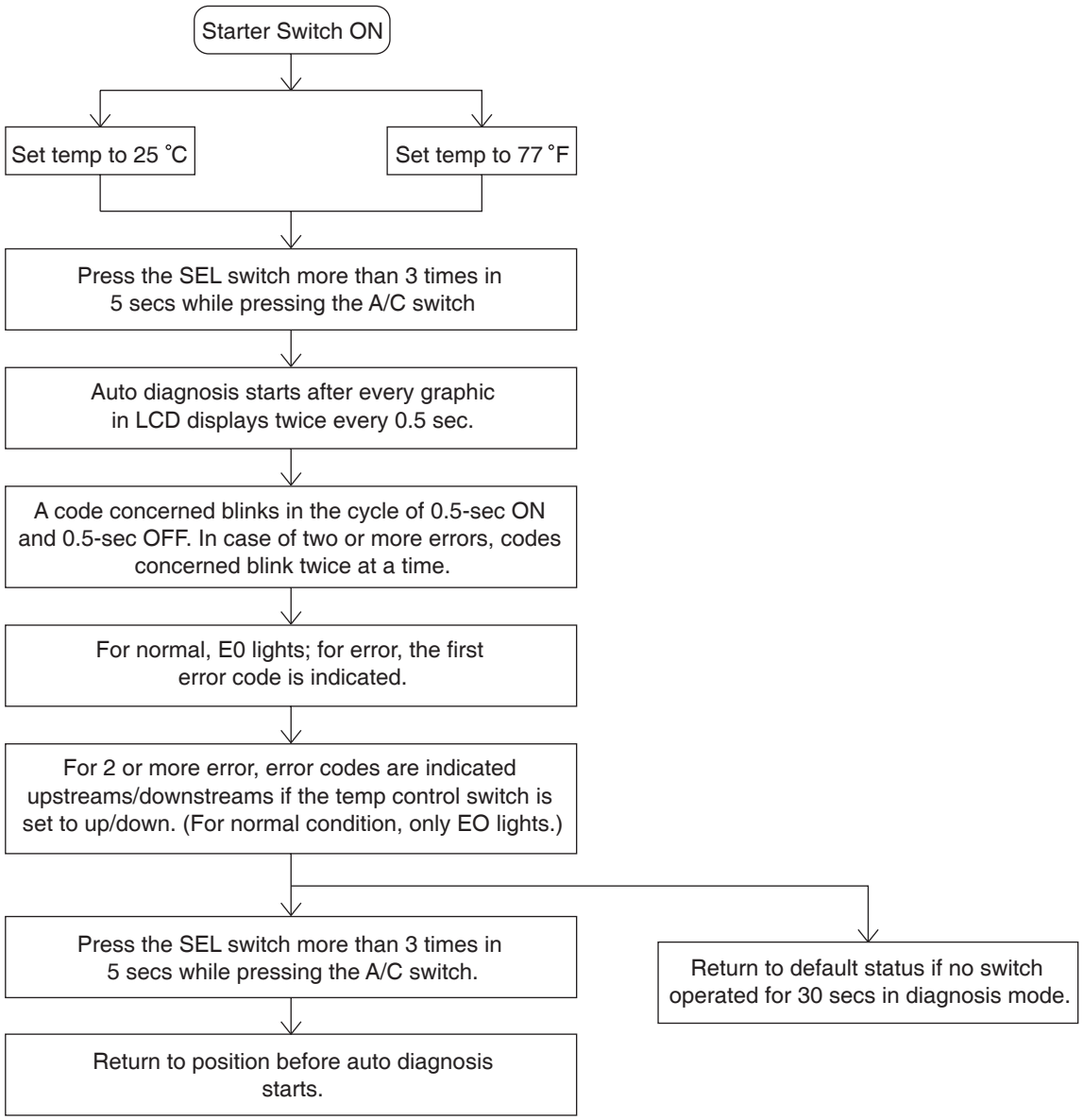
Wind Direction Mode	Output Terminal	Voltage
Vent	c(+): CN10-10 b(-): CN10-4	0.5 ±0.2V
Bi-level		1.3 ±0.2V
Foot		2.45 ±0.2V
Foot/def		3.5 ±0.2V
Def		4.5 ±0.2V

Actuator - Temp control

Set Temp	Output Terminal	Voltage
Max cooling	c(+): CN10-9 b(-): CN10-4	Below 0.4V
Max heating		Above 4.5V

Self Diagnosis

How to start self diagnosis

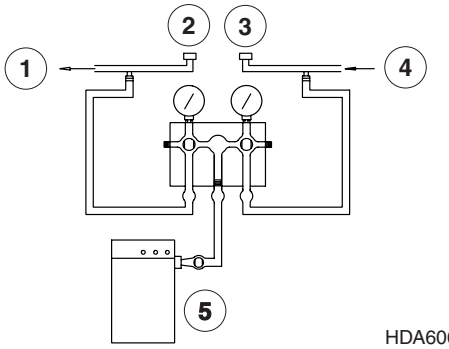


FG001367

Figure 21

Refrigerant Recovery

Reference Number	Description
1	To Compressor
2	Low-pressure Side
3	High-pressure Side
4	From Receiver
5	Refrigerant Recovery Tank



HDA6067L

Figure 29

1. Attach the manifold gauges and the refrigerant recovery unit to the refrigerant lines as shown.

   NOTE: *Be careful not to switch the connections for the low and high-pressure valves.*

2. Open the high-pressure valve slowly to release the refrigerant to the recovery unit.

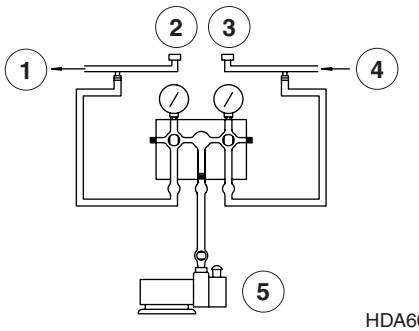
   NOTE: *Open the valve slowly, while checking to see that refrigerant is not leaking out.*

3. When the manifold gauge dial falls below 3.5 kg/cm^2 (50 psi), slowly open the low-pressure valve.

4. Open both the high and low-pressure valves slowly until the manifold gauge dials indicates 0 kg/cm^2 (0 psi).

Vacuuming Refrigerant System

Reference Number	Description
1	To Compressor
2	Low-pressure Side
3	High-pressure Side
4	From Receiver
5	Vacuum Pump



HDA6068L

Figure 30

1. Vacuuming Procedure

   NOTE: *When the A/C system has been exposed to the air, it must be vacuumed out. Perform vacuum process for 30 minutes for complete moisture and air evacuation.*

   A. Attach the manifold gauges and vacuum pump to the refrigerant system as shown.

   B. Turn on the vacuum pump and open both valves.

   C. When the low-pressure gauge shows approximately 710 mmHg, close both valves and turn off vacuum pump.

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Drive Coupling (Main Pump)

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Hydraulic System Troubleshooting, Testing and Adjustment

Bucket Operating Circuit

The bucket operating circuit includes the left main pump, the left half of the control valve and the bucket cylinder. 360 kg/cm^2 (5,112 psi) overload relief valves at BKT and BKTD 1 ports of the control valve protect the circuit and its components from being damaged.

Bucket Crowd Circuit

When the bucket control lever is placed in the crowd position, the bucket control valve spool on the left side of the control valve opens and oil from left main pump flows to the bucket cylinder.

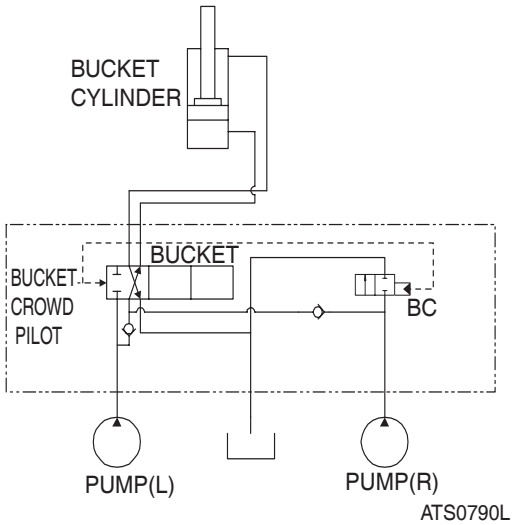


Figure 6

Bucket Dump Circuit

When the bucket control lever is put in the dump mode, the bucket control valve spool in the left half of the control valve opens to supply oil from the left main pump to the cylinder.

Swing Operating Circuit

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

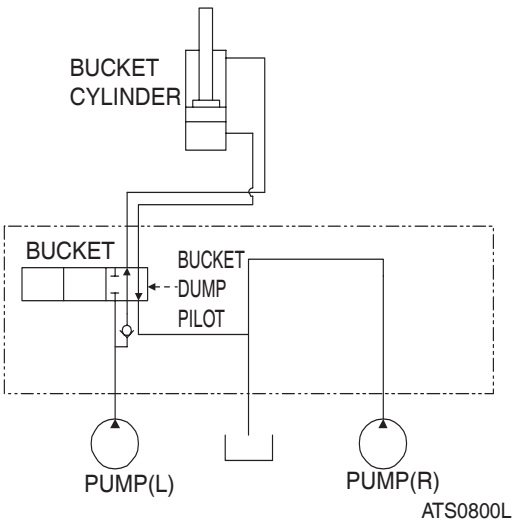


Figure 7

Power Mode	Operation	Main Pressure and Tolerance	Pilot Pressure and Tolerance
Mode	Neutral, No Operation	20 - 40 bar (290 - 580 psi)	30 bar +10 bar (435 psi +145 psi)
Mode	Cylinder Stall	320 bar +5 bar (4,641 psi +75 psi)	30 bar +10 bar (435 psi +145 psi)
Mode W/ Pressure Up	Cylinder Stall	350 bar +10 bar 5,075 psi +145 psi	30 bar +10 bar (435 psi +145 psi)

NOTE: *The electrical pressure up (power boost) solenoid valve alongside the swing priority solenoid and arm speed control solenoid, in compartment rear of the operator's cabin, must be operating correctly, or pressure tests and further adjustments cannot be made.*

Problem	Possible Cause	Remedy
Pressure at swing motor inlet shows no increase, and the swing motor is making irregular noises.	Swing motor drive shaft damage.	Replace swing motor.
	Internal damage to gearbox drive train.	Repair/Replace broken or faulty assemblies.
Pressure at swing motor inlet shown no increase, but without irregular noises from the swing motor.	Hydraulic pump or valve problem.	Troubleshoot hydraulic system.
Oil Leakage:		
From drive shaft From bolted connections or other assembled surfaces.	Oil seal damaged Assembly compound (joint sealer) old and not sealing, bolt not tight or flange warped.	Replace oil seal Disassemble and check mating surfaces. Reapply Loctite; torque bolts to specifications.
Excess heat:		
Gearbox casing becomes excessively hot, with or without irregular noise (s), during operation.	Low oil level.	Replace oil; refill to specified level.
	Bearings or gears worn but not completely inoperative.	Repair or replace gearbox.

TROUBLESHOOTING – HYDRAULIC PROBLEMS

Problem	Possible Cause	Remedy
Attachment cylinders, swing and travel motors are all inoperable. Loud noises are heard from main pump assembly.	Main pump(s) malfunction.	Repair or replace.
	Low oil level in hydraulic system.	Refill.
	Main pump inlet (oil supply) piping or hose damaged.	Repair or replace.
Attachment cylinders, swing and travel motors are all inoperable. No usual or loud noises can be heard.	Pilot pump malfunction.	Repair or replace.
	Pilot cutoff solenoid stuck.	Repair or replace.
	Pilot cutoff switch faulty.	Repair or replace.
	Engine/pump flex coupling damaged.	Replace flex coupling.
Sluggish performance of all hydraulic functions – attachment, swing and travel.	Main pump(s) damaged or worn.	Repair or replace.
	Main relief valve pressure off.	Readjust pressure.
	Low oil level in hydraulic system.	Refill.
	Hydraulic reservoir intake strainer clogged.	Clean.
	Pump inlet (supply side) piping or hose allowing air into hydraulic system.	Tighten connection.

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.

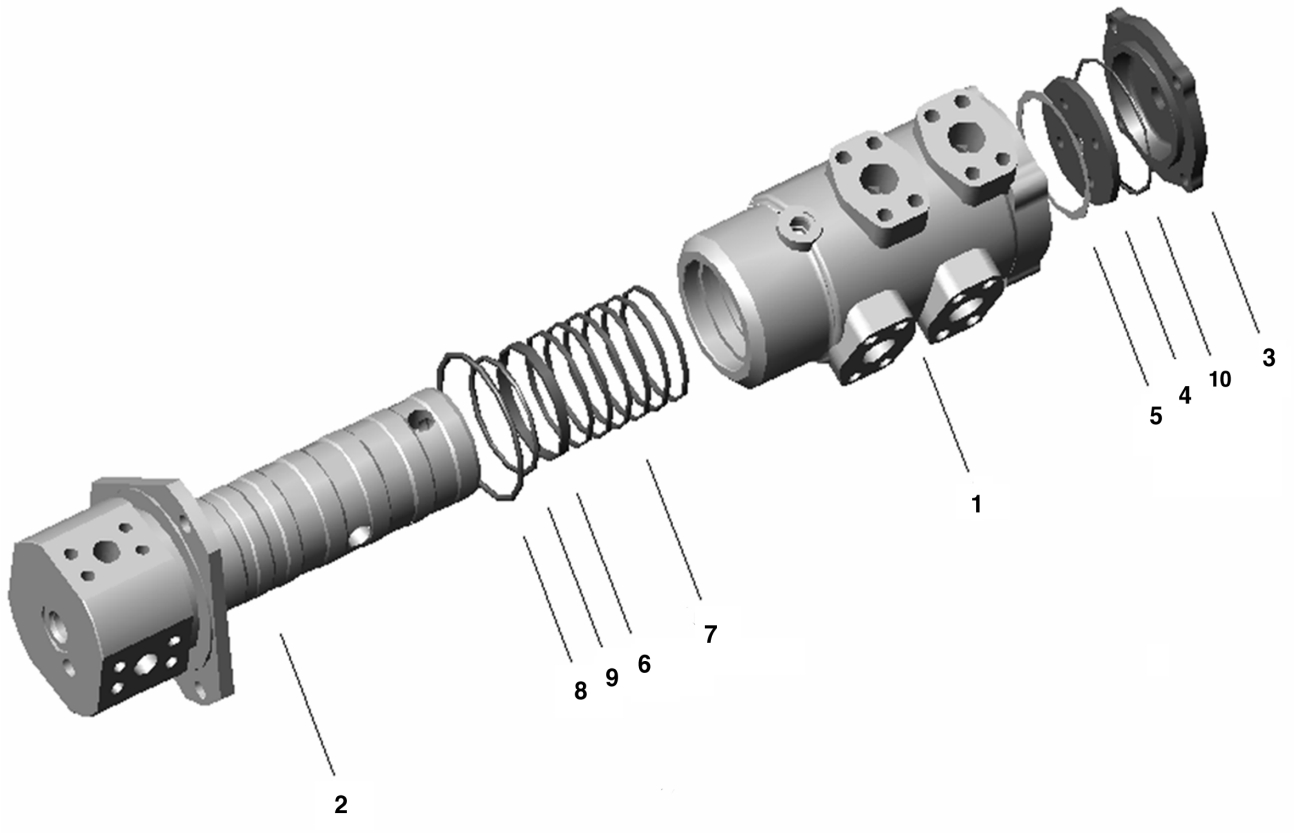
Remember, that ultimately safety is your own personal responsibility.

APPLICABLE MODELS

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

MODEL	SERIAL NUMBER RANGE
DX300LC	5001 and Up
DX340LC	5001 and Up
DX420LC	5001 and Up
DX480LC	5001 and Up
DX520LC	5001 and Up

Center Joint Disassembly Diagram



FG004446

Figure 1

Reference Number	Description
1	Body
2	Shaft
3	Cover
4	Spacer
5	Shim

Reference Number	Description
6	Wear Ring
7	Slipper Seal
8	O-ring(1AP 120)
9	O-ring(1BP 100)
10	O-ring(1BG 120)

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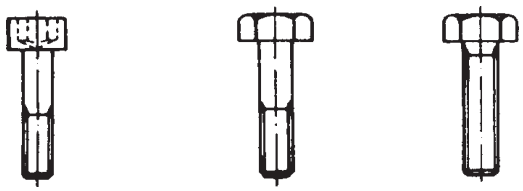
Cylinders

ASSEMBLY GUIDELINES FOR TIGHTENING TORQUES

BOLTS (TO N 08.001)

Values stated are valid for bolts with metric ISO threads to DIN 13 part 13, as well as head areas to DIN 912 socked head cap screws, DIN 931 hexagon bolt or DIN 933 hexagon bolts with threads up to the head.

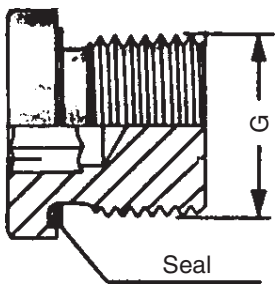


ASS1110L

Figure 112

Thread	Tensile Strength Class		
	8.8	10.9	12.9
	Tightening Torque M_A In Nm		
M 3	1.1	1.6	1.9
M 4	3.1	4.5	5.3
M 5	6.1	8.9	10.4
M 6	10.4	15.5	18
M 8	25	37	43
M 10	51	75	87
M 12	87	130	150
M 14	140	205	240
M 16	215	310	370
M 18	300	430	510
M 20	430	620	720
M 22	480	830	970
M 24	740	1060	1240

PLUGS WITH INTERNAL HEXAGON AND PROFILE SEAL RING (TO N 02.009).



ASS1120L

Figure 113

Signal Passage (Figure 2)

1. Oil supplied to port (PP, Figure 2), after passing through orifice (Lc3), is divided into two flows. One flow is sent to port (PT), and the other flows through land (Lc4) and passage (5) to land (Rc3) and into tank passage (Ta).
2. The same oil supplied from port (PP), after passing through orifice (Lc5), flows partly to port (PA) and passes partly through passages (L4), (8) and (R4), to boom spool 1 land (Rc4) and flows into tank passage (Ta).
3. The oil passing through orifice (Lc6) flows partly from land (Lc7), to tank passage (Ta), and passes partly through passage (4) to travel spool land (Rc5) and flows into tank passage (Ta).

2. Arm crowd (2 speed junction)

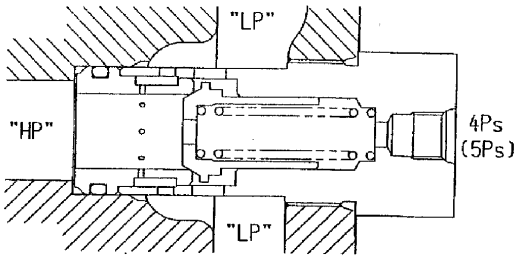
   When arm spool 1 is shifted by increasing pressure of arm 1 (section 5) pilot port (Pa5), oil supplied from port (P1) flows through, neutral passage (L1), load check valve (S5-1), passage (S5-2), and spool, into port (A5). When arm 2 spool is shifted by increasing pressure of arm 2 (section 9) pilot port (pa9) also, oil supplied from port (P2) flows through neutral passage (R1), load check valve (S9-1), passage (S9-2), spool and passage (9), it then joins with port (A5). When spool (AD3) of anti drift valve is shifted by increasing pressure of port (pc1) also, poppet (AD1) is opened by decreasing of pressure of spring chamber (AD5), and return oil from port (B5) returned through spool, passage (S5-3) and arm variable regeneration throttle (Lc8) to tank passage (Ta). Some of return oil open poppet (S5-4) in boom 1 spool, flows through passage (S5-2), it then joins with port (A5), increases cylinder speed, and then prevents cavitation on cylinder bottom side.

3. Variable regeneration (when crowding) (Figure 10)

   When crowding arm, spool (S5-6) is stroked according to pressure of passage (S5-2) connected to passage (S5-5), and opening size of arm variable regeneration throttle (Lc8) varies. When pressure of passage (S5-2) is high, stroke of spool (S5-6) is increased, so that opening size of throttle (Lc8) is increased. In contrary, when pressure of passage (S5-2) is low, stroke of spool (S5-6) is decreased, so that opening size of throttle (Lc8) is decreased. Therefore regeneration flow varies according to pressure of bottom of arm cylinder.

Low Pressure Relief Valve

1. When oil does not pass

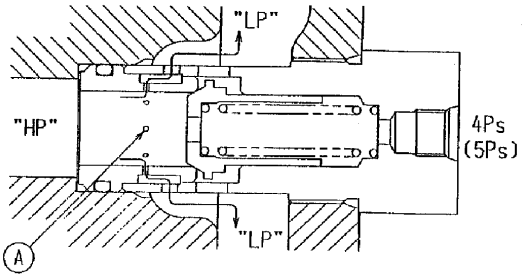


ASS1540S

Figure 27

2. When spool is in neutral

   Oil in neutral oil passage (HP) flows through signal orifice (A) into low pressure oil passage (LP). The pressure of the signal port (4Ps (5Ps)) increases by the negacon signal orifice (A).

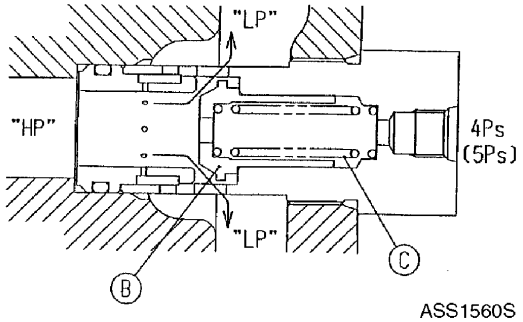


ASS1550S

Figure 28

3. Low pressure relief valve operation

   When the excessive quantities of oil in the neutral oil passage (HP) flow, pressure in neutral oil passage (HP) exceeds spring setting pressure (C). This causes poppet (B) to open. Oil then flows from neutral oil passage (HP) into low pressure oil passage (LP) so excessive pressure is prevented in neutral oil passage (HP).



ASS1560S

Figure 29

Relief Valve Assembly (50)

Reference Number	Description
1	Plug
2	Spring
3	Poppet
4	Sleeve
5	O-ring
6	O-ring

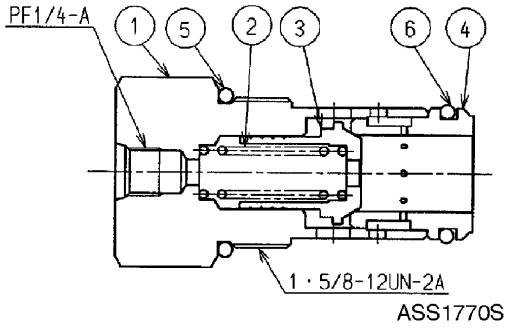


Figure 49

Specifications

Component Name	Specification
Rated Flow	400 liter/min. 500 liter.min at Neutral
Max. Pressure	31.9 MPa
Allowable Back Pressure	Peak Pressure: Below 1.5 MPa Normal Pressure: Below 0.5 MPa
Allowable Working Temperature Range	-20 ~ 90°C

Disassembly of Overload Relief Valve

1. This relief valve should be replaced as an assembly. When replacing it, loosen cap (1, width across flats: 31.75 mm) and O-ring (2). If oil leaks from nut (3), remove adjusting kit and replace O-ring (4).

   NOTE: *When disassembling adjusting kit, be careful not to allow components to spring out by force of spring or to lose the poppet.*

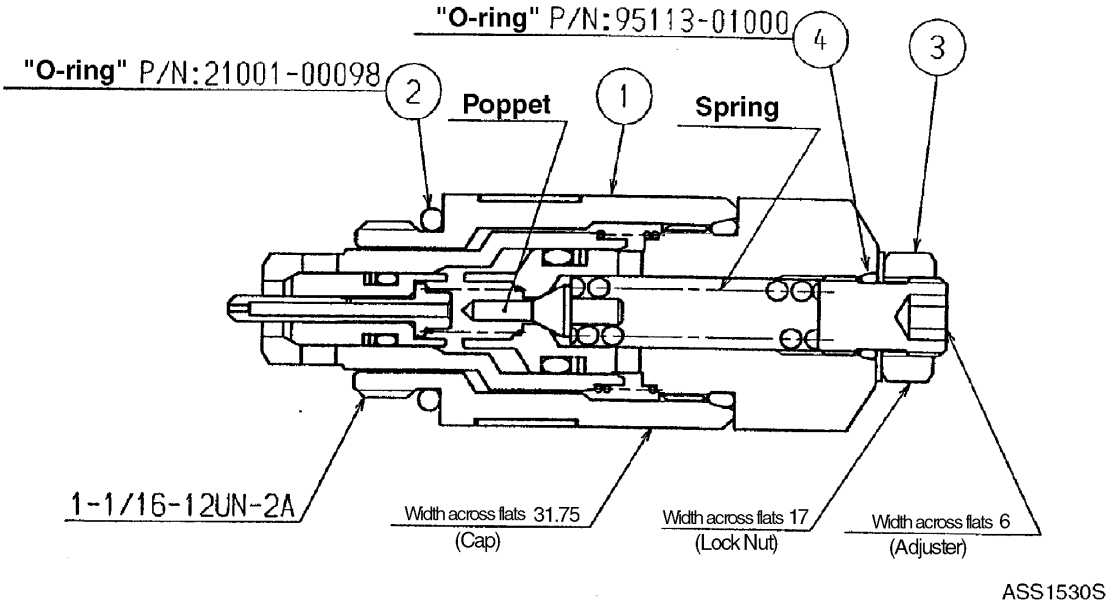


Figure 52

Disassembly of Low Pressure Relief Valve

1. This relief valve is a press fit at area (D) making it a non-serviceable item, that should be replaced as a whole assembly.

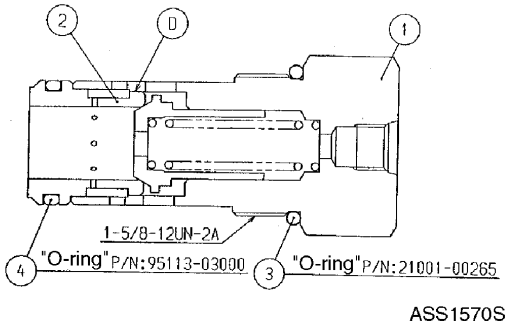


Figure 53

Specifications

Performance

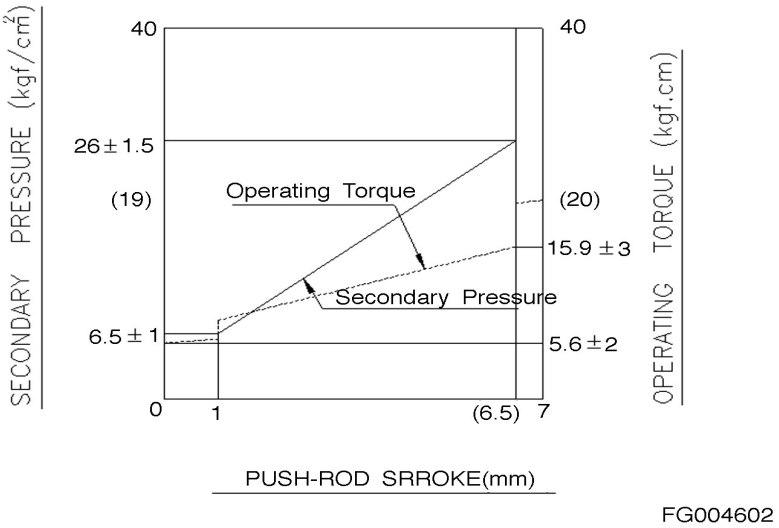


Figure 2

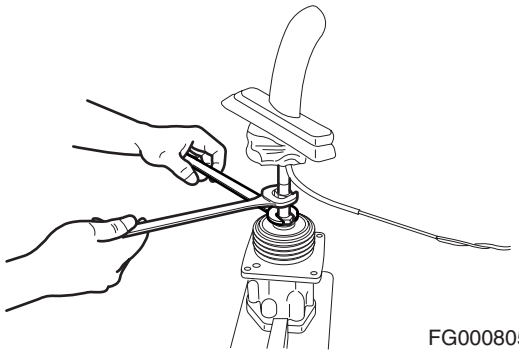
Torques

No.	Tool	Standard	Remark
3	Plug	PF 3/8	500 kg•cm (36 ft lb)
19	Swash Plate	27 mm	1,660 kg•cm (120 ft lb)
20	Hex Nut	22 mm	1,660 kg•cm (120 ft lb)
22	Nut	22 mm	1,660 kg•cm (120 ft lb)

TOOLS AND MATERIALS

No.	Tool	Standard	Remark
3	L Wrench	8 mm	
19	Spanner	27 mm	
20	Spanner	22 mm	
22	Spanner	22 mm	

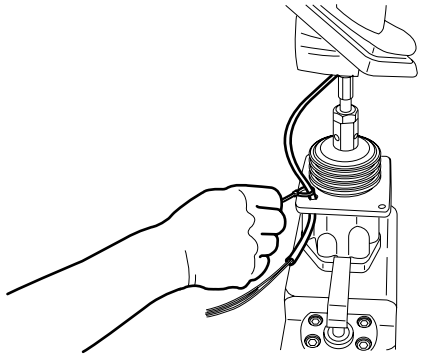
13. Install lever assembly into case (1).



FG000805

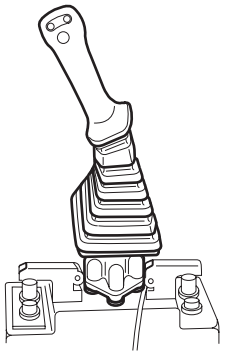
Figure 35

14. Put lead wire in bushing (29), tie it, and arrange boot.



FG000826

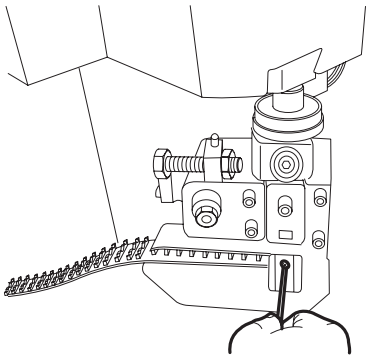
Figure 36



FG000827

Figure 37

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



FG001097

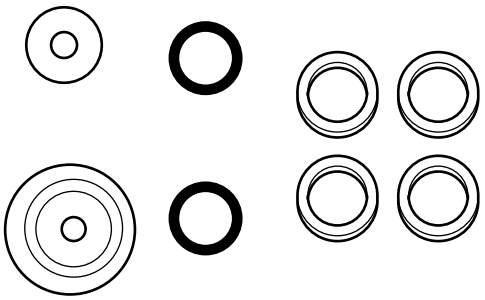
Figure 38

Dampening Parts of the Control Section

1. In the neutral position, the push rod is pushed up to its neutral position by the return spring and damper spring.
2. When the cam is moved in the clockwise direction from the neutral position, the push rod and damper spool of port 1 are moved in a downward direction. At this time, the pressurized oil in the damper spool is discharged through the orifice and the dampening pressure is generated. Meanwhile, the push rod in port 2 moves up with the damper spring and the damper spool between them. At the same time, the oil from the oil tank passes through the check ball (3 positions) consisting of a spring and steel ball, and flows out through port T in the upper portion of the casing to tank.
3. When the operating levers are moved to the extreme opposite position: When the cam is moved to the counterclockwise position from the clockwise most position, the push rod and piston in port 2 is moved in the downward direction. As in the case described above, the oil in the damping piston chamber is discharged through the orifice and the dampening pressure is generated in this chamber, providing dampening force. In port 1, the push rod is moved up by the action of the return spring and damper spring. At the same time, the oil from the oil tank passes through the check ball (3 positions) consisting of a spring and steel ball, and flows out through port T in the upper portion of the casing to tank

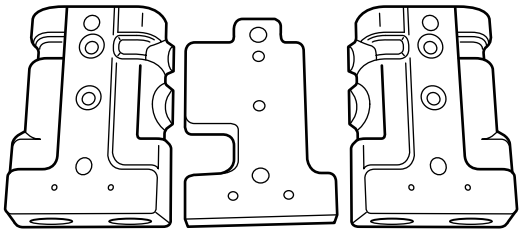
The damping operation is effective in both operations, when the levers are moved from the neutral position to the maximum travel position and when the levers are moved from the maximum travel position to the neutral position as well.

10. Remove hex socket head bolt (37) from each body (1 and 2). Disassemble each body (1 and 2) and spacer (34). Remove plugs (3 and 4) and O rings (35 and 36).



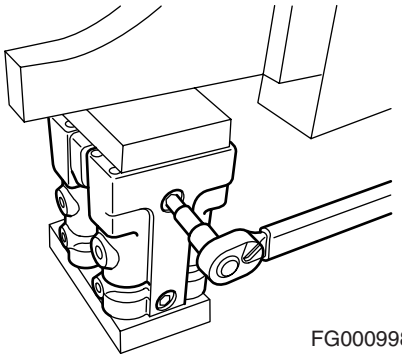
FG000996

Figure 20



FG000997

Figure 21



FG000998

Figure 22

CLEANING AND INSPECTION (WEAR LIMITS AND TOLERANCES)

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

MEMO

Check Points and Solutions for Problems

Symptoms	Causes	How to Check	Solutions
Malfunction of solenoid valve	Foreign substance, dirt, dust in solenoid valve	Disassemble the solenoid valve concerned and check if there are any contaminant such as foreign substance and sludge between the case and the spool.	Remove contaminant, wash, and assemble compartments.
	Tube or retainer of solenoid valve damaged	Disassemble the solenoid valve concerned and check if there is any deformation (bending or reduction) in the tube or the retainer.	Replace the solenoid valve.
	Coil broken, short, or burnt	Disassemble the solenoid valve concerned and check the resistance of the coil. Spec : 26.7Ω @ 20°C Disconnection: ∞ Short: Low or excessive resistance Disassemble the solenoid valve concerned and check the outside of the coil to see if its molding is burnt and melted.	Replace the coil.
	Connector terminal earth defect	Check if the cap housing (where coil lead is attached) and the housing (across its length) are earthed properly.	Replace housing or terminal concerned.
Pilot pressure fails to generate	Pilot pressure	Remove the plug of the "P5" port, set up a pressure gage, and check the pilot pressure discharged from the pilot pump when operating the cut-off (C1) valve.	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 bypassed due to 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.	Treat defect(s) accordingly.
	Solenoid valve	Set up a pressure gage at each outlet port of the solenoid valve concerned (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.	Treat according to findings.
	Other components	Check if each component works properly.	Treat according to findings.

MAINTENANCE INSTRUCTIONS

Maintenance

Bolt Tightening Torque

Table 1 shows torques used to tighten bolts of the motor.

Make sure that assembly work should be done according to Table 1.

Bolt Sizes	Names	Used Torques (kgf.cm)
M 35	Hex bolt	450 ± 50
M 10	Hex bolt	200 ± 20
NPTF 1/16	Plug	90

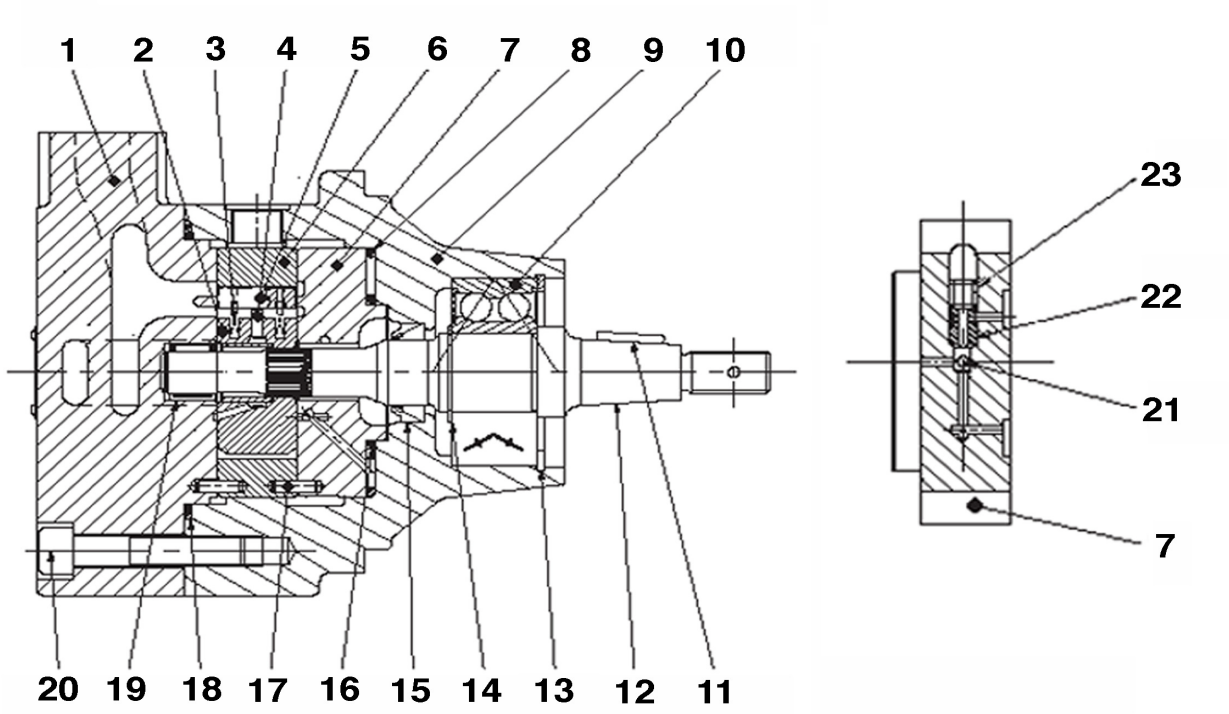
Tools Used for Disassembly and Assembly

Table 2 shows tools necessary for disassembly and assembly.

As bolts and plugs to be used depend on types, they should be checked accordingly in advance.

For	Sizes	Used Torques	Used Tools
Solenoid	M 35	450 ± 50	Spanner
Sleeve	M 10	200 ± 20	Hex bar spanner
NPTF plug	1/16	90	Hex bar spanner

PARTS LIST



FG004709

Figure 1

Reference Number	Description
1	End Cap (UNC)
2	Rotor Insert Assembly
3	Spring Vane
4	Pin-Vane Holdout
5	Vane
6	Cam Ring 012
7	Port Plate Pressure
8	O-ring
9	Housing
10	Ball Bearing
11	Key
12	Shaft

Reference Number	Description
13	Retaining Ring
14	Retaining Ring
15	Shaft Seal
16	Sq. Section seal
17	Dowel Pin
18	Sq. Section seal
19	Needle Bearing
20	Screw
21	Ball
22	Adaptor Valve
23	Screw

3. With the same screws, remove the pressure plate (7).

CAUTION!

the cartridge and the pressure plate may go out from the housing together, sticked by oil.

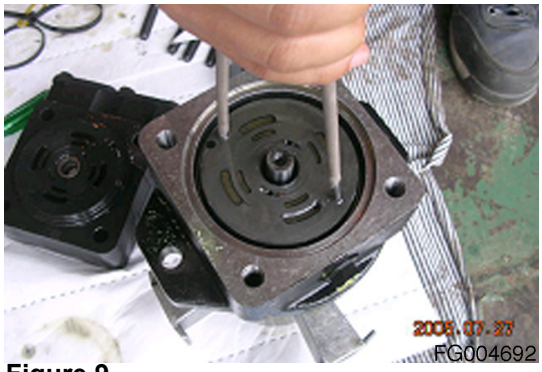


Figure 9

4. Remove the retaining ring (13) by using the tool.

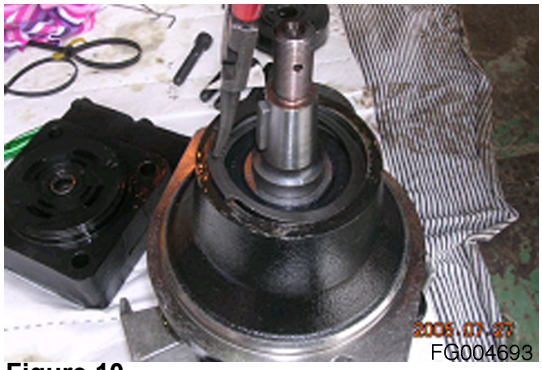


Figure 10

5. Remove the shaft (12) from the housing.

Figure 11

MEMO

8. Remove first section, and through shaft.

Figure 28

9. Remove all remaining components with same way of removal first section.

Figure 29

COOLING FAN A CHANGE OF DIRECTION VALVE

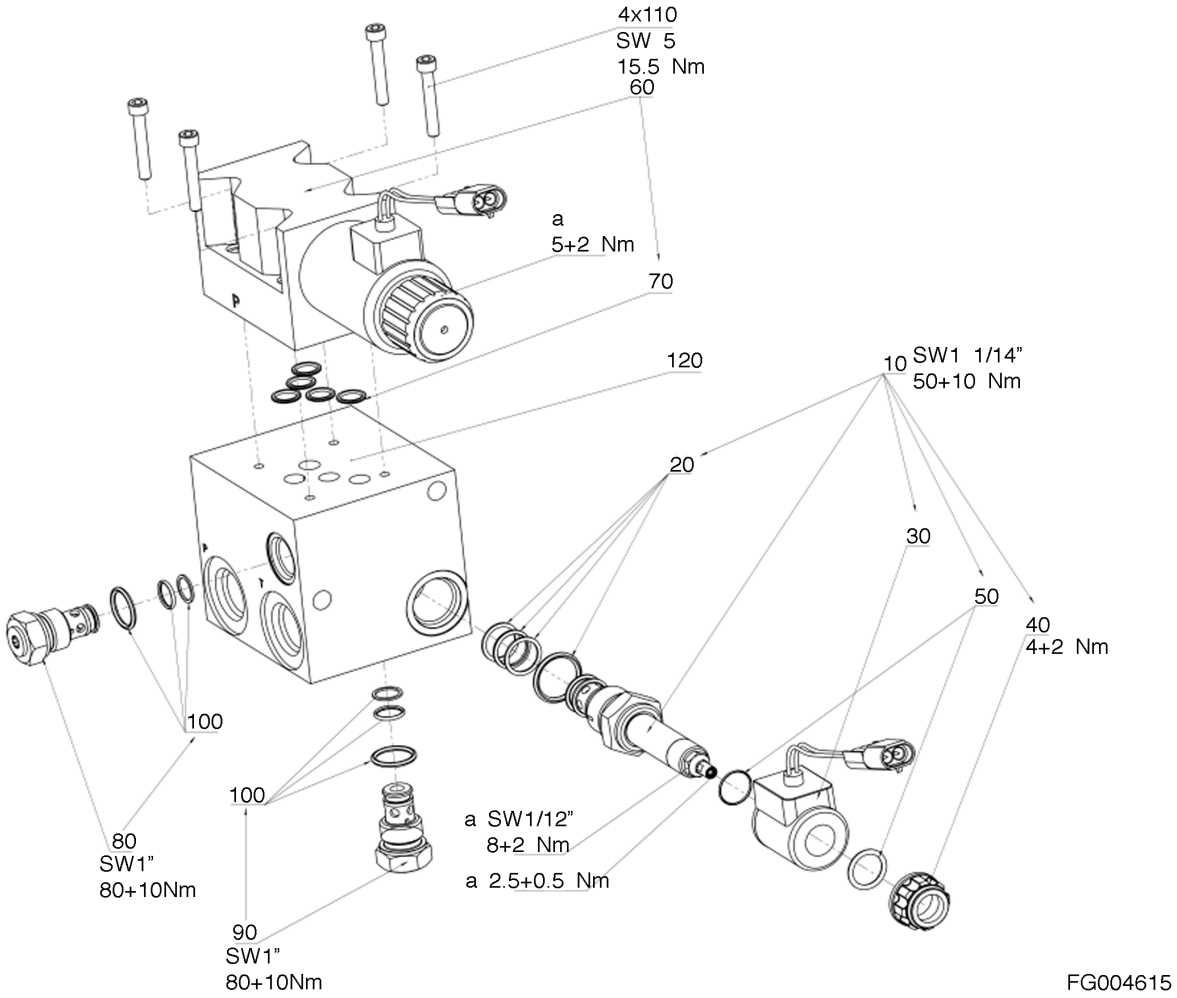


Figure 1

Reference Number	Description
10	Relief Valve
20	Seal Kit
30	Coil
40	Nut
50	O-ring
60	Solenoid Valve

Reference Number	Description
70	Seal Kit
80	Check Valve : Make up
90	Check Valve
100	Seal Kit
110	Socket Bolt
120	Body

ENGINE STOP

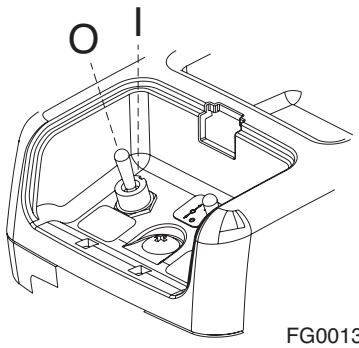
When starter switch (5) is turned "ON" the engine controller (8) is activated. The engine controller monitors and controls the engine including the injector solenoid (9). It controls the fuel deliver rate and the injection timing for each cylinder.

NOTE: *There is an individual injector solenoid (9) for each of the six cylinders. Only one soleniod is shown in Figure 6.*

When starter switch (5) is turned "OFF," the engine controller stops suppling power to the injector solenoid (9). This stops fuel from being injexted into the engine cylinder, thus stopping the engine.

In the event that the engine can be shut down using the starter switch (5), an emergency stop switch (10) is provided to shut down engine. To activate the emergancy stop switch, move it to the "I" (EMERGENCY STOP) position.

The emergency stop switch (10) is in its "O" (OFF) position during normal operation. The switch must be moved and held in the "I" (EMERGENCY STOP) position until the engine stops. When released it will automatically move back to the "O" (OFF) position.

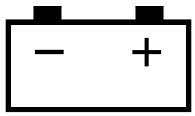
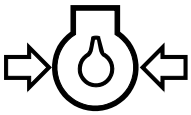
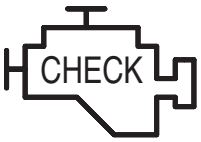


FG001344

Figure 5 ENGINE EMERGENCY STOP SWITCH

WARNING AND INDICATOR LIGHTS

Indication of Warning Lights

Description	Symbol	Input Terminal	Operation	Remarks
Charge	 HAOA610L	CN2 - 14	It lights in case of no charge [voltage of "R(I)" terminal is below 12 ±1V] or overcharge [voltage of "R(I)" terminal is above 33(V)].	Normally, it lights when starting engine and is out after engine starts.
Engine Oil Pressure	 HAOA620L	ECU-CAN Communication	It lights when engine oil pressure is below the reference.	After starting engine, if engine oil pressure is insufficient after 8 seconds, a warning buzzer will sound.
Engine Check	 FG000045	ECU-CAN Communication	It lights in case of failure in engine system.	
Coolant Temperature	 HAOD350L	ECU-CAN Communication	It lights when engine coolant temperature sensor resistant is below about 128 ohms.	
Preheating	 HAOA639L	CN5-2	It lights during preheating ("CN5-2" terminal voltage is below 2V) and turns "OFF" after completion of preheating.	Preheating period depends on coolant temperature. No preheating at above 10°C 10 sec preheating at 5°C 20 sec preheating at below 0°C

SPECIAL MENU

In this menu, many types of operating conditions and functions can be accessed and displayed, including the e-EPOS controller. This menu is mainly used for machine testing and failure diagnostics.

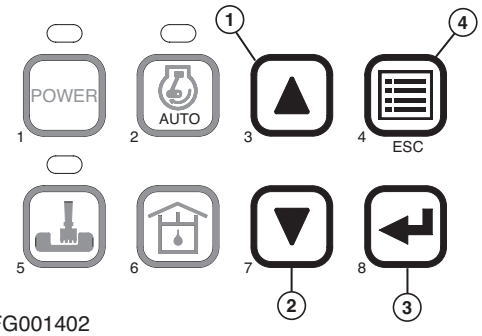
The special menu offers three sub-menus:

1. Machine status.
2. Failure information.
3. Information on machine operation.

Entering/Accessing and Exiting/Escaping Menus

Entering/Accessing Menus

When normal mode screen is displayed, if the enter button (↵, 3) and escape button (ESC, 4) are pressed simultaneously for more than 3 seconds, normal mode screen (Figure 24) will be changed to special menu screen (Figure 25).

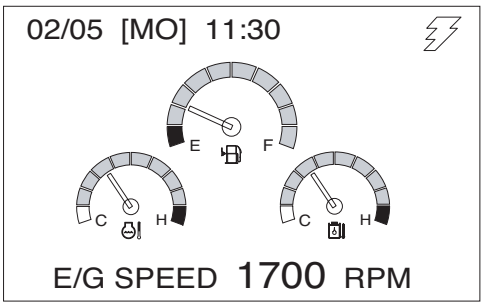


FG001402

Figure 23

Normal Mode Screen

NOTE: *Normal mode screen can display many kinds of display mode by selecting, for example, engine speed (RPM), battery voltage (VOLT), front pump pressure (BAR), rear pump pressure (BAR) and so on by selecting.*



FG000043

Figure 24

Failure Information Code at Engine Side

Code	Failure Component	Measuring Points	Current Valve		Remarks
			Active	Passive	
E011	Coolant temperature sensor	2-36 2-18	-	R=186 ±5 Ω (100°C (212°F))	
E012	Fuel temperature sensor	2-34 2-17	-	R=186 ±5 Ω (100°C (212°F))	
E013	Boost air temperature sensor	2-29 2-21	-	R=186 ±5 Ω (100°C (212°F))	
E014	Boost air pressure sensor	2-28 2-10	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	2-35 2-19	-	R=186 ±5 Ω (100°C (212°F))	
E018	E/G oil pressure sensor	2-33 2-09	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	1-13 1-15	V = V_volt (Note 4.)	-	
E022	Fuel pressure sensor	2-27 2-20	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	2-7 2-5	-	R=2.60 ±3.15 Ω (20°C (68°F))	
E037	CAN module	1-53 and 1-52 1-35 and 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 (ECU)		-	-	
E041	Redundant shutoff path		-	-	Abnormal engine stop.
E042	E/G speed (Crankshaft)	2-25 2-24	-	R=860 ±6 Ω (20°C (68°F))	

POWER MODE CONTROL

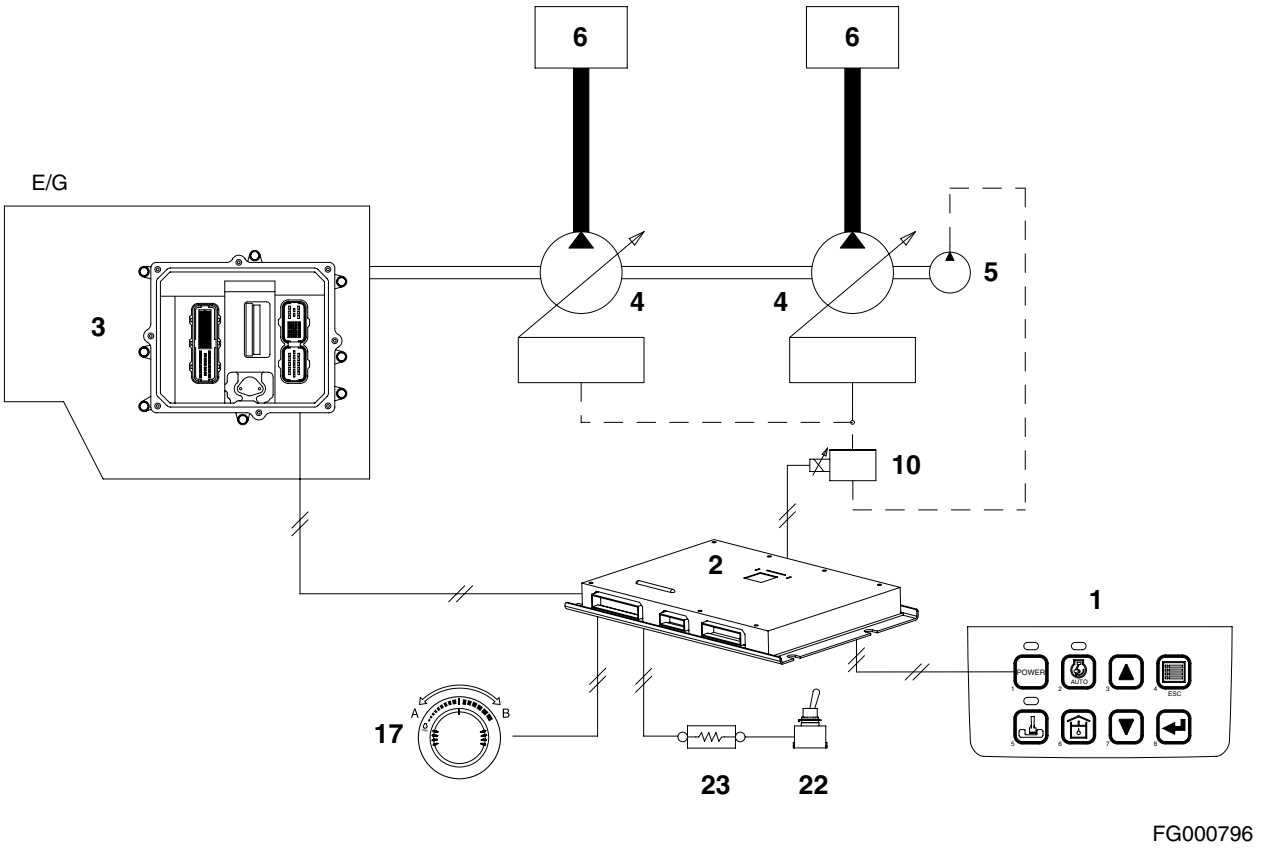
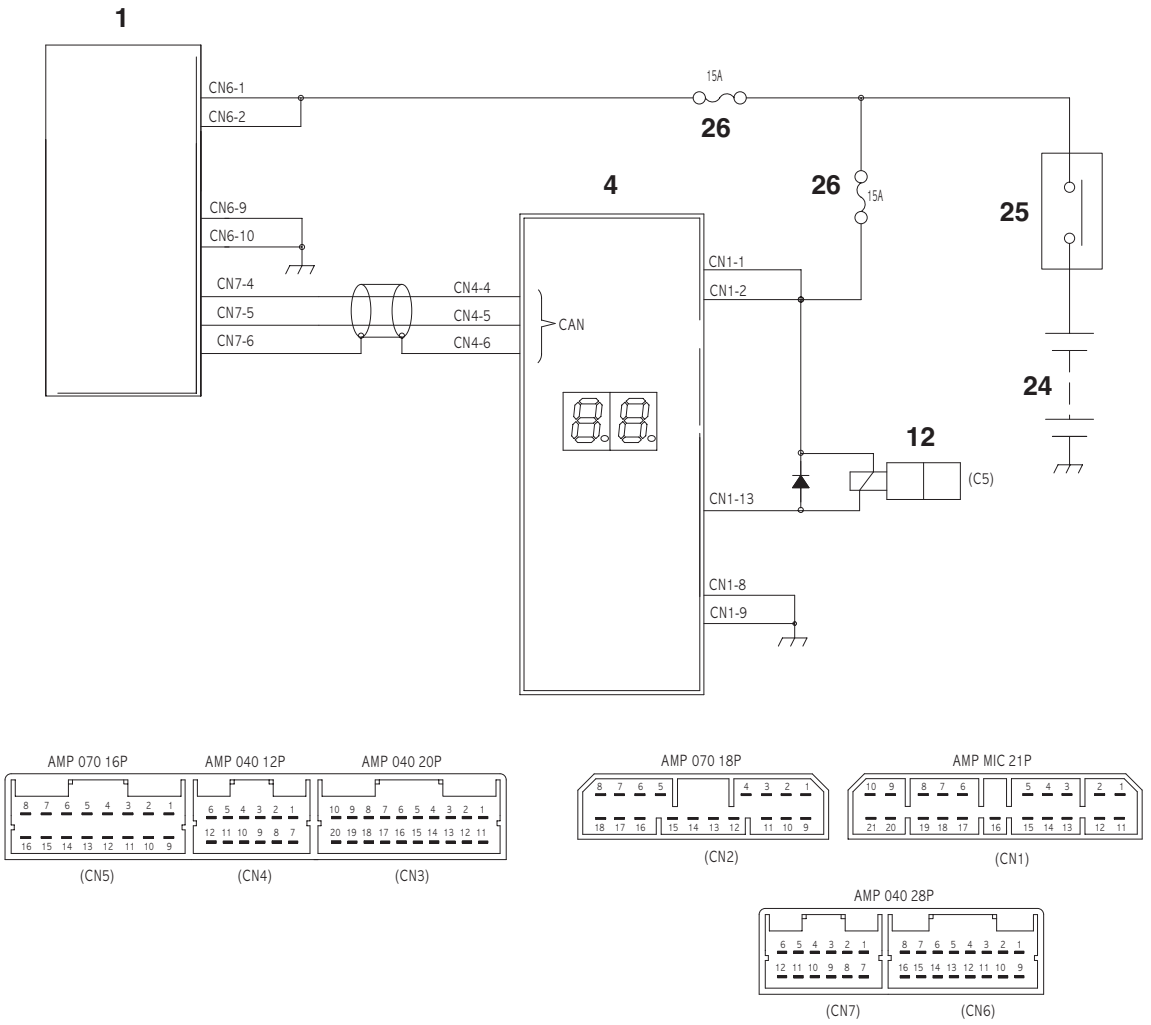


Figure 50

Reference Number	Description
1	Instrument Panel (Power Mode Selector Switch)
2	e-EPOS Controller
3	Engine Controller (ECU)
4	Main Pump
5	Aux Pump
6	Control Valve

Reference Number	Description
10	Electromagnetic Proportional Pressure Reducing Valve (Mode Control)
17	Engine Control Dial
22	Aux Mode Switch
23	Aux Mode Resistor

WORK MODE CONTROL - CIRCUIT DIAGRAM



FG000583

Figure 57

Reference Number	Description
1	Instrument Panel
2	e-EPOS Controller
12	Solenoid Valve (Swing Priority)

Reference Number	Description
24	Battery
25	Battery Relay
26	Fuse

POWER BOOST MODE

Operation

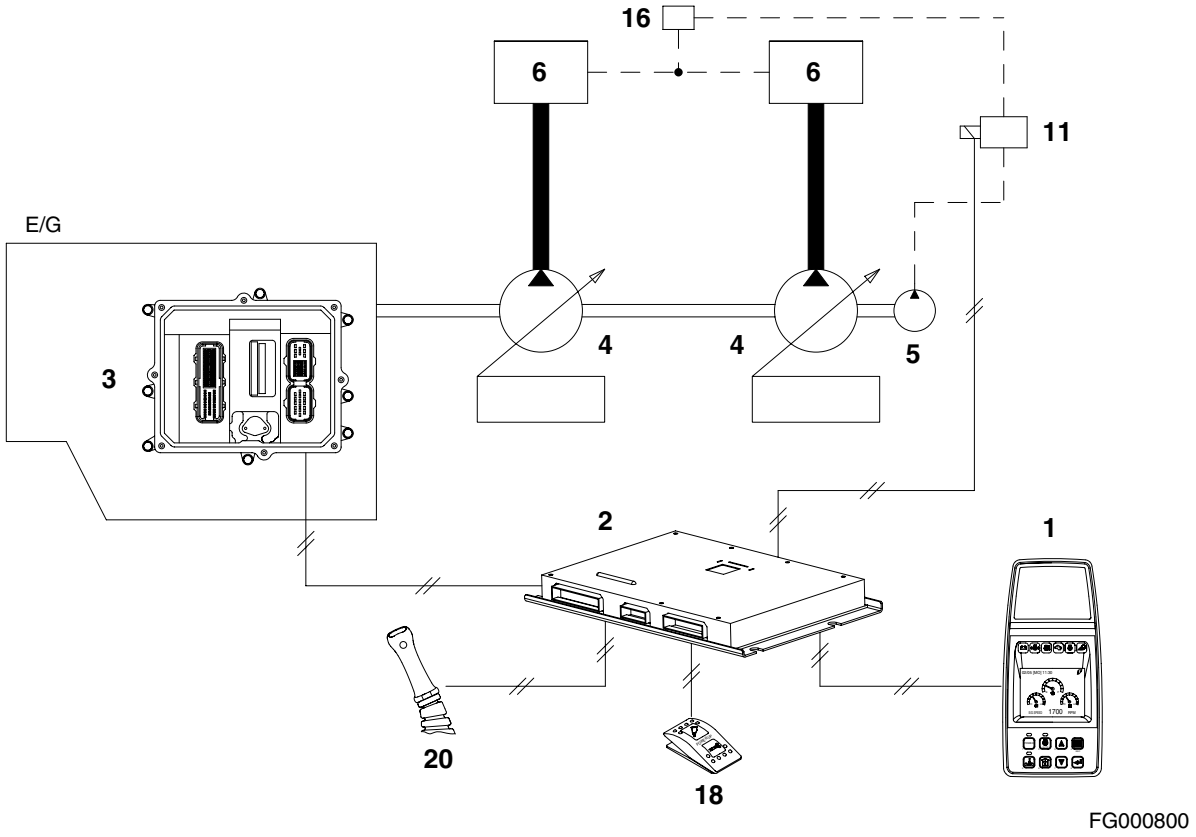


Figure 63

Reference Number	Description
1	Instrument Panel
2	e-EPOS Controller
3	Engine Controller
4	Main Pump
5	Aux Pump
6	Control Valve

Reference Number	Description
11	Solenoid Valve (Boost)
16	Main Relief Valve
18	Breaker/Boost/Shear Selector Switch
20	Power Boost Switch (Top of Right Work Lever)

(Please refer to the Operation Manual for detailed whole automatic control.

Vent mode selects the direction of discharged air.

Outlets by vent modes

Modes					
Outlets	A	A+B	B	B+C	C

Internal and External Filters

Internal and external air purification filters are installed for the driver's room.

Filters should be cleaned every 500 hours.

If machine operates in an excessively contaminated environment, filters should be cleaned more frequently and if necessary, replaced with new ones.

How to check Indoor air filter

1. Press both levers on the left and right side at the top of the filter installed at the rear of the driver's seat.

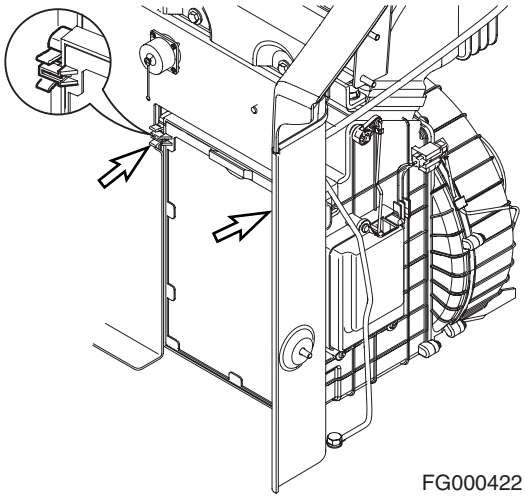


Figure 69

How to check outdoor air filter

1. Open the front door at the left side of machine and loosen four marked bolts to remove the cover (1, Figure 70).

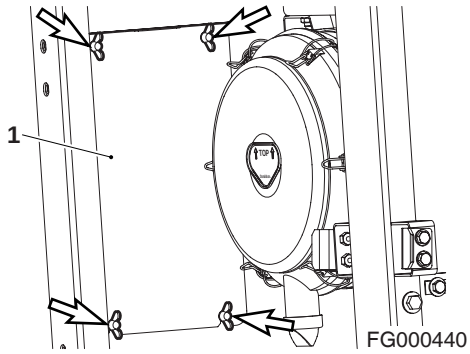
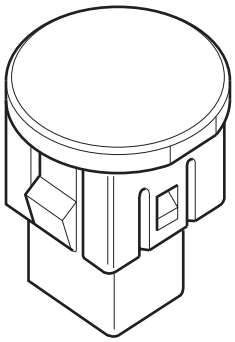
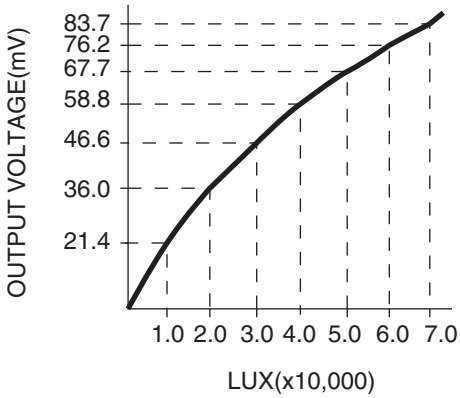


Figure 70

Sun Sensor

Built beside the socket of spare power, it senses the quantity of the sun radiation to optimize discharge temperature and air flow as set by driver.



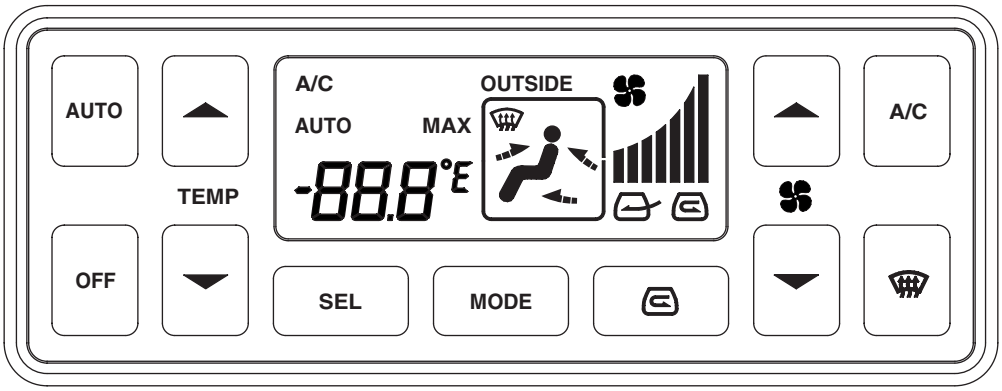


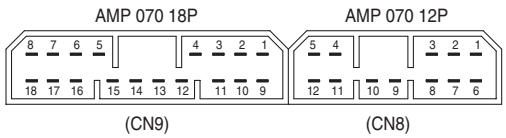
FG001062

Figure 86

Control Panel

Appearance and Terminal Arrangement





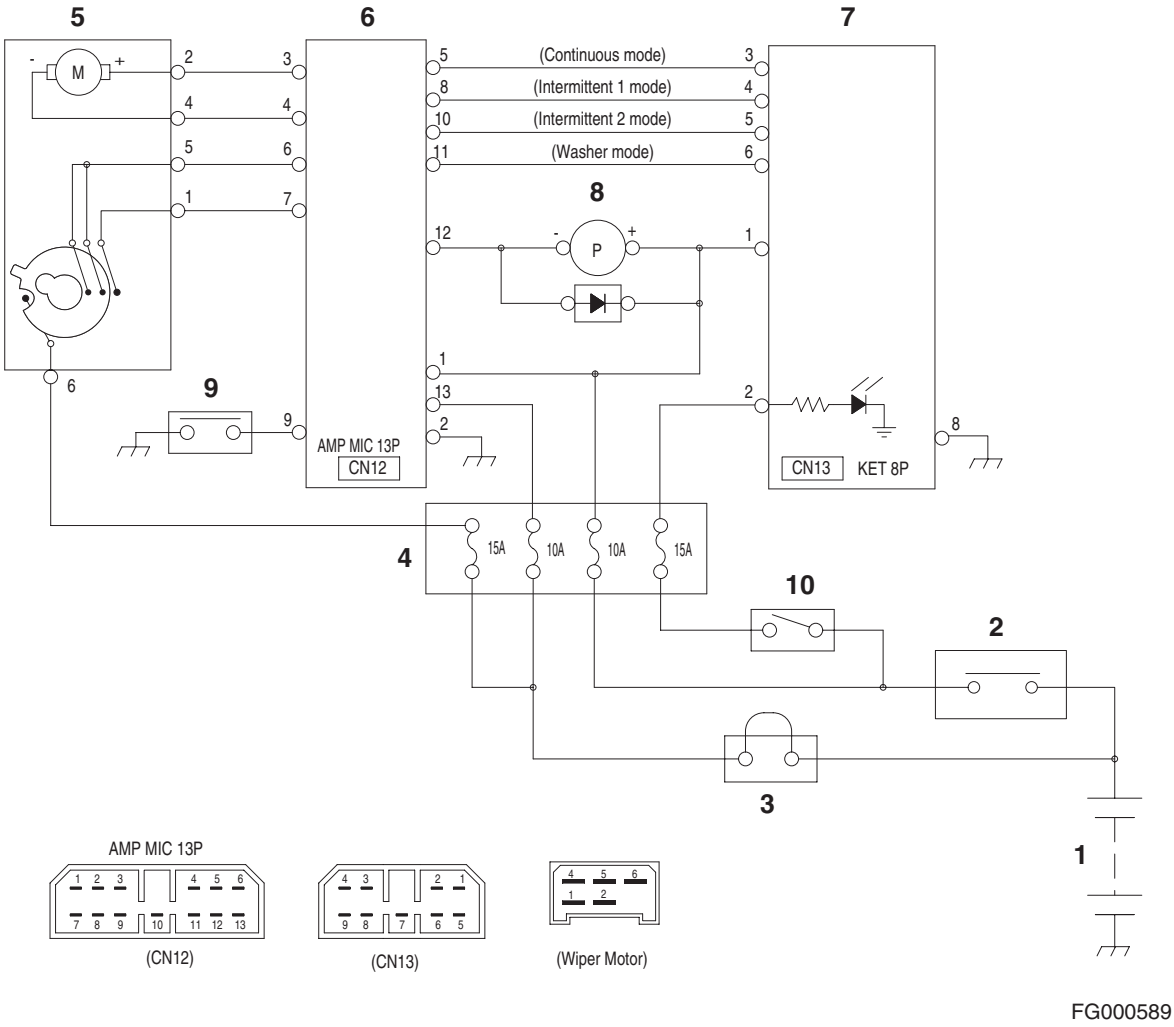
FG001063

Figure 87

Refer to "Air Conditioner and Heater" of operation manual.

WIPER SYSTEM

Wiper Circuit



FG000589

Figure 94

Reference Number	Description
1	Battery
2	Battery Relay
3	Fusible Link
4	Fuse Box
5	Wiper Motor

Reference Number	Description
6	Wiper Controller
7	Wiper Switch Panel
8	Window Washer
9	Wiper Cutoff Switch
10	Light Switch

MEMO

Boom Removal Procedure

NOTE: *Boom removal may be simplified if the shell of the operator's cabin is taken off the turntable deck first. Refer to the Operator's Cabin Removal procedure before continuing, if both components are to be removed from the excavator.*

After the bucket, arm and arm cylinder have been removed, lower the end of the boom to a stable, secure blocking support.

Attach the assist crane sling to the body of either boom cylinder, break the mounting pin connection to the boom by tapping through the pin from the same side of the boom and repeat for the opposite cylinder.

Release hydraulic pressure and disconnect line couplings as previously outlined in the Arm Removal Procedure, observing the same precautions.

Disconnect wiring for work light assemblies and any other accessory lines or connections. Locate the sling of the assist crane near the center of gravity, optimum lift point for the boom, and use the crane to take pressure off the boom foot pin. Drive out the pin after disassembling retainers and carefully lift away the boom.

⚠ WARNING!

Traveling the excavator, swinging the turntable or movement over bumps or sloping, uneven surfaces could all produce loss of control and possible accidents or injuries, if the turntable deck has been unbalanced by removal of weight from one end only.

To maintain stability, the counterweight should be removed whenever the front attachment is taken off the machine.