Solar 225LL

Shop Manual

023-00078E

Serial Number 1001 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.

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TRACK EXCAVATOR SAFETY

⚠ 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 is in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

MODEL	SERIAL NUMBER RANGE
Solar 225LL	1001 and Up
Solar 300LL	1001 and Up

June 2004

FUEL, OIL AND HYDRAULIC FLUID FIRE HAZARDS

Fuel, oil and antifreeze will catch fire if it is brought close to a flame. Fuel is particularly flammable and can be hazardous.

Always strictly observe the following.

Add fuel, oil, antifreeze and hydraulic fluid to the machine only in a well ventilated area. The machine must be parked with controls, lights and switches turned "OFF." The engine must be "OFF" and any flames, glowing embers, auxiliary heating units or spark causing equipment must be doused, turned "OFF" and/or kept well clear of the machine.

Static electricity can produce dangerous sparks at the fuel filling nozzle. In very cold, dry weather or other conditions that could produce a static discharge, keep the tip of the fuel nozzle in constant contact with the neck of the fuel filling nozzle, to provide a ground.

Keep fuel and other fluid reservoir caps tight and do not start the engine until caps have been secured.

Figure 3

PRECAUTIONS WHEN HANDLING FLUIDS AT HIGH TEMPERATURE

Immediately after operations are stopped, the coolant, engine oil, and hydraulic oil are at high temperature and the radiator and hydraulic tank are still under pressure. Attempting to remove the cap, drain the oil or coolant, or replace the filters may lead to serious burns. Always wait for the temperature to go down, and follow the specified procedures when carrying out these operations.

To prevent hot coolant from spurting out, shut down engine, wait for the coolant to cool, then loosen the cap slowly to relieve the pressure.

To prevent hot oil from spurting out, shut down engine, wait for the oil to cool, then loosen the cap slowly to relieve the pressure.

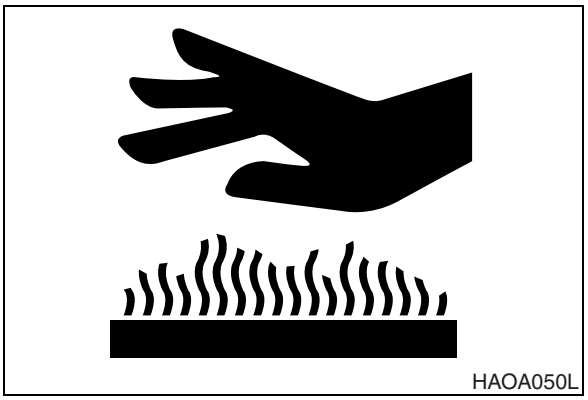

Figure 4

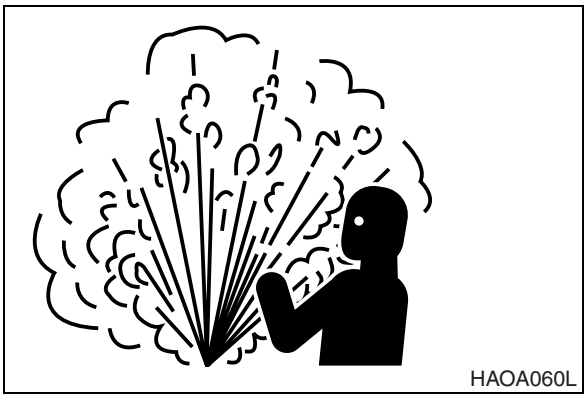

Figure 5

TRAVELING ON SLOPES

Never jump onto a machine that is running away to stop it. There is danger of serious injury.

Traveling on slopes could result in the machine tipping over or slipping.

On hills, banks or slopes, carry the bucket approximately 20 - 30 cm (8 - 12 in) above the ground. In case of an emergency, quickly lower the bucket to the ground to help stop the machine.

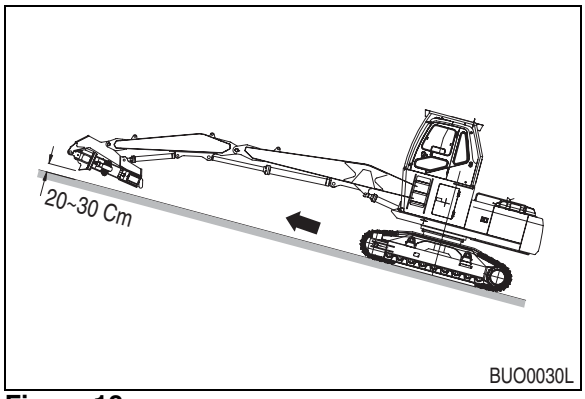

Figure 18

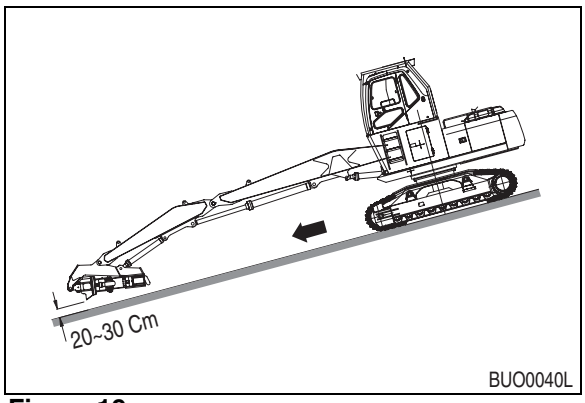

Figure 19

Do not travel on grass, fallen leaves, or wet steel plates. Even slight slopes may cause the machine to slip to the side, so travel at low speed and make sure that the machine is always traveling directly up or down the slope.

Avoid changing the direction of travel on a slope. This could result in tipping or side slipping of the machine.

When possible, operate the machine up slopes and down slopes. Avoid operating the machine across the slope, when possible.

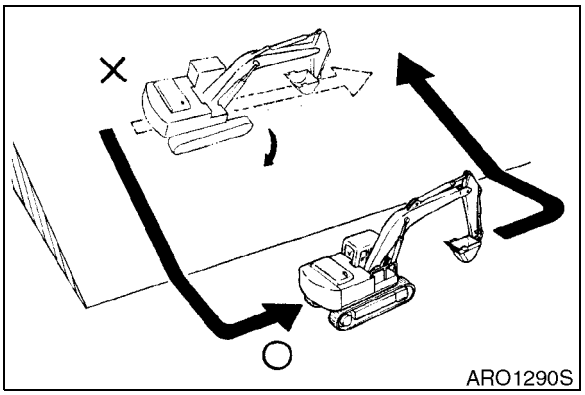

Figure 20

PROHIBITED OPERATIONS

Do not dig the work face under an overhang. This may cause the overhang to collapse and fall on top of the machine.

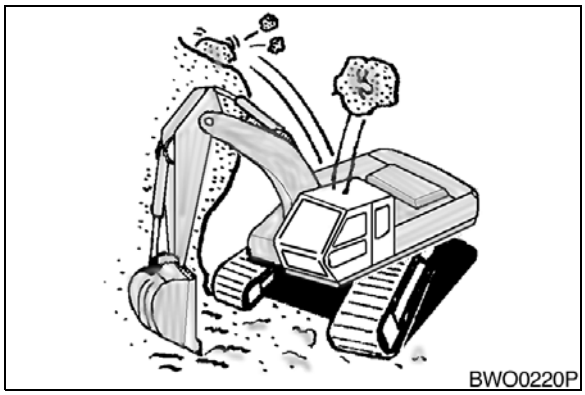

Figure 21

ACTION WHEN ABNORMALLY IS FOUND DURING INSPECTION

If any abnormality is found during inspection, always carry out repairs. In particular, if the machine is used when there are still problems with the brake or work equipment systems, it may lead to serious injury.

If necessary depending on the type of failure, please contact your Daewoo distributor for repairs.

PRECAUTIONS WITH HIGH-PRESSURE LINE, TUBES AND HOSES

When inspecting or replacing high-pressure piping or hoses, check that the pressure has been released from the circuit. Failure to release the pressure may lead to serious injury. Always do the following;

- Wear protective glasses and leather gloves.
- Fluid leaks from hydraulic hoses or pressurized components can be difficult to see but pressurized oil has enough force to pierce the skin and cause serious injury. Always use a piece of wood or cardboard to check for suspected hydraulic leaks. Never use your hands or expose your fingers.
- Do not bend high-pressure lines. Do not strike high-pressure lines. Do not install lines, tubes or hoses that are bent or damaged.
- Make sure that all clamps, guards and heat shields are installed correctly to prevent vibration, rubbing against other parts, and excessive heat during operation.
  - If any of the following conditions are found, replace the part.
  - Damage or leakage from hose end.
  - Wear, damage, cutting of covering, or exposure of strengthening wire layer.
  - Cover portion is swollen in places.
  - There is twisting or crushing at movable parts of hose.
  - Foreign material is embedded in the covering.
  - Hose end is deformed.

NOTE: *Refer to "Hose In-service Lifetime Limit (European Standard ISO 8331 and EN982 CEN)" in Operation and Maintenance Manual, for additional European regulations.*

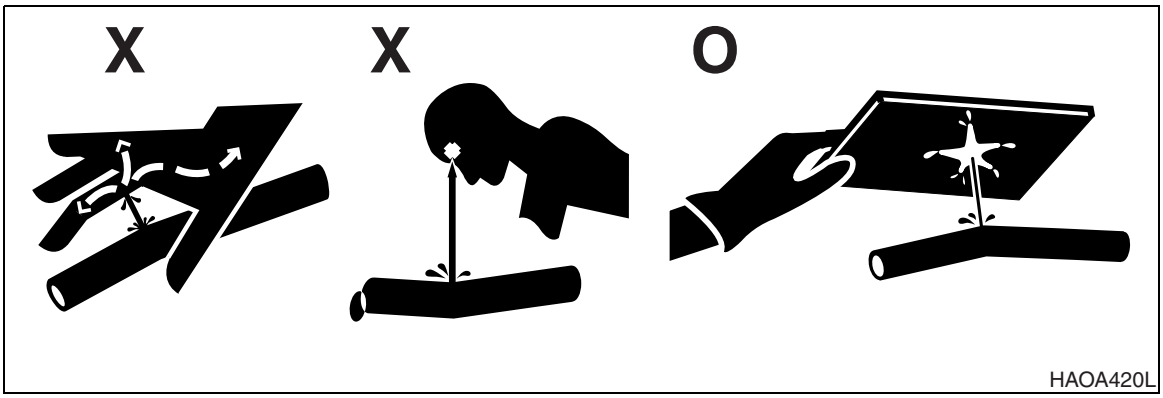

Figure 37

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 -4.)

MATERIAL	LOW WEIGHT OR DENSITY 1,100 KG/M^3 (1,850 LB/YD^3), OR LESS	MEDIUM WEIGHT OR DENSITY 1,600 KG/M^3 (2,700 LB/YD^3), OR LESS	HIGH WEIGHT OR DENSITY 2,000 KG/M^3 (3,370 LB/YD^3), OR LESS
Gypsum, calcined, (heated, powder)	961 kg/m^3 (1,620 lb/yd^3)	----------	----------
Gypsum, crushed to 3 inch size	----------	1,522 kg/m^3 (2,565 lb/yd^3)	----------
Gravel, DRY, packed fragments	----------	----------	1,810 kg/m^3 (3,051 lb/yd^3)
Gravel, WET, packed fragments	----------	----------	1,922 kg/m^3 (3,240 lb/yd^3)
Limestone, graded above 2	----------	1,282 kg/m^3 (2,160 lb/yd^3)	----------
Limestone, graded 1-1/2 or 2	----------	1,362 kg/m^3 (2,295 lb/yd^3)	----------
Limestone, crushed	----------	1,522 kg/m^3 (2,565 lb/yd^3)	----------
Limestone, fine	----------	----------	1,602 kg/m^3 (2,705 lb/yd^3)
Phosphate, rock	----------	1,282 kg/m^3 (2,160 lb/yd^3)	----------
Salt	929 kg/m^3 (1,566 lb/yd^3)	----------	----------
Snow, light density	529 kg/m^3 (891 lb/yd^3)	----------	----------
Sand, DRY, loose	----------	1,522 kg/m^3 (2,565 lb/yd^3)	----------
Sand, WET, packed	----------	----------	1,922 kg/m^3 (3,240 lb/yd^3)
Shale, broken	----------	1,362 kg/m^3 (2,295 lb/yd^3)	----------
Sulphur, broken	529 kg/m^3 (1,620 lb/yd^3)	----------	----------

WELDING PRECAUTIONS AND GUIDELINES

IMPORTANT

To avoid accidents, personal injury and the possibility of causing damage to the machine or to components, welding must only be performed by properly trained and qualified personnel, who possess the correct certification (when required) for the specific welding fabrication or specialized repair being performed.

⚠ WARNING!

Structural elements of the machine may be built from a variety of steels. These could contain unique alloys or may have been heat treated to obtain particular strength characteristics. It is extremely important that welding repairs on these types of steel are performed with the proper procedures and equipment. If repairs are performed incorrectly, structural weakening or other damage to the machine (that is not always readily visible) could be caused. Always consult Daewoo After Sales Service before welding on integral components (loader arm, frames, car body, track frames, turntable, attachment, etc.) of the machine. It is possible that some types of structurally critical repairs may require Magnetic Particle or Liquid Penetrant testing, to make sure there are no hidden cracks or damage, before the machine can be returned to service.

⚠ CAUTION!

Always perform welding procedures with the proper safety equipment on hand. Adequate ventilation and a dry work area are absolutely essential. Keep a fire extinguisher nearby and always wear protective clothing and the recommended type of eye protection.

Heat Discoloration

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

Excessive heat can cause softening of races or rollers.

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

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

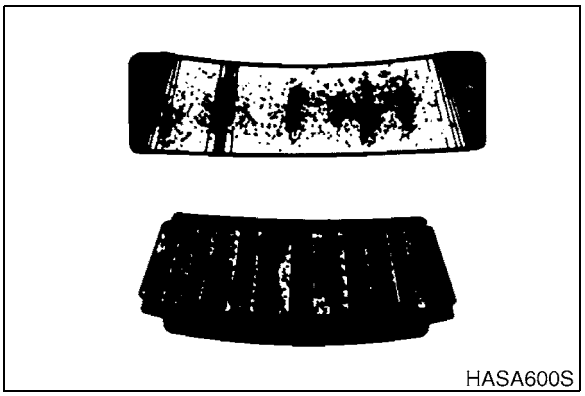

Figure 17

Stain Discoloration

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

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

Check seals and other related parts for damage.

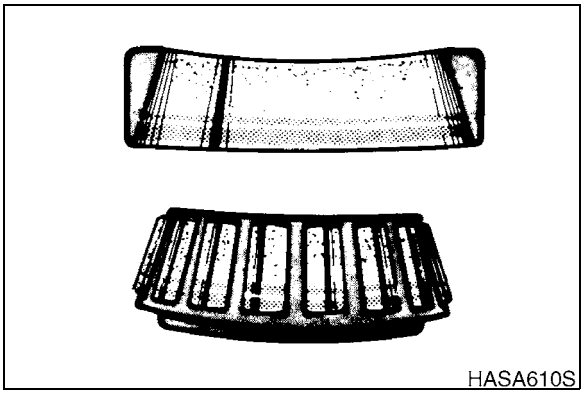

Figure 18

TORQUE WRENCH EXTENSION TOOLS

Very large diameter, high grade fasteners (nuts, bolts, cap screws, etc.) require a great deal of turning force to achieve recommended tightening torque values.

Common problems that could occur as a result are:

- Recommended torque exceeds the measuring capacity of the torque wrench.
- Specialized sockets do not fit the adapter on the front end (nose) of the torque wrench.
- Generating adequate force on the back end (handle) of the wrench is difficult or impossible.
- Restricted access or an obstruction may make use of the torque wrench impossible.
- A unique application requires fabrication of an adapter or other special extension.

Most standard torque wrenches can be adapted to suit any one of the proceeding needs or situations, if the right extension tool is used or fabricated.

TORQUE MULTIPLICATION

A wrench extension tool can be used to increase the tightening force on a high capacity nut or bolt.

For example, doubling the distance between the bolt and the back (handle) end of the torque wrench doubles the tightening force on the bolt. It also halves the indicated reading on the scale or dial of the torque wrench. To accurately adjust or convert indicated scale or dial readings, use the following formula:

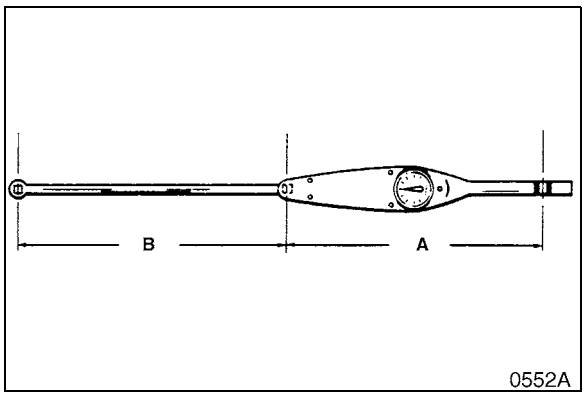

Figure 1

I = A x T / A + B where:

I = Indicated force shown on the torque wrench scale or dial.

T = Tightening force applied to the nut or bolt (actual Torque).

A = Length of the torque wrench (between the center of the nut or bolt and the center of the handle).

B = Length of the extension.

As an example, if a 12" extension is added to a 12" torque wrench, and the indicated torque on the dial reads "150 ft lb," the real force applied to the bolt is 300 ft lb:

$$I = \frac{A \times T}{A + B} = \frac{12 \times 300}{12 + 12} = \frac{3600}{24} = 150$$

NOTE: *The formula assumes that there is no added deflection or "give" in the joint between the extension and torque wrench. Readings may also be inaccurate:*

- If the extension itself absorbs some of the tightening force and starts to bend or bow out.
- If an extension has to be fabricated that is not perfectly straight (for example, an extension made to go around an obstruction, to allow access to a difficult to tighten fastener), the materials and methods used must be solid enough to transmit full tightening torque.

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

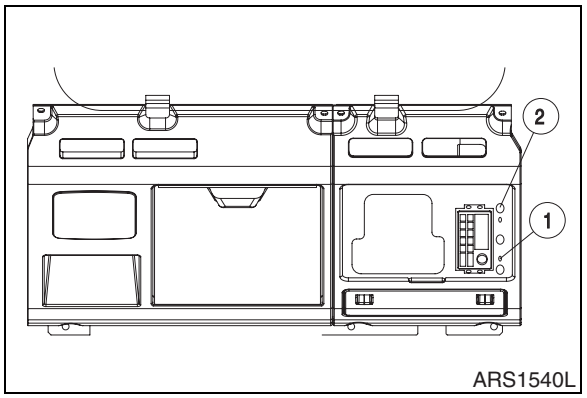

Figure 5

24. Remove four mounting nuts from four corners of cab floor (2, Figure 6).
25. Remove four hex bolts (3, Figure 6) from door side of cab floor.
26. Remove two hex bolts (1, Figure 6) from right side of cab floor and one bolt (4) from front of cab floor.

Quantity	Description
4	16 mm hex nuts at each corner of the cab
4	10 mm x 1.5 hex bolts at the door side of the cab
3	10 mm x 1.5 mm hex head bolts, 2 on the right side of the cab and 1 under the front window.

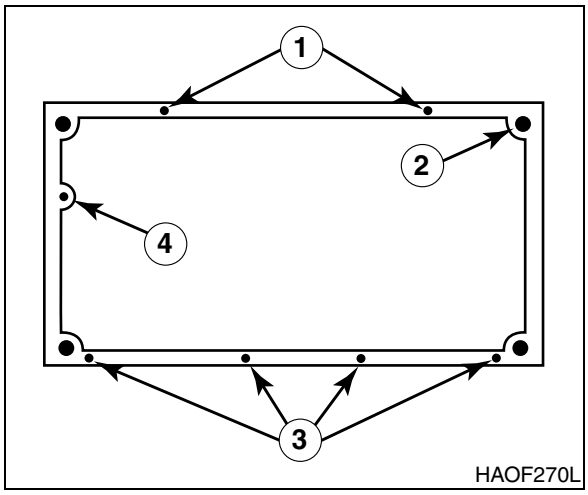

Figure 6

27. Using a suitable lifting device, attach slings to four lift points on top of cab (Figure 7).

    NOTE: *Cab weighs approximately 290 kg (640 lb).*

28. Lift the cab approximately 25 - 50 mm (1" - 2") above the deck height. Check that all the electrical connections have been disconnected and all other items unbolted.
29. Continue lifting with the assist crane to remove the cab shell. Lower the shell to a prepared safe blocking support.

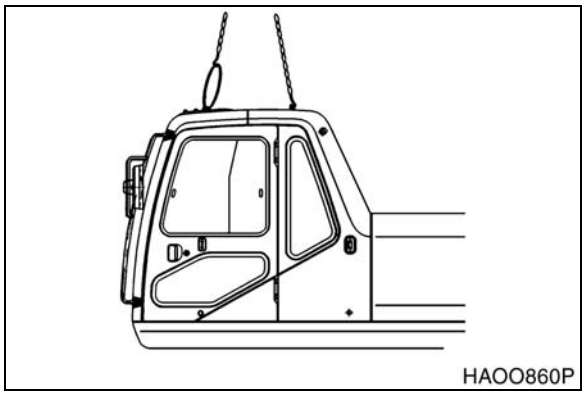

Figure 7

INSTALLATION

1. Raise engine compartment cover.
2. Using suitable lifting device capable of handling load, raise counterweight (2, Figure 6) into position just above support frame (6) leaving counterweight suspended. Verify that counterweight is level and even.

   NOTE: *Leave counterweight (2, Figure 6) suspended 3 mm (0.125") above support frame (6) until all four mounting bolts (4) are started in counterweight mounting holes.*

3. Slide spacers/washers (5, Figure 6) onto bolts (4). Apply Loctite #242 to mounting bolt threads.
4. Install four bolts (4, Figure 6) with spacers/ washers (5) into counterweight until spacers contact support frame. Fully lower counterweight onto support frame and finish tightening bolts.

   NOTE: *Tighten bolts (4, Figure 6) to values shown in following table.*

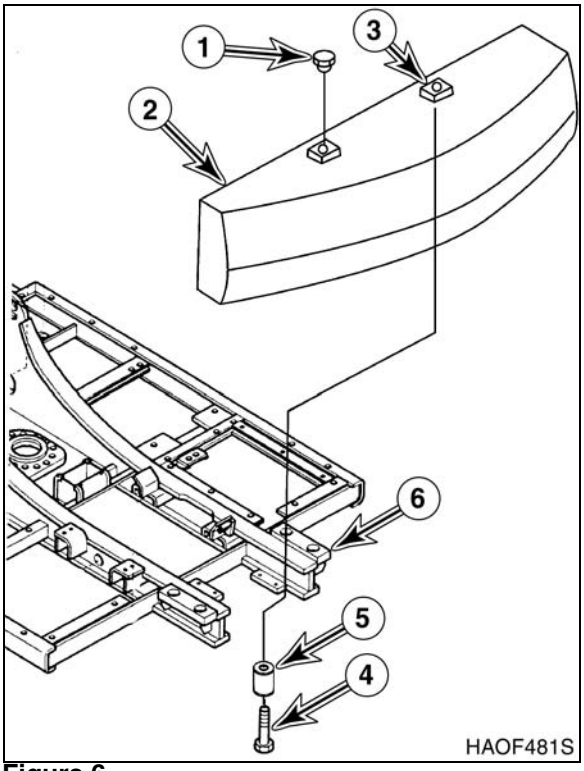

Figure 6

Model	Bolt Torque
Solar 130LC-V Solar 140LC-V	115 kg•m (830 ft lb)
Solar 170LC-V Solar 170W-V Solar 200W-V Solar 220LC-V Solar 220LL Solar 225LL	150 kg•m (1,080 ft lb)
Solar 290LC-V Solar 290LL Solar 300LL	408 kg•m (2,950 ft lb)
Solar 250LC-V Solar 330LC-V Solar 400LC-V Solar 450LC-V	250 kg•m (1,810 ft lb)

5. Remove lifting device and lifting eyes from counterweight lifting holes (3, Figure 6).
6. Install two caps (1, Figure 6) in lifting holes (3).

20. Install two 12 mm eyebolts in threaded holes at that bolts (1 and 2, Figure 11) come out of. Using a suitable lifting device, sling eyebolts.

21. Remove four bolts and washers (4) holding tank (3) 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.*

22. Remove shims (5).

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

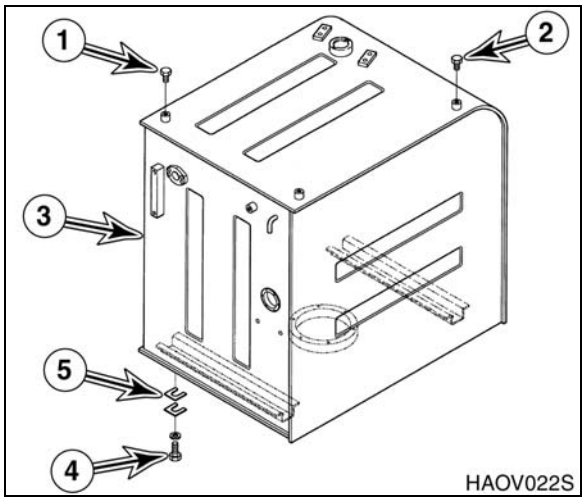

Figure 11

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SWING REDUCTION GEARBOX

⚠ CAUTION!

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MODEL	SERIAL NUMBER RANGE
Solar 225LC-V	1001 and Up
Solar 225NLC-V	1001 and Up
Solar 225LL	1001 and Up

June 2004

7. Install 10 mm ring bolts and use them to lift out and separate the No. 2 carrier assembly.

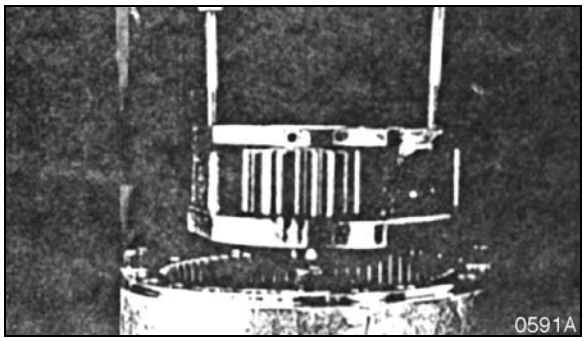

Figure 14

8. Remove the thrust ring, in order to begin disassembly of the No. 2 carrier. Position the carrier vertically, as shown in the photograph. Insert an appropriate tool through the hole in the back side of the carrier. Hammer out the spring pin (31), so that pin No. 2 (14) can be withdrawn. Remove the upper and lower (18, 19) side plates of the differential gears.

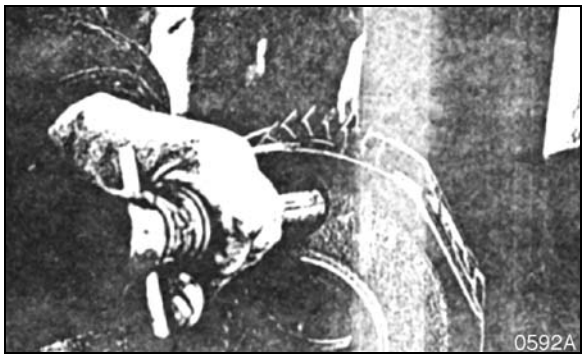

Figure 15

IMPORTANT

Pin No. 2 should not be reused. Replace it with a new component. Further disassembly of the carrier is generally not required, unless there is evidence of unusual damage or excessive wear.

9. Disassemble the ring gear. Tighten two 16 mm bolts into the holes shown in the photograph. Separate the ring gear using even force.

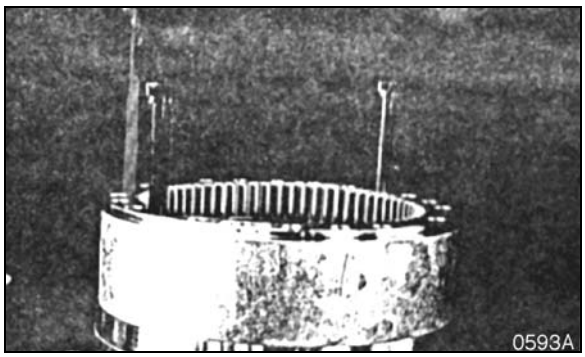

Figure 16

10. Before turning the gearbox end for end (180°, so that the drive shaft is facing up, as shown in the photograph) remove the 4 pipes and lock pins (21). Lock pins (21) should not require further disassembly. Loosen the mounting bolts (26) and detach the front cover plate (1).

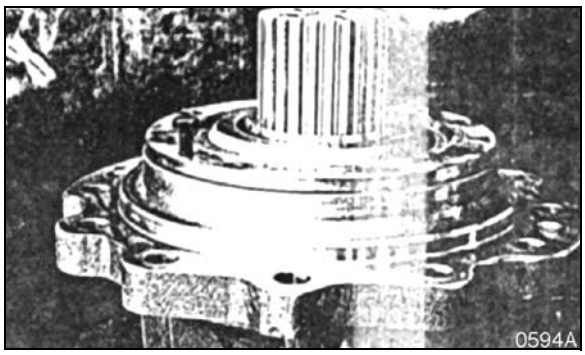

Figure 17

26. Lay out the No. 1 carrier on the workbench. Align the holes of the carrier and the spring pins of the No. 2 pins, and press them into place with a press.

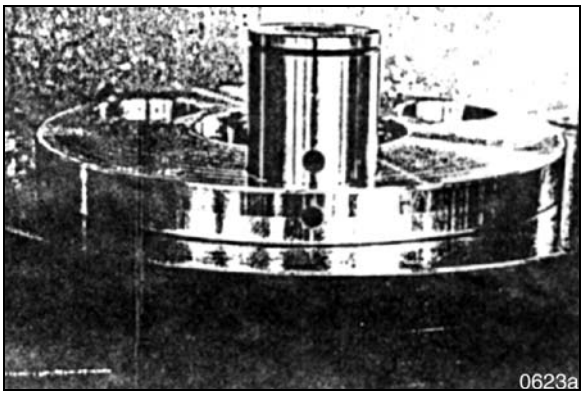

Figure 47

27. Install spring pins using the spring pin insert jig, as in step 17 (preceding) and punch two notches off each spring pin.

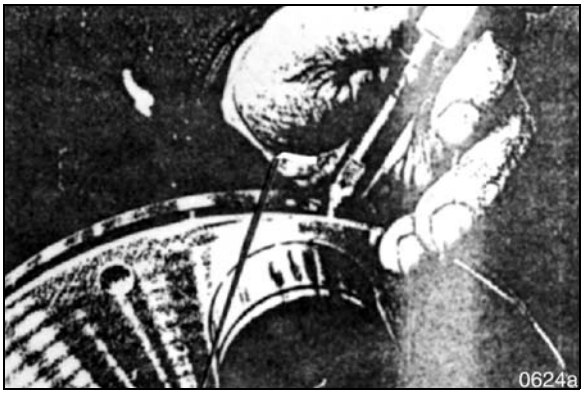

Figure 48

28. Install lower side plates.

    NOTE: *The upper and lower side plates have different thicknesses. Lower side plates are approximately 1 mm (0.39") thick.*

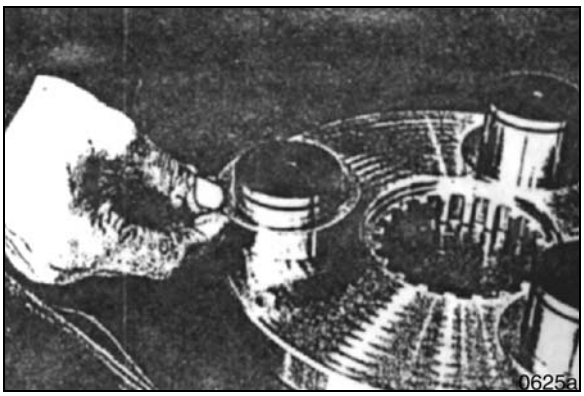

Figure 49

29. Install the center side plate to about 1 mm, or 0.39."

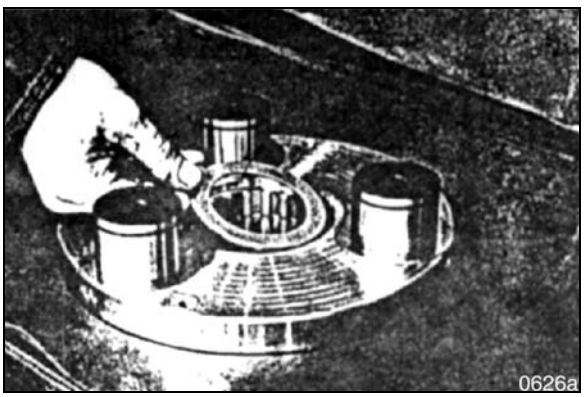

Figure 50

Terrain Type	Distance "A"
Normal	320 ~ 340 mm (12.60 ~ 13.38 in)
Muddy	340 - 380 mm (13.38 - 14.96 in)
Gravel, Rocky, Sand or Snow	380 mm (14.96 in)

⚠ WARNING!

The track adjusting mechanism is under very high-pressure. NEVER release pressure too suddenly. The grease cylinder valve should never be backed off more than 1 complete turn from the fully tightened down position. Bleed off pressure slowly and keep your body away from the valve at all times.

5. Track tension adjustments are made through the grease fitting (1, Figure 3) in the middle of each side frame. Adding grease increases the length of an adjustment cylinder (2). The longer the adjustment cylinder, the greater the pressure on the tension spring pushing the track idler wheel outward.
6. If there is not enough slack or clearance in the tracks and the adjustment is too tight, the idler wheel and adjusting cylinder can be retracted by bleeding off grease thru hole in adjustment cylinder (2, Figure 3).

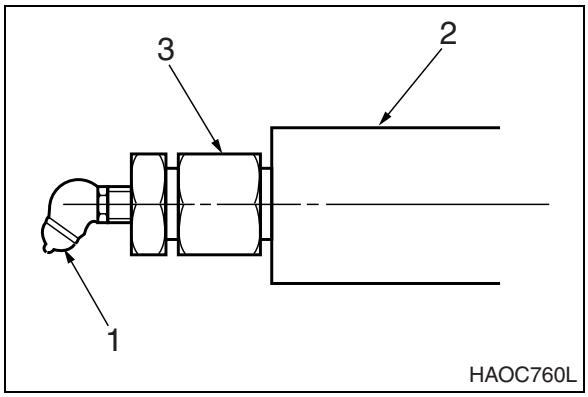

Figure 3

FRONT IDLER ROLLER REASSEMBLY

1. Degrease, clean and dry all parts before reassembly. Insert bushing (8, Figure 24) into the idler (7).
2. Grease O-ring (4, Figure 24) and insert it into the axle.
3. Align the bearing (1, Figure 24) and axle (5) holes and pin (3) them together.

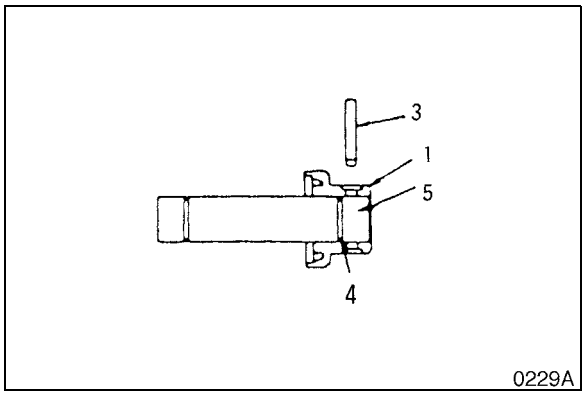

Figure 24

4. Install group seal (6, Figure 25) inside the idler (7) and bearing (1).

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

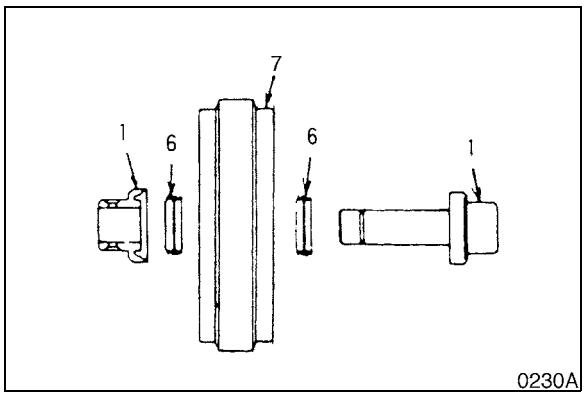

Figure 25

5. Install idler (7, Figure 26) on the axle.
6. Install bearing (1, Figure 26) and pin (3) to the axle.

   NOTE: *Fill the idler assembly with new engine oil with approximately 260 cc (8.79 oz).*

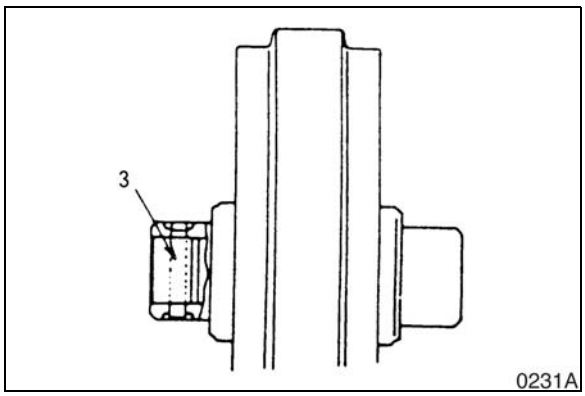

Figure 26

TRACK SPRING AND TRACK ADJUSTING CYLINDER

PARTS LIST

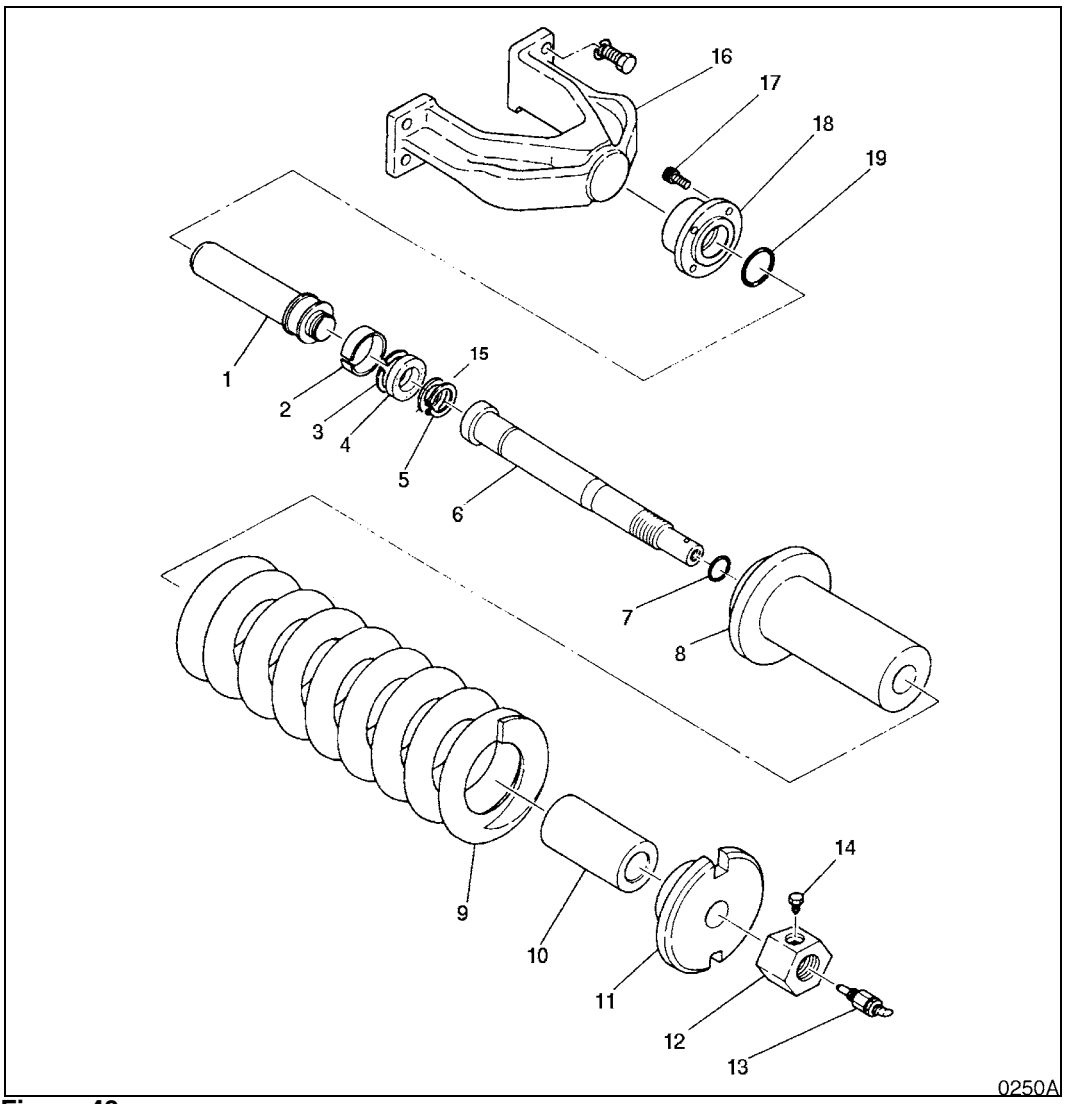

Figure 48

Reference Number	Description
1	Piston Rod
2	Piston Ring
3	Backup Ring
4	Packing
5	Retaining Ring
6	Rod
7	O-ring
8	Cylinder
9	Spring
10	Spacer

Reference Number	Description
11	Flange
12	Nut
13	Valve
14	Bolt
15	Plate
16	Yoke
17	Socket Bolt
18	Flange
19	O-ring

CONTROL PANEL

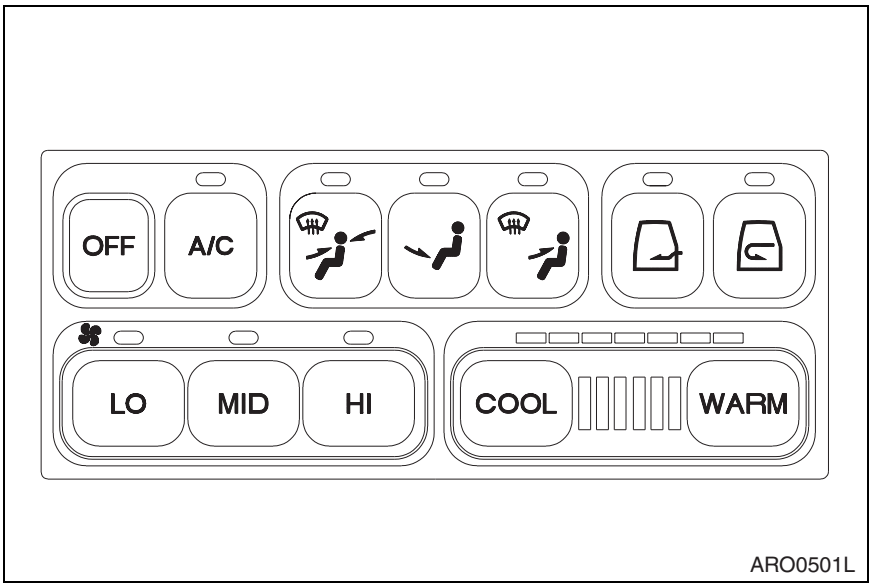

Figure 5

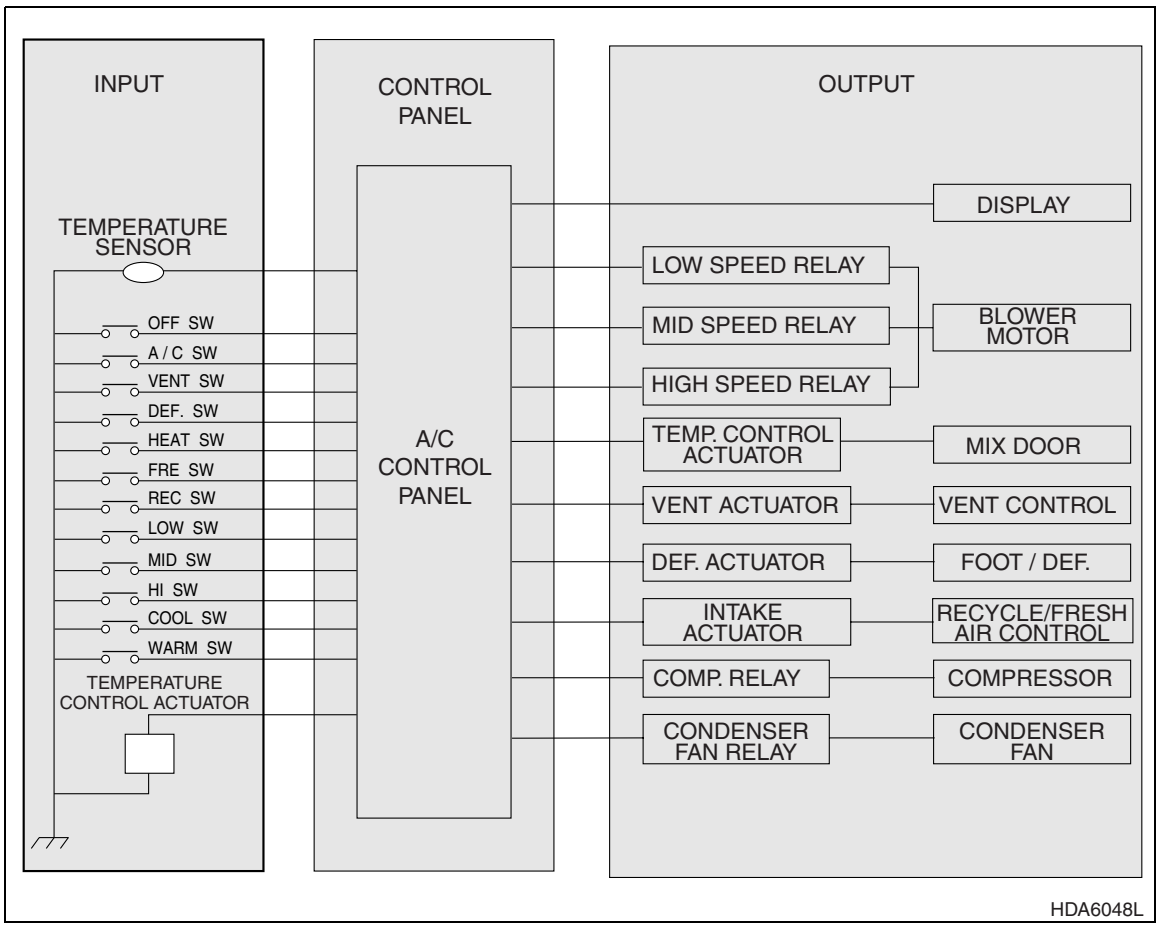

Figure 6

Model	Weight of Gas
Solar 250LC-V	850 ±20 grams (30 ±0.7 oz)
Solar 255LC-V	850 ±20 grams (30 ±0.7 oz)
Solar 280LC-III	1250 ±20 grams (44 ±0.7 oz)
Solar 290LC-V	850 ±20 grams (30 ±0.7 oz)
Solar 290LL	850 ±20 grams (30 ±0.7 oz)
Solar 300LC-V	850 ±20 grams (30 ±0.7 oz)
Solar 300LL	850 ±20 grams (30 ±0.7 oz)
Solar 330-III	1250 ±20 grams (44 ±0.7 oz)
Solar 330LC-V	850 ±20 grams (30 ±0.7 oz)
Solar 340LC-V	850 ±20 grams (30 ±0.7 oz)
Solar 400LC-III	1250 ±20 grams (44 ±0.7 oz)
Solar 400LC-V	850 ±20 grams (30 ±0.7 oz)
Solar 420LC-V	850 ±20 grams (30 ±0.7 oz)
Solar 450LC-III	1250 ±20 grams (44 ±0.7 oz)
Solar 450LC-V	850 ±20 grams (30 ±0.7 oz)
Solar 470LC-V	850 ±20 grams (30 ±0.7 oz)
Solar 55	750 ±20 grams (26 ±0.7 oz)
Solar 55-V PLUS	750 ±20 grams (26 ±0.7 oz)
Solar 55W-V PLUS	750 ±20 grams (26 ±0.7 oz)
Solar 70-III	800 ±20 grams (28 ±0.7 oz)
Solar 75-V	750 ±20 grams (26 ±0.7 oz)

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DRIVE COUPLING (MAIN PUMP)

⚠ 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 is in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

MODEL	SERIAL NUMBER RANGE
DD80L	0001 and Up
Solar 130LC-III	0001 and Up
Solar 130LC-V	0001 and Up
Solar 130W-III	0001 and Up
Solar 130W-V	0001 and Up
Solar 140LC-V	1001 and Up
Solar 140W-V	1001 and Up
Solar 160W-V	1001 and Up
Solar 170LC-III	0001 and Up
Solar 170LC-V	1001 and Up
Solar 170W-III	0001 and Up
Solar 170W-V	1001 and Up
Solar 200W-III	0001 and Up
Solar 200W-V	0001 and Up
Solar 210W-V	1001 and Up
Solar 220LC-III	0001 and Up
Solar 220LC-V	0001 and Up
Solar 220LL	1001 and Up
Solar 220N-V	1001 and Up

Models continued on back of cover.

January 2004

Table 1 Parts Information and Torque for Figure 9 and Figure 10			
Reference Number	**Description**	**Qty.**	**Torque (See Table 2 and 3)**
1	Spring Pin	4	
2	Insert	4	
3	Bolt	4	Ta
4	Flywheel	1	
5	Spring Pin	8	
6	Insert	4	
7	Hub	1	
8	Bolt	4	Ta
9	Pump Shaft	1	
10	Clamping Screw	2	Tb
11	Element	1	

HYDRAULIC SCHEMATIC

The hydraulic schematic(s) is available in the "Hydraulic and Electrical Schematic Shop Manual." This manual is a collection of diagrams and schematics for a number of models.

GENERAL NOTES

When referring to the schematic, refer to the following items:

- As shown in the schematic, the main pump assembly is driven by the engine. Mechanical energy is converted to hydraulic power, generating the required hydraulic flow which drives the system. Two main pumps (a right side pump and a left side pump) make up the main pump assembly.
- Hydraulic output from the right side pump is transmitted to the right side of the control valve. Output from the left side pump is transmitted to the valve spools on the left side of the control valve. Hydraulic output from the pilot pump is used to control the pump and to operate pilot and solenoid valves.
- The right half of the hydraulic control valve, supplied by the right pump in the pump assembly, operates valve spools for right travel, boom, bucket and arm functions. The amount of oil flow to the actuators at the output end of each of those circuits is regulated through the movement of each individual valve spool.
- The left half of the hydraulic control valve, fed by the left pump in the pump assembly, has control spools for left travel, swing, boom up and arm operation.
- Two-stage operation is a feature of boom, arm and bucket function. All three of these circuits can be operated using the output of only one half of the hydraulic pump assembly (one pump or the other), or – since both halves of the control valve have a spool and available circuit for these functions – the output of both pumps can be combined, allowing higher speed operation. Boom up, arm crowd and dumping functions can operate in any one of the three available power modes – the standard or general duty mode, the high speed/rapid cycling mode, or the low noise/high fuel efficiency mode.
- Whenever the right travel or left travel control spools are shifted, output from the main pump assembly flows through the center joint to one or both of the axial piston motors driving the side frame crawler tracks. A pilot valve connected to the swash plate of each travel motor changes motor capacity (and output) in direct proportion to the position of the travel switch selected by the operator.
- The hydraulic reservoir return line and the pilot circuit both have 10 micron full flow filters. The disposable elements in these two canister type filters trap and remove impurities from the oil in the system. An 80 mesh, 177 micron reservoir intake strainer also helps maintain system cleanliness and should be cleaned each time hydraulic fluid is drained and replaced. An oil cooler in the hydraulic system helps maintain the operating temperature of the system at approximately 50°C (122°F).
- The arm cylinder operating circuit includes antivacuum valves which protect the hydraulic system from vacuum that could result from external shocks or other unusual conditions. The arm cylinder circuit is also protected by overload relief valves. Whenever high-pressure is generated as a result of a shock or overload, excess pressure is dumped to the reservoir return circuit through the relief valve.
- A selection valve in the travel circuit can be used to provide constant high torque/low speed travel, or variable speed/variable torque output for travel. To prevent sliding during simultaneous travel and boom/arm/bucket operation, select the high torque/low speed travel position.

SWING PRIORITY VALVE

CONTROL VALVE PRESSURE AND CURRENT ADJUSTMENTS

⚠ WARNING!

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

The swing priority control valve is inside the compartment behind the cabin.

The same jumper harness used for testing the power mode (EPOS) control valve is used to test this valve. Shut down engine, disconnect either of the electrical leads and connect the test equipment to that side of the valve. An in-line "T-style" gauge adapter can be used to connect a 60 bar/870 psi (1,000 psi) test gauge to the outlet (pressure) side of the valve. Set the engine control speed dial to maximum and warm up the engine to at least 45°C (113°F) before making any tests.

NOTE: *Vent air from the hydraulic system before installing test equipment. Use the lever on the reservoir, while the engine is running. Pour clean replacement fluid back into the system if excessive fluid was lost.*

To verify operation of the swing priority solenoid valve, connect test equipment and begin testing with the work mode switch set to "digging" (the state turning off the "trenching" light) and the engine speed control dial at the maximum rpm position.

Operate the swing motor in both directions. Measure signal current and hydraulic pressure through the valve and record the highest and lowest values as the swing motor rotate clockwise and counter clockwise several times. Reset the work mode control to "trenching" mode and repeat the same tests.

Valve Function / Work Mode	Signal Voltage	Hydraulic Pressure
Swing Priority / Digging	0 V	0 bar (0 psi)
Swing Priority / Trenching	20 - 30 V	20 - 40 bar (290 - 580 psi)

NOTE: *If recorded values do not conform to the specified current or pressure in the table, readjust as required.*

Problem	Possible Causes	Remedies
Travel motors operate very slowly.	Track tension poorly adjusted Low oil in idlers or rollers.	Readjust tension Refill.
	Travel brake dragging.	Repair.
	Track frame out of alignment, deformed or twisted.	Repair.
Swing motor inoperable.	Swing brake not releasing.	Repair or replace.
	Relief valve malfunction.	Repair or replace.
	Pilot piping damaged.	Repair or replace.
Swing motor operates unevenly.	Swing gear, bearing or mounting loose or worn.	Repair or replace.
	Lubricant worn away, inadequate.	Grease.
	Swing relief valve may be faulty.	Repair/Replace the swing relief valve.

TROUBLESHOOTING – CONTROL VALVE

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

Problem	Possible Causes	Remedies
Main Relief Valve	Particulate contamination.	Disassemble, clean main poppet.
	Broken or damaged spring.	Replace.
	Adjusting screw loose.	Readjust.
	Main poppet sticking.	Repair/replace.
	Clogged orifice in pilot passage to control valve.	Clean/replace.
Cylinder goes down in spool neutral.	Excessive clearance between casing and spool.	Replace spool or casing.
	Spool does not return to neutral/ sticking spool.	Check secondary pilot pressure.
	Spool does not return to neutral because of dirt or other contaminants.	Clean.
	Broken or damaged spring.	Replace.
	Main relief or port relief not operating properly.	See above.
	Impurities in pilot circuit.	Clean.

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CENTER JOINT (SWIVEL)

⚠ 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 is in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

MODEL	SERIAL NUMBER RANGE
Solar 170LC-V	1001 and Up
Solar 175LC-V	1001 and Up
Solar 220LC-V	0001 and Up
Solar 220LL	1001 and Up
Solar 225LC-V	1001 and Up
Solar 225LL	1001 and Up
Solar 225NLC-V	1001 and Up
Solar 250LC-V	1001 and Up
Solar 255LC-V	1001 and Up

November 2002

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CYLINDERS

⚠ CAUTION!

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Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

MODEL	SERIAL NUMBER RANGE
Solar 130LC-V	0001 and Up
Solar 130W-V	0001 and Up
Solar 140LC-V	1001 and Up
Solar 140W-V	1001 and Up
Solar 160W-V	1001 and Up
Solar 170LC-V	1001 and Up
Solar 170W-V	1001 and Up
Solar 175LC-V	1001 and Up
Solar 180W-V	1001 and Up
Solar 200W-V	0001 and Up
Solar 210W-V	1001 and Up
Solar 220LC-V	0001 and Up
Solar 225LC-V	1001 and Up
Solar 225NLC-V	1001 and Up
Solar 250LC-V	1001 and Up
Solar 255LC-V	1001 and Up
Solar 290LC-V	0001 and Up
Solar 300LC-V	1001 and Up

Models continued on back of cover.

January 2004

MODEL	CYLINDER	A (±0.1)	øB	øC	øD	MODEL (CYLINDER)
S55	BOOM	80.0 mm (3.15 in)	11.0 mm (0.43 in)	45.0 mm (1.77 in)	110.0 mm (4.33 in)	S55 (BOOM (OP)) S55W-V (BOOM)
	SWING	58.0 mm (2.28 in)	11.0 mm (0.43 in)	38.0 mm (1.50 in)	80.0 mm (3.15 in)	MEGA 300 (P/S)
S55-V PLUS	ARM	65.0 mm (2.56 in)	11.0 mm (0.43 in)	49.0 mm (1.93 in)	90.0 mm (3.54 in)	MEGA 130-III (LIFT) MEGA 160TC (BUCKET) MEGA 400 (P/S)
S70-III	ARM	70 mm (2.76 in)	11 mm (0.43 in)	51 mm (2.01 in)	95 mm (3.74 in)	S80W-II (ARM)
	BUCKET	60 mm (2.36 in)	11 mm (0.43 in)	43 mm (1.69 in)	85 mm (3.35 in)	S80W-II (BUCKET, DOZER) S75-V (BUCKET)
	DOZER	70 mm (2.76 in)	11 mm (0.43 in)	53 mm (2.09 in)	95 mm (3.74 in)	S75-V (ARM, DOZER) S130LC-V (DOZER) S140LC-V (DOZER) S140W-V (DOZER) S160W-V (DOZER)
S220LC-V	ARM	110 mm (4.33 in)	13 mm (0.51 in)	76 mm (2.99 in)	140 mm (5.51 in)	S210W-V (ARM) S220LC-V (BOOM) S220N-V (ARM (OP)) S225NLC-V (BOOM) S225NLC-V (ARM (OP)) S250LC-V (ARM) S255LC-V (ARM) S290LC-V (BOOM, BUCKET) S300LC-V (BOOM, BUCKET)
	BUCKET	90 mm (3.54 in)	11 mm (0.43 in)	63 mm (2.48 in)	115 mm (4.53 in)	S70-III (BOOM) S75-V (SWING) S80W-II (BOOM) S130W-V (ARM (EURO)) S130LC-V (S/ARM, BOOM (OP), ARM) S140LC-V (S/ARM, BOOM (OP), ARM) S160W-V (ARM) S170LC-V (BOOM) S170W-V (BUCKET, BOOM) S175LC-V (BOOM) S180W-V (BOOM) S210W-V (BUCKET) S220LC-V (BUCKET) S225LC-V (BUCKET) S225NLC-V (BUCKET) MEGA 200-III (LIFT)
S290LC-V	ARM S/ARM	120 mm (4.72 in)	13 mm (0.51 in)	85 mm (3.35 in)	150 mm (5.91 in)	S290LL (BUCKET, BOOM) S300LC-V (ARM, S/ARM) S300LL (BUCKET, BOOM) S330LC-V (BOOM, BUCKET) S340LC-V (BUCKET, BOOM, BUCKET (OP)) S370LC-V (BUCKET, BUCKET (OP))

MODEL	CYLINDER	øA-0.2	øB-0.2	C0	D	MODEL (CYLINDER)
S290LC-V	ARM	105 mm (4.13 in)	121 mm (4.76 in)	6 mm (0.24 in)	7 mm (2.28 in)	S290LC-V (S/ARM) S300LC-V (ARM, S/ARM) S370LC-V (BOOM)
	S/ARM	105 mm (4.13 in)	121 mm (4.76 in)	6 mm (0.24 in)	7 mm (2.28 in)	
	BOOM	95 mm (3.74 in)	109 mm (4.29 in)	6 mm (0.24 in)	7 mm (2.28 in)	
	BUCKET	90 mm (3.54 in)	104 mm (4.10 in)	6 mm (0.24 in)	7 mm (2.28 in)	
	S/BUCKET	90 mm (3.54 in)	104 mm (4.10 in)	6 mm (0.24 in)	7 mm (2.28 in)	
S290LL S300LL	ARM (STICK)	120 mm (4.72 in)	136 mm (5.35 in)	9 mm (0.35 in)	7 mm (2.28 in)	
	BOOM (HOIST)	100 mm (3.94 in)	114 mm (4.49 in)	6 mm (0.24 in)	7 mm (2.28 in)	
	BUCKET (HEEL)	100 mm (3.94 in)	114 mm (4.49 in)	6 mm (0.24 in)	7 mm (2.28 in)	
S360LC-V	ARM	115 mm (4.53 in)	131 mm (5.16 in)	6 mm (0.24 in)	7 mm (2.28 in)	
	BOOM	100 mm (3.94 in)	114 mm (4.49 in)	6 mm (0.24 in)	7 mm (2.28 in)	
	BUCKET	100 mm (3.94 in)	114 mm (4.49 in)	6 mm (0.24 in)	7 mm (2.28 in)	
	BUCKET (OP)	100 mm (3.94 in)	114 mm (4.49 in)	6 mm (0.24 in)	7 mm (2.28 in)	
S400LC-V	ARM	120 mm (4.72 in)	136 mm (5.35 in)	9 mm (0.35 in)	7 mm (2.28 in)	S420LC-V (ARM) S290LL (ARM (STICK)) S300LL (ARM (STICK))
	BOOM	115 mm (4.53 in)	131 mm (5.16 in)	6 mm (0.24 in)	7 mm (2.28 in)	
	BUCKET	110 mm (4.33 in)	126 mm (4.96 in)	6 mm (0.24 in)	7 mm (2.28 in)	S420LC-V (BUCKET)
S450LC-V	ARM	130 mm (5.12 in)	146 mm (5.75 in)	6.5 mm (0.26 in)	7 mm (2.28 in)	S470LC-V (ARM)
	BOOM	115 mm (4.53 in)	131 mm (5.16 in)	6 mm (0.24 in)	7 mm (2.28 in)	S140W-V (ARTI.) S160W-V (ARTI.)
	BUCKET	115 mm (4.53 in)	131 mm (5.16 in)	6 mm (0.24 in)	7 mm (2.28 in)	
S55W-V	ARM	55 mm (2.17 in)	69 mm (2.72 in)	5 mm (0.20 in)	6 mm (0.24 in)	S55W-V PLUS (ARM)
	SWING	40 mm (1.58 in)	52 mm (2.05 in)	3.5 mm (0.14 in)	6 mm (0.24 in)	S55W-V PLUS (SWING)
	BOOM	60 mm (2.36 in)	74 mm (2.91 in)	5 mm (0.20 in)	6 mm (0.24 in)	S55W-V PLUS (BOOM)
	BUCKET	50 mm (1.97 in)	62 mm (2.44 in)	4.5 mm (0.18 in)	6 mm (0.24 in)	S55W-V PLUS (BUCKET)
	DOZER	60 mm (2.36 in)	74 mm (2.91 in)	5 mm (0.20 in)	6 mm (0.24 in)	S55W-V PLUS (DOZER)

DISASSEMBLY

⚠ CAUTION!

Vent air from the hydraulic system before disconnecting cylinder piping connections. Use the lever on the reservoir, while the engine is running. Discharge the hydraulic accumulator and vent residual tank pressure after the engine is shut off. Pour clean replacement fluid back into the system if excessive fluid is lost.

1. Following removal of cylinder from excavator attachment, support cylinder on some type of sturdy work platform and drain all oil. Rotate cylinder so that piping ports are on top, to allow trapped air to vent.

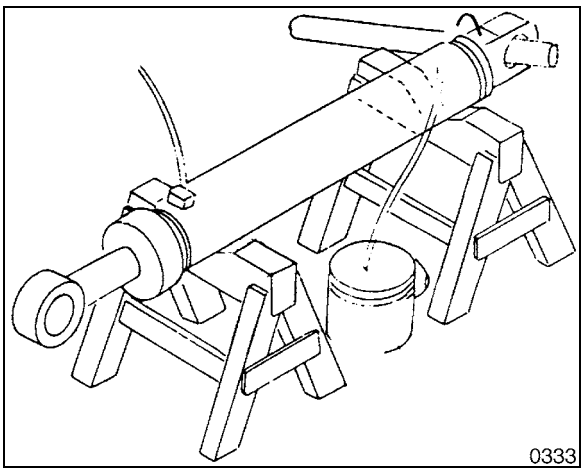

Figure 12

2. Position piston rod so that it is extended approximately one half meter (20").

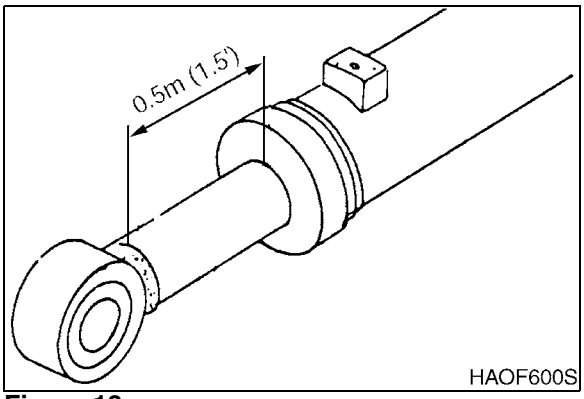

Figure 13

3. Remove bolts (7) on the end of cylinder.

   NOTE: *Wrap a cloth or other protective material around piston rod, to avoid possibility of accidentally scratching or scoring rod surface while fasteners are being loosened and removed. Component parts (numbered in parentheses) are keyed to Figure 4.*

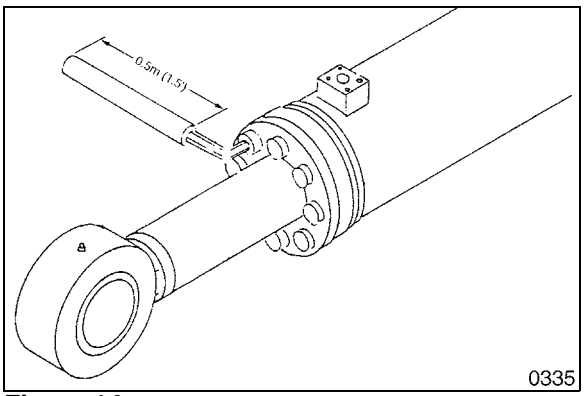

Figure 14

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SWING MOTOR

⚠ 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 is in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

MODEL	SERIAL NUMBER RANGE
Solar 225LC-V	1001 and Up
Solar 225LL	1001 and Up
Solar 225NLC-V	1001 and Up
Solar 250LC-V	1001 and Up
Solar 255LC-V	1001 and Up
Solar 290LC-V	0001 and Up
Solar 290LL	1001 and Up

November 2002

Reference Number	Description
31	Brake Valve
51	Relief Valve
101	Drive Shaft
106	Spacer
111	Cylinder Block
113	Spherical Bushing
114	Cylinder Spring
116	Push Rod
117	Spacer (F)
118	Spacer (R)
121	Piston
122	Shoe
123	Retainer Plate
124	Shoe Plate
131	Valve Plate
301	Lower Casing
303	Upper Valve Casing
304	Front Cover
351	Plunger
355	Spring
401	Socket Head Cover Bolt
432	Stop Ring
433	Stop Ring

Reference Number	Description
437	Lock Ring
438	Lock Ring
443	Roller Bearing
444	Roller Bearing
451	Pin Spring
464	VP Plug
468	VP Plug
469	RO Plug
471	O-ring
472	O-ring
485	O-ring
487	O-ring
488	O-ring
491	Oil Seal
702	Brake Piston
706	O-ring
707	O-ring
712	Brake Spring
742	Friction Plate
743	Separator Plate
993	PT Plug
994	PT Plug

CLEANING AND INSPECTION (WEAR LIMITS AND TOLERANCES)

Inspect all components and precision surfaces, to confirm that they haven't been worn beyond service limits. Refer to table below for dimensional specifications.

All parts should be cleaned, air-dried and relubricated with clean, approved type hydraulic fluid, before final reassembly or as the final step after the unit has been put back together.

Replacement of all O-rings and oil seals with new parts is generally recommended, unless motor has had minimal use. Inspect O-rings and oil seals very carefully for cuts, nicks, brittleness or softness, or any other type of damage or distortion, before final reassembly.

NOTE: *When parts exceed the standard, replace them. When there is conspicuous surface damage, it is always safer to replace parts, whether standards are exceeded or not.*

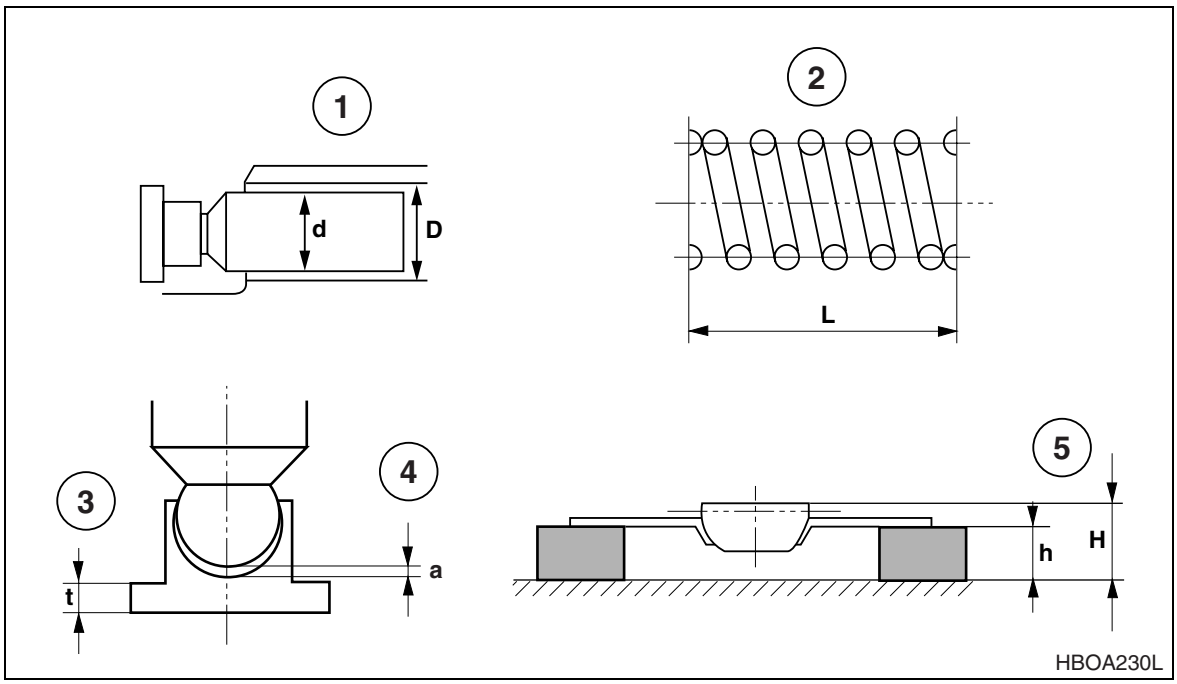

Figure 26

Reference Number	Description
1	Clearance Between Piston and Cylinder Bore (D-d)
2	Spring Free Length (L)
3	Thickness of Shoe (t)
4	Piston Ball - Shoe Socket Clearance (a)
5	Height Between Round Bushing and Push Plate (H-h)

NOTE: *Spherical bushing and push plate must always be replaced as a set. If either one requires replacement, replace the other*

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TRAVEL MOTOR (WITH GEARBOX) (TM40VC)

⚠ CAUTION!

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

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

MODEL	SERIAL NUMBER RANGE
Solar 220LC-V	2359 and Up
Solar 220LL	1090 and Up
Solar 225LC-V	1192 and Up
Solar 225LL	1001 and Up

December 2003

Reference Number	Description
	Travel Motor
102	Shaft
103	Plate; Swash
104	Block; Cylinder
	Piston and Shoe Assembly
105	Piston
106	Shoe
107	Plate; Retainer
108	Ball; Thrust
109	Plate; Timing
110	Washer; Plain
111	Collar (Washer)
112	P/piston
113	Spring
114	Spring
115	Plate; Friction
116	Plate; Mating
132	Seal; Oil
135	O-ring
139	O-ring
145	Ring; Snap
149	Bearing; Ball
150	Bearing; Ball
151	Roller
	Piston and Shoe Assembly
161	Piston (Two Speed)
162	Shoe (Two Speed)
167	Pivot
171	Pin; Parallel
193	Spring
	Relief Valve Assembly
201	Valve
202	Sleeve
203	Retainer; Spring
204	Plug
205	Shim
208	O-ring 1BP16

Reference Number	Description
209	O-ring 1BP22
210	O-ring 1BP18
211	Ring; Backup
217	Ring; Backup
219	O-ring 1BP29
220	Seal; Piston
301	Flange; Rear
323	Spool
324	Plug
325	Stopper
326	Plug
327	Valve
328	Spring
330	Spring
336	O-ring 1BP32
337	O-ring 1BP22A
341	Pin; Parallel
343	Bolt; Socket M16x40
346	Plug; Pt
352	Plug; Ro
354	Plug; Pt
355	O-ring 1BP18
357	Plug; Ro
358	O-ring 1BP11
359	O-ring 1BP14
363	Spool
366	Spring
368	Ball; Steel
379	Filter
380	Plug
381	Piston
382	Plug
383	O-ring 1BP5
384	O-ring 1BP8
385	Ball; Steel
397	Orifice
398	Plug

4. Remove timing plate (109), parallel pin (341), twelve springs (113) and ball bearing (150) from rear flange (301) and motor housing.

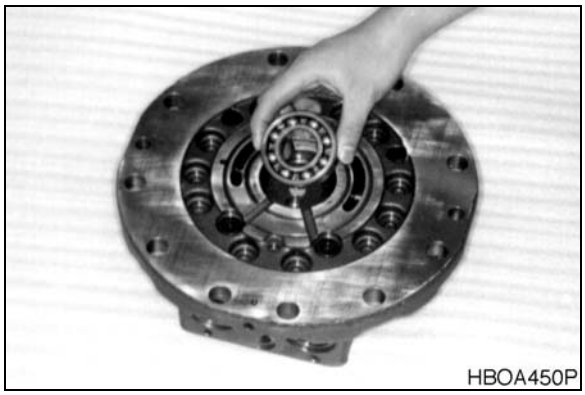


Figure 18

5. Drain gear oil from reduction gear housing.
6. Turn gear assembly around so that reduction gear cover is facing up.
7. Install two eyebolts to the screw holes.

Figure 19

8. Remove cover (8) by installing hooks to the eyebolts and lift using a lifting device.

Figure 20

8. Remove hold flange (3) from spindle (2).
9. Rotate motor in opposite direction.
10. Remove two stationary metal fitting.

Figure 51

11. Install eyebolt (M16) to spindle (2), and hook the eyebolt, and remove from hub by hanging it with crane.

Figure 52

Ball Bearing, RV Gear Assembly, and Pin Disassembly

1. By tapping with sharp tip punch (B) and hammer (A) at pin (C) (17)'s end part, remove ball bearing (D) (21) from hub (1). At this time, RV gear assembly (RV gear A (4), RV gear B (5), crankshaft (9), conical roller bearing (22), needle type roller bearing (23) with support) along with pin (17) can be taken out together.

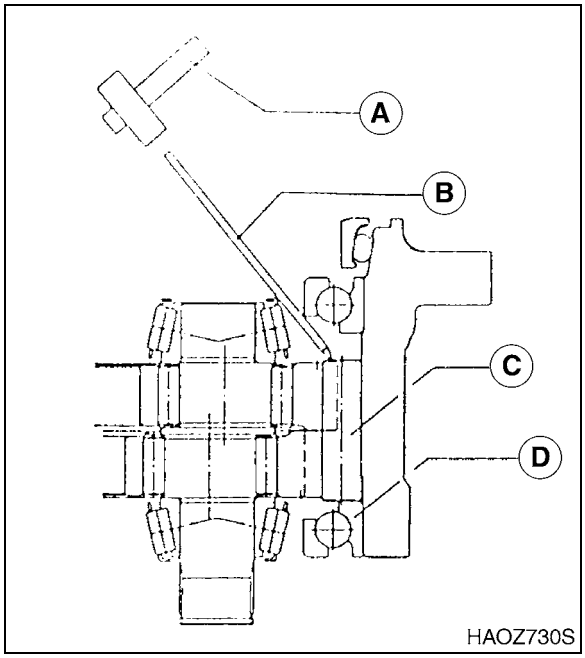


Figure 53

6. Repeat procedure for the other side.

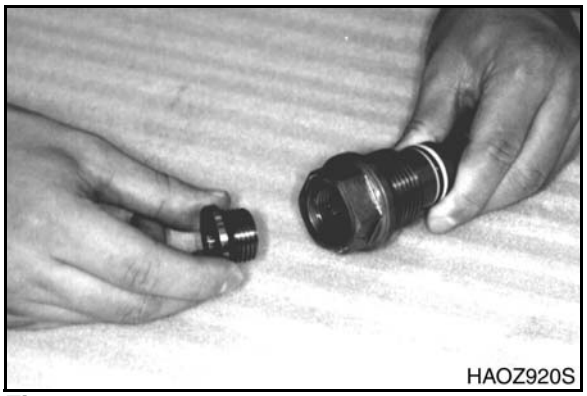


Figure 72

TRAVEL MOTOR AND REDUCTION GEAR REASSEMBLY

1. Insert friction plate (115) and companion plate (116) alternately into cylinder block.

Figure 101

IMPORTANT

Install friction plate (115) after soaking it in operating oil.

⚠ CAUTION!

Be careful not to mistake the order of friction plate and companion plate. If mistaken, there is possibility to weaken the parking brake.

2. Lightly coat O-rings with grease and install onto piston (112).
3. Insert piston (112) into spindle (2).
4. Lightly tap piston (112) end with plastic hammer and install piston (112) into spindle (2).

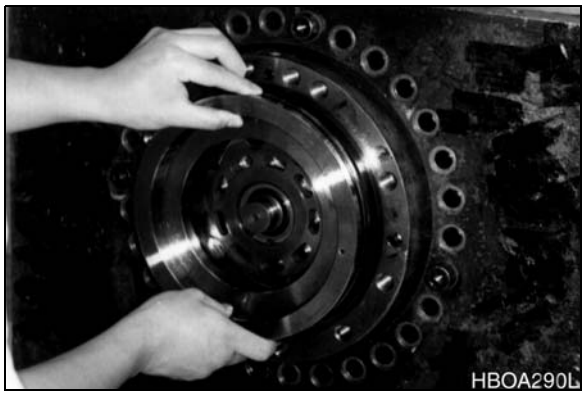


Figure 102

5. Install ball bearing (150), timing plate (109), parallel pin (341) and twelve springs (113) into rear flange (301).

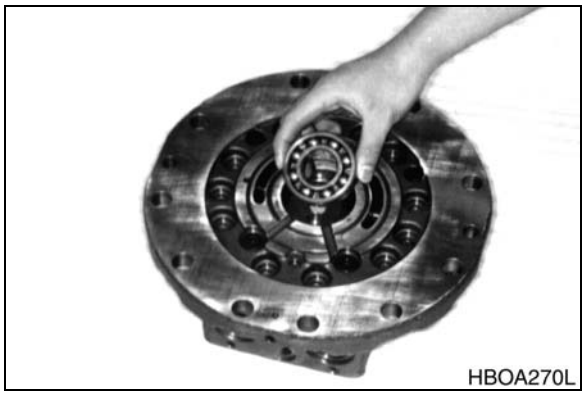


Figure 103

IMPORTANT

Coat twelve springs (113) and timing plate (109) with generous amount of grease and be careful not to let springs fall out rear flange (301).

IMPORTANT

Coat ball bearing (150) with oil.

Reference Number	Description
1	Special Bolts
1A	Special Bolts
1B	Special Bolts
1C	Special Bolts
2	End Cover
3	Seal Ring - Commutator
4	Seal Ring (5)
5	Commutator
6	Commutator Ring
7	Manifold
8	Rotor Set
8A	Rotor
8B	Stator or Stator Half
8C	Vane (7)
8D	Stator Half
8E	Vane (7)
9	Wear Plate
10	Drive Link
11	Thrust Bearing
12	Coupling Shaft

Reference Number	Description
12A	Key
12B	Nut
12C	Washer
12D	Bolt
12E	Lock Washer
12F	Retaining Ring
13	Bearing/Bushing, Inner
14	Thrust Washer
15	Thrust Bearing
16	Seal
17	Backup Washer
18	Housing
18A	O-ring (2)
19	Bearing/Bushing, Outer
20	Dirt and Water Seal
21	Plug 12)
22	O-ring (2)
23	Spring
24	Valve (Shuttle or Relief)
25	Backup Washer

SPECIAL TOOLS AND MATERIALS

SPECIAL TOOLS

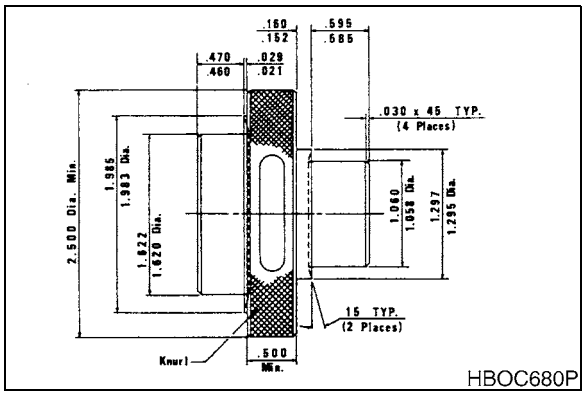


Figure 3 Fabricate if considered necessary
MG and MF

NOTE: *Series ME Torqmotors™ may have a rotor set with two stator halfs (8B and 8D) with a seal ring (4) between them and two sets of seven vanes (8C and 8E). Discard seal ring only if stator halfs become disassembled during the service procedures.*

NOTE: *A polished pattern on the wear plate from rotor rotation is normal.*

11. Place rotor set (8) and wear plate (9) on a flat surface and center rotor (8A) in stator (8B) such that two rotor lobes (180 degrees apart) and a roller vane (8C) center line are on the same stator center line. Check the rotor lobe to roller vane clearance with a feeler gage at this common center line. If there is more than.005 inches (0.13 mm) of clearance, replace rotor set. See Figure 18.

    NOTE: *If rotor set (8) has two stator halfs (8B and 8D) and two sets of seven vanes (8C and 8E) as shown in the alternate construction ME rotor set assembly view, check the rotor lobe to roller vane clearance at both ends of rotor.*

12. Remove drive link (10) from coupling shaft (12) if it was not removed with rotor set and wear plate. Inspect drive link for cracks and worn or damaged splines. No perceptible lash (play) should be noted between mating spline parts. See Figure 19. Remove and discard seal ring (4) from housing (18).

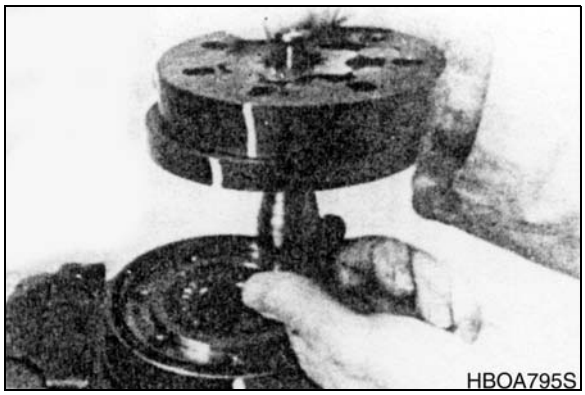


Figure 17

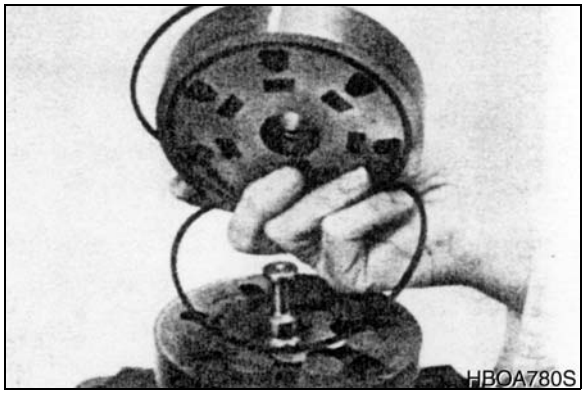


Figure 18

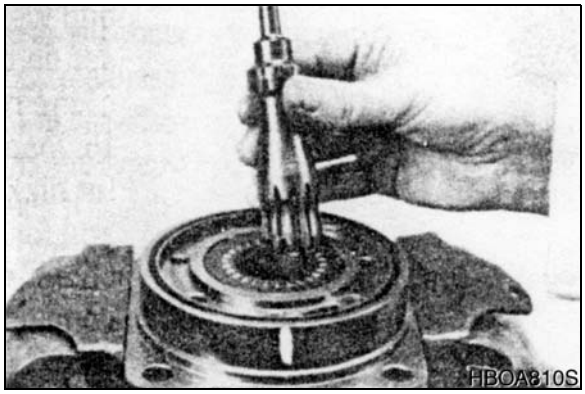


Figure 19

8. Be sure that a generous amount of clean corrosion resistant grease has been applied to the lower (outer) housing bearing/bushing (19). Install the coupling shaft (12) into housing (18), seating it against the thrust bearing (15) in MG and MF Series housings and against the second thrust washer (14) in MB and ME Series housings. See Figure 48.

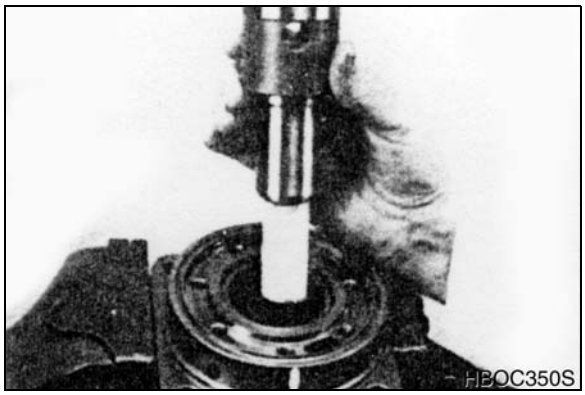


Figure 49

> **⚠ CAUTION!**
>
> **The outer bearing (19) is not lubricated by the system's hydraulic fluid. Be sure it is thoroughly packed with the recommended grease, Ross Gear grease specification #045236, E/M Lubricant #K-70M.**

NOTE: *Mobil Mobilith SHC (9 460 NOTE: A 102 Tube (P/N 406010) is included in each seal kit.*

NOTE: *The coupling shaft (12) will be flush or just below the housing wear plate surface on Small Frame, Series MG and MF Torqmotors™ when properly seated while the coupling shaft (12) on Large Frame, Series MB and ME Torqmotors™ will be approximately 0.10 inch (2.54 mm) below the housing wear plate surface to allow the assembly of thrust bearing (11). The coupling shaft must rotate smoothly on the thrust bearing package. See Figure 50.*

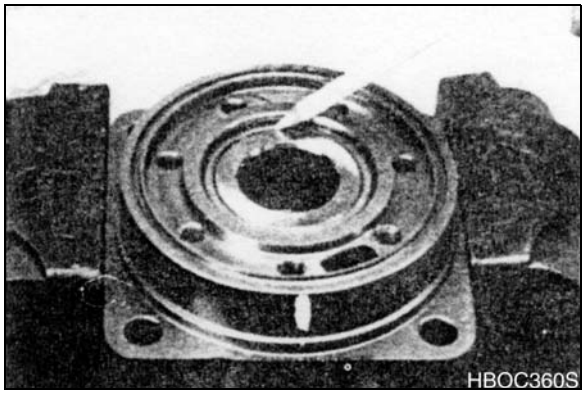


Figure 50

9. Install thrust bearing (11) onto the end of coupling shaft (12) only if you are servicing an MB or ME Series Torqmotor™. See Figure 51.

Figure 51

START-UP PROCEDURES

- Pressurize the Torqmotor™ with 100 p.s.i. dry air or nitrogen and submerge in solvent to check for external leaks.
- Check Torqmotor™ for rotation. Torque required to rotate coupling shaft should not be more than 50 ft lb (68 Nm)
- On MG and MF Series Torqmotors, pressure port with "A" cast under it on housing (18) is for clockwise coupling shaft rotation as viewed from the output end of coupling shaft. Pressure port with "B" cast under it is for counter clockwise coupling shaft rotation.
- On MB, ME, and MJ Series Torqmotors, pressure port with "B" cast under it on housing (18 is for clockwise coupling shaft rotation as viewed from the output end of coupling shaft. Pressure port with "A" case under it is for counter clockwise coupling shaft rotation.
- Use test stand if available, to check operation of the Torqmotor™.

HYDRAULIC FLUID

Keep the hydraulic system filled with one of the following:

- Hydraulic fluid as recommended by equipment manufacturer, but the viscosity should not drop below 50 SSU or contain less than.125% zinc anti-wear additives.

⚠ CAUTION!

Do not mix oil types. Any mixture, or an unapproved oil, could deteriorate the seals. Maintain the proper fluid level in the reservoir. When changing fluid, completely drain old oil from the system. It is suggested also that you flush the system with clean oil.

- Adjust fluid level in reservoir as necessary.
- Encourage all operators to report any malfunction or accident that may have damaged the hydraulic system or component.
- Do not attempt to weld any broken Torqmotor™ component. Replace the component with original equipment only.
- Do not cold straighten, hot straighten, or bend any Torqmotor™ part.
- Prevent dirt or other foreign material from entering the hydraulic system. Clean the area around and the fill caps before checking oil level.
- Investigate and correct any external leak in the hydraulic system, no matter how minor the leak.
- Comply with manufacturer's specifications for cleaning or replacing the filter.

⚠ CAUTION!

Do not weld, braze, solder or any way alter any Torqmotor™ component.

PUMP OUTPUT DECREASE

When pilot pressure (Pi) increases, the pilot piston (643) shifts toward the right, stopping at that point at which pilot pressure and the force of the return spring (646) cancel each other out. Movement of the pilot piston pushes the pin (875) attached to the feedback lever assembly (613, 611, 897) around the "B-point plug" (614) and the pin (875) on the opposite side of the feedback lever assembly. The pin at the lower end of the feedback lever is attached to the tilting pin of the swash plate (531/538 in Figure 1).

NOTE: *In Figure 6, the circled capital letter "D" at the lower end of the feedback lever shows the approximate location where the assemblies shown in Figure 1, Figure 6 and Figure 8 react as the pin (897) at the top of the feedback lever moves and the piston shifts, maintaining dynamic balance through the valve between pilot pressure (Pi) and discharge output flow (Q) as shown in Figure 7.*

PUMP DISCHARGE DECREASE

The regulator feedback lever assembly is also pin-connected to the outermost spool (652) in the discharge port (CI) of the regulator (Figure 8). As that spool moves toward the right, in response to differences in servo pressure, the servo piston moves to the right, resulting in a decreased swash plate tilt angle and reduced pump output flow. The system is balanced and control movement of the spool (and servo piston) stops when the outermost spool (652) and spool sleeve (651) close into each other, shutting off oil movement.

PUMP DISCHARGE INCREASE

When pilot pressure (Pi) decreases, the pilot piston shifts toward the left and the feedback lever assembly pivots around point "D" (Figure 6), pushing the spool and servo piston left. Swash plate tilt angle is heightened and pump output flow begins to increase as a result. Control movement of the spool and servo piston stops when the feedback lever assembly rotates around point "C" (Figure 6), moving the spool to the right until it slides into the sleeve (651) and oil movement is blocked.

HORSEPOWER CONTROL

Horsepower control function occurs as each regulator responds to changes in the output of the opposite pump. As increases or decreases in pump output occur (as outlined in the preceding paragraphs) at one pump, it is necessary for the output of the remaining pump to compensate to allow equalizing of the total discharge rate.

The relationship between changes in pressure and changes in output flow when the operation of both pumps (P1 and P2) is measured (Figure 9).

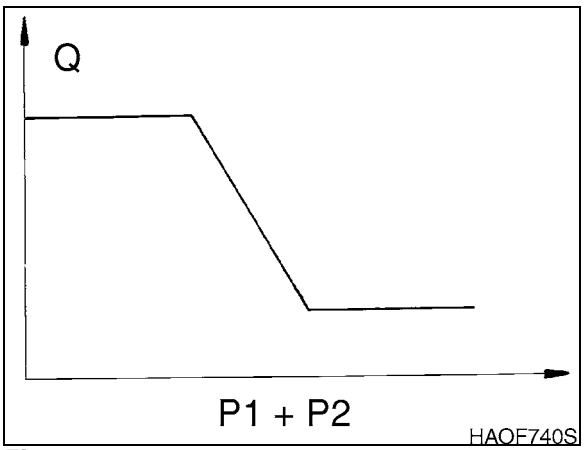


Figure 9

Main Pump Pressure/Flow Output (Model: SOLAR 255LC-V)

Engine Speed	2000 rpm (High Mode)	1900 rpm (Standard Mode)
Pump Input Horsepower	162 ps (160 hp)	132 ps (130 hp)
Main Pump Total Displacement	112 cc (7.44 in^3) x 2 pumps	
Main Pump Pressure	350 kg/cm^2 (4,550 psi) (for pressure up)	
Pilot Pump Displacement	15 cc/rev (0.9 in^3/rev)	
Pilot Pump Pressure	40 kg/cm^2 (569 psi)	

NOTE: *Values in the graph marked "K" are pressure, in kg/cm^2.*

NOTE: *Values in the graph marked "L" are flow, in Liters/minute.*

NOTE: *If a complete tear down and reassembly is being performed, the only parts which should NOT be loosened or removed are the hex nut (808) spring pin servo piston stoppers in the swash plate supports. (The preset discharge value would require calibration if they were removed.) All other remaining parts may be withdrawn from valve block - needle bearing (124), spline coupling (114) and pump casing - along with stoppers (534, 535), servo piston (532) and tilting pin (531) from the top of the pump casing.*

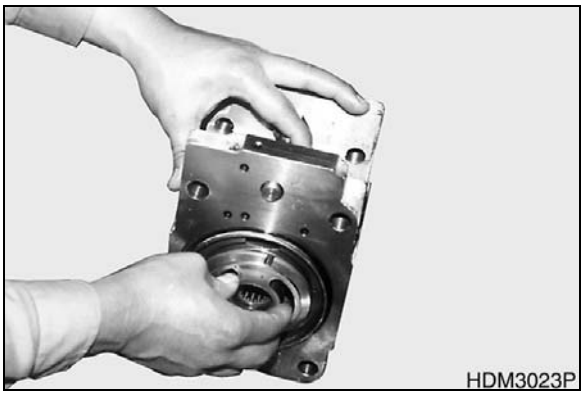


Figure 26

IMPORTANT

Separation of servo pistons (532) and tilting pins (531) must be done with a special fixture. Loctite #609 is required for reassembly - on servo piston/tilting pin/feedback pin (538).

NOTE: *Do not disassemble needle bearings (124). They can only be replaced with new parts if they are excessively worn or have been damaged.*

PUMP REGULATOR DISASSEMBLY

1. Remove four allen head bolts (412, 413) and pump regulator assembly from pump body. Remove and inspect
   O-ring gaskets (708, 724) found between regulator casing and pump body.

   NOTE: *The regulator mounting bolts are uneven in length and should be noted and replaced to the same location.*

   Once the regulator has been removed from pump, go to a clean, well lighted, protected area for further disassembly. Use a rubber mat or other protective covering on the workbench area to prevent damage or scratching of any precision machined components.

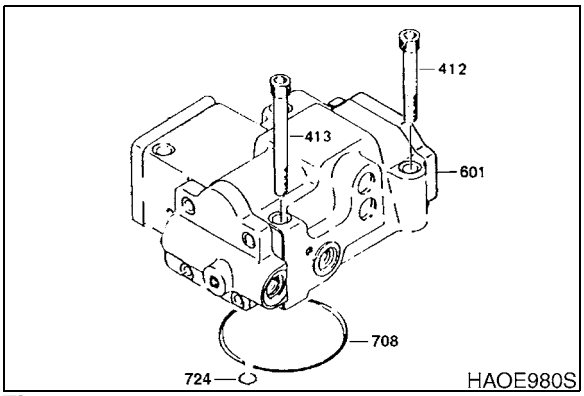


Figure 27

14. Insert adjusting screw bushing (647) into pilot piston bore. Install O-rings (725, 730, 732, 734) into their proper locations. Mount pilot cover (641) onto regulator casing by using four allen head bolts (436, 438).

    NOTE: *Cover mounting bolts (436, 438) are uneven in length and should be replaced to their proper location.*

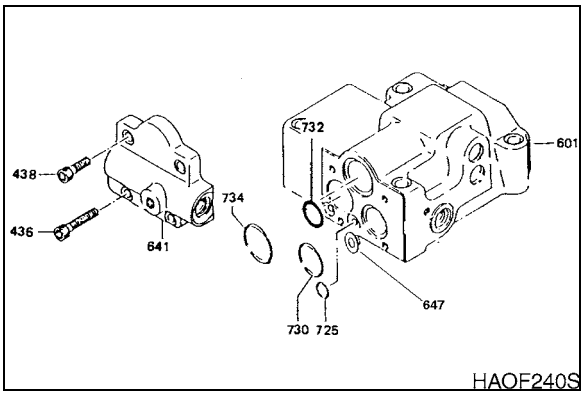


Figure 51

15. Install O-rings (708, 724) to regulator casing base and mount regulator to pump body using four allen head bolts (412, 413)

    NOTE: *The regulator mounting bolts (412, 413) are uneven in length and should be replaced to their proper location.*

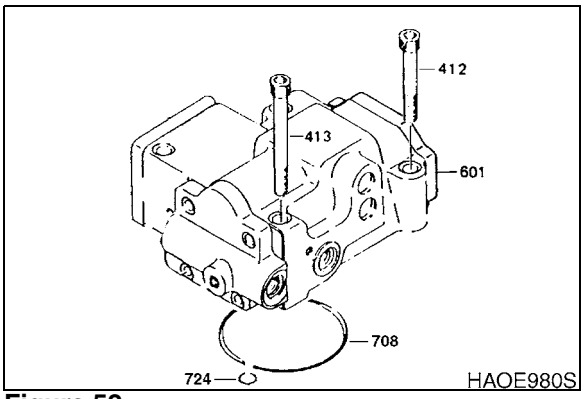


Figure 52

MAIN PUMP REASSEMBLY

NOTE: *Reassembly should be done by reversing disassembly steps.*

1. Begin reassembly with servo piston (532), tilting pin (531) and feedback pin (538) at top of pump case. Use Loctite #609 to hold tilting pin and servo piston if those parts have been disassembled.
2. Bolt swash plate support (251) to pump casing (271). Tighten four allen head mounting bolts.
3. Turn pump case upside down, with regulator mounting surface on work surface. Insert tilting bushing (214) of swash plate into tilting pin (531) and assemble swash plate assembly (212/211) to support (251).

    NOTE: *Apply lubricant to all parts of swash plate assembly to make assembly work easier. Use both hands to check and verify complete free movement of assembly after parts have been reinstalled.*

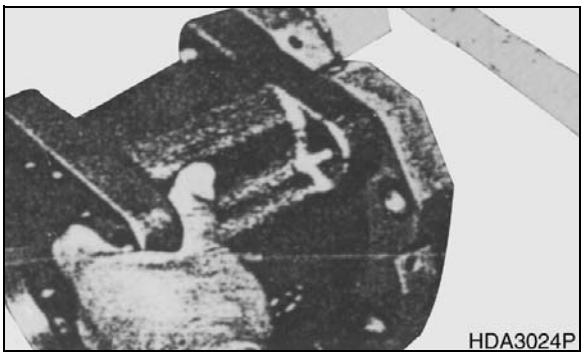


Figure 53

STRAIGHT TRAVELING CIRCUIT

Straight traveling circuit maintains straight travel of the excavator even if other actuators (SW, AM, BKT, BM) are operated in combination.

1. Straight Travel Circuit (Travel Only)

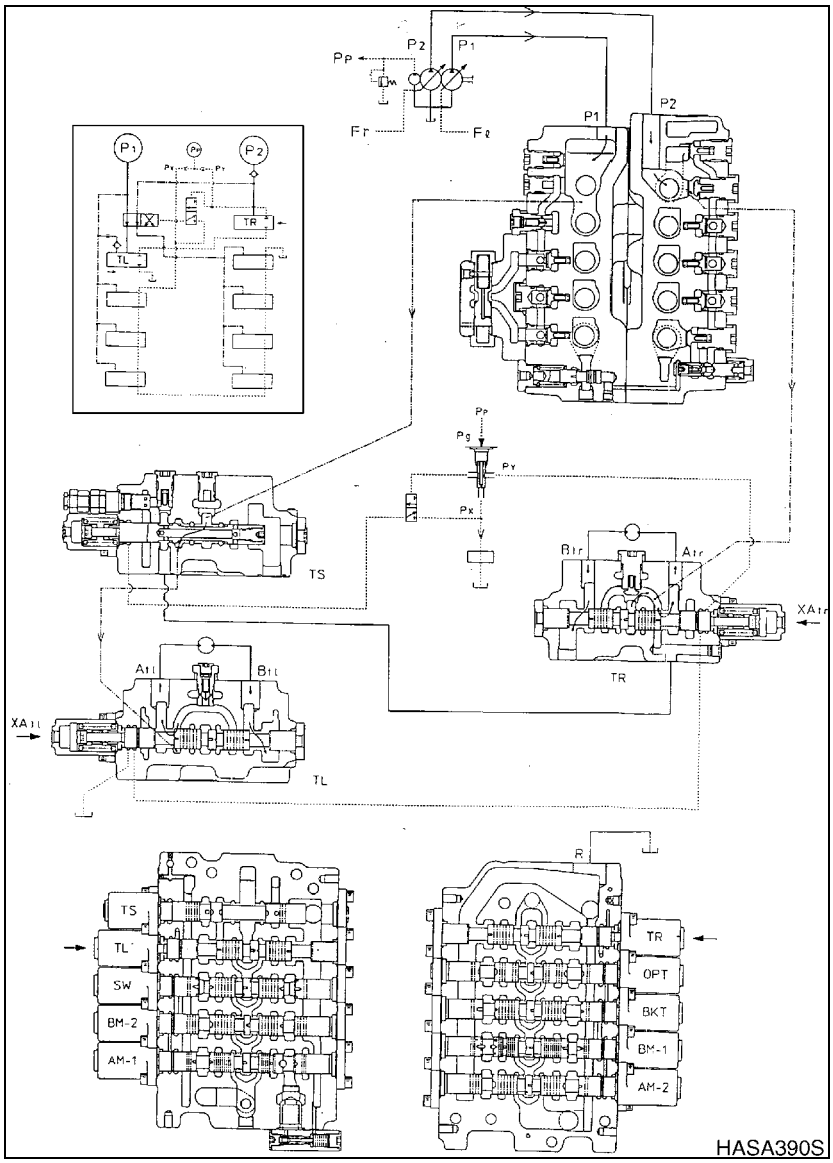


Figure 4

A. As the plunger is switched on the pilot signal line (Py) is blocked off, but since the signal line (Px) is connected to the tank by the orifice, the hydraulic fluid flow from P1 pump is supplied to the left travel motor without activating the travel straight (TS) switching valve.

B. The hydraulic fluid flow from P2 pump is supplied to the right travel motor in the same manner. As a result P1 pump powers the left travel motor and P2 pump powers the right travel motor and straight travel is achieved.

B. Boom-down (Pc > Pv) (Pi pilot signal: "ON").

Pilot signal pressure enters signal port, spool A moves to the right and chamber (1) and drain (1) are connected allowing chamber (1) to drain. Since pressure Pc is greater than Pv, oil flows through the opened poppet B and flows back to the tank.

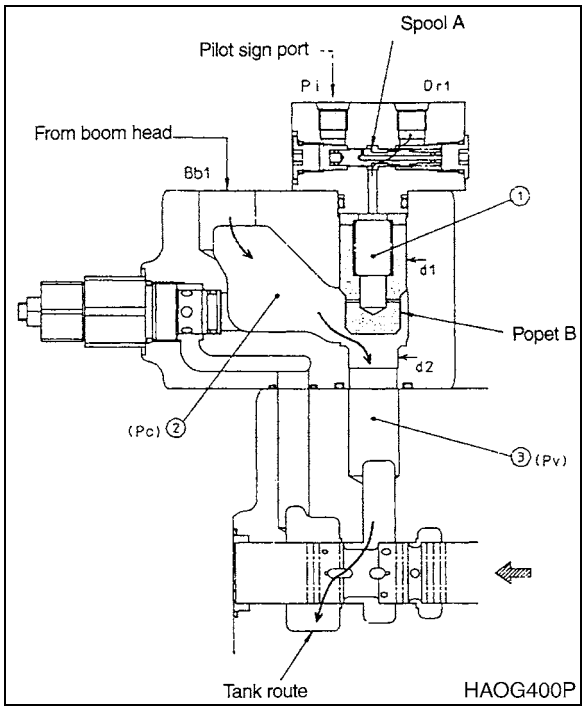


Figure 21

Arm Regeneration Valve

Reference Number	Description
1	Cap
2	Piston
3	O-ring
4	Spool
5	Spring
6	Sleeve

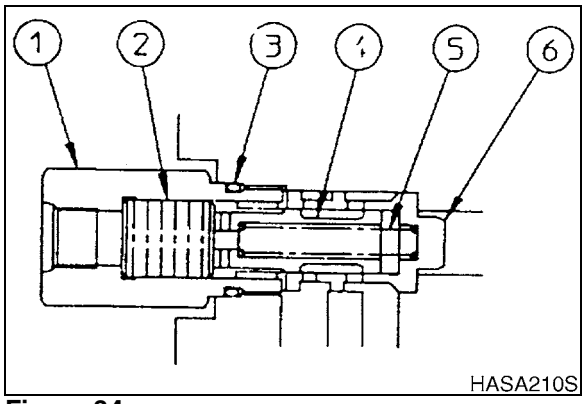


Figure 34

Foot Relief Valve

Reference Number	Description
1	Cap
2	Seam
3	Seam
4	Cap
5	Spring
6	Poppet
7	O-ring

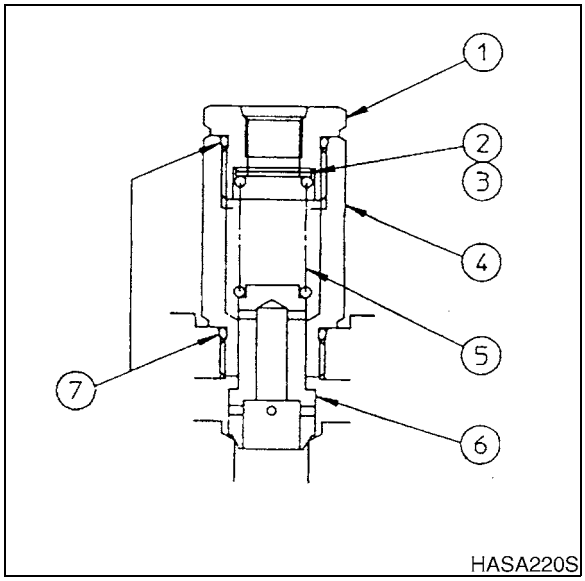


Figure 35

Arm Priority Valve [Ap Valve]

Reference Number	Description
1	Cap
2	O-ring
3	Spring
4	Check
5	Spool BP
6	Spring
7	Cover
8	Bolt With Hole
9	O-ring

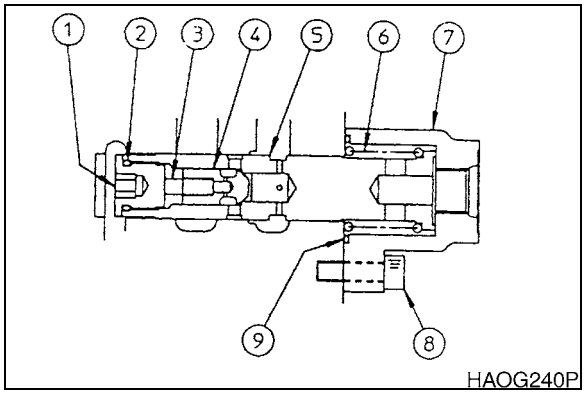


Figure 36

Reference Number	Description	Quantity
1	Main Plunger	9
2	Main Relief Valve	1
3	Overload Relief Valve	8
4	Bucket 2-Speed Check	1
5	Boom Holding Valve	1
6	Boom 2-Speed Check	1
7	Arm Regeneration Valve	1
8	Foot Relief Valve	2
9	Arm Priority Valve (AP Valve)	1
10	Check Valve (TR, AM-2)	2
11	Check Valve (OPT, BKT, BM-1, BM-2)	4
12	Check Valve	1
13	Check Valve	1
14	Cap	1
15	Check Valve (TL)	1
16	Check Valve (SW)	1
17	Check Valve (AM-1)	1
18	Straight Travel Pilot Valve	1
19	Swing Priority Valve (SP Valve)	1
20	Center Bypass Valve (CB Valve)	1
21	Arm Holding Valve	1
22	Orifice (Px, Py)	1

IMPORTANT

When disassembling Arm Load Holding Valve, tag and label each component so that all parts can be reassembled in the proper order.

Check Valve Main Body

1. Remove allen head bolts (1) and cover (2).

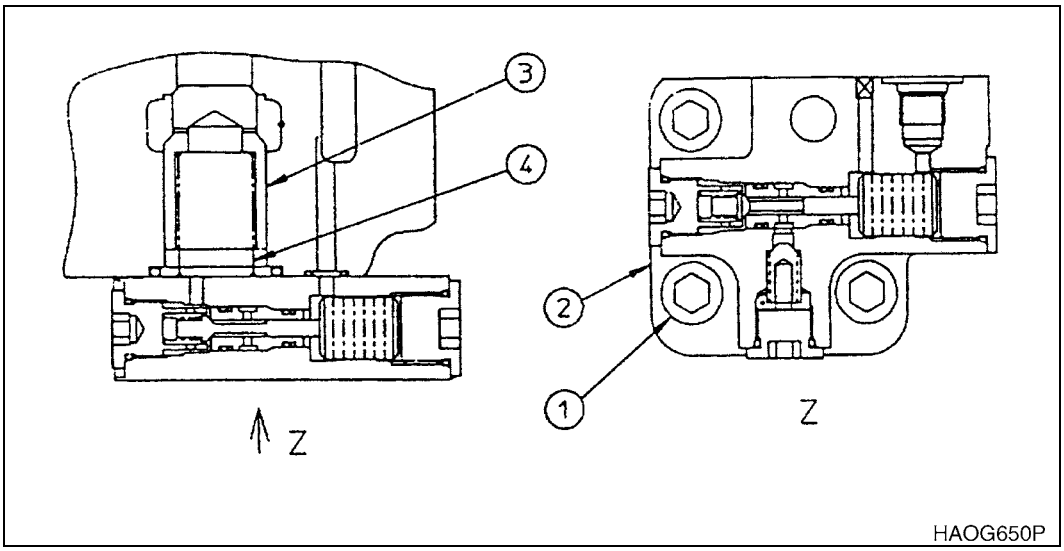


Figure 80

Mounting Bolt Allen Socket	10 mm
Tightening Torque	10 kg•m (72 ft lb)

IMPORTANT

When assembling cover, inspect O-rings for any damage and replace as necessary.

2. Remove spring (3) and poppet (4).

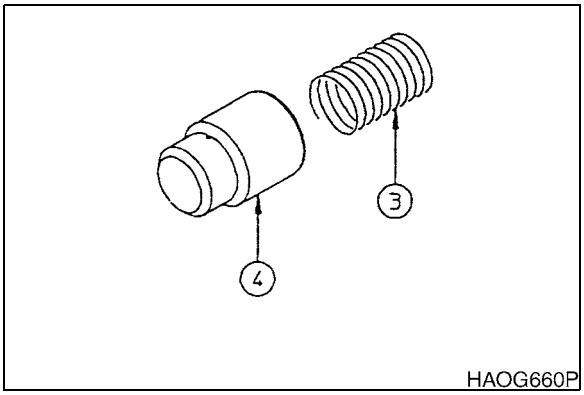


Figure 81

2. Slide out spool assembly and remove spring (3).

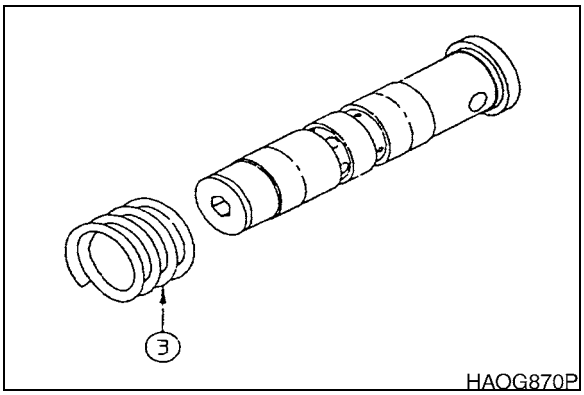


Figure 101

3. Using the tool described above, clamp and hold the spool in place. Remove cap (4), Spring (5) and check (6).

Allen Hole Size	6 mm
Tightening Torque	3.5 kg•m (25 ft lb)

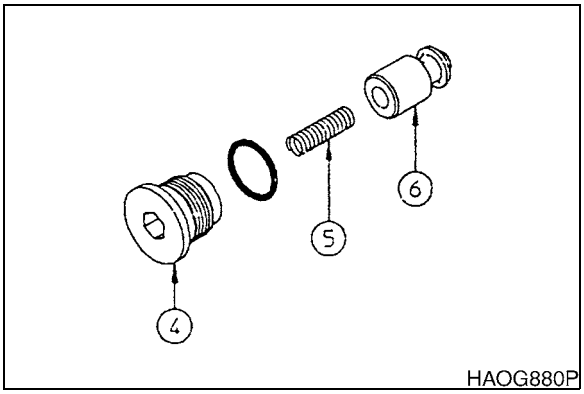


Figure 102

G: Check Valve [AM-1]

IMPORTANT
SP valve must be removed first, before removing SW valve.

IMPORTANT
The SW and AM-1 sleeves may look similar but are different and cannot be interchanged.

Reference Number	Description
1	Sleeve
2	Check
3	Spring

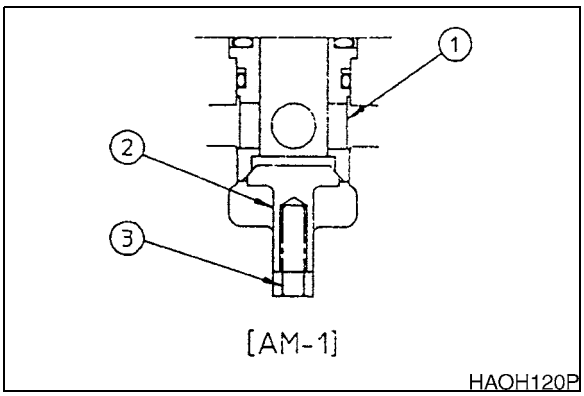


Figure 122

1. Pull out sleeve (1) by using traverse holes.

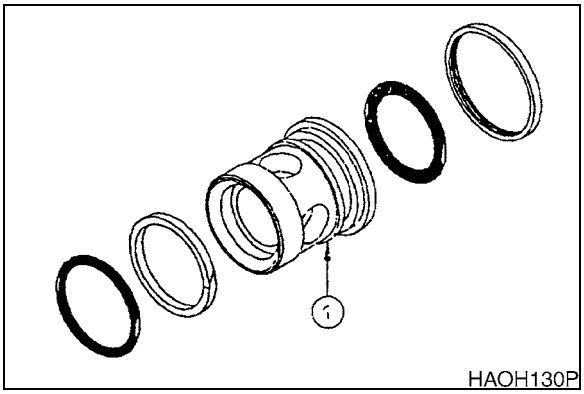


Figure 123

2. Remove check (2) and spring (3).

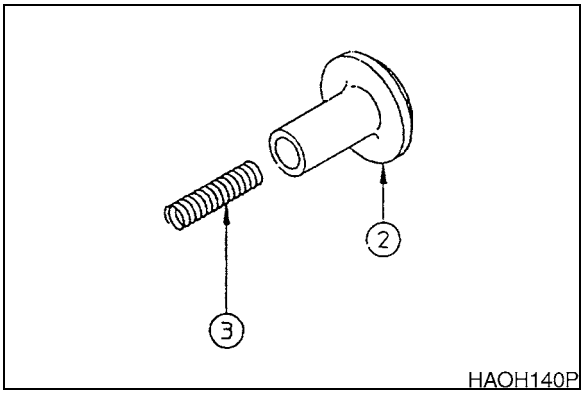


Figure 124

3. Remove hex nut (5) and plate (23).

Figure 6

4. Detach joint (24) using special tool.

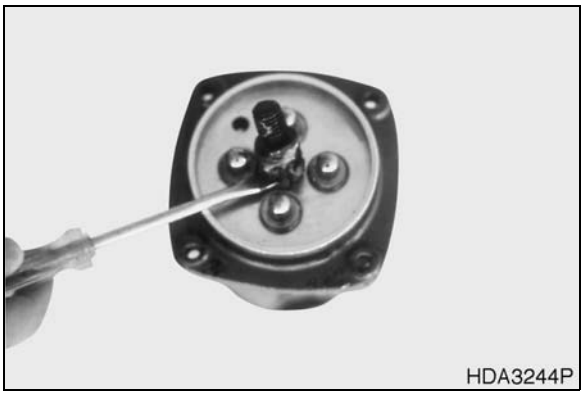


Figure 7

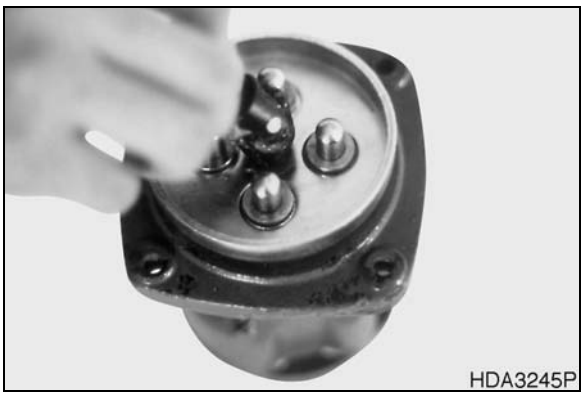


Figure 8

5. Remove plate (23).

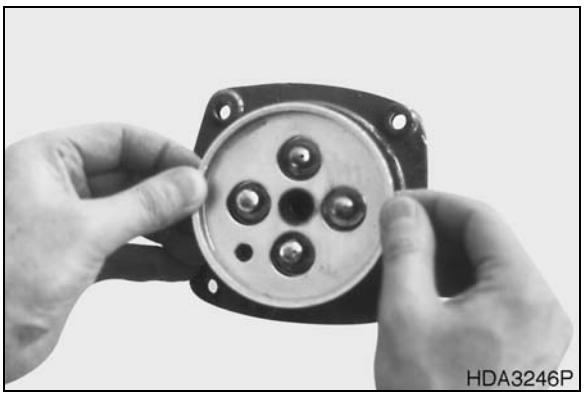


Figure 9

DAEWOO
DAEWOO HEAVY INDUSTRIES & MACHINERY LTD.

TRAVEL CONTROL VALVE (WITH DAMPER)

⚠ 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 is in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

MODEL	SERIAL NUMBER RANGE
Solar 140LC-V	1001 and Up
Solar 175LC-V	1001 and Up
Solar 225LC-V	1001 and Up
Solar 225LL	1001 and Up
Solar 225NLC-V	1001 and Up
Solar 255LC-V	1001 and Up
Solar 300LC-V	1001 and Up
Solar 300LL	1001 and Up
Solar 340LC-V	1001 and Up
Solar 420LC-V	1001 and Up
Solar 470LC-V	1001 and Up
Solar 75-V	1001 and Up

January 2004

DISASSEMBLY

IMPORTANT

1. **Prepare a clean, well lit, stable work bench where disassembly can be performed.**
2. **Prepare the necessary tools, materials and a container in which disassembled parts can be stored.**
3. **All precision parts must be handled with great care and all parts must be reassembled to their original position.**
4. **All parts must be carefully reassembled and not be forced. Damaged parts will cause oil leaks and poor performance of the equipment.**
5. **Do not leave parts exposed to air during or after disassembly. Exposed parts will come in contact with contaminants and will cause rust and damage.**

NOTE: *Dispose of drained fluids according to local regulations.*

1. Remove bellows (33).

Figure 11

2. Remove set screw (30) by using L wrench.

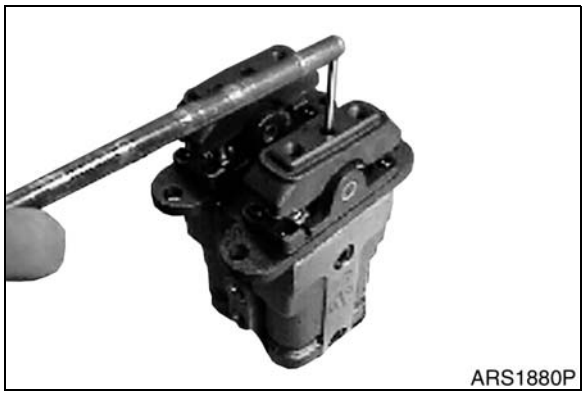


Figure 12

11. Install plug assembly (21 - 24) with push rod assembly (14 - 20) on body (1 and 2).

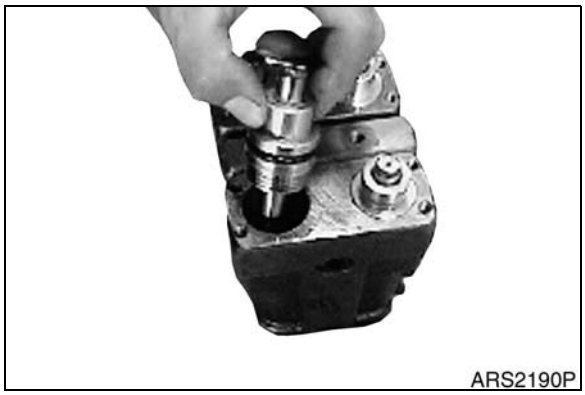


Figure 42

12. Install cover (25) on the side of body (1 and 2) facing up.

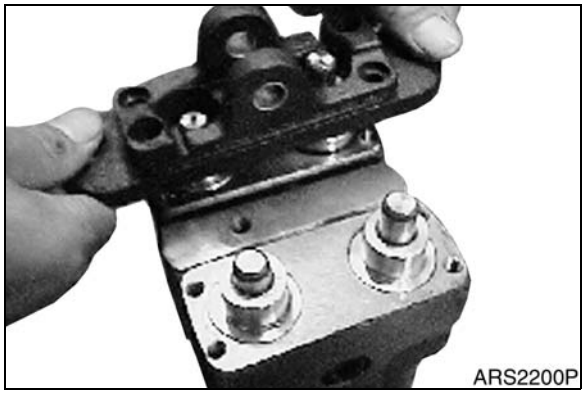


Figure 43

13. Tighten wrench bolt (26).

    NOTE: *Tightening torque: 88 kg•cm (6 ft lb).*

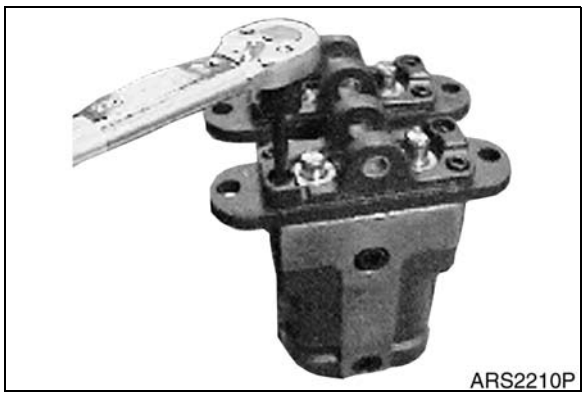
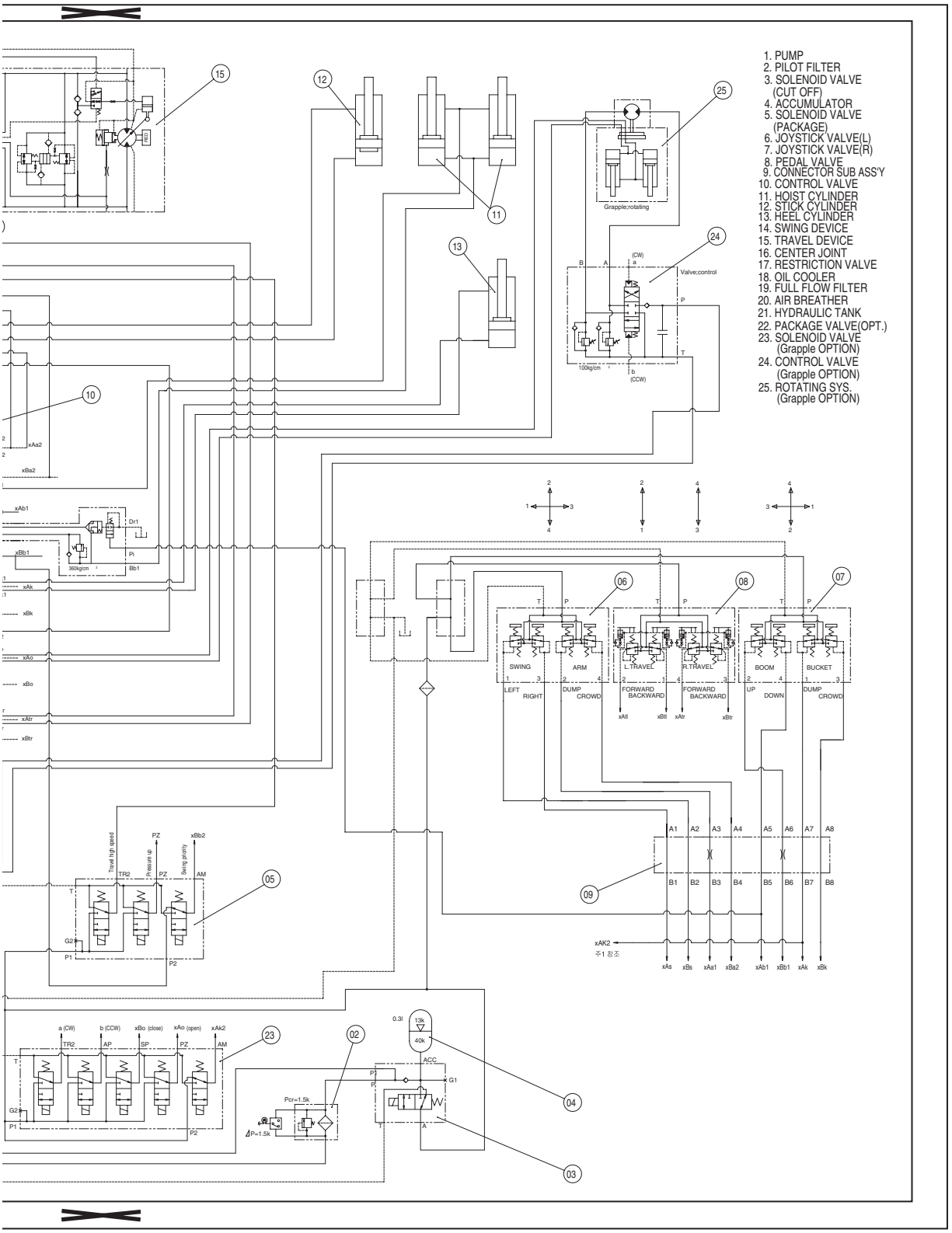


Figure 44

14. Put cam (27) on cover (25) and install cam shaft (29).

IMPORTANT
Check whether there is a play of cam.

Figure 45


1. PUMP
2. PILOT FILTER
3. SOLENOID VALVE (CUT OFF)
4. ACCUMULATOR
5. SOLENOID VALVE (PACKAGE)
6. JOYSTICK VALVE(L)
7. JOYSTICK VALVE(R)
8. PEDAL VALVE
9. CONNECTOR SUB ASS'Y
10. CONTROL VALVE
11. HOIST CYLINDER
12. STICK CYLINDER
13. HEEL CYLINDER
14. SWING DEVICE
15. TRAVEL DEVICE
16. CENTER JOINT
17. RESTRICTION VALVE
18. OIL COOLER
19. FULL FLOW FILTER
20. AIR BREATHER
21. HYDRAULIC TANK
22. PACKAGE VALVE(OPT.)
23. SOLENOID VALVE (Grapple OPTION)
24. CONTROL VALVE (Grapple OPTION)
25. ROTATING SYS. (Grapple OPTION)
Grapple;rotating
Valve;control
SWING
ARM
L.TRAVEL
R.TRAVEL
BOOM
BUCKET
LEFT
RIGHT
DUMP
CROWD
FORWARD
BACKWARD
UP
DOWN
xAK2
주1 참조

BUS0070L

ELECTRIC SUPPLY SYSTEM

The electric power circuit supplies electric current to each electric component. It consists of a battery, battery relay, starter switch, circuit breaker, fusible link and fuse box.

The negative terminal of the battery is grounded to the vehicle body.

Even when the starter switch (5) is in the "OFF" position, electric current is supplied to the following components through battery (1) →fusible link (3) →fuse box (6).

1. Cabin light, fuel pump switch, No. 1 terminal of DC-DC converter (backup for stereo memory)
2. "B" terminal of starter switch and No. 22 terminal of air conditioner control panel.
3. No. 17 terminal of instrument panel (backup for instrument panel).
4. Power terminal "B" of engine stop motor.

When the starter switch (5) is in the "PREHEAT, ON and START" positions, the current flows from the battery (1) →fusible link (3) →fuse box (6) →starter switch (5) "B" terminal/starter switch (5) "BR" terminal →battery relay (2) "BR" terminal which activates the coil of the battery relay and the electric supply system is energized.

When the battery relay's contacts are connected, all electric devices can be operated.

While the engine is not running, the electric power for all electric devices are supplied by the battery. Once the engine is started the power is supplied from the alternator (7).

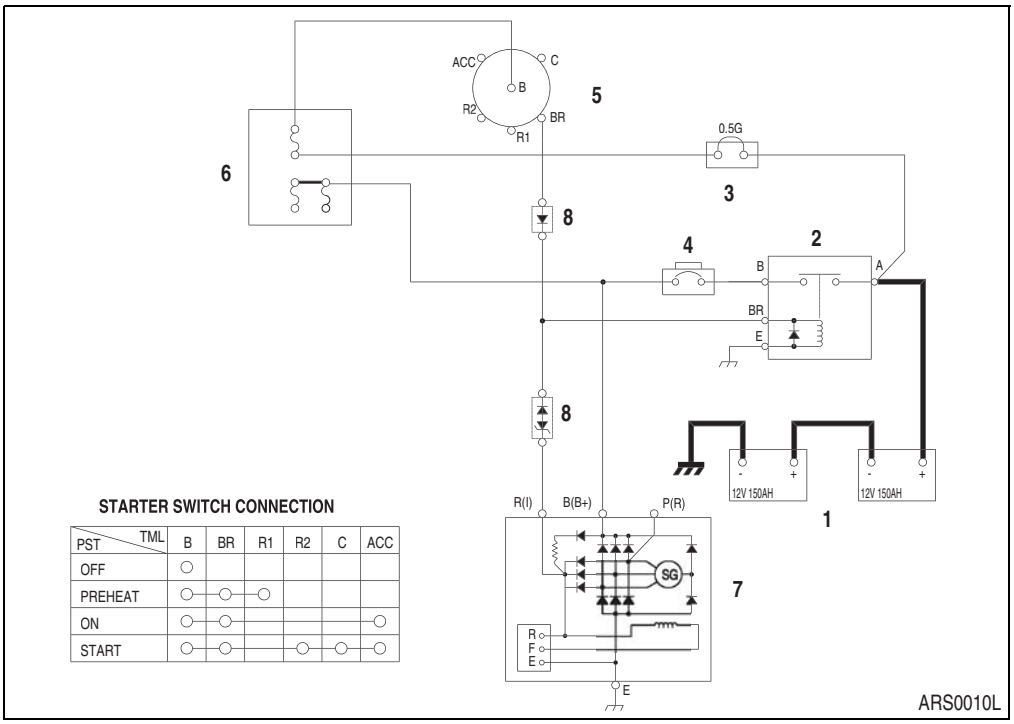


Figure 1 ELECTRIC POWER CIRCUIT DIAGRAM

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

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

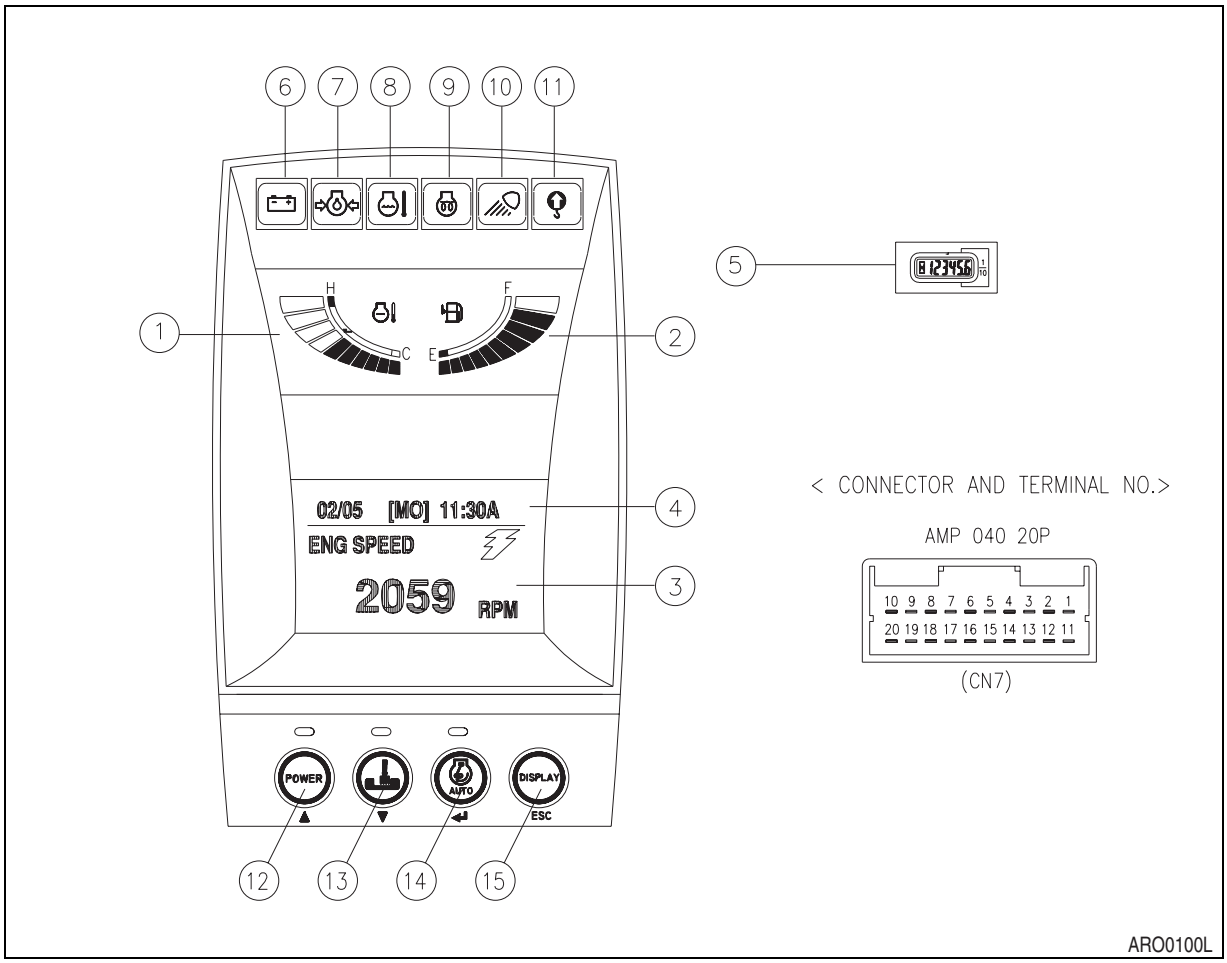


Figure 10

Gauges	Warning Lights	Mode Selector Switches
1. Engine Coolant Temperature Gauge	6. Battery Warning Light	12. Power Mode Selector Switch (Up Arrow Button)
2. Fuel Gauge	7. Engine Oil Pressure Warning Light	13. Trenching Mode Select Switch (Down Arrow Button)
3. Multifunction Gauge and Graphic Information Area	8. Coolant Temp. Warning Light	14. Auto Idle Switch (Enter Button)
4. Digital Clock	9. Preheat Indicator Light	15. Display Selector Switch (Escape Button)
5. Service Hour Meter	10. Work Light Indicator Light	
	11. Overload Warning Light	

When the engine starter switch is turned to the "I" (ON) position, all bands of gauges, indicator lights of switches/buttons and indicator/warning lights will turn "ON" and the alarm buzzer will sound for about 2 seconds.

During this time, a moving excavator will appear on the digital clock and graphic information area (3 and 4, Figure 10).

MAIN MENUS FOR THE GRAPHIC DISPLAY AREA

1. Main menu: Language setting, Time setting, Filter/Oil information.
2. Special menu: Information of machine status, failure information, Information of machine operation.

MENU SELECTOR BUTTONS

1. Up Arrow Button (▲, 1 on Figure 12): Move the cursor to up, left and previous screen.
2. Down Arrow Button (▼, 2 on Figure 12): Move the cursor to down, right and next screen.
3. Enter Button (↵, 3 on Figure 12): Move the menu to selected mode. When setting the menu, this button is used to function as the selector button.
4. Escape Button (ESC, 4 on Figure 12): Move a screen to previous menu or main menu.

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 by using "PRV" (▲, 1 on Figure 18) or "NXT" (▼, 2 on Figure 18) button.

* CODE: 12: Unique code of failure information.
* 01/02: A serial number of current failure/ total quantity of failure.

This example shows one of two failures.

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 by using "PRV" (▲, 1 on Figure 18) or "NXT" (▼, 2 on Figure 18) button.

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

" xxxx Hr ": It will display the operation hour until the failure is generated. (Above example screen shows that breaking of a wire of pressure solenoid valve is generated at 75Hr.)

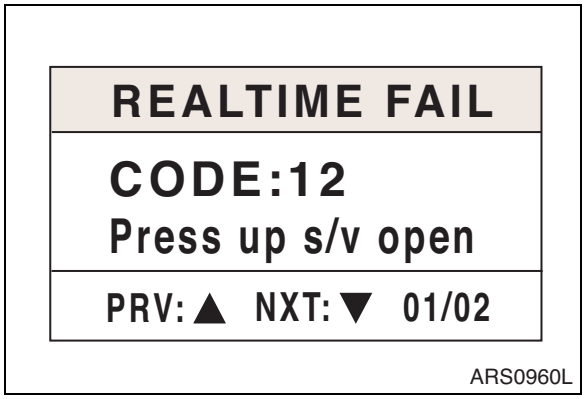


Figure 34

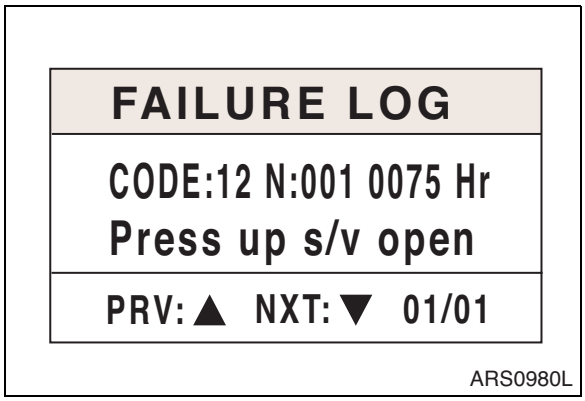


Figure 35

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%

OPERATION

1. Power Mode

This mode should be selected for high speed work. In this mode the engine output is most efficiently utilized due to the discharged oil volume being controlled based on the equivalent horsepower curve at various loaded pressures. The e-EPOS controller compares the target engine speed with the actual engine speed and controls the signal to the E.P.P.R. (Electric Proportional Pressure Reducing) valve which in turn varies the pump output quantity.

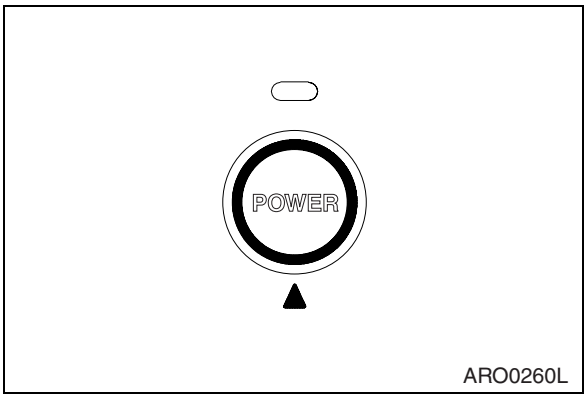


Figure 45

If the load increases, the engine speed will fall below the rated speed. When this occurs, the controller senses this decrease and immediately reduces the pump discharge volume to maintain the engine speed at the rated level.

On the other hand, if the load is decreased the controller increases the discharge volume of the pump to maintain the engine speed at the rated level.

By repeating these control operations, the engine speed is maintained at the rated speed so that maximum power can be generated.

In Power Mode, the controller receives engine speed signals from the engine speed sensor and the throttle position sensor (sensor is built into engine control motor) and converts it to an operating signal current and is then transferred to the pump's E.P.P.R valve. At this time the E.P.P.R. valve converts the electric signal to the corresponding control pressure and sends it to the two pumps, adjusting the pump discharge volume to the desired level.

ENGINE CONTROL MOTOR

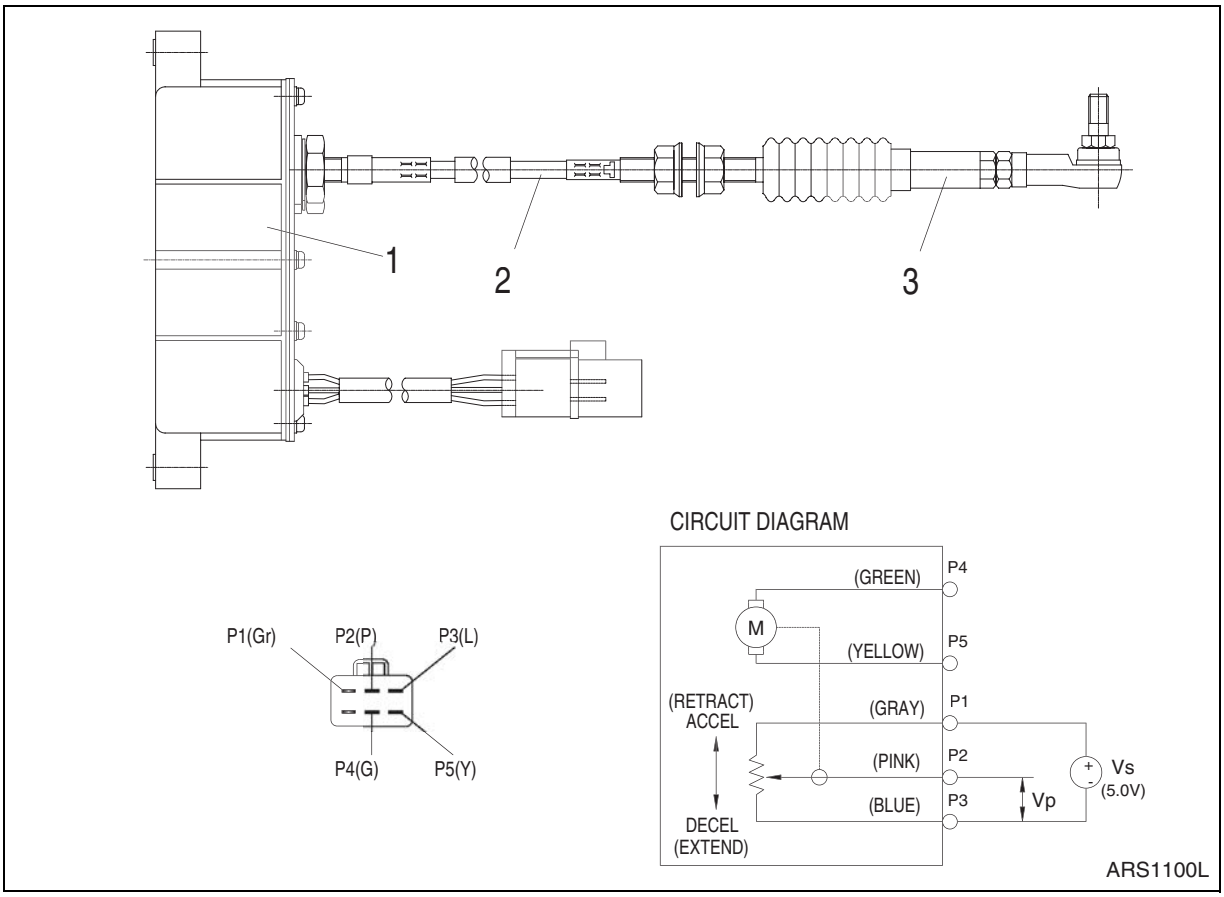


Figure 53

Reference Number	Description
1	Motor Assembly
2	Cable
3	Spring Assembly

The engine control motor uses a D.C. motor with a built in potentiometer to sense the position of the control cable. If an abnormal load (worn or kinked control cable) is sensed in the control motor, the engine controller cuts off the electric current flowing to the engine control motor to protect the system. In such a case, the engine control motor will not operate even though the engine control dial is moved.

The starter switch should be turned "OFF" and the cause of abnormal load should be repaired and the starter switch can be turned "ON" again. The engine control dial can again be used to control the engine speed.

IMPORTANT

When the engine control motor has been replaced or repaired refer to Adjusting the Engine Control Device for correct adjustment of the engine control system. The engine will not perform to its maximum efficiency if it is not adjusted properly.

ENGINE CONTROL DEVICE - ADJUSTMENT

Engine speed adjustment should be made by following the procedures listed below. (Under no load conditions)

1. Adjusting the High Idle Speed

1. Turn the starter switch to the "ON" position. Select Power Mode from the instrument panel. Turn the engine speed control dial to the "HIGH IDLE" position to reduce the (3) motor cable to the shortest length.
2. Adjust the (3) motor cable linked with the (2) bracket so that the engine governor lever touches the maximum position of the stopper.

2. Adjusting the Low Idle Speed

1. Turn the engine speed control dial to the "LOW IDLE" position so that the (3) motor cable is extended to the maximum length. (The maximum stroke range for the lever and cable is 37.0 mm (1.46 in).)
2. Check that the engine governor is at the minimum stopper position and the cable slack is acceptable.
3. A. If the lever is not in the minimum position and touching the stopper, move the (3) cable to one hole lower on the lever. If the cable slack is excessive, move the (3) cable to one hole above the original hole on the lever. Repeat above steps 1 and 2.

   B. Shorten the (3) motor cable 1 - 1.25 mm (0.0394 - 0.0591 in) by turning the cable adjustment nut for motor cable (3), 2/3 - 1 turn in the high idle position.

3. Adjusting the Automatic Deceleration System and Power Mode (First perform adjustments 1 and 2 before performing this adjustment.)

1. Automatic Deceleration (Auto Idle)
   A. Turn engine speed control dial to "HIGH IDLE" position.
   B. Turn power mode and auto idle buttons to "ON" position.
   C. Adjust engine speed by slowly turning variable resistor screw "VR1." (See Figure 64.)
2. Standard Mode
   A. Turn engine speed control dial to "HIGH IDLE" position.
   B. Turn power mode and auto idle buttons to "OFF" position.
   C. Adjust engine speed by slowly turning variable resistor screw "VR2." (See Figure 64.)

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

Reference Number	Description
*10	Rear Cabin Light Relay
11	Instrument Panel
12	e-EPOS Controller
*13	Rotating Warning Light
14	Headlight (2 ea.)
15	Work Light (2 ea.)
*16	Additional Work Light (2 ea.)
*17	Front Cabin Light (2 ea.)
*18	Front Cabin Light (4 ea.)
*19	Rear Cabin Light (2 ea.)

NOTE: *The "*" mark (5, 9, 10, 13, 16, 17, 18, 19) are optional parts.*

KIND OF LIGHT

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

OPERATION

Switch	Position	Connected Terminal of switch	Activated Relay	Lit Light
Light Switch	1	2-6 Terminal	-	Illumination Light of Switch
	2	2-6 Terminal	-	Illumination Light of Switch
		2-3 Terminal	Headlight Relay	Headlight (2 Ea.)
			Work Relay	Work Light (2 Ea.), Additional Work Light (2 Ea.) Indicator Light of Work Light (L5)
Cabin Light Switch	1	2-6 Terminal	Front Cabin Light Relay	Front Cabin Light (2 Ea.) or Front Cabin Light (4 Ea.)
	2	2-6 Terminal	Front Cabin Light Relay	Front Cabin Light (2 Ea.) or Front Cabin Light (4 Ea.)
		2-3 Terminal	Rear Cabin Light Relay	Rear Cabin Light (2 Ea.)
Warning Light Switch	-	5-1 Terminal	-	Rotating Warning Light