

Solar 180W-V

Shop Manual

023-00068E

Serial Number 1001 and Up

February 2003

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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TO THE OPERATOR OF A DAEWOO EXCAVATOR



DANGER!

Unsafe use of the excavator could lead to serious injury or death. Operating procedures, maintenance and equipment practices or traveling or shipping methods that do not follow the safety guidelines on the following pages could cause serious, potentially fatal injuries or extensive damage to the machine or nearby property.

Please respect the importance of taking responsibility for your own safety, and that of other people who may be affected by your actions.

The safety information on the following pages is organized into the following sections:

1. "General Safety Essentials" on page 6
2. "Location of Safety Labels" on page 6
3. "Summary of Safety Precautions for Lifting in Digging Mode" on page 7
4. "Unauthorized Modifications" on page 8
5. "General Hazard Information" on page 8
6. "Before Starting Engine" on page 17
7. "Machine Operation" on page 20
8. "Maintenance" on page 25
9. "Battery" on page 33
10. "Towing" on page 35
11. "Shipping and Transportation" on page 36
12. "Lifting With Sling" on page 36

ASBESTOS DUST HAZARD PREVENTION

Asbestos dust can be HAZARDOUS to your health if it is inhaled. Materials containing asbestos fiber can be present on work site. Breathing air that contains asbestos fiber can ultimately cause serious or fatal lung damage. To prevent lung damage from asbestos fiber, observe following precautions;

- Use a respirator that is approved for use in an asbestos-laden atmosphere.
- Never use compressed air for cleaning.
- Use water for cleaning to keep down the dust.
- Work on the machine or component with the wind at your back whenever possible.
- Always observe any rules and regulations related to the work site and working environment.

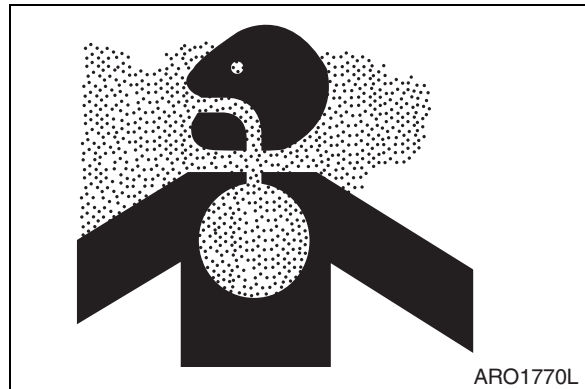


Figure 6

INJURY FROM WORK EQUIPMENT

Do not enter or put your hand, arm or any other part of your body between movable parts, such as between the work equipment and cylinders, or between the machine and work equipment.

If the control levers are operated, the clearance between the machine and the work equipment will change and this may lead to serious damage or personal injury.

If going between movable parts is necessary, always position and secure the work equipment so that it cannot move.

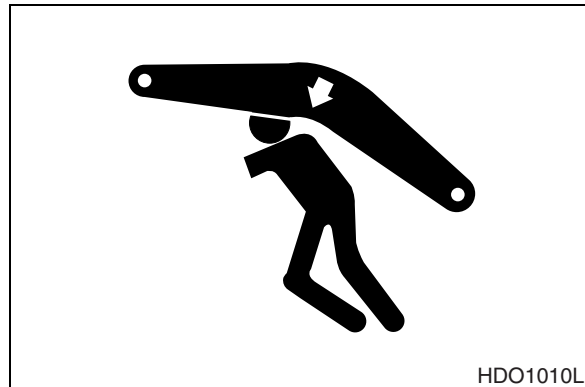


Figure 7

To avoid hitting the work equipment, always do the following;

- When working in tunnels, on bridges, under electric wires, or when parking the machine or carrying out other operations in places with limited height, be extremely careful not to hit the bucket or other parts.
- To prevent collisions, operate the machine at a safe speed when working in confined spaces, indoors, or in crowded areas.
- Do not pass the bucket over the heads of workers or over the operator's compartment of dump truck.

AVOID HIGH-VOLTAGE CABLES

Serious injury or death can result from contact or proximity to high-voltage electric lines. The bucket does not have to make physical contact with power lines for current to be transmitted.

Use a spotter and hand signals to stay away from power lines not clearly visible to the operator.

Voltage	Minimum Safe Distance
6.6 kV	3 m (9' 10")
33.0 kV	4 m (13' 1")
66.0 kV	5 m (16' 5")
154.0 kV	8 m (26' 3")
275.0 kV	10 m (32' 10")

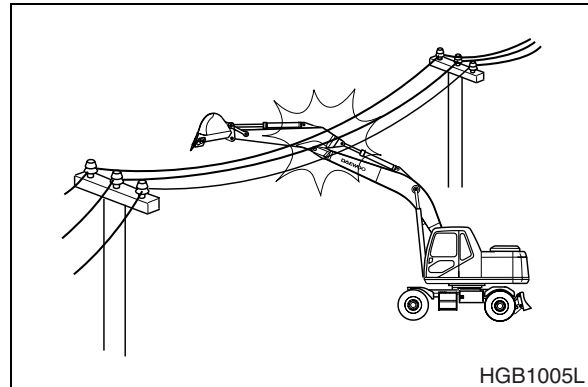


Figure 23

Use these minimum distances as a guideline only. Depending upon the voltage in the line and atmospheric conditions, strong current shocks can occur with the boom or bucket as far away as 4 - 6 m (13 - 20 ft) from the power line. Very high voltage and rainy weather could further decrease that safety margin.

NOTE: *Before starting any type of operation near power lines (either above ground or buried cable-type), you should always contact the power utility directly and work out a safety plan with them.*

OPERATE CAREFULLY ON SNOW, ICE AND IN VERY COLD TEMPERATURES

In icy cold weather avoid sudden travel movements and stay away from even slight slopes. The machine could skid off to one side very easily.

Snow accumulation could hide or obscure potential hazards. Use care while operating or while using the machine to clear snow.

Warming up the engine for a short period may be necessary, to avoid operating with sluggish or reduced working capacity. The jolting shocks and impact loads caused by bumping or bottoming the boom or attachment are more likely to cause severe stress in very cold temperatures. Reducing work cycle rate and work load may be necessary.

When the temperature rises, frozen road surfaces become soft, so the machine travel becomes unstable.

In cold weather, do not touch metal surfaces with your bare hands. If you touch a metal surface in extremely cold weather, your skin may freeze to the metal surface.

BATTERY

BATTERY HAZARD PREVENTION

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

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

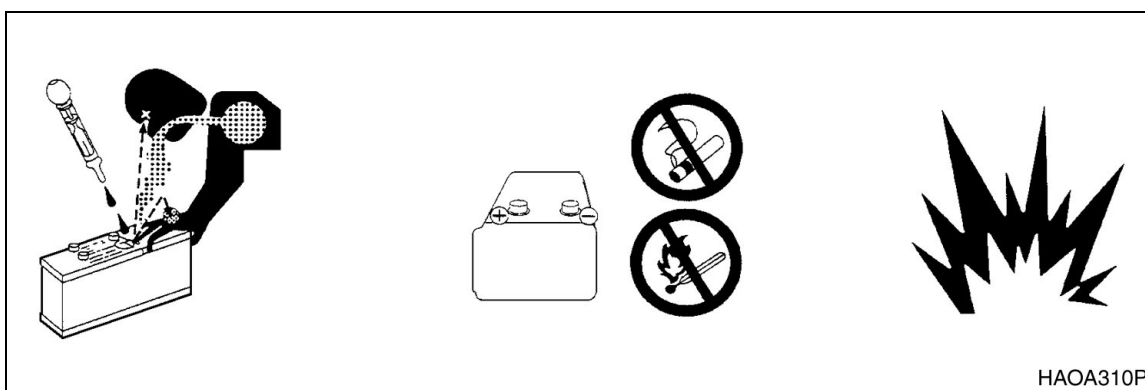


Figure 37

Reference Number	Description
1	Radiator & Oil Cooler
2	Air Cleaner
3	Cab
4	Battery Compartment
5	Fuel Tank Fill Cap
6	Fuel Tank
7	Hyd. Oil Tank
8	Pumps
9	Counterweight
10	Engine
11	Muffler
12	Control Valve
13	Swing Motor
14	Pre - Cleaner
15	Center Joint
16	Boom Cylinder
17	Boom
18	Arm Cylinder

Reference Number	Description
19	Arm
20	Bucket Cylinder
21	Guide Link
22	Link
23	Bucket
24	Side Cutter
25	Bucket Tooth
26	Ram Cylinder
27	Front Axle
28	Drive Shaft
29	Wheel Chock
30	Step
31	Swing Bearing
32	Travel Motor
33	Transmission
34	Rear Axle
35	Blade Cylinder
36	Dozer Blade

CONDITION	SPECIFICATION
Barometric Pressure	760 mm Hg [20°C (68°F)]
Cooling Fan	625 mm dia. (24.61 in. dia.), Sucker
Alternator	Installed
Air Cleaner	Installed
Muffler	Installed

Performance Standard	KS R1004
Power (Maximum Rated)	152 ps (150 hp) @ 2,100 rpm, per KS-R1004
Maximum Torque	60 kg•m @ 1,600 rpm (434 ft lbs @ 1,600 rpm)
Fuel Consumption (Minimum Rated)	170 g/ps•h (6.1 oz/Hp.h) @ 2,100 rpm, per DIN 6271

TESTS

Evaluation of equipment performance and operating condition can be made by running the excavator through a series of different tests, and recording results with a stop watch and tape measure. Compare results of performance tests against the specifications and standards, which are for equipment in new or renewed condition.

TEST CONDITIONS

1. All tests should be performed on a flat, level, firmly supporting ground surface.

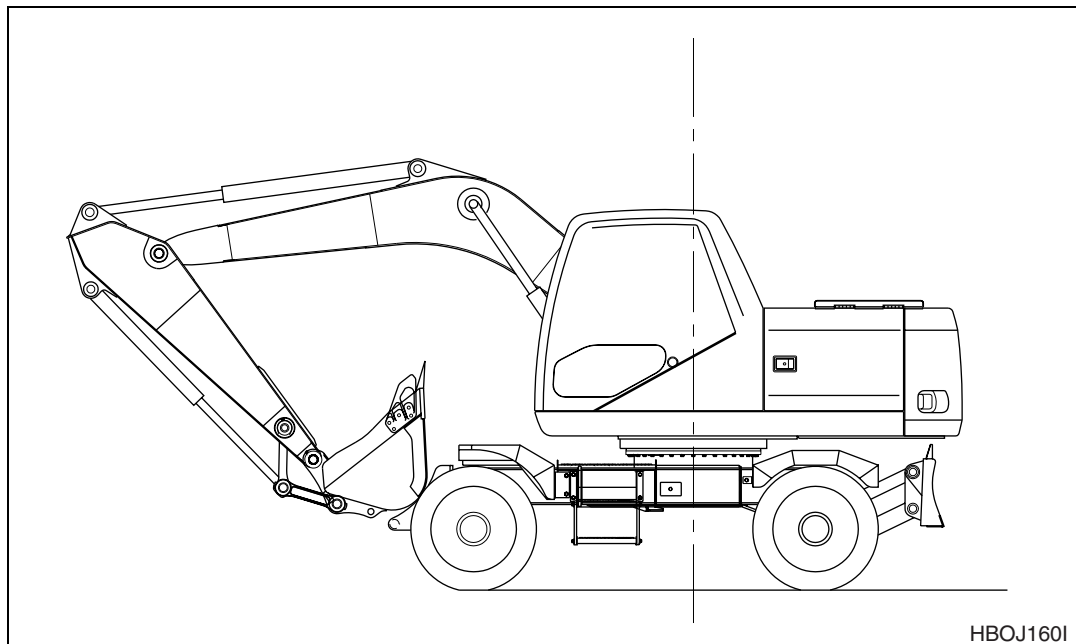


Figure 6

2. All recommended, applicable maintenance and adjustment service should be completed prior to testing.
3. Hydraulic fluid and engine oil should be of appropriate viscosity for ambient weather conditions. Warm up hydraulic oil to standard operating temperature, between 45° to 55°C (112° to 135°F).
4. Run all tests with the engine speed control set to maximum rpm.
5. Repeat tests with Power Mode engine control settings at both Power Mode S (standard work mode) and Power Mode H (high speed mode). Travel speed tests should also be repeated at both high and low speed.

IMPORTANT

Hydraulic system operating conditions (repetitive cycling, heavy work loads, fluid circulating under high pressure) make it extremely critical that dust, grit or any other type of contamination be kept out of the system. Observe fluid and filter change maintenance interval recommendations and always pre-clean any exterior surface of the system before it is exposed to air. For example, the reservoir filler cap and neck area, hoses that have to be disassembled, and the covers and external surfaces of filter canisters should all be cleaned before disassembly.

MAINTENANCE SERVICE AND REPAIR PROCEDURE

GENERAL PRECAUTIONS

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

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

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

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

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

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

STANDARD TORQUES



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
ALL MODELS	ALL RANGES

I. "Loctite" Fastener Adhesives

Product	Application	Color	Removal	Break-away 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/non-clog" 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 non-rigid assemblies subject to shock, vibration or deflection.	Purple	Use Locquic "N" primer for faster (1/4 - 2 hours) setup. Unprimed setup 1 - 12 hours.

9. Install stereo assembly with bolts (2, Figure 10) after connecting speaker and antenna wires.

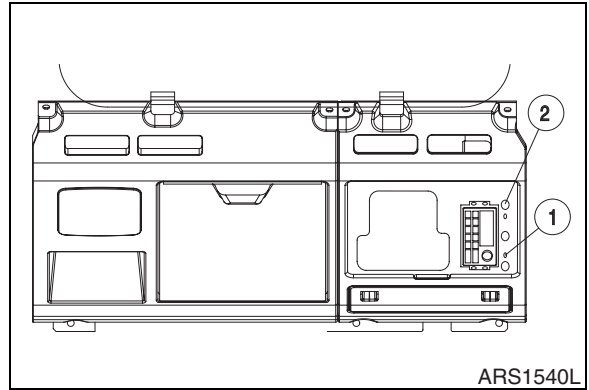


Figure 10

10. Install right side dash cover (4, Figure 11) with bolts (1, Figure 10).
11. Install left side dash cover (3, Figure 11) with bolts (1, Figure 10). Install two rubber stops (2, Figure 11).
12. Install cover (5, Figure 11) on left side dash cover (3).

NOTE: *Connect speaker wire before installing cover.*

13. Connect washer hose located at floor plate bottom.
14. Install air duct (3, 2 and 1, Figure 12) located at right side of cab.

NOTE: *Connect wire connector of duct (2, Figure 12).*

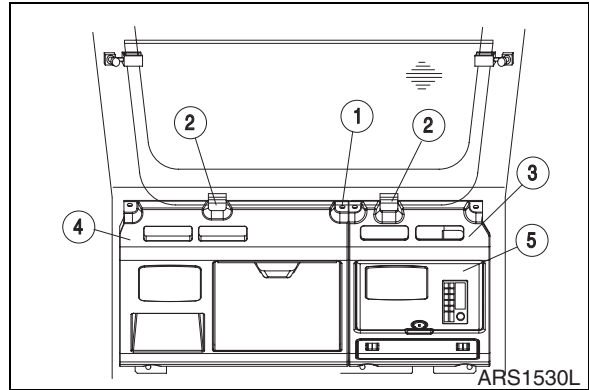


Figure 11

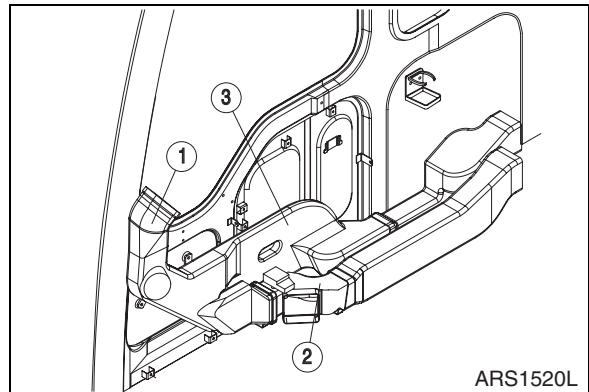


Figure 12



FUEL TANK

 **CAUTION!**

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MODEL	SERIAL NUMBER RANGE
Solar 180W-V	1001 and Up

INSTALLATION

1. Install two 12 mm eye bolts in threaded holes (1 and 2, Figure 11). Using a suitable lifting device, sling eye bolts.
2. Set fuel tank (3, Figure 11) into position. Install six bolts and washers (4) finger tight, to secure tank to frame.

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

3. Install shims (5, Figure 11) as needed to prevent tank (3) from rocking or stress from mounting bolts (4).
4. Tighten mounting bolts (4, Figure 11) after shims are installed.

NOTE: *Bolt torque is 27 kg•m (195 ft lb)*

5. Install four bolts (4, Figure 12) and cover (5) on frame.

Install four bolts (1 and 2), clamp (6) and stay (3) on fuel tank and frame.

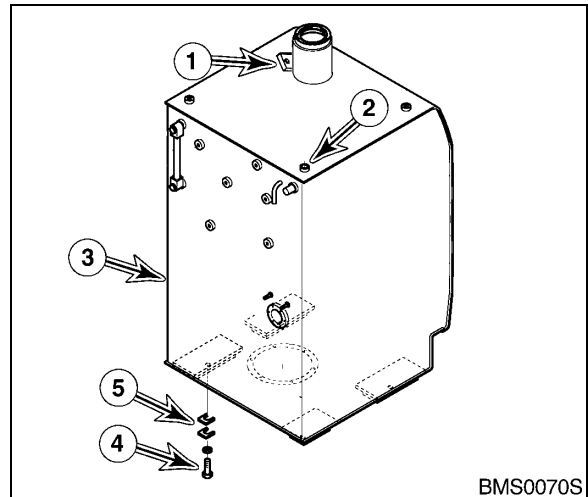


Figure 11

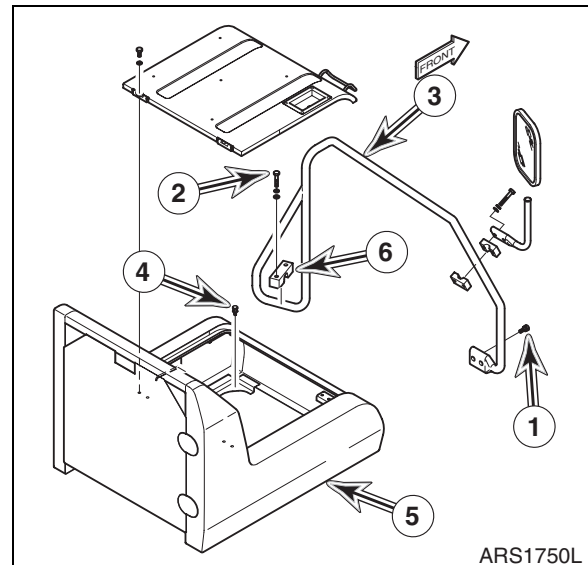


Figure 12

SWING BEARING



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MODEL	SERIAL NUMBER RANGE
Solar 130W-V	0001 and Up
Solar 140W-V	1001 and Up
Solar 160W-V	1001 and Up
Solar 170W-V	1001 and Up
Solar 180W-V	1001 and Up
Solar 200W-V	0001 and Up
Solar 210W-V	1001 and Up

Reference Number	Description
1	Casing
2	Drive Shaft
3	Plate
4	Roller Bearing
5	Cover Plate
6	Thrust Washer No. 1
7	Oil Seal
8	Roller Bearing
9	No. 1 Ring Gear
10	No. 2 Carrier
11	Thrust Washer No. 2
12	Planet Gear No. 2
13	No. 2 Bushing
14	No. 2 Pin
15	Spring Pin
16	Bolt
17	No. 3 Thrust Washer
18	No. 2 Sun Gear
19	Knock Pin
20	No. 1 Carrier

Reference Number	Description
21	-----
22	No. 1 Planet Gear
23	No. 1 Pin Assembly
24	Socket Bolt
25	No. 1 Sun Gear
26	Spacer
27	Plug
28	Plug
29	Level Gauge Pipe
30	Level Gauge
31	Double Tab Washer
32	Pipe
33	Snap Ring
34	Pinion
35	Cover
36	Spring Washer
37	Bolt
38	Wire
39	Bolt

SPECIFICATIONS

Swing Reduction Gearbox	Specification
Drive Type	Two Stage Planetary Gear
Reduction Ratio	19.636
Maximum Output Speed	66.6 rpm
Maximum Output Torque	1,120 kg•m (8,100 ft lb)
Weight	180 kg (397 lb)

Pinion Gear	Specification
Type	Stub Gear
Gear P.C.D.	180 mm (7.09 in)
No. of Teeth	15
Module	12



RAM LOCK VALVE OPERATION



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MODEL	SERIAL NUMBER RANGE
Solar 130W-V	0001 and Up
Solar 140W-V	1001 and Up
Solar 160W-V	1001 and Up
Solar 170W-V	1001 and Up
Solar 180W-V	1001 and Up
Solar 200W-V	0001 and Up
Solar 210W-V	1001 and Up

Adjust Track and Steering Lock.....	117
Version "A" - With Stop Ring.....	117
Version "B" - Without Stop Ring.....	121
Adjust Toe-in Resp. Toe-out.....	125
Check Tightness of the Steering Assembly	126
Illustrated Table	127

IMPORTANT

Check correct torque limit of all screwed joints within regular intervals. (First check after 50 operating hours) Axles with ZF multi disk self-licking differentials: a light noise could be noted, when oil without limited slip additives have been filled in. this noise can be regarded harmless. In case of a heavy noise or when the tire is jerking, use EP-gear lubricants with limited-slip additives. You will find the corresponding products on the list of lubricants TE-ML 05 for the above mentioned units.

This list can be obtained through any ZF After Sales Service point. Zahnradfabrik Passau GmbH

Postflight 26 40

D-8390 Passau 1

Telephone (08 51) 494-0

Telex 5 78 49 zp d

Telefax (08 51) 45 340

BRAKE LINING - WEAR TEST ON ZF-AXLES OF THE SERIES AP (L) - B 700

A brake lining wear test gives a limited information about the overall condition of the brake plate pack - without disassembly of the output.

The test must be carried out especially in case of a changed brake performance, as e.g. Brake noises, Reduced brake power, Change of the deceleration, Change of the brake-fluid level, Change of the brake pressure and in the course of the oil change intervals, resp. at least once a year.

Carry out the wear test on both final drive sides.

Limit Value for Piston Stroke with Max, Wear Condition	Piston Stroke - New
AP(L)-B755 (4 Plates)... 5.0 mm (0.1969 in)	2.50 - 2.90 mm (0.0984 - 0.1142 in)
AP(L)-B755 (5 Plates)... 5.0 mm (0.1969 in)	3.10 - 3.50 mm (0.1220 - 0.1378 in)

CARRY OUT WEAR TEST

1. Turn the wheel head until the screw plug "A" is in top position (12 o'clock position), see Figure 13.
2. Remove screw plug and pressurize the brake (required brake pressure min. 40 bar (580 psi)).

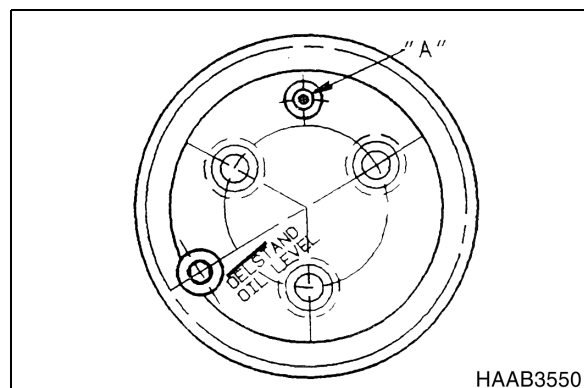


Figure 13

FINAL DRIVE - DISASSEMBLY

NOTE: See Illustrated Table 1. Figure 180 on page -71.

1. Figure 23, shows the complete axle on the assembly car.

(S) Assembly car - 5870 350 000

(S) Support - 5870 350 055

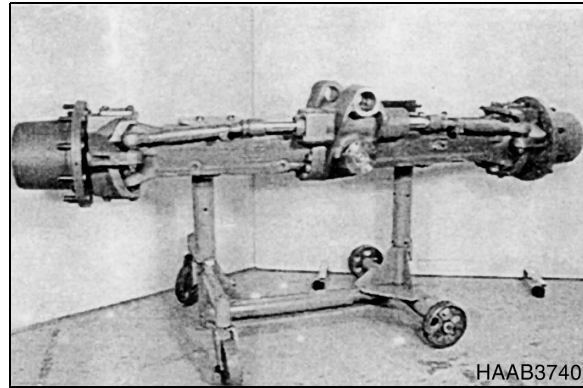


Figure 23

2. Drain oil from the axle housing.

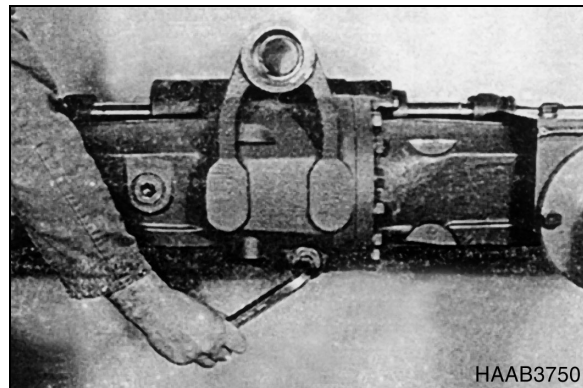


Figure 24

PLANETARY CARRIER

1. Screw out screw plug carefully.
2. Swivel planetary carrier through 180° and drain oil.

NOTE: Pay attention to the position of the screw plug - 12-o'clock position while opening.

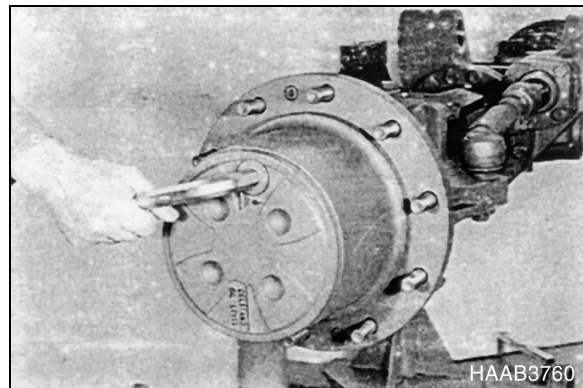


Figure 25

3. Expand the retaining ring and remove the stub shaft.

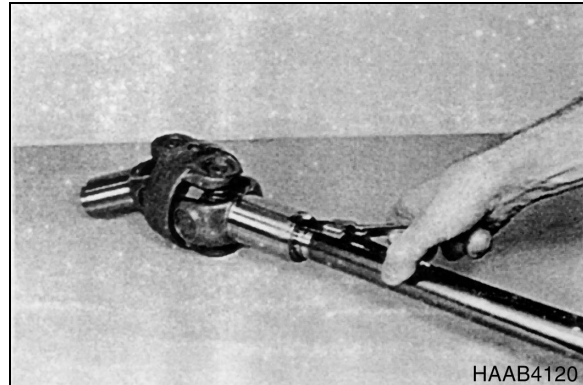


Figure 61

AXLE HOUSING

1. Pull outer bearing race out of the steering knuckle bores.

(S) Internal puller - 5870 300 019

(S) Backup tool - 5870 300 020

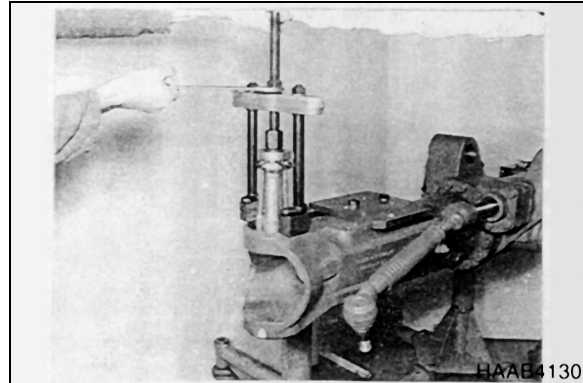


Figure 62

2. Pull the shaft seal and the sleeve installed behind it out of the bore.

(S) Internal puller - 5870 300 019

(S) Backup tool - 5870 300 020

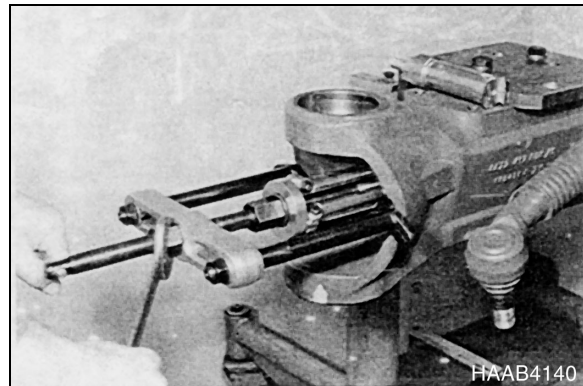


Figure 63

3. In case of versions - with traversing steering knuckle bore, if necessary, drive the cover out of the steering knuckle bore.

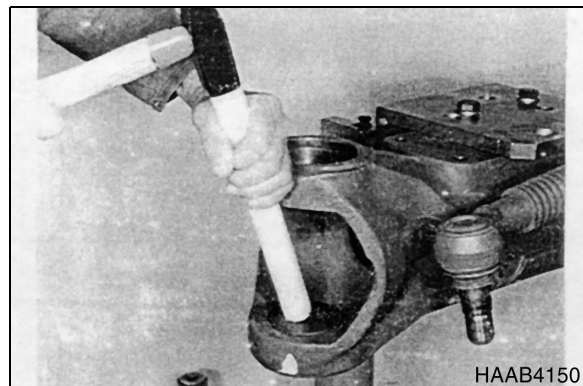


Figure 64

3. Assemble spacing ring (e.g. $s = 14.50 \text{ mm}$ (0.5709 in) - empirical value).

NOTE: *If the hub and the two wheel bearings have not been replaced, we recommend to reuse the actual spacing ring again. Binding, however is the prescribed rolling resistance of the wheel bearing (Figure 101).*

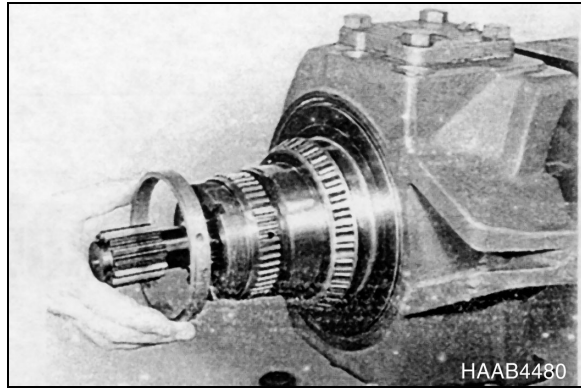


Figure 97

4. Assemble the hub (without the shaft seal) and fix it using the heated inner bearing race.

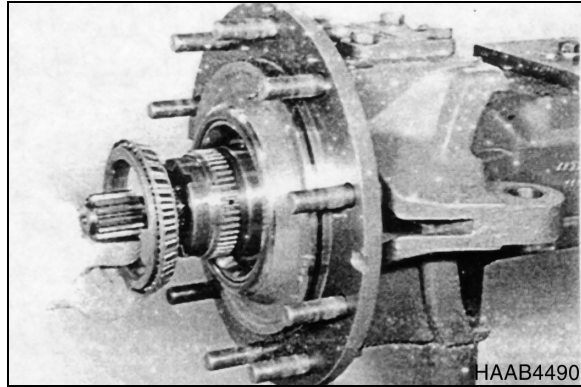


Figure 98

5. Assemble the internal gear (without sealing elements).

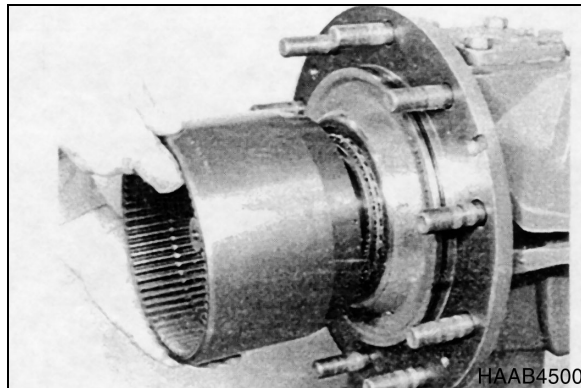


Figure 99

6. Fix hook spanner using the retaining ring (Also see Figure 36).

7. Cover threads of slotted nut with lubricant (Type Molypaul 11) and tighten the slotted nut.

NOTE: *Torque limit 158 - 214 kg•m (1,140 - 1,550 ft lb).*

NOTE: *Aim at the conformity of Slotted nut / Pocket of Steering knuckle hull, starting with lower torque limit {158.06 kg•m (1,143 ft lb)}. During tightening, make several full revolutions of the hub in both senses.*

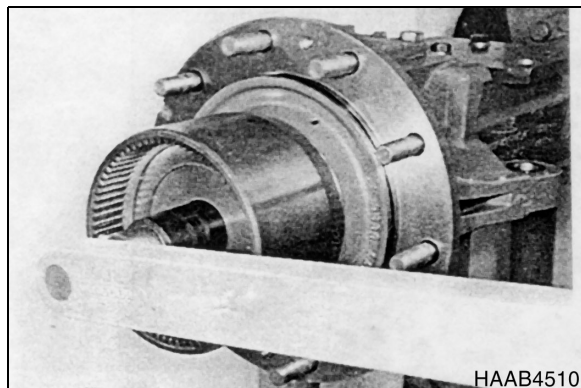


Figure 100

2. Heat the two backup rings in an oil bath and insert them in the piston recesses.
3. Install grooved rings.

NOTE: Pay attention to the installation position, see Figure 132.

Reference Number	Description
1	Piston
2	Backup Rings
3	Grooved Rings
4	Pressure Chamber

4. The illustrated assembly help (S) facilitates, the resp. assures a correct reassembly of the prescribed piston.

(S) Assembly ring / Part I Centering ring - 5870 347 013

(S) Assembly ring / Part II Installer

5. After the cooling down, oil the backup ring and the grooved ring. (Use W-10 oils.)

Reference Number	Description
1	Assembly Help / Part I
2	Assembly Help / Part II
3	Piston

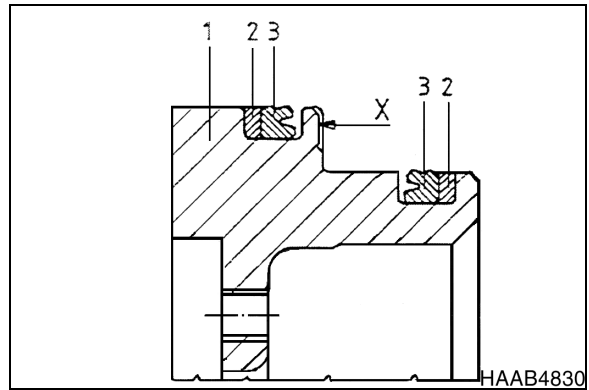


Figure 132

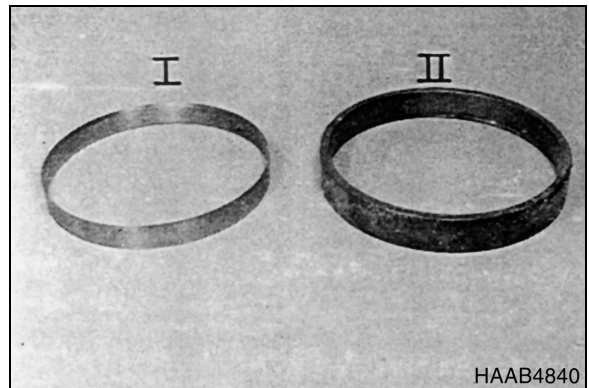


Figure 133

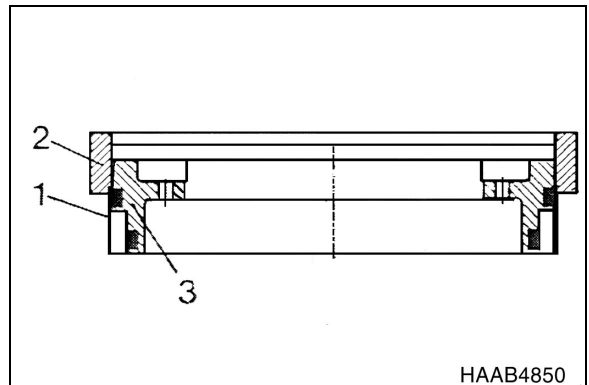


Figure 134

8. Make the thrust washer (with the two tongues in the free Grooves / Steering knuckle hull) adhere with grease.

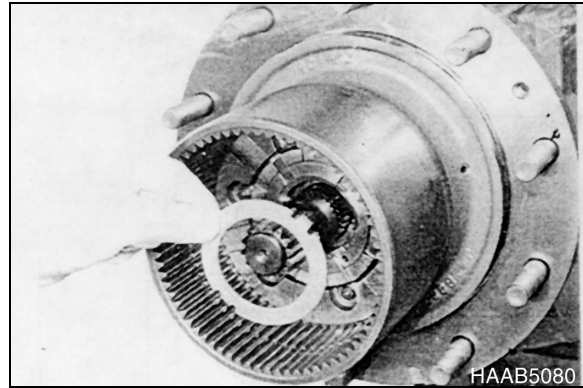


Figure 162

9. Engage the retaining ring in the plate carrier.

(S) Set of internal snap ring pliers -
5870 900 013



Figure 163

10. Assemble the plate carrier upon the sun gear shaft and fix it using the retaining ring.

11. Now, place the sun-gear shaft along with the plate carrier against shoulder (thrust washer).

(S) Set of external snap ring pliers -
5870 900 015

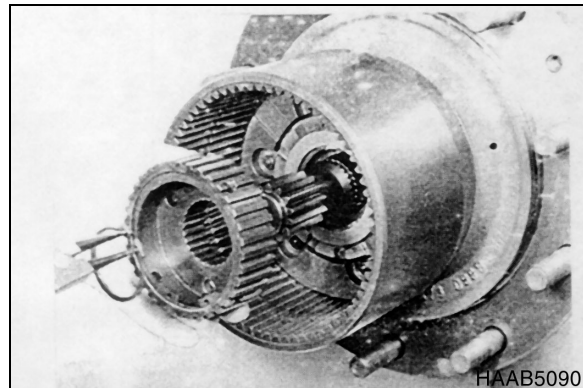


Figure 164

Plate Arrangement

To assure a correct plate arrangement, the undulated outer plates are marked by suppression of several teeth.

Figure 165 thru Figure 166 show the correct arrangement of the outer plates.

Great tooth space (2 teeth missing) must be central in line.

Small tooth space (1 tooth missing, see arrows) lies alternating to the left (outer plate 1, 3, 4, 5), resp. to the right (outer plate 2, 4, 6 - only in case of 5-coated plate arrangement).

NOTE: *There must be one coated (inner) plate installed between the two outer plates.*

4. Lift the complete differential case out of the axle housing.

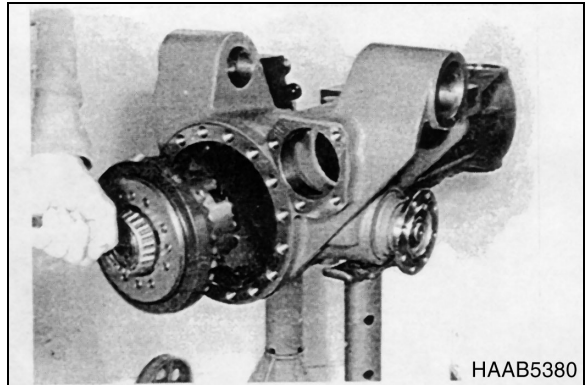


Figure 192

DISASSEMBLE DIFFERENTIAL

1. Pull off the two tapered roller bearings.
(S) Grab sleeve "Super" - 5870 026 017
(S) Back-off insert - 5870 026 100
(S) Pressure piece - 5870 100 009
NOTE: *Version 100% lock:*
(S) Grab sleeve "Super" - 5870 027 009
(S) Basic set - 5870 027 000
(S) Pressure piece - 5870 506 104
2. Loosen socket head screws.

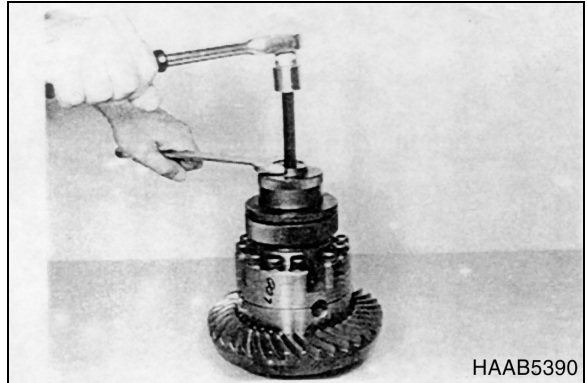


Figure 193

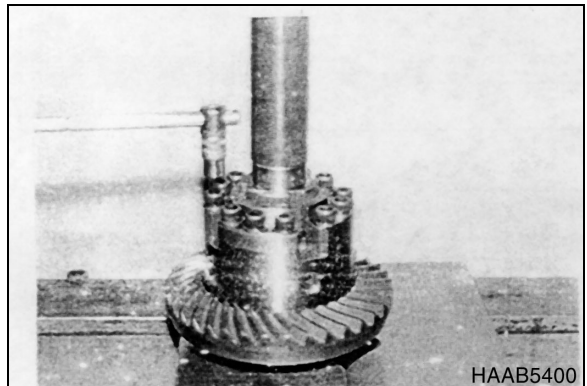


Figure 194

3. Take off Differential case half / Part II and remove the released components.

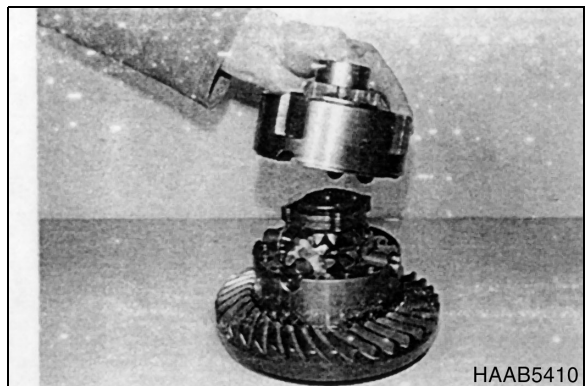
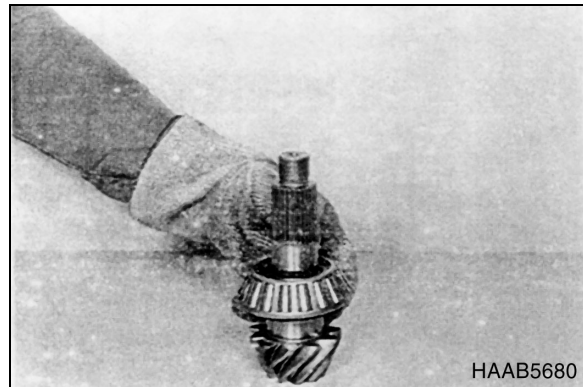


Figure 195

- Heat tapered roller bearing and replace it firmly against shoulder.

NOTE: *Reset the bearing and replace it firmly against shoulder.*



HAAB5680

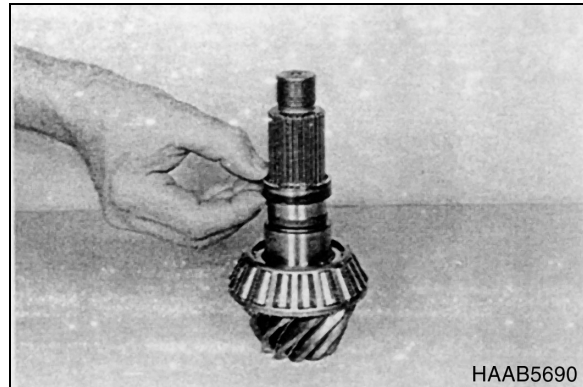
Figure 222

ADJUST ROLLING MOMENT OF THE DRIVE PINION BEARING

NOTE: *0.10 - 0.20 kg•m (1 - 2 ft lb) (without shaft seal): (Figure 223 thru Figure 232)*

- Assemble gauge ring.
- Shape and description of gauge ring, see Figure 217.

(S) Gauge ring - 5870 340 030

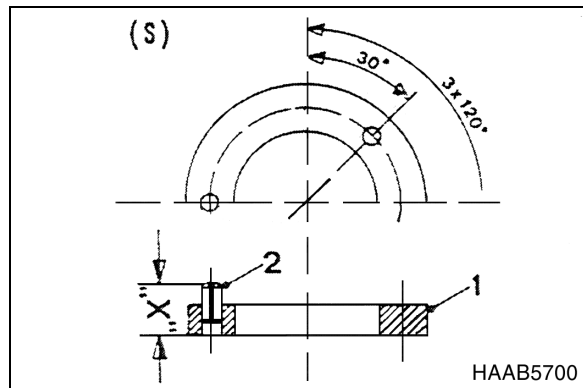


HAAB5690

Figure 223

Reference Number	Description
1	Gauge Ring
2	Roll Pins (3x)

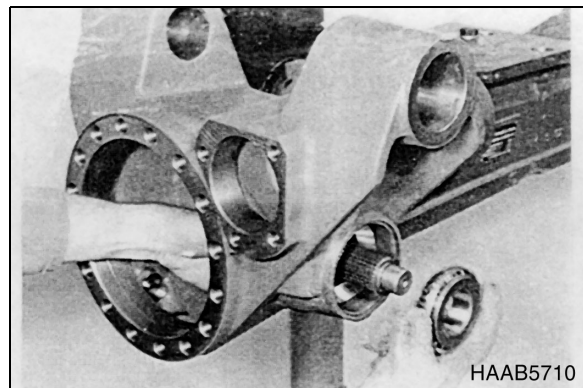
NOTE: *Dimension "X" = Thickness of the spacing ring.*



HAAB5700

Figure 224

- Insert pre-assembled drive pinion and assemble the heated inner bearing race until contact is obtained.



HAAB5710

Figure 225

9. Mount flat washers and tighten socket head screws.

NOTE: Torque limit (M12x1,5) 14.79 kg•m (107 ft lb).

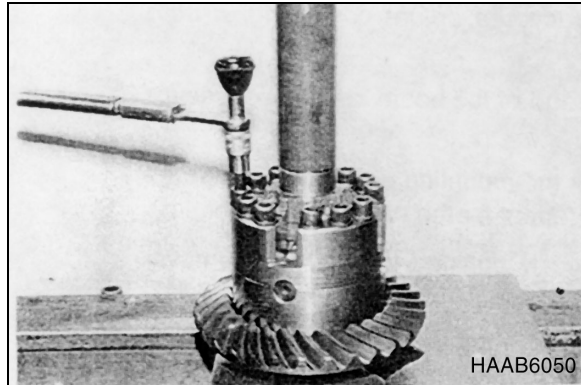


Figure 259

10. Heat the two inner bearing races and press them against shoulder until contact is obtained.

NOTE: For pressing on the second inner bearing race, support the first inner bearing race using the pressing mandrel.

(S) Pressing mandrel - 5870 506 103

Only for Version - 100% lock:

(S) Pressing mandrel - 5870 506 104

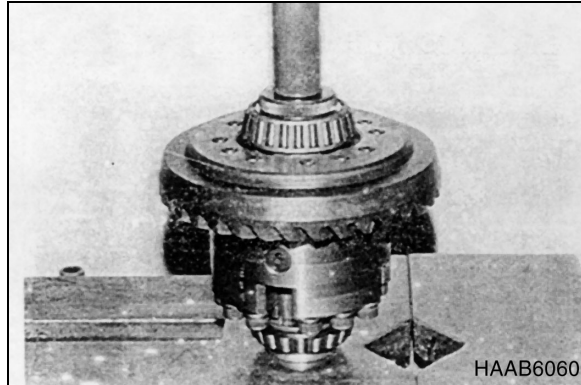


Figure 260

DETERMINE AND ADJUST BACKLASH OF THE CROWN

NOTE: Wheel set and bearing preload of the differential;

Backlash: 0.15 - 0.25 mm
(0.0059 - 0.0098 in).

Bearing rolling moment: 0.10 - 0.20 kg•m (1 - 2 ft lb).

1. Insert shim e.g. s = 170.0 mm (6.6929 in) (empirical value) in the bearing bore (Axle housing / Part I) and install subsequently outer bearing race.

(S) Driver - 5870 058 061

(S) Handle - 5870 260 002

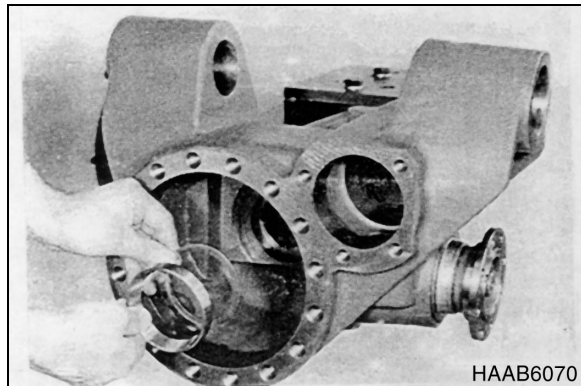


Figure 261

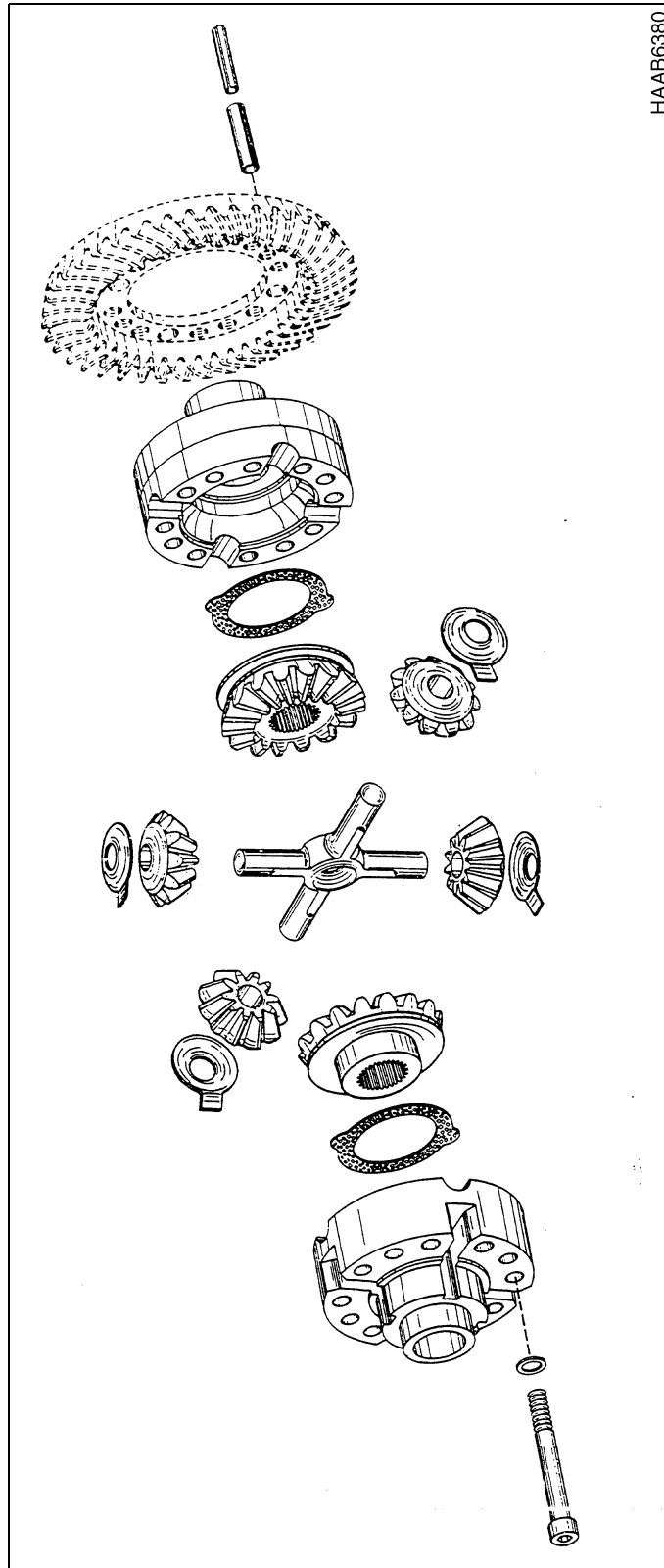


Figure 292

- Grease O-ring (6), mount it along with disk (5) carefully over the second groove into the piston.

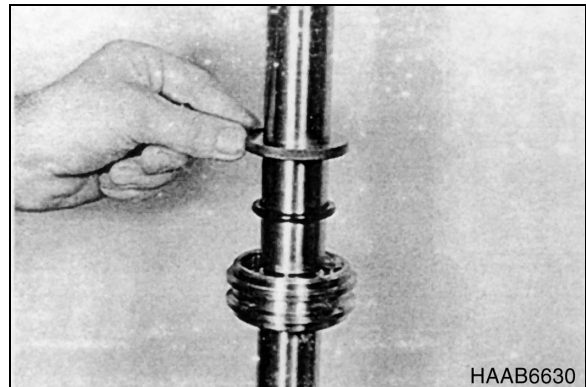


Figure 317

- Insert split ring (4), fix it using retaining ring (3) and snap ring (2).

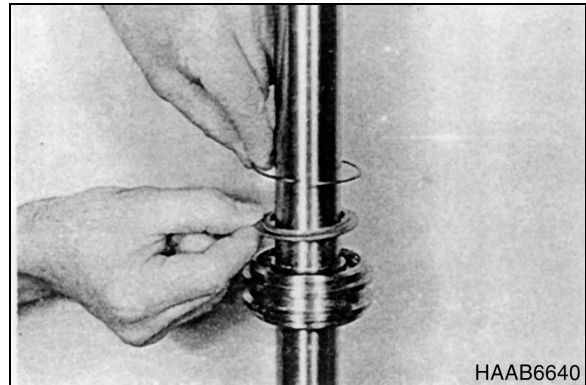


Figure 318

- Assemble scraper ring (8) and sealing ring (9) upon the piston.

- Grease sealing elements.

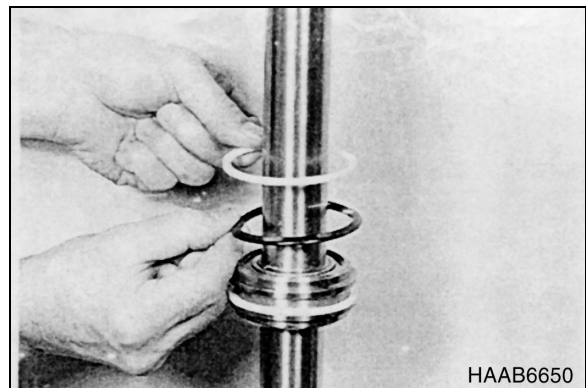


Figure 319

- Introduce complete piston rod into the cylinder.

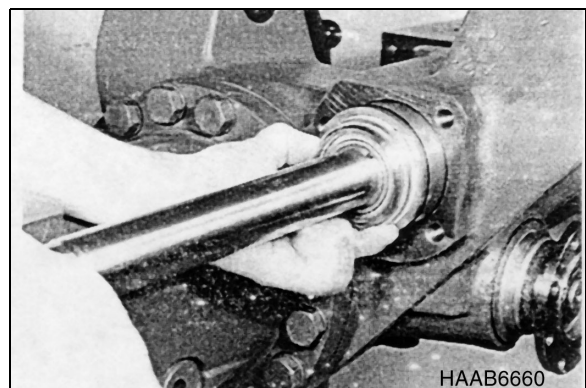


Figure 320

Adjust Toe-in Resp. Toe-out

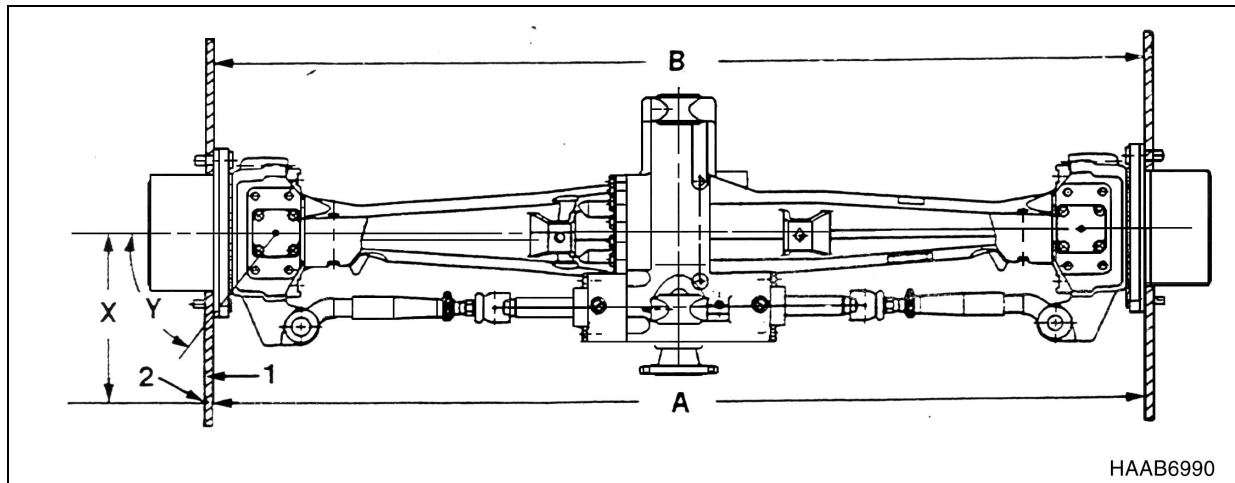


Figure 353

Reference Number	Description
1	Straightedge
2	Marking Notch

Reference Number	Description
Y	Steering Lock

1. Determine Dimension "A," starting from the marking notches of the straightedges.
2. Now, turn the two wheel hubs through 180° and determine Dimension "B."
3. Adjust the track, according to the Indications of the Manufacturer of the vehicle by axial displacement of the tie rods.

NOTE: *During the track adjustment, the distance of the straightedges (track) must be modified on the two tie rods in the same way. Dimension "X" (See Figure 353) corresponds to the distance "Wheel center to Rim Flange."*

INSCRIPTIONS ON THE MODEL IDENTIFICATION PLATE (FOR ZF-AXLES)

Reference Number	Description
1	Axle Type
2	Axle Serial No.
3	ZF- Parts-List No.
4	Total-Ratio of the Axle/ Version with or without ZF- multi disk self-locking Differential
5	Type of Lubricant
6	Lubricant Specifications

NOTE: Number 6: ZF-Lubricants for ZF-Axles TE-ML- 05.

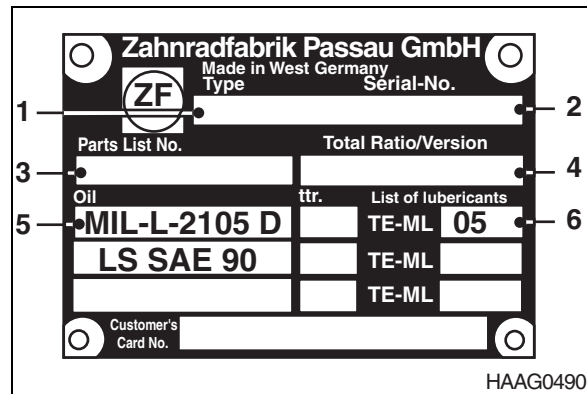


Figure 9

LUBRICATION AND MAINTENANCE INSTRUCTIONS

- Oil Quality:** Transmission oil with Limited-Slip Additives

API-G5

SAE 80 W-90

SAE 85 W-90

SAE 85 W-140

SAE 90

If multigrade Transmission Oils are used, the basic oil may contain, apart from the EP-Adding process, not more than 2% in weight of dissolved admixtures (VI-Improver, Pour Point Depressant etc.).

- Oil Change:** Precondition for a correct oil change is the installation position of the axle in every sense.

Position the vehicle horizontally.

Clean all the drain plugs, filler plugs and control plugs carefully before opening them.

Drain oil only immediately after a longer travel.

- Squeeze angle ring out and pull inner bearing race (along with cylindrical rollers) out of the planetary gear.

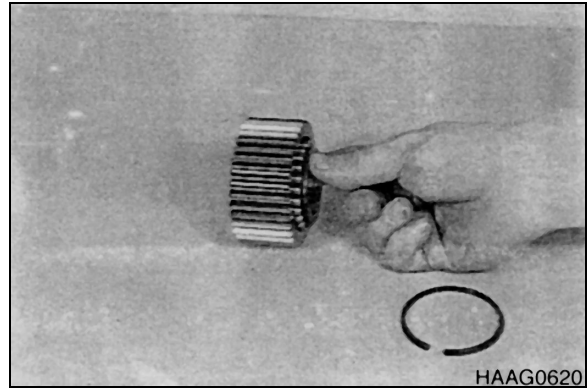


Figure 22

- Pull sun-gear shaft along with inner plate carrier from the stub shaft, resp. out of the plate pack.
- Remove the released thrust washer.

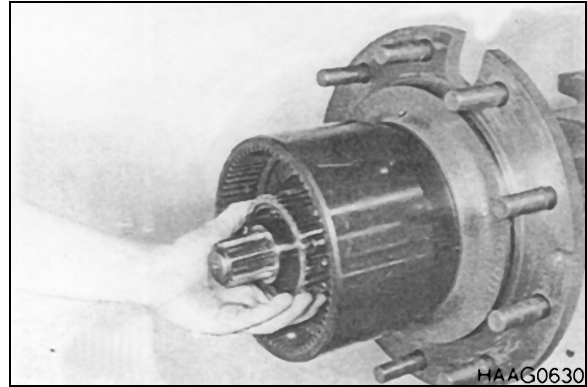


Figure 23

- Squeeze the retaining ring out.
(S) Clamping pliers - 5870 900 021

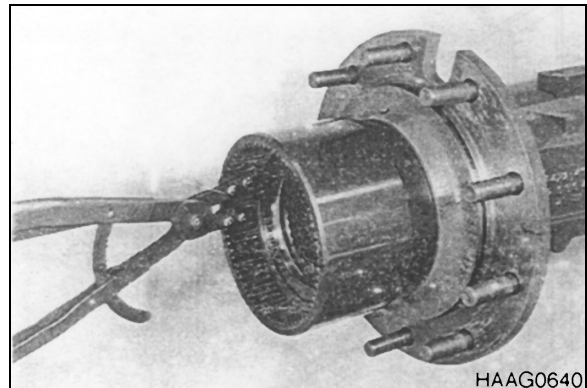


Figure 24

- Remove backing plate and plate pack.

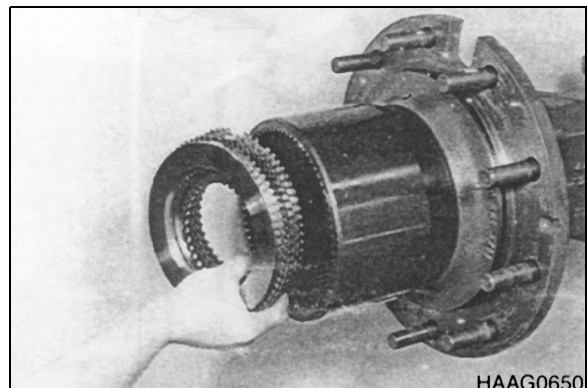


Figure 25

5. Remove the spacer and pull the tapered roller bearing from the drive pinion.

(S) Grab sleeve "Super" - 5870 026 001

(S) Basic set - 5870 026 000

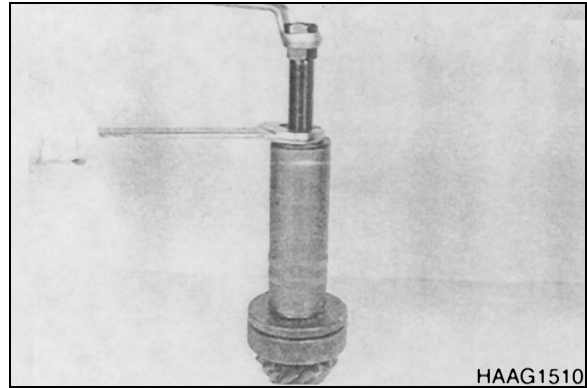


Figure 56

6. Remove the shaft seal and the released tapered roller bearing.

(S) Pry bar - 5870 345 065

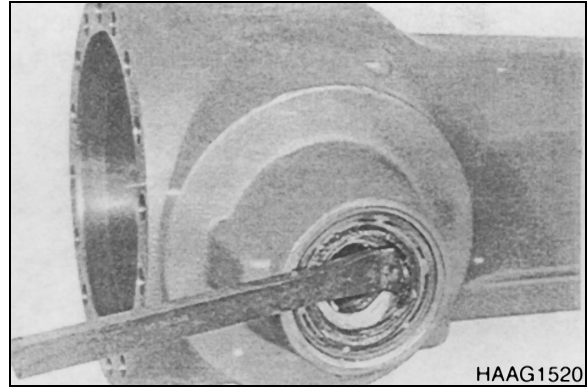


Figure 57

7. Drive outer bearing race out of the inner bearing bore.

NOTE: Pay attention to the released spacing washer.

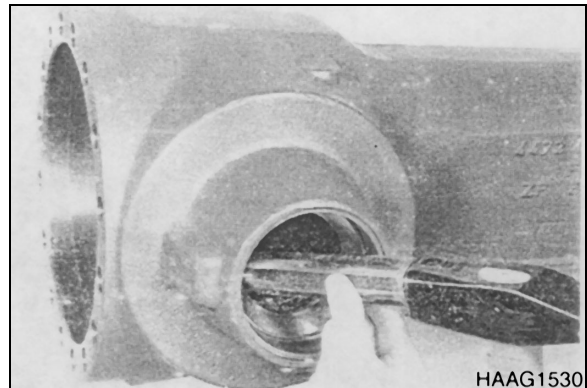


Figure 58

8. Pull outer bearing race out of the outer bearing bore.

(S) Internal puller - 5870 300 019

(S) Backup tool - 5870 300 020

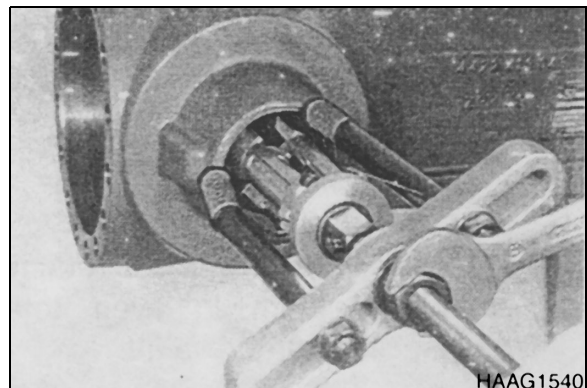


Figure 59

COMPLETE AND INSTALL DIFFERENTIAL

NOTE: Before the installation, oil all differential components according to the List of lubricants TE-ML 05.

1. Drive the roll pins (2 pieces each/bore) into the blind holes (4x) of the differential case half.

NOTE: Install roll pin openings always in the circumferential direction and 180 degree spaced.

2. Press crown wheel over the roll pins until contact is obtained.

3. Install thrust washer and side gear.

4. Install the complete differential spider.

NOTE: Pay attention to the radial installation position of the thrust washers noses are showing upwards.

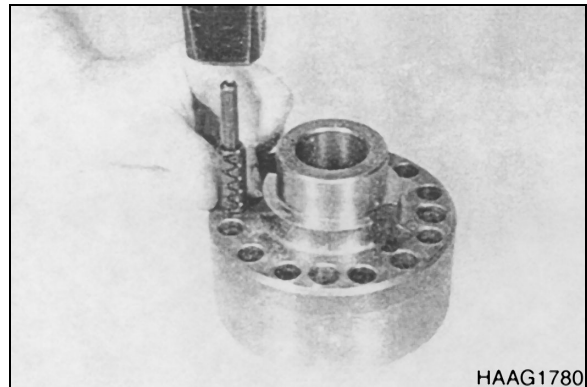


Figure 84

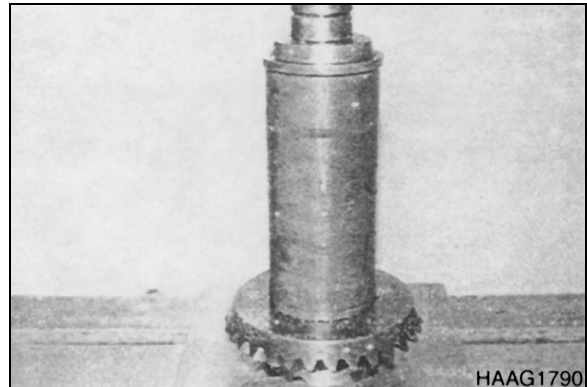


Figure 85

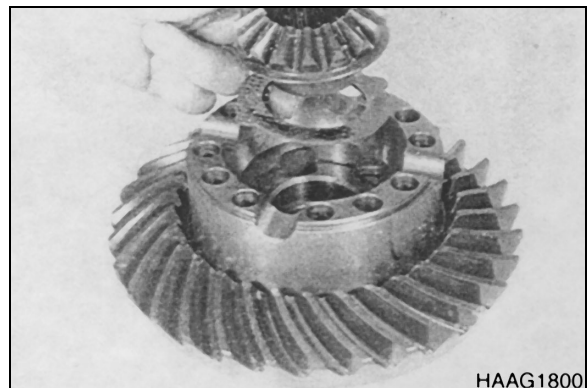


Figure 86

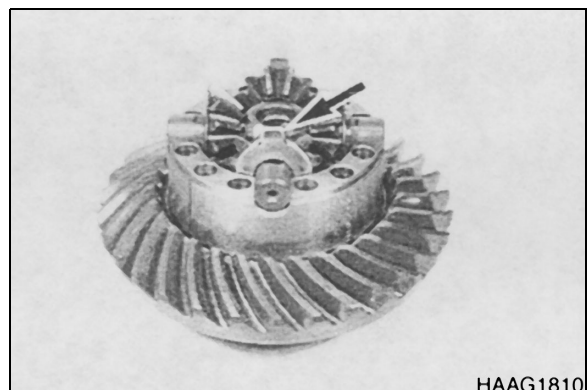


Figure 87

1. Heat inner bearing race and assemble it until contact is obtained.

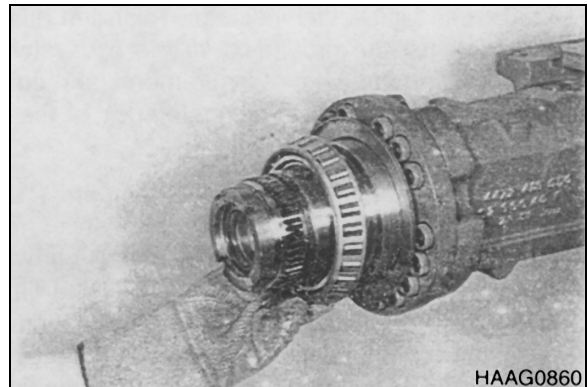


Figure 114

2. Place adjusting ring, e.g. 4.45 mm (0.1752 in) (empirical value) against the hub carrier collar until contact is obtained.

NOTE: *If the hub and both wheel bearings have not been replaced, we recommend to install the existing spacer again. Decisive however is the rolling moment of the wheel bearing (Figure 121).*

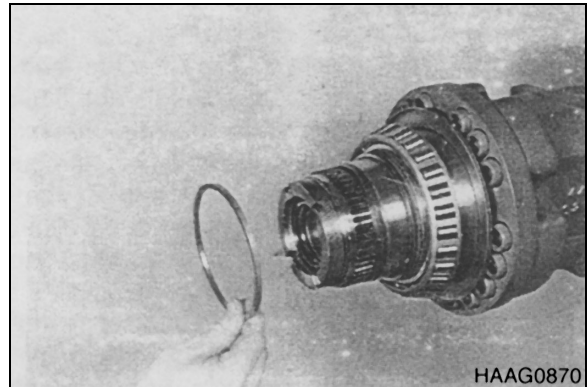


Figure 115

3. Assemble hub (without shaft seal) and fix it using heated inner bearing race.

NOTE: *The installation of the shaft seal is carried out after the adjustment of the wheel bearing.*

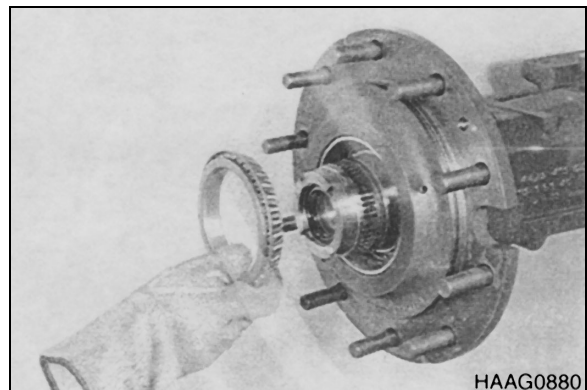


Figure 116

Tighten Slotted Nut

1. Figure 117 shows the components of the Special Tool.
 - (S) Hook spanner - 5870 401 085 (1)
 - (S) Spacer - 5870 912 017 (2)
 - (S) Centering disk (compl) - 5870 912 009 (3)

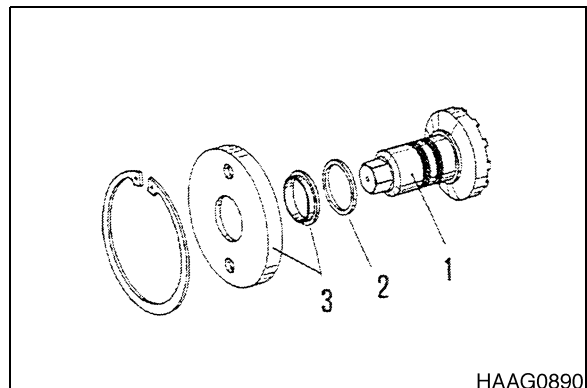


Figure 117

EXAMPLE:

Dimension "I"	90.70 mm (3.5709 in)
Dimension "II"	- 46.50 mm (1.8307 in)
Difference Piston Stroke	44.20 mm (1.7402 in)
Max.	- 3.50 mm (0.1378 in)
Min.	- 3.10 mm (0.1220 in)
Gives Installation Dimension	40.70 mm (1.6024 in) to 41.10 mm (1.6181 in)

By installation of the following components the required installation dimension, resp. the piston stroke is obtained.

5 Lining Plates	(5.s = 3.50 mm (0.1378 in))	= 17.50 mm (0.6890 in)
5 Outer Plates	(5.s = 2.50 mm (0.0984 in))	= 12.50 mm (0.4921 in)
1 Outer Plate	(1.s = 2.00 mm (0.0787 in))	= 2.00 mm (0.0787 in)
1 Backing Plate	(1.s = 9.00 mm (0.3543 in))	= 9.00 mm (0.3543 in)

Gives Total height, resp. Installation dimension = 41.0 mm (1.6142 in)

NOTE: Check the total height of the plate pack again (Figure 146). In case of deviations from the required installation dimension, resp. piston stroke, correct using corresponding outer plates $s = 2.0 \text{ mm (0.0787 in)}$, $2.5 \text{ mm (0.0984 in)}$ or $3.0 \text{ mm (0.1181 in)}$. The installation of the thinner outer plates must always be carried out on the piston and or backing plate side.

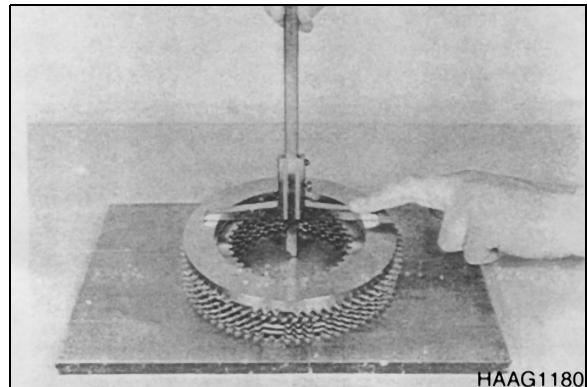


Figure 146

(S) Depth gauge - 5870 200 052

GENERAL DESCRIPTION

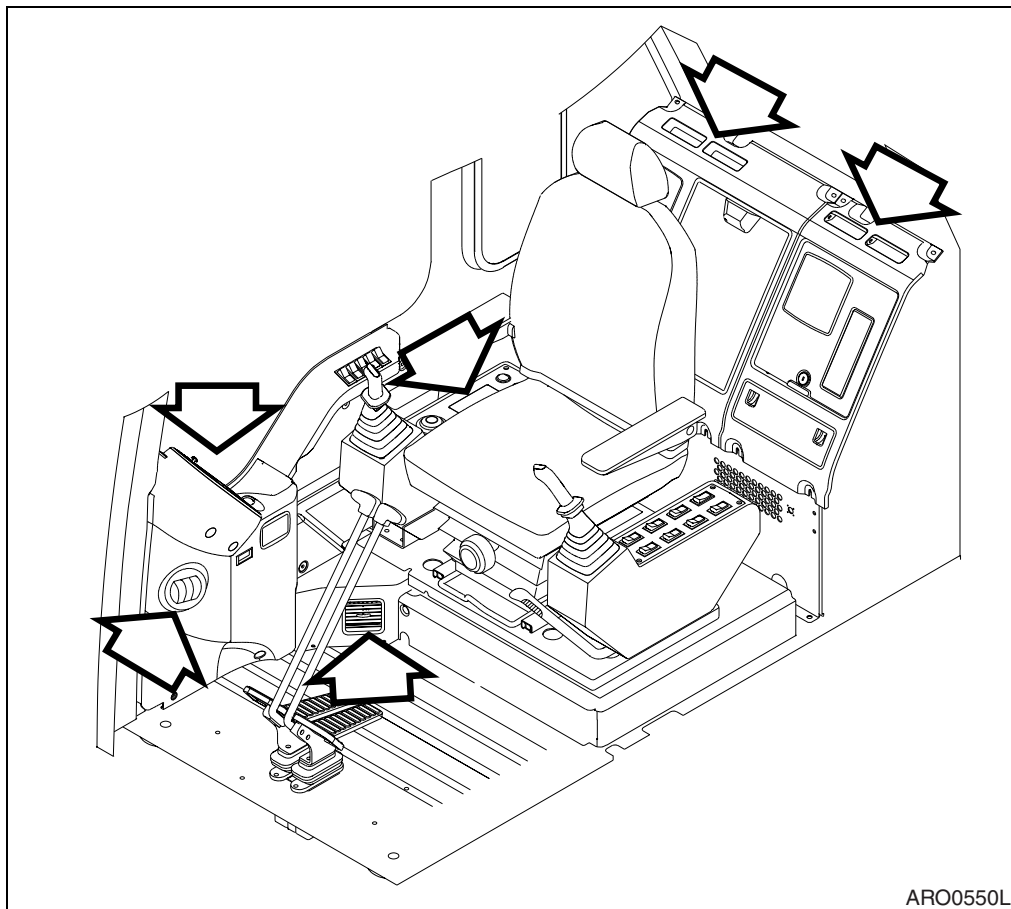


Figure 1

The heater and air-conditioner are combined into one unit in the rear cover behind the operator's seat. If necessary, the operator can control inner temperature using the operation panel installed in the right hand control stand.

The unit is equipped with an air filtration system which filters out dirt and dust particles from air being circulated into operator's cab. This filter should be cleaned out every 500 hours.

NOTE: *In the event that the unit is being operated in a dusty environment, the cleaning and replacement should be performed more frequently. If filter element is damaged, replace damaged filter by a new one.*



WARNING!

All service and inspection of air conditioning system should be performed with the starter switch in the "O" (OFF) position.

Reference Number	Description
1	Battery
2	Battery Relay
3	Fusible Link
4	Circuit Breaker
5	Fuse
6	Lamp Switch
7	Condenser Fan Relay
8	Condenser Fan Motor
9	Compressor Relay
10	Foot / Defrost Control Actuator
11	Receiver Dryer (Low / High Pressure Cut Off Switch)
12	Diode

Reference Number	Description
13	Compressor
14	A/C Control Panel
15	A/C Unit
15-1	Blower Motor
15-2	Resister
15-3	High Speed Relay
15-4	Mid Speed Relay
15-5	Low Speed Relay
15-6	Recirculate / Fresh Air Control Actuator
15-7	Vent Actuator
15-8	Temperature Control Actuator
15-9	Temperature Sensor (Evaporator)

- Charge system until the low side gauge dial indicates a pressure of 1 kg/cm² (14 psi) and close the high side valve.
- Using a refrigerant leak detector or soapy water check each joint for leakage.

Reference Number	Description
1	Refrigerant Leak Detection Device

- If a leak is detected, check for O-ring damage or correct tightening torque and replace or repair as necessary.
- If no leaks are detected, proceed with the charging process.

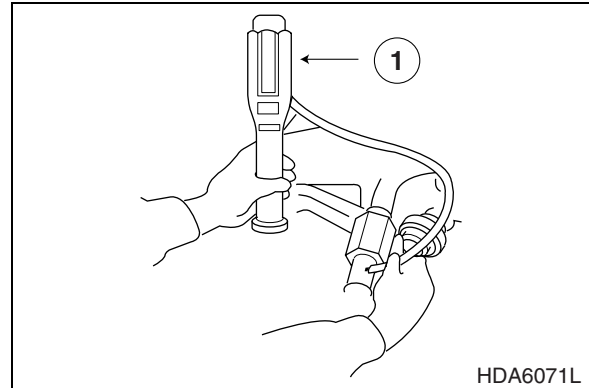



Figure 21

 WARNING!
<p>For accurate refrigerant leak detection, perform leak detection procedure in a well ventilated area.</p>

REFRIGERANT CHARGING

- Perform the vacuuming procedure, vacuum holding and leaking tests as described in the preceding headings.

NOTE: *First charge the refrigerant system with 100g (3.5 ounces) of refrigerant with the engine off. Then using the manifold gauges as a guide fully charge the system with the engine running.*

When exchanging refrigerant containers, press the manifold gauge low side valve to eliminate air from the charging hose.

INSTALLATION VIEW AND INSTRUCTIONS FOR THE OIL FILLING PROCEDURE

GEARBOX AND AXLE

Reference Number	Description
1	Oil Filling Drain
2	Oil Drain
3	Oil Filling (Axle Housing)
4	Oil Drain (Axle Housing)
5	Oil Filling, Check and Oil Drain (Planetary Drive)

Separate installation.

Installation position vertical.

Separate installation.

Installation position horizontal.

Oil quality - gearbox - TE-ML 07

Oil quality - axle - TE-ML 05

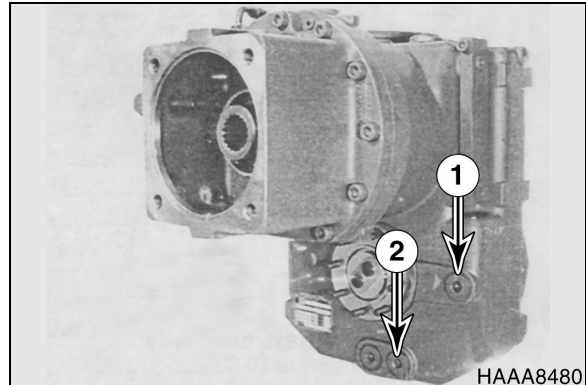


Figure 2

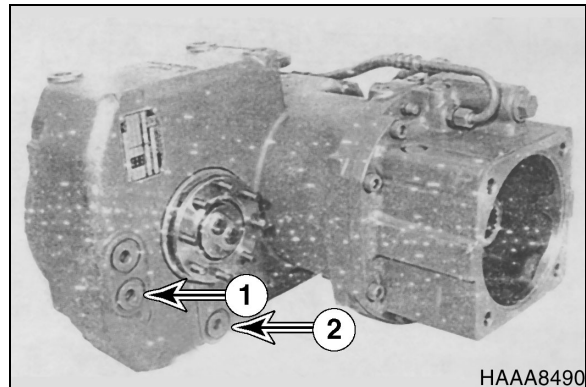


Figure 3

2 HL-100 attached on the ZF-Axle (axle attachment)

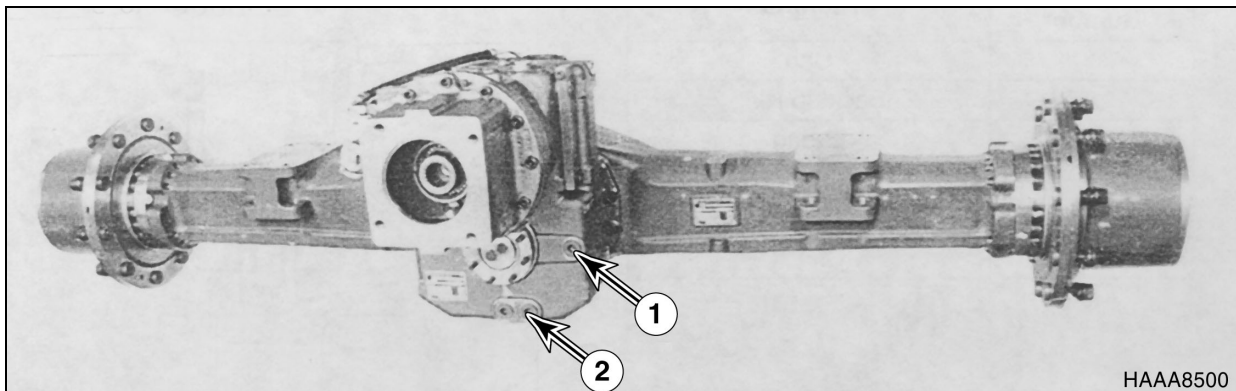


Figure 4

12. Pull gasket out of the housing bore, using offset screw driver.

(S) Adjustment device - 5870 400 001

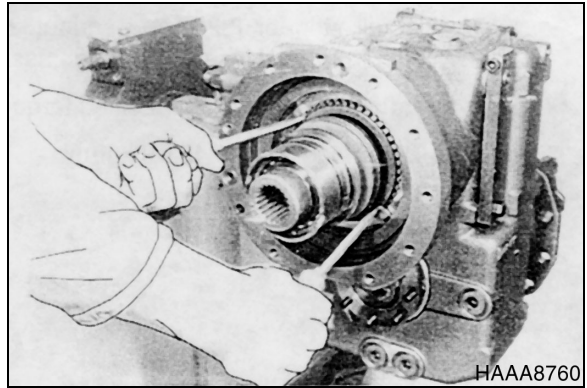


Figure 30

13. Remove O-ring (Arrow).

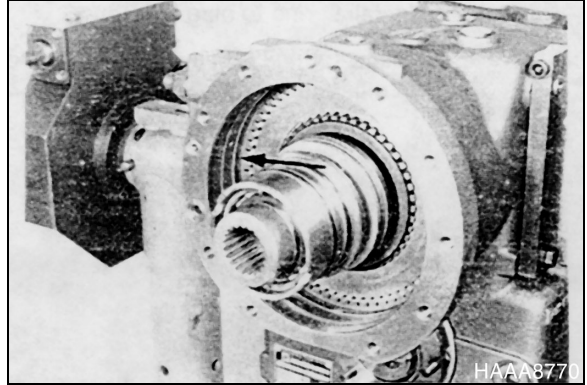


Figure 31

14. Remove plate pack and backing plate.

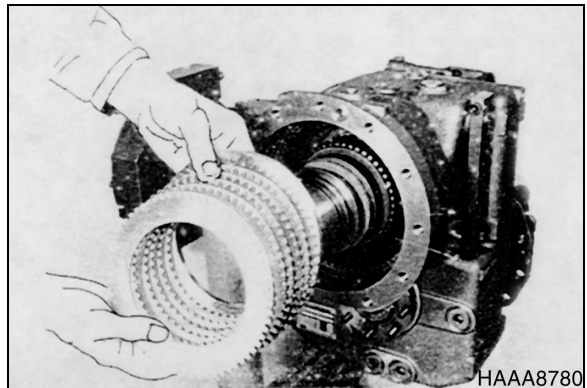


Figure 32

15. Squeeze out retaining ring (Arrow).

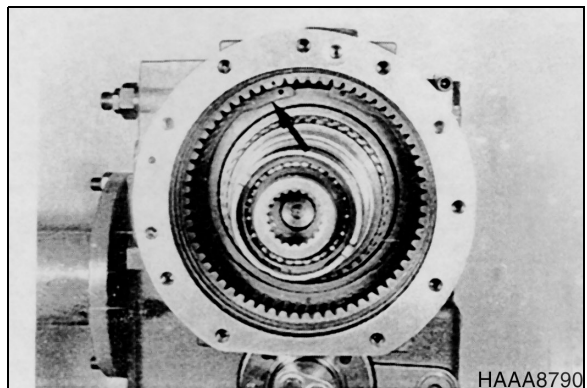


Figure 33

- Determine gap (Dimension "B") between measuring pin and measuring shaft, using feeler gauge.

NOTE: *Dimension "B" e.g. 0.85 mm (0.0335 in).*

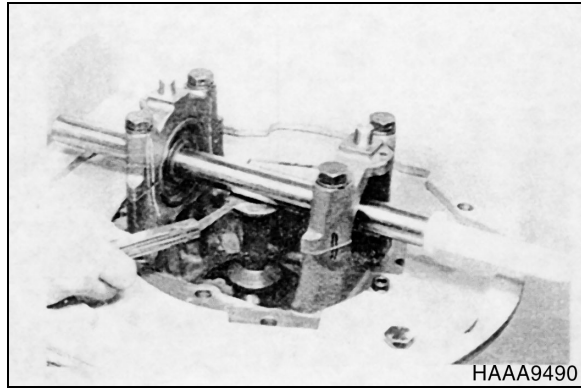


Figure 104

EXAMPLE "A":

Dimension "A" (= measuring pin)

134.00 mm (5.2756 in)

Dimension "B"

+ 0.85 mm (0.0335 in)

Dimension "C" (1/2 ϕ measuring shaft)

+ 15.00 mm (0.5906 in)

Gives Dimension "X"

149.85 mm (5.8996 in)

- Determine bearing width.

NOTE: *Bearing width e.g. 36.50 mm (1.4370 in).*

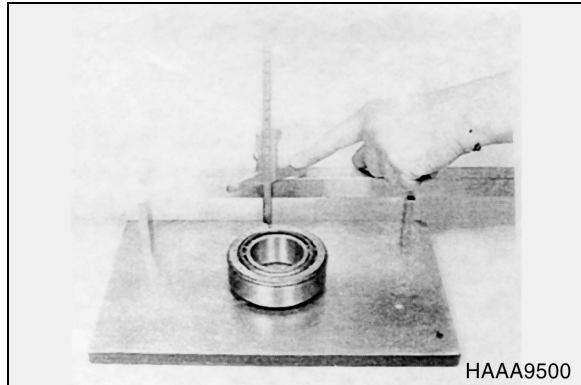


Figure 105

11. Replace outer bearing races and insert differential into the axle carrier.

NOTE: Pay attention to the installation position of the crown wheel, see Figure 141.

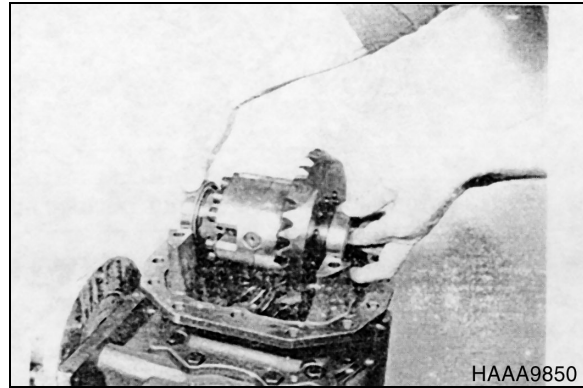


Figure 140

12. Figure 141 shows the installation position of the crown wheel (differential) in the arrangement as rear axle.
13. Direction of Arrow indicates "Forward drive."

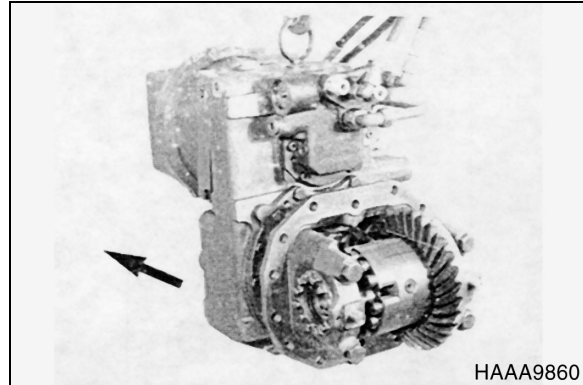


Figure 141

14. Screw the two adjusting nuts into the bearing bores.

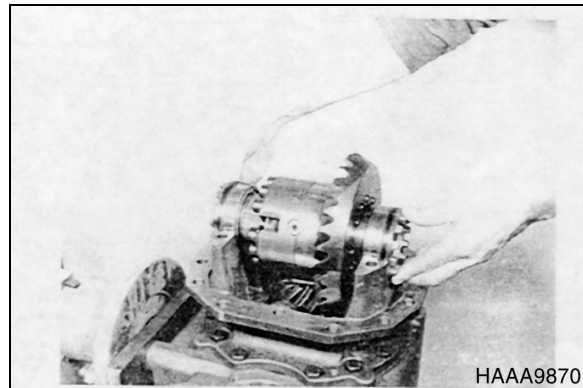


Figure 142

15. Drive straight pin into the bore of the two bearing caps until contact is obtained.

NOTE: Use Loctite #242.

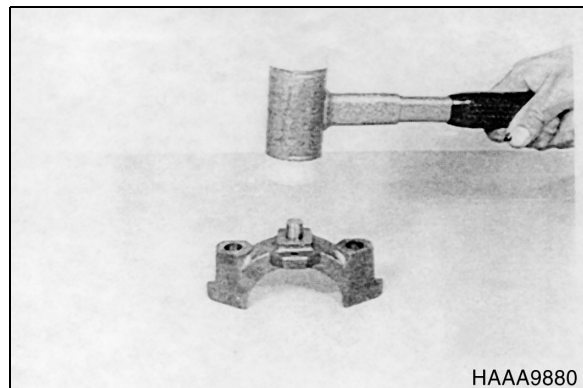


Figure 143

6. Fix sleeve using retaining ring.

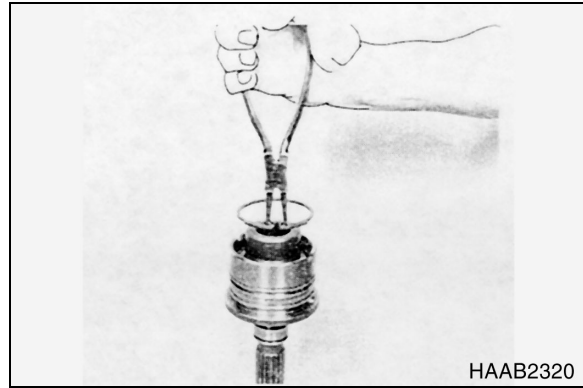


Figure 178

7. Squeeze in retaining ring (Arrow) and replace backup plate, with the offset plane surface showing upwards.

NOTE: *Only the installation of one new retaining ring admitted.*

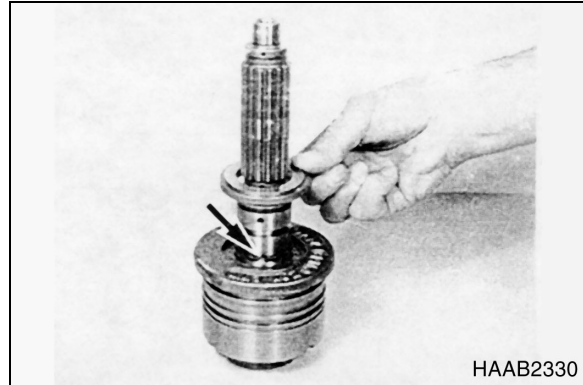


Figure 179

8. Measure Dimension "Y" from the locating face of the drive casing to the flange-mounted surface.

NOTE: *Dimension "Y" e.g. 11.10 mm (0.4370 in).*

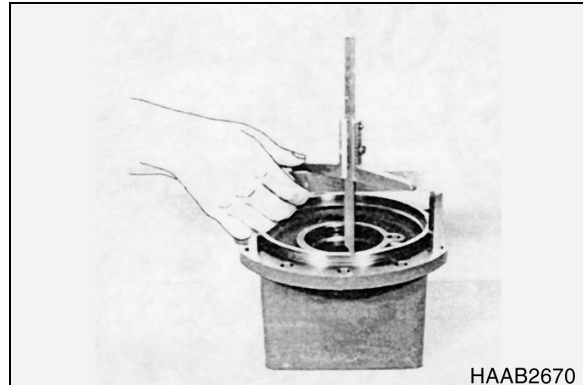


Figure 213

EXAMPLE "E":

Dimension "X" 12.60 mm (0.4961 in)

Dimension "Y" - 11.10 mm (0.4370 in)

Difference = Adjustment value "A" = 1.50 mm (0.0591 in)

NOTE: *Carry out possible corrections with corresponding outer plates 3.0, 3.2, and 3.5 mm (0.1181, 0.1260, and 0.1378 in). Now take off the measuring cover and remove the piston again.*

9. Insert O-ring in the ring groove of the housing. See arrow.

NOTE: *Expand O-ring slightly before the reassembly to ensure a perfect contact in the recess.*

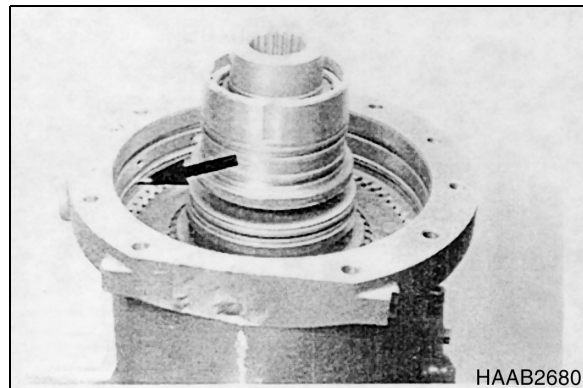


Figure 214

2. Fill cavities between inner and outer rotor (Arrow) with acid-free grease.

NOTE: *Improves the intake characteristics at the first start.*

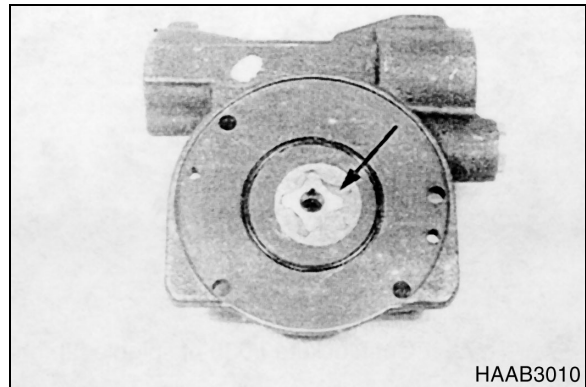


Figure 247

3. Insert shaft seal into the pump cover bore (Arrow 1).
4. Grease O-ring and insert it into the ring groove (Arrow 2).

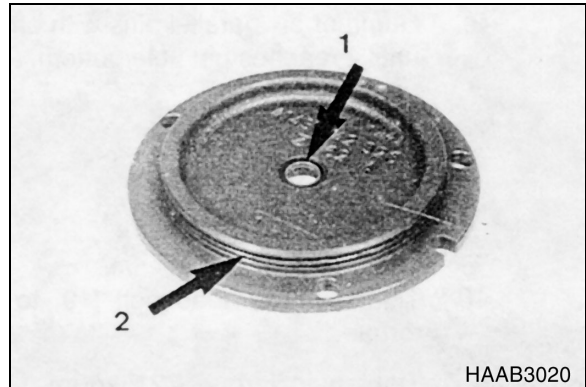


Figure 248

5. Pre-assemble the pump shaft.

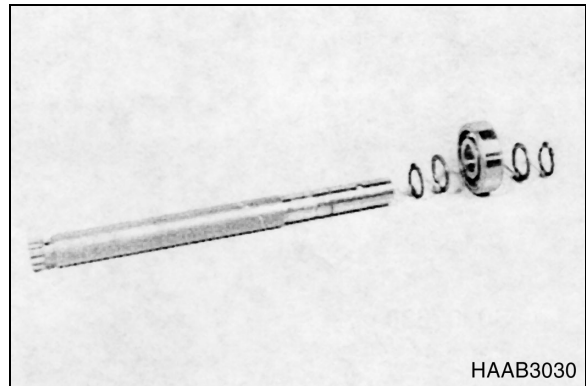


Figure 249

6. Assemble pump shaft.

NOTE: *Pay attention to the installation position, drive ball bore above.*

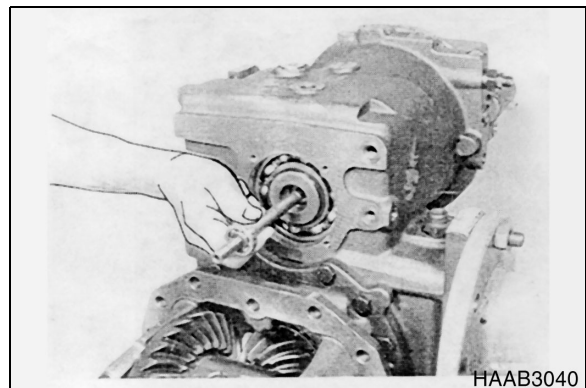


Figure 250

8. Insert O-ring (Arrow) in the groove and grease it.

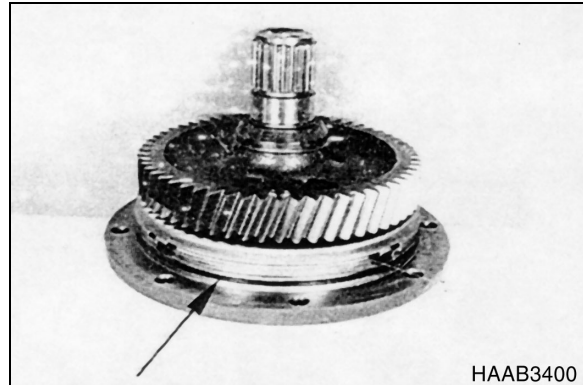


Figure 286

9. Heat ball bearing (Figure 287), install two adjusting screws and assemble bearing cap until contact is obtained. (Figure 288)
(S) Hot-air blower - 220 V - 5870 221 500
(S) Hot-air blower - 110 V - 5870 2210 501
(S) Adjusting screws (M12) - 5870 204 021

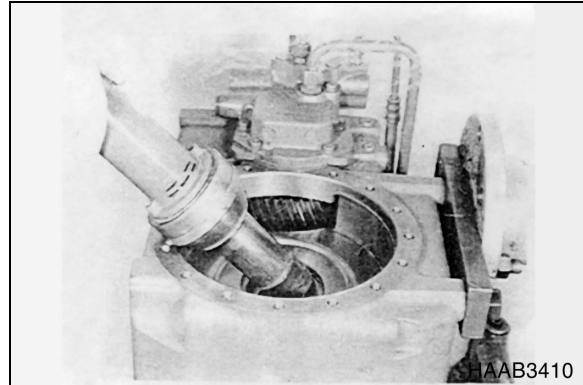


Figure 287

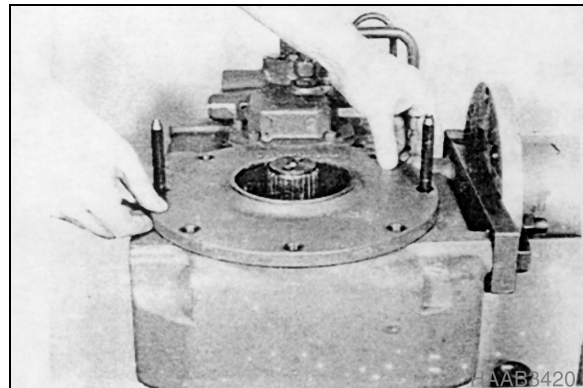


Figure 288

10. Fasten bearing cap using hex. head screws.

NOTE: *Torque limit (M12/8.8) 8.06 kg•m (58 ft lb).*

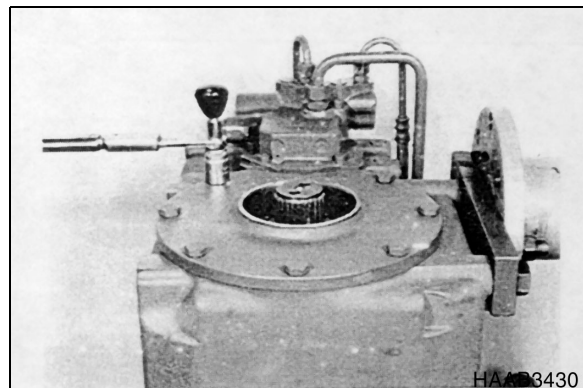


Figure 289

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Dimensional Details for Figure 5		
Dimension	Measurement	Models
A	6 ±0.1 mm (0.2362 ±0.0039 in)	S300LC-V, S300LL
B	7 ±0.1 mm (0.2756 ±0.0039 in)	S340LC-V, S420LC-V, S470LC-V
C	20.0 mm (0.787 in)	
D	7.0 mm (0.275 in)	
E	18.0 mm (0.708 in) Radius	
F	22.0 mm (0.866 in) Radius	
G	30.0 mm (1.181 in) Radius	
H	1.0 mm (0.039 in) x 45° Chamfer	

Dimensional Details for Figure 5		
Dimension	Measurement	Models
A	10.5 ±0.1 mm (0.4134 ±0.0039 in)	S225LC-V, S225NLC-V, S255LC-V
B	8.5 ±0.1 mm (0.3346 ±0.0039 in)	S175LC-V, S180W-V
C	20.0 mm (0.787 in)	
D	7.0 mm (0.275 in)	
E	14.0 mm (0.551 in) Radius	
F	17.0 mm (0.669 in) Radius	
G	25.0 mm (0.984 in) Radius	
H	1.0 mm (0.039 in) x 45° Chamfer	

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, swing, boom up 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, bucket, boom and arm operation.
- Two-stage operation is a feature of boom and arm function. All 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 two available power modes – the standard or general duty mode, the high speed/rapid cycling 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 anti-vacuum valves which protect the hydraulic system from vacuum that could result from external shocks or other unusual conditions. Boom, Arm, and Bucket cylinder circuit are also protected by overload relief valves. Whenever high pressure is generated 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.

PRESSURE UP VALVE

CHECKS AND ADJUSTMENTS



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.

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

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

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

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

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

Because one adjustment can affect the other, check low-stage main relief pressure by repeating the cylinder stall test without "pressure up." Readjust standard relief pressure by turning the inner-most (smallest diameter) screw clockwise to increase the setting, or counterclockwise to decrease it. Pressure should be at least 320 bars (4,641 psi), but less than 325 bars (4,714 psi).

IMPORTANT

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

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

Problem	Possible Causes	Remedies
Swing movement is in one direction only.	Check to see that pilot pressure is the same right and left.	If pilot pressure is unequal, clean or repair piping or repair/replace valve.
	Swing control valve spool may be stuck.	Repair/Replace the swing control valve.
	Swing relief valve may be faulty.	Repair/Replace the swing relief valve.
No rotation and:		
Pressure at swing motor inlet increases.	Swing brake not releasing.	Check brake engagement and disengagement; check release pressure.
	Internal damage to gearbox drive train.	Replace broken gears and drive train assemblies.
	Overload.	Reduce load weight.
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 noises, during operation.	Low oil level.	Replace oil; refill to specified level.
	Bearings or gears worn but not completely inoperative.	Repair or replace gearbox.

GENERAL DESCRIPTION

The accumulator is a gas-charged storage device designed to hold a reserve quantity of hydraulic fluid under pressure. Accumulators are used in hydraulic circuits in much the same way that condensers (or capacitors) are used to collect, store and maintain electrical charge in a circuit.

In a hydraulic circuit, minor variations or lags in pump output that might otherwise cause unsteady or irregular operation are made up from the supply of pressurized oil in the accumulator.

Reference Number	Description
1	Screw Plug
2	Steel Pressure Vessel
3	Diaphragm
4	Fluid Valve

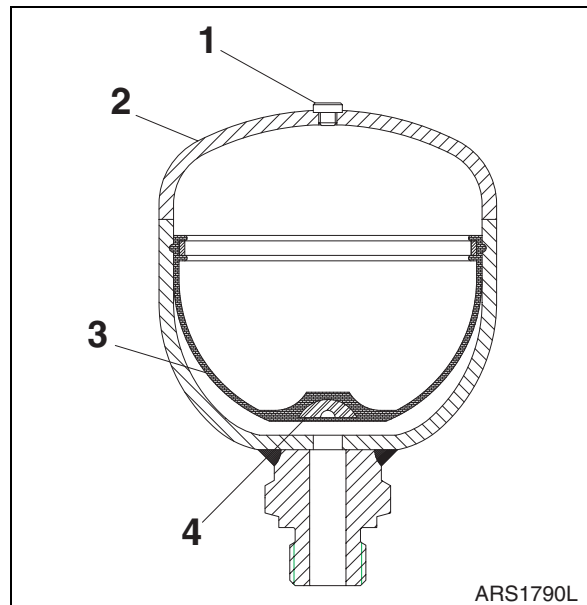


Figure 1

Accumulators are solidly constructed to resist the high operating pressures of the fluids they contain. There are only three main moving parts: a plug at the top allows pre-charging or expelling gas from the compressible, pre-charged upper chamber; a valve assembly at the bottom of the accumulator for passing hydraulic fluid in and out, and an elastic diaphragm to separate the two chambers. The flexible diaphragm changes shape to conform to the changing pressures and volumes of the two fluids in the upper and lower chambers.

There are six possible positions the diaphragm can be in and they are as follows:

1. With no gas charge in the upper chamber 0 bar (0 psi, empty) and no oil in the bottom 0 bar (0 psi, dry) the elastic diaphragm hangs loosely.
2. When the pre-pressure charge of gas (usually nitrogen) is introduced through the port at the top of the accumulator, the diaphragm expands to maximum size. The valve button in the center of the diaphragm pushes into the fluid opening in the bottom chamber, sealing off the lower valve. If the pressure of the gas charge exceeds system oil pressure, no fluid enters the accumulator. The button also keeps the diaphragm from protruding into the lower valve opening.

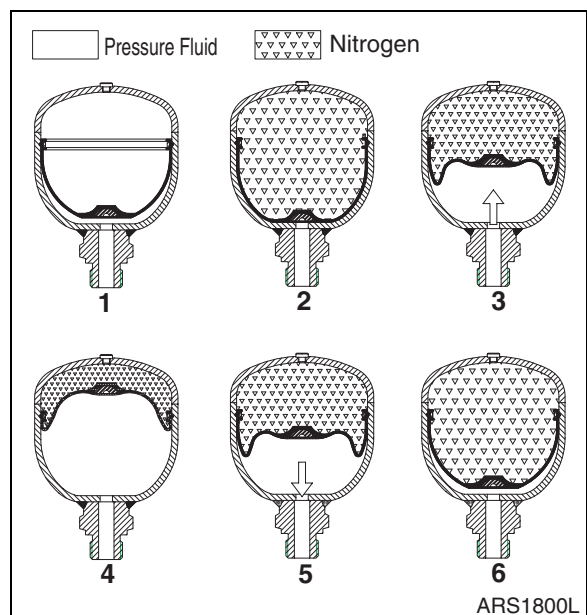


Figure 2

DISASSEMBLY

Refer to the assembly drawing of the swivel joint for component references (Figure 1).

IMPORTANT

Do not unbolt the center joint from the lower car body until an adequate number of piping block-off plates are available, for disconnected piping lines. Be sure that system pressure has been vented - including the hydraulic accumulator and tank reserve pressure - before disassembly is started.

1. Clean off the exterior of the swivel joint after it has been removed.
2. Scribe or otherwise mark a line across the cover and the body of the center joint, to allow reassembly in the same configuration.
3. Unbolt the four 12 mm fasteners holding the cover. Use a vise or v-block to hold the assembly in place.
4. Remove the cover, withdraw the O-ring and unbolt the fasteners holding the thrust plate, taking care to support the stem (inner) assembly, so that it will not separate and fall out when bolts are disconnected.
5. If the stem assembly doesn't separate easily when the thrust plate and fastener bolts are removed, use a wooden block and hammer to drive it out of the housing.
6. O-rings and seals should be replaced whenever the assembly is being overhauled or rebuilt. For repair procedures or emergency tear down, use a thin but rounded-tip, smooth-edge scraper or spatula to remove O-rings or seals, to avoid causing damage to those that must be reused.

NOTE: *The "backup ring" shown in the assembly drawing (above the swivel joint stem lower seals) should not be overlooked. It is tucked behind the top slip ring, doubled up inside the same groove in the body of the stem.*

7. Before reassembling the center swivel, inspect ball bearing surfaces for visible signs of wear, damage or discoloration and replace any worn component.

Check clearance between the cover and thrust plate, and between the stem and thrust plate. Replace any component that shows more than 0.5 mm (0.020") of visible wear.

Clearance between the stem and body of the center swivel must be tight. Replace or repair either component if there is more than 0.1 mm (0.0039") of measurable wear.

MODEL	CYLINDER	øA	øB	C	D	MODEL (CYLINDER)
S170W-V	ARM	140 mm (5.52 in)	98 mm (3.86 in)	12 mm (0.47 in)	5 mm (0.20 in)	S170LC-V (ARM) S175LC-V (ARM) S180W-V (ARM) S250LC-V (BOOM, BUCKET) S255LC-V (BOOM, BUCKET) S290LC-V (S/BUCKET, BUCKET) S300LC-V (S/ BUCKET, BUCKET)
S210W-V	DOZER	132 mm (5.20 in)	92 mm (3.62 in)	12 mm (0.47 in)	5 mm (0.20 in)	S180W-V (DOZER) S180W-V (OUTRIGGER) S210W-V (OUTRIGGER)
P/S: Power Steering						

MODEL	CYLINDER	ϕA ^{-0.2} _{-0.3}	ϕB ^{-0.2} _{-0.3}	C ⁰ _{-0.1}	D	MODEL (CYLINDER)
DD80L	TILT	35 mm (1.38 in)	47 mm (1.85 in)	0	6 mm (0.24 in)	
	DOZER	45 mm (1.77 in)	57 mm (2.24 in)	0.5 mm (0.02 in)	6 mm (0.24 in)	DD80L (ANGLE)
	ANGLE	45 mm (1.77 in)	57 mm (2.24 in)	0.5 mm (0.02 in)	6 mm (0.24 in)	
S55-V	ARM	55 mm (2.17 in)	69 mm (2.72 in)	5 mm (0.20 in)	6 mm (0.24 in)	
	BOOM	55 mm (2.17 in)	69 mm (2.72 in)	5 mm (0.20 in)	6 mm (0.24 in)	
	BOOM (OP)	55 mm (2.17 in)	69 mm (2.72 in)	5 mm (0.20 in)	6 mm (0.24 in)	
	BUCKET	55 mm (2.17 in)	69 mm (2.72 in)	5 mm (0.20 in)	6 mm (0.24 in)	
	SWING	40 mm (1.58 in)	52 mm (2.05 in)	3.5 mm (0.14 in)	6 mm (0.24 in)	S55W-V (SWING)
	DOZER	60 mm (2.36 in)	74 mm (2.91 in)	7 mm (0.28 in)	6 mm (0.24 in)	
S70-III	ARM	65 mm (2.56 in)	79 mm (3.11 in)	5.5 mm (0.22 in)	6 mm (0.24 in)	S80W-III (ARM)
	BOOM	70 mm (2.76 in)	84 mm (3.31 in)	5.5 mm (0.22 in)	6 mm (0.24 in)	S80W-III (BOOM) S130W-V (BOOM) S130LC-V (BOOM) MEGA 160-III (BUCKET)
	BUCKET	55 mm (2.17 in)	69 mm (2.72 in)	5 mm (0.20 in)	6 mm (0.24 in)	S55-V (ARM, BOOM, BOOM (OP), BUCKET) S55-V PLUS (BUCKET, SWING) S55W-V (ARM) S75-V (BUCKET) S80W-III (BUCKET) MEGA 130-III (LIFT)
	DOZER	60 mm (2.36 in)	74 mm (2.91 in)	5 mm (0.20 in)	6 mm (0.24 in)	S55W-V (BOOM) S55-V PLUS (ARM, BOOM) S75-V (ARM, SWING DOZER) S140W-V (DOZER) S160W-V (DOZER) MEGA 130-III (BUCKET) MEGA 160-III (LIFT) MEGA 200-III TC (BUCKET)
S75-V	BOOM	70 mm (2.76 in)	84 mm (3.31 in)	5 mm (0.20 in)	6 mm (0.24 in)	
S80-III	DOZER	60 mm (2.36 in)	74 mm (2.91 in)	7 mm (2.28 in)	6 mm (0.24 in)	S55-V (DOZER) S55-V PLUS (DOZER) S55W-V (DOZER)
S130LC-V	ARM	80 mm (3.15 in)	94 mm (3.70 in)	6 mm (0.24 in)	7 mm (2.28 in)	S160W-V (ARM) S170W-V (BOOM) S220N-V (BOOM (OP)) S225NLC-V (BOOM (OP))
	BOOM	70 mm (2.76 in)	84 mm (3.31 in)	6 mm (0.24 in)	7 mm (2.28 in)	
	BOOM (OP)	75 mm (2.95 in)	89 mm (3.50 in)	6 mm (0.24 in)	7 mm (2.28 in)	

MODEL	CYLINDER	$\varnothing A$ ^{+0.2} / _{+0.1}	MODEL (CYLINDER)
S55-V	ARM	85 mm (3.35 in)	S55W-V (ARM)
	BOOM	110 mm (4.33 in)	S55-V (BOOM (OP)) S55W-V (BOOM)
	SWING	80 mm (3.15 in)	S55W-V (BUCKET, SWING) S55-V PLUS (BUCKET) MEGA 300-III P/S
	DOZER	100 mm (3.94 in)	S55W-V (DOZER) S55-V PLUS (DOZER)
S55-V PLUS	ARM	90 mm (3.54 in)	
	BOOM	115 mm (4.53 in)	
S75-V	BOOM	115 mm (4.53 in)	
	ARM	95 mm (3.74 in)	
	BUCKET	85 mm (3.35 in)	
	SWING	110 mm (4.33 in)	
S70-III	BUCKET	85 mm (3.35 in)	S55-V (ARM) S80W-III (BUCKET) S80-III (DOZER)
S130LC-V	ARM	115 mm (4.53 in)	S170W-V (BOOM) S180W-V (BOOM) S210W-V (BUCKET) S220LC-V (BUCKET) S220LL (BUCKET (HEEL)) S225LC-V (BUCKET) S225NLC-V (BUCKET)
S220LC-V	BOOM	120 mm (4.72 in)	S220N-V (BUCKET (OP)) S225LC-V (BUCKET (OP)) S225NLC-V (BUCKET (OP)) S225NLC-V (BOOM)
S220LL	ARM (STICK)	165 mm (6.50 in)	S400LC-V (BOOM) S420LC-V (BOOM)
S250LC-V	ARM	140 mm (5.51 in)	S220LL (BOOM (HOIST)) S255LC-V (ARM) S290-V (BOOM, BUCKET, S/BUCKET) S300LC-V (BOOM, BUCKET, S/BUCKET)
	BOOM	130 mm (5.12 in)	S250LC-V (BUCKET) S255LC-V (BOOM, BUCKET)
S290LC-V	ARM	150 mm (5.91 in)	S300LC-V (ARM, S/ARM) S340LC-V (BOOM, BUCKET, BUCKET (OP)) S370LC-V (BOOM, BUCKET, BUCKET (OP)) S290-V (S/ARM) S360-V (BOOM, BUCKET, BUCKET (OP)) S290LL (BOOM (HOIST), BUCKET (HEEL))
S360-V	ARM	170 mm (6.69 in)	S340LC-V (ARM) S370LC-V (ARM) S470LC-V (BOOM, BUCKET) S450-V (BOOM, BUCKET)

- Use specially fabricate or factory-sourced tool to tighten piston nut (22).

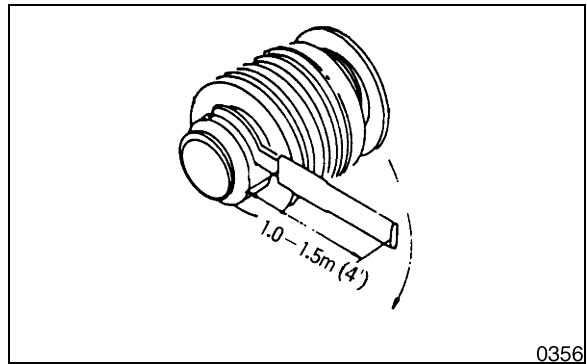


Figure 35

- Assemble wear ring (18), slide ring (17) and set screw (23) to piston assembly.

Reference Number	Description
1	Set Screw

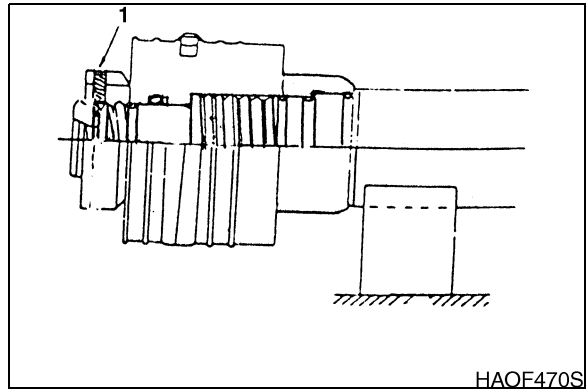


Figure 36

- Immobilize body of cylinder before assembly.

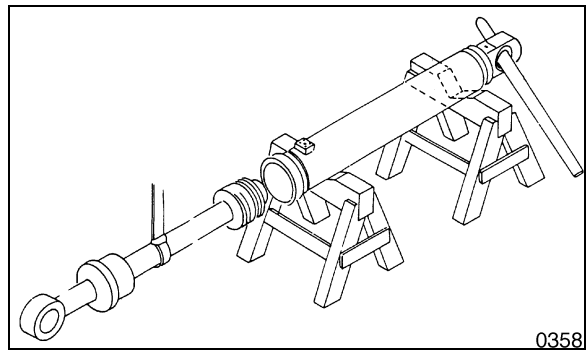


Figure 37

- Pre-apply fastener locking compound (Loctite #242 or #243 or an alternate manufacturer's equivalent product) to all end cover retaining bolts. Wrap a protective cushion around end of rod while tightening fasteners, to prevent possible damage to polished surface of rod, should a wrench slip during retightening.

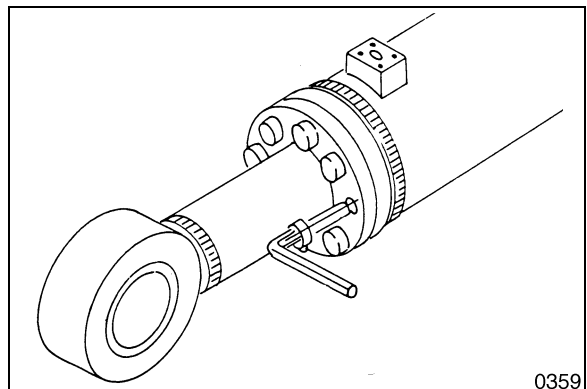


Figure 38

Reference Number	Description
31	Brake Valve
31-1	O-ring
31-2	O-ring
51	Relief Valve
51-1	O-ring
51-2	Backup Ring
52	Reactionless Swing Valve
52-1	O-ring
101	Drive Shaft
106	Spacer
111	Cylinder Block
113	Spherical Bushing
114	Cylinder Spring
116	Push Rod
117	Front Spacer
118	Rear Spacer
*	Piston Assembly
121	Piston
122	Shoe
123	Retainer
124	Shoe Plate
131	Valve Plate
301	Casing
303	Valve Casing
304	Front Cover
351	Plunger
355	Spring

Reference Number	Description
401	Socket Bolt
432	Snap Ring
433	Snap Ring
437	Snap Ring
438	Snap Ring
443	Roller Bearing
444	Roller Bearing
451	Spring Pin
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	Separation Plate
841	Socket Bolt
993	PT Plug
994	PT Plug

11. Reposition motor so that end of drive shaft faces out to one side. Pull out cylinder block (111) and disassemble pistons (121), retainer plate (123), spherical bushing (113), front spacer (117) and shoe plate (124). Be careful not to make any scratches or leave nicks on reciprocating parts.

NOTE: *Record or mark piston position or store them in order in which they were removed so that they can be returned to same cylinder bores they were taken out of. Service life could be extended incrementally by maintaining previous wear pattern relationships by avoiding new ones.*

12. Pull out friction plates (742) and separator plates (743) from area behind cylinder block.

13. Remove lock ring (437) from around drive shaft. Use a large enough pair of snap-ring pliers to properly tension ring and pull it away from locking groove.

Use extra caution in pulling off front cover (304) behind snap ring. Drive shaft oil seal (491) underneath cover must be replaced if it is damaged during disassembly. Use a little bit of extra caution (and a very large set of channel locks, a puller or extra wide adjustable wrench) to carefully withdraw cover straight back off drive shaft.

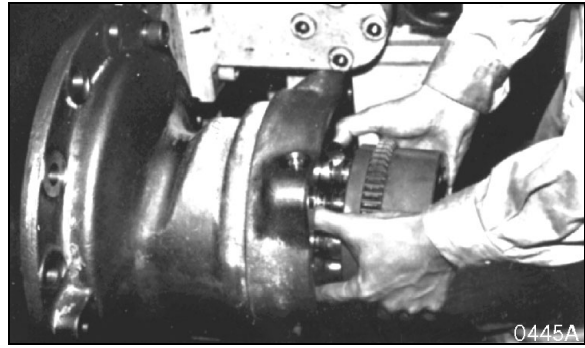


Figure 18

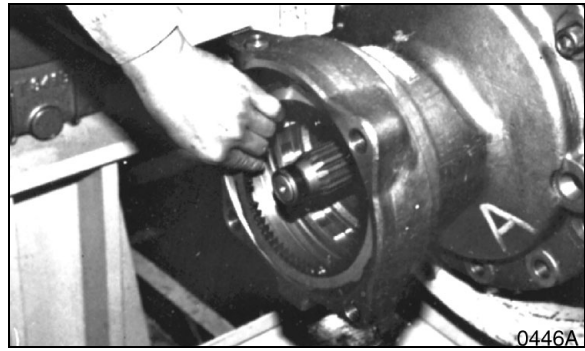


Figure 19

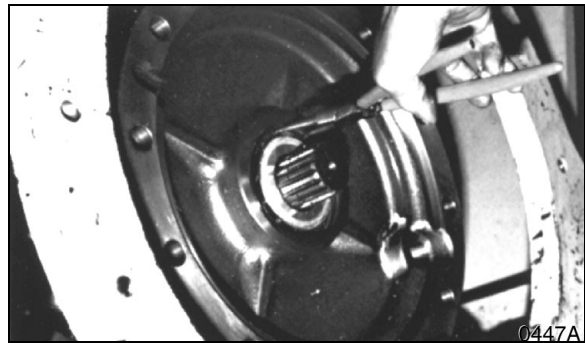


Figure 20

15. Reinstall brake springs, making sure that each gets fully seated on piston.

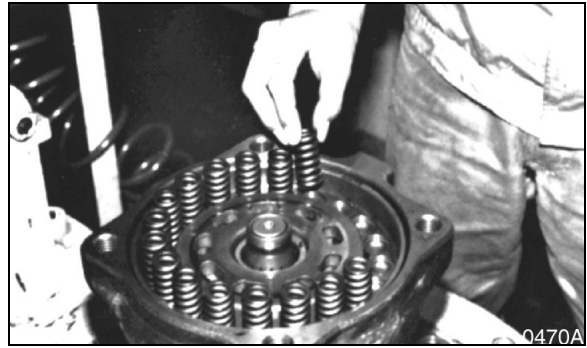


Figure 44

16. Tap roller bearing (444) race back into upper valve casing (303), using hammer and copper rod specified in tool list.

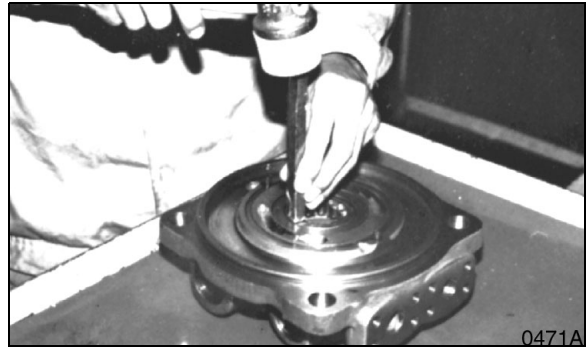


Figure 45

17. Assemble valve plate (131), O-ring and upper valve casing (303). Refer to assembly that shows "R" part (2, Figure 46) of the valve plate turned away from mounting flanges (1) on side of valve plate. Lightly grease O-ring to help keep it in place during assembly.

Reference Number	Description
1	Flange Side
2	R Port

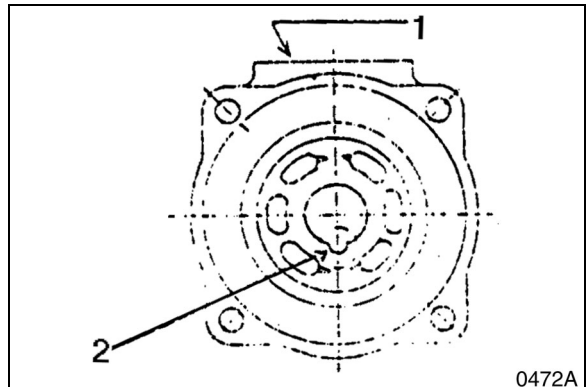


Figure 46

18. Bolt up two halves of motor casing (301 and 303, Figure 5). Be careful not to lose or damage O-ring. Tighten four 20 mm socket head bolts using a progressive, even rotation. Make sure that all brake springs are fully seated and that valve casing inlet and output ports are correctly matched.

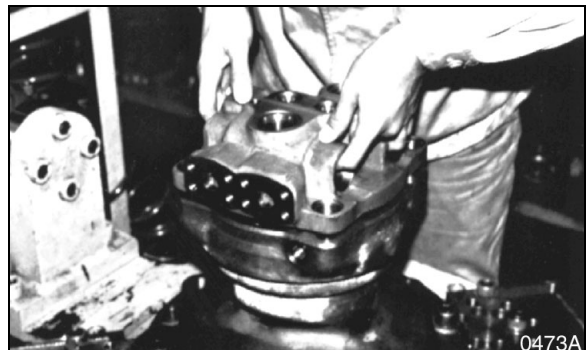


Figure 47

Complete rotary group

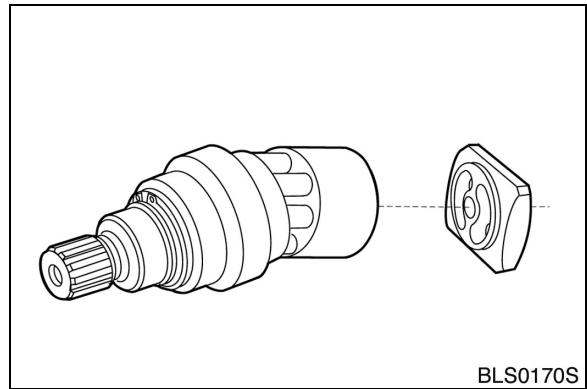


Figure 10

Port plate with control piston

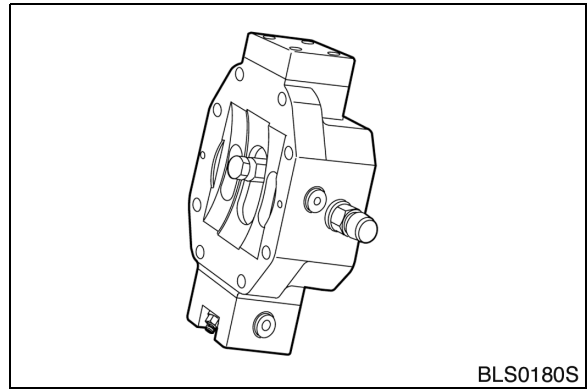
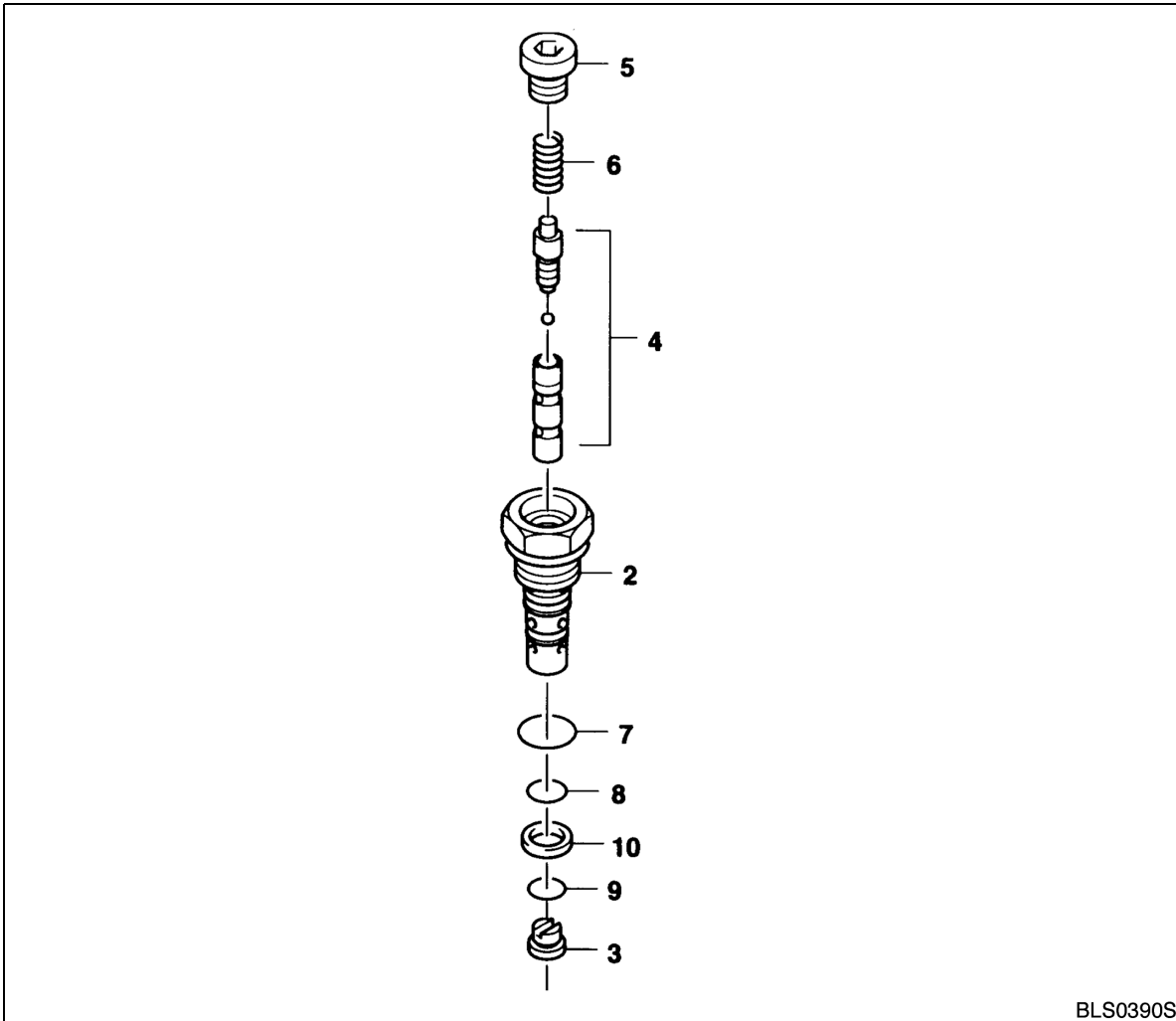


Figure 11

SPARE PARTS LIST BRAKE RELEASE VALVE (POS. 50)



BLS0390S

Figure 32

Reference Number	Description
2	Guide
3	Sleeve
4	Spool
5	Screw Plug
6	Spring

Reference Number	Description
7	O-ring
8	O-ring
9	O-ring
10	Thrust Ring

These parts are not available separately

INSPECTION NOTES

Free of corrosion, erosion or fretting; no damage to splines or keyways.

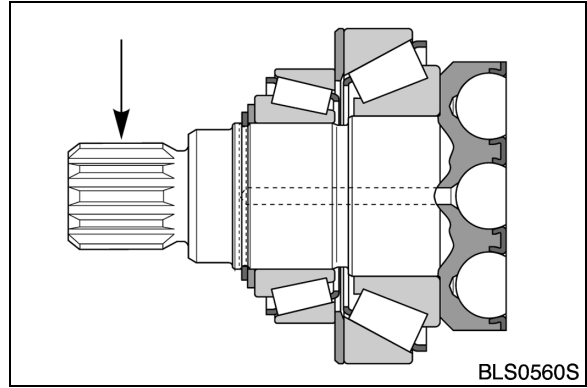


Figure 49

Pistons
No scoring and no pittings.

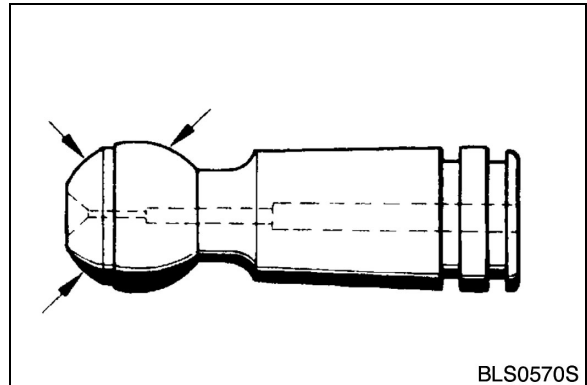


Figure 50

Center pin
No scoring and no pittings.

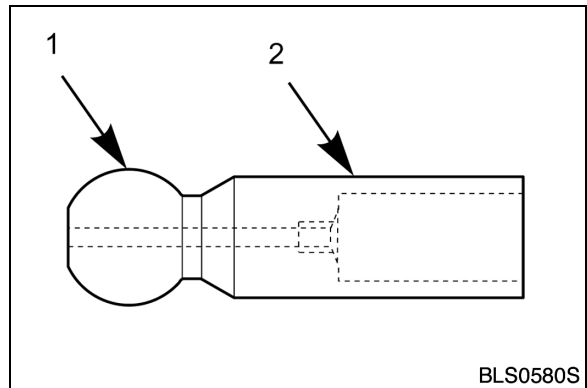


Figure 51

TIGHTENING TORQUES

Tightening torques for shaft bolts (Metric ISO Standard Thread)

The values for tightening torques shown in the table are valid only for shaft bolts with metric ISO-standard threads and head support surface dimensions in accordance with DIN 912, DIN 931 and DIN 933. These values are also valid only for light or unoiled, untreated surface as well as for use only with torque-indicating wrenches and force limiting tools.

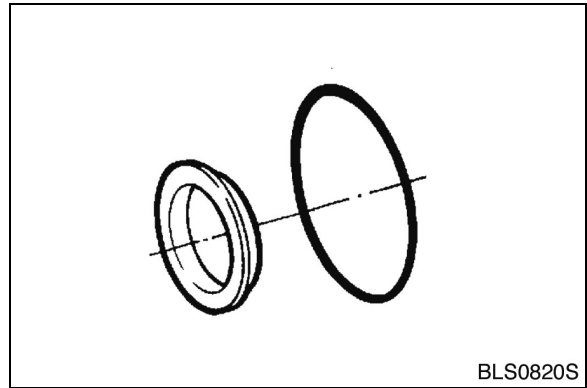
Tread Size	Strength Classes					
	8.8	10.9	12.9	8.8	10.9	12.9
	Tightening Torque (Nm)			Tightening Torque (lb. ft)		
M 3	1.1	1.6	1.9	0.8	1.2	1.4
M 4	2.9	4.1	4.9	2.1	3.0	3.6
M 5	6	8.5	10	4.4	6.3	7.4
M 6	10	14	17	7.4	10.3	12.5
M 8	25	36	41	18.4	25.8	30.2
M 10	49	69	83	36.1	50.9	61.2
M 12	86	120	145	63.4	88.4	106.9
M 14	135	190	230	99.5	140.0	169.5
M 16	210	295	355	154.8	217.4	261.6
M 18	290	405	485	213.7	298.5	357.4
M 20	410	580	690	302.2	427.5	508.5
M 22	550	780	930	405.4	574.9	685.4
M 24	710	1000	1200	523.5	737.0	884.4
M 27	1050	1500	1800	773.9	1105.5	1326.6
M 30	1450	2000	2400	1068.7	1474.0	1768.8

Tightening Torques for Locking Screws VSTI (Metric ISO fine thread)

Thread Size	Designation	Tightening Torques (Nm)	Tightening Torque (lb. ft)
M 8 x 1	VSTI 8 x 1 -ED/SA	= 5	= 4
M 10 x 1	VSTI 10 x 1 -ED	= 10	= 7
M 12 x 1.5	VSTI 12 x 1.5 -ED	= 20	= 15
M 14 x 1.5	VSTI 14 x 1.5 -ED	= 30	= 22
M 16 x 1.5	VSTI 16 x 1.5 -ED/SA	= 40	= 22
M 18 x 1.5	VSTI 18 x 1.5 -ED/SA	= 50	= 29
M 20 x 1.5	VSTI 20 x 1.5 -ED/SA	= 60	= 37
M 22 x 1.5	VSTI 22 x 1.5 -ED	= 70	= 44
M 26 x 1.5	VSTI 26 x 1.5 -ED/SA	= 80	= 51
M 27 x 2	VSTI 27 x 2 -ED	= 90	= 66
M 30 x 1.5	VSTI 30 x 1.5 -ED/SA	= 100	= 74
M 33 x 2	VSTI 33 x 2 -ED/SA	= 120	= 88
M 42 x 2	VSTI 42 x 2 -ED/SA	= 200	= 147
M 48x 2	VSTI 48 x 2 -ED	= 300	= 220

SEAL KITS AND SUB-ASSEMBLIES

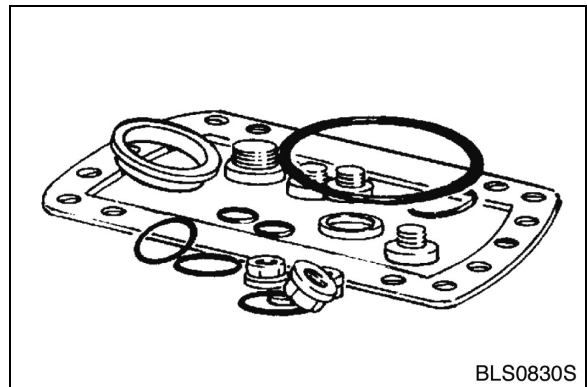
Seal kit for drive shaft.



BLS0820S

Figure 7

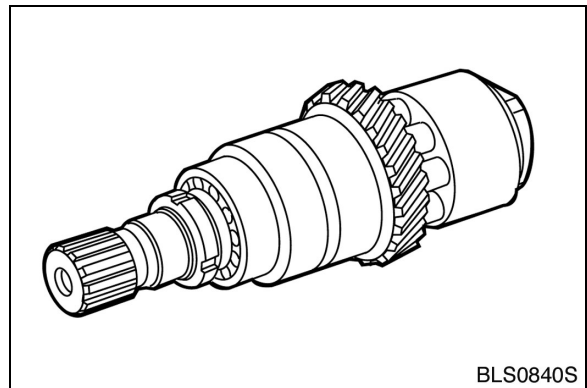
Peripheral seal kit.



BLS0830S

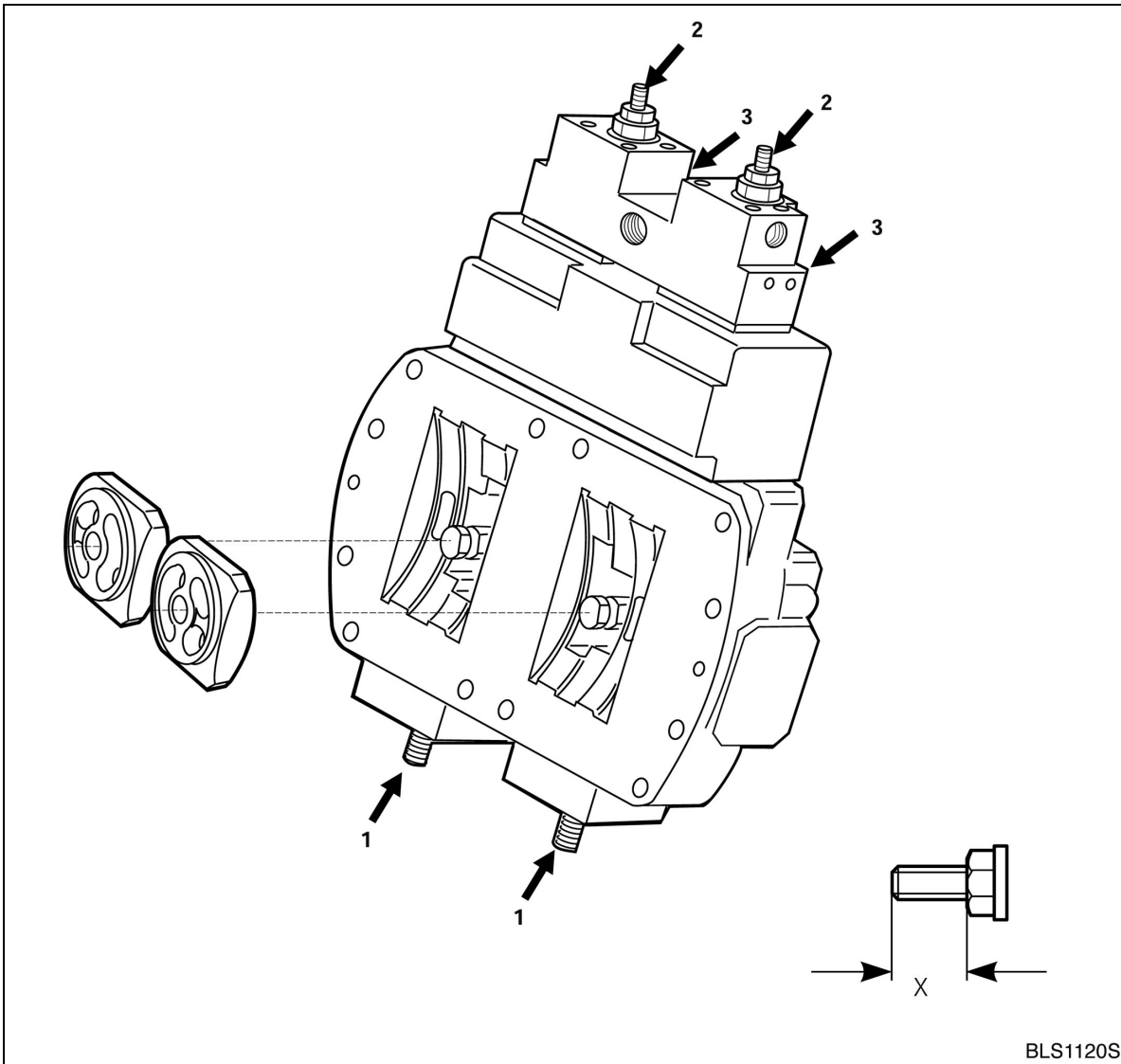
Figure 8

Rotary group 1, ready to install.



BLS0840S

Figure 9



BLS1120S

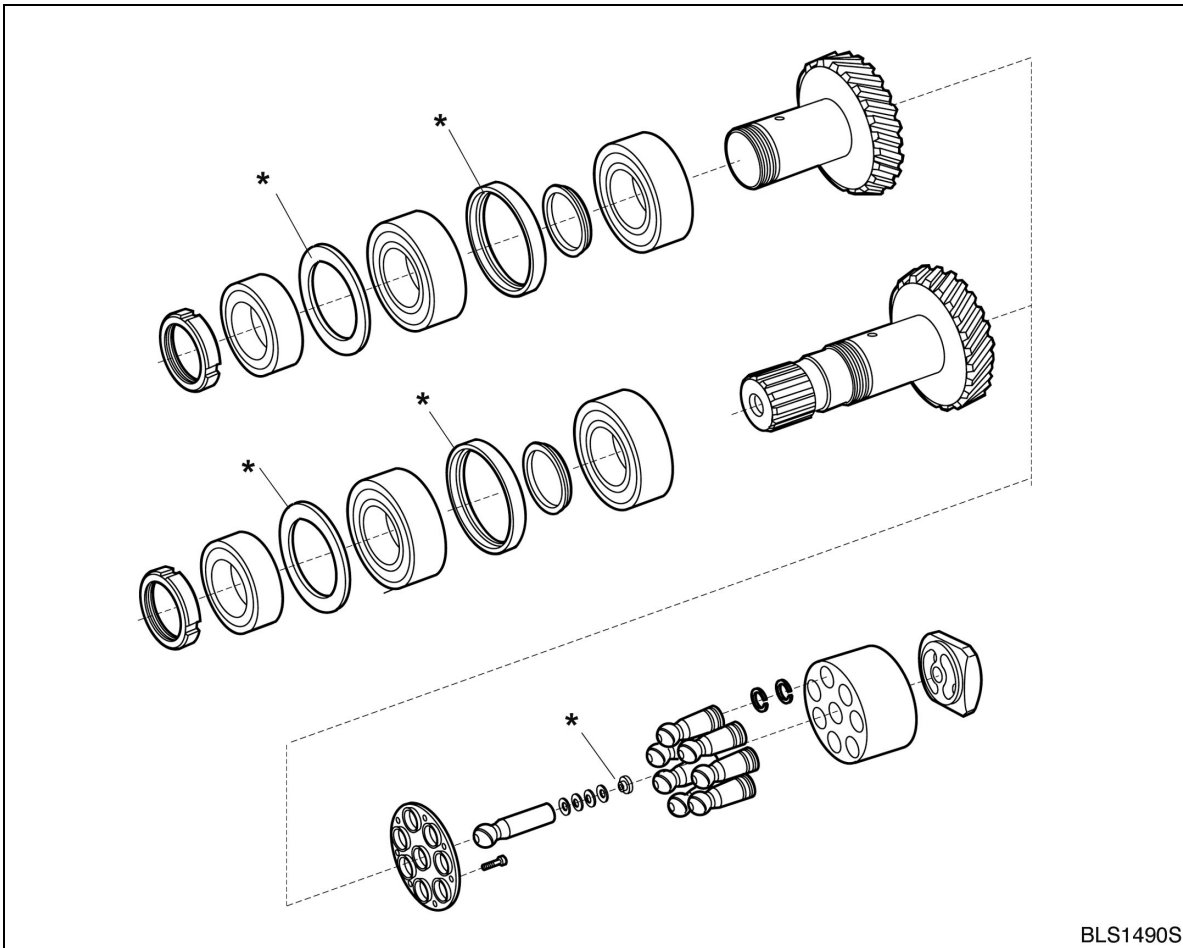
Figure 37

Reference Number	Description	
1	Setting Screw	Q_{max}
2	Setting Screw	Hydraulic Stroke Limitation
3	Setting Screw	Power Characteristic (Begin of Regulation)

NOTE: Before carrying out a setting or disassembly of the regulator, measure the measurement X and note of the setting screw.

NOTE: *Pos.* Drive shafts with bearing set are the smallest assembly group. The assembly group is adjusted to measurement A. The tapered roller bearings are adjusted to the specified torque.*

NOTE: *Fixing screw - Retaining device
Loosen of the screws is only possible if the drive shaft is warmed up at a temperature of approx. 120°C (248°F) 1/2 hour in an oil bath or heat air furnace. Screw out the screw quickly.*



BLS1490S

Figure 74

Rotary group: All of the components

* Adjustment

For adjustment values, torque values, see service information

FIT CONTROL HOUSING

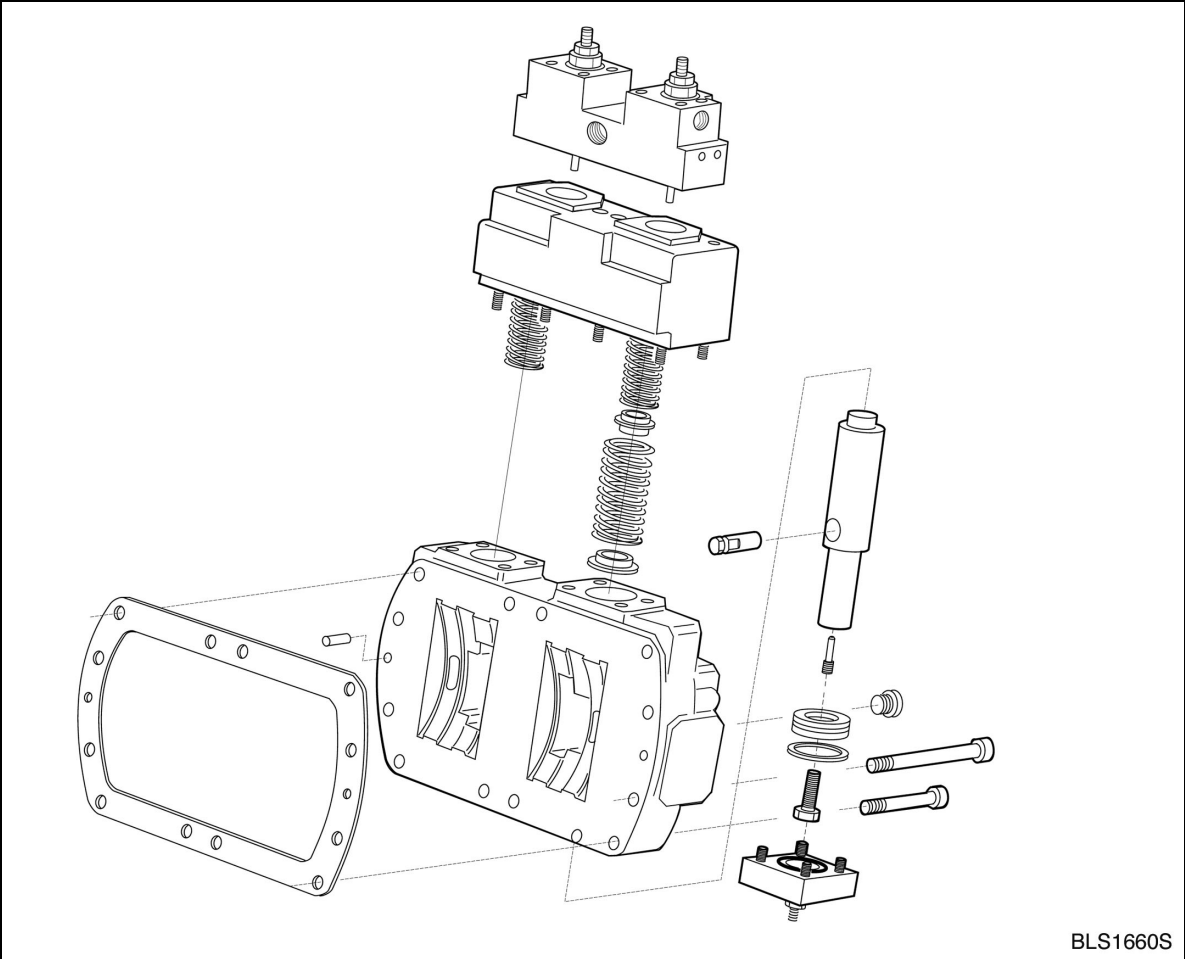


Figure 91

Thread Size	Designation	Tightening Torques (Nm)	Tightening Torque (lb. ft)
M 33 x 2	VSTI 33 x 2 -ED/SA	120	88
M 42 x 2	VSTI 42 x 2 -ED/SA	200	147
M 48x 2	VSTI 48 x 2 -ED	300	220

Tightening Torques for Seal-lock Nuts (Metric ISO-Standard Thread)

The values for tightening torques shown in the table are valid only for seal-lock nuts of the strength class 8.8 and with metric ISO-standard thread.

Tread Size	Strength Classes					
	8.8	10.9	12.9	8.8	10.9	12.9
	Tightening Torque (Nm)			Tightening Torque (lb. ft)		
M 6	10			7		
M 8	22			16		
M 10	40			30		
M 12	69			51		
M 14	110			81		
M 16	170			125		

Tightening Torques for Cross-slotted Lens Head Screws DIN 7985 (Metric ISO-Standard Thread)

The values for tightening torques shown in the table are valid only for cross-slotted lens head screws DIN 7985 of the strength class 8.8 and with metric ISO-standard thread.

Tread Size	Strength Classes					
	8.8	10.9	12.9	8.8	10.9	12.9
	Tightening Torque (Nm)			Tightening Torque (lb. ft)		
M 3	1.1			1		
M 4	2.9			2		
M 5	6			4		
M 6	10			7		
M 8	25			18		
M 10	49			36		

GENERAL DESCRIPTION

The counterbalance valve is used in such a way that it is engaged in a running travel motor for the bell-type shovel. It functions as a double counterbalance valve which prevents the vehicle body from overrunning while running forward or backward.

WHILE OPERATING TO RUN FORWARD

It refers to running operation which is done by means of applying pressure to motor either for accelerated climbing or for running fast on a flat road like expressway. **B** port working on left side of spool will overpower spring, thanks to pressure, and spool will open completely, causing oil to flow through individual ports (**B** → **B'** → **Motor** → **A'** → **A**).

The vehicle body will run at higher speed than speed of pump discharge due to inertial force while it is in deceleration or in descent. This will result in decreasing pressure of **B** port, causing power pressing the right side of spool to decline, and the spool to move toward center. This will generate counter pressure at **A'** port, which will control port pressure up to moderate level. At this time, spool will be controlled at level where pump discharged will be counterbalanced with counter pressure, and pressure of **B** port will be the pressure of spring which will be counterbalanced with the controlled level of spool.

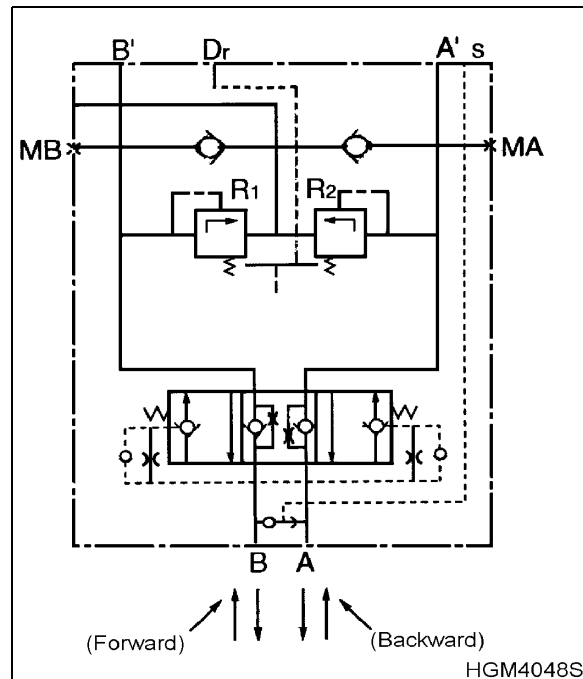


Figure 1

WHILE OPERATING TO STOP

Stop operation involves decrease of pressure of **B** port, causing spool to move to neutral position where only the neutral orifice will work. This set orifice will cause **A'** port to generate counter pressure, allowing the vehicle body with hydraulic brake to stop.

The relief valve regulates pressure of brake which came into operation when the pressure produced, at stop operation, from neutral orifice (counter pressure) reached the set pressure of valve. It also offers such operation as cutoff of surge pressure which is produced, at a rapid operation like an additional manipulation, from **A** port. If there occurs no cavitation at **A'** (**B'**) port, oil is supplied from **T** port. Therefore, there are anti-cavitation check for both sides.

WHILE OPERATING TO BACK

Backward operation also has counterbalancing function like forward operation. The spool moves to left when motor works either for accelerated climbing or for uniform running on a flat road, while oil flows through individual ports (**B** → **B'** to **Motor** to **A'** to **A**). While in deceleration and in decent, counter pressure is produced at **B'** port, contrary to the case of forwarding, causing vehicle body to be under control. While in operation to stop, spool moves toward neutral position and counter pressure produced from neutral orifice (at **B'** port) produces braking pressure of the relief valve, which forces the vehicle body to stop.



MAIN CONTROL VALVE (TOSHIBA DX28)



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 170W-V	1001 and Up
Solar 180W-V	1001 and Up
Solar 200W-V	0001 and Up
Solar 210W-V	1001 and Up

2. High pressure operation (Pz pilot signal: "ON").

When piston (D, Figure 6) is in the left most position and the pressure has increased above the set pressure of spring (C), high pressure condition is achieved.

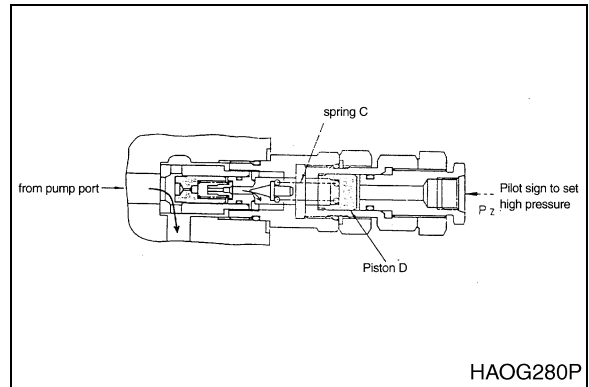


Figure 6

OVERLOAD RELIEF VALVE

1. Operation of overload relief valve.
 - A. The pressurized oil from the cylinder port enter into chamber (2, Figure 7) through orifice (3) of piston (A). Main poppet (B) is closed shut due to $d1 > d2$.
 - B. When the pressurized oil overcomes the set pressure of spring (C, Figure 7) pilot poppet (D) opens and oil flows to the tank through the transverse hole (4) and path (5).

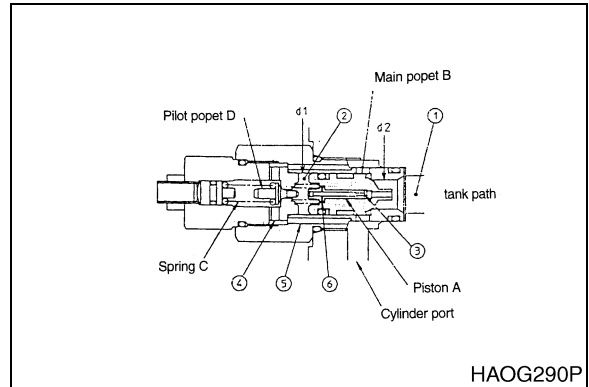


Figure 7

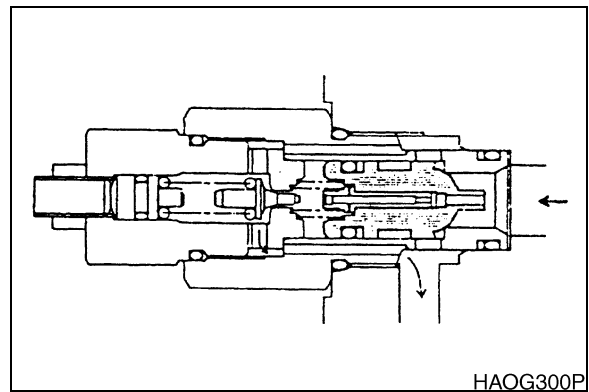


Figure 8

FOOT RELIEF VALVE

1. Oil from center bypass route flows to tank route through orifice (A, Figure 22) of poppet. The pressure (f_p) generated by flow passed through orifice is fed back to the pump to control the discharge volume by the pump.

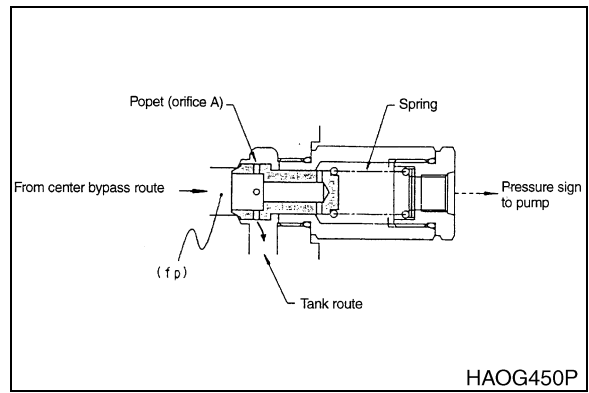


Figure 22

2. A large amount of fluid flow from delayed pump response causes pressure (f_p) to overcome set spring pressure and the poppet is opened, allowing oil to flow to the tank operating as a relief valve.

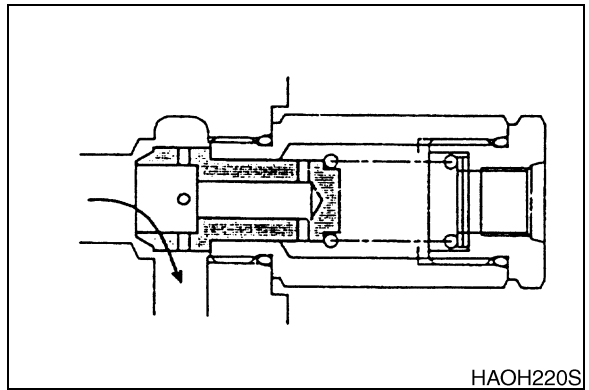


Figure 23

Arm Load Holding Valve

Reference Number	Description
1	Poppet
2	Spring
3	O-ring
4	O-ring
5	O-ring
6	Cap
7	Piston
8	Backup Ring
9	O-ring
10	Sleeve
11	Backup Ring
12	O-ring
13	Poppet
14	Spring
15	O-ring
16	Cap
17	Bolt With Hole
18	Cover
19	Cap
20	Spring
21	Check

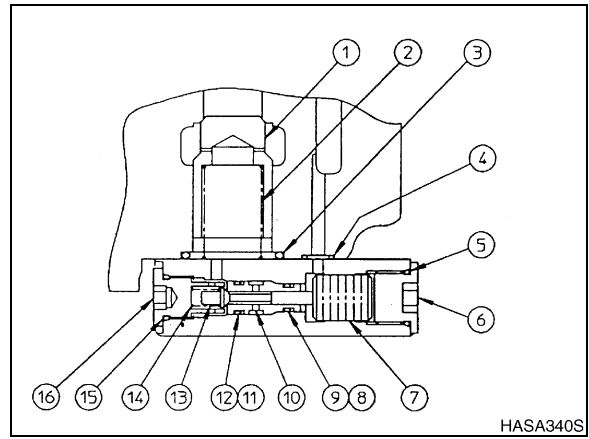


Figure 41

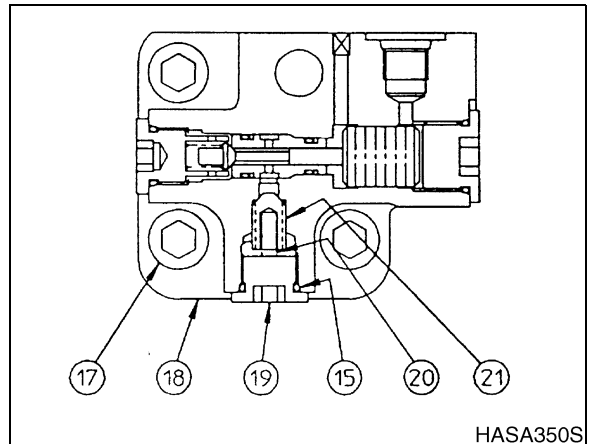


Figure 42

SPECIFICATIONS

Control Valve	Relief Valves (Main):	320 kg/cm ² (4,600 psi) - normal, travel 350 kg/cm ² (5,000 psi)
	Left Side Spools: (and spool diameter)	Dozer: left 28 mm (1.1") diameter Swing: 28 mm (1.1") diameter Boom-2: 28 mm (1.1") diameter Arm-1: 28 mm (1.1") diameter
	Right Side Spools: (and spool diameter)	Travel: 28 mm (1.1") diameter Option: open 28 mm (1.1") diameter Bucket: 28 mm (1.1") diameter Boom-1: 28 mm (1.1") diameter Arm-2: 28 mm (1.1") diameter
	Overload Relief Pressure:	360 kg/cm ² (5,100 psi)

5. Plunger (Lower side)

AM-1: Remove cap (7, Figure 64), O-rings, backup ring, spring (8) and check valve (9).

Lower Cap Hex Hole	8.0 mm
Tightening Torque	6 kg•m (43 ft lb)

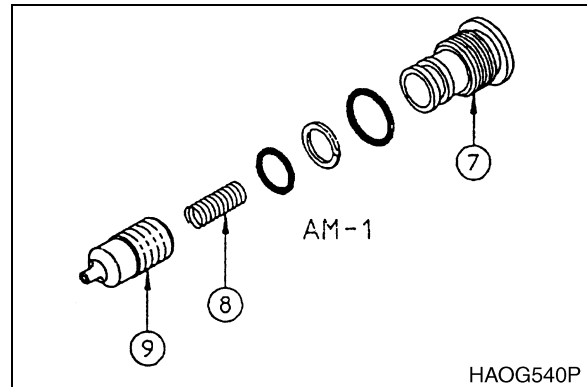


Figure 64

BM-1: Remove cap (7, Figure 65), O-ring, backup ring, sleeve (10), check valve (11) and spring (12).

Lower Cap Hex Hole	8.0 mm
Tightening Torque	6 kg•m (43 ft lb)

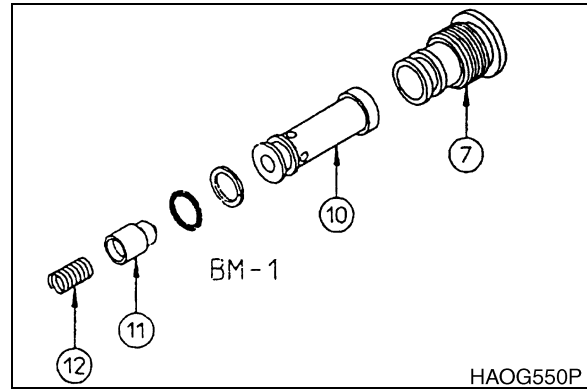


Figure 65

TS: Remove cap (7, Figure 66), O-ring and backup ring.

Lower Cap Hex Hole	8.0 mm
Tightening Torque	6 kg•m (43 ft lb)

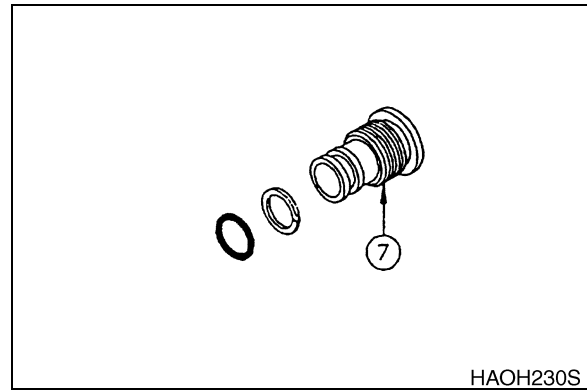


Figure 66

- Remove spring tray (5), spring (7) and poppet (8) from manifold bore.

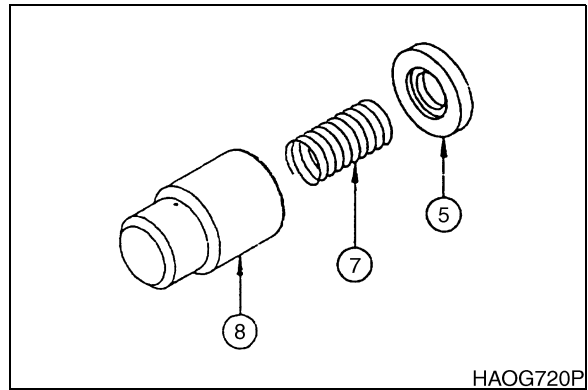


Figure 81

- Loosen cap (4) and remove spring (3) and spool (2).

Cap Allen Wrench Size	6 mm
Tightening Torque	3 kg•m (22 ft lb)

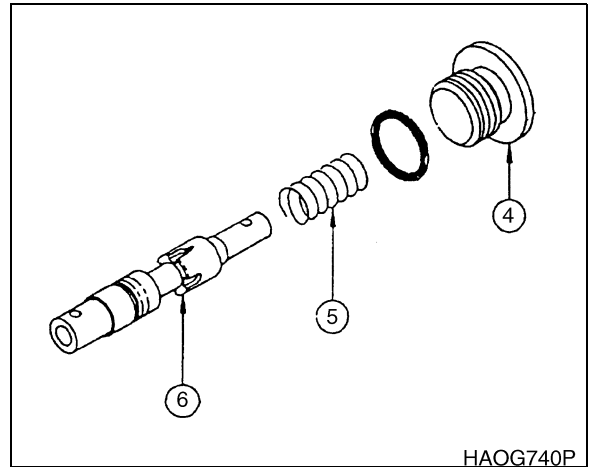


Figure 82

C: Check Valve [AM-2]

Reference Number	Description
1	Cap
2	Spring
3	Check

Cap Wrench Size	12 mm
Tightening Torque	20 kg•m (145 ft lb)

1. Loosen cap (1), remove spring (2) and check (3).

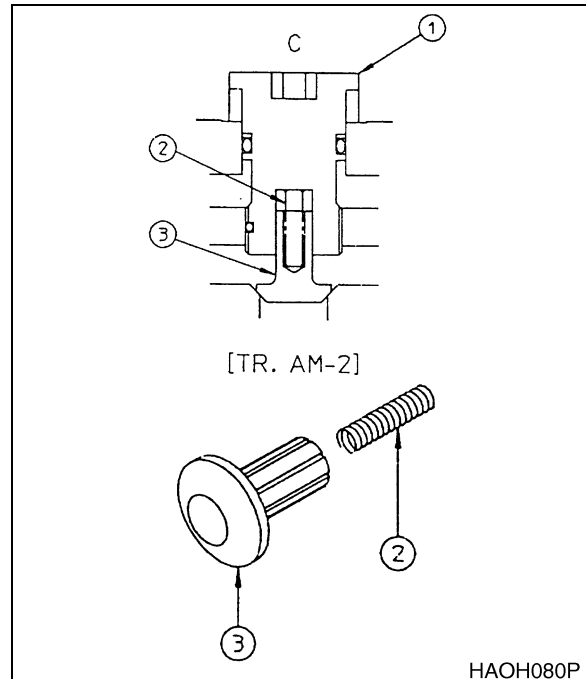


Figure 103

D: Check Valve [OPT, BKT, BM-1, BM-2, AM-1]

IMPORTANT
Even though the valve caps look the same, they are different, and cannot be interchanged.

Reference Number	Description
1	Cap
2	Spring
3	Check

Cap Wrench Size	12 mm
Tightening Torque	20 kg•m (145 ft lb)

1. Loosen cap (1), remove spring (2) and check (3).

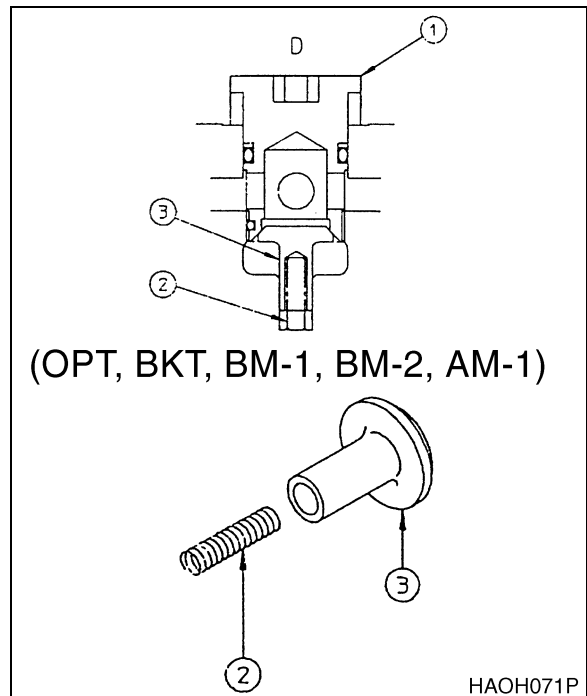


Figure 104

DISASSEMBLY

1. Lift up the boot (28) and pull the switch cord through the hole in the case (1).

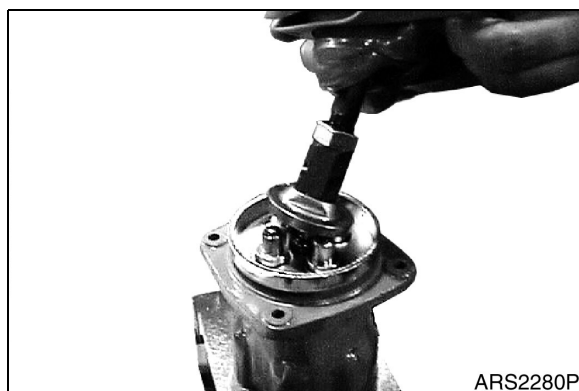


Figure 8



Figure 9

2. Loosen nut (27) from hex nut (25) and remove handle assembly (30).

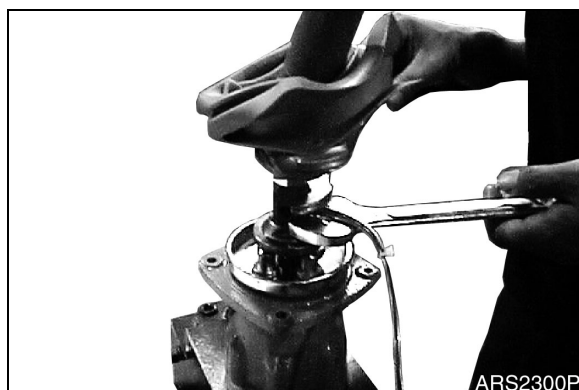


Figure 10

INSTALLATION

1. Connect hoses as tagged during removal to remote control valve R.H. (1, Figure 39).
2. Position remote control valve R.H. (1, Figure 39) on control stand and install four bolts and washers (3) and cover (2).

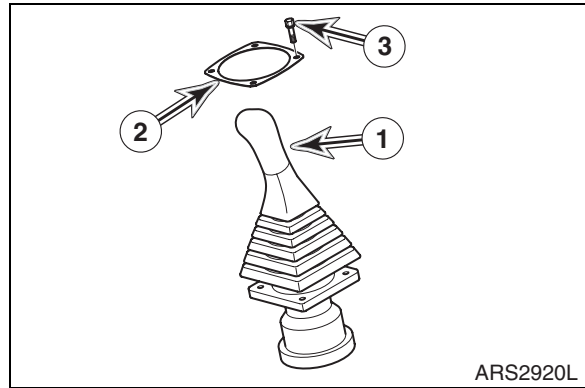


Figure 39

3. Install two screws, two bolts and washers (7 and 8, Figure 40) and cover (4).
4. Install a screw, three bolts and washers (6, Figure 40) and cover (3). Push cap (5) into cover (3).
5. Install four bolts and washers (2, Figure 40) and cover (1).

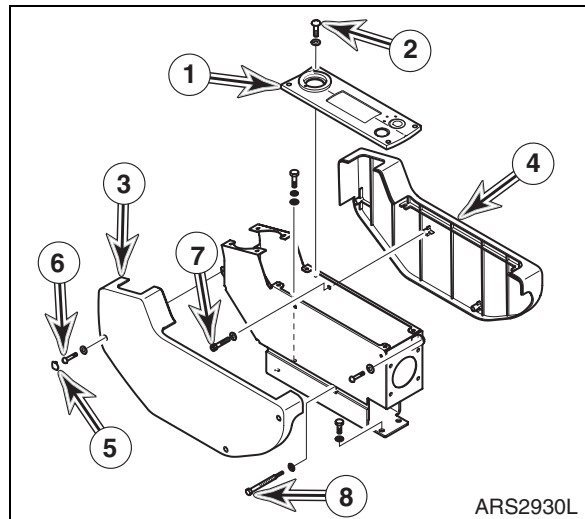


Figure 40

6. Connect hoses as tagged during removal to remote control valve L.H. (1, Figure 41).
7. Position remote control valve L.H. (1, Figure 41) on control stand and install four bolts and washers (3), and cover (2).

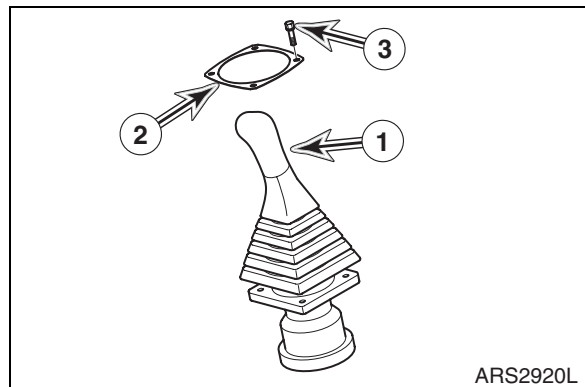


Figure 41

C. Assembly tool for lip seal. Code no. SJ 150-9000-17.



HAAB7051

Figure 6

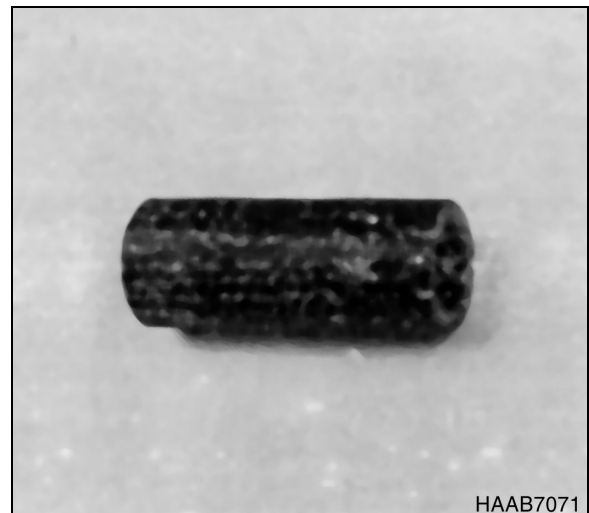
D. Assembly tool for cardin shaft. Code no. 150-9000-3.



HAAB7061

Figure 7

E. Assembly tool for dust seal. Code no. SJ 150-9000-22.



HAAB7071

Figure 8

REASSEMBLY

1. Assemble spool/sleeve, making sure marks on spool and sleeve are lined up.



Figure 33

2. Place two, flat, neutral position springs in slot. Place curved springs between flat springs and press into place.



Figure 34

3. Line up spring set.



Figure 35

29. Fit gearwheel (rotor) and cardan shaft so that a tooth base in the rotor is positioned in relation to shaft slot as shown. Turn gear rim so that seven holes match holes in housing.

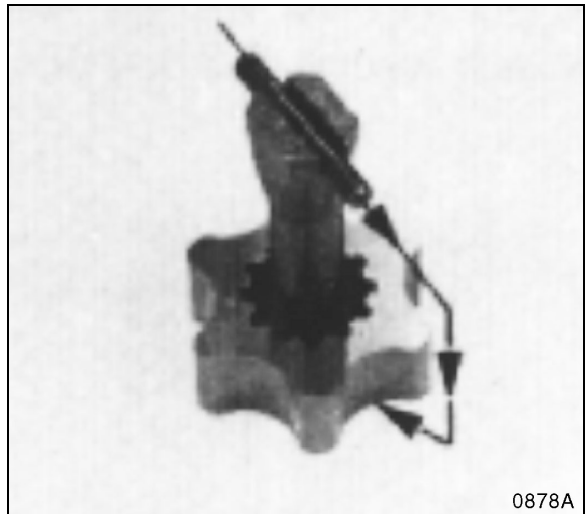


Figure 63

30. Install spacer, if used.



Figure 64

31. Place end cover in position.



Figure 65

GENERAL DESCRIPTION

Schematic(s) presented in this section are laid out on facing pages.

An overlapping edge has been taken into consideration so that a photocopy can be made and pasted together to make a complete schematic.

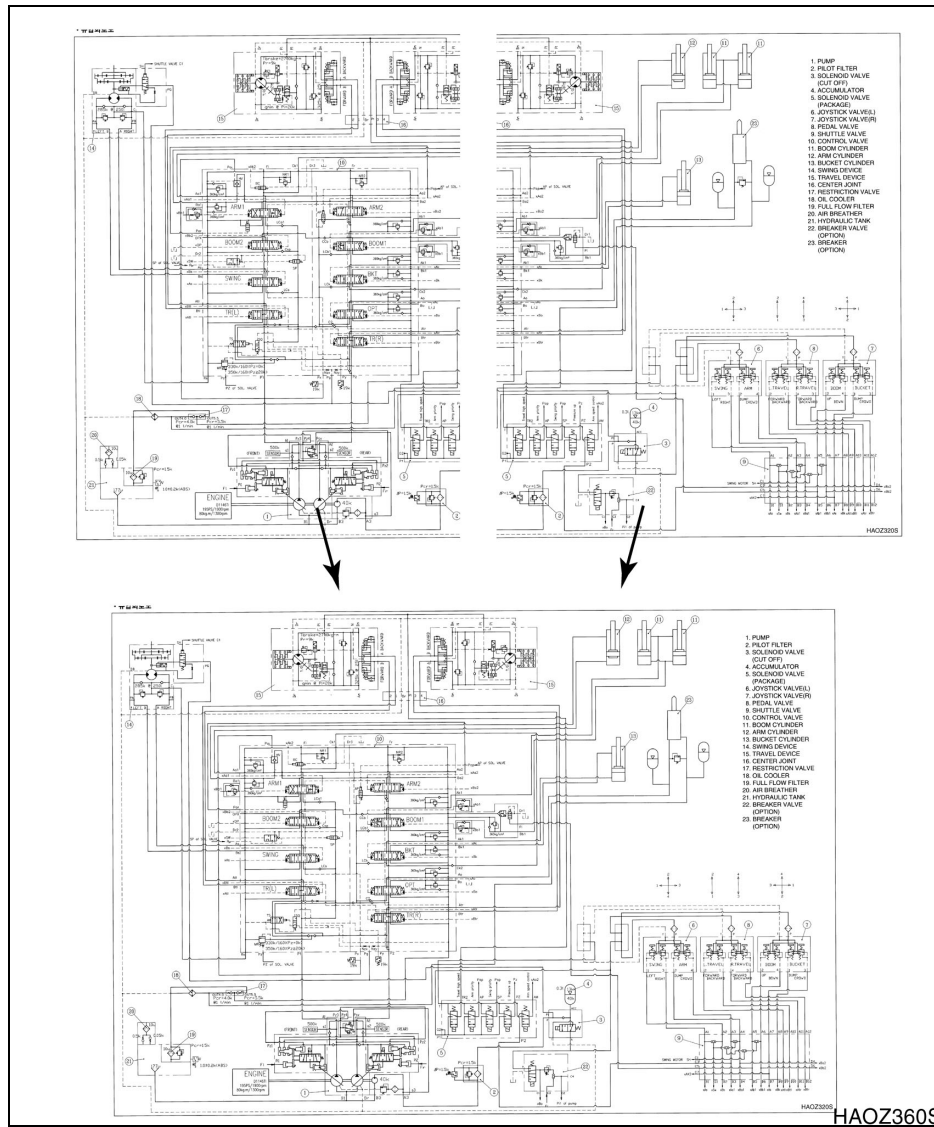


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Operation In Engine Running Mode

When the starter switch (3) is turned to the "ON" position, the contact points "30" and "87" of the engine stop relay (5) are closed due to current flowing from the battery (1) → fusible link (2) → "B" terminal of starter switch (3) → "ACC" terminal of starter switch (3) → "86" terminal of engine stop relay (5) → "85" terminal of engine stop relay (5) → ground.

As a result, the engine stop motor (6) is rotated by the current flow from the battery (1) → fusible link (2) → "B" terminal of the engine stop motor (6) → "P2" terminal of engine stop motor (6) → "87" terminal of engine stop relay (5) → "30" terminal of the engine stop relay (5) → "A" terminal of engine stop motor (6) → "E" terminal of engine stop motor (6) → ground. The engine stop motor opens (pushes) the fuel shut off lever of the fuel injection pump and the system is in the running mode. The engine stop motor rotates 180° and comes to a stop due to the cam switch which shuts off the current to the motor.

When the starter switch is in the "ON" position, the internal components of the engine stop motor's cam switch is in running mode position.

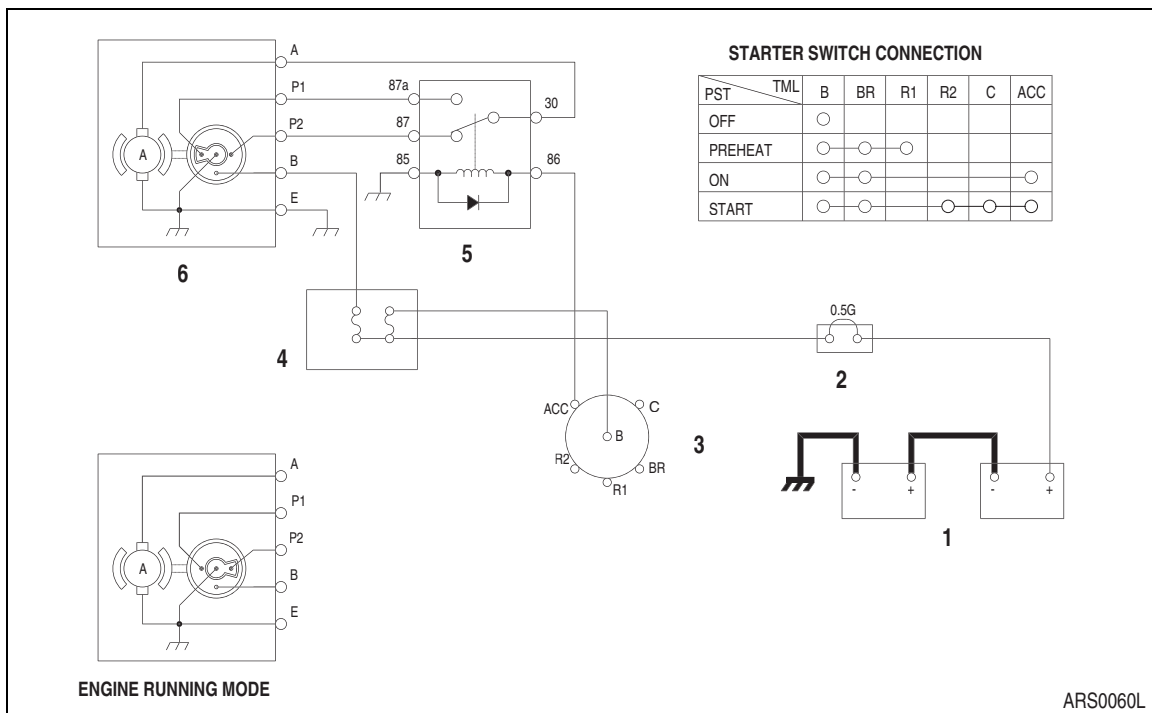


Figure 6 ENGINE STOP CIRCUIT - RUNNING MODE

Reference Number	Description
1	Battery
2	Fusible Link
3	Starter Switch

Reference Number	Description
4	Fuse Box
5	Engine Stop Relay
6	Engine Stop Motor

OPERATION

INSTRUMENTS

Function	Display	Sensor Specification	
		Input Terminal	Input Specification
Engine Coolant Temperature		CN4-5 CN4-6	41°C (106°F) → 1,372 ohms 61°C (142°F) → 855 ohms 102°C (216°F) → 160 ohms 105°C (221°F) → 147 ohms 107°C (225°F) → 128 ohms
Fuel Level		CN4-7 CN4-8	1/10 LCD Blinking → over 5K ohms FULL → under 525 ohms
Tachometer		CN4-16 CN4-17	N = 129 f / 60 (S140W-V) N = 129 f / 60 (S160W-V) N = 129 f / 60 (S180W-V) N = 129 f / 60 (S210W-V)
Voltmeter		CN7-9 CN7-19	0 - 32 VDC

GRAPHIC INFORMATION AREA DISPLAY

OVERVIEW

Many kinds of condition of machine are displayed on the letter information display department. The information display department is divided into two menus. One is main menu for user and the other is special menu for specialist. These menus can be moved from normal display mode by the combination of select buttons.

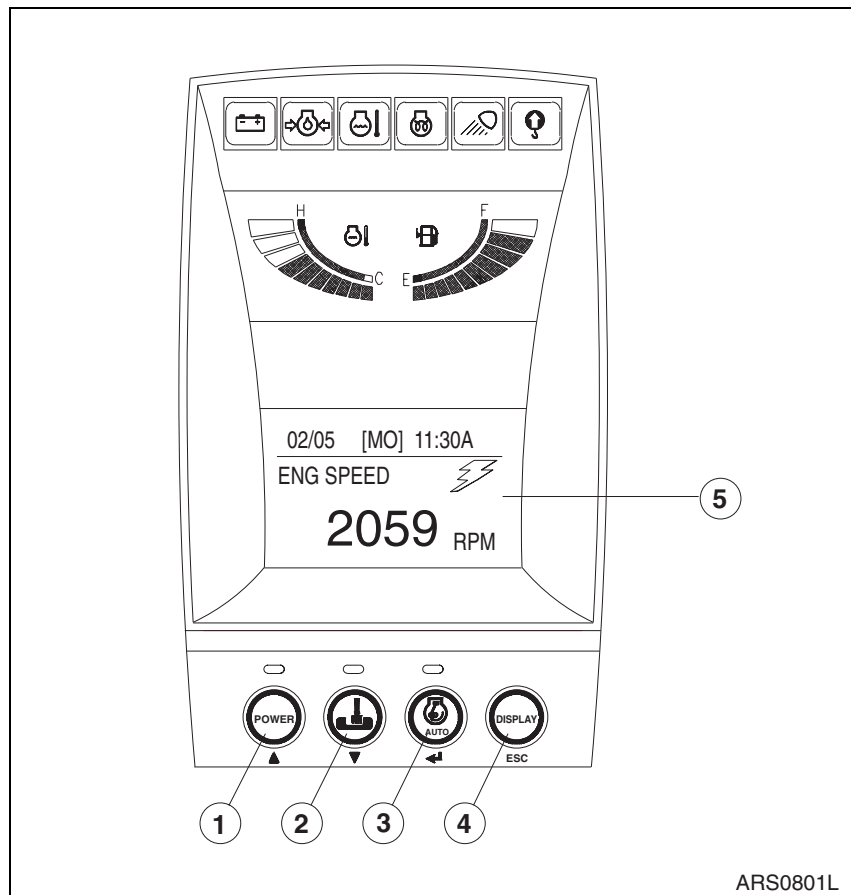


Figure 13

Selection Buttons	Graphic Display Area
<ol style="list-style-type: none"> 1. Up Arrow Button 2. Down Arrow Button 3. Enter Button 4. Escape Button 	<ol style="list-style-type: none"> 5. Letter Information Display Department

7. Boom Pressure (Optional)

On machine with OWD (Overload Warning Device), detected pressure from boom cylinder is displayed with numeric values (Unit: Bar).

The relative equation between the, output voltage of pressure sensor, and the pressure of boom cylinder, is as follows.

- $V = 0.00816P + 1$

V: Output voltage of pressure sensor (V).

P: Displayed pressure (Bar).

NOTE: *At standard machine, "0 BAR" is always displayed.*

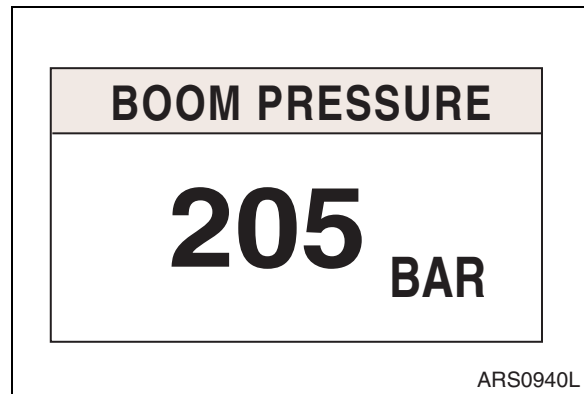


Figure 32

Failure Information

1. Entering Sub-menus: When a cursor is located in "Failure Info" of special menu screen press enter button (↵, 3 on Figure 19) and "Failure Info" screen is displayed.
2. Exiting Sub-menus: If escape button (ESC, 4 on Figure 19) is pressed for more than 1 second, this information screen will be returned to previous screen.

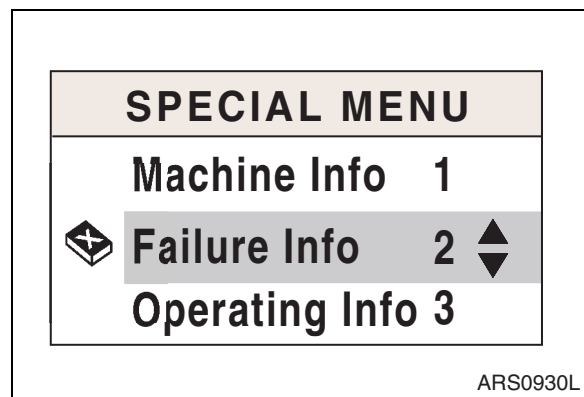


Figure 33

- * Real-time Failure:
Current status of failure is displayed.
- * Failure Log:
Memorized record of past failure is displayed.
- * Delete Fail Log:
This mode is used to delete all of the memorized record of past failure.

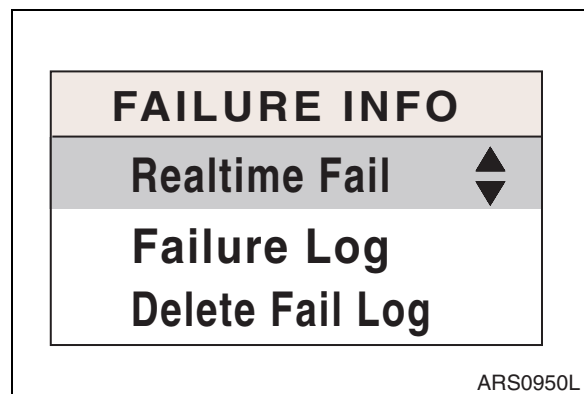


Figure 34

POWER MODE CONTROL

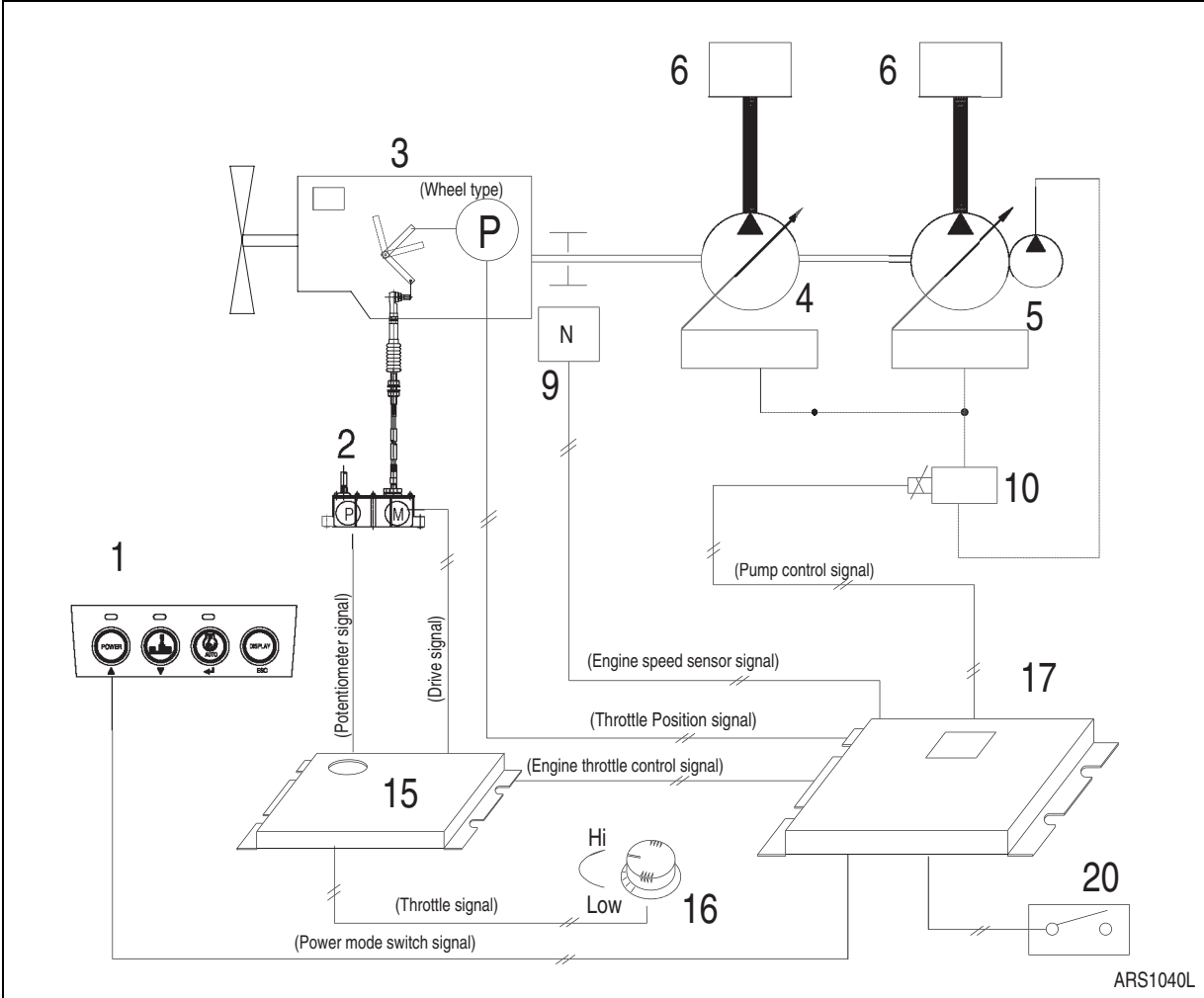


Figure 45

Reference Number	Description
1	Instrument Panel (Power Mode Selection Switch)
2	Engine Control Motor
3	Engine
4	Main Hydraulic Pump
5	Control Pump
6	Control Valve

Reference Number	Description
9	Engine Speed Sensor
10	E.P.P.R. Valve
15	Engine Throttle Controller
16	Engine Control Dial
17	e-EPOS Controller
20	Work / Travel Selection Switch (Wheel Type)

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

ENGINE CONTROL SYSTEM

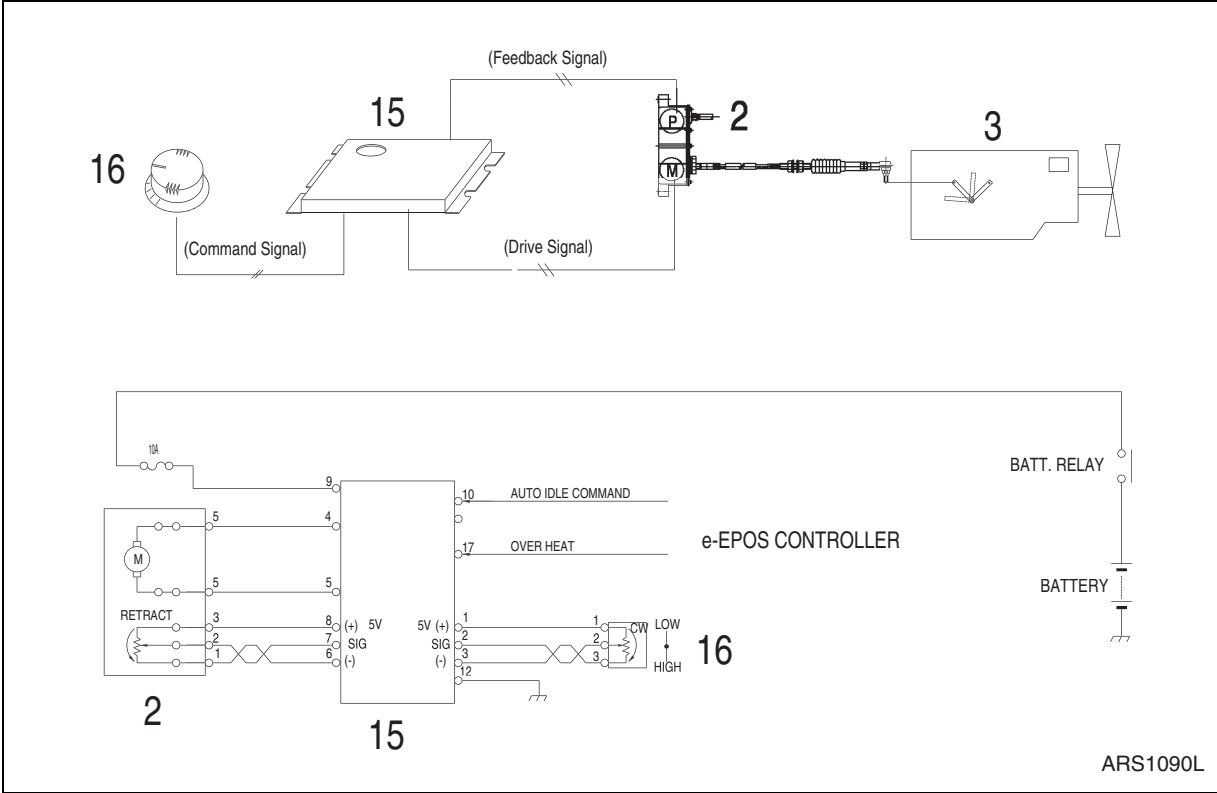


Figure 54

Reference Number	Description
2	Engine Control Motor
3	Engine

Reference Number	Description
15	Engine Throttle Controller
16	Engine Control Dial

When the engine control dial is moved the output voltage changes according to the dial position. This signal is input to the engine throttle controller. The engine throttle controller then compares the input voltage from the engine speed dial with the feedback signal from the throttle position sensor built into the engine control motor and drives the motor to the position set by the control dial. When the command signal and the potentiometer feed back signals are the same the engine controller shuts off the current to the control motor. The engine control motor cable is a solid type and is connected to the engine fuel injection control lever. The engine speed is controlled by the movement of the fuel injection lever which is directly linked with the rotation of the control motor.

Reference Number	Description
1	Battery
2	Battery Relay
3	Fuse
4	e-EPOS Controller
5	Instrument Panel

Reference Number	Description
6	Solenoid Valve (Pressure Up)
7	Power Boost Switch (Top of Right Work Lever)
8	Travel Select Switch
9	Pressure Switch

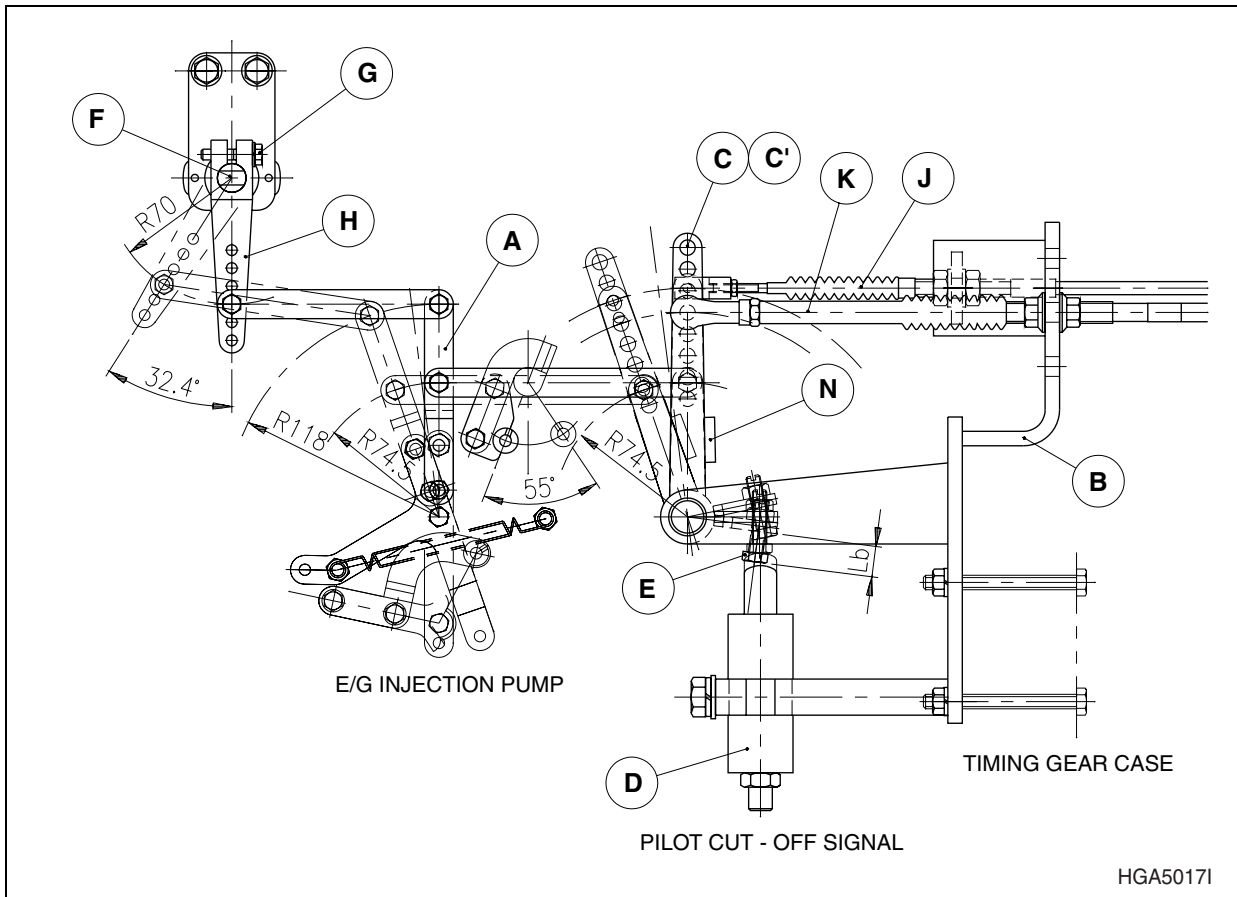


Figure 70

Adjustment of Work Mode RPM (Refer to Figure 72)

1. Engine Control Motor Adjustment

- A. Start engine, set to "POWER" for power mode, "OFF" for auto idle switch.
- B. Set work/travel select switch to "WORK," and check that forward/reverse lever is in "NEUTRAL."
- C. Set engine speed control dial to "HIGH IDLE."
- D. With a small screw driver adjust the variable resistor "VR4" shown in Figure 72. Adjust it until the engine is at "A (Table 1)" rpm.
- E. Check the "A" rpm setting by turning the engine speed control dial from "LOW IDLE" to "HIGH IDLE," and work/travel select switch to "TRAVEL"/"WORK."

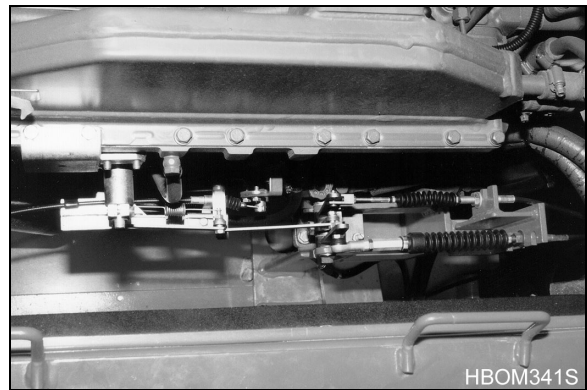


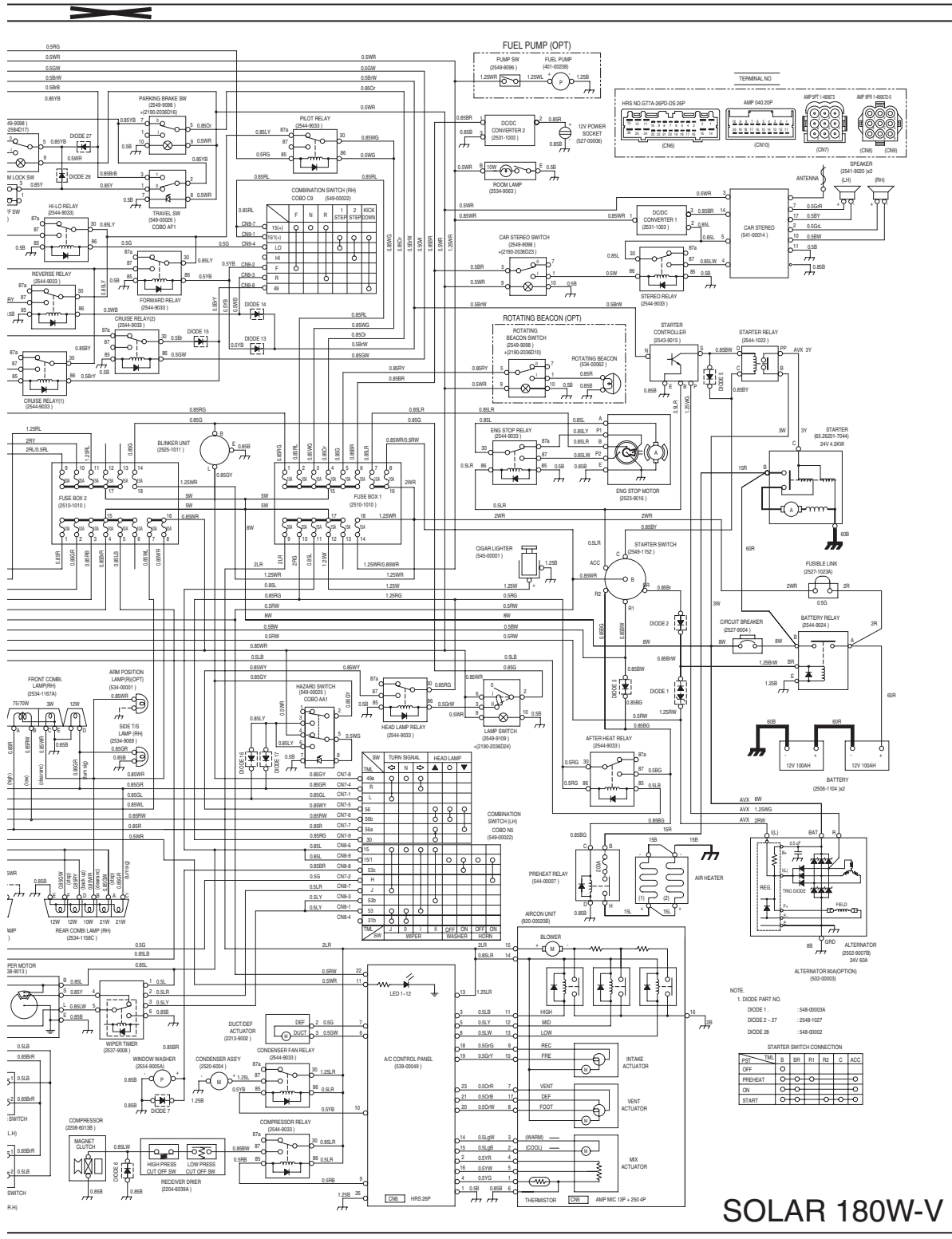


Figure 71 ENGINE THROTTLE LINKAGE

NOTE: *The values of the engine rpm may vary as the engine speed is changed from high to low and low to high. This deviation is normal.*

No.	Fault Area	Cause	Display Readout	Action	Reset Procedure
15	Rear Pump Pressure	Output Voltage: over 4.6 ±0.2 V Abnormal: under 0.4 ±0.2 V	 HAOH540L		Automatic reset when problem is corrected.
16	Mode Select Signal Input	CN1 - 12 and CN1 - 13 Terminals At High Level (12 V)	 HAOH550L		Automatic reset when problem is corrected.



SOLAR 180W-V

BLS1770L

INSTALLATION

ARM INSTALLATION PROCEDURE

Re-attach the base of the arm cylinder to the mounting point on top of the boom.



Before assembling the front attachment, make sure that the individual boom, arm and bucket sections are all compatible and can be used safely for work intended. Refer to the General Safety Pages, Lift Ratings, Working Range Diagrams and Weights of Materials sections in the Operation and Maintenance Manual. Consult your dealer or Daewoo After Sales Service for more information if you have any questions or require more information.

Begin with the arm securely supported on blocking in front of the excavator. Pre-grease the mounting pin for the rod end of the arm cylinder and push it through the ears on the end of the arm. Attach a sling around that mounting pin and lift the arm with an assist crane until it is in position for the boom-arm pin connection to be made.

Relieve hydraulic pressure from all points of the system before any hydraulic lines are opened, then carefully assemble hydraulic connections to the arm cylinder.

Remove the sling from around the rod end arm cylinder pin, withdraw the pin and lift the body of the arm cylinder to re-pin the mounting connection.

BOOM INSTALLATION PROCEDURE

Before reassembling the attachment, make sure to inspect all bushings and pivot points of each section. To avoid damaging the seats, bushings should never be hammered or chiseled out of their seats.

Installation is otherwise a reversal of the removal procedures.

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