TABLE OF CONTENTS

Page

Introduction 2
Specifications 3
Safety 4-5
Decal Locations 6-7
Towing A Disabled Loader 8
Lubrication 9-11
Chassis 12-19
  Description 12
  General Information 12-19
    Overhead Guard 12-13
      Removal 12-13
      Installation 13
    Lift Arm Assembly 13-14
      Removal 13
      Installation 14
    Tri-link, Leveling Links & Hydro-lock 15
      Removal 15
      Installation 15
    Floor Plates 16
      Rear Floor Plate Removal 16
      Front Floor Plate Removal 16
      Rear Floor Plate Installation 16
      Front Floor Plate Installation 16
    Consoles 17
      Removal 17
      Installation 17
    Chain Case & Access Covers 18
      Removal 18
      Installation 18
    Fuel Tank 19
      Removal 19
      Installation 19
Drive 20-34
  Brakes 20-23
    Disc Brakes Adjustment-Before SN3251-SL4510 & SN3601-SL4610 20
    Brake Pad Replacement-Before SN3251-SL4510 & SN3601-SL4610 20
    Disc Brake Adjustment-After SN3250-SL4510 & SN3600-SL4610 20
    Brake Pad Replacement-After SN3250-SL4510 & SN3600-SL4610 21
      Removal 21
      Installation 21
    Brake Cables-Before SN3251-SL4510 & SN3601-SL4610 22
      Removal 22
      Installation 22
    Brake Cables-After SN3250-SL4510 & SN3600-SL4610 23
      Removal 23
      Installation 23
  Traction Drive T-Bar 24-25
    Detent Adjustment 24
    Drive Linkage Neutral Adjustment 24
    Stop Cam Adjustment 24
    T-Bar Assembly 25
      Removal 25
      Installation 25
  Lift/Tilt T-Bar 26
    Control Linkage Adjustment 26

Page

    T-Bar Assembly 26
      Removal 26
      Installation 26
  Throttle Assembly 27
    Hand Throttle Adjustment 27
    Throttle Rod Adjustment 27
    Diesel Shut-off Adjustment-SL4610 Before SN4501 27
    Throttle Handle Assembly 27
      Removal 27
      Installation 27
  Pump Control Arms & Pump Arm Support 28-29
    Removal 28
    Installation 29
  Drive Chains 29-34
    Adjustment 29
    Secondary Drive Chains (Jackshaft Sprocket to Axle Sprockets) 30
      Removal 30
      Installation 30
    Primary Drive Chain (Drive Motor Sprocket to Jackshaft Sprocket) 30-31
      Removal 30
      Installation 31
    Jack Shaft & Sprocket 31-32
      Removal 31
      Installation 31-32
    Axle & Sprocket 32-33
      Removal 32
      Installation 32-33
    Wheel Bearings 33-34
      Removal 33-34
      Installation 34
Hydrostatic System 35-56
  Introduction 35-38
    Neutral 36
    Forward 37
    Reverse 38
    Turns 38
  Troubleshooting 39-42
  Hydrostatic Testing 43-44
    Propulsion Pump and Drive Motor 43
    Charge Pressure 43
    Charge Inlet Pressure 43-44
  General Information 44-56
    Tandem Pump 44-45
      Removal 44-45
      Installation 45
    Tandem Pump Breakdown 45-50
      Disassembly 45-48
      Parts Wear Inspection 49
      Reassembly 49-50
    Pump Drive Coupling 50-52
      Removal 50-51
      Installation 51-52
    Hydrostatic Drive Motor 52-53
      Removal 52
      Installation 52-53
    Drive Motors Breakdown 53-54
      Disassembly 53-54
      Inspection 54

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SECTION 1

INTRODUCTION

This manual has been written and illustrated to help you, the serviceman, in troubleshooting and servicing the SL4010 Series (SL4510, SL4610, SL4515* & SL4615*) Skid Loaders. The material in this manual is the latest in factory service information. It has been compiled by our factory Service Department and Engineering personnel to give you the best service information available. Follow all procedures carefully, to avoid unnecessary delays and/or damage to the equipment. Where procedures are given in a step-by-step manner, follow them in the order given. Although we have outlined assembly and disassembly procedures for you to follow, there are probably alternate methods that could also work.

The Hydraulic System and the Engine are the two most important parts of an SL4010 Series Skid Loader. When any service is performed on the Hydraulics System, always clean the hydraulic component and fittings, before disconnecting any hydraulic lines. Contamination is the greatest cause of failure in Hydraulics Systems. For any Engine repairs, consult your Ford or Perkins Engine Service Manual.

The SL4510 or SL4515* model Loader uses the Ford 98 CID Gasoline Engine. The SL4610 or SL4615* model Loader uses the Perkins 4.108 Diesel Engine.

The Model and Serial Numbers Plate, for the SL4010 Series Skid Loaders, is located inside the Right Chassis Riser, between the Lift Arm and Lift Cylinder Pivots.

"Right" and "Left" are determined from a position sitting on the Seat and facing forward. From this position, the Traction (Propulsion) Control T-Bar is on the "left" and the Lift/Tilt Control T-Bar is on the "right".

The Ford 98 CID Engine has an identification decal affixed to the right side of the rocker cover. The decal contains the engine serial number, which differentiates that engine from any other. Besides the serial number, there is the displacement (that determines the engine specifications), the model number and, the SO (Special Options) number (which determines the parts or components required on this unit). When requesting information or ordering replacement parts for this engine, **BE SURE** to provide **all** the numbers.

The Perkins 4.108 Diesel Engine Number is located on a machined pad on the fuel injection pump mounting flange, where the fuel injection pump is mounted.

A Torque Chart is provided on the inside rear cover which specifies the torque values for all of the hardware used on the Skid Loader. Almost all of the attaching bolts are Grade 5. All hardware is readily identifiable by markings on the head of the bolt. The torque values specified are to be used for all attaching except Lock Nuts (LN), Thread-cutting Screws (TCS), Thread-forming Screws (TFS) Sheet Metal Screws (SMS). Always use the tabulated torque values, unless otherwise instructed differently.

GEHL Company reserves the right to make changes or improvements in the design or construction of any part of the unit without incurring the obligation to install such changes on any unit previously delivered.

NOTE: On original Tire replacement, company policy prohibits the sale of replacement tires for all original GEHL machinery. Replacement Wheel Sets are available and tire size information is called-out with the Wheel Sets to facilitate replacement tire selection. ALL REPLACEMENT TIRES MUST BE PURCHASED LOCALLY.

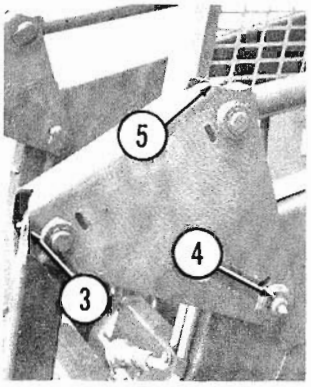
The following abbreviations are used in this manual:

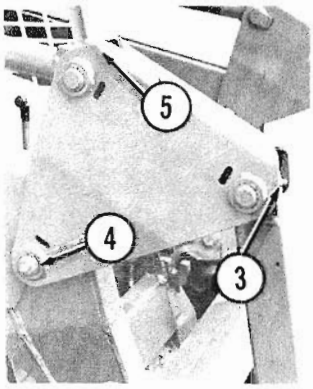
CB	- Carriage Bolt
CS	- Cap Screw (Hexagon Head)
FLS	- Flanged Lock Screw
RHMS	- Round Head Machine Screw
SHSS	- Socket Head Set Screw
SQHSS	- Square Head Set Screw
TCS	- Thread-cutting Screw
THMS	- Truss Head Machine Screw
TFS	- Thread-forming Screw
WLS	- Whiz-lock Screw
CN	- Castellated Nut
FLN	- Flanged Lock Nut (Hexagon)
JN	- Jam Nut (Hexagon)
LN	- Lock Nut (Hexagon)
N	- Nut (Hexagon)
NILN	- Nylon-insert Lock Nut
L	- Lock (Washer)
P	- Plain (Washer)
RGT	- Right
LT	- Left
AR	- (Quantity) As Required
DEG	- Degree
THD	- Thread
BRKT	- Bracket
AUX	- Auxiliary
SL	- Self-locking (Thread)
NF	- National Fine (Thread)
LH	- Left Hand (Thread)
RH	- Right Hand (Thread)
NA	- Not Applicable
SMV	- Slow-moving Vehicle
Sq.	- Square
T	- Tooth
NPT	- National Pipe Thread
I.D.	- Inside Diameter
O.D.	- Outside Diameter
JIC	- Joint Industry Conference (Standards)

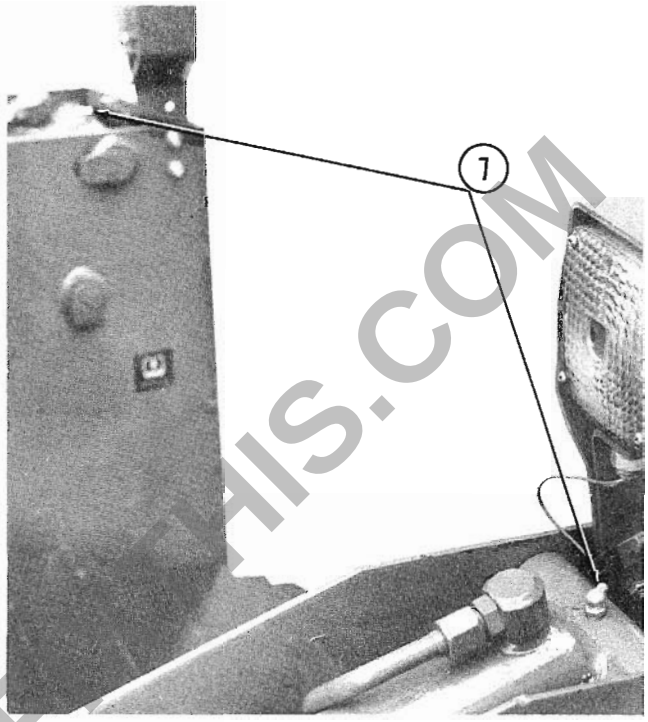
*** SL4515 and SL4615 designate newly created model numbers for Industrial Skid Loaders. Although this manual makes specific references to SL4510 and SL4610 units, it should be understood that all information, without Serial Number differentiation, and specific information differentiated as "4510 after SN" and "4610 after SN" is also applicable to respective SL4515 and SL4615 Industrial Skid Loaders.**

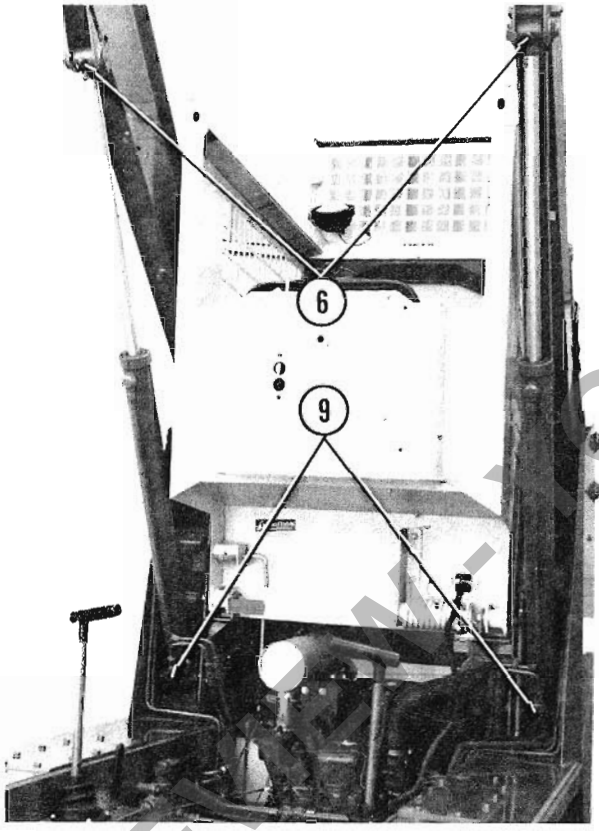
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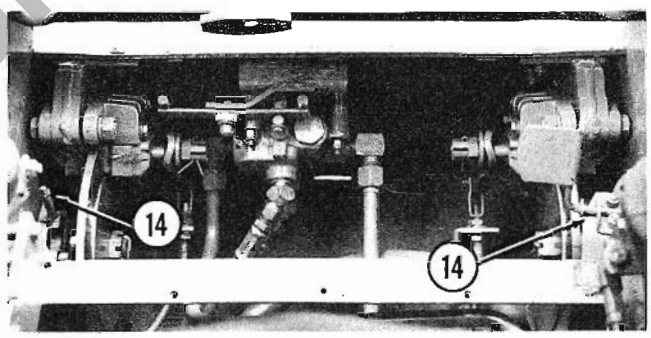
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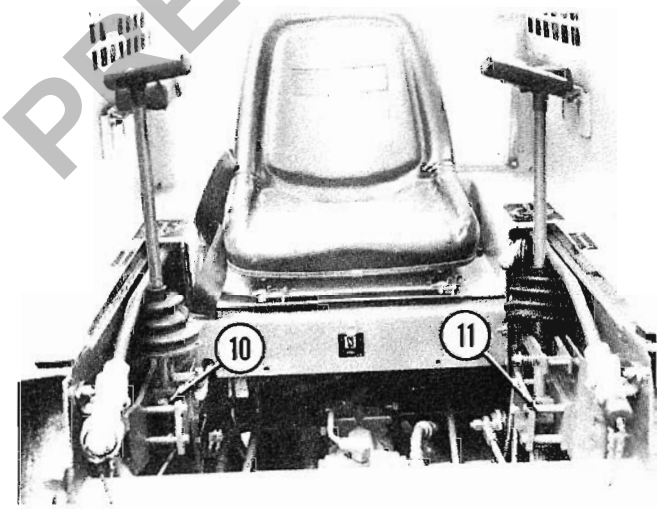


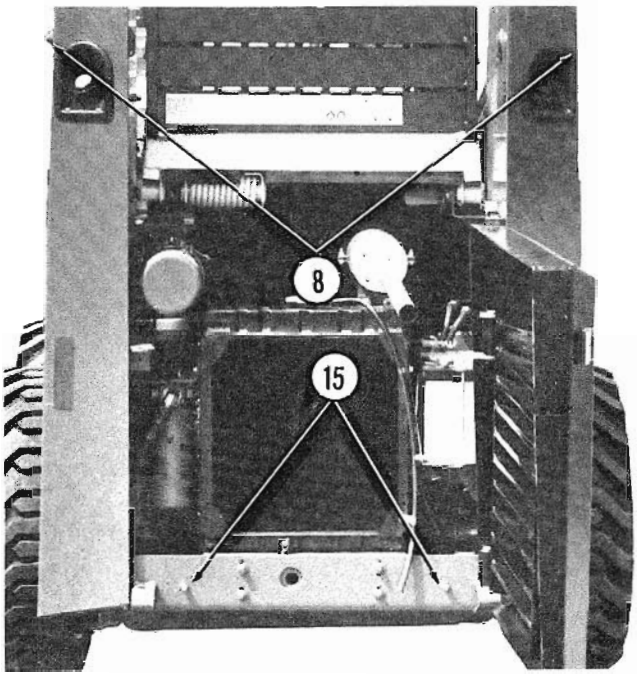












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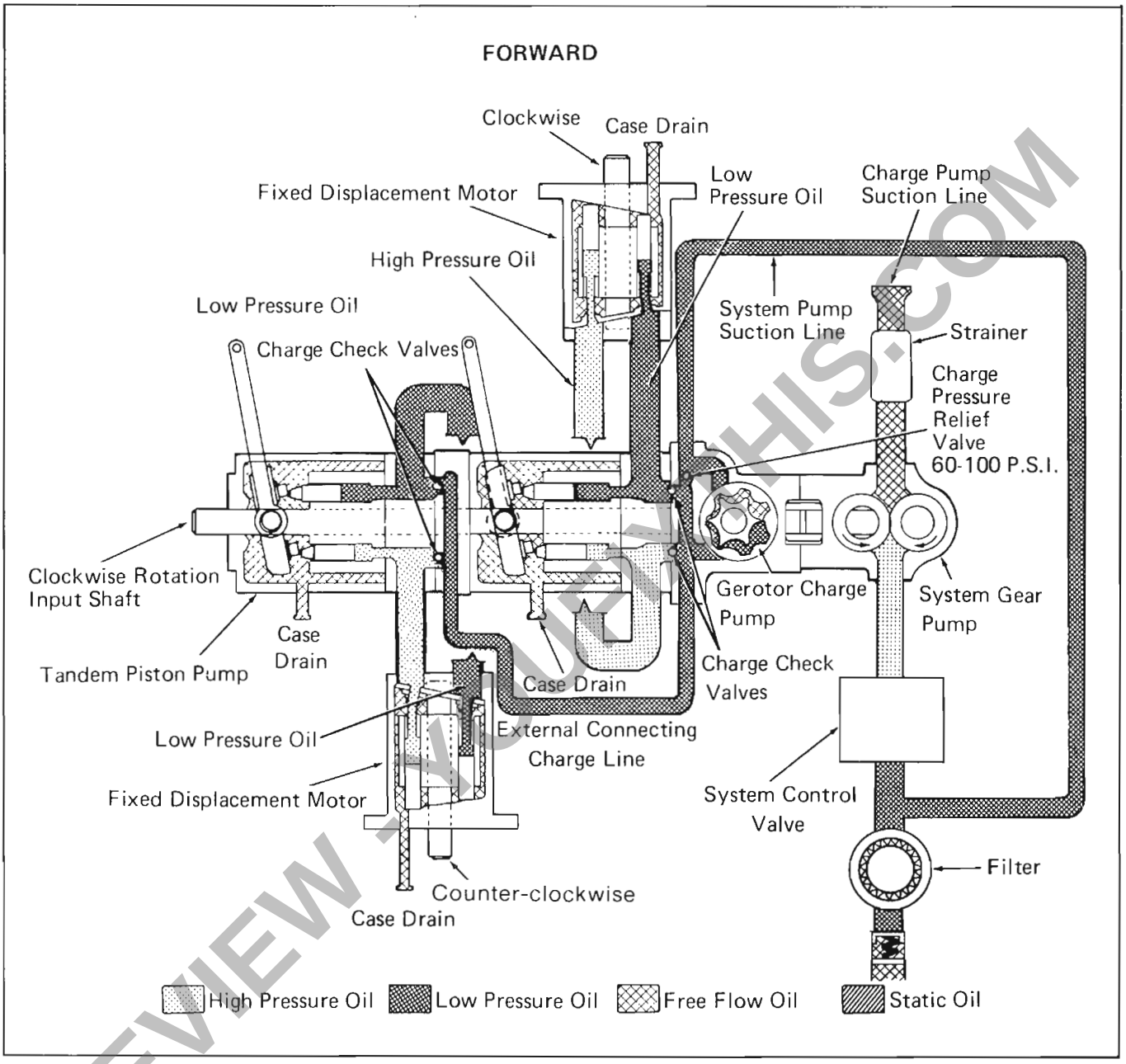


Fig. 9-2: Forward Condition Flow Diagram

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Forward (Fig. 9-2)

Forward movement is controlled by moving the Control Lever slowly towards the forward direction. As the Cam Plate moves from the neutral position, the Pistons start to reciprocate, thus pumping a small volume of oil to the Motors. Forward motion of the vehicle has started. As the forward movement of the Control Lever continues, the cam angle increases and the Pistons reciprocate further, providing more oil to the Motors and the speed of the vehicle is increased. The minimum Cam angle, on the Piston Pumps, provide a slow speed and maximum torque at the Drive Wheels. The maximum Cam angle, on the Piston Pumps, provides full speed.

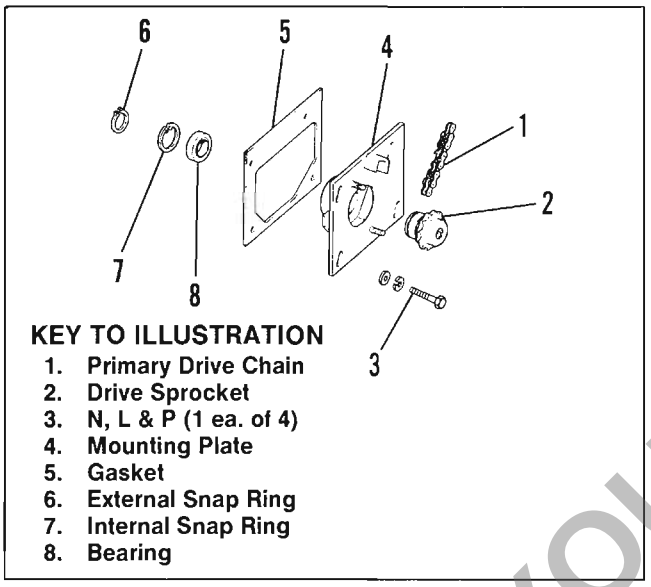
Any internal leakage, that occurs inside the Piston Pumps and Piston Motors, is made up for by the Gerotor Charge Pump. This make-up oil is forced into the low pressure side of the closed loop, maintaining a pressure of 60 to 100 PSI.

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7. Remove Mounting Plate with Drive Sprocket. A Gasket is used between Mounting Plate and Chassis. When removing Mounting Plate, use caution so as **NOT** to damage Gasket.

8. Remove external Snap Ring, from Sprocket and Shaft assembly, and remove Sprocket.

9. Remove internal Snap Ring, from Mounting Plate, and remove Bearing.



KEY TO ILLUSTRATION

1. Primary Drive Chain
2. Drive Sprocket
3. N, L & P (1 ea. of 4)
4. Mounting Plate
5. Gasket
6. External Snap Ring
7. Internal Snap Ring
8. Bearing

Fig. 9-17: Hydrostatic Motor Mounting Plate & Drive Sprocket Before SN3251-SL4510 & SN3601-SL4610

Installation

1. Insert Bearing into Mounting Plate and install Internal Snap Ring.

2. Insert Sprocket into Mounting Plate and install External Snap Ring on Sprocket and Shaft assembly.

3. Check condition of Gasket and replace, if necessary. Apply silicone sealer to Chassis and place Gasket against Chassis.

4. Apply a thin film of grease to side of Gasket, contacting Mounting Plate, for easier movement of Mounting Plate, when adjusting Primary Drive Chain.

5. Attach Mounting Plate to Chassis with (4) N, L and P. Leave hardware loose for Chain adjustment.

6. Install Primary Drive Chain around Drive Sprocket and install Connector Link. Connector Link is to be installed from the inside out.

7. Turn the Emergency Towing Valves to the operating position.

8. Install the Access Cover and remove the blocking.

9. Install Hydrostatic Drive Motor, following the procedure outlined in this section.

Hydrostatic Drive Motor Mounting Plate & Drive Sprocket After SN3250-SL4510 & SN3600-SL4610 (Fig. 9-18)

Removal

NOTE: Before removing Mounting Plate and Drive Sprocket, remove Hydrostatic Motor, following the procedure outlined in this section.

1. Securely block up Skid Loader so Wheels are off the Ground.

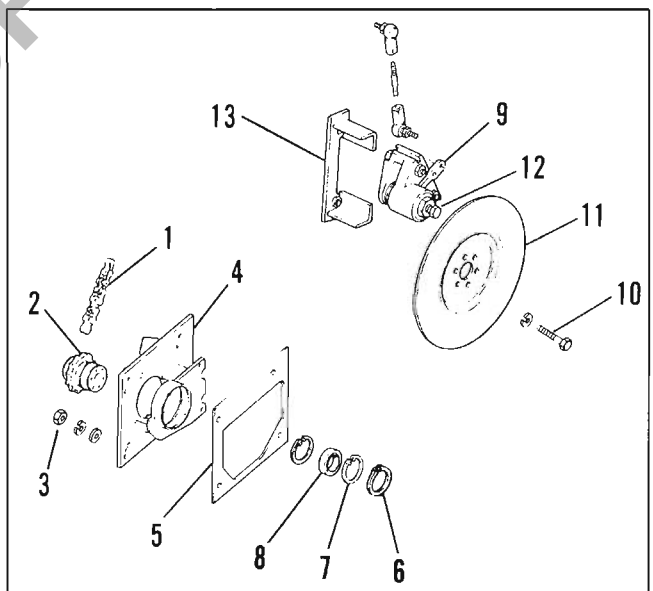
2. Remove the front Wheel and Tire.

3. Remove the Access Cover.

4. Open Emergency Towing Valvves, (Rear Piston Pump for right side and Front Piston Pump for left side), so Wheels can be rotated freely.

5. Rotate Wheels so that the Connector Link, on Primary Chain, is accessible.

6. Remove the Caliper Brake assembly.



KEY TO ILLUSTRATION

1. Primary Drive Chain
2. Drive Sprocket
3. N, L & P (1 ea. of 4)
4. Mounting Plate
5. Gasket
6. External Snap Ring
7. Internal Snap Ring (1 of 2)
8. Bearing
9. Caliper Brake Assembly
10. CS & L (1 ea. of 6)
11. Brake Disc.
12. Brake Adjustment Screw
13. Brake Mounting Bracket

Fig. 9-18: Hydrostatic Motor Mounting Plate & Drive Sprocket After SN3250-SL4510 & SN3600-SL4610

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Back Pressure Poppet (Super Charge Valve) (Fig. 10-21)

Removal

NOTE: Always clean area around Hydraulic Fittings, before disconnecting any Hydraulic Lines. When removing Hydraulic Lines, cap ends to prevent contamination from getting into Hydraulic system. Fasten Hydraulic Lines in an upright position immediately after removing, to prevent more oil loss.

1. Drain oil out of Hydraulic Reservoir.
2. Swing open Rear Grill.
3. Disconnect Hydraulic Oil Filter Return Hose from the 90° Elbow on the left side of the Return Oil Pipe.

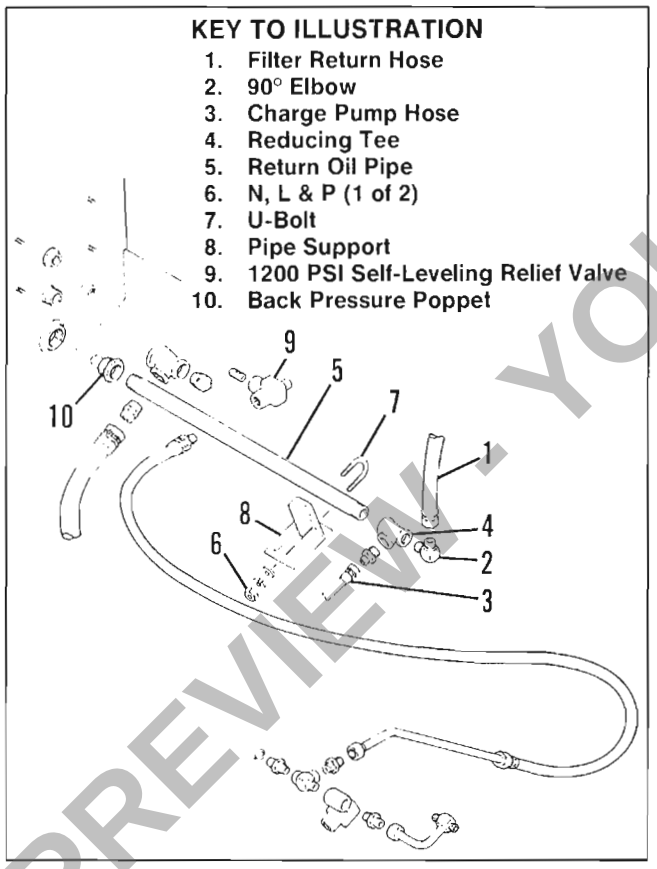


Fig. 10-21: Back Pressure Poppet

4. Disconnect the Charge Pump Hose from the Reducing Tee on the left end of Return Oil Pipe.
5. Remove (2) N, L, P and U-bolt, attaching Return Oil Pipe to Pipe Support.
6. Remove the 1200 PSI Self-leveling Relief Valve.
7. Turn Return Oil Pipe counterclockwise out of Back Pressure Poppet.
8. Using a 2″ socket, turn Back Pressure Poppet counterclockwise out of Hydraulic Reservoir.

NOTE: Back Pressure Poppet is NOT serviceble. Replace with a new assembly.

Installation

NOTE: Always apply thread sealer (preferably a liquid) to Hydraulic Pipe Fittings upon reassembly. Do NOT use thread sealer on flared or O-ring fittings. NEVER turn in pipe style Fittings too far and then loosen.

1. Using a 2″ socket, turn Back Pressure Poppet clockwise into Hydraulic Reservoir.
2. Turn Return Oil Pipe clockwise into Back Pressure Poppet.
3. Install 1200 PSI Self-leveling Relief Valve.
4. Attach Return Oil Pipe to Pipe Support with (2) N, L, P and U-bolt.
5. Connect Hydraulic Oil Filter Return Hose to the 90° Elbow on the left side of the Return Oil Pipe.
6. Connect Charge Pump Hose to the Reducing Tee on the left end of Return Oil Pipe.
7. Fill Hydraulic Oil Reservoir to the proper level.

NOTE: Always check for hydraulic oil leaks, whenever reassembling any components of the Hydraulic system. In addition, for "Oil Cooler" service, see Radiator & Oil Cooler topic in Engine Section.

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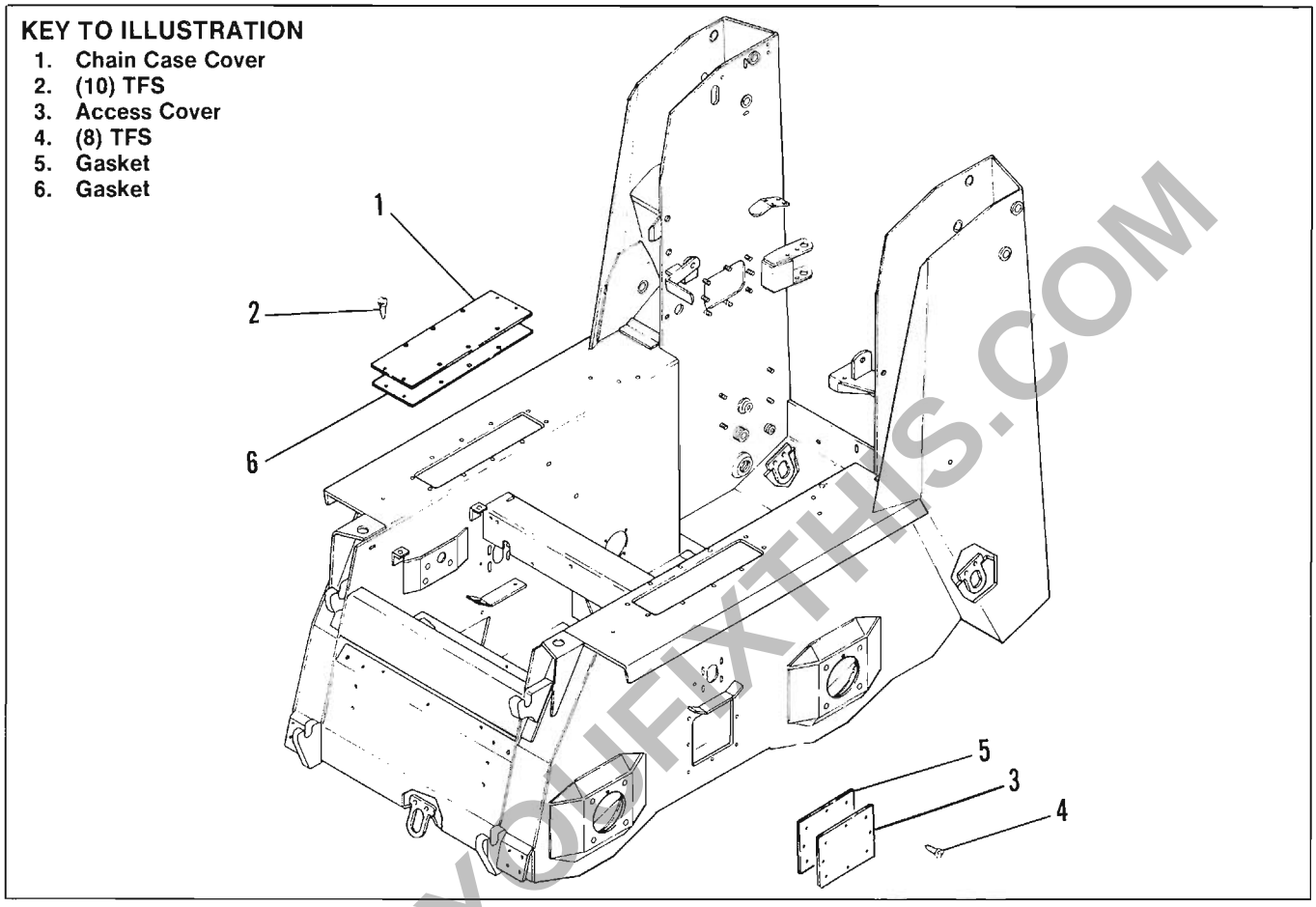


Fig. 7-6: Chain Case & Access Covers

Chain Case & Access Covers (Fig. 7-6)

Removal

1. Lock Lift Arm up and roll Overhead Guard back.
2. Remove the (10) TFS attaching Chain Case Cover to Chassis. Loosen Cover by striking top of Cover with a hammer.
3. Insert a knife or screwdriver between Gasket and Chain Case to loosen silicone-treated Gasket and remove Cover and Gasket.

NOTE: To remove Access Cover only, it is not necessary to lock Lift Arm up and roll Overhead Guard back.

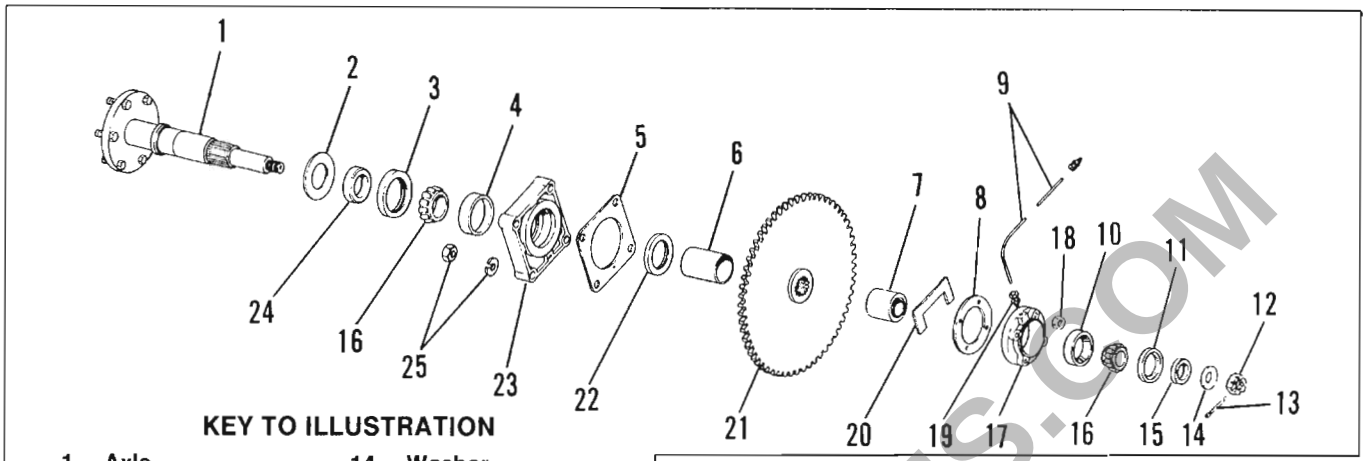
4. Securely block Skid Loader up and remove Front Wheel and Tire.
5. Remove (8) TFS attaching Access Cover to Chassis. After SN3250-SL4510 & SN3600-SL4610, (9) TFS are used.
6. Insert a knife or screwdriver between Gasket and Chassis to loosen silicone-treated Gasket and remove Cover and Gasket.

Installation

1. Apply silicone sealer to Chain Case side of Access Cover Gasket.
2. Attach Access Cover and Gasket to Chassis with (8) or (9) TFS.
3. Apply silicone sealer to Chain Case side of Chain Case Cover Gasket.
4. Attach Cover and Gasket to Chain Case with (10) TFS.
5. Roll Overhead Guard down and bolt in place.
6. Install Front Wheel and Tire. Torque Wheel Bolts from 90 to 110 ft-lbs.

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KEY TO ILLUSTRATION

1. Axle	14. Washer
2. Seal Washer	15. Rear Spacer Seal
3. Inner Oil Seal	16. Bearing Cone
4. Bearing Cup	17. Bearing Housing
5. Gasket	18. NILN (1 of 4)
6. Axle Spacer	19. Male Tube Connector
7. Inner Axle Spacer	20. Bearing Shim
8. Gasket	21. Sprocket
9. Grease Line	22. Bearing Inner Seal
10. Bearing Cup	23. Bearing Housing
11. Bearing Outer Seal	24. Axle Outer Spacer
12. Castellated Nut	25. N & L (1 each of 4)
13. Cotter Pin	

Fig. 8-20: Wheel Bearings

8. On early Skid Loaders, pull Axle outward just far enough to remove Brake Disc from Axle.

9. Remove (4) NILN, holding Bearing Housing to Frame.

10. Remove Bearing Housing with Bearing, Bearing Cup and Bearing Outer Seal.

To remove Outer Wheel Bearing:

1. Pull Axle assembly out.

2. Remove (4) N and L attaching Bearing Housing to Frame.

3. Remove Housing with Bearing, Bearing Cup, Inner Oil Seal and Outer Axle Spacer.

Installation & Adjustment

NOTE: Grease tapered Wheel Bearings, before installation. After assembly, fill cavity in Bearing casting with grease, using grease fitting. Do NOT overfill. In addition, check condition of Gaskets and replace, if necessary.

1. Attach Outer Wheel Bearing Housing, with Bearing Cup, Bearing, Seals, Outer Axle Spacer, Seal Washer and Gasket, to Frame with (4) CS, N and L.

2. Attach Inner Bearing Housing, with Bearing, Bearing Cup and Seal, to Frame with (4) CS and NILN. Leave hardware loose.

3 Push Axle inward and install Axle Spacers and Sprocket.

4. Install Shims between Inner Bearing Housing and Frame. Tighten (4) CS and NILN.

5. On early Skid Loaders, push Axle inward just far enough to install Brake Disc (Front Wheel only).

6. Push Axle inward and install Washer and Castellated Nut.

7. Tighten Axle Nut slowly and rotate Axle. If excess drag occurs, determine tight spot by removing a Shim from between Inner Bearing Housing and Frame. Do **NOT** remove Nuts from Bolts, holding Inner Bearing Housing. If **NO** drag occurs, tighten Nut to 150 ft-lbs and check for looseness. Bearing tightness is permissible, provided it is generally uniform through 360° and Axle can be turned by hand.

8. If looseness is evident, loosen Axle Nut and insert more Shims between Bearing Housing and Frame. **NO** looseness or end play should be evident, if it is shimmed properly. Different shimming, on each side or top and bottom of Bearing Housing, may be necessary.

9. Seal outer edge of Bearing Housing with silicone sealer, over Shims, to prevent oil seepage from the Chain Case.

10. Install Cotter Pin. Bend Cotter Pin so it does **NOT** extend beyond end of Axle Shaft.

11. On early Skid Loaders, install Caliper Brake assembly (on Front Wheel only).

12. Connect Grease Line to Bearing Housing at Male Tube Connector (on Rear Wheel only).

13. Install Wheel and Tire. Torque Wheel Nuts from 90 to 110 ft-lbs.

14. Adjust Drive Chains.

15. Add proper amount of oil to Chain Case, install Chain Case Cover, Access Cover and Floor Plates, if removed. Use silicone sealer on both Covers.

16. Remove blocking and roll Overhead Guard down.

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2. Install new O-ring on Cam Plate Trunnion. Insert Cam Plate in Housing. Insert Needle Bearings and the Bearing Inner Race over the Shaft and slide into the Housing. The numbered end of the Race should face outward and the chamfered I.D. **MUST** be inward.

3. Install new O-rings, around O.D. of Cam Pivot Bearings. Install Trunnion Cover and secure with Snap Ring.

4. Install Sleeve Cover and secure with Snap Ring.

5. Install Snap Ring on Shaft. Install Thrust Washer, Thrust Bearing, and second Thrust Washer. Secure with second Snap Ring.

6. Slide Washer and new Shaft Seal on Shaft and insert Shaft in Housing. Oil I.D. of Shaft Seal, before sliding on Shaft. Set Pump upright and, with a collar, drive the Shaft Seal in far enough to see the Snap Ring groove. Install Snap Ring and drive Snap Ring in, with a collar, until it seats in groove.

7. Compress the Pin Keeper and install in the Spline. Install the three Pins with head end to the inside of the block and install in the special grooves of the Piston Block Spline.

8. Install the Washer, Spring, and Washer in the Piston Block. Use the two 5/16 I.D. Washers and the 5/16 x 2-7/8 CS to compress the Spring and retain it with a Snap Ring. Remove 5/16 x 2-7/8 CS and the two Washers.

9. Install Pivot, Spider, and the Piston assemblies in the Piston Block. Hold Housing assembly up and install Piston Block assembly in the Housing assembly. Piston Shoes **MUST** be in contact with the Cam Plate. Be sure all parts are in their proper position.

10. Clamp assembly in a protected jaw vise with the open end of the Housing up.

11. Install new Gasket **DRY**. Do **NOT** allow any lubricant on Gasket clamp surface.

12. Install Back Plate.

13. Install new O-ring and backup Washers on Check Valve assembly. Install O-ring nearest Roll Pin. Install in Back Plate with Roll Pin in Back Plate.

14. Install Outer Gerotor Gear in Housing. Use STP® to lubricate Gear.

15. Install Snap Ring on Coupler. Place Key in Coupler and install Inner Gerotor and retain with Snap Ring. Install this sub-assembly into Adapter Plate. Use STP® to lubricate Gear.

16. Install O-ring in groove and hold it in place with clean clear grease. Assemble Adapter Plate on Pump Back Plate. Install (4) CS and evenly torque from 17 to 20 ft-lbs.

17. Remove Pump from vise and install Adapter Kit (Poppet, Spring and Spring Retainer). Torque Spring Retainer from 5 to 7 ft-lbs.

18. Install new O-ring and Tow Valve in Back Plate. Torque from 27 to 30 ft-lbs.

19. Install Check Valve assemblies in Back Plate.

20. Install new O-ring and Spring on Plug. Install Plugs in Back Plate and torque from 55 to 60 ft-lbs.

21. When reassembling Rear Drive Pump, install Splined Coupling onto Input Shaft.

NOTE: Check that Coupling slides in and out easily, through a full 360° rotation. Clamp Pump Shaft in a protected vise, so as NOT to damage Shaft. Rotate Pump Housing slowly, while moving Coupling in and out. At NO time, should Coupling bind. If Coupling binds, loosen (4) CS in Adapter Plate and retighten until Coupling slides in and out freely.

22. Reassemble Tandem Pump assembly. Fill Pump half full of system oil and install Charge Line, connecting the two Piston Pumps.

Pump Drive Coupling (Fig. 9-14)

Removal

1. Lock Lift Arm up, roll Overhead Guard back and remove Rear Floor Plate.

2. Remove (4) CS, L and P, attaching Engine Housing Cover to Front Engine Mount.

3. Lift Cover up slightly and slide it over to the left side and out over Tandem Pump.

4. Remove paint from end of Pump Control Arm Shafts.

5. Loosen (4) CS, holding Shaft Couplers to Pump Control Arms and Pump Shafts.

6. Pry Shaft Couplers off of Pump Shafts.

7. Remove CS, N, L and P, attaching Pump Mounting Support to Mounting Support Bracket, and LN, attaching Pump Mounting Support to Chassis.

8. Remove the Pump Mounting Support.

NOTE: Pump Mounting Support Bracket is located behind Pump Mounting Support. Pump Mounting Support has to be removed, before Pump can be slid forward.

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5. Remove (4) 3/8 SHCS.
6. Remove Pump from vise. Hold Pump in your hands and bump Shaft against wooden block, to separate Cover from Body.
7. Remove Idler Shaft and Drive Shaft from Body.
8. Remove Wear Plate, Sealing Ring, Seal Preload and Load Seal.
9. Remove Shaft Seal from Body.
10. Remove Dowel Pins from Cover.

Pump Parts Inspection

General

1. Clean and dry all parts.
2. Remove nicks and burrs, from all parts, with emery cloth.

Gear Assembly

1. Inspect both the Drive Gear and Idler Gear Shafts, at Bearing points and Seal area, for rough surfaces and excessive wear.
2. Inspect faces, of Gears, for scoring and excessive wear.
3. Check Gear teeth for sharp edges.

Body

1. Check Bearings for wear. (Bearings are **NOT** available as separate items).

Cover

1. Check for scoring on face of Cover.
2. Check inside Gear pockets, for excessive scoring or wear.

Reassembly

1. Install Dowel Pins in Cover.
2. The Load Seal, Seal Preload, Sealing Ring, Wear Plate and, Shaft Seal should be replaced as new parts. Using a collar, drive Shaft Seal into Body far enough to see Snap Ring groove.

NOTE: Install Wear Plate with bronze side facing Gears.

3. Dip Gear Assemblies into oil and install Drive Shaft into Body. Carefully work Shaft into Shaft Seal, so as **NOT** to cut rubber sealing lip. (Oil the Seal, before assembly).
4. Install Idler Gear into Body.
5. Apply a thin coat of heavy grease to face of Cover. Slip Cover over Gears and onto Body.
6. Install (4) 5/16 and (4) 3/8 SHCS and draw up evenly.
7. Install Snap Ring into body and be sure it seats in groove.
8. Rotate Pump Shaft, by hand or with pliers. Pump will have a small amount of drag, but will turn freely after a short period of use.

Hydraulic Oil Filter (Fig. 10-10)

Removal

NOTE: Always clean exterior of Filter, before disconnecting any Hydraulic Lines. When removing Hydraulic Lines, cap ends to prevent contamination from getting into Hydraulic system. Fasten Hydraulic Lines in an upright position immediately after removing, to prevent more oil loss.

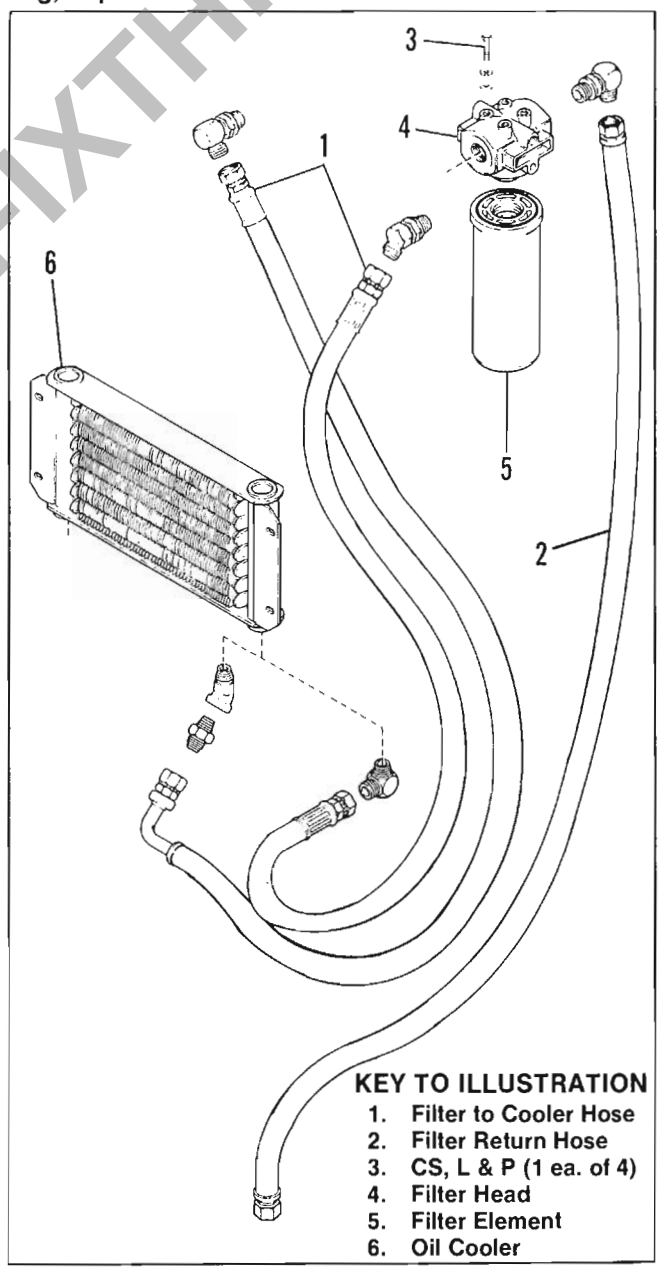


Fig. 10-10 Hydraulic Oil Filter

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PROBLEM	CAUSE	CORRECTIVE ACTION
Engine will **NOT** turn over.	Battery connections are loose or corroded.	Clean the Battery terminals and retighten them.
	Battery discharged.	Check battery and recharge.
	Seat-actuated Safety Switch is not operation properly.	Replace Seat-actuated Switch. Check and readjust Switch or Stop Bolt — Earlier units only.
	Starter circuit Fuse is blown. Ignition Switch defective.	Replace Starter 25 ampere fuse. Check by jumping Starter to start Engine. If necessary, replace Ignition Switch.
	Wire lead connections to and from Ignition Switch and Safety Seat-actuated Switches are loose or disconnected.	Check all terminals and connections for loose or broken leads.
	Seat-actuated Switch not properly set.	Check and readjust Seat-actuated Switch or Stop Bolt — Earlier units only.
	Operator Restraint Bar not lowered. Starter Solenoid is defective.	Lower Restraint Bar. Replace Solenoid.
Engine turns over but will not start.	Fuel Tank is empty.	Check Fuel Gauge and refill Tank. On SL4610 only, if Tank was run dry, system will require deaerating before attempting to start. See Diesel Engine manual for deaerating procedures.
	Spark Plugs are fouled. (SL4510 only).	Clean and regap Plugs. Replace Plugs if necessary.
	Fuel is not reaching carburetor. (SL4510 only).	Check Fuel Filter; clean or replace. Check Fuel Pump.
	Points are improperly gapped. (SL4510 only).	Replace Points and reset gap to .032.
	Timing is off. (SL45110 only).	Reset timing to 10° - 12° BTDC.
	Air or moisture in fuel line.	See Engine Manual.
	Throttle open too far.	Position Throttle Lever about ¼ throttle.
	Throttle Control is in "shutdown" position. (4610 only).	Move Throttle lever to about ¼ throttle.
	Pump is not pumping fuel. (SL4610 only).	See Engine Manual.

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