TEREX®

Service Manual

Skid Steer Loader

TSR-50/60

Part Number: 7000-756
Printed (12-10)

Table of Contents

1. Product Safety

Chapter Overview

This chapter contains product safety information for the Terex TSR-50/60 Skid Steer Loaders. Read and understand all product safety information before attempting to service any Skid Steer Loader.

Safety Alert Symbol
This symbol means: **Attention! Be alert! Your safety is involved!**

The safety alert symbol is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

This symbol is used as an attention-getting device throughout this manual as well as on decals and labels fixed to the machinery to assist in potential hazard recognition and prevention.

Property or equipment damage warnings in this publication are identified by the signal word "NOTICE".

NOTICE

“NOTICE” Indicates a hazardous situation which, if not avoided, could result in property or equipment damage.

The word “Note” is used throughout this manual to draw your attention to specific topics or to supplement the information provided in that section.

Improper or incomplete maintenance/repair of a Skid Steer Loader can be dangerous and may result in machine damage, injury or death.

Do not attempt to perform any type of repair or maintenance on a Skid Steer Loader until you have read and fully understood both this manual and the machine specific operation and maintenance manual.

Refer to the Operation and Maintenance manual for instructions regarding proper machine operation and maintenance techniques before operating or servicing any Skid Steer Loader.

The person(s) in charge of servicing a Skid Steer Loader may be unfamiliar with many of the systems on the machine. This makes it especially important to use caution when performing service tasks. Familiarize yourself with the affected system(s) and components before attempting any type of maintenance or service.

It is not possible to anticipate every potential hazard. The safety messages included in this document and displayed on the machine are not all-inclusive. They are intended to make you aware of potential risks and encourage a safe approach to performing service work.

If you use a tool, procedure, work method or operating technique that is not specifically recommended by Terex, you must satisfy yourself that it is safe for you and others. You must also ensure that the machine will not be damaged or be made unsafe by the operation, lubrication, maintenance or repair procedures that you choose.

Basic Precautions

Safety Labels

Safety labels have been included and are displayed in various places throughout the machine to serve as warnings of potentially dangerous conditions. Read and understand all "Safety" labels on any Skid Steer Loader before attempting to operate, maintain or repair it. Replace any damaged, illegible or missing labels immediately, prior to service.

Personal Protective Equipment

Personal protection equipment is recommended when performing maintenance or service on a machine. Always wear appropriate protective equipment for working conditions when working on or around the machine. Loose clothing should not be worn and long hair should be restrained. Wear hard hats, protective face/eyewear, safety shoes and any other equipment necessary to ensure your safety and the safety of others around you as you work.

Entering and Exiting

Always use steps and handholds when entering or exiting a Skid Steer Loader. Clean any foreign materials from steps or work platforms before using them. Always face the machine when using steps and handholds. When it is not possible to use the designed entry/exit system, utilize appropriate ladders, scaffolds, or work platforms to safely gain access to the machine.

Lifting

Use a hoist when lifting components that weigh 50 lb (23 kg) or more, to avoid back injury. Make sure all chains, hooks, slings, etc., are in good condition and are of the correct capacity. Be sure hooks are positioned correctly and equipped with a spring latch. Lifting eyes are not to be side loaded during a lifting operation.

Hot Fluids and Components

Stay clear of hot components and system fluids of the engine, exhaust, radiator/oil cooler and hydraulic lines/tubes. Also, use caution when removing fill caps, breathers and plugs on the machine. Hold a rag over the cap or plug to prevent being sprayed or splashed by liquids under pressure. Be especially careful if the machine has been operated recently, fluids may still be hot.

To ensure your safety, allow the machine to cool before attempting any service procedure that involves hot fluids or components.

Corrosion Inhibitor

Corrosion inhibitor contains alkali. Avoid contact with eyes. Avoid prolonged or repeated contact with skin. Do not take internally. In case of contact, wash skin immediately with soap and water. For eyes, flush with large amounts of water for at least 15 minutes. Call Physician. Keep out of reach of children.

Batteries

Do not smoke when inspecting the battery electrolyte level. Never disconnect any charging unit circuit or battery circuit cable from the battery when the charging unit is operating. A spark can cause an explosion from the flammable vapor mixture of hydrogen and oxygen that is released from the electrolyte through the battery outlets. Do not let electrolyte solution make contact with skin or eyes. Electrolyte solution is an acid. In case of contact, immediately wash skin with soap and water. For eyes, flush with large amounts of water for at least 15 minutes. Call Physician. Keep out of reach of children.

Pressurized Items

1. Do not use hands or any other body part to check for fluid leaks in the hydraulic system. Always use a solid material like wood or metal to check for this type of leak. Leaking fluid under pressure can penetrate body tissue. Fluid penetration can cause serious injury or death.

Fluid injected into skin must be surgically removed within a few hours by a doctor familiar with this type of injury or gangrene will result.

2. Relieve pressure from the hydraulic system before disconnecting or removing any lines, fittings or related items. Do this by relaxing all hydraulic actuators. If the lift arms are raised, make sure they are securely braced. Be alert for possible pressure release when disconnecting any device from a pressurized system.

3. Lower the lift arms before performing any work on the machine. If this cannot be done, make sure they are securely braced to prevent them from dropping unexpectedly during service.

4. Loose or damaged fuel, oil, hydraulic, lines, tubes and hoses can cause fires. Do not bend or strike high pressure lines or install ones that have been bent or damaged. Check lines, tubes and hoses carefully. See item 1 for precautions on checking for fluid leaks.

5. Pressurized air or water can also cause injury. When pressurized air or water is used for cleaning, wear a protective face shield, protective clothing, and protective shoes. The recommended maximum air pressure for cleaning purposes is 30 psi (205 kPa). When using a pressure washer, keep in mind that nozzle pressures are typically very high. Generally, pressures are well above 2000 psi (13790 kPa). Follow all recommended practices provided by the pressure washer manufacturer.

Repair

Accidental machine starting can cause injury or even death to personnel working on a Skid Steer Loader.

As a precaution, disconnect the battery cables from the battery terminals, tape the battery clamps and remove the key from the ignition switch prior to performing any service work on a Skid Steer Loader.

Place a "Do Not Operate" tag prominently on the machine to inform personnel that the machine is being serviced.

1. Disconnect the battery and discharge any capacitor before beginning work on a machine. Attach a **Do Not Operate** tag in the cab to alert any operator that service is in progress.
2. If possible, make all repairs with the machine parked on a level, hard surface. Use blocks to prevent the machine from rolling while working on or under the machine.
3. Do not work on or under any machine that is supported only by a hydraulic jack or hoist. Always use suitable mechanical supports to ensure that the machine will not fall.
4. Make sure the work area around the machine is safe and make yourself aware of any hazardous conditions that may exist. If the engine needs to be started inside an enclosure, make sure that the engine's exhaust is properly vented.
5. Be sure all protective devices including guards and shields are properly installed and functioning correctly before beginning any service task. If a guard or shield must be removed to perform the repair work, use extra caution.
6. Always use the appropriate tools for the work to be performed. Tools should be in good condition and you should understand how to use them properly before performing any service work.
7. When replacing fasteners, use parts of equivalent grade and size. Do not use a lesser quality fastener if replacements are necessary.
8. Be prepared to stop an engine if it has been recently overhauled or the fuel system has been recently serviced. If the engine has not been assembled correctly, or if the fuel settings are not correct, the engine can possibly overspeed and cause bodily injury, death or property damage. Be prepared to shut off the fuel and air supply to the engine in order to stop the engine.
9. Be careful when removing cover plates. Back off the last two bolts or nuts located on opposite sides of the cover slightly, but leave them threaded in place. Then, pry the cover loose to relieve any spring or other pressure before removing the last two nuts or bolts completely.
10. Repairs requiring welding should be performed only by personnel adequately trained and knowledgeable in welding procedures and with the guidance of appropriate reference information. Determine the type of metal being welded and select the correct welding procedure and filler material to provide a weld that is as strong or stronger than the original weld.
11. Take precautions to avoid damaging wiring during removal and installation operations. Carefully route wires so that they will not contact sharp corners, objects or hot surfaces during operation.
12. When performing service that requires the lift arms to be in the raised position, always utilize the lift arm brace located on the rear of the loader tower.
13. Relieve hydraulic system pressure by relaxing all hydraulic actuators prior to attempting any hydraulic maintenance or repair.
14. Always tighten connections to the correct torque specification. Make sure that all shields, clamps and guards are installed correctly to avoid excessive heat, vibration or unwanted contact between parts during operation. Shields that protect exhaust components from oil spray in event of a line, tube or seal failure must be correctly installed.
15. Do not operate a machine if any rotating part is damaged or contacts other parts during operation. Any high speed rotating component that has been damaged or altered should be checked for balance before reusing. Make sure all protective devices, including guards and shields, are properly installed and functioning correctly before starting the engine or operating the machine.

When replacement parts are required for your machine, use only genuine Terex replacement parts or parts that meet or exceed original specifications including, but not limited to physical dimensions, type, strength and material.

Installing lesser components can lead to premature failures, product damage, personal injury or death.

⚠ Attachments

Only use attachments that are recommended by Terex.

Make sure that all necessary guards and protective equipment are in place and functioning prior to operating any attachment.

Wear protective glasses and protective equipment as required by conditions or as recommended in the attachment specific operation manual.

Ensure that all personnel are far enough away from the work area so they will not be struck by flying objects.

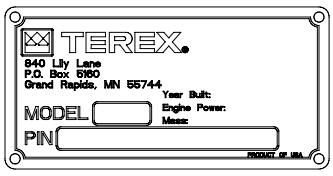
Stay clear of the cutting edges, pinching surfaces or crushing surfaces of the attachment while performing any attachment maintenance, testing or adjustments.

⚠ Machine Labels and Decals

Labels and decals placed on the machine provide safety information and operating instructions. Familiarize yourself with the location and significance of these labels to ensure your safety.

Product Identification Number

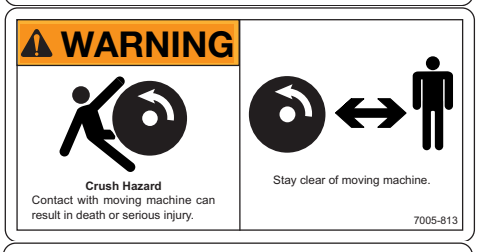
The Product Identification Number (PIN) is located on the front of the cab enclosure (figure 1-1). Always provide the PIN when contacting the dealer about parts, service, warranty or accessories. No warranty claims will be processed unless the PIN is provided.

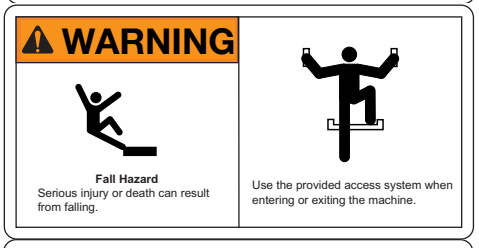


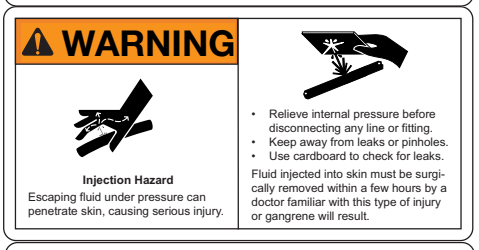
1-1

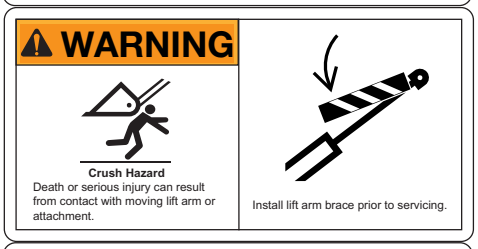
Safety Label Examples

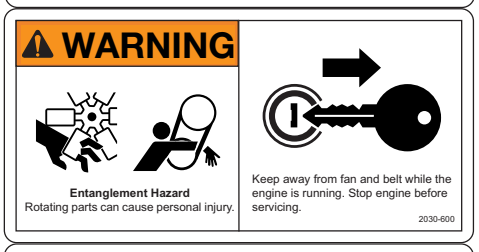
Examples of the labels and decals displayed on the machine are shown on this page.

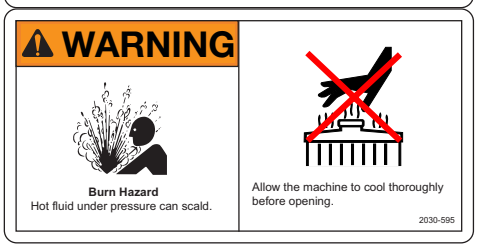












⚠ WARNING

Improper operation or maintenance can result in serious injury or death.

Read and understand the operator's manual and all safety signs prior to operating or maintaining the machine.

⚠ WARNING

Fall Hazard
Falling can result in serious injury or death.

Do not use the bucket/attachment as a work platform.

NOTICE

Fire Hazard
Flammable debris can collect near hot components and lead to a fire.

Read Operator's Manual
Keep the engine, exhaust and chassis areas free of debris.

⚠ WARNING

Crush Hazard
Machine rollover can result in death or serious injury.

Always fasten Seat Belt

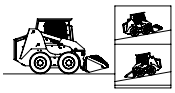
⚠ WARNING

Fall Hazard
Falling from a machine can result in death or serious injury.

No Riders

⚠ WARNING

Rollover/Ejection Hazard
Death or serious injury can result.



Carry loads low. Load unload and turn on level ground. Travel on inclines with heaviest end of machine uphill.

⚠ DANGER

Explosion/Burn Hazard
Will cause death, burns or blindness due to ignition of explosive gasses or contact with corrosive acid.

- **Keep all flames/sparks away!**
- **No Smoking!**
- **Read and understand all manuals prior to operation.**

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2. Technical Specifications & Service Tools

TSR-50/60 single speed / flow

Engine (TSR 50)
- Model: Perkins 404D-22
- Displacement: 2.2 liter
- Gross horsepower: 50 hp (37.3 kW)
- Torque: 105 lb-ft., 143 Nm
- Idle rpm: 1175 (low idle), 2800 (high idle)
- Average water /thermostat temperature: 190°F, 87.8°C

Engine (TSR 60)
- Model: Perkins 404D-22 T
- Displacement: 2.2 liter
- Gross horsepower: 60 hp (44.7 kW)
- Torque: 140 lb-ft., 190 Nm
- Idle rpm: 1175 (low idle), 2800 (high idle)
- Average water /thermostat temperature: 190°F, 87.8°C

Drive Pumps
- Model: A22VG (38.5cc) tandem (Rexroth)
- Displacement: 2.349 in3/rev (38.5 cc/rev)
- Relief pressure: 5500 psi (380 bar)
- Flow: 28 gpm (106 lpm) @ 2800 rpm (high idle)

Charge Pump
- Displacement @ 1.098 in3/rev (18 cc/rev)
- Relief pressure: 400-450 psi (2758-3103 kPa)
- Flow: 13.5 gpm (51.1 lpm) @2800 rpm

Drive Motors
- Model: Rexroth MCR3
- Displacement: 24.4 in3/rev (400 cc/rev)

Controls (Joysticks)
- Model: Rexroth R908353009 (LH)
- Model: Rexroth R908352996 (RH)
- Type: Pilot

Auxiliary Pump
- Model: Barnes Haladex
- Type: Gear pump
- Displacement: 1.343 in3/rev (22 cc/rev)
- Aux. Flow: 17.4 gpm (65.9 lpm) @ 2800 rpm
- Aux. Flow Relief Pressure: 3300 psi (22,750 kPa)
- LS (Standby) Pressure: 218 psi (1,503 kPa)
- Cooling/filtering: Oil is filtered at all times and is cooled at all times with the exception of an 80 psi cooler bypass valve to prevent excessive pressure in the cooling system when the oil is cold.

Lift Arm Control Valve
- Make: Husco
- Model: 9610-CXX

Oil Cooler
- Operating pressure: 150 psi (1034 kPa)
- Bypass relief pressure: 80 psi (689 kPa)
- Hot oil sending unit: 225°F (107.2°C)
- Avg. oil operating temp. 50-60°F / 28-33°C above ambient.
  (High flow application 80°F / 44°C above ambient.)

Critical Torque Specs
- Drive Pump Mounting Bolts
  -- 85 ft-lb. w/Blue Loctite
- Wheel Lug Nuts
  -- 150 ft-lb.+ / - 8 / 203 Nm -Dry
- Drive Motor Mounting Bolts
  -- 88 ft-lbs. / 119 Nm -Dry
- Pod Mounting Bolts
  -- 150 ft-lb.+ / - 8 / 203 Nm -Dry
- Front/Rear Drive Sprocket Retaining Bolts
  -- 190 ft-lb. / 258 Nm -Dry
- Center (Drive Motor) Sprocket Retaining Bolts
  -- 65 ft-lb. / 88 Nm -Dry

Service Tools

Listed below are common service tools which are identified and utilized in the service procedures described in this manual. Use tools recommended by Terex whenever possible to reduce risk of injury and or machine damage during service.

- Heavy Duty Hydraulic Jack (5-ton rating)
- Test Gauge Kit (TEREX P/N: 0402-935)
- Ratchet Strap
- Long Pry Bar(s)

TSR-50/60 two speed / flow

Engine (TSR 50)

- Model: Perkins 404D-22
- Displacement: 2.2 liter
- Gross horsepower: 50 hp (37.3 kW)
- Torque: 105 lb-ft., 143 Nm
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- Model: Perkins 404D-22 T
- Displacement: 2.2 liter
- Gross horsepower: 60 hp (44.7 kW)
- Torque: 140 lb-ft., 190 Nm
- Idle rpm: 1175 (low idle), 2800 (high idle)
- Average water /thermostat temperature: 190°F, 87.8°C

Drive Pumps

- Model: A20VG45 tandem (Rexroth)
- Displacement: 1.71 in3/rev (28 cc/rev)
- Relief pressure: 5500 psi (380 bar)
- Flow: 20.7 gpm (78.4 lpm) @ 2800 rpm (per pump)

Charge Pump

- Displacement @ 1.098 in3/rev (18 cc/rev)
- Relief pressure: 400-450 psi (2758-3103 kPa)
- Flow: 13.5 gpm (51.1 lpm) @2800 rpm

Drive Motors

- Model: Rexroth MCR3
- Displacement (High): 12.2 in3/rev (200 cc/rev)
- Displacement (Low): 24.4 in3/rev (400 cc/rev)

Controls (Joysticks)

- Model: Rexroth R908353009 (LH)
- Model: Rexroth R908352996 (RH)
- Type: Pilot

Auxiliary Pump

- Model: Barnes Haladex
- Type: Gear pump
- Displacement: 1.343 in3/rev (22 cc/rev)
- Aux. Flow: 17.4 gpm (65.9 lpm) @ 2800 rpm
- Aux. Flow Relief Pressure: 3300 psi (22,750 kPa)
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- Cooling/filtering: Oil is filtered at all times and is cooled at all times with the exception of an 80 psi cooler bypass valve to prevent excessive pressure in the cooling system when the oil is cold.

Lift Arm Control Valve

- Make: Husco
- Model: 9610-CXX

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- Operating pressure: 150 psi (1034 kPa)
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- Hot oil sending unit: 225°F (107.2°C)
- Avg. oil operating temp. 50-60°F / 28-33°C above ambient.
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Critical Torque Specs

- Drive Pump Mounting Bolts
  -- 85 ft-lb. w/Blue Loctite
- Wheel Lug Nuts
  -- 150 ft-lb.+ / - 8 / 203 Nm -Dry
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- Pod Mounting Bolts
  -- 150 ft-lb.+ / - 8 / 203 Nm -Dry
- Front/Rear Drive Sprocket Retaining Bolts
  -- 190 ft-lb. / 258 Nm -Dry
- Center (Drive Motor) Sprocket Retaining Bolts
  -- 65 ft-lb. / 88 Nm -Dry

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- Heavy Duty Hydraulic Jack (5-ton rating)
- Test Gauge Kit (TEREX P/N: 0402-935)
- Ratchet Strap
- Long Pry Bar(s)

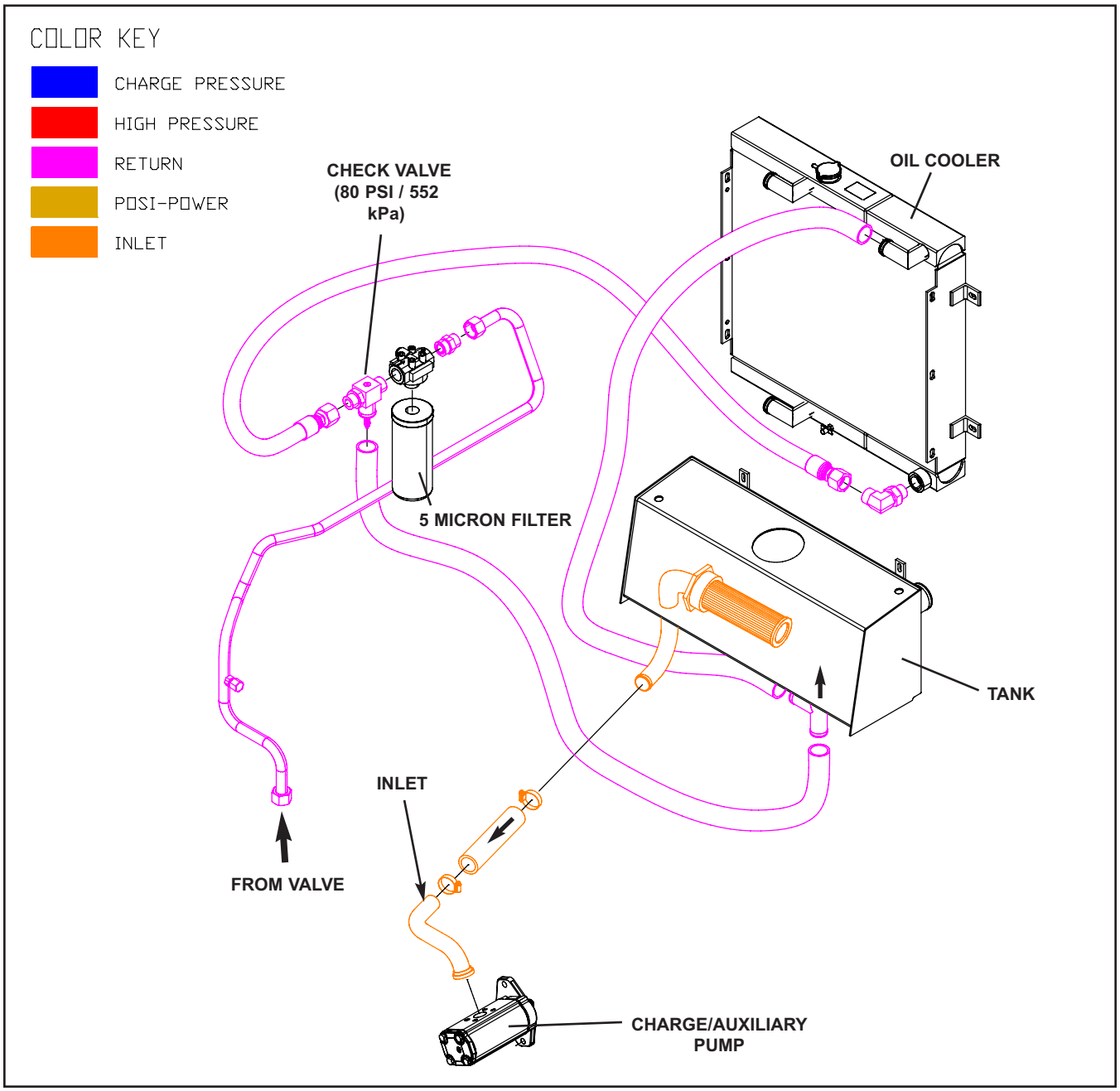
3. Circuit Diagrams

Chapter Overview

This chapter contains diagrams for the following TSR-50/60 circuits: hydraulic filtering/cooling circuit, hydraulic control/auxiliary circuit, hydraulic drive circuit (single speed), hydraulic drive circuit (two speed), lift arm control valve, hydraulic solenoid blocks, drive control routing, lift arm control routing and electrical attachment outlet.

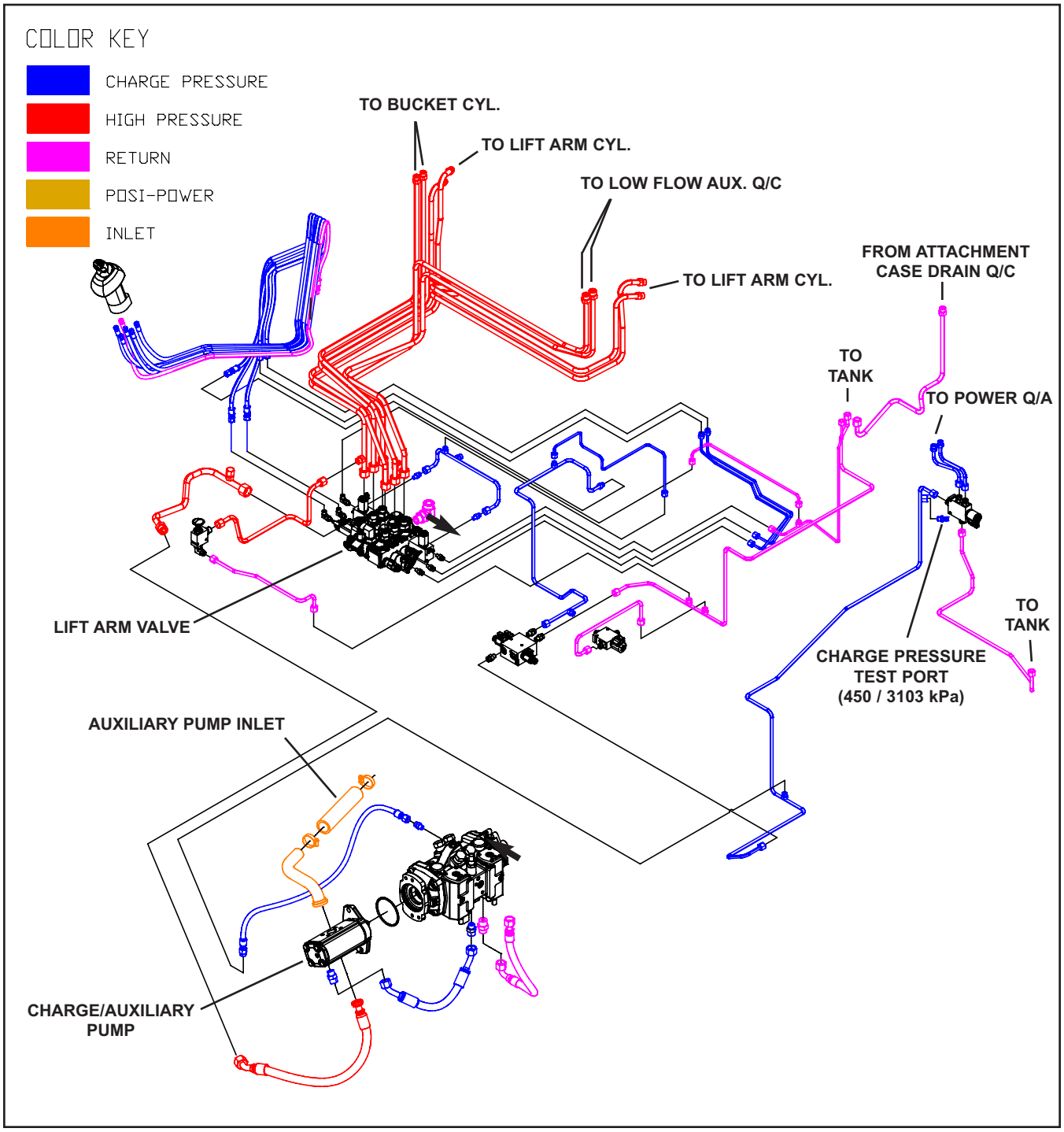
Hyd. Filtering/Cooling Circuit

Figure 3-1 TSR-50-60 Hyd. Filtering/Cooling Circuit



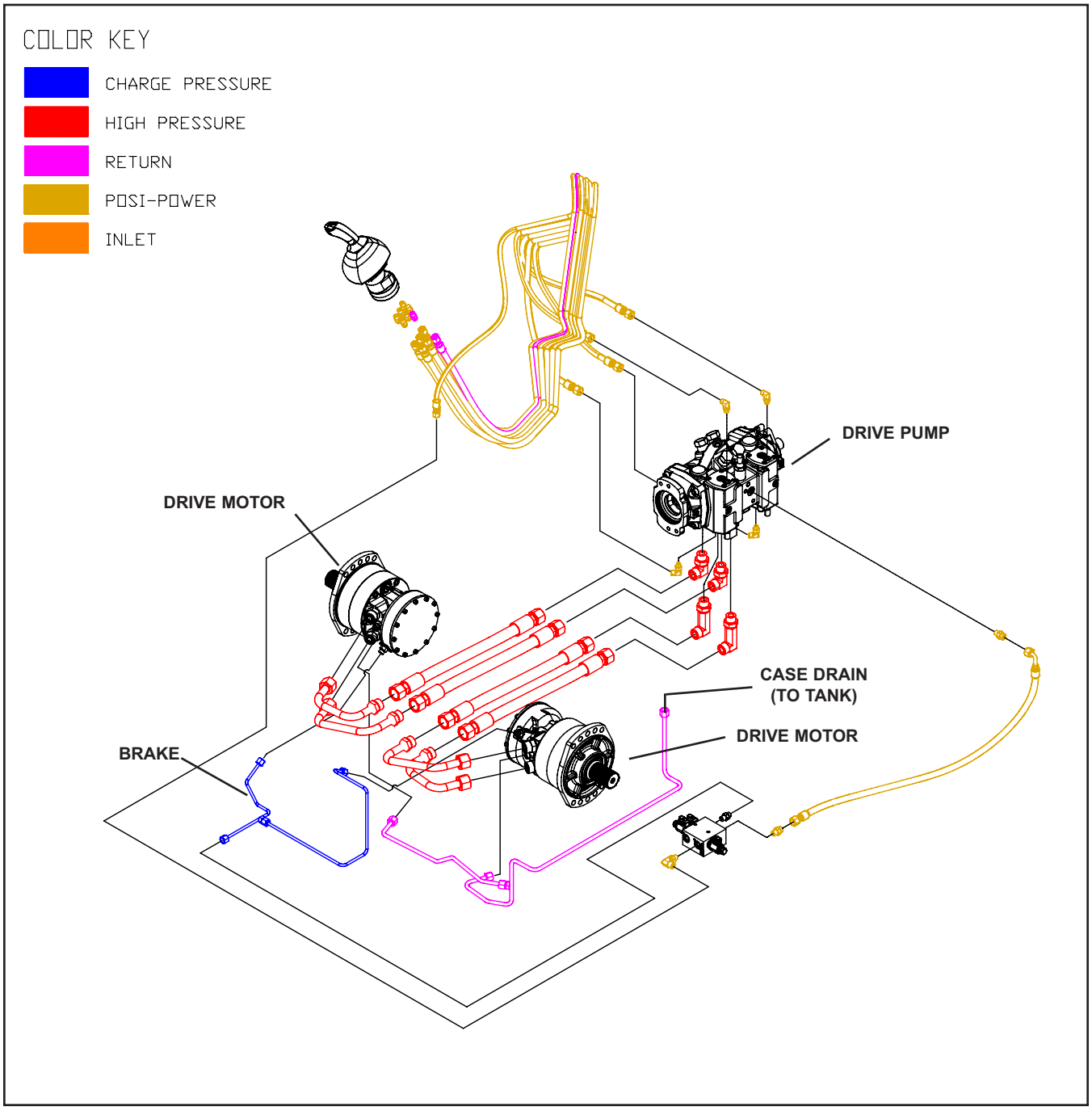
Hydraulic Control/Auxiliary Circuit

Figure 3-2 TSR-50/60 Control Auxiliary Circuit



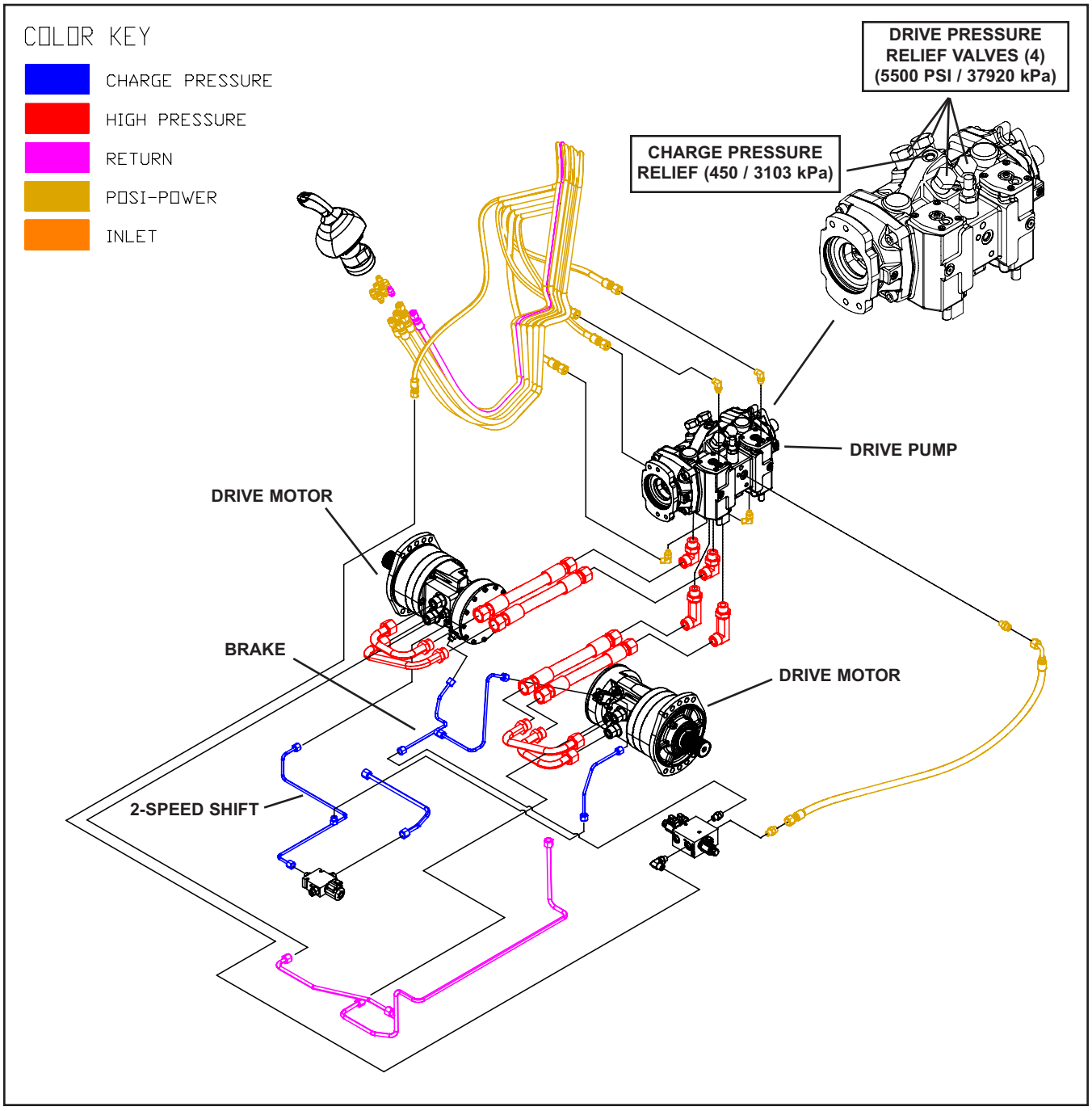
Hydraulic Drive Circuit (1-spd)

Figure 3-3 TSR-50/60 Hydraulic Drive Circuit (1-spd)



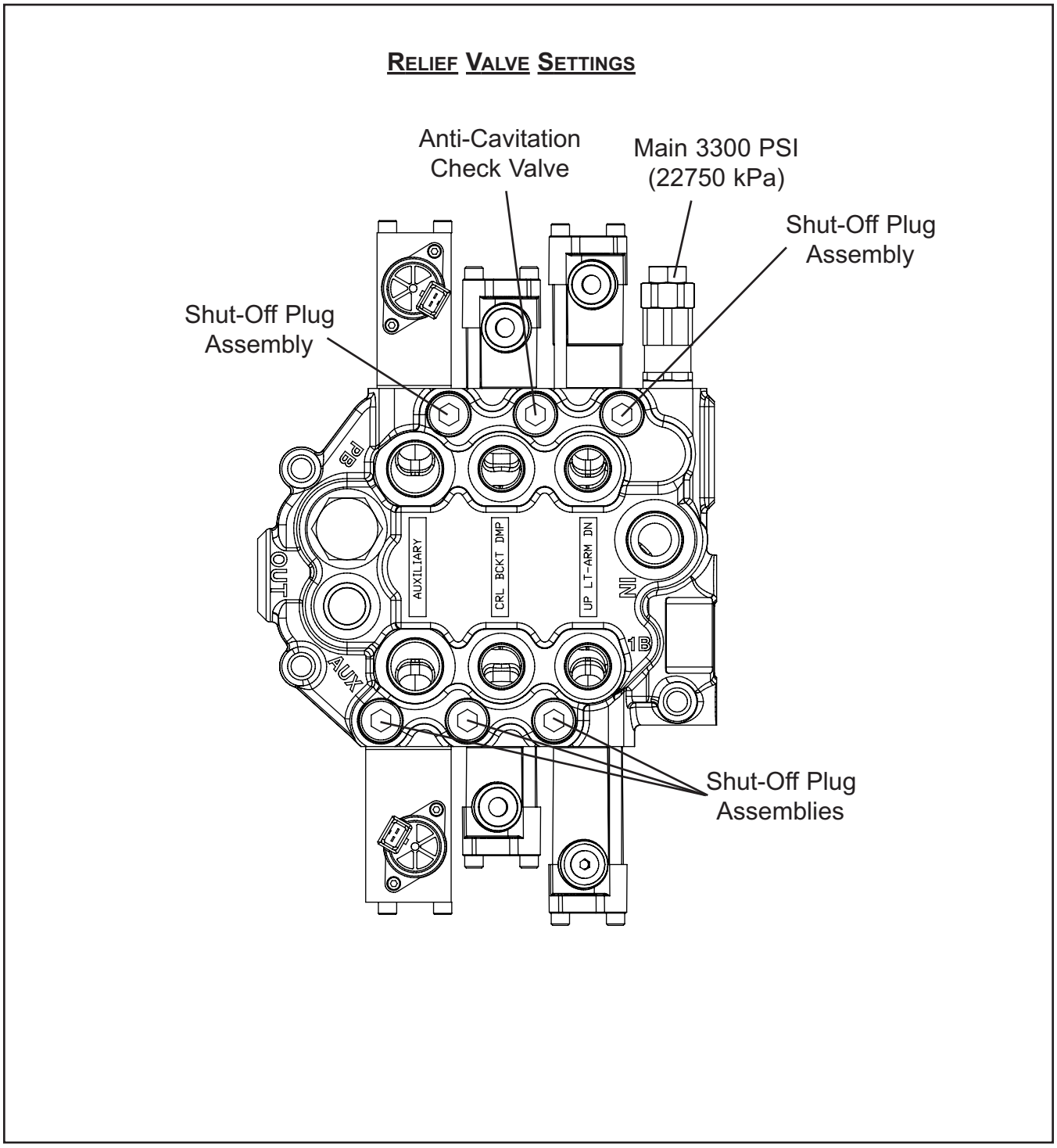
Hydraulic Drive Circuit (2-spd)

Figure 3-4 TSR-50/60 Hydraulic Drive Circuit (2-spd)



Lift Arm Control Valve

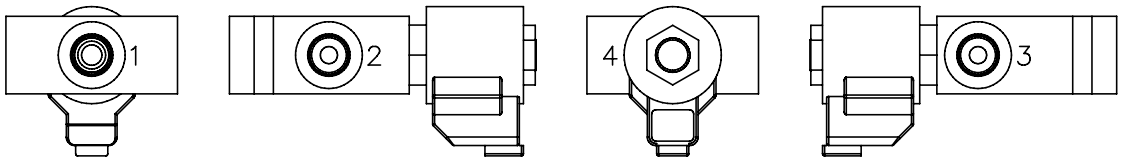
Figure 3-5 TSR-50-60 Lift Arm Control Valve



Hydraulic Solenoid Blocks

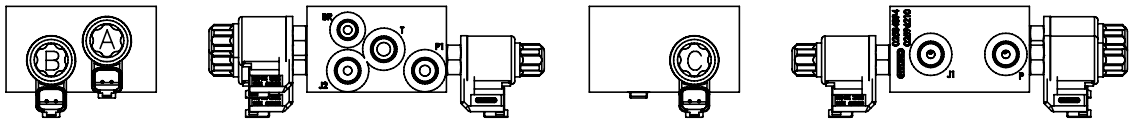
Figure 3-6 TSR-50/60 Hyd. Solenoid blocks

2–Speed Block



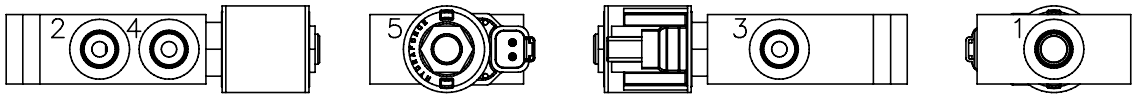
1 – 2–speed (outlet to drive motors)
2 – Pressure (inlet from joystick)
3 – Return to tank
4 – 2–Speed activation solenoid

Pilot Generation Block



P – Quick Attach (inlet from drive pump)
J1 – Drive Control (outlet to joystick)
P1 – Pressure (inlet from drive pump)
T – Return to tank
BR – Brake (outlet to brake ports)
J2 – Lift Arm Control (outet to joystick)
A – Brake Solenoid
B – Safety Solenoid
C – Drive Solenoid

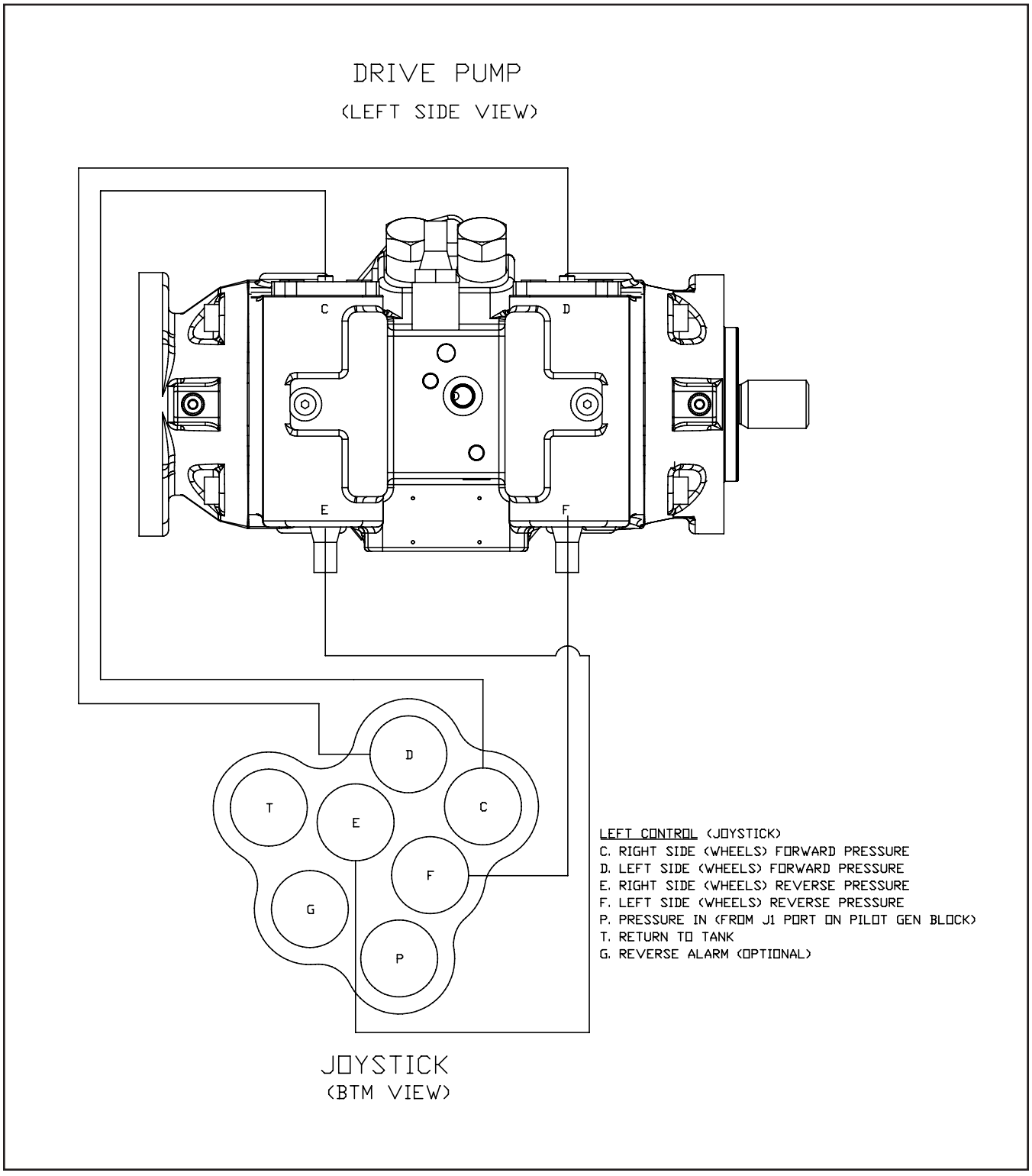
Quick Attach Block



1 – Pressure (inlet from drive pump)
2 – Quick attach (outlet to Q/A cylinders)
3 – Return to tank
4 – Quick attach (outlet to Q/A cylinders)
5 – Power Q/A activation solenoid

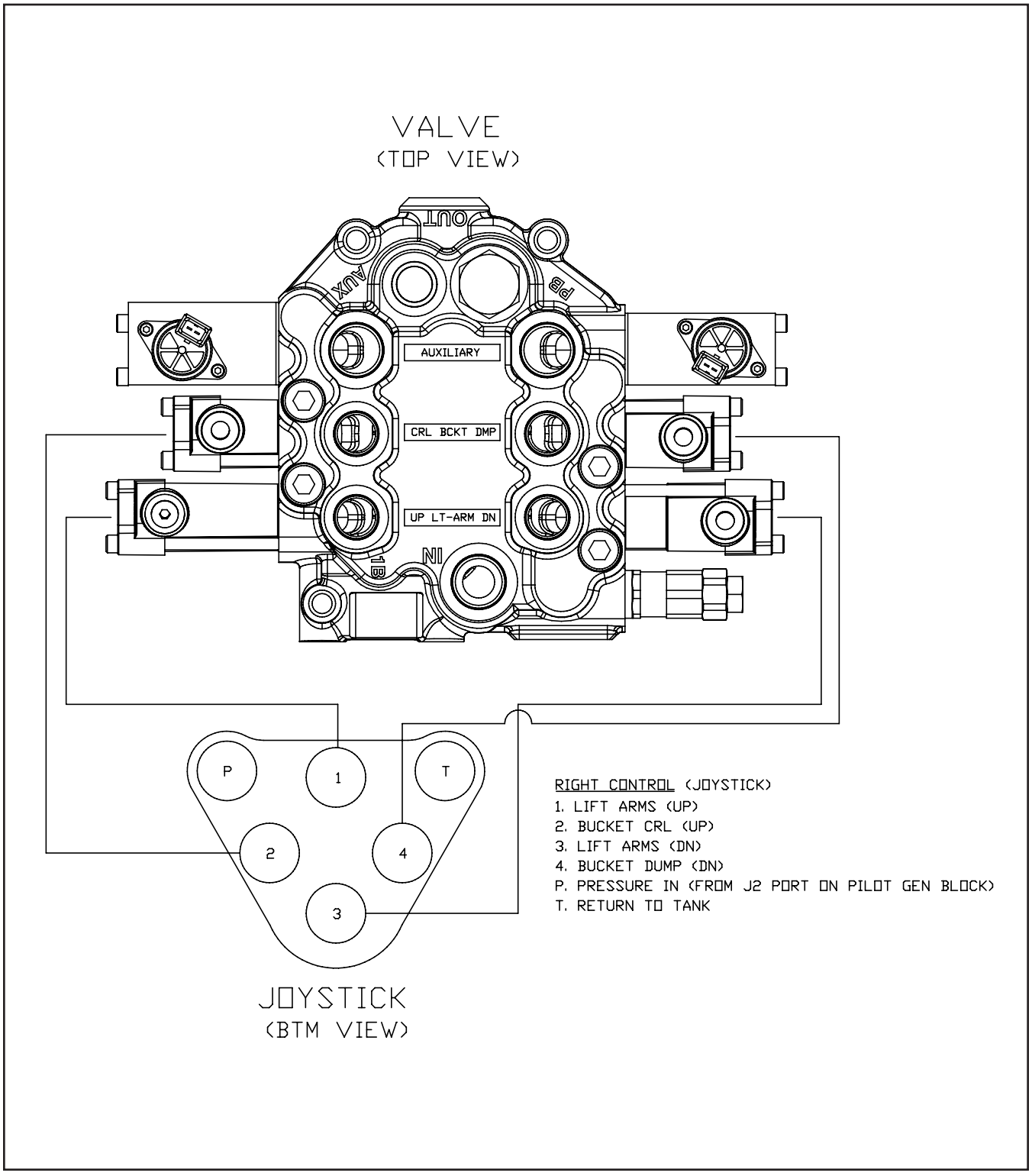
Drive Control Routing

Figure 3-7 TSR-50/60 Drive Routing



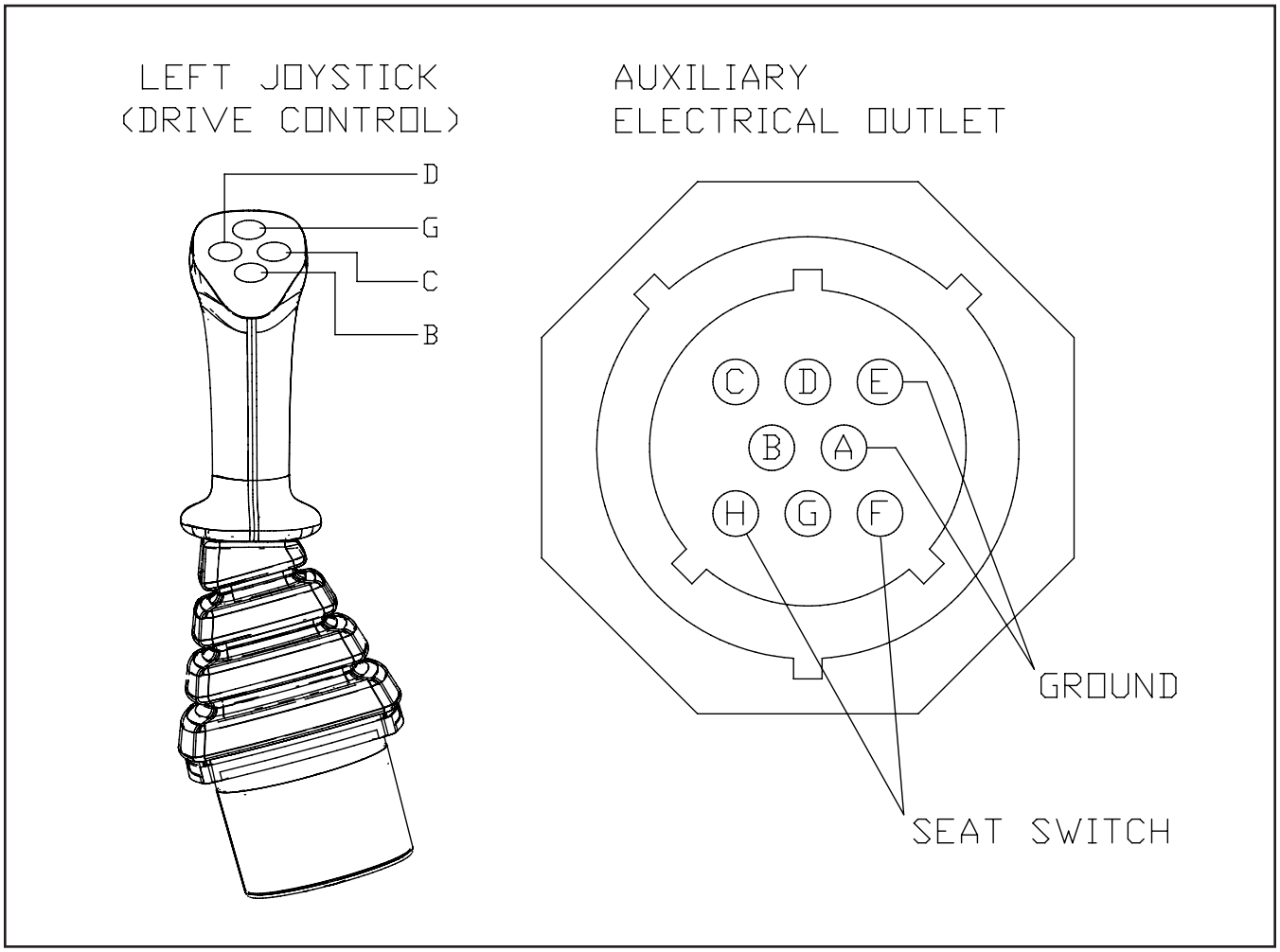
Lift Arm Control Routing

Figure 3-8 TSR-50/60 Lift Arm Routing



Electrical Attachment Outlet

Figure 3-9 TSR-50/60 Electrical Attachment Outlet



4. Maintenance

Chapter Overview

This chapter provides information on general maintenance procedures for the TSR-50-60. If there is an issue that requires troubleshooting, refer to Chapter 16, Troubleshooting.

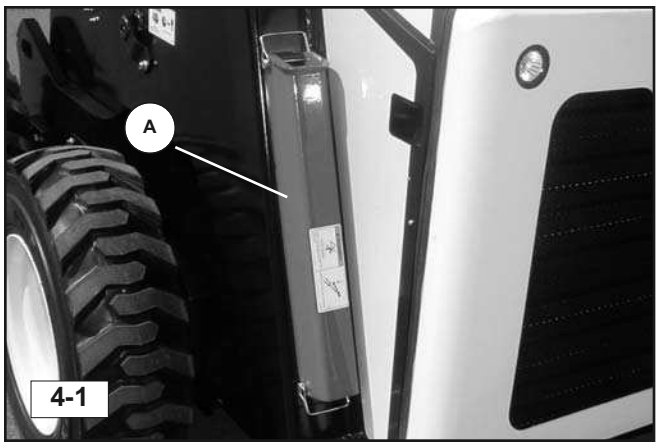
Personal Safety

Improper or incomplete maintenance/repair of a Skid Steer Loader can be dangerous and may result in machine damage, injury or even death.

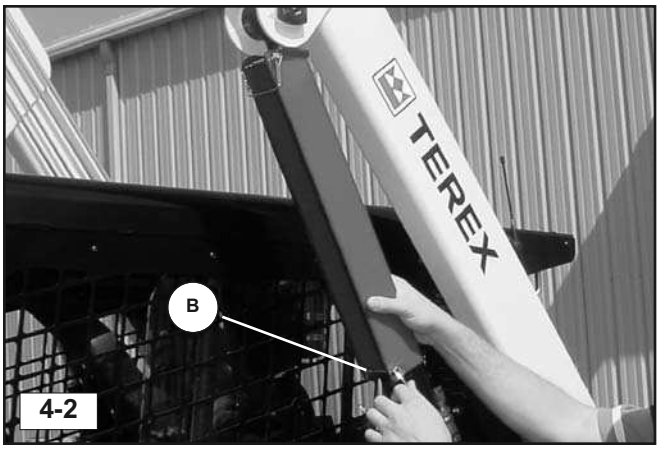
Do not attempt to perform any type of repair or maintenance on a Skid Steer Loader until you have read and fully understood the information in this manual.

Refer to the Operation and Maintenance manual for instructions regarding proper machine operation techniques before operating any Skid Steer Loader.

Prior to performing any type of service work on a Skid Steer Loader, read and understand Chapter 1 (Product Safety) for personal safety information.



4-1



4-2

Lift Arm Brace

The lift arm brace (item A, figure 4-1) is intended to keep service personnel safe when it is necessary to work on a machine with the lift arms in the raised position. It is not safe to rely on the hydraulic system to hold the lift arms in the raised position just as it is not safe to crawl under a machine supported only by a jack. The lift arm brace is used to support the weight of the lift arms much like jack stands are used to mechanically support vehicle weight.

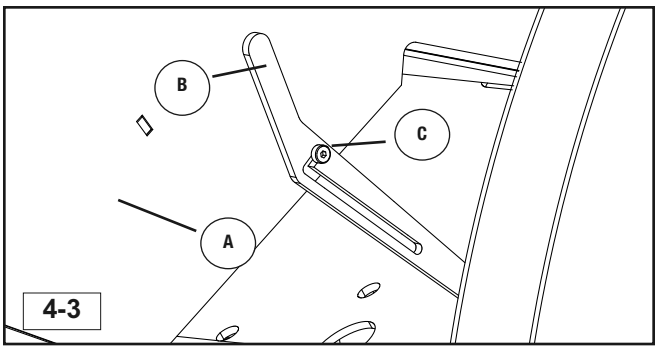
To install the lift arm brace:

1. Park the machine on level ground in a safe area for performing service work.
2. Remove any attachments that may be fastened to the quick attach.
3. Have an assistant remove the retaining pins (item B, figure 4-2) securing the lift arm brace and remove it from the machine.
4. Make sure bystanders are clear of the lift arms, then raise them to the upper limit.
5. Have an assistant Install the brace around the cylinder shaft as shown and reinstall the pins to secure it to the cylinder.
6. Lower the lift arms slowly until they come to rest on the brace.
7. It is now safe to shut the engine off and exit the machine.

Do not work on or near the machine with the lift arms in the raised position unless the lift arm brace has been correctly installed.

To remove the lift arm brace:

1. Start the machine and raise the lift arms until they are clear of the brace.
2. Once clear, have an assistant remove the brace from the cylinder and stow it on the machine with the pins.
3. Once the brace has been stowed and the assistant is clear of the lift arms, lower the arms to the ground and shut the engine off to complete the procedure.



Tilt-Up Cab (figure 4-3)

The ROPS/FOPS approved cab (A) tilts up to allow easier access while performing maintenance. It features a gas spring assist and a brace mechanism to hold it in place while tilted.

To tilt the cab:

1. Remove any attachments that may be fastened to the machine.
2. (Optional) Raise the lift arms and secure them with the lift arm brace. (See page 4-1.)
3. Remove the two bolts that fasten the cab to the chassis. They are located inside the cab, one in each of the front corners.
4. Once the bolts have been removed, tilt the cab slowly upwards. The cab brace (B) should fall onto the shoulder bolt (C) locking the cab in its upright position.

The cab is now secure.

To lower the cab:

1. Raise the cab brace so that the locking channel is clear of the shoulder bolt.
2. Hold the brace upwards and lower the cab until the locking channel is clear of the shoulder bolt then release the brace.
3. The cab is now free to be lowered into operating position.
4. Lower the cab completely and then fasten it to the chassis with the two bolts removed previously.

Jacking Procedure

Occasionally, your machine may need to be suspended off of the ground to perform maintenance. Exercise caution when jacking the machine. Always use a jack that is capable of lifting the machine and support its weight with suitable mechanical supports while suspended off of the ground. Never work on or under a machine supported only by a hydraulic jack.

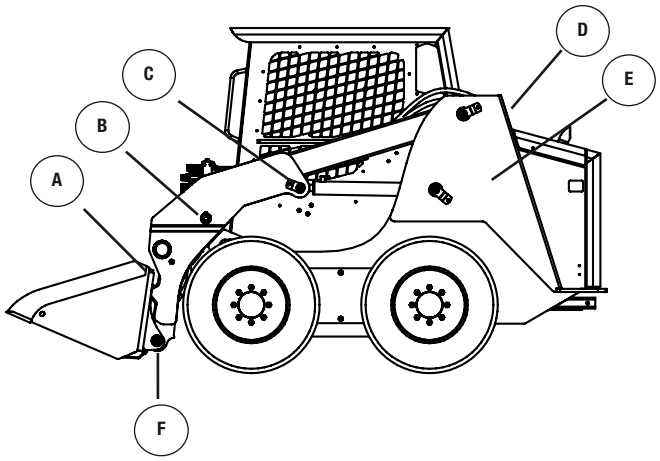
To safely jack your machine:

1. Remove any attachments that may be fastened to the machine and raise the lift arms.
2. Install the lift arm brace as instructed on page 4-1.
3. Once the lift arms are secured, carefully exit the machine.
4. Roll or slide your jack under the rear of the machine and center the lifting pad (left to right) on the flat bottom surface of the chassis.
5. Once in place, jack/lift the machine upward making sure it remains stable until it has reached sufficient height to install suitable mechanical supports beneath the machine.
6. Slide the mechanical supports into place making sure to position them in a manner that will allow the machine to remain stable when the jack is lowered and the rear of the machine rests on the supports.
7. Once the supports are in place, slowly lower the machine onto them, then remove the jack.

Repeat steps 4-7 at the front of the machine should both ends of the machine need to be off of the ground for service.

Lubrication Points:

A. Lower Bucket Cylinder Pivot
B. Upper Bucket Cylinder Pivot
C. Front Lift Cylinder Pivot
D. Lift Arm Pivot
E. Rear Lift Cylinder Pivot
F. Lower Bucket Pivot



4-6

Grease Fittings

The TSR-50-60 are equipped with grease fittings at pivot points throughout the machine. The illustration above shows the locations of all fittings on the left side of the machine. An identical fitting exists on the right side of the machine for each one identified in the illustration. Lubricate all fittings **DAILY** or after every 10 hours of operation to maximize component life and ensure proper machine function. (fig. 4-6)

Tire Pressure **(figure 4-7)**

Proper tire inflation should be maintained at all times to ensure safe and efficient operation. Operating with low tire pressure can shorten the service life of the tire.

Standard tire size:	10-16.5 R4 (8 ply)
Standard rim size:	16.5” x 8.25”
Standard tire pressure:	60 p.s.i.
Optional tire size:	10-16.5 R4 (10 ply)
Optional rim size:	16.5” x 8.25”
Optional tire pressure:	75 p.s.i.

4-7

⚠ A tire blowout or rim failure can cause death or serious injury.

Use a lock on style air chuck and position yourself in the area behind the tread of the tire (using wheel chocks for safety) while inflating the tires.

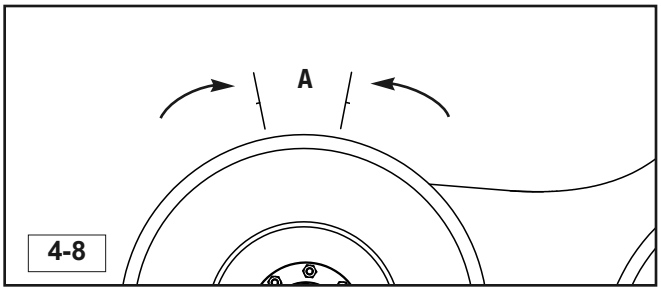
Also, mount the tire to the machine or encase it in a tire cage or other restraining device during inflation to minimize the possibility of injury.

Chain Tension Check

Proper chain tension should be maintained to minimize wear and prevent damage to the final drive system. Chain tension should be checked every 500 hours and adjusted as necessary.

To check chain tension:

1. Shut the machine down as described in section 5.13 of the operations manual, then elevate and support the front of the machine as described on page 4-2 of this manual. The front tires must be off of the ground to perform this inspection.



2. Rotate the wheel forward and backward checking for free play at the wheel (a result of slack in the drive chains). Measure total free play “A” as shown in figure 4-8.

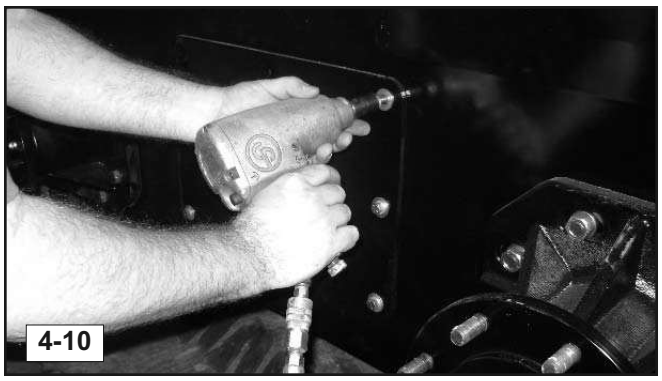
Note: Total free play measured along the circumference of the tire should not exceed 0.6” (15mm). If the free play measurement is less than this amount, no further action is required. If the free play measurement exceeds this amount, adjustment is required. Check all four wheels in this manner for proper tension.

Chain Tension Adjustment

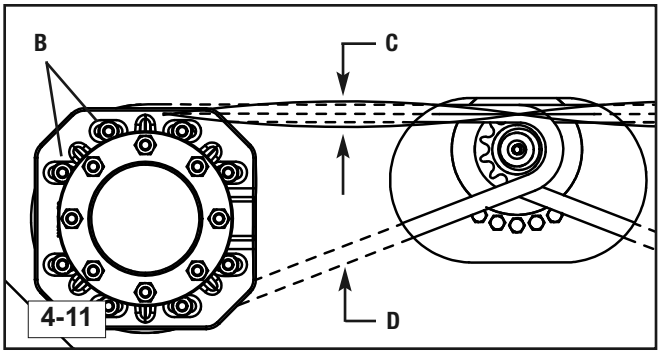
To adjust chain tension:

1. Shut the machine down as described in section 5.13 of the operations manual, then elevate and support the front of the machine as described on page 4-2 (chock the rear wheels).

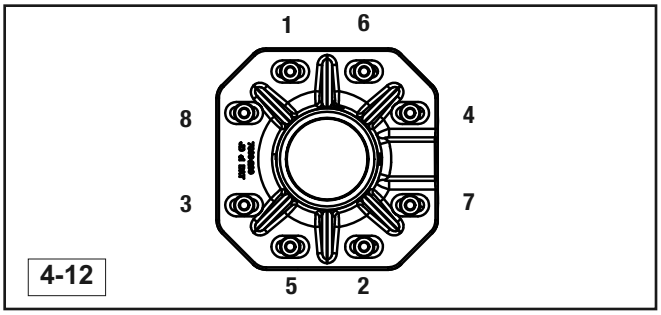
2. Remove the lug nuts securing the front wheel to the pod, then remove the wheel (use a suitable hoist and lifting straps)(fig 4-9).



3. Remove the chain case side cover plate to access the chains for adjustment (fig. 4-10).



4. Loosen the eight nuts “B” that secure the front wheel pod to the chassis (fig. 4-11).
5. Use a screw jack (or similar device) to slide the front wheel pod forward until chain free play “C” measures .06” (15mm) (lower chain is taut.”D”).



6. Tighten the nuts securing the wheel pod to the chassis to 150+/- 8 ft. lb. (203 Nm) in the order shown in figure 4-12.

7. Install the wheel by reversing step 2, torque to 150 +/- 8 ft. lb. (203 Nm).
8. Repeat steps 2-7 of this procedure on the opposite side of the machine to complete front chain adjustment. Reverse step 1 to lower the front wheels.
9. Repeat this procedure on the rear of the machine to adjust rear chain tension. Then clean the chain case covers and chassis to remove old sealant. Once clean, apply sealant to each cover and re-install.

Chain Case Oil Change

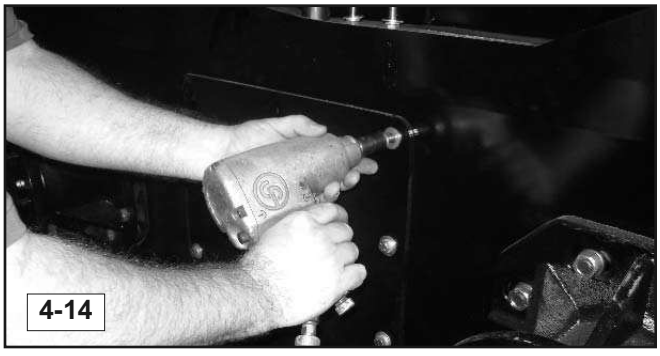
chain case oil should be changed every 1000 hours to maintain proper lubrication and minimize component wear.

To change to chain case oil:

1. Shut the machine down according to the procedure outlined in section 5.13 of the operations manual.


4-13

2. Use the correct size allen wrench to remove the drain plug from the right chain case (located at the rear of the case) (fig. 4-13). Drain the oil into a suitable catch container and dispose of used oil according to mandates.
3. Repeat step 2 on the right case, then reinstall and tighten both drain plugs.


4-14


4-15

4. Remove the side covers from the chain cases (fig. 4-14) and add 80/90 gear lube (4.25 quarts) to each case (fig. 4-15). When properly filled, there should be approximately 1” of oil covering the bottom of the case when on firm and level ground.
5. Clean the covers and chassis to remove old sealant, then apply new silicone RTV sealant to the cover around the perimeter (as found upon removal) and reinstall to complete the procedure. Wipe away any excess sealant once side panels have been secured with mounting hardware.

Air Cleaner

The TSR-50-60 are equipped with two air filter elements to remove contaminants from the air used for combustion. Regular inspection and replacement is necessary to ensure proper performance and to prolong engine life.

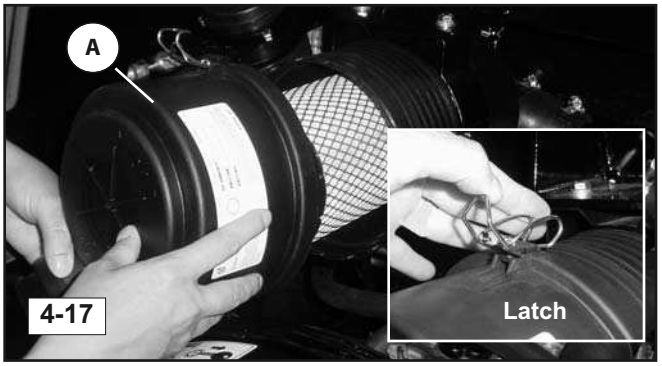
To remove and inspect your air cleaner elements:

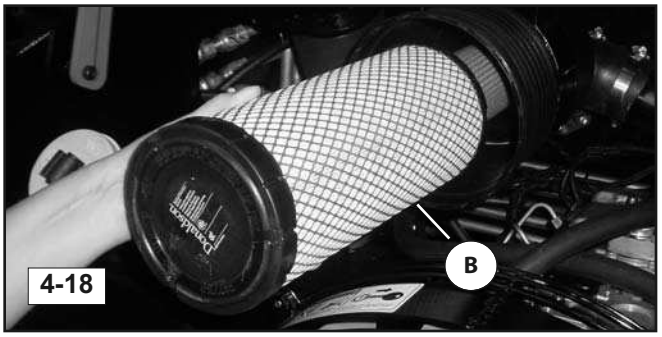
1. Shut the machine down as described in section 5.13 of the operations manual.
2. Open the hood and rear door to gain access to the engine compartment.
3. Locate the black air cleaner enclosure near the top left of the engine compartment (when viewed from the rear as shown in fig. 4-16).
4. Open the upper and lower latches and remove the housing cover (item A, figure 4-17) to expose the primary element (item B, figure 4-18).
5. Remove the primary element and inspect it. If it appears damaged in any way, replace it. If the element is heavily soiled, replace it. If it appears to be in good condition, clean if necessary and re-install.
6. Once the primary element has been removed, the secondary element (item C, figure 4-19) should be visible. Remove and inspect it. If the element is damaged or heavily soiled, replace it.

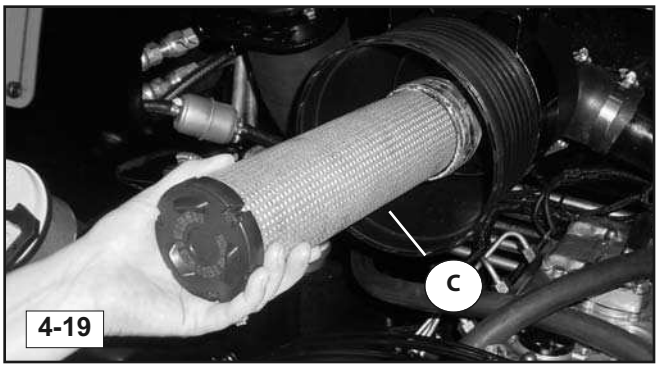
Note: The secondary element is not serviceable. It should be replaced after every three cleanings of the primary filter.

Note: The primary element may be cleaned and reused up to five times if properly maintained, but should be replaced at least once a year.

7. Once the inspection has been performed, install the new secondary filter element into the enclosure as found upon disassembly.
8. Install the primary element by sliding it into place in the enclosure as found upon disassembly.
9. Install the cover as found upon removal and close the latches to secure it in place.







To clean your primary filter element:

1. Remove loose dirt from the filter element with compressed air or water hose.

   Compressed air: 100 P.S.I. (689 kPa) max. 1/8" (.3175cm) diameter nozzle at least 2" (5.1 cm) away .

   Water: 40 P.S.I. (276 kPa) max. without nozzle.
2. Soak the filter in a non-sudsing detergent solution for at least 15 minutes moving it gently through the solution to further clean the element. (Never soak for more than 24 hours.)
3. Rinse the filter thoroughly with a gentle stream of water to remove all dirt and remaining detergent.
4. Allow the filter to dry completely before re-installing it into the machine.

NOTICE

Do not use any heat source other than warm air at less than 160°F to dry the filter.

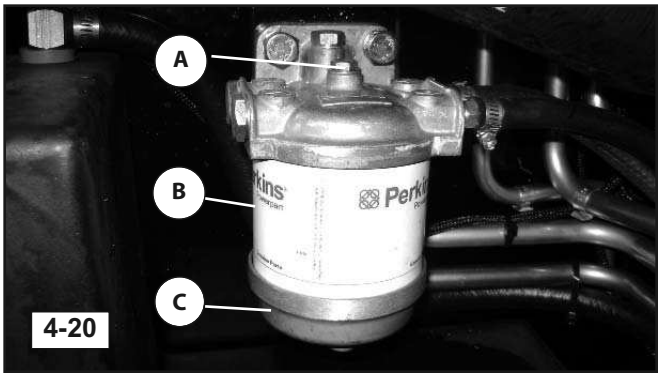
Do not clean air filter elements while engine warranty is in effect. During the warranty period, Terex recommends replacing air filter elements instead of cleaning them. Heavy-duty air filter manufacturers will not warrant the air filter once it has been cleaned.

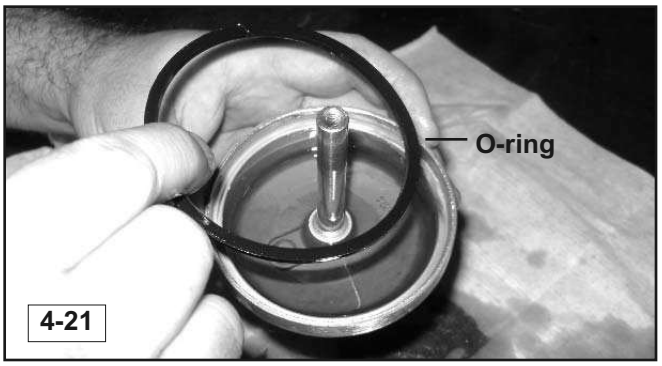
Fuel Filter

The fuel filter removes contaminants from the fuel as it enters the engine for combustion. Over time the filter can become plugged and cause the engine to lose power, run roughly or fail to start. The fuel filter should be changed every 500 hours or more often if needed to prevent these conditions from occurring.

To change the fuel filter:

1. Locate the fuel filter assembly under the rear hood on the left side of the engine compartment.
2. Clean the outside of the filter assembly thoroughly to reduce the chances of contaminants being introduced into the fuel system.





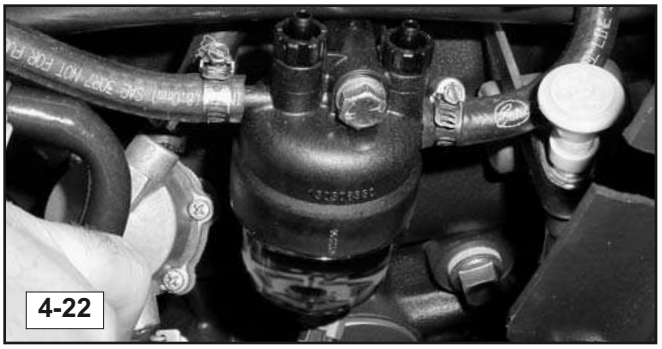
3. Remove the bolt (item A, fig. 4-20) on top of the filter assembly. Be sure to support entire assembly, as it drops from the bracket.
4. Twist the water separator catch bowl (item C, fig. 4-20) counter clockwise and remove it from the filter (item B, figure 4-20). Take care not to lose the o-ring that seals the separator catch bowl to the filter base (fig. 4-21).
5. Install separator catch bowl to the new filter and install back onto bracket by reversing step 2.

Water Separator (figure 4-22)

The water separator removes water from the fuel supply as the engine runs. Drain the water separator daily to maintain proper function.

To drain the water separator:

1. Loosen the black screw on the bottom of the separator.
2. Re-tighten the screw after the water has been drained from the catch bowl.



Accessory Belt Tension

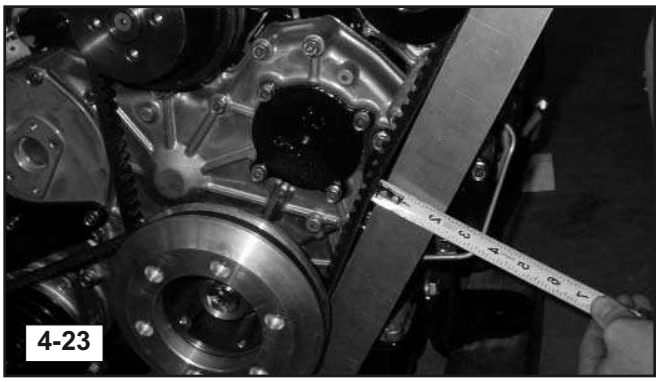
Drive belts typically stretch and wear during their service life. The fan and A/C belts should be checked for tension, condition and presence daily prior to operating your machine.

To check fan or A/C belt tension:

1. With the engine cold and off, remove the key from the ignition to avoid accidental start.
2. Lift the hood and open the door at the rear of the machine and check to make sure the fan and A/C belts are present and in good condition. If they appear excessively worn, or cracked, replace them.
3. Remove the fan guard and fan according to page 8-1 (optional).
4. Lay a straight edge across the alternator and crankshaft pulleys (crank and A/C pulleys for A/C belt) and apply a force of 10 lbs. (4.5kg) midway between the pulleys. (fig. 4-23, 4-24)
5. Measure the distance from the bottom of the straight edge to the top surface of each belt (deflection). Fan belt deflection should measure 3/8" (.95cm) (7/16" / 1.11cm A/C) if properly tensioned.
6. If the belts are loose or tight, adjust tension until correct.

To adjust fan or A/C belt tension:

1. Make sure the engine is cold, off, and the key has been removed from the ignition to avoid accidental start.
2. Lift the hood at the rear of the machine and loosen the bolts securing the alternator or A/C pump slightly to allow the alternator or A/C pump to pivot. (fig. 4-25, 4-26)
3. Once loose, use a small pry bar as a lever to force the alternator or A/C pump against the belt(s) to increase belt tension to appropriate level then tighten bolts to specification. (fig. 4-25, 4-26)
4. Check the belt tension.
5. Adjust belt tension as necessary until correct.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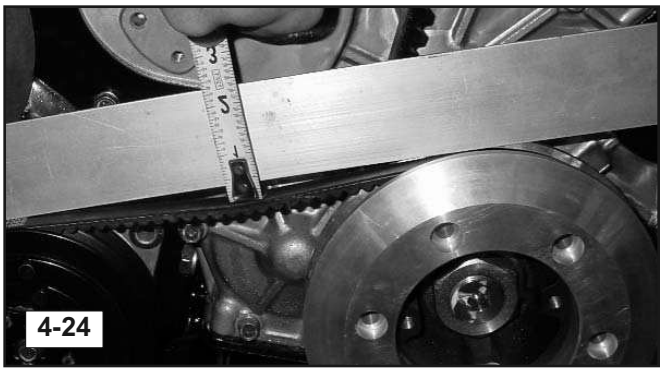
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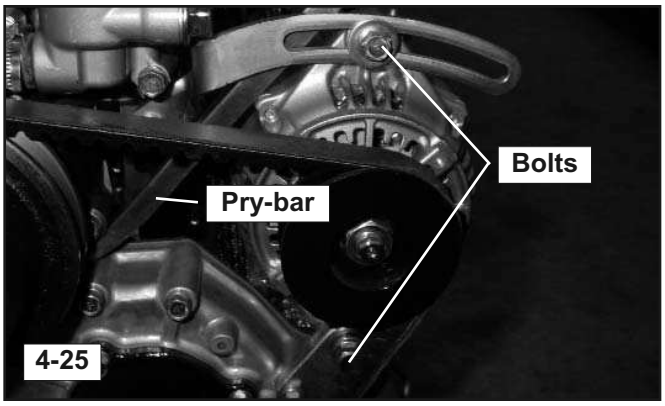


4-25

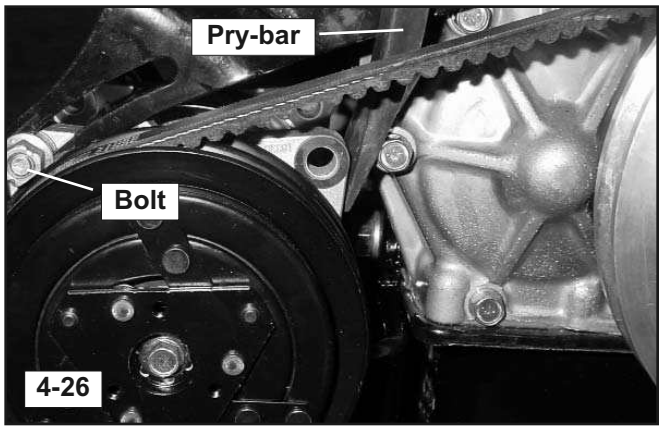
Fan Belt Removal & Installation

To remove the fan belt:

1. Follow steps 1 and 2 of the belt tension adjustment procedure.
2. Once loose, pivot the alternator towards the engine to increase slack in the belt.
3. Follow fan guard and fan removal procedure on page 8-1.
4. Slip the belt off of the engine pulleys and work it around the fan until it is clear of the blades.

To install the fan belt:

1. Reverse the steps of the removal procedure.
2. Perform the belt tension check and adjustment procedures on page 4-8 to complete the installation.



A/C Belt Removal & Installation

To remove the A/C belt:

1. Follow steps 1 and 2 of the belt tension adjustment procedure on page 4-8.
2. Once loose, pivot the A/C pump towards the engine to increase slack in the belt.
3. Slip the belt off of the pulleys and remove it from the machine.

To install the A/C belt:

1. Reverse the steps of the removal procedure to reinstall the belt.
2. Perform the belt tension check and adjustment procedures on page 4-8 to complete the installation.

Engine Oil/Filter Change

Regular oil changes are necessary to maintain a strong running engine. Terex recommends a normal oil change interval of 250 hours or every six months. This recommendation has been made to help ensure proper lubrication during operation and to prolong engine life under typical operating conditions.

To change the oil and filter:

1. Start and run the engine for a few minutes to warm the oil.
2. Shut the machine down according to the procedure in section 5.13 of the operation and maintenance manual and allow the machine to cool before per forming this procedure.
3. Remove the large bolt (oil drain plug) in the floor of the chassis to the right of the oil pan and route the engine oil drain hose through it.
4. Place a suitable container under the engine oil drain plug.
5. Open the rear door and hood to access the engine compartment.
6. Lift the drain valve tab upward and then rotate it counter clockwise in the slot as shown figure 4-27. Drain the oil into a suitable catch container.
7. Remove engine oil filter . Upon removal, make sure the filter gasket is still present on the filter. If not, remove it from the filter port (on the engine) prior to installing the new filter to prevent leaks (fig. 4-28).

NOTICE

If the old filter gasket is not removed from the filter head and the new filter is installed on top of it, an oil leak will result when the engine is started. If unnoticed, the engine can run itself out of oil causing engine failure.

8. Prepare new filter by applying fresh oil on the exposed gasket surface and install the new filter.
9. Thread the new filter onto the filter head. Tighten the filter by hand as instructed by the label located on the filter or filter box.
10. Reverse steps 3 and 4 to close the drain valve and store the hose.
11. Remove the oil filler cap and fill the engine crankcase with Terex 10W-30 Heavy Duty Engine Oil (capacity: 11.2 quarts (10.6 gal) including filter) (fig. 4-29).
12. Install the oil filler cap.
13. Perform a visual inspection to make sure the drain plug, filter and oil filler cap are in place and tight.


4-27

4-28


4-29

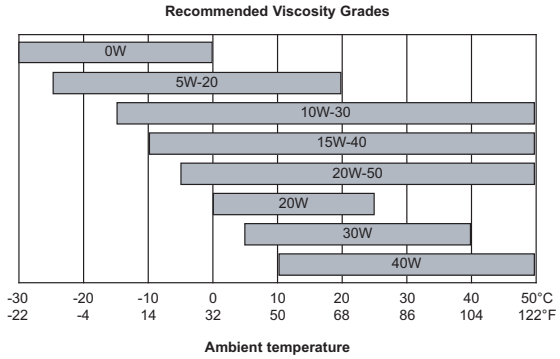
14. Start the engine and watch the display to ensure the oil pressure guage needle rises into the green zone (or warning light goes out) shortly after startup indicating oil pressure.
15. Once oil pressure has been verified, have an assistant visually inspect the machine for engine oil leaks. If none are found, shut the engine down and exit the machine.
16. Perform the oil level check procedure.
17. Dispose of the used oil and filter according to mandates.

Engine Oil Specifications

Terex recommends using Terex 10W-30 Heavy Duty Engine Oil for most conditions. In the event of an alternate working environment, the following chart may be used as a guide to oil viscosity grades.

You may also use a quality engine oil substitute meeting the following minimum specification:

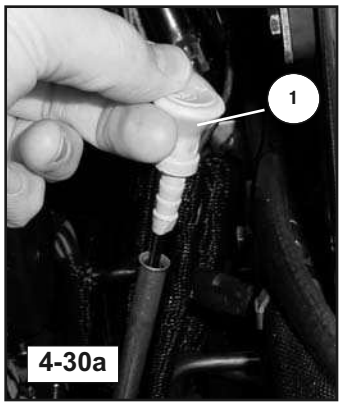
• API CH-4 multigrade engine oil.

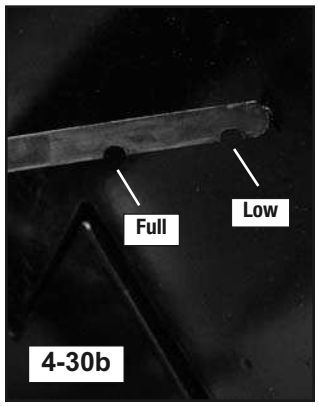


Oil Level Check

To check the oil level:

1. Shut the machine down according to the procedure in section 5.13 of the operation manual.
2. Open the rear door and hood to gain access to the engine compartment.
3. Locate and remove the engine oil dipstick (1) from its tube (fig. 4-30a).
4. Wipe the dipstick with a clean shop cloth and reinsert it into the tube until it comes to rest in its seated position.
5. Remove the dipstick once again and inspect the end for oil on the level indicator.
6. Oil should be present on the dipstick up to, but not over the upper (full) level indicator notch. If the level is correct, reinstall the dipstick and then close and latch the hood and rear door to complete the procedure (fig. 4-30b).
7. If the level is low, add the proper grade and viscosity engine oil and re-check as necessary until the proper level has been achieved. Then re-install the dipstick and filler cap and close and latch the hood and rear door to complete the procedure.





Hydraulic Fluid/Filter Change

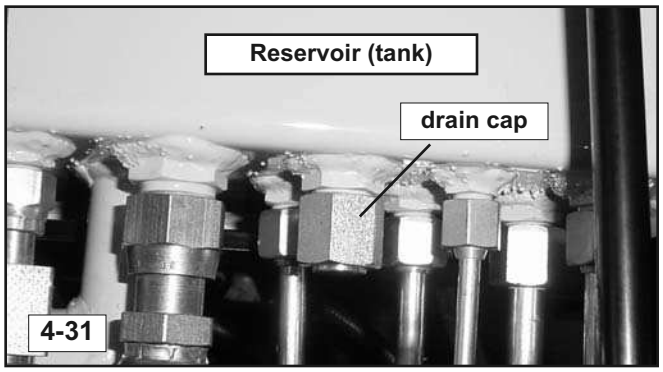
Hydrostatic components require extremely clean oil in order to have a long service life. Use extreme caution when changing the hydraulic oil. Introducing dirt or debris could be detrimental to the hydraulic system. Terex recommends service intervals of 500 hours for hydraulic fluid and 250 hours for hydraulic fluid filters.

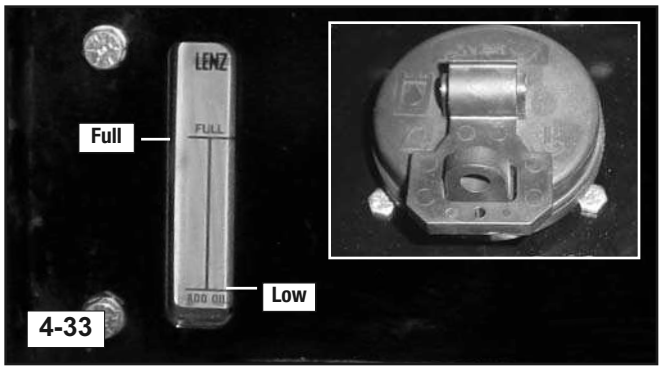
To change the hydraulic fluid:

1. Lower the lift arms until flat on a solid surface.
2. Shut the machine down according to the procedure in section 5.13 of the operations manual.
3. Allow the machine to cool, then release any residual pressure in the hydraulic system by following the procedure in section 4.7 in the operation manual.
4. Raise the cab according to page 4-2 of this chapter to access the tank drain.
5. Remove the hydraulic fluid drain cap from the left side of the tank (fig 4-31).
6. Drain the used oil into a suitable catch container.
7. Dispose of the oil according to local mandates.
8. Locate the hydraulic filter underneath the cab on the left side of the machine (fig. 4-32).
9. Thoroughly clean around the filter to prevent dirt or debris from entering the system and remove the filter by hand or with a strap as required.
10. Check to make sure the filter gaskets are still present on the old filters. If not, check the filter heads to make sure they are free from old gasket material prior to installing the new filter.
11. Prepare the new filter by rubbing a small amount of fresh hydraulic oil onto the filter gasket surface and then threading it onto the filter head. Tighten the filter by hand as instructed by the label located on the filter or filter box.
12. Install the hydraulic system drain plug and tighten.
13. Remove the hydraulic reservoir filler cap (black) and fill the hydraulic system with Mobile DTE 10 Excel Series Hydraulic Oil or equivalent until the full mark on the hydraulic fluid sight gauge has reached (approx. 18 gal. (68l) (fig. 4-33).

Note: When checking or adding to the hydraulic fluid level, do so with the lift arms in the lowered position. If the level is checked with the lift arms in the raised position, an inaccurate reading will result.

Note: When adding hydraulic fluid, add fluid slowly until it is visible in the sight gauge. Once visible, add fluid in one quart increments until the full mark has been reached.





14. Install and secure the hydraulic reservoir filler cap.
15. Start the machine and operate all hydraulic circuits to work any trapped air out of the system.
    - Drive the machine forward and backward.
    - Raise and lower the lift arms(unloaded).
    - Dump and curl bucket/quick attach.
16. Once you have purged the air from the system, check the level on the hydraulic fluid level sight gauge. If the level is low repeat step 12 and 13 to complete the procedure.

Radiator/Oil Cooler Cleaning

The Radiator and Oil Cooler must be kept clean to ensure proper operation. Engine and hydraulic system overheating, damage and even failure can result if the radiator/oil cooler is not kept clean. A pressure washer or compressed air nozzle work well to blow debris clear of the fins in the oil cooler and radiator.

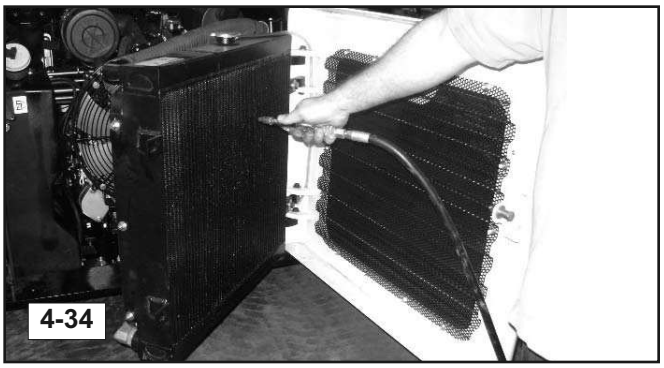
Note: If hydraulic oil or engine coolant temperature gauges indicate abnormally high temperatures during operation, increase cleaning intervals.

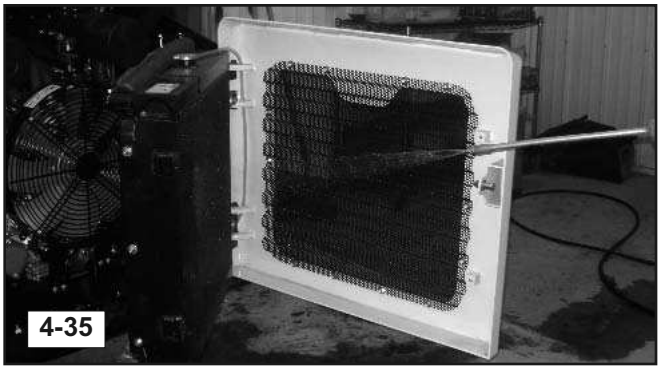
Note: In brush cutting applications check and clean the coolers often to avoid overheating.

To clean radiator/oil cooler:

1. Shut the machine down according to the procedure in section 5.13 of the operations manual.
2. Using compressed air or a pressure washer, thoroughly clean radiator/oil cooler as shown in figures 4-34 & 4-35.

Note: Make sure water nozzle is at least 12 in. / 30.5 cm (8 in. / 20.3 cm for air) from the cooler and that the spray is directed straight through the cooler or the cooling fins may be damaged (bent over) which will decrease cooling performance.


4-34


4-35

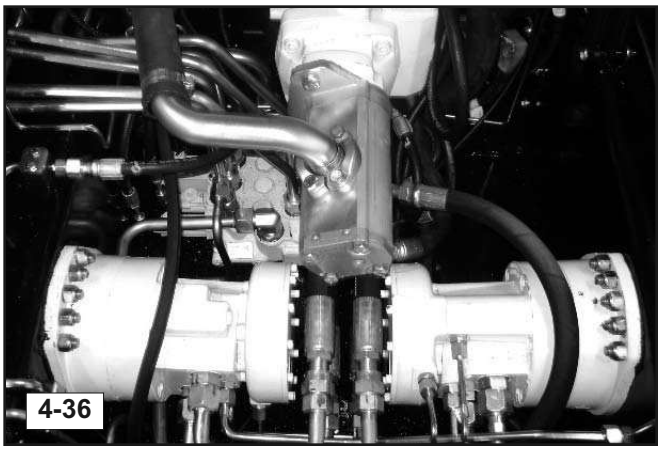
Engine/Drive Compartment Cleaning

Periodic cleaning of the chassis area beneath the cab and engine compartment are also necessary to maintain safe operation. Clean as required.

1. Tilt the cab up according to page 4-2 of this chapter and raise the hood and open the door at the rear of the machine.
2. Lower the access panel in the base of the chassis to allow water and dirt/debris to drain.
3. Pressure wash any debris from the engine compartment and chassis area (fig. 4-36).

Note: It may be useful to have a shop-vac handy to get into tight places and to remove any water or debris that doesn't make it out though the lower opening.

4. Once clean, reverse steps 1 and 2 to complete the procedure.


4-36

Fuse Panel

The electrical systems in the TSR machines are equipped with fuses that protect the electrical components from damage. They are located on the fuse panel behind the access cover on the upper right side behind the operator seat. (fig. 4-37)

In the event of an electrical malfunction, the most logical place to start is at the fuse panel. Check the fuse related to the problem you are having and inspect it. If the fuse appears black and burned, it needs to be replaced. Replace fuses with the correct amperage replacement fuse only. Replacing a fuse with one of a lower amperage rating may lead to premature fuse failure. Replacing a fuse with one of a higher amperage rating may burn out the electrical component the fuse was meant to protect. See the troubleshooting section in this manual for an additional resource to aid in tracking suspected electrical problems.

Lift Arm Bushings

Quick Attach Wear Inspection

Daily inspection can be carried out by performing the following steps:

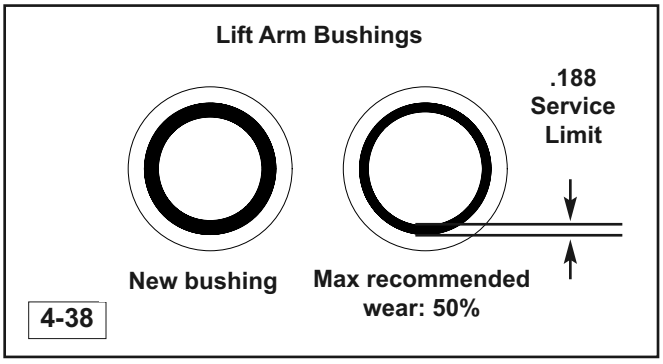
1. Lower the lift arm until it makes contact with the chassis stops. Rotate the bucket against the ground repeatedly. Have an assistant look for independent movement between the bucket and the lift arm. Any movement should be readily noticeable by the attendant. If movement is detected, bushing will need further inspection.
2. Rotate the bucket downward to approximately 45° from level. Then lower the lift arm until the bucket contacts the ground repeatedly. Have an assistant look for independent movement between the:

- Lift arms & chassis
- Lift arms & lift cylinder
- Lift cylinder & chassis

Any movement will be readily noticeable by the attendant. If movement is detected, bushings will need further inspection as shown in the following step.

3. Refer to Chapter 13 of Lift Arm Bushing Removal and Installation procedure to access bushings for measurement inspection.

Note: Inspect the bushing for wear and replace as necessary. Maximum recommended wear on the bushing is 50% as shown in figure 4-38.



Maintenance Item	Service Required	Interval	Notes	Service Capacity
Grease fittings	Lubricate	Daily	Grease often	
Fluid levels	Check	Daily	Adjust levels as necessary	
Fan tension	Check	Daily	Adjust tension as necessary	
Fan condition	Inspect	Daily	Replace if damaged	
Water seperator	Drain	Daily		
Wheel Condition	Inspect	Daily	Replace if severly damaged	
Air Cleaners	Inspect	Daily	Replace if damaged of heavily soild	
Raidator / Oil Cooler	Inspect	Daily	Clean often as necessary	
Chain Tension	Inspect	500 hr	Adjust tension as necessary	
Tire Pressure	Check	Daily	Adjust pressure as necessary	Standard tire: 60 psi
Chaincase Oil	Check	1000 hr	Service change	80/90 gear lube 4.25 quarts to each case
Engine Compartment	Inspect	Daily	Clean often as necessary	
Engine oil and filter	Replace	250 hr		11.2 qt. (10.6 l)
Hydraulic filter	Replace	250 hr		
Hydraulic Oil	Replace	1000 hr	Service refill capacity only	18 gal. (68 l)
Water Seperator -Fuel Filter	Replace	500 hr	Repalce fuel filter element	
Radiator Coolant	Replace	1000 hr	Coolant with SCA additive required	3.5 gal. (13 L)

5. Machine Controls and Instrumentation

Chapter Overview

This chapter contains an overview of the machine controls and instrumentation. For further information regarding machine controls, instrumentation or operation, refer to the operation and maintenance manual for the TSR 50-60. Included here are illustrations of the following control and instrumentation components and a description of their functions.

- Machine Controls
- Gauge Location and Function
- Switch Location and Function

Machine Controls (fig. 5-1)

There are three primary machine controls: lift arm control (1), drive control (2) and throttle (3).

Lift Arm Control

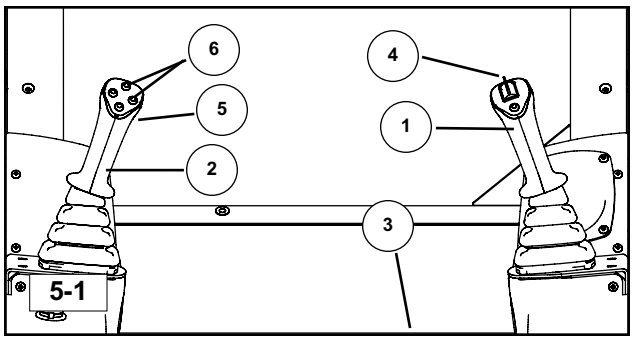
The lift arm control (1) is an hydraulic pilot joystick that allows the operator to raise or lower the lift arms and dump or curl the quick attach mechanism. Item 4 (found on the lift arm control) is a switch that controls variable low flow auxiliary hydraulic operation.

Drive Control

The drive control (2) is also a hydraulic pilot joystick. It allows the operator to change the direction and speed of the machine. Item 5 (trigger) activates 2-speed operation (if equipped). Item(s) 6 send electrical signals to attachments connected to the outlet located at the end of the lift arms.

Throttle

The mechanical foot throttle (floor mounted pedal, item 3) controls engine rpm.



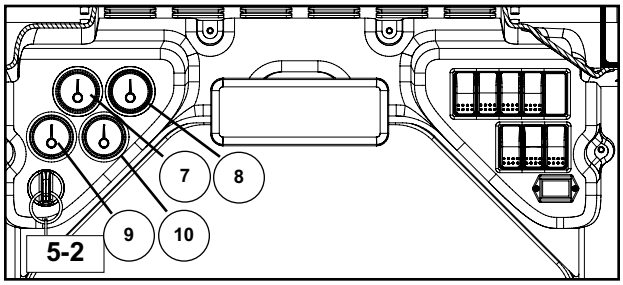
Instrumentation

The Instruments (Figure 5-2) are positioned in the dash panel for good access and visibility when seated inside the operator enclosure. Instruments include the following components.

Note: The presence and location of switches may vary depending on machine configuration.

(7) Tachometer
(8) Fuel Guage
(9) Warning Indicator Display
- Oil Pressure light
- Battery voltage light
- Hyd. Oil Temperature light
- Engine Temperature Light

(10) Engine Coolant Temperature



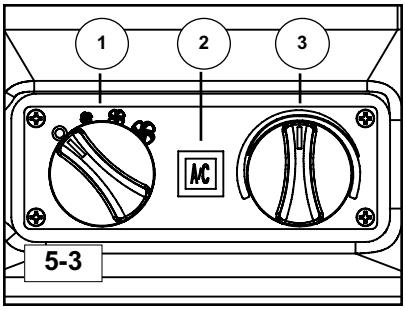
NOTICE

Should a light be illuminated on the warning indicator display during normal operation indicating low engine oil pressure, excessive hydraulic oil temperature or excessive engine coolant temperature, shut the machine down immediately (in a safe location). Diagnose the problem and make needed repairs before resuming operation.

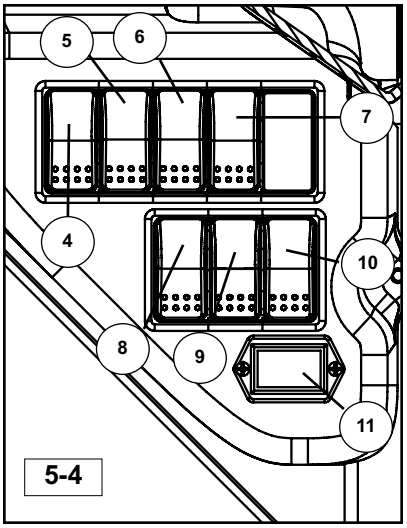
Switches

The various switches (Figure 5-3, 5-4) are positioned to provide good access and visibility. The standard and optional switches are listed below.

1. Fan Speed Switch (optional)
2. A/C Activation Switch (optional
3. Air Temperature Control (optional)
4. Power Quick Attach Switch (optional)
5. Hydraulic Auxiliary Switch
6. High Flow Auxiliary Switch
7. Bucket Positioning Switch (optional)
8. Light Switch
9. Beacon Switch (optional)
10. Parking Brake Switch
11. Hour Meter



5-3



5-4

6. Operator Enclosure

Chapter Overview

This chapter provides information on the assembly and disassembly of the operator enclosure assembly. If there is an issue that requires troubleshooting, refer to Chapter 16, Troubleshooting.

Personal Safety

Improper or incomplete maintenance/repair of a Skid Steer Loader can be dangerous and may result in machine damage, injury or death.

Do not attempt to perform any type of repair or maintenance on a Skid Steer Loader until you have read and fully understood the information in this manual. Refer to the Operation and Maintenance manual for instructions regarding proper machine operation techniques before operating any Skid Steer Loader.

Prior to performing any type of service work on a Skid Steer Loader, read and understand Chapter 1 (Product Safety) for personal safety information.

Machine Preparation

Accidental machine starting can cause injury or death to personnel working on a Skid Steer Loader.

As a precaution, disconnect the battery cables from the battery terminals, tape the battery clamps and remove the key from the ignition switch prior to performing any service work on a Skid Steer Loader.

Place a “Do Not Operate” tag prominently on the machine to inform personnel that the machine is being worked on.

Removal and Installation

Removal and installation procedures are provided for the following operator enclosure components.

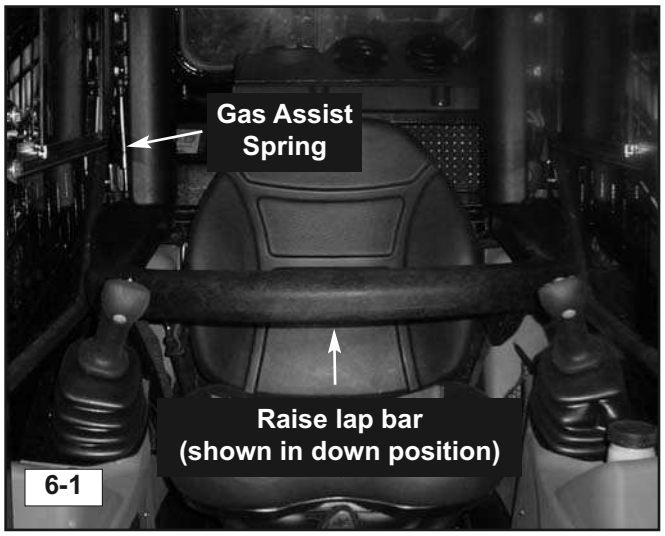
- Lap Bar Gas Spring
- Dash Pod Cover
- Side Panels
- Seat
- Headliner

Note: Procedures are provided for only the operator enclosure components listed above. However, exploded parts diagrams exist in the TSR-50-60 Parts manuals to serve as visual aids in the removal or installation of other operator enclosure components.

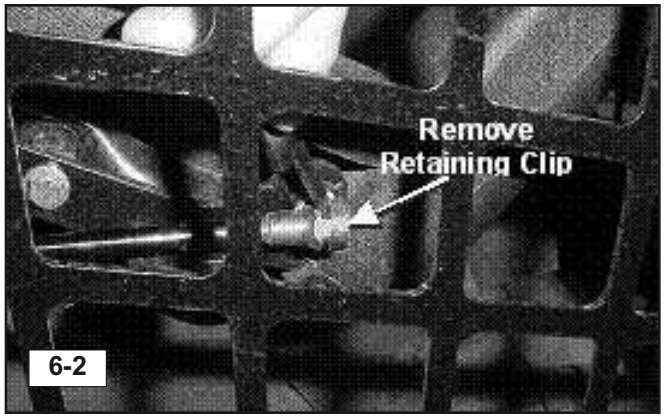
Lap Bar Gas Spring

Removal

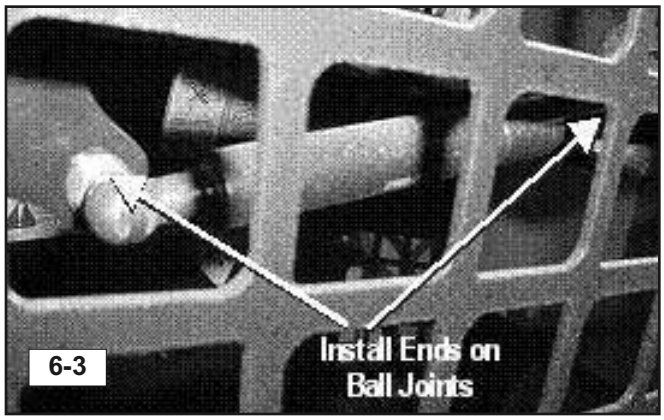
Required Tools
Blade Type Screwdriver



1. Raise the lap bar to minimize tension on the lap bar gas spring during removal and installation (fig. 6-1).



2. Remove the retaining clip from each end of the gas spring using a small screwdriver (fig. 6-2).



3. Remove the gas spring by pulling both ends off of the ball stud mounts (fig. 6-3).

Installation

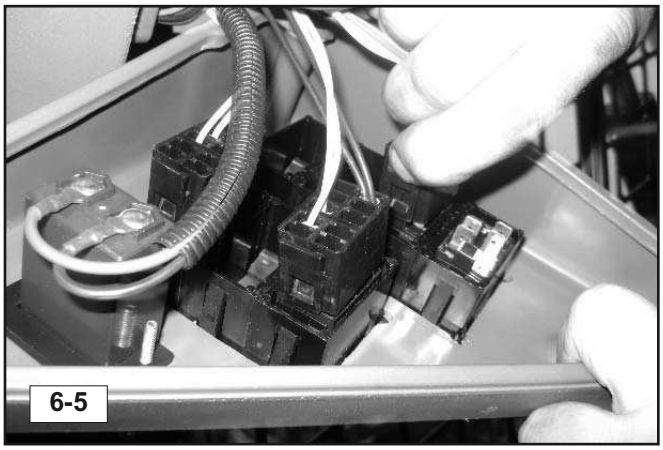
1. To reinstall the lap bar gas assist springs, reverse the removal procedure.

Dash Pod Cover

Removal

Required Tools
Phillips Type Screwdriver

1. Remove the fasteners securing the dash pod cover to the pod base (fig. 6-4).



2. Pivot the cover away from the pod base to expose the connectors. Disconnect the switches and gauges from the cab harness, then remove the cover (fig. 6-5).

Note: The connectors on the harness are labeled as are the wires in the cover. Use these labels to properly identify (match up) and reconnect the harness to the instruments during installation.

Note: At this point in the disassembly process, the instruments mounted to the cover may be removed and replaced if needed.

Installation

1. To reinstall either cover, reverse the steps of the removal procedure.

Side Panels

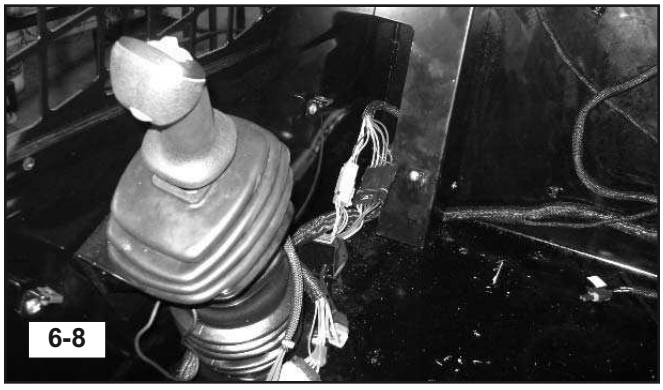
Removal

Required Tools
Phillips Type Screwdriver

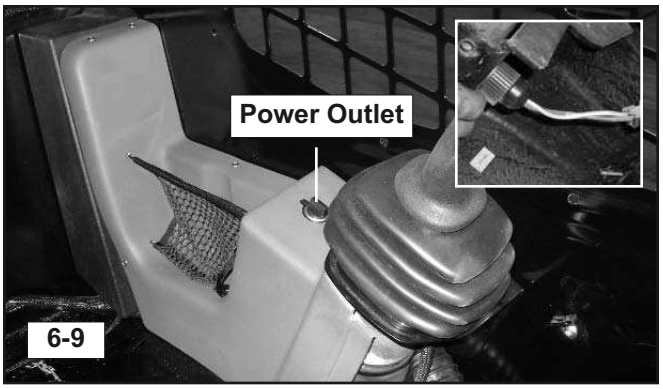
1. Remove the seat assembly as described on page 6-4 of this chapter.

2. Remove the fasteners securing the forward portion of the side panel to the cab enclosure (fig. 6-6).

3. Pull the side panel away from the cab, then remove it from the cab (fig. 6-7).



4. Remove the fasteners securing the rear portion of the side panel to the cab enclosure and remove it from the cab as shown (fig. 6-8).



5. If removing the left side panel, disconnect the 12v power outlet, then remove the panel from the machine (fig. 6-9).

Installation

1. To install the side panels, reverse the removal procedure.

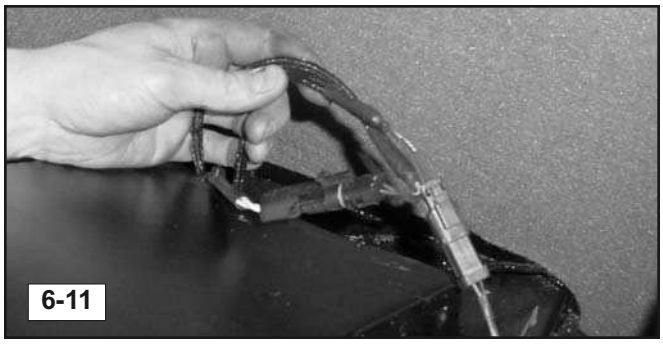
Seat

Removal

Required Tools
Combination/Socket Wrench

1. Raise and secure the cab as described on page 4-2 of this manual.

2. Remove the four nuts securing the seat to the cab floor (fig. 6-10).
3. Lower the cab to gain access to the seat.



4. Lift and move the seat forward slightly to expose the seat switch harness located behind the seat (fig. 6-11).

5. Disconnect the harness, then remove the seat from the machine (fig. 6-12).

Installation

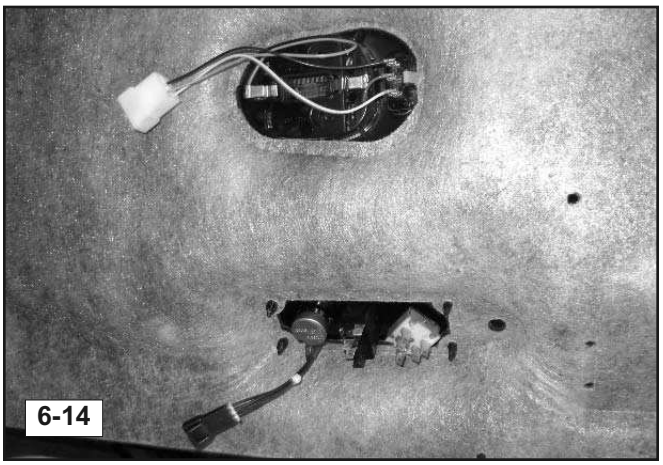
1. To install the seat, reverse the removal procedure.

Headliner

Removal

Required Tools
Phillips screwdriver

1. Remove all headliner screws with a phillips screwdriver (fig.6-13).



2. Lower the headliner slightly, then disconnect the dome light and climate controls from the cab harness. Once disconnected, you may remove the headliner from the cab (fig. 6-14).

Installation

1. To install the headliner panel, reverse the removal procedure.

7. Chassis and Fuel Tank

Chapter Overview

This chapter provides information on the assembly and disassembly of the chassis. If there is an issue that requires troubleshooting, refer to Chapter 16, Troubleshooting.

⚠ Personal Safety

Improper or incomplete maintenance/repair of a Skid Steer Loader can be dangerous and may result in machine damage, injury or death.

Do not attempt to perform any type of repair or maintenance on a Skid Steer Loader until you have read and fully understood the information in this manual. Refer to the Operation and Maintenance manual for instructions regarding proper machine operation techniques before operating any Skid Steer Loader.

Prior to performing any type of service work on a Skid Steer Loader, read and understand Chapter 1 (Product Safety) for personal safety information.

⚠ Machine Preparation

Accidental machine starting can cause injury or death to personnel working on a Skid Steer Loader.

As a precaution, disconnect the battery cables from the battery terminals, tape the battery clamps and remove the key from the ignition switch prior to performing any service work on a Skid Steer Loader.

Place a “Do Not Operate” tag prominently on the machine to inform personnel that the machine is being worked on.

Removal and Installation

Removal and installation procedures are provided for the following chassis components.

- Fuel Sending Unit
- Fuel Tank
- Footwell
- Foot Throttle Assembly
- Hood Assembly
- Rear Door Assembly

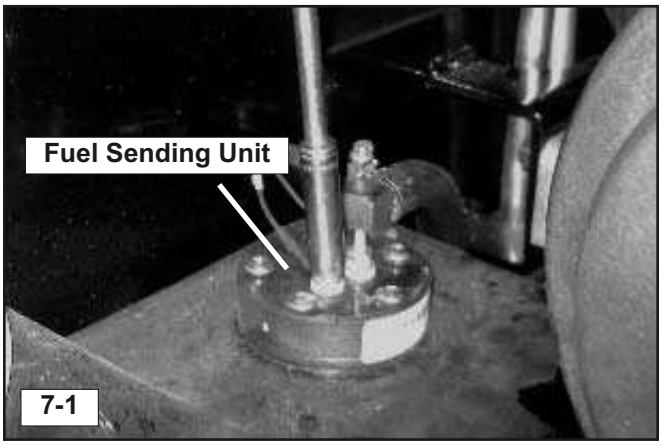
Note: Procedures are provided for only those chassis components listed above. However, exploded parts diagrams exist in the TSR-50-60 Parts manual to serve as visual aids in the assembly and disassembly of other chassis components.

Fuel Sending Unit

Removal

Required Tools
Screwdriver Combination/Socket Wrench

1. Raise and support the lift arms as described on page 4-1 of this manual.
2. Tilt and support the operator enclosure (cab) as described on page 4-2 of this manual.

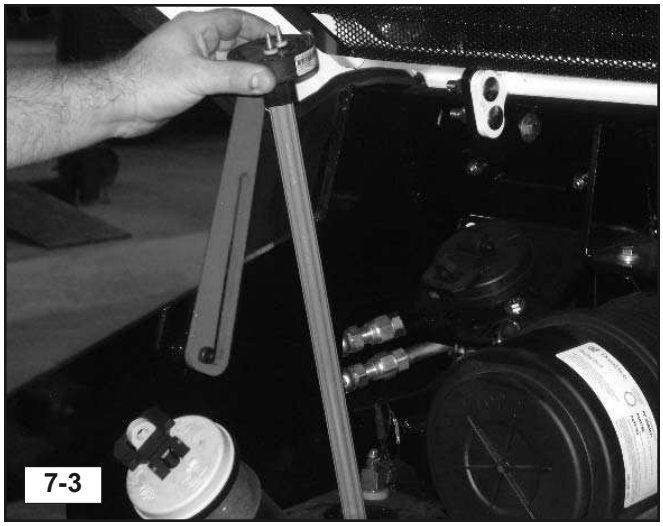


3. Locate the fuel sending unit behind the fuel fill location on the left side of the fuel tank (fig. 7-1).
4. Remove the nuts and associated hardware securing the leads to the sending unit (fig. 7-1).

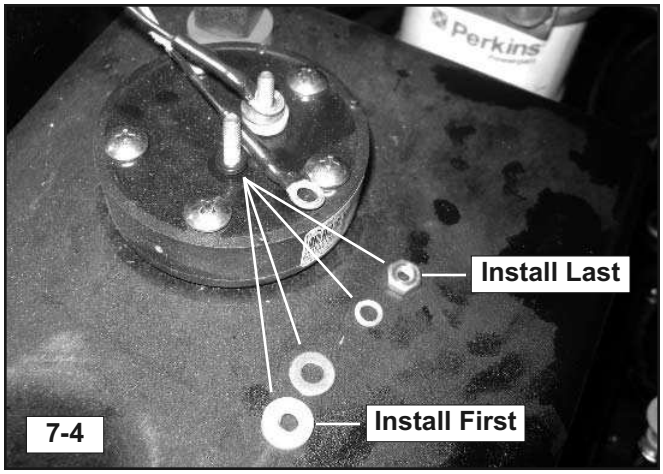
Note: Record the order of assembly and polarity of the leads to ensure proper function when reassembled.


7-2

5. Remove the screws that secure the fuel sending unit to the tank (fig. 7-2).


7-3

6. Remove the sending unit by pulling it upward through the opening in the fuel tank (fig. 7-3).



7-4

Installation

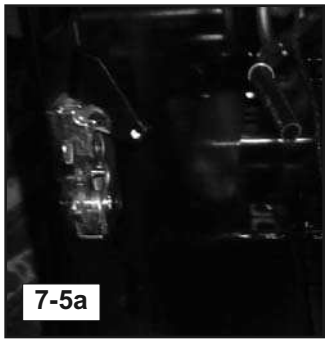
1. To install the fuel sending unit, reverse the removal procedure (See fig. 7-4 for terminal installation).

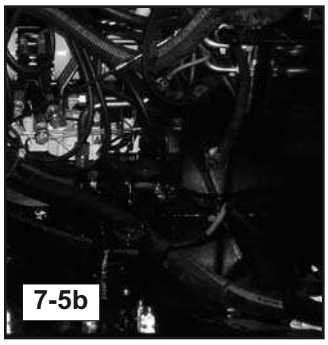
Fuel Tank

Removal

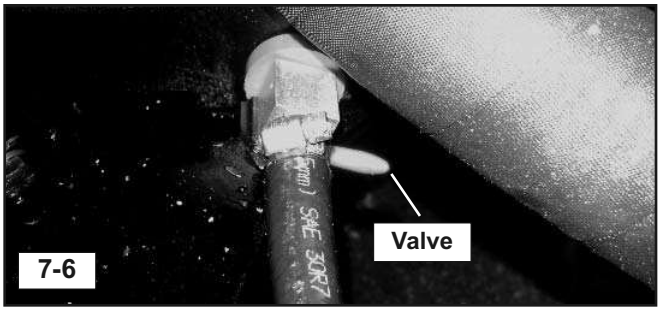
Required Tools
Blade Style Screwdriver Combination/Socket Wrench

1. Remove the hood and rear door assembly as described on pages 7-4 & 7-5 of this chapter.
2. Remove the fan/fan guard and radiator/cooler as described on pages 8-1 & 8-2 of this manual.
3. Remove the engine as described on page 12-3 of this manual.


7-5a

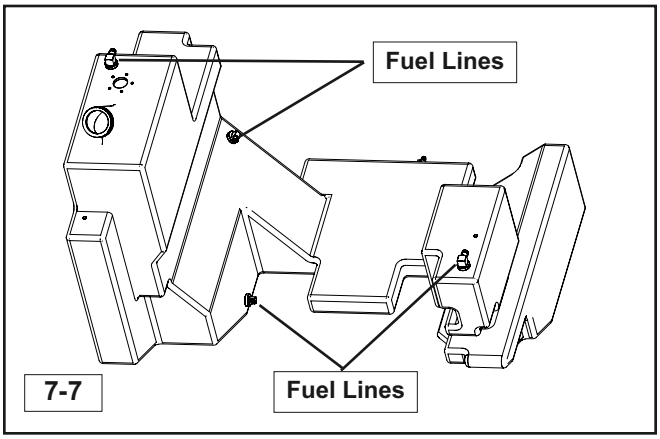

7-5b

4. Remove the rear door latch and lower door hinge (fig 7-5a & b).



7-6

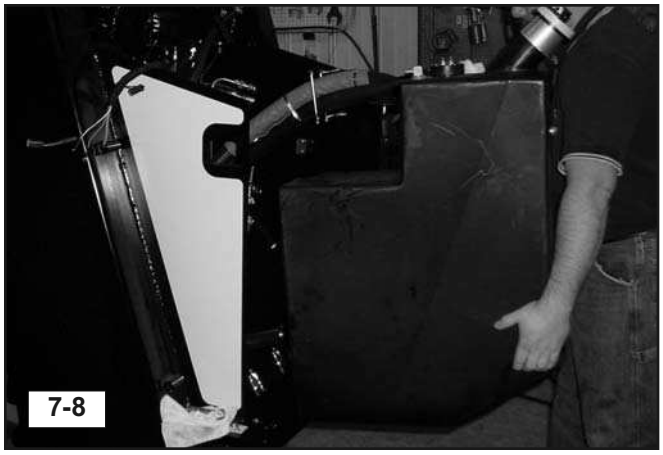
5. Remove the bolts securing the access panel found on the bottom of the chassis (mid-machine). Route the drain hose through the opening. Open the valve to drain fuel into suitable container (fig. 7-6).



7-7

Note: Collect and contain flammable liquids in suitable containers. Dispose of all liquids according to mandates.

6. Loosen the hose clamps that secure the various hoses to the left and right side of the fuel tank (fig. 7-7).
7. Disconnect and plug the ends of the hoses to prevent fuel leakage.
8. Unplug the main wire harness from the fuel sending unit.
9. Remove the three brackets that secure the fuel tank to the chassis. The two rear brackets can be found on the upper left and lower right sides of the fuel tank. The forward bracket is located on the right, front corner of the fuel tank.


7-8

10. Lift and remove the tank from the rear as shown (fig. 7-8).

Installation

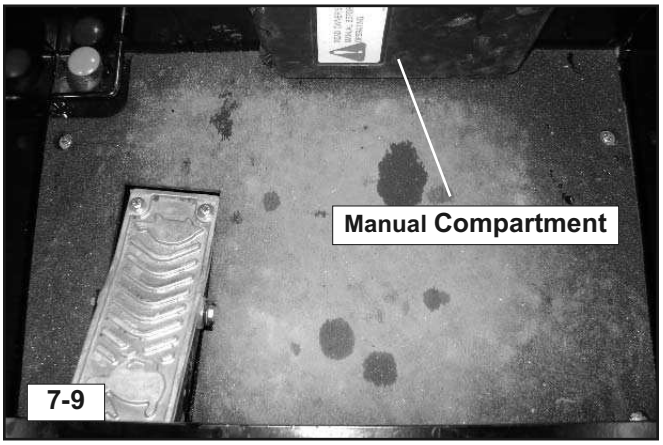
1. To install the fuel tank, reverse the removal procedure.

Footwell

Removal

Required Tools
Combination/Socket Wrench

1. Raise and support the lift arms as described on page 4-1 of this manual.
2. Tilt and support the operator enclosure (cab) as described on page 4-2 of this manual.

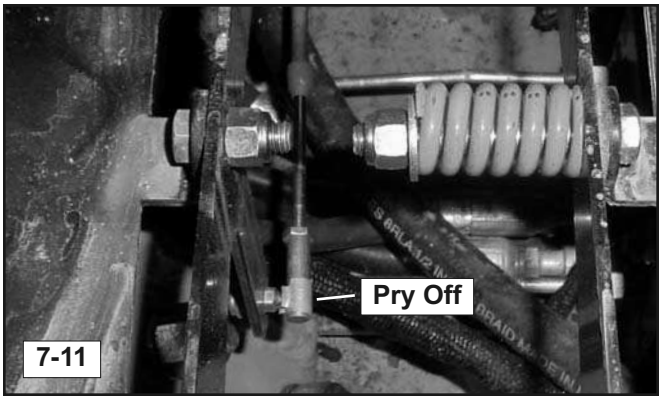


7-9

3. Remove the bolts that secure the manual compartment to the footwell wall (fig. 7-9).


7-10

4. Remove the four bolts that secure the upper plate to the foot throttle assembly and remove to expose the throttle linkage (fig. 7-10).



7-11

5. Pry the throttle cable off of the ball stud on the foot throttle assembly (fig. 7-11).
6. Remove the floor mat from the floor of the footwell.

7. Remove the bolts that secure the footwell to the chassis and remove as shown in figure 7-12.

Installation

1. To install the footwell, reverse the removal procedure.

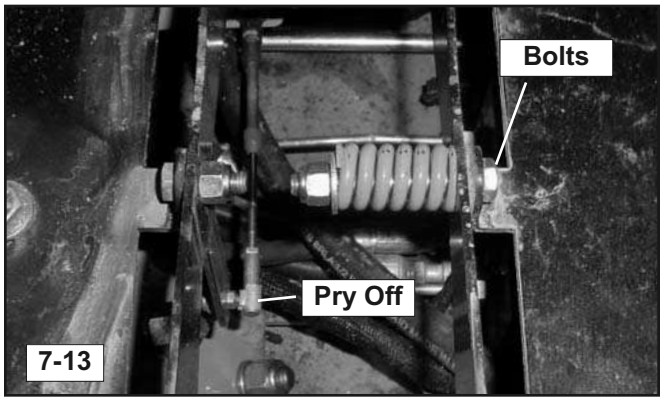
Foot Throttle Assembly

Removal

Required Tools
Screwdriver Combination/Socket Wrench

Note: The foot throttle assembly may be removed with the footwell still installed in the machine.

1. Perform steps 4, 5 and 6 of the footwell removal procedure of page 7-3.



2. Remove the bolts (2) and associated hardware that secure the foot throttle assembly to the footwell (fig. 7-13).

Note: Record the order of assembly during removal to ensure proper operation when re-installed.

3. Remove the foot throttle from the machine.

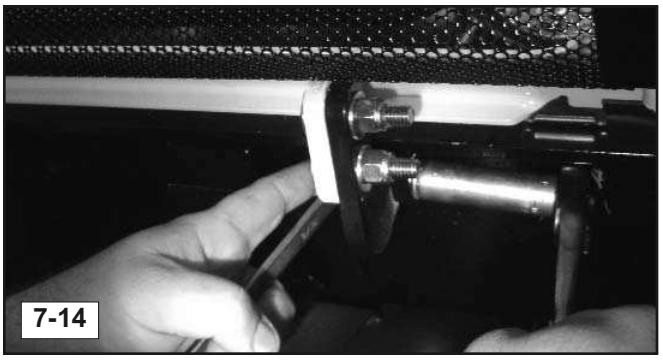
Installation

1. To install the foot throttle assembly, reverse the removal procedure.

Hood Assembly

Removal

Required Tools
Allen Wrench Combination/Socket Wrench



1. Raise and lock the hood into position as described on page 7-4. Ask an assistant to support the weight of the hood. Then, remove the bolts from the hood brackets (both sides) as shown (fig. 7-14).

2. Remove the shoulder bolt that secures the hood brace to the chassis (fig. 7-15).

3. Remove the hood from the machine as shown in figure 7-16.

Installation

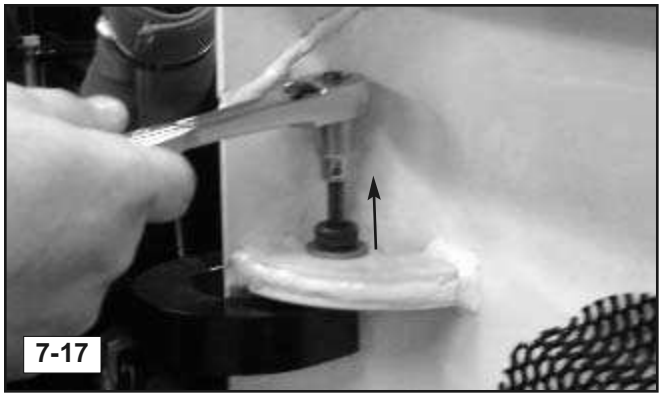
1. To install the hood assembly, reverse the removal procedure.

Rear Door

Removal

Required Tools
Allen Wrench

1. Perform radiator/cooler removal procedure found on page 8-2 of this manual.
2. Support the weight of the rear door with a suitable lifting device and straps.



3. Remove the shoulder bolts on both the upper and lower door hinges (fig. 7-17).

4. Remove the rear door from the machine (using a suitable lifting device) 7-18).

Installation

1. To install the rear door, reverse the removal procedure.

8. Radiator and Oil Cooler

Chapter Overview

This chapter provides information on the disassembly and assembly of the radiator/oil cooler and associated components. If there is an issue that requires trouble shooting, refer to chapter 16, Troubleshooting.

Personal Safety

Improper or incomplete maintenance/repair of a Skid Steer Loader can be dangerous and may result in machine damage, injury or death.

Do not attempt to perform any type of repair or maintenance on a Skid Steer Loader until you have read and fully understood the information in this manual. Refer to the Operation and Maintenance manual for instructions regarding proper machine operation techniques before operating any Skid Steer Loader.

Prior to performing any type of service work on a Skid Steer Loader, read and understand Chapter 1 (Product Safety) for personal safety information.

Machine Preparation

Accidental machine starting can cause injury or death to personnel working on a Skid Steer Loader.

As a precaution, disconnect the battery cables from the battery terminals, tape the battery clamps and remove the key from the ignition switch prior to performing any service work on a Skid Steer Loader.

Place a “Do Not Operate” tag prominently on the machine to inform personnel that the machine is being worked on.

Removal and Installation

Removal and installation procedures are provided for the following radiator/oil cooler components.

- Fan and Fan Guard Assembly
- Radiator/Oil Cooler

Note: Procedures are provided for only those radiator/oil cooler components listed above. However, exploded parts diagrams exist in the TSR-50-60 Parts manuals to serve as visual aids in the assembly and disassembly of other system components.

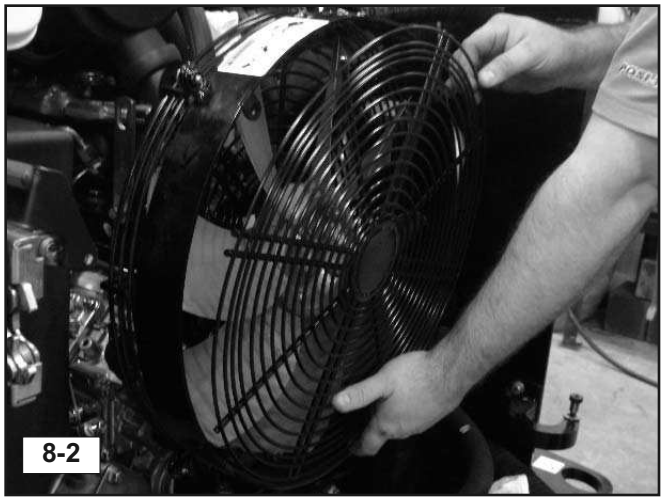
Note: Refer to pages 3-1 for pictorial views of the filtering and cooling system components.

Fan and Fan Guard Assembly

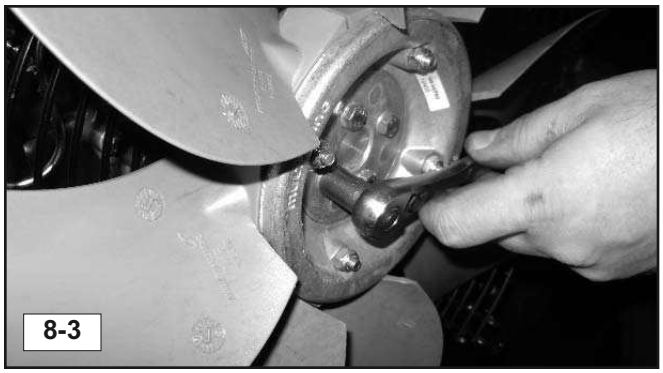
Removal

Required Tools
Combination Wrench **Socket Wrench**

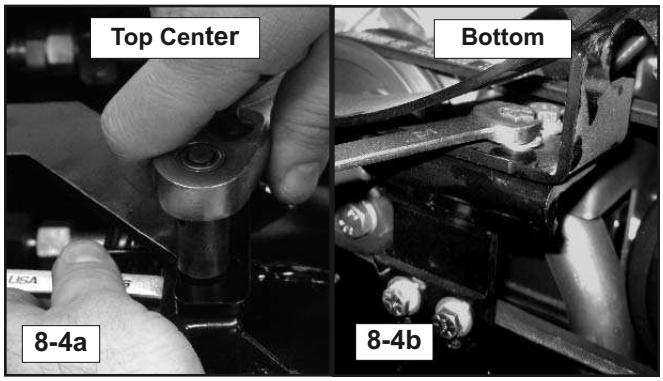
1. Remove the ignition key to avoid accidental start, then open the hood and rear door to access the fan and guard. Remove the bolts that secure the forward and rearward fan guard screens to the fan surround (fig. 8-1).



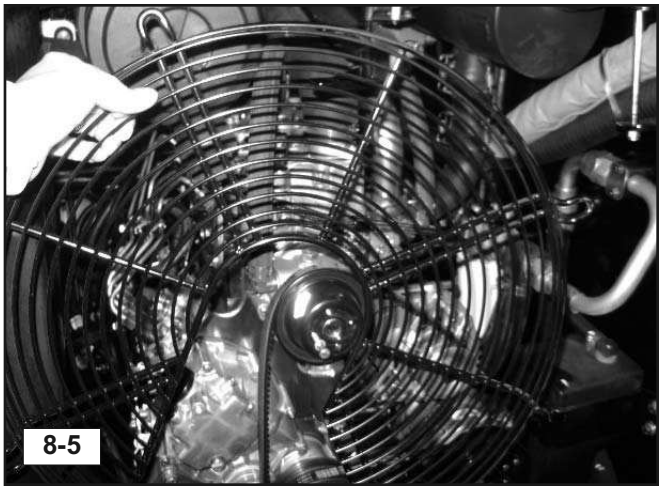
2. Remove the rearward fan guard screen from the machine (fig. 8-2).



3. Remove the bolts securing the fan to the engine as shown, then remove the fan (fig. 8-3).



4. Remove the fasteners securing the fan surround to the chassis. Upper (figure 8-4a) and lower right and left (figure 8-4b, right side shown). Then remove the fan surround.



5. Remove the forward fan guard screen as shown in figure 8-5.

Installation

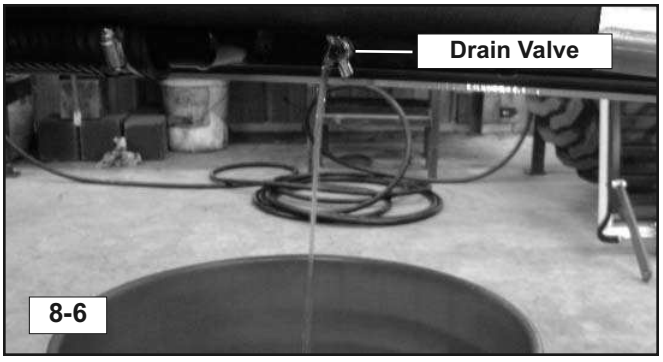
1. To install the fan guard assembly and fan, reverse the removal procedure.

Radiator/Oil Cooler

Removal

Required Tools
Combination Wrench
Socket Wrench
Blade type screwdriver
Allen Wrench

Note: Collect and contain liquids in suitable containers. Dispose of all liquids according to mandates.



1. With the machine off and cool and ignition key removed to avoid accidental start, access the radiator / oil cooler by opening the rear door.

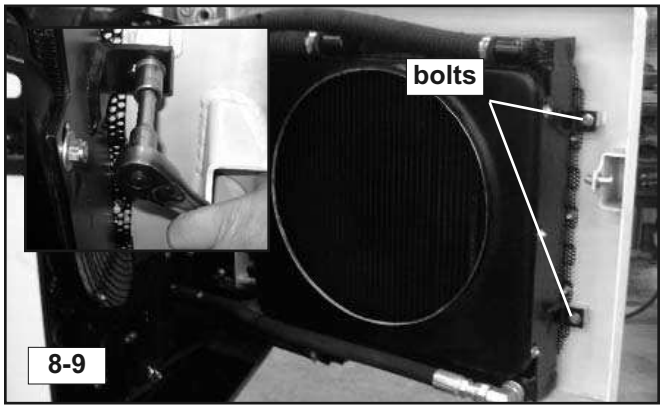
2. Twist the drain valve counter clockwise to drain the cooling system. Drain fluids into suitable catch containers. (fig. 8-6).

⚠ Fluids and machine components can be HOT! Allow the machine to cool thoroughly prior to performing maintenance or service to avoid the possibility of burns.

3. Loosen and disconnect the lower cooler hose and allow hydraulic fluid to drain in a suitable container. Cap and plug the line and cooler opening upon disassembly (fig. 8-7).

4. Loosen and disconnect the lower radiator hose and allow antifreeze to drain in a suitable container. Plug the line and radiator opening upon disassembly (fig 8-8).

5. Repeat step 3 & 4 to disconnect the upper radiator and cooler hoses.



6. Remove two bolts that secure the radiator / cooler to the surface of the rear door (fig. 8-9).

7. Support the weight of the radiator with a suitable mechanical lifting device, then begin removing the upper and lower shoulder bolts that secure the radiator / cooler hinges to the to the rear door hinges as shown in figure 8-10.

8. Remove the radiator/cooler from the machine.

Installation

1. To install the radiator / cooler, reverse the removal procedure.

2. Refill antifreeze and hydraulic oil levels as needed.

9. Hydraulic Reservoir

Chapter Overview

This chapter provides removal and installation procedures for the hydraulic reservoir.

Personal Safety

Improper or incomplete maintenance/repair of a Skid Steer Loader can be dangerous and may result in machine damage, injury or death.

Do not attempt to perform any type of repair or maintenance on a Skid Steer Loader until you have read and fully understood the information in this manual. Refer to the Operation and Maintenance manual for instructions regarding proper machine operation techniques before operating any Skid Steer Loader.

Prior to performing any type of service work on a Skid Steer Loader, read and understand Chapter 1 (Product Safety) for personal safety information.

Machine Preparation

Accidental machine starting can cause injury or death to personnel working on a Skid Steer Loader.

As a precaution, disconnect the battery cables from the battery terminals, tape the battery clamps and remove the key from the ignition switch prior to performing any service work on a Skid Steer Loader.

Place a “Do Not Operate” tag prominently on the machine to inform personnel that the machine is being worked on.

Removal and Installation

Removal and installation procedures are provided for the following hydraulic components.

- Hydraulic Reservoir (tank)
- Suction Screen

Note: Procedures are provided for only those hydraulic components listed above. However, exploded parts diagrams exist in the TSR-50-60 Parts manuals to serve as visual aids in the removal and installation of other system components.

Note: Refer to pages 3-1, 3-2 and 3-3 for additional hydraulic circuit and system information.

Hydraulic Reservoir

Removal (in event of contamination)

Required Tools
Screwdriver
Combination/Socket Wrench
Mechanical Lift / Support

Relax all hydraulic circuits and make sure the oil is cool before disconnecting any component or line from the system. Pressurized and or hot hydraulic fluid can cause personal injury.

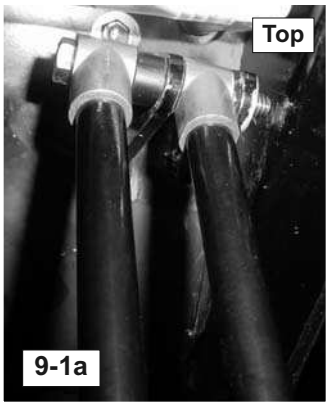
Note: Collect and contain liquids in suitable containers. Dispose of all liquids according to mandates.

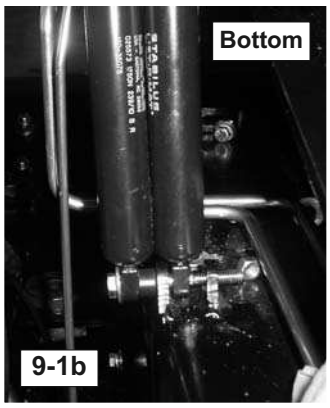
NOTICE

During disassembly, plug and cap all hoses and fittings to prevent system fluid loss or contamination.

1. Raise lift arms and brace according to the procedure on page 4-1.
2. Shut the machine down according to the procedure in section 5.13 of the operations manual.
3. Allow the machine to cool, then release any residual pressure in the hydraulic system by following the procedure on section 4.7 of the operation and maintenance manual.
4. Raise the cab according to page 4-2 of this chapter to access the tank drain.
5. Drain the hydraulic oil from the tank according to the procedure on page 4-12 steps 5 & 6.

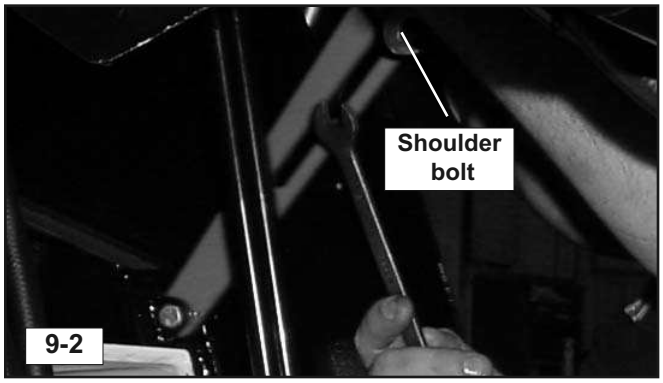
⚠ Use a suitable mechanical lifting device to support the weight of the cab enclosure once in the raised position. The gas assist springs and the cab brace must be removed for clearance when removing the hydraulic reservoir. The cab enclosure MUST be supported to ensure safety while performing this procedure.





6. Loosen the and remove the nuts securing the two gas assist springs which aid in lifting the cab.

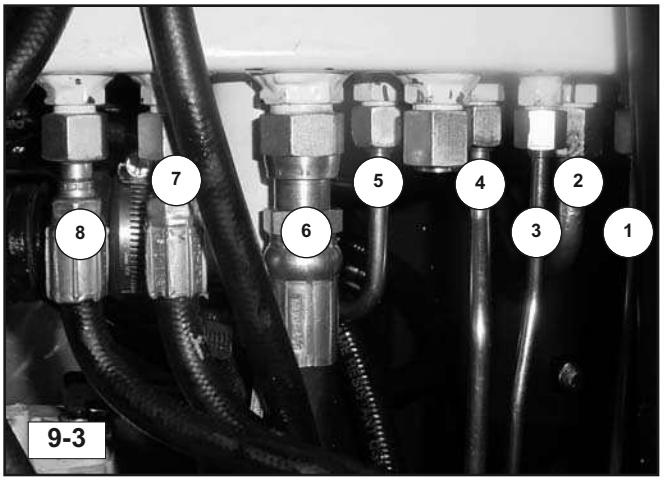
Note: Note the order of removal to aid during reassembly.



7. Remove the shoulder bolt on the cab brace to allow the brace to remain attached to chassis (fig. 9-2).

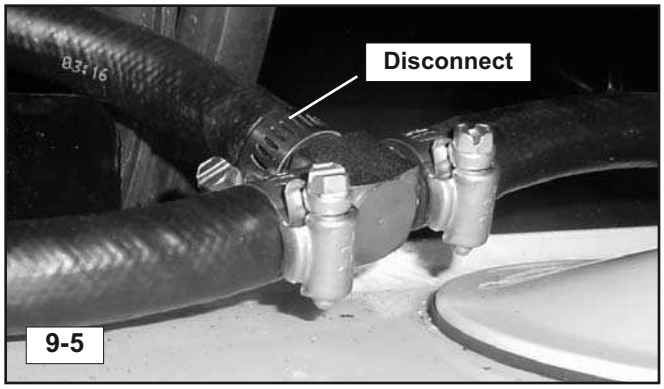
8. Once the cab brace is detached from the cab, raise the cab with the mechanical lifting device to relieve cab weight on the gas assist springs.

9. Remove the bolts, hardware, and gas assist springs from the machine.

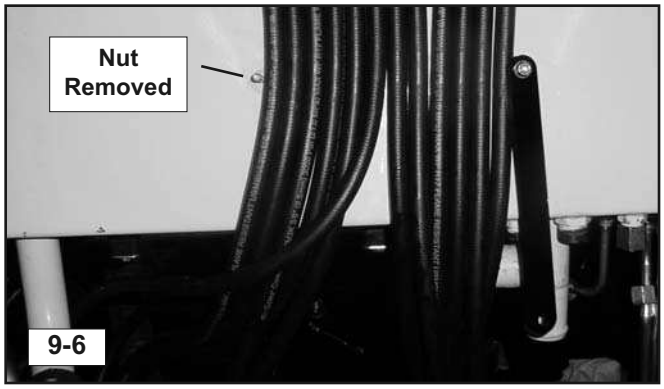


10. Disconnect hydraulic hoses and tubes in the order shown in figure 9-3 starting with number "1". Mark or label each tube to aid in re-assembly.

11. Loosen hose clamps and disconnect hydraulic inlet and return hoses from the reservoir (fig. 9-4).

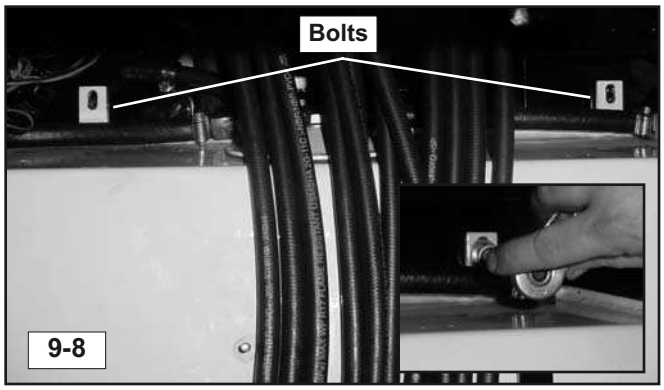


12. Loosen hose clamps on the vent tubes located near the top of the reservoir and disconnect them (fig. 9-5).



13. Remove one nut from the bracket that secures the pilot hoses to the front of the hydraulic reservoir and pivot it aside (fig. 9-6).

14. Loosen hose clamp and disconnect the fill hose from the rear of the hydraulic tank (fig. 9-7).



15. Ask an assistant to support the weight of the empty reservoir as you remove the fasteners that secure it to the chassis (fig. 9-8).

16. Carefully maneuver the hydraulic tank around the pilot hoses and out of the machine with the help of an assistant (fig. 9-9).

Installation

1. To install the hydraulic reservoir, reverse the removal procedure.

Note: Typically, the only service issue warranting the removal of the reservoir is hydraulic system contamination. Upon installation, the tank must be clean and free of **any** dirt or debris that may contaminate the hydraulic oil. If you are unable to successfully flush the tank clean of **all** dirt or debris, replace the tank.

Suction Screen (fig. 9-10)

Removal

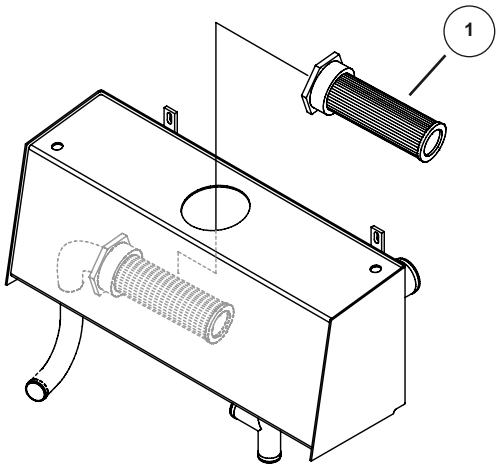
Required Tools
Socket/Combination Wrenches

1. Remove the hydraulic reservoir from the machine as described in this chapter.
2. Remove the acess hole cover on the top of the reservoir to access the suction screen (item 1).
3. If removal is necessary, thread the suction screen off of the flange weldment and remove (fig 9-10).

Installation

1. To install the suction screen, reverse the removal procedure.

Note: It is important to inspect the screen for pieces of metal or other debris that may have been generated by a worn or defective component. If there is debris present on the screen, the hydraulic system (including the reservoir) must be flushed clean to remove any and all contamination (debris). The screen should be replaced as well as any components found to be defective.



9-10

10. Lift-Arm/Drive Controls

Chapter Overview

This chapter provides removal and installation procedures for the lift-arm and drive control components.

Personal Safety

Improper or incomplete maintenance/repair of a Skid Steer Loader can be dangerous and may result in machine damage, injury or death.

Do not attempt to perform any type of repair or maintenance on a Skid Steer Loader until you have read and fully understood the information in this manual. Refer to the Operation and Maintenance manual for instructions regarding proper machine operation techniques before operating any Skid Steer Loader.

Prior to performing any type of service work on a Skid Steer Loader, read and understand Chapter 1 (Product Safety) for personal safety information.

Machine Preparation

Accidental machine starting can cause injury or death to personnel working on a Skid Steer Loader.

As a precaution, disconnect the battery cables from the battery terminals, tape the battery clamps and remove the key from the ignition switch prior to performing any service work on a Skid Steer Loader.

Place a “Do Not Operate” tag prominently on the machine to inform personnel that the machine is being worked on.

Prior to performing any type of service work on a Skid Steer Loader, read and understand Chapter 1 (Product Safety) for personal safety information.

Removal and Installation

Removal and installation procedures are provided for the following lift-arm/drive control components.

- Pilot Control Joystick
- Lift Arm Float Magnet
- Lift Arm Control (loader) Valve

Note: Procedures are provided for only those lift-arm/drive control components listed above. However, exploded parts diagrams exist in the TSR-50-60 Parts manuals to serve as visual aids in the assembly and disassembly of other system components.

Note: Refer to page 3-2 and 3-3 for pictorial views of the hydraulic auxiliary and drive systems and components.

Pilot Control Joystick

Removal

Required Tools
Side Cutter **Combination/Open End/Socket Wrenches** **Hydraulic Caps/Plugs (various sizes)**

Note: The procedures for removing and installing the right and left joysticks are basically identical. As a result, only the procedures for the right joystick are described in this section.

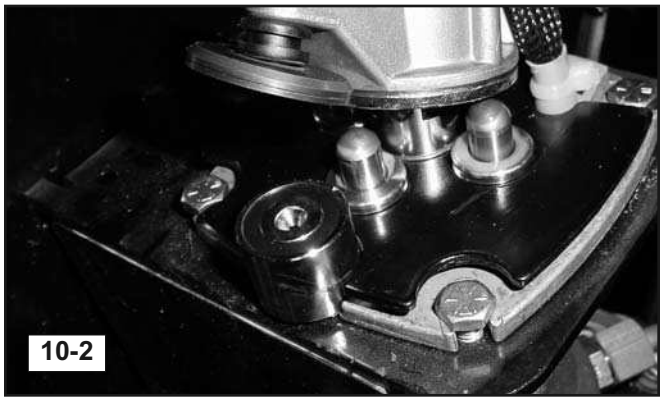
NOTICE

Cap and plug all fittings and hoses to prevent fluid loss and or contamination during service work.

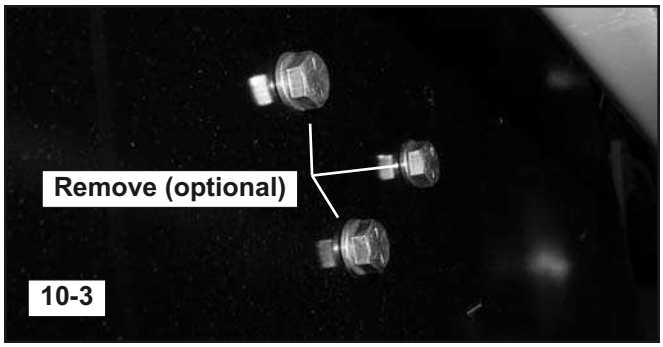
Relax all hydraulic circuits and make sure the oil is cool before disconnecting any component or line from the system. Pressurized and or hot hydraulic fluid can cause personal injury.

1. Relax all hydraulic actuators to relieve pressure in the hydraulic system prior to service.
2. Turn the ignition switch to the **OFF** position, remove the key and disconnect the battery to avoid accidental start.
3. Perform the interior side panel removal procedure that addresses the joystick you plan to remove on page 6-3 of this manual.

4. Expose and cut the zip tie securing the lower portion of the boot to the joystick body, then lift it upwards (figure 10-1).



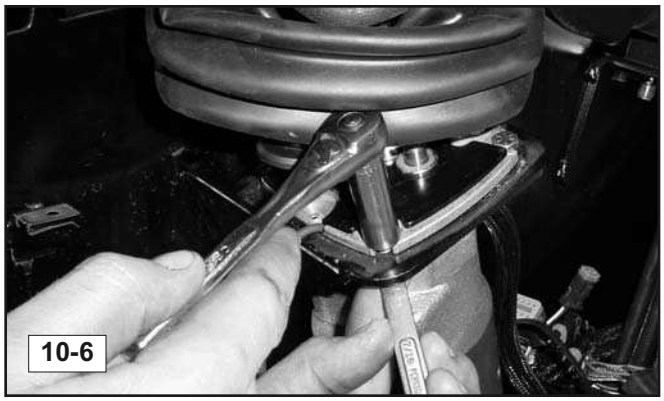
Note: The float magnet is now exposed as well as the mounting bolts securing the joystick to the bracket (figure 10-2).



5. Remove the bolts (3) securing the joystick mounting bracket to the cab from the outside (fig. 10-3) (optional).

6. Label the hydraulic hoses to aid in reassembly.
7. Disconnect the hydraulic hoses from the various joystick fittings and lay them aside (fig. 10-4).

8. Disconnect all connectors coming from the joystick harness. (fig. 10-5)



9. Remove the bolts and nuts securing the joystick to the mounting bracket (fig. 10-6).

10. Lift the joystick through the opening in the bracket and remove it from the machine (fig. 10-7).

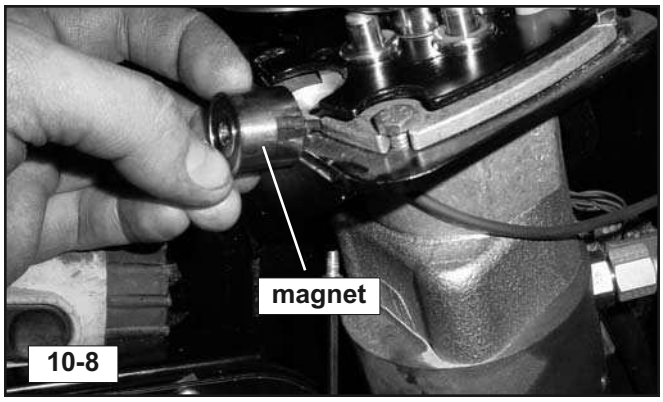
Installation

1. To install the joystick, reverse the removal procedure.

Lift Arm Float Magnet
Removal

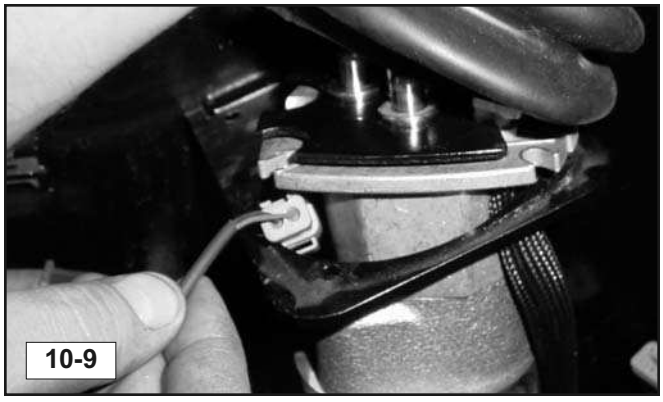
Required Tools
Socket Wrench **Combination/Open End Wrench** **Allen Wrench**

1. Perform steps 3, 4 and 9 of the lift arm joystick control removal process.



2. Remove the allen bolt from the underside of the magnet (fig. 10-8).

3. Disconnect the magnet harness connector from the machine.



4. Lift the joystick within the bracket slightly, then pull the magnet harness and connector through the bracket past the joystick to remove it (fig. 10-9).

Installation

1. To install the float magnet, reverse the removal procedure.

Lift Arm Control Valve
Removal

Required Tools
Socket Wrench **Combination/Open End Wrench**

1. Perform steps 1 and 2 of the lift arm joystick control removal process.

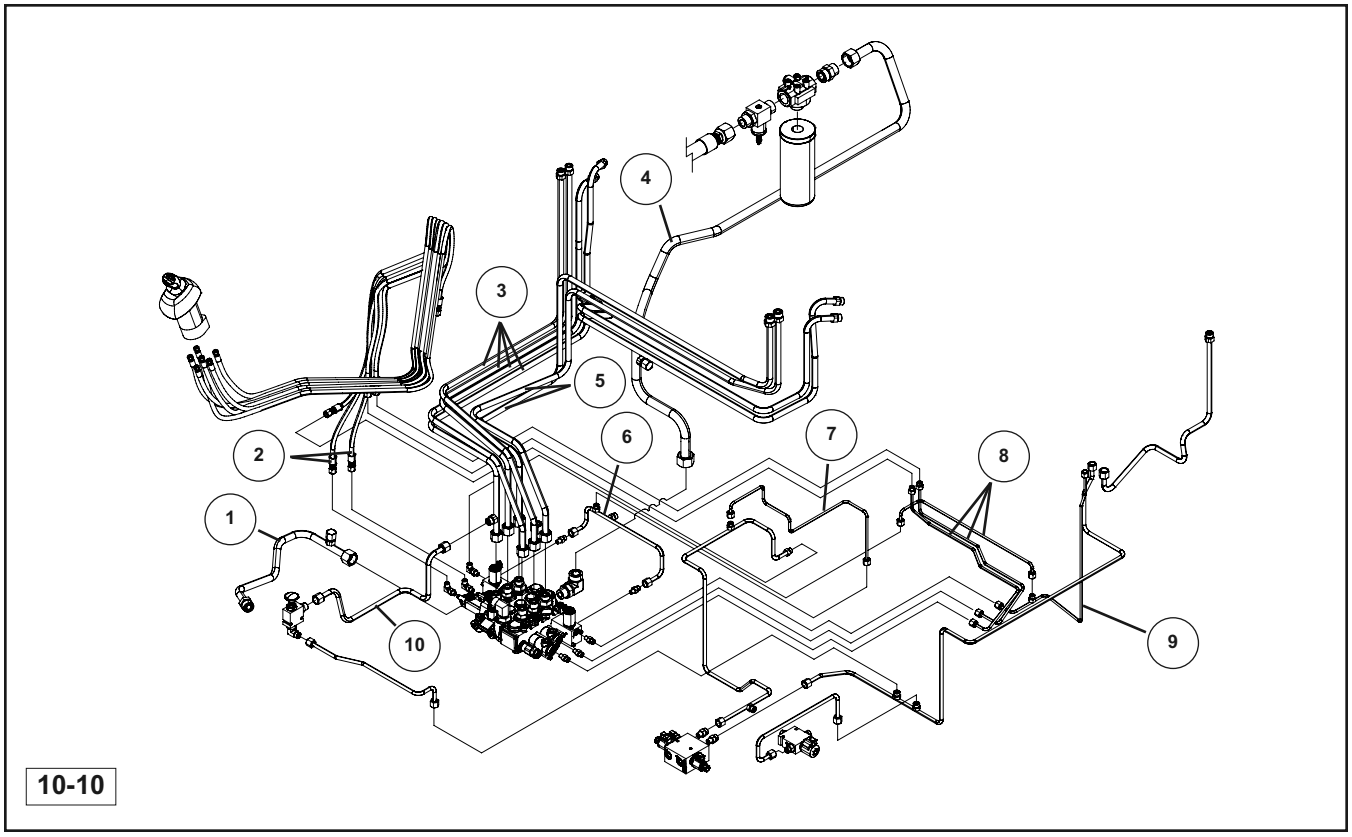
2. Remove the bolts securing the lower access panel to the chassis and remove it to allow the valve to be removed.

3. Raise the operator enclosure according to the procedure outlined on page 4-2 of this manual to access the valve from the top.

4. Disconnect tubes and hoses (items 1-10) from the lift arm valve assembly (fig 10-10).

5. Once the valve has been disconnected from all hoses/tubes, remove the retaining bolts securing it to the chassis.

6. Slide the lift arm valve out through the lower opening in the chassis and remove.



10-10

NOTICE

Cap and plug all fittings and hoses to prevent fluid loss and or contamination during service work.

Installation

1. To install the lift arm valve, reverse the removal procedure.

11. Hydraulic Pumps/Motors

Chapter Overview

This chapter provides removal and installation procedures for the hydraulic pumps and motors.

Personal Safety

Improper or incomplete maintenance/repair of a Skid Steer Loader can be dangerous and may result in machine damage, injury or death.

Do not attempt to perform any type of repair or maintenance on a Skid Steer Loader until you have read and fully understood the information in this manual. Refer to the Operation and Maintenance manual for instructions regarding proper machine operation techniques before operating any Skid Steer Loader.

Prior to performing any type of service work on a Skid Steer Loader, read and understand Chapter 1 (Product Safety) for personal safety information.

Machine Preparation

Accidental machine starting can cause injury or death to personnel working on a Skid Steer Loader.

As a precaution, disconnect the battery cables from the battery terminals, tape the battery clamps and remove the key from the ignition switch prior to performing any service work on a Skid Steer Loader.

Place a “Do Not Operate” tag prominently on the machine to inform personnel that the machine is being worked on.

NOTICE

The hydraulic system fluid should be changed following any hydraulic component service according to the procedure described on page 4-12.

Removal and Installation

Removal and installation procedures are provided for the following hydraulic components.

- Charge/Auxiliary Pump
- Tandem (Drive) Pump
- Drive Chains (pre-req. for drive motor removal)
- Drive Motors

Note: Procedures are provided for only those hydraulic components listed above. However, exploded parts diagrams exist in the TSR-50-60 Parts manuals to serve as visual aids in the removal and installation of other system components.

Note: Refer to pages 3-1, 3-2 and 3-3 for additional motor, pump and hydraulic system information.

Charge/Auxiliary Pump (figure 11-1)

Removal

Required Tools
Screwdriver **Combination Wrench** **Socket Wrench**

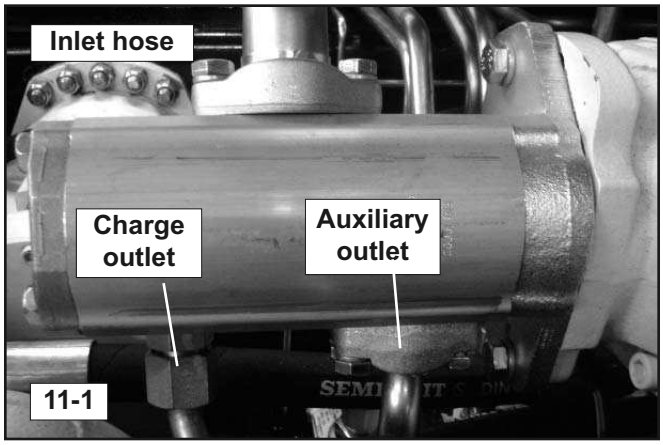
Remove any attachment, relax all actuators and make sure the hydraulic oil is cool before removing any components or lines. Hot or pressurized oil can cause personal injury.

Note: Collect and contain liquids in suitable containers. Dispose of all liquids according to mandates.

NOTICE

During disassembly, plug and cap all hoses and fittings to prevent system fluid loss or contamination.

1. Raise and support lift arms as described on page 4-1of this manual.
2. Turn the ignition switch to the **OFF** position and remove the key to avoid accidental start.
3. Drain the hydraulic fluid. Refer to page 4-12 for the hydraulic fluid and filter change procedure.
4. Tilt and support the operator enclosure (cab) as described on page 4-2 of this manual.
5. Disconnect battery cables.



6. Remove the four bolts securing the inlet hose to the auxiliary pump and lay it aside.
7. Disconnect charge pump outlet hose from the fitting.
8. Remove the four bolts and split flange clamp from the auxiliary pump outlet tube and lay it aside.
9. Support the charge/auxiliary pump with a suitable lifting device.
10. Remove the upper and lower bolts that secure the auxiliary pump to the drive pump and remove.

Installation

1. To install the auxiliary pump, reverse the removal procedure.

Tandem (Drive) Pump

Removal

Required Tools
Screwdriver Combination/Open End Wrenches

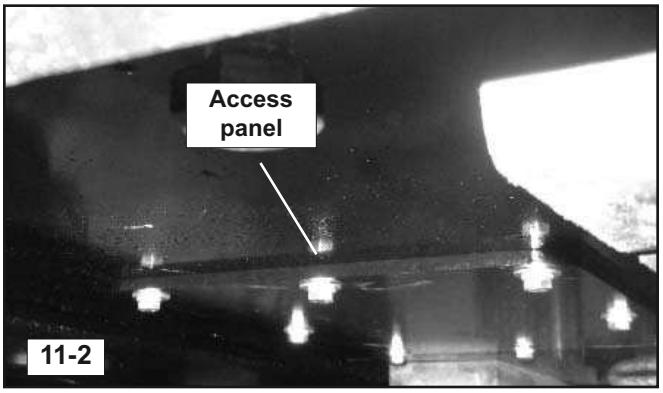
Personal injury can result from exposure to hot fluids and components. Allow the machine to cool thoroughly before attempting any type of service on the cooling or hydraulic systems.

Note: Collect and contain liquids in a suitable container. Dispose of all fluids according to mandates.

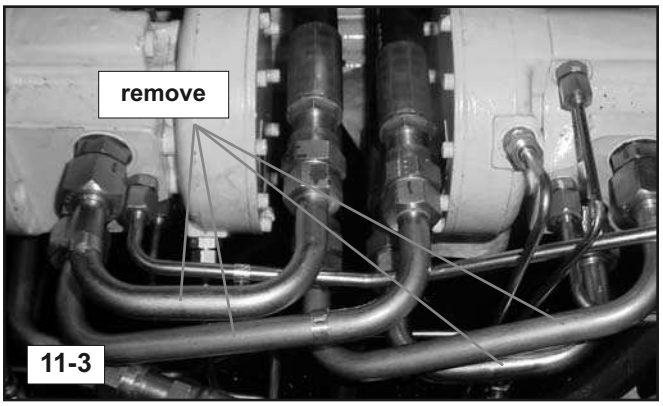
NOTICE

During disassembly, plug and cap hoses and fittings to prevent fluid loss and or contamination.

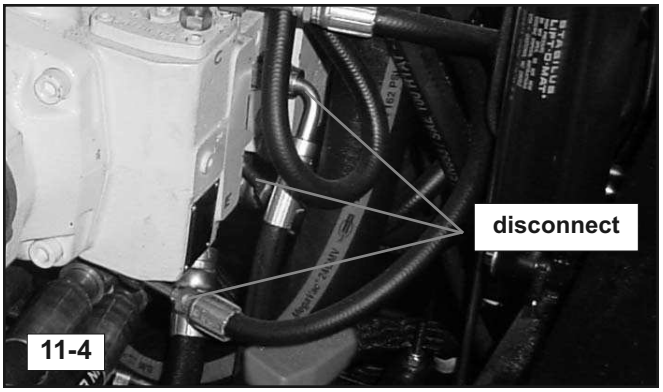
1. Perform the auxiliary pump removal procedure found in this chapter.



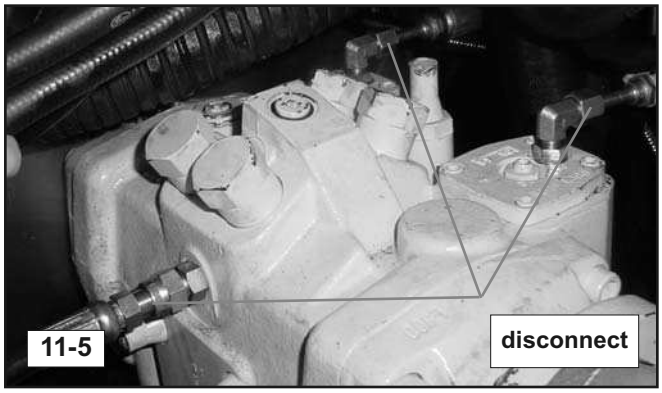
2. Remove the access panel from the bottom of the chassis (fig. 11-2).



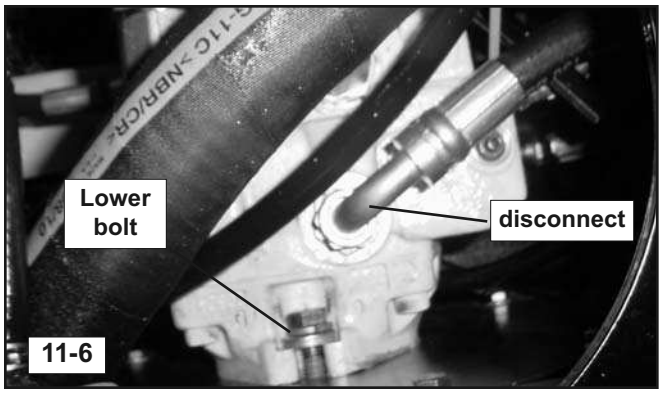
3. Disconnect the drive tubes from the drive pump and drive hoses and remove (fig. 11-3).



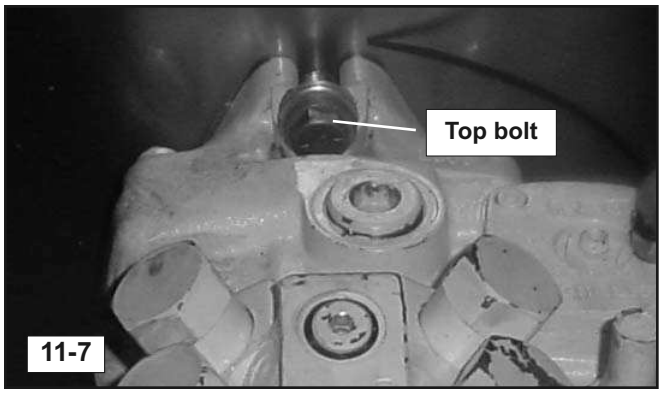
4. Disconnect the lower pilot hoses and posi-power outlet hose from the drive pump (fig. 11-4).



5. Disconnect the upper pilot hoses and right side charge outlet hose from the drive pump (fig. 11-5).
6. Secure the weight of the transmission with a suitable mechanical hoist.



7. Disconnect the lower return and charge hoses from the underside of the pump through the access panel on the bottom of the chassis (fig. 11-6).
8. Remove lower bolt that secures the drive pump to the engine through the access panel (fig. 11-6).



9. Remove the upper bolt that secures the drive pump to the engine (fig. 11-7).
10. Using a suitable mechanical hoist and straps, carefully lift the pump up and out of the chassis.

Installation

1. To install the transmission pump, reverse the removal procedure.

Drive Chain

Removal

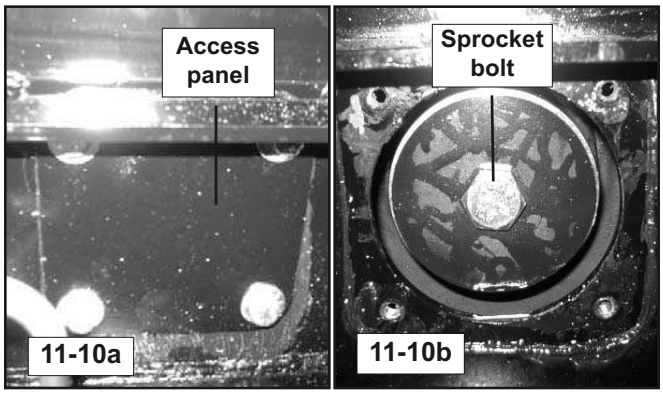
Required Tools
Combination/Socket Wrench Impact Wrench

Note: The following procedure is shown being performed on the right side of the machine. The procedure is identical for the left side.

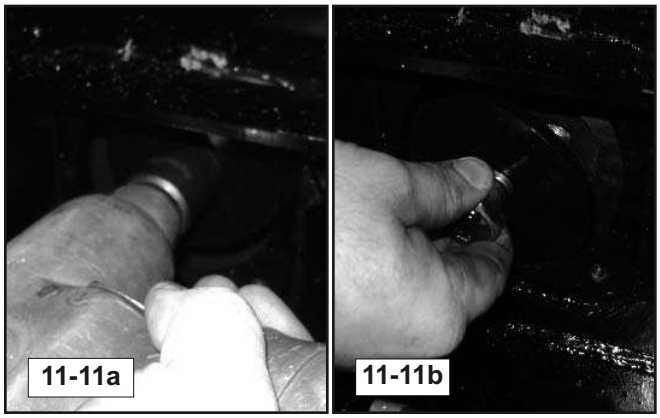
1. Shut the machine down as described in section 5.13 of the operation and maintenance manual, then elevate and support the front and rear of the machine as described on page 4-2.

2. Remove the lug nuts securing the front wheel to the pod, then remove the wheel (use a suitable hoist and lifting straps)(fig 11-8).

3. Remove the chain case side cover plate to access the chains for removal (fig. 11-9).

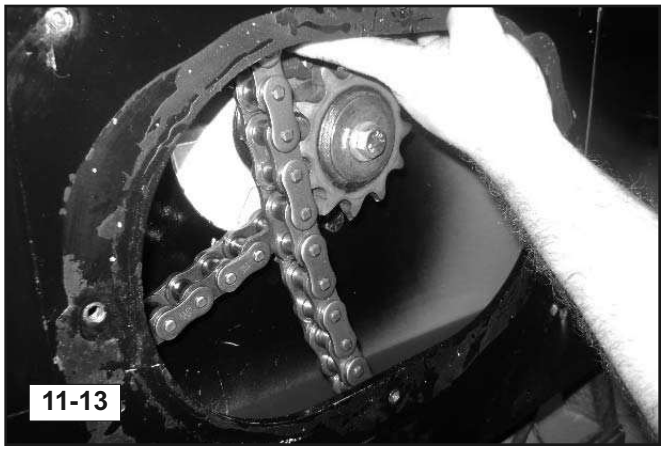


4. Remove the sprocket access panel (fig. 11-10a), located next to the drive motor on the inside of the chassis, to gain access to the sprocket bolt (fig. 11-10b).

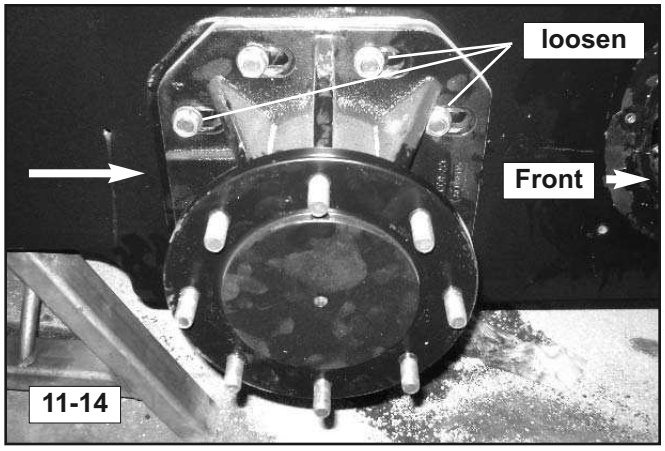


5. Remove sprocket bolt to free sprocket for removal (fig. 11-11 a & b).

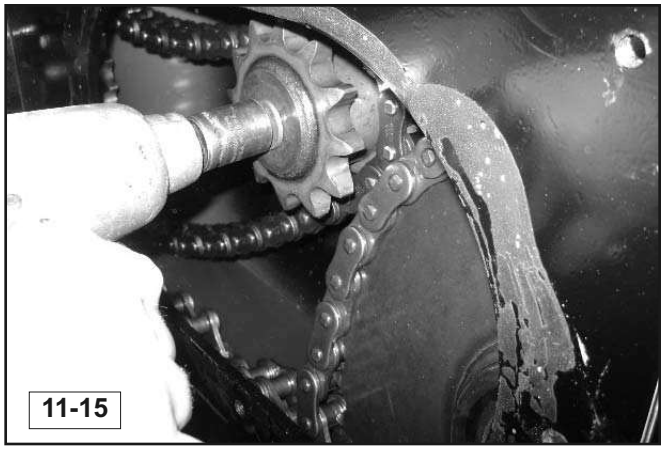
6. Remove bolts that secure the wheel pod to chassis and attach a hoist to support the weight of the pod. Remove the wheel pod as shown (fig. 11-12).



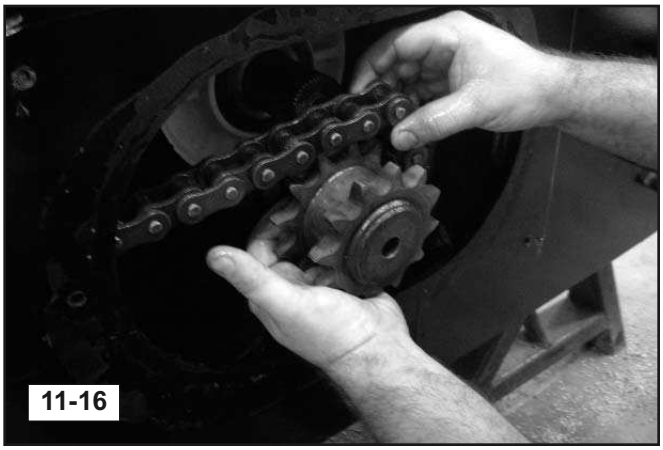
7. Pull on the chain to increase slack. Lift the chain over and off of the drive sprocket (fig.11-13).



8. Complete steps 4-5 on the rear wheel pod. The rear wheel pod does not need to be removed but it does need to be loosened and moved forward to increase slack in the chain (fig. 11-14).



9. Remove drive motor sprocket bolt (fig 11-15).



10. Remove the sprocket from the drive shaft, then the chains and driven sprockets may be removed for inspection or replacement (fig. 11-16).

Installation

1. To install the drive chains, reverse the removal procedure.

Drive Motor

Removal

Required Tools
Combination/Socket Wrench **Impact Wrench**

Remove any attachment, relax all actuators and make sure the hydraulic oil is cool before removing any components or lines. Hot or pressurized oil can cause personal injury.

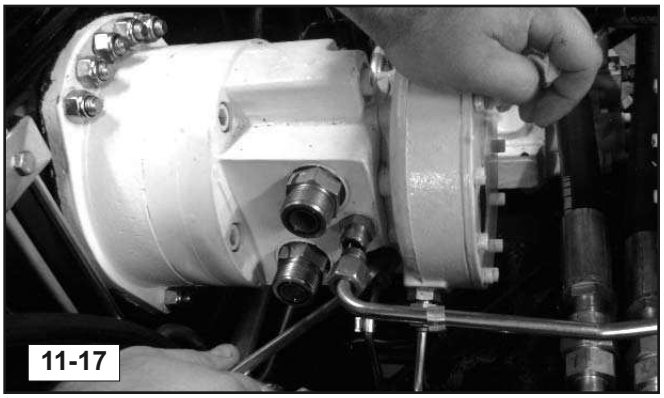
Note: Collect and contain liquids in suitable containers. Dispose of all liquids according to mandates.

NOTICE

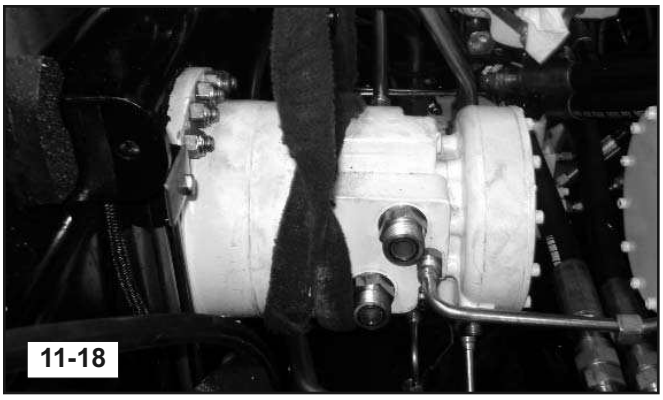
During disassembly, plug and cap all hoses and fittings to prevent system fluid loss or contamination.

Note: The following procedure is shown being performed on the right side of the machine. The procedure is identical for the left side.

1. Perform the drive chain removal as described in the procedure on page 8-3 of this manual.



2. Disconnect all hydraulic tubes & hoses from the drive motor (fig. 11-17).



3. Support the drive motor's weight with a suitable mechanical hoist and straps (fig. 11-18).

4. Remove the bolts securing the drive motor to the chassis with a suitable wrench (fig. 11-19).

5. Carefully guide the motor output shaft out of the chain case opening and remove it from the machine.

Installation

1. To install the drive motor, reverse the removal procedure.

12. Engine

Chapter Overview

This chapter provides procedures for the removal and installation of the engine and associated components.

Personal Safety

Improper or incomplete maintenance/repair of a Skid Steer Loader can be dangerous and may result in machine damage, injury or death.

Do not attempt to perform any type of repair or maintenance on a Skid Steer Loader until you have read and fully understood the information in this manual. Refer to the Operation and Maintenance manual for instructions regarding proper machine operation techniques before operating any Skid Steer Loader.

Prior to performing any type of service work on a Skid Steer Loader, read and understand Chapter 1 (Product Safety) for personal safety information.

Machine Preparation

Accidental machine starting can cause injury or death to personnel working on a Skid Steer Loader.

As a precaution, disconnect the battery cables from the battery terminals, tape the battery clamps and remove the key from the ignition switch prior to performing any service work on a Skid Steer Loader.

Place a “Do Not Operate” tag prominently on the machine to inform personnel that the machine is being worked on.

Removal and Installation

Removal and installation procedures are provided for the following engine related components.

- Battery
- Exhaust
- Air Cleaner
- Engine

Note: Procedures are provided for only those engine associated components listed above. However, exploded parts diagrams exist in the TSR-50-60 parts manuals to serve as visual aids in the assembly and disassembly of other system components.

Battery (figure 12-1)

Removal

1. Raise lift arms and brace according to the procedure on page 4-1.
2. Shut the machine down according to the procedure in section 5.13 of the operation manual.
3. Raise the cab according to page 4-2 of this chapter to access the battery.

4. Remove the bolt that secures the battery restraint then remove the restraint.
5. Disconnect the negative battery cable, then the positive, **in that order** and lay them aside.
6. Remove the battery from the machine.

Installation

1. To install the battery, reverse the removal procedure.

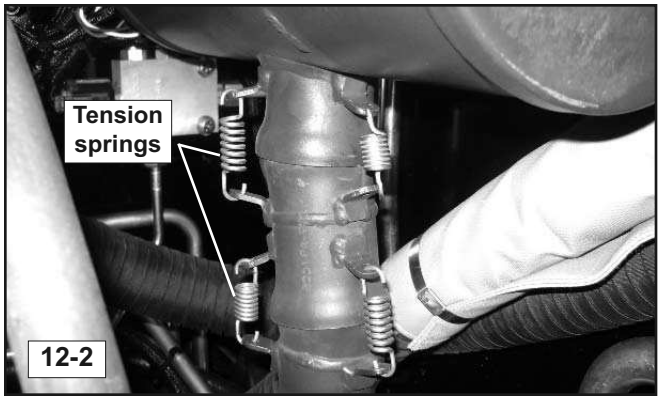
Exhaust System

Removal

Required Tools
Combination/Socket Wrench

⚠ The exhaust system is very hot at operating temperature. Make sure the machine is off and cool before attempting to service the exhaust system.

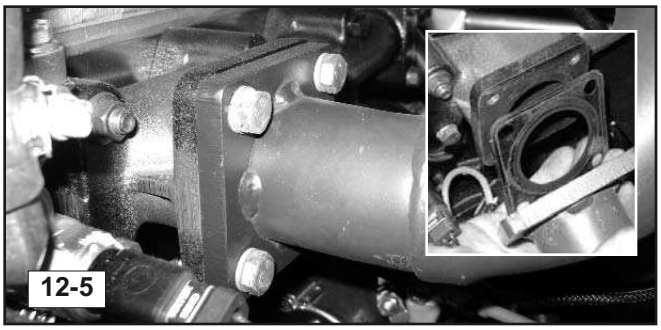
1. Raise and support the rear hood as described on page 7-4 and open the rear door on page 7-5 to access exhaust system.



2. Remove the tension springs that secure the exhaust components together. (fig.12-2).

3. Remove the bolts that secure the muffler to the chassis (fig. 12-3).

4. Remove the muffler from the machine as shown in figure 12-4.



5. Remove the bolts securing the header pipe to the manifold, then remove it. Take care not to lose the gasket (fig. 12-5).

Installation

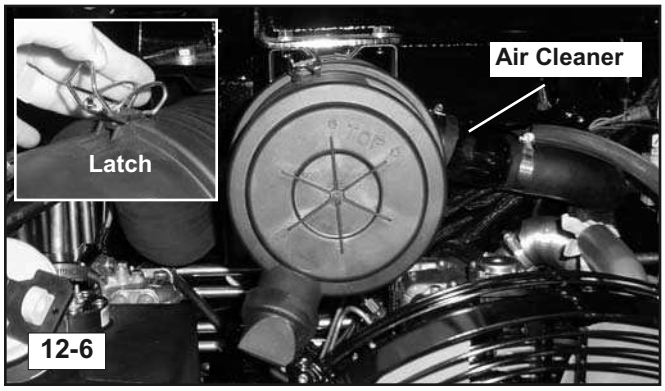
1. To install the exhaust system, reverse the exhaust system removal procedure.

Air Cleaner

Removal

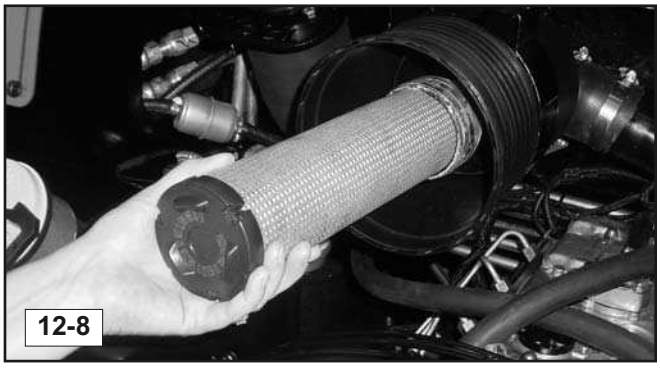
Required Tools
Combination Wrenches Socket Wrench & Extension

1. Shut the machine down as described in section 5.13 of the operations manual.
2. Raise and support the rear hood as described on page 7-4 and open the rear door on page 7-5 to access exhaust system.

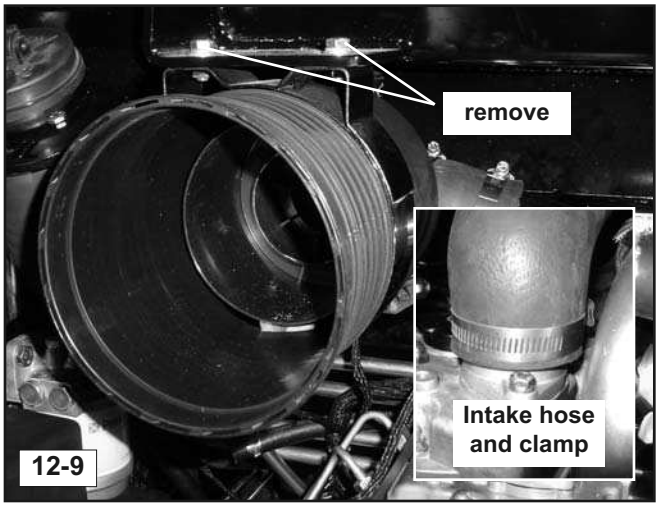


3. Locate the air cleaner enclosure in the upper left corner of the engine compartment (when viewed from the rear) and open the upper and lower latches to remove the cover (fig. 12-6).

4. Remove the primary element (fig. 12-7)



5. Once the primary element has been removed, the secondary element should be visible, remove it.



6. Loosen the clamp on the air intake hose and disconnect the hose from the engine (fig. 12-9).
7. Remove the bolts securing the air cleaner housing to the chassis, then remove it from machine (fig. 12-9).

Installation

1. To install the air cleaner assembly reverse the air cleaner removal procedure.

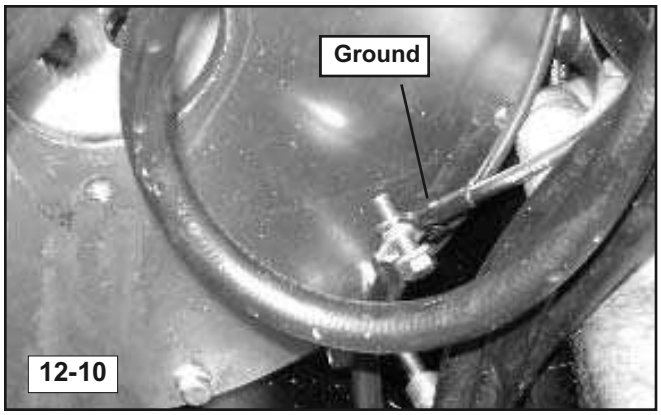
Engine

Required Tools
Combination/Socket Wrenches
Tie Down or Ratchet Strap
Forklift/Engine Hoist

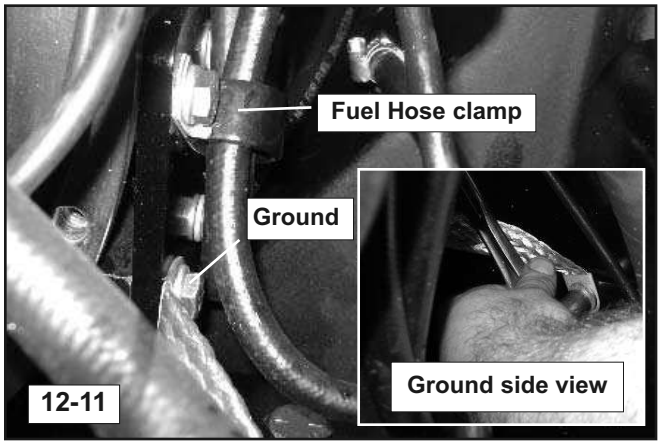
Removal

1. Perform the battery, air cleaner, auxiliary pump, and tandem pump removal procedures (found in chapters 11and 12 of this manual).
2. Raise and support the hood as described on page 7-4 and open the rear door on page 7-5 to access engine compartment.
3. Remove the fan and fan guard assemblies as described on page 8-1 of this manual.
4. Raise and support the operator enclosure (cab) as described on page 4-2 of this manual.
5. Perform the exhaust removal procedure on page 12-2 of this manual.
6. Perform the air cleaner removal procedure on page 12-3 of this manual.

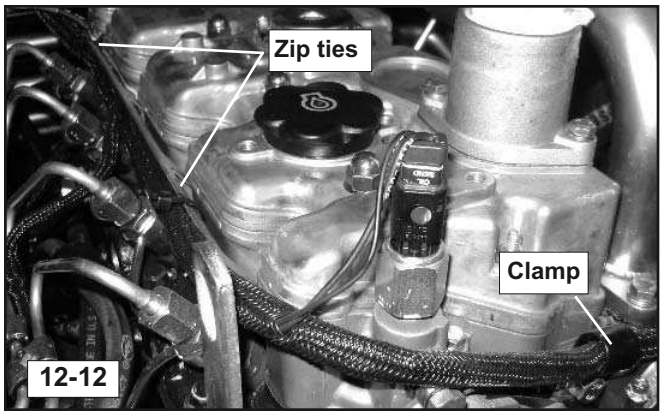
7. Disconnect engine harness wires from the alternator and the starter.



8. Locate and disconnect the ground wires connected to the engine/drive pump adapter plate (fig. 12-10).

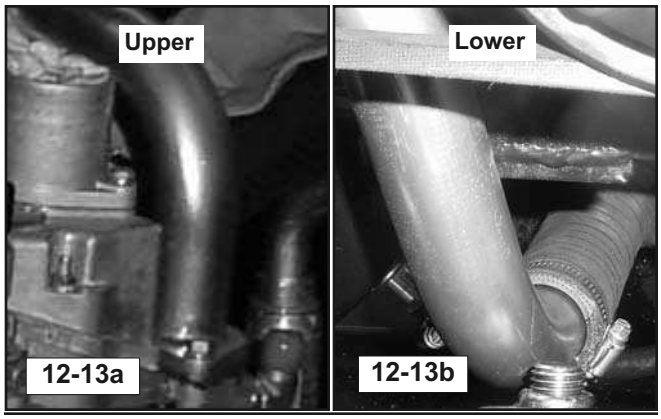


9. Disconnect the ground strap and remove the clamp (securing the fuel hose) from the forward left engine mount (fig. 12-11).

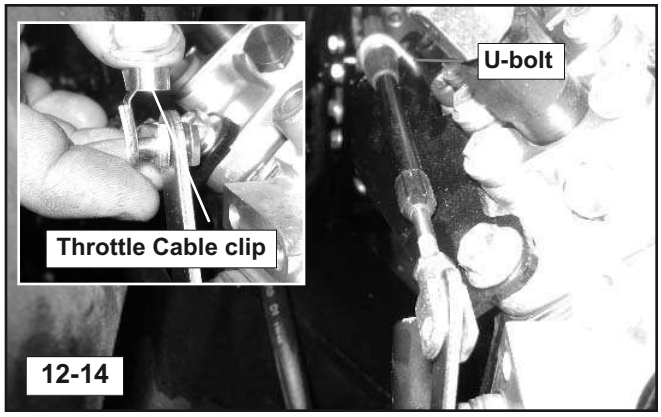


10. Remove the remainder of the harness from the engine components removing all zip ties and wire clamps (fig. 12-12).

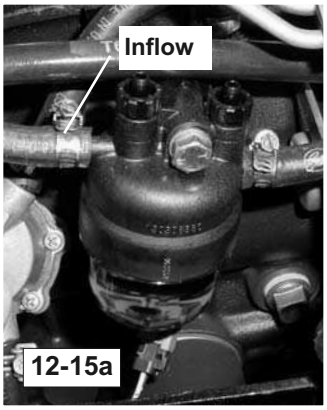
Note: Take note of the harness connections during disassembly to aid during reassembly. The harness is labeled to make this process easier.

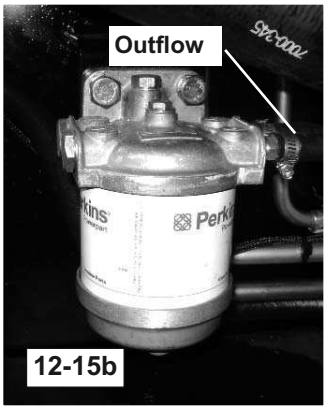


11. Locate the upper and lower coolant tube/hose on the right side of the engine. Remove the bolts securing the upper cooler tube and remove it (fig. 12.-13a). Then remove the hose clamp on the lower cooler hose by loosening hose clamp and disconnect the hose.(fig. 12-13b).

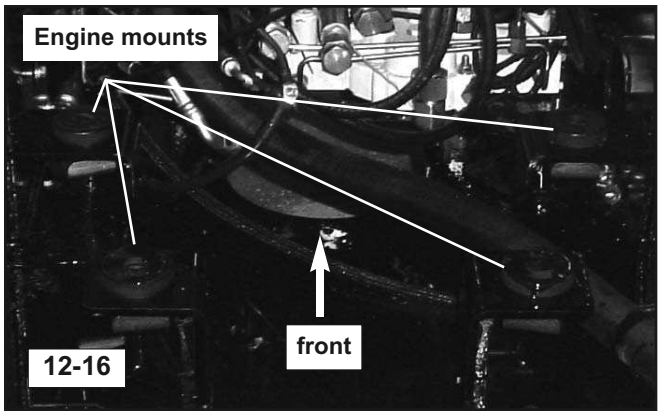


12. Disconnect the throttle cable from the throttle linkage on the engine by removing the retaining clip. Then remove the u-bolt as shown (fig. 12-14).

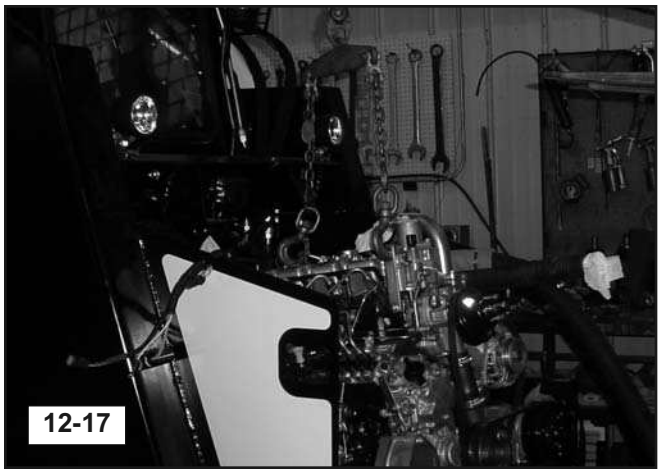




13. Disconnect the inlet hose from the water separator (fig. 12-15a) and the outlet hose from the fuel filter (fig. 12-15b). Then disconnect the primer bulb fuel line from the fuel pump.



14. Remove engine mount bolts securing the engine from the chassis (fig. 12-16).



15. Attach a suitable hoist and chains to the engine lifting points in the front and rear of the engine as shown. Then, lift and move the engine rearward, guiding it carefully upward and out of the chassis (fig. 12-17).

Installation

1. To install the engine, reverse the removal procedure.

Note: When reinstalling the engine, lightly grease the rubber motor mount surfaces to allow the engine to slide onto them without snagging or disfiguring them.

NOTICE

Once the engine has been installed, make sure to properly reconnect and install all items removed during engine removal to ensure proper operation.

Prior to starting, make sure all fluids are at appropriate levels and that they have not been contaminated with dirt or debris during service. Change fluids or adjust fluid levels as needed to ensure proper operation.

13. Quick Attach

Chapter Overview

This chapter provides removal and installation procedures for the quick attach and associated components.

Personal Safety

Improper or incomplete maintenance/repair of a Skid Steer Loader can be dangerous and may result in machine damage, injury or death.

Do not attempt to perform any type of repair or maintenance on a Skid SteerLoader until you have read and fully understood the information in this manual. Refer to the Operation and Maintenance manual for instructions regarding proper machine operation techniques before operating any Skid Steer Loader.

Prior to performing any type of service work on a Skid Steer Loader, read and understand Chapter 1 (Product Safety) for personal safety information.

Machine Preparation

Accidental machine starting can cause injury or death to personnel working on a Skid Steer Loader.

As a precaution, disconnect the battery cables from the battery terminals, tape the battery clamps and remove the key from the ignition switch prior to per-forming any service work on a Skid Steer Loader.

Place a “Do Not Operate” tag prominently on the machine to inform personnel that the machine is being worked on.

Removal and Installation

Removal and installation procedures are provided for the following quick attach components.

- Quick Attach locking Pin Assemblies
- Quick Attach Pivot Pins

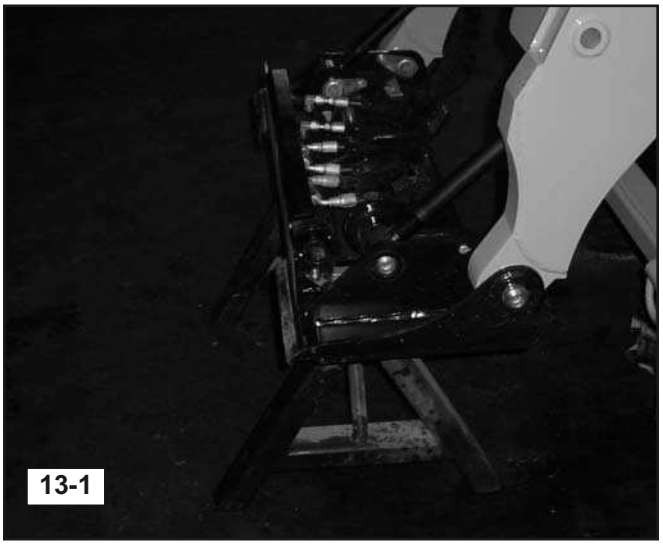
Note: Procedures are provided for only those quick attach components listed above. However, exploded parts diagrams exist in the TSR 50-60 Parts manual to serve as visual aids in the assembly and disassembly of other system components.

Locking Pin Assembly

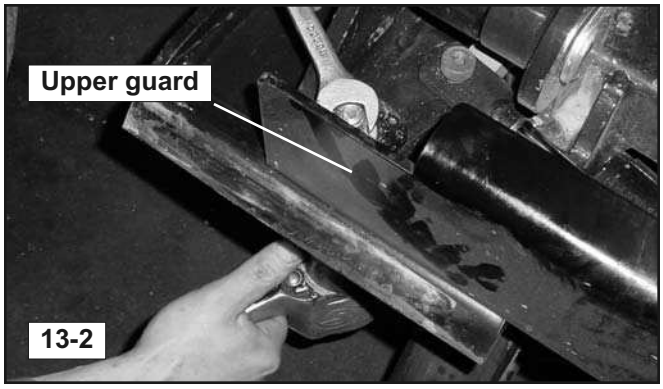
Removal

Required Tools
Combination/Open End/Socket Wrenches Mechanical Supports

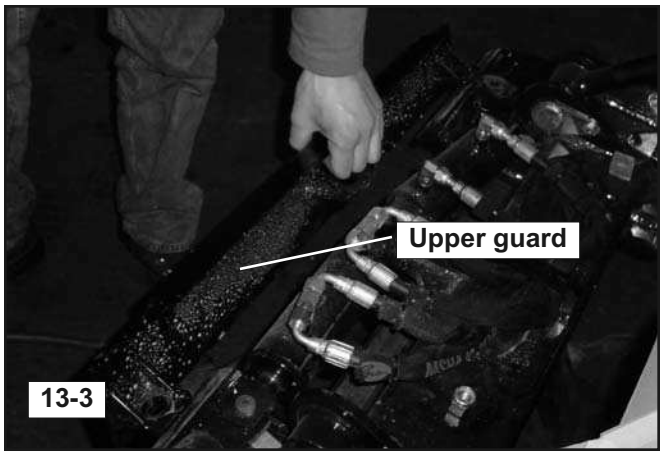
Remove any attachment, lower or safely support the lift arms and make sure the hydraulic oil is cool before removing any components or lines. Hot or pressurized oil can cause personal injury.



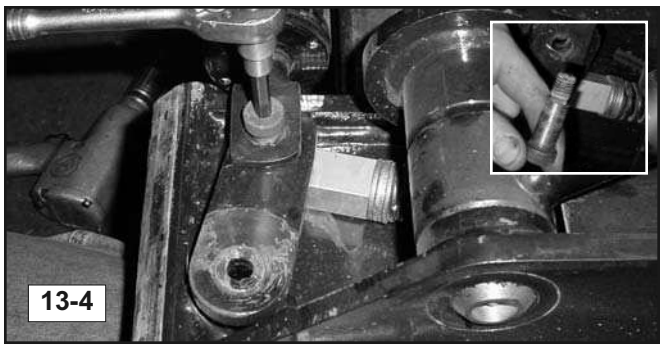
1. Rest the lift arms on mechanical support to provide clearance for quick attach disassembly (fig. 13-1).



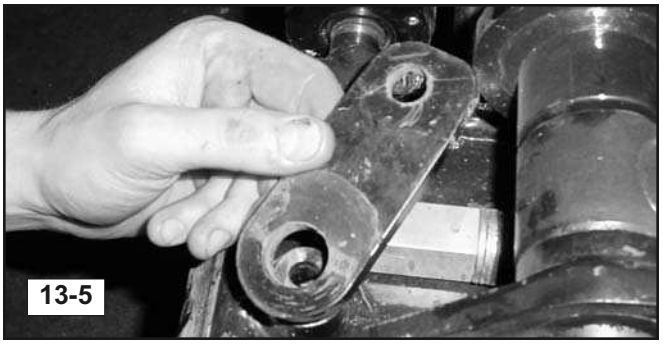
2. Remove the bolts securing the upper guard to the quick attach weldment (fig.13-2).



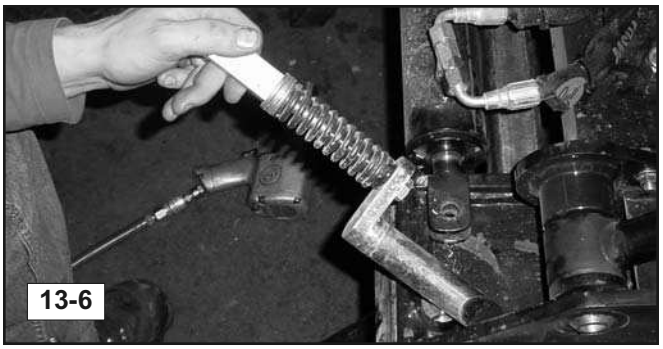
3. Remove the upper guard from the quick attach (fig. 13-3)



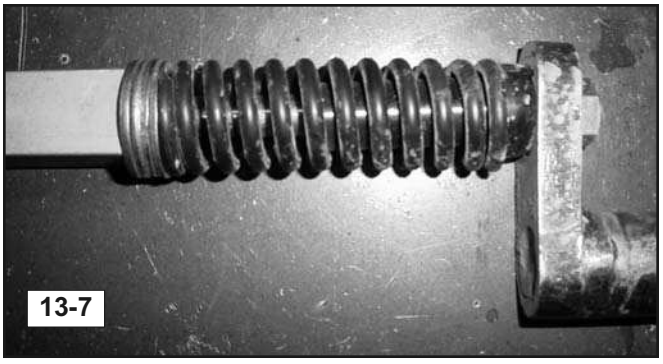
4. Remove the bolt securing the locking pin assembly to the locking cylinder or latch handle (fig. 13-4).



5. Remove the pivot link from the quick attach (fig. 13-5).



6. Slide the locking pin assembly out of the quick attach (fig. 13-6).



Note: At this time the locking pin assembly components are easily accessible for replacement. Inspect them for visible wear or damage and replace them as necessary .

Pay attention to the quantity and position(s) of each component to aid during reassembly (fig. 13-7).

Installation

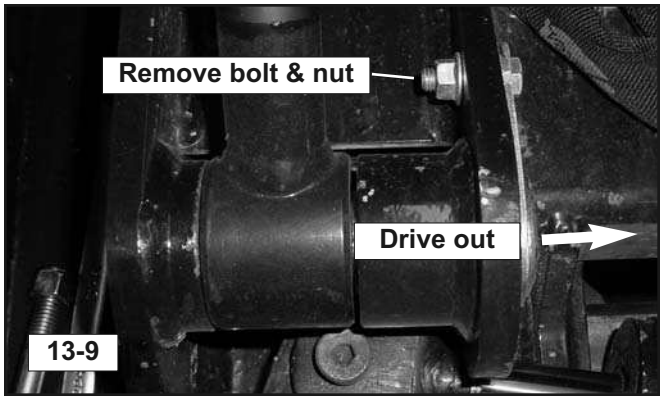
1. To install the quick attach locking pin assembly, reverse the removal procedure.

Pivot Pin (quick attach)

Removal

Required Tools
Combination/Open End/Socket Wrenches **Hammer** **Punch (brass)**

1. Rest the lift arms on an suitable mechanical support to provide clearance for quick attach disassembly (fig. 13-8.)



2. Remove the bolt securing the pivot pin to the quick attach weldment, then drive the pin out with a hammer and brass drift (punch) (fig. 13-9).

Note: There are four pivot pins that connect the quick attach to the lift arm and cylinders. All four pins are removed in a similar manner.

Installation

1. To install the quick attach pivot pins, reverse the removal procedure.

2. Repeat this process as necessary to remove and replace worn or damaged quick attach pins.

14. Lift-Arm Components

Chapter Overview

This chapter provides removal and installation procedures for the lift-arm components.

Personal Safety

Improper or incomplete maintenance/repair of a Skid Steer Loader can be dangerous and may result in machine damage, injury or death.

Do not attempt to perform any type of repair or maintenance on a Skid Steer Loader until you have read and fully understood the information in this manual. Refer to the Operation and Maintenance manual for instructions regarding proper machine operation techniques before operating any Skid Steer Loader.

Prior to performing any type of service work on a Skid Steer Loader, read and understand Chapter 1 (Product Safety) for personal safety information.

Machine Preparation

Accidental machine starting can cause injury or death to personnel working on a Skid Steer Loader.

As a precaution, disconnect the battery cables from the battery terminals, tape the battery clamps and remove the key from the ignition switch prior to performing any service work on a Skid Steer Loader.

Place a “Do Not Operate” tag prominently on the machine to inform personnel that the machine is being worked on.

NOTICE

The hydraulic system fluid should be changed following any hydraulic component service according to the procedure described on page 4-12.

Removal and Installation

Removal and installation procedures are provided for the following lift-arm components.

- Lift Cylinder
- Bucket/Tilt Cylinder
- Lift Arm Bushings
- Quick Coupler Block PRV

Note: Procedures are provided for only those lift-arm components listed above. However, exploded parts diagrams exist in the TSR-50-60 Parts manual to serve as visual aids in the assembly and disassembly of other system components.

Note: Refer to page 3-1 through 3-9 for pictorial views of the hydraulic systems and components.

Lift / Tilt Cylinder

Removal

Required Tools
Combination/Open End/Socket Wrenches **Hydraulic Caps/Plugs (various sizes)** **Mechanical Supports**

NOTICE

Cap and plug all fittings and hoses to prevent fluid loss and or contamination during service work.

Remove any attachment, lower or safely support the lift arms and make sure the hydraulic oil is cool before removing any components or lines. Hot or pressurized oil can cause personal injury.

Collect and contain liquids in a suitable container. Dispose of all liquids according to mandates.

1. To remove lift cylinders raise the lift arms and support them with the lift arm brace as described in 4-1 of this manual.

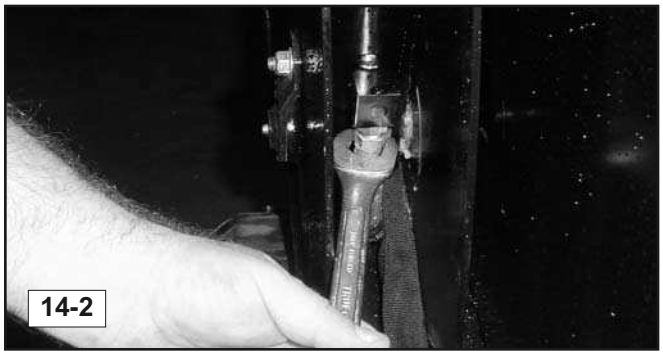
Note: When removing tilt cylinder(s), lower the loader arms onto a suitable mechanical support with the arms resting about 6 inches off the ground.

2. Turn the ignition switch to the OFF position and remove the key to avoid accidental start.

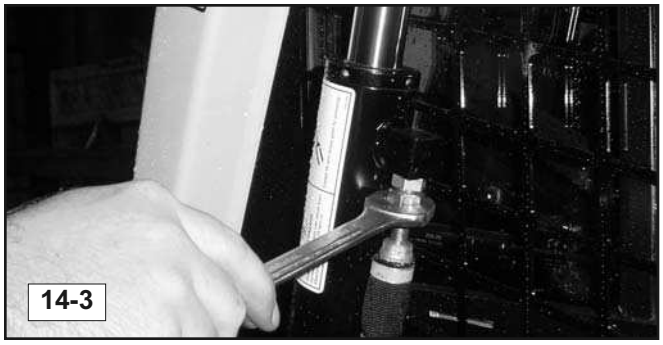

14-1

3. Remove the zip tie that secures the hydraulic hose to the lift cylinder (fig. 14-1).

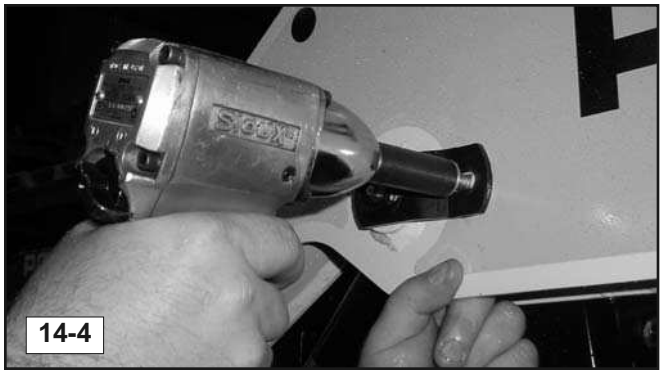
4. Release hydraulic pressure by performing step 3 on page 14-7 of this chapter.


14-2

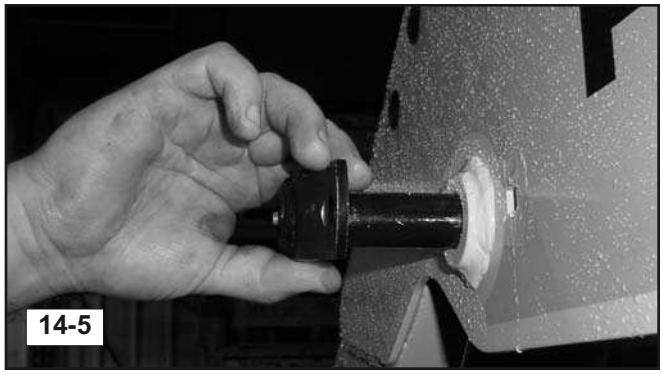
5. Remove and cap the hose on the rear end of the cylinder (fig. 14-2).


14-3

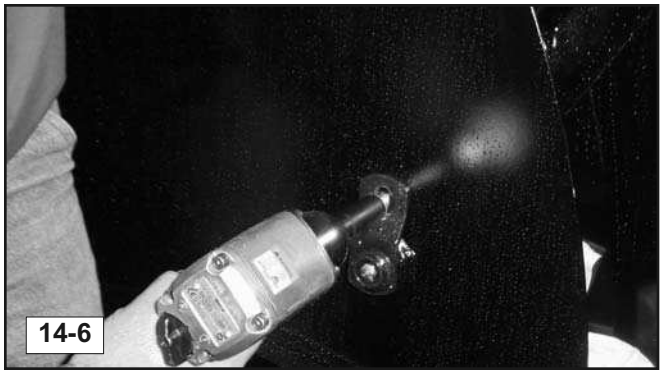
6. Remove and cap the hose on the forward end of the cylinder (fig. 14-3).


14-4

7. Remove the forward pin assembly bolt (fig. 14-3).


14-5

8. Support the cylinder from the underside then remove the forward pin assembly (fig. 14-5).


14-6

9. Remove the bolt and pin from the loader tower (fig. 14-6).

10. Again support the cylinder form the underside then remove the lift cylinder from the machine.

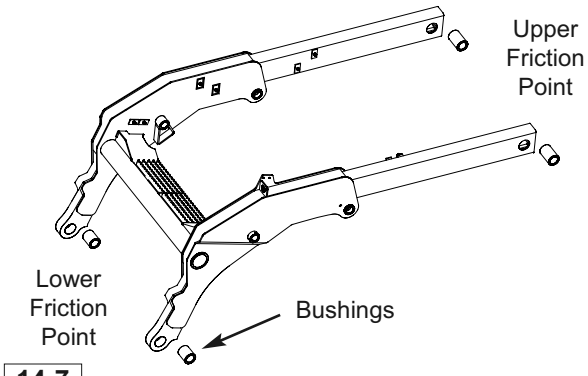
Lift Cylinder/Tilt Cylinder Installation

1. To install the lift/tilt cylinder, reverse the removal procedure.
2. Add grease to loader pin zerks to ensure proper lubrication of bushings.

Lift Arm Bushing Removal and Installation

Required Tools
Combination/Open End/Socket Wrenches **Hydraulic Caps/Plugs (various sizes)** **Mechanical Supports**

Lift Arm Bushing Placement (figure 14-7)

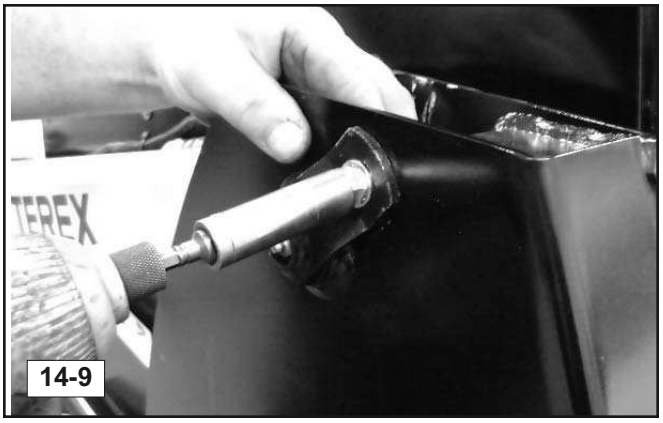


14-7

Upper Friction Points:

14-8

1. Lower the lift arm to the loader stops. Then attach suitable lifting device as shown in figure 14-8.
2. Turn the engine start switch to the OFF position and remove the key to avoid accidental start.



14-9

3. Remove the bolts that secure the lift arm pins to from each side of the chassis (fig. 14-9).

14-10

4. Remove the pins from each side of the chassis (fig. 14-10).

14-11

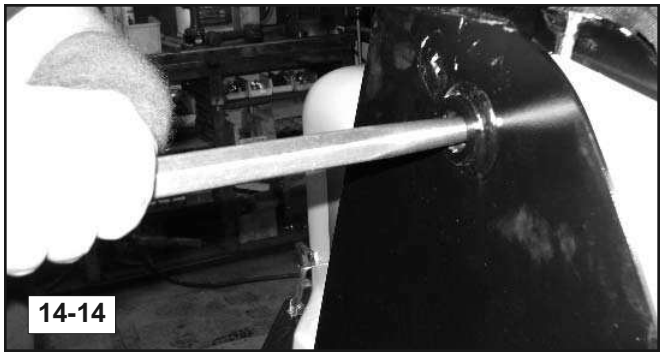
5. Raise the lifting device until arm has cleared the chassis and the hydraulic hoses. Use a pry bar to guide the lift arm upward if necessary as shown in figure 14-11.
6. Inspect the bushings for wear according to the procedure in page 4-14 of this manual. If it is determined that replacement is needed, continue onto step 7 of this procedure.

7. Compress a replacement bushing to fit the hole size and start the insertion with a dead blow hammer as shown. As you drive the new bushing into the lift arm, the old bushing will be forced out of the opposite side of the lift arm (fig. 14-12).

8. Complete the insertion of the bushing with an appropriate socket and hammer until the bushing is flush with the surface of the lift arm (fig. 14-13).

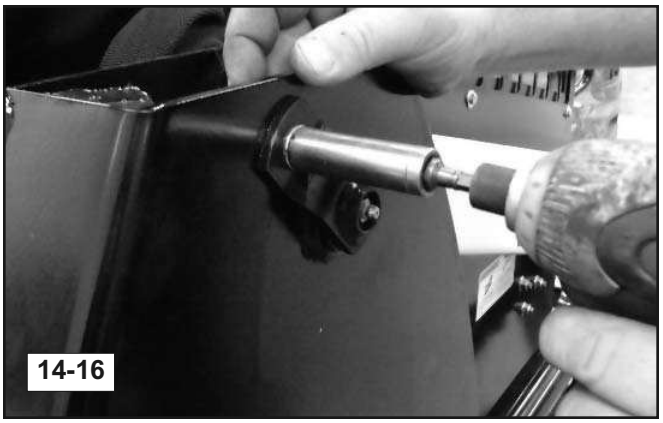
9. Clean and remove any debris from the inside of the bushing, then apply anti-seize to the inside of the bushings.

10. Perform steps 7-9 on opposite side of lift arm to remove remaining bushings.



11. Ask an assistant to lower the lift arm back into position to re-install pins. A pry bar may be used to aid in aligning chassis and lift arm pin holes (fig. 14-14).

12. Insert the pin into the chassis and then through the lift arm (fig. 14-15).



13. Install the bolt and nut to secure the pin to the chassis (fig. 14-16).

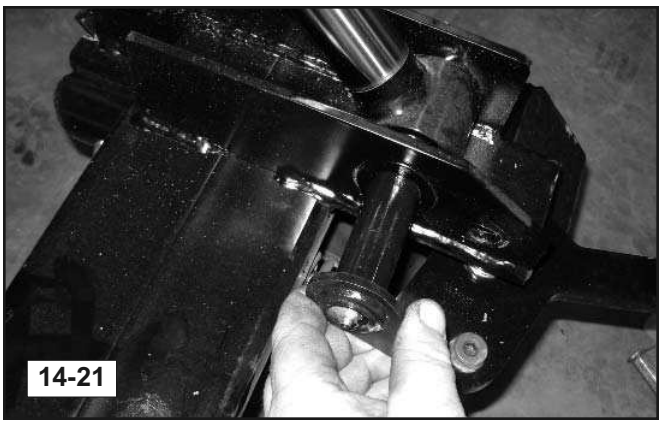
14. Perform steps 12-13 to install the pin on the opposite side of the lift arm.

15. Add grease to the zerks located on each of the lift pins to lubricate them as shown in figure 14-17.

Lower Friction Points:

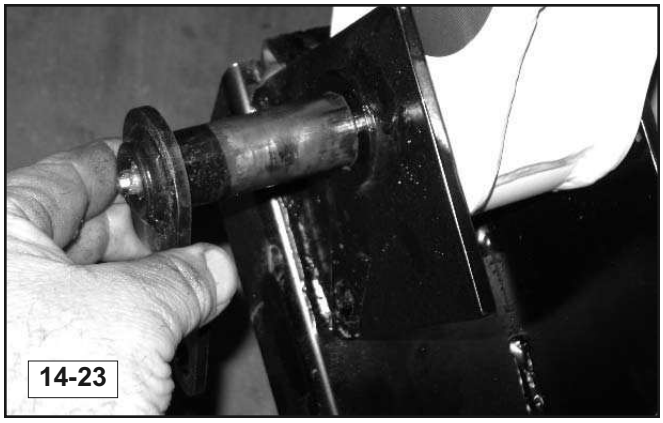
1. Lower lift arms onto a suitable mechanical support, with quick attach resting about 1 ft. off the ground (fig. 14-18). Then attach a lifting device to secure the lift arm in position (fig. 14-19).

2. Remove bolt from pins that secure the tilt cylinder to the quick attach (fig. 14-20).



3. Remove pin from the cylinder and quick attach (fig. 14-21).

4. Remove bolt from pins that secure the quick attach to the lift arm (fig 14-22).



5. Remove the quick attach pin (fig. 14-23).
6. Perform steps 2-5 on opposite side of the quick attach.
7. Inspect the lower lift arm bushings for wear according to the procedure in page 4-14 of this manual. If it is determined that replacement is needed, continue on to step 8 of this procedure.

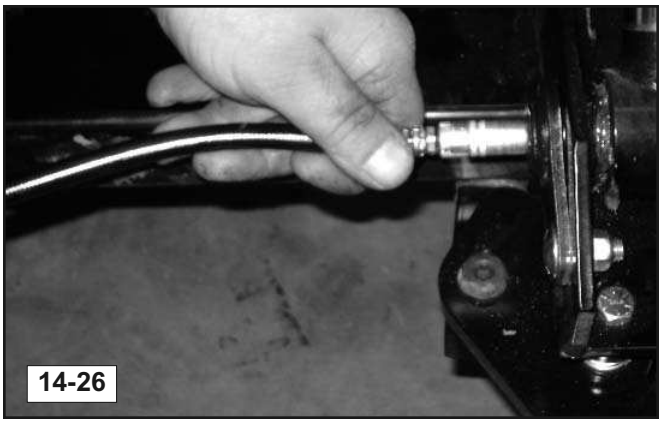
8. Compress the replacement bushing to fit the hole size and start the insertion with a dead blow hammer as shown in figure 14-24.

9. Complete insertion of the bushing with a socket and a hammer until the bushing is flush with the surface of the lift arm. This action will force the worn bushing out of the opposite side of the lift arm for removal (fig. 14-25).

10. Repeat steps 7-9 for opposite side of lower lift arm.

11. Clean and remove any debris, then apply anti-seize to the inside of the bushings.

12. Reverse steps 2-6 to install the pins and bolts.



13. Add grease to the zerks located on each of the lift pins and lubricate them as shown in figure 14-26.

Quick-Coupler Block / Pressure Release Valve
Removal and Installation

Required Tools
Socket Wrench Combination/Open End Wrenches

Hot oil can cause personal injury. Make sure the oil is cool before removing any components or lines.
Remove the oil filler cap only when the engine is stopped and the machine has been allowed to cool thoroughly.

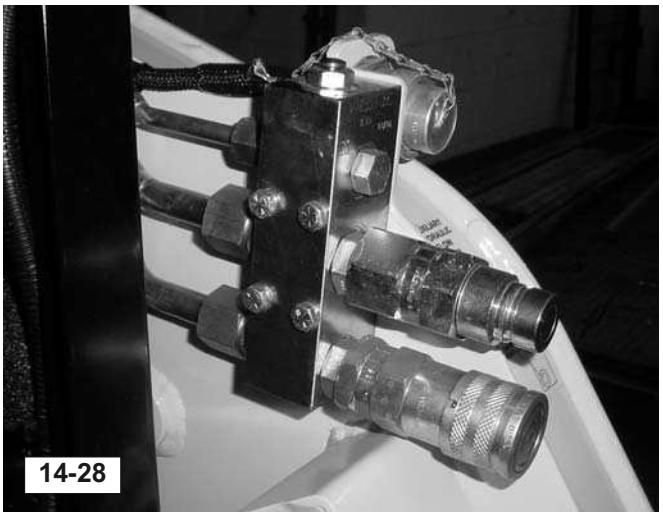
Collect and contain liquids in a suitable container. Dispose of all liquids according to mandates.

Pressure Release Valve Removal:

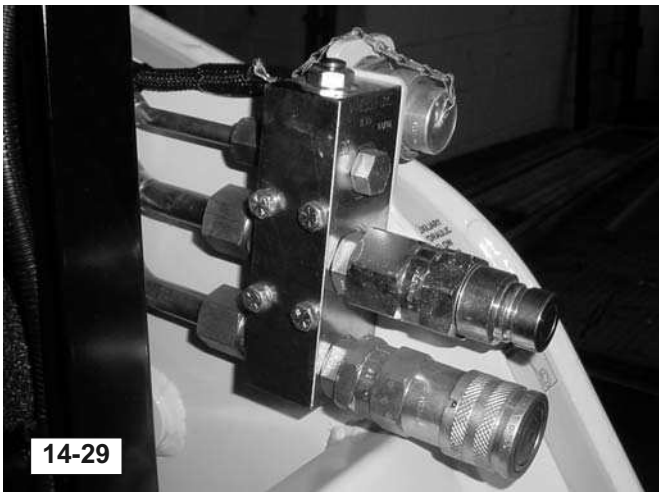
Note: During disassembly, cap all hoses and fittings to prevent fluid loss and contamination of the system fluids.

1. Lower the lift arms to the ground.
2. Turn the engine start switch to the OFF position.

3. Press the button on top of the block to release hydraulic pressure.

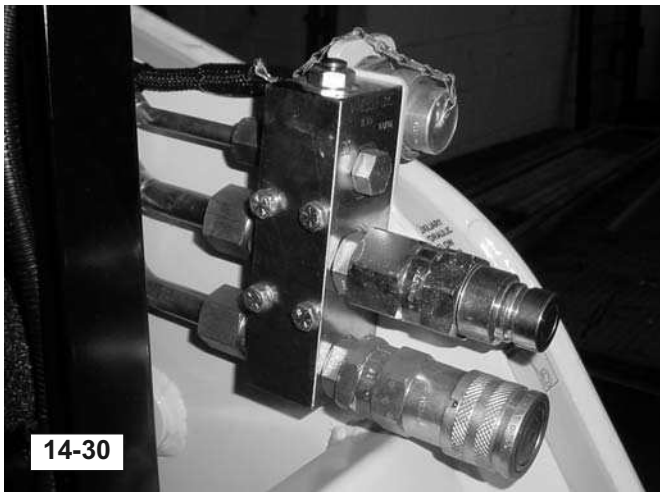


4. Disconnect and cap each of the hydraulic tubes.

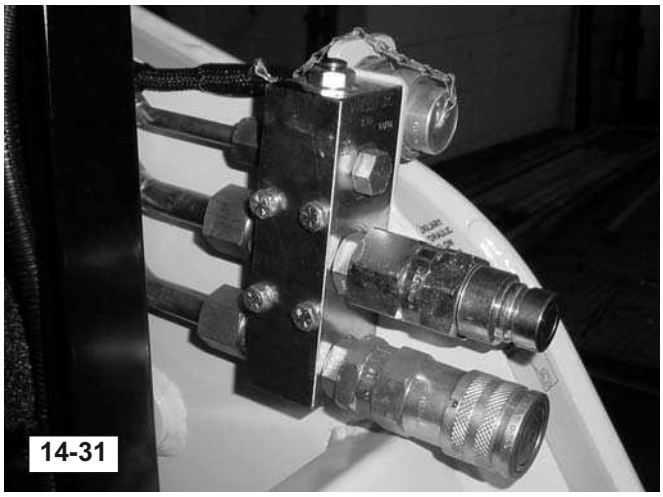


5. Remove the four bolts that secure the quick coupler block to the loader frame and remove the block.

Quick Coupler Block / Pressure Release Valve Installation



1. Install the four bolts that secure the low-flow relief valve to the loader frame.



2. Reconnect all of the hydraulic tubes.

NOTICE

Disassembly of hydraulic components should only be performed by factory trained personnel experienced in the disassembly and repair of hydraulic components. Components should not be serviced during the warranty period without written instruction from the Terex service department. Component disassembly during this period may void the manufacturer's warranty.

15. Hydraulic Component Service Procedures

Chapter Overview

This chapter provides information on inspection, disassembly and assembly of major hydraulic components.

Personal Safety

Improper or incomplete maintenance/repair of a Skid Steer Loader can be dangerous and may result in machine damage, injury or death.

Do not attempt to perform any type of repair or maintenance on a Skid Steer Loader until you have read and fully understood the information in this manual. Refer to the Operation and Maintenance manual for instructions regarding proper machine operation techniques before operating any Skid Steer Loader.

Prior to performing any type of service work on a Skid Steer Loader, read and understand Chapter 1 (Product Safety) for personal safety information.

Machine Preparation

Accidental machine starting can cause injury or death to personnel working on a Skid Steer Loader.

As a precaution, disconnect the battery cables from the battery terminals, tape the battery clamps and remove the key from the ignition switch prior to performing any service work on a Skid Steer Loader.

Place a "Do Not Operate" tag prominently on the machine to inform personnel that the machine is being worked on.

NOTICE

When servicing any hydraulic component, keep in mind that any scratches or damage that can be felt with a fingernail on surfaces that parts move, slide, roll or rotate upon indicate a need for part replacement.

Hydraulic components must be kept extremely clean to ensure proper function and service life. Do not assemble any components that have not been inspected for damage and thoroughly cleaned prior to assembly.

The hydraulic system fluid should be changed following any hydraulic component service according to the procedure described on page 4-12.

Disassembly & Assembly

Disassembly and assembly procedures are provided for the following components:

- Hydraulic Cylinders
- Lift Arm Control Valve
- Drive motor
- Drive Pump
- Auxiliary Pump

Note: Procedures are provided for only those components listed above. However, exploded parts diagrams exist in the TSR 50-60 parts manuals to serve as visual aids in the assembly and disassembly of other system components.

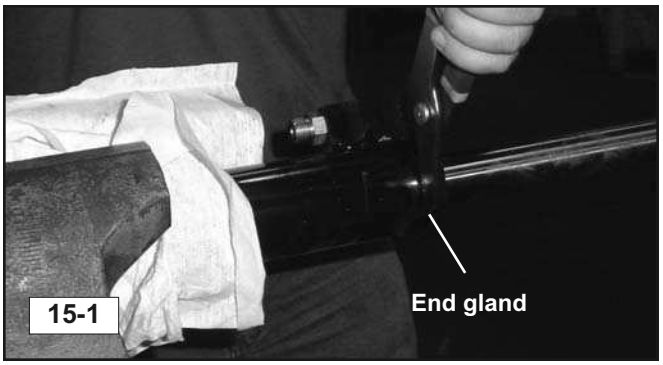
Hydraulic Lift/Tilt Cylinders Seal Kit

Disassembly

Required Tools
Bench Vise
Pipe Wrench
Socket or Impact Wrench
Screwdriver (blade type)
Rubber or Dead Blow Hammer

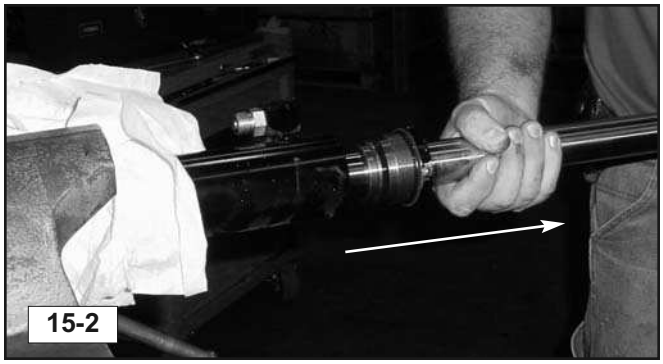
Note: When servicing cylinders, the attached components must be supported in a manner that allows the cylinders to be safely removed and installed. (lift arms & quick attach)

1. With machine off and cool and with hydraulic actuators relaxed, disconnect and cap hoses from the cylinder(s) to be serviced.

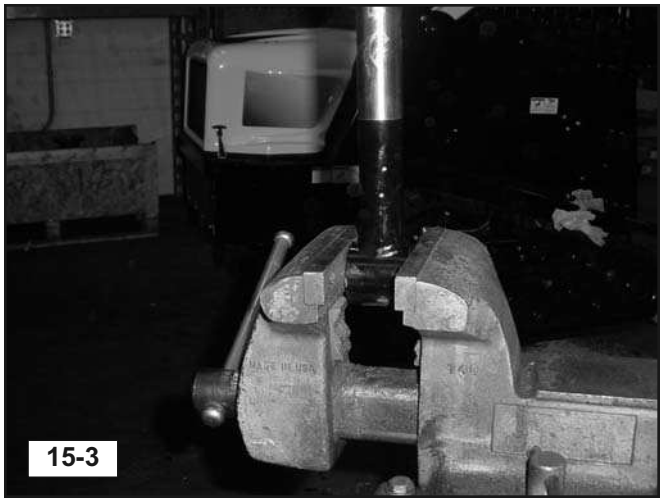


15-1

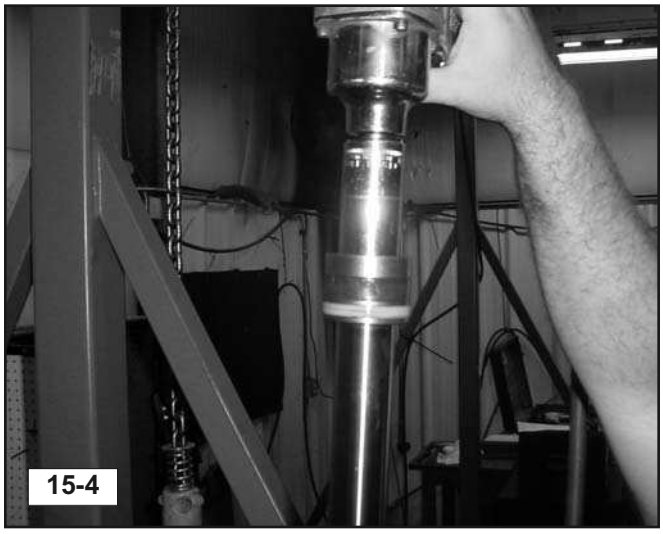
2. Secure the cylinder into a vice and remove the end gland by turning counter clockwise with channel lock pliers. Be sure to have a container to catch draining hydraulic fluid (fig. 15-1).



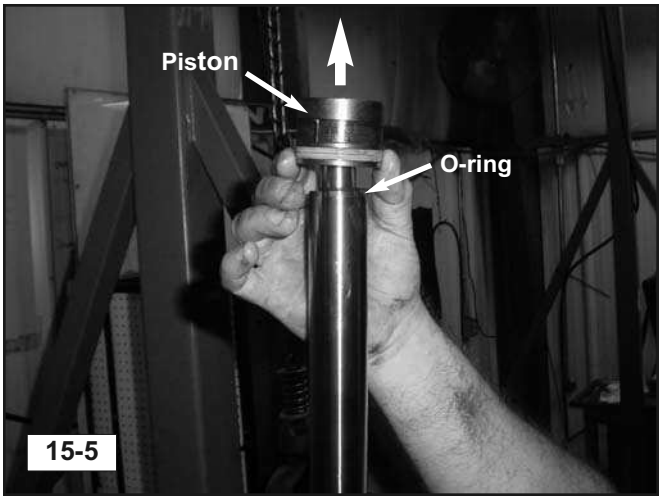
3. Remove the rod from the cylinder by pulling outward using both hands as shown in figure 15-2.



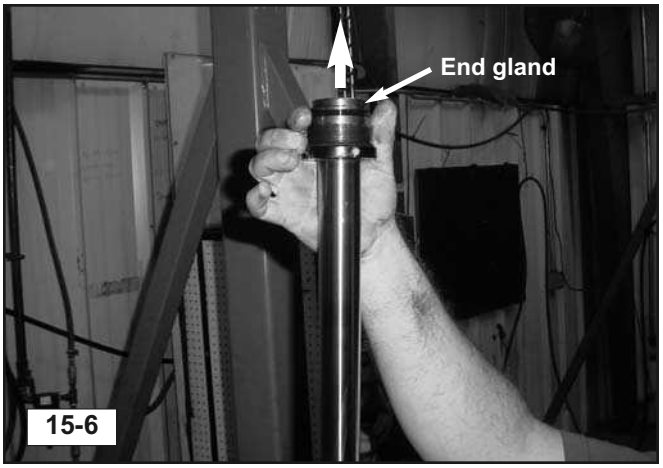
4. Secure the rod in the bench vice as shown in figure 15-3.



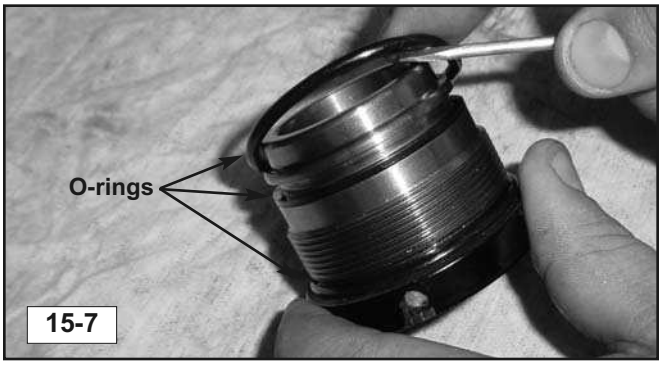
5. Remove the nut from the rod end using the correct size socket (fig. 15-4).



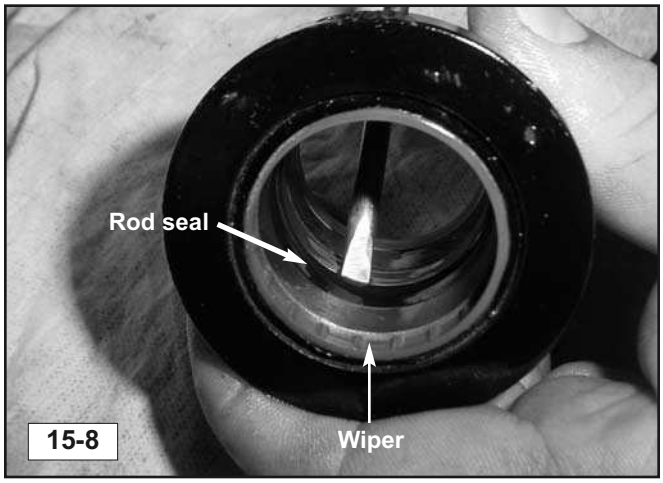
6. Remove the piston and the o-ring off the rod by sliding them upward and off (fig. 15-5).



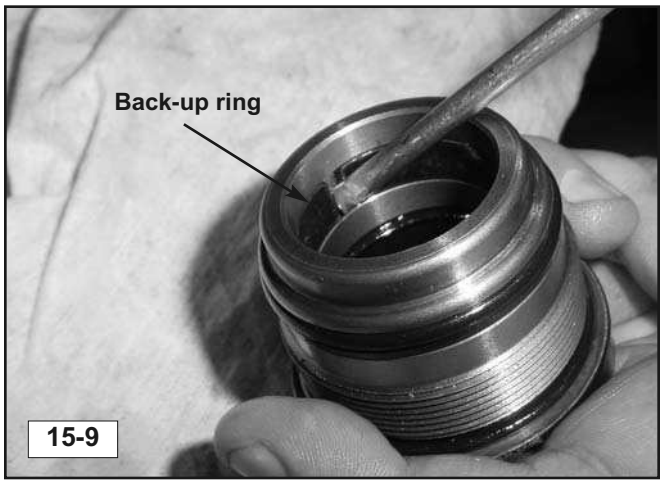
7. Remove the end gland sliding upward and off of the rod (fig. 15-6).



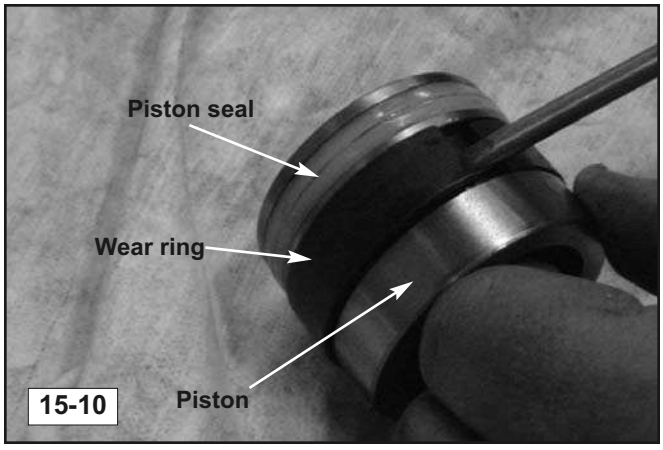
8. Remove the three o-rings located on the outside of the end gland with a small blade type screwdriver paying close attention to the order they are removed to aid during installation of new seals (fig. 15-7).



9. Remove the shaft wiper and then the rod seal from the inside of the end gland with a small blade type screwdriver. Pay attention to seal orientation upon removal to aid during installation of new seals (fig. 15-8).



10. Remove the back-up ring on the inside of the end with a small flathead screwdriver (fig. 15-9).



11. Remove piston seal and wear ring from piston using a blade type screwdriver (fig. 15-10).

12. To remove cylinder bushings, secure the cylinder in a vice and find a socket that has roughly the same outside diameter as the bushing (slightly smaller). Remove the bushing by tapping it out with a rubber mallet and the socket. You may need to use a punch to complete the removal of the bushing (fig. 15-11).

13. Thoroughly clean and dry all parts prior to installation of new seals to prevent contamination of hydraulic oil when cylinders are reassembled and installed.

Lift Cylinder/Tilt Cylinder Seal Kit Assembly

Note: The procedures for installing the seal kits on the lift cylinders and tilt cylinders are similar, only the lift cylinder procedure is described below.

Lift Cylinder Seal Kit: P/N 7000-658
Tilt Cylinder Seal Kit: P/N 7000-636

1. To install the new seal kit, reverse the cylinder seal removal procedure in both the lift and tilt cylinders.

2. Make sure your work area is clean and that all tools are clean before beginning seal install. Lubricate all seals with new hydraulic oil prior to install.

3. Use a rubber mallet and a socket or section of pipe with the same outside diameter as the seal to drive into place (fig. 15-12).

4. Reverse steps 2-7 of the seal removal procedure in this chapter to reassemble the cylinder.

5. Add removable loc-tite to the nut and torque to 75 ft. lbs.

6. Torque the cap gland to 100 ft. lbs.

16. Troubleshooting

Chapter Overview

This chapter contains basic troubleshooting procedures for the TSR 50-60 Skid Steer Loaders.

Additional troubleshooting aids are provided in Chapter 3 (Circuit Diagrams) and in chapters containing disassembly and assembly procedures for the appropriate component or assembly.

Personal Safety

Improper or incomplete maintenance/repair of a Skid Steer Loader can be dangerous and may result in machine damage, injury or even death.

Do not attempt to perform any type of repair or maintenance on a Skid Steer Loader until you have read and fully understood the information in this manual.

Refer to the Operation and Maintenance manual for instructions regarding proper machine operation techniques before operating any Skid Steer Loader.

Prior to performing any type of service work on a Skid Steer Loader, read and understand Chapter 1 (Product Safety) for personal safety information.

Visual Inspection

Prior to troubleshooting, walk around the machine and perform an overall visual inspection. Look for missing, loose, worn or broken parts. Pay particular attention to the following items:

- Case Chain tension
- Fluid levels
- Fan belt tension and condition
- Hoses (no visible sign of wear)
- Fittings (no apparent leaks)
- Battery cables
- Fuse panel (fuses in place and operational)
- Controls (for neutral)

A simple visual inspection and operational check can identify many problems without the need for extensive troubleshooting. However, if these checks indicate a problem that requires further analysis, proceed to Troubleshooting.

General Troubleshooting

The most effective way to prevent a malfunction from occurring is to closely follow the recommended maintenance schedule and instructions throughout the life of the machine. However, if a malfunction does occur, finding the problem and fixing it quickly are important. This section covers a select set of symptoms that may occur and suggests possible causes.

Problem 1:
Machine will not crank over.

Possible causes:

1. Power quick-attach switch in unlocked position. (if equipped)
2. Battery cables loose or corroded.
3. Ignition fuse blown.
4. Main starter fuse blown.
5. Starter relay malfunctioning.
6. Weak or dead battery.
7. Faulty continuous hydraulic flow switch.
8. Faulty power quick attach switch.
9. Faulty ignition switch.
10. Faulty starter.
11. Loose, broken or disconnected wiring at key, relay or starter.
12. Main power fuse (60-80 amp) blown.

Problem 2:

Machine cranks, but will not start.

Possible causes

1. Fuel tank empty, fuel filter plugged or fuel line restricted.
2. Battery discharged (engine rotates slowly).
3. Injection pump fuse blown.
4. Power relay (B) fuse blown (40 amp).
5. Faulty power relay (B).
6. Loose, broken or disconnected wiring at injection pump, fuel pump or fuse.
7. Glow plugs not pre-heating (look for black smoke).
   a) Main glow plug fuse blown.
   b) Glow plug relay malfunctioning.
   c) Loose, broken, or disconnected wiring at ignition switch, relay or glow plug ground strip.
   d) Faulty glow plugs.
8. Faulty ignition switch.
9. Loose, broken or disconnected wiring in starting circuit.
10. Loose, broken or disconnected wiring at fuel shutoff solenoid.
11. Air in fuel system or defective fuel injection pump.

Problem 3:

Machine starts, but hydraulics will not operate.

Possible causes

1. Operator not in seat.
2. Seat belt not fastened.
3. Safety relay fuse and or or safety solenoid fuse for seat belt or operator presence safety switches blown.
4. Faulty operator presence safety switch.
   a) Test for continuity through operator presence and seat belt switches. Adjust or replace as necessary.
5. Loose, broken or disconnected ground wires (check ground connections behind the operator seat, from cab to chassis and on the chassis crossmember.)
6. Faulty safety relay.
7. Faulty safety solenoid or safety solenoid spool.
8. Loose, broken or disconnected wiring at fuse, relay, or safety solenoid.
9. Low charge pressure.

Problem 4:

Lift arm/bucket controls are operational, but wheels will not move.

Possible causes

1. Leak in feed line to drive control joystick (pilot control).
2. Loose, broken or disconnected wire to DA control solenoid.
3. Drive control joystick (pilot control) malfunction.
4. Low charge pressure.
5. Parking brake switch in on position.
6. Faulty parking brake switch.

Problem 5:

Wheels are operational, but lift arms will not move.

Possible causes

1. Continuous hydraulic flow switch activated, sending oil over relief. (lift arms work, but move slowly)

If auxiliary flow hydraulics work check for:

   a) Leak in feed line to lift arm control joystick (pilot control).
   b) Lift arm control joystick (pilot control) malfunc tion.
   c) Lift arm control valve assembly malfunction.

If auxiliary flow hydraulics do not work check for:

   a) Main auxiliary relief malfunction.
   b) Faulty auxiliary pump.

Problem 6:

Lift arms are operational, but high/low flow auxiliary circuits are not.

Possible causes

1. Micro hydraulic fuse blown.
2. Faulty auxiliary hydraulic switch.
3. Faulty auxiliary hydraulic solenoid at the valve.
4. Loose, broken or disconnected wire at fuse, auxiliary hydraulic switch, pin connector P40.
5. Faulty or improperly connected quick coupler.
6. Quick coupler block pressure release stuck in down (open) position.

Problem 7:

Multiple switches/electrical accessories are not operational in ON or RUN position.

Possible causes

1. Power A or B fuse blown.
2. Faulty power relay (A or B).
3. Faulty ignition switch.
4. Loose, broken or disconnected wiring at ignition switch, fuse or relay.

Problem 8:

Battery will not charge/maintain charge.

Possible causes:

1. Loose alternator belt.
2. Alternator fuse blown.
3. Faulty alternator diode.
4. Loose, broken or disconnected wiring at battery, alternator, diode or fuse.
5. Excessive current draw with key in "off" position.
6. Faulty battery.
7. Faulty alternator.

Problem 9:
Lift arm control joystick will not lock into float position.
Possible causes

1. Float magnet fuse blown.
2. Loose, broken, or disconnected wiring at fuse, float detent magnet, or pin connector P8.
3. Faulty float detent magnet.

Problem 10:
Lift arms will not float, engine labors and lift arms create down pressure when float is engaged.
Possible causes

1. Engine RPM too low.
2. Low charge pressure.
3. Lift arm control joystick malfunction (pilot control).
4. Lift arm control valve malfunctioning.

Problem 11:
Hydraulic oil temperature elevated; hydraulic system overheating.
Possible causes

1. Debris plugging oil cooler, limiting airflow.
2. Low hydraulic oil level.
3. Loose or missing fan belt.
4. Damaged or missing cooling fan blades.
5. Incompatible attachment.
   a) Attachment must match machine flow capabilities.
   b) Attachment hose inside diameter must be at least ½" for low flow and ¾" for high flow.
   c) Low flow attachment coupled to high flow circuit.
6. Faulty hydraulic oil temperature sending unit.
7. Faulty quick coupler.
8. Cooler bypass relief open.

Note: Cooler bypass should open at 80 PSI.

Problem 12:
Engine coolant temperature elevated; engine overheating.
Possible causes:

1. Low coolant level.
2. Debris plugging radiator, limiting airflow.
3. Damaged or missing cooling fan blades.
4. Loose or missing fan belt.
5. Faulty engine coolant temperature gauge.

Engine/Machine Troubleshooting

When a problem occurs that effects engine performance or function, it is important to determine whether or not the problem lies with the machine itself, or with the engine. A machine problem should be repaired by an Terex dealer, while an engine specific problem should only be repaired by a representative of the engine manufacturer. Making this determination will ensure timely and appropriate service to help minimize down-time.

Problem:
Hard starting
check for:

1. 12V power to glow plugs. (With test light or multi-meter, measure voltage at ***green*** glow plug common power lead.)
   a) If power is not present, see problem 1, step 7.
2. Water in fuel.
3. Proper grade and quality fuel.

Problem:
Low power
check for:

1. Dirty, clogged, or restricted fuel filter.
2. Adequate supply of fuel to engine (fuel lines).
3. Water in fuel.
4. Proper grade and quality fuel.

Problem:
No start
check for:

1. 12V power at fuel shutoff solenoid. (With test light or multi-meter, measure voltage at ***white*** power lead entering the solenoid.)
   a) If no power is present, see problem 1, step 3-6)
2. Ensure 12V power to fuel pump. (With test light or multi-meter, measure voltage at ***white*** power lead entering the electronic fuel pump.)
3. Low fuel.
4. Out of fuel. (ensure proper gauge/sending unit function. Inspect tank for fuel)
5. Blocked or restricted fuel line. (try alternate/remote fuel supply to pump.)
6. Water in fuel.
7. Proper grade and quality fuel.

If any of the above conditions are present, the problem lies with the machine and should be serviced by an Terex dealer. If the conditions listed above are not present, the problem lies with the engine and it should be serviced by a Perkins engine repair facility to comply with the conditions of the engine warranty.

17. Lubricant & Fuel Specifications

Chapter Overview

When replacing or replenishing the fluids and lubricants in an Terex Skid Steer Loader, use Terex products. This ensures that the new fluids and lubricants match those originally installed when the machine left the Terex factory. Terex products were developed for, tested and approved by Terex to assure optimum life and performance in all Terex Skid Steer Loaders, when used as recommended.

Fluids

Engine Oil

- SAE 10W-30 (API CH-4)
  Capacity: 11.2 quarts (10.6l) including filter

Engine Anti-freeze/Coolant

- Terex Long-Life 50/50 Antifreeze/Coolant
  Capacity: 3.5 gallons (13l)
  P/N: 0300-766 1 gallon
  P/N: 0402-841 6 gallons

Hydraulic Oil

- Mobil DTE 10 Excel 46
  Service Capacity: 18 gal.(68l) incl. filters
  P/N: 0404-094 2.5 gallons

Grease (general-use)

- Terex Multi-Purpose EP Lithium Grease
  P/N: 0300-769 1 tube
  P/N: 0402-844 10 tubes
  P/N: 0402-834 40 tubes

Gear Lube

- 80/90 gear lube
  Service Capacity: 4.25 quarts (4.02l)

If Terex products are not available, use high quality substitutions that meet or exceed factory installed fluid specifications.

Fuel Specifications

Diesel fuel, distilled from crude oil, identified as No. 1-D or No. 2-D in “ASTM D975” and “EN 590” generally meet machine requirements.

18. Service Aids & Supplements

General Torque Specifications

Inch Fasteners

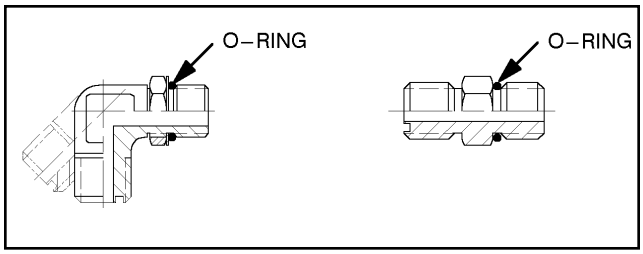
Thread Size	Standard Torque
1/4"	9 +/- 2 lb ft
5/16"	18 +/- 4 lb ft
3/8"	35 +/- 7lb ft
7/16"	50 +/- 11 lb ft
1/2"	75 +/- 15 lb ft
9/16"	120 +/- 22 lb ft
5/8"	160 +/- 30 lb ft
3/4"	275 +/- 37 lb ft
7/8"	460 +/- 60 lb ft
1"	660 +/- 75 lb ft
1-1/8"	960 +/- 110 lb ft
1-1/4"	1320 +/- 150 lb ft
1-3/8"	1780 +/- 220 lb ft
1-1/2"	2280 +/- 260 lb ft

Metric Fasteners

Thread Size	Standard Torque
M6	12 +/- 3 Nm
M8	28 +/- 7 Nm
M10	55 +/- 10 Nm
M12	100 +/- 20 Nm
M14	160 +/- 30 Nm
M16	240 +/- 40 Nm
M20	460 +/- 60 Nm
M24	800 +/- 100 Nm
M30	1600 +/- 200 Nm
M36	2700 +/- 300 Nm

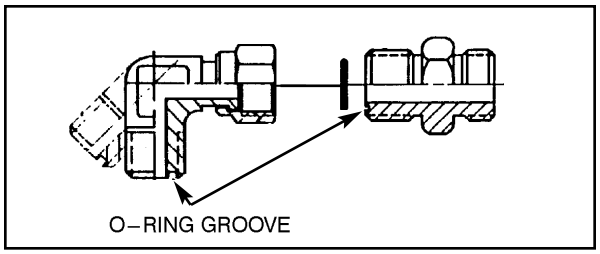
Fitting Torque Specifications

O-Ring Port (in conjunction with ORFS connectors)



REF NOMINAL TUBE OD		THREAD SIZE	DYNAMIC ASSEMBLY TORQUE
mm	INCH		(N·m)
4.76	.188	3/8	12+2
6.35	.250	7/16	22+2
7.94	.312	1/2	30+3
9.52	.375	9/16	48+5
12.70	.500	3/4	82+8
15.88	.625	7/8	140+14
19.05	.750	1–1/16	190+15
22.22	.875	1–3/16	250+20
25.40	1.000	1–5/16	300+30
31.75	1.250	1–5/8	350+35
38.10	1.500	1–7/8	415+40

O-Ring Face Seal (ORFS)



REF NOMINAL TUBE OD		THREAD SIZE	DYNAMIC ASSEMBLY TORQUE (N·m)
mm	INCH		
6.35	.250	9/16	25+3
9.52	.375	11/16	40+4
12.70	.500	13/16	55+5
15.88	.625	1	86+8
19.05	.750	1–3/16	125+15
25.40	1.000	1–7/16	165+15
31.75	1.250	1–11/16	200+20
38.10	1.500	2	245+20

Note: For o-ring port fittings, use 50% of listed torque values if fitting or port material is non-ferrous.

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