JACOBSEN
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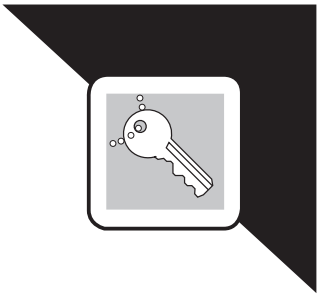

Service & Repair Instructions
LF-1880

WARNING: If incorrectly used this machine can cause severe injury. Those who use and maintain this machine should be trained in its proper use, warned of its dangers and should read the entire manual before attempting to set up, operate, adjust or service the machine.

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SECTION 1
INTRODUCTION

SECTION 1A. GENERAL INFORMATION

CONTENTS

This manual contains repair instructions for major tractor components, attachments, and options. The Table of Contents at the start of each section lists the contents of that section. Sections are identified by tabs in the right hand margin.

This manual is to be used in conjunction with the Operator's Manual and Parts Catalog.

Normal maintenance, adjustment, and operating procedures are also covered in the Operator's Manual and are only included where appropriate in this Service and Repair Manual.

Engine repair is not covered in this manual. Refer to the appropriate engine manufacturer's instructions for engine service and repair.

This manual includes all removal, disassembly, inspection, repair, reassembly, installation, adjustment, and testing procedures. If you, as the user of this machine, do not consider yourself or your repair facilities capable of a given procedure, please contact your Jacobsen dealer or distributor.

Information, specifications, illustrations, and procedures in this manual are based on information in effect at the time this manual was published. Improvements and product changes due to continual advancements of the product design may cause changes to your product that may not be included in this manual. Each manual is reviewed and updated as required to include changes and product improvements.

Read each section completely before proceeding with specific repairs in that section. You will minimize errors by understanding what you will be doing and how the component relates to others in its system. Lists of repair tools and materials for each section of the manual are given at the start of that section.

The designations L.H. (left hand) and R.H. (right hand) are used throughout this manual and refer to the operator's left or right when sitting in the normal operating position.

REGISTRATION

A registration card is provided in the back of this manual (bottom portion of page). Fill out the card, remove, and mail immediately upon opening the manual for the first time.

The registration entitles you to receive manual updates for a period of two years. Updates are sent free of charge.

NOTE:

Only the original registration card will be accepted. Photocopies, card from other manuals, suggestion cards, or any facsimile are not acceptable and will not constitute a registration.

INDEX NUMBERS

Illustrations showing removal, disassembly, reassembly, and illustration may have index numbers to call out the sequence of procedures.

Where the sequence of procedures is not important or self-evident (e.g. linkages, hoses, clamps, etc.) index numbers are not included.

Repair procedures for items not subject to wear (e.g. panels, brackets, frames) are not included in this manual except for the general procedures given below.

Exercise common sense during disassembly or reassembly; remove only the items required to accomplish the necessary repair or service.

REPLACEMENT PARTS

Use the appropriate Parts Catalog when ordering replacement parts. Follow the installation instructions shipped with service parts or kits. When ordering parts, always give the serial number and product number and description of the parts needed.

To eliminate error and speed delivery:

1. Write your NAME and ADDRESS on your order plainly.
2. Explain WHERE and HOW to make shipment.
3. Give the PRODUCT NUMBER, NAME, and SERIAL NUMBER that is stamped on the NAME and SERIAL PLATE of your product.
4. Order by QUANTITY DESIRED, the PART NUMBER, and the PART DESCRIPTION.
5. Send your order to or visit your nearest Jacobsen dealer or distributor.
6. INSPECT ALL SHIPMENTS UPON RECEIPT. If any parts are damaged or missing, file a claim with the carrier before accepting.

7. Do not return material to your Jacobsen dealer or distributor without a letter of explanation. Make a list of all returned parts, show your name and address, and include the letter and list with the shipment. TRANSPORTATION CHARGES MUST BE PREPAID.

SPECIFICATIONS

Product Information

67923 ..... Super LF-1880 2WD
67924 ..... Super LF-1880 4WD
67938 ..... Super LF 1800 Turbo 4WD

Product	EEC Sound Power	Sound Pressure Level Operator Ear	Vibration M/S^2	
			Arms	Body
67923	<105 dba	88.05 dba	3.7	0.11
67924	<105 dba	88.05 dba	3.7	0.11

An identification plate, like the one shown, listing the serial number, is attached to the frame of the tractor near the center lift arm mount (Figure 1A-2).

Always provide the serial number of the unit when ordering replacement parts or requesting service information.

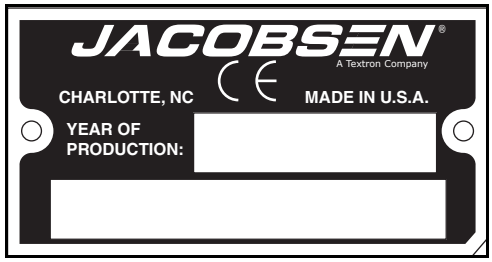


Figure 1A-1. Serial Plate

Kubota D1105-E Engine

Make ..... Kubota
Model ..... D1105 E
Horsepower ..... 26 hp (19.4 kW) @3000 rpm

NOTE:

Actual sustained horsepower will likely be lower than listed in specifications due to operating limitations and environmental factors.

Displacement ..... 68.5 cu. In (1123 cc)
Torque ..... 54 ft-lbs. (73 Nm) @ 2200 rpm
Fuel:
- Type ..... No. 2 Diesel
- Rating ..... Cetane Rating-45
- Capacity ..... 12 U.S. Gal. (45.4 liters)

High-speed - rpm ..... 3150 no load
Low idle - rpm ..... 1750 no load
Lubrication:
- Capacity ..... 5.4 qt (5.1 liters)
- Type ..... SAE 10W30
- API Classification ..... Liquid cooled

Air Filter ..... Dry type with service indicator
Alternator ..... 40 amp
Cooling system ..... Liquid Cooled

Kubota D1105-TE Engine

Make ..... Kubota
Model ..... D1105 TE
Horsepower ..... 33 hp (24.6 kW) @3000 rpm

NOTE:

Actual sustained horsepower will likely be lower than listed in specifications due to operating limitations and environmental factors.

Displacement ..... 68.5 cu. In (1123 cc)
Torque ..... 60 ft-lbs. (81 Nm) @ 2200 rpm
Fuel:
- Type ..... No. 2 Diesel
- Rating ..... Cetane Rating-45
- Capacity ..... 12 U.S. Gal. (45.4 liters)

High-speed - rpm ..... 3150 no load
Low idle - rpm ..... 1750 no load
Lubrication:
- Capacity ..... 5.4 qt (5.1 liters)
- Type ..... SAE 10W30
- API Classification ..... CD, CE

Air Filter ..... Dry type with service indicator
Alternator ..... 40 amp
Cooling system ..... Liquid Cooled

Cutting Units

Reel ..... 5 Reels, 18 in. (457 mm) wide
Reel Diameter ..... 5 in. (127 mm)
Blade Options ..... 8 or 11 blades
Cutting Height ..... 0.30 to 0.70 in (7.6 to 18mm)
Cutting Width ..... 80 in (2032 mm)
Cutting Frequency:
- 8 Blade ..... 0.067 in/mph (1.06 mm/kph)
- 11 Blade ..... 0.049 in/mph (0.77 mm/kph)

Tractor

Tires:
- Front ..... 24 x 13 - 12 2 ply
- Rear ..... 18 x 9.5-8 2 ply

Pressure ..... 10-12 psi (69-83 kPa)
Battery:
- Type ..... 12 Volt Lead/Acid
- Group ..... 45 GMF

Parking Brake ..... Mechanical front wheel disc
Speed:
- Mow (4WD) ..... 0 - 6 mph (9.6 kph)
- Transport (2WD) ..... 0 - 10.5 mph (16.9)
- Reverse ..... 0 - 4 mph (6.4 kph)

Hydraulic System:
Capacity ..... 8 U.S. Gal (30.28 liters) System
Fluid Type ..... GreenCare 68
Return Filter ..... Full Flow 10 micron
Steering ..... Hydrostatic power steering
Mower Lift ..... Hydraulic Double Acting Cylinders

Weights and Dimensions

Dimension	In	(mm)
Length - Grass Catchers On	106	(2692)
Height - Top of Steering Wheel	56	(1422)
Wheel Base	59.1	(1501)
Width - Transport Position	88.5	(2248)
Width - Mowing Position	88.5	(2248)
Width - Wheel	74.25	(1886)
Turning Radius	18	(457)
Weights	**Llbs**	**(kg)**
Working Weight Less Operator		
69723	2115	(959)
69724	2200	(998)

Accessories and Support Literature

Contact your area Jacobsen dealer for a complete listing of accessories and attachments

⚠ CAUTION

Use of other than Jacobsen authorized parts and accessories may cause personal injury or damage to the equipment and could void the warranty.

Accessories

Air Blow Gun JAC5098
Orange Touch-up Paint (12 oz. spray) 554598
Arm Rest 66156
Deluxe Suspension for Seat 66172
Grass Catcher 67930
Powered Rear Roller Cleaner Brush 67929
Turf Groomer 1/2” Spacing 68926
2 Post ROPS 66185

Canopy (Requires 2 Post ROPS) 66184
4WD Field Conversion Kit 67931

Reels

11 Blade Reed 67932
8 Blade Reel 68933
Vertical Mower 67928
Vertical Mower Lift Yoke Kit 67934

Rollers

3” dia. Grooved Front Roller with Scraper 67925
High Cut Roller Kit 15/16 in 68634

Support Literature

Safety & Operation Manual 4102144
Parts & Maintenance Manual 4102143
Diesel Engine Parts Catalog 2812022
Operator Training Video 4102141
Service & Repair Manual

SERIAL NUMBERS

See Figure 1A-2 for location of tractor assembly series number.

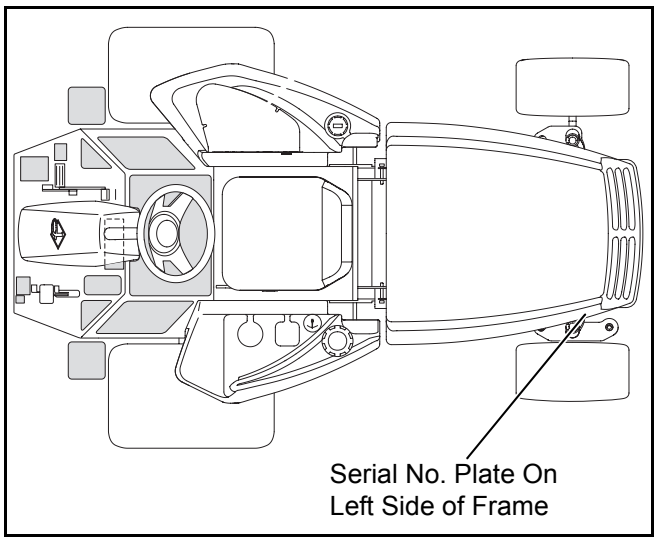


Figure 1A-2. Serial Number Location

GENERAL CLEANING

Improper cleaning and lubrication of your machine results in equipment failures. Before any repairs are undertaken, thoroughly clean the exterior of the component to be removed.

Use a clean surface to lay out parts being removed. Keep lubricants clean and cover containers not being used. Plug or cap all hydraulic lines and ports to hydraulic components immediately after disconnecting.

SAFETY

Safety should always be the rule when working on or with machinery. Always use safe practices and common sense when using hand or power tools. Use the suggested procedures in this manual when working with the tractor.

Throughout this manual signal words will be used to highlight special procedures. The signal words and their meanings are as follows:

NOTE:

Any task needing special care when performing a procedure.

⚠ CAUTION

Hazards or unsafe practices which *could* result in personal injury, or product or property damage.

⚠ WARNING

Hazards or unsafe practices which *could* result in *severe* personal injury or death.

⚠ DANGER

Imminent hazards which *will* result in *severe* personal injury or death if precautions are not taken.

Decals on the machine denote cautions, warnings, and dangers. These cautions, warnings, and danger decals must be on the machine at all times. If they become worn, torn, or painted over, new decals should be installed as shown in Section 14A of this manual.

⚠ CAUTION

Disconnect leads at the alternator before electric welding is done on components in common ground with the engine.

⚠ DANGER

This machine is equipped with an interlock system which is intended to protect the operator and other from injury, by preventing the engine from starting, unless the reel switch is in the “Off” position, traction pedal is in the “Neutral” position and the brake is set. The system also shuts off the engine if the operator leaves the seat with the reel switch in “Cut” position. In the interest of safe operating conditions, this machine must never be operated with the interlock relays or interlock system disconnected or malfunctioning.

TORQUE VALUES

Torque values are given in the “Torque Specifications Chart.” Special torque values are called out in illustrations and text throughout this manual.

Torque Specifications - Standard SAE Grade #5 Screws

Size (In)	Torque Values	Size (In)	Torque Values
8-32	27-33 in-lbs (3-4 Nm)	1/2-13	67-83 ft-lbs. (90-113 Nm)
8-36	28-34 in-lbs (3-4 Nm)	1/2-20	81-99 ft-lbs (110-134 Nm)
10-24	39-47 in-lbs (4-5 Nm)	9/16-12	99-121 ft-lbs (134-164 Nm)
10-32	44-54 in-lbs (5-6 Nm)	9/16-18	108-132 ft-lbs (146-179 Nm)
1/4-20	7-9 ft-lbs (9-12 Nm)	5/8-11	135-165 ft-lbs (183-223 Nm)
1/4-28	9-11 ft-lbs (12-15 Nm)	5/8-18	162-198 ft-lbs (220-268 Nm)
5/16-18	15-18 ft-lbs (20-24 Nm)	3/4-10	234-286 ft-lbs (317-388 Nm)
5/16-24	17-21 ft-lbs (23028 Nm)	3/4-16	270-330 ft-lbs (366-447 Nm)
3/8-16	27-33 ft-lbs (37-45 Nm)	7/8-9	360-440 ft-lbs (488-597 Nm)
3/8-24	31-39 ft-lbs (42-53 Nm)	7/8-14	396-484 ft-lbs (537-656 Nm)
7/16-14	45-55 ft-lbs (61-75 Nm)	1-8	522-638 ft-lbs (708-865 Nm)
7/16-20	49-61 ft-lbs (66-83 Nm)	1-12	576-704 ft-lbs (780-954 Nm)

NOTE: These torque values are to be used for all hardware excluding: locknuts, self-tapping screws, thread forming screws, sheet metal screws, and socket head setscrews.

Torque Specifications - Metric

Diameter — Coarse thread	Metric Grade							
	5.6		8.8		10.9		12.9	
	Nm	ft-lbs	Nm	ft-lbs	Nm	ft-lbs	Nm	ft-lbs
M6	4.6	3.3	10.5	7.7	15	11	18	13
M7	7.8	5.6	17.5	12.9	26	18.4	29	21.3
M8	11	8.1	26	19	36	26	43	31
M10	22	16	51	37	72	53	87	64
M12	39	28	89	66	125	92	150	110
M14	62	45	141	103	198	146	240	177
M16	95	70	215	158	305	224	365	269
M18	130	95	295	217	420	309	500	368
M20	184	135	470	309	590	435	710	623

SECTION 2
CONTROLS

SECTION 2A. REPAIR AND SERVICE TOOLS AND MATERIALS

MATERIALS REQUIRED

Tools required:	Standard automotive hand tools
Cleaning materials:	Stoddard solvent or equivalent Detergent and water
Lubricants:	Refer to Section 11

SECTION 2B. FAILURE ANALYSIS

GENERAL

The following table lists common problems, probable causes, and suggested remedies with section references to detailed descriptions of remedial procedures.

PROBLEM	PROBABLE CAUSE	REMEDY
1. Engine does not turn over	a. Not in neutral	a. Check neutral position
	b. Electrical fault	b. See Electrical Failure Analysis (Section 10B)
	c. Neutral start switch not adjusted or faulty	c. Adjust (Section 2C) Check (Section 10G)
	d. Dead battery	d. Charge battery or replace as necessary
2. Engine speed does not increase when throttle control is moved	a. Throttle control is not properly adjusted	a. Adjust (Section 2C)
	b. Throttle control is broken	b. Repair or replace (Section 2C)
3. The unit “creeps” in either direction when the treadle pedal is not depressed	a. Traction pedal linkage out of adjustment	a. Adjust traction (Section 2C)
4. Parking brake fails	a. Brake not adjusted	a. Adjust brake (Section 2C)
	b. Worn brake shoes	b. Replace pads (Section 5C)
	c. Damaged or broken linkage	c. Repair as necessary
5. Reel does not lift or lower properly as joystick is activated	a. Joystick faulty	a. Test joystick (Section 8G)
	b. Control valve leaking or defective	b. Test value (Section 8N) Repair valve (Section 8L)
	c. Relief too low	c. Adjust (Section 8O)
	d. System relief valve too low	d. Adjust (Section 8O)
	e. Faulty lift cylinder	e. Test cylinder (Section 8N and Section 8O)
	f. Faulty charge pump	f. Test pump (Section 8O)
6. Slow traction speed	a. Engine rpm too low	a. Adjust (Section 2C)
	b. Pedal linkage not adjusted	b. Adjust (Section 2C)
	c. Parking brake not releasing	c. Adjust (Section 2C)
	d. Faulty hydro	d. Test hydro pump (Section 8O)
7. 4 wheel drive does not engage	a. Faulty 4 wheel drive ON-OFF switch	a. Test/replace (Section 10G)
	b. Traction pedal 4 wheel drive switch not adjusted or faulty	b. Adjust/replace (Section 10J and Section 10G)

SECTION 2C. CONTROL ADJUSTMENTS

GENERAL

Repair of controls is limited to adjustment of linkages and cables, straightening of bent rods, or replacement. Replace, do not adjust worn or damaged components.

⚠ WARNING

To prevent injury, lower implements to the ground, disengage all drives, engage parking brake, stop engine, and remove the key from the ignition switch before making any adjustments or performing maintenance.

Make sure the tractor is parked on a solid and level surface. Never work on a tractor that is supported only by a jack. Always use jack stands.

If only the front or rear of the tractor is raised, place chocks in front of and behind the wheels that are not raised.

A qualified technician should perform adjustments. If proper adjustment cannot be made, contact an authorized Jacobsen dealer.

⚠ CAUTION

Be careful to prevent entrapment of the hands and fingers between moving and fixed components of the machine.

THROTTLE

Located to the right of the operator's seat, the throttle control is used to regulate engine rpm. Replace a worn throttle cable as shown in Figure 2C-1.

Adjustment

Check throttle adjustment, if engine runs below recommended rpm with throttle lever in the high-speed position.

NOTE:

Refer to the Engine Owner's Manual supplied by the engine manufacturer.

1. Remove the side cover from the instrument panel.
2. Position the throttle lever in the high-speed position with 0.0625 - 0.25 inch (2-6 mm) gap between lever and panel.
3. Place the engine throttle lever against the max speed screw.
4. Adjust the throttle cable nuts until the cable eyelet is positioned on the pin as shown.
5. Replace the side cover.

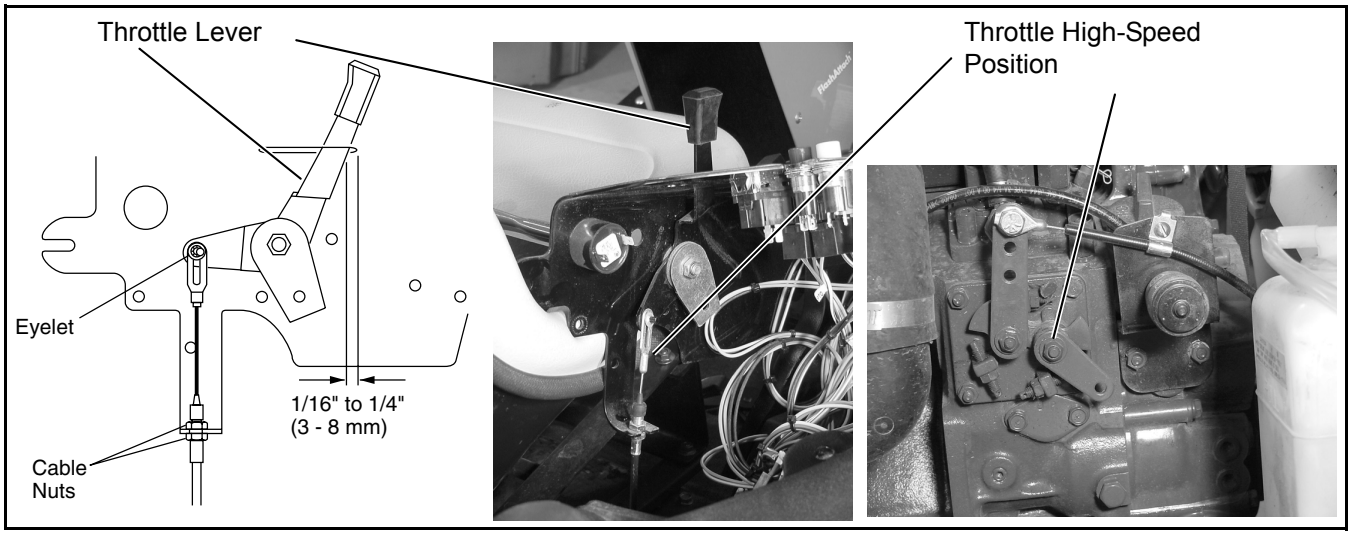


Figure 2C-1. Throttle Control Adjustment

NEUTRAL AND 4WD CUT-OUT SWITCHES

Neutral Switch

The traction pedal is designed to return to neutral whenever the forward or reverse foot pedals are released. If the tractor continues to creep after the traction pedal is released, check the neutral adjustments and adjust the traction pedal linkage (Figure 2C-2).

1. Disconnect the pump linkage from the traction pedal.
2. Check the position of the return arm on the drive pump. The pointer on arm should be centered in the sensing area of the switch.

NOTE:

The neutral switch forms part of the interlock system and senses when the traction pedal is in neutral. If the Interlock system fails to operate properly, check and replace the switch before operating the tractor.

3. Adjust the pointer by loosening the jam nut and turning the adjustment screw while holding the adjustment nut.
4. Tighten jam nut against adjusting nut.
5. Connect the pump linkage to the traction pedal.
6. Check the Interlock system and operation of traction pedal after adjustment.

4WD Cut-Out Switch

A four-wheel drive cut-out switch is included on machines equipped with four-wheel drive. The switch stops four-wheel drive operation when the machine is placed in reverse or neutral. The switch is located on the same mounting bracket as the neutral switch (Figure 2C-2).

1. Loosen the switch mounting screws.
2. While in neutral, adjust the switch as required to position the sensing area under the return arm as shown.

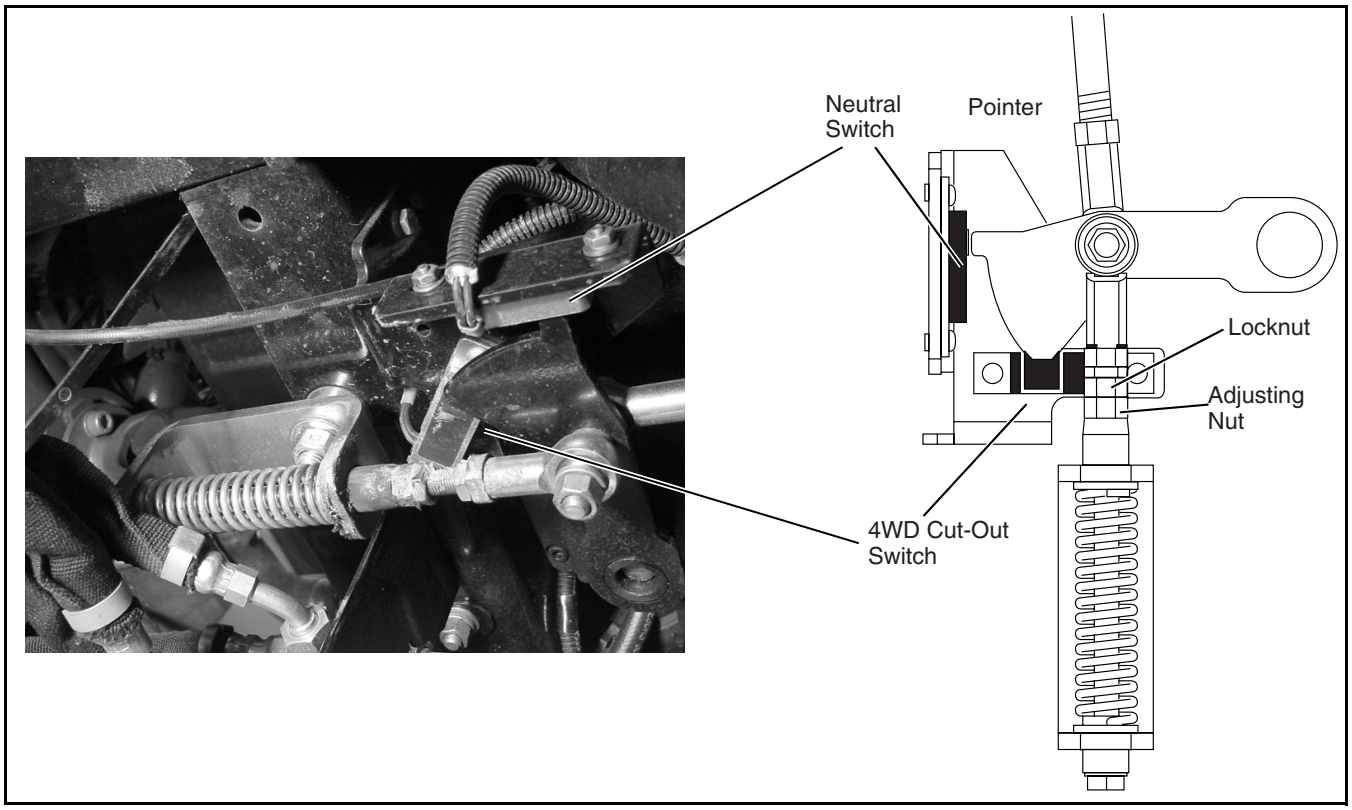


Figure 2C-2. Neutral and 4WD Cut-Out Switches

TRACTION PEDAL SPEED LIMITER

Cutting quality is better at speeds well below the transport speed of the tractor. An initial mow speed of 6 mph is set at the factory and should be satisfactory for most cutting conditions. Local turf conditions may respond better to different speeds (Figure 2C-3).

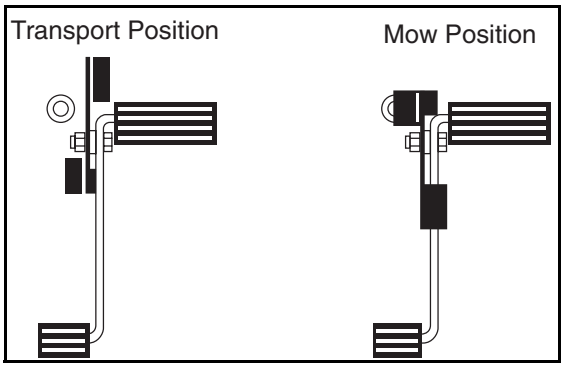


Figure 2C-3. Traction Pedal Speed Limiter

To adjust the mowing speed limit, loosen the jam nut and adjust the stop screw (Figure 2C-4) up to reduce speed or down to increase speed. Tighten jam nut to hold adjustment in place.

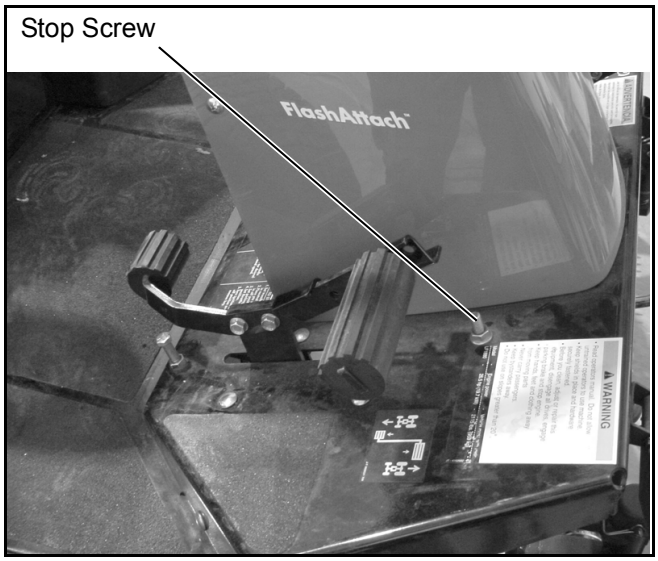


Figure 2C-4. Speed Limiter Stop Screw

MAXIMUM TRANSPORT SPEED

Before making speed adjustments at the pump, check that the engine is running at full rpm under load and the throttle is adjusted correctly.

NOTE:

The following adjustment is a forward transport speed (Figure 2C-5). See Traction Pedal Speed Limiter for adjusting mowing speed.

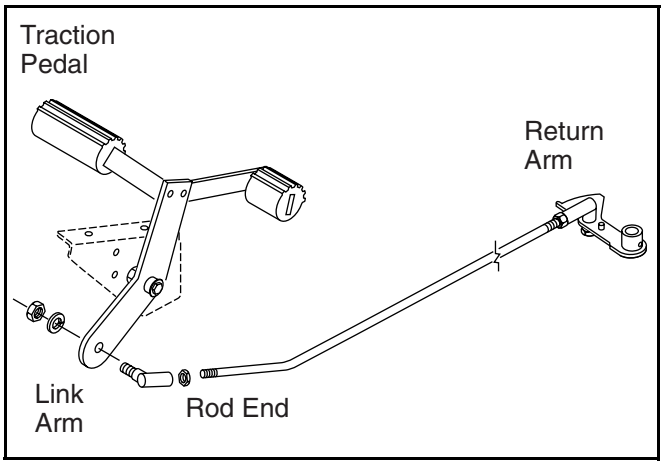


Figure 2C-5. Traction Pedal Linkage

1. Check the neutral adjustment and adjust if necessary.
2. Place the traction pedal speed limiter in the transport position.
3. Disconnect the rod end from the traction pedal.
4. Push the traction pedal forward until it touches the floor panel.
5. Push the return arm on the drive pump back until it hits the internal stop on the pump housing. This position places the pump at full stroke.
6. With the return arm and traction pedal at full forward stroke, adjust the rod end in or out until it aligns with the link arm.

NOTE:

Additional adjustment may be made on the rod end at the pump if necessary.

7. Connect the rod end (Figure 2C-6) to the traction pedal and tighten the jam nut on the rod.

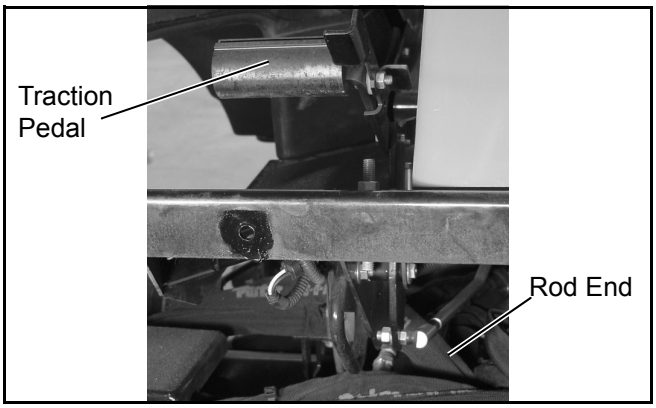


Figure 2C-6. Rod End

PARKING BRAKE

Adjust brakes after replacing or servicing the brake assembly, or if pedal travel becomes excessive.

1. After installing new brake pads (Figure 2C-7), burnish pads by driving tractor at mowing speed while applying slight pressure on the brake pedal for approximately five seconds. Release and repeat five times before making final adjustments.

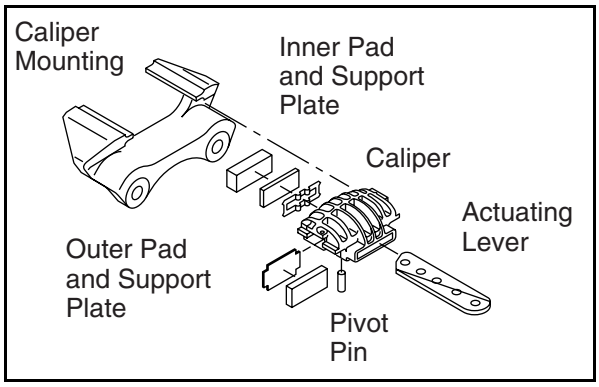


Figure 2C-7. Parking Brake

2. Loosen the upper brake cable-adjusting nut (Figure 2C-9).

3. Disconnect the brake return spring (Figure 2C-8) at the caliper.

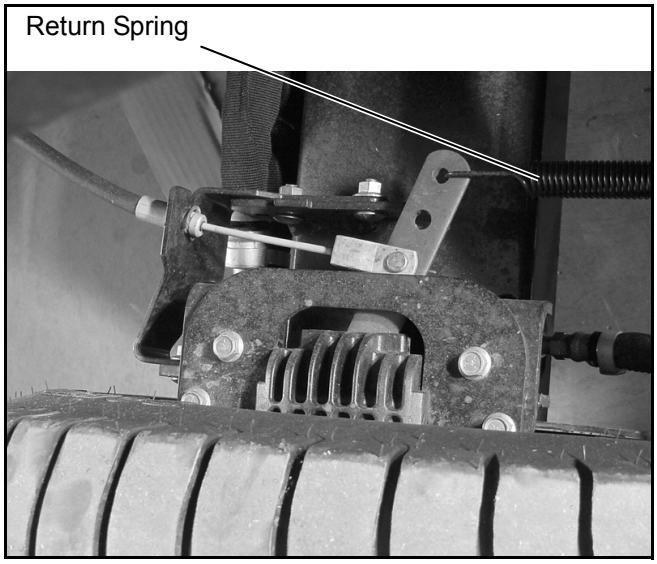


Figure 2C-8. Parking Brake

4. Pull the cable behind the lower cable-adjusting nut (Figure 2C-9) away from the pedal until brake pads just contact the brake disc. Thread the lower adjusting nut up until it contacts the mounting plate. Tighten the upper adjusting nut while holding the cable in place. Tighten the upper adjusting nut to 20 ft-lbs (27 Nm).

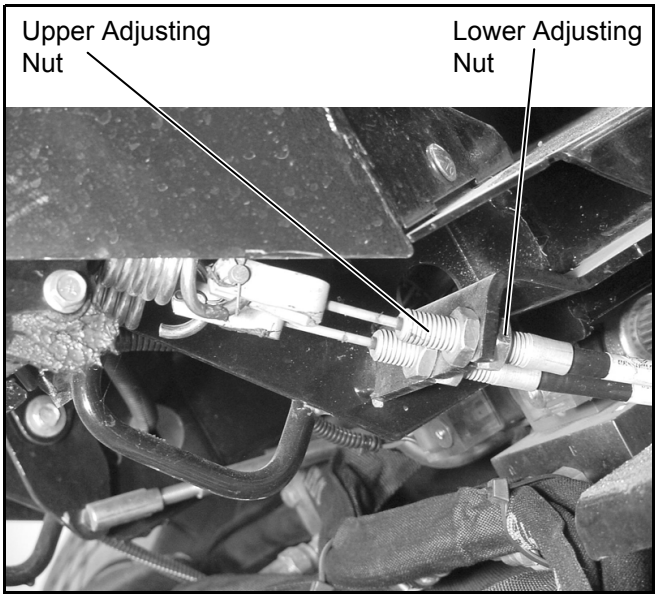


Figure 2C-9. Parking Brake Cables

NOTE:

Do not overtighten or turn the cable.

5. Connect the brake return spring. Repeat for the second cable.

BRAKE INTERLOCK SWITCH

NOTE:

Use a multimeter to determine when the switch contacts open and close. With the ignition switch in the ON position, one of the switch wires will have current (12V) available at all times. The other wire will only have current available when the parking brake is depressed.

1. Engage the parking brake and adjust the brake switch as required to close the contacts when the pedal is pressed and to open when the pedal is released (Figure 2C-10).

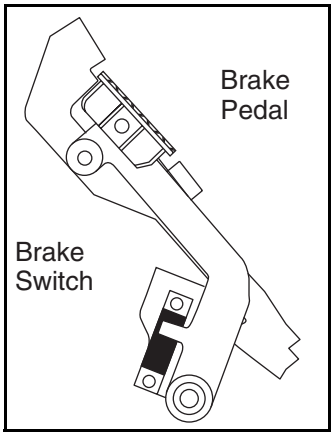


Figure 2C-10. Parking Brake Switch

2. Add or remove shims as needed to obtain an air gap (Figure 2C-11) of 0.09375 to 0.125 in (2 to 3 mm) between the sensing surface of the switch and brake arm.

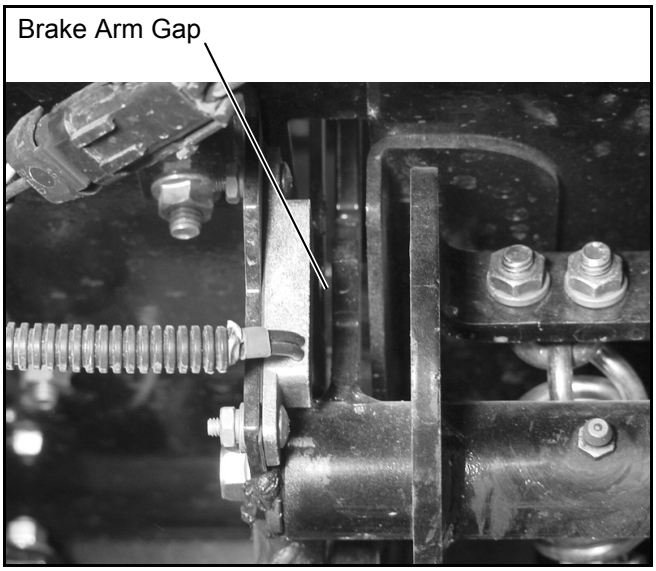


Figure 2C-11. Brake Arm Gap

LIFT-LIMIT SWITCH

The center reel lift arm is equipped with a proximity switch. The switch turns off the reels when the center reel rises above 30° over horizontal.

The switch is mounted on the front axle directly behind the lift arm. If the reels continue to run when lifted, or do not run when lowered, inspect the switch. Adjust or replace the switch as needed (Figure 2C-12).

1. Park the tractor on a flat, level surface.
2. Remove the center reel from the lift arm.
3. Place the ignition switch in the OFF position and remove the ignition key.
4. Add or remove shims as needed to obtain an air gap of 0.09375 to 0.125 in (2 to 3 mm) between the lift-limit switch and lift arm.

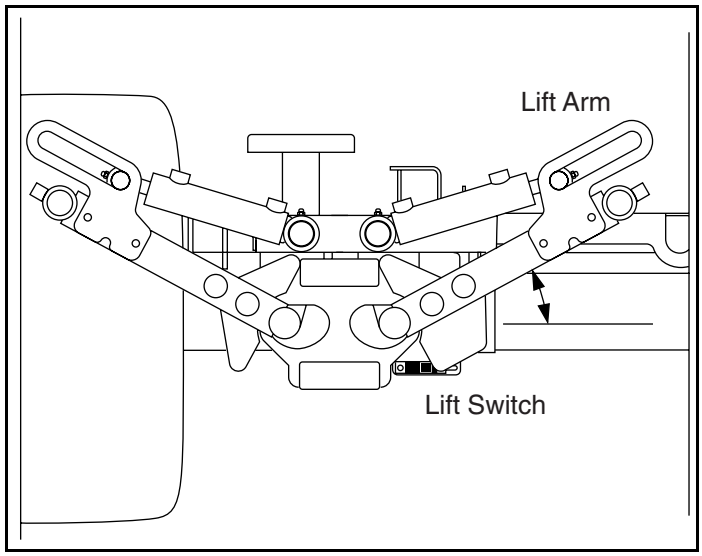


Figure 2C-12. Lift-Limit Switch

NOTE:

Use a multimeter to check for continuity between the switch wires. Continuity should be available when the lift arm passes just below 30° from horizontal.

5. Use a multimeter to determine when the switch contacts are opened or closed.
6. Raise the lift arm manually to 30° above horizontal.

NOTE:

The lift-limit switch sets the point where the switch turns off the reel drive, not how high the reels rise. The reels will actually rise to a position slightly above 30°.

7. With the lift arm at 30°, adjust the switch (Figure 2C-13) until the contacts open. Secure the switch to maintain the setting.
8. Manually lower the lift arm. The switch contact should close when the lift arm drops below 30° (Figure 2C-13).

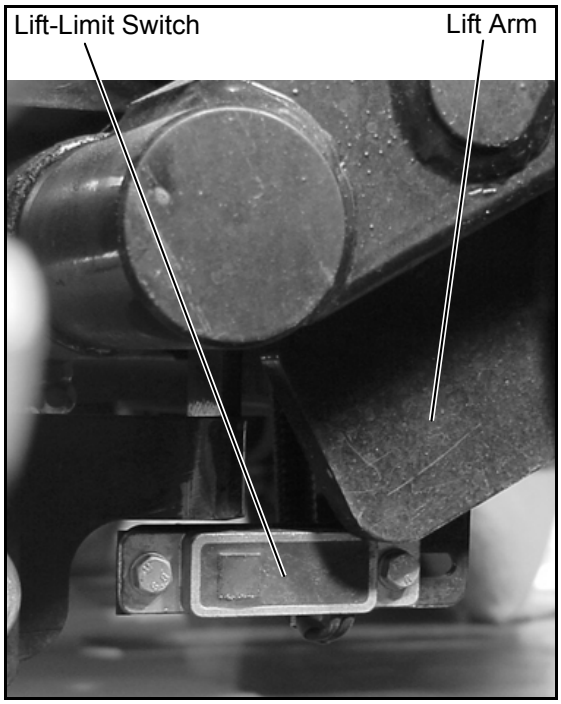


Figure 2C-13. Lift Switch Mounting

SECTION 2D. GAUGES AND INSTRUMENTS

REPAIR

NOTE:

Refer to Section 10 for test and repair procedures of switches.

Instrument repair is limited to replacement of the components. Replace the components using the following procedures (Figure 2D-1).

1. Disconnect the battery ground (black) cable.
2. Label the wires for proper identification and disconnect wiring.
3. Remove the attached hardware and replace the component.
4. Using the labels created in Step 2, install the hardware and connect the wiring.
5. Connect the battery ground (black) cable.

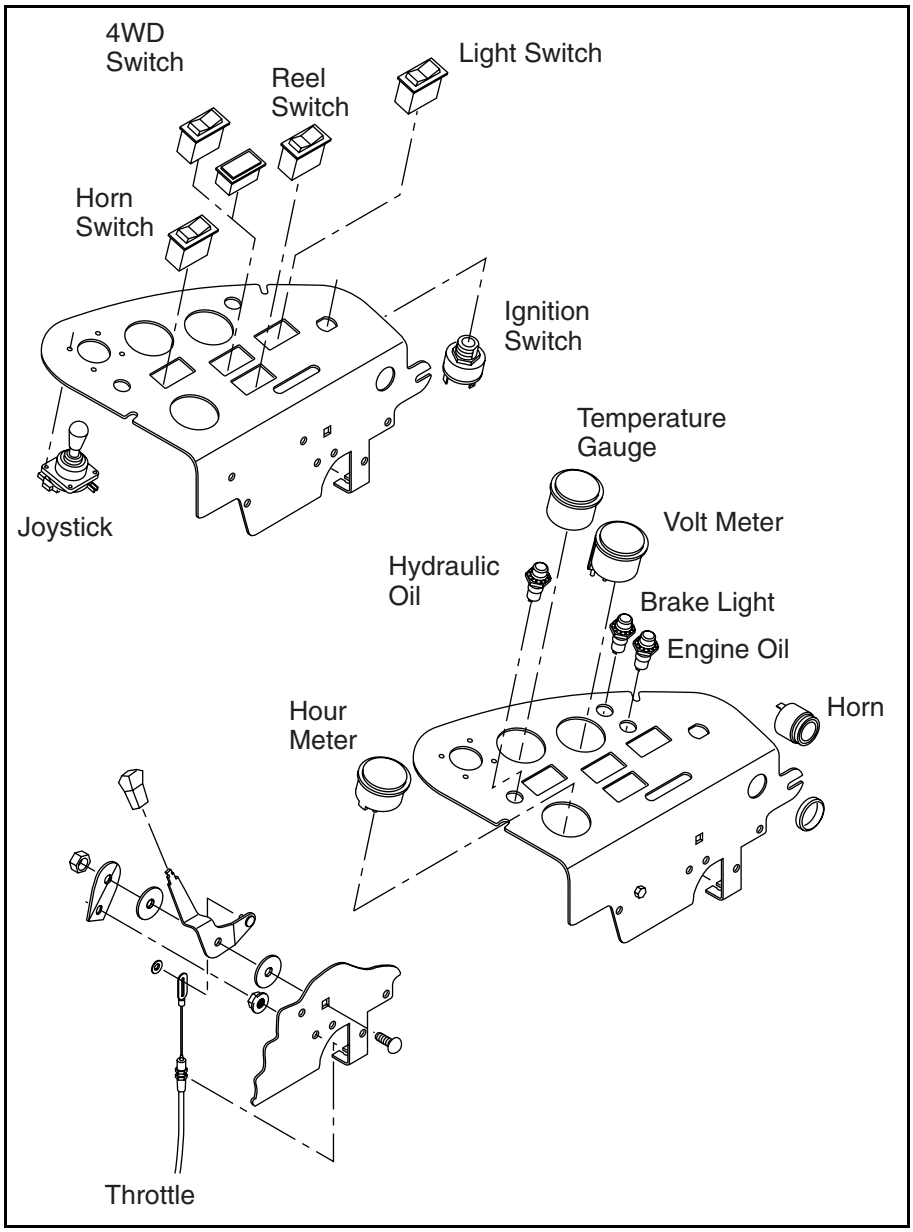


Figure 2D-1. Gauges and Instrument

SECTION 3
ENGINE

SECTION 3A. REPAIR, SERVICE TOOLS, AND MATERIALS

MATERIALS REQUIRED

Tools required:	Standard automotive hand tools
Cleaning materials:	Stoddard solvent or equivalent Detergent and water Anti-rust, Never-Seize
Lubricants:	Refer to Section 11
Other service items:	Compressed air source Engine hoist

SECTION 3B. FAILURE ANALYSIS

GENERAL

The following table lists common problems, probable causes, and suggested remedies with section references to detailed descriptions of remedial procedures.

PROBLEM	PROBABLE CAUSE	REMEDY
1. Engine will not start	a. Parking brake disengaged or mow switch on	a. Engage parking brake, turn off mow switch
	b. Glow plug inoperative	b. Check glow plugs
	c. Battery low on charge or defective	c. Inspect the condition of the battery and battery connections
	d. Fuel tank empty or dirty	d. Fill with fresh fuel Change the fuel filter Bleed the fuel lines (Section 3D)
	e. Fuse blown	e. Replace fuse
	f. Relay defective	f. Test and replace relay (Section 10)
	g. Traction pedal not in neutral	g. Check position of the pedal
	h. Neutral switch out of adjustment or defective	h. Adjust or replace the switch (Section 2 and Section 10)
2. Engine is hard to start or runs poorly	a. Fuel level low, fuel or fuel filter dirty	a. Fill with fresh fuel Change the fuel filter Bleed fuel lines (Section 3D).
	b. Air cleaner dirty	b. Inspect and replace the air filter (Section 3D)
	c. Injectors, fuel pump faulty	c. Consult the engine manufacturer's manual
	d. Engine problem	d. Consult the engine manufacturer's manual
3. Engine stops	a. Fuel tank empty	a. Fill with fresh fuel and bleed the fuel lines (Section 3D)
	b. Interlocks are not set before leaving the operator's seat	b. Engage parking brake and set mow switch to OFF
4. Engine overheating	a. Coolant level low	a. Inspect and add coolant
	b. Air intake restricted	b. Clean air intake or radiator
	c. Water pump belt broken	c. Tighten or replace belt

SECTION 3C. GENERAL INSTRUCTIONS

CONTENTS

A Kubota three cylinder diesel engine is used in the Super LF-1880 Fairway Mower. The Kubota D1105-E liquid cooled engine is used for all mower operations. An optional D1105-TE turbocharged diesel engine is available for four-wheel drive models.

A Kubota operator's manual and parts manual are included with the LF-1880. Refer to these manuals for information on engine parts, service, and repairs.

This section covers repairs to components used for engine operation (e.g. exhaust system, air cleaner, radiator). Removal and installation of the engine is covered in this manual. Engine repair is not included in this manual; refer to the manufacturer's instructions.

NOTE:

Testing of the alternator, starter, and fuel solenoid are included in Section 10. If the components are faulty, refer to the engine manufacturer's manual for repair instructions.

EXHAUST SYSTEM

Thoroughly cleaning the engine on a regular basis will provide better conditions for component removal, repair, and inspection. A clean engine also aids in troubleshooting coolant and engine oil leaks. Thoroughly clean components after removal from the machine. Engine lubrication is included in Section 11.

SECTION 3D. ENGINE

GENERAL

An engine operator's manual, prepared by the engine manufacturer is supplied with the machine. Study the manual carefully to become familiar with the maintenance, operation, and adjustment of the equipment. Following the manufacturer's instructions will assure maximum service life and operation of the engine.

⚠ WARNING

To prevent serious injury, lower the reels to the ground, disengage all drives, engage the brake, stop the engine, and remove the key from the ignition before making any adjustments or performing maintenance.

Ensure the tractor is parked on a solid level surface. Never work on a tractor that is supported only by a jack. Always use jack stands.

Use chocks in front of and behind the wheels of the axle remaining on the ground when lifting only one axle.

1. Adjustments and maintenance should always be performed by a qualified technician. If proper adjustment cannot be made, contact an authorized Jacobsen dealer.
2. Replace, do not adjust, worn or damaged components.

ENGINE BELT

Inspect and adjust the new engine belt after the first 50 hours of operation. Check and adjust annually thereafter.

1. Adjust the alternator pulleys to 0.25 to 0.31256 in (6 to 8 mm) with a deflection of 20 lbs. Push at the midpoint between pulleys (Figure 3D-1). See the engine manufacturer's manual.

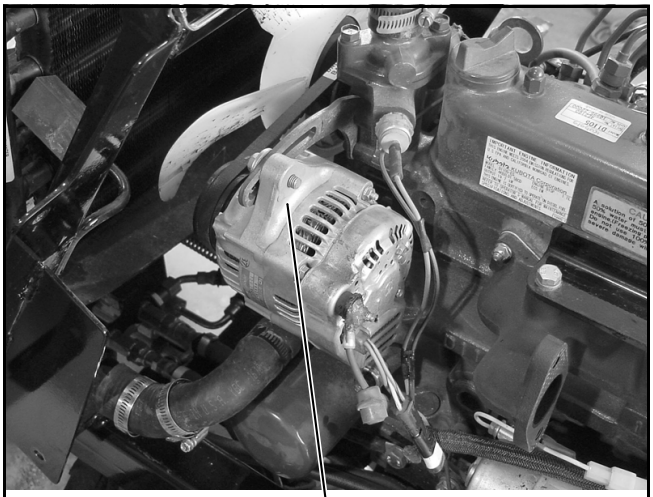


Figure 3D-1. Alternator Mounting

2. Adjust the belt tension by loosening the alternator mounting bolts and pulling the alternator against the belt until the proper tension is achieved (Figure 3D-2).

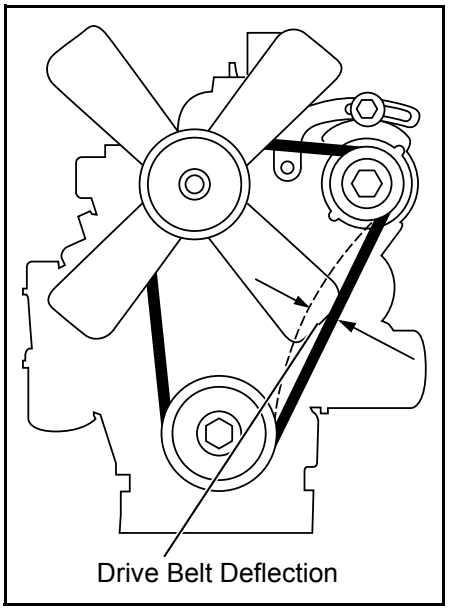


Figure 3D-2. Engine Drive Belt

ENGINE OIL

Check the engine oil at the start of each day, before starting the engine. If the oil level is low, remove the oil filler cap and add oil as required (Figure 3D-3).

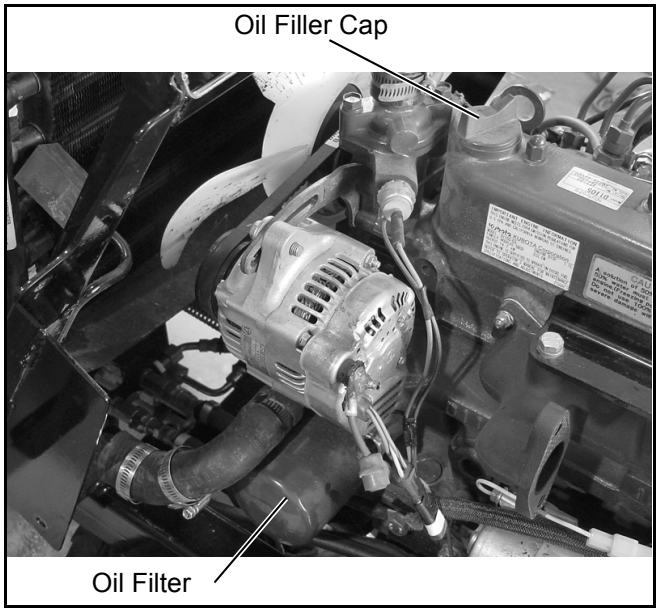


Figure 3D-3. Engine Oil Filler Cap and Filter

Perform an initial oil change after the first 50 hours of operation and every 200 hours thereafter. Refer to the engine manual for additional information and instructions.

Use engine oils with API classification CD/CE.

Ambient Temperature	Oil Weight
Above 77°F (25°C)	SAE 30W or SAE 10W30/10W40
32° to 77°F (0° to 25°C)	SAE 20W or SAE 10W30/10W40
Below 32°F (0°F)	SAE 10W or SAE 10W30/10W40

See the Parts & Maintenance manual for engine break-in information.

AIR CLEANER

The air cleaner assembly includes an air filter restriction gauge. The gauge indicates the condition of the air filter based on the amount of suction required to draw air through the filter. When the air filter becomes restricted, a red line will be drawn into the visible area of the gauge.

NOTE:

Do not open the air cleaner assembly for inspection and cleaning until the air filter restriction gauge indicates air filter restriction. Removing the air filter increases the possibility of dust, dirt, and contaminant entering the engine.

The cyclonic action of air moving through the air cleaner deposits dust and dirt into a rubber dust evacuator. The dust evacuator then dumps the debris. The valve should be checked daily for contaminants. Squeeze the sides of the valve together to release debris trapper inside.

When the restriction gauge indicates a need for air filter service, clean the outside of the air cleaner assembly, and gently remove the filter element using the following procedure.

⚠ CAUTION

Do not attempt to clean and replace the air filter element. Discard the dirty element and replace with a new element.

⚠ WARNING

Do not use starting fluids. Use of starting fluid in the air intake system is potentially explosive and can cause a “RUN-AWAY ENGINE” condition resulting in serious personal injury or engine damage.

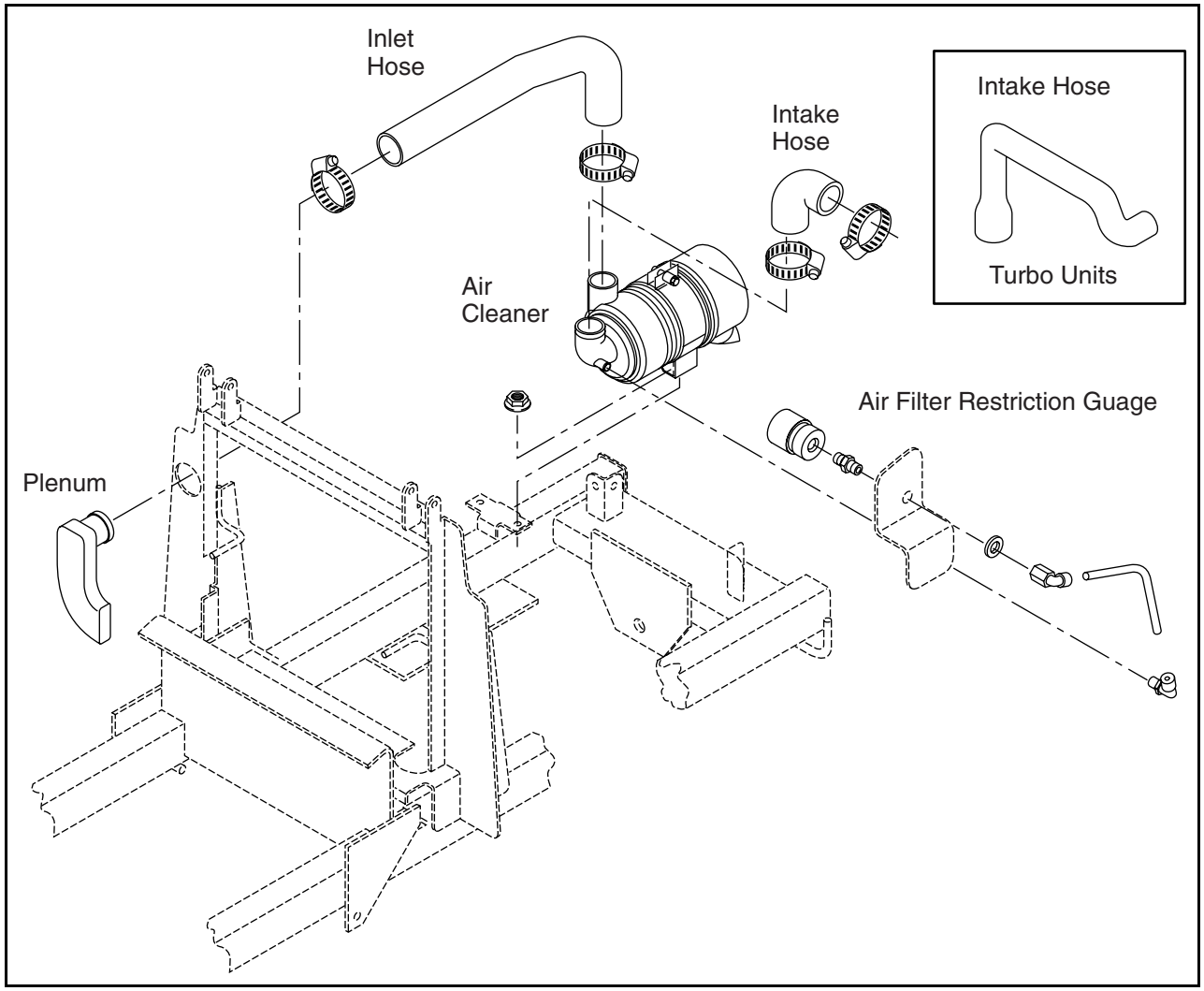


Figure 3D-4. Air Cleaner Assembly Exploded View

1. Release the spring clips and remove the air cleaner end cover. Using damp lint-free cloths, thoroughly clean the inside of the end cover including the dust evacuator (Figure 3D-5).
2. Pull the air filter element free of the housing. Using damp lint-free cloths, clean the inside of the filter housing (Figure 3D-5).
3. Inspect the air inlet and intake hoses for wear and damage, replace all damaged hoses. Ensure the hose clamps secure the hoses without leaks.
4. Inspect the new filter element. Do not use a damaged element, especially the open-end seal.
5. Install the new filter element, making sure it is properly seated in the housing.
6. Install the end cover with the dust evacuator located at the bottom of the assembly. Secure with spring clips.

7. Reset the air filter restriction gauge by pressing the button on the end of the indicator.

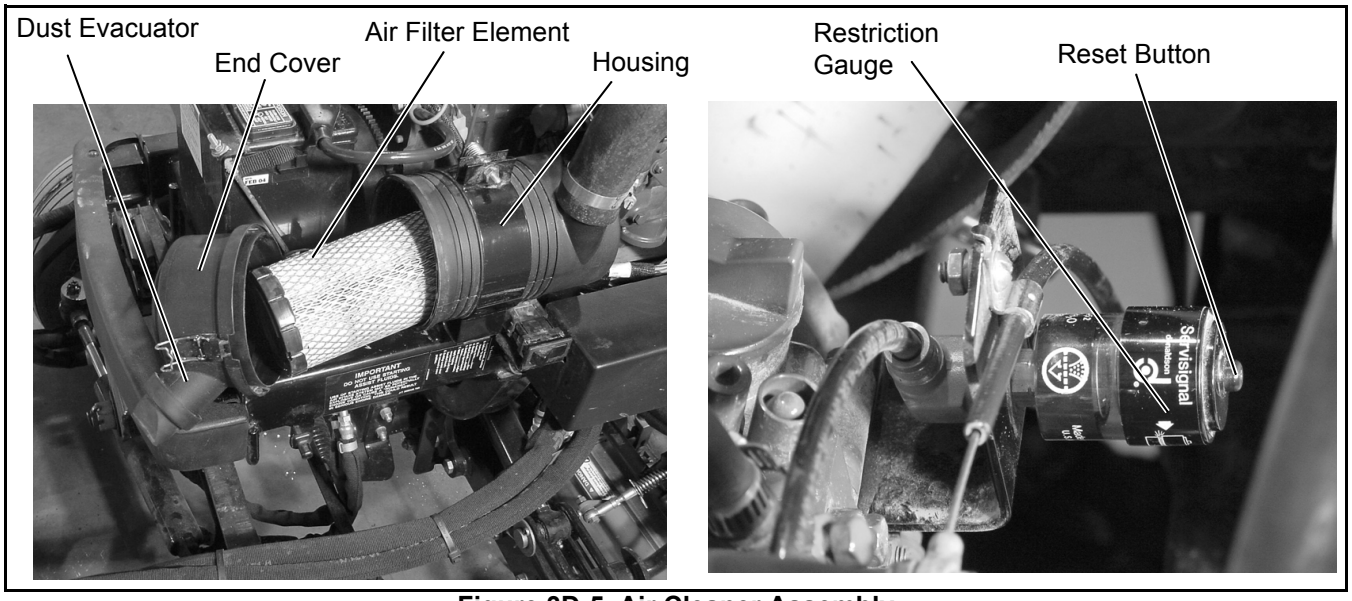


Figure 3D-5. Air Cleaner Assembly

RADIATOR SERVICE

⚠ CAUTION

Never remove the radiator cap when the coolant is hot. The engine must be shut down and cooled before the radiator cap is removed. Very hot coolant will be sprayed from the radiator if the cap is loosened before the engine has cooled. Serious personal injury can occur.

The radiator is mounted between the hydraulic oil cooler and engine-cooling fan. The oil cooler is mounted in front of the radiator and behind a removable dust screen. The dust screen should be removed and cleaned after each use. Hydraulic oil cooler service is covered in Section 8.

Changing Coolant

1. Shut down the engine and remove the ignition key. Allow the engine to cool completely.
2. Remove the radiator cap and open the drain petcock located on the bottom of the radiator (Figure 3D-6). Drain the coolant into a suitable container.

NOTE:

It is illegal to dispose of most antifreeze in an inappropriate manner. Always dispose of antifreeze according to local environment laws and regulations. Contact local environment personnel for information on disposal methods.

3. With the petcock open, flush the inside of the radiator with fresh water.

⚠ CAUTION

Always use a mixture of antifreeze and fresh water in the engine cooling system. Normally a 50/50 coolant mixture will provide freeze protection to -37°F (-38°C) and boil over protection in an efficient cooling system.

4. Fill the radiator with a 50/50 mixture of good quality antifreeze and clean fresh water.
5. Install the radiator cap and start the engine following the instructions in the Safety & Operation manual.
6. The engine allows air to circulate through the radiator, cooling the antifreeze/water mixture (coolant). If the core becomes clogged with dust and dirt, or the cooling fins are bent, the radiator will not cool properly.

⚠ WARNING

Always wear eye protection when using compressed air. Never use compressed air in excess of 20 psi (138 kPa) for cleaning purposes. Never point the air nozzle at another individual; serious personal injury can occur from contact with compressed air.

Do not use screwdrivers or sharp tools to clean the radiator core. Sharp edges can damage the core and cause coolant leaks. Use commercially available fins tools for repair of bent fins.

7. Remove the dust screen. Using low-pressure compressed air blow dust and debris from the radiator core (Figure 3D-6).

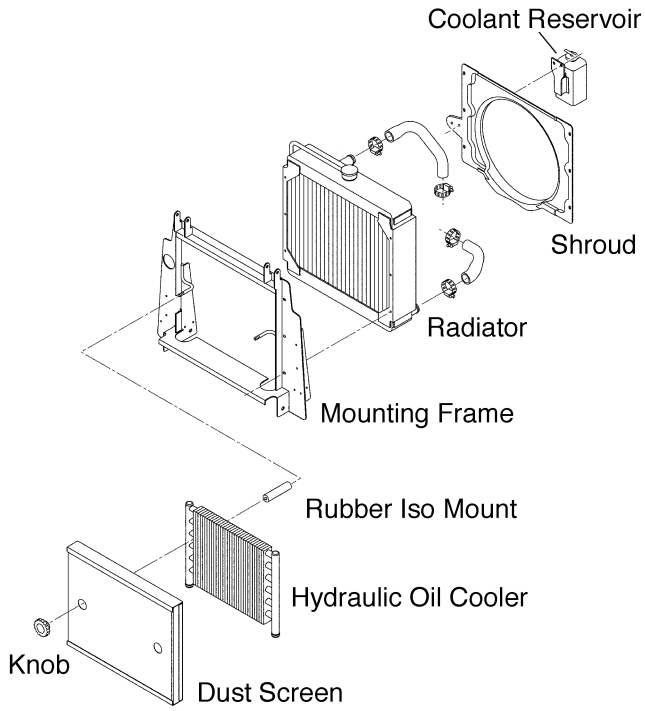


Figure 3D-6. Radiator, Hydraulic Oil Cooler, and Dust Screen

Removal

1. Shut down the engine and remove the ignition key.

⚠ CAUTION

Allow the engine coolant to completely cool before removing the radiator cap. Hot coolant sprayed from the cap can cause serious personal injury.

2. Allow the coolant to cool completely and remove the radiator cap.
3. Remove the dust screen knobs and dust screen.
4. Disconnect the coolant reservoir hose at the radiator overflow outlet.
5. Place a suitable container underneath the radiator petcock drain. Drain the coolant system.
6. Disconnect and remove the upper and lower radiator hoses.
7. Remove three bolts on each side of the shroud. Remove the shroud and coolant reservoir.
8. While supporting the radiator, remove three mounting bolts on each side of the radiator.
9. Carefully remove the radiator from the mount.

Installation

1. Place the radiator in position on the radiator mount and secure with three bolts on each side.
2. Position the shroud and coolant reservoir on the radiator. Secure with three bolts on each side.
3. Install the upper and lower radiator hoses. Secure the hoses with hose clamps.
4. Ensure the drain petcock is closed and fill with a 50/50 mixture of good quality antifreeze and clean fresh water.
5. Carefully inspect the radiator cap for wear and damage, replace if necessary. Install the radiator cap on the radiator.
6. Install the coolant reservoir hose on the radiator overflow outlet.
7. Install the dust screen over the radiator and hydraulic oil cooler. Secure the screen with the knobs.
8. Using the instructions in the Safety and Operation manual, start the engine and allow the engine to warm to operating temperature. Fill the coolant reservoir to the hot level.

EXHAUST SYSTEM

⚠ CAUTION

Do not attempt to service the exhaust system when the engine is hot. Serious personal injury can occur.

NOTE:

If a change in the color or sound of the exhaust occurs, stop the engine immediately, identify the problem and repair as necessary.

NOTE:

Tighten all exhaust manifold hardware evenly.

Inspection

To protect personnel from carbon monoxide poisoning, inspect the complete exhaust system regularly.

Inspect the exhaust system for cracks, holes, and distortion (Figure 3D-7). Tighten or replace the exhaust clamps.

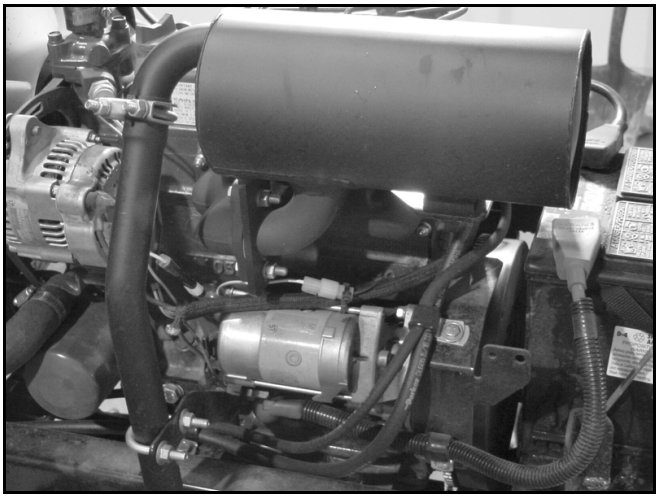


Figure 3D-7. Exhaust System

Removal and Installation

Remove and install the exhaust system components as shown in Figure 3D-8.

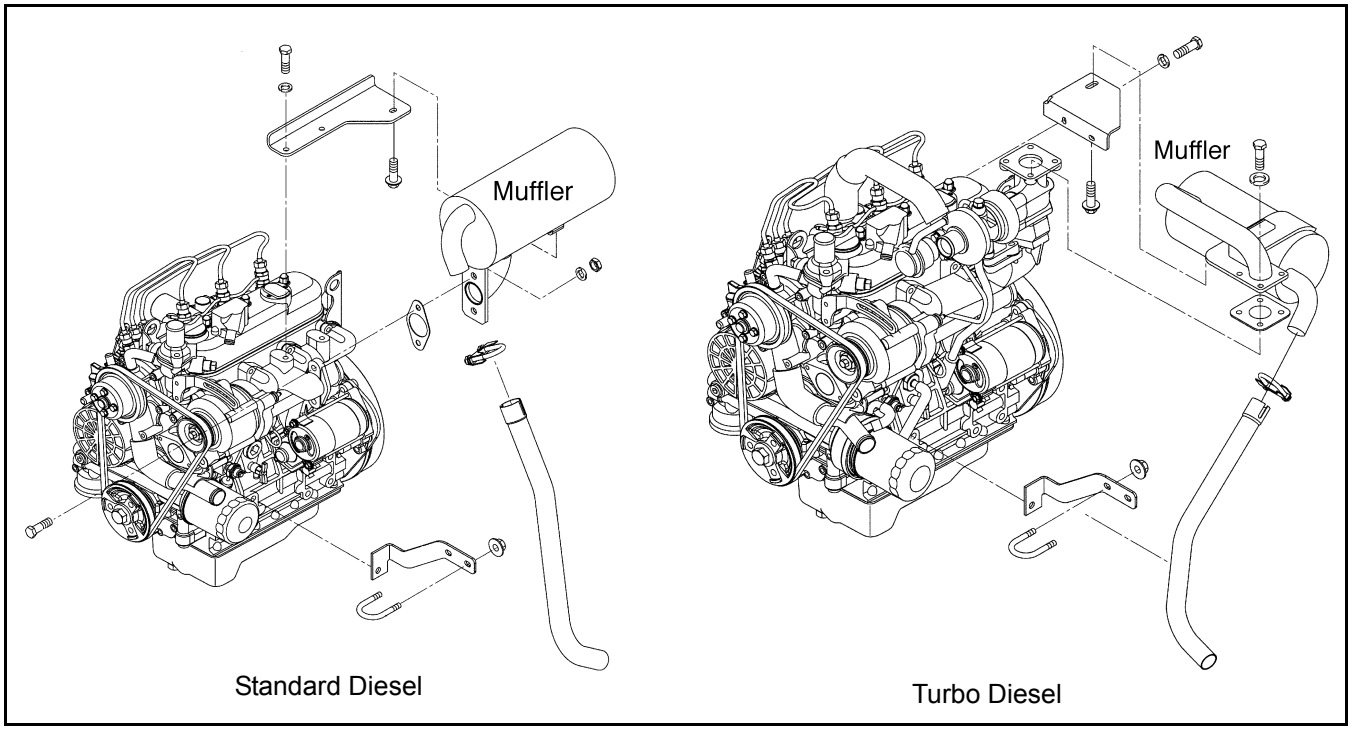


Figure 3D-8. Exhaust System

FUEL SYSTEM

The fuel filter is mounted on the rear of the engine above the battery. Moisture and other foreign matter can accumulate in the fuel filter. The filter should be changed and the bowl cleaned periodically (refer to Section 11).

⚠ CAUTION

Diesel fuel is flammable, handle with care. Use an approved container with a spout that will fit inside the fuel filler neck. Avoid using unapproved containers to transport fuel. Keep all fuel containers clean and closed when not in use.

⚠ CAUTION

Never remove the fuel cap from the fuel tank or add fuel when the engine is running.

Do not smoke when handling fuel. Never fill or drain the fuel tank indoors.

Do not spill fuel and always clean fuel spills.

Never handle or store fuel containers near an open flame or any device that may create sparks and ignite the fuel or fuel vapors.

Always install and tighten the fuel cap.

Fuel Filter Service

1. Shut down the engine and remove the ignition key. Allow the engine to cool completely before servicing.
2. Close the fuel filter valve (Figure 3D-9).

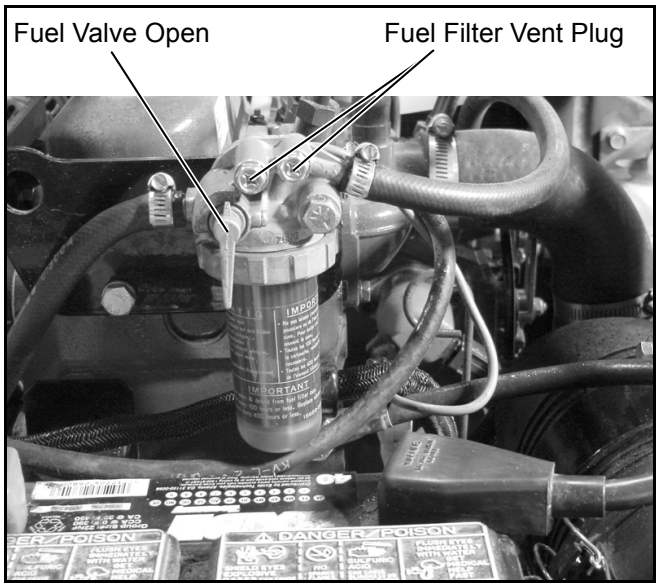


Figure 3D-9. Open Fuel Valve and Vent Plug

3. Thoroughly clean the fuel filter and area surrounding the fuel filter.
4. Remove the filter clamp ring (Figure 3D-10).

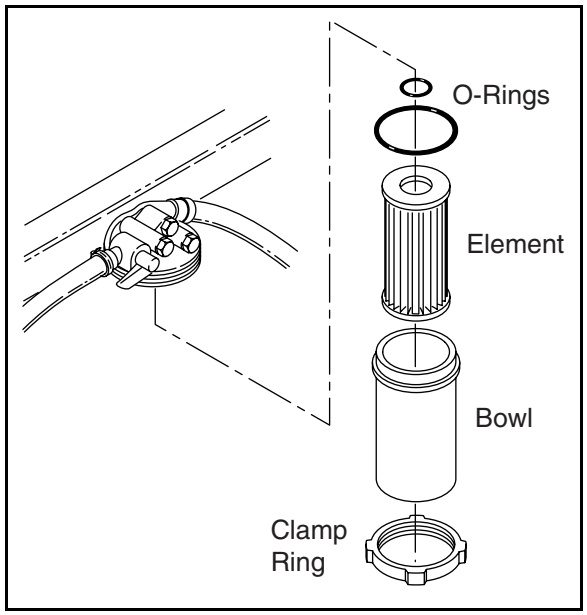


Figure 3D-10. Fuel Filter Assembly

5. Remove the filter element and drain the excess fuel into an appropriate container.

⚠ CAUTION

Dispose of fuel properly. Contact the local environmental department for instructions on disposing of unwanted fuel products.

6. Remove the o-rings.
7. Clean the inside and outside of the fuel bowl and mounting.
8. Lightly lubricate the new o-rings with clean diesel fuel and install in the mounting.
9. Install the filter element and bowl securely. Secure with a clamp ring.
10. Open the fuel filter valve (Figure 3D-11).

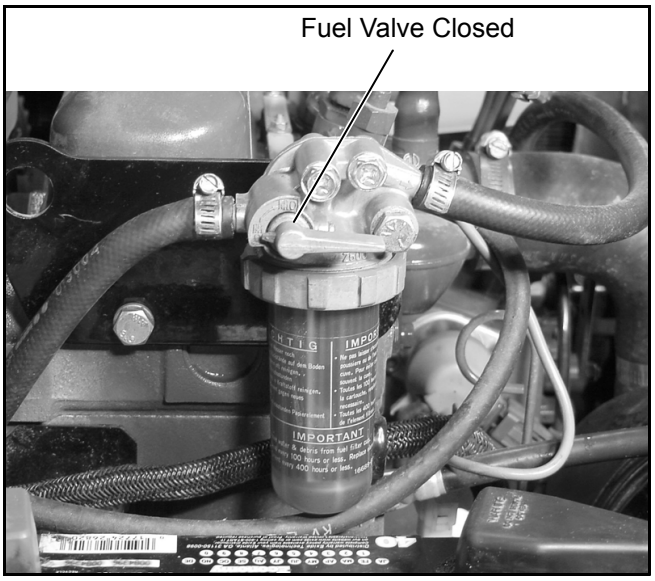


Figure 3D-11. Closed Fuel Valve

11. Purge any air from the fuel system after installing the new filter.

Purging the Fuel System

NOTE:

Refer to the engine manufacturer's manual for additional information on the fuel system.

When the fuel filter is replaced, fuel piping is removed, the fuel tank is emptied, or the engine has not been operated for a long time, purge the fuel system of air using the following procedure.

1. Fill the fuel tank with fuel.
2. Loosen the air vent screw at the top of the filter by turning counterclockwise two turns. Drain any excess fuel into a suitable fuel container.

3. Place the ignition switch in the ON position to energize the electric fuel pump.
4. Allow the fuel to drain from the air vent until air bubbles no longer appear. Tighten the vent plug.
5. Open the air vent on the fuel injection pump vent by turning the vent plug approximately two turns counterclockwise.
6. Allow fuel to flow from the injection pump vent until air bubbles no longer appear. Tighten the vent plug (Figure 3D-12).

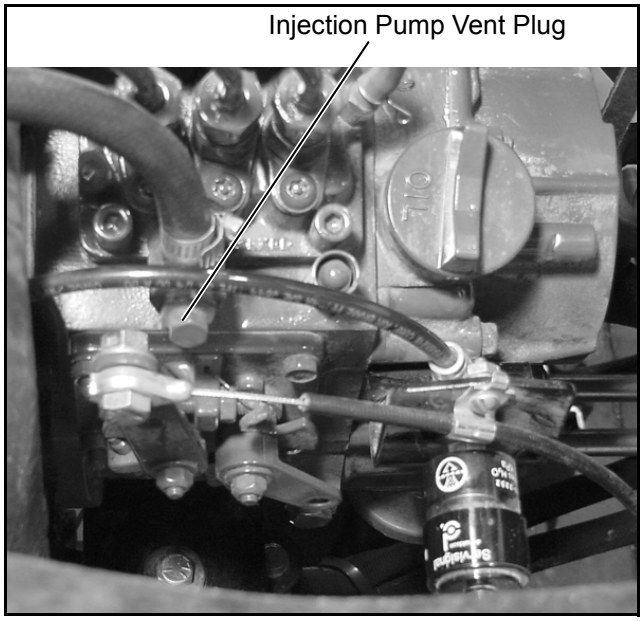


Figure 3D-12. Injection Pump Vent Plug

7. Inspect the fuel filter, hoses, clamps, and pipes for leaks. Repair as necessary.
8. Place the ignition switch in the OFF position.

ENGINE REMOVAL

The engine is mounted behind the driver's seat and drives the traction pump using a drive shaft. Some components can be serviced or removed using procedures previously described in this section.

1. Shut down the engine and remove the ignition key. Allow the engine to cool completely before attempting to service the engine.
2. Disconnect the negative battery clamp first, then remove the positive clamp. Remove the battery hold down clamp and battery.
3. Using a suitable container drain the radiator, engine block, and engine oil.
4. Remove the upper and lower radiator hoses.
5. Close the fuel filter valve and disconnect the fuel outlet hose from the filter to the injection pump.
6. Disconnect the throttle cable from the injection pump and the throttle cable housing from the clamp.
7. Remove the air cleaner assembly.
8. Remove the exhaust assembly.
9. Tag and disconnect the wiring harness at the fuel solenoid, starter, oil sender, coolant temperature sender, and alternator. Remove the harness hold down and the wiring harness away from the engine.
10. Remove the drive shaft.
11. Remove the fuel filter mounting bolts and fuel inlet hose hold down clamps.
12. Using an engine hoist, support the engine and remove the lower engine mounting bolts.
13. While checking for connected wires and components, carefully remove the engine from the machine. Be careful to support the engine properly in order to prevent damage.
14. If the engine is being replaced, some components must be removed and installed on the new engine. See the parts manual for additional information and illustrations.

ENGINE INSTALLATION

1. If necessary, remove components from the engine and install on the components on the new engine.
2. Using an engine hoist, position the engine on the mower frame for installation.
3. Install and tighten the engine mounting bolts.
4. Install the drive shaft.
5. Install the fuel filter, mounting bolts, and fuel inlet hose hold down clamps.
6. Using the tags created during disassembly, connect the wiring harness to the fuel solenoid, starter, oil sender, coolant sender, and alternator.
7. Using new gaskets, install the exhaust system.
8. Install the air cleaner assembly.
9. Using the procedures in Section 2, connect the throttle cable on the injection pump and cable housing clamp.
10. Connect the fuel outlet hose to the fuel filter and open the fuel valve.

11. Install and tighten the upper and lower radiator hoses. Secure the hoses with clamps.
12. Clean and install the battery and hold down clamp. Install the positive battery clamp first and then the negative clamp.
13. Purge air from the fuel system.
14. Using the instructions in the Safety and Operator's manual and the manufacturer's manual, start the engine. Use the new engine break-in procedures if installing a new engine.

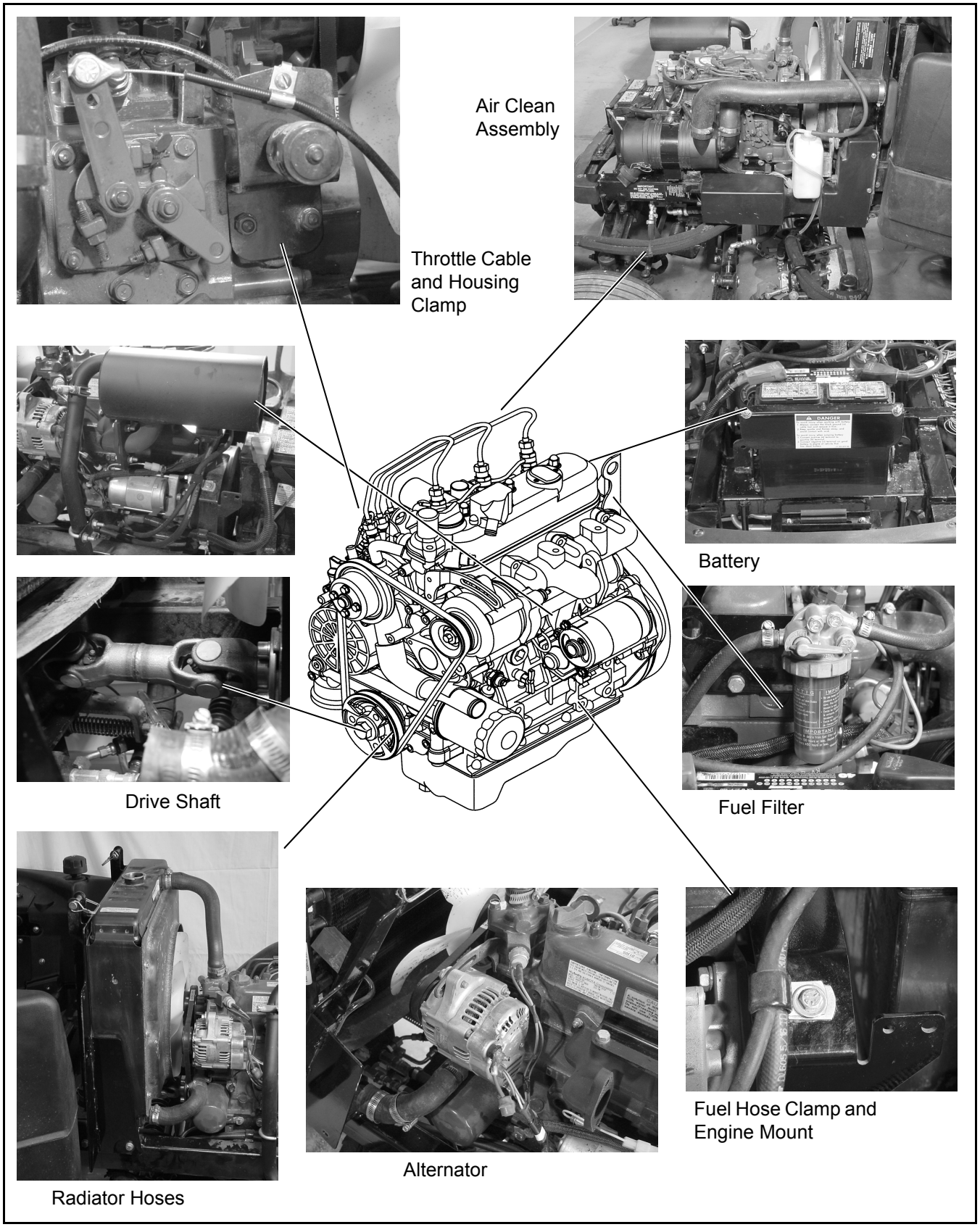


Figure 3D-13. Engine Components

SECTION 4
DRIVE TRAIN

SECTION 4A. REPAIR AND SERVICE TOOLS AND MATERIALS

MATERIALS REQUIRED

Tools required:	Standard automotive hand tools
Cleaning materials:	Stoddard solvent or equivalent
Lubricants:	Refer to Section 11

SECTION 4B. FAILURE ANALYSIS

GENERAL

The following table lists common problems, probable causes, and suggested remedies with section references to detailed descriptions of remedial procedures.

PROBLEM	PROBABLE CAUSE	REMEDY
1. Drive shaft loose	a. Universal joints worn	a. Change (Section 4C)
2. Metallic rattling sound when load is reduced on drive line	a. Universal joints worn	a. Change (Section 4C)

SECTION 4C. HYDRO-DRIVE SHAFT

GENERAL

The hydrostatic drive pump is driven by a universal joint type drive shaft connected between the drive pump and engine.

SERVICE

Removal

1. Remove the four socket head screws securing the rear yoke to the engine drive plate (Figure 4C-1).

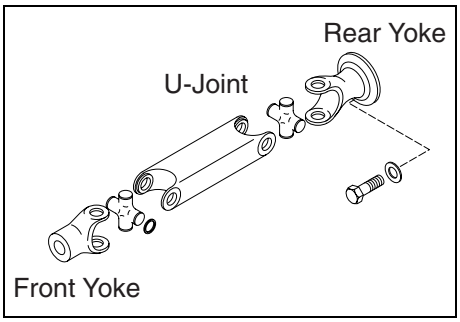


Figure 4C-1. Drive Shaft

2. Slide the drive shaft off the drive pump splined shaft.

Disassembly

NOTE:

Note the position and depth of the bearing caps in the ears.

1. Position the u-joint on a vise as shown in Figure 4C-2.

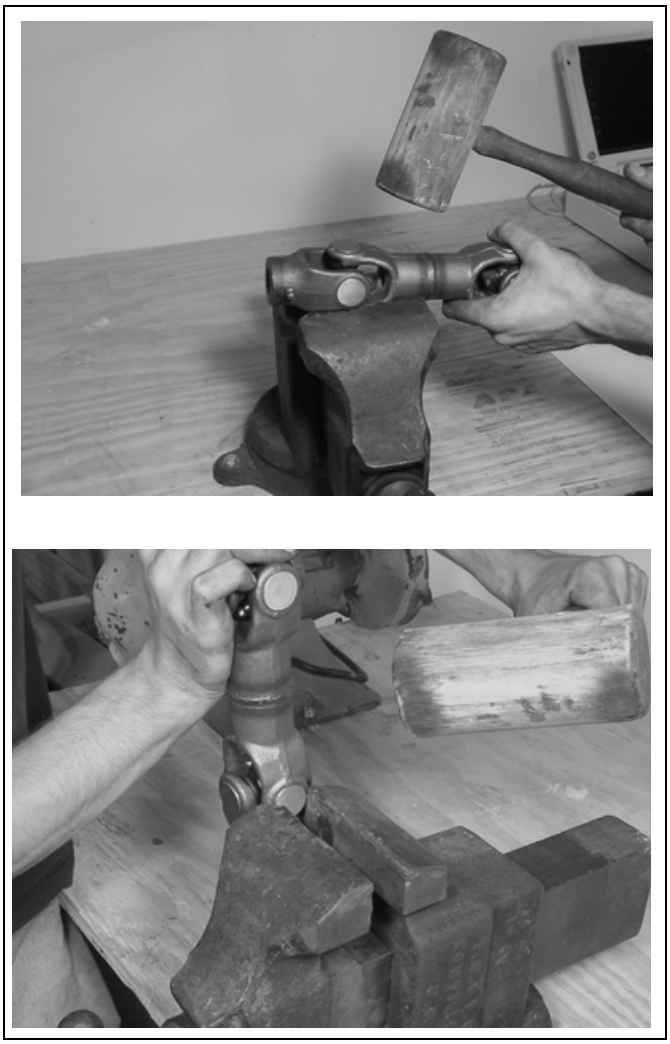


Figure 4C-2. Drive Shaft Disassembly

2. Using a soft face hammer, strike the top ear of the yoke driving the upper bearing upward and out of the ear.
3. Grip the loose bearing in the vise and drive the yoke off the bearing.
4. Repeat Step 1 through Step 3 for the remaining bearings.

Assembly

NOTE:

During assembly make sure all parts, especially the caps, are clean inside and outside.

1. Ensure the roller bearings are well lubricated inside the bearing cap.
2. Place the bearing cross inside the yoke and a bearing cap on each ear opposite the cross. Tap the bearing cap inside the ear slightly.
3. Position the yoke, bearing caps, and cross in a vise as shown in Figure 4C-3.

Figure 4C-3. Drive Shaft Assembly

4. Slowly and carefully tighten the vise. The bearing caps will be pressed into the ears. The bearing caps should be pressed evenly until the bearing cap rubber seal completely covers the cross shaft.
5. Remove the yoke from the vise and check for free movement of the bearing in the yoke.

NOTE:

If the bearing seems tight in the bearing caps, place the joint on a vise as described in Step 1 of Disassembly. Using a soft face hammer loosen the bearing caps slightly as described in Step 2 of Disassembly.

Installation

1. Slide the front yoke over the drive pump shaft.
2. Place the rear yoke over the engine drive plate and install four socket head screws.

NOTE:

The engine drive plate mounting screws can be installed evenly with the end yoke approximately 1 inch (25.4 mm) from the engine drive plate.

SECTION 5
BRAKE SYSTEM

SECTION 5A. REPAIR AND SERVICE TOOLS AND MATERIALS

MATERIALS REQUIRED

Tools required:	Standard automotive hand tools
Cleaning materials:	Stoddard solvent or equivalent
Lubricants:	Refer to Section 11
Other service items:	Brake pads

SECTION 5B. FAILURE ANALYSIS

GENERAL

The following table lists common problems, probable causes, and suggested remedies with section references to detailed descriptions of remedial procedures.

PROBLEM	PROBABLE CAUSE	REMEDY
1. Parking brake does not hold tractor in position when the engine is off	a. Brake is misadjusted b. Worn brake pads c. Broken or work brake cable	a. Adjust brake (Section 5C) b. Replace pads (Section 5C) c. Replace cable (Section 5C)
2. Parking brake does not hold tractor in position when the engine is on	a. Brake is misadjusted b. Worn brake pads c. Traction control needs adjusting	a. Adjust brake (Section 5C) b. Replaced pads (Section 5C) c. Adjust (Section 5C)

SECTION 5C. PARKING BRAKE

GENERAL

The brake system used on the LF-1880 is a mechanical disc brake system actuated by a left and right brake cable. The disc brake act as service brakes and a parking brake.

The brake caliper (Figure 5C-1) contains the brake pads, support plates, spring lever retainer, and actuating lever.

CABLES

The brake cables (Figure 5C-1) are connected to the brake pedal and the actuating lever. When pushed, the brake pedal pulls on the cables, which pulls the actuating lever. The actuating lever has a cam type lobe, which pushes the inner support plate and pad against the brake disc, stopping the tractor.

As the pads wear, the cables can be adjusted to compensate for the wear. When released, a return spring moves the actuating lever to the released position.

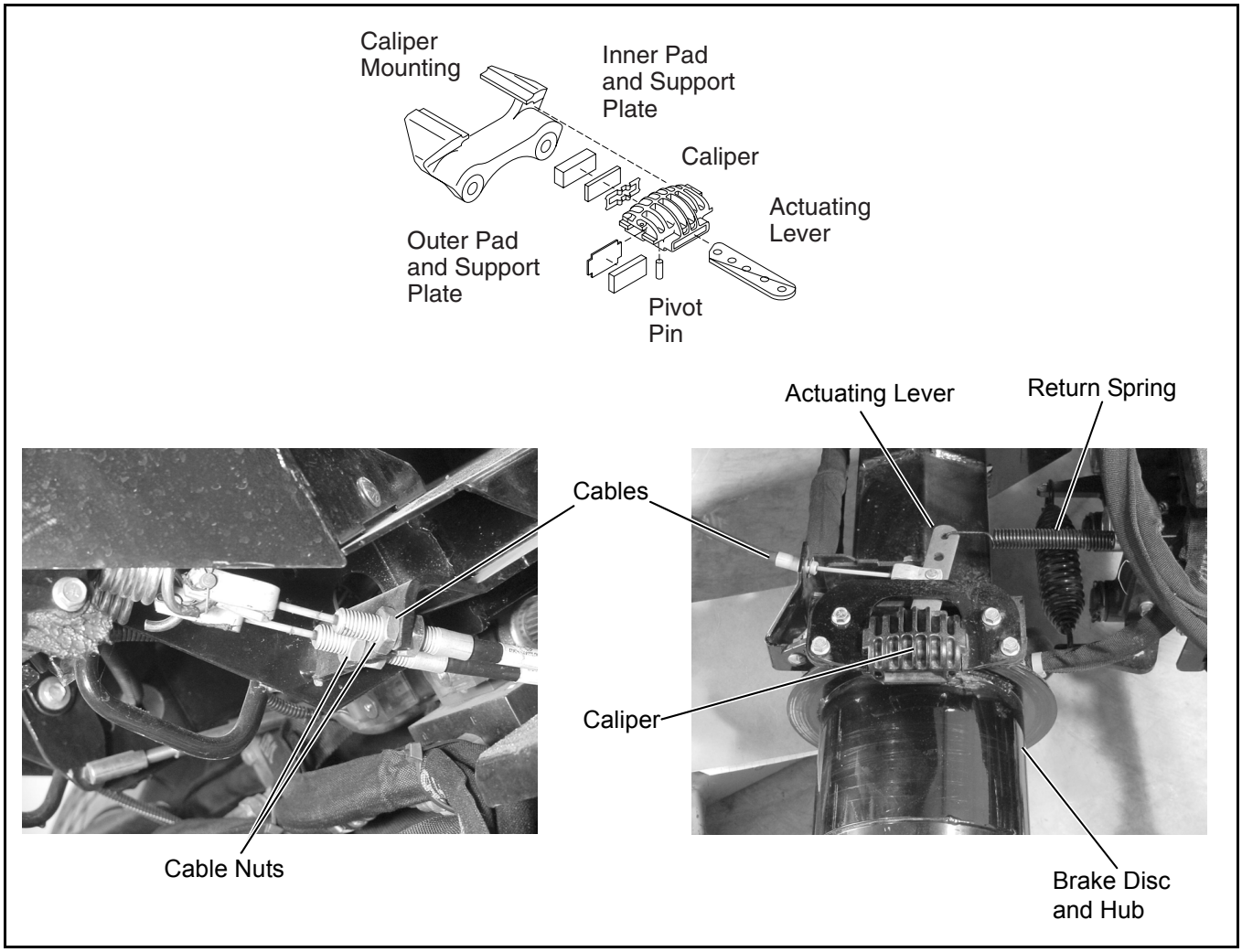


Figure 5C-1. Parking Brake

Disassembly

1. Using a suitable jack, lift the front wheels off the ground. Support the tractor with jack stands.
2. Release the parking brake.

NOTE:

Removing the wheel allows better access to the brake assembly.

3. Remove the return spring (Figure 5C-2).
4. Remove the cable and yoke from the actuating lever.
5. Remove four bolts from the brake bracket.
6. Remove the brake bracket from the caliper.
7. Remove the brake pads and support plates from the caliper.
8. Remove the spring retainer and actuating lever.

Inspection and Cleaning

1. Remove brake dust, dirt, and debris from the brake assembly.
2. Inspect the brake pads and support plates for wear and distortion. Replace as necessary.
3. Inspect the spring retainer and actuating lever and return springs for wear and distortion. Replace as necessary.
4. Inspect the cables and cable mounting for wear and damage. Replace as necessary.
5. Inspect the brake disc and hub for grooves, excessive wear, and damage. Replace the hub and brake disc as necessary.

Assembly

1. Assemble the caliper, actuating lever, spring retainer, pads, and support plate (Figure 5C-2).
2. Install the caliper assembly over the brake disc and secure with the brake bracket and four bolts.

NOTE:

If the brake has been adjusted in the past, it may be necessary to adjust the brake cables down for installation of the cable and yoke on the actuating lever.

3. Install the brake cable and return spring on the actuating lever.
4. Adjust the parking brake as needed.
5. Lift the tractor and remove the jack stands.

Adjustment

1. Check the brake-actuating lever. The lever should just touch the inner support plate.
2. Check the brake pedal free travel (Figure 5C-2). The pedal free travel should be approximately 1.5 in (38 mm).
3. Use the cable nuts to adjust free travel and actuating lever position.
4. Repeat the procedure for the other side.

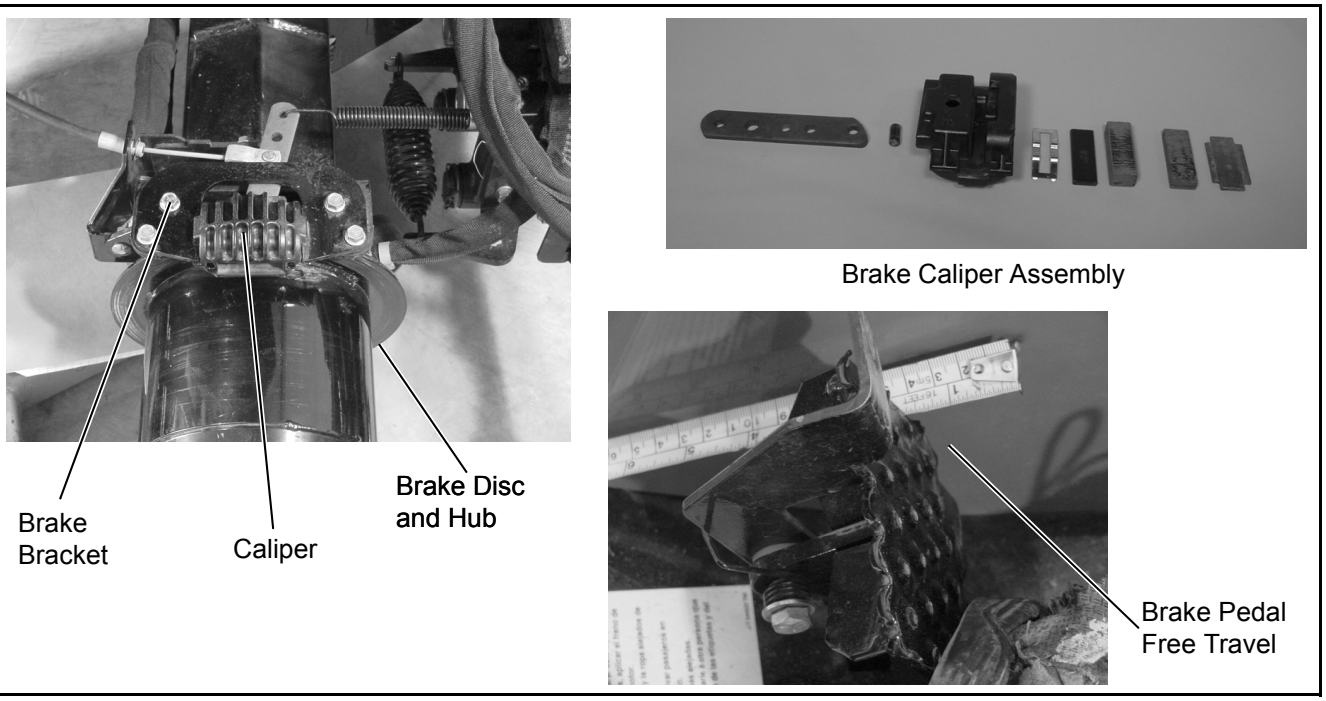


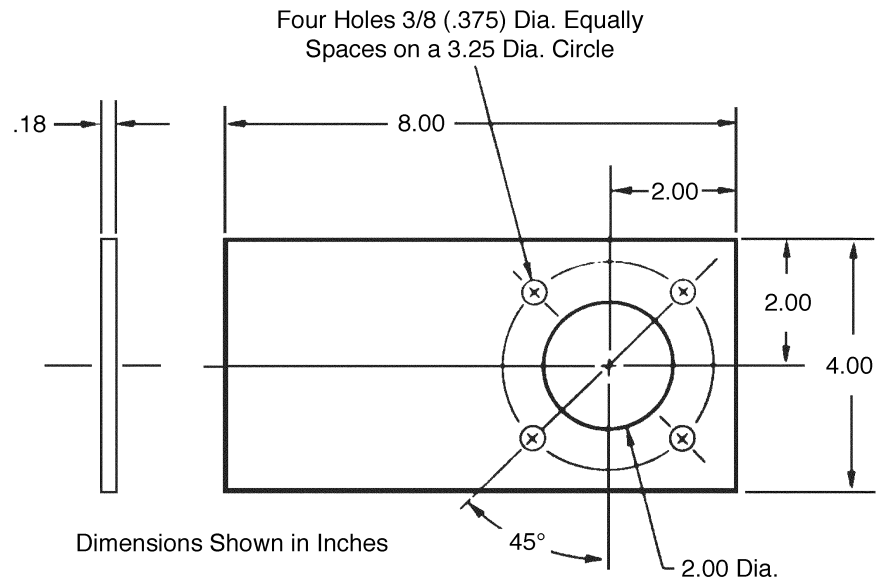
Figure 5C-2. Brake Assembly and Adjustment

SECTION 6
STEERING

SECTION 6A. REPAIR, SERVICE TOOLS, AND MATERIALS

MATERIALS REQUIRED

Tools required:	Standard automotive hand tools
Cleaning materials:	Stoddard solvent or equivalent
Lubricants:	Refer to Section 11
Other service items:	6 pieces 0.007 in (0.18 mm) shim stock 0.5 in (13 mm) wide and 1.5 in (38 mm) long Portable hydraulic filtering unit Vacuum pump Service fixture for Power Steering Unit (Figure 6A-1).



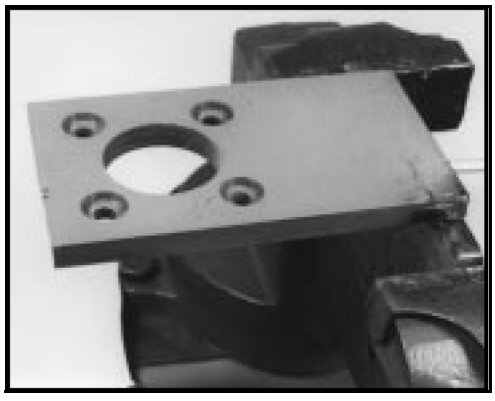


Figure 6A-1. Steering Valve Service Fixture

SECTION 6B. FAILURE ANALYSIS

GENERAL

The following table lists common problems, probable causes, and suggested remedies with section references to detailed descriptions of remedial procedures.

PROBLEM	PROBABLE CAUSE	REMEDY
1. Noisy when steering wheel is turned	a. Low hissing sound	a. Normal
	b. Relief valve squeals when steering to maximum turn	a. Normal
2. Steering wanders	a. Tire pressure incorrect	a. Properly inflate tires (Section 7C)
	b. Loose or worn steering cylinder	b. Tighten or repair (Section 6D)
	c. Steering cylinder internal leakage	c. Repair (Section 6E)
	d. Steering wheels out of adjustment	d. Adjust (Section 6D)
3. Shimmy	a. Tire mounting nuts loose	a. Tighten (Section 7C)
	b. Loose or worn steering linkage	b. Tighten or repair (Section 9F)
	c. Steering cylinder internal leakage	c. Repair (Section 6D)
	d. Steering wheels out of adjustment	d. Adjust (Section 6E)
4. Hard steering in one direction	a. Internal failure of steering unit	a. Repair (Section 6C).
	b. Loose or worn steering linkage	b. Tighten or repair (Section 9F)
5. Hard steering in both directions	a. Tires under-inflated	a. Inflate tires (Section 7C)
	b. Low hydraulic oil level	b. Check oil level (Section 11) and add oil if required
	c. Low oil pressure	c. Check traction pump relief (Section 8O)
	d. Steering unit failure	d. Test steering unit (Section 8O)
6. Lost motion at steering wheel	a. Steering wheel loose	a. Tighten
	b. Loose or worn steering linkage	b. Tighten or repair (Section 9F)
	c. Steering cylinder internal leakage	c. Repair (Section 6D)
	d. Steering unit internal leakage	d. Repair (Section 6C)
	e. Excessive heat, hot oil	e. Check oil cooler and clean if necessary

PROBLEM	PROBABLE CAUSE	REMEDY
7. No steering	a. Steering relief stuck open	a. Test (Section 8N)
	b. Steering unit excessive internal leakage	b. Test (Section 8)
	c. Steering cylinder	c. Test (Section 8)

SECTION 6C. STEERING UNIT

GENERAL

The power steering unit uses hydraulic pressure produced by the hydraulic traction pump. A pressure relief valve located in the traction pump protects the steering system from pressure damage. The relief valve is factory set at 1160 psi (7998 kPa).

Power steering is available as long as the engine is running. The machine can be steered manually without assistance from the hydraulic system.

REMOVAL

NOTE:

If available, use a portable hydraulic filtering unit to remove the hydraulic oil from the hydraulic tank. Place the filtering unit suction hose in the tank and pump the oil into a clean and sealable container.

If a portable filter is not available, an adjustable vacuum pump can be installed on the hydraulic tank fill port and vacuum applied to prevent leaking during hydraulic system service and repair.

If a drain pan is used to drain the hydraulic tank, dispose of the hydraulic oil and fill with clean oil when service or repair is completed.

1. Using a portable filtering unit, vacuum pump, or suitable container, drain the hydraulic oil or install a vacuum pump on the hydraulic tank fill port.
2. Tag and remove the hoses from the bottom of the steering valve. Immediately plug the hoses and valve to prevent contamination of the hydraulic system (Figure 6C-1).
3. Tilt the steering unit all the way toward the rear of the machine.
4. Remove the steering tower cover (Figure 6C-1).
5. Remove the steering wheel cap, nut, and lock washer (Figure 6C-1).
6. Remove the steering wheel (Figure 6C-1).
7. While supporting the steering valve, remove the steering valve mounting nuts at the mounting bracket (Figure 6C-1).
8. Remove the steering valve from the steering unit (Figure 6C-1).

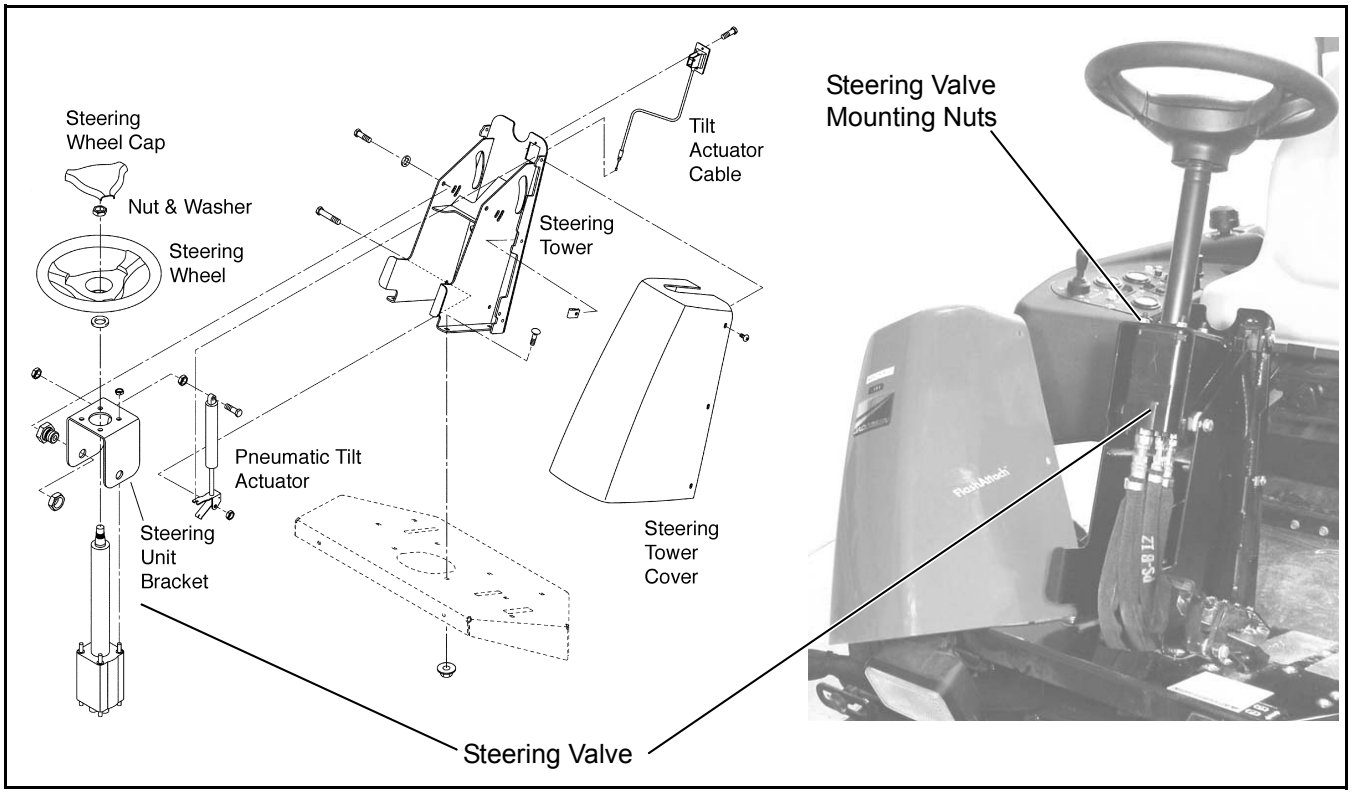


Figure 6C-1. Steering Unit Removal and Installation

STEERING VALVE DISASSEMBLY

NOTE:

Before attempting repairs or disassembly of any hydraulic components, thoroughly clean the components and work area. A clean work area is essential to satisfactory operation of repaired hydraulic components.

NOTE:

Scribe a line from the top to the bottom of the steering valve assembly not including the steering tube. A scribed line can be used for reference during assembly for proper assembly of valve sections.

⚠ WARNING

Wear eye protection when assembling and disassembling the steering valve. Springs and other objects may be propelled into the air causing eye injury.

1. Place the power steering service fixture (Figure 6A-1) securely in a vise.
2. Remove the nuts (1) and cover (2), see Figure 6C-2.
3. Remove the nine needle rollers (5), see Figure 6C-2.
4. Carefully remove the port manifold (6). Be prepared to catch the three springs (7). Remove the springs (Figure 6C-2.).
5. Remove the valve ring (8), valve plate springs (10), and valve plate (9), see Figure 6C-2.
6. Remove the hex drive (11) and isolation manifold (13), see Figure 6C-2.

NOTE:

Secure the alignments pins (12) to prevent loss, see Figure 6C-2.

7. Remove the drive link (14) and metering ring (15), see Figure 6C-2.
8. Remove the metering package (17) and commutator seal (16), see Figure 6C-2. The metering package is serviced as an assembly kit. Refer to the parts manual.

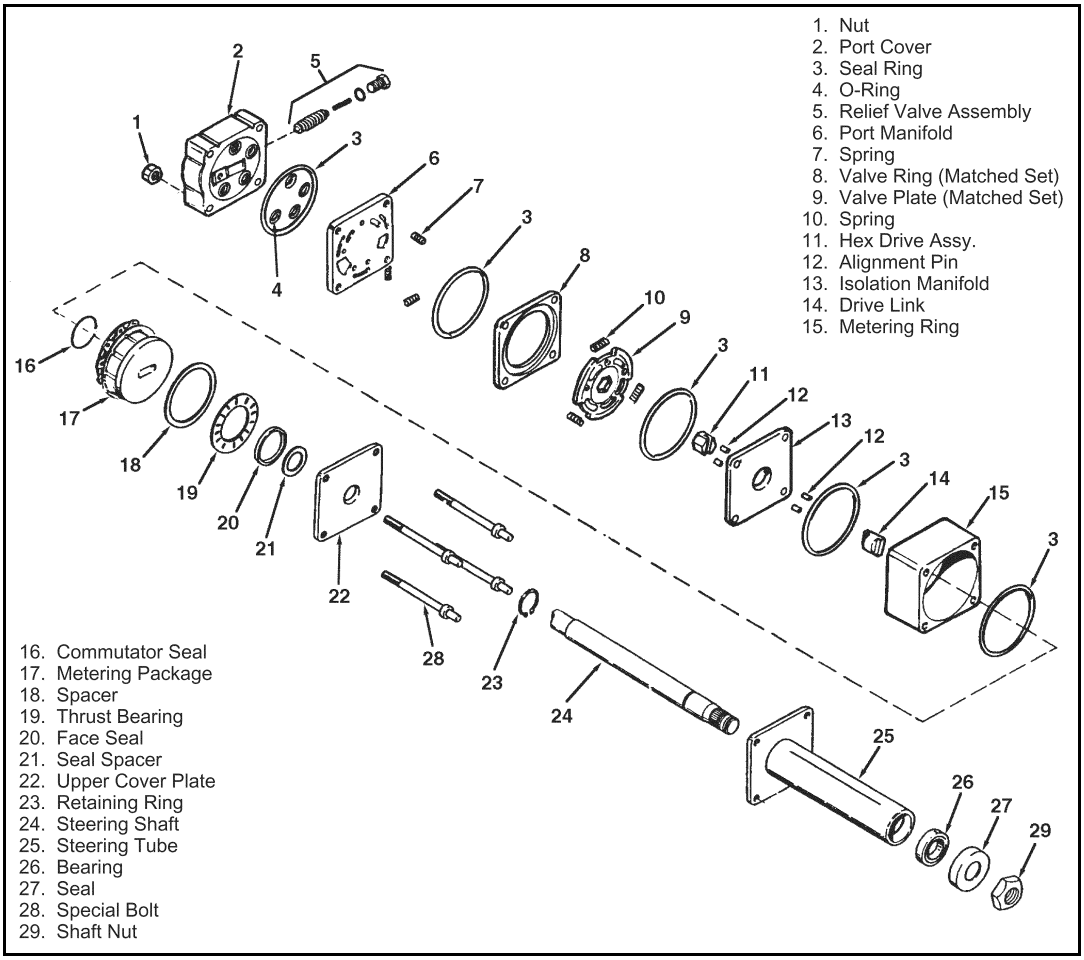


Figure 6C-2. Steering Unit Exploded View

NOTE:

The metering package should be disassembled for inspection purposes only. Proceed with STEP 9 for disassembly and inspection procedures.

9. Remove the socket head capscrews (1), commutator cover (2), commutator ring (3), and commutator (4), see Figure 6C-3.
10. Remove the five alignment pins (5), see Figure 6C-3.
11. Remove the drive link spacer (6), rotor (7), and stator (8) from the drive plate (9), see Figure 6C-3.

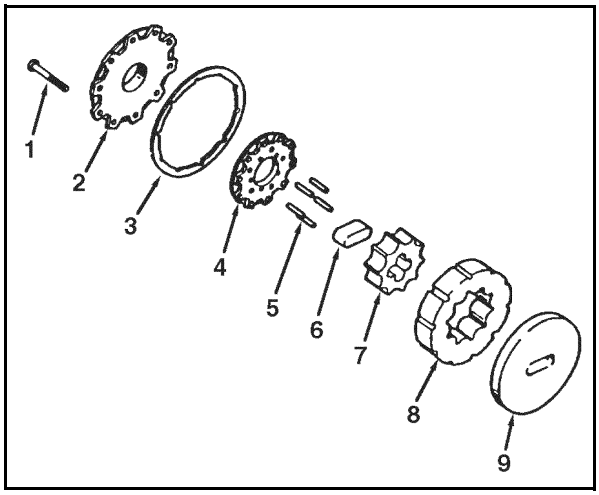


Figure 6C-3. Metering Package Disassembly

12. Remove the face seal (20), backup ring (21), and seal spacer (22), see Figure 6C-2.
13. Remove the thrust bearing (19) and spacer (18), see Figure 6C-2.
14. Remove the upper cover plate (23) and retaining ring (24), see Figure 6C-2.
15. Remove the special bolts (25), see Figure 6C-2.
16. Remove the steering shaft (26) out of tube (27), see Figure 6C-2.
17. Remove the bushing (28) and seal (29), see Figure 6C-2.
18. Remove the relief valve assembly (5) from the port cover (2).

STEERING VALVE INSPECTION

1. Inspect the springs (7 and 10) for bent, broken, or distorted coils.

NOTE:

Always replace springs as a set.

2. Inspect the finished ground surfaces of all the components.
3. Inspect the slot edges and surface for nicks, scoring, and rounding.

NOTE:

The valve ring (8) and valve plate (9) are a matched set and are not serviceable.

4. Inspect the hex drive (11) for wear.
5. Inspect the isolation manifold (13) for nicks, scratches, and scoring. A polished wear pattern due to valve plate rotation is normal.
6. Inspect the drive link (14) for wear and damage.
7. Inspect the thrust bearing (19) for brinelling, spalling, and missing rollers.
8. Discard all seals and seal rings.
9. Inspect the commutator cover (2) and drive plate (9) for wear and damage. A polished wear pattern is normal.
10. Inspect the rotor (7) and stator (8) fit, see Figure 6C-4.
11. Clean and inspect the relief valve assembly (5).

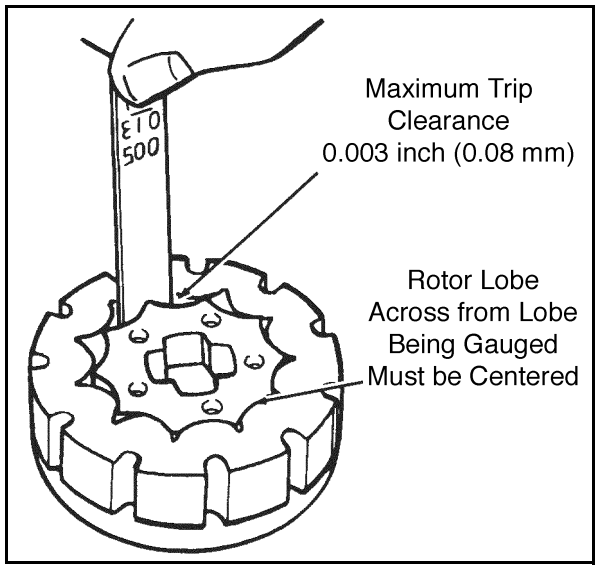


Figure 6C-4. Rotor and Stator Inspection

STEERING VALVE ASSEMBLY

1. Install a new seal (27) and bushing (26) in the tube (25). Crimp the tube and end in two places, 90° apart.
2. Place the tube (25) and special bolts (28) in the service fixture.
3. Install a new retaining ring (23) on the shaft (24) and attach to tube (27).

NOTE:

In the following assembly steps, it is important to align the components for proper operation of the

steering valve. The correct alignment is illustrated in Figure 6C-7.

4. Install the upper cover plate (22), see Figure 6C-2.
5. Assemble the seal spacer (21) and seal (20) as shown in Figure 6C-2.
6. Grease the upper cover plate (22) and install the assembled seal, backup ring, and seal spacer, see Figure 6C-2.

NOTE:

If the metering package was disassembled, proceed with STEP 7. If the metering package was not disassembled or a new one is being installed, proceed with STEP 18.

7. Place the drive plate (9) on a flat lint-free surface, see Figure 6C-3.
8. Place the stator (8) on the drive plate (9) and insert the rotor (7) into the stator, see Figure 6C-3.
9. Apply a small amount of grease to the drive link spacer (6) and install in the rotor (Figure 6C-3).
10. Place the commutator (4) on top of the rotor (7) with the aligning pin holes facing up (Figure 6C-3). Place a few drops of oil in each recess of the commutator.

NOTE:

Make sure the pins (5) are pressed below the surface of the commutator (4).

11. Align the five pin (5) holes in the commutator (4) with the holes in the rotor (7) and install the pins (5), see Figure 6C-3.
12. Install the commutator ring (3) and commutator cover (2), flat surface down with ring screw recesses, stator screw slots, and cover screw holes aligned. Install eleven socket head capscrews (1), see Figure 6C-3.

NOTE:

Do not tighten the capscrews (1).

13. Place the metering ring (15) on a hard flat surface, see Figure 6C-2.
14. Place the assembled metering package in the center of metering ring (15) with the commutator cover down, see Figure 6C-2.
15. Place a 0.007 in (0.18 mm) shim shock, 0.5 in (13 mm) wide by 1.5 in (38 mm) long in three places, equal distance apart, between the metering ring and metering package as shown in Figure 6C-6.
16. Tighten the capscrews (1) twice in sequence (as shown in Figure 6C-6) to 11-13 in-lbs (1.2-1.5 Nm) torque.
17. Remove the metering package and shims. Place the drive link (14) large tang into the rotor (7, Figure 6C-6). Turn the metering package by hand to make sure there is no binding.

NOTE:

The metering package should rotate inside the stator. If binding occurs, disassemble the metering package, correct the cause, and repeat the assembly process.

18. Place the metering ring (15) on top of the upper cover plate (23) with the alignment pin holes up.
19. Lubricate and install the thrust bearing spacer (18) and thrust bearing (19) into the metering ring (15).
20. Place the metering package (17) into the metering ring (15), engaging the drive slot with the steering shaft.
21. Install the commutator ring (16) and seal ring (3).
22. Place the isolation manifold (13) on the metering ring (15) with the alignment pin holes up. Install the alignment pins (12).
23. Install three 0.5 in springs (10) into the insolation manifold (13) and install the valve ring (8).

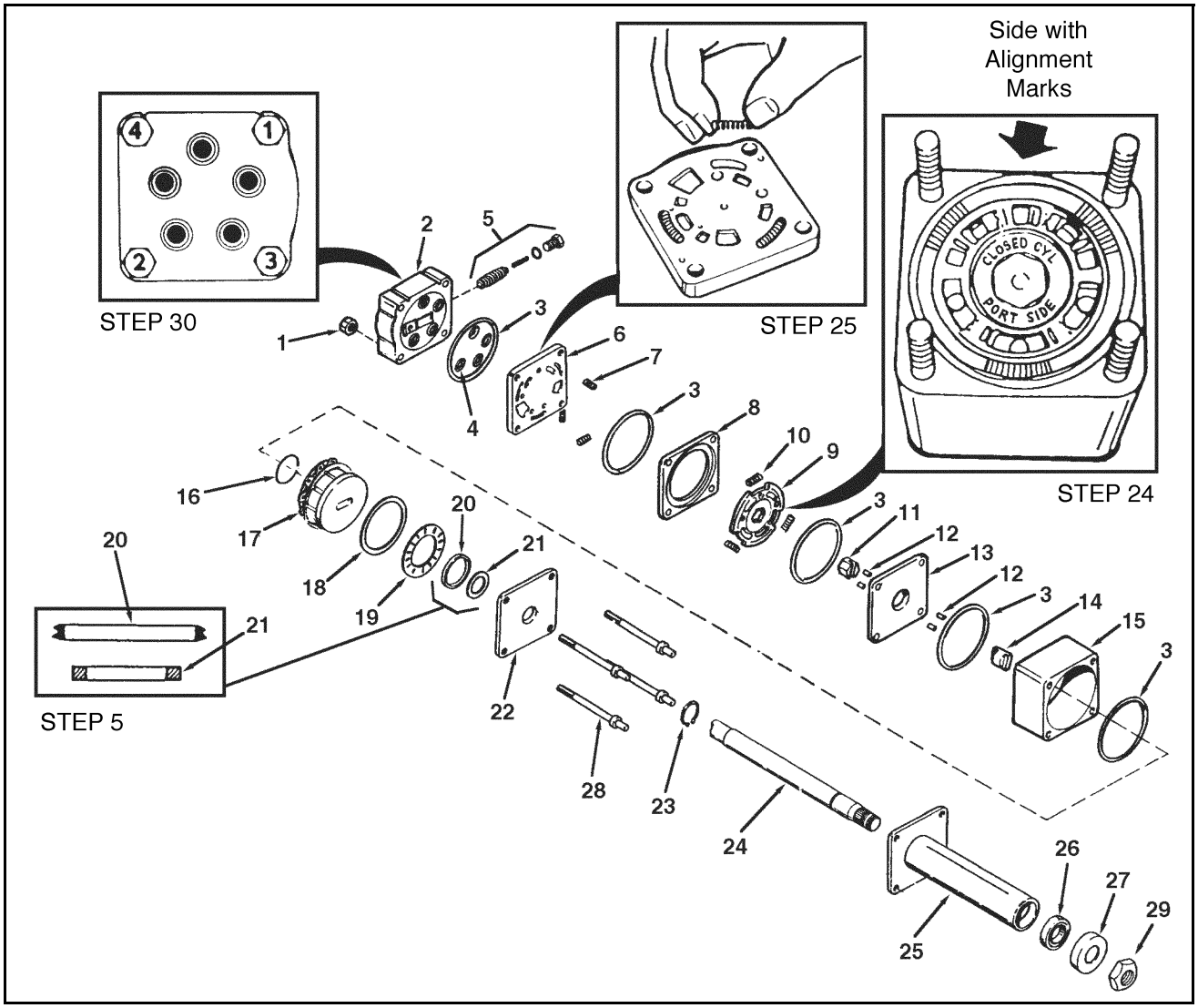


Figure 6C-5. Steering Valve Assembly

24. Install the valve plate (9) as shown (closed cylinder up) in the valve ring (8), aligning the spring slots with the springs. Install the seal ring (3).

25. Place three 0.75 in (19.05 mm) springs (7) in the port manifold (6) as shown.

26. Carefully place the port manifold (6), springs down, onto the valve ring (8), see Figure 6C-6.

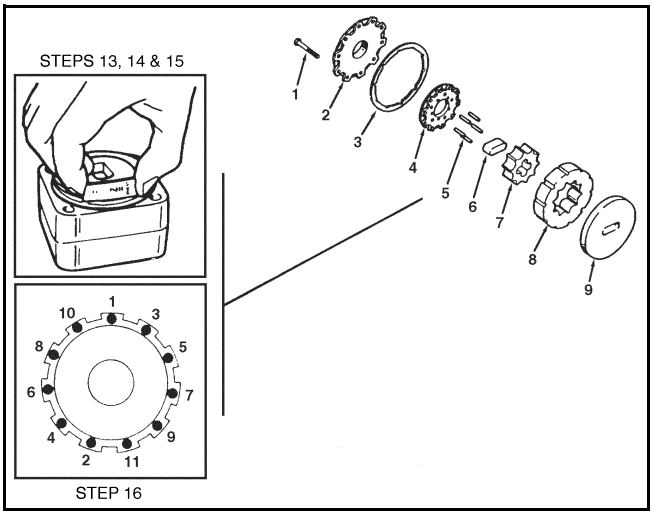


Figure 6C-6. Metering Package Assembly

27. Install the o-rings (4) and seal ring (3) on the port cover (2).
28. Install the needle rollers (5) in the port manifold (6).
29. Install the port manifold (6).
30. Install the lock nuts (1). Tighten the lock nuts gradually in sequence to 20-24 ft-lbs (27-33 Nm) torque, see Figure 6C-7.
31. Install the relief valve assembly (5) into the port cover (2).

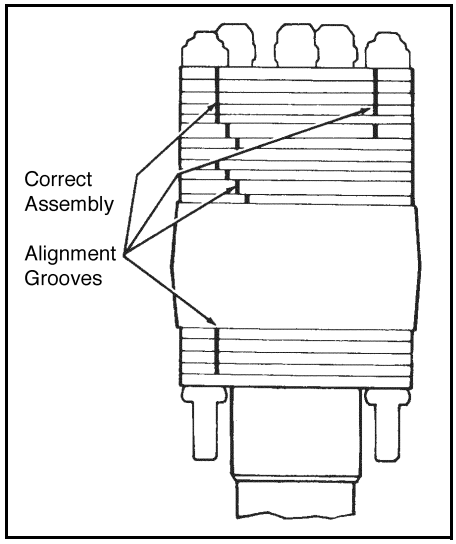


Figure 6C-7. Alignment Grooves

INSTALLATION

1. Place the steering valve in the steering unit bracket with the four studs protruding through the bracket.
2. Install the steering unit mounting nuts.
3. Install the steering wheel, lockwasher, and nut. Tighten the nut to 25-30 ft-lbs (34-41 Nm) torque.
4. Remove the plugs from the steering valve and hydraulic hoses. Using the tags created during disassembly, connect the hoses to the steering valve.
5. Install the steering tower cover.

SECTION 6D. STEERING CYLINDER

GENERAL

The steering cylinder is attached to the steering axle between the right side of the axle and the left steering arm. The steering cylinder is actuated using hydraulic pressure as directed by the steering unit (Figure 6D-1).

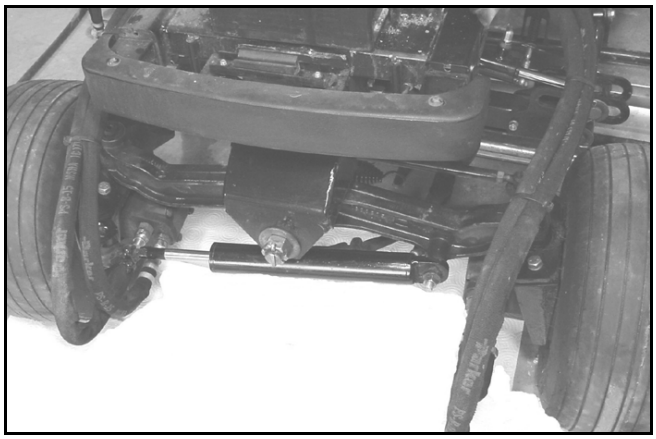


Figure 6D-1. Steering Cylinder

REMOVAL

1. Shut down the engine and remove the ignition key.
2. Block the wheels and set the parking brake.
3. Thoroughly clean the area surrounding the steering cylinder especially the hydraulic hose fittings.
4. Tag and remove hydraulic hoses from the steering cylinder. Immediately plug the hose ends and cylinder to prevent contamination of the hydraulic system.
5. Remove the cotter pin and castle nut from the steering cylinder ball joint at the steering arm, see Figure 6D-2.
6. Using a ball joint removal tool, remove the ball joint from the steering arm, see Figure 6D-2.
7. Remove the steering cylinder by removing the bolt, nut, and washers securing the cylinder to the steering axle, see Figure 6D-2.

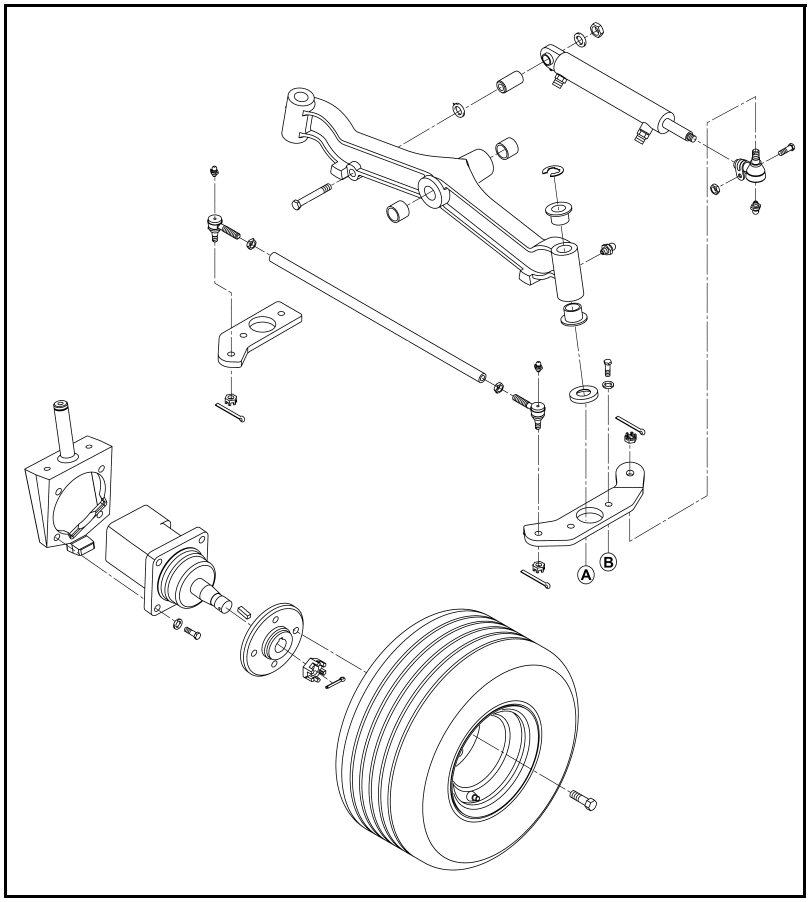


Figure 6D-2. Steering Cylinder Mounting

DISASSEMBLY

⚠ WARNING

Use appropriate eye protection when using compressed air for cleaning or drying purposes. Compressed air can cause serious personal injury. Use safety reduction valves to reduce the air pressure to a safe level before use.

Clean and dry the exterior of the cylinder before disassembly. Disassemble the cylinder following the steps in Figure 6D-3.

NOTE:

When removing the ball joint, count the number of turns for removal. This will aid in replacing the ball joint.

INSPECTION

1. Inspect all parts for excessive wear, cracks, broken parts, and damaged threads.
2. Discard all o-rings, seals, and backup rings.
3. Inspect the barrel for dents and lines, or grooves inside.
4. Inspect the fittings for wear and damage.

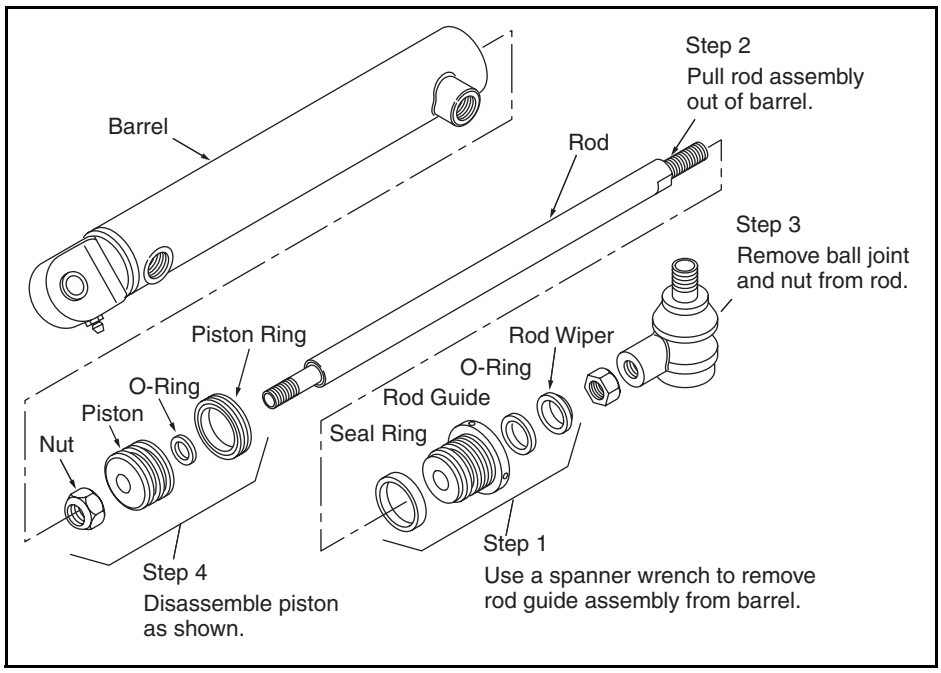


Figure 6D-3. Steering Cylinder Disassembly

ASSEMBLY

1. Install the seal kit as shown in Figure 6D-5.
2. Lubricate all parts with clean hydraulic oil before assembly.
3. Follow the steps illustrated in Figure 6D-4 for assembly.

NOTE:

Install the ball joint, using the same number of turns as noted during removal.

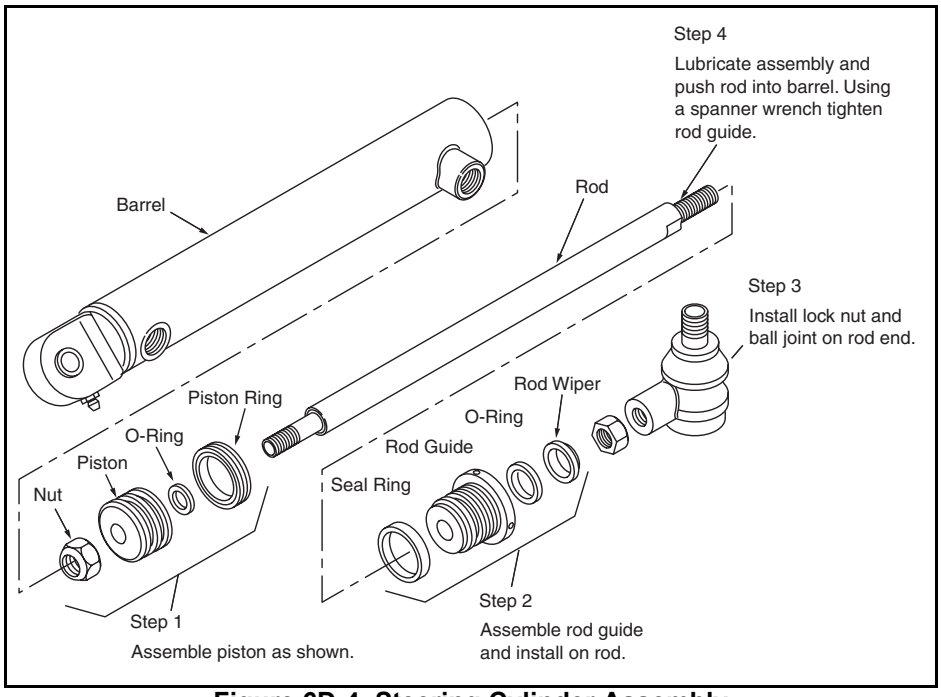


Figure 6D-4. Steering Cylinder Assembly

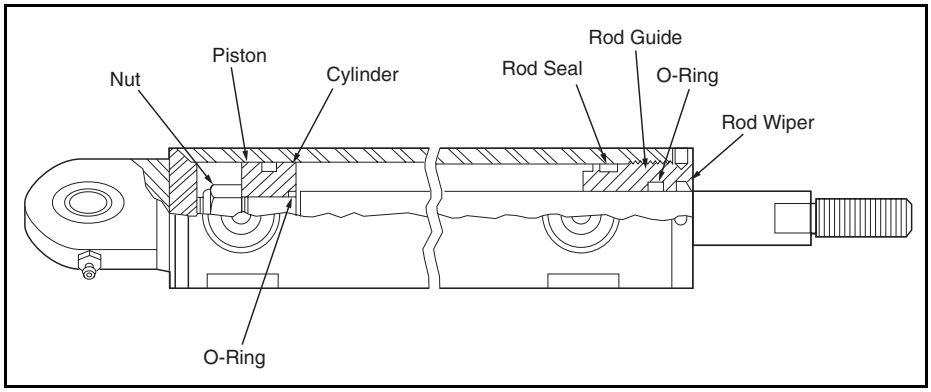


Figure 6D-5. Seal Kit Installation

INSTALLATION

1. Inspect and replace, if necessary, the steering arms mounting spacer and flat washer.
2. Position the steering cylinder for installation on the axle and secure with a bolt, flat washers, spacer, and nut.
3. Install the ball joint on the steering arm and secure with the castle nut and cotter pin.
4. Using the tags created during disassembly, connect the hydraulic hoses to the cylinder.
5. Start the machine and check for hydraulic leaks and cylinder operation. Repair as necessary.
6. Check the steering toe-in and turn stop adjustments as described in this section and in the Parts and Maintenance manual.

SECTION 6E. STEERING WHEEL ADJUSTMENT

STEERING ADJUSTMENTS

1. Turn the wheel to the straight ahead position.
2. Loosen the jam nuts (Q) on both sides of the tie rod (R), see Figure 6E-1.
3. Turn the tie rod (R) to provide proper toe-in. Toe-in must not exceed 0.0625 in (1.5 mm) (S), see Figure 6E-1. Align the ball joints and tighten the jam nuts.
4. After adjusting the tie rod, adjust the steering cylinder by threading the ball joint (T) in or out so the spindle arm clears the stop on the axle by 0.0625 to 0.125 in (1.5 to 3 mm) when the cylinder is fully extended, see Figure 6E-1.

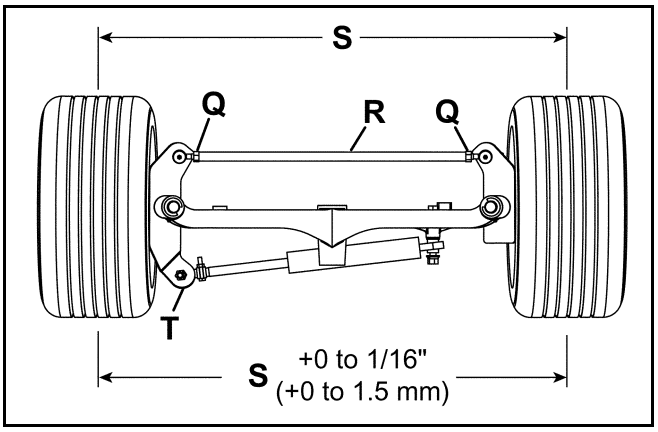


Figure 6E-1. Steering Adjustments

Torque Values

Steering Adjustment Nuts	Torque
Tie Rod Castle Nuts	30-35 ft-lbs
Steering Cylinder Castle Nut	40-55 ft-lbs

SECTION 7
WHEELS AND TIRES

SECTION 7A. REPAIR, SERVICE TOOLS, AND MATERIALS

MATERIALS REQUIRED

Tools required:	Standard automotive hand tools
Cleaning materials:	Stoddard solvent or equivalent
Lubricants:	Refer to Section 11
Other service items:	Commercial tire sealant Tire pressure gauge Compressed air source with inflation tool

SECTION 7B. FAILURE ANALYSIS

GENERAL

The following table lists common problems, probable causes, and suggested remedies with section references to detailed descriptions of remedial procedures.

PROBLEM	PROBABLE CAUSE	REMEDY
1. Tractor rides hard	a. Over-inflated tires	a. Reduce tire pressure to 10-12 psi (69-83 kPa)
2. Tractor wanders	a. Under-inflated tires	a. Inflate tires to 10-12 psi (69-83 kPa)
	b. Malfunctioning tractor motor	b. Repair traction motor. Refer to Section 8E and Section 8F
	c. Steering malfunctioning	c. Steering test. Refer to Section 8O
	d. Wheel nuts loose	d. Tighten wheel bolts to 88 to 95 ft-lbs (115 to 128 Nm)
	e. Steer wheels out of adjustment	e. Adjust. Refer to Section 6D
3. Poor traction	a. Over-inflated tires	a. Reduce tire pressure to 10-12 psi (69-83 kPa)

SECTION 7C. TIRE SERVICE

GENERAL

The tires are subject to damage from sharp objects. If large punctures or tears occur, take the tire (on the wheel) to a qualified tire repair shop.

The front (drive) and rear (steering) wheels on 2WD machines are bolted directly to the wheel hub. Tighten the front wheel bolts 90 ft-lbs (± 5 ft-lbs). Tighten the rear wheel lug nuts to 90 ft-lbs (± 5 ft-lbs).

On 4WD machines, the rear (steering) wheels are bolted to the wheel drive motors. Tighten the rear wheel bolts to 90 ft-lbs (± 5 ft-lbs).

SERVICE

The front tires are inflated to 10 to 12 psi (69 to 83 kPa) and the rear tires are inflated to 8 to 10 psi (55 to 69 kPa). These pressures provide the best results during average use.

⚠ WARNING

Compressed air can inflict serious injury. Use a standoff gauge or tire cage when inflating tires. Know the proper inflation rate before attempting to inflate tires.

When mounting a tire on the rim, inflate to 22 psi (152 kPa) to ensure proper seating. After mounting, reduce the tire pressure to the desired level for operation (Figure 7C-1).

NOTE:

Never use grease or oil on the wheel rim when mounting tires.

Mounting leaks around the tire bead can be repaired using commercial sealants available at tire repair shops. Apply the sealant using the procedure below.

NOTE:

Commercial sealants can be injected through the valve stem or directly into the tire.

1. Inject sealant through the valve stem or break one bead loose and pull the tire past the rim flange.
2. Pour sealant into tire cavity.
3. Seat bead on the rim by inflating the tire to 22 psi (152 kPa).
4. Rotate the tire slowly to spread the compound inside the tire.
5. Reduce tire pressure to proper level.

7C

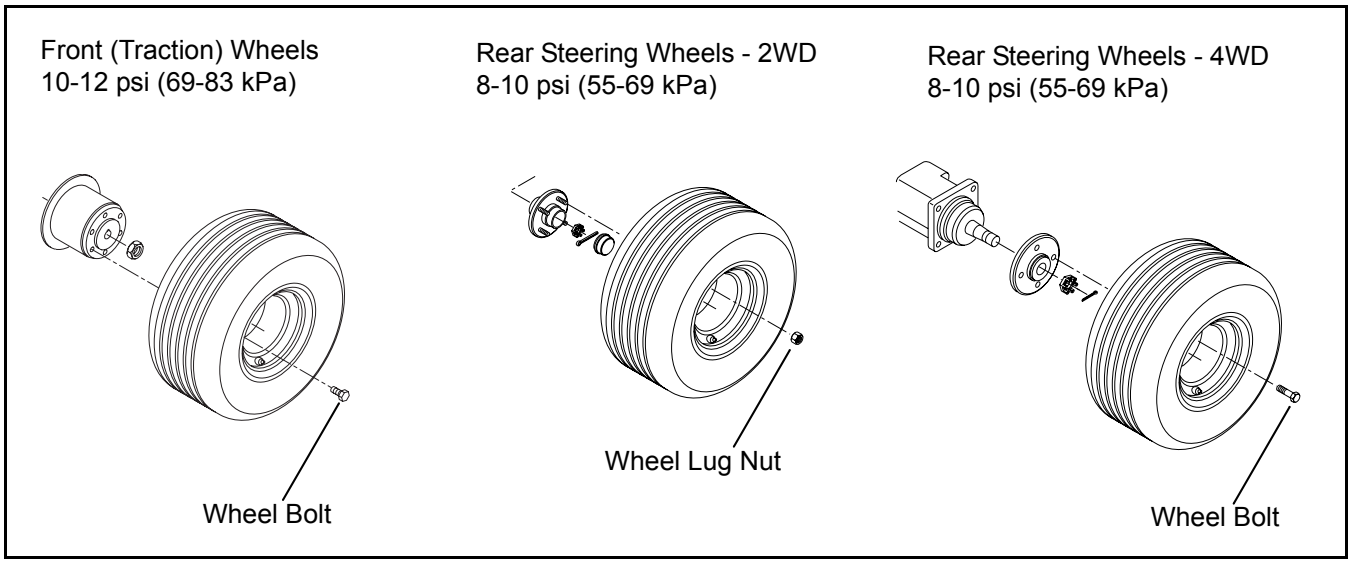


Figure 7C-1. Wheels And Tires

SECTION 8
HYDRAULICS

SECTION 8A. REPAIR, SERVICE TOOLS, AND MATERIALS

MATERIALS REQUIRED

Tools required:	Standard automotive hand tools, including torque wrench, seal drivers, snap ring pliers, and bearing driver Tachometer Hydra sleuth or in-line tester equipment with load valve (Figure 8A-1 and Figure 8A-2)
Cleaning materials:	Stoddard solvent or equivalent Detergent and water Loctite “Locquic” Primer “T”
Lubricants:	Refer to Section 11
Other service items:	Seal and Repair Kits (available from Jacobsen dealers) Liquid gasket Special bearing mandrel Front Traction Motor Repair JAC 5052 Rear Traction Motor Repair JAC 5053 Blind hole puller (Traction motors) Hydraulic fitting kit (available from Jacobsen dealers) Loctite 242 Blue Flow lock tool JAC 5000

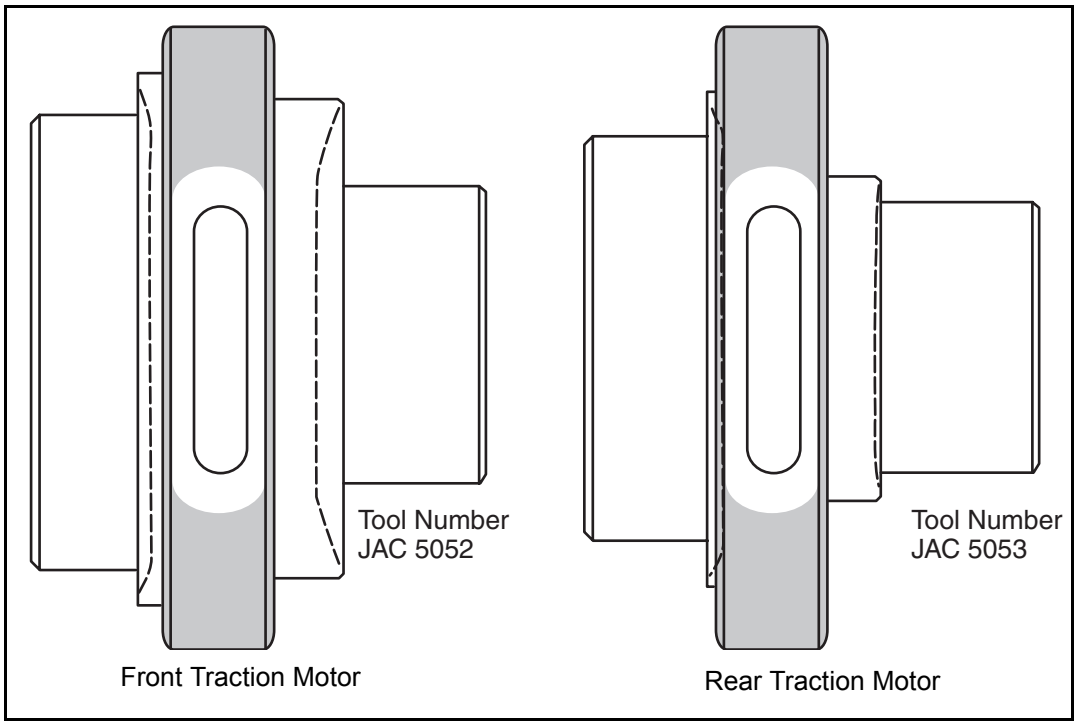


Figure 8A-1. Special Bearing Mandrel (Front Traction Motors)

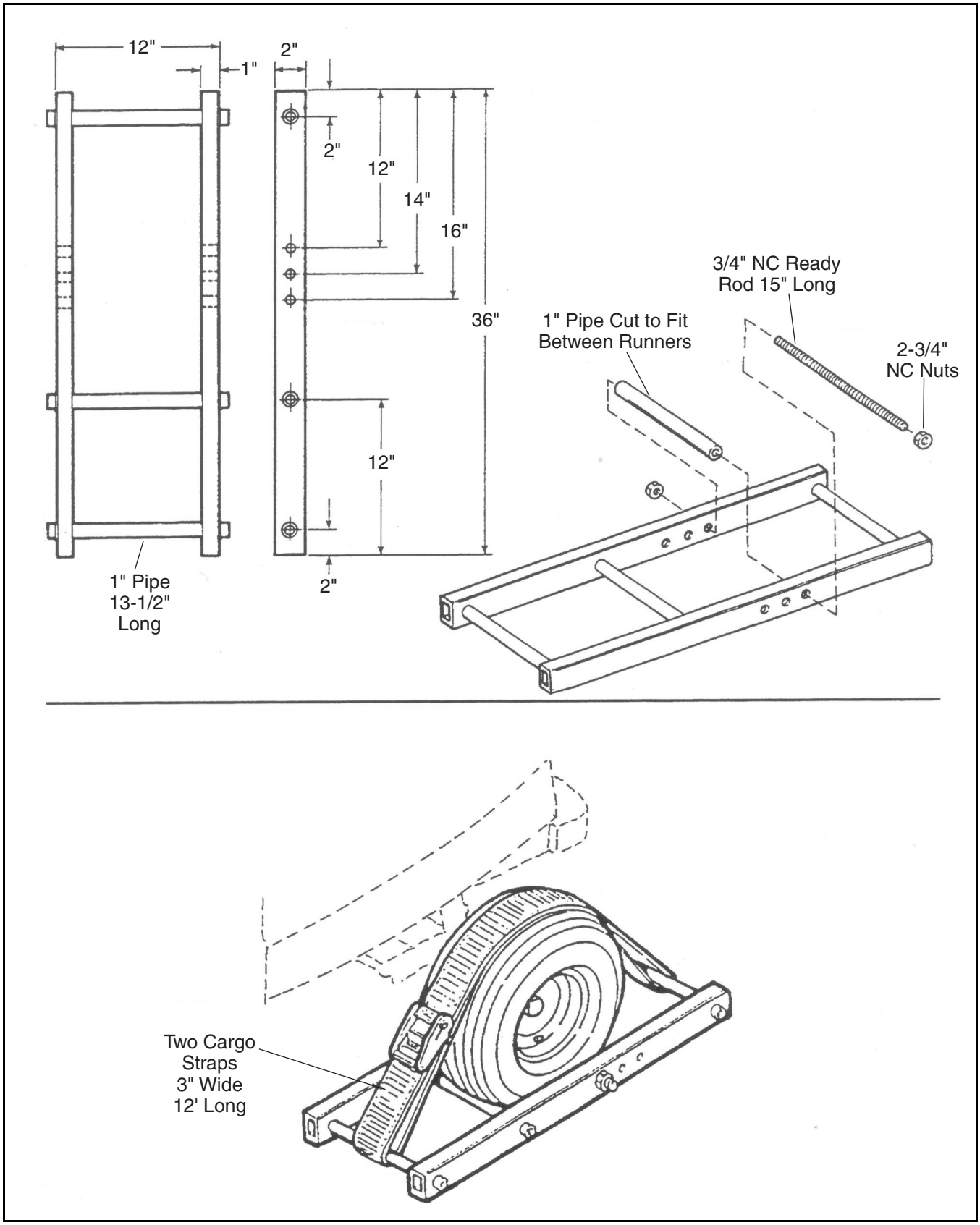


Figure 8A-2. Wheel Restraint

SECTION 8B. FAILURE ANALYSIS

GENERAL

The following table lists common problems, probable causes, and suggested remedies with section references to detailed descriptions of remedial procedures.

PROBLEM	PROBABLE CAUSE	REMEDY
1. System noisy	a. Oil cold	a. Let oil warm up
	b. Air in system	b. Add oil (Section 11), loosen inlet connection, tighten
	c. Clogged inlet strainer	c. Clean strainer
	d. Charge pump internal failure	d. Check charge pressure (Section 8O)
	e. Pump or motor internal failure	e. Repair
	f. Faulty crossover relief	f. Repair (Section 8O)
2. No traction in either direction	a. Oil supply	a. Add oil (Section 11) Inlet strainer plugged (Section 8O)
	b. Faulty charge pump	b. Check charge pressure. (Section 8O). Replace Section 8D)
	c. Faulty charge relief	c. Check charge pressure (Section 8O) Repair (Section 8D)
	d. Tow valve open	d. Close tow valve
	e. Traction motor faulty	e. Isolate, repair (Section 8E and Section 8F)
	f. Faulty crossover relief valve	f. Repair (Section 8D)
	g. Internal damage of hydro	g. Repair (Section 8D)
	h. Hydro control arm loose	h. Repair (Section 2)
3. Traction in one direction only	a. Internal check valve in hydro	a. Repair (Section 8D)
	b. Pedal/linkage out of adjustment	b. Adjust (Section 2C)

PROBLEM	PROBABLE CAUSE	REMEDY
4. Sluggish response to acceleration or deceleration	a. Air in system	a. Add oil (Section 11) Inlet strainer plugged (Section 8C) Loosen inlet line, tighten
	b. Low charge pressure	b. Check charge pressure (Section 8O) Charge pump relief faulty (Section 8D) Internal charge pump damaged, replace.
	c. Tow valve partially open	c. Close tow valve
	d. Internal damage of hydro	d. Repair (Section 8D)
	e. Faulty crossover relief valve	e. Repair (Section 8D)
5. No 4 wheel drive	a. Faulty 4 wheel drive valve	a. Repair (Section 8G)
	b. Faulty crossover relief valve	b. Repair (Section 8D)
	c. Rear traction motor faulty	c. Repair (Section 8F)
	d. Low charge pressure	d. Check charge pressure (Section 8O) Charge pump relief faulty (Section 8D) Internal charge pump damaged, replace

SECTION 8C. GENERAL INSTRUCTIONS

GENERAL

NOTE:

Component location illustrations and hydraulic system diagrams are located at the end of this section.

The following general instructions apply to all hydraulic system service procedures. Carefully read and adhere to each precaution.

- Dirt in the hydraulic system will cause damage to the system components and reduce the life of the machine. Clean all dirt from around the fittings and components before disconnecting any hydraulic lines or removing any components.
- Relieve system pressure at the components or hydraulic lines by slightly loosening the line fitting before removing.
- Immediately, after disconnecting a hydraulic line, cap the line fitting and plug the port of the removed component from the machine. This not only prevents the entry of dirt into the system, but also eliminates the loss of hydraulic fluid.
- Identify and label all linkages, hydraulic lines, and components parts. Mark the pump and motor sections before removal and disassembly. This will ensure the correct order of parts during reassembly and installation.
- Drain the hydraulic fluid from the components before disassembly.
- Discard all seals and o-rings as they are removed. Install new seals and o-rings during reassembly. Most seals are available in component kit form from your Jacobsen dealer.

⚠ CAUTION

Do not use steam or high pressure washers to clean hydraulic components.

- All parts should be thoroughly cleaned in a suitable non-flammable solvent and air blown dry before beginning repair or reassembly.
- Perform repair procedures in a clean work area using clean tools.
- Do not force or pry components apart or together. Light tapping with a plastic mallet is recommended unless otherwise specified in the repair instructions.
- Unless otherwise indicated, apply a light coat of clean hydraulic fluid to parts as each is reassembled. Apply clean grease to o-rings, if necessary, to hold them in position during reassembly.
- Hydraulic hose and tube lines should be inspected daily to check for loose connections, kinks, worn, or cut hoses, etc. Be sure tubes and hoses do not contact other frame parts which could cause abrasive wear. Always replace worn hose or tube assemblies before operating machine.

⚠ CAUTION

If, during the disassembly of any hydraulic component, metal chips or damage is found, the hydraulic system must be drained, thoroughly flushed with clean oil and then refilled.

⚠ CAUTION

Always check the hydraulic tank level after removing and installing a hydraulic component or line. Severe damage to system components can result if they are allowed to run dry.

HYDRAULIC TUBE AND HOSE FITTINGS

⚠ WARNING

To avoid serious bodily injury, always lower mower fully, place all controls in neutral and shut off the engine before inspecting the hydraulic lines or hoses. Never run hands across tubes, hoses, or fittings to check for leaks. Hydraulic fluid escaping under pressure can have sufficient force to penetrate skin and may cause infection in a minor cut or opening in the skin.

37° FLARE FITTINGS

Torque Recommendations

1. Assemble tube nut adapter to fitting with a minimum torque (finger tight) until the flare contact the seat on the fitting body.
2. For tightening reference mark a line lengthwise on the flats of both the nut and adapter fitting with a marker shown in Figure 8C-1.

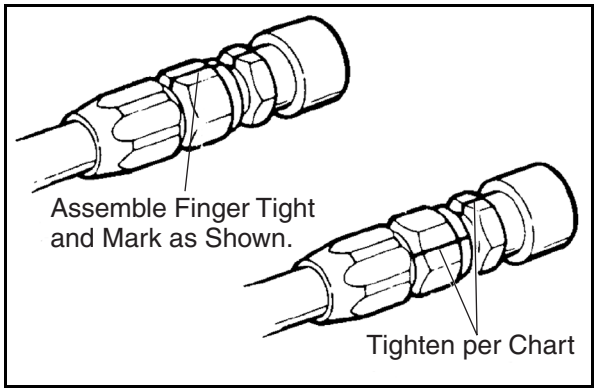


Figure 8C-1. Reference Marking

3. Using a wrench, tighten the nut the amount shown in the table below. The line will show which fittings have been tightened correctly and also indicates if a fitting is becoming loose.

Table 8C-1: 37° Flare Torque Recommendations

SAE Dash Size	Thread Size	Tube O.D.	Torque In-lbs	# of Flat Rotations
3	3/8-24	0.188	95-105	1 1/2:1 3/4
4	7/16-20	0.250	135-145	2 1/4:2 3/4
5	1/2-20	0.312	170-190	3 1/4:3 3/4
6	9/16-18	0.375	215-245	2 1/4:2 3/4
8	3/4-16	0.500	430-470	2 1/4:2 3/4
10	7/8-14	0.625	680-750	2:2 1/2
12	1 1/16-12	0.750	950-1050	2:2 1/2
14	1 3/8-12	0.875	1000-1100	1:1 1/2
16	1 5/16-12	1.000	1300-1360	2 1/4:2 3/4
20	1 5/8-12	1.250	1520-1600	1 1/4:1 3/4
24	1 7/8-12	1.500	1900-2000	3/4:1 1/4

Tube O.D or Hose I.D.	Rotate No. of Hex Flats
3/8”	2
1/2”	2
5/8”	1 1/2-2
1”	3/4-1

HOSE INSTALLATION INSTRUCTIONS

1. Hold the fixed portion of the hose coupling with one wrench; use a second wrench to tighten or loosen the hose nut. This will avoid damaging the fitting seal. When tightening a hose, do not permit it to twist; hold it in a normal straight position.
2. When installing mower hoses, place the fittings at angles to avoid contact with fixed parts when turning. Make sure hoses are assembled to proper “A” and “B” ports on components.

Table 8C-2: Replacement o-rings for o-ring Boss Fittings

A	B	C
Tubing O.D. or Hose I.D.	Thread Size	Jacobsen Part No.
1/8	5/16-24	459290
3/16	3/8-24	459291
1/4	7/16	339896
5/16	1/2-20	459293
1/2	3/4-16	339898
5/8	7/8-14	339899
3/4	1 1/16-12	339900
7/8	1 3/16-12	459296
1	1 5/18-12	339901
1 1/4	1 5/8-12	339902
1 1/2	1 7/8-12	339903
2	2 1/2-12	459300

NOTE:

O-rings should be lubricated with the fluid to be used in the system prior to assembly, see Figure 8C-2.

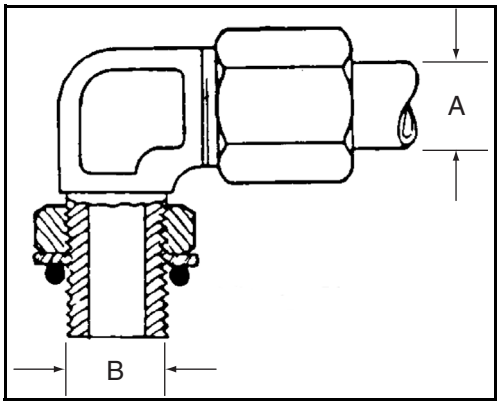


Figure 8C-2. Boss Fitting O-ring Installation

Table 8C-3: O-ring Boss Torque Recommendations

SAE Dash Size	Thread Size	Tube O.D.	Torque In-lbs
3	3/8-24	0.188	96-120
4	7/16-20	0.250	168-192
5	1/2-20	0.312	216-240
6	9/16-18	0.375	288-312
8	3/4-16	0.500	600-720
10	7/8-14	0.625	864-960
12	1 1/16-12	0.750	1500-1620
14	1 3/8-12	0.875	1920-2160
16	1 5/16-12	1.000	2400-2640
20	1 5/8-12	1.250	2520-3360
24	1 7/8-12	1.500	3240-4320

ORS (FACE SEAL) FITTINGS

Face seal fittings have o-ring grooves machined into the flat male face. This o-ring and flat surface mate against the mating fittings machine face.

The swivel nut can be retracted to inspect the o-ring and fitting face without removal of tubes or components, see Figure 8C-3.

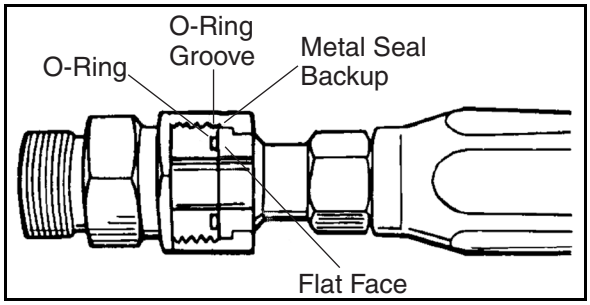


Figure 8C-3. ORS (Face Seal) Fitting

Table 8C-4: Replacement o-ring for ORS Fittings

ORS Tube Size	ORS O-ring Size	Jacobsen Part No.
4	11	339908
6	12	339909
8	14	339910
10	16	339911
12	18	339912
16	21	339913
20	25	339914
24	29	339915

Table 8C-5: O-ring Face Seal Torque Recommendations

SAE Dash Size	Thread Size	Tube O.D.	Torque In-lbs
3		N/A	N/A
4	9/16	0.250	120-144
5		N/A	N/A
6	11/16	0.375	216-240
8	13/16	0.500	384-420
10	1-14	0.625	552-600
12	1 3/16-12	0.750	780-840
16	1 7/16-12	1.000	1104-1200
20	1 11/16-12	1.250	1500-1680
24	2-12	1.500	1800-3960

SECTION 8D. HYDROSTATIC TRACTION PUMP

GENERAL

The hydrostatic traction pump (Figure 8D-1) is mounted underneath the seat pan and in front of the engine. The pump is driven by a drive shaft, coupled directly to the engine.

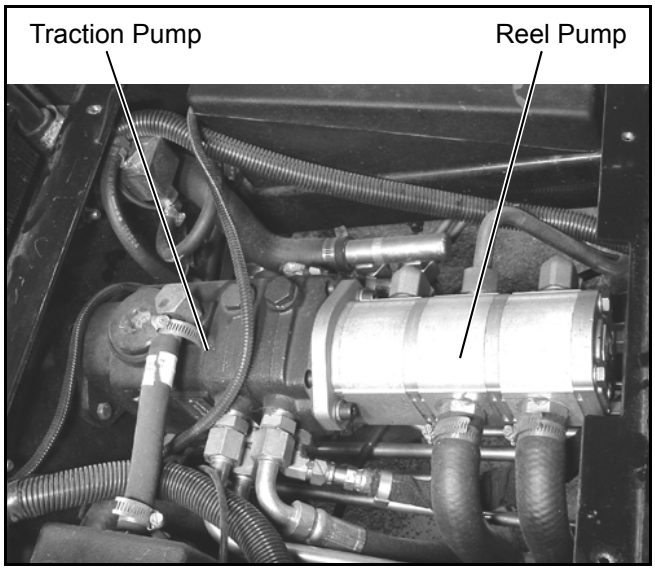


Figure 8D-1. Traction Pump/Reel Pump

The traction pump uses a PTO coupler to drive the reel pump, which supplies hydraulic flow to drive the wheel motors.

A splined shaft runs through the center of the traction pump (Figure 8D-2). A slip yoke mounted on the engine drive shaft slips over the splined end of the pump shaft turning the shaft and operating the traction pump.

A set of eight pistons and barrel assembly produce pump suction and pressure. The pistons have shoes that ride against a swiveling swashblock. By swiveling the swashblock the piston stroke is extended on one side of the barrel assembly and shortened on the other side. The extended piston stroke produces hydraulic pressure, which is directed to one side of the wheel traction motors turning the motors and attached wheels. Oil passes through the motor and returns to the traction pump.

When the swashblock is swiveled in the opposite direction, oil flows to the opposite side of the traction motors turning the motor and attached wheels.

The direction of swashblock swivel is controlled by the traction pedal and pump control arm.

A supercharge pump is mounted between the rotating group and rear valve plate assembly. The pump draws fluid from the hydraulic tank and supplies hydraulic pressure to the steering unit and the traction circuits through the cross port relief valves.

Repair of the traction pump is limited to replacement of the various pump group service kits. These kits are illustrated and defined by part numbers in the parts section of the Parts & Maintenance Manual.

Before disassembling the traction pump, perform the hydraulic tests in Section 8O to verify the pump is at fault.

Only disassemble what is necessary to facilitate needed repairs. Use the following procedure taking note of special instructions. If possible, do not remove locator pins. Discard and replace all o-rings, backup rings and gaskets.

Disassembly should be in an area free of dust, dirt and away from grinding and welding areas. Keep parts in a bath of clean hydraulic fluid.

NOTE:

The system must be high pressure filtered after any repairs to the traction pump or motor. A suitable high pressure filter such as the Jacobsen 5097 is recommended.

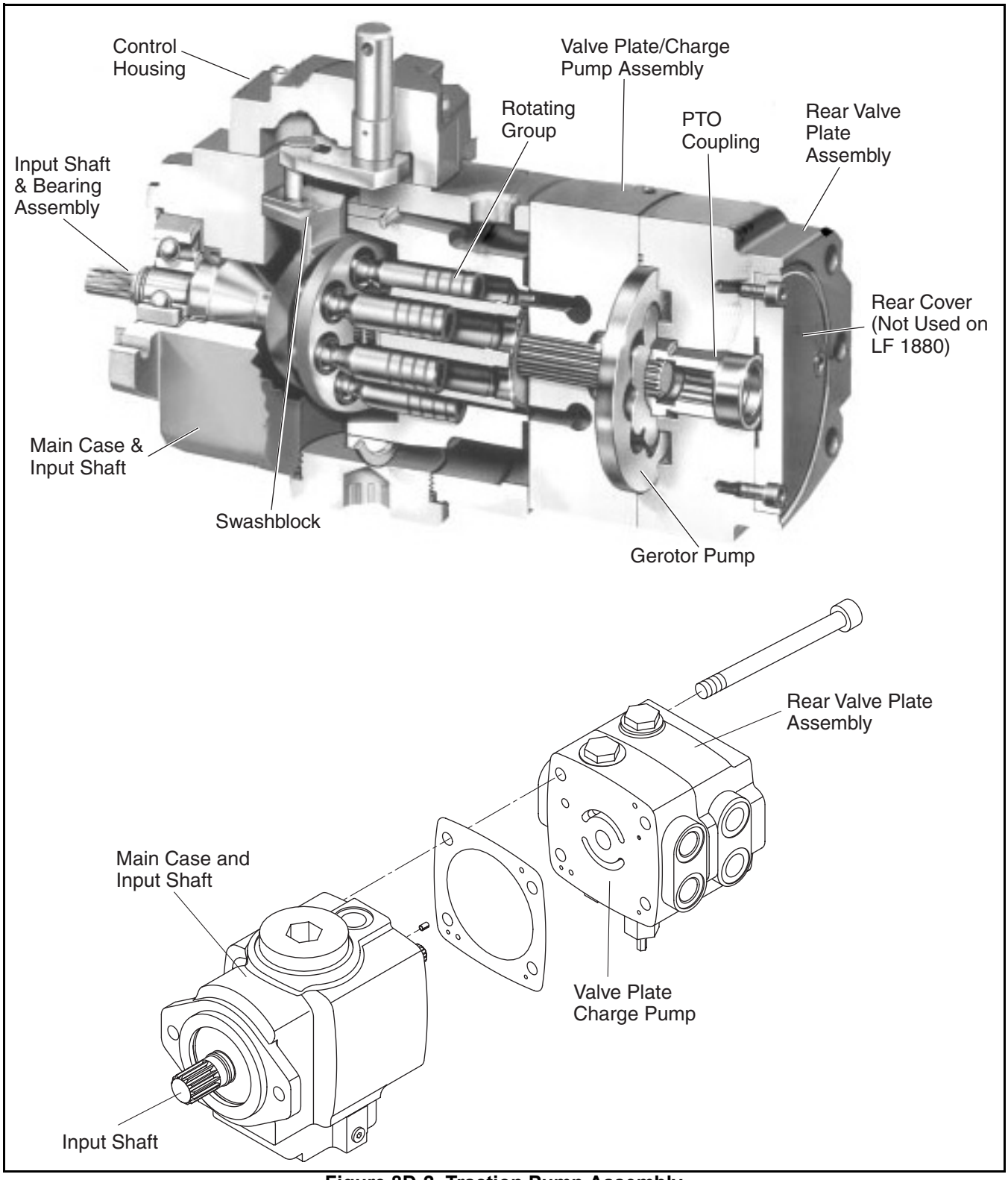


Figure 8D-2. Traction Pump Assembly

REMOVAL

1. Shut down the engine and remove the ignition key. Allow the engine to cool completely.
2. Drain the hydraulic tank.
3. Remove the seat and seat pan.
4. Remove the drive shaft assembly.
5. Thoroughly clean the auxiliary pump, especially the area surrounding the hydraulic hoses, tubes and fittings.
6. Tag and disconnect the hydraulic hoses and tubes from the traction pump and reel pump. Immediately plug the hoses, tubes and pumps to prevent contamination of the hydraulic system.
7. While supporting the traction pump and reel pump, remove the mounting bolts, nuts, washers, and mounting bracket.
8. Remove the traction pump and reel pump from the frame.
9. Remove the two socket head capscrews that secure the reel pump to the traction pump.
10. Remove the reel pump and o-ring from the traction pump. Discard the o-ring.

DISASSEMBLY

Control Group and Valve Plate

1. Place traction pump on a workbench with input shaft down.
2. Completely loosen, but do not remove socket head capscrews.
3. Remove the valve plate/charge pump and rear valve plate as an assembly (Figure 8D-3).

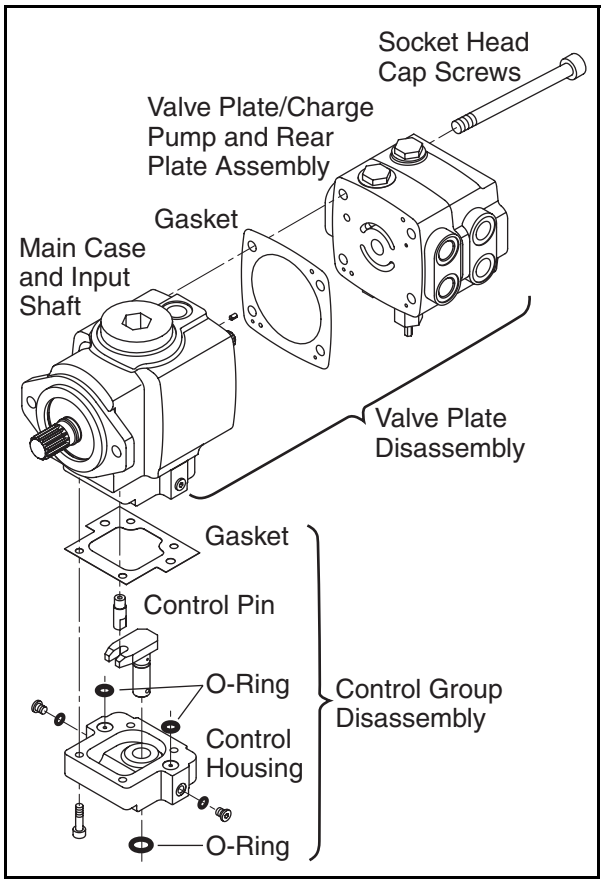


Figure 8D-3. Control Group and Valve Plate Disassembly

Valve Plate And Gerotor

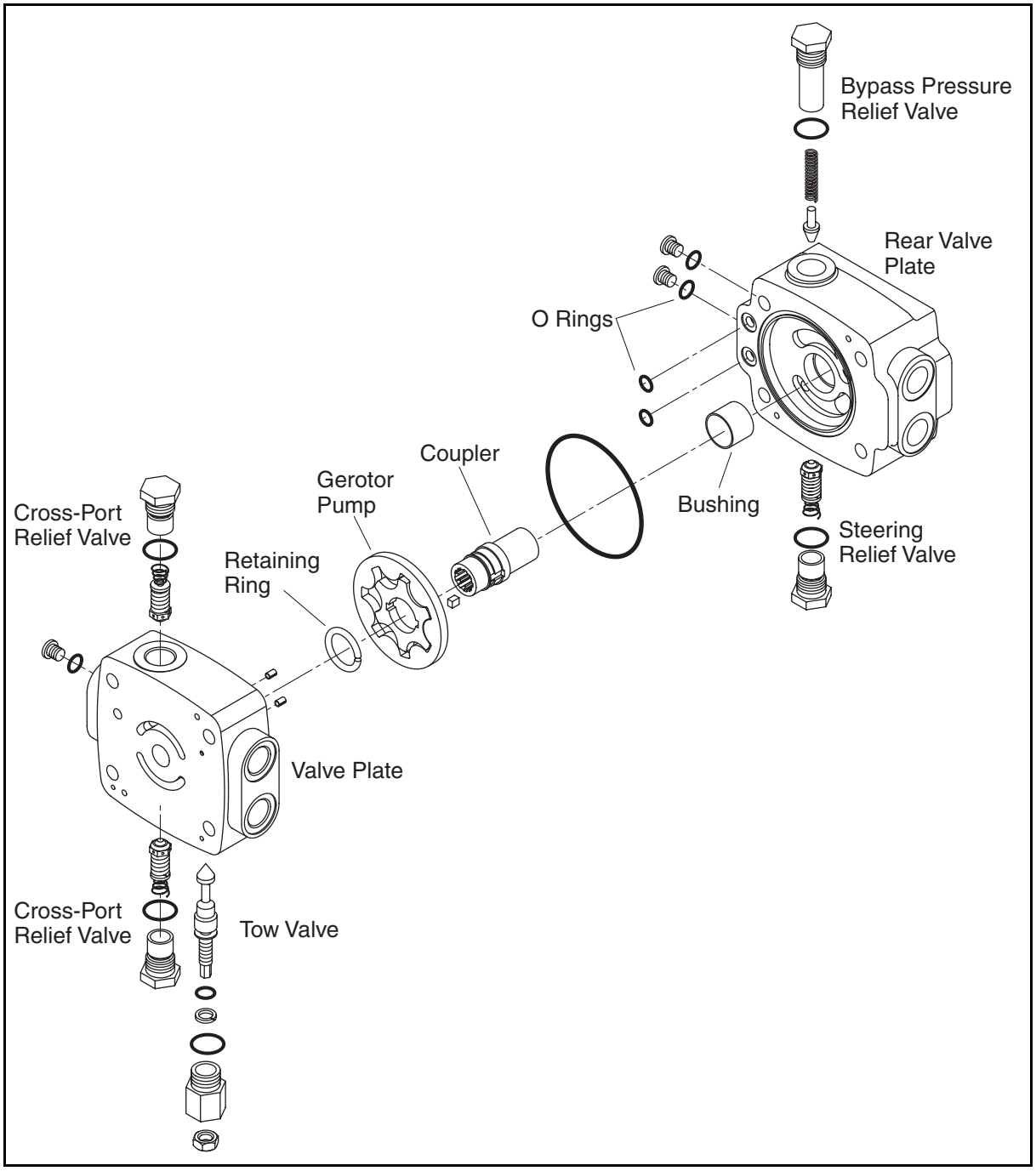


Figure 8D-4. Valve Plate and Gerotor Pump Disassembly

Rotating Group

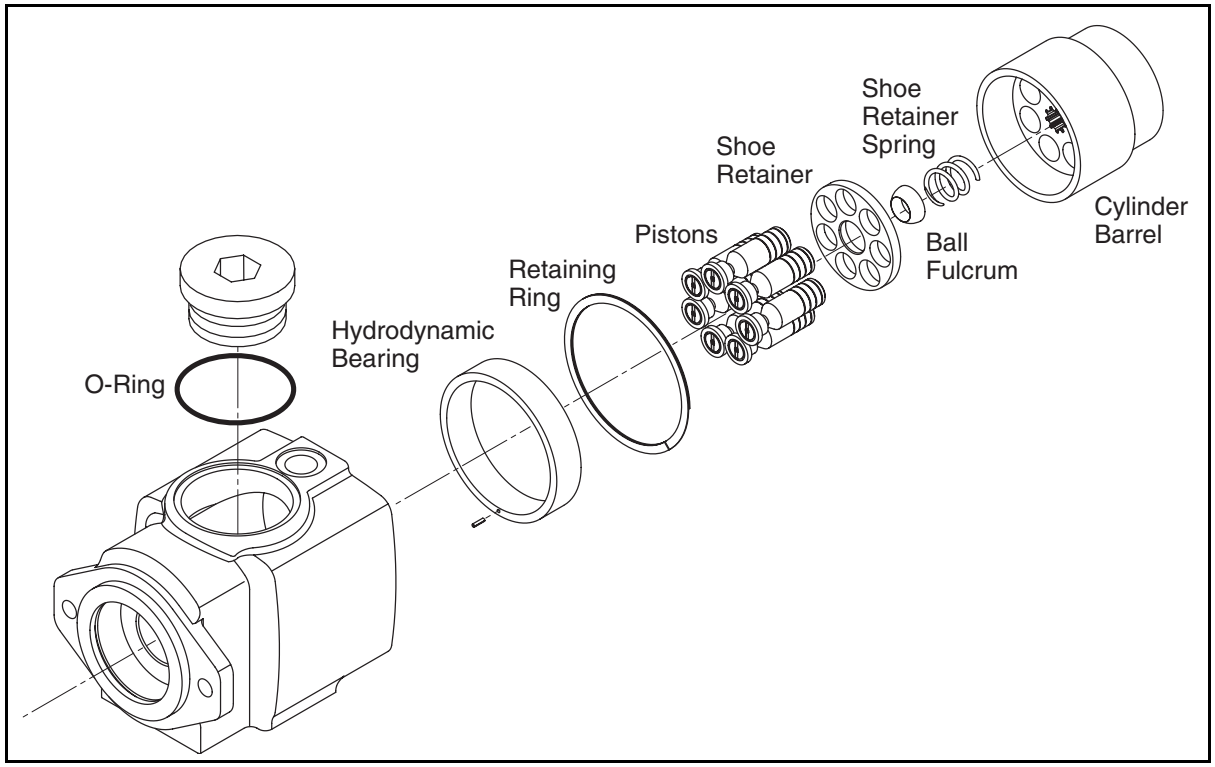


Figure 8D-5. Rotating Group Disassembly

Drive Shaft Group

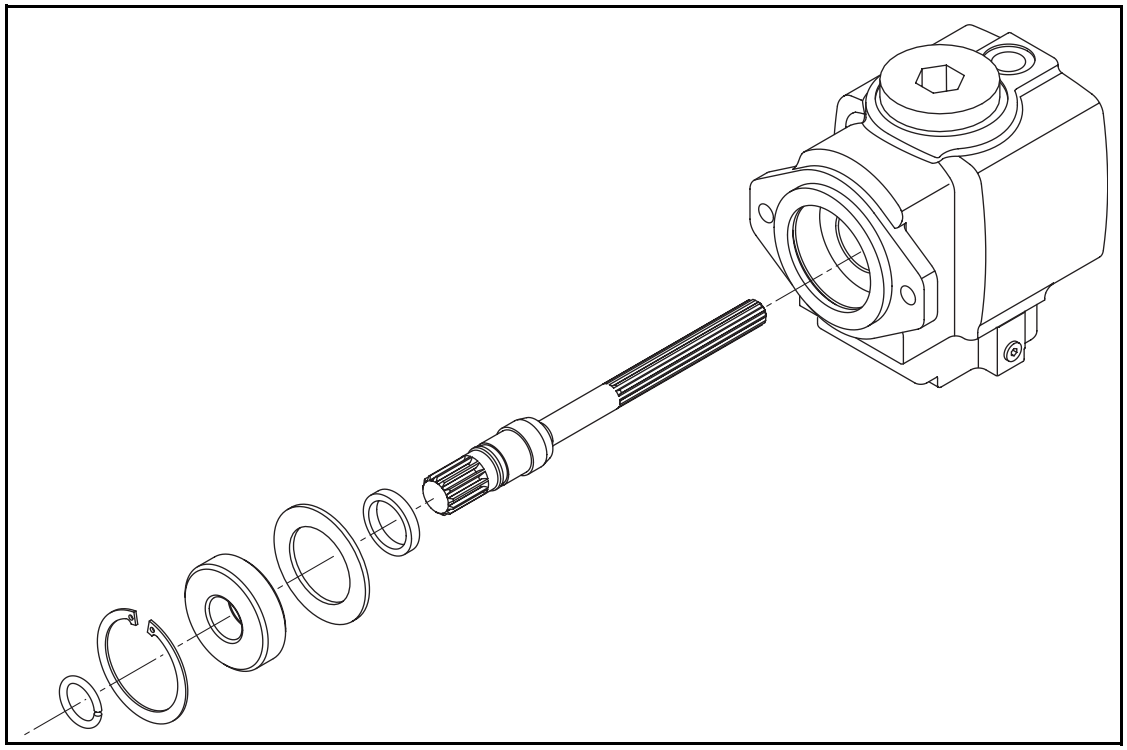


Figure 8D-6. Drive Shaft Group Disassembly

Swashblock Group

See Figure 8D-7 for swashblock group disassembly.

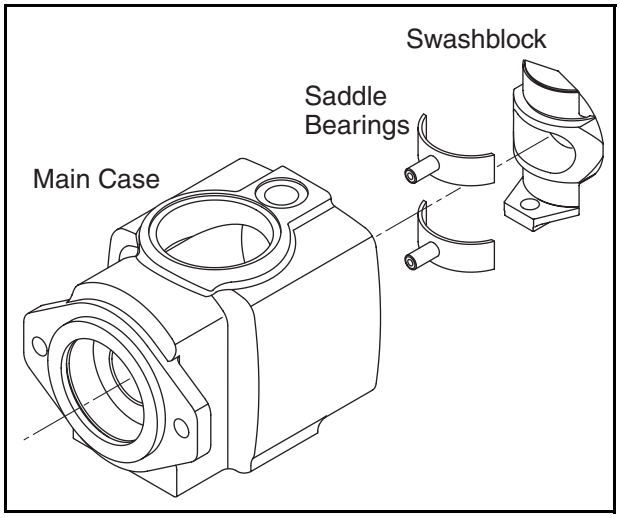


Figure 8D-7. Swashblock Group Disassembly

INSPECTION

- Clean all parts thoroughly.
- Discard all seals and o-rings and replace with new ones.
- Check all locating pins for damage.
- Check all springs for cracks or distortion, replace if necessary.
- Check the fit of the control pin in swashblock, there should be no play.
- Inspect the valve plate surface that mates with cylinder barrel for excessive wear or scoring. Minor defects can be removed by lightly stoning the surface to within 0.0001” (0.03 mm). Excessive stoning will remove the hardened surface. If worn or damaged excessively, replace valve plate and cylinder barrel.
- Inspect the hydrodynamic cylinder rotating group. Inspect the cylinder bearing and barrel, replace if worn or damaged.
- Piston shoes must pivot smoothly, end play should not exceed 0.003” (0.076 mm). To check end play proceed as follows:

1. Place square end of piston on a bench and hold firmly.
2. Pull on the end of the hose with the other hand and note the end play. A good piston/shoe fit will have no end play with the shoe free to rotate and pivot on the piston ball.

- Check each shoe for proper thickness (See Figure 8D-8). All shoes must be equal within 0.001” (0.025 mm). The shoes should be replaced as a set.
- Inspect swashblock for wear, scoring or damage. Replace if worn or damaged.

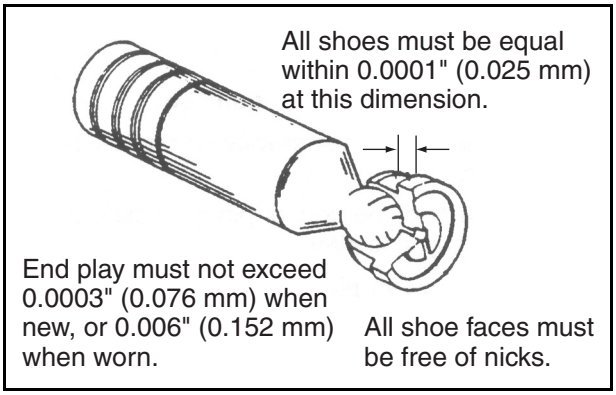


Figure 8D-8. Piston and Shoe Thickness

- Compare saddle-bearing thickness in the wear area. If difference in thickness is greater than 0.010” (0.25 mm) replace saddle bearings.
- Inspect mating surface of swashblock for cracks or excessive wear. Swashblock should move freely and smoothly.
- Examine the seal area of the drive shaft for scoring or roughness.
- Inspect the front shaft bearing for roughness, galling, or binding, replace if necessary.
- Check shaft and splines for wear and straightness, replace if necessary.
- Check the faces of the gerotor pump assembly and the matching faces of the valve plate and rear plate for scratches or damage. Remove minor defects by stoning or lapping the surface. Only stone or lap gerotor pump surfaces. If wear is excessive replace as necessary.

ASSEMBLY

Swashblock

Position the hydrodynamic bearing in the housing so that the pin is at the 8 o'clock position between protrusion and pump housing to assure CCW rotation (Figure 8D-9).

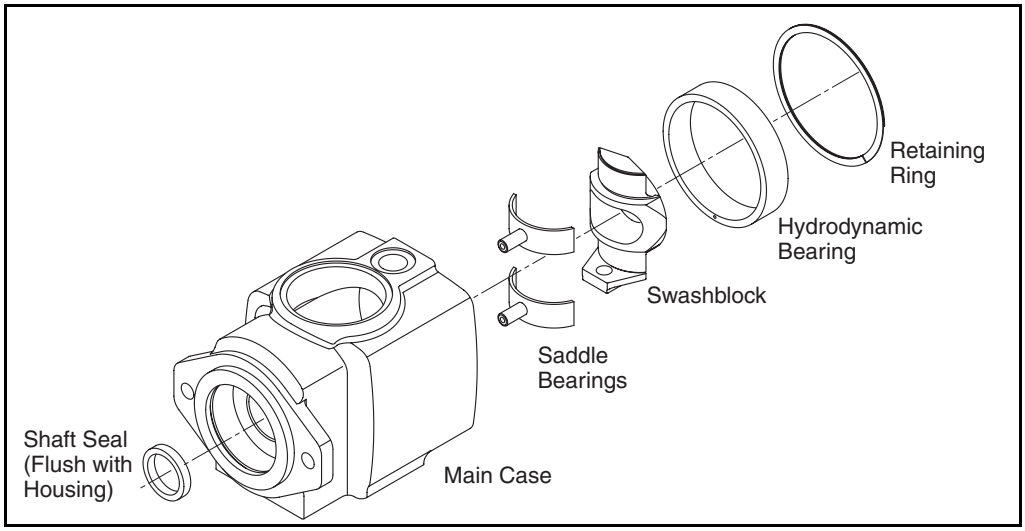


Figure 8D-9. Swashblock Group Assembly

Drive Shaft Group

NOTE:

When installing the bearing, press on the outer face. Install with numbers on bearing to the outside (Figure 8D-10).

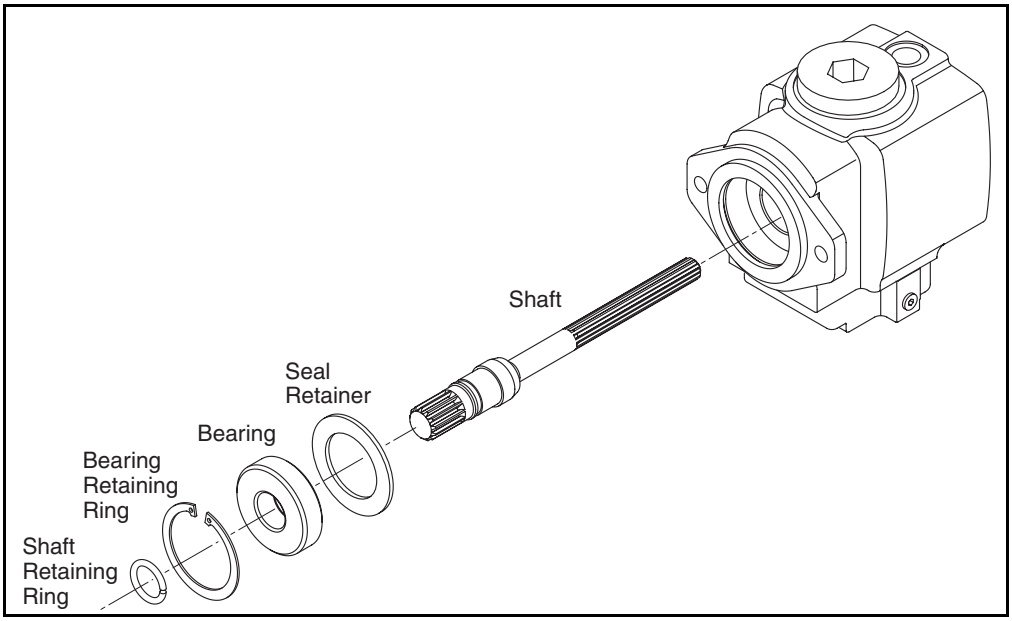


Figure 8D-10. Drive Group Assembly

Rotating Group Assembly

Install the shoe retainer with the center curved surface toward the fulcrum ball (Figure 8D-11).

NOTE:

Do not force pistons into barrel. The pistons should fit loosely.

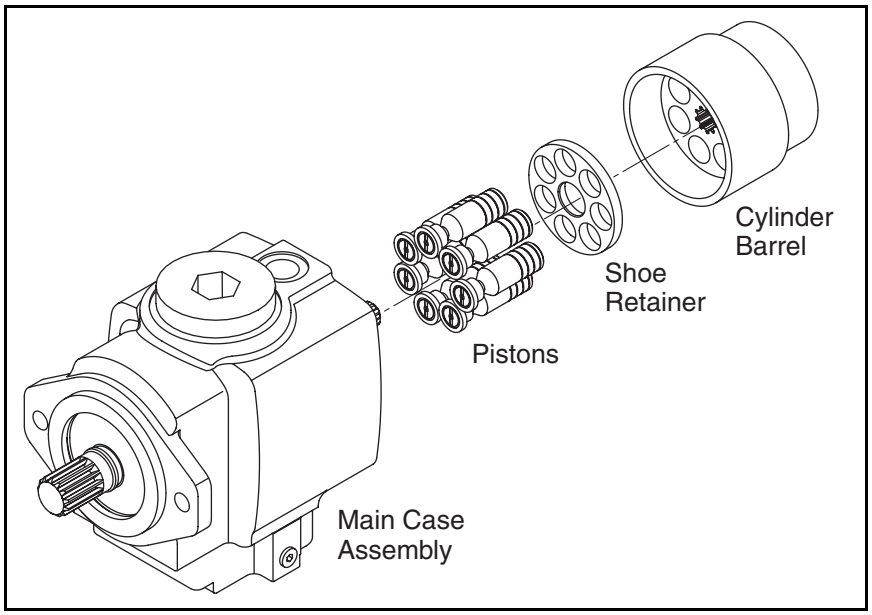


Figure 8D-11. Rotating Group Assembly

Valve Plate, Gerotor Pump, Rear Plate Assembly

See Figure 8D-12 for valve plate, gerotor pump, and rear plate assembly.

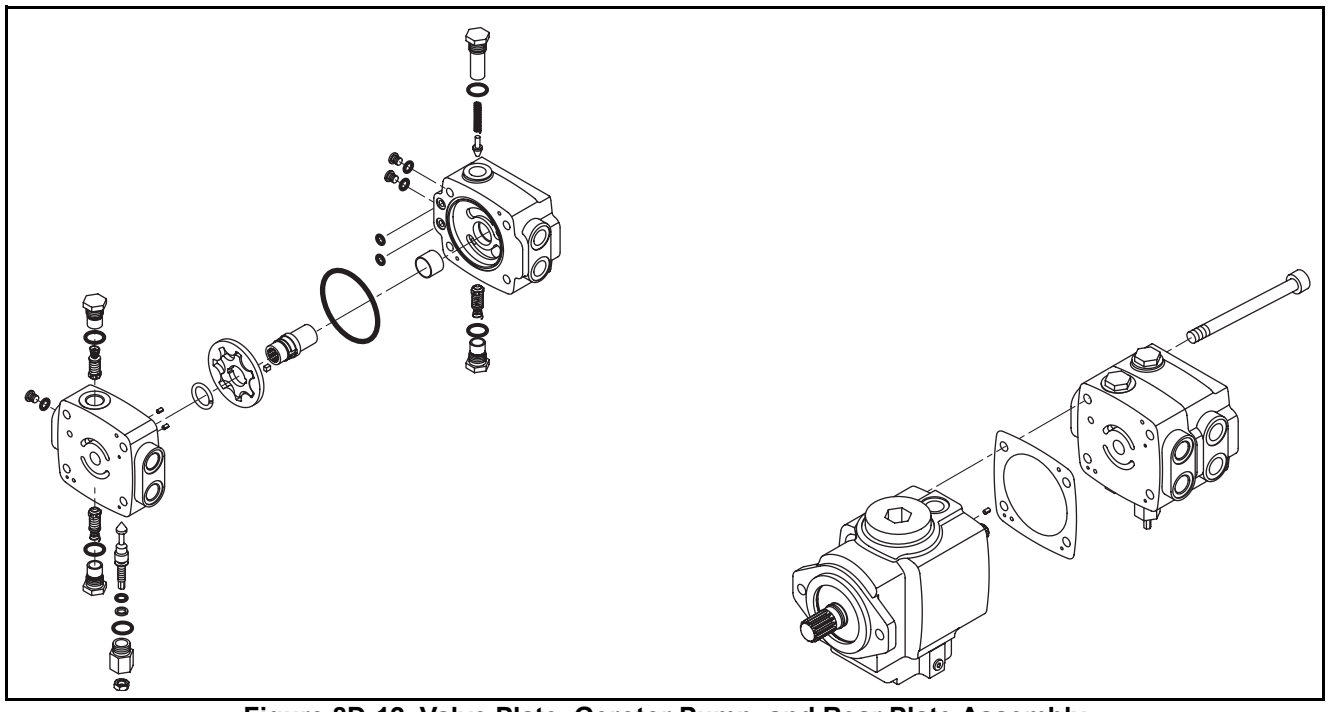


Figure 8D-12. Valve Plate, Gerotor Pump, and Rear Plate Assembly

Control Group Assembly

See Figure 8D-13 for control group assembly.

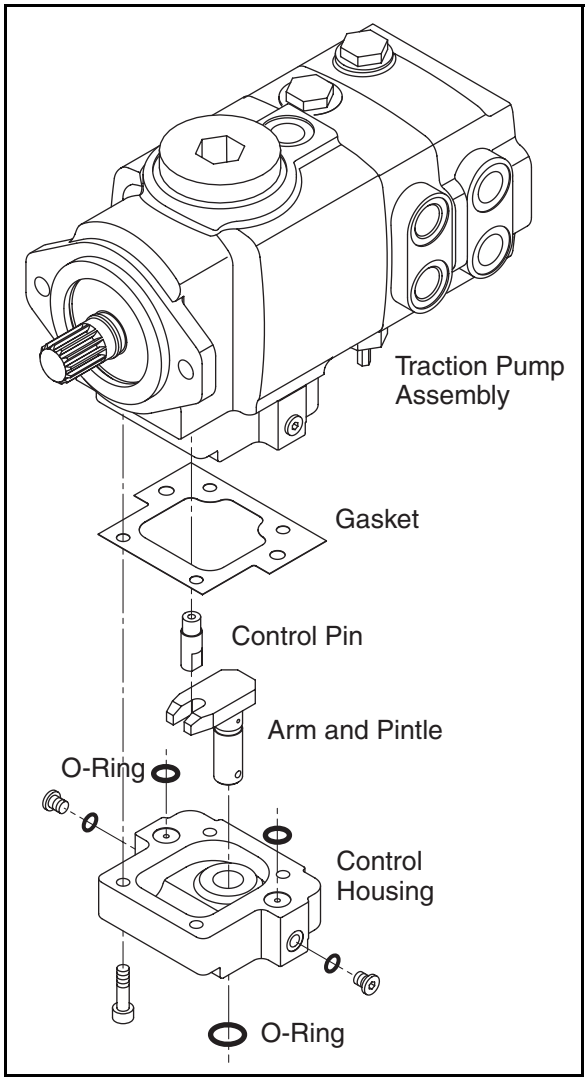


Figure 8D-13. Control Group Assembly

INSTALLATION

1. Using a new o-ring lubricated with clean hydraulic oil, position the reel pump on the traction pump and secure with two socket head capscrews.
2. Place the traction pump/reel pump in the frame and secure the mounting bolts, nuts, washer, and mounting bracket.
3. Using tags created during disassembly, remove plugs and connect hoses to the traction pump and reel pump.
4. Install the drive shaft on the traction pump input shaft and engine.
5. Replace the hydraulic oil filter and fill the hydraulic tank with hydraulic oil.
6. Install the seat and seat pan.
7. Start the engine and check component operation. If necessary, performing tests and checks as described in Section 10O.

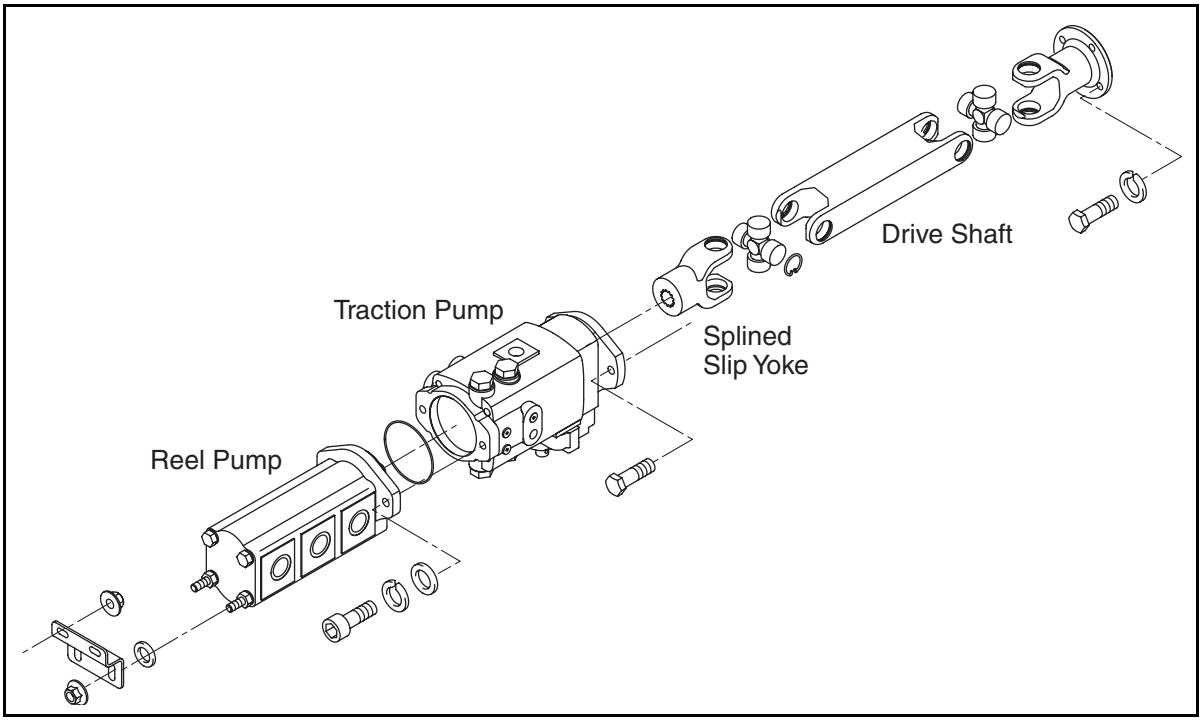


Figure 8D-14. Pump Installation

SECTION 8E. FRONT TRACTION MOTOR

GENERAL

The traction pedal and traction pump control the front traction motors. The motor is mounted inside the front axle with a hub mounted on the output shaft. The hub contains the brake disc and is used to mount the wheels, see Figure 8E-1.

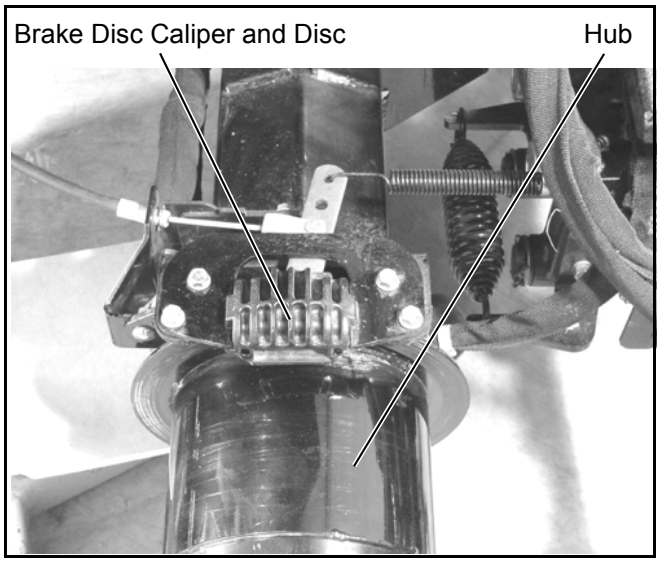


Figure 8E-1. Wheel Hub and Brake Disc

REMOVAL

1. Shut down engine and remove ignition key.
2. Using jack stands and chocks, lift and support the front axle.
3. Remove the wheel and tire.
4. Remove the brake return spring, caliper and support bracket.
5. Remove the cotter pin and nut from the motor output shaft. Remove the hub and key.
6. Thoroughly clean the motor especially the area surrounding the hydraulic fittings.
7. Tag and disconnect the hydraulic hoses from the motor. Immediately plug the hoses and motor to prevent contamination of the hydraulic system.
8. While supporting the motor, remove four mounting bolts and lock washers.
9. Remove the motor from the axle (Figure 8E-2).

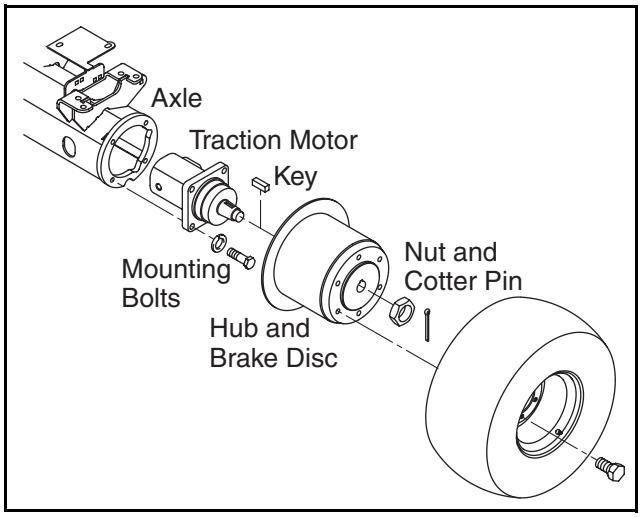


Figure 8E-2. Traction Motor Mounting

REPAIR

1. Disassemble motor as shown in Figure 8E-3.

NOTE:

When removing the port manifold cover, be careful not to lose the two pins and springs between the balance ring and cover.

2. Press the shaft and bearing assembly from the mounting flange.
3. Remove and discard all seals, backup ring, and seal rings.

5. Inspect all the parts for wear or damage. The only serviceable items are the shaft and bearing assembly, shaft, nut, bolts, and seal kit.

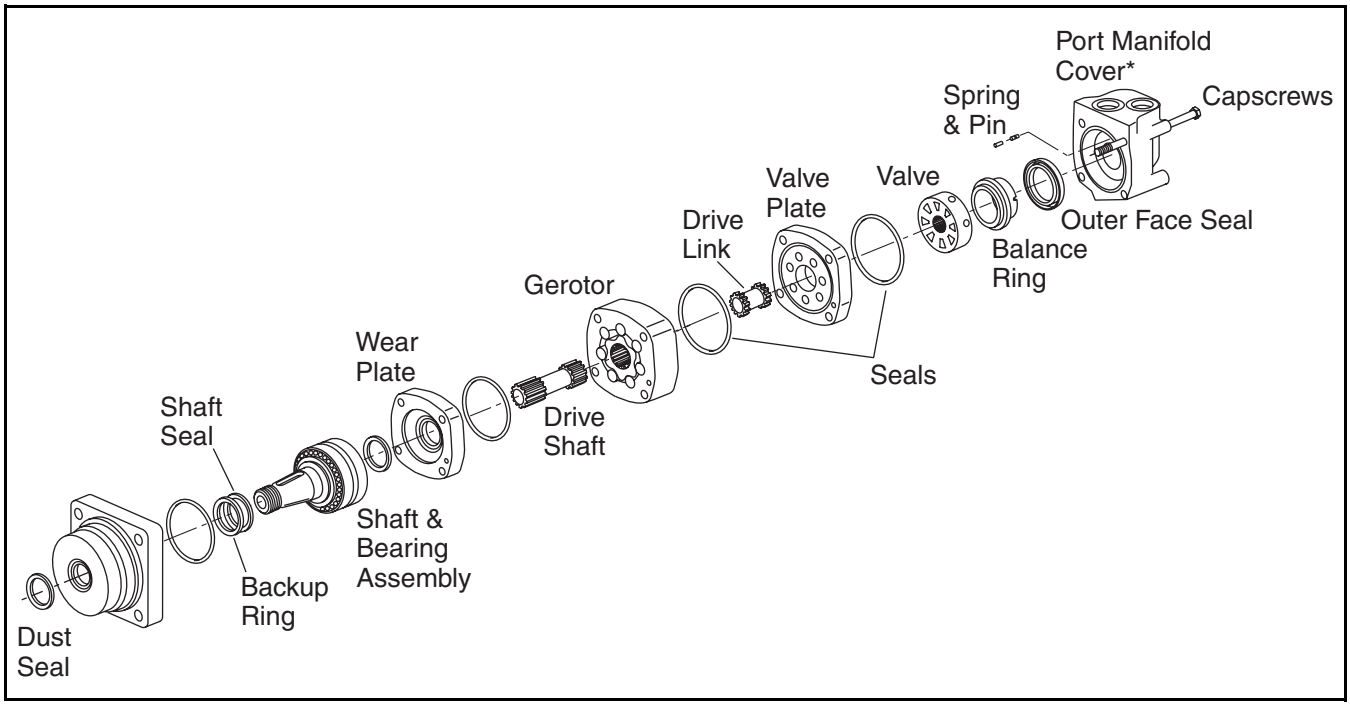


Figure 8E-3. Front Traction Motor

NOTE:

During assembly, position the seals, seal rings, and backup ring properly, see Figure 8E-4.

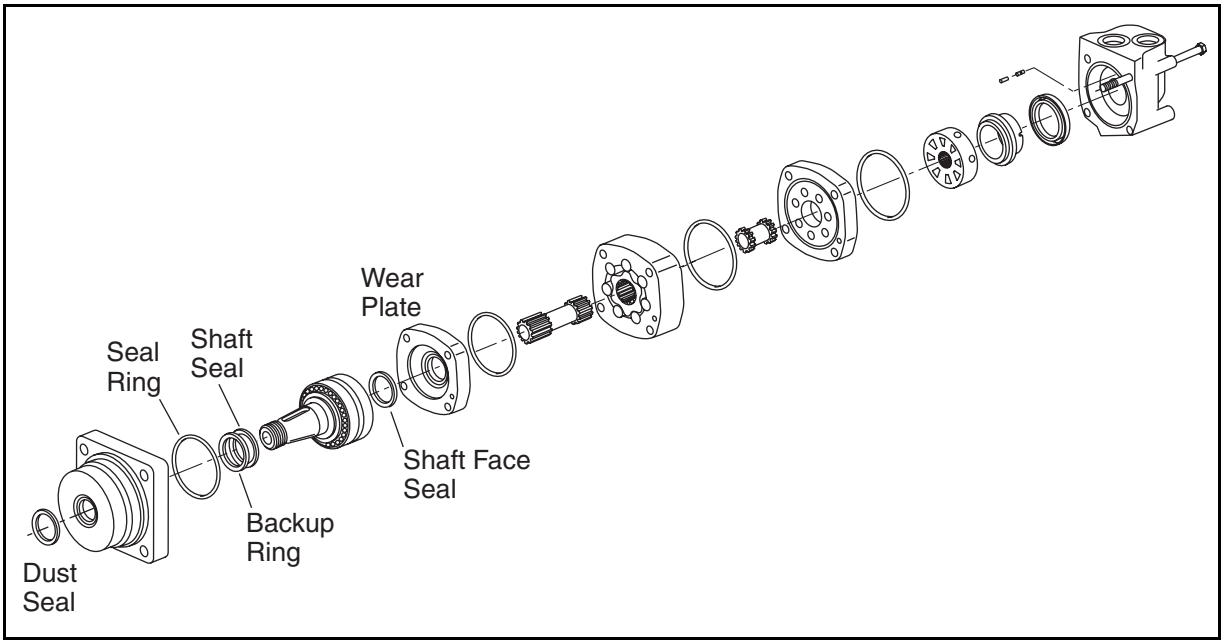


Figure 8E-4. Seal Assemblies

6. Install the seals and backup ring in the flange end as shown in Figure 8E-5.

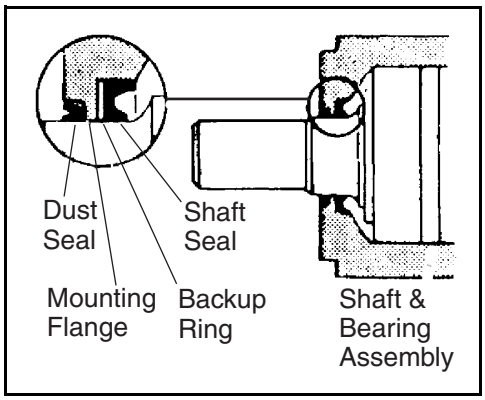


Figure 8E-5. Seals and Backup Ring

7. Press the bearing and shaft assembly into the flange end of the motor.

8. Install the shaft face seal as shown in Figure 8E-6. Place the wear plate on the flange end.

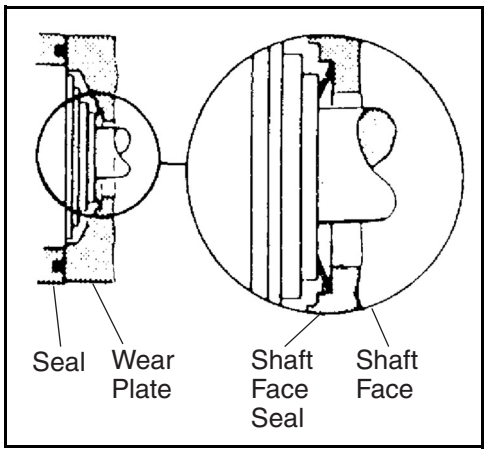


Figure 8E-6. Installation of Face Seal

9. Continue to assemble as shown in Figure 8E-7.

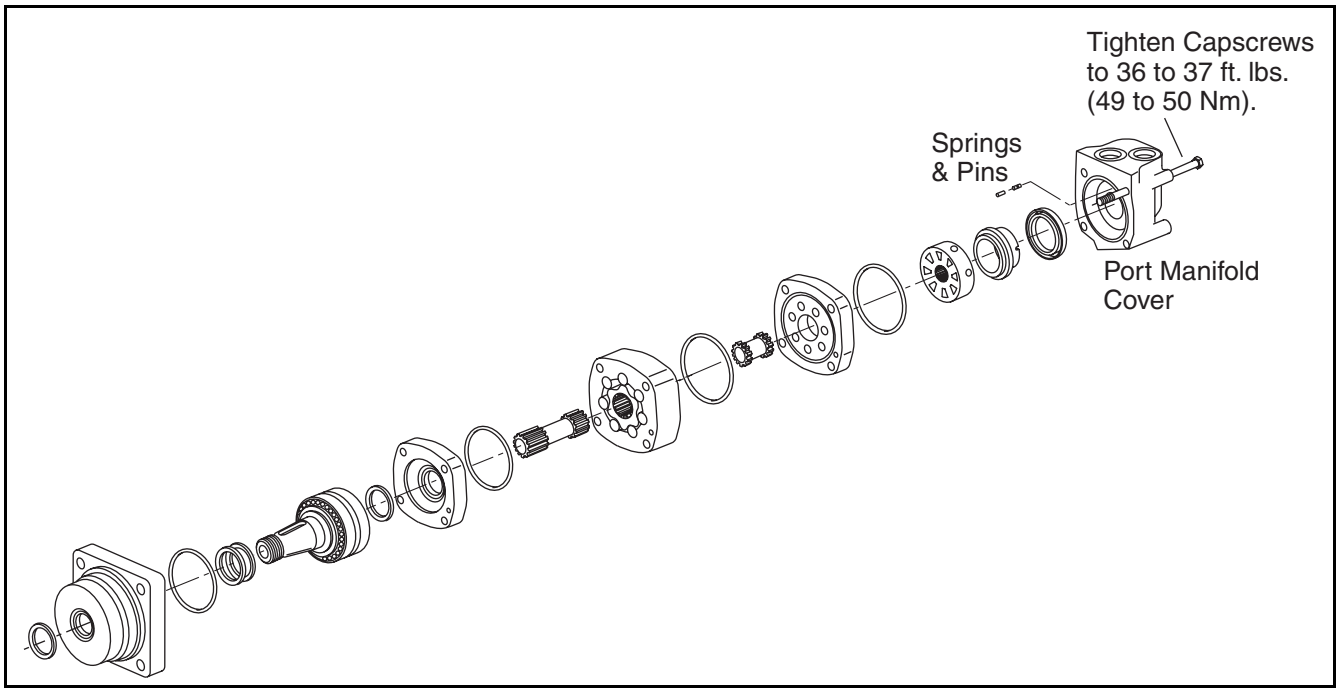


Figure 8E-7. O-Rings and Seals

NOTE:

Be sure the gerotor, valve plate, and valve are timed (Figure 8E-8).

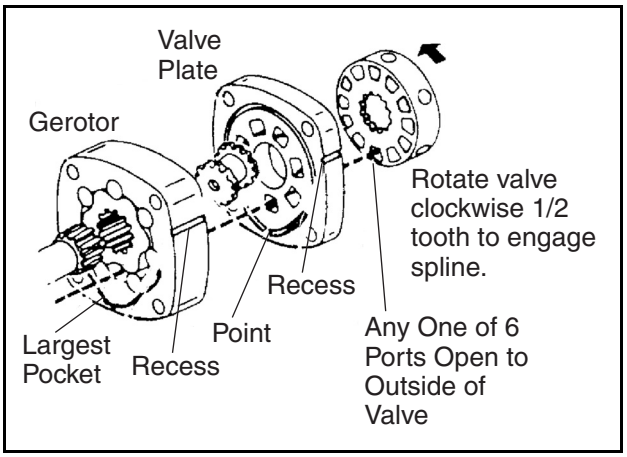


Figure 8E-8. Gerotor, Valve Plate, and Valve

10. Install the inner and outer face seal to the balance ring (Figure 8E-9).

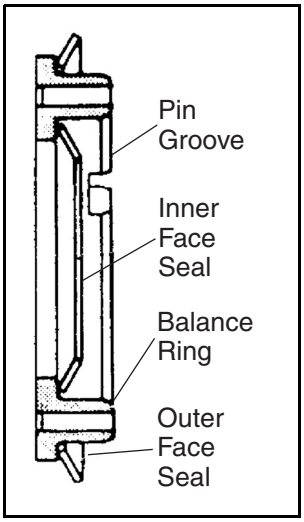


Figure 8E-9. Face Seal

11. Install the balance ring on the valve with the pin groove facing upwards.
12. Coat the springs and pins with petroleum jelly. Install both springs and pins in the holes of the manifold cover.
13. Carefully install the manifold cover on the valve plate.

    Center the manifold cover and balance ring. When centered and aligned, push down on the cover until contact with the valve plate occurs.

NOTE:

The mounting cover normally has a slight spring load.

14. Install four capscrews and tighten to 36 to 37 ft-lbs (49 to 50 Nm) torque.

INSTALLATION

1. Position motor in the front axle.
2. While supporting the motor, install four mounting bolts and lock washers.
3. Remove the plugs from the hydraulic hoses and motor. Using tags created during disassembly, connect the hoses to the motor fittings.
4. Install key in motor output shaft.
5. Position hub over the output shaft and secure with nut and cotter pin. Torque the front wheel hub to nut to 400 ft-lbs (± 50 ft-lbs).
6. Install the brake caliper and support bracket. Install the brake spring.
7. Install wheel and tire.
8. Start engine and check operation. Check for leaks and repair as necessary.

SECTION 8F. REAR (4 WHEEL DRIVE) TRACTION MOTOR

GENERAL

The traction pedal and traction pump control the rear traction motors. The motor is mounted inside a swiveling motor mount, which is mounted to the steering axle with a hub mounted on the output shaft, see Figure 8F-1. The hub is used to mount the wheels.

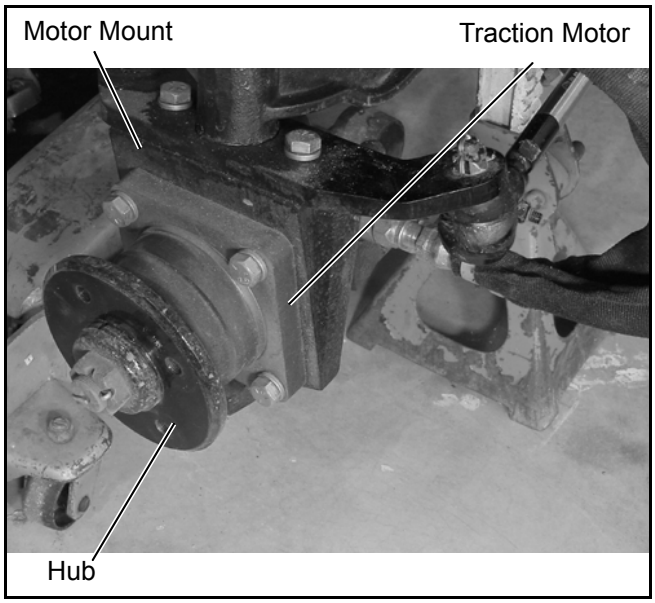


Figure 8F-1. Rear Traction Motor

REMOVAL

1. Shut down the engine and remove the ignition key.
2. Lift the tractor and support the steering axle with jack stands and chocks.
3. Remove the wheel and tire.
4. Remove the cotter pin and nut from the motor output shaft, see Figure 8F-2.
5. Using a suitable hub puller, remove the hub and key.
6. Thoroughly clean the motor especially the area surrounding the hydraulic hoses.
7. Tag and disconnect the hydraulic hoses from the motor. Immediately plug the hoses and motor to prevent contamination of the hydraulic system.
8. While supporting the motor, remove the four mounting bolts and lock washers, see Figure 8F-2.
9. Remove the motor from the motor mount.

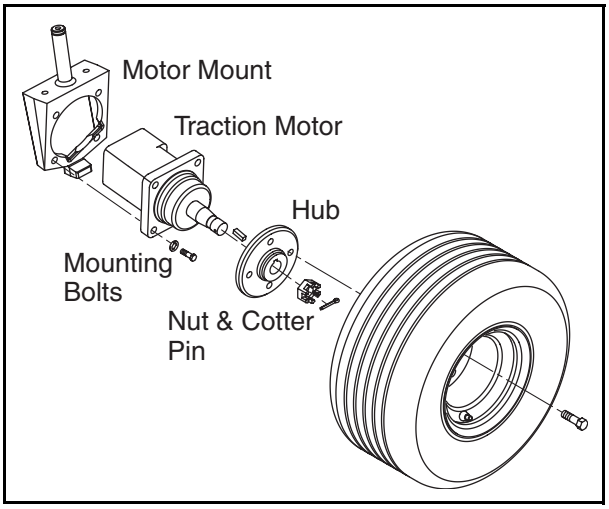


Figure 8F-2. Traction Motor Mounting

REPAIR

1. Disassemble motor as shown in Figure 8F-3.

NOTE:

When removing the port manifold cover, be careful not to lose the two pins and springs between the balance ring and cover.

2. Press the shaft and bearing assembly from the mounting flange end.
3. Remove and discard all seals, backup ring, and seal rings.
4. Clean all the parts in a suitable solvent.

5. Inspect the parts for wear and damage. The only serviceable items are the shaft and bearing assembly, shaft, nut, bolts, and seal kit.

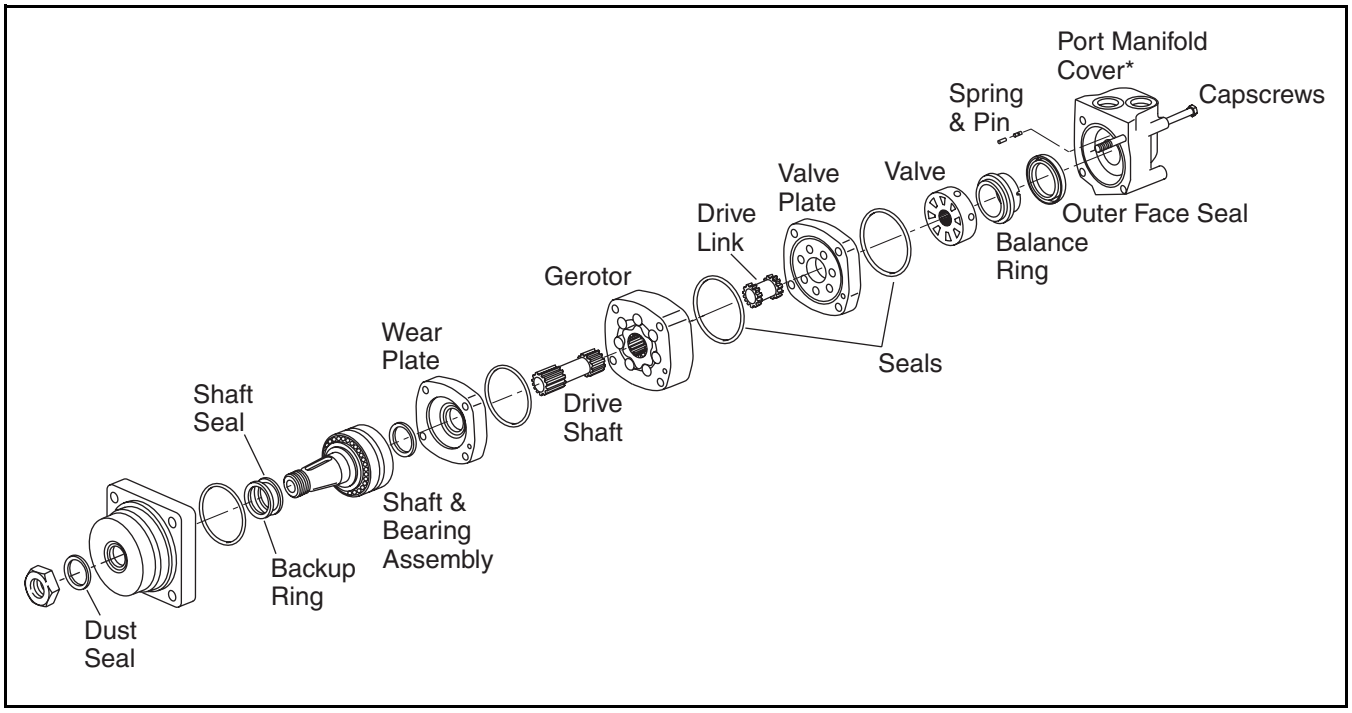


Figure 8F-3. Rear Traction Motor

NOTE:

During assembly, position the seals, seal rings, and backup ring properly, see Figure 8F-4.

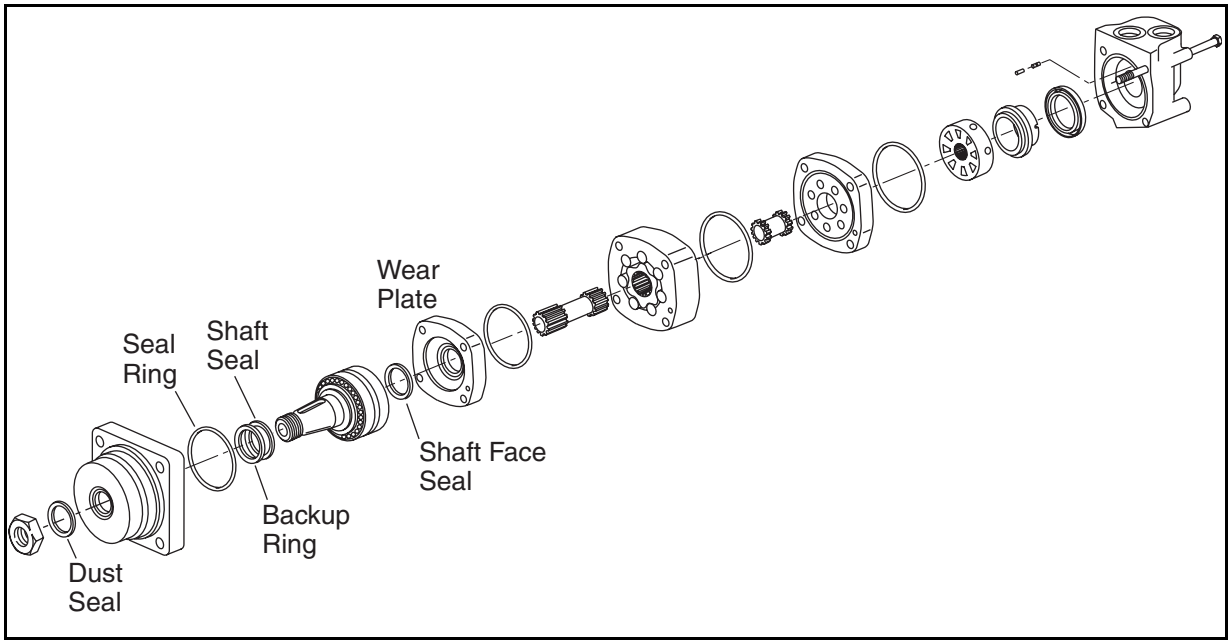


Figure 8F-4. Seal Assemblies

6. Install the seals and backup ring in the flange end as shown in Figure 8F-5.
7. Press the bearing and shaft assembly into the flange end of the motor.

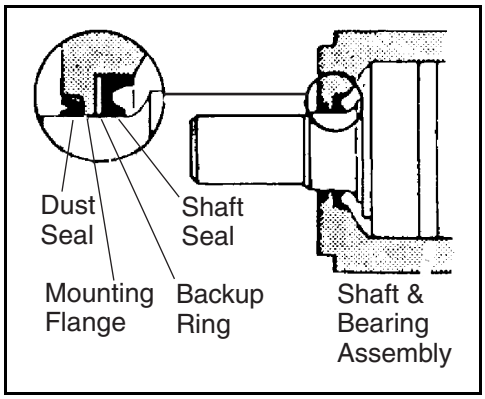


Figure 8F-5. Seals and Backup Ring

8. Install the shaft face seal as shown in Figure 8F-6. Place the wear plate on the flange end.

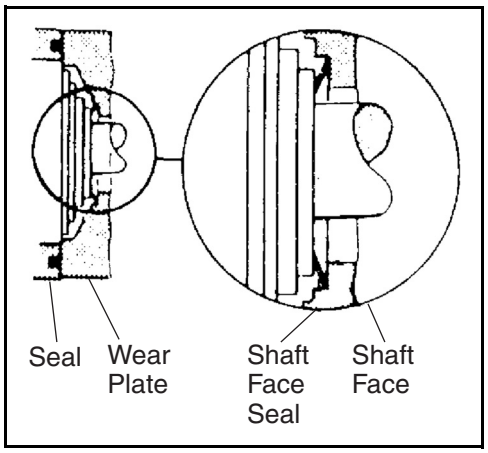


Figure 8F-6. Installation of Face Seal

9. Continue to assemble as shown in Figure 8F-7.

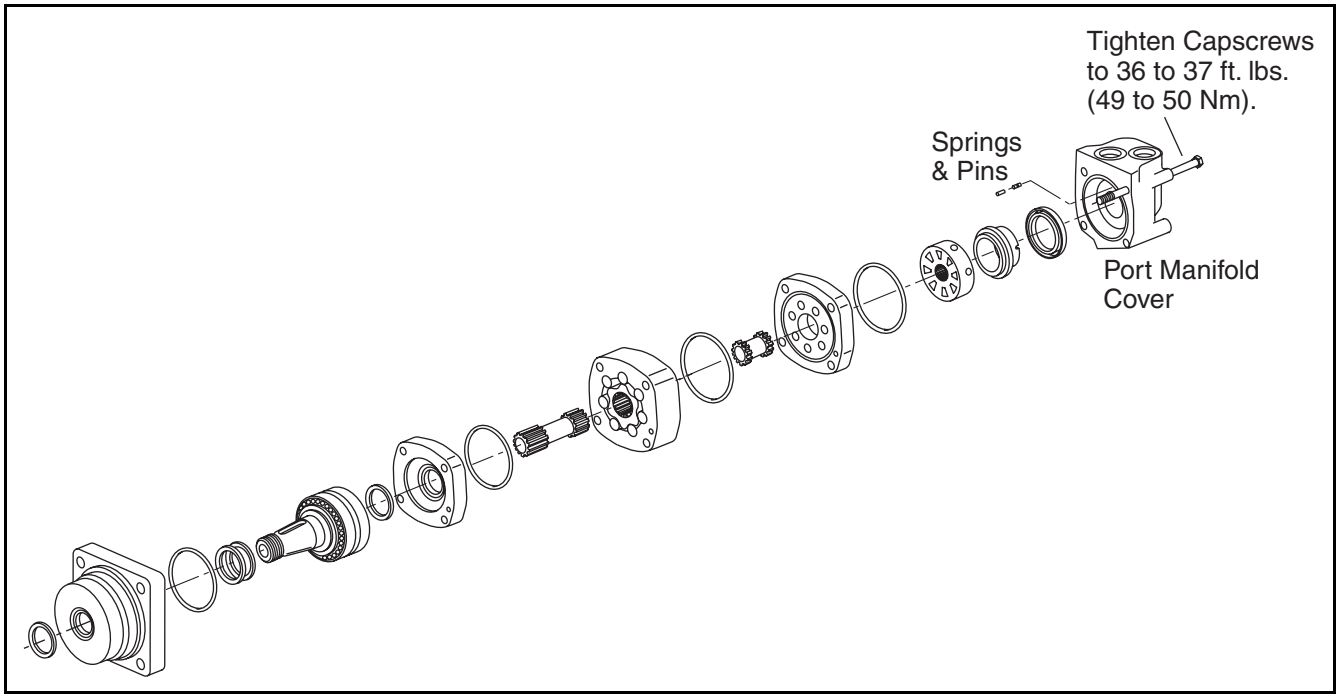


Figure 8F-7. O-rings and Seals

NOTE:

Be sure the Gerotor, valve plate, and valve are timed (Figure 8F-8).

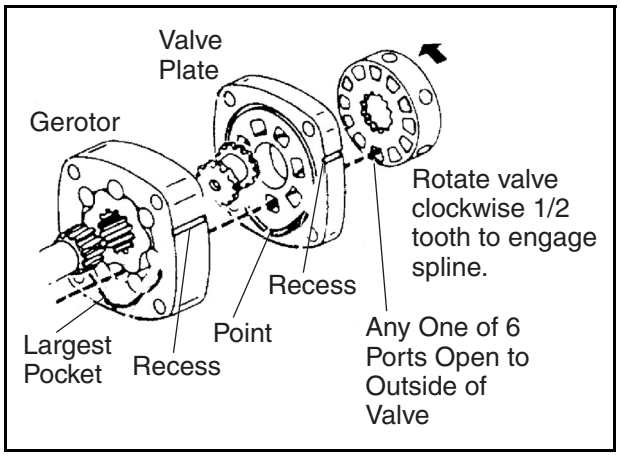


Figure 8F-8. Gerotor, Valve Plate, and Valve

10. Install the inner and outer face seal to the balance ring (Figure 8F-9).

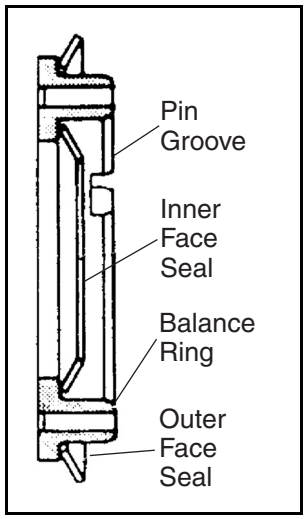


Figure 8F-9. Face Seal

11. Install the balance ring on the valve with the pin groove facing up.
12. Coat the springs and pins with petroleum jelly. Install both springs and pins in the holes of the manifold cover.
13. Carefully install the manifold cover on the valve plate.

    Center the manifold cover and balance ring. When centered and aligned, push down on the cover until contact with the valve plate occurs.

NOTE:

The mounting cover normally has a slight spring load.

14. Install four capscrews and tighten to 38 ft-lbs (49 to 59 Nm).

INSTALLATION

1. Position the motor in the motor mount and secure with four bolts and lock washers.
2. Remove the plugs and using the tags created during removal, connect the hydraulic hoses to the motor.
3. Install the key in the motor output shaft.
4. Position the hub over the output shaft and key, secure with nut and cotter pin. Torque the rear wheel hub nut to 200 ft-lbs (± 25 ft-lbs).
5. Install the wheel and tire on the hub.
6. Lift the tractor and remove the jack stands.
7. Start the engine and check motor operation. Check system for leaks and repair as necessary.

SECTION 8G. 4 WHEEL DRIVE CONTROL VALVE

GENERAL

The 4 wheel drive control valve is mounted on the frame below the engine.

REMOVAL

1. Shut down the engine and remove the ignition key.
2. Thoroughly clean the valve especially the area surrounding the hoses and fittings.
3. Tag and disconnect the hydraulics hoses and tubes. Immediately plug the hoses, tubes, and valve to prevent contamination of the hydraulic system.
4. Tag and disconnect the valve wiring harness.
5. Remove two-frame mounting bolts from each side of the valve-mounting bracket.
6. Remove three bolts and lock washers securing the bracket to the valve.
7. Remove the valve.

REPAIR

The 4 wheel valve repairs are limited to changing o-rings, backup rings, and coil. The valve can be replaced as an assembly, see Figure 8G-1.

INSTALLATION

1. Position the valve and bracket in the frame for mounting.
2. Install three bracket mounting screws and lock washers.
3. Position the mounting bracket on the frame and secure with two mounting screws on each side.
4. Remove plugs and using the tags created during removal, connect the hydraulic hoses and tubes to the valve.
5. Using tag created during removal, connect the wiring harness to the valve.
6. Replace the hydraulic oil filter.
7. Start the engine and check valve operation for leaks. Repair as necessary.

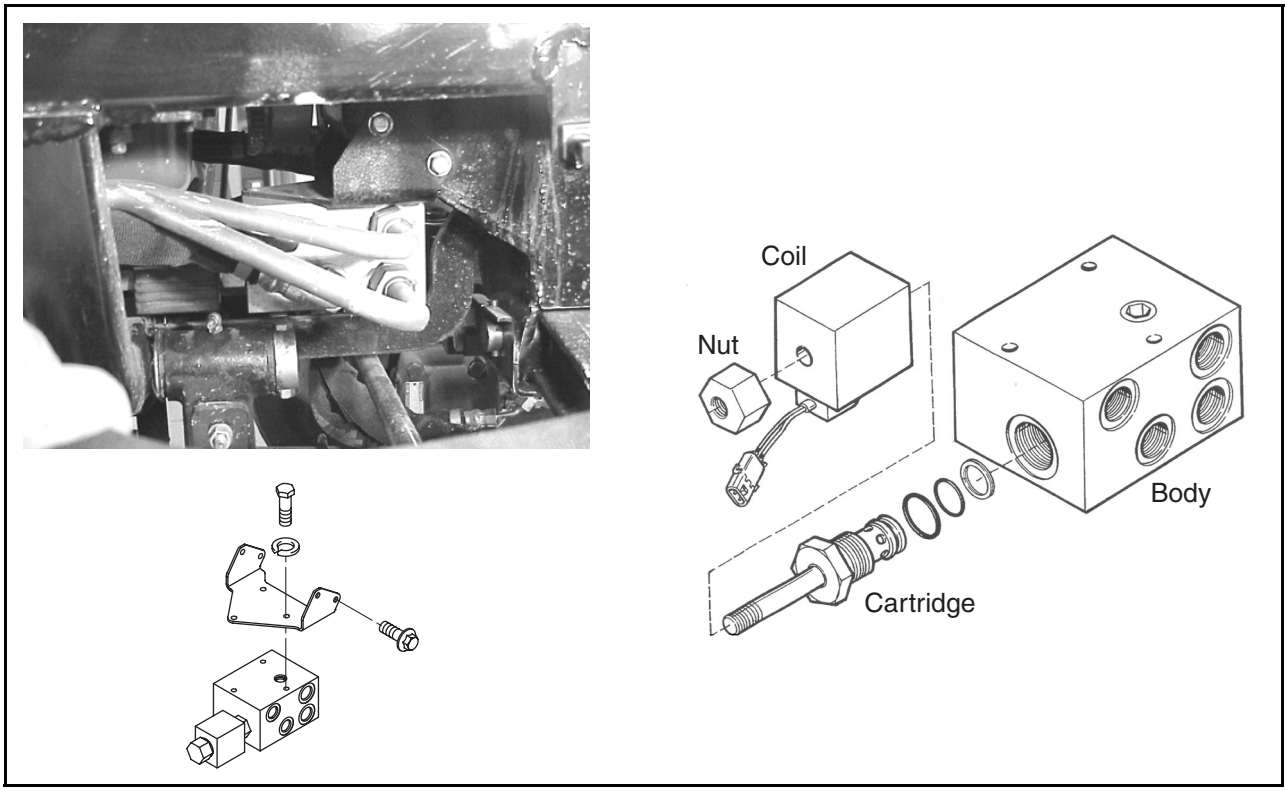


Figure 8G-1. Wheel Drive Valve Repair

SECTION 8H. REEL (AUXILIARY) HYDRAULIC PUMP

GENERAL

The reel (auxiliary) hydraulic pump is mounted on the rear of the traction pump, see Figure 8H-1. The traction pump is driven by a the engine using a conventional drive shaft and u-joints. The auxiliary hydraulic pump provides hydraulic flow for operating the reel motors and reel lifts.

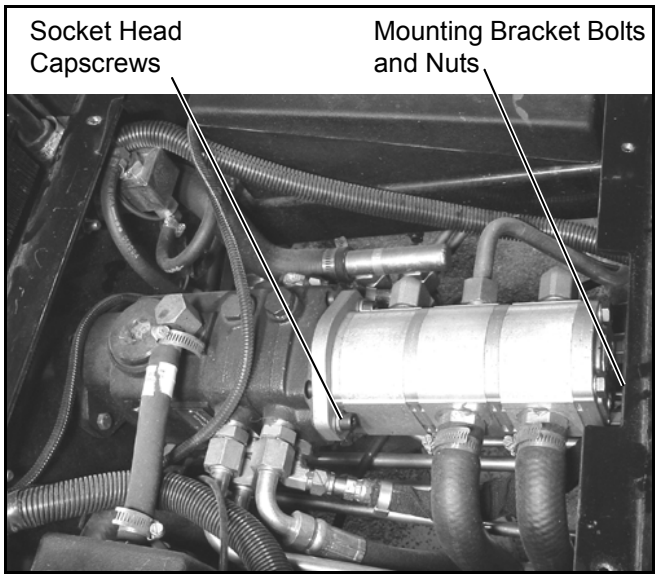


Figure 8H-1. Reel (Auxiliary) Pump Mounting

REMOVAL

1. Shut down the engine and remove the ignition key.
2. Remove the seat and seat pan.
3. Thoroughly clean the auxiliary pump, especially the area surrounding the hydraulic hoses, tubes and fittings.
4. Tag and disconnect the hydraulic hoses and tubes from the auxiliary pump. Immediately plug the hoses and pump to prevent contamination of the hydraulic system.
5. Remove the mounting bracket, bolts, and nuts (Figure 8H-2).
6. While supporting the pump, remove the two socket head capscrews securing the auxiliary pump to the traction pump.
7. Remove the pump from the tractor.

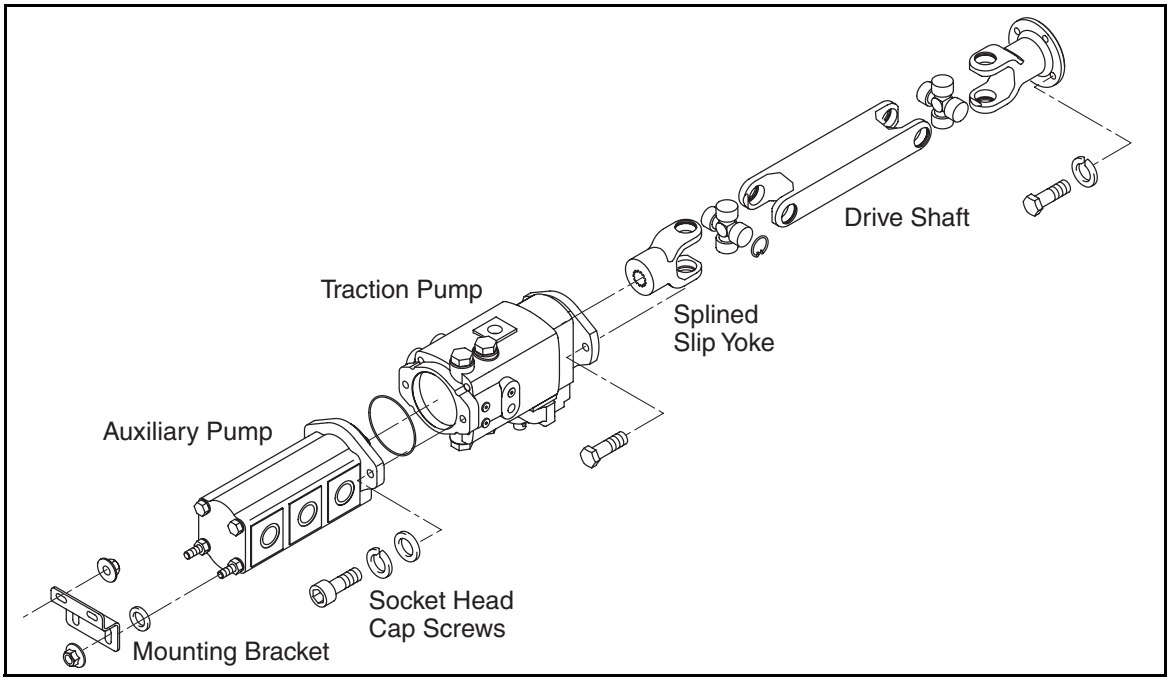


Figure 8H-2. Reel (Auxiliary) Hydraulic Pump Mounting

DISASSEMBLY

1. Thoroughly clean the outside of the pump before removing bolts and nuts.
2. Mark the pump sections to ensure proper assembly. Using a center punch place one mark on section 1, two marks on section 2 and three marks on section 3. see Figure 8H-3.

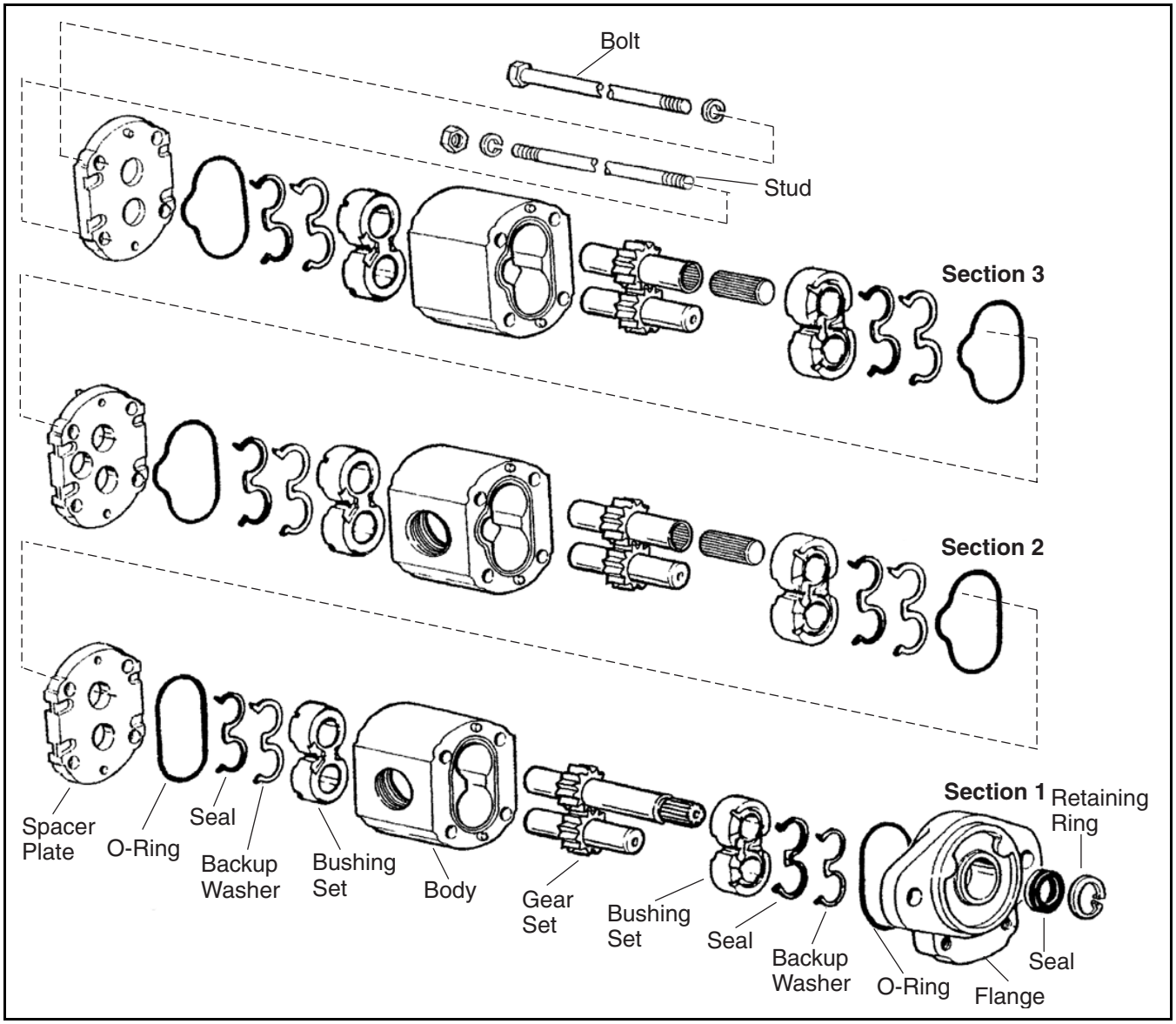


Figure 8H-3. Auxiliary Pump

⚠ CAUTION

Never pry pump sections apart as damage to the sealing areas can result. Use of a soft face hammer to tap sections apart is recommended.

3. After removing studs and bolts, disassemble pump one section at a time. Before removing gear set, mark a line across the meshing teeth to ensure that the gears are reassembled in the same position, see Figure 8H-4.

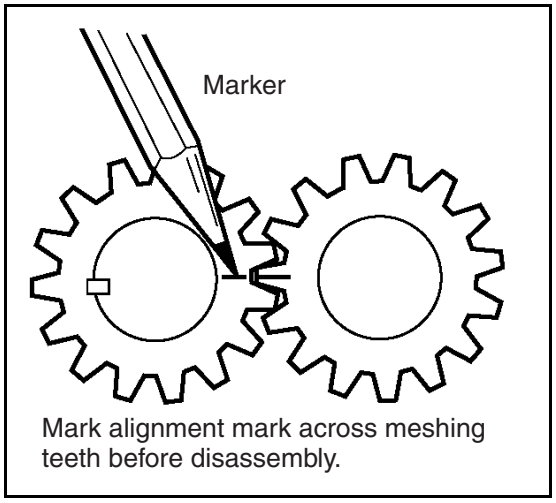


Figure 8H-4. Marking Gear Teeth

4. Place parts in assembly order on a clean work area as the are removed.
5. Discard seals as they are removed.

INSPECTION

1. Keep parts in assembly order; clean and air dry each for inspection. Look for metal clips or slivers during cleaning. Metal slivers are an indication of damage to the pump or other hydraulic components.
2. Inspect all parts for cracks, nicks, burrs, and excessive wear. Replace pump sections if damaged or worn.

REASSEMBLY

1. Apply a coat of clean hydraulic oil to all parts to ease assembly.
2. Assemble pump one section at a time, building up from flange section.
3. Use a new seal kit during assembly. Use clean grease to keep seals in position.
4. Remove the alignment mark from gear sets after they have been installed with teeth in mesh.
5. Rotate the drive shaft after assembling each section to make sure there is no binding between parts.
6. Use extreme care when installing the shaft seal. The shaft seal must sit squarely in the seal bore. Wrap the shaft and keyway with a plastic bag, grease plastic to avoid cutting the seal during assembly.
7. Install the studs, bolts, and nuts finger tight and rotate the drive shaft to make sure it turns freely. Tighten the tie bolts evenly and in steps to a final torque of 32-36 ft-lbs (43-49 Nm).
8. Install the pump and tighten the attaching hardware.
9. Connect the inlet and outlet hydraulic lines.

INSTALLATION

1. Position the pump in the tractor and secure with two socket head capscrews.
2. Install the mounting bracket and secure with mounting bolts and nuts.
3. Remove plugs and using the tags created during removal, connect hydraulic hoses and tubes to the pump fittings.
4. Install the seat and seat pan.
5. Replace the hydraulic filter.
6. Start engine and check operation. Check for leaks and repair as necessary.

SECTION 8I. LIFT/LOWER VALVE

GENERAL

The lift valve is used in conjunction with the reel (auxiliary) hydraulic pump and joystick to lift and lower the reels. The valve is mounted on the center rear of the front axle.

REMOVAL

1. Shut down the engine and remove the ignition key.
2. Remove the floorboard.
3. Thoroughly clean the lift valve, especially the area surrounding the hydraulic hoses, tubes, and fittings.
4. Tag and disconnect the hydraulic hoses and tubes from the lift valve. Immediately plug the hoses, tubes and valve to prevent contamination of the hydraulic system.
5. Tag and disconnect the wiring harness connectors from both solenoids.
6. While supporting the valve, remove two mounting screws and lock washers from the bottom of the valve.
7. Remove the valve from the mower.

INSTALLATION

1. Position the valve on the front axle mounting and secure with two screws and lock washers.
2. Remove plugs and using the tags created during removal, connect the hydraulic hoses and tubes to the valve fittings.
3. Using tags created during removal, connect the wiring to both solenoids.
4. Replace the hydraulic filter.
5. Start the engine and check valve operation. Check for leaks and repair as necessary.
6. Install the floorboard.

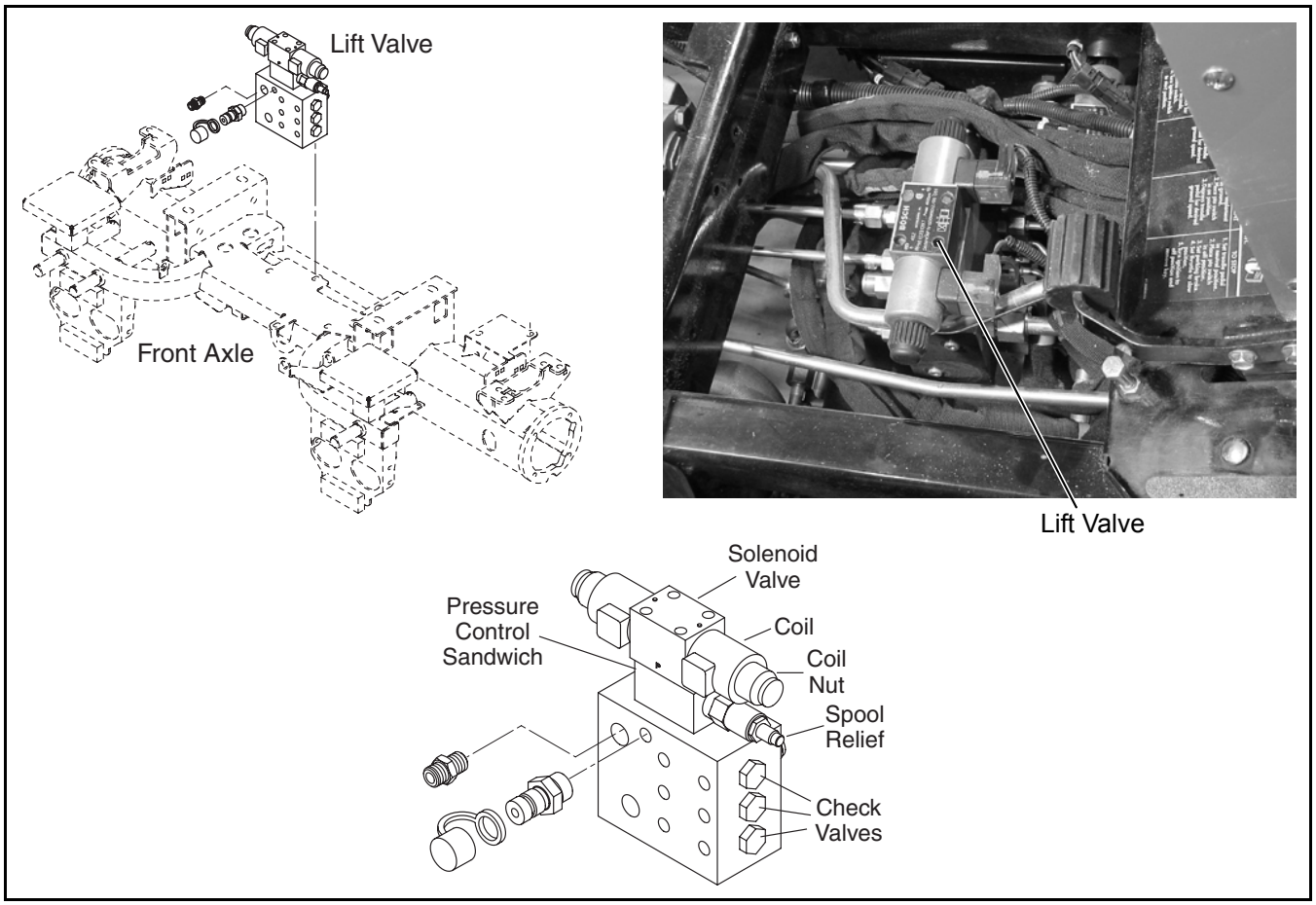


Figure 8I-1. Lift Valve Mounting

SECTION 8J. LIFT CYLINDERS

GENERAL

The LF-1880 mower uses five lift cylinders to lift and lower the reels. The cylinders are all the same.

REMOVAL

See Section 9E.

⚠ CAUTION

During repair of the cylinder, use extreme care not to damage the barrel, rod, and sealing surfaces of the cylinder.

INSPECTION

1. Inspect all parts for excessive wear, cracks, and broken parts.
2. Discard all o-rings, seals, and backup rings.

DISASSEMBLY

1. Clean and air dry exterior of cylinder.
2. Drain the oil from the cylinder.
3. Disassemble the lift cylinder, see Figure 8J-1.

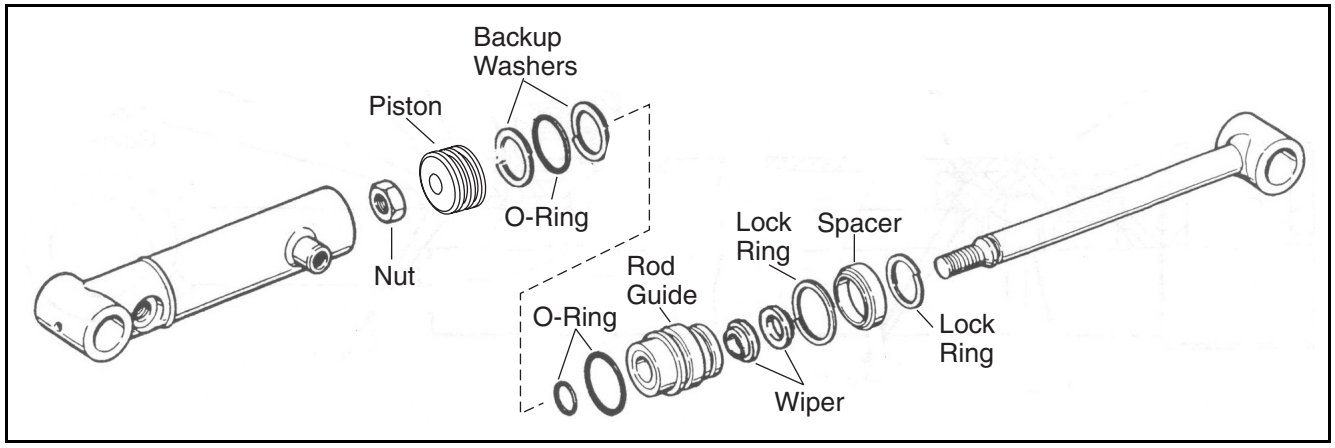


Figure 8J-1. Lift Cylinder Disassembly

a. Remove rod guide lock ring (Figure 8J-2).

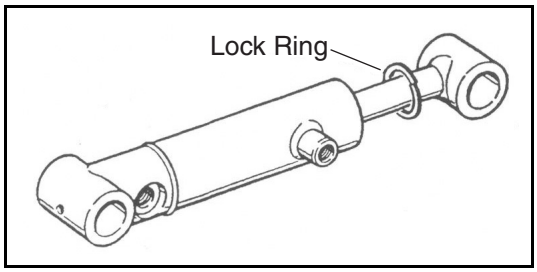


Figure 8J-2. Guide Lock Ring

b. Push rod guide into cylinder approximately 0.75 in (Figure 8J-3).

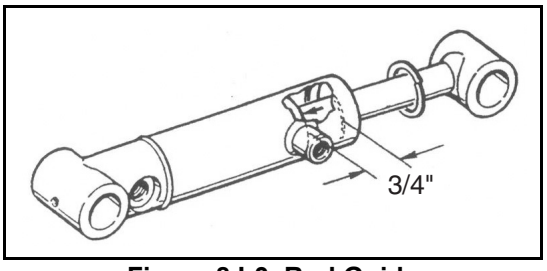


Figure 8J-3. Rod Guide

c. Remove the nylon spacer (Figure 8J-4).

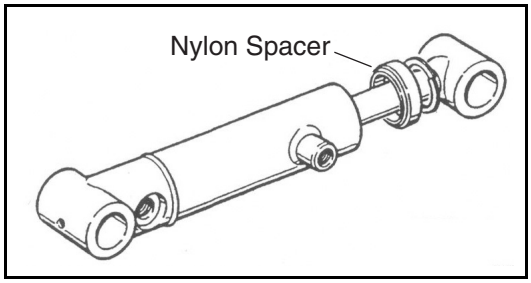


Figure 8J-4. Nylon Spacer

d. Remove head lock ring from inside the cylinder body (Figure 8J-5).

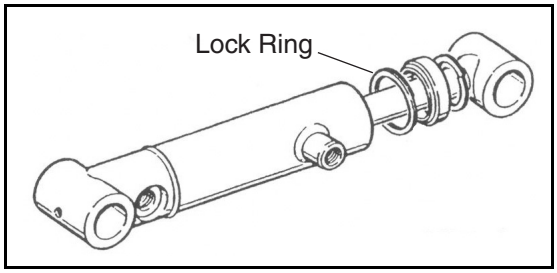


Figure 8J-5. Head Lock Ring

e. Remove sharp edges from the lock ring groove (Figure 8J-6).

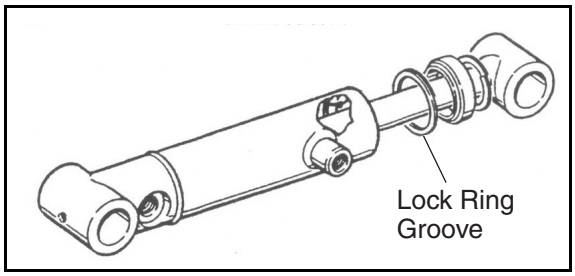


Figure 8J-6. Lock Ring Groove

f. Pull the rod assembly from the cylinder body (Figure 8J-7).

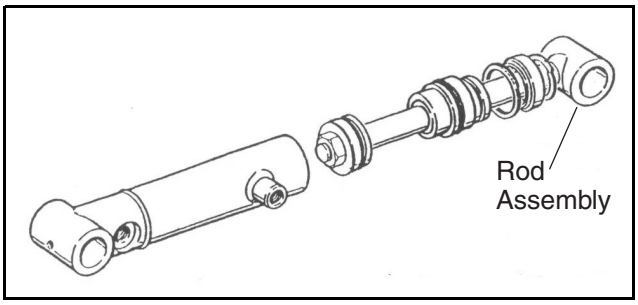


Figure 8J-7. Rod Assembly

ASSEMBLY

1. Lightly lubricate o-rings, backup rings, and seals with clean hydraulic oil.
2. Install seal kit as shown in Figure 8J-8.

NOTE:

Do not install rod o-ring at this time.

3. Lubricate all parts with clean hydraulic oil before assembly.

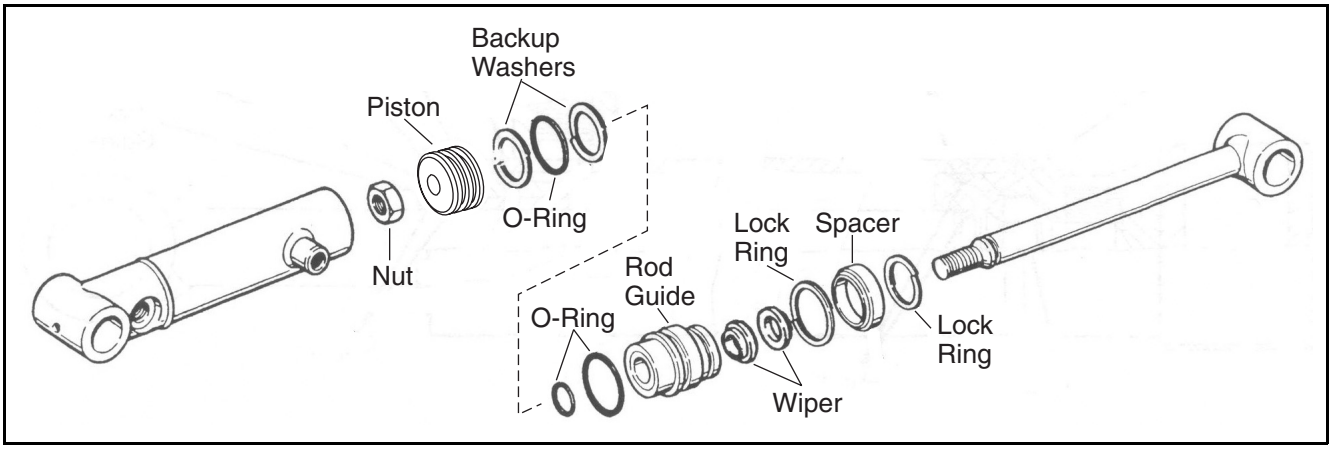


Figure 8J-8. Lift Cylinder Assembly

4. Assemble the cylinder.
   a. Place a small lock ring, nylon spacer, large lock ring, and rod guide onto the rod (Figure 8J-9).

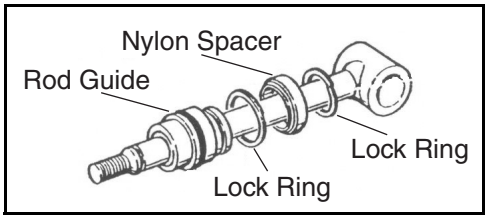


Figure 8J-9. Nylon spacer, Lock Ring, and Rod Guide

   b. Install the rod o-ring. Screw the piston onto the rod and secure with a nut (Figure 8J-10).

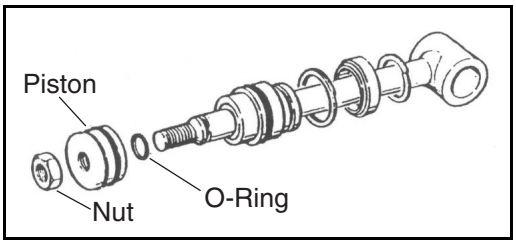


Figure 8J-10. O-ring, Piston, and Nut

   c. Insert the rod assembly into the cylinder body (Figure 8J-11).

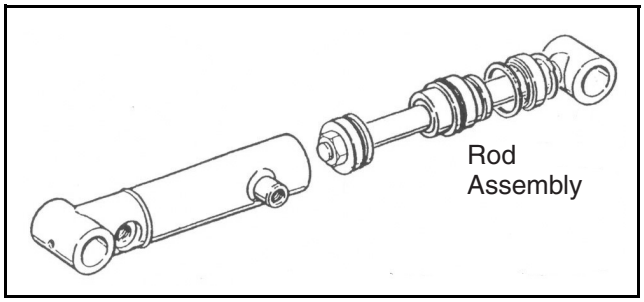


Figure 8J-11. Rod Assembly

   d. Push the rod guide into the cylinder approximately 0.75 in (Figure 8J-12).

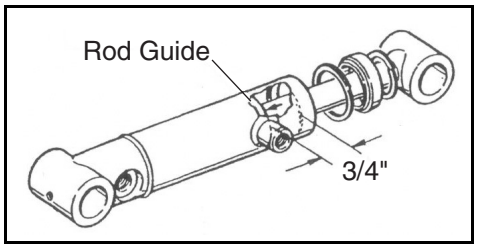


Figure 8J-12. Rod Guide

   e. Install the large snap ring (Figure 8J-13).

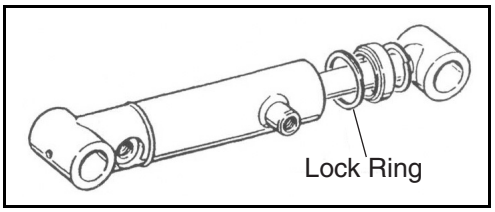


Figure 8J-13. Lock Ring

   f. Pull the rod and guide out. Install a spacer and small snap ring (Figure 8J-14).

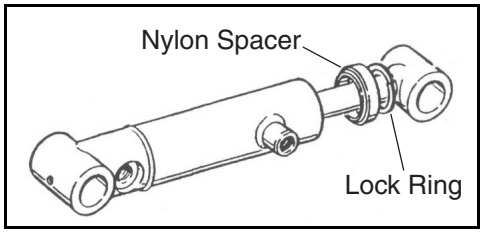


Figure 8J-14. Nylon Spacer and Snap Ring

INSTALLATION

See Section 9E and Figure 8J-15.

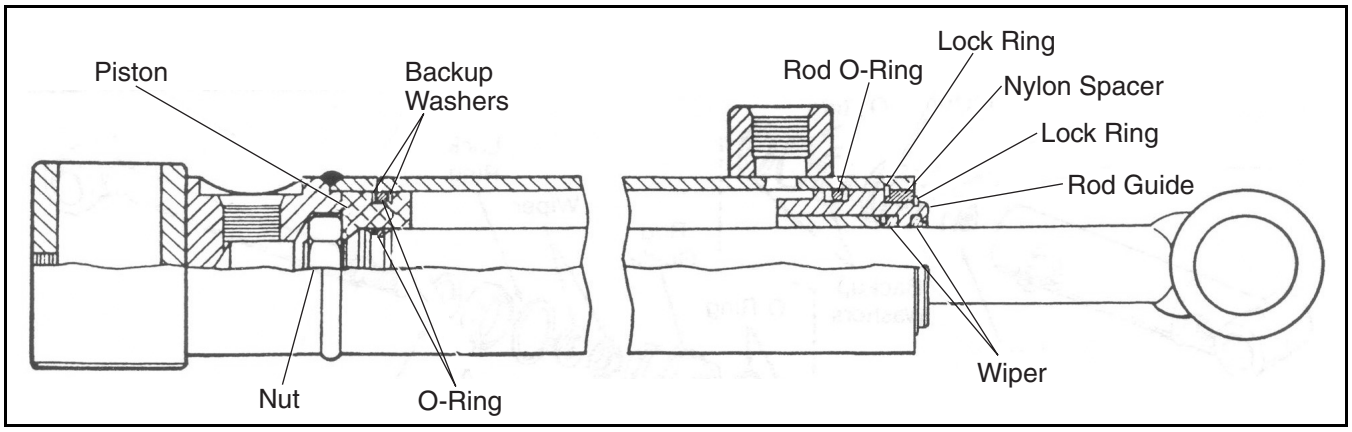


Figure 8J-15. Seal Kit Installation

SECTION 8K. REEL VALVE

GENERAL

There are two reel valves used to control the rotation of the reel motors. Both valves are mounted near the front of the mower. The valves are identical. One valve controls the three front reels and the other valve controls the center reel motor rotation (Figure 8K-1).

REMOVAL

1. Shut down the engine and remove the ignition key.
2. Thoroughly clean the valve especially the area surrounding the hydraulic hoses, tubes, and fittings.
3. Tag and disconnect the hydraulic hoses and tubes from the valve. Immediately plug the hoses, tubes, and valve to prevent contamination of the hydraulic system.
4. Tag and disconnect both solenoid wiring harness connectors.
5. While supporting the valve, remove two mounting screws and lock washers from the bottom of the valve.
6. Remove the valve from the mower.

INSTALLATION

1. Position the valve on the mount and secure with two mounting screws and lock washers.
2. Using tag created during removal, connect the wiring harness connectors to both solenoids.
3. Remove plugs and using tags created during removal, connect the hydraulic hoses and tubes to the valve fittings.
4. Replace the hydraulic filter.
5. Start engine and check valve operation. Check for leaks and repair as necessary.

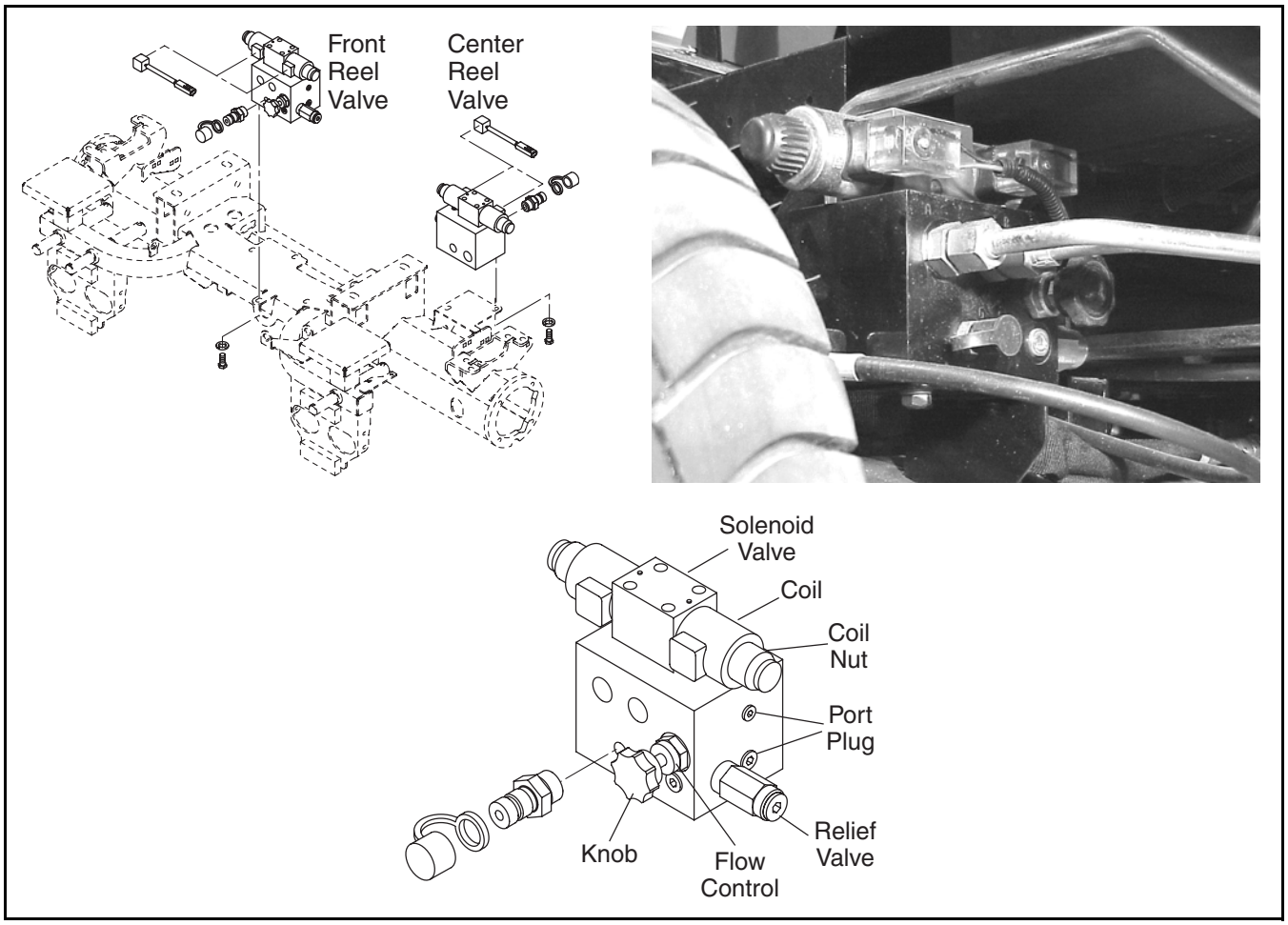


Figure 8K-1. Reel Valve Mounting

SECTION 8L. REEL MOTOR

GENERAL

There are five hydraulic reel motors, two center reel motors and three front reel motors (Figure 8L-1). The motors are identical.

REMOVAL

1. Shut down the engine and remove the ignition key.
2. Thoroughly clean the reel motor, especially the area surrounding the hydraulic hoses and fittings.
3. Remove the two motor retaining clips.
4. Remove the motor-to-reel coupler.
5. Tag and disconnect the hydraulic hoses from the motor fittings. Immediately plug the hoses and motor to prevent contamination of the hydraulic system.

INSTALLATION

1. Remove plugs and using tags created during removal, connect the hydraulic hoses to the motor fittings.
2. Check the reel mounting area for dirt and debris. Clean as necessary.
3. Position the motor to reel coupler on the reel.
4. Install the motor on the reel and over the mounting pins. Secure the motor with the retaining clips.
5. Replace the hydraulic filter.
6. Start the engine and check motor operation. Check for leaks and repair as necessary.

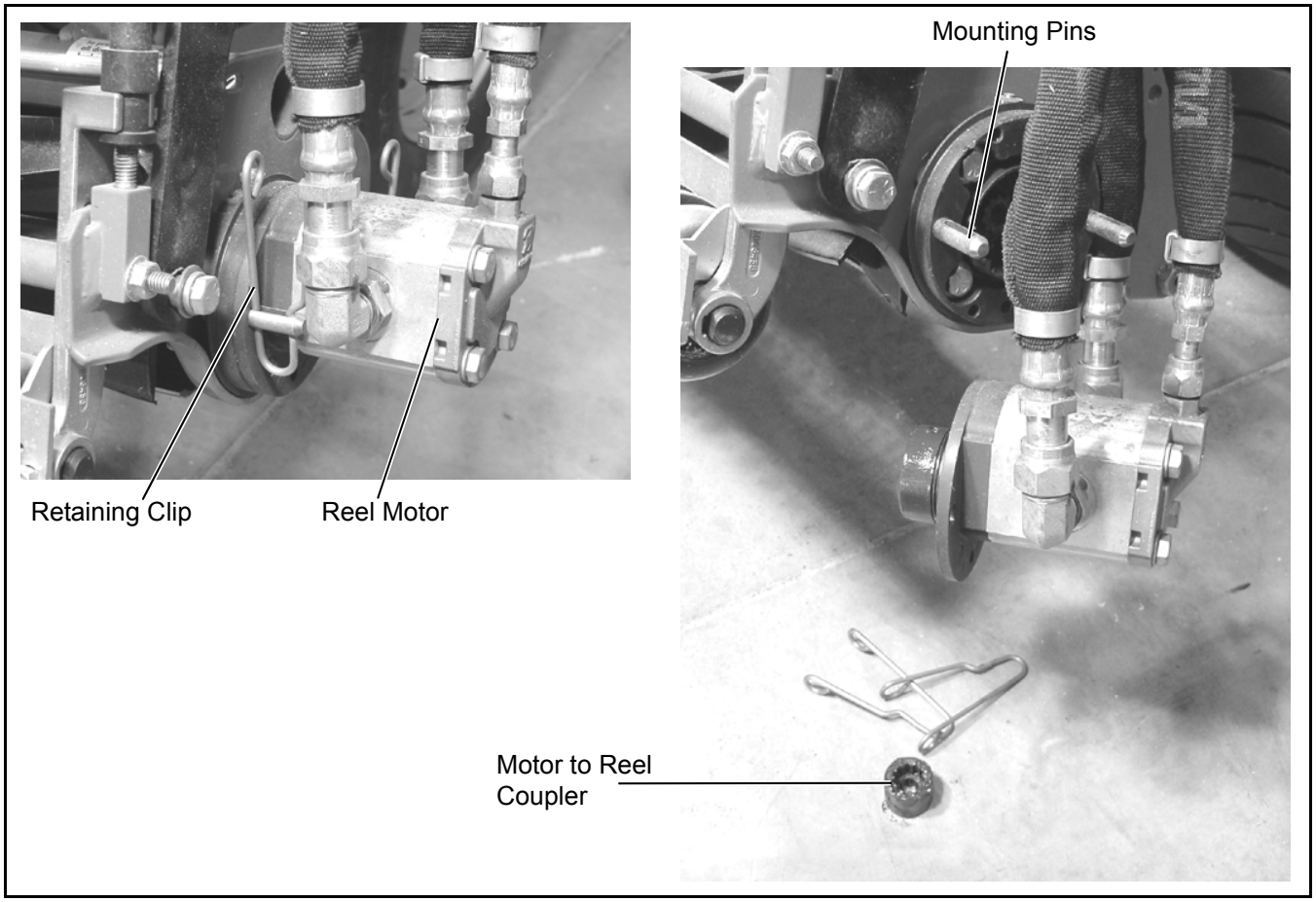


Figure 8L-1. Reel Motor Mounting

SECTION 8M. OIL COOLER

GENERAL

The oil cooler is mounted between the seat and engine. When hydraulic oil overheats the viscosity of the oil changes allowing the oil to become less effective. The oil cooler uses engine cooling fan to cool the hydraulic oil as it circulates through the hydraulic system (Figure 8M-1).

REMOVAL

1. Shut down the engine and remove the ignition key. Allow the engine to cool completely.
2. Remove the radiator/oil cooler screen by removing the screen knobs.
3. Thoroughly clean the oil cooler and surrounding area.
4. Carefully remove the oil cooler rubber iso-mounts.
5. Tag and disconnect the oil cooler hydraulic hoses. Immediately plug the hoses and oil cooler to prevent contamination of the hydraulic system.
6. Remove the oil cooler.

INSTALLATION

1. Position the oil cooler for installation of the hydraulic hoses.
2. Remove plugs and using the tags created during removal, connect the hydraulic hoses to the oil cooler.
3. Install the rubber iso-mounts on the radiator support oil cool studs.
4. Install the oil cooler over the rubber iso-mounts.
5. Start the engine and check for leaks. Repair as necessary.
6. Install the screen over the oil cooler and secure with two knobs.

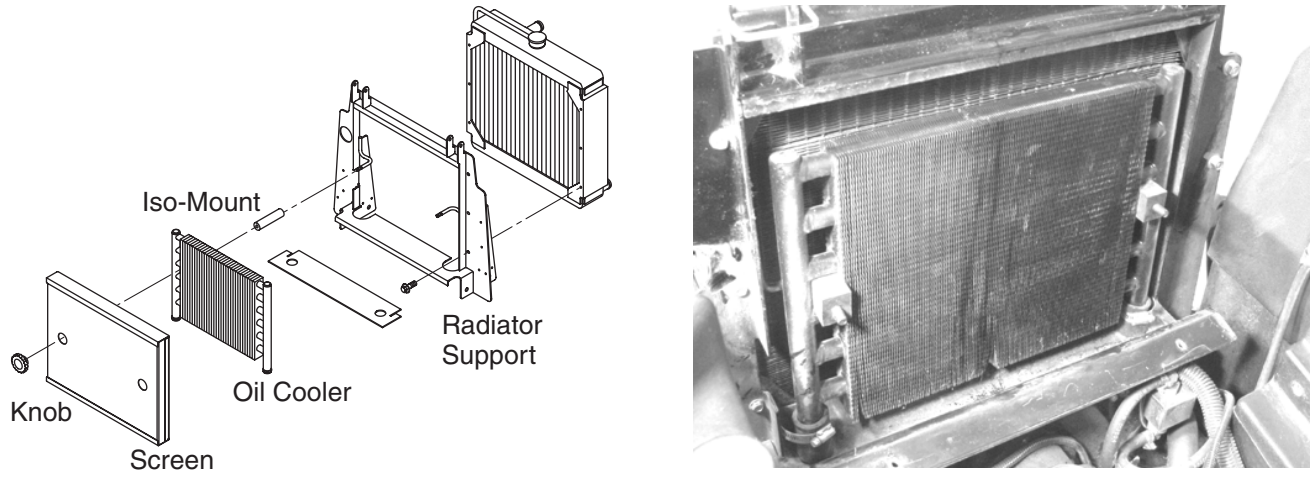


Figure 8M-1. Oil Cooler Mounting

8M

SECTION 8N. HYDRAULIC FIELD TEST PROCEDURES

GENERAL

When a hydraulic failure occurs, some simple, effective tests can be performed prior to using a test instrument. The results of these tests can lead you to the suspected component failure. More extensive test procedures, using test instruments, are presented in Section 8O. Component location illustrations, hydraulic schematics and diagrams are presented in Section 8P. Before performing any tests see Preliminary Checks-below.

AS A SAFETY REMINDER

- Follow the procedures one step at a time.
- Observe all NOTES, CAUTIONS, and WARNINGS.
- Pay attention to what you are doing. Work with a safety conscious attitude.
- Use care when working with HOT oil.
- Wear safety glasses at all times.
- Keep hands and feet away from the mower blades.
- The engine must be shut off and the attachments lowered to the grounded when making adjustments or hydraulic connections unless otherwise specified in the test instructions.

PRELIMINARY CHECKS

The following checks should be made before performing any tests.

1. The reservoir should be checked for proper level, the presence of water (noted by cloudy or milky appearance), air (noted by a foaming appearance), or a rancid odor indicating excessive heat.

   If any of the above symptoms appear, or if the hydraulic oil becomes contaminated, or after a major component failure, the system should be flushed, the oil changed, and a new filter installed.

   NOTE:

   Use only the recommended hydraulic oil (see Section 11). Always change the filter when changing the oil.

   The filter should be changed after the initial 25 hours of operation. Thereafter, the filter should be changed approximately every 250 hours.

2. Check all lines and fittings for leakage and tighten as necessary (see Section 8C).
3. Eliminate all possible mechanical problems before starting the hydraulic tests.

HYDROSTATIC CHARGE PUMP TEST

The charge pump supplies oil pressure for power steering and charging the hydrostat for traction.

If faults exist in both systems proceed with an instrument test for the charge pump.

If a fault exists in steering, proceed with an instrument test, Section 8O.

If a fault exists in lift or lower, proceed with Lift/Lower Test.

HYDROSTATIC TRACTION SYSTEM TEST

NOTE:

Before performing test, be sure tow valve, located on the bottom of the traction pump is closed (Figure 8N-1).

1. Operate the mower until hydraulic oil is at operating temperature, 110 – 130° F (43 – 54°C).
2. Chain the mower to a stationary object, such as a tree or pole, on concrete or asphalt.
3. With the throttle wide open, in two wheel drive, and reels lowered, push the traction pedal forward.

NOTE:

Open tow valve after test is completed (Figure 8N-1).

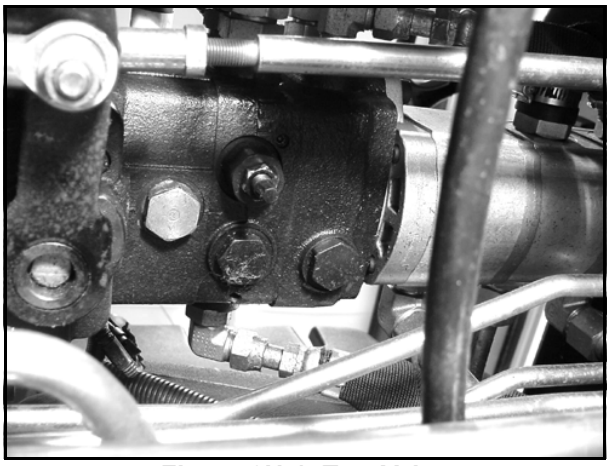


Figure 8N-1. Tow Valve

Conclusion

- If the traction wheels break traction, the traction pump is not at fault.
- If the traction wheels do not break traction and engine does not labor, a fault may exist in the hydrostatic drive circuit, including the traction pump or traction motors.

LIFT SYSTEM TEST

The purpose of this test is to determine if the lift cylinders are bypassing fluid internally (Figure 8N-2).

1. Operate the mower until the hydraulic oil reaches operating temperature, 110 – 130° F (43 – 54°C).
2. Lift the reels and shut down the engine.
3. Measure the distance between the bottom of a reel and the ground.
4. Allow the mower to stand for 15 minutes.

Conclusion

- If the reels do not drop, the lift system has no internal leakage.
- If any of the reels show signs of dropping, proceed with the test.

NOTE:

Use a floor jack and board to support the reel, being carefully not to damage the reel.

5. Lift and support the reel. Shut down the engine.
6. Disconnect the hydraulic hose from the extend side of the lift cylinder. Immediately plug the hydraulic hose.
7. Place a container underneath the cylinder (minimum 1-gallon (3.8-liter)) capacity.
8. Slowly lower the floor jack and observe the cylinder extend side port.

Conclusion

- If the reel does not drop and hydraulic oil does not flow from the cylinder, the cylinder is not bypassing and the problem may be in the lift valve.
- If oil flows from the cylinder port and the reel drops, the cylinder is bypassing oil and must be replaced or repaired.

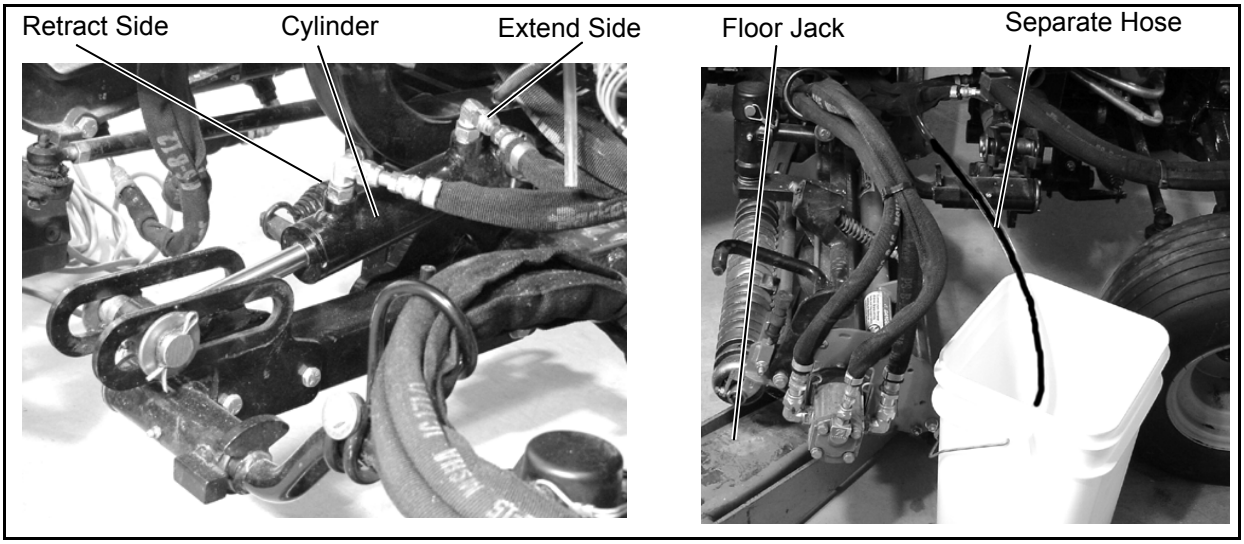


Figure 8N-2. Lift Cylinder Test

POWER STEERING SYSTEM TEST

The purpose of this test is to determine if the steering cylinder and the steering unit are operating properly (Figure 8N-3).

NOTE:

Before performing the test, check the steering systems for mechanical binding and damage that may effect the steering.

1. With the engine running, turn the steering wheel all the way right and then all the way left.

Conclusion

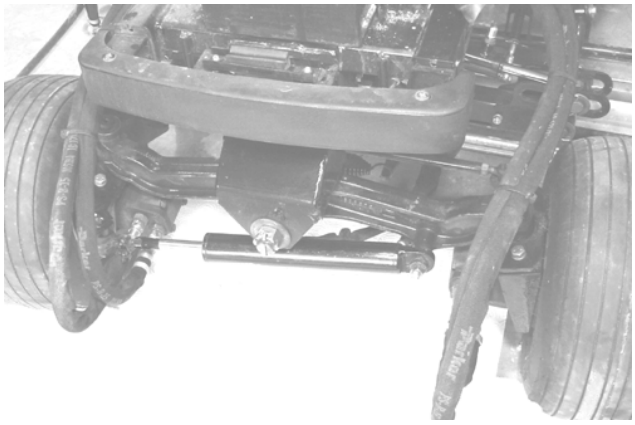
- If the steering wheel becomes hard to turn or stops turning and a hissing sound is heard after steering the maximum right and/or left, the steering unit is not at fault.
- If the steering wheel continues to turn, proceed with the test.

2. Remove both hydraulic hoses from the steering cylinder, plug the hoses and cap the cylinder ports.
3. Turn the steering wheel all the way to the right and then all the way left.

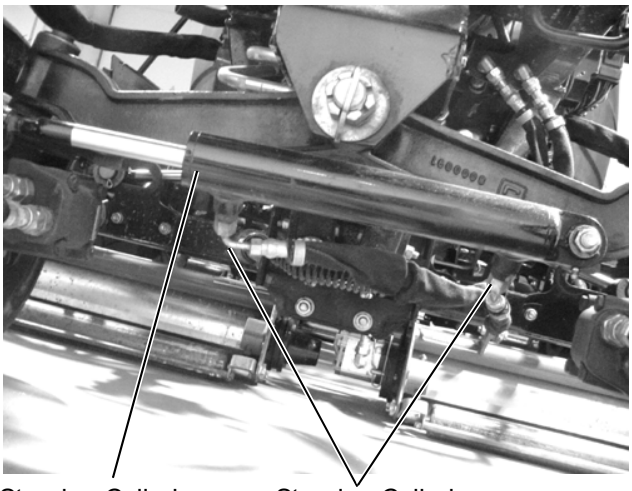
Conclusion

- If the steering wheel becomes hard to turn or stops turning the cylinder is at fault and should be repaired or replaced.
- If the steering wheel continues to turn, perform an instrument test, see Section 8O.

Steering Unit



Steering Cylinder



Steering Cylinder

Steering Cylinder Hoses

Figure 8N-3. Power Steering System

MOWER (REEL MOWER) SYSTEM TEST

The reel motor circuit consists of the reel (auxiliary) hydraulic pump, reel motor control valve, five reel motors, and reel switch. This test will determine if the reel motor is at fault (Figure 8N-4). There are practical field tests to isolate the control valve or pump. An instrument test must be performed as described in Section 8O.

NOTE:

The case drain on a hydraulic motor is used to return excess or bypassed hydraulic oil to the hydraulic tank.

1. Shut down the engine and remove the ignition key.
2. Remove the case drain hose from the reel motor. Immediately plug the hose.
3. Position a drain pan (minimum capacity 1 gallon (3.8 liters)) near the reel motor.
4. Install a separate hose on the case drain fitting and place the free end in the container.
5. Set the parking brake, start the engine and place the reel switch in the forward (ON) position. Run the engine for one full minute.
6. Shut down the engine and remove the ignition key.
7. Measure the amount of oil collected from the case drain in one minute.

Conclusion

- If oil from the case drain is within a half pint per minute, the motor is not at fault, proceed with an instrument test (Section 8O).
- If the oil from the case drain is more than 1-1/2 pints per minute the motor may be faulty and should be repaired or replaced.

8. Remove the separate hose from the motor and plug from the hydraulic hose. Connect the hydraulic hose to the reel motor.

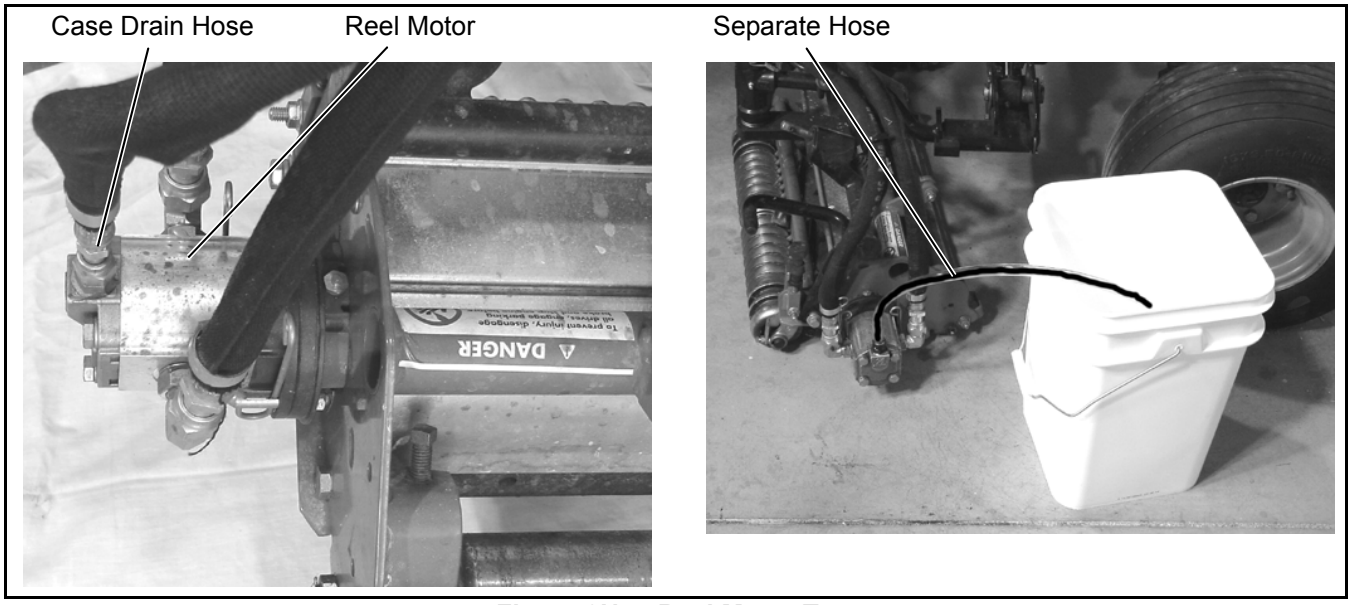


Figure 8N-4. Reel Motor Test

TRACTION MOTOR TEST

The front traction case drain is used to return excess of bypassed hydraulic oil to the hydraulic tank.

1. Shut down the engine and remove the ignition key.
2. Remove the case drain hose from the traction motor. Immediately plug the hose.
3. Position a drain pan (minimum capacity 1 gallon (3.8 liters)) near the wheel motor.
4. Install a separate hose on the case drain fitting and place the free end in the container.
5. Lift the mower and support with jack stands.
6. Start the engine and place the traction pedal in the forward position. Run the engine for one full minute.
7. Shut down the engine and remove the ignition key.
8. Measure the amount of oil collected from the case drain in one minute.

Conclusion

- If oil from the case drain is within a pint per minute, the motor is not at fault, proceed with an instrument test (Section 8O).
- If the oil from the case drain is more than 1-1/2 pints per minute the motor may be faulty and should be repaired or replaced.

9. Remove the separate hose from the motor and plug from the hydraulic hose. Connect the hydraulic hose to the traction motor (Figure 8N-5).

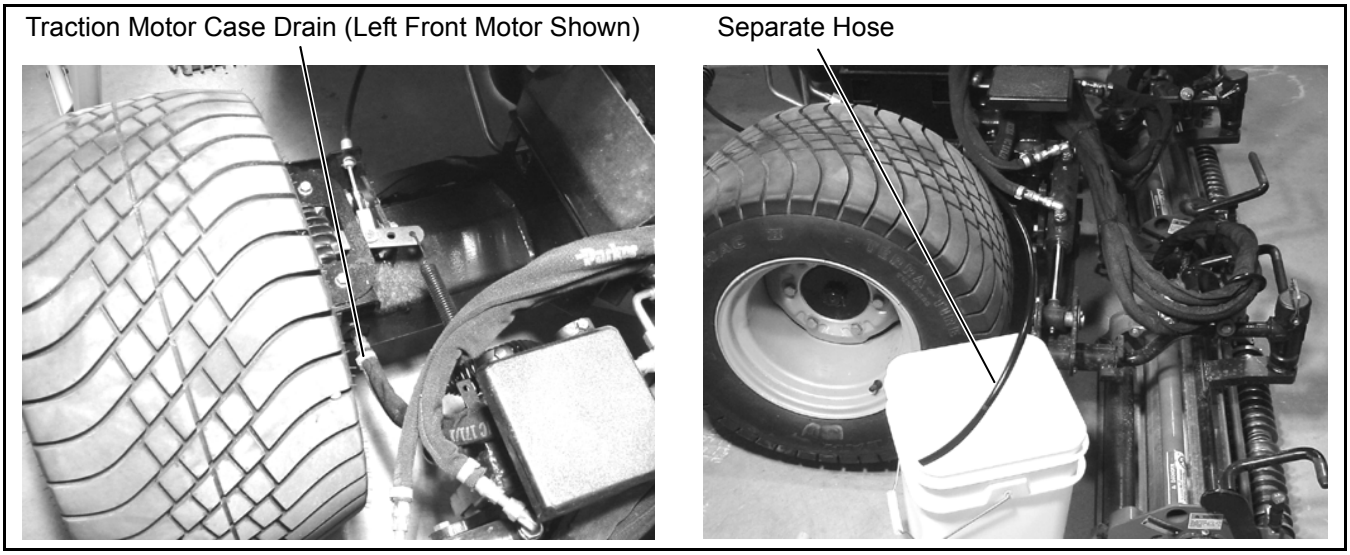


Figure 8N-5. Traction Motor Case Drain (Left Front Motor Shown)

SECTION 8O. HYDRAULIC INSTRUMENT TESTS

GENERAL

The tests in this section are provided as a means of isolating problems in the hydraulic system

This section uses two test methods to identify a problem or to evaluate a hydraulic circuit. The first test is a pressure test. The pressure test determines how much force (pounds per square inch – psi (kPa)) is being used to force the available hydraulic oil through the circuit. The second test (flow) determines how much oil is flowing through the circuit and how long it takes for the oil to flow through the circuit (gallons per minute – gpm (lpm)).

During the pressure test a pressure gauge is installed in-line with the component pressure inlet. The test determines how much pressure is being exerted on the oil flowing to the component.

In the flow test a flow/pressure tester is installed in-line with the component to determine how much (gpm/lpm) oil is flowing to and from the component and how much force (psi/kPa) is being exerted on the oil.

The flow test is more complete and can isolate a problem within a circuit.

Make sure the mower is secured and cannot roll. If interlock systems are bypassed, exercise caution when performing each test.

⚠ CAUTION

If interlock safety features are bypassed during a test, use extreme caution when performing tests and make sure the interlock system is functional after the test.

Follow the instructions carefully and completely. Plug lines and cap ports are directed.

⚠ CAUTION

When using a plug to block a pressure line the plug must be able to withstand the pressure developed in the circuit.

A test record has been provided at the end of this section. Make copies of the record for future use. Use the form to record test results.

NOTE:

An in-line tester (Figure 8O-1) is used in this section to measure oil flow. When using a tester with variable gpm settings, make sure tester is set for the proper flow range to avoid damage to the tester. Record all readings obtained during the test. Perform all tests at the same engine speed (rpm) and the hydraulic oil at operating temperature.

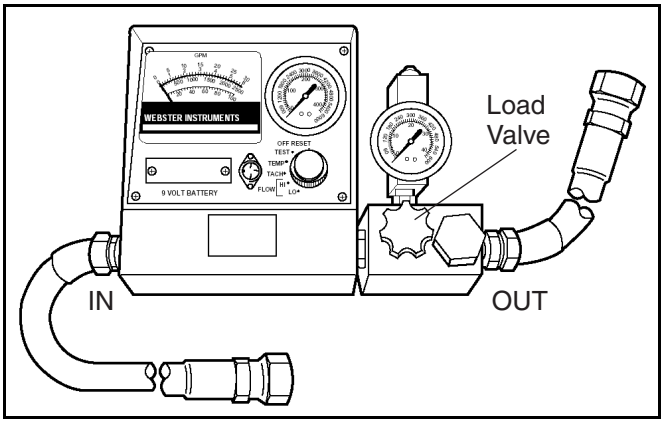


Figure 8O-1. In-Line Flow Tester

NOTE:

The instrument tests described in this section are intended as a guide only and may not include every problem encountered within a hydraulic system Contact your local Jacobsen dealer for additional information and assistance.

PRESSURE TESTS

The pressure tests are frequently inconclusive in isolating a faulty component. A flow test is recommended for isolating a problem within a circuit. The pressure tests are useful in determining the pressure settings of pressure relief valves.

CHARGE PRESSURE TEST

1. Shut down the engine.
2. Install a 200-psi (1379 kPa) pressure gauge and in-line tee between the steering unit inlet and the supply hose, see Figure 8O-2.

3. Set the parking brake, start engine, and advance engine speed to full throttle position.
4. Record the pressure gauge reading. The charge pressure should be 54 to 66 psi (372 to 455 kPa).

Conclusion

- If charge pressure is within range, charge relief setting is correct. Proceed with Steering Circuit Test.
- If charge is not within range the charge relief valve may need cleaning or replacement.

5. Shut down engine and remove ignition key.

Relief Valve

NOTE:

The charge relief valve (Figure 8O-2) cannot be repaired or adjusted. Replace if damaged or faulty.

6. Remove charge relief valve plug, spring, and cone. Inspect for sediment or debris and damage. Clean or replace as necessary. If the relief valve is not clogged or damaged:
   - Charge pump is faulty
   - Traction circuit has excessive internal leakage.

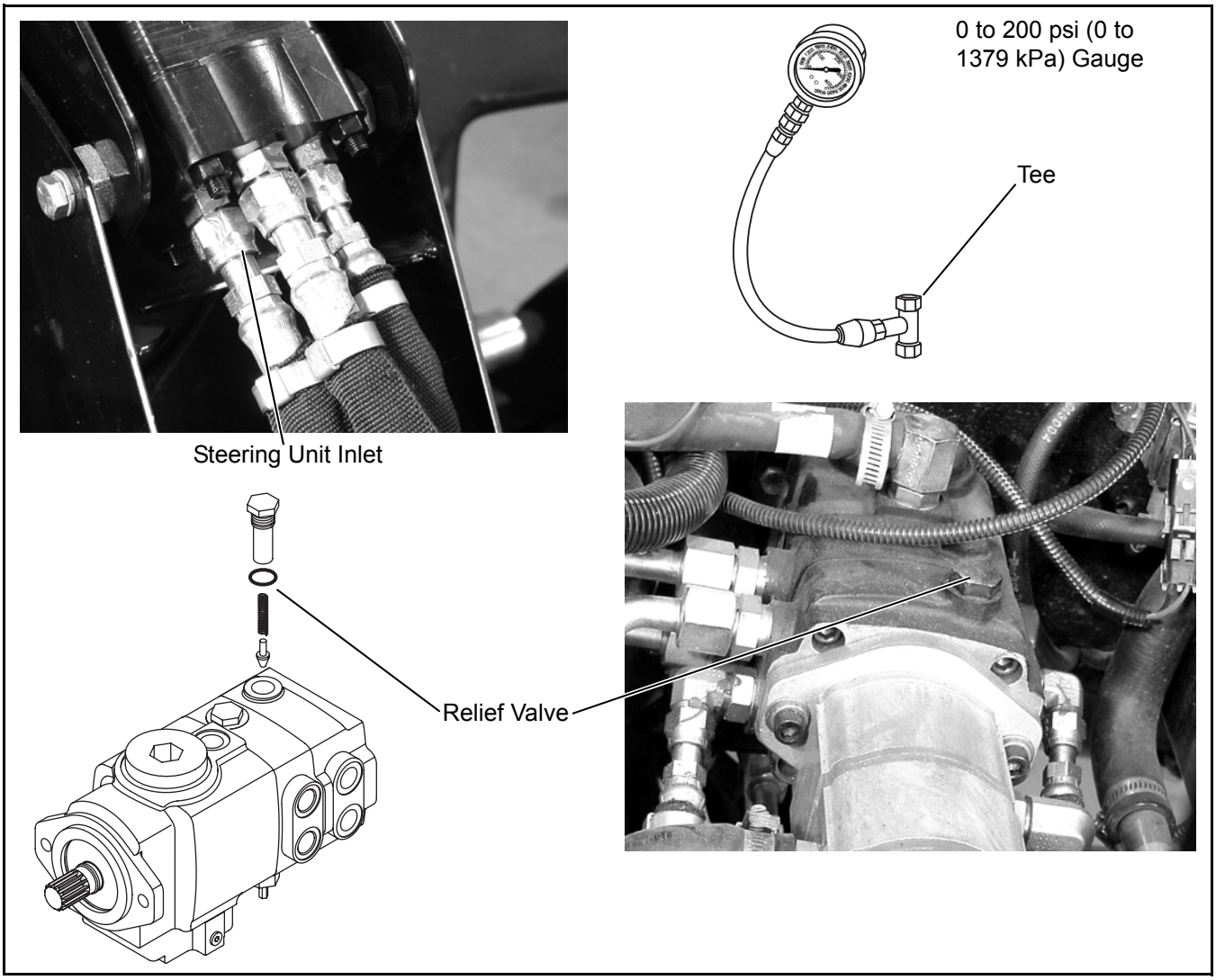


Figure 8O-2. Charge Pressure Test

STEERING CIRCUIT TEST

NOTE:

Check charge pressure before performing the steering circuit test.

1. Shut down the engine.
2. Install a 2000-psi (13790 kPa) pressure gauge and in-line tee between the steering unit outlet and the supply hose, see Figure 8O-3.
3. Set the parking brake, start engine, and advance engine speed to full throttle position.
4. Record the pressure gauge reading. The charge pressure should be 850 to 1160 psi (372 to 7998 kPa), see Figure 8O-3.

Conclusion

- If relief valve opens within range, relief and steering are not at fault.
- If relief pressure is not within range, relief valve should be checked.

5. Shut down the engine and remove the ignition key.

Relief Valve

NOTE:

The charge relief valve cannot be repaired or adjusted. Replace if damaged or faulty (Figure 8O-3).

6. Remove steering system relief valve plug, spring, and cone. Inspect for sediment or debris and damage. Clean or replace as necessary.

If the relief valve is not clogged or damaged:

7. Remove the hydraulic lines from the steering cylinder. Cap the cylinder ports and plug the hydraulic hoses.
8. Set the parking brake, start engine, and advance engine speed to full throttle.
9. Slowly turn the steering wheel until 850 to 1160 psi (5860to 7998 Kpa) is indicated on the pressure gauge.

   If pressure is within range, the steering cylinder is at fault. Repair or replace steering cylinder (see Section 6D).

   If pressure is not within range, the steering unit or charge pump is at fault. Proceed with charge pump flow test.

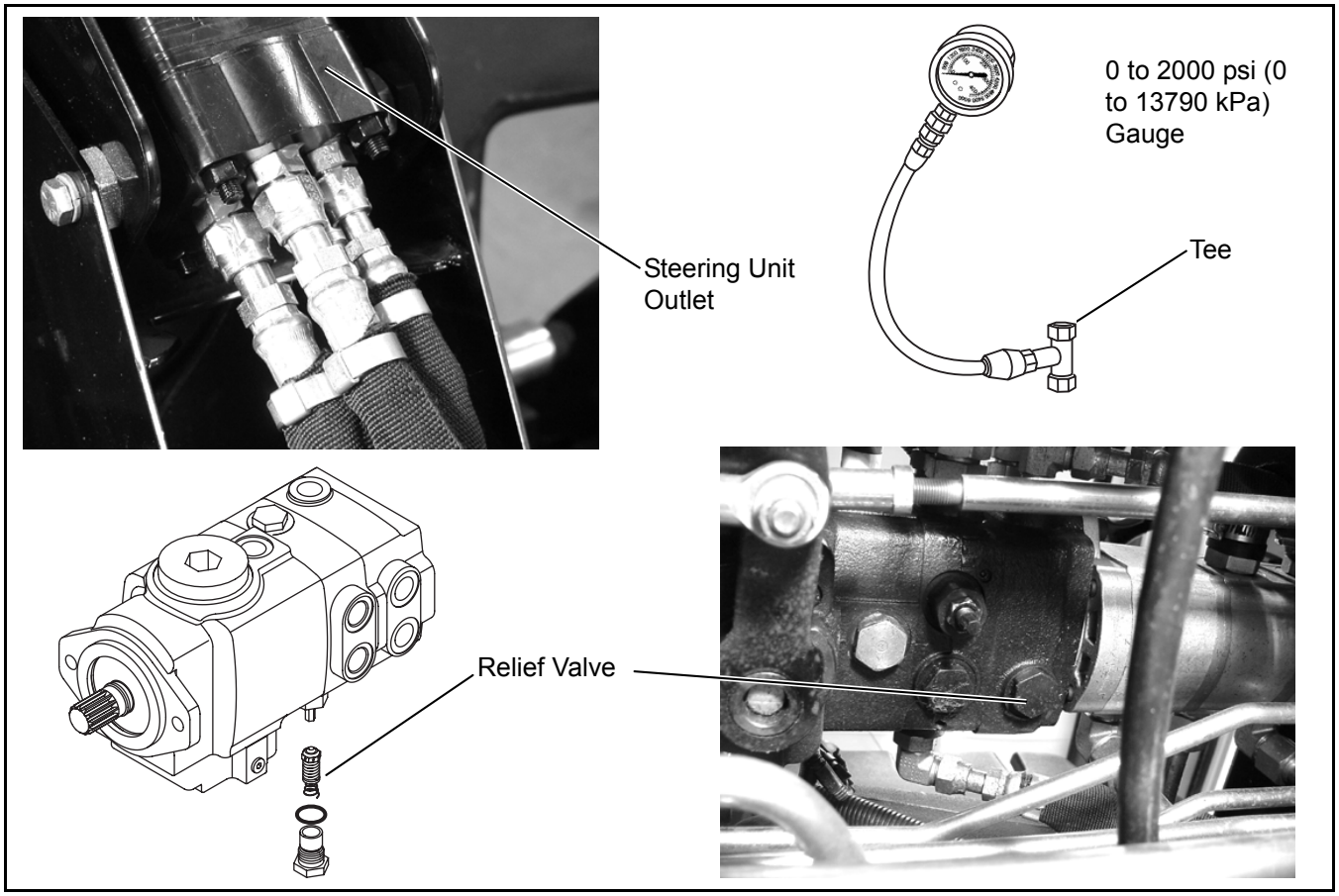


Figure 8O-3. Steering Circuit Test

LIFT CIRCUIT TEST

Lift Circuit

1. Shut down the engine.
2. Install a 2000-psi (13790 kPa) pressure gauge with a quick connect fitting on the quick fitting located on the lift valve; see Figure 8O-4.
3. Set the parking brake, start the engine, and advance the engine speed to full throttle.
4. Using the joystick, lift the reels completely.
5. While watching the pressure gauge place the joystick in the raise position. As the lift cylinder deadends the pressure gauge should read approximately 1500 psi (10,335 kPa).

Conclusion

- If the relief valve opens within range, relief valve and lift circuit are not at fault.
- If the relief valve exceeds range, replace the relief valve.
- If the relief valve does not reach range, the reel (auxiliary) hydraulic pump may be at fault. Proceed to with test.

⚠ CAUTION

The plugs inserted in the lift cylinder hoses must be able to withstand the maximum lift cylinder pressure.

6. Shut down the engine and remove the ignition key.
7. Remove the hydraulic hoses from the lift cylinders (Figure 8O-4) and plug the hoses. Cap the lift cylinder ports.
8. While watching the pressure gauge place the joystick in the raise position. As the lift cylinder deadends the pressure gauge should read approximately 1500 psi (10,335 kPa).

Conclusion

- If the relief valve opens within range, a lift cylinder is at fault. Isolate the cylinder by shutting down the engine and removing the plugs from one lift cylinder at a time and repeating Step 8.
- If the relief valve does not reach range, perform a reel (auxiliary) hydraulic pump flow test.

9. Remove plugs and caps and connect hoses to the lift cylinders.

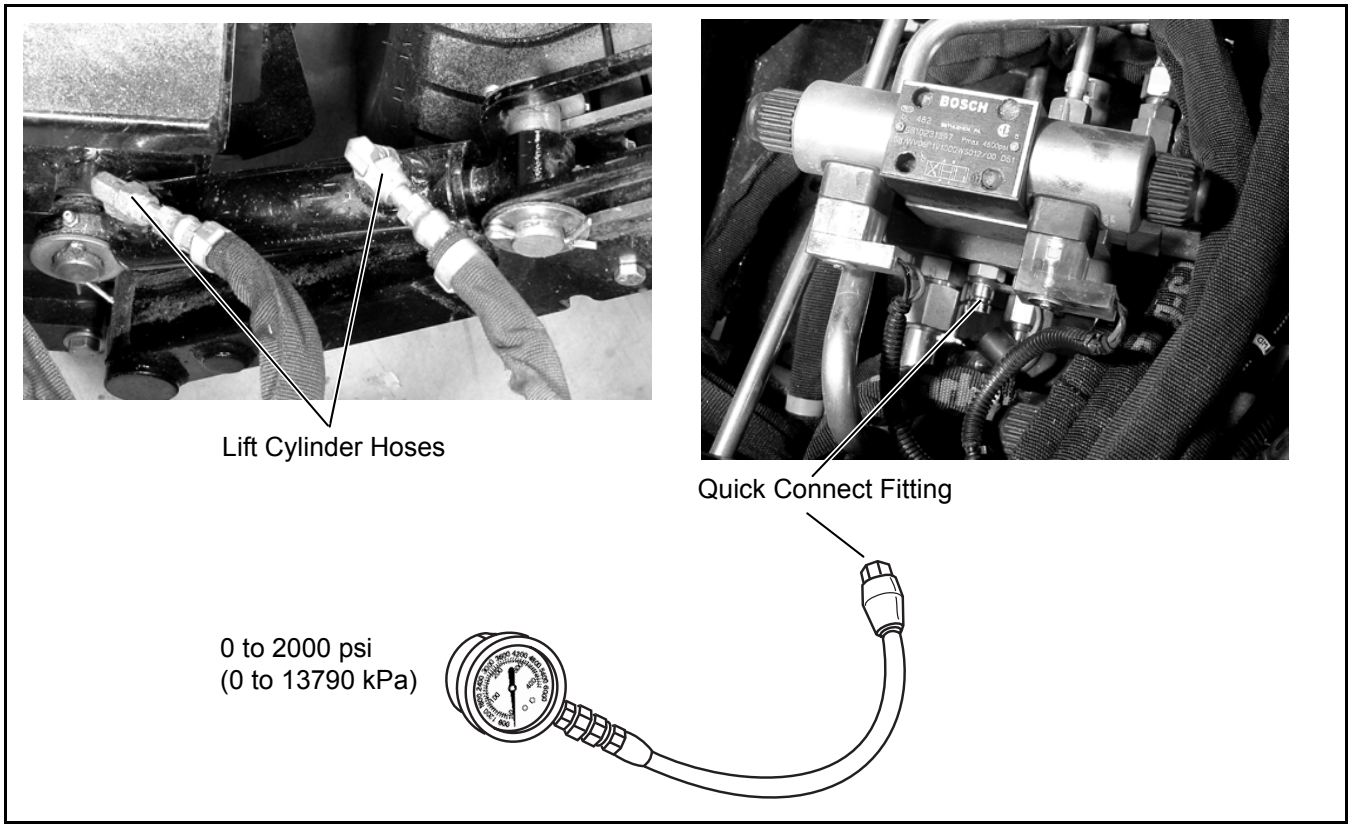


Figure 8O-4. Lift Circuit Testing

Lower Circuit

10. Using the joystick, lower the reels completely.
11. While watching the pressure gauge (Figure 8O-5), place the joystick in the lower position. The relief lower relief valve should open at approximately 500 psi (3445 kPa).

Conclusion

- If the relief valve opens within range, the lower relief valve is not faulty.
- If the relief valve does not open within range, replace the lift valve.

12. Remove the gauge and cover the quick connect port with the rubber cover (Figure 8O-5).

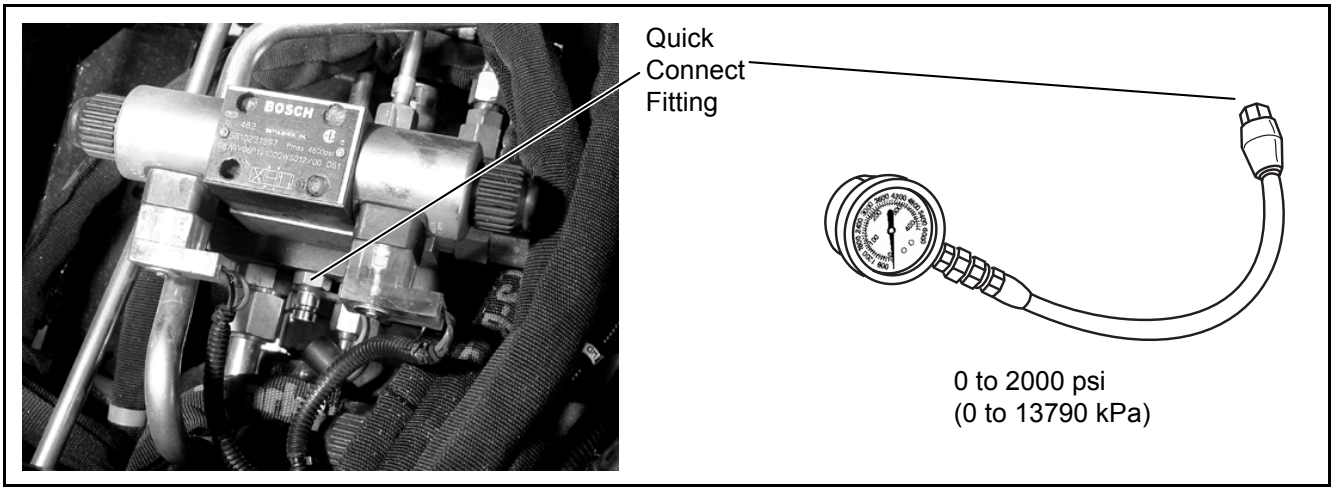


Figure 8O-5. Lower Circuit Testing

REEL MOTOR TEST

The reel motors can be tested at the reel motor control valves. There are two reel motor control valves. One valve controls the front reels while the other controls the center reels. The test for each valve is identical.

1. Shut down the engine and remove the ignition key.
2. Install a 3000 psi (2067 bar) pressure gauge with a quick connect fitting to the quick connect fitting on the reel motor control valve (Figure 8O-6).

⚠ CAUTION

The plugs inserted into the reel motor hoses must be able to withstand the maximum pressure developed by the reel motor system.

3. Remove the pressure hoses from the reel motor. Plug the hoses and cap the motor ports (Figure 8O-6).
4. Set the parking brake and start the engine.
5. Place the reel motors in the forward (ON) position.
6. While watching the pressure gauge, advance the engine speed to full throttle.

⚠ CAUTION

Do not allow the system to develop more that 3500 psi (2411 bar) hydraulic pressure.

7. The relief valve should open at approximately 3000 psi (2067 bar).

Conclusion

- If the relief valve opens within range, the relief valve and reel (auxiliary) hydraulic pump are not at fault. A reel motor may be at fault. Remove the plugs and connect the hoses to the reel motors one at a time and repeat steps 4 through 7.
- If the relief valve does not open within range, replace the relief valve.
- If the relief valve does not develop pressure within range, perform a flow test on the reel (auxiliary) hydraulic pump.

8. Shut down the engine, remove the gauge, place the dust boot on the quick connect fitting.
9. Remove plugs from the reel motor hoses and caps from the reel motors. Connect the hydraulic hoses to the reel motor fittings.
10. If necessary, repeat the test on the other reel control valve.

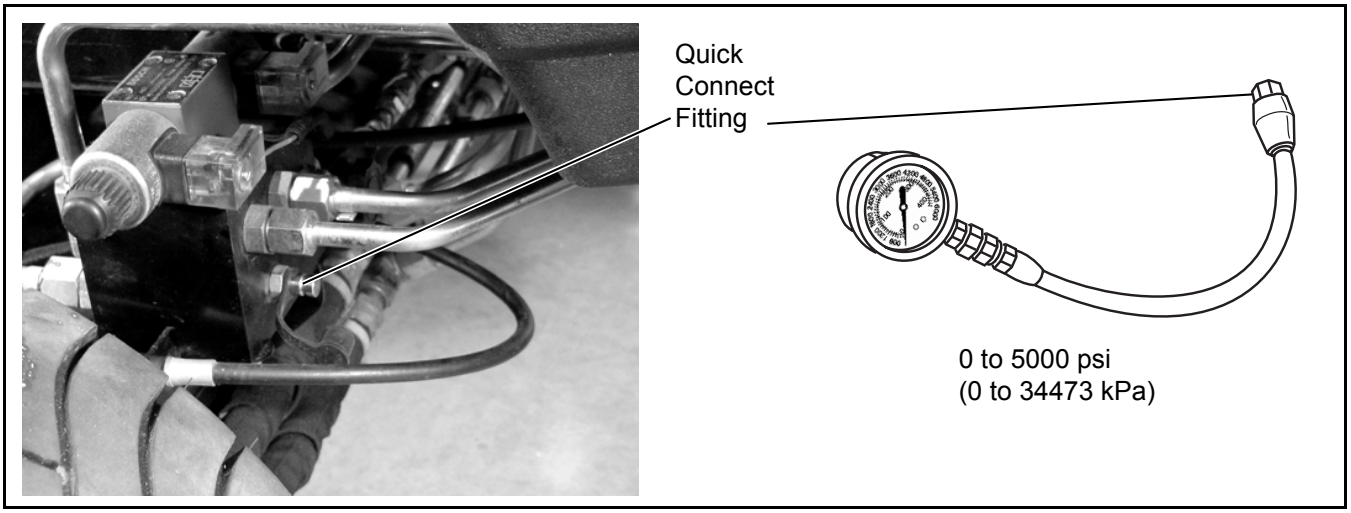


Figure 8O-6. Reel Motor Control Valve Testing

FLOW TESTS

Follow the directions for each test carefully. The hydraulic oil must be at normal operating temperature before performing the test to ensure proper test results.

Read and understand the flow meter directions and instructions before attempting to test the hydraulic system (Figure 8O-7).

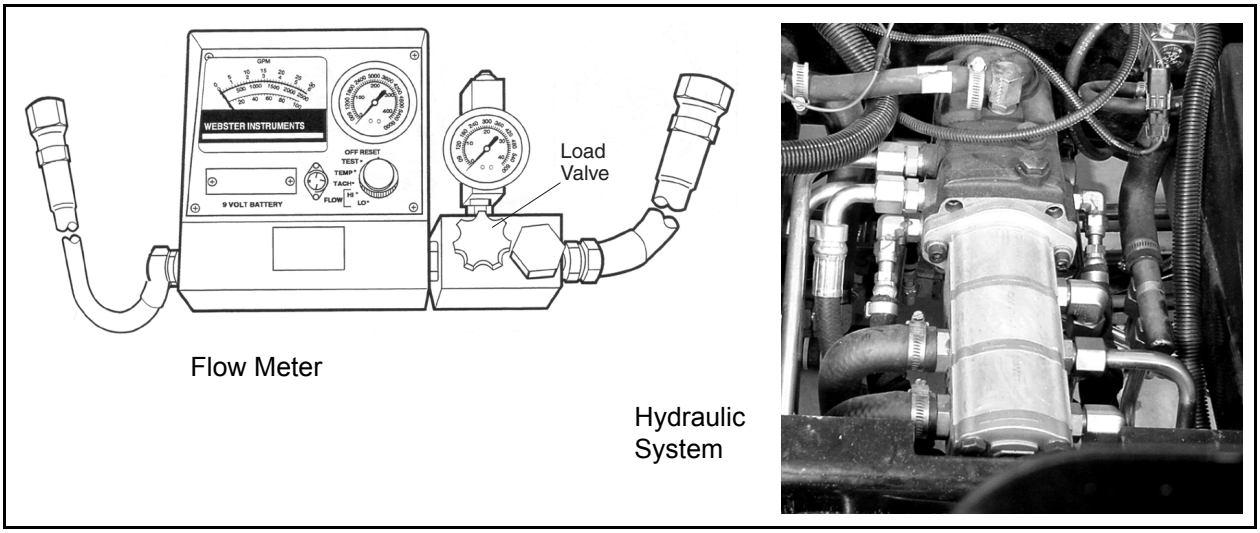


Figure 8O-7. Flow Meter and Hydraulic System

Charge Pump Test

The hydrostatic charge pump supplies oil flow to the steering unit and traction circuit.

1. Shut down the engine and remove the ignition key.
2. Connect the flow meter IN port to the charge pump outlet fitting on the traction pump (Figure 8O-8).
3. Connect flow meter OUT port to the charge pump outlet hose (Figure 8O-8).
4. Open the tester load valve, set the parking brake, start the engine, and advance the engine speed to full throttle.
5. Record the charge pump no load flow indication (a).
6. Slowly close tester load valve until a reading of 1000 psi (6894 kPa) is obtained, record flow indication (b).
7. Subtract flow indication (b) from flow indication (ba. The result is the charge pump leakage.

Conclusion

- If leakage is less that ½ gpm (3.8 lpm), pump is not at fault. Continue test.
- If leakage is ½ to 1 gpm (3.8 lpm), pump and/or charge relief valve is marginal. Continue test.
- If leakage is 1 gpm (3.8 lpm) charge pump and/or steering circuit relief may be faulty. Continue test.

⚠ CAUTION

Do not exceed 1250psi (8618 kPa) during the following test.

8. Slowly close tester load valve until flow drops off and pressure stays constant. This is the steering relief setting which should be 1160 psi (7992 kPa) +/- 10%.

Conclusion

- If relief pressure is within range, relief and pump are not at fault.
- If flow and pressure drop off before reaching range, steering relief or charge pump may be at fault.

NOTE:

The steering relief valve must be replaced as an assembly.

9. Open tester load valve.

Steering Circuit Test

10. Turn steering wheel completely to the right and then to the left and hold at each stop. Record pressure reading in each postion.

Conclusion

- If relief pressure is 1160-psi (7992 kPa) +/- 10%, steering relief valve is not at fault.
- If relief pressure is not within range in one or both directions, the steering relief valve or steering cylinders may be faulty.

11. Remove test equipment and connect hose to traction pump.

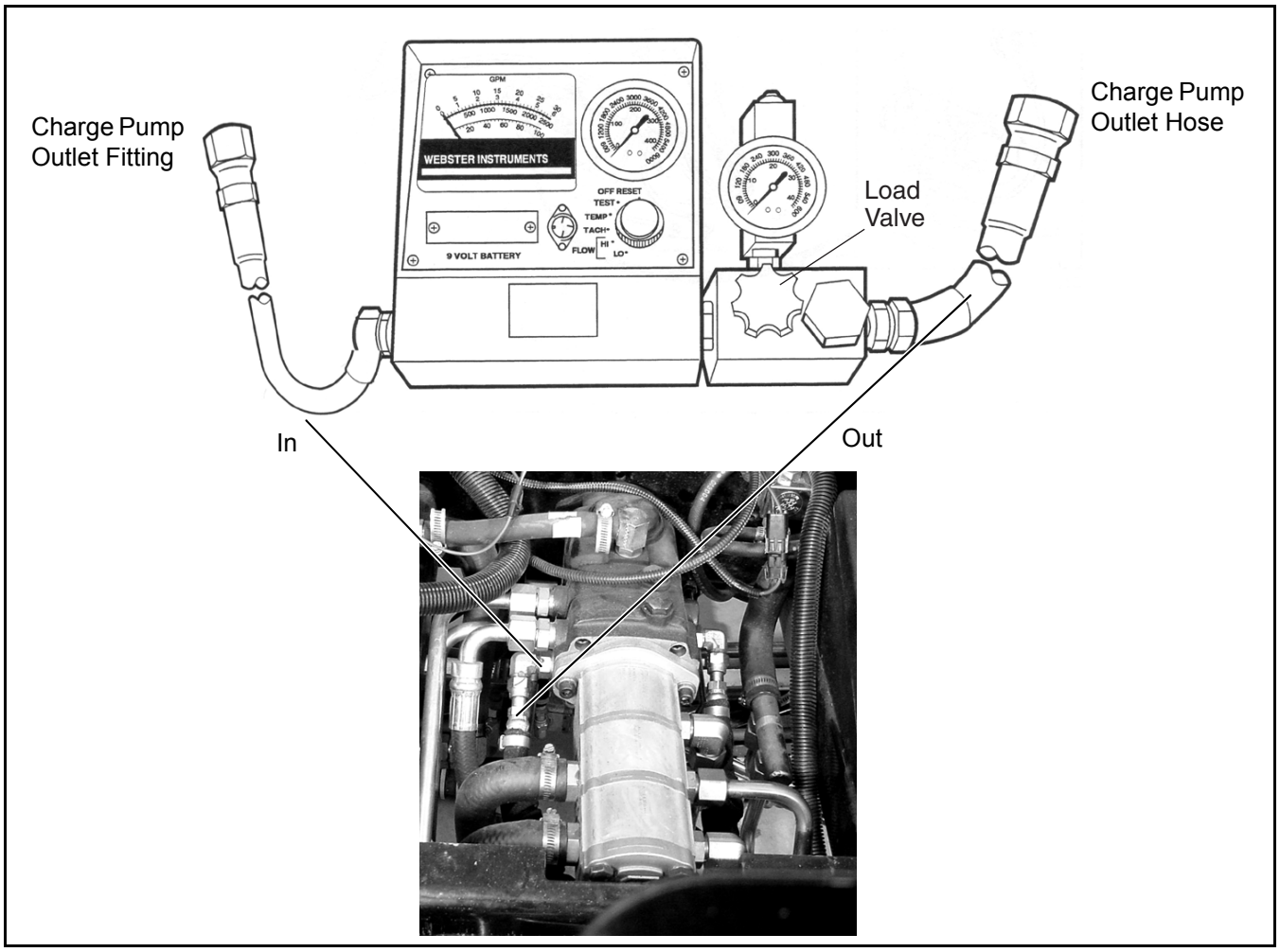


Figure 8O-8. Charge pump Test

Front Reel Valve Test

Section one of the triple gear pumps supplies hydraulic flow to the front reel valve.

1. Shut down engine and remove ignition key.
2. Connect the flow meter to the reel (auxiliary) hydraulic pump section one. Connect the flow meter IN port to the section one pressure fitting and the flow meter OUT port to section one pressure hose (Figure 8O-9).
3. Set parking brake, start engine, and advance engine speed to full throttle.
4. Record pump section one no load flow indication (c).
5. Slowly close tester load valve until 1000 psi (6894 kPa) is indicated on the pressure gauge. Record flow indication (d).
6. Subtract flow indication (d) from flow indication (c). The result is section one pump leakage.

Conclusion

- If leakage is less that ½ gpm (1.9 lpm), pump is not at fault.
- If leakage is ½ to 1 gpm (1.9 to 3.8 lpm), pump and/or reel valve circuit relief is marginal.
- If leakage is 1 gpm (3.8 lpm) pump and/or reel valve circuit relief may be faulty.

7. Shut down the engine and remove the ignition key.
8. Remove test equipment and connect hose to pump.

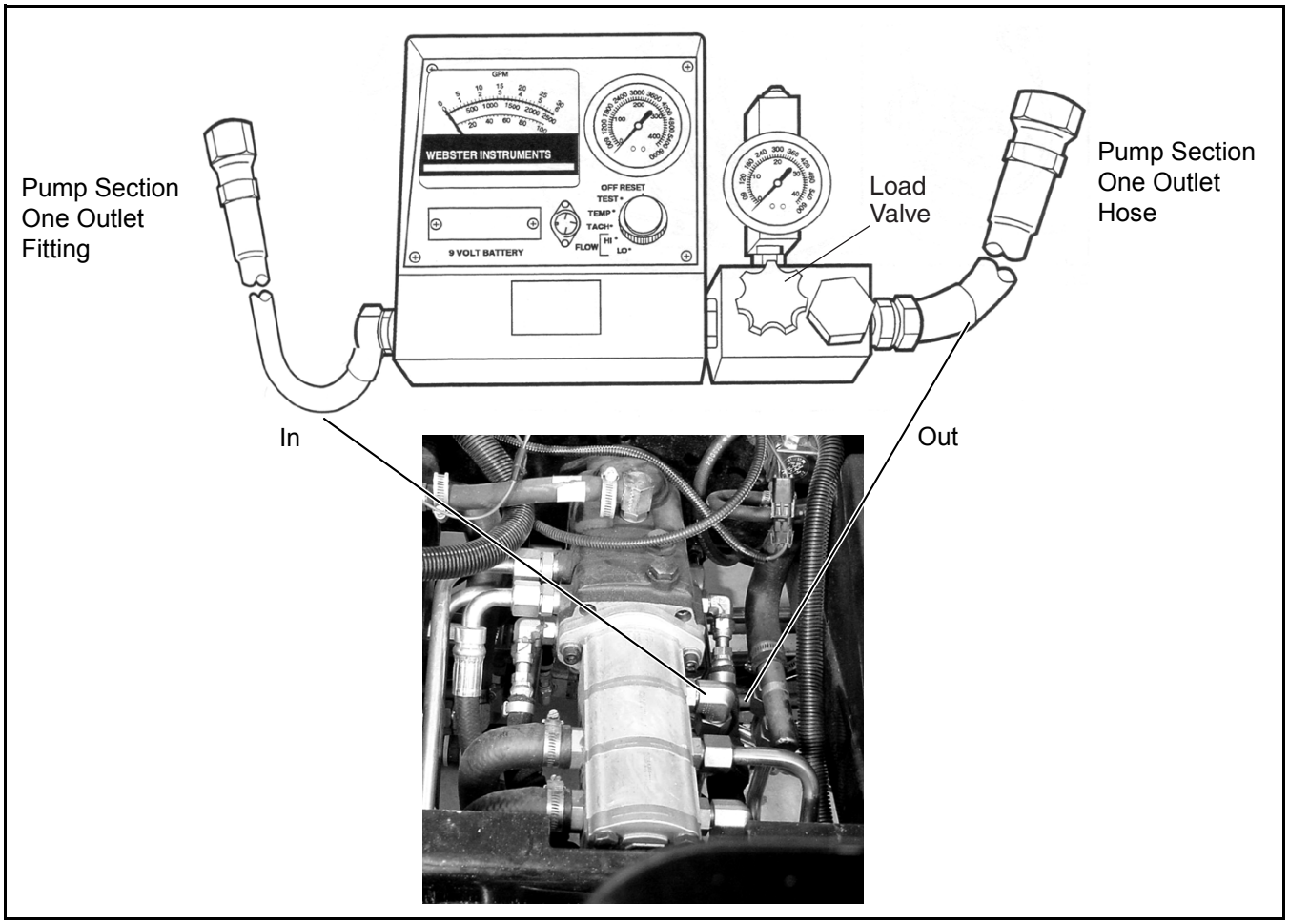


Figure 8O-9. Front Reel Pump Test

Rear Reel Valve Test

Section two or mid-section of the reel (auxiliary) hydraulic pump supplies hydraulic flow to the rear reel valve.

1. Shut down engine and remove ignition key.
2. Connect the flow meter to the reel (auxiliary) hydraulic pump section two. Connect the flow meter IN port to the section two-pressure fitting and the flow meter OUT port to the section two pressure hose (Figure 8O-10).
3. Set parking brake, start engine, and advance engine speed to full throttle.
4. Record pump section two no load flow indication (e).
5. Slowly close tester load valve until 1000 psi (6894 kPa) is indicated on the pressure gauge. Record flow indication (f).
6. Subtract flow indication (f) from flow indication (e). The result is section two pump leakage.

Conclusion

- If leakage is less that ½ gpm (1.9 lpm), pump is not at fault.
- If leakage is ½ to 1 gpm (1.9 to 3.8 lpm), pump and/or reel valve circuit relief is marginal.
- If leakage is 1 gpm (3.8 lpm) pump and/or reel valve circuit relief may be faulty.

7. Shut down the engine and remove the ignition key.
8. Remove test equipment and connect hose to pump.

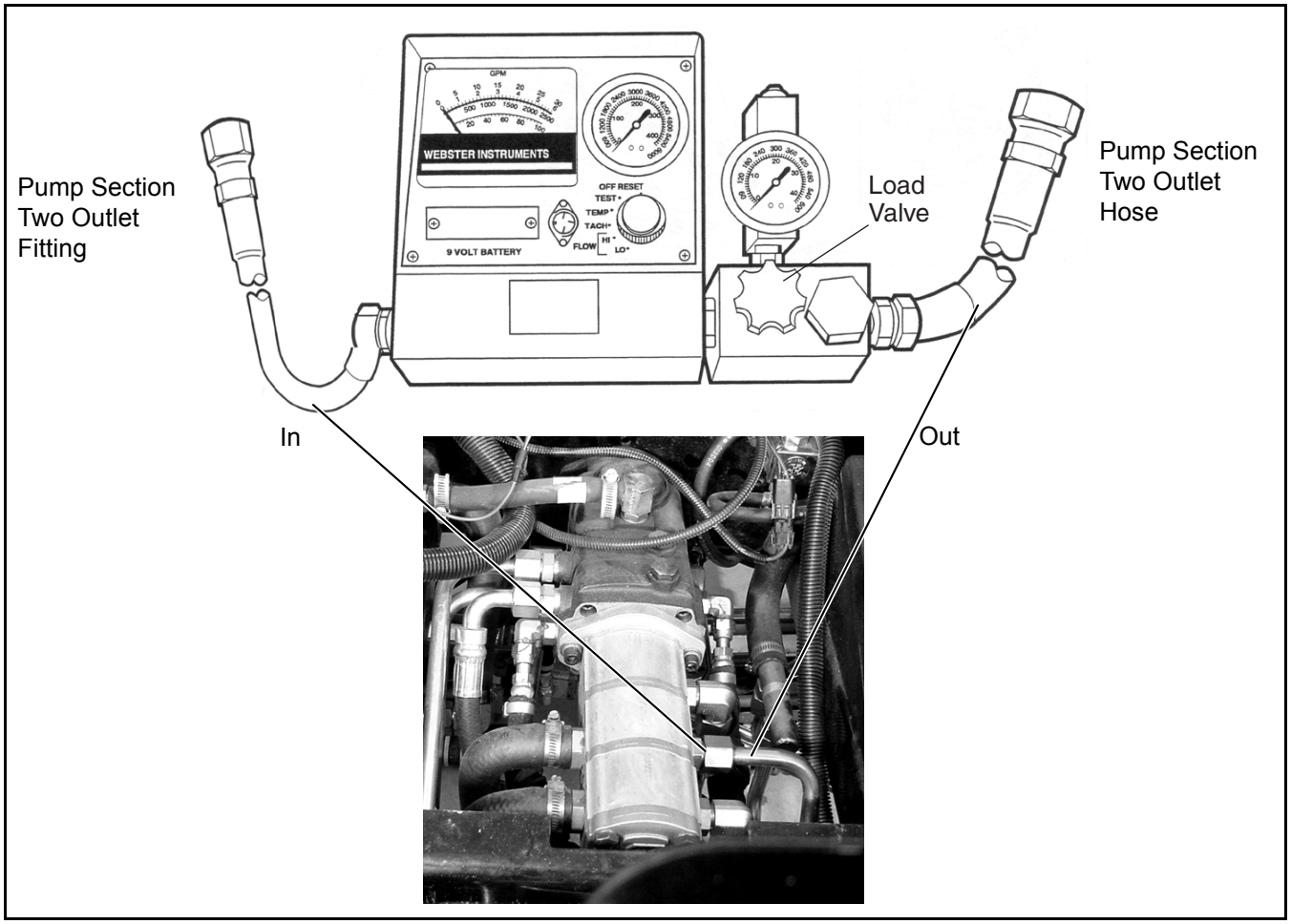


Figure 8O-10. Rear Reel Pump Test

Lift/Lower Valve Test

Section three of the reel (auxiliary) hydraulic pump supplies hydraulic flow to the lift valve.

1. Shut down engine and remove ignition key.
2. Connect the flow meter to the reel (auxiliary) hydraulic pump section three. Connect the flow meter IN port to the section three-pressure fitting and the flow meter OUT port to the section three pressure hose (Figure 8O-11).
3. Set parking brake, start engine, and advance engine speed to full throttle.
4. Record pump section three no load flow indication (g).
5. Slowly close tester load valve until 1000 psi (6894 kPa) is indicated on the pressure gauge. Record flow indication (h).
6. Subtract flow indication (h) from flow indication (g). The result is section three pump leakage.

Conclusion

- If leakage is less that ½ gpm (1.9 lpm), pump is not at fault.
- If leakage is ½ to 1 gpm (1.9 to 3.8 lpm), pump and/or reel valve circuit relief is marginal.
- If leakage is 1 gpm (3.8 lpm) pump and/or reel valve circuit relief may be faulty.

7. Shut down the engine and remove the ignition key.
8. Remove test equipment and connect hose to pump.

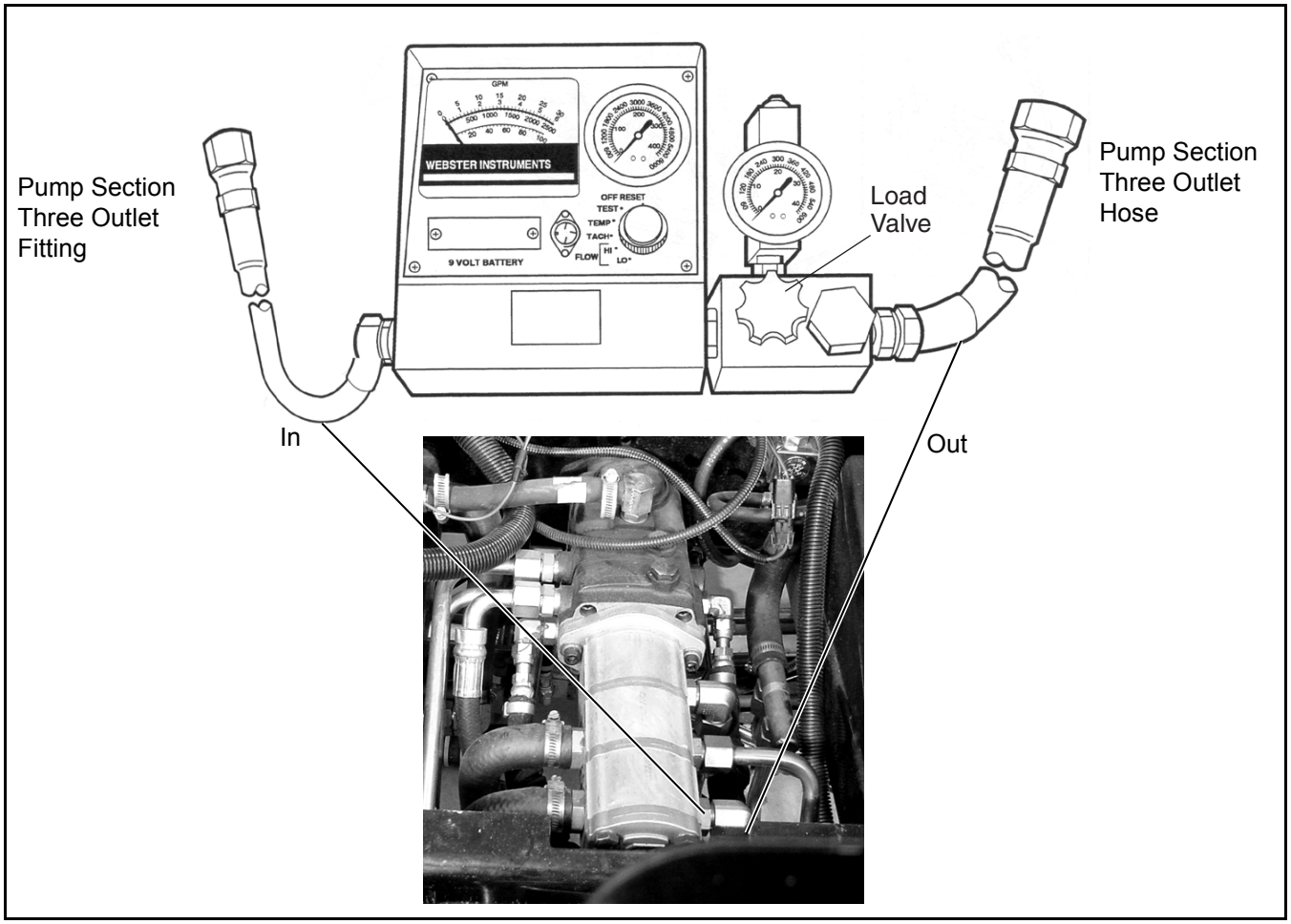


Figure 8O-11. Lift Pump Test

LF-1880 4 WHEEL DRIVE HYDRAULIC FLOW TEST RECORD

LF-1880 4 Wheel Drive Hydraulic Flow Test Record			
Relief Valve Pressure Tests			
Charge Relief	Lift/Lower Pump	Steering Relief	Reel Motor Relief
_____psi	_____psi	_____psi	_____psi
1160 psi (7997 kPa)	1500 psi (1033 bar)	1160 psi (7992 kPa)	3000 psi (2067 bar)
Flow Test Results			
Charge Pump		_____gpm Flow (b) _____gpm Flow (a) _____Leakage	
Lift/Lower Pump		_____gpm Flow (b) _____gpm Flow (a) _____Leakage	
Steering Relief		_____gpm Flow (b) _____gpm Flow (a) _____Leakage	
Steering Relief		_____gpm Flow (b) _____gpm Flow (a) _____Leakage	

Notes/Remarks

SECTION 8P. HYDRAULIC DIAGRAMS AND COMPONENT LOCATIONS

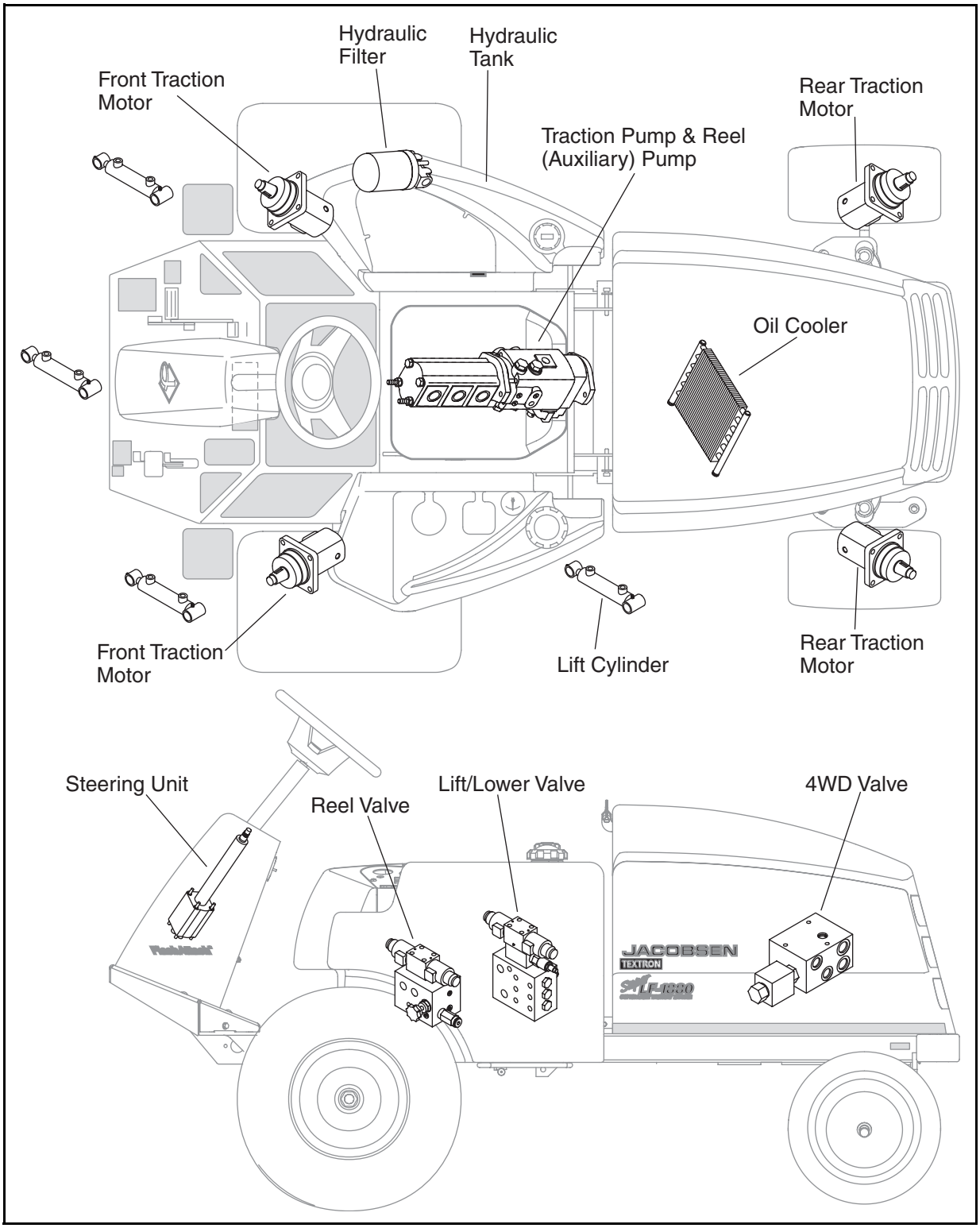


Figure 8P-1. Component Locations

HYDRAULIC SCHEMATIC COLOR CODES

Use the following table to define the color coding used in the hydraulic schematics.

Table 8P-1: Hydraulic Color Guide

Color	Code
Green	Suction
Blue	Return/Free Flow
Yellow	Metered Oil (Orifices)
Orange	Charge Pressure
Red	Pressure

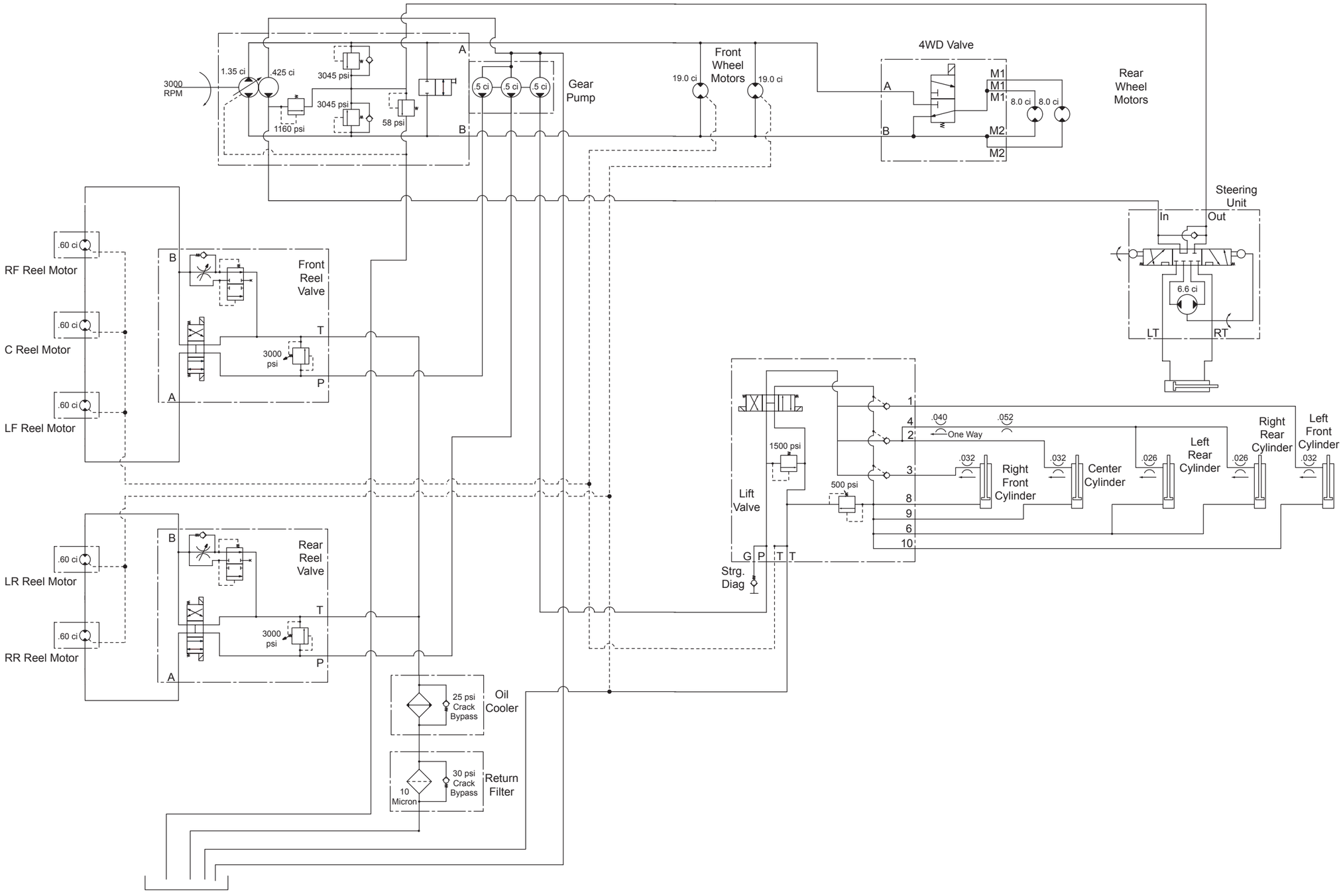


Figure 8P-2. Hydraulic Schematic

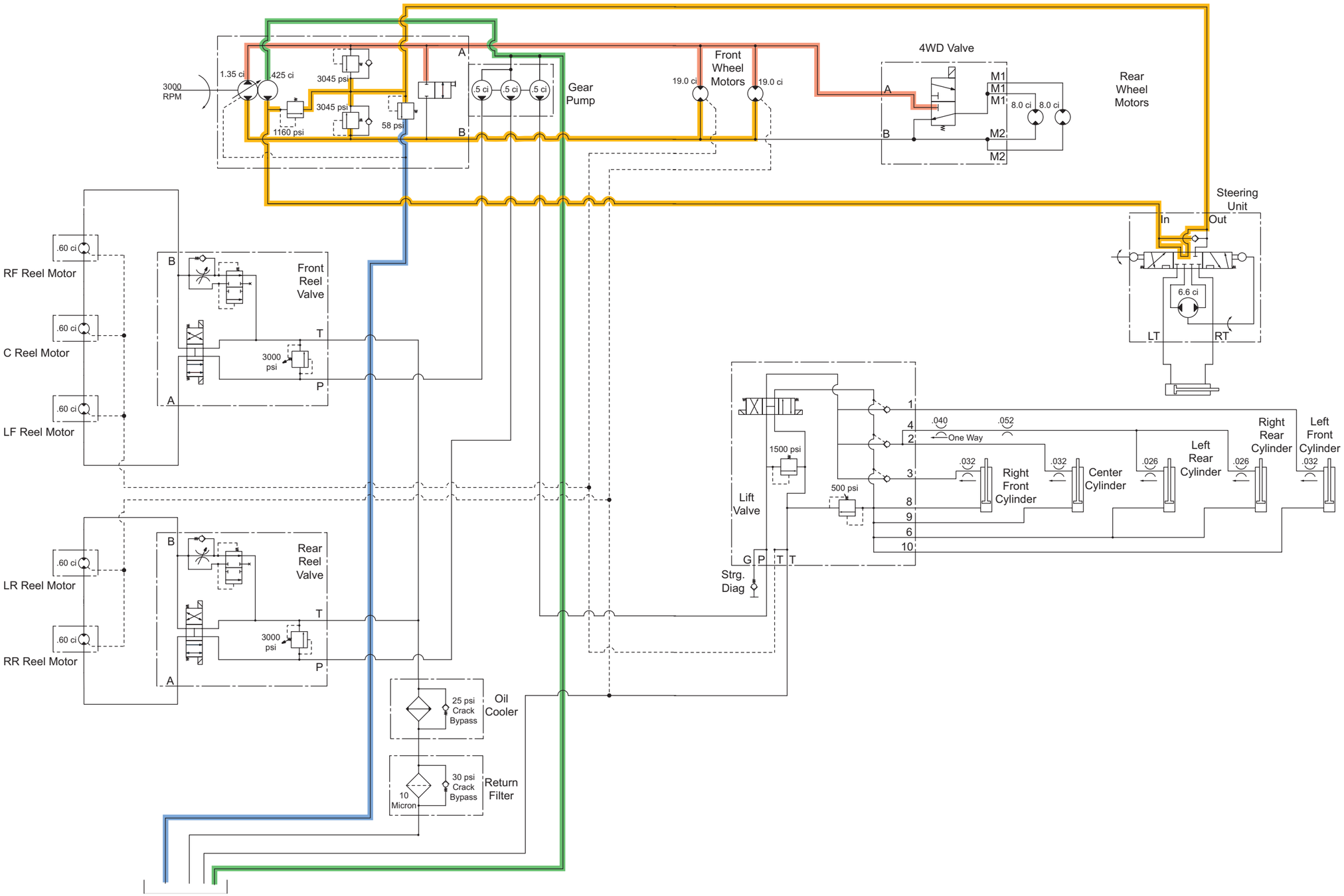


Figure 8P-3. Traction Forward, 2 Wheel Drive

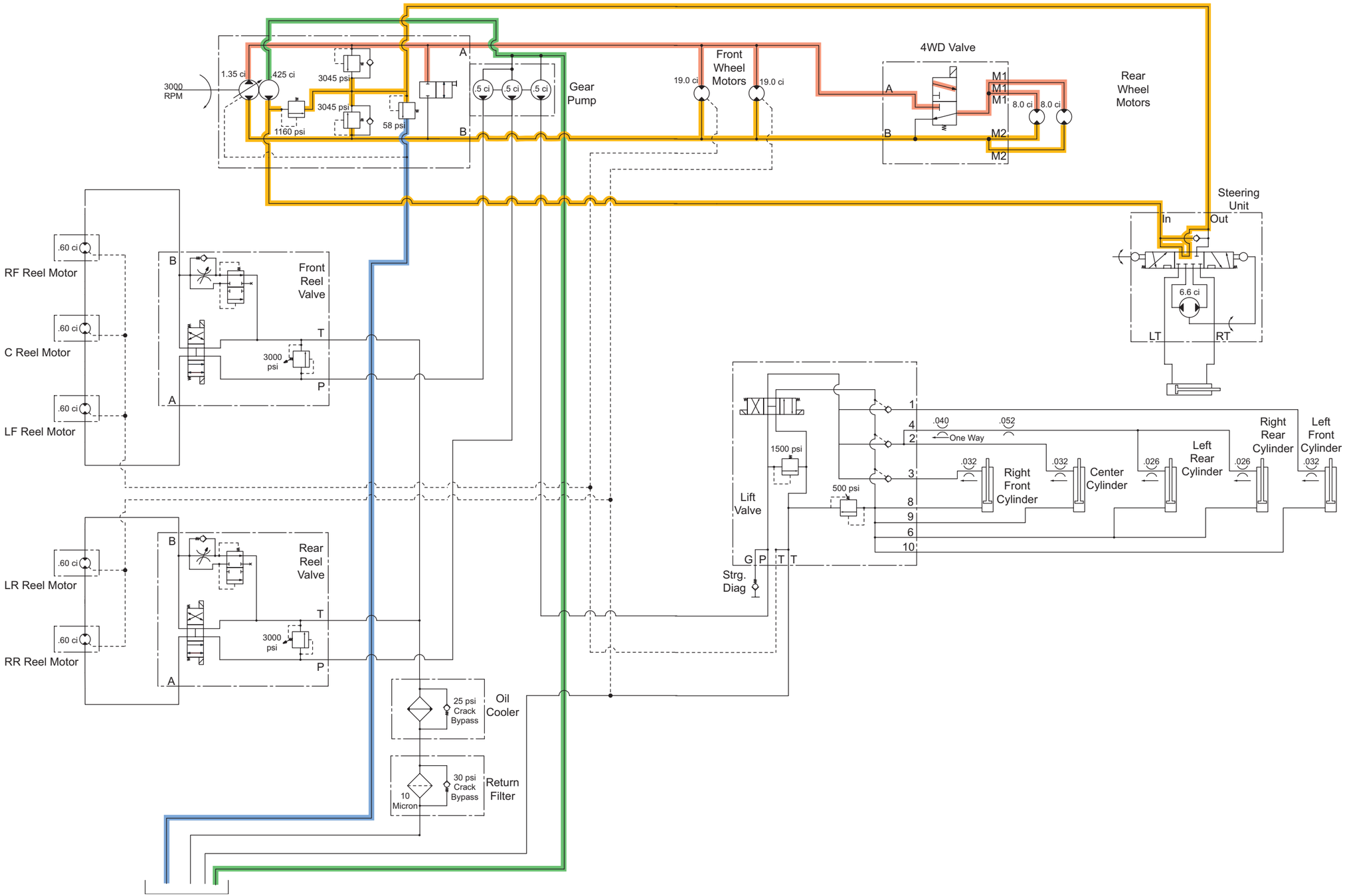


Figure 8P-4. Traction Forward, 4 Wheel Drive

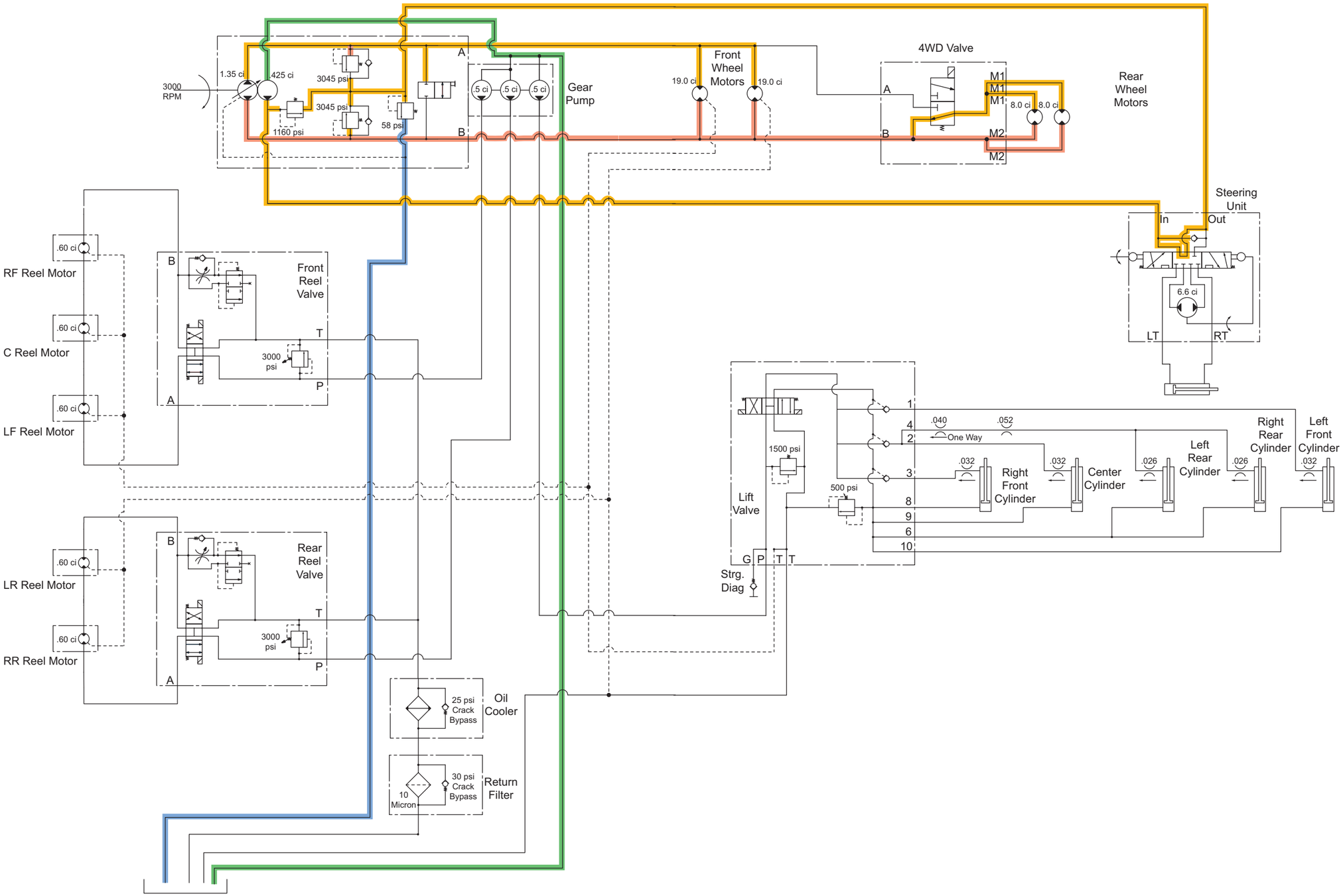


Figure 8P-5. Traction Reverse, 2 Wheel Drive

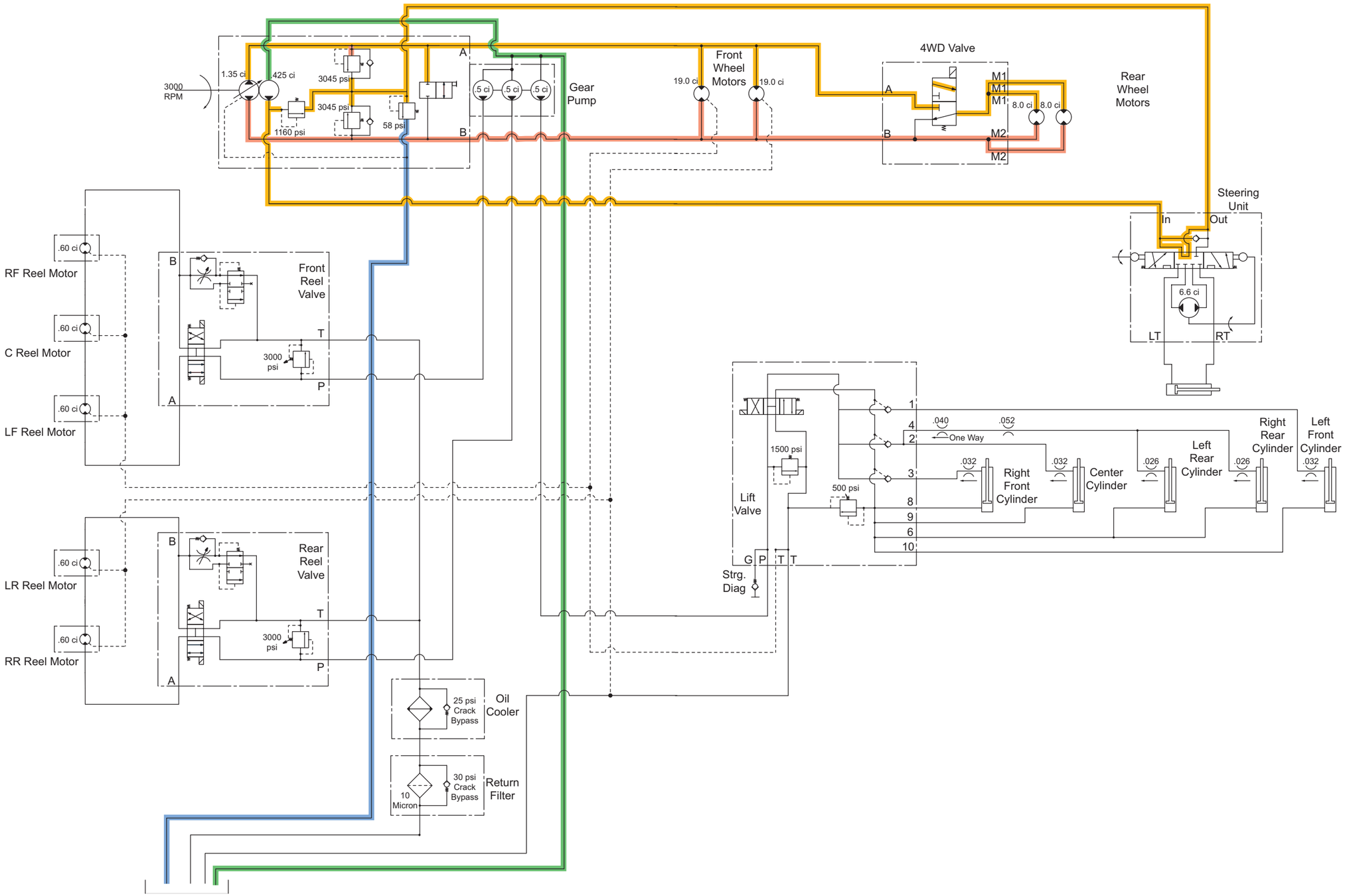


Figure 8P-6. Traction Reverse, 4 Wheel Drive

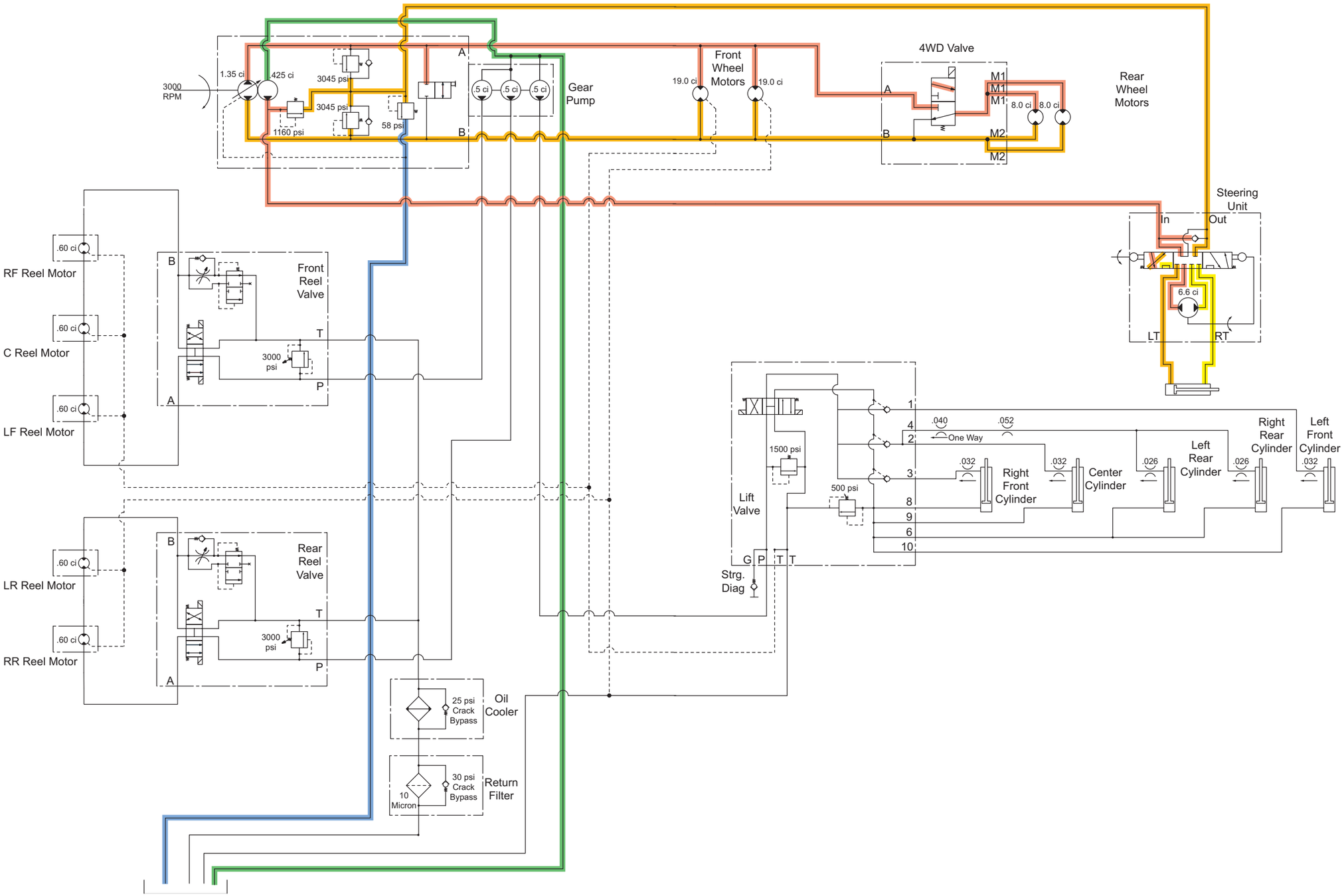


Figure 8P-7. Traction Forward, Right Turn

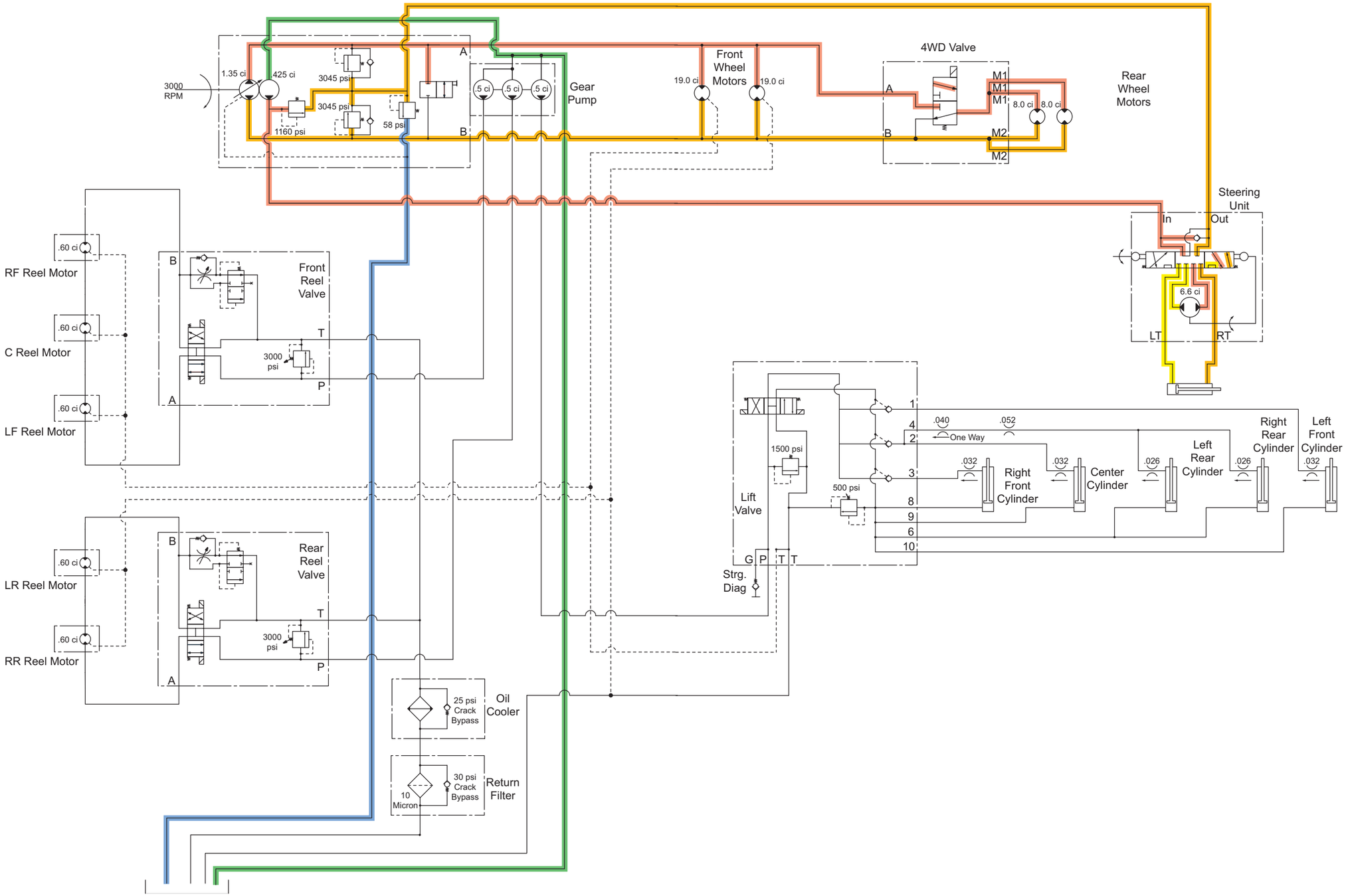


Figure 8P-8. Traction Forward, Left Turn

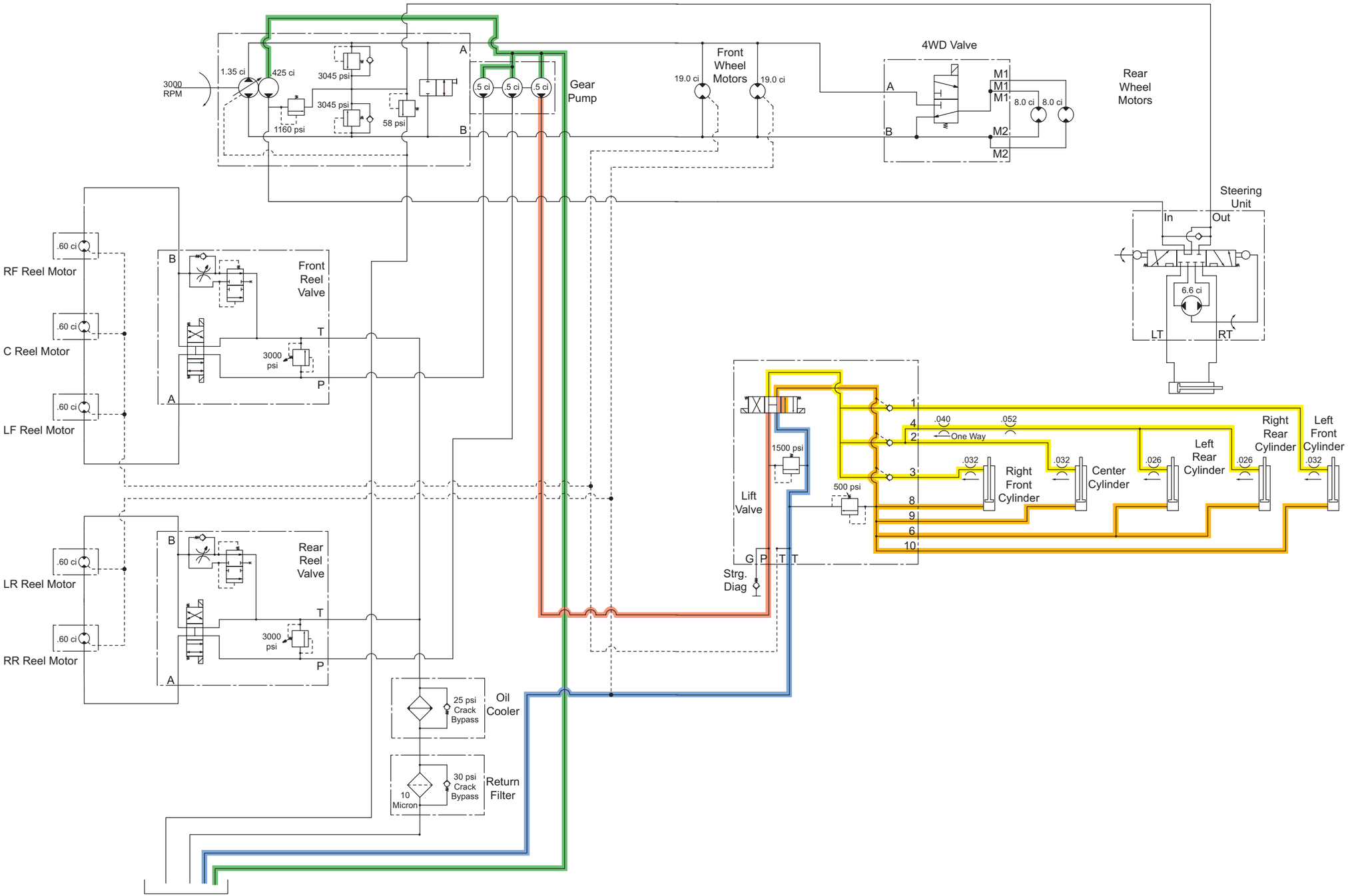


Figure 8P-9. Reel Lift

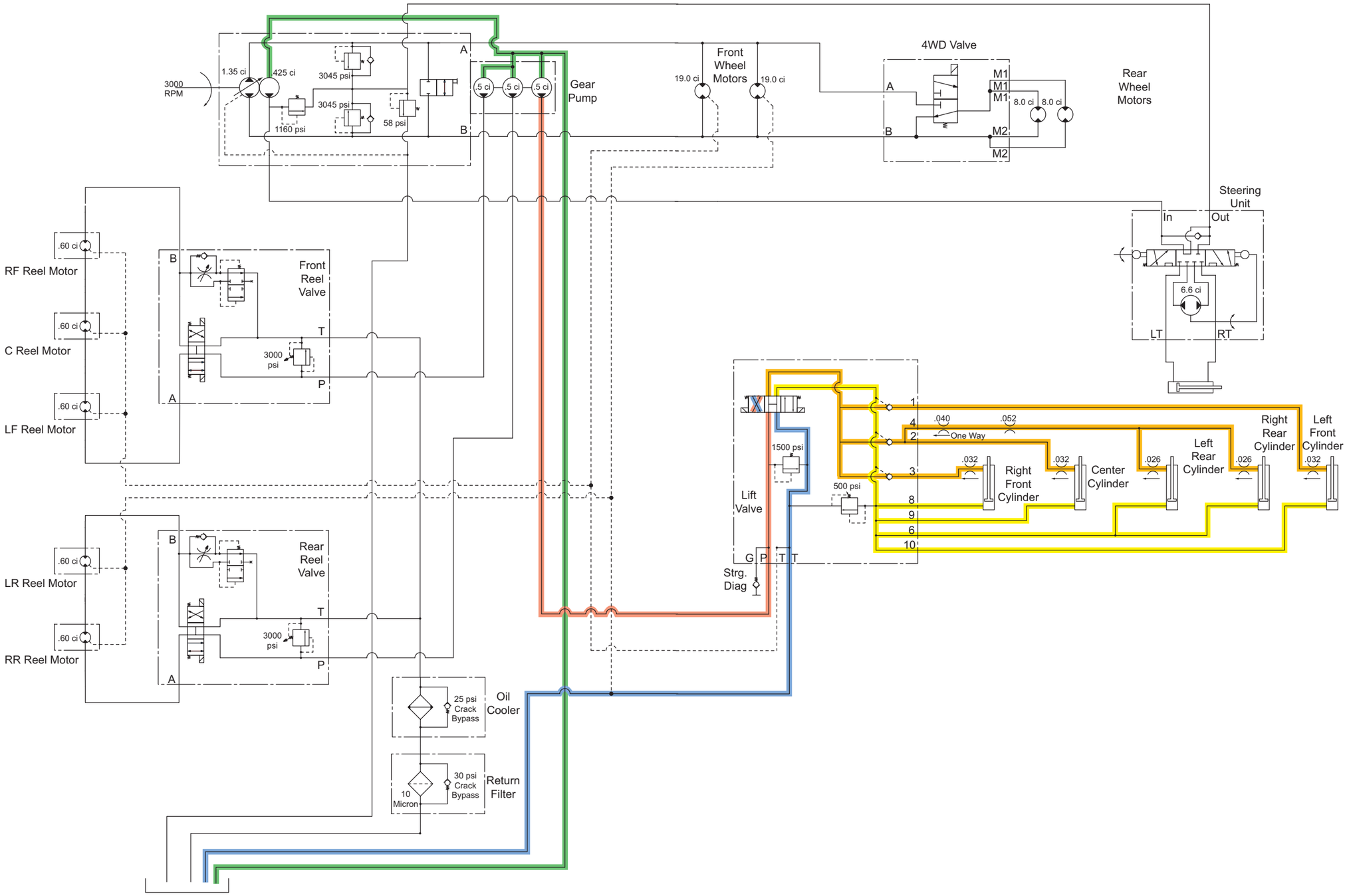


Figure 8P-10. Reel Lower

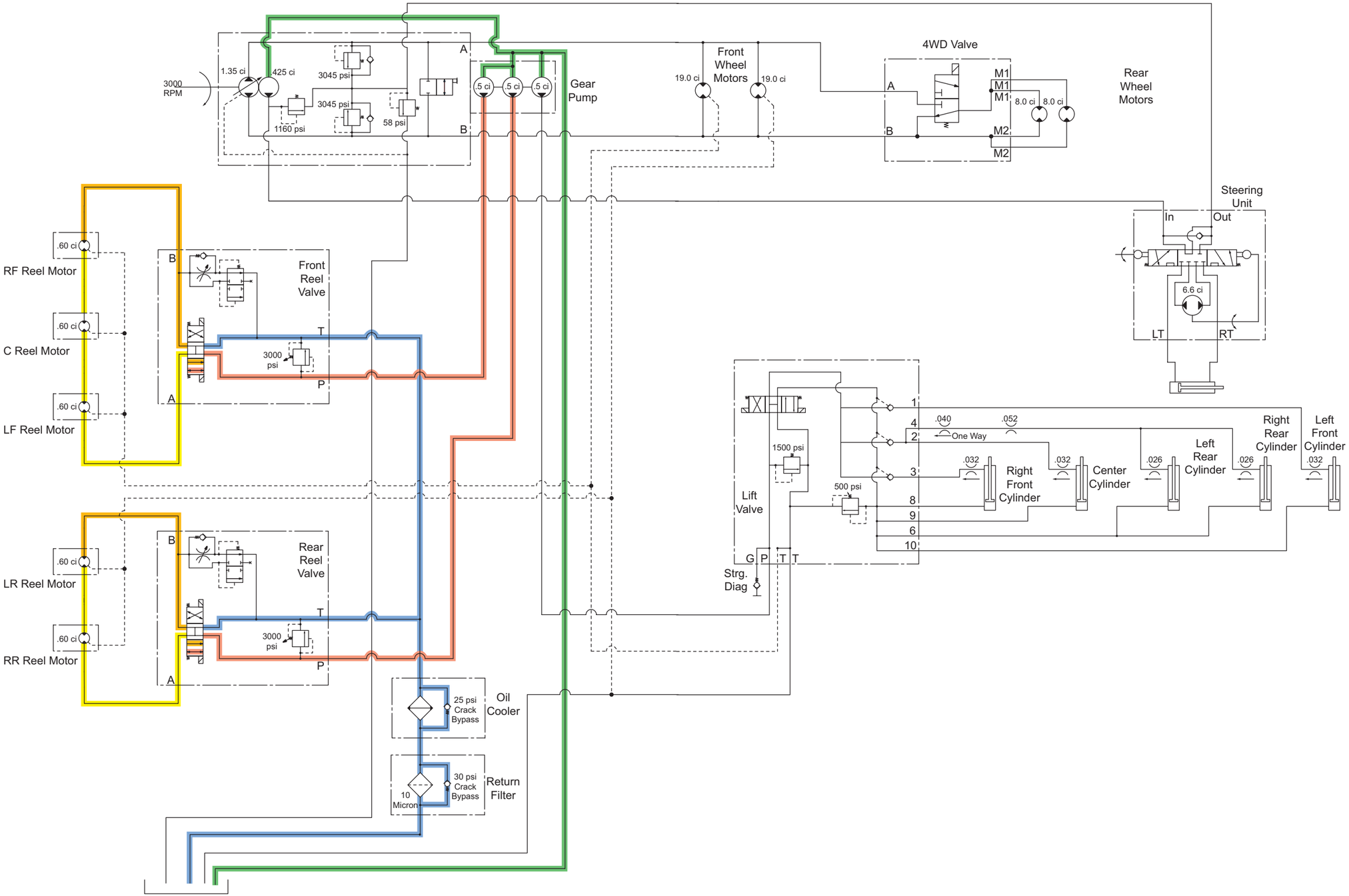


Figure 8P-11. Reels Working

SECTION 9
CHASSIS

SECTION 9A. REPAIR, SERVICE TOOLS, AND MATERIALS

MATERIALS REQUIRED

Tools required:	Standard automotive hand tools including bearing pullers
Cleaning and refinishing materials:	Stoddard solvent or equivalent Detergent and water Paint, Jacobsen orange Paint, Jacobsen black Anti-rust, Never-Seize
Lubricants:	Refer to Section 11

SECTION 9B. FAILURE ANALYSIS

GENERAL

The following table lists common problems, probable causes, and suggested remedies with section references to detailed descriptions of remedial procedures.

PROBLEM	PROBABLE CAUSE	REMEDY
1. Lift/lower functions do not occur when the joystick is actuated	a. Joystick inoperative	a. Check joystick (Section 10G)
	b. Hydraulic lines are kinked	b. Replace lines (Section 8C)
	c. Hydraulic charge pump faulty	c. Test pump (Section 8N or Section 8O)
	d. Hydraulic cylinder is not functioning	d. Test cylinder (Section 8N or Section 8O)
	e. Lift and lower control valve is malfunctioning	e. Test valve (Section 8L, Section 8N, or Section 8O)
2. Slow or noisy drive or lift lower operation	a. Low fluid level in hydraulic tank	a. Fill tank, check for hydraulic leaks
	b. Loose hose connections	b. Tighten connections (Section 8C)
	c. Air in system	c. Bleed system
	d. Steering relief too low	d. See Section 8O

SECTION 9C. FUEL TANK

GENERAL

The fuel tank is located to the left of the operator. A mechanical fuel level indicator is built into the tank. The fuel tank holds 12 U.S. gallons (45.4 liters). The tank is a single piece molded plastic tank with a vented cap (Figure 9C-1). The tank should require little service other than cleaning unless punctured or otherwise accidentally damaged.

⚠ CAUTION

Diesel fuel is flammable. Do not drain fuel inside. Heaters and static electricity can ignite floating fuel vapors. Use extreme caution when draining fuel.

⚠ CAUTION

Dispose of unwanted fuel properly. Check with the local environmental officials for information on properly disposing of fuel products.

The fuel tank should be drained when the machine is stored for an extensive period of time. A drain valve (Figure 9C-1) located on the bottom of the tank can be used to drain fuel.

REMOVAL

1. Place a suitable container underneath the fuel tank drain valve and open the drain valve. Loosen the fuel cap slightly to aid in draining the fuel.
2. After draining, close the fuel cap and drain valve.

NOTE:

The fuel tank is mounted to the seat pan. The seat and seat pan must be removed to remove the fuel tank. The fuel tank and hydraulic tank are seated on looped frame brackets for support.

3. Remove the seat pan mounting bolts, the fuel tank mounting bolts, and the hydraulic tank mounting bolts.
4. Tag and disconnect the seat interlock switch connector located underneath the seat.
5. Carefully remove the seat and seat pan.
6. Tag and disconnect the fuel return hose and fuel outlet hose. Immediately plug the hoses and tank to prevent contamination of the fuel system.
7. Remove the tank from the frame.

INSTALLATION

1. Position the fuel tank on the frame brackets.
2. Using the tags created during removal, remove the plugs and connect the fuel return hose and outlet hose.
3. Carefully position the seat and seat pan for installation. Using tags created during disassembly, insert the seat wiring harness through the seat pan. Connect the seat interlock switch to the wiring harness.
4. Secure the seat pan mounting bolts.
5. Secure the fuel tank and hydraulic tank with mounting bolts.
6. Make sure the fuel drain is closed and fill the fuel tank with fuel.
7. Inspect the filler cap for wear, damage or clogging and replace if necessary.
8. Refer to Section 3 and the engine Manufacturer's Operation Manual for information on purging the fuel system.

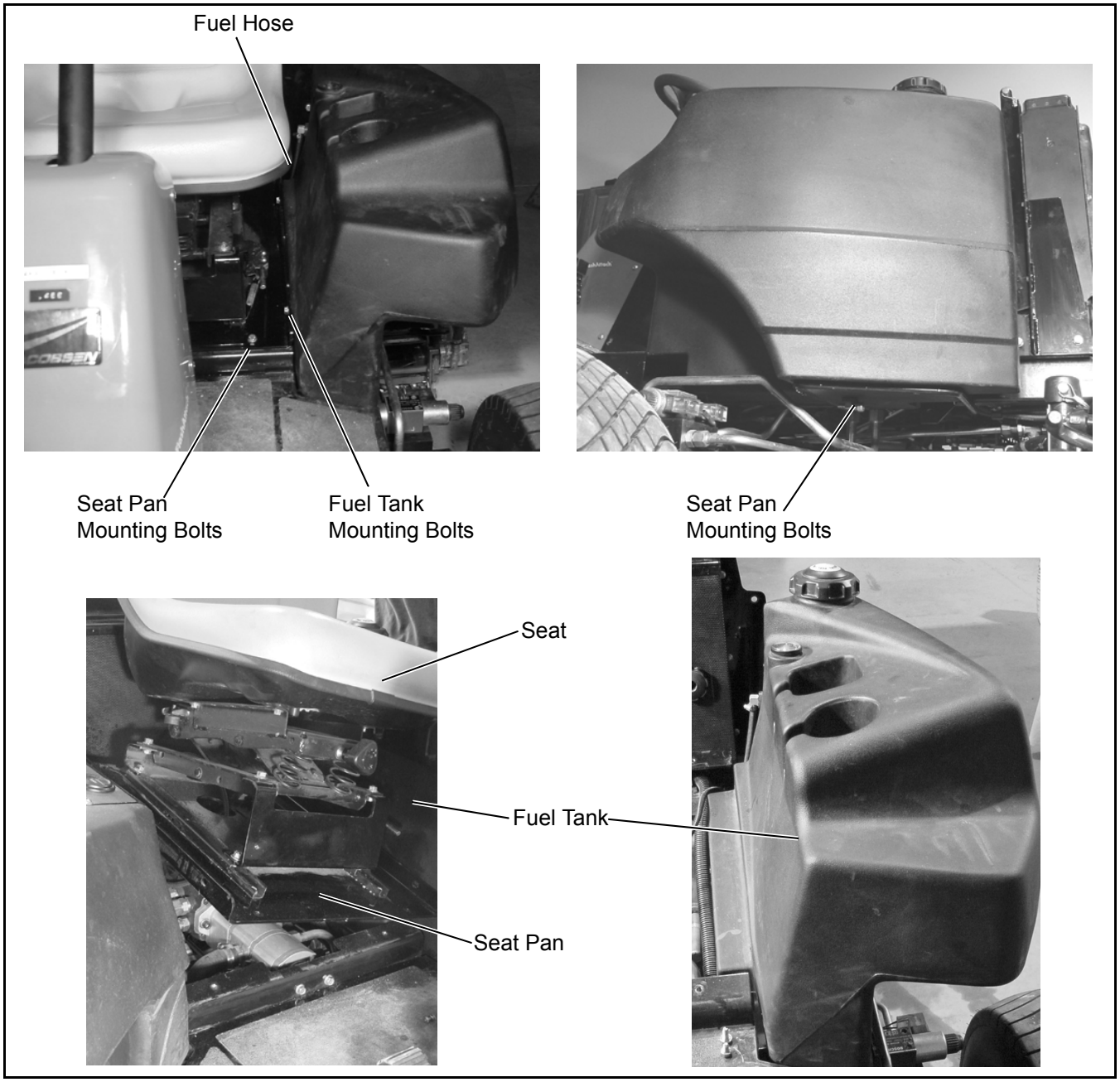


Figure 9C-1. Fuel Tank Removal/Installation

SECTION 9D. HYDRAULIC TANK

GENERAL

The hydraulic tank is mounted to the right of the operator's seat. A plastic cover is mounted over the hydraulic tank and used for mounting the control panel.

The tank is a single piece molded plastic tank with a vented cap that serves as a breather. The tank should require little service other than cleaning unless punctured or otherwise accidentally damaged.

NOTE:

Hydraulic oil expands when hot. Do not check the oil level when the hydraulic oil is hot. Always clean the hydraulic tank before checking the oil level to prevent contamination of the hydraulic system.

A dipstick type level indicator is used to check hydraulic oil level. The oil level should be checked daily. The oil level should never be below the low level mark or more than 0.25 in (6.35 mm) above the high level.

⚠ CAUTION

Do not overfill the hydraulic tank. Overfilling the tank will result in oil leakage through the filler cap breather.

⚠ CAUTION

A damaged filler cap or clogged breather can result in an over-pressurized tank and damage to the hydraulic components or leakage. Inspect the filler cap and breather for wear, damage, or clogging.

Check the filler cap and breather frequently for clogging, wear, and damage.

Check the hydraulic oil for water (noted by a cloudy or milky appearance), air (noted by a foamy appearance), visible contaminants, and rancid odor (indicating excessive heat). The hydraulic oil should be drained and flushed and the filter replaced after changing major hydraulic components.

If water, air or contaminant are indicated, the entire hydraulic system must be inspected for leaks, damaged cap/breather, bad seals, and contaminated oil supplies. Repair or replace components or oil supplies as necessary.

The hydraulic tank holds 8 U.S. gallons (30.28 liters). The control panel, seat, and seat pan must be removed to remove the tank.

REMOVAL

NOTE:

If available, use a portable filtering unit when draining the hydraulic oil. If a portable filter is not available, the oil should be drained into a clean container and filtered for use. If filtering is not available, dispose of the hydraulic oil and fill the tank with clean filtered oil.

1. Using a portable filtering unit, pump the hydraulic oil into a suitable clean container. The tank holds 8 U.S. gallons (30.28 liters). If a filtering unit is not available, remove the drain plug at the bottom of the tank and drain the oil into a suitable container.

⚠ CAUTION

Dispose of unwanted oil properly. Dumping oil in an unsafe manner is illegal. Check with the local environmental officials for information on dumping oil properly.

2. After draining, replace the hydraulic tank drain plug.

NOTE:

The hydraulic tank is mounted to the seat pan. The seat and seat pan must be removed to remove the hydraulic tank. The fuel tank and hydraulic tank are seated on looped frame brackets for support.

3. Remove the seat pan mounting bolts, the fuel tank mounting bolts, and the hydraulic tank mounting bolts (Figure 9D-1).
4. Tag and disconnect the seat interlock switch connector located underneath the seat.
5. Carefully remove the seat and seat pan.
6. Disconnect the negative battery cable from the battery.
7. Remove the control panel from the hydraulic tank cover and place to the side.
8. Tag and disconnect the hydraulic return hoses and outlet hose. Immediately plug the hoses and tank to prevent contamination of the hydraulic system.

9. Tag and disconnect the float switch harness connector.
10. Remove the tank from the frame.
11. Remove the cover and filler cap from the tank.

INSTALLATION

1. Install the cover and filler cap on the hydraulic tank.
2. Place the hydraulic tank on the frame.
3. Remove the plugs from the outlet hose and return hoses. Using the tags created during removal, connect the hoses to the hydraulic tank.
4. Replace the hydraulic oil filter.
5. Using tags created during removal, connect the oil float switch connector to the wiring harness (Figure 9D-1).
6. Install the control panel on the hydraulic tank cover.
7. Connect the negative battery cable on the battery.
8. Position the seat and seat pan between the fuel tank and the hydraulic tank. Insert the seat interlock switch wiring harness through the seat pan. Secure the tanks and seat pan with the mounting bolts (Figure 9D-1).
9. Using the tag created during removal, connect the seat interlock switch to the wiring harness.
10. Make sure the drain plug is in the tank and fill the hydraulic tank with hydraulic oil. Jacobsen recommends GreenCare 68 hydraulic oil.
11. Start the engine and check the component operation.

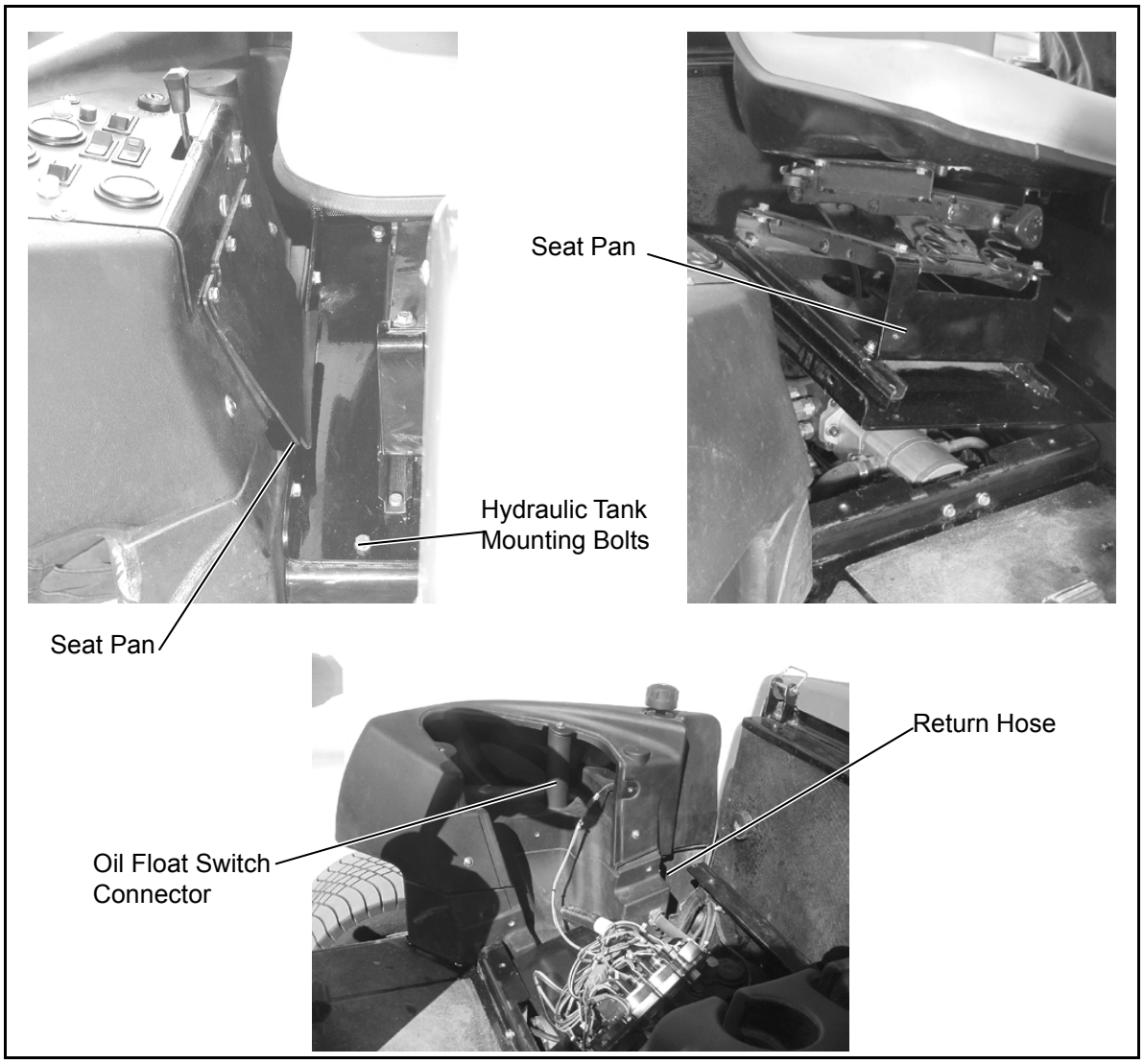


Figure 9D-1. Hydraulic Tank Removal/Installation

SECTION 9E. LIFT ASSEMBLY AND CYLINDER

GENERAL

The lift assembly and lift cylinders are used to lift and lower the reels. The lift arm, yoke, and cylinders are mounted using pins, washers, and cotter pins (Figure 9E-1).

⚠ CAUTION

Care must be taken to avoid damaging the surface of the cylinder rod during removal and installation.

REMOVAL

1. Lower the reels, shut down the engine, and remove the ignition key.
2. Thoroughly clean the hydraulic cylinder and area surrounding the cylinder.
3. Tag and disconnect the hoses at the lift cylinder. Immediately plug the hoses and cylinder ports to prevent contamination of the hydraulic system.
4. Remove the cotter pins, washers, and pin attaching the cylinder to the frame and lift arm.
5. Remove the cylinder.

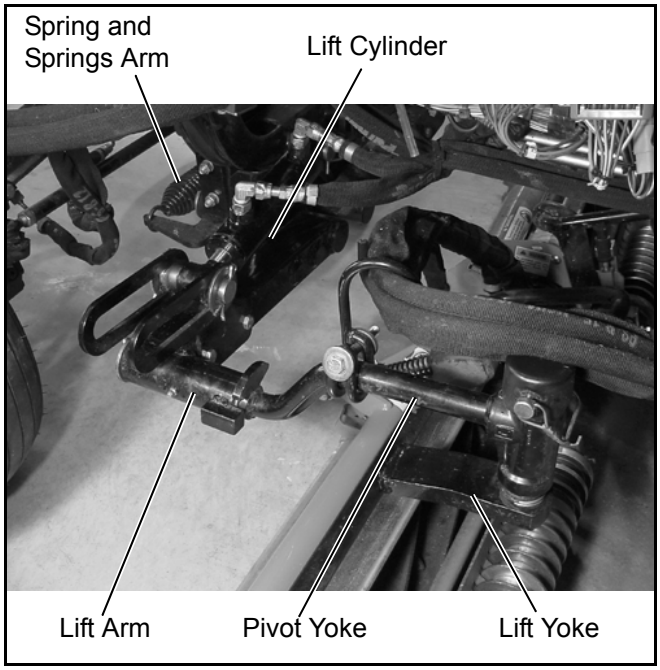


Figure 9E-1. Lift Assembly and Cylinder

INSPECTION

Inspect the lift arm, lift yoke, extension springs and arm, and pivot yoke for sloppy or loose operation (Figure 9E-2).

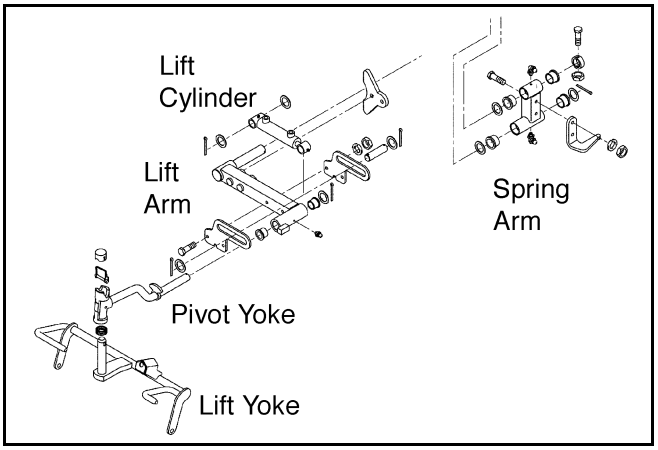


Figure 9E-2. Lift Arm Assembly

Replace damaged or worn parts. If necessary, replace the lift arm and spring arm bushings.

INSTALLATION

See Section 8J for cylinder repair procedures.

1. Position the lift cylinder on the frame and lift arm. Secure with cotter pins, washer, and pins.
2. Remove plugs from the hydraulic hoses and cylinder.
3. Using the tags created during removal, connect the hydraulic hoses to the cylinder.
4. Start the engine and lift and lower reels. Check for leaks and repair as necessary.
5. Check the hydraulic oil level.

SECTION 9F. STEERING AXLE

GENERAL

The steering axles are mounted to the rear of the frame. A hydraulic cylinder actuates the steering. The steering cylinder is attached to the left hand arm. The left steering arm is attached to the right hand steering arm using a tie rod and ball joints (Figure 9F-1). The right ball joint has right hand threads and the left ball joint has left hand threads. The tie rod can be turned to adjust the steering components. See Section 6E for steering wheel adjustments.

2 WHEEL DRIVE AXLE REPAIR

1. Shut down the engine and remove the ignition key.
2. Lift the tractor and support with jack stands.
3. Remove the steering wheels (Section 7C).
4. Remove the steering cylinder (Section 6D).
5. While supporting the axle, remove the cotter pin, castle nut, mounting plate, and mounting shaft from the axle and frame.
6. Inspect and repair or replace the following components as necessary (Figure 9F-1).
   - Tie rod
   - Ball joints
   - Steering arms
   - Mounting shaft
   - Bushings
7. Remove the hubcap, cotter pin, and castle nut from the hub.
8. Remove the hub, bearing cones, and seals.
9. Clean the hub, bearing cones, and cups. Inspect for worn or damaged roller bearings and cup. Replace as necessary.
10. Pack the wheel bearings with grease and install the hub on the steering arm. Secure with the castle nut. Tighten the castle nut firmly and back nut off one-half turn. Install the cotter pin in the nearest castle nut slot and steering hole.
11. Position the axle for installation and install the mounting plate, mounting shaft, castle nut and cotter pin. Tighten the castle nut firmly and back off to the nearest castle nut slot and mounting shaft hole. Install the cotter pin.
12. Install the steering cylinder (Section 6D).
13. Install the steering wheels (Section 7C).

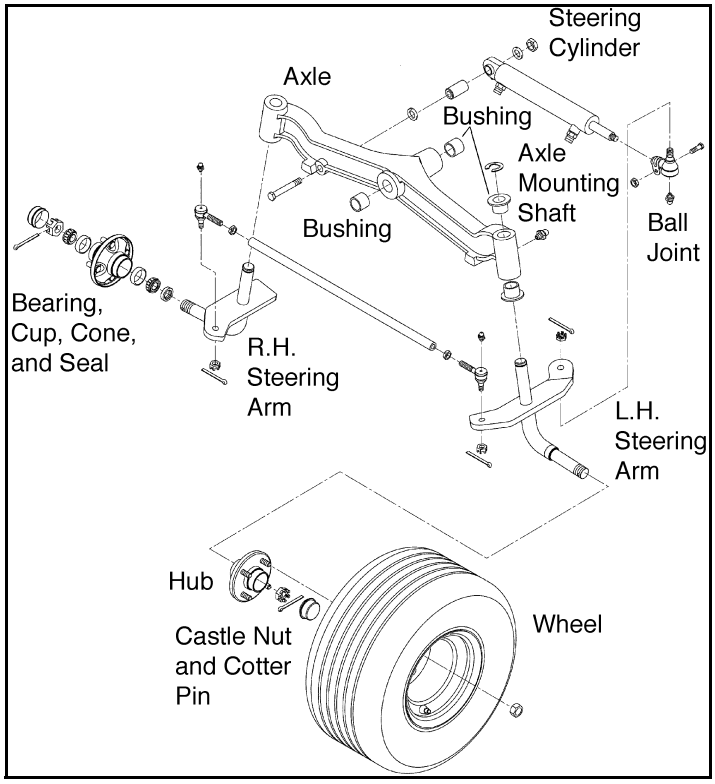


Figure 9F-1. 2 Wheel Drive Steering Axle

4 WHEEL DRIVE AXLE REPAIR

1. Shut down the engine and remove the ignition key.
2. Lift the tractor and support with jack stands (Figure 9F-2).

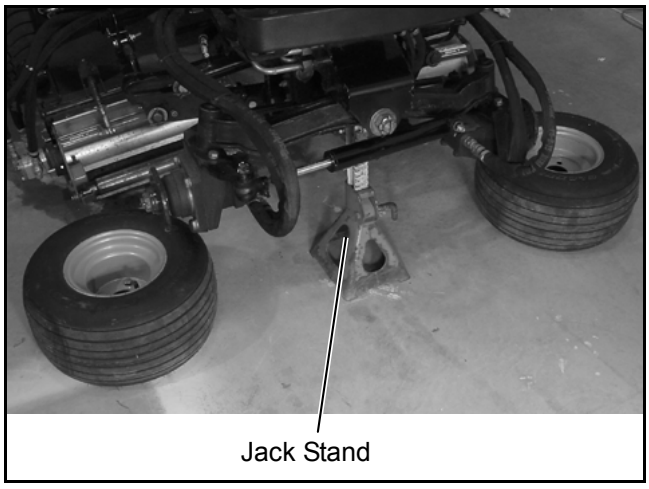


Figure 9F-2. Jack Stands

3. Remove the steering wheels (Section 7C).
4. Remove the steering cylinder (Section 6D).
5. While supporting the axle, remove the cotter pin, castle nut, mounting plate, and mounting shaft from the axle and frame (Figure 9F-3).
6. Inspect and repair or replace the following components as necessary.
   - Tie rod
   - Ball joints
   - Steering arms
   - Wheel hub and spindles
   - Mounting shaft
   - Bushings
7. If necessary, remove the wheel hubs and traction motor (Section 8F).
8. Assemble and install the axle. Secure with the mounting plate, mounting shaft, and castle nut. Tighten the castle nut firmly and back off to the nearest castle nut slot and mounting shaft hole. Install the cotter pin (Figure 9F-3).
9. Install the steering cylinder (Section 6D).
10. Install the steering wheels (Section 7C).

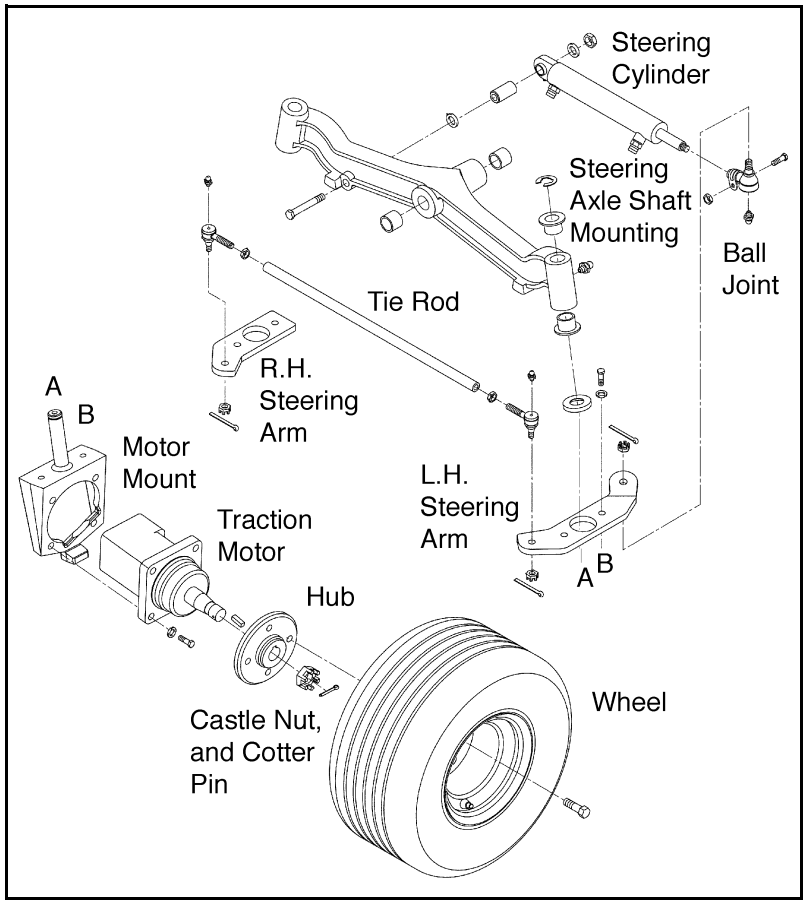


Figure 9F-3. 4 Wheel Drive Steering Axle

SECTION 10
ELECTRICAL SYSTEM

SECTION 10A. REPAIR, SERVICE TOOLS, AND MATERIALS

MATERIALS REQUIRED

Tools required:	Multimeter Jumper Wire
Cleaning materials:	Baking soda and water

SECTION 10B. FAILURE ANALYSIS

GENERAL

The following table lists common problems, probable causes, and suggested remedies with section references to detailed descriptions of remedial procedures.

PROBLEM	PROBABLE CAUSE	REMEDY
1. Battery charge is low	a. Buildup of corrosive acid across top of battery	a. Clean and recharge battery (Section 10D)
	b. Terminals are loose	b. Tighten terminals and recharge battery (Section 10D)
	c. Battery cables are frayed	c. Replace cables and recharge battery (Section 10D)
	d. Faulty battery	d. Replace battery (Section 10D)
	e. Alternator belt not adjusted	e. Adjust belt (Section 3D)
	f. Voltage regulator defective	f. Test regulator (Section 10E)
	g. Ignition switch damaged or corroded	g. Test ignition switch (Section 10G)
	h. Bad ground	h. Check ground corrosion
2. Battery is not charging	a. The alternator belt is not properly adjusted	a. Adjust belt (Section 3D)
	b. Faulty alternator	b. Replace alternator (Section 10E)
	c. Faulty gauge	c. Test/replace fuse (Section 10P)
	d. Ignition switch damaged or corroded	d. Test ignition switch (Section 10G)
	e. Faulty battery	e. Test battery (Section 10D)

PROBLEM	PROBABLE CAUSE	REMEDY
3. Engine will not turn over when ignition switch is engaged	a. Dead battery	a. Charge or replace (Section 10D)
	b. Neutral start switch faulty or out of adjustment	b. Test switch as described in Section 10G. See Section 2C for adjustment instructions
	c. Mower switch on	c. Turn mower switch off
	d. Brake not applied	d. Apply brake
	e. Neutral start switch not adjusted	e. Adjust switch (Section 2C)
	f. Faulty starter solenoid	f. Test solenoid (Section 10K)
	g. Faulty ignition switch	g. Test ignition switch (Section 10G)
	h. Faulty starter	h. See engine manual and Section 10F
	i. Faulty wiring	i. Test wiring (Section 10C)
	j. Faulty fuse or circuit breaker tripped	j. Determine the cause of overload and correct problem Check fuse and or reset circuit breaker (Section 10H)
	k. Faulty mower switch	k. Test mower switch (Section 10G)
	l. Faulty controllers	l. See Section 10N
4. Engine turns over but will not start	a. Battery low	a. Charge battery (Section 10D)
	b. Faulty glow plug	b. Test glow plug (Section 10M)
	c. Faulty fuel shut-off solenoid	c. Test solenoid (Section 10L)
	d. Faulty controller	d. See Section 10O
5. Engine starts but shuts down when the ignition switch is released	a. Faulty solenoid	a. Test (Section 10L)
	b. Faulty controller	b. See Section 10O
6. Reels do not come on when mower switch is on	a. Mower limit switch not closed or faulty	a. Lower cutting unit test switch (Section 10G)
	b. Mower switch faulty	b. Test switch (Section 10G)
	c. Mower control valve solenoid not properly grounded	c. Clean/check ground connections
	d. Motor control valve solenoid faulty	d. Push manual override to verify If mower turns on, change coil (Section 10H) If mower does not turn on, check Hydraulic Failure Analysis (Section 8)
	e. Faulty controller	e. See Section 10O

PROBLEM	PROBABLE CAUSE	REMEDY
7. Reels do not come on in reverse when mower switch is in “REVERSE”	a. Mower switch not in “REVERSE”	a. Push switch to “REVERSE”
	b. Brake not applied	b. Apply brake
	c. Faulty mower switch	c. Test switch (Section 10G)
	d. Motor control valve solenoid not properly grounded	d. Clean/check ground connections
	e. Motor control valve solenoid faulty	e. Override to verify If mower turns on, change coil (Section 10H) If mower does not turn on, check Hydraulic Failure Analysis (Section 8)
	f. Neutral start switch not adjusted or faulty	f. Adjust (Section 2C) Test (Section 10G)
	g. Faulty controller	g. See Section 10P
8. Engine shuts down when mower switch is pushed in “REVERSE”	a. Brake not set	a. Apply brake
	b. Faulty brake switch	b. Test (Section 10G)
	c. Faulty controller	c. See Section 10O
9. Engine does not shut down when operator leaves the seat with the mower switch on	a. Faulty seat switch	a. Test seat switch (Section 10G)
	b. Faulty controller	b. See Section 10O
10. Voltmeter reads low	a. High resistance at fuse	a. Clean contacts and change fuse
	b. Voltmeter faulty	b. Check alternator and battery (Section 10D and Section 10E)

SECTION 10C. GENERAL INSTRUCTIONS

GENERAL

Repair of the electrical system is generally limited to the replacement of defective components or wiring. Wiring diagrams and Component Location illustrations are provided in Section 10Q for troubleshooting and testing the electrical system. Specific repair and replacement instructions, where applicable, are also provided.

NOTE:

The test instrument shown in the illustrations for this section is a digital multimeter (DMM). However, any test instrument capable of measuring the current resistance and continuity values specified is acceptable.

NOTE:

See the engine manufacturer's service manual for information on engine electrical components not covered in this section.

In addition to testing a suspected faulty component, it may be necessary to check for shorts or breaks in the wiring to the component. A common method of testing wires or circuits is to perform a continuity check as described below.

NOTE:

Before performing any component or wiring test, check for corrosion and loose or missing connections.

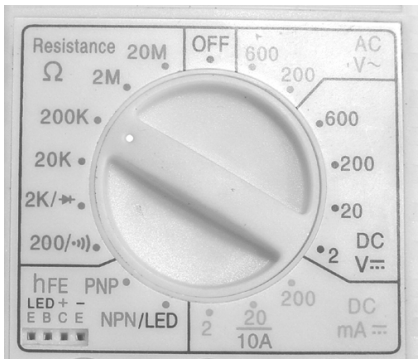
If a component (switch, relay, etc.) is removed for test or replacement, make sure to identify and label all wires so that the component can be reinstalled correctly.

Using A Multimeter

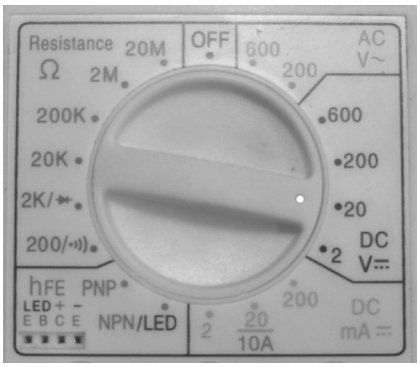
A multimeter can be used to test electrical systems for proper operation. This section describes the multimeter settings used for the various tests performed in the section. The multimeter illustrations show a typical multimeter, see Figure 10C-1.

The multimeter settings include:

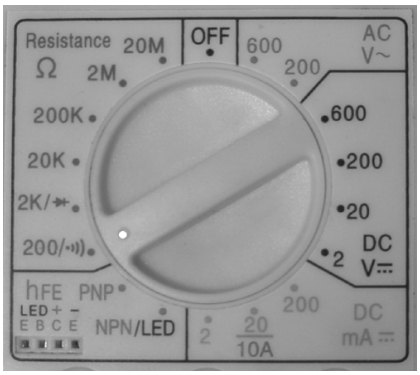
- Resistance (Ohms) – The ability of a material to oppose the flow of current (amps).
- Continuity (—|←) – Test a wire, switch, or other device to determine if the device has an open circuit that will not allow current to pass.
- DC Voltage (VDC) – Used to test the amount of DC voltage passing through a circuit.



Resistance Ω (Ohms)
200K Shown



DC volts - 20 VDC Shown



Continuity - Includes Ohm Reading and Buzzer

Figure 10C-1. Typical Multimeter Settings

WIRE CONTINUITY TEST

1. Identify and locate the wire to be checked on the appropriate wiring diagram (Section 10Q).
2. Set the multimeter to ohm —|← scale and touch the leads to the end of the wire.

   There should be a reading (continuity) on the multimeter and buzzer (Figure 10C-1).
3. Perform a second check by using a jumper wire to bypass the wiring being tested. If the component in question now functions normally, replace the original wire (Figure 10C-2).

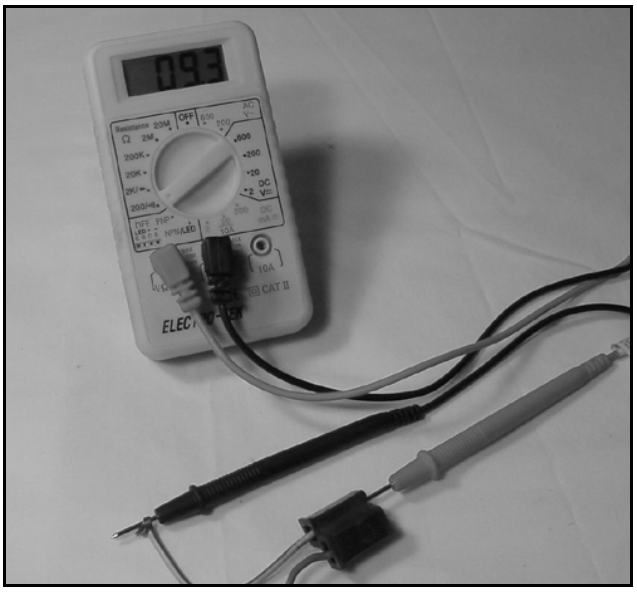


Figure 10C-2. Continuity Test

RESISTANCE TEST

Resistance is measured in Ohms (Ω). Using a multimeter the resistance in a circuit can be tested (Figure 10C-3).

1. Set the multimeter to the Ω scale.
2. Connect the positive (+POS) lead to one terminal on the wire or switch.
3. Read the Ω (OHMS) on the multimeter.

   Contacts of a switch or a wire should have less that 0.5 Ω (OHMS) reading.

   If Ω (OHMS) readings are above 0.5 the switch or wire is questionable.

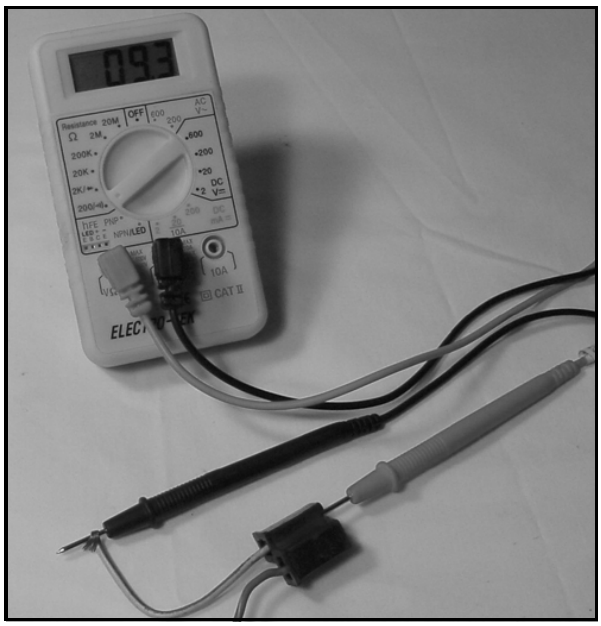


Figure 10C-3. Resistance Tests

SECTION 10D. BATTERY

GENERAL

For normal service, use a battery rated 12V, 600 cold cranking amps at 0°F (-18°C) Group BCI24. For continuos cold weather operation, use a battery rated with approximately 400 cold cranking amps at 0°F (-18°C). AABM Group 22NF batteries meet this specification.

⚠ WARNING

Batteries contain sulfuric acid and can generate explosive mixtures of hydrogen and oxygen gases. Keep any device which may cause sparks or flames away from the battery to prevent explosion.

⚠ WARNING

Always wear protective glasses or goggles and protective clothing when working with batteries.

You must follow the battery manufacturer's instructions on safety, maintenance, and installation procedures.

⚠ WARNING

Always connect the ground (black) last and remove it first when performing any battery maintenance. When the battery is being removed or reinstalled, make sure the positive and negative terminals do not contact metal tractor parts at the same time or arcing will result. Battery connections must be kept clean and tight at all times. Loose cables will cause arcing and pitting of the connections and cause eventual failure. Keep the positive terminal cover in place.

CHARGING A MAINTENANCE FREE BATTERY

NOTE:

Remove the battery from the tractor before you begin charging.

1. Be sure the charger is "OFF."
2. Connect the charger leads to the battery. Connect the positive (+ POS) connector from the charger to the positive battery terminal. Connect the negative (- NEG) connector of the charger to the negative battery terminal.

⚠ WARNING

To avoid possible injury, stand away from the battery when the charger is turned on. A damaged battery or a battery with an internal short could explode.

3. Charge the battery using one of the methods shown below. Follow the manufacturer's instructions on the charger.

Slow Charge	Fast Charge
10 hours at 5 amps	2.5 hours at 20 amps
5 hours at 10 amps	1.5 hours at 30 amps
	1 hour at 45 amps

⚠ CAUTION

If, when charging the battery, violent gassing or spewing of electrolytes occurs, or the battery case feels hot (125°F (52°C)), reduce or temporarily halt charging to avoid damaging the battery.

4. Always turn the charger to "OFF" before removing a charge lead from the battery.

MAINTENANCE/CLEANING

A buildup of corrosive acid across the top of the battery can cause the battery to self-discharge. Even a light coating of this grayish-white substance can cause a circuit to drain and exhaust the energy in the battery. This is especially bad when moisture is present.

To maintain a battery in top condition, check and perform the following services at frequent intervals.

1. Regularly check the level of electrolyte and add water as necessary to maintain a level above the plates. Do not overfill the battery as this can cause poor performance or early failure due to loss of electrolytes.
2. Keep the terminals and the top of the battery clean. Wash with baking soda and rinse with clean water. Do no allow baking soda solution to enter the cells as this will destroy the electrolytes.

3. Make sure the battery terminals are tight and the cables are in good condition.

TESTING

Test battery voltage as follows:

1. Set the multimeter to 20 DC volts.
2. Connect multimeter leads to battery terminals, red (+ POS) lead to positive terminal and black (- NEG) lead to negative terminal (Figure 10D-1).
3. Crank the engine – if battery voltage falls below 9 volts while cranking, the battery is run down or faulty. Charge and perform test again.
4. After charging, if battery still falls below 9 volts when the engine is cranked, the battery is probably faulty and should be load tested and replaced if necessary.

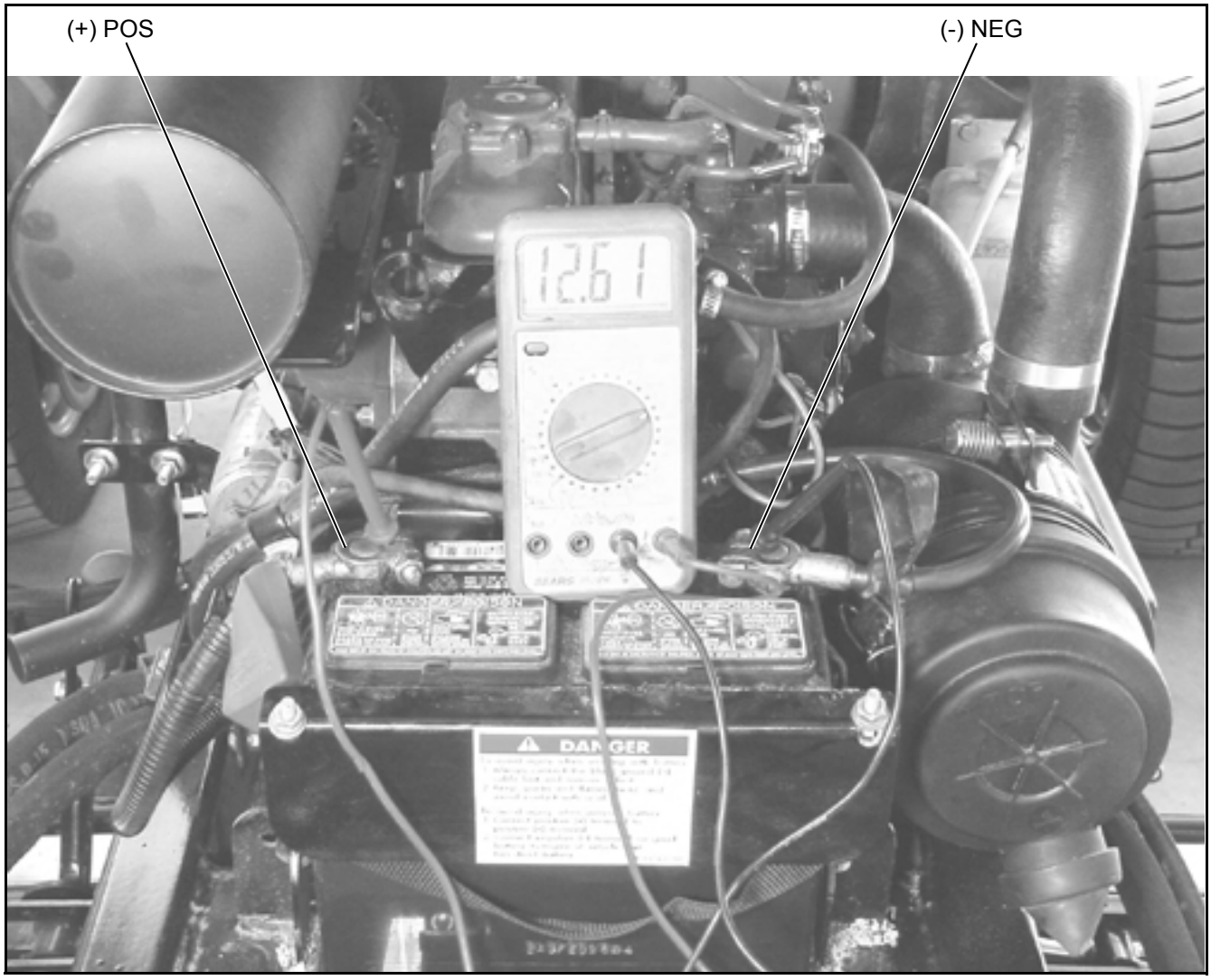


Figure 10D-1. Battery Test

SECTION 10E. CHARGING SYSTEM

GENERAL

The charging system consists of a 40-amp alternator with a built in rectifier/regulator.

The alternator must be disassembled to test the stator, rotor, and rectifier. Refer to the engine manufacturer's service manual for detailed test and repair instructions.

Before attempting to disassemble the alternator, perform the following tests to confirm the alternator is at fault.

OUTPUT VOLTAGE TEST

1. Set the multimeter to 20 DC volts.
2. Place the red (+ POS) lead on the positive terminal, and the black (- NEG) lead on the negative terminal (Figure 10E-1).
3. Using the precautions outlined in the operator's manual, start the engine.

   As the engine rpm increases, voltage should increase to 13.5 volts.

   If NO voltage is measured, proceed with Step 7.

   If voltage does not start coming down after a short running period, battery may be faulty or regulator/rectifier may be faulty.

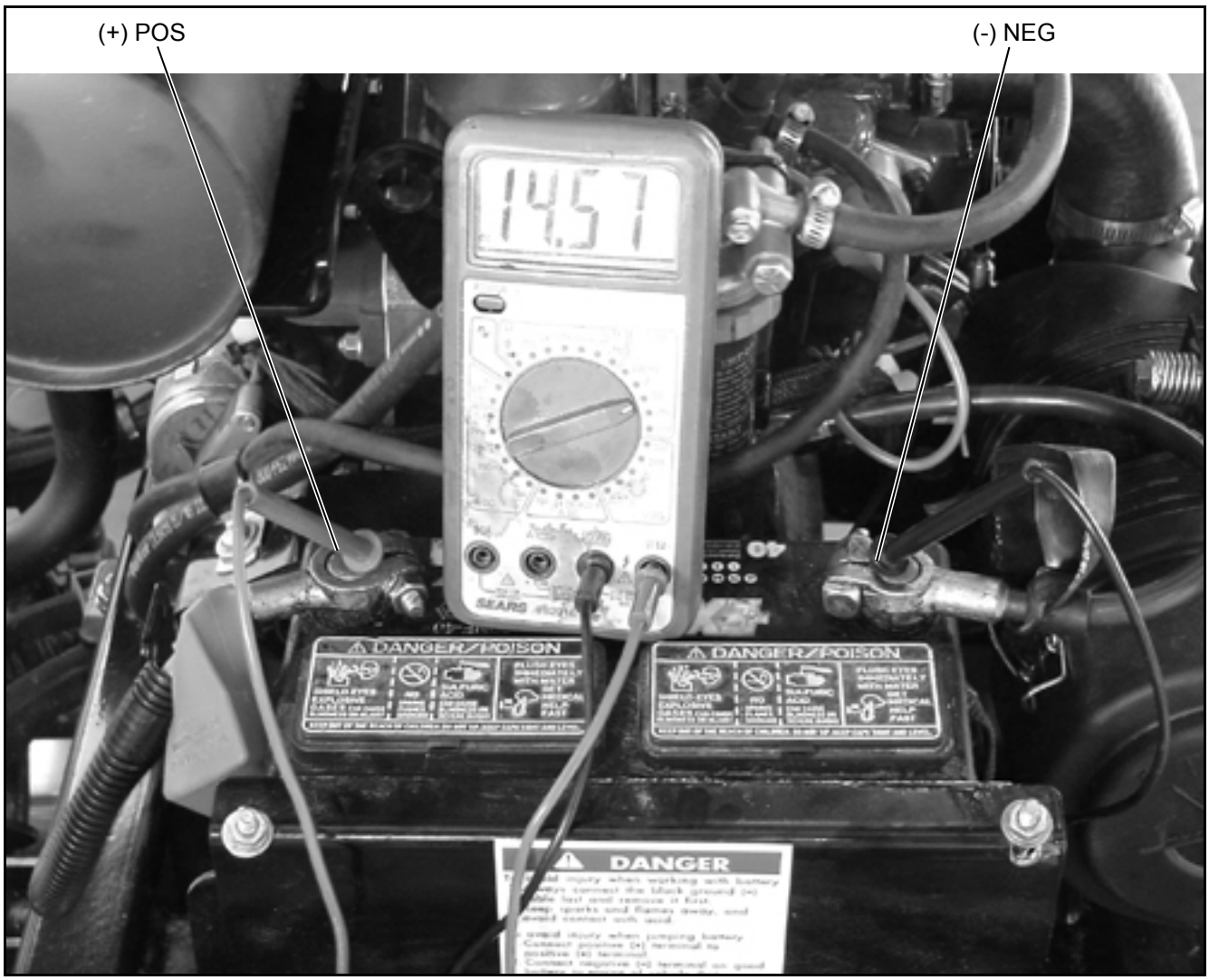


Figure 10E-1. Output Voltage Test

VOLTAGE TEST

1. Set multimeter to 20 DC volts.
2. Connect NEG (-) lead of multimeter to a good ground.
3. Touch the POS (+) lead of the multimeter to the “B” terminal of alternator.

   The multimeter should read battery voltage, proceed with Step 4.

   No or low voltage, check battery, connections and wiring.
4. Remove plug from back of the alternator.
5. Turn ignition switch to the RUN position.
6. Touch POS (+) lead to plug terminal of the two wires ORG and ORG/BLK (Figure 10E-2).

   The multimeter should read battery voltage, proceed with Step 5.

   No or low voltage, faulty wiring, battery, or system relay.
7. Remove the resistor and test as shown in Section 10C. Replace if necessary.

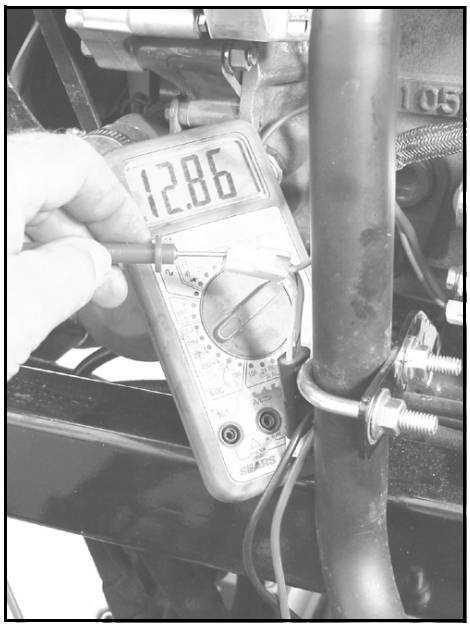


Figure 10E-2. Circuit Voltage Test

REGULATOR TEST

1. Remove the plug from the back of the alternator (Figure 10E-3).

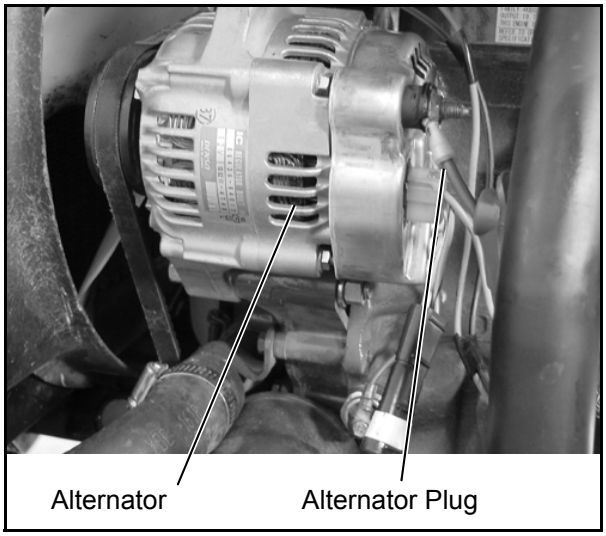


Figure 10E-3. Alternator

2. Set multimeter to the continuity scale (Figure 10E-4).
3. Touch the multimeter leads to the two terminals of the alternator, and then switch lead positions.

   The multimeter should indicate continuity in one direction but not the other.

   If continuity is not available or available in both directions, the regulator may be faulty. Refer to the engine manufacturer’s service manual for detail test and repair instructions.

Figure 10E-4. Regulator Test

SECTION 10F. STARTER

GENERAL

The repair of the starter is covered in the engine manufacturer's service manual which can be obtained through your local Jacobsen dealer/distributor.

FIELD TEST

Starter Motor Solenoid

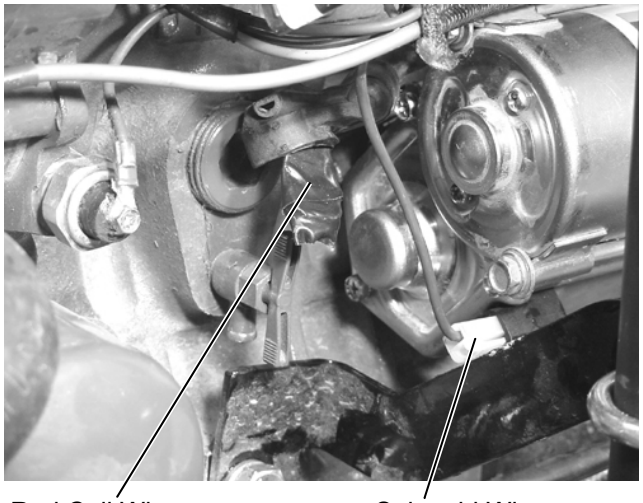
1. Disconnect the NEG (-) battery cable.
2. Disconnect the RED lead from the coil and tape the end (Figure 10F-1).
3. Connect the NEG (-) battery cable and turn the ignition switch to the START position.

   Each time the ignition switch is turned to the start position, a click should be heard from the coil.

   If no click is heard, the coil or electrical supply may be defective. Continue with the next step.
4. Remove the PUR/WHT solenoid wire.
5. Set the multimeter to 20 VDC and connect the POS (+) lead to the solenoid wire. Connect the NEG (-) lead to a good ground.
6. Turn and hold the ignition switch in the start position.

   The multimeter should read the battery voltage (Figure 10F-1).

   If no voltage is measured, an open seat switch (Section 10G), faulty wire (Section 10C), or ignition switch (Section 10G) could be at fault.



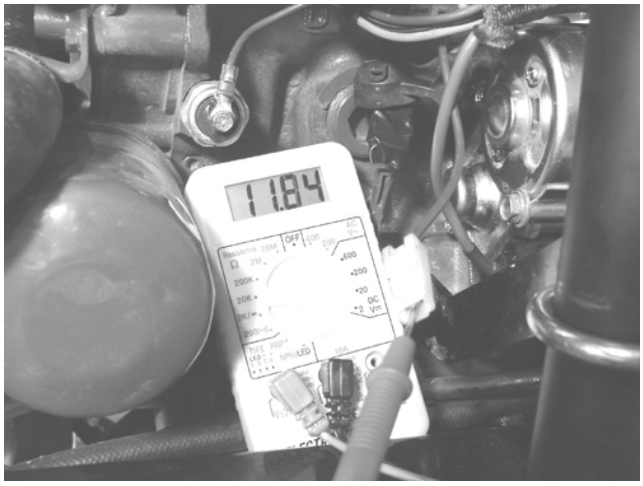


Figure 10F-1. Pull in Coil Test

STARTER MOTOR

If the starter does not respond to tests, remove the starter and bench test as outlined below using jumper cables:

1. Disconnect the NEG (-) battery cable.
2. Disconnect the BRN solenoid wire from the starter solenoid.
3. Remove starter.
4. Connect the POS (+) jumper cable to the starter as shown in Figure 10F-2.
5. Connect the other end of the POS (+) jumper cable to the POS (+) terminal of the battery.

6. Connect the NEG (-) jumper to the NEG (-) battery terminal; touch other end of NEG (-) cable to the starter (Figure 10F-2).

   The starter motor should turn.

   If the starter motor does not turn or turns slowly, connect a multimeter set at 20 VDC to the battery terminals and repeat Step 6.

   If voltage is correct, starter may be faulty. Have starter checked by a local automotive electrical shop.

Figure 10F-2. Starter Motor Test

SECTION 10G. SWITCHES

GENERAL

This section provides instructions for testing the various switches in the electrical system. Repair is limited to replacement of components found faulty during testing. See Section 10Q for location of components.

Switches can be defined as NO (normally open) or NC (normally closed). A normally open switch blocks the flow of current until the switch is activated. A normally closed switch allows current to flow until the switch is activated. Testing a switch allows the mechanic to determine if the switch actually opens or closes when activated and if it is activated.

SEAT SWITCH TEST

The seat switch allows the engine to run when the operator is in the seat and the reels are operating. If the operator leaves or falls from the seat with the engine running, the engine will shut down. See Figure 10G-1 and test switch as follows:

1. Unplug the switch from the harness.
2. Set the multimeter to the continuity scale.
3. Connect one lead to each side of the harness connector. See Figure 10G-1.

   The seat switch should be open with no continuity shown or heard on the multimeter.
4. Depress the seat switch or have a helper sit in the seat.

   The seat switch should be closed and a reading of 0 to 0.5 Ohms on the multimeter.

NOTE:

Replace the switch if the test results are not satisfactory.

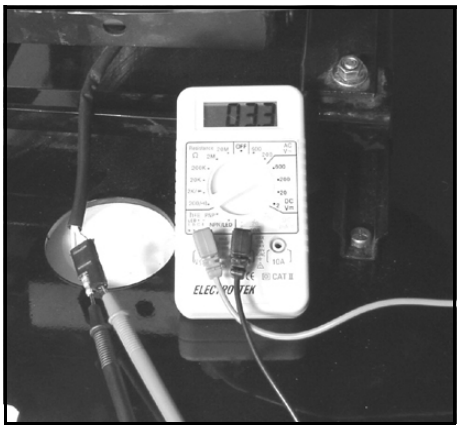


Figure 10G-1. Seat Test

IGNITION SWITCH TEST

1. Disconnect ground (black) cable at battery.
2. Remove the control panel from the top of the hydraulic tank.
3. Remove the wiring harness connector from the ignition switch.
4. Set multimeter to continuity scale.

NOTE:

If a reading of 0.5 Ohms exists in any of the following tests the ignition switch is faulty and must be replaced.

5. See Figure 10G-2 and all switch positions as follows:
   a. With the ignition switch in the OFF position check all pin positions for continuity. Continuity should not be available between any of the pin positions.
   b. Place the ignition switch in the RUN position and connect one test lead to terminal B and one lead to terminal I.

      Continuity should be available between terminals B and I.
   c. With the ignition switch in the RUN position, connect one test lead to terminal B and one lead to terminal S and then to terminal GP.

      Continuity should not be available at terminals S or GP.
   d. Hold ignition switch in the GLOW PLUG position. Connect one test lead to terminal B and one lead to terminal GP.

      Continuity should be available between terminals B and GP.
   e. Hold ignition switch in the START position. Connect one test lead to terminal B and one lead to terminal I.

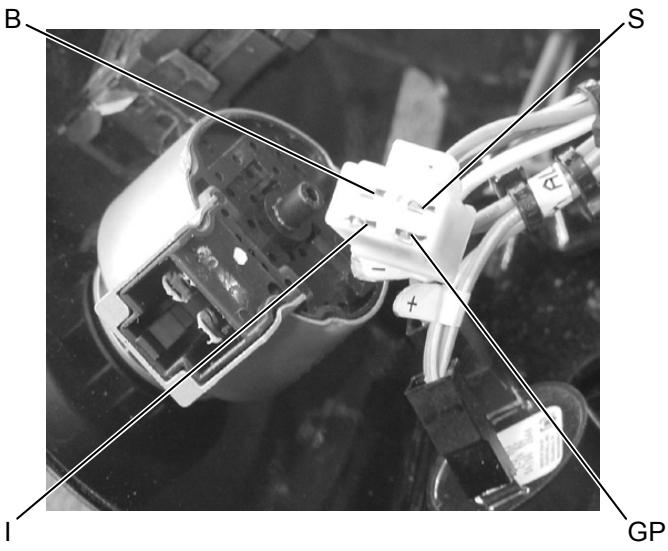
      Continuity should be available between terminals B and I.

f. Hold ignition switch in the START position. Connect one test lead to terminal B and one lead to terminal S.

Continuity should be available between terminals B and S.

NOTE:

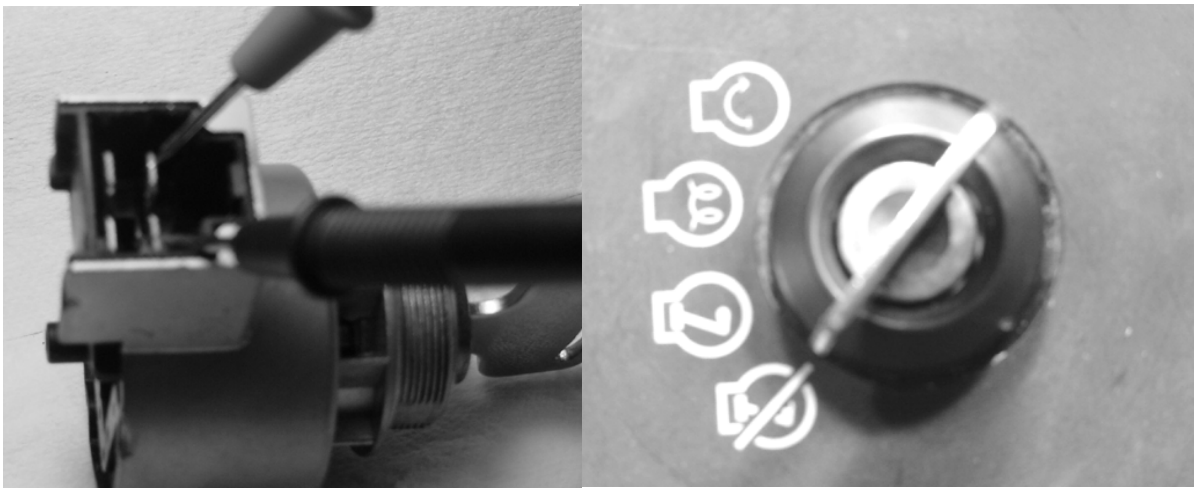
If the ignition switch fails any of the above tests, replace the switch.



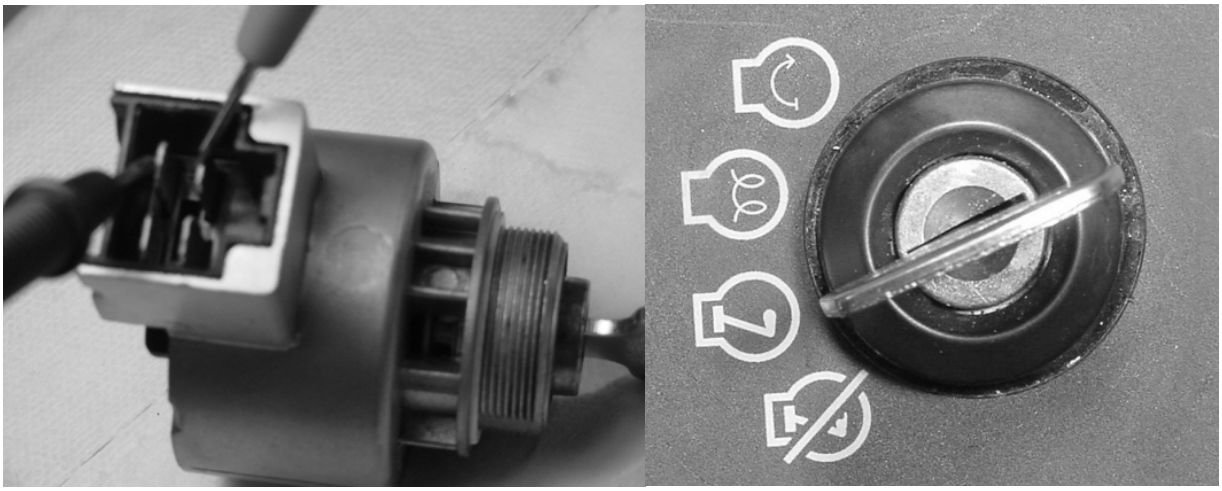
Position	Continuity
OFF	None
RUN	B & I
GLOW PLUG	B & GP
START	B, I, &S

If other terminals test with continuity, the switch should be replaced.

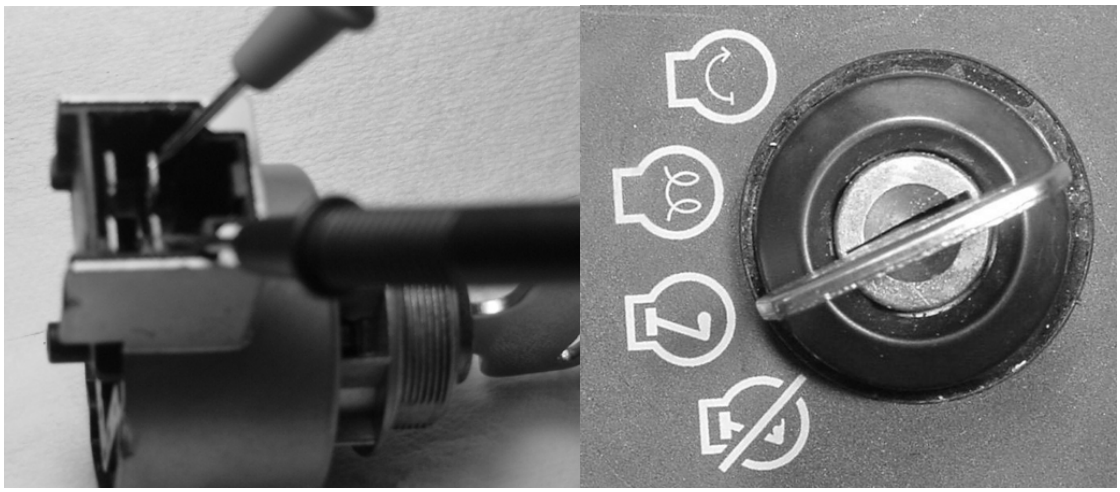
Figure 10G-2. Ignition Switch Test



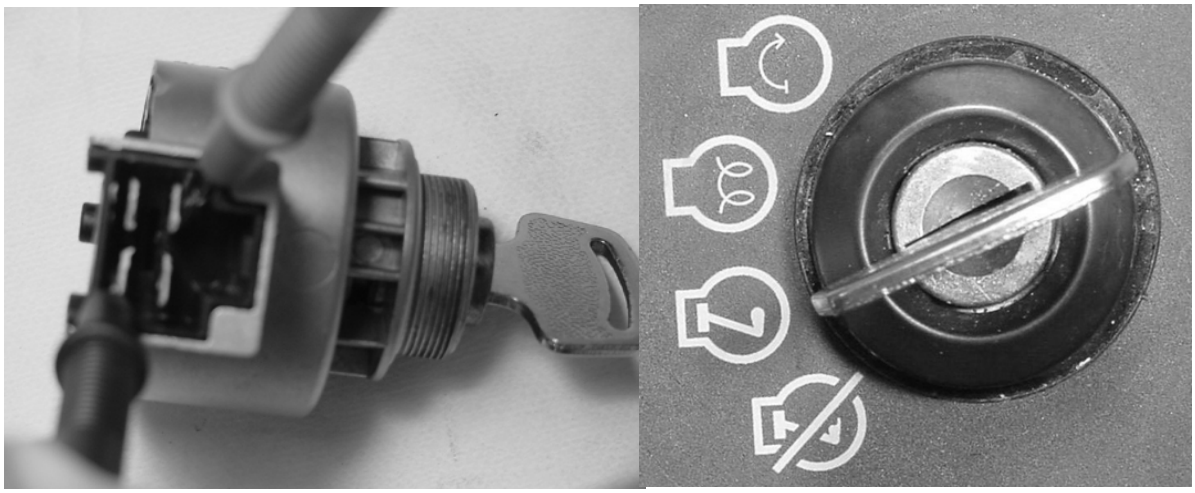
Step 5a. Ignition Switch in OFF Position



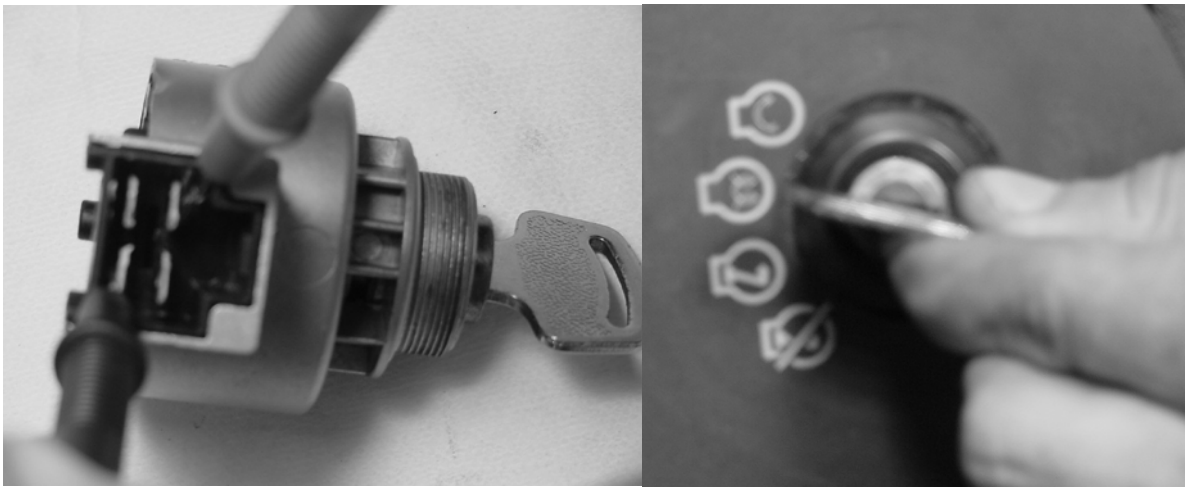
Step 5b. Ignition Switch in RUN Position



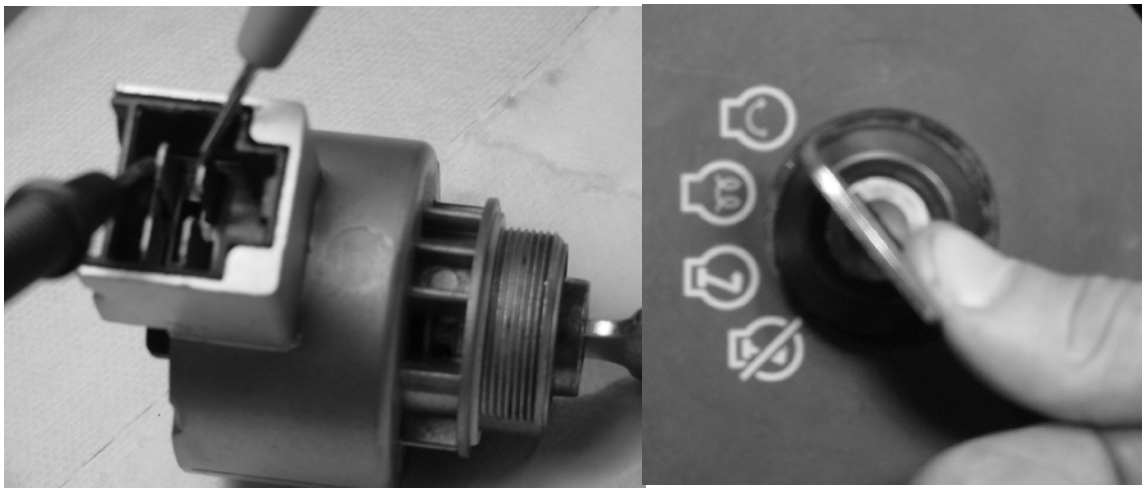
Step 5c. Ignition Switch in RUN Position



Step 5d. Ignition Switch in RUN Position



Step 5d. Ignition Switch in GLOW PLUG Position



Step 5e. Ignition Switch in START Position

WATER TEMPERATURE SWITCH TEST

The water temperature switch is used to warn the operator if the engine coolant temperature exceeds safe limits. The switch is mounted at the base of the upper radiator hose opposite the coolant temperature sender. The switch can be tested as follows:

1. Shut down the engine and remove the ignition key. Allow the engine to cool completely.
2. Remove the wiring harness connector from the switch.
3. Set the multimeter to the continuity scale.
4. Touch one test lead at the base of the switch; place the other test lead on the threaded stud that holds the wiring harness connector (Figure 10G-3).

   Continuity should not be available at the switch.

NOTE:

If the switch indicates continuity and the engine is cold, replace the switch.

Figure 10G-3. Coolant Temperature Switch

PARKING BRAKE, NEUTRAL START, REEL POSITION, AND 4WD DROP OUT PROXIMITY SWITCHES TEST

GENERAL

The proximity switches used on the LF-1880 are normally open switches, which means no current can travel through the switches until activated. When a conductive metallic object (such as steel) is moved near the surface of the switch a set of reeds are closed creating a path for the movement of current through the switch. During the test it must be determined if the switch closes (continuity) and how long the switch stays closed (sensitivity).

⚠ WARNING

Because the proximity switches are used primarily as safety devices it is extremely important that the switches be operational and not be bypassed or otherwise tampered with. Serious injury and or property damage can occur if the switches are bypassed or tampered with. Replace any switch that does meet the requirements of the following tests.

CONTINUITY TEST

1. Shut down the engine and remove the ignition key.
2. Set the multimeter to the continuity scale.
3. Connect one test lead to a connector plug socket and the other test lead in the other plug socket.

   Continuity should not be available when no metallic object is present in the sensing area.
4. Connect one test lead to a connector plug socket and the other test lead in the other plug socket. Pass a metallic object (such as a small screwdriver tip) across the sensing area of the switch.

   Continuity should be available and resistance indicating 0 to 0.5 Ω (OHMS) while the metallic object is present in the sensing area.

SENSITIVITY TEST

The reed contacts should close within 0.05” minimum from alignment of the metallic object and the centerline of the switch magnet (Figure 10G-4). The switch contacts must remain closed for a minimum travel of 0.18”. Travel of the metallic object may be from either direction.

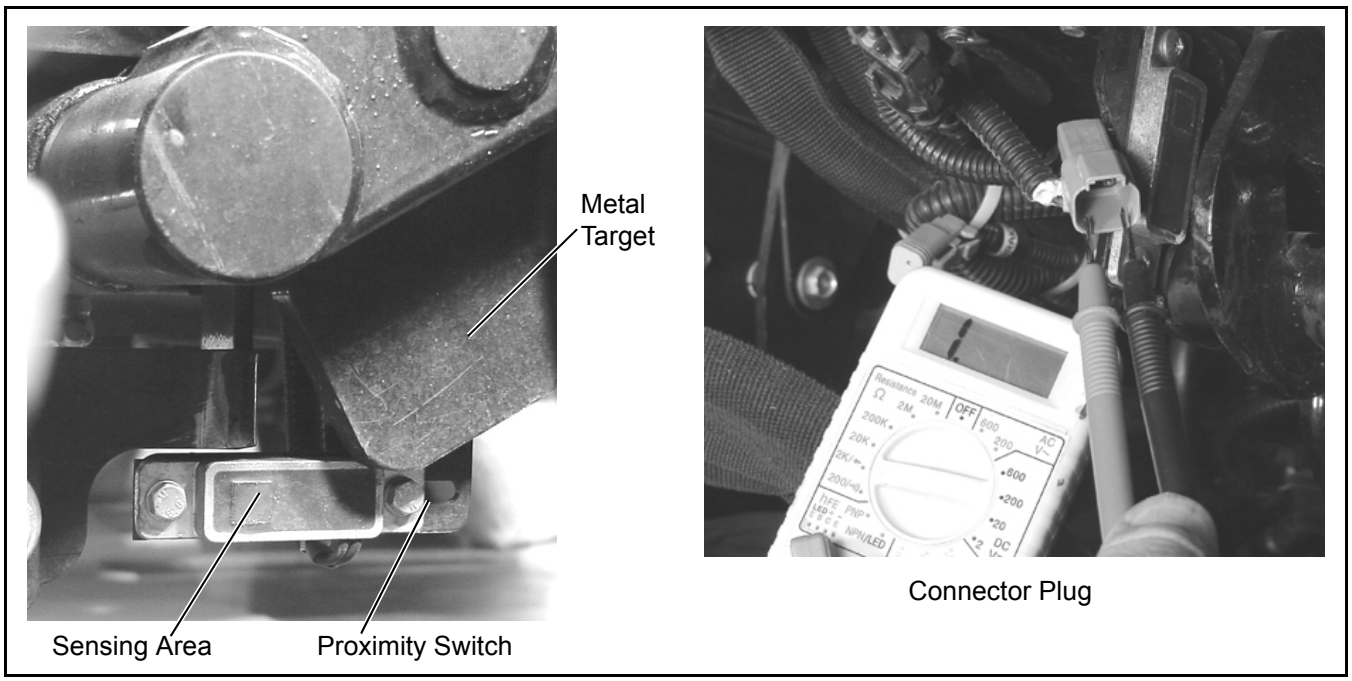


Figure 10G-4. Typical Proximity Switch

REEL SWITCH TEST

The reel switch is mounted on the control panel. The switch has three positions used to control the rotation of the hydraulic reel motors. The center position of the switch is OFF. Pushing the switch forward activates the reel motor into forward rotation. Pushing the switch to the rear activates the reel motor into reverse rotation for back lapping the reels, removing grass buildup and dislodging objects stuck in the reels. The switch reverse position has a safety lock that must be pressed in order to place the switch in the reverse position.

1. Shut down the engine and remove the ignition key.
2. Remove the control panel from the top of the hydraulic tank. Locate the reel switch and remove the wiring harness connector, see Figure 10G-5.
3. Set the multimeter to the continuity scale.
4. Place the switch in the OFF (center) position and test all terminals for continuity (Figure 10G-5).

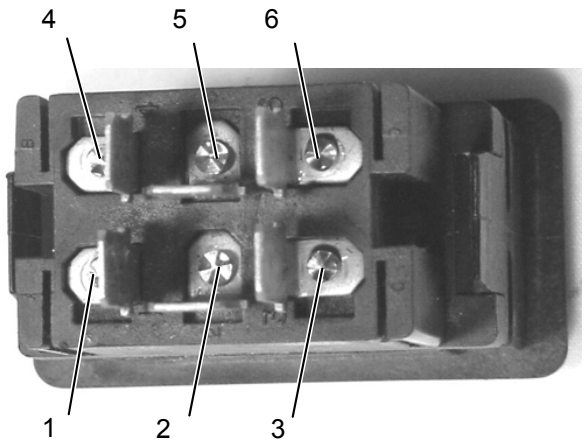
   Continuity should not be available between any terminals.
5. Place switch in the forward position and test all terminals for continuity (Figure 10G-5).

   Continuity should be available between terminal 1 and terminal 2 and between terminal 4 and terminal 5 only.
6. Place switch in the reverse position and check all terminals for continuity (Figure 10G-5).

   Continuity should be available between terminal 2 and terminal 3 and between terminal 5 and terminal 6 only.

NOTE:

Replace the switch if it does not meet the above test results.



Position	Terminal Continuity
OFF	None
FWD ON	1& 2 and 4 & 5
REV ON	2 & 3 and 5 & 6

If other terminals test with continuity, the switch should be replaced.

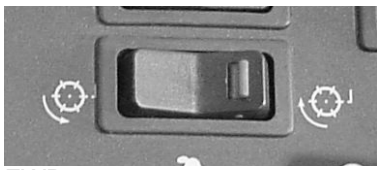


Figure 10G-5. Reel Switch

BACKLAP SWITCH TEST

The backlap switch is mounted to the rear of the fuse/relay boxes. The switch has two positions (ON/OFF) used in conjunction with the reel switch to control the reverse rotation of the hydraulic reel motors. The switch can be tested as follows:

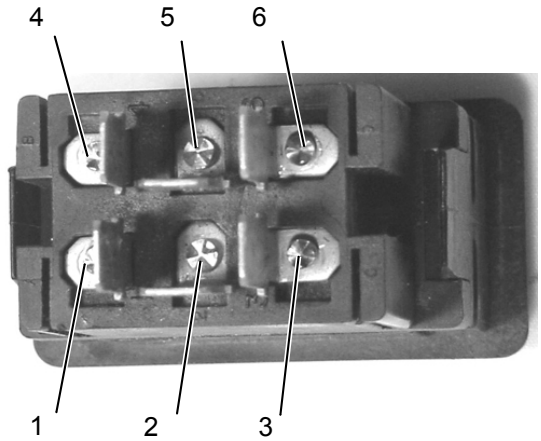
1. Shut down the engine and remove the ignition key.
2. Locate the backlap switch and remove the wiring harness connector, see Figure 10G-6.
3. Set the multimeter to the continuity scale.
4. Place the switch in the OFF position (Figure 10G-6). Check continuity between all terminals.

   Continuity should be available between terminal 2 and terminal 1 and between terminal 5 and terminal 4 only.
5. Place switch in the ON position. Check continuity between all terminals (Figure 10G-6).

   Continuity should be available between terminal 2 and terminal 3 and between terminal 5 and terminal 6 only.

NOTE:

Replace the switch if it does not meet the above test results.



Position	Terminal Continuity
OFF	1& 2 and 4 & 5
ON	2 & 3 and 5 & 6

If other terminals test with continuity, the switch should be replaced.

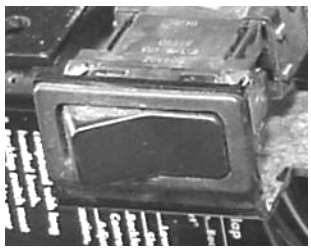


Figure 10G-6. Backup Switch

4 WHEEL DRIVE SWITCH TEST

The 4 wheel drive switch is mounted on the control panel. The switch has two positions (ON/OFF) used to control the traction capability of the mower by switching from 2-wheel drive to 4 wheel drive. The switch can be tested as follows:

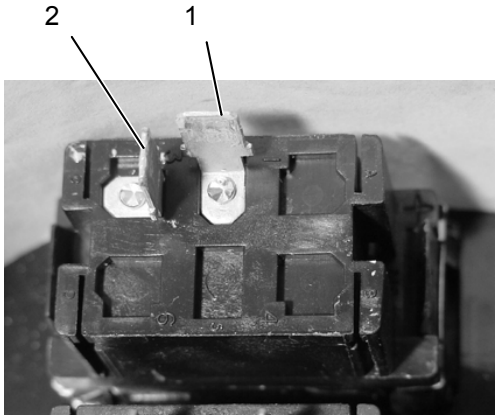
1. Shut down the engine and remove the ignition switch.
2. Remove the control panel from the top of the hydraulic tank. Locate the 4 wheel drive switch and remove the wiring harness connector, see Figure 10G-7.
3. Set the multimeter to the continuity scale.
4. Place the switch in the OFF position. Check continuity between all terminals (Figure 10G-7).

   Continuity should not be available between terminal 1 and terminal 2.
5. Place the switch in the ON position. Check continuity between all terminals (Figure 10G-7).

   Continuity should be available between terminal 1 and 2.

NOTE:

Replace the switch if it does not meet the above test results.



Position	Terminal Continuity
OFF	None
ON	1 & 2

If other terminals test with continuity, the switch should be replaced.

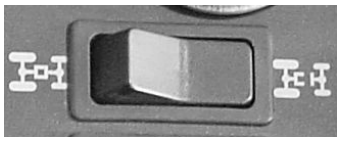


Figure 10G-7. 4 Wheel Drive Switch

JOYSTICK TEST

The joystick is mounted on the control panel and has three positions (RAISE/OFF/LOWER). The joystick is used to raise and lower the reels. The joystick can be tested as follows:

1. Shut down the engine and remove the ignition key.
2. Remove the control panel from the top of the hydraulic tank. Locate the joystick and disconnect the wiring harness connector, see Figure 10G-8.
3. Set the multimeter to the continuity scale.
4. Holding the joystick in the OFF position, check all terminals for continuity (Figure 10G-8).

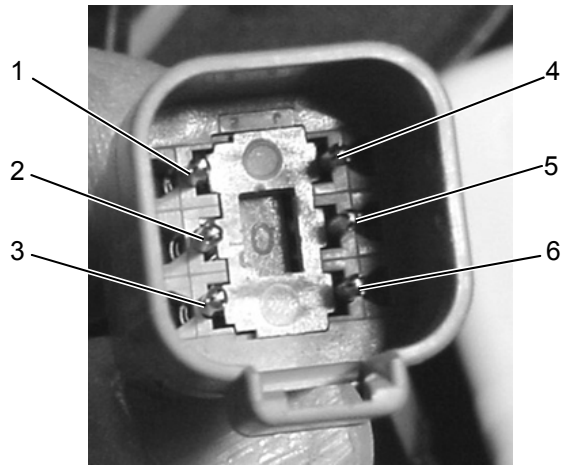
   Continuity should be available between terminal 1 and terminal 3 and between terminal 6 and terminal 4 only.
5. Holding the joystick in the raise position, check all terminals for continuity (Figure 10G-8).

   Continuity should be available between terminal 1 and terminal 2 and between terminal 6 and terminal 4 only.
6. Holding the joystick in the lower position, check all terminals for continuity (Figure 10G-8).

   Continuity should be available between terminal 6 and terminal 5 and between terminal 1 and terminal 3 only.

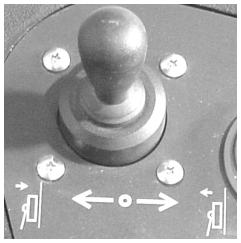
NOTE:

Replace the joystick if it does not meet all the above test results.



Position	Terminal Continuity
OFF	1 & 3 and 6 & 4
RAISE	1 & 2 and 4 & 6
LOWER	1 & 3, 5 & 6

If other terminals test with continuity, the switch should be replaced.



ON OFF

Figure 10G-8. Joystick

LIGHT SWITCH TEST

The light switch is mounted on the control panel and has two positions (ON/OFF). The switch is used to control the work lights. The switch can be tested as follows:

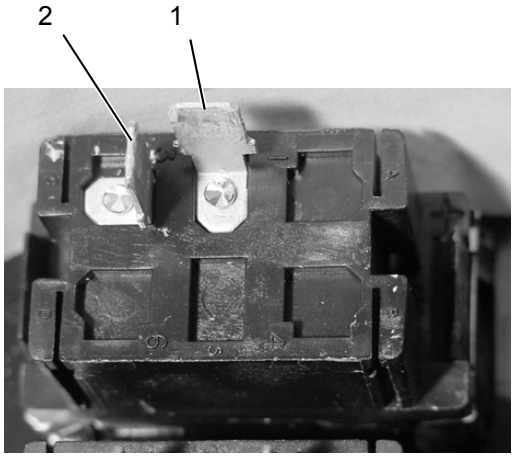
1. Shut down the engine and remove the ignition key.
2. Remove the control panel from the top of the hydraulic tank. Locate the light switch and disconnect the wiring harness connector, see Figure 10G-9.
3. Set the multimeter to the continuity scale.
4. Place the switch in the OFF position (Figure 10G-9). Check all terminals for continuity.

   Continuity should not be available between terminal 1 and terminal 2.
5. Place the switch in the ON position. Check all terminals for continuity (Figure 10G-9).

   Continuity should be available between terminal 1 and terminal 2.

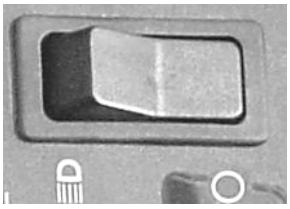
NOTE:

Replace the light switch if it does not meet the above tests results.



Position	Terminal Continuity
OFF	None
ON	1 & 2

If other terminals test with continuity, the switch should be replaced.



ON OFF

Figure 10G-9. Light Switch

HORN SWITCH

The horn switch is mounted on the control panel and has two positions (ON/OFF). The switch is used to sound the horn. In the OFF position the switch is also used as a current path for the float relay to sound the horn in case the hydraulic oil level falls to a critical level. The switch can be tested as follows:

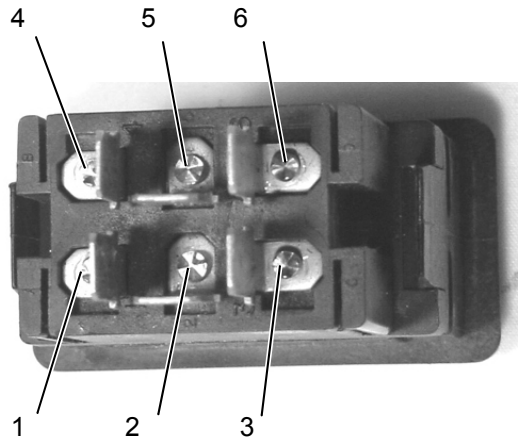
1. Shut down the engine and remove the ignition key.
2. Remove the control panel from the top of the hydraulic tank. Locate the horn switch and disconnect the wiring harness connector, see Figure 10G-10.
3. Set the multimeter to the continuity scale.
4. Place the switch in the OFF position. Check all terminals for continuity (Figure 10G-10).

   Continuity should be available between terminal 4 and terminal 5 only.
5. Place the switch in the ON position. Check all terminals for continuity (Figure 10G-10).

   Continuity should be available at terminal 5 and terminal 6 only.

NOTE:

Replace the horn switch if it does meet the above test results.



Position	Terminal Continuity
OFF	4 & 5
ON	5 & 6

If other terminals test with continuity, the switch should be replaced.

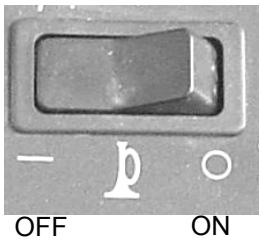


Figure 10G-10. Horn Switch

FLOAT SWITCH

The float switch is mounted in the hydraulic tank and has two positions (ON/OFF). The float switch is used to warn the operator that the hydraulic oil has dropped to a critical level. If the oil drops below a safe level the switch will close and the horn will sound. The switch can be tested as follows:

1. Shut down the engine and remove the ignition key.
2. Remove the control panel from the top of the hydraulic tank. Locate the float switch wiring harness and separate the wiring harness connector, see Figure 10G-11.
3. Check the switch for continuity by place one test lead in each side of the switch side harness connector (Figure 10G-11).

   Continuity should not be available with hydraulic oil at the proper level.
4. Drain oil from the tank to just below the float level.

   Continuity should be available with the oil level below the safe level.

5. Using instructions in the Parts & Maintenance Manual, fill the hydraulic tank to the proper level.

NOTE:

Replace the switch if it does not meet the above test results.

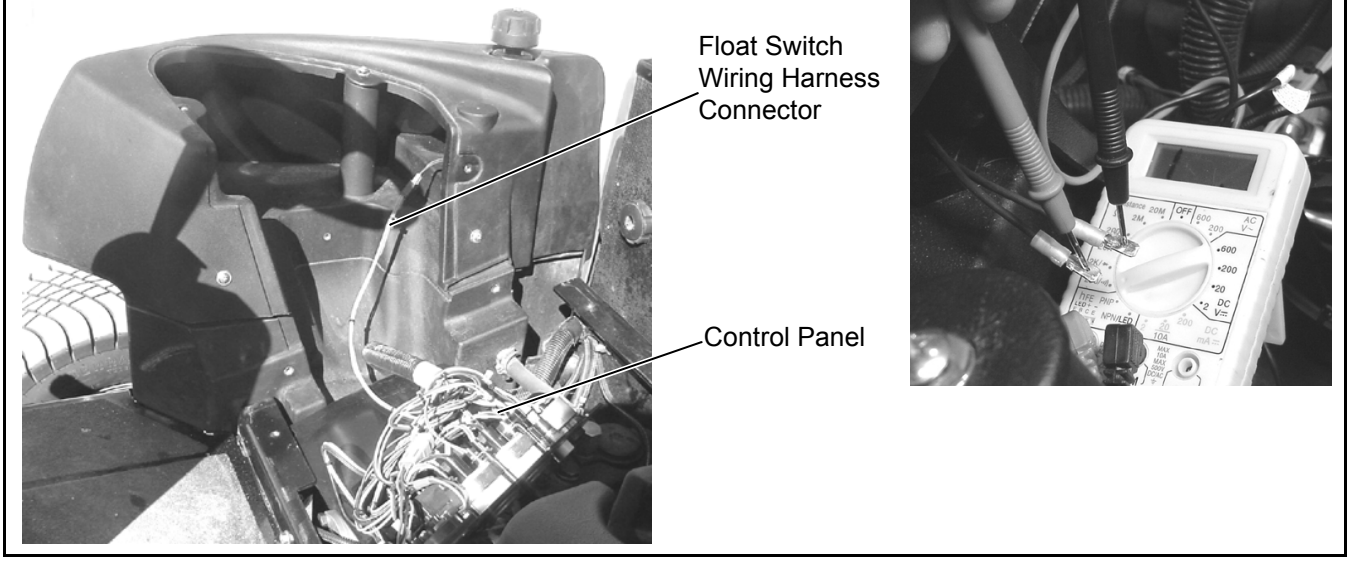


Figure 10G-11. Float Switch Test

SECTION 10H. SENDERS

GENERAL

Senders are used to activate a light or gauge to warn the operator of a condition in the engine. A temperature sender monitors engine coolant temperature and displays the result on a temperature gauge. An oil sender/switch monitors the engine oil pressure and illuminates a warning light to warn the operator when the oil pressure drops to a critical level.

COOLANT TEMPERATURE SENDER TEST

The temperature sender is a rheostat. As temperature rises, resistance in the sender decreases creating a ground drawing the temperature gauge indicator to the hot side.

1. Shut down the engine and remove the ignition key. Allow the engine to cool completely.
2. Remove the wiring harness connector from the end of the sender.
3. Set the multimeter to the continuity scale.
4. Place one test lead on the sender wiring harness connector stud. Place the other test lead on the base of the sender, see Figure 10H-1.

   When cold, continuity should not be available between the connector stud and base.

If continuity exists during testing or the temperature switch causes the horn to sound and continuity does not exist, the temperature sender may be faulty and should be replaced.

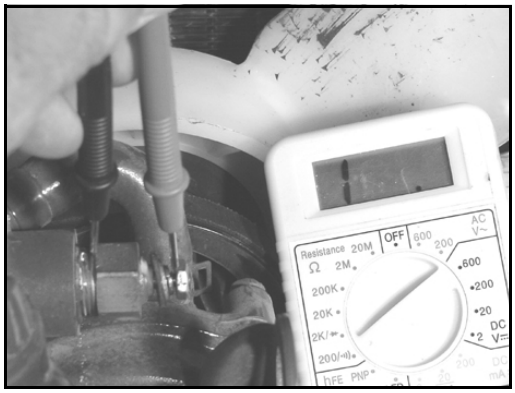


Figure 10H-1. Coolant Temperature Sender

ENGINE OIL PRESSURE SENDER TEST

The oil pressure sender is pressure sensitive and acts as a ground for the oil pressure light on the control panel. When the engine is not running a lack of oil pressure illuminates the oil light. When the engine starts and builds pressure the sender opens and the light goes out.

1. Shut down the engine and remove the ignition key. Allow the engine to cool completely.
2. Remove the wiring harness connector from the end of the oil pressure sender.
3. Set the multimeter to the continuity scale.
4. Place one test lead in the end of the sender and the other test lead on the base of the sender (Figure 10H-2).

   With engine off, continuity should be available between the end of the sender and the base.

⚠ WARNING

Beware of moving engine parts and do not become entangled by loose clothing, jewelry, or hair. Serious injury can occur if caught by moving engine components.

5. Start the engine and perform the continuity test again.

   Continuity should be available between the sender end and the base with the engine running.

If continuity is not available during testing, the oil pressure sender may be faulty and should be replaced.

Figure 10H-2. Oil Pressure Sender

SECTION 10I. RELAYS AND SOLENOIDS

RELAYS

Relays are electromechanical devices used to control the transmission of electrical current with a circuit. A schematic of the internal movement of the relay is printed on the relay itself. The relays used in the LF-1880 electrical system all use the same NO (normally closed) configuration.

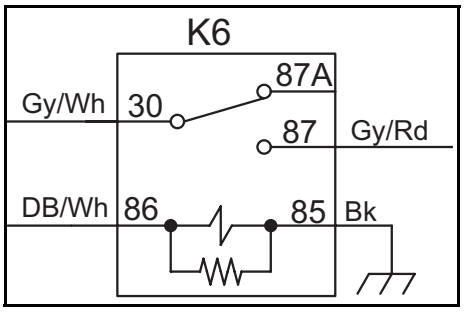


Figure 10I-1. Relay Circuit

Pole 85, as shown in Figure 10I-1, is a grounded terminal. When current is applied to pole 86, the coil circuit between the poles is completed and a magnetic action draws the switch lever at pole 87A to pole 87 closing the relay and allowing current to flow from pole 30 (the input power source) to pole 87 (the output power connection).

RELAY TEST

The relays can be checked for proper operation as follows:

1. Remove the relay from the relay box (Figure 10I-2).
2. Set the multimeter to the continuity scale.
3. Place one test lead on pole 30 and one test lead on pole 87A.

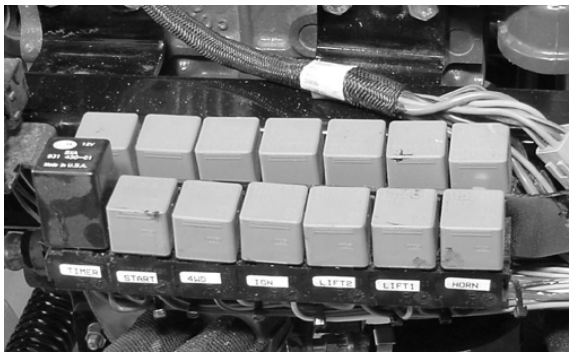
   Continuity should be available between poles 30 and 87A.
4. Using a 12-volt DC power source apply the ground side to pole 85 and 12 VDC to pole 86. At the same time check for continuity between poles 30 and 87.

   There should be an audible “click” when current is applied and continuity should be available between poles 30 and 87.

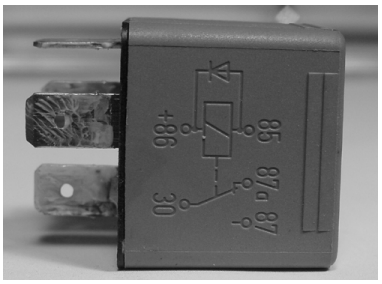
NOTE:

If the relay responds as described in the above test, the circuit problem may be in the power supply to the relay. Using the electrical schematics in Section 10Q and a multimeter, check the relay pole circuits.

Replace a relay that does meet the above test results.



Relay Box



Relay Circuit

Electrical Schematic
Symbol Designation “K”

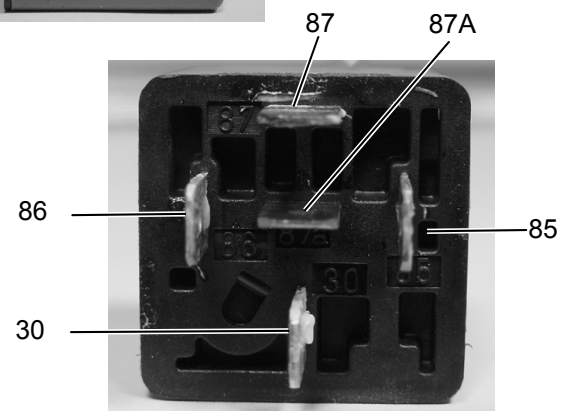


Figure 10I-2. Relays

SOLENOIDS

While solenoids are similar to relays in construction, solenoids have a different purpose. The solenoids used in the LF-1880 electrical system when energized create a magnetic draw, which seat and unseat a poppet or plunger in the fuel or hydraulic system to allow fluids to travel to and from a component. The fuel solenoid allows fuel to flow to the engine fuel system. The hydraulic solenoids control the flow of hydraulic oil to and from hydraulic components.

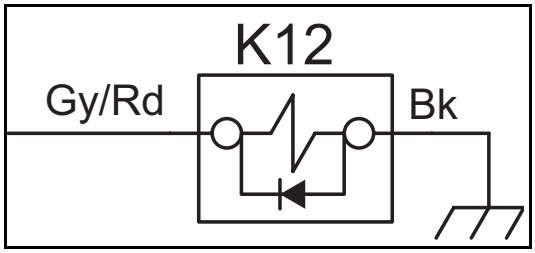


Figure 10I-3. Solenoid Circuit

One side of the solenoid coil is grounded. When current is applied to the opposite side, a magnetic field is generated within the coil (Figure 10G-3). This magnetic field is used to move the poppet or plunger in the component.

There are three basic tests that can be performed on the solenoid to determine its condition.

- Power Inlet and Ground
- Coil Resistance
- Coil Operation

Testing power inlet and ground determines if current from the electrical system is actually applied to the solenoid and if the solenoid is grounded for proper operation.

Testing coil resistance determines if the coil resistance is too high to allow the flow of current.

If the other coil tests are satisfactory, the component needs to be tested to determine if the fluid is present at the solenoid and if the poppet or plunger is moving to allow the fluid to flow through the component.

Use the electrical schematics in Section 10Q to find the solenoid and the wiring harness connections to be tested.

Use the hydraulic schematics in Section 8P and the engine manufacturer's manual to find the fluid flow components.

FUEL SOLENOID TEST

When the ignition switch is placed in the START position, the fuel solenoid plunger is drawn open allowing fuel to flow to the engine fuel system.

CHECKING POWER INLET AND GROUND

1. Shut down the engine and remove the ignition key. Allow the engine to cool completely.
2. Set the multimeter to 20 VDC range.
3. Disconnect wiring harness connector to the fuel solenoid.
4. Connect black (NEG -) to the black wire terminal in the wiring harness connector. Connect the red (POS +) test lead to the brown wire terminal in the wiring harness connector.
5. Hold the ignition switch in the START position.

   Multimeter should read battery voltage; if battery voltage is present the fuel solenoid may be faulty.

   If low or no voltage registers, check for bad grounds, high circuit resistance, opens, and a faulty start relay (K20).
6. Connect black test lead to the black wire terminal in the wiring harness connector. Connect the red test lead to the brown wire terminal in the wiring harness connector.
7. Place the ignition switch in the RUN position.

   There should be no voltage reading on the multimeter.

   If multimeter reads battery voltage, the start relay (K20) may be faulty.
8. Connect the black test lead to the black wire terminal in the wiring harness connector. Connect the red test lead to the green/red wire terminal in the wiring harness connector.
9. Hold the ignition switch in the START position.

   There should be battery voltage reading on the multimeter.

COIL RESISTANCE

1. Set the multimeter to 200 Ω.
2. Connect the black test lead to the black wire terminal (G) in the fuel solenoid connector. Connect the red test lead to the brown (P) wire terminal in the fuel solenoid connector.

   Multimeter should read between 6.5 and 8.0 Ω.

   If multimeter is not within the above range, the coil is faulty – replace coil.

   If there is no multimeter reading, coil is faulty-replace coil.

COIL OPERATION

If the above test results are satisfactory, the fuel supply to the injection pump may be faulty, the fuel pump pressure may be too low or the injection pump may be faulty (Figure 10I-4). See the engine manufacturer's manual for engine fuel system requirements.

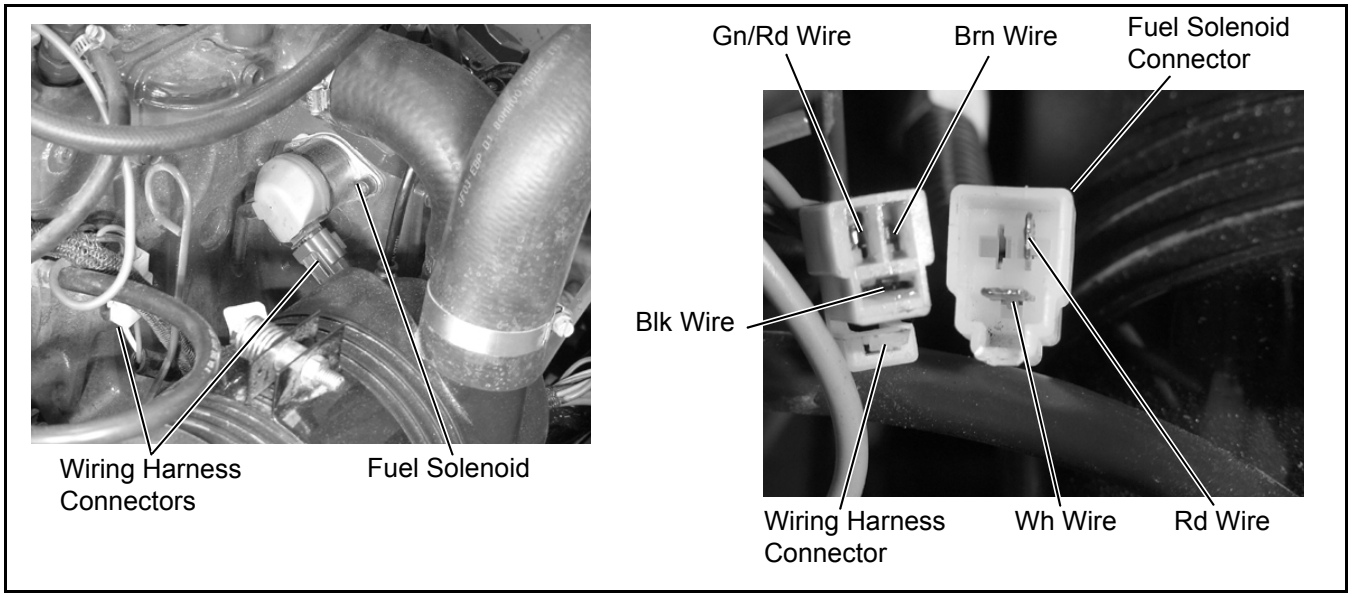


Figure 10I-4. Fuel Solenoid

REEL VALVE SOLENOIDS

The hydraulic reel motors can rotate both forward and reverse. The solenoid valves mounted on top of the reel control valves provide a means of controlling the rotation. There are two hydraulic control valves and a solenoid valve for each control valve. One valve controls the front reel motors and the other controls the rear reel motors. The solenoid valves are double sided, one side for reverse rotation and one side for forward rotation (Figure 10I-5).

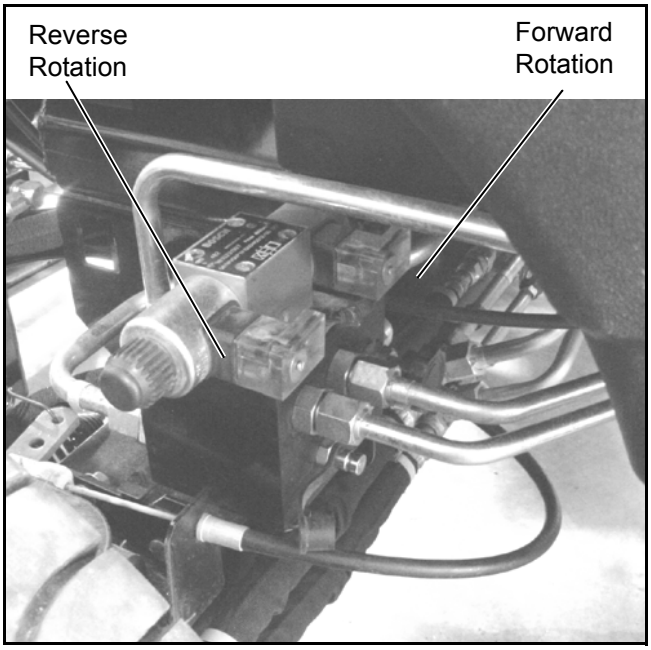


Figure 10I-5. Reel Solenoid Valves (Front Control Valve Shown)

SOLENOID TEST

The solenoid valves can be tested using the following procedure.

1. Shut down the engine and place the ignition switch in the RUN position and release the parking brake.
2. Place the reel switch in the forward or reverse position. An audible click should be heard in the forward solenoid valve. If no click is heard, continue with the test. If a click is heard, the problem may be in the hydraulic control valve. See Section 8 for control valve information.
3. Remove the connector from the solenoid valve.
4. Set the multimeter to the 20 volts DC scale.

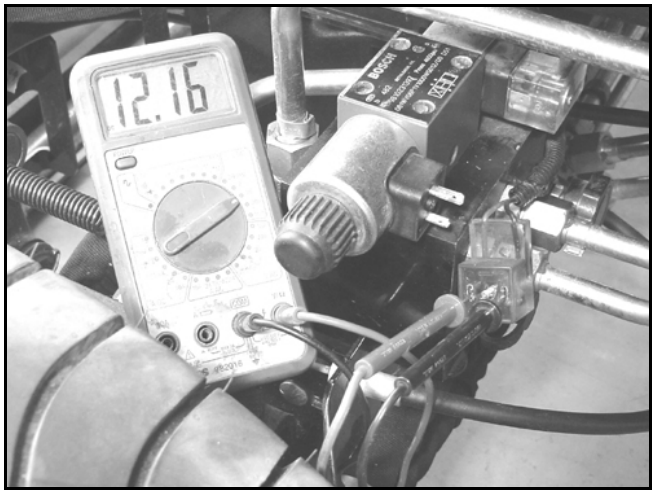


Figure 10I-6. Solenoid Power Test

5. Connect the test leads, red test lead to red wiring harness connector wire and black test lead to the black wire (Figure 10I-6). Activate the reel switch in the appropriate position.

   The multimeter should indicate battery voltage. If no voltage is indicated, connect the black test lead to the battery negative terminal and red test lead to the solenoid red wire to check solenoid ground connection. If no voltage is indicated, check the wiring harness circuit using the electrical schematics in Section 10Q.

6. Set the multimeter to the 200 Ω.
7. Connect the test leads to the solenoid socket (Figure 10I-7).

   The multimeter should indicate approximately 5.1 Ω.

   If coil is not within range, replace coil.

   If there is no voltage indication on the multimeter, replace the coil.

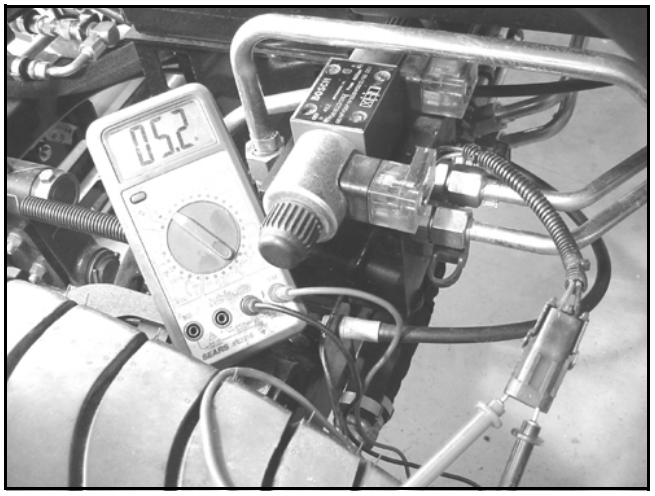


Figure 10I-7. Coil Resistance Test

LIFT/LOWER SOLENOID TESTING

The lift/lower control valve is mounted on the center rear of the front axle (Figure 10I-8). The control valve uses a double-sided solenoid valve to control the lift and lower functions of the control valve.

The lift and lower solenoid coils can be identified using the electrical schematics in Section 10Q. The solenoid lift coil uses a tan power wire and black ground wire. The lower solenoid coil uses a green power wire and black ground wire.

The solenoid coils and circuits can be tested in the same manner as the reel solenoid valve using the joystick instead of the reel switch.

Figure 10I-8. Lift/Lower Control Valve

4WD SOLENOID TEST

The 4WD control valve shifts the LF-1880 from two-wheel drive to four-wheel drive. The solenoid valve is mounted on the control valve and is used to shift the control valve. The control valve is mounted on the frame below and to the rear of the engine.

The solenoid valve can be tested using the following procedure.

1. Shut down the engine, release the parking brake and place the 4WD switch in the 4WD position.
2. Disconnect the wiring harness connector between the solenoid valve and wiring harness.
3. Connect the red test lead to the wiring harness connector brown/yellow wire and the black test lead to the black wire (Figure 10I-9).

   The multimeter should indicate battery voltage. If no voltage is indicated, connect the black test lead to the battery negative terminal and red test lead to the solenoid red wire to check solenoid ground connection. If no voltage is indicated, check the wiring harness circuit using the electrical schematics in Section 10Q.
4. Set the multimeter to 200 Ω.
5. Connect the test leads to the solenoid socket.

   The multimeter should indicate approximately 5.1 Ω.

   If coil is not within range, replace coil.

   If there is no voltage indication on the multimeter, replace coil.

Figure 10I-9. Coil Resistance Test

SECTION 10J. FUSES

FUSE TESTS

The fuses are located in the fuse block mounted on the right side of the mower frame. A plastic cover protects the fuses and must be removed for access. The fuses can be tested as follows:

1. Visually inspect and replace any blown fuse.
2. If the fuse does appear to be blown, check the fuse as follows:
   a. Set the multimeter to the continuity scale.
   b. Connect one test lead to each fuse blade (Figure 10J-1).

      Continuity should be available between the fuse blades. If not, replace the fuse.

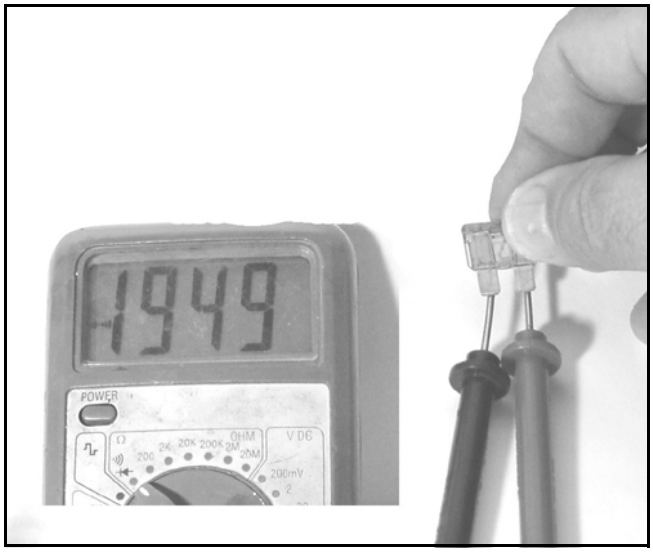


Figure 10J-1. Fuse Test

SECTION 10K. CIRCUIT BREAKERS

CIRCUIT BREAKER TEST

A circuit breaker (CB1) protects the electrical system between the alternator and battery voltage circuit. The circuit breaker is mounted near the fuse block. When tripped, the circuit breaker opens, blocking the flow of current from the alternator to the battery circuit.

The circuit breaker can be tested using the following procedure.

1. Shut down the engine and remove the ignition key. Allow the engine to cool completely.
2. Set the multimeter to 20 volts DC.
3. Connect black test lead to the battery negative (- NEG) terminal.
4. Connect the red test lead to each of the circuit breaker terminals in turn (Figure 10K-1).

   The multimeter should indicate battery voltage at both circuit breaker terminals. If not, replace the circuit breaker.

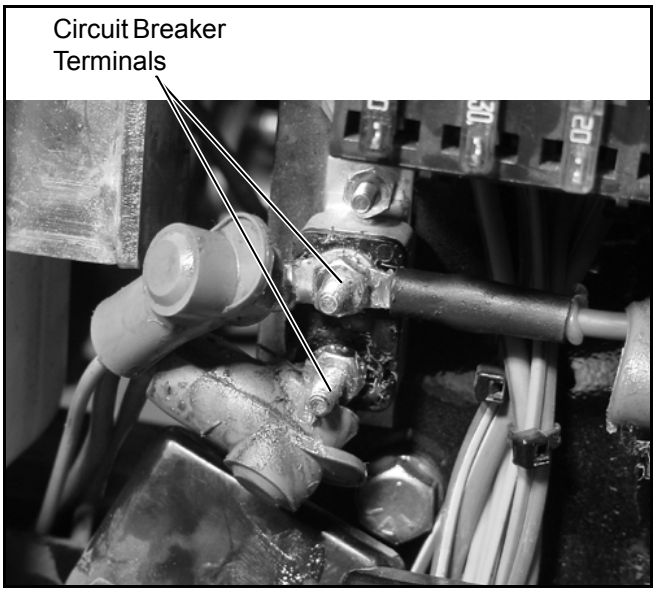


Figure 10K-1. Circuit Breaker Test

SECTION 10L. RESISTORS

RESISTOR TEST

A resistor is connected between the alternator ignition connection and the alternator field lead. The resistor can be tested as follows:

1. Shutdown the engine and remove the ignition key. Allow the engine to cool completely.
2. Remove the resistor from the alternator wiring harness.
3. Set the multimeter to the 200 Ω scale.

NOTE:

The resistor should test 75 Ω. If the multimeter indicates Ω slightly above or below 75 Ω the resistor is probably good and should not be replaced.

4. Connect one test lead in each resistor socket (Figure 10L-1).

   The multimeter should indicate 75 Ω. If the resistor indicates more or less than 75 Ω, replace the resistor.

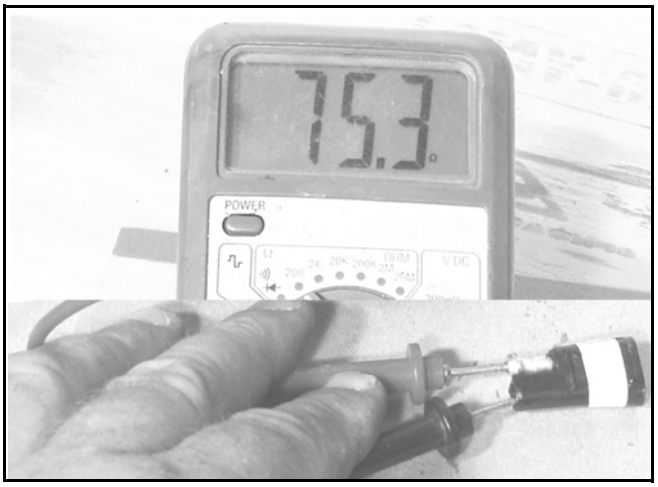


Figure 10L-1. Resistor Test

SECTION 10M. GLOW PLUGS

GLOW PLUG TESTING

The glow plugs warm the engine precombustion chamber and help the engine to start during cold weather. The glow plugs need to operate in unison to warm the engine for quicker starts. The glow plugs are mounted in the cylinder and connected with a metal strip connector.

The glow plugs can be tested using the following procedures.

1. Shut down the engine and remove the ignition key. Allow the engine to cool completely.
2. Remove the wiring harness connector and metal connector strip from the glow plugs.
3. Set the multimeter to 200 Ω scale.
4. Place one test lead to the glow plug connector stud and the other test lead to the base of the glow plug or a good ground (Figure 10M-1).

   The multimeter should indicate approximately 1.4 Ω. If the reading is infinity or 0 Ω, replace the glow plug.

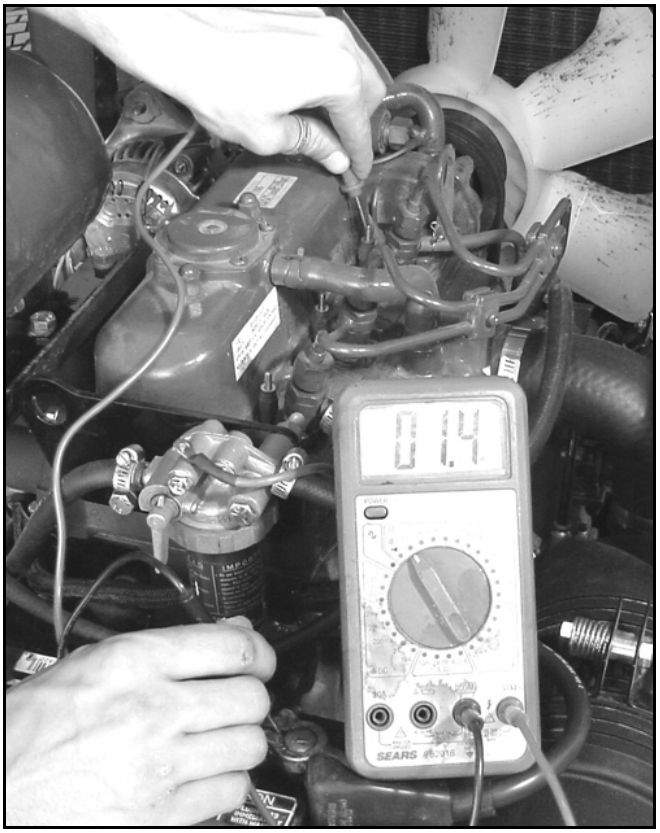


Figure 10M-1. Glow Plug Test

SECTION 10N. DIODES

DIODES

Diodes used in the LF-1880 are solid-state devices that allow current to flow in one direction but not the other.

The diodes are mounted in diode blocks (DB1 and DB2) mounted near the fuse block and protected by removable covers. The cover must be removed for access to the diode cards (Figure 10N-1).

Generally, diodes can be tested by setting the multimeter to the continuity scale and placing one test lead on one side of the diode and the other test lead on the other side of the diode. Continuity should be available in one direction but not the other.

Using the electrical schematics in Section 10Q, remove the diode card cover and carefully test each diode. If continuity is not available in both directions in the diode, replace the entire diode card.

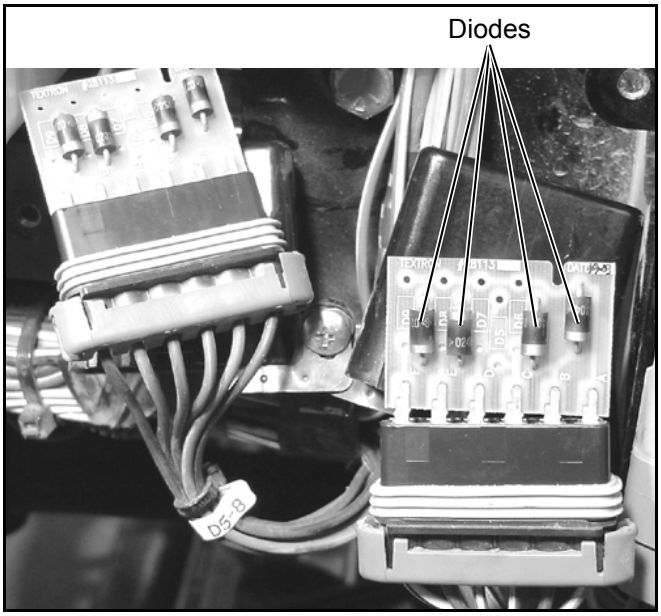


Figure 10N-1. Diode (DB1 & DB2) Diode Blocks

SECTION 10O. GAUGES

GENERAL

Repair of gauges and sensing units are limited to the replacement of faulty components or wiring. Before replacing a gauge that is not working, make sure to check for proper ground connections and perform a voltage check at the gauge wire. If the grounds and voltage checks are okay, a gauge that does not work is faulty, except for a water temperature gauge which can be tested as described below.

NOTE:

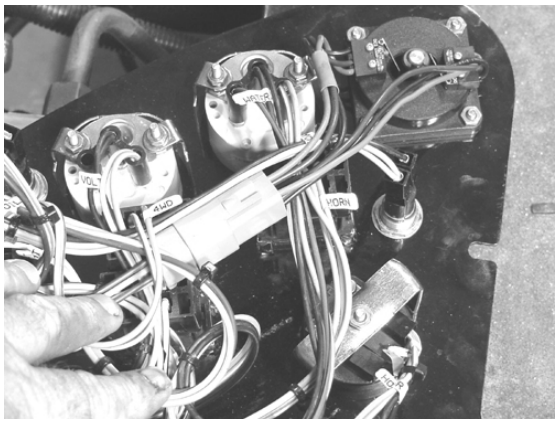
See Section 10Q for the location of all instruments and gauges.

WATER TEMPERATURE GAUGE TEST

Test the water temperature gauge using the following procedure (Figure 10O-1).

1. Turn the ignition switch ON.
2. Disconnect the lead wire to the sending unit on the engine and ground the wire.

   The gauge indicator should go all the way up. If not, the gauge or wiring is defective and must be replaced. If the gauge needle does go to the upper limit but does not work during operation, the sending unit is faulty.



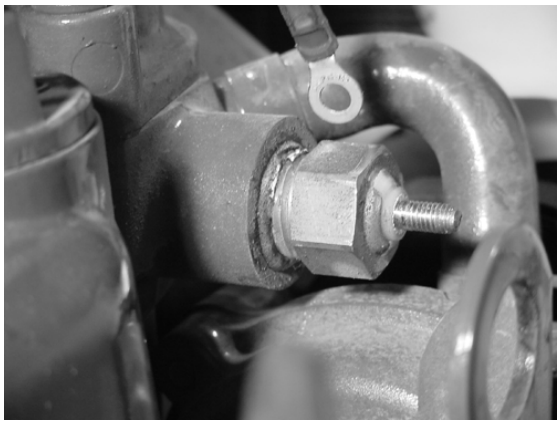


Figure 10O-1. Gauges

SECTION 10P. FUEL PUMP

FUEL PUMP TEST

The fuel pump is located underneath the seat and seat pan. The fuel pump can be tested as follows:

1. Shut down the engine and remove the ignition key. Allow the engine to cool completely.
2. Remove the seat and seat pan.
3. Disconnect the fuel wiring harness connector.
4. Set the multimeter to 20 volts DC and connect the red test lead to the red/white wiring harness connector socket. Connect the black test lead to the ground wire in the wiring connector (Figure 10P-1).
5. Place the ignition switch in the RUN position.

   The multimeter should indicate battery voltage.

   If voltage is not indicated, check wiring harness and circuit for faults.

   If battery voltage is indicated, the fuel pump may be faulty.

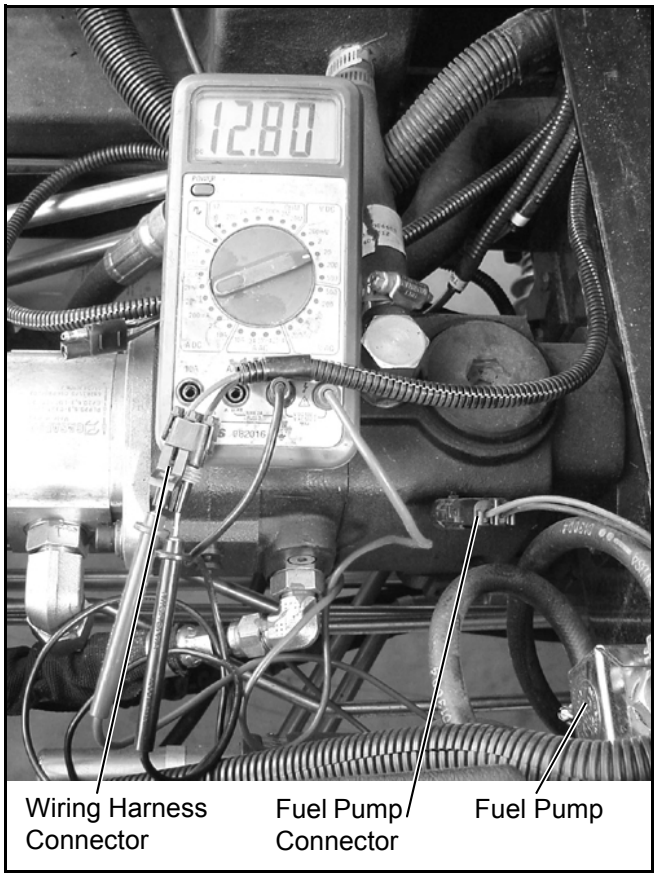


Figure 10P-1. Fuel Pump Test

SECTION 10Q. WIRING DIAGRAMS AND COMPONENT LOCATIONS

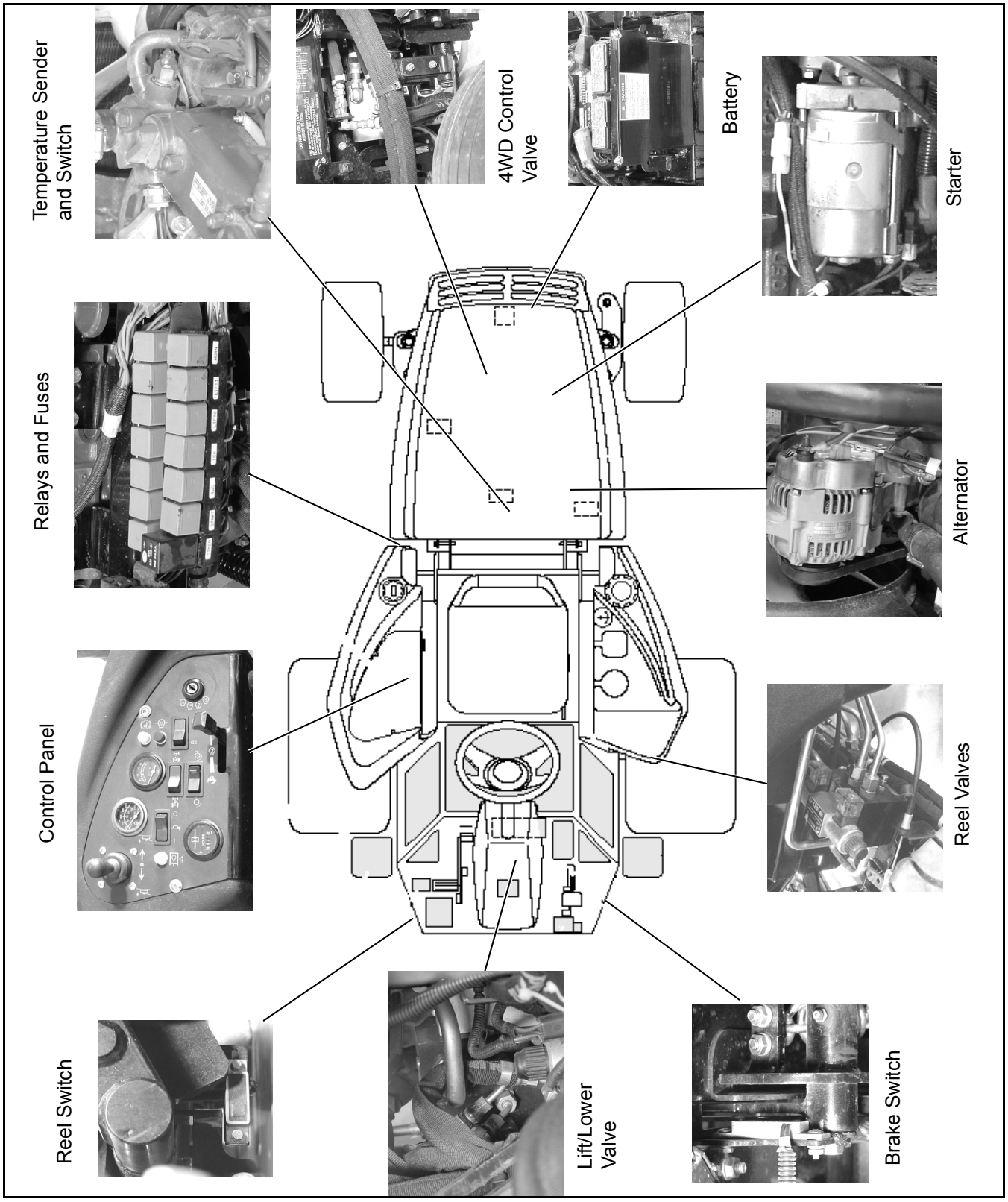


Figure 10Q-1. Electrical Component Location

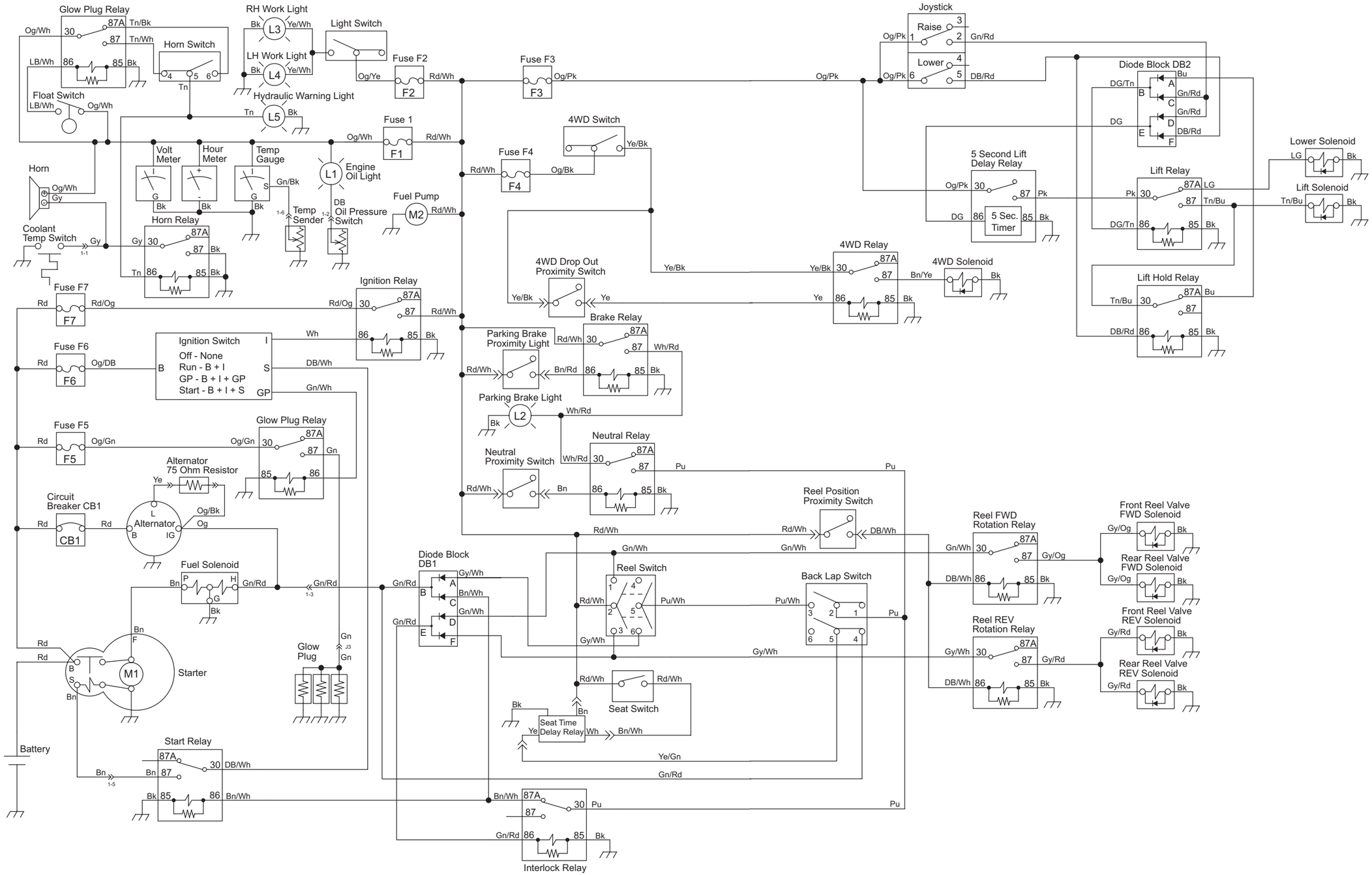


Figure 10Q-2. Electrical Schematic

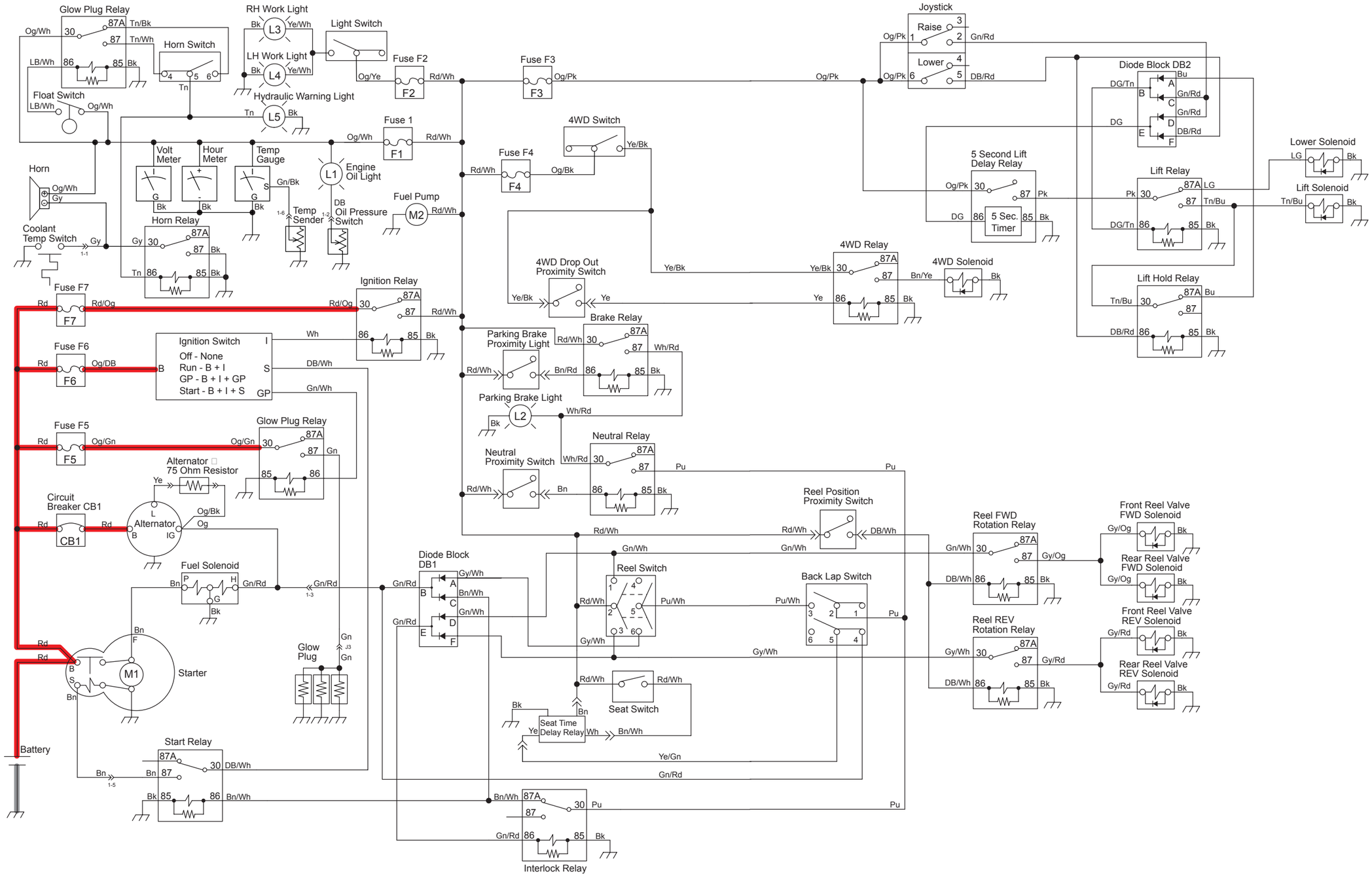


Figure 10Q-3. Battery Power Circuit

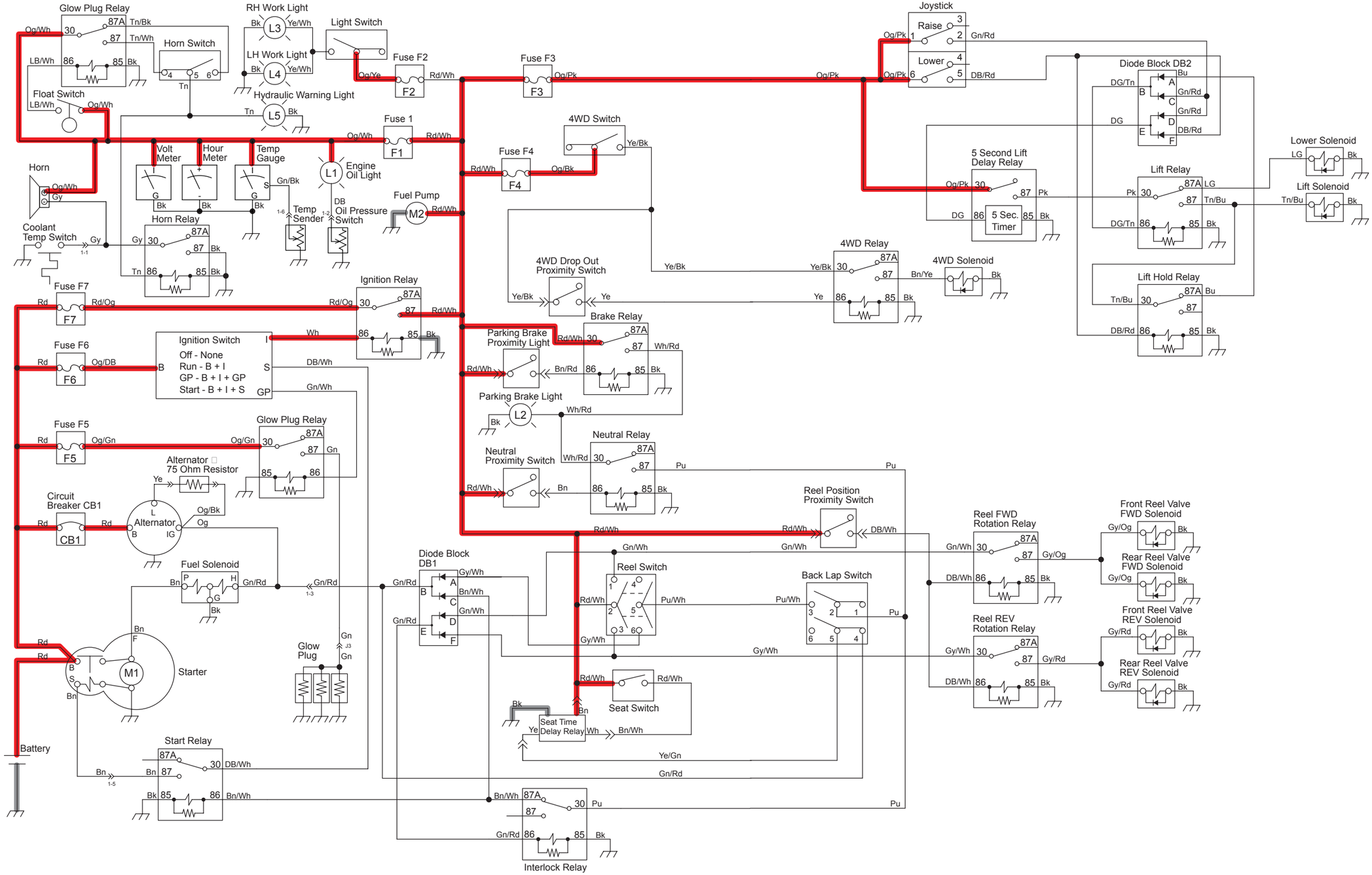


Figure 10Q-4. Switched Power Circuit

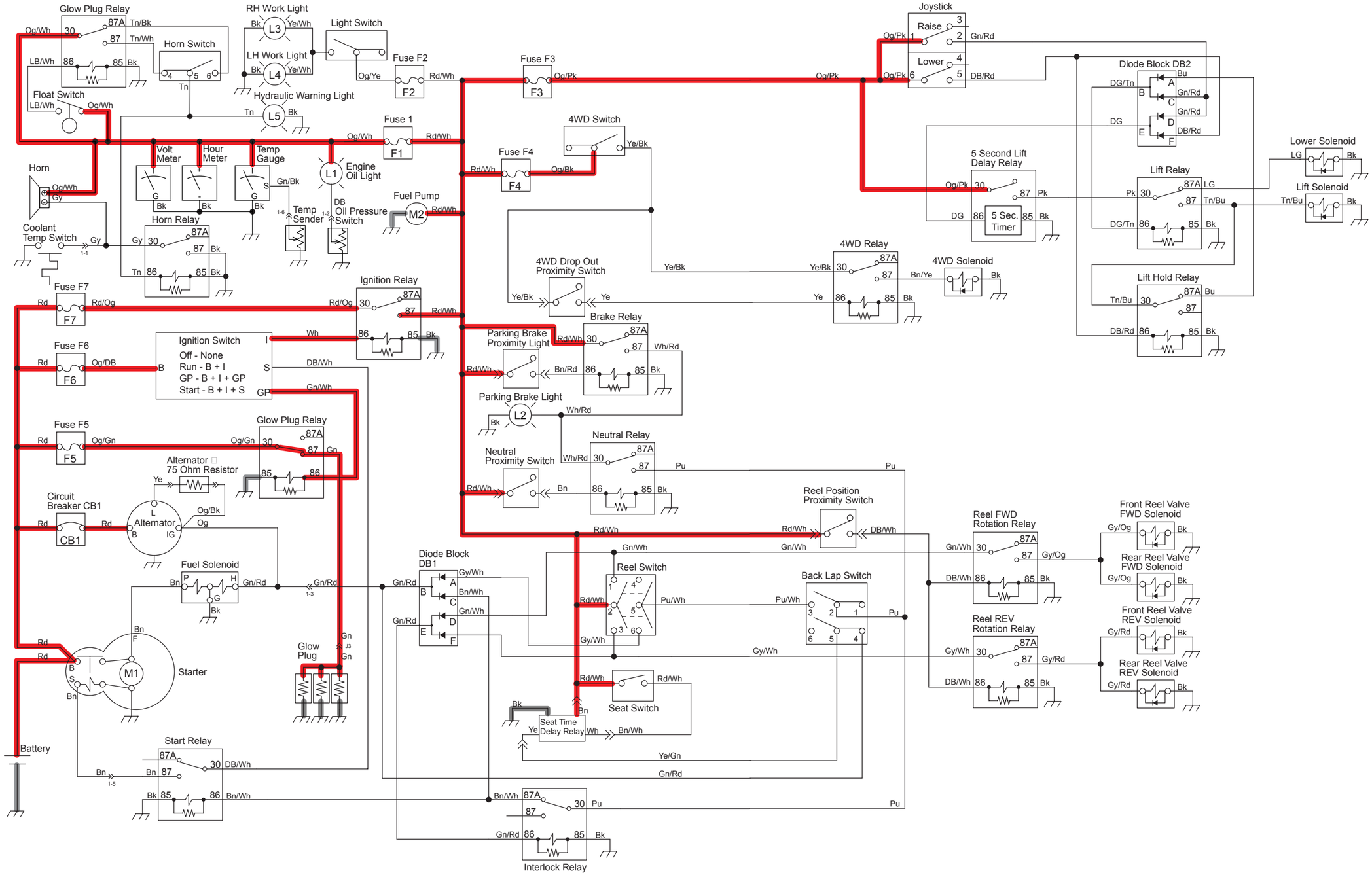


Figure 10Q-5. Glow Plug Circuit

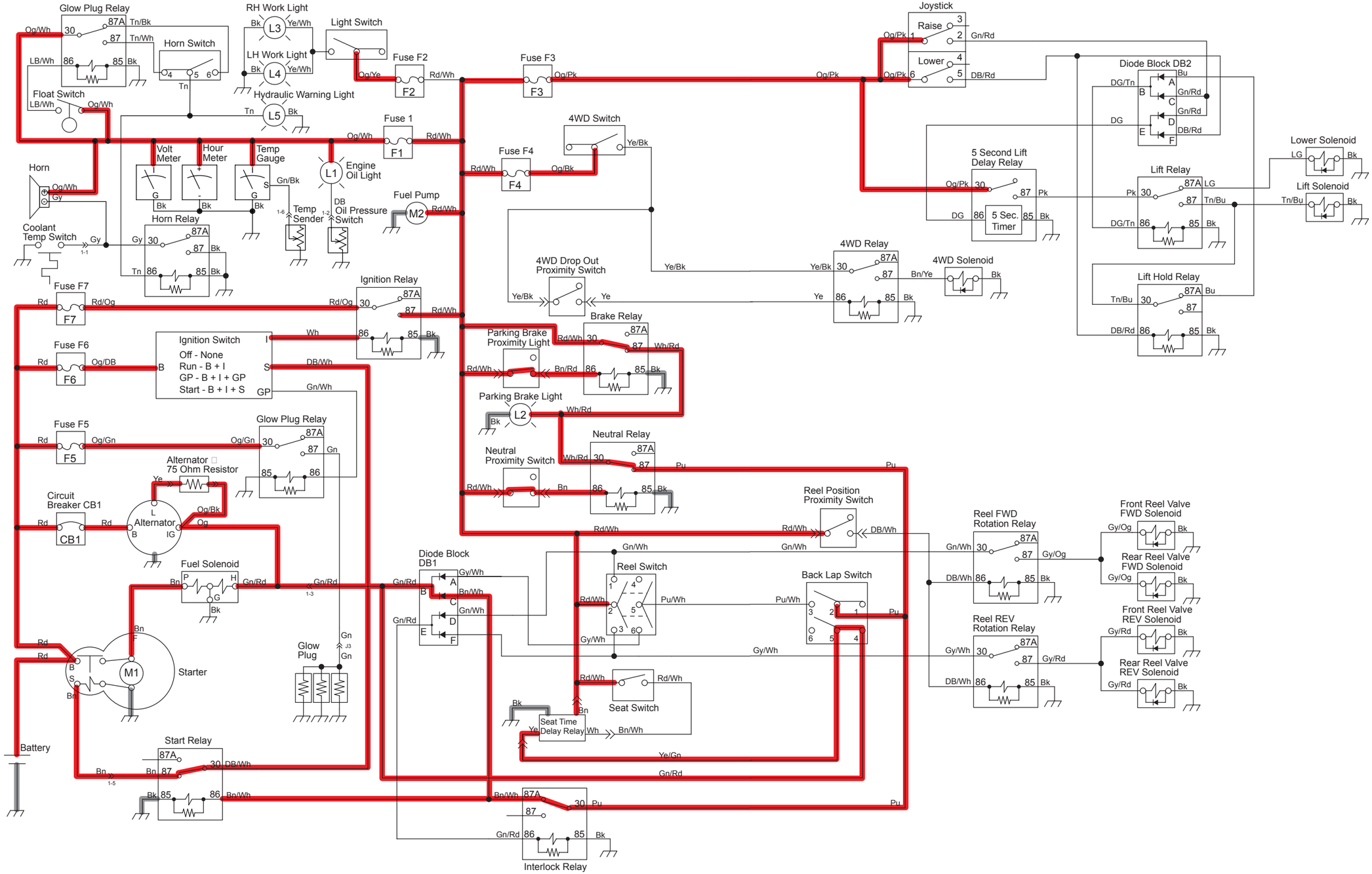


Figure 10Q-6. Start Circuit

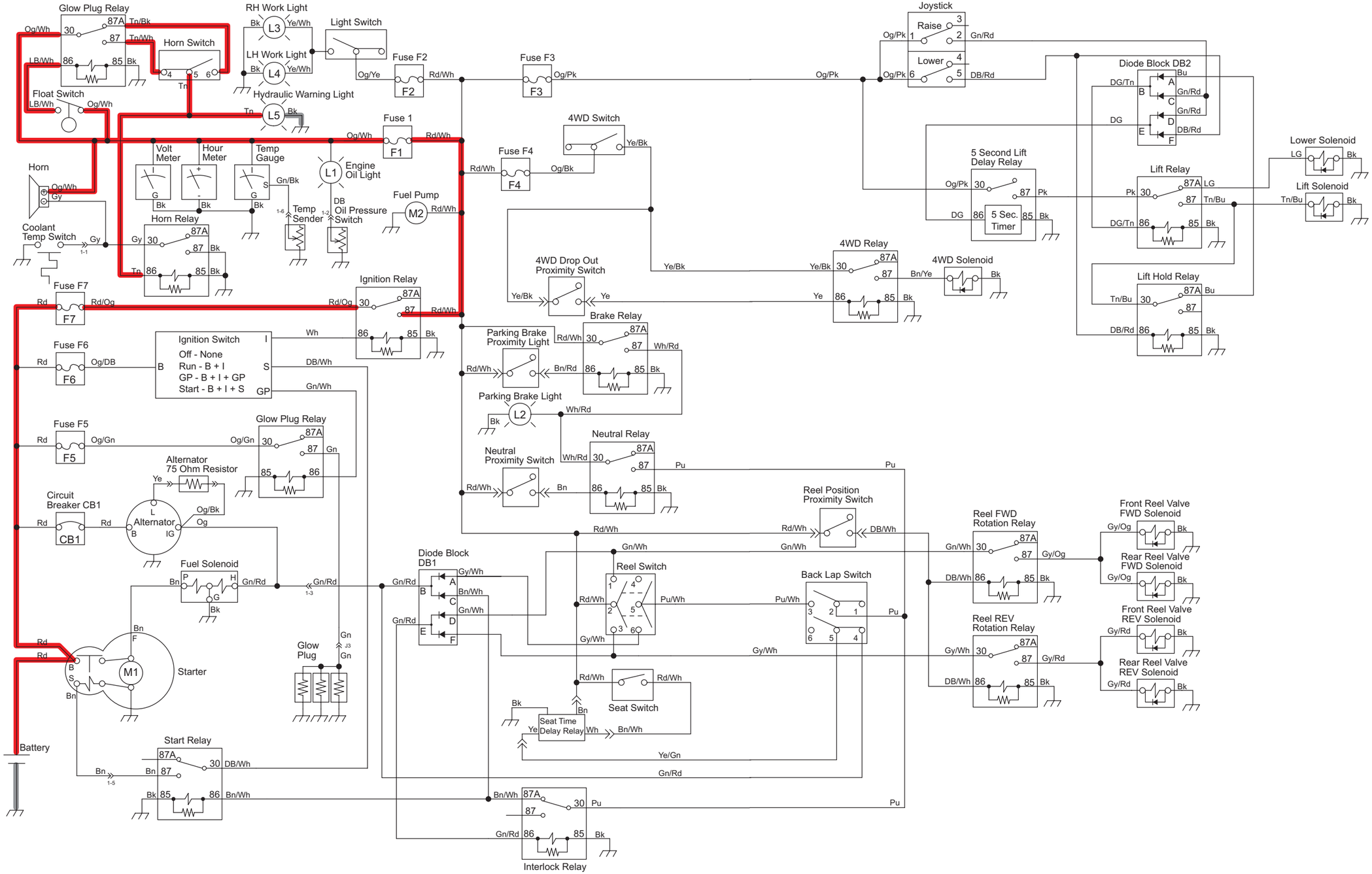


Figure 10Q-7. Test Warning Circuit

SECTION 11
PREVENTIVE MAINTENANCE

SECTION 11A. GENERAL

PREVENTIVE MAINTENANCE

Preventive maintenance (PM) is maintenance performed to prevent malfunctions and component breakdowns by periodically and systemically checking equipment and systems.

SCHEDULING

The machine should be scheduled for preventive maintenance according to the number of hours used, the severity of the use, and the type of environment the machine is used in.

Use the manufacturer's recommendations for preventive maintenance. The recommendations can be altered as experience is gained with the type of equipment and the environmental conditions.

When performing preventive maintenance tasks, watch for conditions that appear abnormal. If an abnormal condition exists a determination must be made to correct the condition immediately or schedule the tractor the necessary repairs.

ADMINISTRATION

Record keeping is an important part of preventive maintenance and also the part most frequently forgotten.

SECTION 11B. LUBRICATION AND MAINTENANCE SCHEDULES

GENERAL

This section contains lubrication and maintenance schedules. Intervals in the lubrication chart, based on operating hours, can be altered when experience is gained in machine operation, terrain, and environment.

Over greasing sill produces high loads on bearings and the engine, resulting in reduced machine performance.

⚠ CAUTION

Do not used compressed air grease guns.

⚠ WARNING

Before cleaning, adjusting, or repairing the machine, disengage all drives, lower the reels to the ground, engage the parking brake, stop the engine, and remove the ignition key from the ignition switch. Serious injury can occur if the machine is started while maintenance is being performed.

1. Always clean the grease fittings before and after lubricating.
2. Lubricate with grease that meets or exceeds NLGI Grade 2 LB specifications. Apply grease with a manual grease gun and fill slowly until grease begins to seep out. Do not use a compressed air gun.
3. Periodically apply a small amount of lithium-based grease to the seat runners.
4. For smooth operation of levers, pivot points and other friction points that are not shown on the lubrication chart, apply several drops of SAE 30 oil every 40 hours or as required.
5. Grease fittings (A — |) every 50 hours, fittings (J — M) every 100 hours, and (N) every 250 hours.

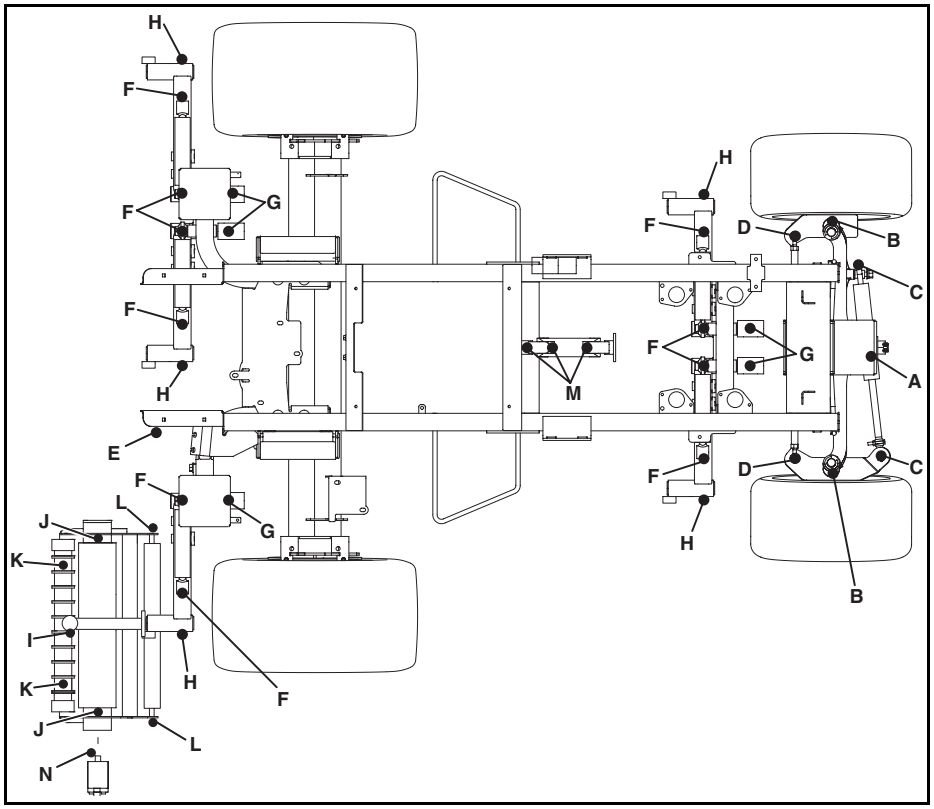


Figure 11B-1. Tractor Lubrication Chart

Table 11B-1: Maintenance Schedule Chart

	Every 8-10 Hours	Every 50 Hours	Every 100 Hours	Every 200 Hours	Every 400 Hours	Every 500 Hours	Every 1000 Hours	Yearly	See Section	Lubricant Type
Air Filter	I		AR					R	4	
Battery Charge			I-C						4	
Belts	I-A*		I-A			R			3	
Brake		I-A*		A					3	
Cooling System	I-C-A							R**	4	IV
Electrical System	I			I					4	IV
Engine Oil	I	R*		R					4	II
Engine Oil Filter		R*		R						
Fuel System		I							4	
Fuel Filter					R				4	
Grease Fittings - All	L	L	L			L			6	I
Hydraulic Hoses and Tubes	I***			I					4	
Hydraulic Oil	I-A					R**			4	III
Hydraulic Oil Filter	I	R*				R			4	
Muffler and Exhaust	I			I					4	
Radiator Screens	I-C/AR								4	
Tires	I	I-A							4	

A = Add or Adjust

C = Clean

I = Inspect

L = Lubricate

R = Replace

AR = As Required

*Indicates initial service for new machines.

**Or every two years whichever comes first.

***Inspect visible hoses and tubes for leaks or oil marks.

I = Manual grease gun with NLGI Grade 2 (Service Class LB).

II = Use Textron Golf, Turf & Speciality Products Green-sCare 68 hydraulic fluid: Capacity: 8 gallons (30 liters). Order Part No. 5003102, containing 55 gallons (208 liters) drum or Part No. 5003103 containing 5 gallons (19 liters) pail.

IV = 50/50 water ethylene glycol mix.

SECTION 12
ATTACHMENTS

SECTION 12A. REPAIR, SERVICE TOOLS, AND MATERIALS

MATERIALS REQUIRED

Tools required:	Standard automotive hand tools, including: • Driving tools and seal spreaders • Reel Grinder • Bedknife Grinder • Lapping Machine • Bearing Puller • Sheet Metal Pliers
Cleaning materials:	Stoddard solvent or equivalent Detergent and water
Lubricants:	Refer to Section 11
Other service items:	Newspaper Gauge bar for adjusting bedknife (P/N 158568) Lapping compound available as: • One 10 pound pail of 80 grit (P/N 5002488) • One 25 pound pail of 80 grit (P/N 5002490) • One 10 pound pail of 120 grit (P/N 5002489) • One 25 pound pail of 120 grit (P/N 5002491)

SECTION 12B. FAILURE ANALYSIS

GENERAL

The following table lists common problems, probable causes, and suggested remedies with section references to detailed descriptions of remedial procedures.

PROBLEM	PROBABLE CAUSE	REMEDY
1. Mower does not turn	a. Reel is jammed with grass	a. Clean reels
	b. Reel motor new (tight)	b. Turn in REVERSE to break in motors
	c. Reel motor malfunctioning	c. Repair or replace (Section 8I or Section 8J)
	d. Bedknife too tight	d. Adjust (Section 12D)
	e. Mower switch malfunctioning	e. Test (Section 10G)
	f. Mower switch not in FORWARD or REVERSE position	f. Push switch into FORWARD or REVERSE position
	g. Reel bearing failure	g. Repair (Section 12D)
	h. Motor drive coupling failure	h. Replace (Section 12D)
2. Reel turns only FORWARD, not in REVERSE when mower switch is pushed	a. Mower switch malfunctioning	a. Test (Section 10G)
	b. Reel valve solenoid failure	b. Test (Section 10K)
3. Reels turn slow	a. Reel motor malfunctioning	a. Test/repair (Section 8N, Section 8I, and Section 8J)
	b. Solenoid valve malfunctioning	b. Test/repair (Section 8N and Section 10K)
	c. Reel pump malfunctioning	c. Test/repair (Section 8N and Section 8H)
4. Only one reel circuit affected	a. Reel motor malfunctioning	a. Test/repair (Section 8N, Section 8I, and Section 8J)
	b. Solenoid valve malfunctioning	b. Test/repair (Section 8N and Section 8H)
	c. One reel pump section malfunctioning	c. Test/repair (Section 8N and Section 8H)
5. Uneven cutting	a. Reel has loose or broken blades	a. Repair (Section 12F)
	b. Reel bearing or bearing housings are worn	b. Repair (Section 12F)
	c. Roller or roller bearings defective	c. Repair (Section 12H)
	d. Reel blade and/or bedknife damaged	d. Repair (Section 12F)

PROBLEM	PROBABLE CAUSE	REMEDY
6. Ragged cutting	a. Bedknife has damaged edge and/or face	a. Sharpen (Section 12E)
	b. Reel not sharp	b. Sharpen (Section 12E)
	c. Poor reel to bedknife adjustment	c. Adjust (Section 12D)

SECTION 12C. GENERAL INSTRUCTIONS

GENERAL

Carefully read the following instructions to make certain they pertain to your machine.

BEDKNIFE VARIATIONS

The standard bedknife for machines shipped from the factory is the “low profile.”

Optional “high profile” and “ultraknife” bedknives are also available.

Bedknife selection depends upon the desired cutting job to be done. Bedknives are designed for various heights.

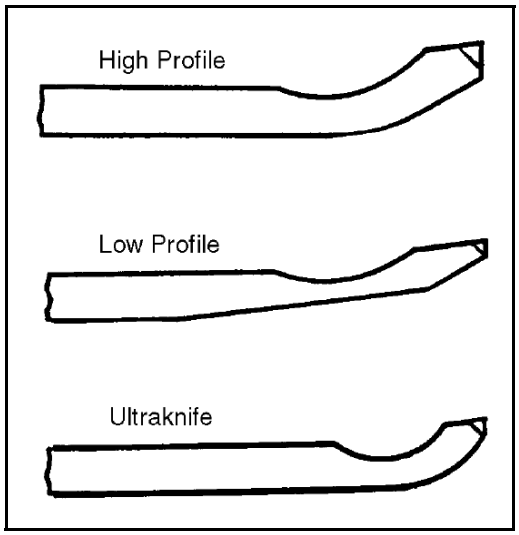


Figure 12C-1. Bedknife Configurations

PREPARATION FOR REPAIR

Thoroughly clean the mower and reel assemblies prior to disassembly and repair procedures. Coat bare metal parts with a light coat of oil.

The cutting and grooming attachments are exposed to water (daily washing), grass clippings, sand, corrosive fertilizers, and foreign objects such as tees. It may be necessary to use bearing pullers and/or wooden chocks and hammers to free up some parts such as bearings and spacers.

When such force is required to remove parts, those parts should be replaced rather than reinstalled on the machine.

⚠ WARNING

Before removing components, turn the mower switch to OFF, lower the reels, stop the engine, set the parking brake, and remove the key from the ignition switch.

DEFLECTOR AND THROW SHIELD

Remove the deflector and throw shield, as shown in Figure 12C-2, to gain access to the mower unit components.

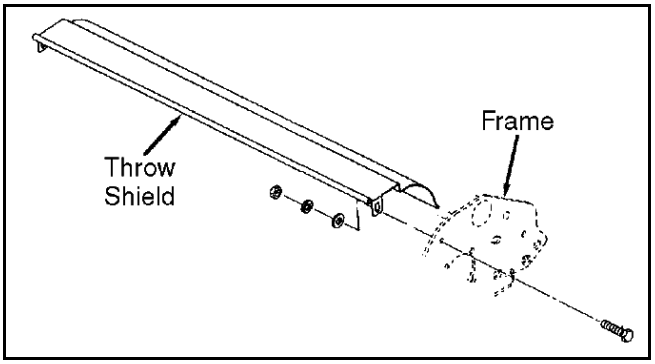


Figure 12C-2. Deflector and Throw Shield

SECTION 12D. MOWER AND REEL ADJUSTMENTS

DOWN PRESSURE ADJUSTMENT

Each reel is equipped with a down pressure spring. Down pressure improves cutting quality by ensuring good contact between the reel and ground when cutting uneven surfaces. Check and adjust down pressure any time the cutting height has been changed (see Figure 12D-1)

1. Lower reels to the ground. Engage the parking brake, stop engine, and remove the key from the ignition switch.

NOTE:

Reels must be lowered when measuring down pressure.

2. Measure the length of the spring as shown. Adjust the spring to 3.75 ±0.06 in (95 ±1.5 mm).

   To make fine adjustments, loosen the jam nut and turn the adjusting rod in or out of the rod end. Tighten the jam nut after the adjustment is made. For adjustments greater than 0.25 in (6 mm), relax spring tension by first raising the reels, then adjust the pin.

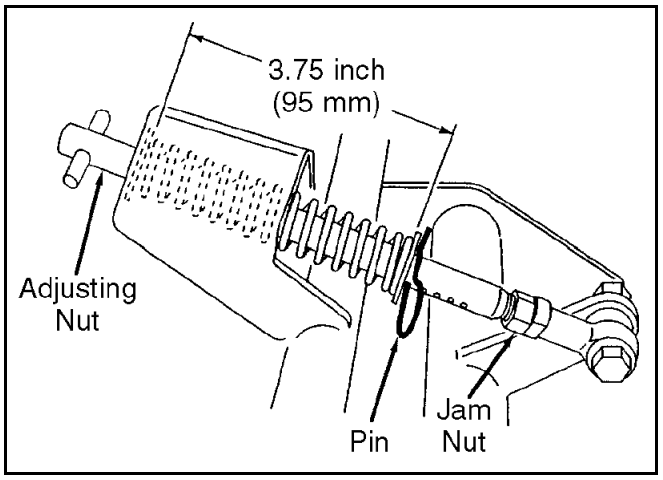


Figure 12D-1. Down Pressure Adjustment

If the down pressure springs require replacement, disassemble as shown in Figure 12D-2. Replace damaged components, reassemble as shown and adjust as described above.

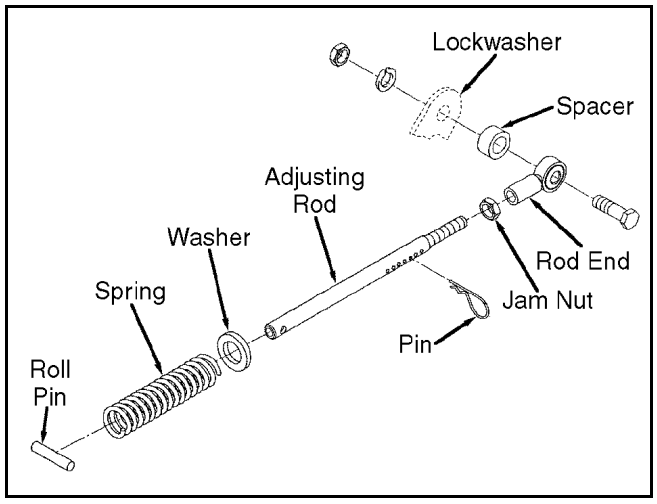


Figure 12D-2. Down Pressure Springs Repair

BEDKNIFE-TO-REEL ADJUSTMENT

⚠ WARNING

To prevent injury and damage to the cutting edges, handle the reel with extreme care.

1. Reel bearings are self-adjusting. Check the reel bearings for end play or radial play which would indicate worn bearings. Replace bearings as described in Section 12F.
2. Inspect the reel blades and bedknife to insure good sharp edges without bends or nicks.
   a. The leading edge of the reel blades must be sharp, free of burrs, and show no signs of rounding off.
   b. The bedknife and bedknife backing must be securely tightened. The bedknife must be straight and sharp.
   c. For the standard low profile bedknife, a flat surface of at least 0.0625 in (1.5 mm) minimum must be maintained on the front face of the bedknife (see Figure 12D-3). Use a small disc grinder to dress the bedknife.

For the optional high profile bedknife, the front face should be 0.09375 in (2.38 mm) For the ultraknife, the front face should be 0.140625 in (0.138 mm), see Figure 12D-3.

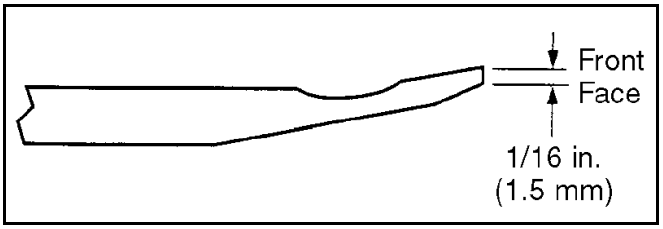


Figure 12D-3. Standard Bedknife Front Face

3. If wear or damage is beyond the point where the reel or bedknife can be corrected by the lapping process, they must be ground (see Section 12E).
4. Proper reel-to-bedknife adjustment is critical. A gap of 0.001 to 0.003 in (0.025 to 0.076 mm) must be maintained across the entire length of the reel and bedknife.
5. The reel must be parallel to the bedknife. An improperly adjusted reel will lose its sharp edges prematurely and may result in serious damage to the reel and bedknife.
6. Grass conditions will also affect the adjustment.
   a. Dry, sparse conditions will require a wider gap to prevent heat buildup and damage to the reel and bedknife.
   b. High quality grass with a good moisture content requires a closer gap (near zero).
7. Start adjustment at the leading end of the reel, followed by the trailing end. The leading end of the reel blade is that end which passes over the bedknife first during normal reel operation (see Figure 12D-4).

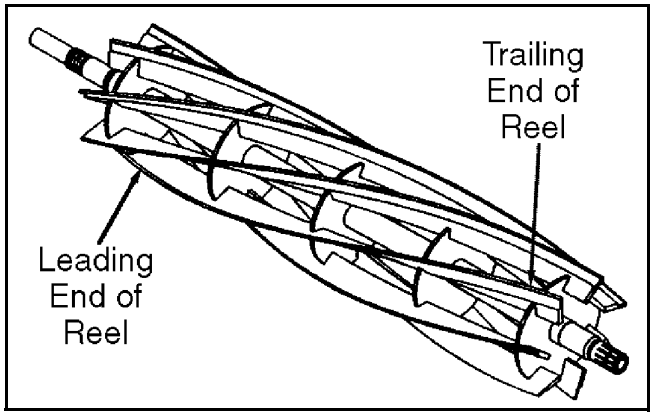


Figure 12D-4. Reel Leading End

8. Set the leading edge of the reel.
9. Slide a feeler gauge or shim stock — 0.001 to 0.003 in (0.025 to 0.076 mm) — between the reel blade and the bedknife. Do not turn the reel.
10. Adjust the trailing end of the reel in the same manner, then recheck the adjustments at the leading end.
11. When the reel is properly adjusted to the bedknife, the reel will spin freely and you should be able to cut a piece of newspaper, along the full length of the reel, when the paper is held at 90° to the bedknife.

NOTE:

Avoid excessive tightening or damage may occur to the bedknife and reel blades. The reels must turn freely.

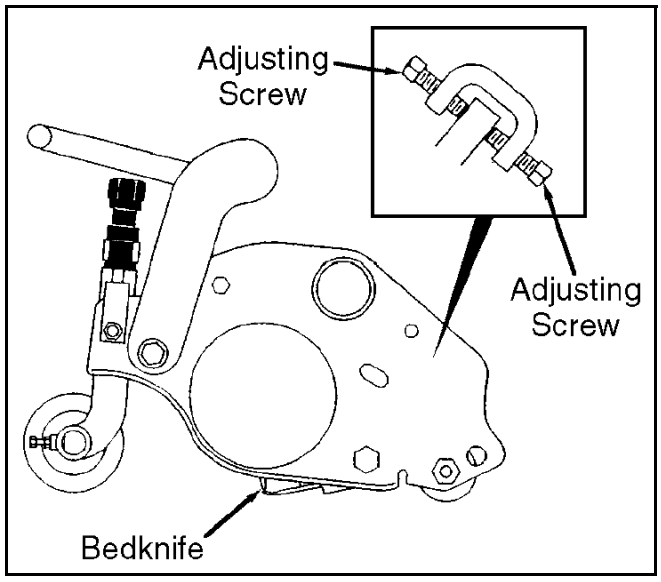


Figure 12D-5. Bedknife-to-Reel Adjustment

CUTTING HEIGHT ADJUSTMENT

All reels must be accurately adjusted to exactly the same height for proper cutting.

It is best to use two gauge bars, one on each side of the reel, then adjust each end equally.

NOTE:

See preceding section for bedknife-to-reel adjustment.

1. Loosen the locknut on the side of the front roller brackets just enough to allow the adjusting nut to raise or lower the bracket.

2. Set cutting height gauge to the desired height by measuring between the underside of the screw head and the gauge bar surface and tighten the wing nut (Figure 12D-6).

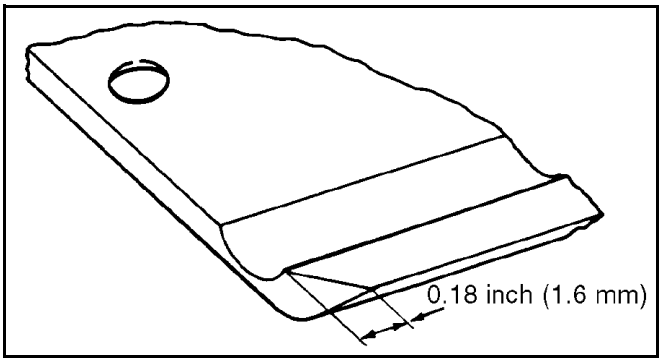


Figure 12D-6. Cutting Height Adjustment

3. Place the gauge bar across the bottom of the front and rear rollers near one end.
4. Slide the head of the gauge screw over the bed-knife.
5. Adjust the hand adjusting knob of the front roller to close the gap between the roller and gauge bar, then tighten the locknut.
6. Repeat for the opposite end.
7. After tightening the locknuts, recheck each end with the gauge for the proper adjustment.

SECTION 12E. SHARPENING REELS AND BEDKNIVES

GENERAL

When a mower reel rotates, it cuts off the tops of grass blades which are lifted and held erect by a flat stationary bedknife. A properly sharpened and adjusted reel mower cuts grass cleanly and with minimum effort. A poorly sharpened reel mower may tear, shred, pull, or leave grass uncut and usually requires more effort than a properly sharpened reel mower.

If a mower cuts in streaks, strips, or ragged areas, chances are the cutting edges are not properly adjusted or they need sharpening.

Inspect the blades and bedknife for nicks, gouges, high or low wear areas, or other signs of damage or uneven wear. However, consider these other factors that can contribute to poor cutting performance before grinding and lapping the cutting edges:

Improper Adjustment

The perfect adjustment of the blade and bedknife is a light contact without drag or resistance to rotation. Owing to the manufacturing clearances required in bearings and other mating components, the bedknife should be set close enough to the reel so the mower cuts a strip of newspaper clear across the blades without metal-to-metal contact between the bedknife and the reel blades.

Damaged Mower Parts

A gouged bedknife, nicked reel blade, or wavy bedknife and reel as well as a bent frame, bent bedknife ears, broken welds, worn bearings, or loose attaching hardware can cause poor quality cutting. Solve such problems by making sure the bedknife mounting screws and other hardware are secure and by replacing parts if damage cannot by corrected by grinding and lapping.

Bad Bearings, End Play, or Radial Play

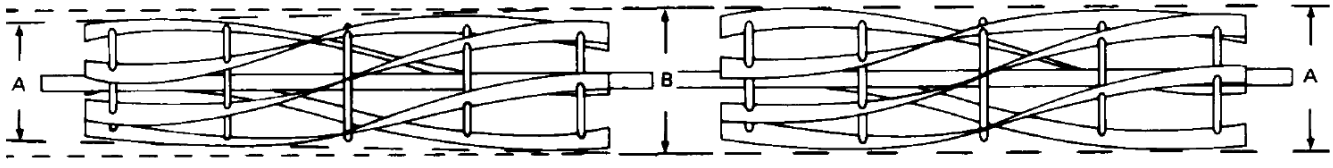
Check for play in the reel bearings. The mower has self adjusting bearings. Excessive play indicates worn bearings or weak tensioning spring. Repair as described in Section 12F.

⚠ CAUTION

Never grind and lap a reel in the frame until all end play and radial play are eliminated. End or radial play will cause uneven grinding.

Reel blades and a bedknife that are slightly dull or have minor nicks or high spots can be honed quickly and easily by lapping. Both grinding and lapping are required when more severe wear or damage exists. If a wave has developed in the bedknife, lapping will not solve the problem and the mower reel and bedknife must be replaced.

A reel worn or incorrectly ground to a conical shape instead of a cylindrical shape will cause a wavy bedknife (Figure 12E-1).



If diameters A and B are not equal, the reel is conical.

If diameters A and B are equal, the reel is cylindrical.

NOTE

Always correct a conical shaped reel by grinding. A conical reel can cause a wavy bedknife.

Figure 12E-1. Reel Wear

BEDKNIFE FRONT FACE ANGLE

If grass is to be cut at the desired height, it must contact the front edge (front face) of the bedknife at the proper angle. This front face angle is called the “front face relief” angle.

Without a relief angle to the bedknife front face, the grass blades would contact the lower edge of the bedknife and simply fold over and not be lifted to an angle where they could be cut by the reel blades.

The proper bedknife front face relief angle for all Jacobsen reel mowers is 0° to 5° (Figure 12E-2). The height thickness of the front face must be taken into consideration when grinding the relief angle. Regardless of the height of the front face, the relief angle is measured from top of the bottom of the front face, not from the top to bottom of the front of the bedknife.

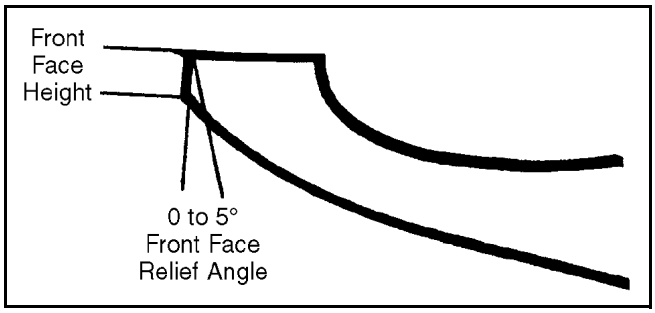


Figure 12E-2. Front Face Grinding Angle

BACKLAPPING

General

Lapping is to be considered a honing process and should not be used to sharpen an extremely dull or damaged reel or bedknife.

Lapping is not a substitute for grinding. Lapping can maintain a sharp edge — it does not create a sharp edge.

Lapping (backlapping) is the method of removing nicks, burrs, and other minor obstructions to clean cutting.

During the lapping process (Figure 12E-3), the reel-to-bedknife clearance is adjusted until the reel and bedknife are in contact. There is no clearance in lapping. Lapping compound is applied to the relief area of the reel blades.

When the reel is turned on the backward direction shown, lapping compound is forced between the top of the bedknife and the “land” (or cutting edge) of the reel blade.

The grit in the lapping compound acts like sandpaper to hone the cutting edges of both the bedknife and the reel blades. Only a small amount of metal, 0.005 in (0.127 mm), or less should be removed by lapping. Beyond that point, the lapping process actually destroys the cutting surface.

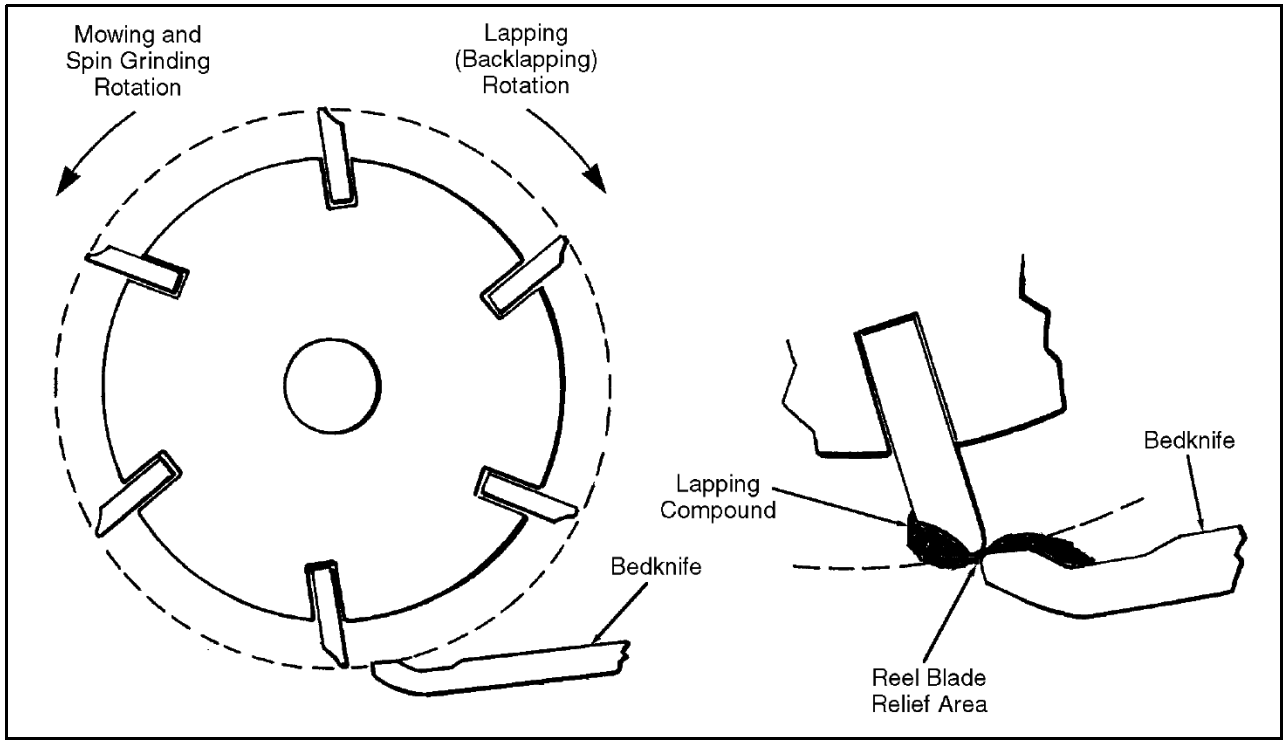


Figure 12E-3. Lapping Process

BACKLAPPING ON THE TRACTOR

⚠ WARNING

Since the engine is operating during lapping on the machine, never backlap on the machine without proper ventilation. Carbon monoxide in exhaust fumes can be fatal.

1. Lower the reels to the ground, disengage all drives, engage the parking brake and stop the engine.
2. Loosen the locknut at the valve stem (Figure 12E-4).
3. Open the hood and place the backlap control to REVERSE (Figure 12E-4). Start the engine and set the throttle to low idle speed.

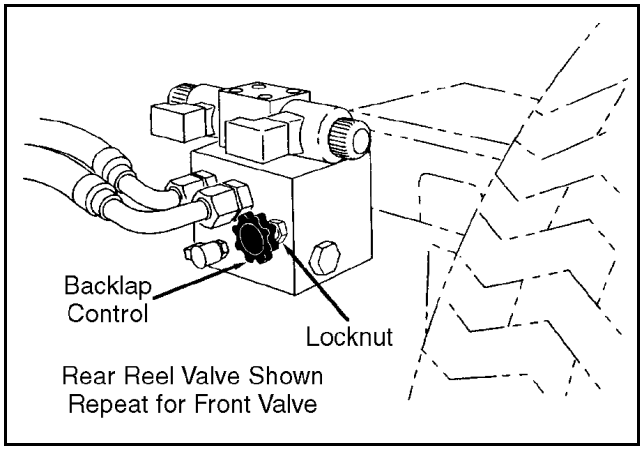


Figure 12E-4. Backlap Control

4. Set the mower switch on the instrument panel to REVERSE. Reels will begin rotating.
5. Both the front and rear reel valves contain an adjustable control to control the speed of the reels. The front valve controls the front three reels. The back valve controls the two rear reels. Turn the valve control counterclockwise to reduce the reel speed. Repeat for both valves.
6. After the desired speed is set, disengage the reels and stop the engine. Tighten the locknut to lock adjustment in place. Start the engine and set the mower switch to REVERSE to begin backlapping.
7. Apply the lapping compound, with a long handled brush, along the entire length of the reel.
8. When the blades have been evenly honed, carefully and thoroughly wash off the remaining mixture.
9. Repeat the entire process on the other reels.
10. After lapping, turn the mow switch to OFF (center position) and set the backlap to FORWARD rotation.

NOTE:

The backlap control limits reverse speed only. Once the desired backlapping speed has been set, the valves can remain in this position for normal mowing. If full reverse speed is needed, for instance during operation of vertical mowers, the valve can be fully closed (turn clockwise).

Bench Lapping

When a reel and bedknife have been ground or a new reel and/or bedknife are being installed, the assembled reel should be lapped using an electric powered bench lapper. Operate the bench lapper in accordance with the manufacturer's instructions.

1. Connect the lapper to the reel shaft at the end opposite the hydraulic reel motor.
2. Apply lapping compound to each reel blade.
3. Run the lapper and continue applying lapping compound, making slight reel-to-bedknife adjustments if necessary until there is uniform contact along the full length of the cutting edges.

⚠ WARNING

Do not operate the reel by hand. Use a piece of wood, plastic, or other rigid non-metallic material to rotate the reel by hand, when checking clearances.

4. Turn off the lapper.
5. Wash off the compound before running the reel in the forward direction.
6. Carefully turn the reel backward slowly by using a wooden or other non-metallic probe. Make the necessary reel-to-bedknife clearance adjustments (see Section 12D).
7. As a final check, place a strip of newspaper vertically between the reel and bedknife. Manually rotate the reel forward. The blades should cut the newspaper across the entire edge of the bedknife.
8. If the mower unit was removed, lubricate and install the mower unit on the machine as described in Section 12F.
9. Make reel-to-bedknife adjustments and cutting height adjustments for each reel after installation (see Section 12D).

REEL REPAIR AND GRINDING

Reel blades and bedknife that are slightly dull or have minor nicks or high spots can be reconditioned quickly and easily by lapping. Grinding is required when more severe wear or damage exists. If a wave has developed in the bedknife, lapping will not solve the problem and the mower reel and bedknife must be ground or replaced.

NOTE:

A reel worn or one incorrectly ground to a conical shape instead of a cylindrical shape will cause a wavy bedknife.

Prior to grinding the reel, clean, inspect, and repair the reel as follows:

- Steam clean or wash the reel.
- Clean the reel thoroughly by scraping off all dried material from the blades.
- Inspect the back of each reel blade for irregular surface which could cause the guide finger to hang while grinding. Remove any irregularities.
- Inspect the welds at the spiders. If any have cracked or broken loose, reweld using a #7018 low hydrogen welding rod.
- Straighten any bent reel blades by hammering into shape with a block of steel and a hammer.

The method of grinding will depend upon the grinding equipment being used (Figure 12E-5). Set up and operate the grinding machine in accordance with the manufacturer's instructions.

⚠ DANGER

Always wear eye protection when operating a grinding machine.

⚠ CAUTION

Handle and store grinding wheels carefully. Discard grinding wheels that are cracked, badly chipped, or have been dropped.

⚠ CAUTION

Always install blotter washers between the grinding wheel and the flanges. Do not overtighten the flange nut on the grinding wheel. Do not run a grinding wheel faster than specified on the wheel blotters.

⚠ DANGER

Do not stand in line with a grinding wheel the first three minutes it is run. Never jam a grinding wheel into the work piece.

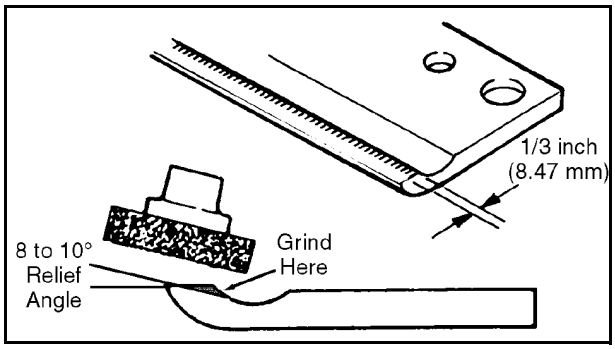


Figure 12E-5. Reel Grinding Procedure

1. Before mounting the bedknife on the grinding machine, thoroughly remove all dried material, rust, and scale from the bedknife.
2. Hand held grinders can be used to grind the bedknife while it is installed in the mower unit. Other grinding machines require the removal of the bedknife from the mower. Refer to the grinding machine manufacturer's instructions for mounting the bedknife and operating the grinder.
3. Tilt the grinding head so the stone contacts the bedknife at the rear one third of the top surface. This will give proper set up to grind the bedknife correctly (Figure 12E-6).

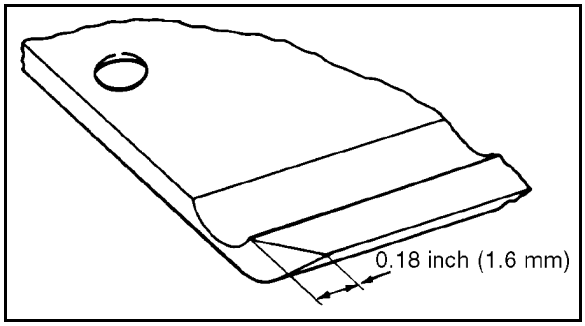


Figure 12E-6. Bedknife Grinding Angle

4. Grind the top face and front face as described in the preceding paragraphs.

NOTE:

The bedknife end at which the reel first makes contact is called the leading end. A beveled corner (dub) is ground on this end. It is important that the dub be maintained throughout the life of the bedknife. The dub provides an entrance ramp for the reel blade on to the bedknife. If the dub is worn or ground away and not replaced, the reel blade could hook the corner of the bedknife as it begins contact.

5. After grinding the bedknife, examine the dub. If, through grinding, it has become smaller tank 0.18 in (1.6 mm) hand grind or file the surface to the specified dimensions (Figure 12E-7).
6. Use a fine hone or block of wood to clean up ground material and any small burrs after grinding the bedknife.

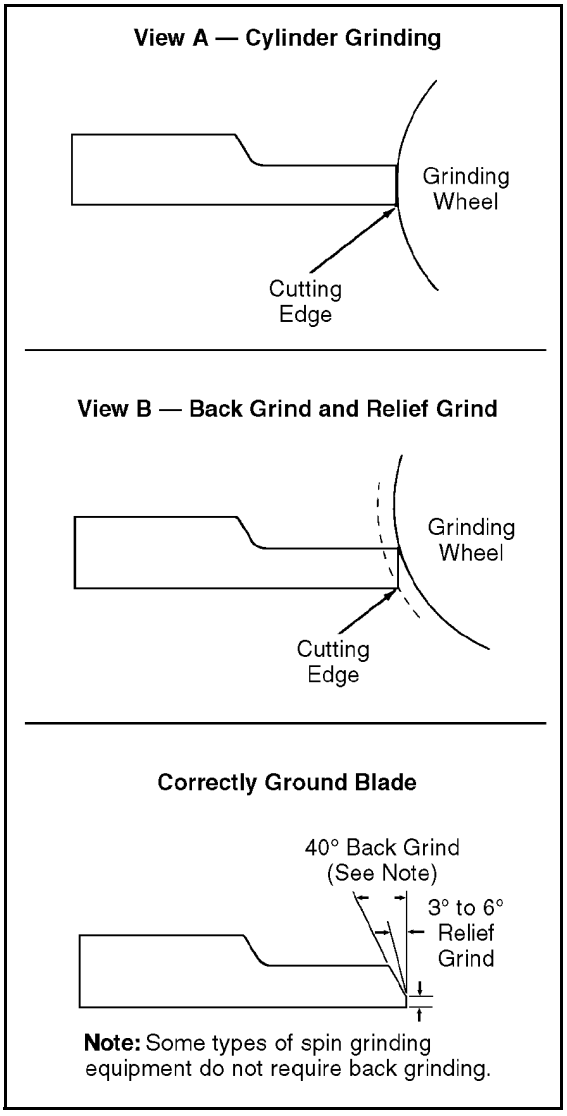


Figure 12E-7. Bedknife Dub

SECTION 12F. LF-1880 MOWER UNITS

REMOVAL

1. Lower the mower units to the ground. Mark or note the position of the down pressure adjustment pins (see Section 12D). Remove the down pressure adjustment pins.
2. Lift the quick release pin and turn it forward to release the reel motor.
3. Pull the reel motor straight out from the mower housing.
4. Carefully place the reel motor and its hoses away from the mower unit. Cap or cover the bearing housing cavity to prevent contamination and/or damage to internal mower components.
5. Remove the cap on the lift arm. Unfasten the pin retaining clip and remove the yoke pin.
6. Carefully raise the lift arm to clear the lift yoke and remove the mower unit.

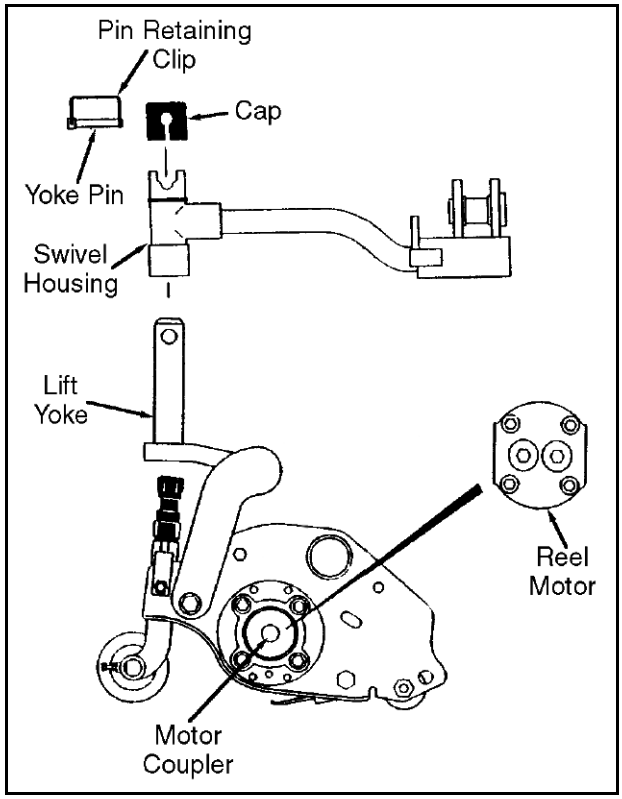


Figure 12F-1. Mower Unit Removal/Installation

BEDKNIFE REPLACEMENT

Bedknives that cannot be repaired by lapping or grinding should be replaced. The bedknife is held to the bedknife shoe by flat head screws. When replacing a bedknife, the bedknife should be lightly ground to level the cutting edge.

1. When a bedknife is installed, clean the backing prior to installation.
2. Secure the installed bedknife by tightening the mounting screws, starting with those at the center and working out to the ends.
3. A new bedknife must be ground to assure straightness and parallelism with the reel cylinder (see Section 12D).

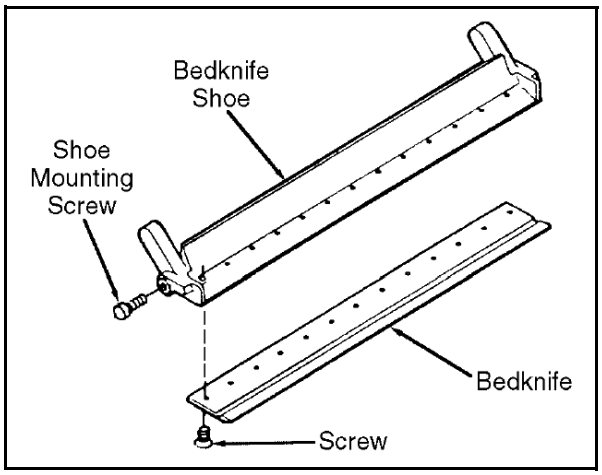


Figure 12F-2. Bedknife Removal and Replacement

DISASSEMBLY

1. Remove the lift yoke attaching the hardware and lift yoke.
2. Refer to Figure 12F-3 (sheet 1 of 2). If not previously removed, remove the throw shield.
3. Remove the bedknife assembly from the mower frame (see Figure 12F-3, sheet 2).
4. Using a block of wood, block the reel so it will not turn.
5. Using a suitable puller, remove the reel motor coupler.
6. Remove the remaining components as shown in Figure 12F-3, sheets 1 and 2.

INSPECTION

1. Inspect the reel, if cracked or broken, repair using a #7018 low hydrogen welding rod.
2. Discard seals and bearings.
3. Check the frame for cracks and/or bent frame members.

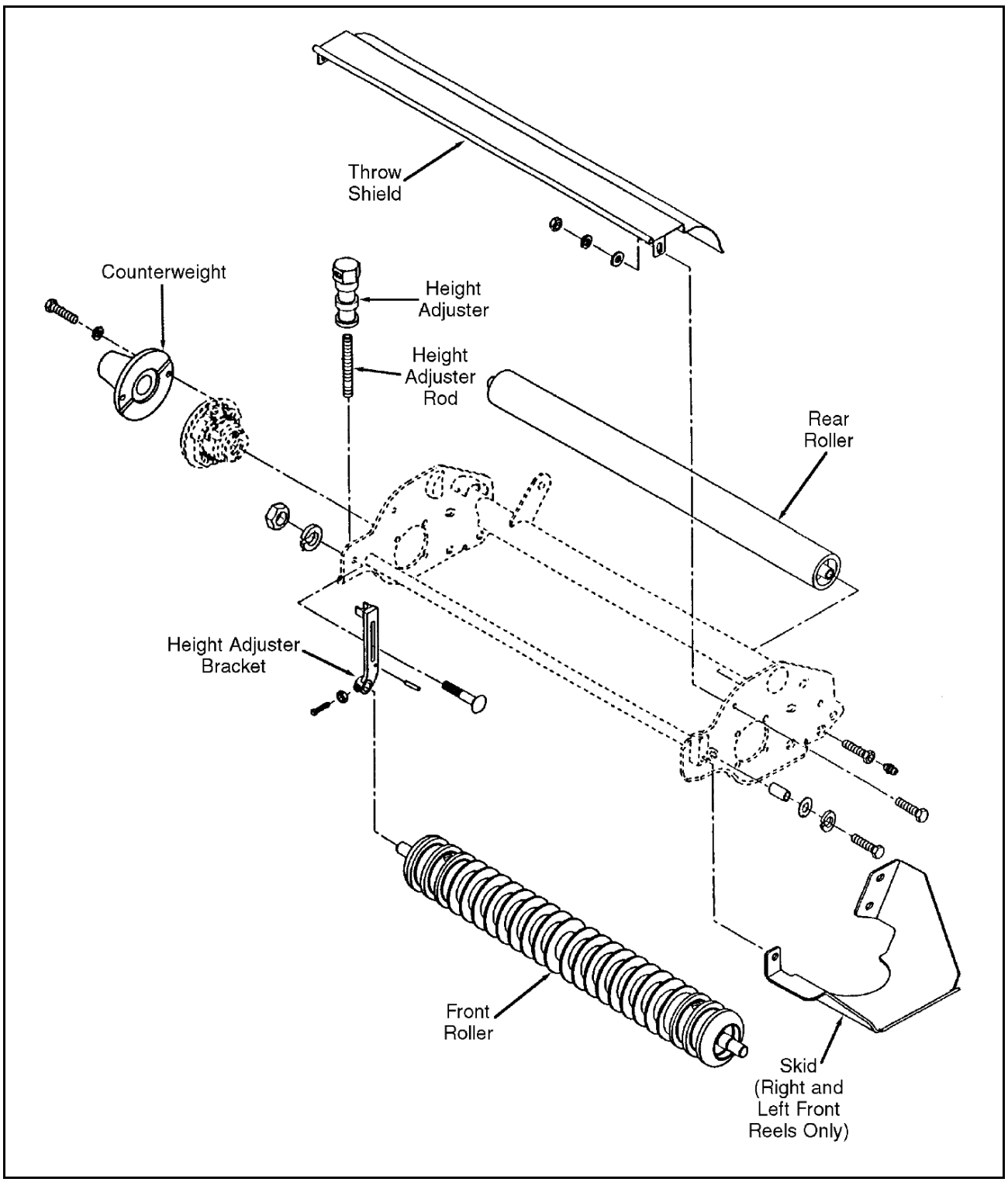


Figure 12F-3. Mower Unit Repair (Sheet 1 of 2)

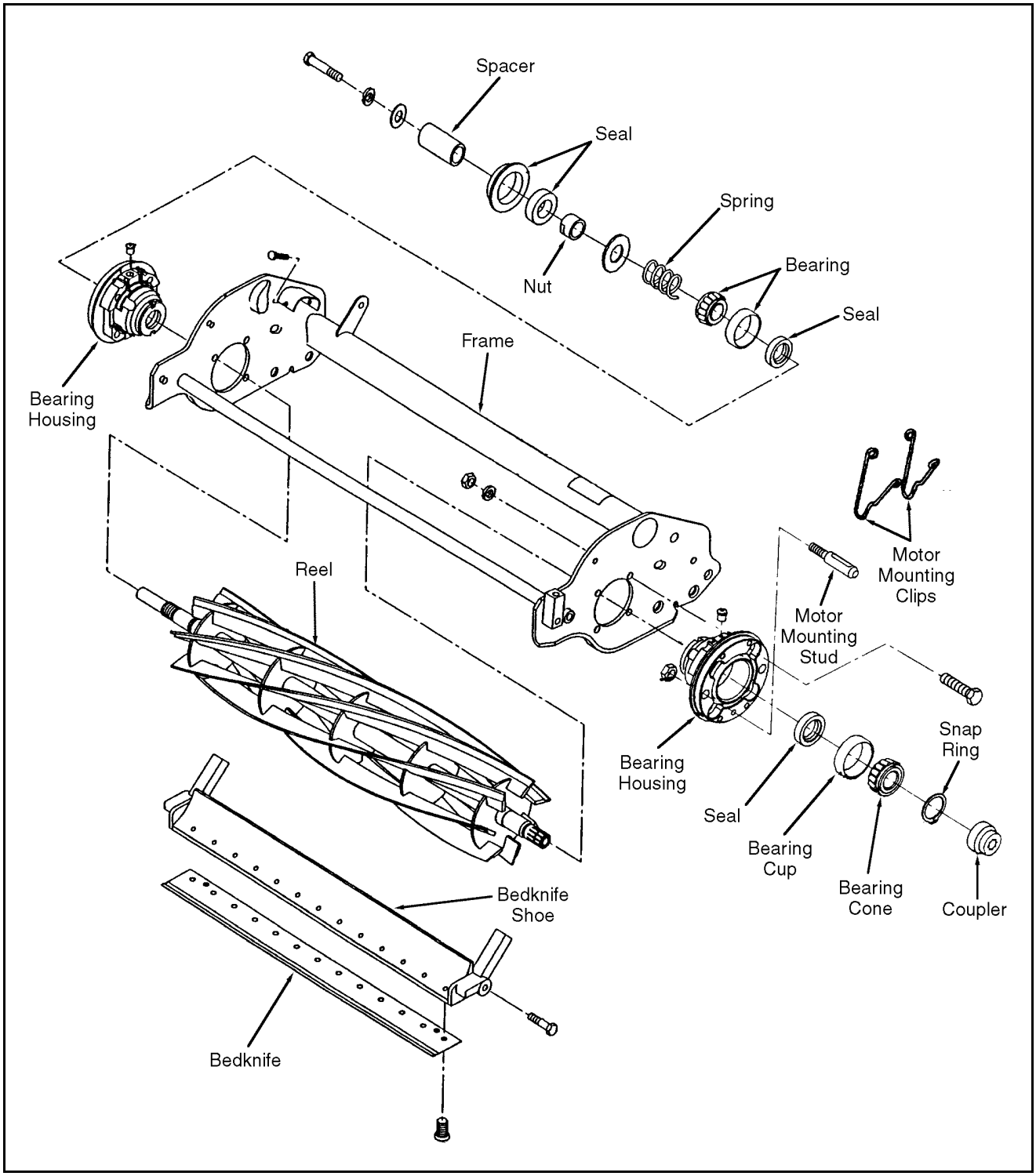


Figure 12F-3. Mower Unit Repair (Sheet 2 of 2)

REEL REASSEMBLY

NOTE:

See the Magknife Installation section for instructions on replacing the existing bedknife and bedknife shoes with the Jacobsen Magknife quick-change bedknife and bedknife shoes.

1. Using a suitable press, install new seals, lip to the outside, in the bearing housings (Figure 12F-4).
2. Using a suitable press, install bearing cups, taper toward the inside of the housing.

NOTE:

Make sure the bearing is seated squarely against shoulder of the housing.

3. Wrap both ends of the reel shaft with a plastic bag or wrapping material. This will protect the shaft seal when installing the reel.
4. Install the reel, splined end on the left, into the frame.
5. Slide the bearing housing with the quick release pin over the splined end of the shaft against the frame. Fasten it with the mounting hardware.
6. Repeat Step 5 on the right side of the frame.
7. On the left, install the bearing cone and snap ring.
8. On the right, install the bearing cone and spring.
9. Apply a small amount of Loctite® (Jacobsen P/N 2810300 [10 ml btl.] or 2811163 [50 ml btl]) to the threads of the nut. Install the nut so there is 1-27/32 in (46.8 mm) from the nut to the end of the reel shaft.
10. Install the seal assembly, counterweight, spacer, flat washer, lockwasher, and screw.
11. Install the reel motor coupler in the bearing housing as shown in Figure 12F-3, sheet 2.
12. Install the bedknife.
13. Install the rear roller, height adjusters, front roller, skids, and throw shield as shown in Figure 12F-3, sheet 1.
14. Install the left yoke and install the mower unit in the swivel housing (see Figure 12F-1).
15. Make the adjustments describes in Section 12D.

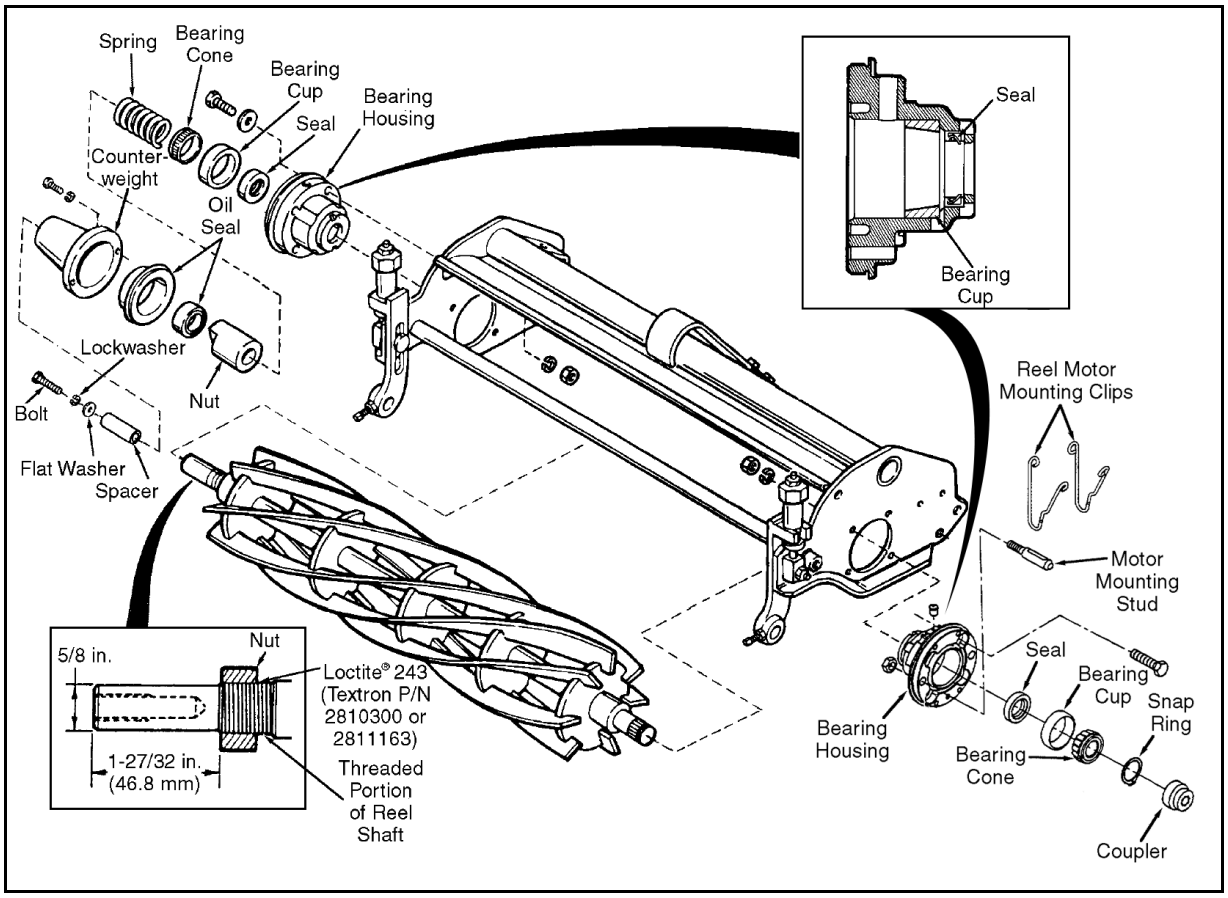


Figure 12F-4. Reel Reassembly

MAGKNIFE INSTALLATION

NOTE:

Contact your local authorized Jacobsen dealer for availability and installation of the Jacobsen Magknife bedknife system.

The Magknife bedknife system uses powerful magnets and dowel pins to secure the bedknife to the bedknife shoe. Replace the existing bedknife shoe with the Magknife shoe and install as described in Reel Reassembly section.

The bedknife can be installed on the bedknife shoe using locking sheetmetal pliers.

1. Clean any dirt and debris from the bedknife shoe.
2. Grip the bedknife using locking sheetmetal pliers (Figure 12F-5).

Figure 12F-5. Locking Sheetmetal Pliers

3. Position the bedknife for installation on the bedknife shoe and over the dowel pins (Figure 12F-6).

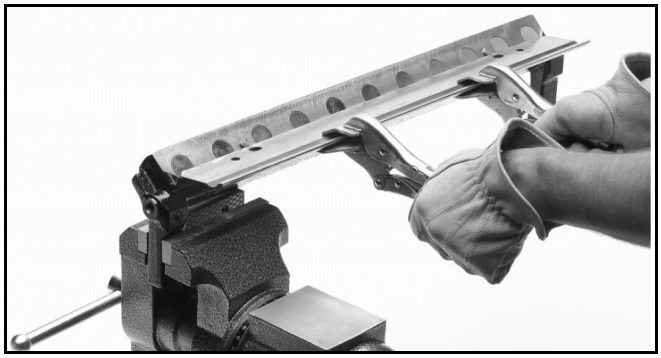


Figure 12F-6. Position Bedknife

4. Using the locking pliers, install the bedknife over the dowel pins and onto the magnets (Figure 12F-7).

Figure 12F-7. Install Bedknife

SECTION 12G. FRONT ROLLER

DISASSEMBLY

1. Remove the lock nut, deflector cup, and seal on each end of the roller.
2. Using a soft face hammer, tap one end of the shaft. Remove the wear sleeves, bearing cone, and shaft.
3. Use a blind hole puller to remove the bearing cup from the roller.

NOTE:

When replacing the bearing cup and cone, the cup and cone should be replaced as a set.

4. Remove the seal.

REASSEMBLY

1. Install a new seal (lip to inside) in each end of the roller.
2. Install the bearing cup in each end of the roller.
3. Insert the shaft in the roller.
4. At each end of the roller, install the bearing cone and wear sleeve.
5. Install the oil seals (lip to inside), deflector cup and nuts.

ADJUSTMENT

1. Tighten locknuts to 10 ft-lbs (13.6 Nm).
2. Continue to torque nuts until 5 to 10 ft-lbs (0.56 to 1.12 Nm) of rotational torque is achieved. DO NOT torque nuts more than 30 ft-lbs (40.6 Nm).

LUBRICATION

Refer to Section 11 for additional information on lubrication.

1. If no grease fitting is installed, remove the plug from the roller.
2. Insert the grease fitting (1/4-28UNF-2B). Slowly pump grease into the roller until resistance is felt.
3. Remove the grease fitting and replace the plug.

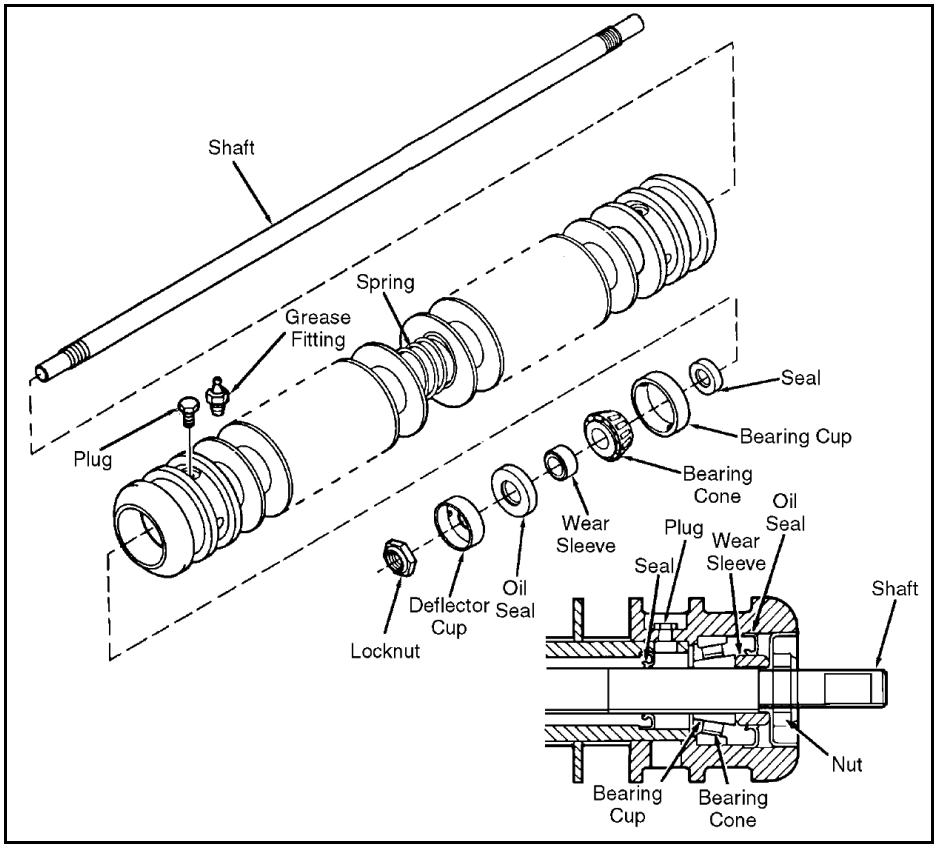


Figure 12G-1. Front Roller

SECTION 12H. REAR ROLLER

DISASSEMBLY

1. Remove roller from the cutting unit (see Section 12F).
2. Remove locknuts from both ends of the roller shaft.
3. Remove the bearings and discard the old seals.

INSPECTION

Clean and inspect the bearings. Replace if necessary.

⚠ DANGER

Do NOT spin the bearing using compressed air.

Clean the outside diameter of the wear sleeve and check for grooves. If grooves are present, replace the wear sleeve.

REASSEMBLY

1. Use a suitable press to install a bearing cup, taper to the outside, in one of the roller tubes.
2. Pack the bearing with grease.
3. Using a suitable press, install a bearing cone, taper in, in one end of the roller shaft.
4. Be careful not to damage the inner seal, install the roller shaft into the roller tube.
5. Pack the bearing cavity 3/4 full of grease.
6. Using a suitable tool, install an outer seal, lip to the inside.
7. Install a wear sleeve and locknut. Do not tighten the locknut.
8. Repeat Step 1 through Step 7 for the other end of the roller.
9. Evenly tighten both locknuts 10 to 30 ft-lbs (13.5 to 40.6 Nm). This will set in the bearings.
10. Back off one locknut. Retighten the same locknut to obtain a roller rotational torque of 3 to 7 in-lbs (0.3 to 0.8 Nm).

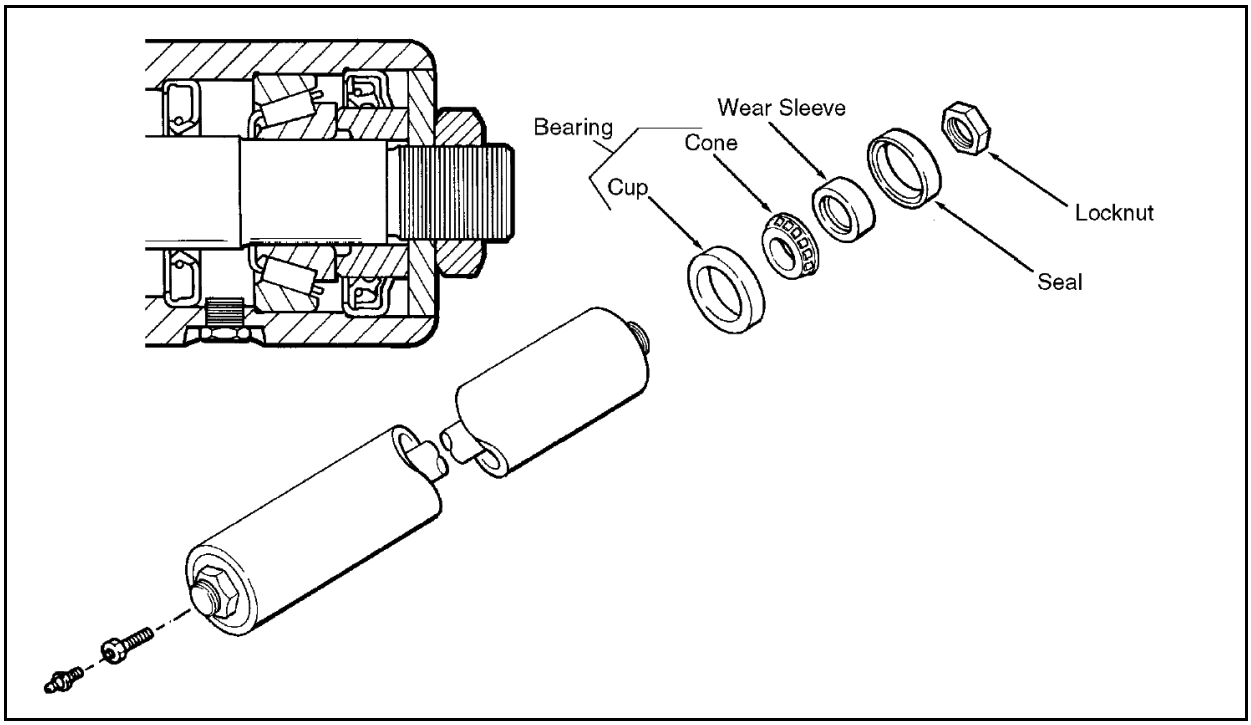


Figure 12H-1. Rear Roller Repair

SECTION 13
OPTIONS

SECTION 13A. REPAIR, SERVICE TOOLS, AND MATERIALS

MATERIALS REQUIRED

Tools required:	Standard automotive hand tools, including: • Driving tools • Bearing pullers • Seal spreaders
Cleaning materials:	Stoddard solvent or equivalent Detergent and water
Lubricants:	Refer to Section 11
Other service items:	Gauge bar for adjusting height of cut (Part No. 163694) Bearing Tool Part No. JAC 5084 Bearing Housing Tool Part No. JAC 5085 Blind Hole Puller Roller Tool Part No. JAC 5078

SECTION 13B. VERTICAL MOWER

GENERAL

Vertical mower attachments are normally used as replacements for standard reel mowers when thatch removal and grain control is the primary greens and fairway care objective.

The vertical mower uses the same lift yoke and reel motor as the standard reel mower.

There is no grinding or sharpening procedure for vertical blades. Bent blades can be straightened; broken or dull blades must be replaced.

The vertical mower assembly includes a front roller assembly and front roller grass shield assembly.

REPAIR AND SERVICE

Normal repairs and servicing of vertical mowers consist of blade replacement and cleaning and lubricating or replacement of bearings.

Individual blades are readily removed without removing the reel from the frame. To replace the blades, back off the blade clamp nut 0.25 to 0.375 in (6.3 to 9.5 mm). Pull the spacer next to the blade to be removed toward the blade clamp nut to disengage it from the locking lugs on the spacer. Remove the slotted blade from the shaft. Install replacement blade with the slot in the blade in the same position as the blade that was removed and retighten the blade clamp nut 12 to 15 ft-lbs (16 to 20 Nm). Retighten the clamp nut lock screw and nut.

NOTE:

When replacing all the blades, starting from one end rotate each blade 90° in the same direction.

1. Remove the reel motor and disconnect the mower from the lift yoke.
2. Disassemble and reassemble the cutter assembly as shown in Figure 13B-1.

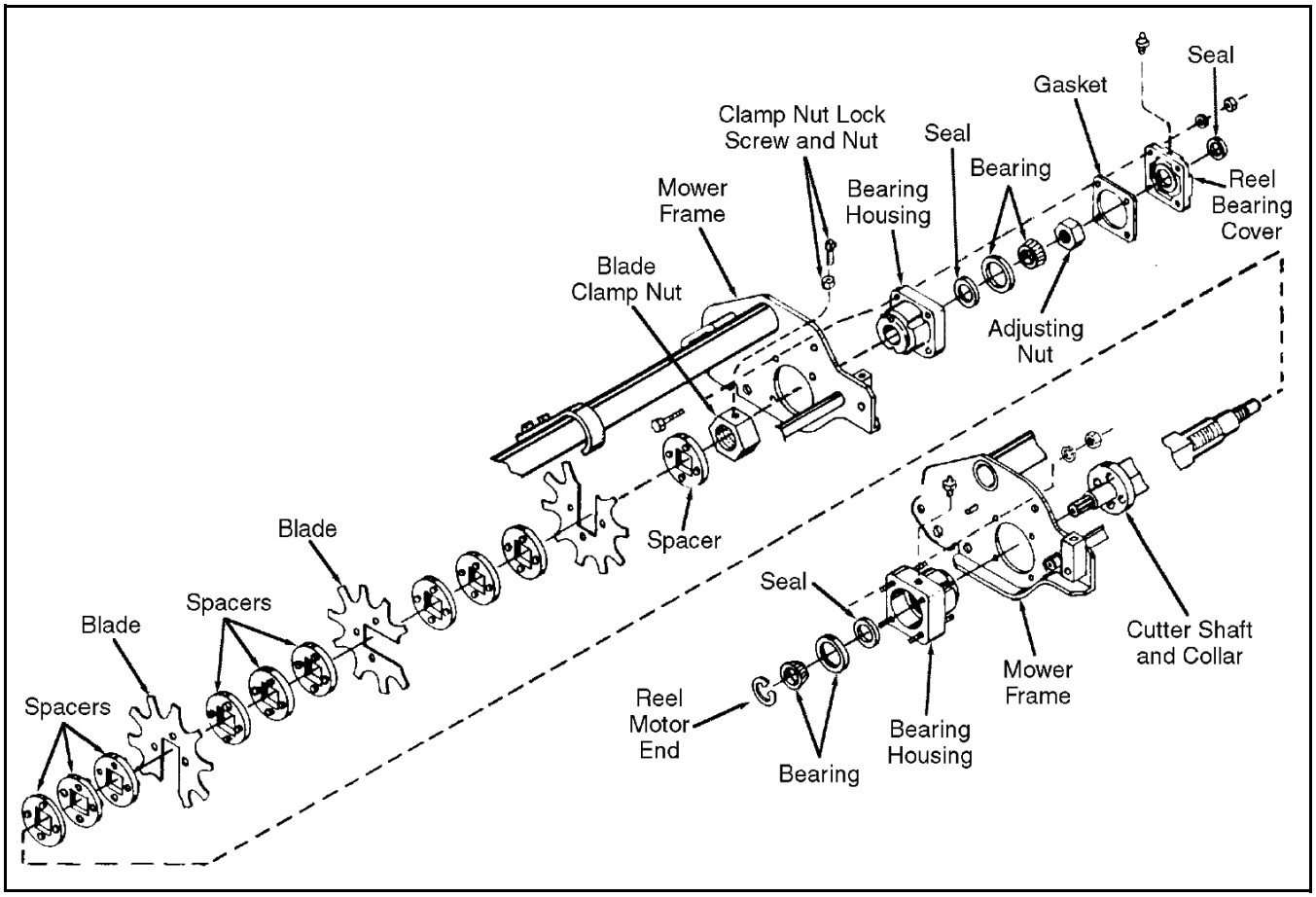


Figure 13B-1. Disassembly and Reassembly of the Vertical Mower Assembly

3. Clean the bearings in solvent and dry. Replace worn or badly pitted bearings. Pack the bearing cups and cone with grease and reassembly. Grease all lube fittings after reassemble.
4. Turn the adjusting nut slowly in a clockwise direction until all end play is removed and slight resistance can be felt when turning the reel. Tap the end of the shaft with a soft hammer, if turning resistance is still present, back off the adjusting nut 1/8 turn and tap with the hammer. Repeat if necessary. The adjustment is correct when the reel can be revolved freely and end play does not exceed 0.010 inch (.25 mm).
5. Install the mower on the machine as described in Section 12D.

CHANGING BLADE SPACING

Blade spacing of 0.75 in (19 mm) is standard on factory built mowers (Figure 13B-2). Cutting widths can be reduced or increased between 0.5 and 1.5 in (12.7 and 38 mm) in 0.25 (6.35 mm) increments by adding or removing individual blades. To do this, follow the instructions on the removal of individual blades.

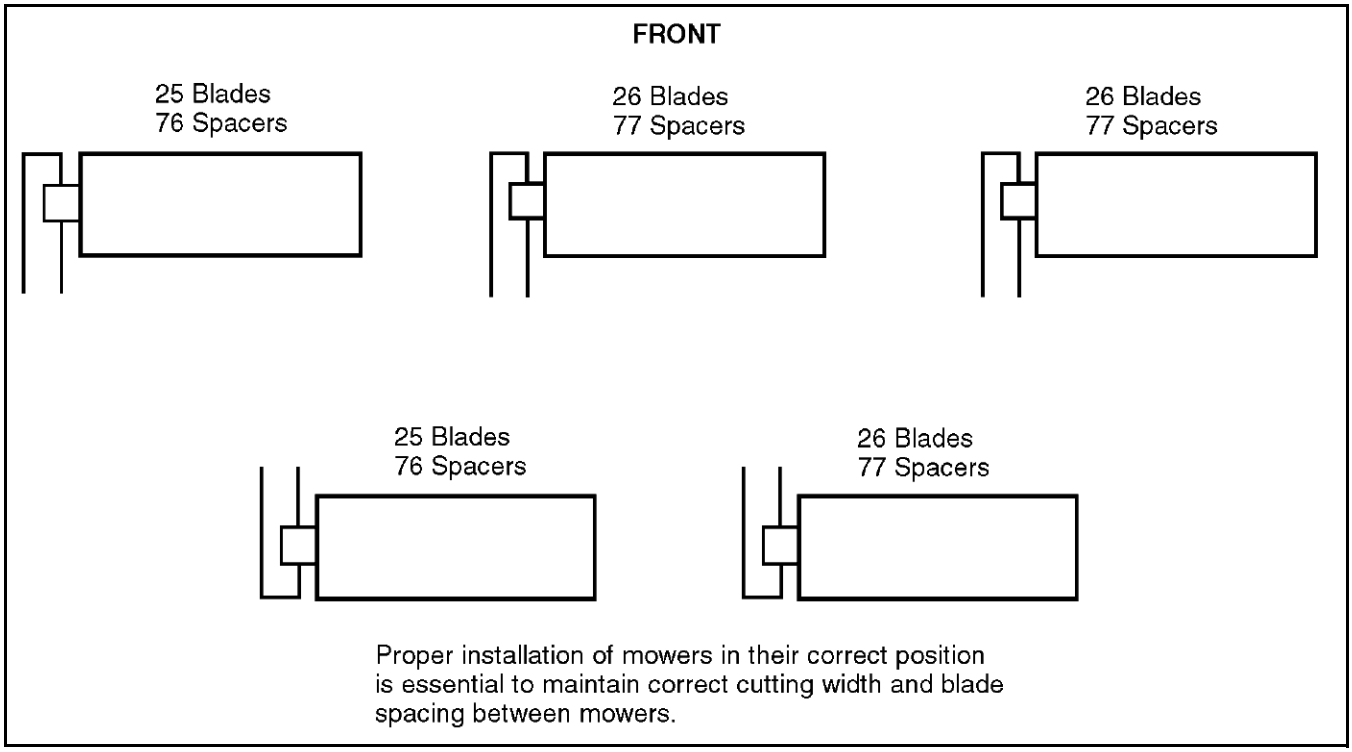


Figure 13B-2. Blade Spacing Adjustment

REPAIR OF FRONT ROLLER, GRASS SHIELDS, AND SCRAPERS

If the front roller, grass shields and grass shield scrapers require repair or replacement, disassemble and reassemble as shown in Figure 13B-3. Replace worn or badly pitted bearings. Clean in solvent, dry, and pack (with grease gun) bearings and bearing seals before installing. Fill the lube fittings on the front roller after reassembling.

NOTE:

When installing the front roller in a vertical reel mower, the roller brackets must be assembled with the roller in the forward position as shown in Figure 13B-3.

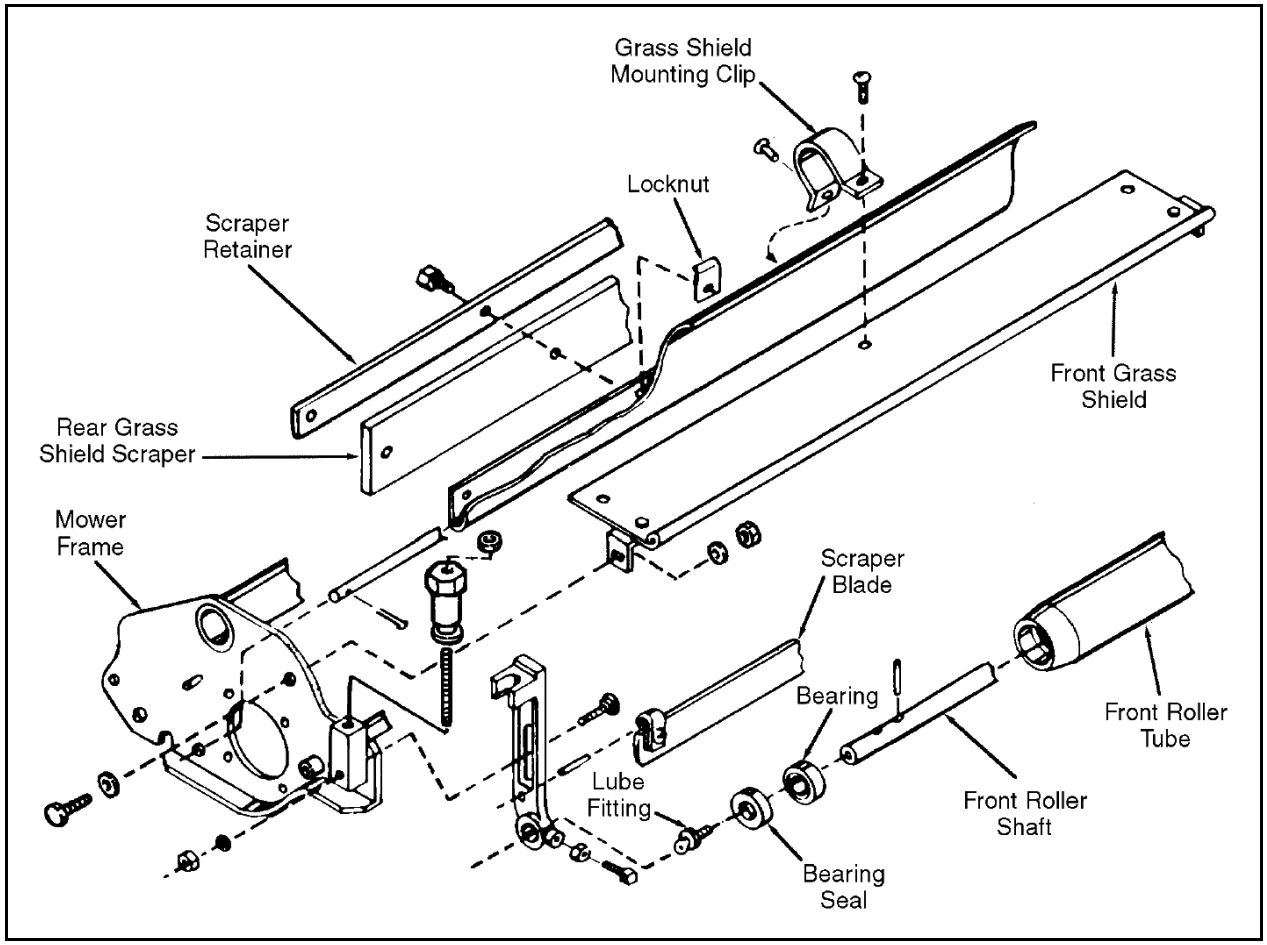


Figure 13B-3. Disassembly and Reassembly of Front Rollers, Grass Shields, and Scrapers

CUTTING DEPTH ADJUSTMENT

With the engine stopped and the reels raised, adjust reels to desired cutting depth before using the mower. Optimum cutting depth is 0.125 to 0.1875 in (3.2 to 4.7 mm) for most turf conditions. A greater cutting depth may damage the root structure. IF the mower slows down under load, it is an indication that the cut may be too deep. Teeth should not penetrate into the soil under any circumstances. To provide an even cut, reels should be adjusted to the same depth below the rollers within 0.015625 in (.39 mm) from end to end.

To make a cutting depth adjustment (Figure 13B-4), loosen the locknuts on both sides enough to allow the hand knobs to move the front roller brackets freely in the side frames. Place a height adjusting gauge across the two rollers outside the first blade on one end of the reel and turn the reel to place one tooth of the blade at 90° to the top of the gauge. Adjust the reel visually to the approximate depth desired. Check and make the final adjustment with a scale to measure the distance the tooth projects below the roller contacting the edge of the gauge. Repeat the above on the opposite end of the reel and tighten locknuts.

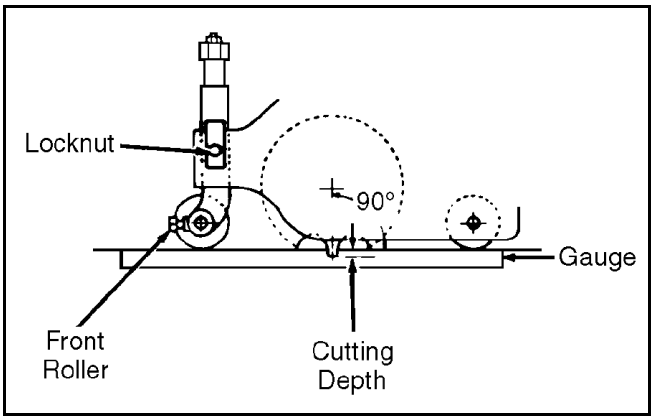


Figure 13B-4. Cutting Depth Adjustment

SECTION 13C. TURF GROOMER

GROOVED ROLLER

Removal

1. Loosen setscrews on the outer roller shaft nuts (Figure 13C-1).
2. Remove the roller shaft nuts and spacer(s).
3. On the motor end, remove the groomer side plates.
4. Remove the roller.

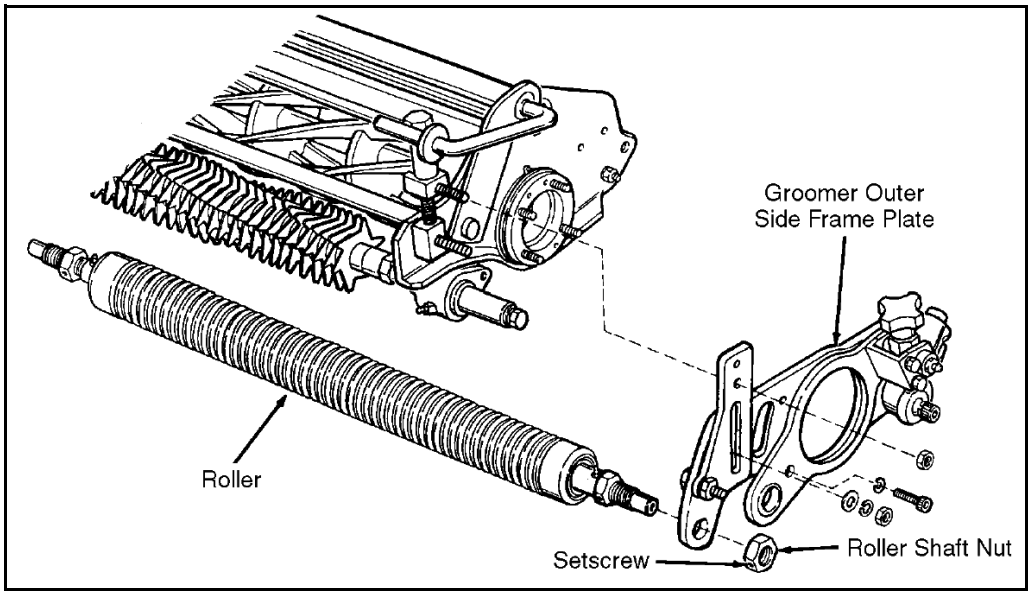


Figure 13C-1. Roller Removal

Repair

1. Remove the snap ring (Figure 13C-2).
2. Using a puller, remove the shaft assembly.
3. Bearing, nilos ring, and seal can be removed by first removing the nut and associated hardware.

NOTE:

Grease fitting and shaft nuts should be removed before reassembly.

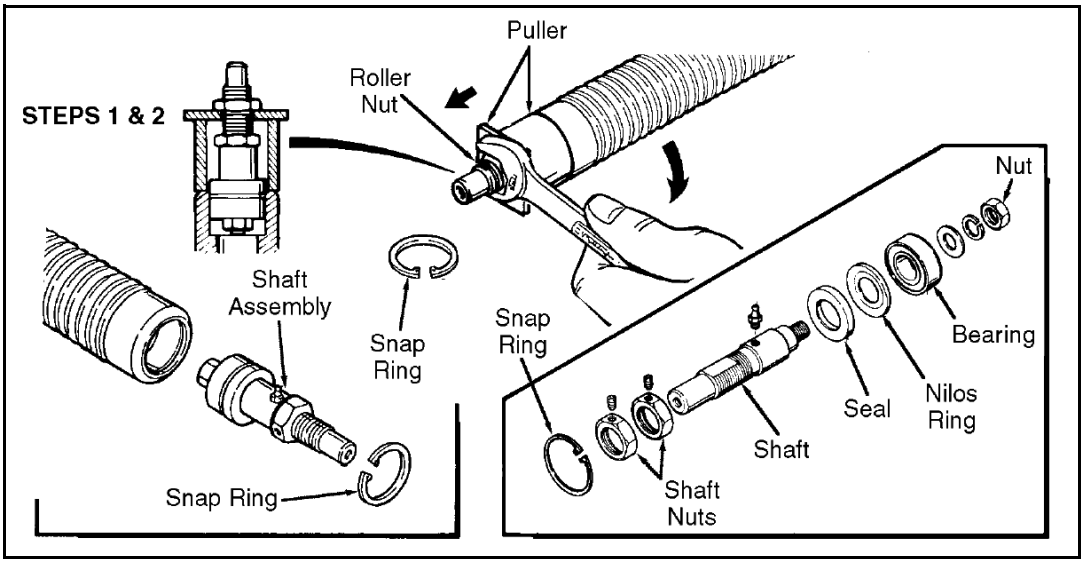


Figure 13C-2. Roller Repair

4. Install the nilos ring onto the shaft.
5. Install the bearing, seal side first, onto the shaft.
6. Install the flat washer, lockwasher, and nut. Torque the nut to 20 ft-lbs (27 Nm).
7. Press the shaft subassembly into the roller.

NOTE:

The seal must be pressed so it just clears the snap ring groove in the roller.

8. Press the seal (seal lip to the inside) into the roller.
9. Install the snap ring.
10. Install the grease fitting and one shaft nut.

Installation

1. Loosen the setscrews in the roller nuts (Figure 13C-3).
2. Position the roller end in the groomer side frame.
3. Install the groomer side frame on the motor end, tighten hardware as shown.
4. Using the two inside roller nuts, center the groomer blades between the roller discs.
5. Install shims and the outer nuts.

NOTE:

Install the required amount of shims necessary so that when the outer nut is tightened there are no threads exposed beyond the nut. Each shim is 0.60 in (15.24 mm) thick.

6. Tighten the roller shaft outer nuts and the nut set-screws.

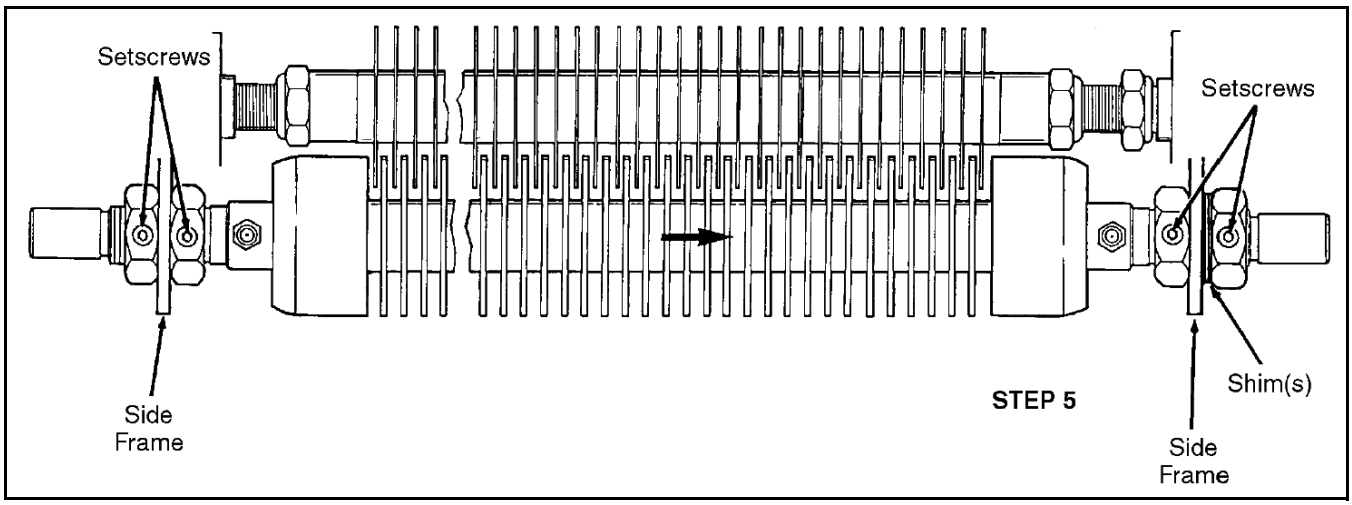


Figure 13C-3. Roller Installation Alignment

GROOMER SHAFT ASSEMBLY

Removal

1. Remove the belt case cover and loosen the belt adjusting eccentric. Remove the bearing retainer capscrew (Figure 13C-4).
2. Remove the clutch, drive key, and spacer.
3. Remove the drive gear and belt.

NOTE:

Do not pry on the pulley flange.

4. On the motor end, remove the bearing retainer capscrew.
5. Remove the quick height pivot screw and nylon clamp.

6. Remove the groomer mounting bracket and groomer shaft.

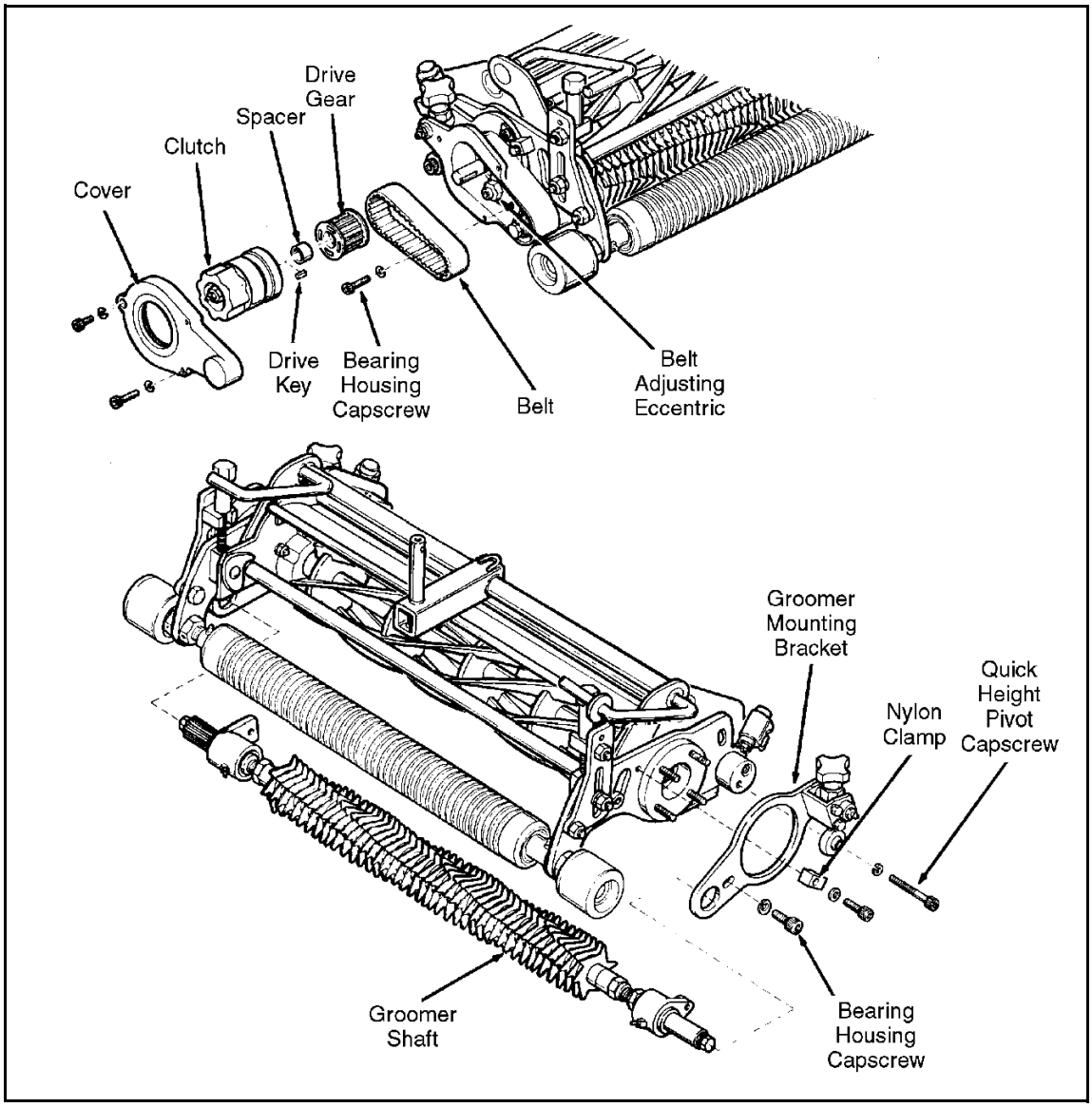


Figure 13C-4. Groomer Shaft Assembly

Bearing Replacement

Disassembly

1. Remove the hardware as shown in Figure 13C-5 from ends of the groomer shaft.
2. Remove the bearing housing.
3. Remove the outer snap ring from the bearing housing.
4. Remove the seal and inner snap ring.
5. Press the bearing from the bearing housing.

NOTE:

Discard the old seal and bearing.

Reassembly

⚠ CAUTION

Properly support the retainer to prevent damage.

1. Press the new bearing into the housing.
2. Install the inner snap ring and press in the new seal (lip to the inside).
3. Install the outer snap ring and spacer.
4. On the drive end install the spacer, square drive key, and driven gear.
5. Install hardware on both ends, torque to 20 ft-lbs (27 Nm).

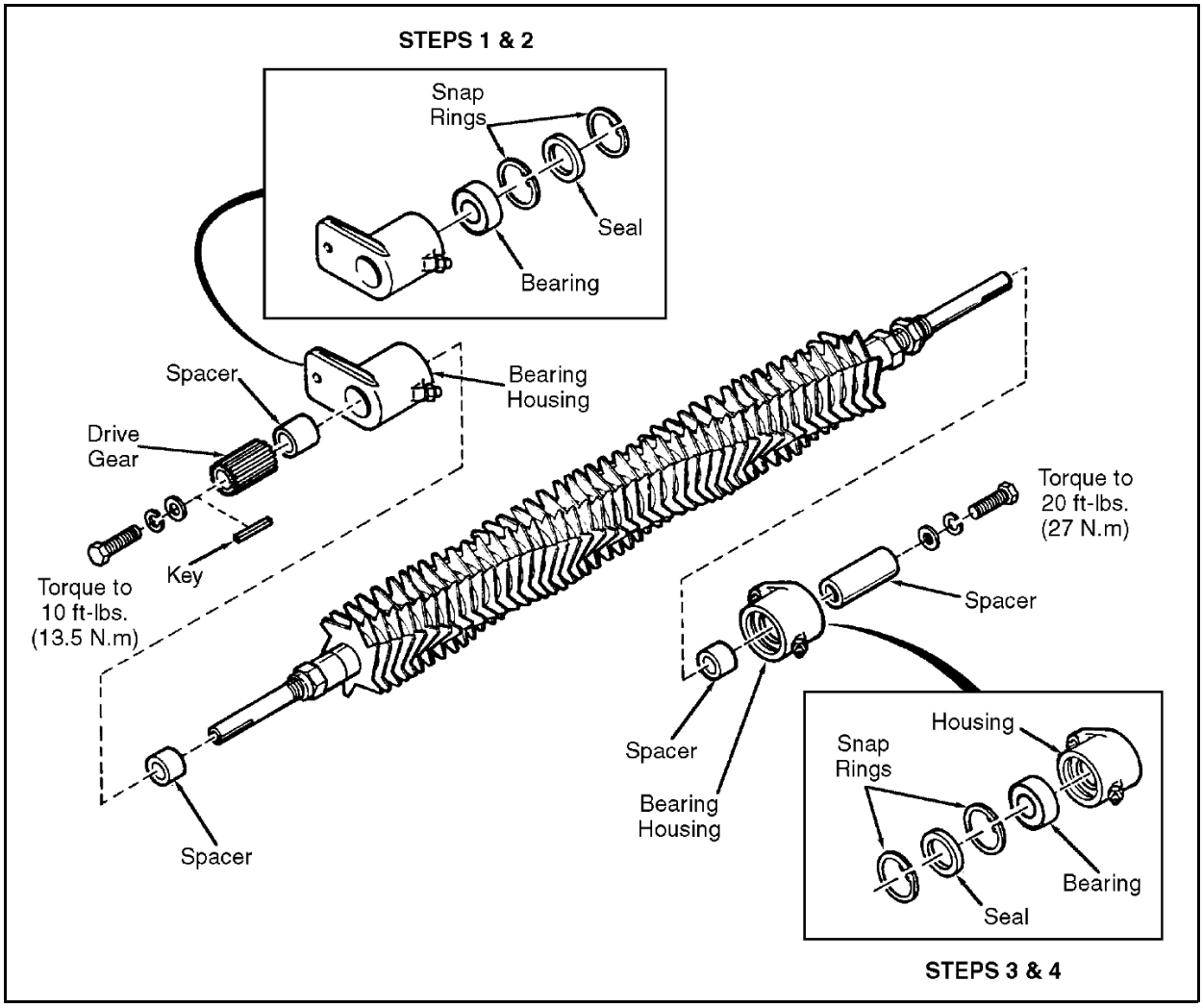


Figure 13C-5. Groomer Shaft Assembly

Blade Repair

Check the condition of the blades and straighten bent blades whenever practical. If the blades must be replaced, proceed as described below.

Disassembly

1. Remove the groomer shaft assembly as described in the Removal section.
2. On the motor end of the groomer shaft, remove the capscrew, spacer, bearing housing, and bearing adjustment nut.
3. Remove the blade, retaining the nut and spacer.
4. Remove the spacers and damaged blade(s) as necessary.

Reassembly

1. Install and set the blade retainer nut on the drive end, 1 in from the shoulder of the shaft to inside of the nut (see Figure 13C-6 inset).
2. Install a 0.75 in (19.05 mm) spacer, 0.46875 in (11.91 mm) spacer, and a blade.

NOTE:

The blade must be positioned so the flat of the blade rotates toward the bedknife.

3. Alternately install a spacer and blade until 41 spacers and 40 blades have been installed.
4. Install the blade, retaining nut, torque to 10 to 15 ft-lbs (13.5 to 20 Nm).

NOTE:

It is necessary to align the blades with the grooves of the roller. This can be done after installing the groomer shaft assembly.

5. Install the groomer shaft assembly as described in the Installation section.

Installation

1. Install the groomer shaft drive end into the belt case, aligning the bearing housing flat in the belt case groove.
2. Install the bearing housing capscrew, do not tighten.
3. Install the groomer mounting bracket, do not tighten.

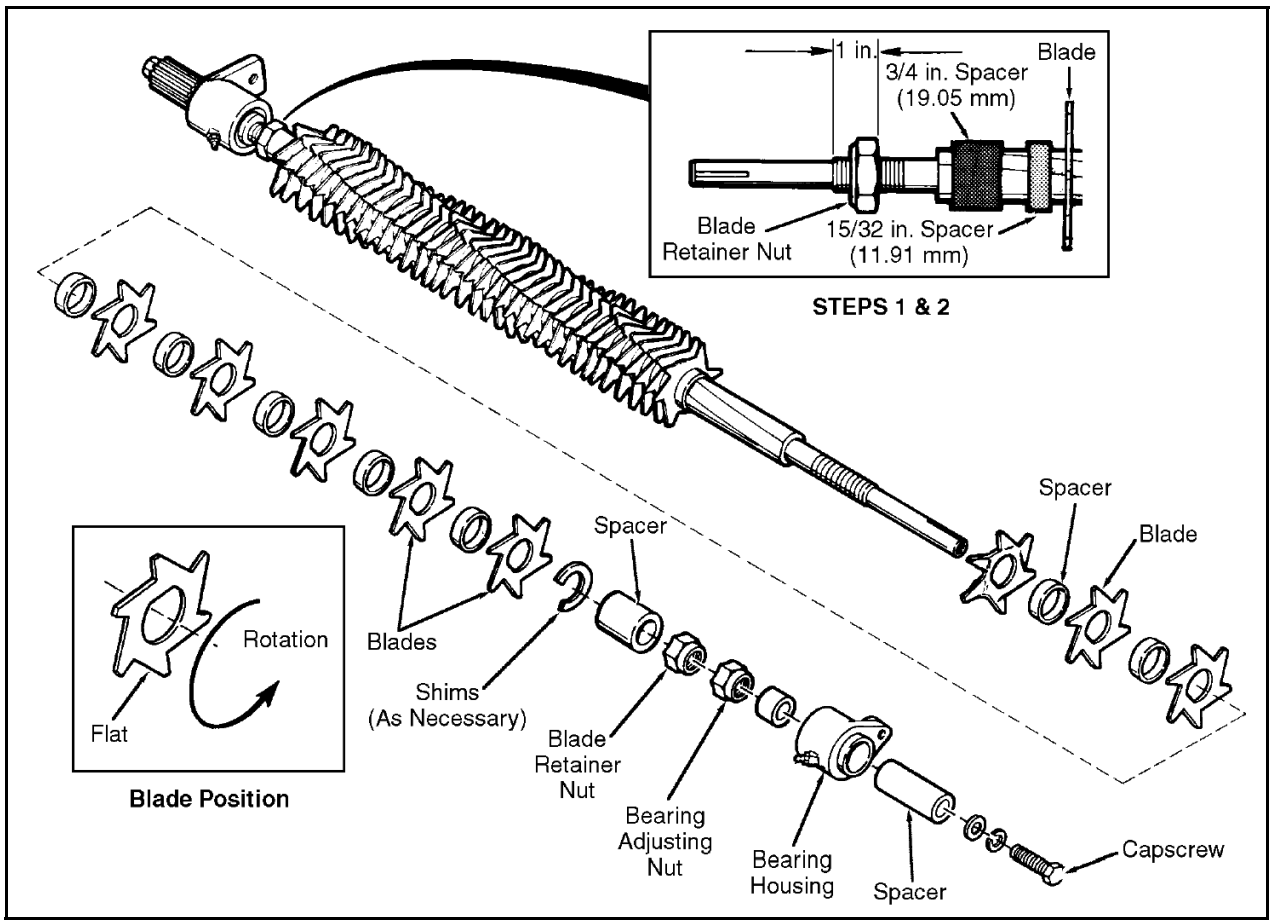


Figure 13C-6. Groomer Blade Repair

4. Install the quick height pivot screw, tighten then back off 1/8 turn.
5. Adjust the groomer shaft bearing as described in the Bearing Adjustment section.
6. Install the drive gear and belt.
7. Install the spacer, drive key and clutch. Torque the clutch bolt to 20 ft-lbs (27 Nm).
8. Adjust the belt as described in the Drive Pulley Repair section.

9. Install the cover. Torque the capscrews to 6 to 8 ft-lbs (8 to 10.8 Nm).
10. Align the blades to roller as described in the Blade to Roller Alignment section.

Blade to Roller Alignment

1. The groomer shaft should be installed to properly align the groomer cutter to the roller (Figure 13C-7).
2. Loosen the front roller locknuts. Slide the roller toward the belt case end until the cutter contacts the roller discs.
3. Starting on the drive end, check that all blades touch the roller disks. If there is a space, install 0.010 in (0.25 mm) shim P/N 364040 until all blades touch the roller disks.
4. Torque the blade retainer nut 10 to 15 ft-lbs (13.5 to 20 Nm).
5. Slide the roller toward the motor end so the blades are centered between each disc. Fasten the roller retaining locknuts on each end.

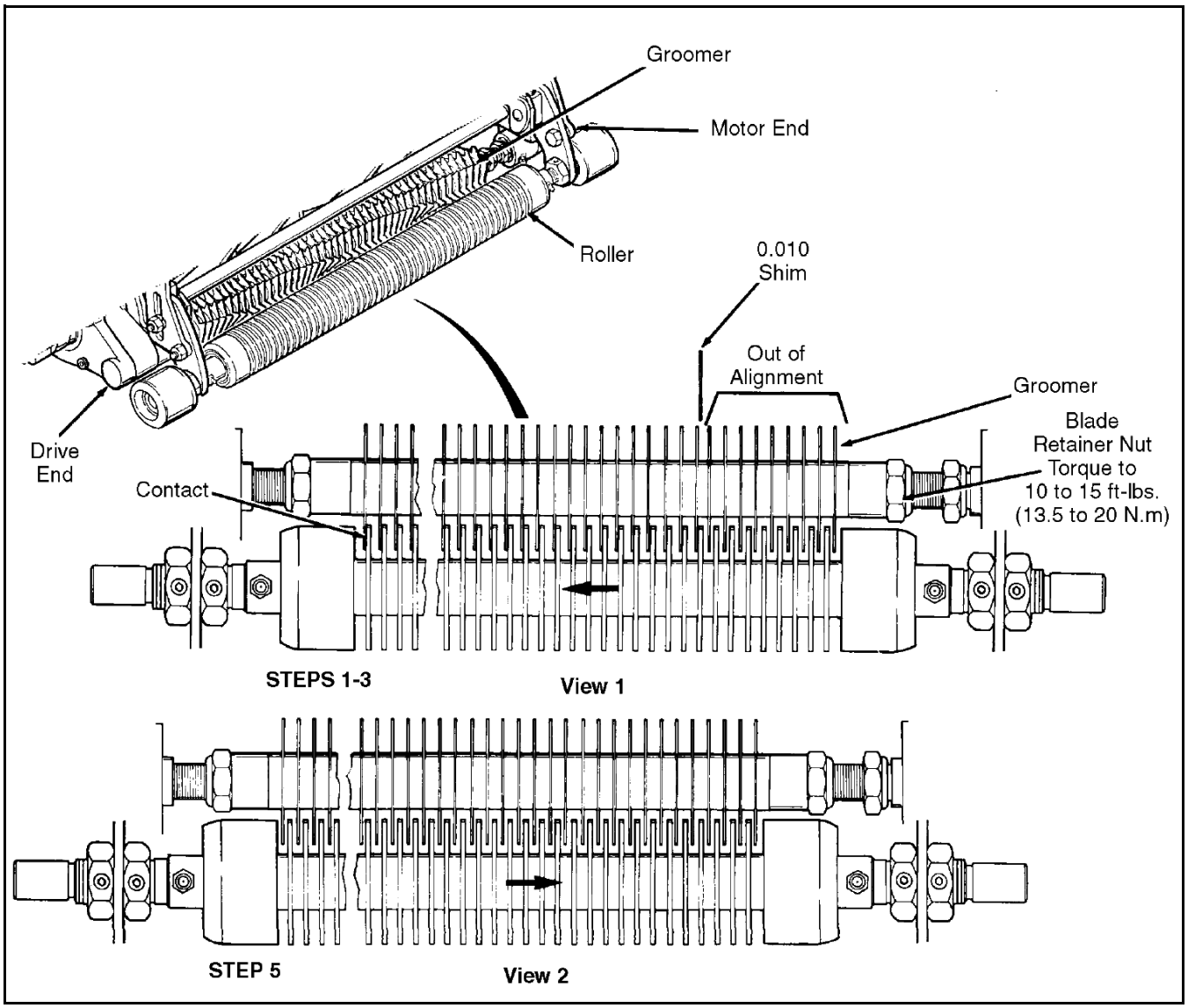


Figure 13C-7. Blade to Roller Alignment

Bearing Adjustment

1. Remove the nylon clamp and loosen the capscrew on the end of the groomer shaft (Figure 13C-8).
2. Pull the groomer mounting bracket out, away from the cutting unit. You will see a gap between the inner and outer groomer brackets.
3. Slowly tighten the capscrew (C) on the end of the groomer shaft until the outer groomer bracket is pulled in against the inner bracket and the gap closes.
4. Using two wrenches, hold the cutter retaining nut (A) and slowly turn the bearing adjustment nut (B) until it just contacts the bearing spacer, slight resistance will be felt.
5. Torque the capscrew (C) on the end of the groomer shaft to 20ft-lbs (27 Nm).
6. Install the nylon clamp, torque to 5 ft-lbs (6.7 Nm).

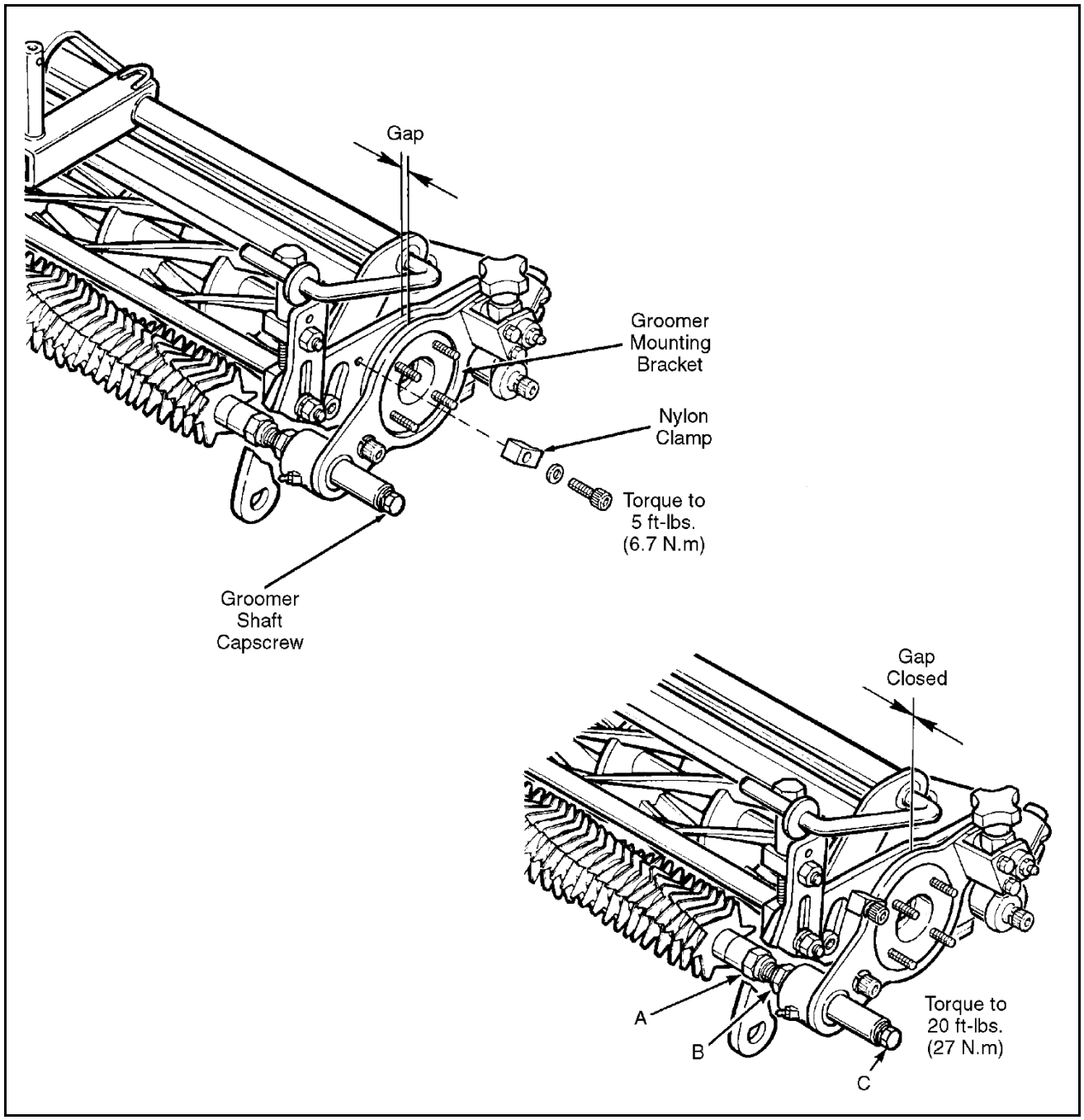


Figure 13C-8. Bearing Adjustment

DRIVE

Drive Pulley Repair

1. Remove the belt case cover, clutch, and drive key (Figure 13C-11).
2. Loosen the drive belt.
3. Remove the drive pulley, spacer, and belt.

⚠ CAUTION

Do not support the drive pulley on the outer flange. Support the drive pulley only on the solid part of the gear.

4. Using a drift punch, drive the outer bearing from the drive gear (Figure 13C-9).

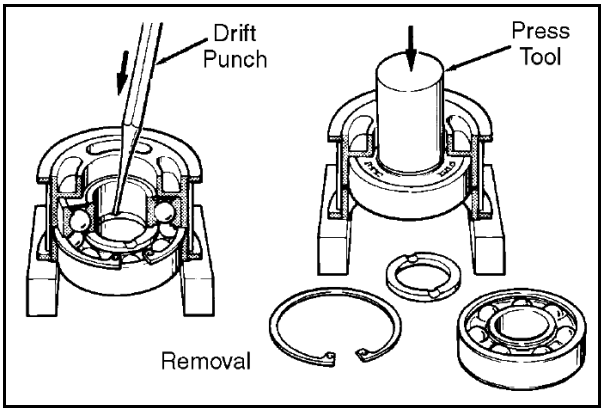


Figure 13C-9. Drift Punch

NOTE:

The spacer will be damaged during bearing removal, discard and install a new spacer.

5. Remove the snap ring and press out the inner bearing.
6. Press a new bearing seal side first into the drive gear. (Figure 13C-10)

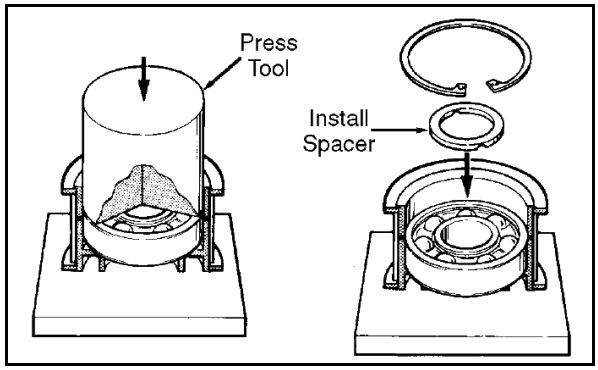


Figure 13C-10. Press Tool

⚠ CAUTION

When pressing new bearings, always use a flat or round mandrel the diameter of the bearing outer race. Do not press on the inner race only.

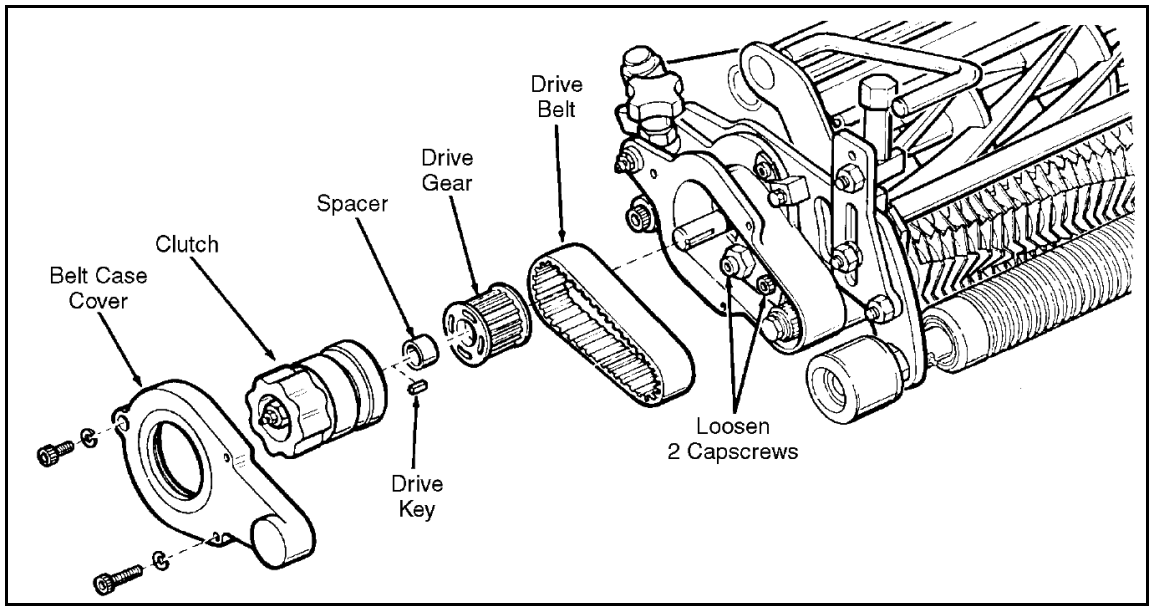


Figure 13C-11. Drive Pulley Repair

7. Install the snap ring and new spacer.

NOTE:

The spacer does not have to be centered at this point.

8. Install the outer bearing with side out (Figure 13C-12).

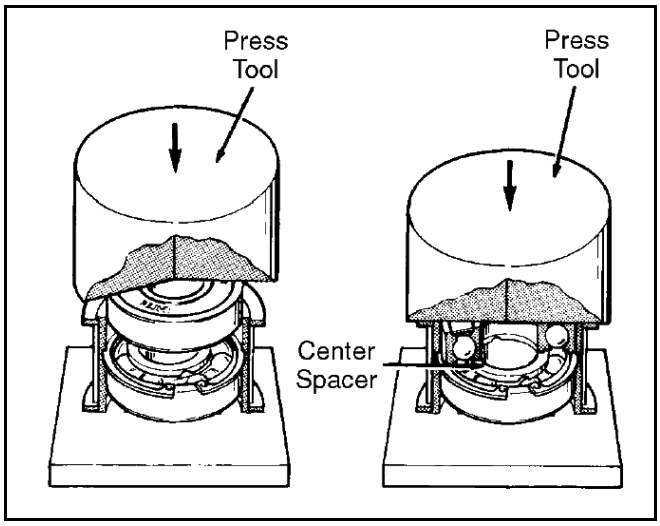


Figure 13C-12. Drive Groomer Installation

NOTE:

When installing the outer bearing, use a flat plate across the top of the bearing.

9. When the bearing has been pressed 3/4 of the way in the drive gear, center the spacer. Continue pressing the bearing until it contacts the center spacer.
10. Install the drive gear and belt into the belt case (see Figure 13C-8).
11. Install the spacer, drive key, and clutch, torque the clutch bolt to 20 ft-lbs (27 Nm).
12. Adjust the drive belt as described in the Belt Adjustment section.
13. Install the belt case cover and torque the cap-screws 6 to 8 ft-lbs (8 to 10.8 Nm).

Belt Replacement

1. Remove the belt case cover (Figure 13C-13).
2. Remove the clutch and drive key.
3. Loosen the belt adjuster eccentric and bearing retainer capscrew.
4. Remove the spacer, drive pulley, and belt.
5. Install the drive gear, bearing toward the inside and belt over the reel shaft. Work the belt over the groomer shaft drive gear.
6. Install the spacer, drive key and clutch, torque clutch belt to 20 ft-lbs (27 Nm).
7. Proceed with Step 3 of the Belt Adjustment section.

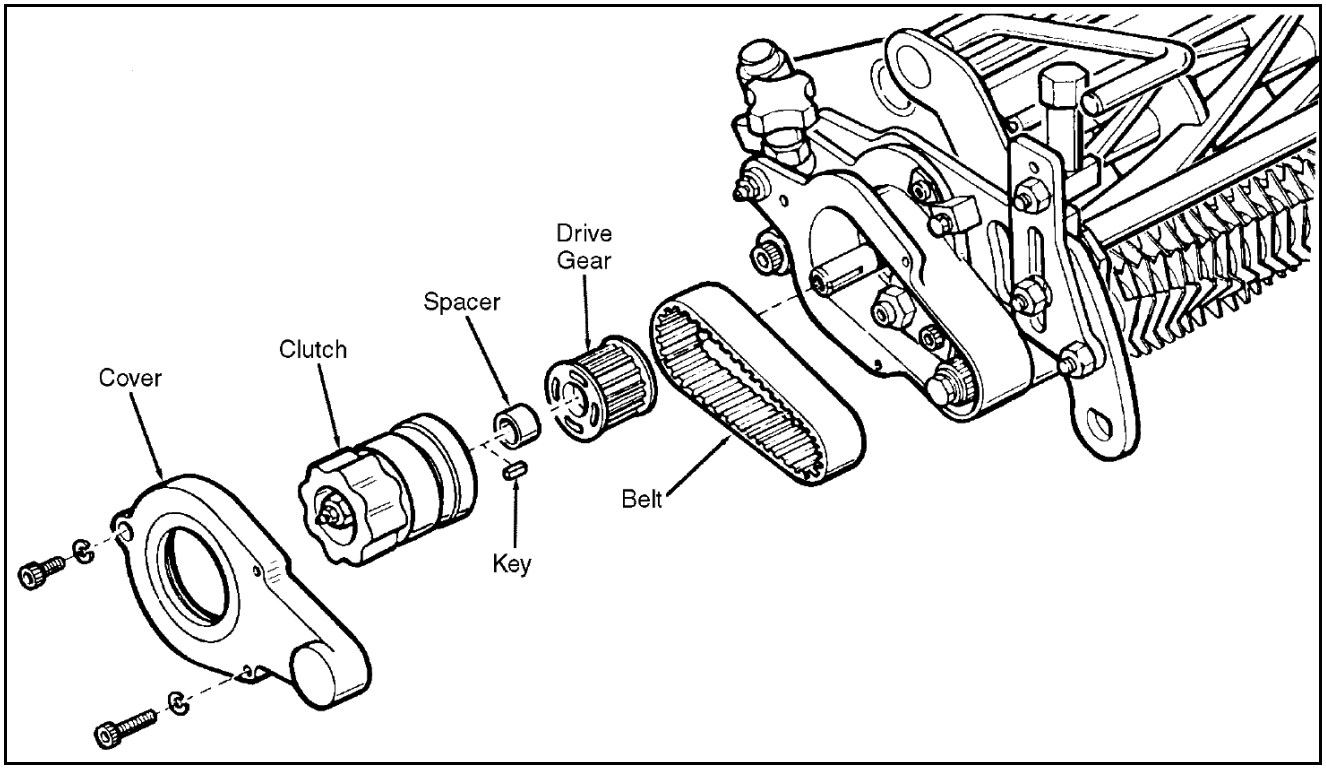


Figure 13C-13. Belt Replacement

Belt Adjustment

1. Remove the belt case cover.
2. Slightly loosen the tightener eccentric and bearing housing capscrews (Figure 13C-14).
3. Using a deep socket, turn the eccentric tightener by hand until the belt just becomes tight.
4. Hold the adjustment and tighten the bearing housing capscrew. Remove the socket and tighten eccentric capscrew.

⚠ CAUTION

DO NOT OVERTIGHTEN BELT. Belt and bearing may be damaged if overtightened.

5. Torque both capscrews to 10 ft-lbs (13.5 Nm).
6. Install the belt case cover and torque to 6 to 8 ft-lbs (8 to 10.8 Nm).

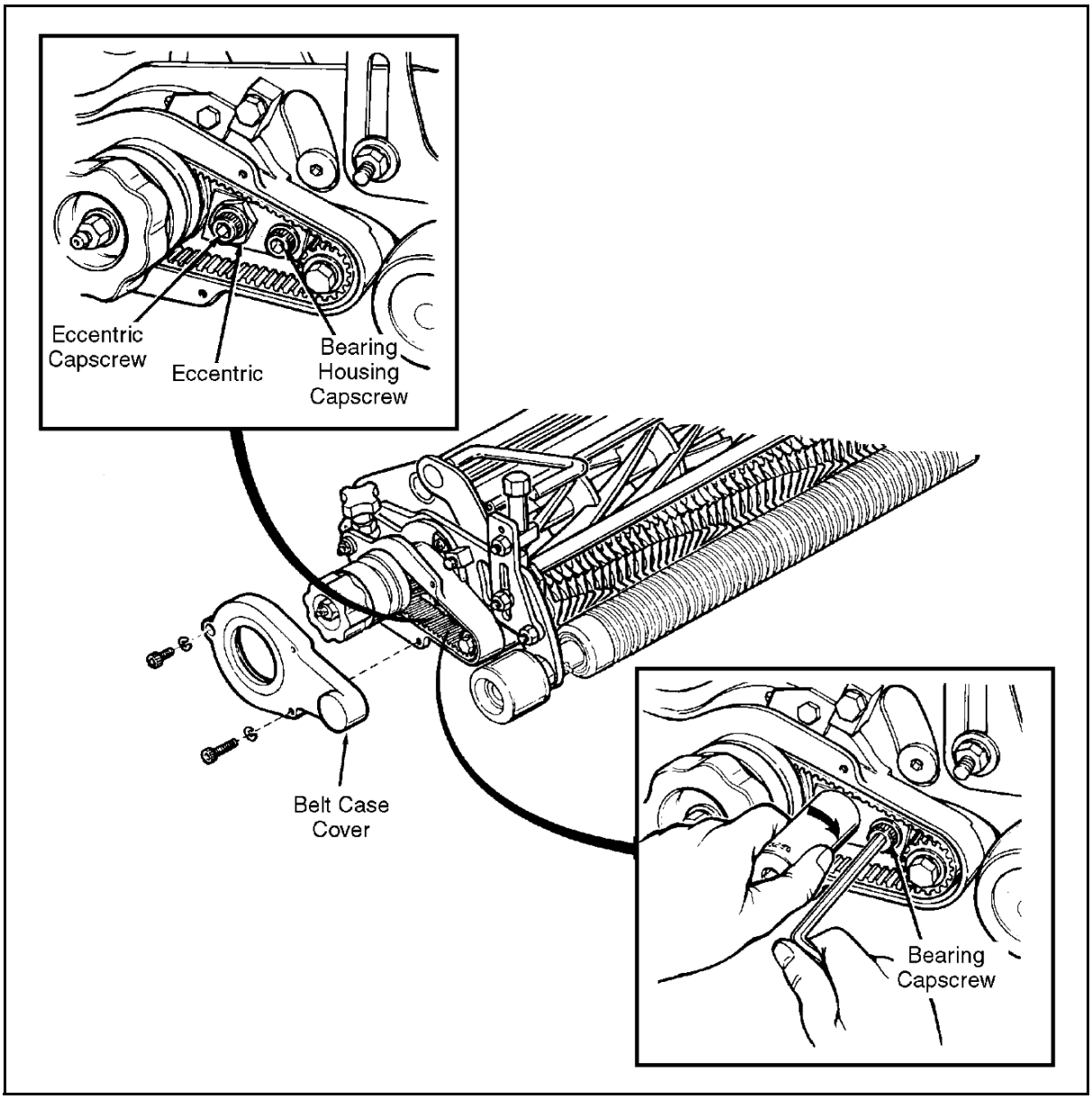


Figure 13C-14. Groomer Belt Adjustment

CLUTCH ASSEMBLY

Clutch repair is limited to replacing worn or broken springs and/or clutch pins (Figure 13C-15).

When working on the clutch, place it pulley side down on a work bench.

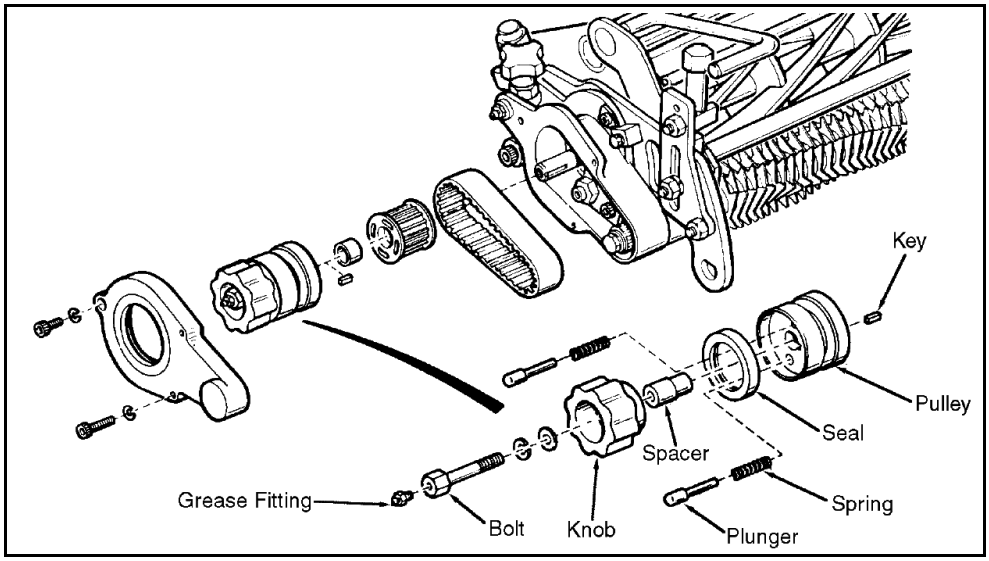


Figure 13C-15. Clutch Assembly

QUICK HEIGHT ADJUST ASSEMBLY

Repair

Inspect all parts and replace any that are questionable. Follow the disassembly/reassembly as shown in Figure 13C-16.

Adjustment

Each notch the quick height adjust is moved changes the groomer shaft 1/8 inch (3.18 mm).

If the control is loose when locked in a notch, proceed as follows:

1. Remove the knob by loosening the setscrew.
2. Using an open end wrench hold bolt. Turn the nut on top counterclockwise until control is tight in notch.
3. Install the knob and tighten the setscrew.

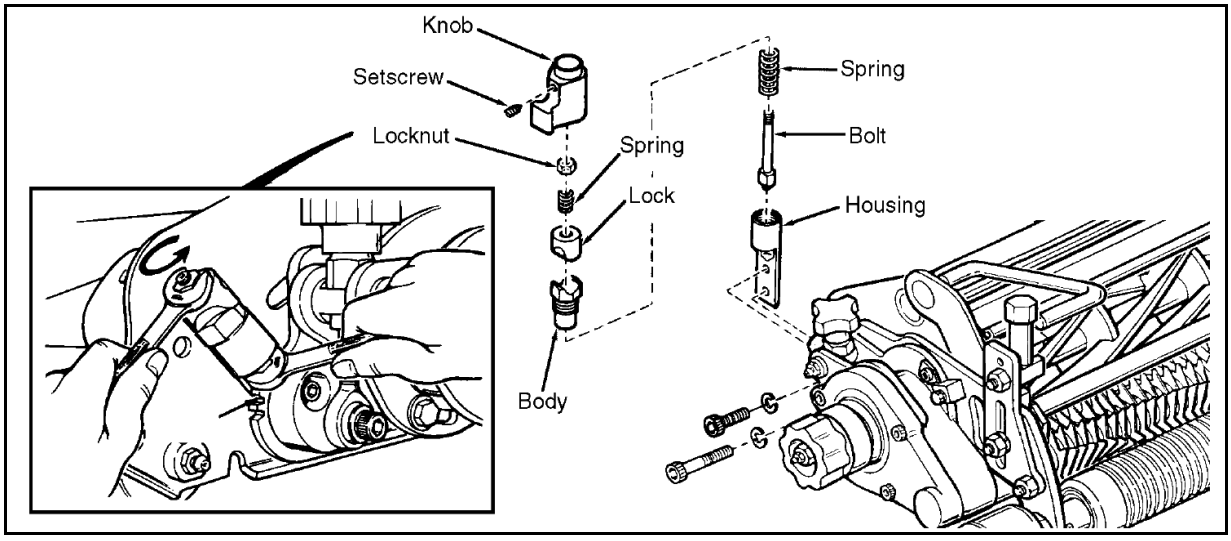


Figure 13C-16. Quick Height Adjustment

MICRO HEIGHT ADJUST ASSEMBLY

The micro height adjust can be disassembled for repairs as shown in Figure 13C-17.

As the time of assembly make sure the roll pin in the pin assembly is on the BOTTOM when installing the pin assembly in the pivot block.

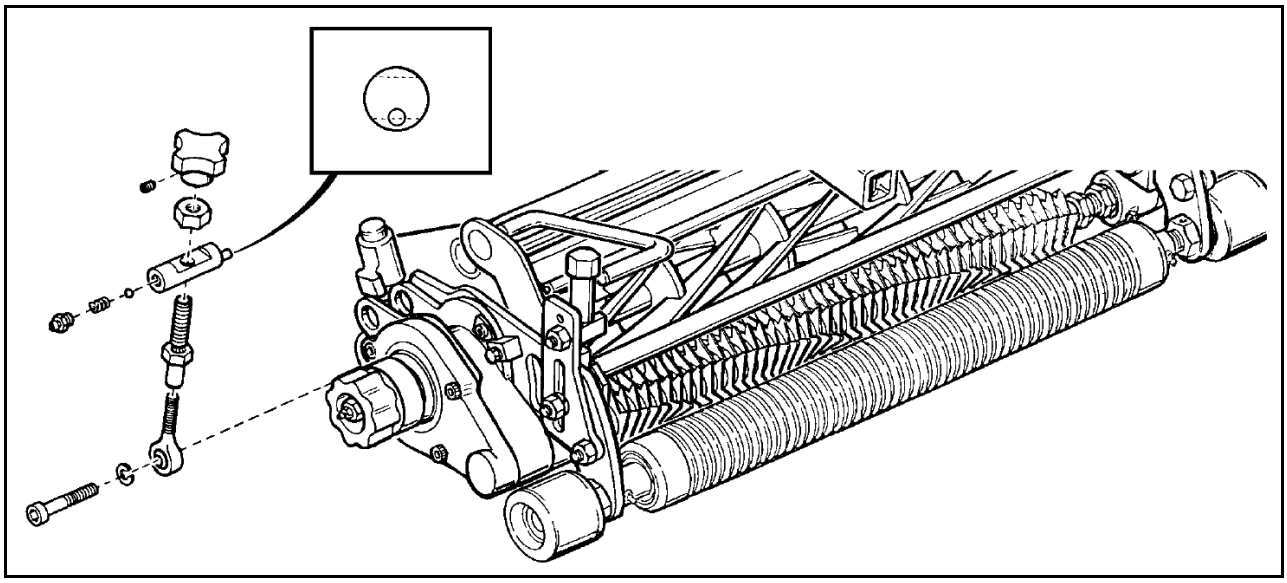


Figure 13C-17. Micro Height Adjustment

LUBRICATION

Use a hand grease gun when lubricating the Turf Groomer components (Figure 13C-18).

Pump the gun slowly and carefully until a slight amount of pressure is felt, then stop — DO NOT over grease.

Lubricate the groomer shaft bearings, roller shaft bearings, and clutch monthly.

Lubricate the micro adjusters monthly. Wipe off excess grease.

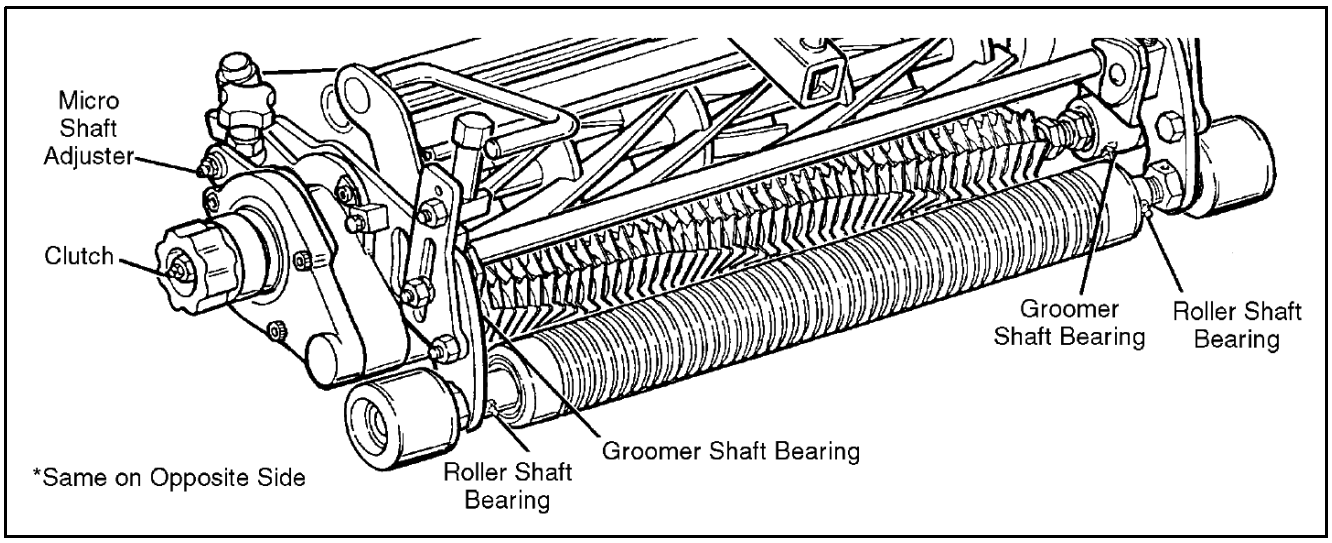


Figure 13C-18. Lubrication

SECTION 13D. POWER REAR ROLLER CLEANER

ASSEMBLY

1. Remove and discard the existing hardware holding the rear roller in place (Figure 13D-1).
   a. Attach the grease fitting (2) to the roller mounting bolt (16).
   b. Loosely assemble the setscrew (17) to the eccentric nut (15).
   c. Slip the eccentric nut (15) over the bolt (16), and fasten to the roller. The setscrew is to be positioned towards the outside of the reel on both sides.

Repeat Step a though Step c for the other side.

2. Assemble the right side bearing housing (1R) as shown in Figure 13D-1. The seal (5) and cup portion of the bearing (4) is pre-assembled.
   a. Place the bearing (4), nilos ring (24), and spacer (14) into the housing.
   b. Insert the short end of the roller shaft (13) into the housing and secure the two assemblies together with one 3/8 in flat washer (6), 3/8 in lockwasher (8), and one 3/8-16 x 3/4” screw (9).
   c. Attach the grease fitting to the bearing housing, then fully tighten the screw (9).

3. Slide the housing and brush over the right side eccentric adjuster. Secure the housing to the frame with one 5/16-18 x 1” screw (19), 5/16” flat washers (3) on both sides, 5/16” lockwasher (35), and one 5/16-18 nut (20).

4. Assemble the left side bearing housing (1L) as shown in Figure 13D-1.
   a. Insert the roller bearing (4) and nilos cup (24) into the housing.
   b. Slide the subassembly over the shaft and onto the eccentric adjuster. Make certain the set screw (17) is facing the outside of the frame.

5. Place on 5/16-18 c 3/4” screw (31) with one 5/16” flat washer (3) as shown in Figure 13D-1. Add the remaining components:
   a. Spacer (34) is behind the bracket (28) when a Jacobsen Turf Groomer is used.
   b. Spacer (34) is assembled in front of the bracket (28) when the Jacobsen Turf Groomer is not used.
   c. Add one lockwasher (35) and nut (20), but do not tighten.

6. Complete the brush assembly by adding one spacer (12), spring (7), and the key (11).

   Place the spring on the inside of the pulley on a 5/8” diameter shaft.

   Place the spring on the outside of the pulley on 1/2” diameter shaft.
   a. Align the keyway in the pulley (10) and slide the pulley over the key and shaft.
   b. Add one 7/16” flat washer (36). When using the brush with the Jacobsen Turf Groomer, add one lockwasher and one 3/8-16 x 3/4” screw (8 and 9).

7. Loosely assemble the shield brace (27) to the mower’s bearings housing as shown in Figure 13D-1.

8. Slide the corresponding spacer (22) over the shaft (depending on the diameter of the shaft). If required add one key (11).
   a. Assemble the setscrews (33) to the pulley if required.
   b. Place the belt (23) onto the groove of pulley (10) and pulley (18).
   c. Slide pulley (18) onto the reel shaft edge and add one 3/8” washer (6), 3/8” lockwasher (8) and 3/8-24 x 1” bolt (21).
   d. Align both pulleys with a straight edge, then tighten (21 and 33).

9. Attach the belt shield (26) to braces (27 and 28) using a 1/4” flat washer (32), lockwashers (30), and 1/4-2- c 3/4” screw (29) as shown in Figure 13D-1. Add a nut (40) if using the other bracket.

FINAL ASSEMBLY

1. Make sure all components have been properly assembled and adjusted, and that all hardware is securely fastened.
2. Clean the grease fitting before and after you apply grease. Use a grease gun with NLGI Grade 0 grease and fill the cavity in both housings (1).
3. Attach the cutting unit to the tractor.

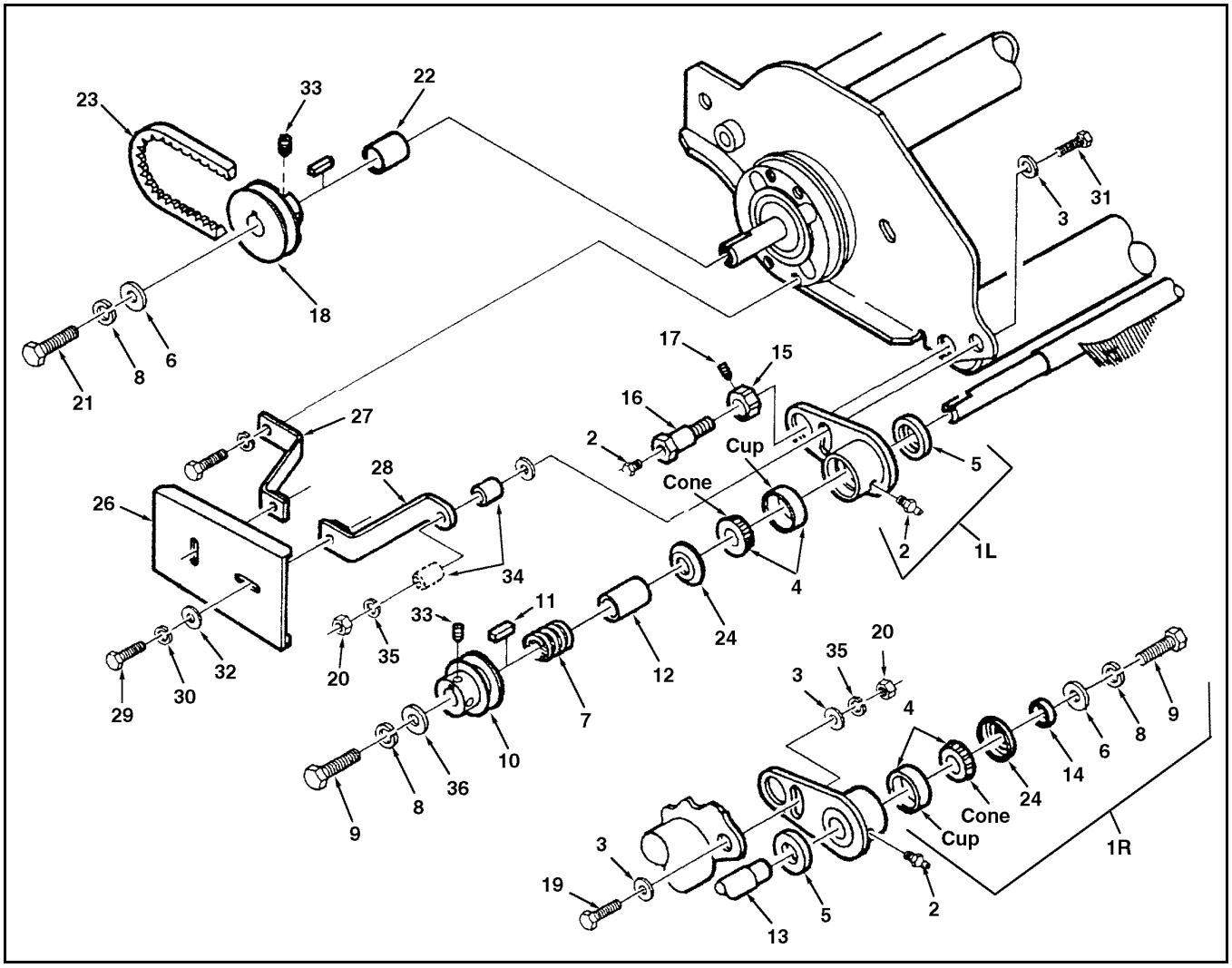
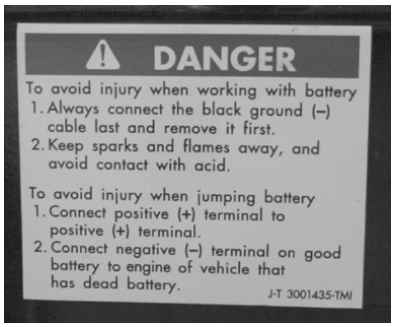


Figure 13D-1. Power Rear Roller Cleaner

SECTION 14
MISCELLANEOUS

SECTION 14A. PRECAUTION DECAL LOCATIONS



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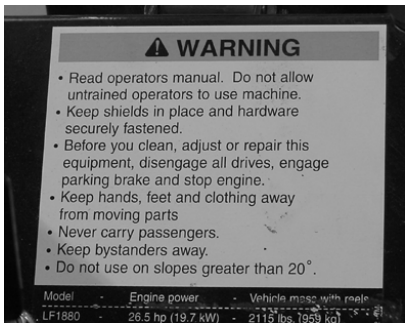
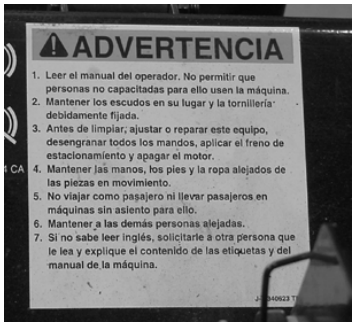
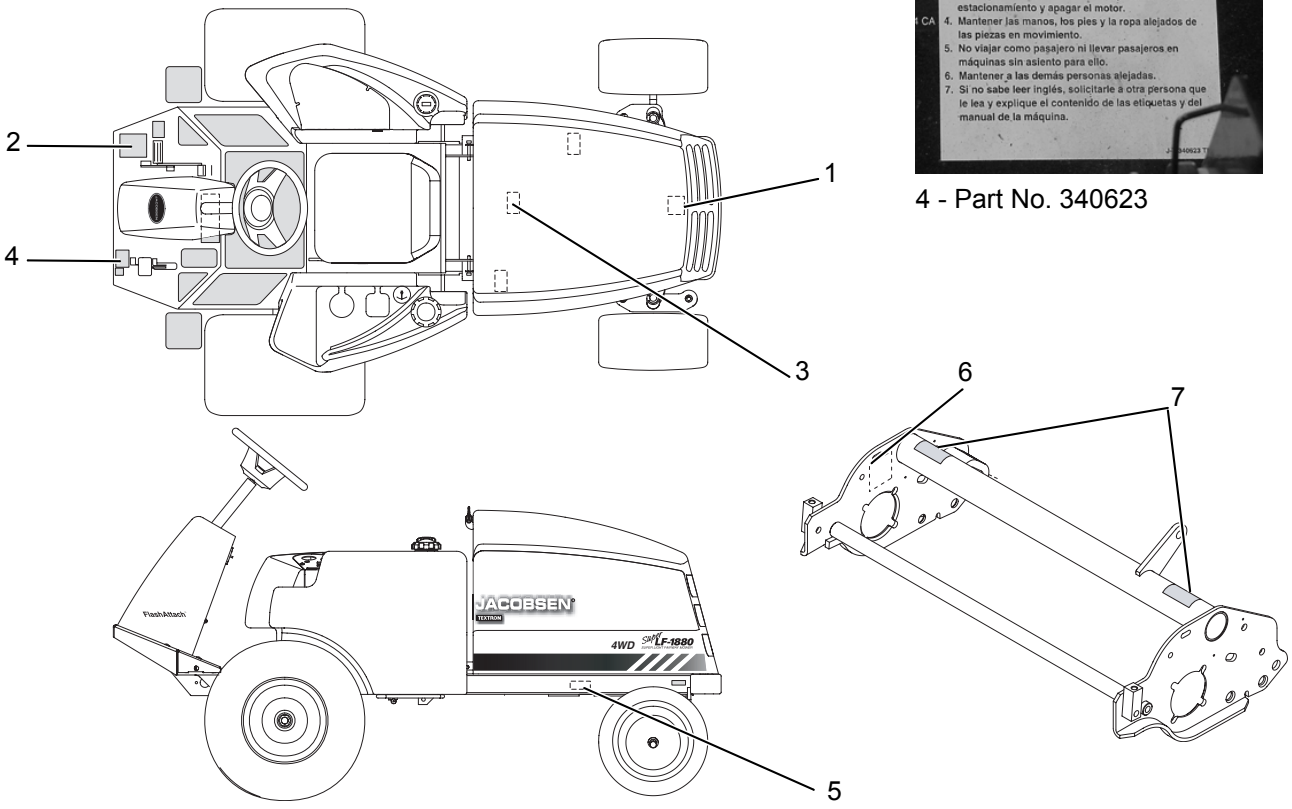


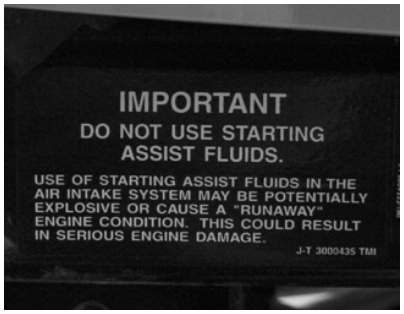
2 - Part No. 4102682

3 - Part No. 365956



4 - Part No. 340623





5 - Part No. 3000435

6 - Part No. 1000997

7 - Part No. 361877

Figure 14A-1. Precaution Decals

SECTION 14B. CONVERSION CHARTS

MILLIMETERS TO DECIMALS CONVERSION

Table 14B-1: Millimeters to Decimals

mm	Decimal	mm	Decimal	mm	Decimal	mm	Decimal	mm	Decimal
0.01	0.00039	0.41	0.01614	0.81	0.03189	21	0.82677	61	2.40157
0.02	0.00079	0.42	0.01654	0.82	0.03228	22	0.86614	62	2.44094
0.03	0.00118	0.43	0.01693	0.83	0.03268	23	0.90551	63	2.48031
0.04	0.00157	0.44	0.01732	0.84	0.03307	24	0.94488	64	2.51969
0.05	0.00197	0.45	0.01772	0.85	0.03346	25	0.98425	65	2.55906
0.06	0.00236	0.46	0.01811	0.86	0.03386	26	1.02363	66	2.59843
0.07	0.00276	0.47	0.01850	0.87	0.03425	27	1.06299	67	2.63780
0.08	0.00315	0.48	0.01890	0.88	0.03465	28	1.10236	68	2.67717
0.09	0.00354	0.49	0.01929	0.89	0.03504	29	1.14173	69	2.71654
0.10	0.00394	0.50	0.01969	0.90	0.03543	30	1.18110	70	2.75591
0.11	0.00433	0.51	0.2008	0.91	0.03586	31	1.22047	71	2.79528
0.12	0.00472	0.52	0.02047	0.92	0.03622	32	1.25984	72	2.83465
0.13	0.00512	0.53	0.02087	0.93	0.03661	33	1.29921	73	2.87402
0.14	0.00551	0.54	0.02126	0.94	0.03701	34	1.33858	74	2.91339
0.15	0.00591	0.55	0.02165	0.95	0.03740	35	1.37795	75	2.95276
0.16	0.00630	0.56	0.02205	0.96	0.03780	36	1.41732	76	2.99213
0.17	0.00669	0.57	0.02244	0.97	0.03819	37	1.45669	77	3.03150
0.18	0.00709	0.58	0.02283	0.98	0.03858	38	1.49606	78	3.07087
0.19	0.00748	0.59	0.02323	0.99	0.03898	39	1.53543	79	3.11024
0.20	0.00787	0.60	0.2362	1.00	0.03937	40	1.57480	80	3.14961
0.21	0.00827	0.61	0.02402	1	0.03937	41	1.61417	81	3.18898
0.22	0.00866	0.62	0.02441	2	0.07874	42	1.65354	82	3.22835

Table 14B-1: Millimeters to Decimals

mm	Decimal	mm	Decimal	mm	Decimal	mm	Decimal	mm	Decimal
0.23	0.00906	0.63	0.02480	3	0.11811	43	1.69291	83	3.26772
0.24	0.00946	0.64	0.02520	4	0.15748	44	1.73228	84	3.30709
0.25	0.00984	0.65	0.02559	5	0.19685	45	1.77165	85	3.34646
0.26	0.01204	0.66	0.02598	6	0.23622	46	1.181102	86	3.38583
0.27	0.01063	0.67	0.02638	7	0.27559	47	1.85039	87	3.42520
0.28	0.01102	0.68	0.02677	8	0.31496	48	1.88976	88	3.46457
0.29	0.01142	0.69	0.02717	9	0.35433	49	1.92913	89	3.50394
0.30	0.01181	0.70	0.02756	10	0.39370	50	1.96850	90	3.54331
0.31	0.01220	0.71	0.02795	11	0.43307	51	2.00787	91	3.58268
0.32	0.01260	0.72	0.02835	12	0.47244	52	2.04724	92	3.62205
0.33	0.01299	0.73	0.02874	13	0.51181	53	2.08661	93	3.66142
0.34	0.01339	0.74	0.02913	14	0.55118	54	2.12598	94	3.70079
0.35	0.01378	0.75	0.02953	15	0.59055	55	2.16535	95	3.74016
0.36	0.01417	0.76	0.02992	16	0.62992	56	2.20472	96	3.77953
0.37	0.01457	0.77	0.03032	17	0.66929	57	2.24409	97	3.81890
0.38	0.01496	0.78	0.03071	18	0.70866	58	2.28346	98	3.85827
0.39	0.01535	0.79	0.03110	19	0.74803	59	2.32283	99	3.89764
0.40	0.01575	0.80	0.03150	20	0.78740	60	2.36220	100	3.93701

US TO METRIC CONVERSION

Table 14B-2: US to Metric

	To Convert	Into	Multiply By
Linear Measurement	Miles	Kilometers	1.609
	Yards	Meters	0.9144
	Feet	Meters	0.3048
	Feet	Centimeters	30.48
	Inches	Meters	0.0254
	Inches	Centimeters	2.54
	Inches	Millimeters	25.4
Area	Square Miles	Square Kilometers	2.59
	Square Feet	Square Meters	0.0929
	Square Inches	Square Centimeters	6.452
	Acre	Hectare	0.4047
Volume	Cubic Yards	Cubic Meters	0.7646
	Cubic Feet	Cubic Meters	0.02832
	Cubic Inches	Cubic Centimeters	16.39
Weight	Tons (Short)	Metric Tons	0.9078
	Pounds	Kilograms	0.4536
	Ounces (Avdp.)	Grams	28.3495
Pressure	Pounds/Sq. In.	Kilopascal	6.895
		Bars	0.0689
Work	Foot-pounds	Newton-Meters	1.356
	Foot-pounds	Kilogram-Meters	0.1383
	Inch-pounds	Kilogram- Centimeters	1.152144
Liquid Volume	Quarts	Liters	0.9463
	Gallons	Liters	3.785
Liquid Flow	Gallons/Minute	Liters/Minute	3.785
Temperature	Fahrenheit	Celsius	Subtract 32° Multiply by 5/9