

JACOBSEN®

SERVICE & REPAIR INSTRUCTIONS

GREENS KING IV

Product No.
Greens Kings: 62221
62225
62226
62229
62300

TF-60's: 62228
62606
62608
62610
62620
62622

PUBLICATION REGISTRATION

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Includes Attachments
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12/95
4/97

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Suggested Retail Price
\$60.00



WARNING: If incorrectly used this machine can cause severe injury. Those who use and maintain the 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 1A. GENERAL INFORMATION

1A

CONTENTS

This manual contains repair instructions for major tractor components, attachments and options. The Table of Contents at the start of each section lists 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 user 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 which can be performed at the distributor shop level. If you, as user of this machine, do not consider yourself or your repair facilities capable of a given procedure, please consult your 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) used throughout this manual refer to the operator's left or right when seated in the normal operating position.

INDEX NUMBERS

Illustrations showing removal, disassembly, reassembly and installation have index numbers to call out the sequence of procedure.

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

Repair procedures for items not subject to wear (eg. 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 necessary repair or service.

REPLACEMENT PARTS

Use the appropriate Parts Catalog when ordering replacement parts. Follow installation instructions shipped with service parts or kits. When ordering parts, always give the serial number and product number of your machine as well as quantity, part 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 PRODUCT NUMBER, NAME, and SERIAL NUMBER that is stamped on the NAME PLATE or SERIAL PLATE of your product.
4. Order by QUANTITY DESIRED, the PART NUMBER and the DESCRIPTION OF PART.
5. Send your order to or visit your nearest AUTHORIZED JACOBSEN TURF EQUIPMENT DISTRIBUTOR.
6. INSPECT ALL SHIPMENTS ON RECEIPT. If any parts are damaged or missing, file a claim with the carrier before accepting.
7. Do not return material to your AUTHORIZED JACOBSEN DISTRIBUTOR without a letter of explanation. Make a list of all returned parts, show your name and address, and include it with the shipment. TRANSPORTATION CHARGES MUST BE PREPAID.

SERIAL NUMBERS

Serial numbers for machines with diesel engines (Product No. 62300, 62620 and 62622) are located on the left hand rear frame near the fuel filter. Serial numbers for machines with gasoline engines (Product Nos. 62221, 62225, 62606 and 62226, 62608, 62610) are located on the L.H. engine mounting bracket.

SECTION 1A. GENERAL INFORMATION

GENERAL CLEANING

Improper cleaning and lubrication of your machine results in the majority of 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.

See "Recommended Lubricants" and "Recommended Solvents" in Section 11 of this manual.

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 meaning are as follows:

NOTE

Any procedure 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 14 of this manual.



CAUTION

If your machine is gasoline engine powered, disconnect leads at rectifier-regulator before electric welding is done on components in common ground with engine.



WARNING

This machine is equipped with an interlock system which is intended to protect the operator and others from injury, by preventing the engine from starting, unless the reel levers are in the "Off" position and the traction lever is in the "Neutral" position. The system also shuts off the engine if the operator leaves the seat with the reels engaged. In the interest of safe operating conditions, this machine must never be operated with the interlock relays or interlock system disconnected or malfunctioning.

SECTION 1A. GENERAL INFORMATION

1A

TORQUE VALUES

Torque values are given in the "Torque Specification Chart" below. Special torque values are called out on illustrations and text throughout this manual.

TORQUE SPECIFICATIONS FOR STANDARD MACHINE HARDWARE SAE GRADE #5 SCREWS

Size	Torque Values	Size	Torque Values
8-32	27-33 in-lbs. (3-4 N.m)	1/2-13	67-83 ft-lbs. (90-113 N.m)
8-36	28-34 in-lbs. (3-4 N.m)	1/2-20	81-99 ft-lbs. (110-134 N.m)
10-24	39-47 in-lbs. (4-5 N.m)	9/16-12	99-121 ft-lbs. (134-164 N.m)
10-32	44-54 in-lbs. (5-6 N.m)	9/16-18	108-132 ft-lbs. (146-179 N.m)
1/4-20	7-9 ft-lbs. (9-12 N.m)	5/8-11	135-165 ft-lbs. (183-223 N.m)
1/4-28	9-11 ft-lbs. (12-15 N.m)	5/8-18	162-198 ft-lbs. (220-268 N.m)
5/16-18	15-18 ft-lbs. (20-24 N.m)	3/4-10	234-286 ft-lbs. (317-388 N.m)
5/16-24	17-21 ft-lbs. (23-28 N.m)	3/4-16	270-330 ft-lbs. (366-447 N.m)
3/8-16	27-33 ft-lbs. (37-45 N.m)	7/8-9	360-440 ft-lbs. (488-597 N.m)
3/8-24	31-39 ft-lbs. (42-53 N.m)	7/8-14	396-484 ft-lbs. (537-656 N.m)
7/16-14	45-55 ft-lbs. (61-75 N.m)	1-8	522-638 ft-lbs. (708-865 N.m)
7/16-20	49-61 ft-lbs. (66-83 N.m)	1-12	576-704 ft-lbs. (780-954 N.m)

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.

SECTION 1B. FAILURE ANALYSIS

FAILURE ANALYSIS

1B

The following table gives common problems, probable causes, and suggested remedies with page references to detailed description of remedial procedure.

PROBLEM	PROBABLE CAUSE	REMEDY
1. Engine speed does not increase when throttle control is moved.	a. Throttle control is not properly adjusted. b. Throttle control is broken. c. Fuel shutoff solenoid linkage is not properly adjusted. d. Fuel shutoff solenoid is not functioning properly.	a. Adjust properly. Refer to Section 2B. b. Repair or replace. Refer to Section 2B. c. Adjust linkage properly. Refer to Section 2B. d. Perform test. Refer to Section 10H.
2. Accelerator pedal sticks.	a. Linkage damaged. b. Pedal is broken. c. Dirt build-up around traction metering valve carriage bolt.	a. Repair damaged linkage. Refer to Section 2B. b. Repair. Refer to Section 2B. c. Clean area around traction metering valve carriage bolt.
3. Parking brake fails.	a. Brake is maladjusted. b. Worn brake shoes.	a. Adjust brake. Refer to Section 2B. b. Replace lining. Refer to Section 5B.
4. Lift/lower functions do not occur when pedal is actuated.	a. Pedal linkage is out of adjustment. b. Hydraulic lines are kinked, worn or broken. c. Hydraulic cylinders are not functioning properly. d. Main control valve is malfunctioning.	a. Adjust linkage. Refer to Section 2B. b. Adjust or replace lines. Refer to Section 8B. c. Repair or replace cylinders. Refer to Section 8G. d. Repair or replace valve. Refer to Section 8D.
5. Traction functions (mow and transport) do not occur when levers are activated.	a. Lever linkage is out of adjustment. b. Traction motor seals are leaking. c. Traction motors are not functioning properly. d. Traction metering valve is malfunctioning. e. Pump is malfunctioning.	a. Adjust linkage. Refer to Section 2B. b. Replace seals. Refer to Section 8H. c. Repair or replace motors. Refer to Section 8H. d. Repair or replace valve. See Section 8F. e. Repair or replace pump. See Section 8H.
6. Reel levers are not functioning properly.	a. Lever linkage is out of adjustment. b. Hydraulic hoses are kinked or worn. c. Reel motors are not functioning properly.	a. Adjust linkage. Refer to Section 2B. b. Repair or replace hoses. Refer to Section 8B. c. Repair or replace motors. Refer to Section 8I.

SECTION 1B. TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
ENGINE		
1. Engine not running smoothly.	a. Dirty fuel filter and/or clogged fuel tank strainer.	a. Replace fuel filter and/or clean tank strainer as necessary. See Section 3.
2. Any other problems with the proper function of the engine.	NOTE: Refer to engine manufacturer's service manual for complete service information on your model engine.	
BRAKE SYSTEM		
1. Brakes grab.	a. Oil, moisture, or dirt on brake shoes. b. Brakes out of adjustment.	a. Allow shoes to dry. Move mower against brake pressure to dry shoes and remove oil. b. Adjust brakes. Refer to Section 5B.
2. Brakes fail.	a. Leakage in brake system. b. Worn brake shoes.	a. Inspect and repair brake lines. Refer to Section 5B. b. Replace shoes. Refer to Section 5B.
STEERING		
1. Machine steers hard.	a. Cables are kinked or are binding on the pulleys. b. Nut on fork too tight. c. Pulleys need lubrication.	a. Unkink and unbind cable or replace cable. See Section 6B. b. Adjust torque on nut. c. Lubricate
2. Machine will not steer.	a. Cable is broken. b. Pulley is bent or broken.	a. Replace cable. See Section 6B. b. Replace pulley. Refer to Section 6B.
WHEELS AND TIRES		
1. Tractor wanders.	a. Improper tire inflation. b. Worn bearing in wheel. c. Malfunctioning wheel motor. d. Steering cables loose.	a. Inflate tires. See Section 7B. b. Replace bearing. See Section 7C. c. Repair wheel motor. Refer to Section 8H. d. Tighten cables.
HYDRAULICS		
1. Oil leaks.	a. Loose connections in hoses and to components. b. Worn seals in valves. c. Worn seals in motors.	a. Repair connections. Refer to Section 8B. b. Replace seals. Refer to Section 8D. c. Replace seals. Refer to Sections 8H and 8I.
2. Excessive noise.	a. Air in system. b. Valves or motor malfunctioning.	a. Bleed system. Refer to Section 8. b. Repair or replace valve or motors. See Section 8.
3. Rear mower lowers too soon or too late.	a. The sequence valve is out of adjustment.	a. Adjust sequence valve. Refer to Section 8E.

SECTION 1B. TROUBLESHOOTING

1E

PROBLEM	PROBABLE CAUSE	REMEDY
HYDRAULICS (Continued)		
4. Rear mower lifts too soon or too late.	a. The sequence valve is out of adjustment.	a. Adjust sequence valve. Refer to Section 12E.
5. Reel RPM too slow.	a. Valve, motor or pump problem.	a. See Section 8.
ELECTRICAL SYSTEM		
1. Battery charge is low.	a. Buildup of corrosive acid across top of battery. b. Terminals are loose. c. Battery cables are frayed. d. Defective battery.	a. Clean and recharge battery. Refer to Section 10C. b. Tighten terminals and recharge battery. Refer to Section 10C. c. Replace cables and recharge battery. Refer to Section 10C. d. Replace battery. Refer to Section 10C.
2. Battery is not charging.	a. The alternator belt is not properly adjusted. b. Defective alternator. c. Defective rectifier fuse.	a. Adjust belt. b. Replace alternator. Refer to Section 10D. c. Replace fuse.
3. Machine does not start.	a. Ignition switch is defective. b. Solenoid, wiring or neutral start switches. c. Defective starter.	a. Replace ignition switch. See Section 10F. b. Replace defective component. c. See engine manufacturer's manual.
NOTE There are four neutral start switches on your Greens King. They will allow you to start your Greens King only when the traction lever is in neutral and all three reel control levers are in the "Off" position.		
4. Machine does not start when traction lever is in neutral position and reel control levers are in "Off" position.	a. Neutral start switch is loose or defective.	a. Replace switch. Refer to Section 10F.
5. The reels do not disengage when mowers are raised. NOTE: Reels will be engaged if reel lever is in "Backlap" position.	a. Spools in control valve are sticking. b. Spools centering spring weak or broken.	a. Clean area around spool. b. Replace spring. See Section 8D.

SECTION 1B. TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
ATTACHMENTS		
1. Reel does not turn.	a. Reel is jammed with grass. b. Reel motor is malfunctioning. c. Bedknife too tight. d. Hydraulic System malfunction.	a. Clean reel. Refer to Section 12C. b. Repair or replace reel motor. Refer to Section 8. c. Adjust bedknife to reel. See Section 12. d. See pump, valve or reel motor hydraulic test procedure in Section 8J.
2. Uneven cutting.	a. Reel has loose or broken blades. b. Reel bearing or bearing housings are worn. c. Roller or roller bearings defective.	a. Replace blades. Refer to Section 12. b. Replace bearing and bearing housing. Refer to Section 12. c. Replace defective component. See Section 12.
3. Ragged cutting.	a. Bedknife has a sharp, jagged edge. b. Reel not sharpened. c. Reel to bedknife contact not correct.	a. Dress or replace bedknife. Refer to Section 12. b. Sharpen reel. See Section 12. c. Adjust bedknife. See Section 12.

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SECTION 2A. REPAIR AND SERVICE TOOLS AND MATERIALS

2A

Tools required: Standard automotive hand tools, including driving tools, bearing pullers and seal sleeves.

Cleaning materials: Stoddard or equivalent solvent.
Detergent and water.

Lubricants: Non-metallic additive wheel bearing grease (eg. Sunray DX 692 or Enco Fibrox 280).
Grease gun grease (eg. Sunray DX 671 or Gulf Supreme No. 0 [SAE 30 oil]).

SECTION 2B. CONTROL ADJUSTMENTS

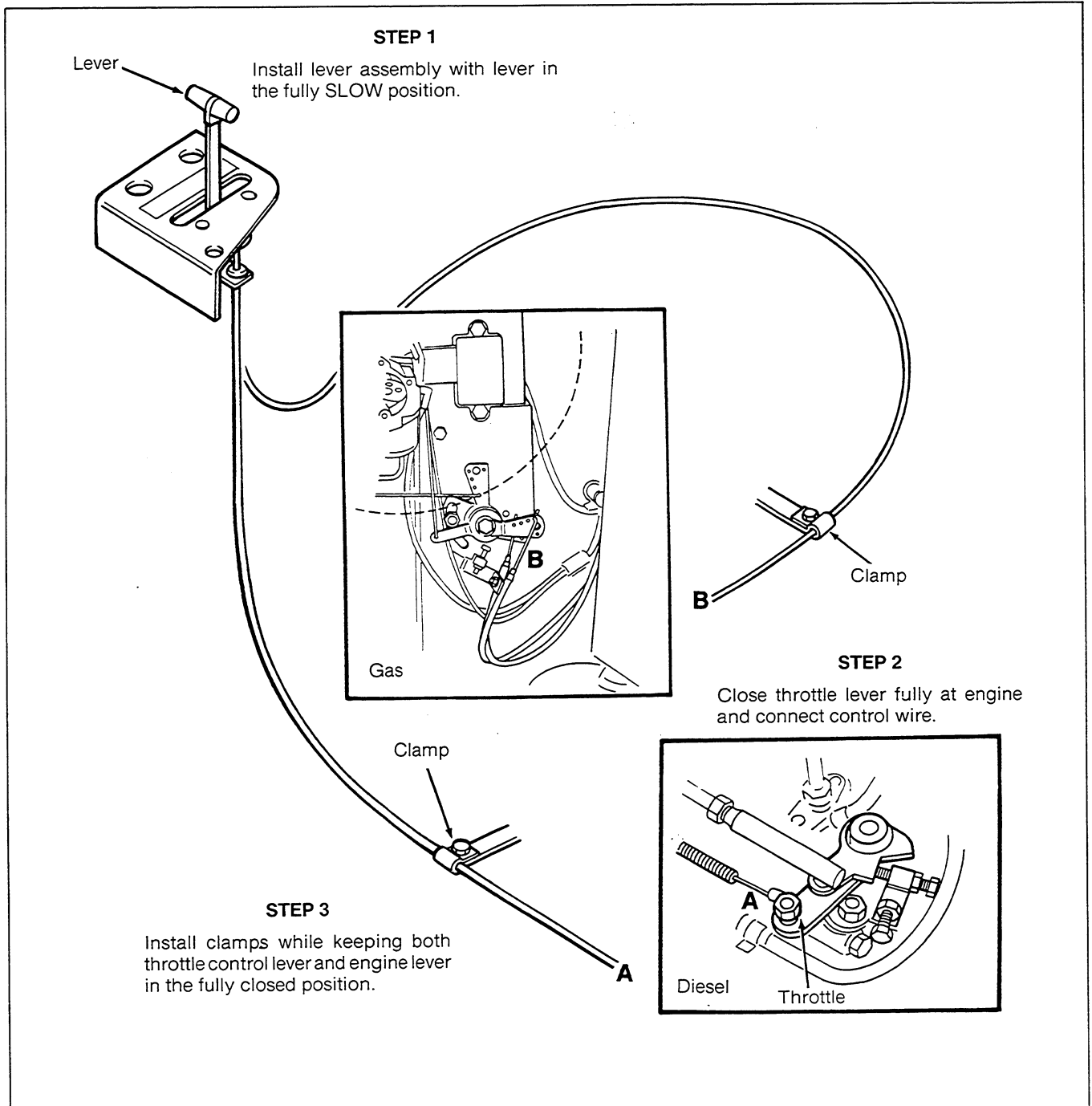
GENERAL

The repair of controls is limited to adjustment of linkages, straightening of bent rods or replacement of defective parts and hardware.

THROTTLE

Located to the right of the operators seat, the throttle control is used to regulate engine speed. Replace a defective throttle as shown in the "Repair" illustration.

2B

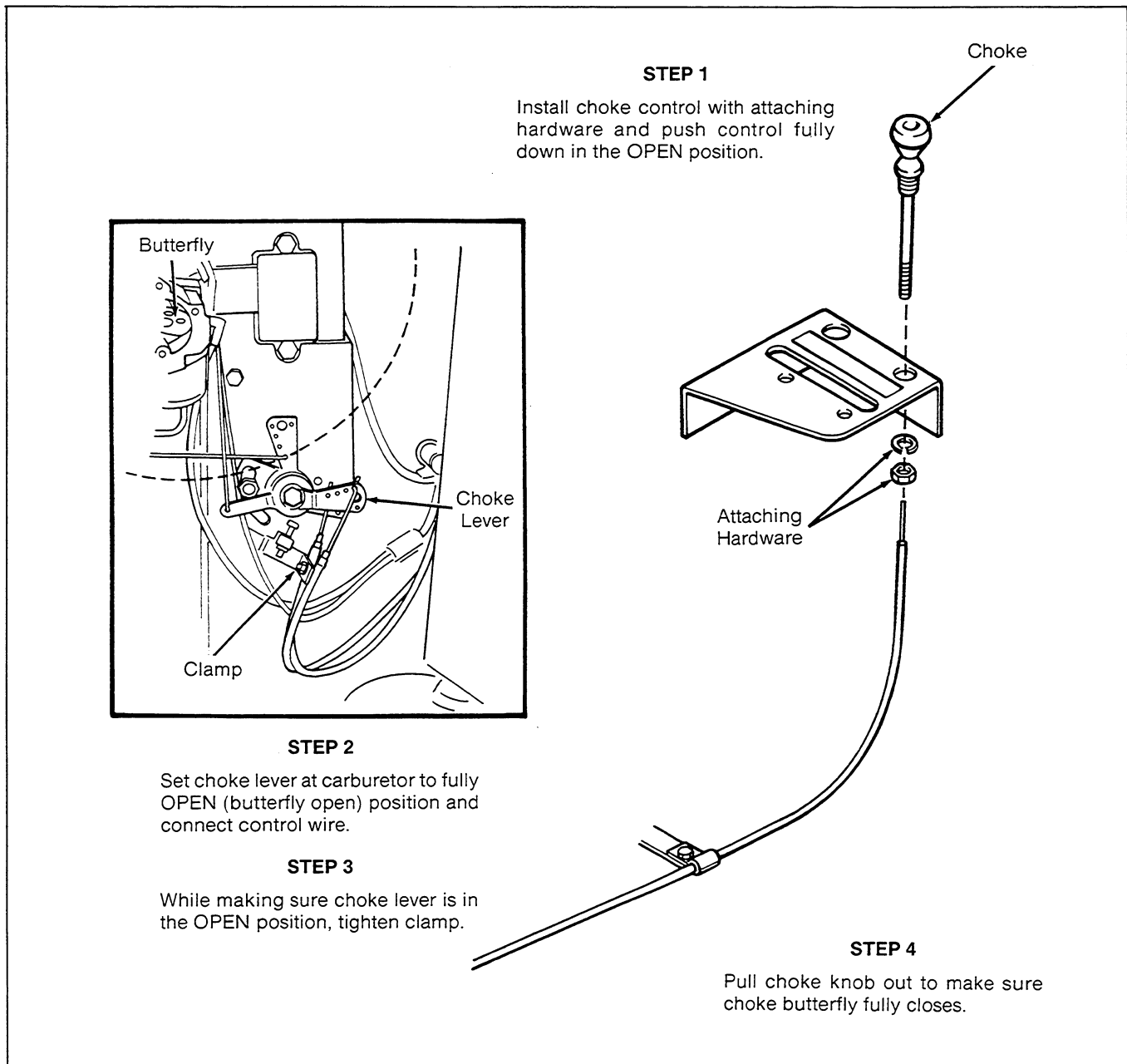


THROTTLE CONTROL REPAIR

SECTION 2B. CONTROL ADJUSTMENTS

GASOLINE ENGINE CHOKE

The choke control is factory set and normally requires no adjustment. If the choke control becomes damaged install and adjust a new choke control as shown on the "Repair" illustration.



CHOKE CONTROL REPAIR

SECTION 2B. CONTROL ADJUSTMENTS

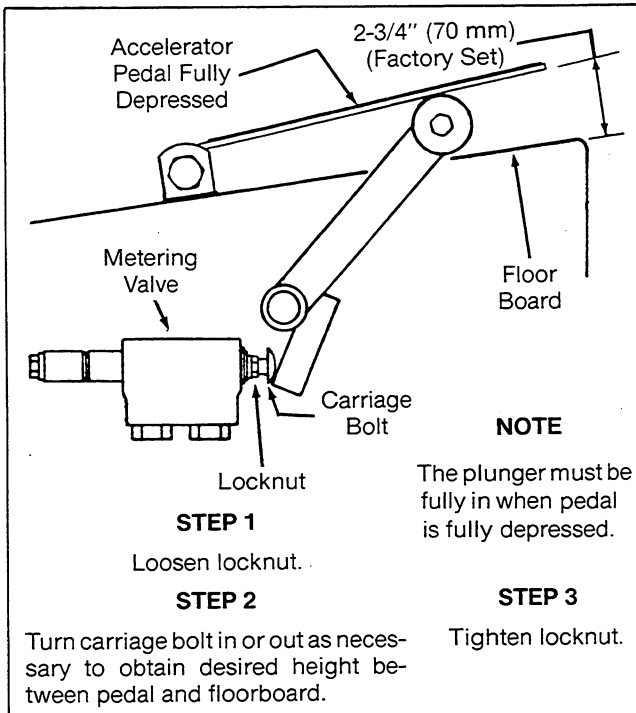
2B

ACCELERATOR PEDAL

The accelerator pedal controls tractor ground speed by regulating the amount of hydraulic oil flow to the traction motors through the metering valve.

The pedal is factory pre-set to be 2-3/4 in. (70 mm) from the floorboard when fully depressed (full speed).

To adjust the pedal to a different desired height or to adjust it after installing a new pedal or metering valve see instructions on the "Accelerator Pedal Adjustment" illustration.



ACCELERATOR PEDAL ADJUSTMENT

BRAKE ADJUSTMENT (See "Brake Adjustment" Illustration)

The Greens King has drum type friction brakes. Adjust the brake if the foot pedal is too close to floorboard when depressed, adjust as follows:

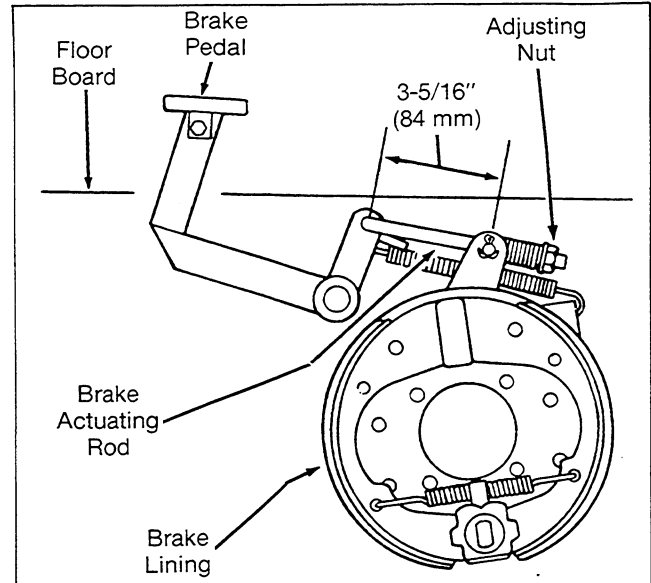
1. Turn the adjusting nuts at both wheels in equally to increase distance between floorboard and brake pedal (when depressed).

NOTE

When adjusting nut is near end of actuating rod check brake lining thickness — new shoes may be needed.

The distance between pivot points should be 3-5/16 (84 mm) when brake shoes are new.

2. In an open area, drive straight ahead with traction



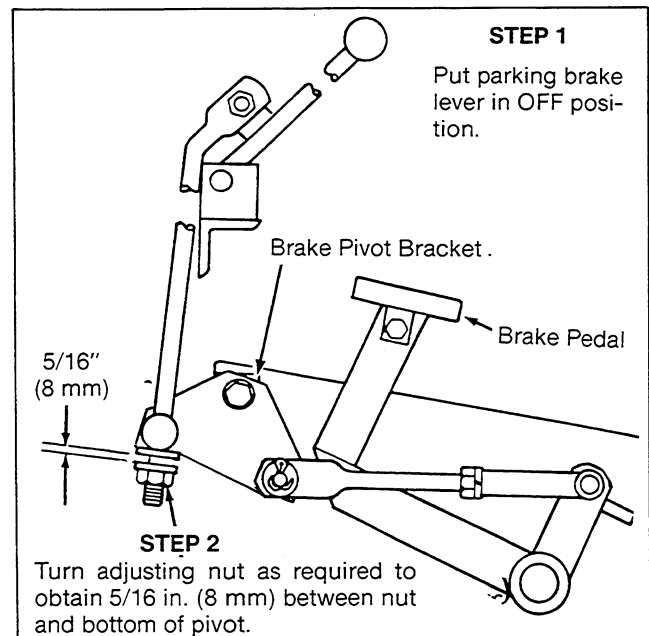
BRAKE ADJUSTMENT

lever in MOW position and throttle lever in SLOW position.

3. Apply brakes lightly. If machine pulls to one side turn adjusting nut on *opposite* side clockwise. Repeat procedure until machine stops straight without pulling to either side.

PARKING BRAKE ADJUSTMENT (See "Parking Brake Adjustment" Illustration)

The parking brake adjustment should be checked occasionally and any time new brake parts have been installed. Adjust parking brake as described on "Parking Brake Adjustment" illustration.

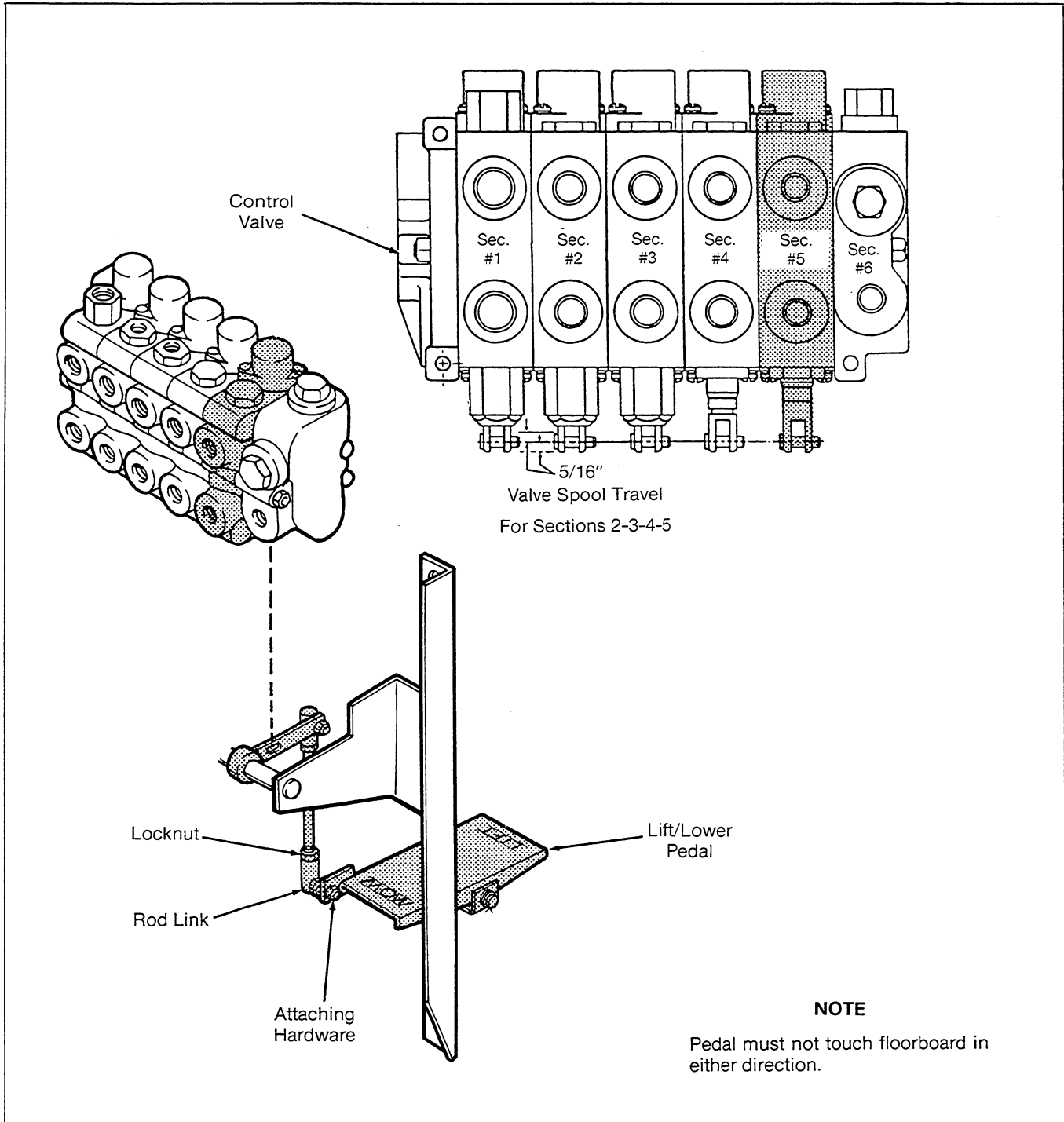


PARKING BRAKE ADJUSTMENT

SECTION 2B. CONTROL ADJUSTMENTS**LIFT/LOWER PEDAL ADJUSTMENT**

The lift/lower pedal raises or lowers attachments by positioning the spool in section 5 of the control valve. Repair of the lift/lower pedal assembly is limited to replacement of damaged linkage or missing hardware and adjustment as described below and shown on the "Adjustment" illustration.

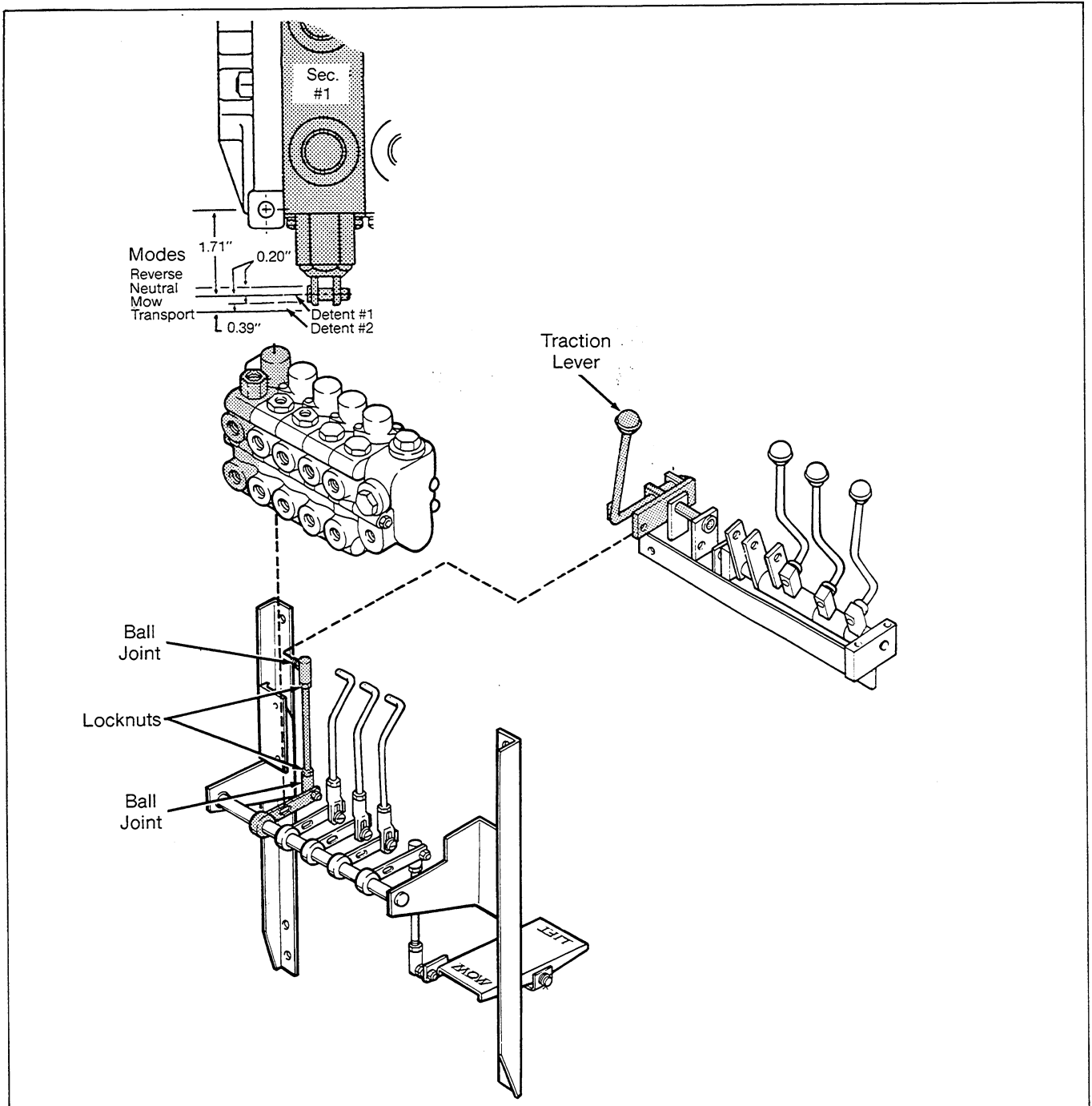
1. Loosen locknut.
2. Remove attaching hardware and turn rod link as necessary to obtain correct adjustment at control valve.
3. Tighten locknut.

**LIFT/LOWER PEDAL ADJUSTMENT (ALL PRODUCTS)**

SECTION 2B. CONTROL ADJUSTMENTS**TRACTION LEVER**

The traction lever is used to select one of three transport modes by positioning the transport section spool on the main control valve. Repair of the traction lever is limited to the replacement of damaged linkage or missing hardware. Adjust traction lever as follows:

1. Lower attachments to ground and remove ignition key.
2. Remove front cowling to gain access to lever.
3. Place traction lever in neutral position.
4. Loosen locknuts and adjust ball joints to achieve correct adjustment of spool travel at valve.
5. Make sure traction lever engages neutral start switch in the NEUTRAL position.

2B**TRACTION LEVER ADJUSTMENT**

SECTION 2B. CONTROL ADJUSTMENTS

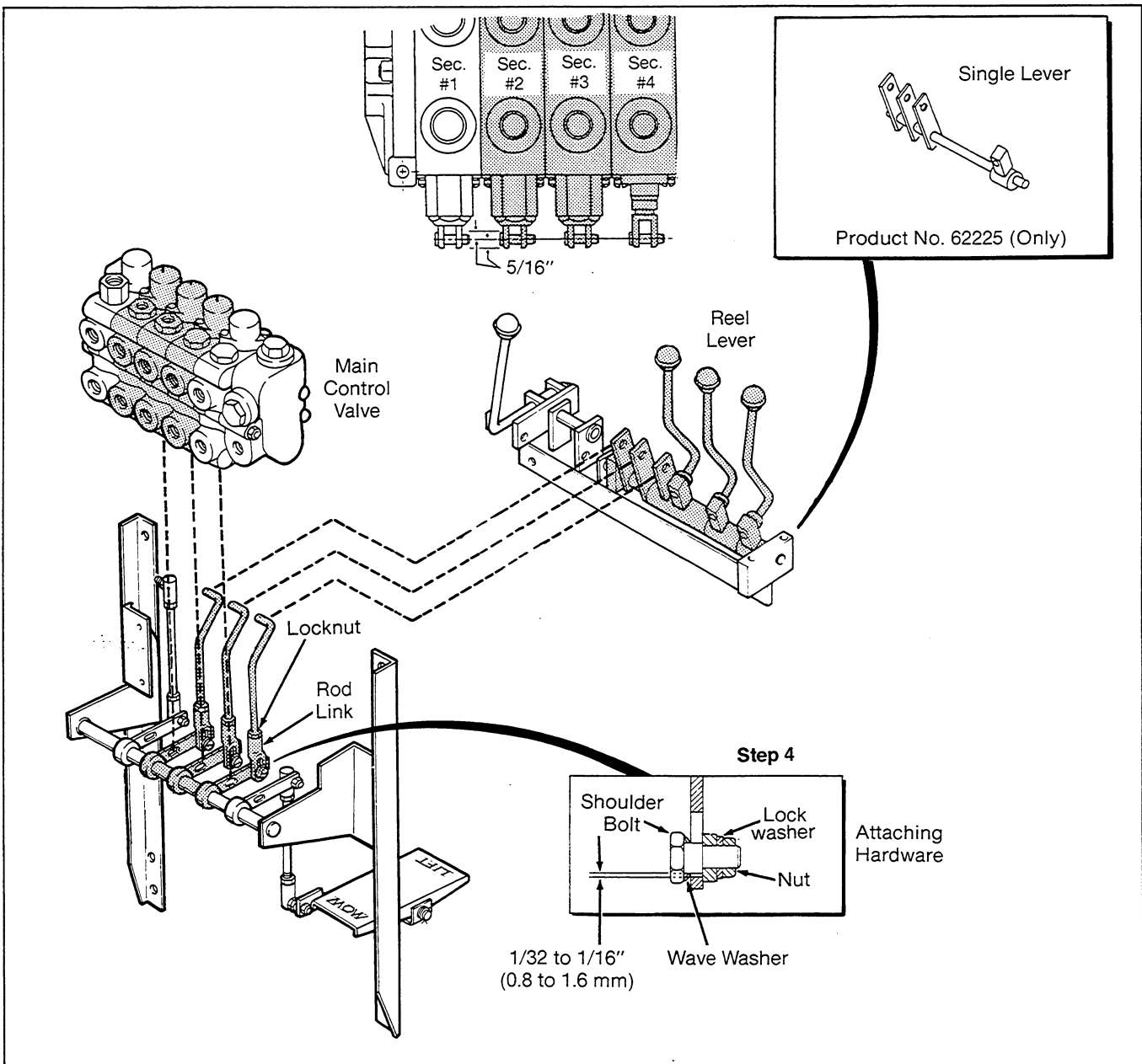
REEL CONTROL LEVERS

The reel control levers control operation (ON, OFF or BACKLAP) of the reels by positioning the appropriate spools in the main control valve.

Repair of reel control levers is limited to replacement of damaged or missing parts. Anytime new parts are installed or if the reels do not disengage when raised (and reel levers are in ON position) see "Reel Control Lever Adjustment" illustration and adjust as follows:

1. Lower attachments to ground.
2. Turn off ignition and remove keys.
3. Put reel control lever(s) in the ON position.

4. Remove front cowling to gain access to levers.
5. The shoulder bolt should be 1/32 to 1/16 in. (0.8 to 1.6 mm) from the bottom of rod link slot, if not, follow adjustment steps below and as shown on illustration.
 - a. Remove attaching hardware.
 - b. Loosen locknut.
 - c. Turn rod link as necessary to obtain correct adjustment at both rod end and valve spool.
 - d. Tighten locknut and install attaching hardware.



REEL CONTROL LEVER ADJUSTMENT

SECTION 2C. GAUGES AND INSTRUMENTS**2C****REPAIR**

Repair of instruments is limited to replacement of defective components. See Section 10, ELECTRICAL, for instructions on testing water temperature gauge. See the appropriate instrument repair illustration for location and replacement instructions.

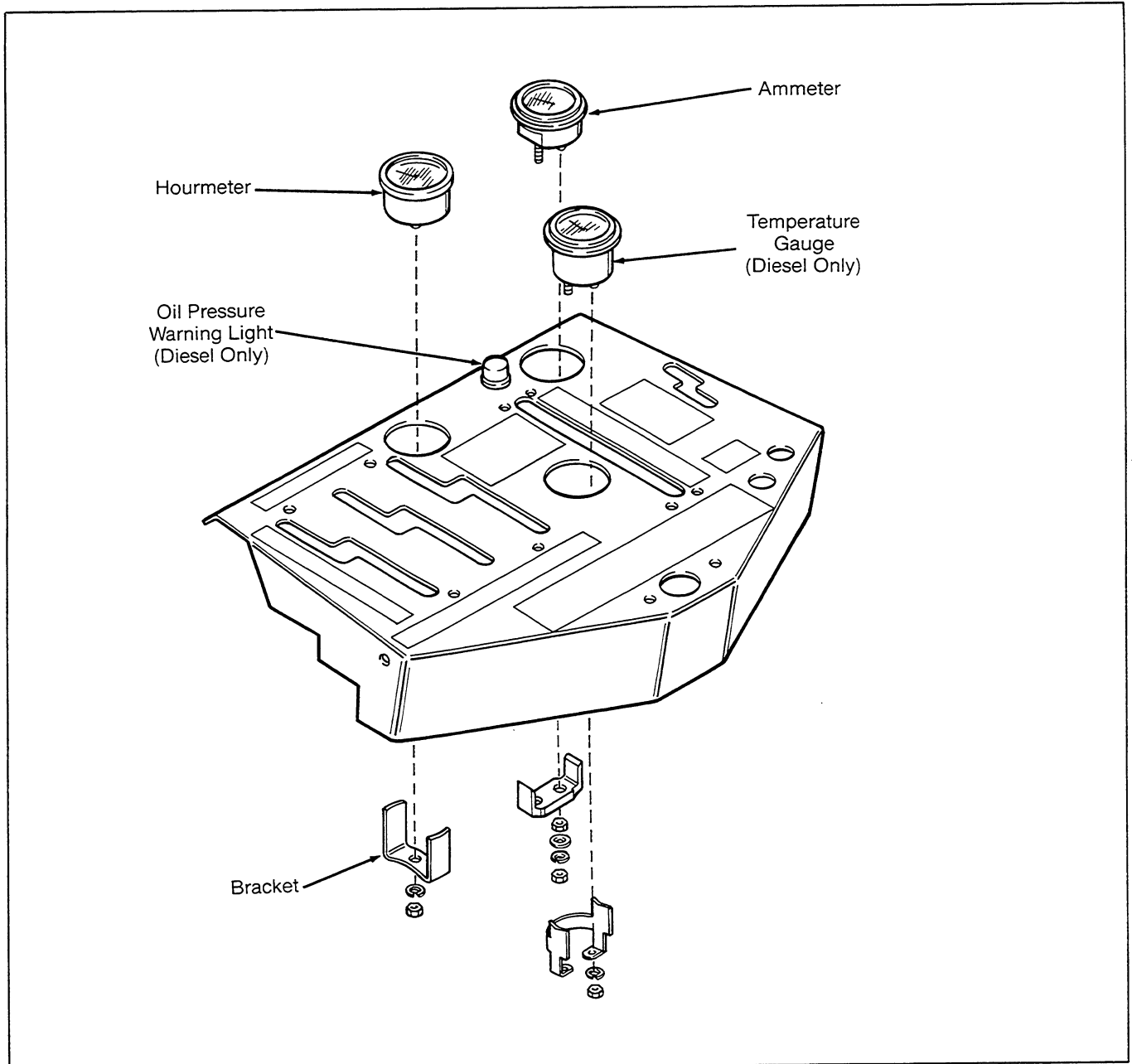
1. Disconnect battery ground (black) cable.

2. Label wires for proper identification and disconnect wiring.

3. Remove attaching hardware and replace defective instrument.

4. Connect wiring.

5. Connect battery ground cable.



GAUGES AND INSTRUMENTS REMOVAL AND REPLACEMENT

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SECTION 3A. REPAIR AND SERVICE TOOLS AND MATERIALS

- Tools required:** Standard automotive hand tools.
- Cleaning materials:** Stoddard or equivalent solvent.
Detergent and water.
Anti-rust oil.
- Lubricants:** Grease gun grease (eg. Sunray DX671 or Gulf Supreme No. 0).
Hydraulic Oil Options:
 Jacobsen Part No. 502693, 5 gal. (19 liter).
 Jacobsen Part No. 502696, 2.5 gal. (9.5 liter).
 Sunoco H.P. Engine Oil SAE 10W30.
 Mobil Delvac (Special) SAE 10W30.
Engine Oil Options — API Classification CC/CD, SE/SF grades:
 77° SAE 30, 32°-77° F SAE 20, below 32° F SAE 10W or SAE 10W-30.
- Other service items:** Shims (Part No. 357908).
Compressed Air Source

3A

SECTION 3B. GENERAL INSTRUCTIONS

CONTENTS

This section covers repairs to the engine associated components (eg. mufflers, air cleaners, radiators). Removal and installation of engines is also covered but engine repair is not included in this manual. Refer to the appropriate engine manufacturer's instructions for engine service and repair.

Section 10 of this manual gives tests used for alternators, starters, and rectifiers. Repair or replace these engine accessories as described in the appropriate engine manufacturer's manual.

Order the engine manual for your Green's King IV from your Jacobsen distributor.

NOTE

Tests for alternators, starters, and rectifiers are included in Section 10 of this manual. If these components are found faulty, refer to the appropriate engine manufacturer's manual for repair or replacement instructions. Engine manufacturer's manuals are available from your Jacobsen distributor.

The engines used on the Green's King IV are:

- 14 HP air cooled Kohler gasoline engine Model K-321S (with electrical ignition system) used on Product No. 62221.
- 14 HP air cooled Kohler "Magnum" gasoline engine Model 14M (with solid state ignition system) used on Product No. 62225.
- 16 HP air cooled Kohler "Magnum" gasoline engine Model 16M (with solid state ignition system) used on Product No. 62226.
- 16.5 HP liquid cooled Kubota diesel engine Model D600B used on Product No. 62300.

3B

CLEANING AND LUBRICATION

Thoroughly clean each component after removal from the machine.

Follow engine manufacturer's instructions for lubrication of engine.

SECTION 3C. GASOLINE ENGINES

AIR CLEANER SERVICE (See “Air Cleaner Service” Illustration)

The Greens King IV gasoline engines have dry type air cleaners which should be serviced as follows.

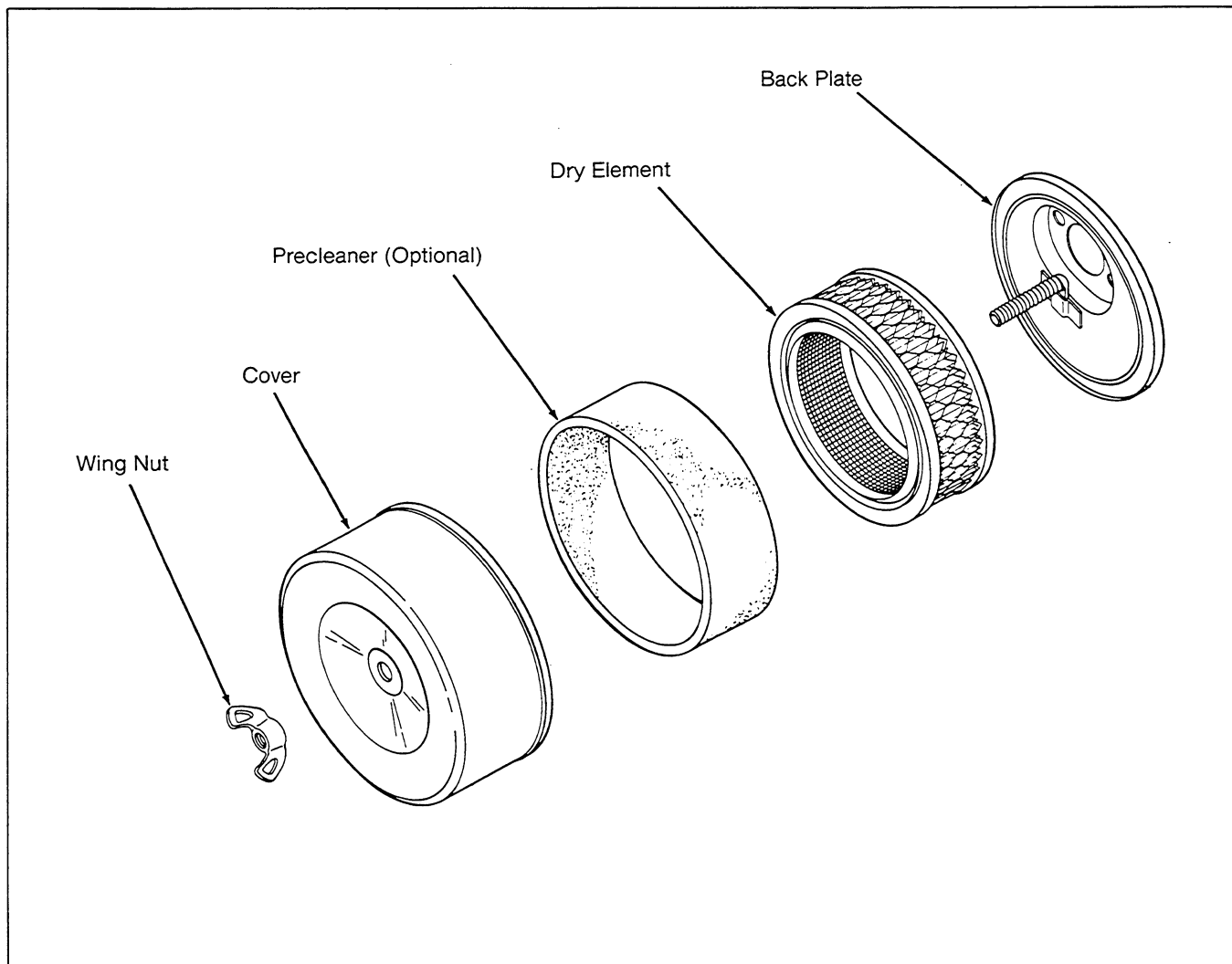
1. Remove the wing nut and cover.
2. Remove element and tap lightly on a flat surface to remove loose surface dirt. Replace element if dirt does not drop off easily. *Do not* wash dry elements in any liquid or attempt to blow dirt off with air hose as this will puncture filter element. When replacing element, use only manufacturers (Kohler) elements.
3. Carefully handle new element — do not use if gasket surfaces are bent or twisted. Check the following when installing new or serviced element:
 - a. Back plate must be securely tightened to carburetor. Replace back plate if bent or cracked.

- b. Gasket surfaces of element must be flat against back plate and cover to seal effectively.
- c. Wing nut must be finger tight — don't overtighten.

PRECLEANER SERVICE

Your air cleaner may be equipped with an optional precleaner. Precleaners are normally used in dusty environments.

1. Wash precleaner in water using a detergent.
2. Rinse thoroughly until all traces of detergent are eliminated.
3. Squeeze away excess water and air dry. (Do not wring precleaner.)
4. Soak in fresh, clean engine oil and squeeze to remove excess oil.
5. Reinstall precleaner over air filter element.

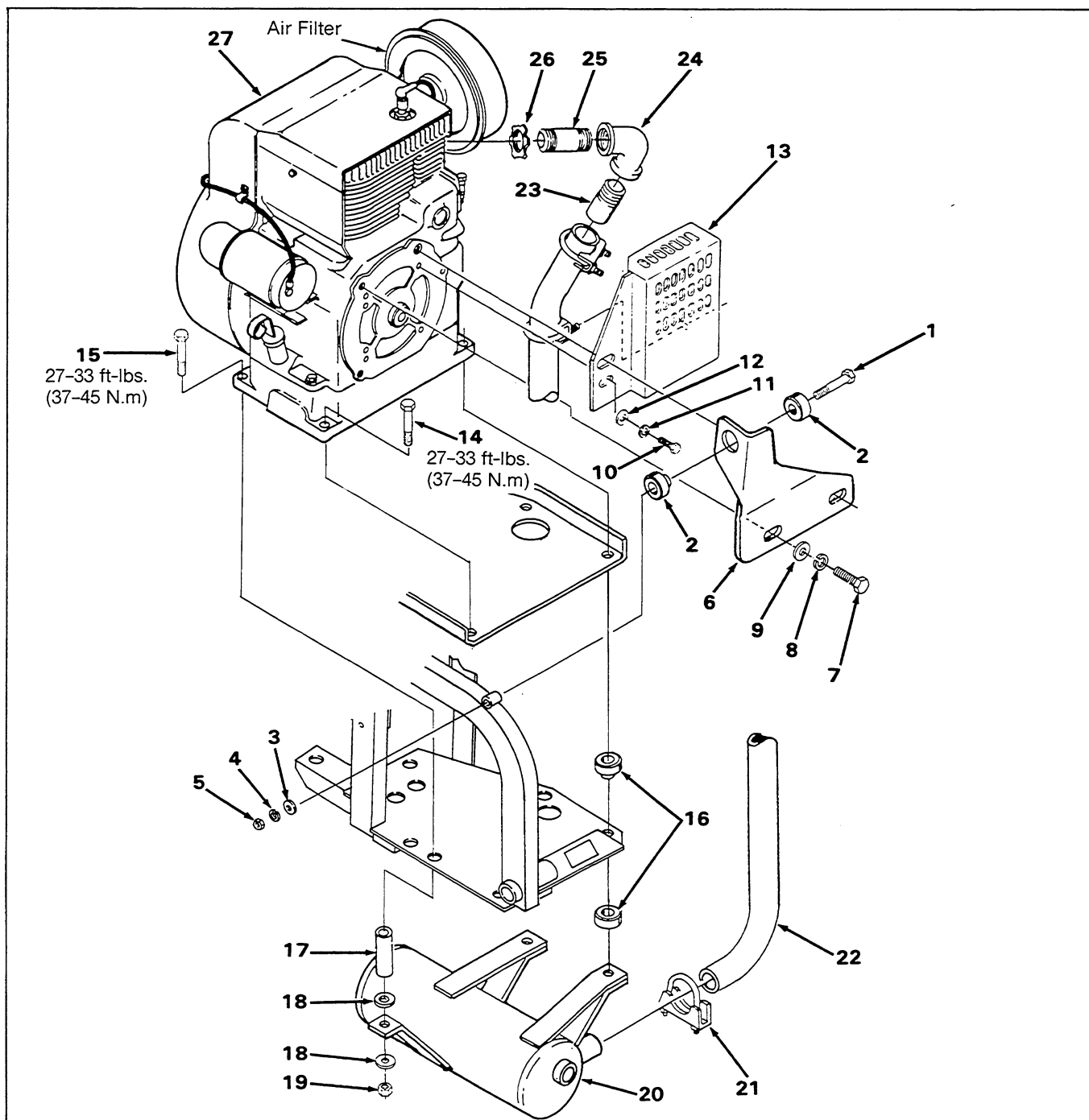


AIR CLEANER SERVICE

SECTION 3C. GASOLINE ENGINES

EXHAUST SYSTEM REMOVAL

1. Remove the bolt (1), shock absorber mounts (2), flat washer (3), lockwasher (4) and locknut which secures the tie down bracket (6) to the frame.
2. Remove the two bolts (7), lockwashers (8), flat washers (9) and tie down bracket (6).
3. Remove the screw (10), lockwasher (11), flat washer (12) and the exhaust pipe guard (13).
4. Remove the hex head bolts (14) and (15), shock absorbers (16), muffler mounting spacer (17), washers (18), locknuts (19) and muffler (20).
5. Remove the muffler clamps (21) and exhaust pipe (22).
6. Remove the pipe nipple (23), pipe elbow (24), pipe nipple (25) and electric conduit nut (26) from the engine (27).



GASOLINE ENGINE EXHAUST SYSTEM REMOVAL AND INSTALLATION

SECTION 3C. GASOLINE ENGINES

EXHAUST SYSTEM INSPECTION

1. Inspect exhaust system for cracks, breaks, distortion or deformation.
2. Clean all sections of the exhaust system of dirt, dust or other foreign material.

EXHAUST SYSTEM INSTALLATION

1. Install the electric conduit nut (26) on pipe nipple (25). Install the pipe elbow (24), pipe nipple (23) into the exhaust pipe (22) and secure with muffler mounting clamps (21).
2. Position the muffler (20) and install it through the holes in the frame to the engine (27) with the screws (14) and (15), shock absorbers (16), muffler mounting spacers (17), washers (18) and locknuts (19).
3. Attach the exhaust pipe (22) to the rear of the muffler (20) and secure with a muffler clamp (21).
4. Mount the exhaust pipe guard (13) with screw (10), lockwasher (11) and flat washer (12).
5. Install the tie down bracket (6) using the two bolts (7), lockwashers (8) and flat washers (9).
6. Secure the tie down bracket (6) to the frame with the bolt (1), shock absorber mounts (2), flat washer (3), lockwasher (4) and locknut (5).

ENGINE REMOVAL (See "Removal and Installation" Illustration)

1. Disconnect and tag electrical connections at the engine.
2. Shut off fuel supply at the fuel tank and disconnect the fuel line at the carburetor.
3. Remove the exhaust system as described above.

NOTE

The bolts used for mounting the muffler assembly also serve as mounting bolts for the engine to the engine base mounting and frame.

4. Remove bolts (1) and lockwashers (2) from coupling disc (3) and remove coupling disc.
5. Remove the engine (4) from the engine mounting base (5).

3C

CAUTION

Use a suitable lifting device to remove engine from the frame.

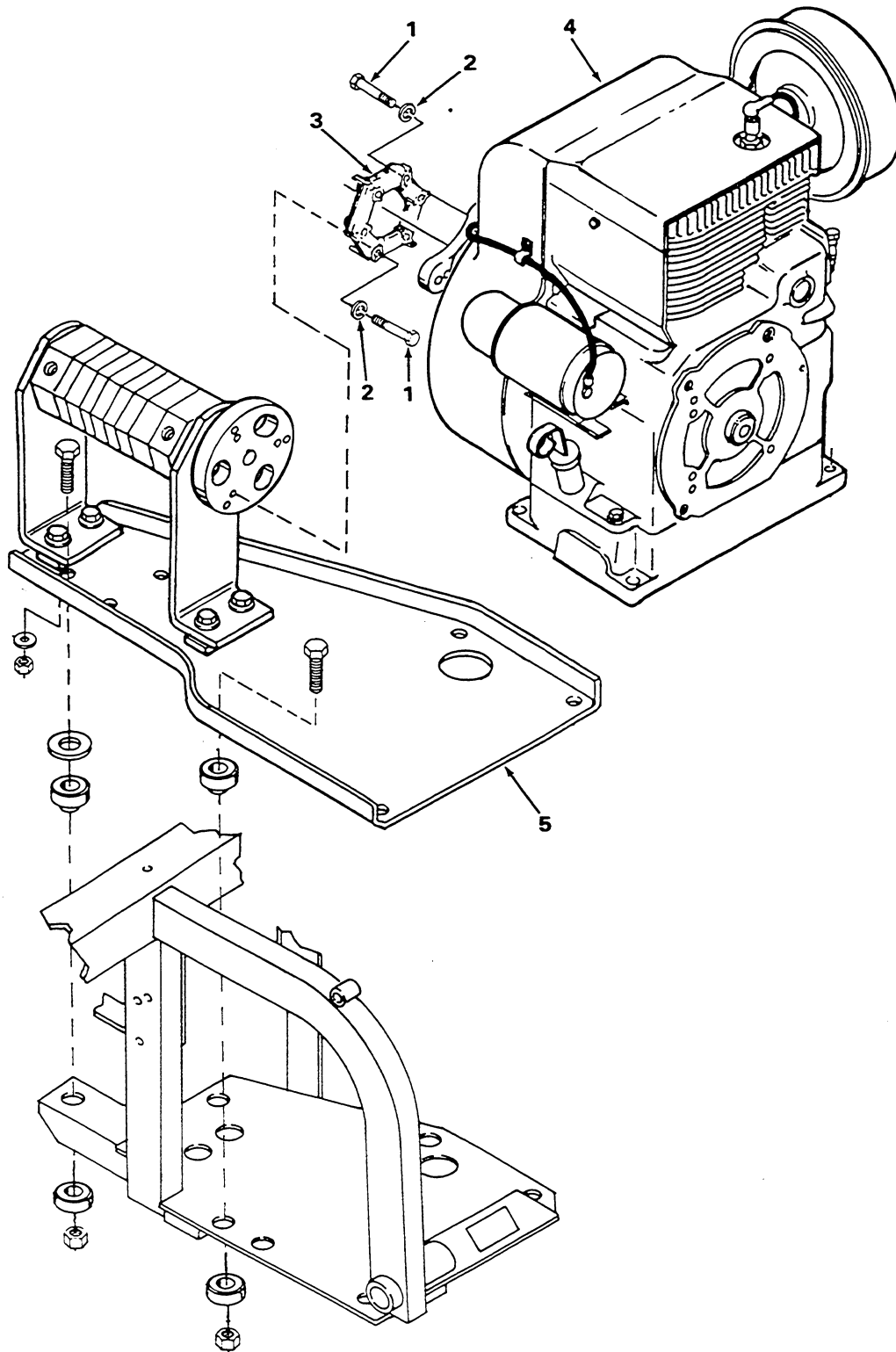
NOTE

Refer to the engine manufacturer's manual for complete service to the engine. Order engine manual from your Jacobsen distributor.

ENGINE INSTALLATION

1. Position the engine (4) on the engine mounting base (5), using a suitable chain hoist.
2. Position the coupling disc (3). Install the bolts (1) and lockwashers (2).
3. Install the Exhaust System. Refer to installation instructions on the Exhaust System in this section.
4. Connect fuel lines.
5. Connect electrical to appropriate plugs, terminals, and sensors at the engine. If your machine has a performance monitor option, adjust as described in Section 13L.

SECTION 3C. GASOLINE ENGINES



GASOLINE ENGINE REMOVAL AND INSTALLATION

SECTION 3D. DIESEL ENGINES

AIR CLEANER SERVICE (See "Removal and Installation Illustration")

1. Loosen the retaining clamp (1) and slide the cover (2) off of the air cleaner assembly. Remove the baffle (3) and empty dust from the cover. Wipe clean with a clean damp cloth.
2. Remove the wing nut and gasket (4), and slide the element (5) out of assembly.
3. Install the element (5). Install the wing nut and gasket (4).
4. Install the baffle (3) in cover (2) and install cover (2) with retaining clamp (1).

AIR CLEANER REMOVAL

1. Loosen the clamp (6) which holds hose (7) to the air cleaner. Disconnect the hose.

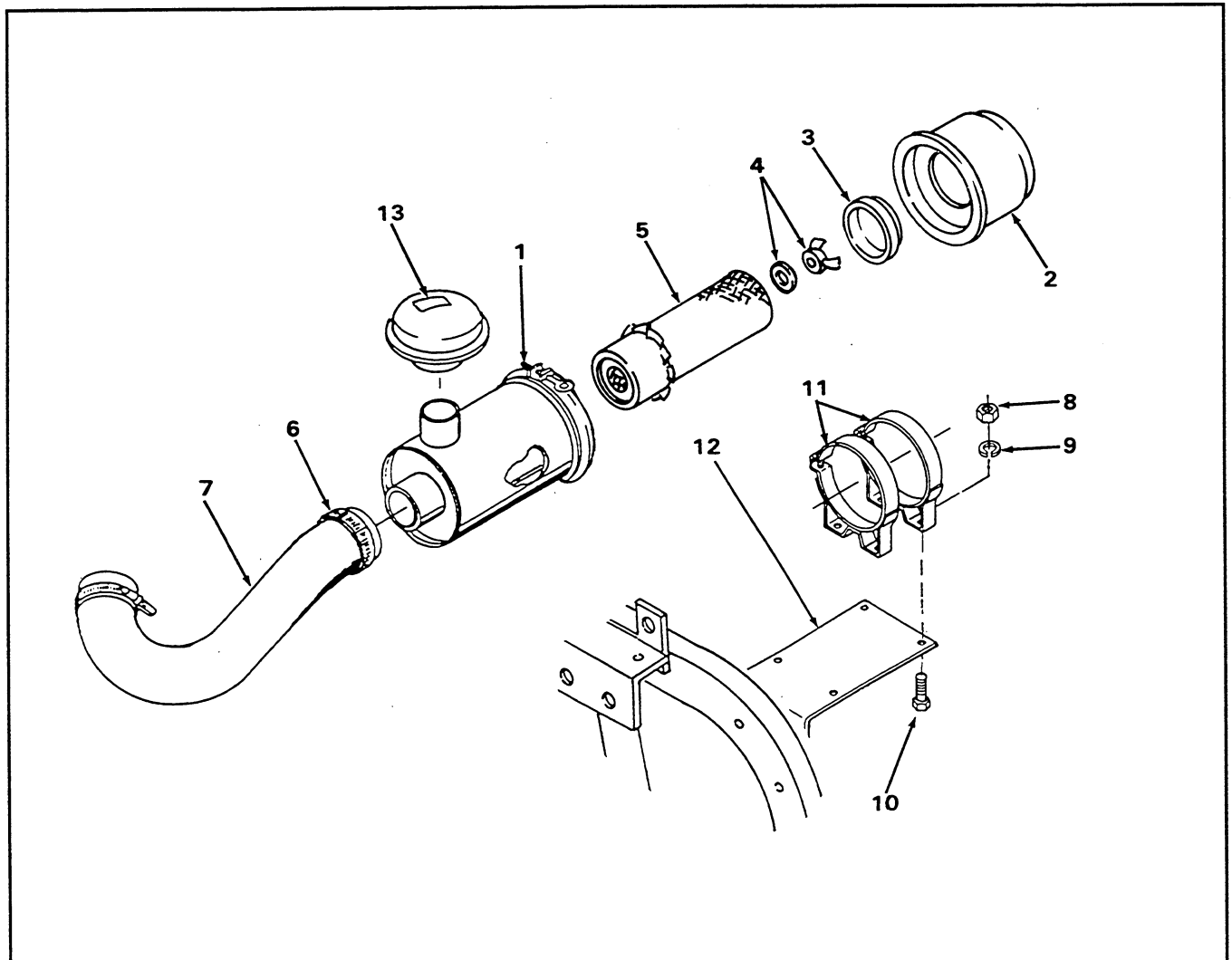
2. Remove the nut (8), lockwasher (9) and capscrew (10) and remove the two clamps (11) which attach the air cleaner to bracket (12).

AIR CLEANER INSPECTION

1. Inspect the hose (7) for cracks and wear, replace if damaged.
2. Inspect the baffle (3), element (5), and air inlet cover (13) for cleanliness.

AIR CLEANER INSTALLATION

1. Install the element (5), and baffle (3) as described above.
2. Install the air inlet cover (13) on the unit.
3. Install the air cleaner unit in the two clamps (11) and secure the clamps (11) to the bracket (12) with capscrews (10), lockwashers (9) and nuts (8).



AIR CLEANER REMOVAL AND INSTALLATION

SECTION 3D. DIESEL ENGINES

4. Secure the air cleaner hose (7) with clamps (6).
5. Check that all connections are tight.



WARNING

DO NOT USE STARTING ASSIST FLUIDS. Use of starting assist fluids in the air intake system may be potentially explosive or cause a "RUN-AWAY" engine condition. This could result in serious engine damage and/or personal injury.

RADIATOR SERVICING (See "Removal and Installation" Illustration)

Changing Coolant

1. Open drain cock (1) and radiator cap (2) to drain the coolant.
2. Flush the inside of the radiator (3) with clean water.

NOTE

When temperatures fall below 32° F (0° C), always mix anti-freeze with the cooling water. Mixture ratios differ with the anti-freeze manufacturer and temperature, follow the instructions of each manufacturer.



CAUTION

Never open radiator cap (2) while engine is running or soon after it stops. Hot water sometimes shoots out if the radiator cap is opened while the engine is hot.

Cleaning Radiator Core

When dust enters between fins and tubes, wash out with tap water under pressure.

NOTE

Never use a screwdriver or other pointed tool for cleaning. It may damage the special tubes or cause the radiator to lose its function.

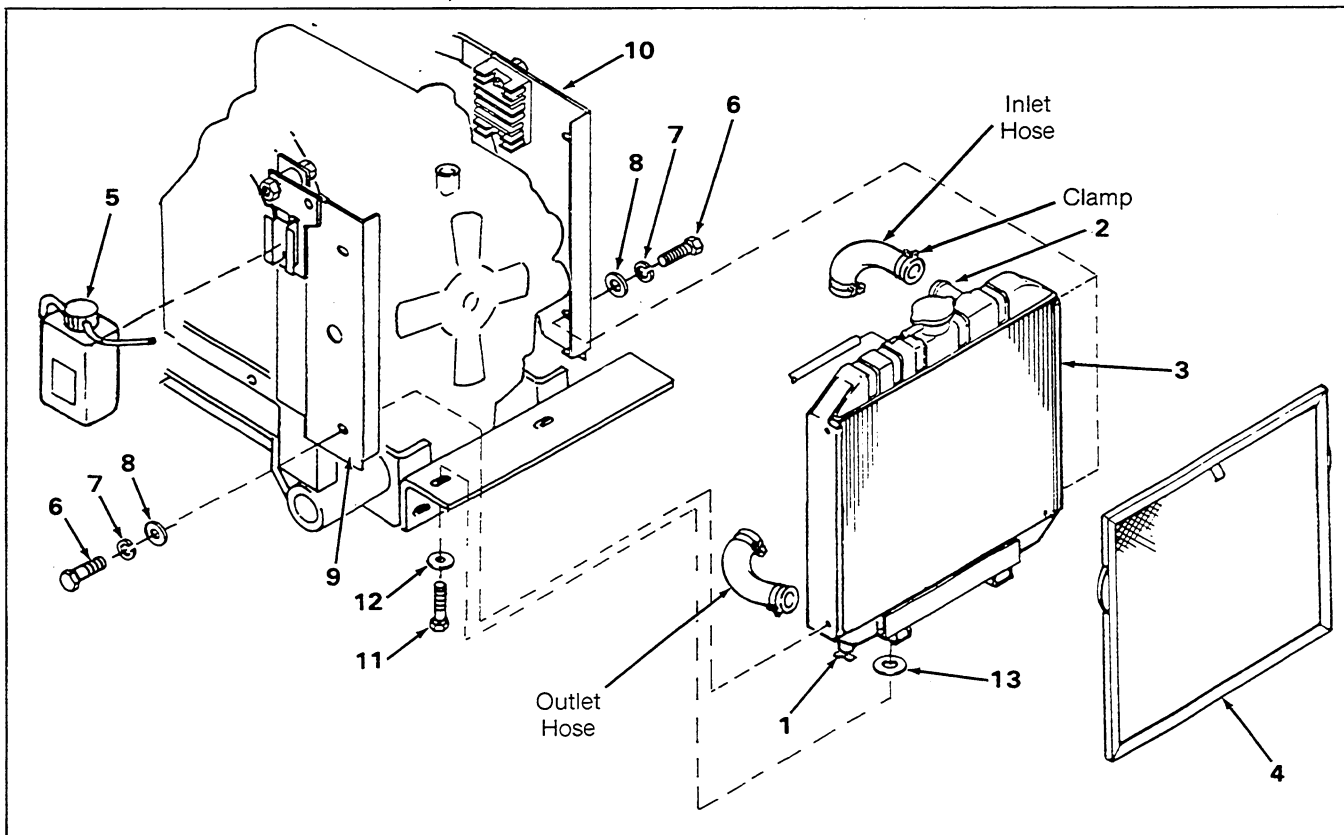
Radiator Screen

1. Remove the screen (4) by sliding up and out of slots in front of radiator.
2. Clean in warm soapy water, rinse and air dry.

RADIATOR REMOVAL

NOTE

Open drain cock and radiator cap to drain the coolant. Disconnect the inlet and outlet hoses by loosening hose clamps.



RADIATOR REMOVAL AND INSTALLATION

SECTION 3D. DIESEL ENGINES

1. Remove overflow coolant container with tube and clamps (5) from the side of radiator (3).
2. Remove screws (6), lockwashers (7) and flat washer (8) from brackets (9 and 10).
3. Remove screws (11), washers (12), and grommets (13) holding radiator (3) to frame.
4. Remove the radiator (3) from frame.

RADIATOR INSTALLATION

1. Place the radiator (3) on frame and secure with screws (11), flat washer (12) and grommet (13).
2. Install brackets (9 and 10) to radiator (3) using screws (6), lockwashers (7) and flat washers (8).
3. Install overflow coolant container (5) with tubes and clamps and connect the inlet and outlet hoses; tighten hose clamps.
4. Fill the radiator with clean distilled water.

NOTE

Always mix anti-freeze with the cooling water. Mixture ratios differ with the anti-freeze manufacturer and temperature. Follow the instructions of each manufacturer. However, do not exceed a 50/50 mixture of antifreeze to water.

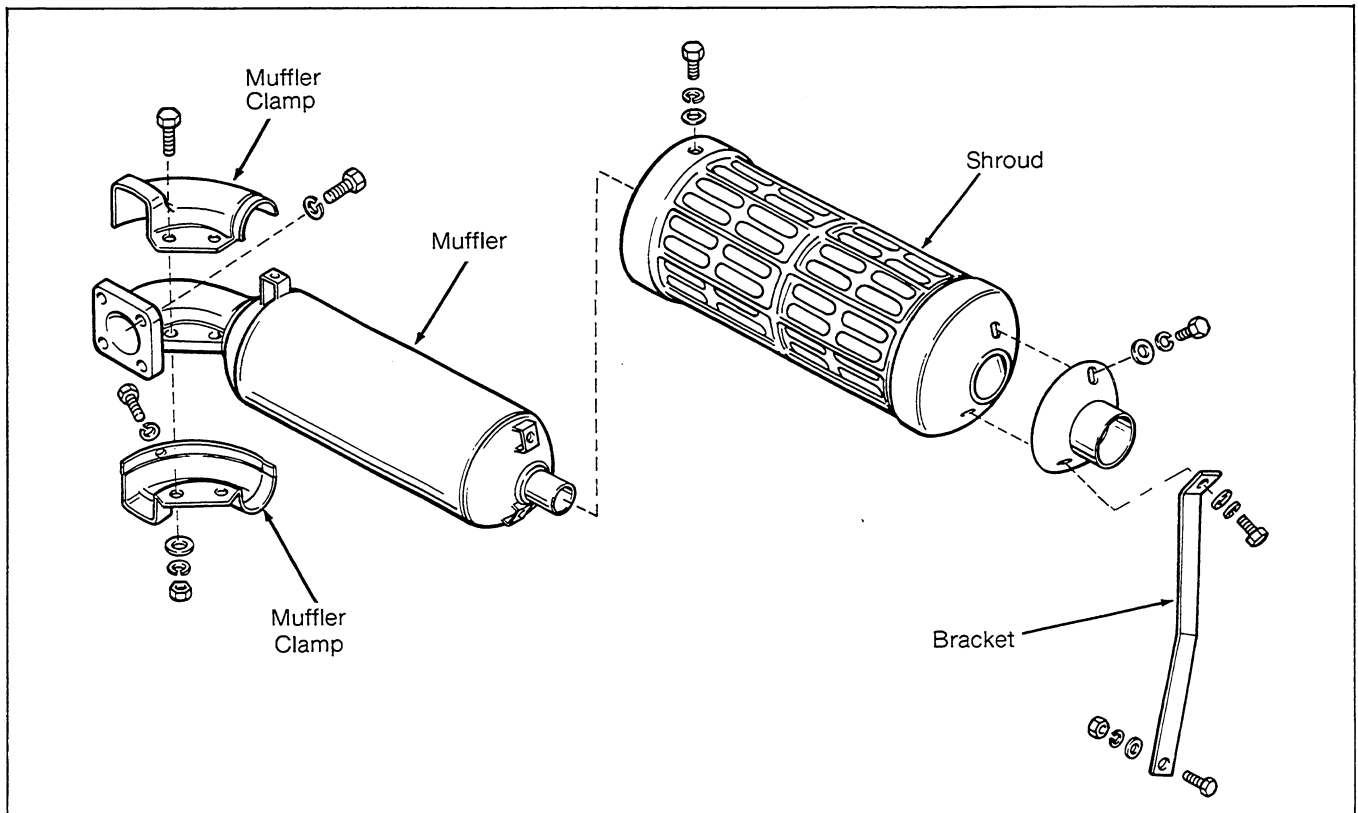
CAUTION

Never open radiator cap while engine is running or soon after it stops. Hot water sometimes shoots out if the radiator cap is opened while the engine is hot.

3D

MUFFLER REMOVAL AND INSTALLATION

Remove and install the muffler on the engine as shown in the following illustration.



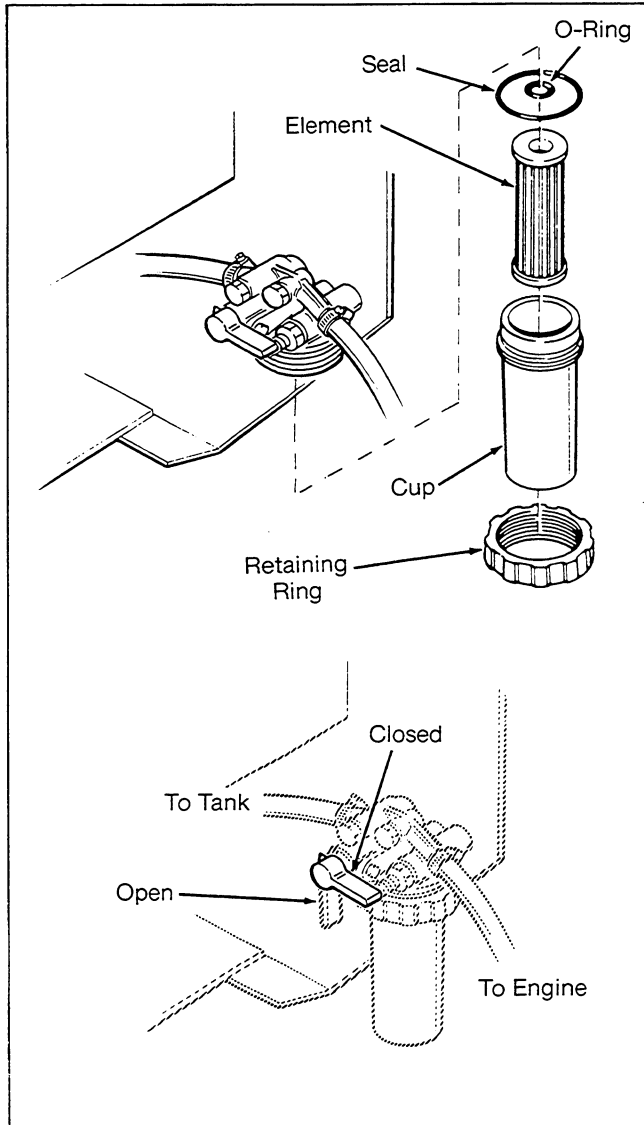
MUFFLER REMOVAL AND INSTALLATION

SECTION 3D. DIESEL ENGINES

FUEL FILTER SERVICE (See "Fuel Filter Service" Illustration)

The fuel filter is mounted on the left rear tractor frame below the fuel tank. Moisture and other foreign matter accumulate in the fuel filter. Periodically clean and replace the filter element.

1. Close the fuel filter cock (see illustration).



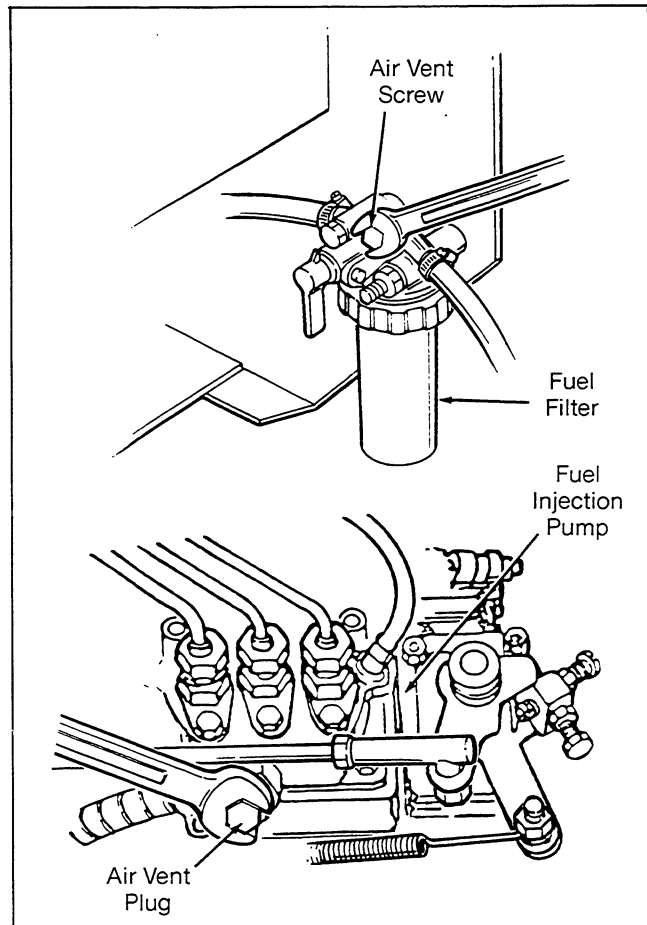
FUEL FILTER SERVICE

2. Loosen the retaining ring on the filter cup and clean the filter cup and element in light fuel oil.
3. Reassemble the cup, element, seal, and retaining ring, being careful to keep dust and dirt out of the filter components.
4. Vent air from the fuel system and open the fuel filter cock.

PURGING AIR FROM THE FUEL SYSTEM (See "Purging the Fuel System" Illustration)

Whenever the fuel filter or fuel piping are removed, the fuel tank becomes completely empty, or the engine has not been used for an extended time, vent the system as follows:

1. Fill the fuel tank with fuel, and open the fuel cock.
2. Loosen the air vent screw at the top of the filter by turning it twice. Use a suitable container to catch fuel which will flow from screw hole.



PURGING THE FUEL SYSTEM

3. When bubbles disappear from fuel coming out of the air vent screw hole, turn the screw back on.
4. Open the air vent plug on the fuel injection pump.
5. Pull the engine stop lever back completely to stop the engine, and run the starter for about 10 seconds.
6. Close the air vent plug when air bubbles disappear from the fuel flowing out.

NOTE

Do not perform venting when the engine is hot.

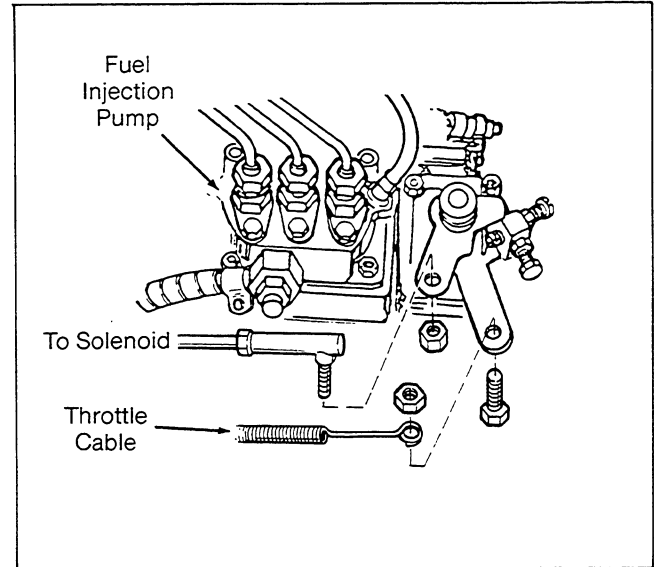
SECTION 3D. DIESEL ENGINES

ENGINE REMOVAL

1. Disconnect and tag all electrical connections at the engine.
2. Shut off fuel at the filter by moving the fuel filter cock to the closed position (see "Fuel Filter Service" illustration).
3. Remove fuel tank and fuel tank bracket (see page 9A-1).
4. Disconnect the fuel shut-off solenoid and throttle cable at the fuel injection pump (see illustration at right).
5. Remove the muffler, radiator, and air cleaner as described in preceding paragraphs (pages 3D-1 thru 3D-3).

NOTE

When removing the engine, it is advisable to remove all components (fuel tank, fuel tank bracket, radiator brackets and supports, engine mount bolts, etc.) and lift the engine out of the machine with a hoist attached to the eye bolts.



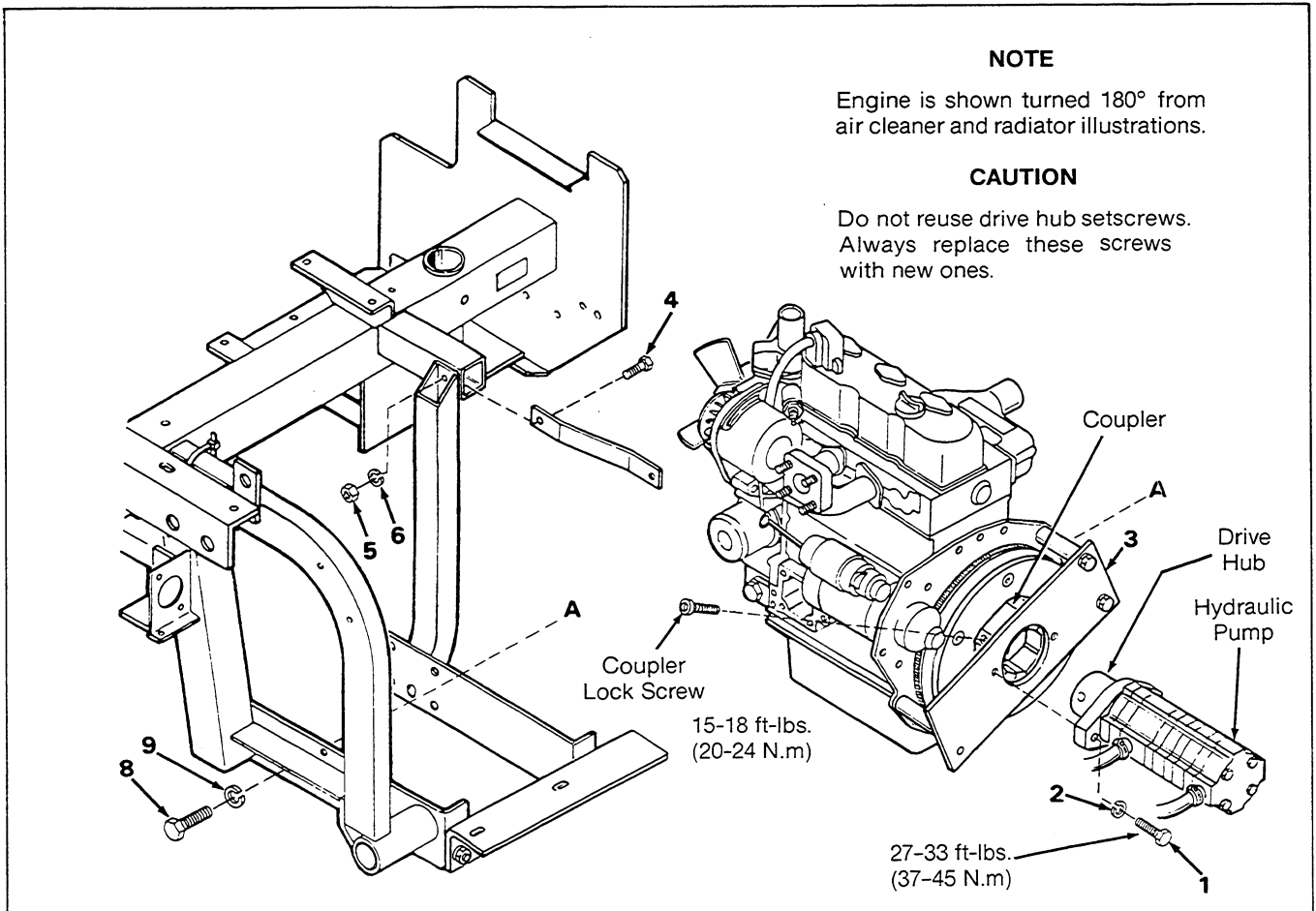
FUEL SHUT-OFF SOLENOID AND THROTTLE CABLE CONNECTIONS

NOTE

Engine is shown turned 180° from air cleaner and radiator illustrations.

CAUTION

Do not reuse drive hub setscrews. Always replace these screws with new ones.



DIESEL ENGINE REMOVAL AND INSTALLATION

SECTION 3D. DIESEL ENGINES

6. Remove the drive hub locking setscrews.
7. Remove the bolts (1) and lockwashers (2) that mount the hydraulic pump to the pump mounting plate (3).
8. Carefully pull the assembled hydraulic pump and drive hub free of the pump mounting plate (3). Support the pump to relieve strain on the hydraulic hoses which are attached to the pump.
9. Attach a chain hoist to the engine (the engine weighs close to 200 lbs.).
10. Turn the steering wheel to its extreme clockwise position to provide maximum clearance between the engine and rear (steering) tire.
11. Remove the bolt (4), nut (5), and lockwasher (6) and remove the radiator brace (7).
12. Remove any other brackets or braces that have not been previously removed when the muffler, air cleaner, and radiator were removed.
13. Remove all bolts (8) and lockwashers (9) that hold the engine to the machine frame.
14. Carefully lift the engine out of the machine.

ENGINE INSTALLATION

1. Move the engine into its approximate mounting position using a chain hoist.
2. Align and loosely attach all bolts (8) and lock-

washers (9) that secure the engine to the frame. Tighten mounting bolts (8) after all have been installed.

3. Attach all brackets and braces which have previously been removed including radiator brace (7).
4. Pack the hydraulic pump drive hub with recommended grease (see "Recommended Lubricants," Section 11). Install the assembled drive hub and hydraulic pump in the mounting plate (3). Secure with bolts (1) and washers (2).
5. Install the coupler locking setscrew and tighten securely.
6. Install the air cleaner, radiator, and muffler as described in preceeding paragraphs of this section.
7. Connect and adjust the fuel shut-off solenoid and throttle control (see Section 2 of this manual).
8. Connect all electrical connections to the engine (see Section 10 for location and testing).

NOTE

If the machine is equipped with a performance monitor option, install and adjust the pick-up as described in Section 13L.

9. Install fuel tank and bracket (see Section 9B).
10. Open the fuel filter by moving the cock to the open position (see "Fuel Filter Service" illustration in this section).

SECTION 4 DRIVE TRAIN

There is no mechanical drive train on the Greens King IV and TF-60. Traction is provided by hydraulic motors at the front (drive) wheels. See Section 8 of this manual for repair and service of the Traction Motors.

SECTION 5 BRAKES

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Repair	5B-1

SECTION 5A. REPAIR AND SERVICE TOOLS AND MATERIALS

- Tools required:** Standard automotive hand tools.
- Cleaning materials:** Stoddard solvent or equivalent.
- Lubricants:** Non-metallic additive wheel bearing grease (eg. Sun-ray DX692 or Enco Fibrox 280).
- Other service items:** Brake linings.

5A

SECTION 5B. ADJUSTMENT AND REPAIR

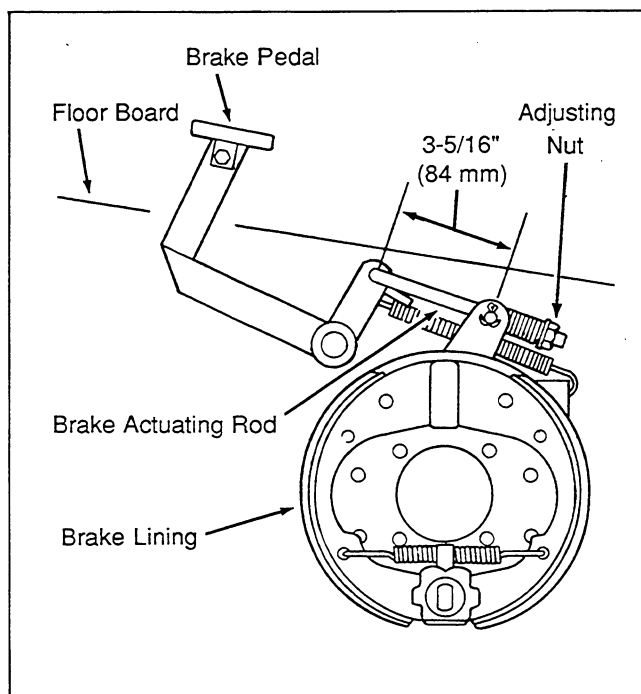
GENERAL

Automotive type service brakes are mounted to the front (drive) wheels and are operated through mechanical linkage to the brake pedal. The parking brake linkage locks the service brakes in the engaged position. See Section 2 of this manual for linkage adjustments.

BRAKE ADJUSTMENT (See "Brake Adjustment" Illustration)

Check brake pedal travel. If the pedal is close to floor when brakes are fully applied, adjust by turning adjusting nuts on brake rods an equal number of turns on each side. Move the machine to an open area to check brake adjustment. Drive the machine straight ahead with shift lever in mow position and throttle in a slow position. Apply light brake pedal pressure and check for machine pulling to right or left. If machine pulls right, turn adjusting nut on left side clockwise until machine stops straight without any pulling. Reverse adjustment for pulling to the left. Check the parking brake to be sure that it is working properly at all times.

1. Adjust the nut on the brake actuating rod (both wheels) to obtain correct pedal movement. Distance between rod pivot points should be 3-5/16" (84 mm), when brakes are new.

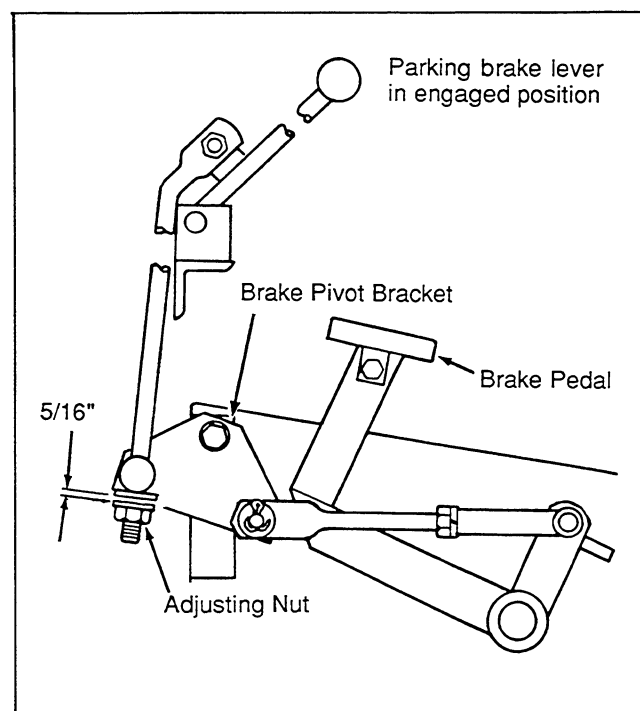


BRAKE ADJUSTMENT

2. When the nut has been tightened to near the end of the thread area on brake actuating rod, it is advisable to pull a wheel and check the amount of brake lining left. If the lining shows considerable wear, it should be replaced.

PARKING BRAKE ADJUSTMENT (See "Parking Brake Adjustment" Illustration)

Place parking brake lever in "Off" position and measure the distance between nut and bottom of pivot. It should be 5/16".



PARKING BRAKE ADJUSTMENT

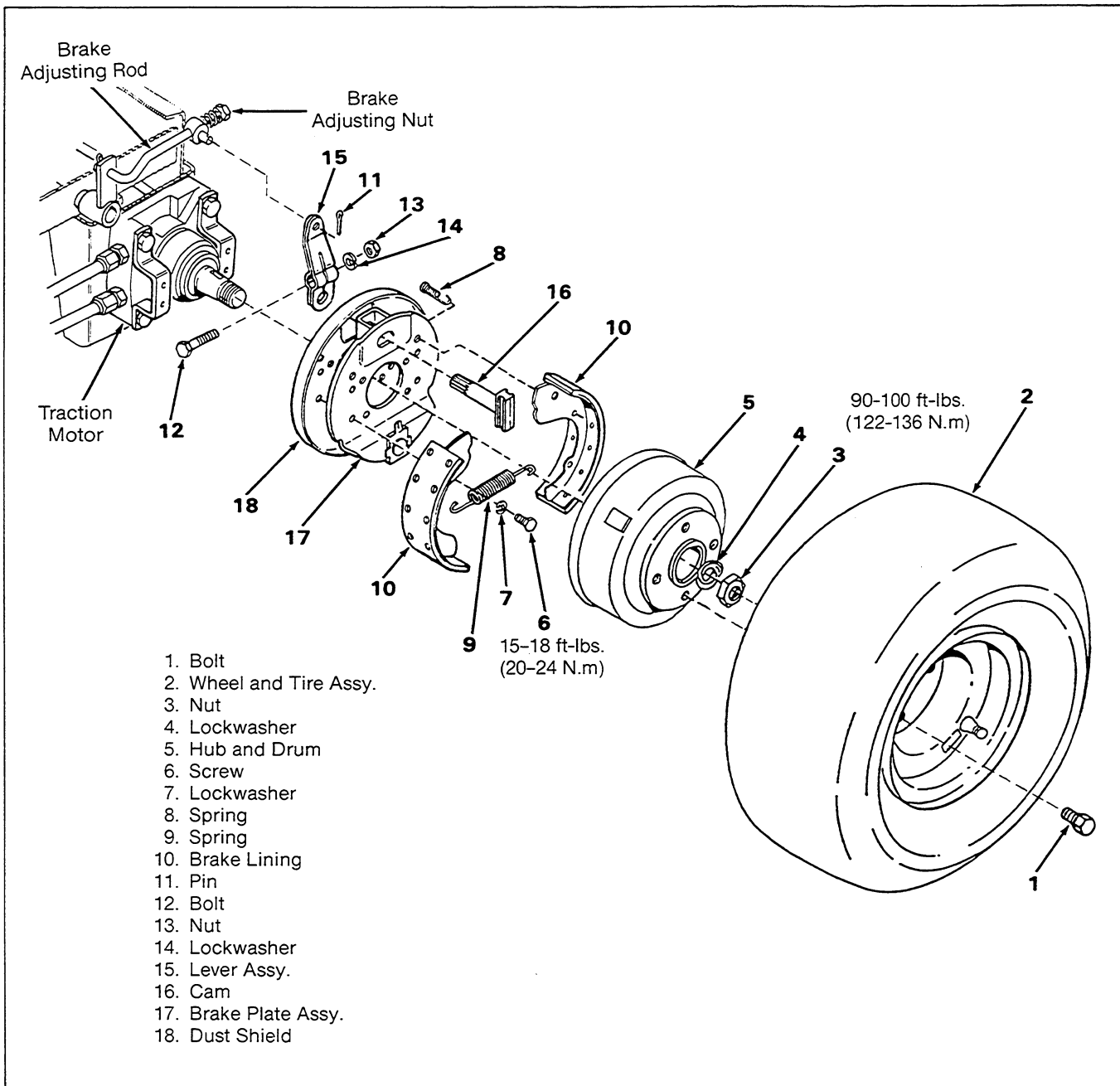
REPAIR (See "Brake Repair" Illustration)

Whenever the wheels are pulled or when the brake adjusting nuts have been tightened to near the end of the threaded area on the brake actuating rod, check the amount of brake lining left. Inspect brake linings (10), springs (8 and 9), actuating lever (15), and cam (16). Replace worn brake linings and other parts which show signs of wear as shown in the "Brake Repair" illustration. After replacing brake components, adjust brakes as described in the preceding "Brake Adjustment" paragraph.

CAUTION

Do not use any type of anti-seez or lubricant on taper of brake drum.

SECTION 5B. ADJUSTMENT AND REPAIR



BRAKE REPAIR

SECTION 6 STEERING

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6A

SECTION 6B. FAILURE ANALYSIS**POWER STEERING**

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

6B

SECTION 6C. MANUAL STEERING

GENERAL

The steering wheel is connected by a cable to a steering pulley on the rear wheel. Four guide pulleys are mounted on the frame. The cable and pulleys should be checked for wear and kept clean of excess grease, grass, and foreign matter.

STEERING WHEEL ADJUSTMENT (See Figure 6C-1 Steering Wheel Adjustment)

When the steering wheel is square with the tractor, the rear wheel is set for straight ahead operation. If the steering wheel gets out of square, proceed as follows:

1. Loosen the cable mounting nut "A" or "B" as necessary and tighten opposite nut until the steering wheel is square and the tractor runs straight ahead.
2. After the steering wheel is adjusted, adjust both cable mounting nuts until there is 1/2 to 5/8" (13 to 16 mm) deflection in center of cables with a 10 pound pull.

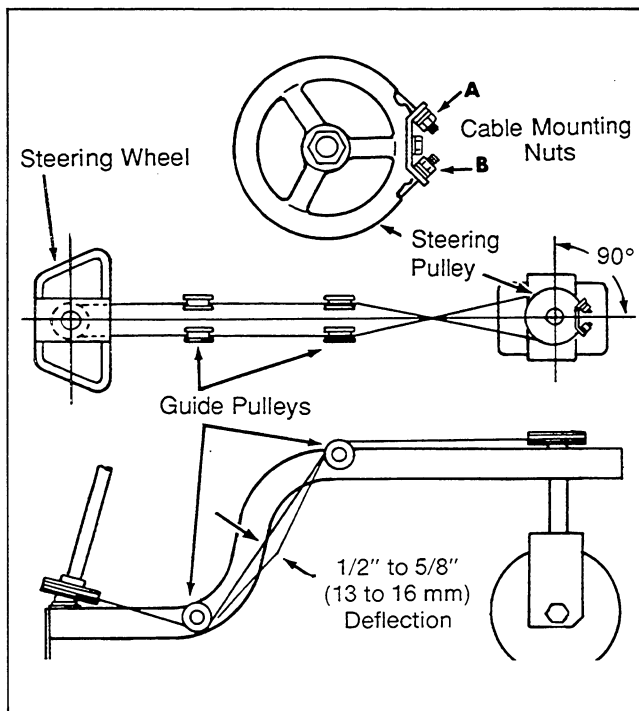


Figure 6C-1. Steering Wheel Adjustment

TURNING RADIUS (See Figure 6C-2 Turning Radius Adjustment)

The factory setting for the turning radius is 65 to 71 in. (1651 to 1803 mm). The turning radius can be checked by the following method:

1. Choose a flat, level area, with the reels raised and at a low speed turn the steering wheel as far as possible in either direction and stop the tractor.
2. Drive a stake into the ground even with edge of the inner traction tire and in line with the axle shaft.
3. Continue the turn until the tractor has traveled 180 degrees and is directly opposite the stake. Stop the tractor.
4. Measure the distance from the edge of the inner traction tire to the outside edge of the stake. This dimension should be 15 to 21 in. (381 to 533 mm) if the turning radius is 65 to 71 in. (1651 to 1803 mm).
5. Repeat the above in the opposite direction.

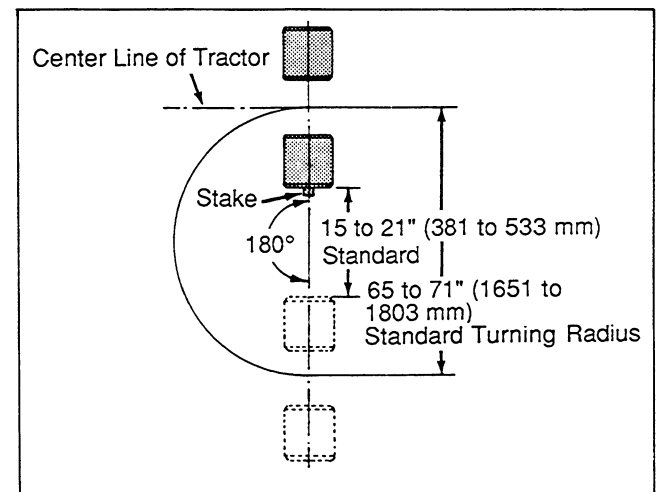
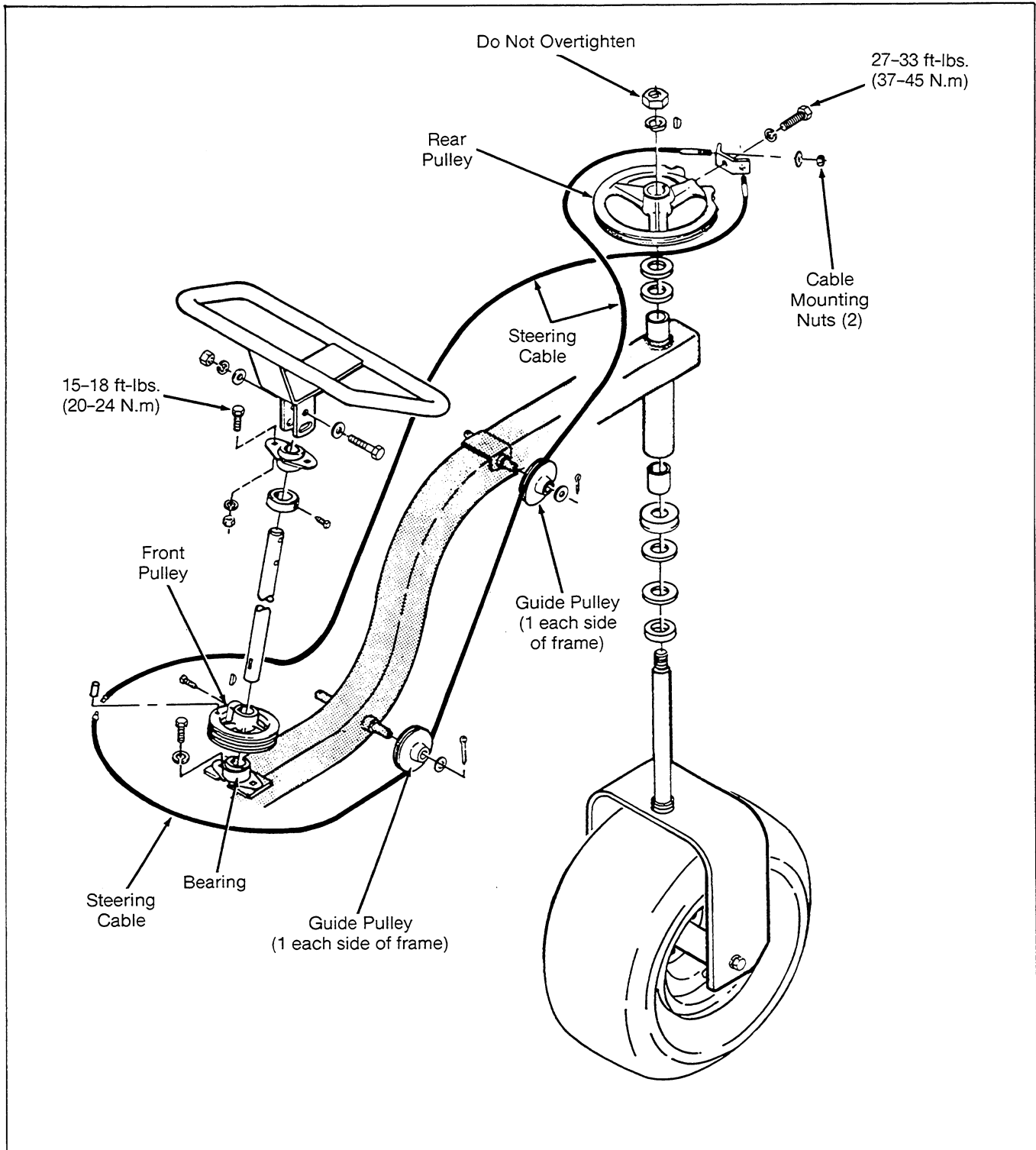


Figure 6C-2. Turning Radius Adjustment

REPAIR (See Figure 6C-3 Steering System Repair)

Remove and replace worn pulleys, bearings, and cable as shown in the repair illustration. If the steering cable is replaced, the steering wheel and turning radius adjustments in the preceding paragraphs must be done before returning the machine to service.

SECTION 6C. MANUAL STEERING**Figure 6C-3. Steering System Repair**

SECTION 6D. POWER STEERING UNIT**GENERAL**

Oil is supplied to the power steering unit from pump section #5. Power steering is provided as long as the engine is running. If an engine failure occurs, the steering unit provides manual steering.

REMOVAL (See Figure 6D-1)

1. Remove steering wheel cap (1), nut (2) and steering wheel (3).
2. Remove steering tower covers (5).
3. Label and remove hydraulic lines from steering unit (4).
4. Remove steering unit attaching hardware and steering unit (6).

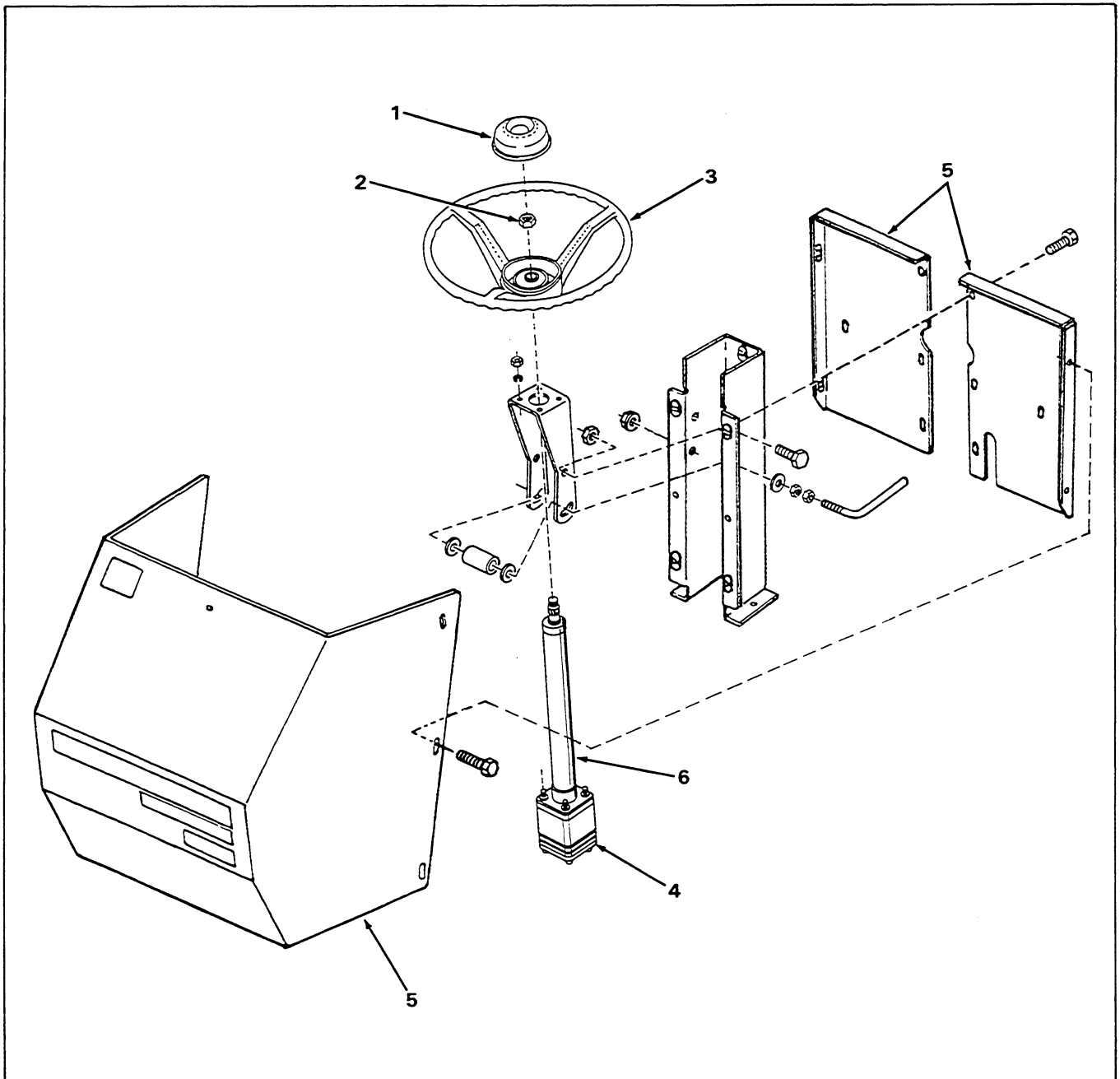


Figure 6D-1. Steering Unit Removal and Installation

SECTION 6D. POWER STEERING UNIT

DISASSEMBLY (See Figure 6D-2)

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

NOTE

DO NOT LOSE ALIGNMENT PINS (12).

6. Remove drive link (14) and metering ring (15).

7. Remove metering package (17) and commutator seal (16). The metering package (17) is serviced as an assembly kit. Refer to your parts manual (proceed with step 11).

Disassembly of metering package should be for inspection ONLY. To disassemble metering package, proceed with step 8.

(See Figure 6D-3)

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

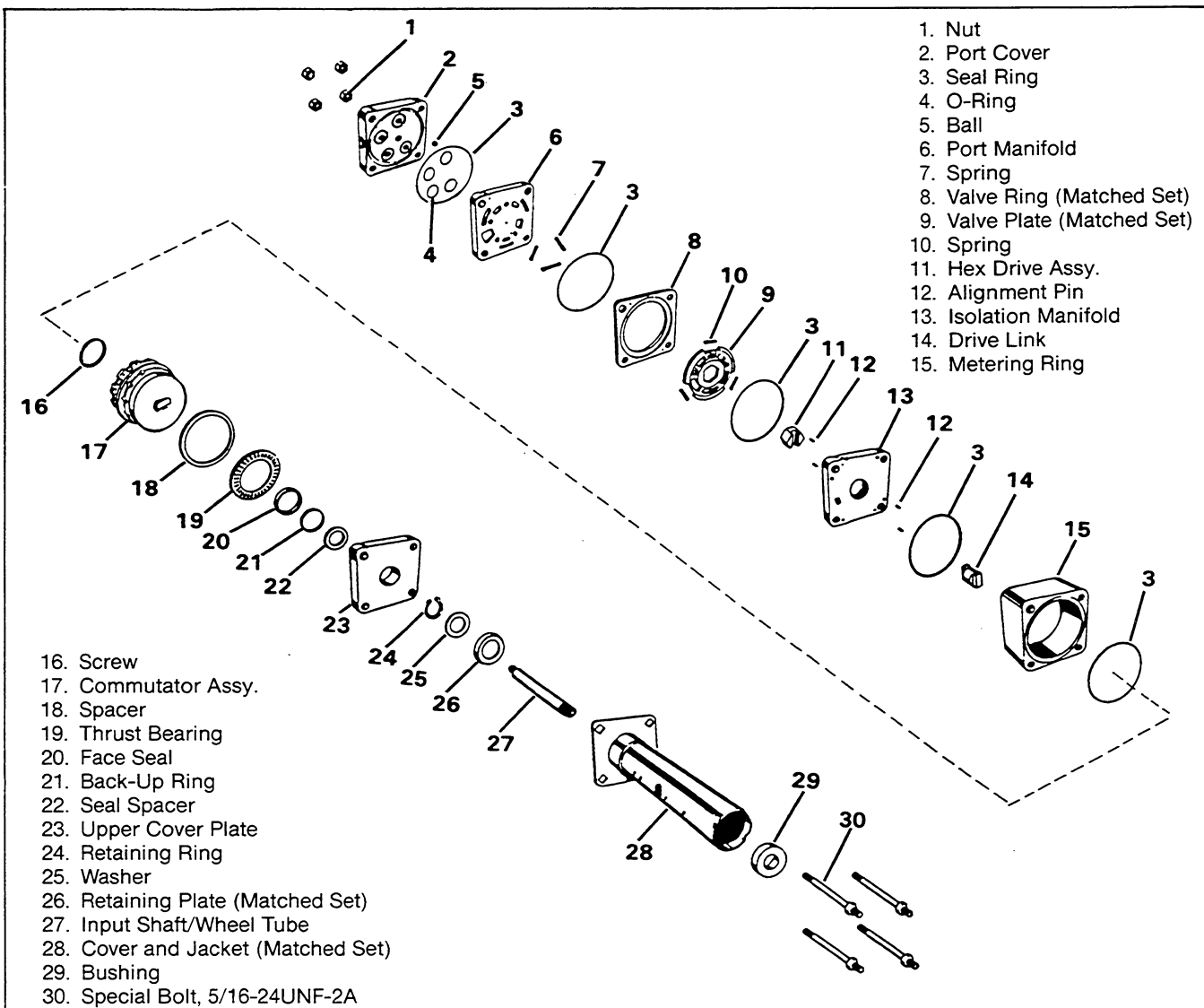


Figure 6D-2. Steering Unit Disassembly

SECTION 6D. POWER STEERING UNIT

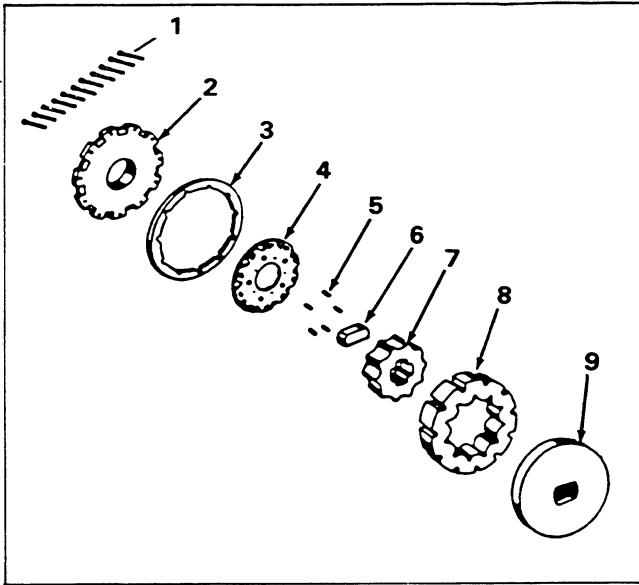


Figure 6D-3. Metering Package Disassembly

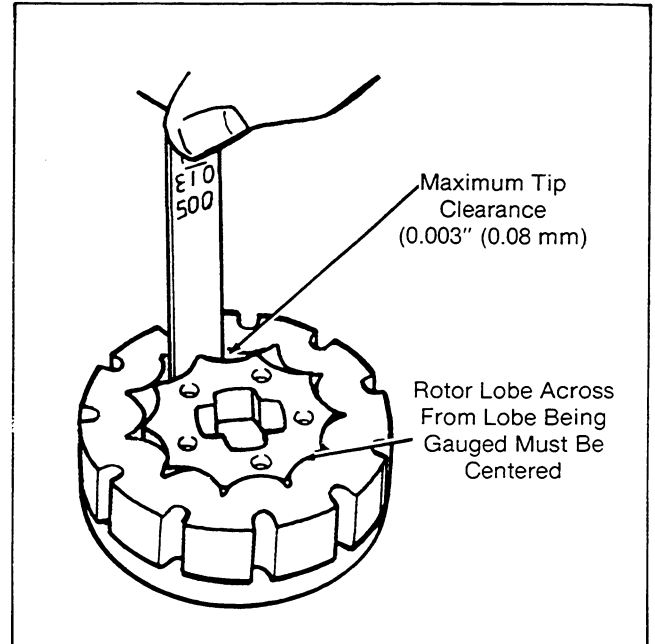


Figure 6D-4. Rotor and Stator Inspection

(See Figure 6D-2).

11. Remove face seal (20), back up ring (21) and seal spacer (22).
12. Remove thrust bearing (19) and spacer (18).
13. Remove upper cover plate (23).
14. Pull steering shaft (27) up out of tube (28).
15. Remove washer (25) and retainer plate (26).
16. Remove bushing (29).

INSPECTION

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

NOTE

Always replace springs as a set.

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

NOTE

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

- Inspect hex drive (11) for wear.
- Inspect isolation manifold (13). A normal polished pattern due to valve plate rotation will occur. Also, look for nicks, scratches or scoring.
- Inspect drive link (14).

- Inspect thrust bearing (19) for brinelling, spalling, or missing rollers.
- Discard all seals and seal rings.

(See Figure 6D-3)

- Inspect commutator cover (2), drive plate (9). A normal polished pattern will occur.
- Inspect the rotor (7) and stator (8) fit.

ASSEMBLY (See Figure 6D-5)

1. Install a new bushing (29) in tube (28). Crimp the tube end in two places 90° apart.
2. Place tube (28) and spiral bolts (30) in the service fixture.
3. Place retainer plate (26) in tube (28) with flat side down. Install washer (25) into retainer plate (26).
4. Install a new snap ring (24) to shaft (27) and install into tube (28).

⚠ CAUTION

In the following assembly steps, it is important to align components for proper operation of steering unit. The correct alignment is illustrated in Figure 6D-7.

SECTION 6D. POWER STEERING UNIT

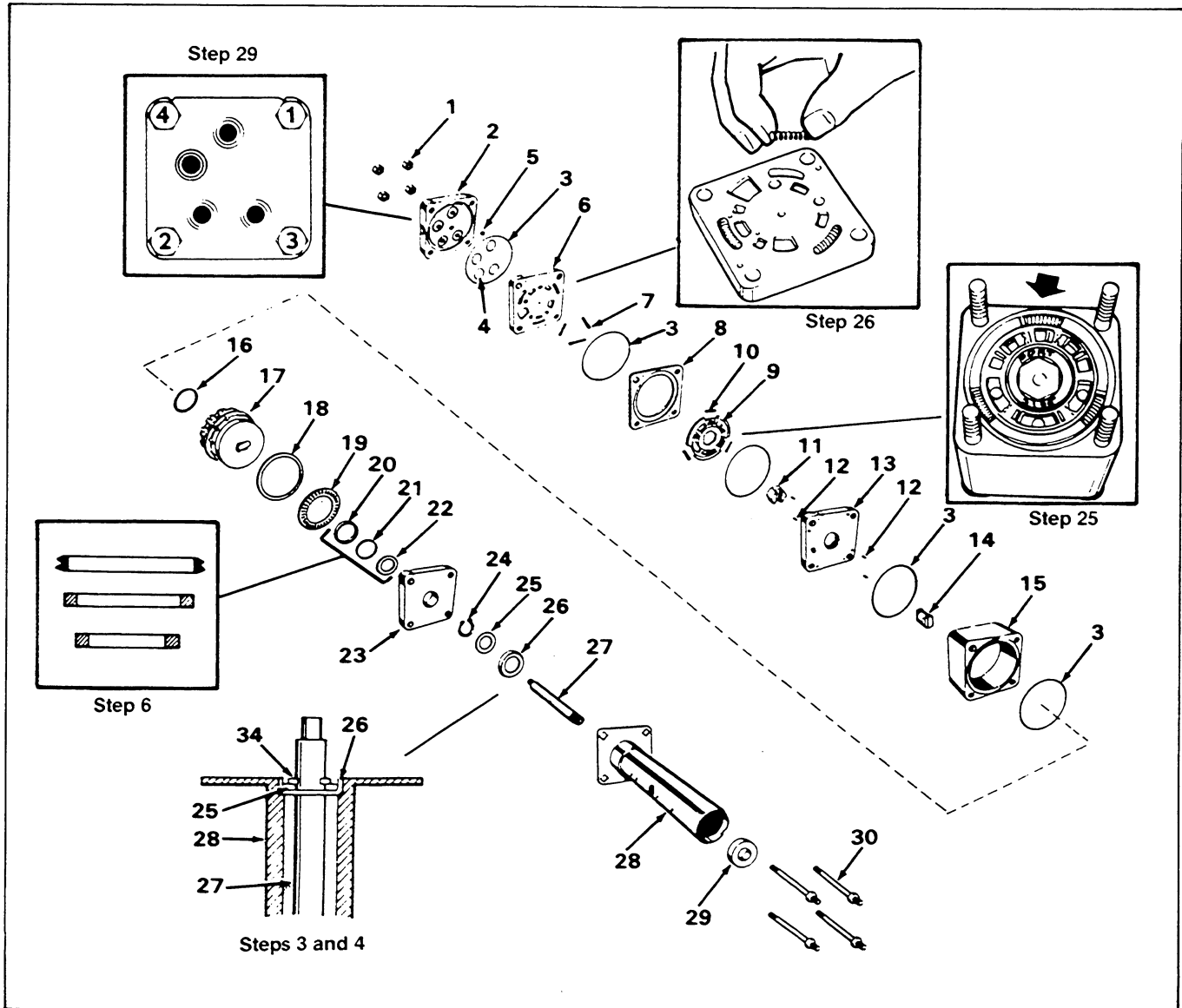


Figure 6D-5. Steering Unit Assembly

5. Install upper cover plate (23).
6. Assemble seal spacer (22), seal ring (21) and seal (20) as shown.
7. Grease upper cover plate (23) and install assembled seal.
If the metering package was disassembled, proceed with step 8.
If the metering package was not disassembled or a new one is being installed, proceed with step 19.

(See Figure 6D-6)

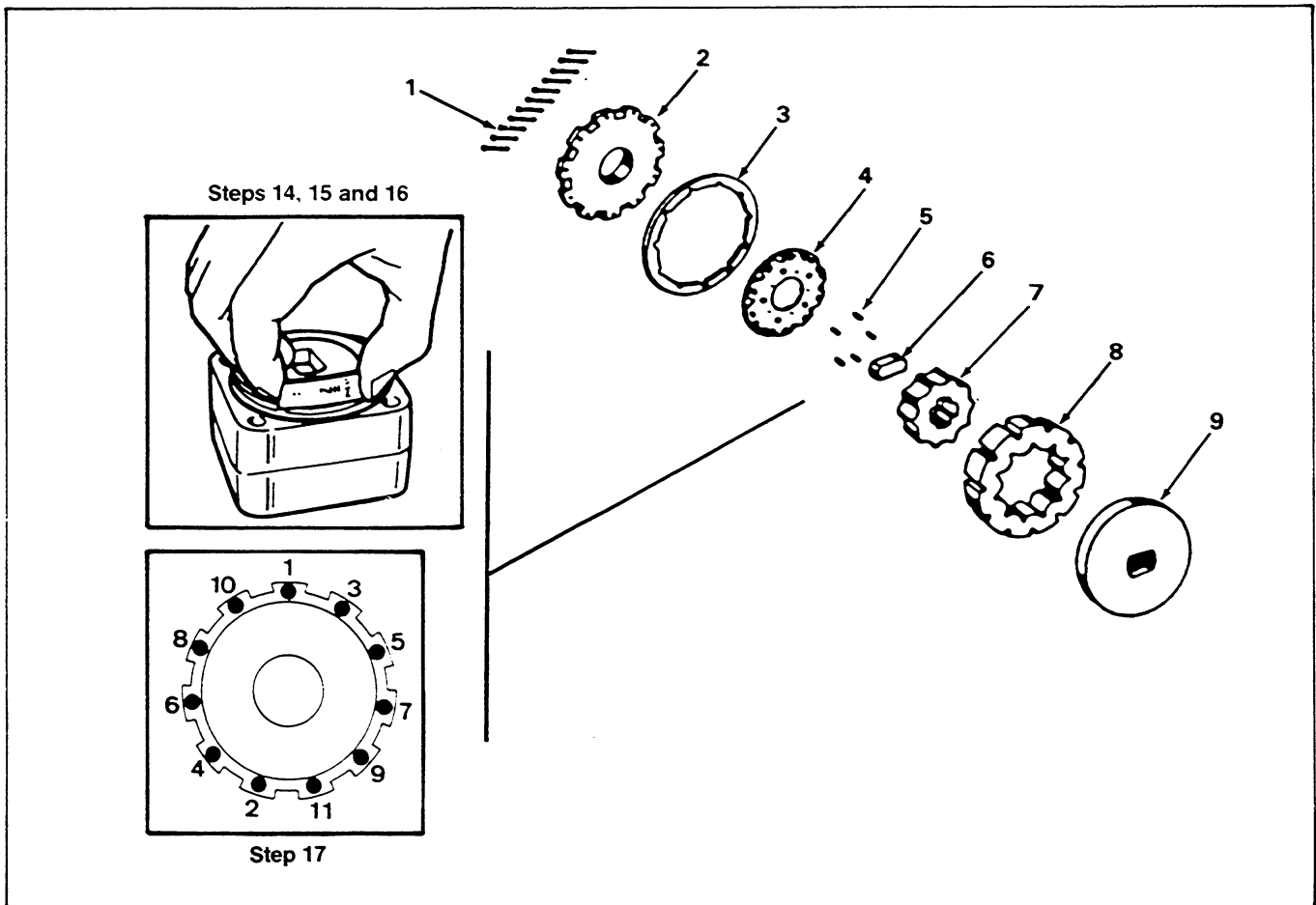
8. Place drive plate (9) on a flat lint free surface.
9. Place stator (8) on drive plate (9) and insert rotor (7) into stator.

10. Apply a small amount of grease to drive link spacer (6) and install in rotor (7).
11. Place commutator (4) on top of rotor (7) with aligning pin holes up and place a few drops of oil in each recess of commutator.
12. Align the five holes of commutator (4) with holes in rotor (7) and install 5 pins (5).
13. Install commutator ring (3) and commutator cover (2) and eleven socket capscrews (1).

NOTE

DO NOT TIGHTEN CAPSCREWS.

SECTION 6D. POWER STEERING UNIT



6D

Figure 6D-6. Metering Package Assembly

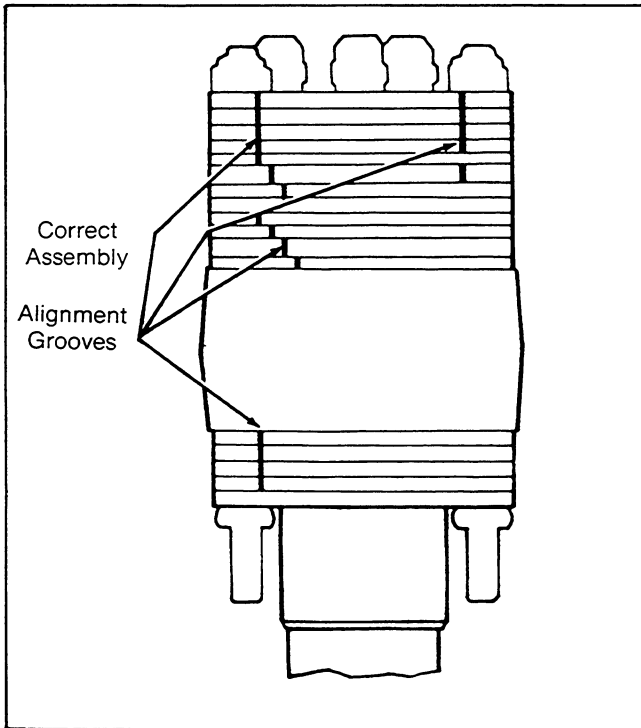
(See Figure 6D-2)

14. Place metering ring (15) on a hard flat surface.
15. Place the now assembled metering package in the center of metering ring (15) with commutator cover down.
16. Place shim stock 0.007 inch (0.18 mm) thick, 1/2 inch (13 mm) wide by 1-1/2 inch (38 mm) long in three places between the metering ring and metering package as shown.
17. Tighten socket capscrews twice in sequence as shown to a final torque of 11-13 in-lbs (1.2-1.5 N.m).
18. Remove the metering package and shims. Place drive link (14) in rotor and turn by hand to make sure there is no binding.

(See Figure 6D-5 and 6D-6)

19. Place metering ring (15) on top of upper cover plate (23) with aligning pin holes up.

20. Lubricate and install thrust bearing spacer (18) and thrust bearing (19) into metering ring (15).
21. Place metering package (17) into metering ring (15) engaging the drive slot with the steering shaft.
22. Install commutator ring (16) and seal ring (3). Install drive link (14).
23. Place isolation manifold (13) on metering ring (15) with aligning pin holes up. Install aligning pins (12).
24. Install three 1/2 inch springs (10) in isolation manifold (13) and install valve ring (8).
25. Install valve plate (9) as shown (port side up) in valve ring (8) aligning spring slots with springs. Install seal ring (3).
26. Place three 3/4 inch springs (7) in port manifold (6) as shown.
27. Carefully place port manifold (6) springs down onto valve ring (8).

SECTION 6D. POWER STEERING UNIT**Figure 6D-7. Alignment Grooves**

28. Install O-rings (4) and seal ring (3) to port cover (2) and install on port manifold (6).
29. Check ball (5) in inlet port of port manifold (6).
30. Install port manifold (6).
31. Install self-locking nuts (1) and tighten in sequence shown gradually until a final torque of 20-24 ft-lbs (27-33 N.m) is obtained.

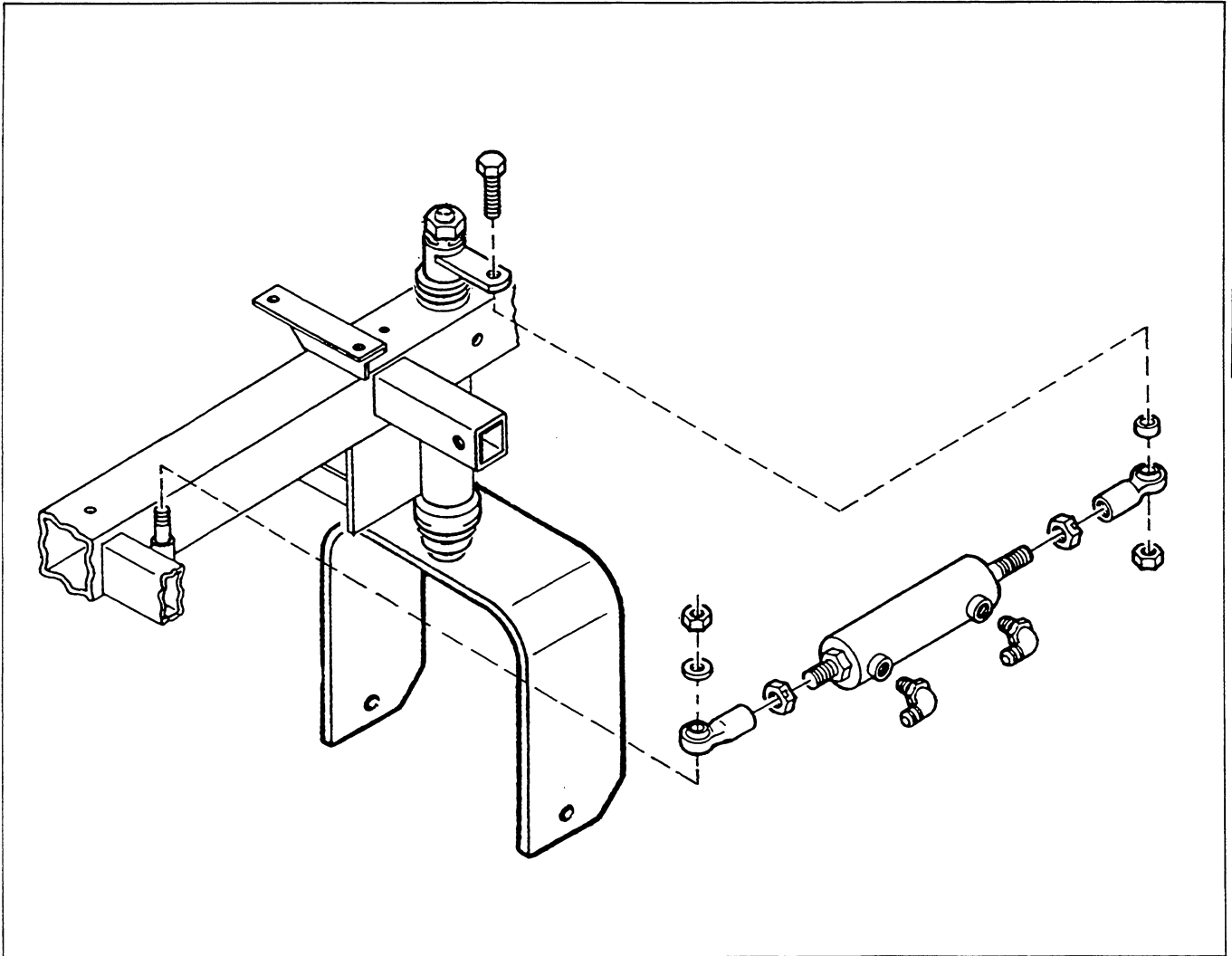
INSTALLATION (See Figure 6D-1)

1. Position and fasten steering unit with attaching hardware.
2. Connect hydraulic lines to steering unit.
3. Install steering tower cover (5).
4. Install steering tube seal (4), steering wheel (3) and nut (2). Torque nut to 25-30 ft-lbs (34-41 N.m).
5. Install steering wheel cap (1).

SECTION 6E. STEERING CYLINDER

REMOVAL (See Figure 6E-1)

1. Block the wheel and set the parking brake.
2. Tag and remove hydraulic lines. Cap the cylinder ports and plug the lines.
3. Remove attaching hardware and remove cylinder.



6E

Figure 6E-1. Steering Cylinder Removal and Installation

SECTION 6E. STEERING CYLINDER (P/N 338740)**DISASSEMBLY (See Figure 6E-2)**

Clean and air dry exterior of cylinder. Drain oil from the cylinder. Disassemble following the steps as illustrated.

INSPECTION

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

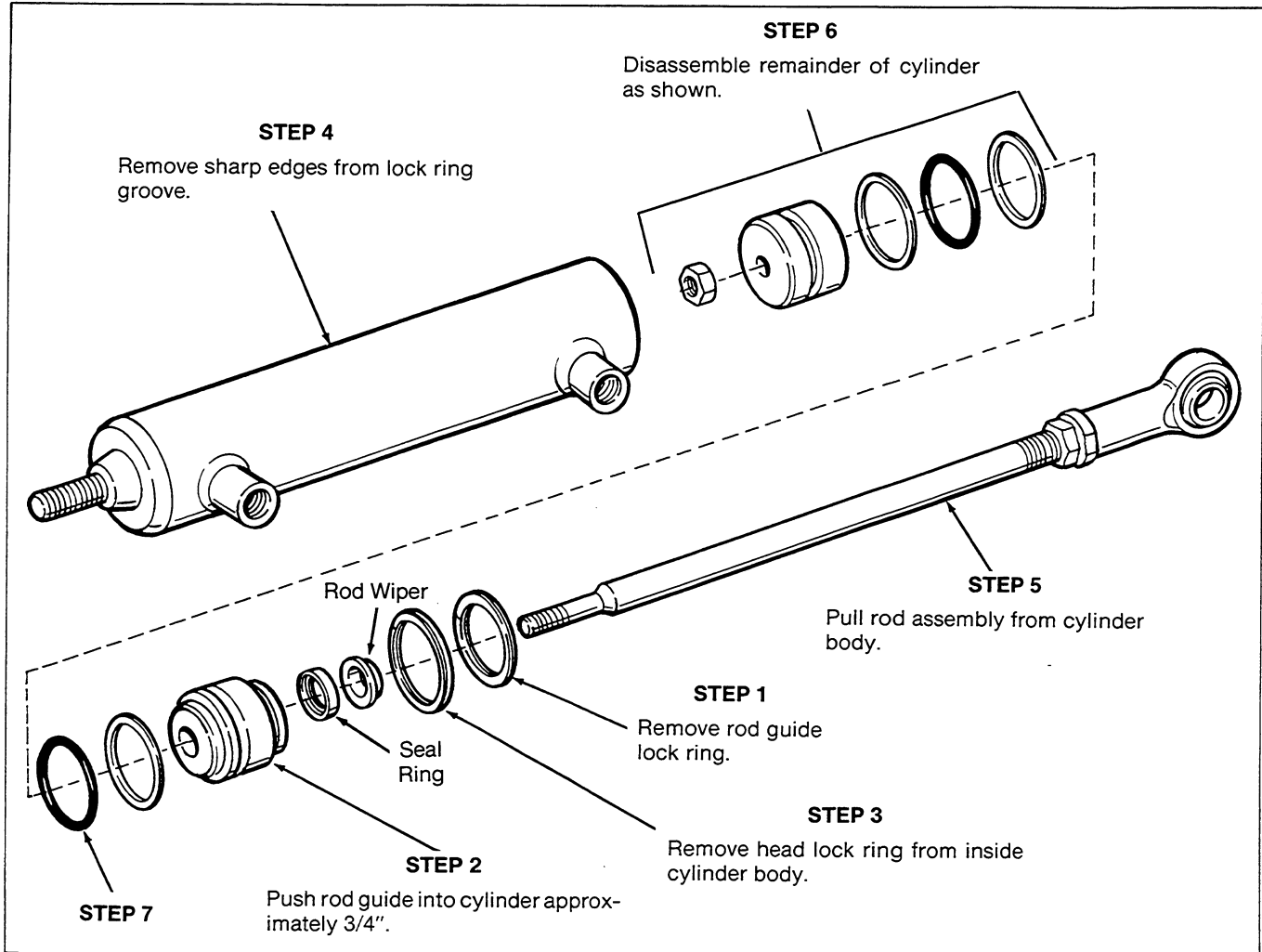


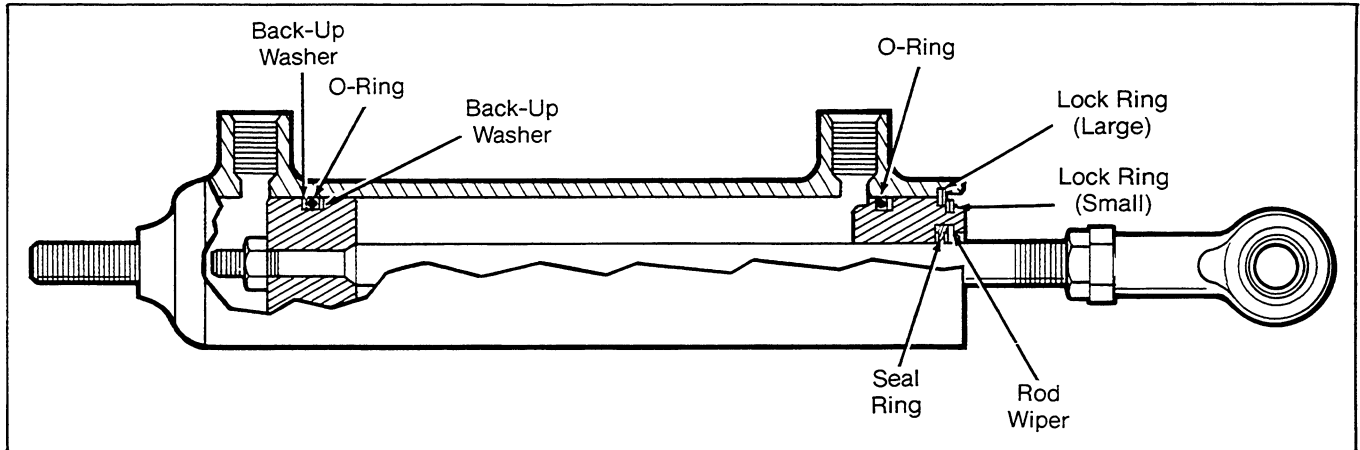
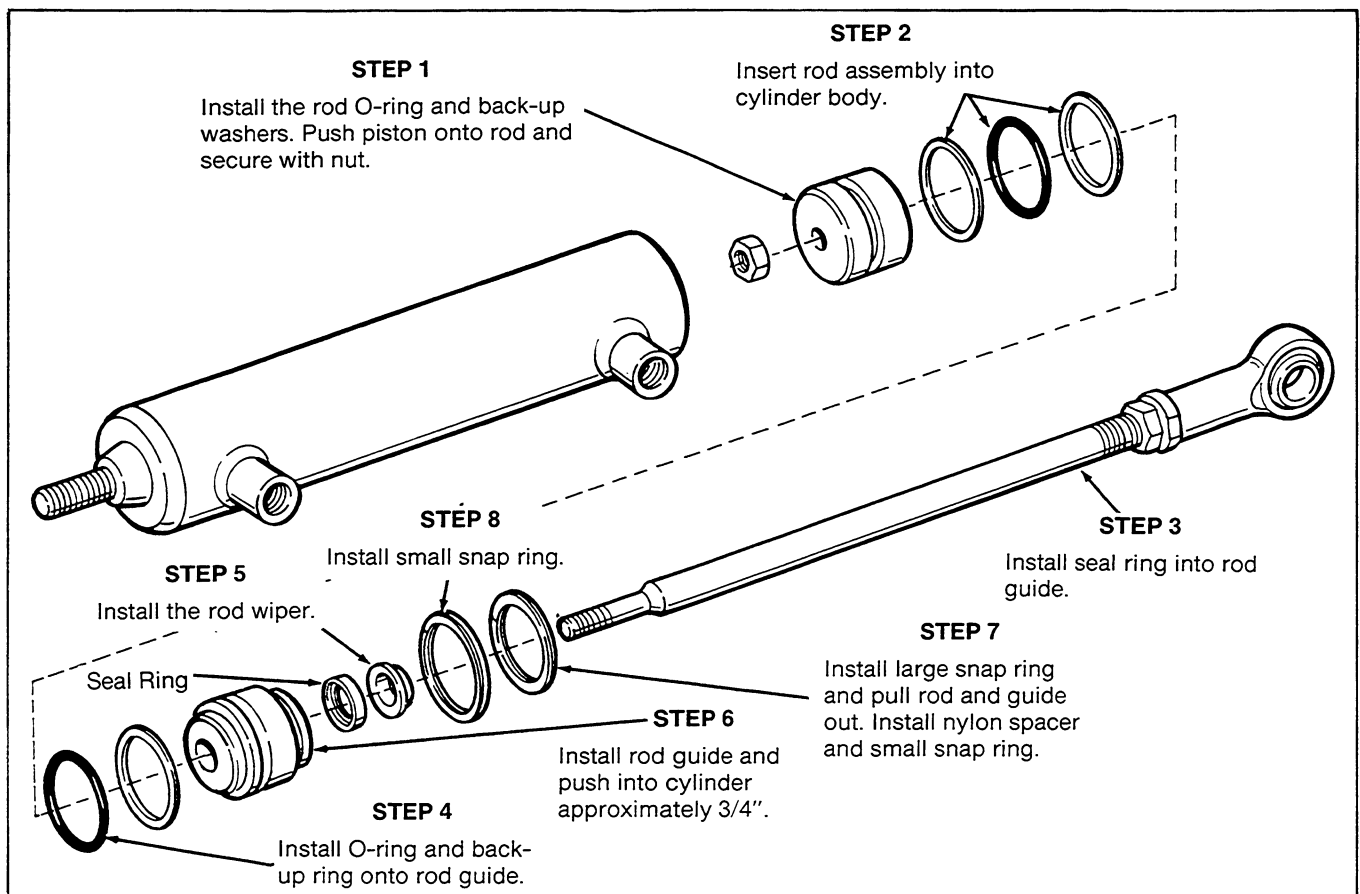
Figure 6E-2. Steering Cylinder (P/N 338740) Disassembly

SECTION 6E. STEERING CYLINDER (P/N 338740)**REASSEMBLY**

1. Lightly lubricate O-rings, backup rings and seals.
2. Install seal kit as shown in Figure 6E-3.
3. Lubricate all parts before assembly.
4. Follow the steps as illustrated in Figure 6E-4 for reassembly.

INSTALLATION (See Figure 6E-1)

1. Install cylinder and secure with attaching hardware.
2. Connect hydraulic hoses.
3. Start tractor and check for leaks. Repair as necessary.

**Figure 6E-3. Seal Kit Installation****6E****Figure 6E-4. Steering Cylinder (P/N 338740) Assembly**

SECTION 6E. STEERING CYLINDER (P/N 132525)**DISASSEMBLY (See Figure 6E-5)**

Clean and air dry exterior of cylinder. Drain oil from the cylinder. Disassemble following the steps as illustrated.

INSPECTION

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

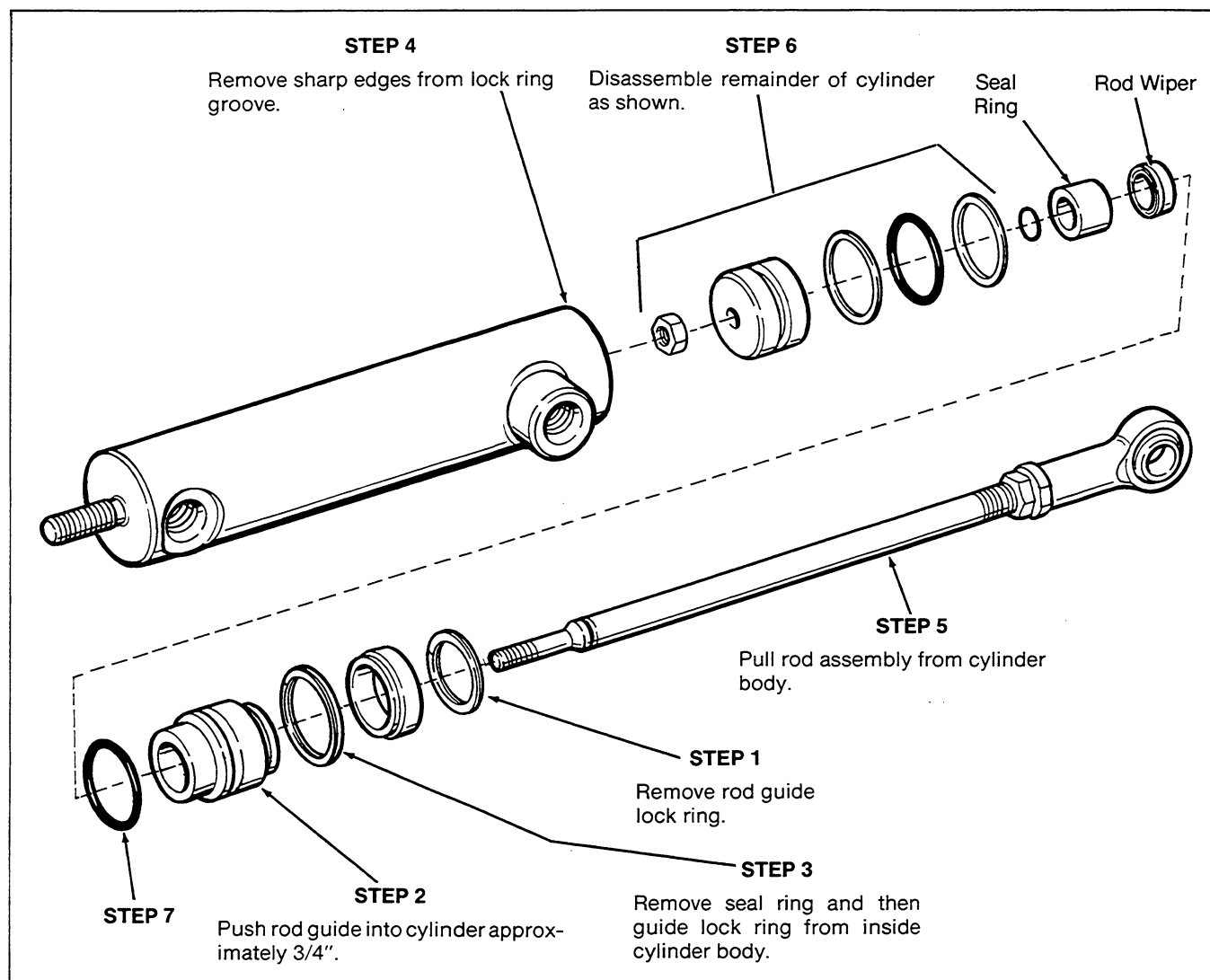


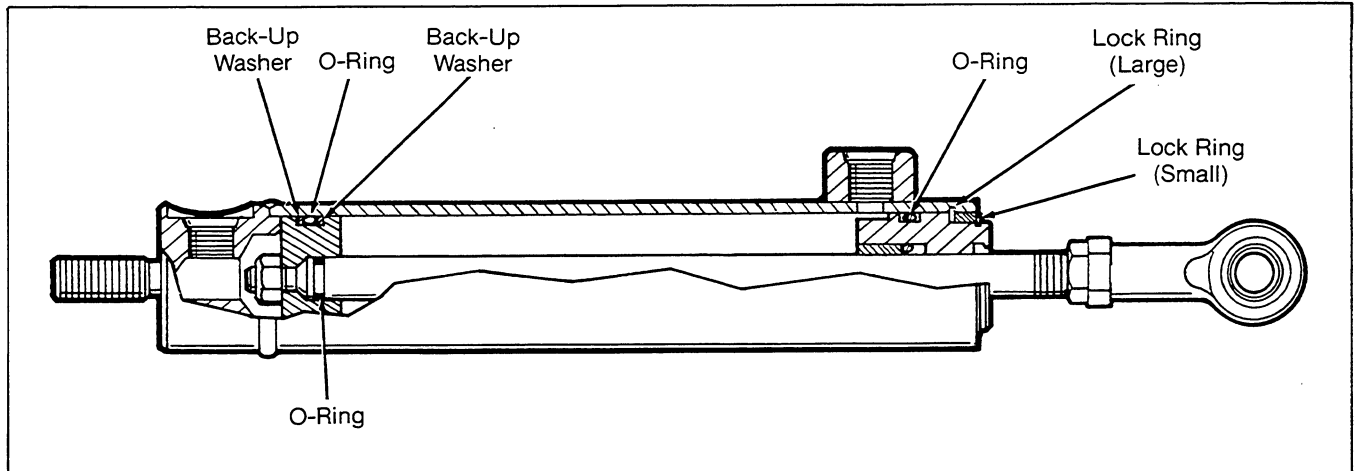
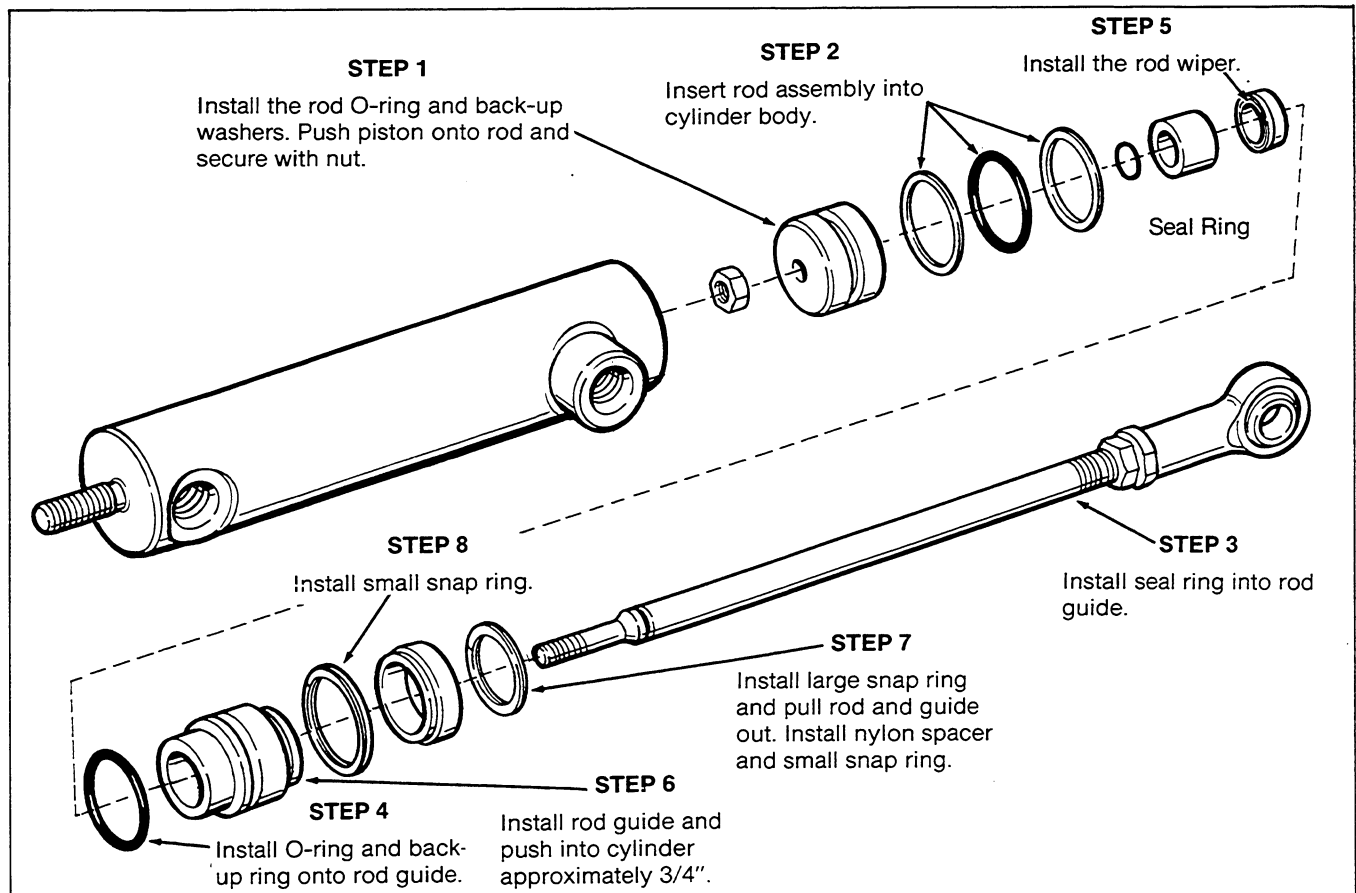
Figure 6E-5. Steering Cylinder (P/N 132525) Disassembly

SECTION 6E. STEERING CYLINDER (P/N 132525)**REASSEMBLY**

1. Lightly lubricate O-rings, backup rings and seals.
2. Install seal kit as shown in Figure 6E-6.
3. Lubricate all parts before assembly.
4. Follow the steps as illustrated in Figure 6E-7 for reassembly.

INSTALLATION (See Figure 6E-1)

1. Install cylinder and secure with attaching hardware.
2. Connect hydraulic hoses.
3. Start tractor and check for leaks. Repair as necessary.

**Figure 6E-6. Seal Kit Installation****Figure 6E-7. Steering Cylinder (P/N 132525) Assembly****6E**

SECTION 6F. STEERING ASSEMBLY**REPAIR (See Figure 6F-1)**

Remove and replace worm bearing, thrust washers and steering crank assembly as shown in Figure 6F-1 Steering Assembly Repair.

After reassembly, check steer alignment and adjust as described in Steer Wheel Adjustment.

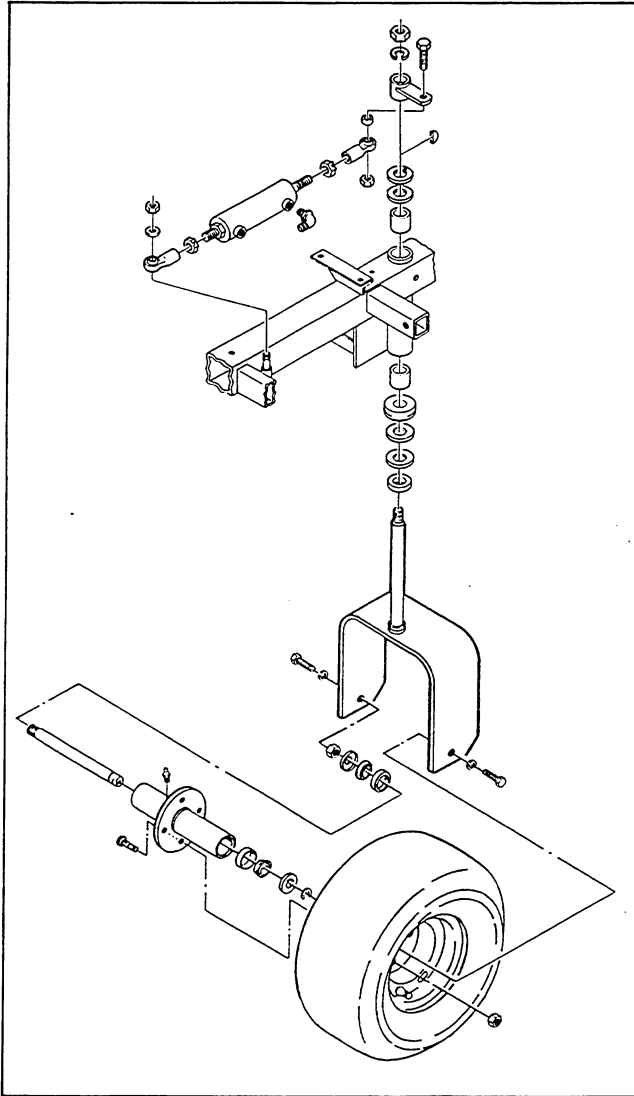


Figure 6F-1. Steering Assembly Repair

**STEER WHEEL ADJUSTMENT
(See Figure 6F-2)**

1. To adjust the steering alignment, remove bolt (1).
2. Loosen rod nut (2).
3. Put steering wheel and steering fork in the straight forward or parallel with the tractor frame.
4. Turn ball joint (3) aligning hole with hole in crank assembly (4).
5. When holes are aligned, install bolt (1) and attaching hardware.
6. Tighten nut (2).

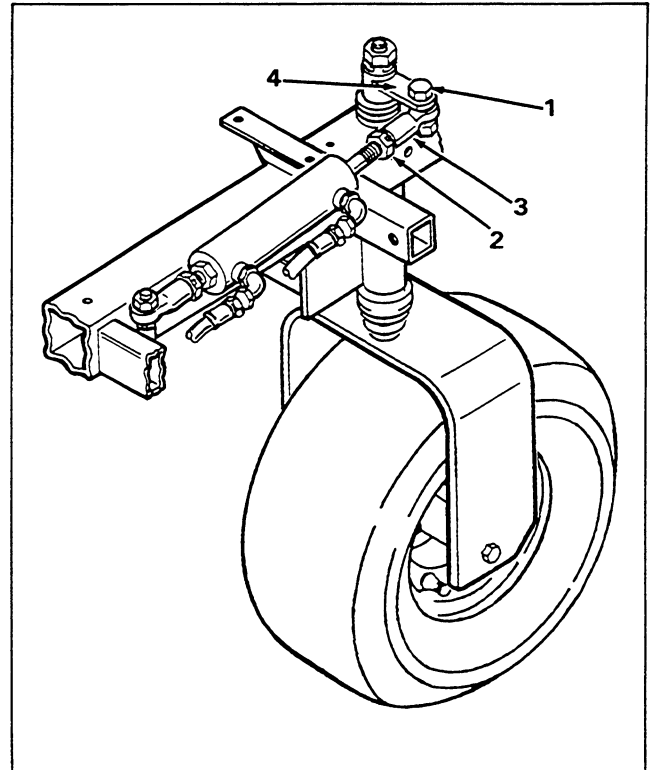


Figure 6F-2. Steering Adjustment

6F

SECTION 7 WHEELS AND TIRES

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SECTION 7A. REPAIR AND SERVICE TOOLS AND MATERIALS

Tools required: Standard automotive hand tools including wood block for driving off “frozen bearings”.

Cleaning materials: Stoddard or equivalent solvent.

Lubricants: Non-metallic additive wheel bearing grease (eg. Sunray DX 692 or Enco Fibrox 280).
Grease gun grease (eg. Sunray DX 671 or Gulf Supreme No. 0 [SAE 30 oil]).

Other service items: Commercially available tire sealant.
Tire pressure gauge.
Compressed air with tire valve fitting.

SECTION 7B. TIRE SERVICE**GENERAL**

The soft treadless tires of the Greens King IV are subject to damage from ties and other sharp objects. If large punctures or tears occur, it is advisable to take the tire (installed on the wheel) to a qualified tire repair shop.

The front (drive) wheels are bolted directly to the wheel hub; there are no wheel bearings to repair or service on the front wheels.

The rear wheel has two wheel bearings which should be serviced as described in Rear Wheel Bearing Service.

SERVICE

Tires are inflated to 8 to 12 psi (.55 to .82 bars) pressure. This pressure gives the best results for average use. Tire pressure should never be less than 8 psi (.55 bars) and should be equal in all tires.

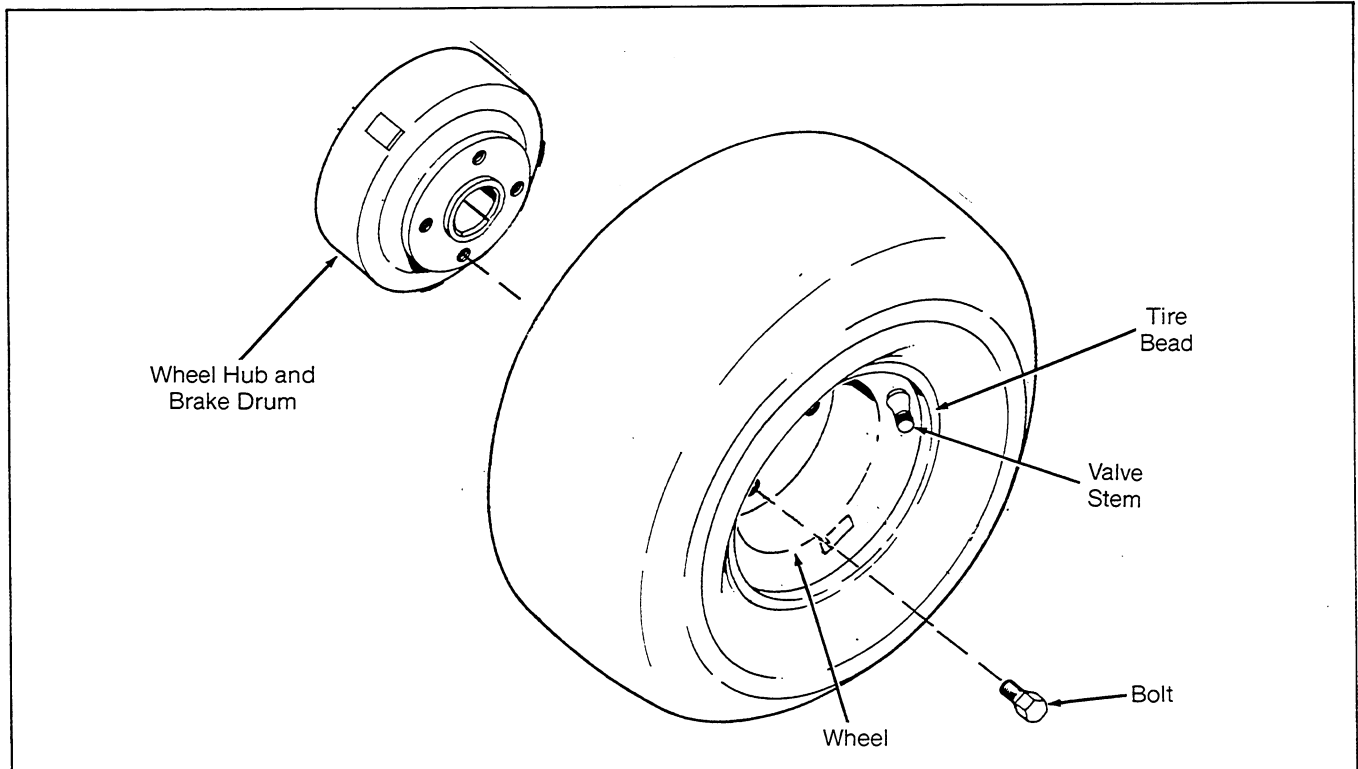
If a tire is removed from the rim it should be inflated to approximately 30 psi (2 bars), when it is replaced. This assures proper seating of the tire bead to the rim. Then reduce the pressure to the desired level before using.

NOTE

Never use grease or oil on the rim when mounting a tire.

Bead sealing of the tires may be repaired by using tire sealants available from tire repair shops. To apply sealant:

1. Break one bead from seal on rim and pull out past rim flange at bottom or install through valve stem.
2. Pour sealant into tire cavity.
3. Reseat bead on rim by inflating the tire to 30 psi (2 bars).
4. Rotate tire slowly to spread compound.
5. Reduce tire pressure to 8 to 12 psi (.55 to .82 bars).



FRONT WHEEL AND TIRE REMOVAL AND INSTALLATION

SECTION 7C. REAR WHEEL BEARING SERVICE

The wheel bearings require lubrication every 100 operating hours; fill the grease fitting on the wheel hub with good quality grease using a grease gun. Every 1000 operating hours, the rear wheel bearings should be cleaned and repacked as follows:

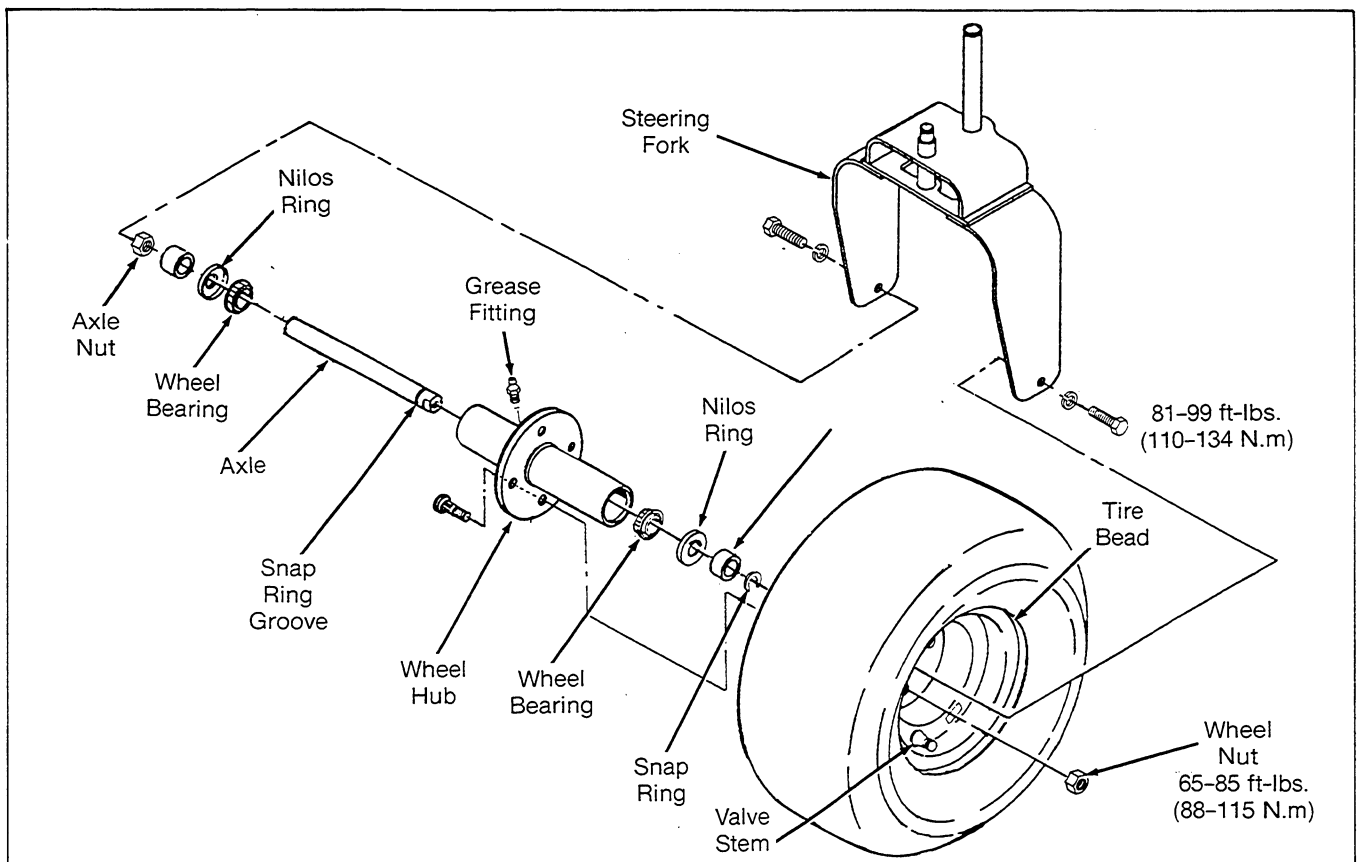
NOTE

The wheel bearing cups and cones are serviced as matched sets. Do not interchange right and left bearing parts. Identify each cup and cone for proper reassembly.

NOTE

If the machine is equipped with a performance monitor, remove the pick-up and target disc (see page 13-13).

1. Jack or hoist the rear wheel off the ground.
2. Remove the screws and lockwashers that hold the axle to the steering fork. Remove the axle, wheel hub and bearing assembly. Remove the four wheel nuts and remove the wheel.
3. Remove the snap ring and nut that hold the Nilos rings and wheel bearings to the axle. Pull the axle, wheel bearings, and Nilos rings out of the wheel hub.
4. Clean the bearing cup and cone in solvent and dry. Replace worn or damaged bearings.
5. Press new or cleaned bearing cups into the wheel hub until seated, pack the bearing cones with grease and place into their respective cups. Install the Nilos rings. Install the snap ring on the axle as shown in the "Rear Wheel and Bearing" illustration.
6. Slide the axle into the assembled wheel hub, bearings, and Nilos ring until the snap ring touches the L.H. Nilos ring.
7. Thread the axle nut onto the axle until it bears against the Nilos ring. Tighten the axle nut, then back off 1/2 to 1 turn. Install the wheel and tire.
8. Install the assembled wheel hub and axle in the fork; attach with bolts and lockwashers. Turn the axle to check for easy rotation. Adjust the axle nut as required.
9. Spin the wheel to check for proper wheel bearing adjustment. The wheel should turn freely with very little side play. Tighten or loosen the axle nut as required.
10. When the wheel side play has been adjusted, lower the wheel to the ground.
11. Add grease to grease fitting until grease just starts to ooze from around Nilos ring.

7C**REAR TIRE AND BEARING REMOVAL AND INSTALLATION**

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SECTION 8A. REPAIR AND SERVICE TOOLS AND MATERIALS

Tools required: Standard automotive hand tools, including torque wrench, seal drivers, snap ring pliers, bearing driver
Special tool kit, Kent Moore Part No. J26905
Tachometer
Hydra sleuth or in-line tester equipped with load valve
Universal Pressure test kit

Cleaning materials: Stoddard or equivalent solvent.
Detergent and water.

Lubricants: Hydraulic Oil Options:
Jacobsen Part No. 502693, 5 gal. (19 liter).
Jacobsen Part No. 502696, 2.5 gal. (9.5 liter).
Sunoco H.P. Engine Oil SAE 10W30.
Mobil Delvac (Special) SAE 10W30.
Grease: Sunray DX671 or Gulf Supreme No. 0.

Other service items: Seal Kits (available from Jacobsen distributors)

Hydraulic Hoses and Fittings Required for Instrument Tests

1. Hoses adaptable from the hydro-sleuth to the following 37 degrees flare sizes:

- a. #6 9/16 - 18
- b. #8 3/4 - 16
- c. #10 7/8 - 14

2. A jumper hose 4 feet long, size #8 3/4-16 with #10 7/8-14 female 37 degree flare swivels on each end.

3. #10 nipple.

SECTION 8B. GENERAL INSTRUCTIONS**GENERAL****NOTE**

Component location illustrations and hydraulic 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 system components and reduce the life of the machine. Clean all dirt from around fittings and components *before* disconnecting any hydraulic lines or removing components.
- Relieve system pressure at 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 component parts. Mark the pump and valve sections before removal and disassembly. This will insure the correct order of parts during reassembly and installation.
- Drain hydraulic fluid from 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 Distributor.

**CAUTION**

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

- All parts should be thoroughly cleaned in a suitable non-flammable solvent and air blown dried 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 instruction.

- 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 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.

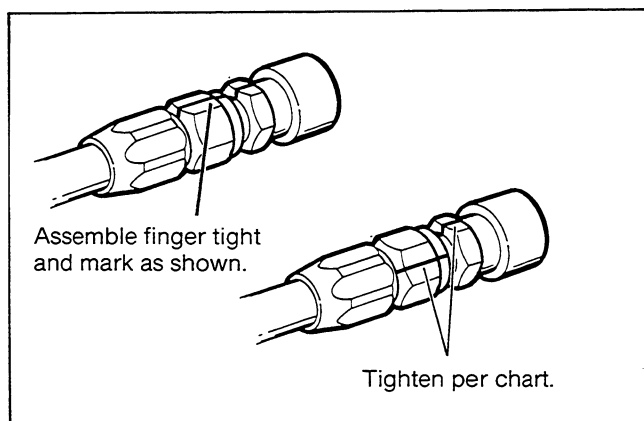
8B**HYDRAULIC TUBE AND HOSE FITTING
TORQUE RECOMMENDATIONS****WARNING**

To avoid serious bodily injury, always lower mowers fully, place all controls in neutral and shut off engine before inspecting 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.

SECTION 8B. GENERAL INSTRUCTIONS

Steel Tube and Hose Fittings

1. Assemble tube nut adapter to fitting with minimum torque (finger tight) until flare contacts seat on fitting body.
2. For tightening reference, mark a line lengthwise on the flats of both the nut and adapter fitting with a marker as shown below.
3. Using a wrench, tighten the nut the amount shown in the chart below. The line will show which fittings have been tightened correctly and also indicates if a fitting is becoming loose.



REFERENCE MARKING

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

Special 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. On hoses with O-ring fittings, make sure O-rings are clean and hose fittings are properly seated before tightening. Always install new O-rings. See "Boss Fitting O-Ring Installation" illustration.

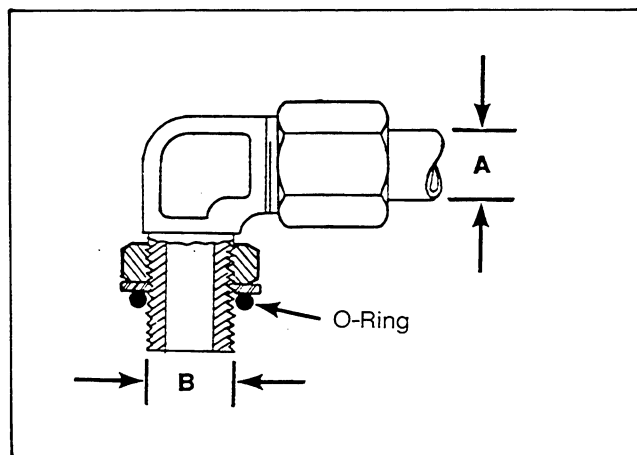
3. When installing mower hoses, place fittings at angles shown on "Hydraulic Tubes, Hoses and Fittings" illustration to avoid contact with fixed parts when turning. Make sure hoses are assembled to proper "A" and "B" ports on components.

Replacement O-Rings for O-Ring Boss Fittings

A	B	O-Ring
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	7/16-20	459292
5/16	1/2-20	459293
3/8	9/16-18	459294
1/2	3/4-16	459029
5/8	7/8-14	459035
3/4	1 1/8-12	459295
7/8	1 3/16-12	459296
1	1 5/16-12	459297
1 1/4	1 7/8-12	459298
1 1/2	1 7/8-12	459299
2	2 1/2-12	459300

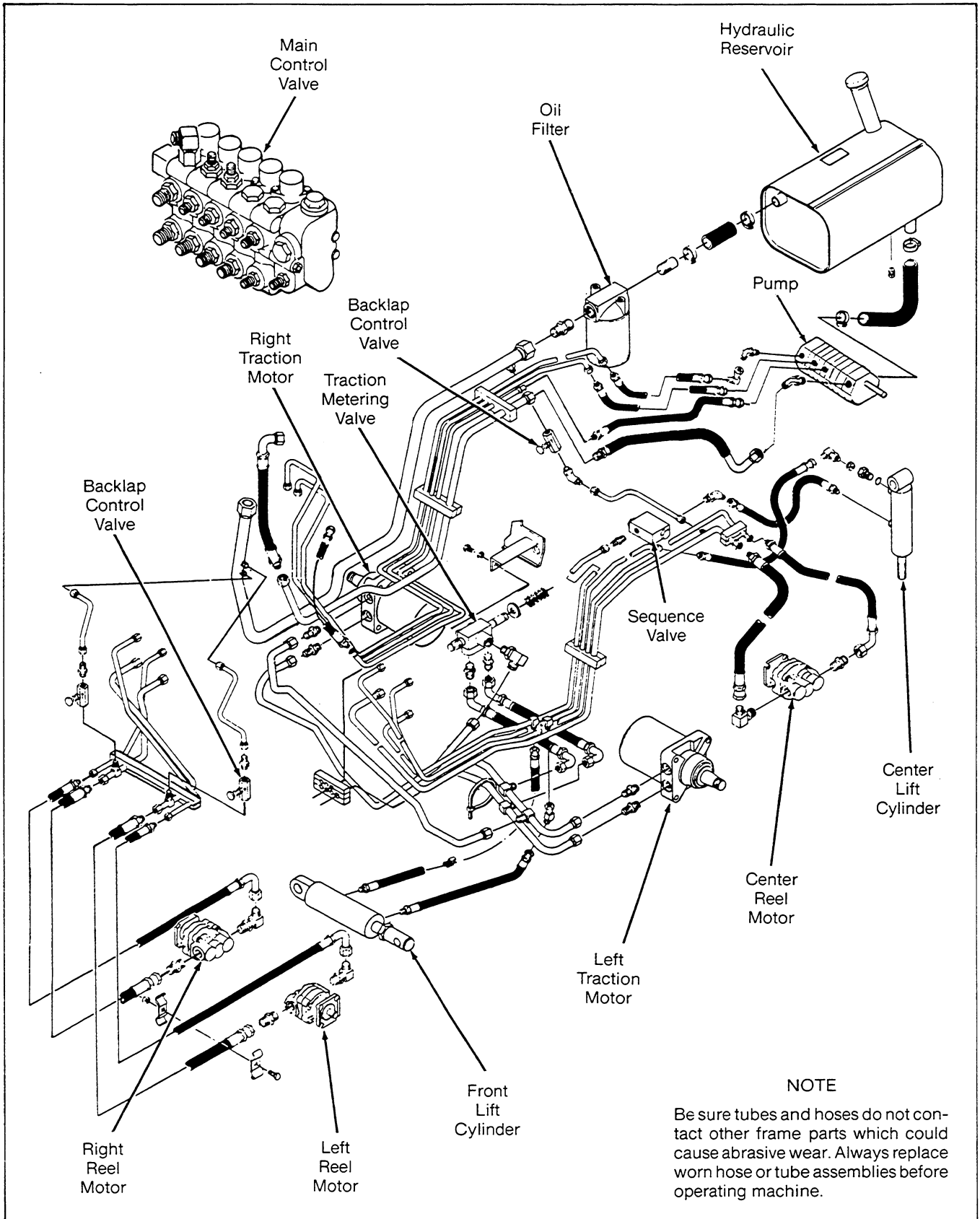
NOTE

O-rings should be lubricated with the fluid to be used in the system prior to assembly.



BOSS FITTING O-RING INSTALLATION

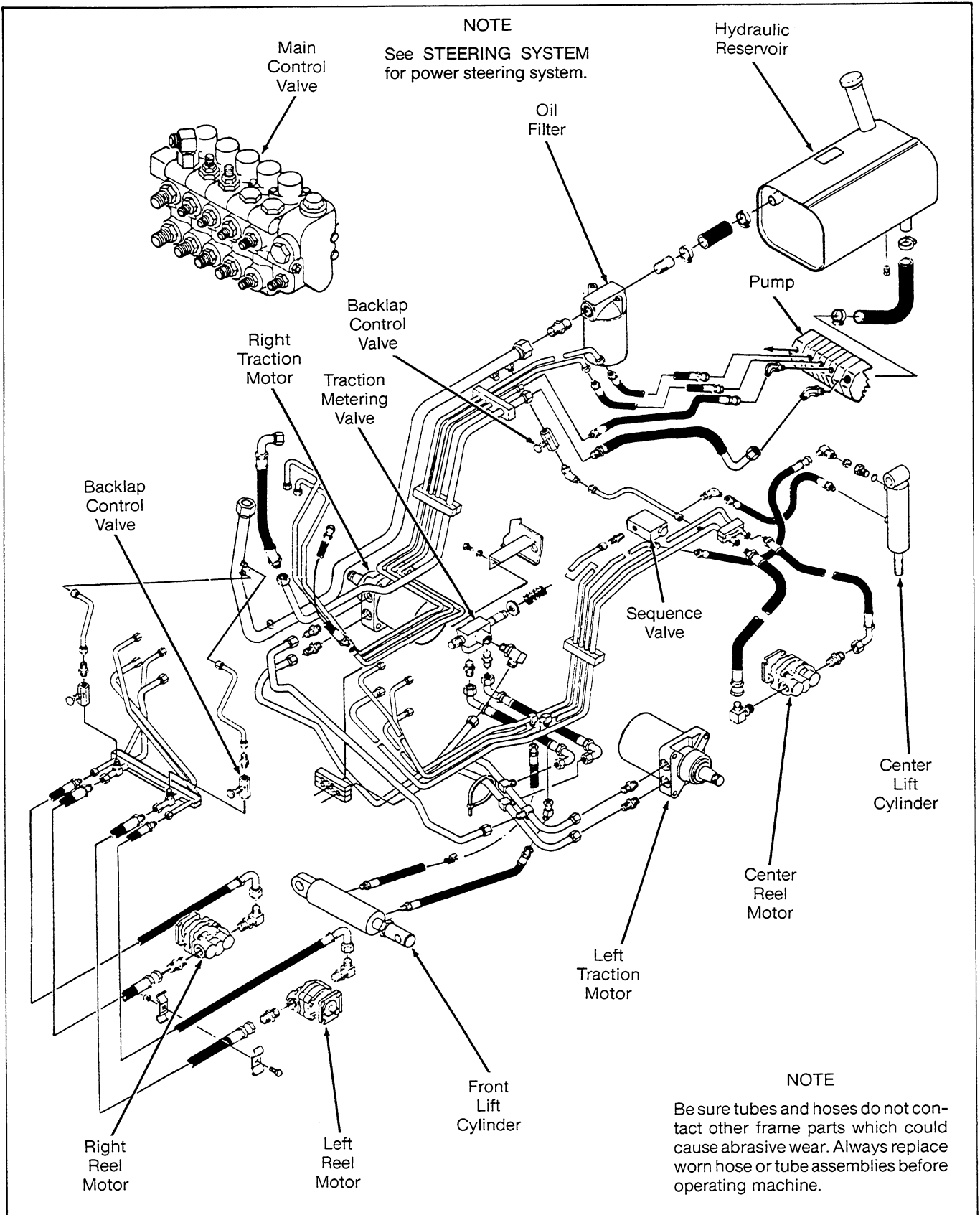
SECTION 8B. GENERAL INSTRUCTIONS



8B

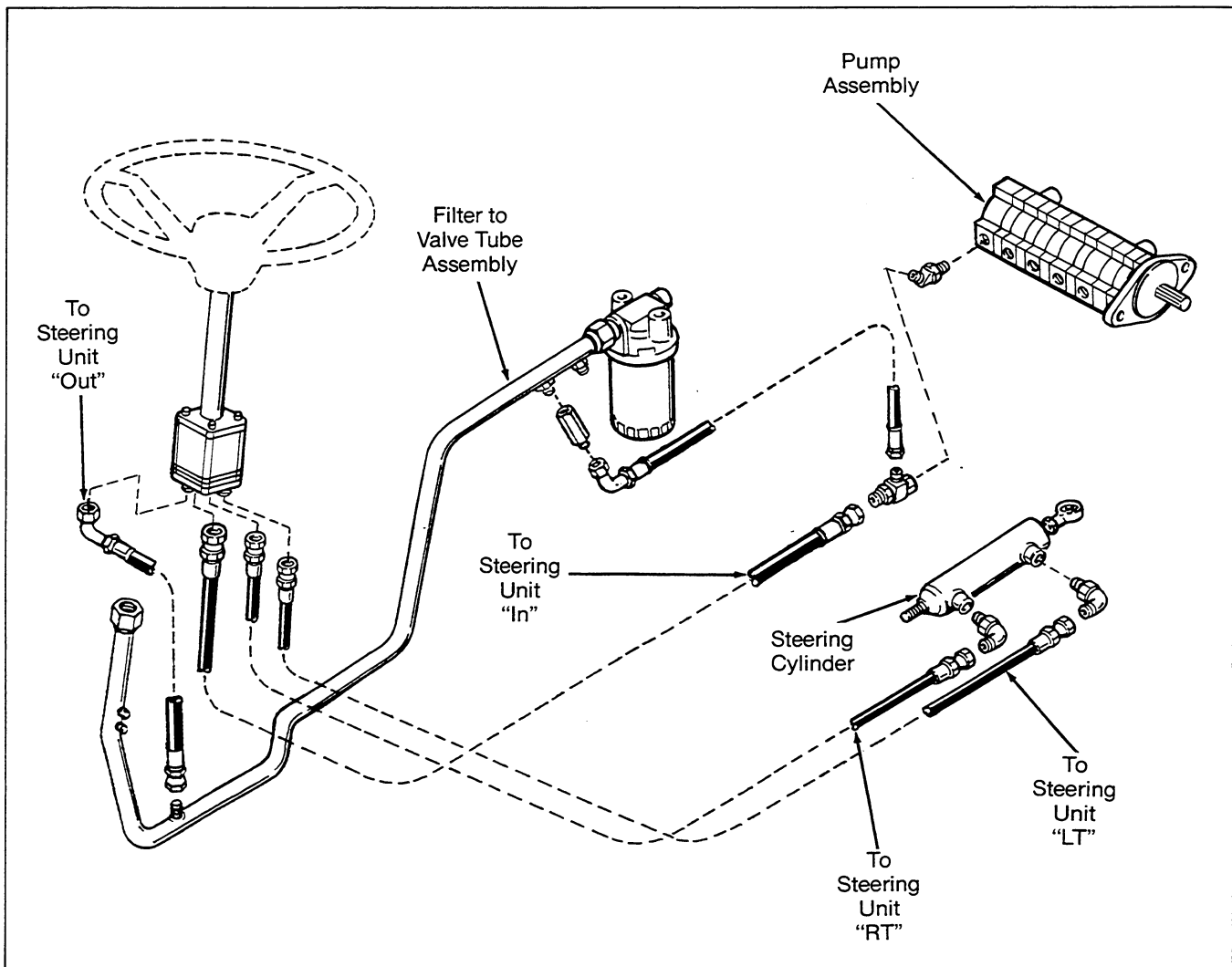
HYDRAULIC TUBES, HOSES & FITTINGS

SECTION 8B. GENERAL INSTRUCTIONS



8B

HYDRAULIC TUBES, HOSES & FITTINGS

SECTION 8B. GENERAL INSTRUCTIONS**POWER STEERING SYSTEM**

SECTION 8C. HYDRAULIC PUMPS

GENERAL

The hydraulic pump supplies oil for all hydraulic system functions; attachment lift and lower, attachment drive, and unit transport. The pump is an engine driven four section pump.

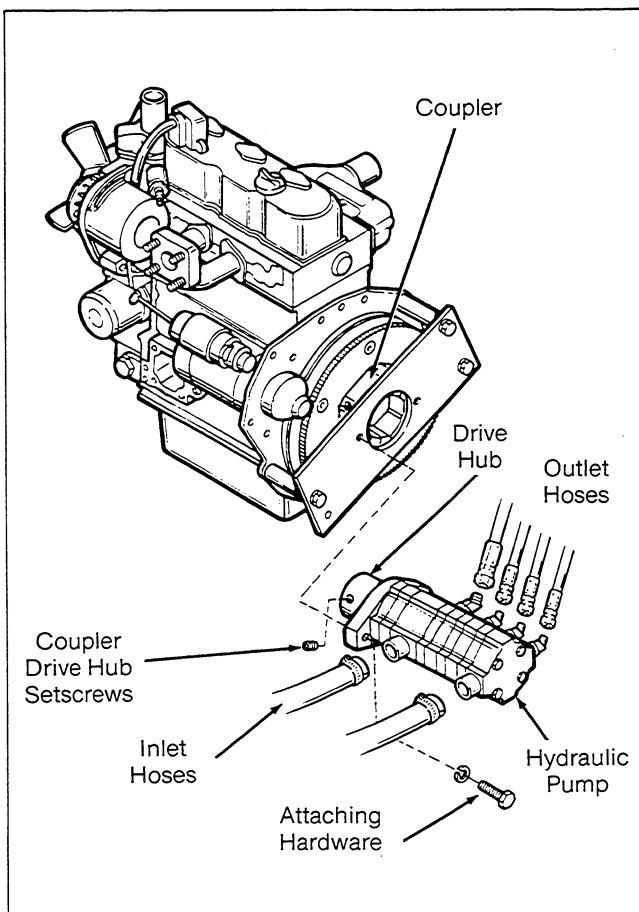
REMOVAL (DIESEL)

(See "Removal" Illustration)

NOTE

Do not remove hydraulic pump for repair unless test procedures (in this section) indicate internal leakage.

1. Lower attachments to ground and remove ignition key.
2. Drain hydraulic tank. After tank is drained remove supply hose.
3. Label all outlet hoses at pump for proper identification during installation, disconnect hoses. **Plug pump ports and cap hose fittings!**



HYDRAULIC PUMP REMOVAL
(DIESEL PRODUCTS)

NOTE

Pump sections are #1 thru #4 starting at the drive shaft end.

4. Loosen drive hub setscrews.
5. Remove attaching hardware and pump.

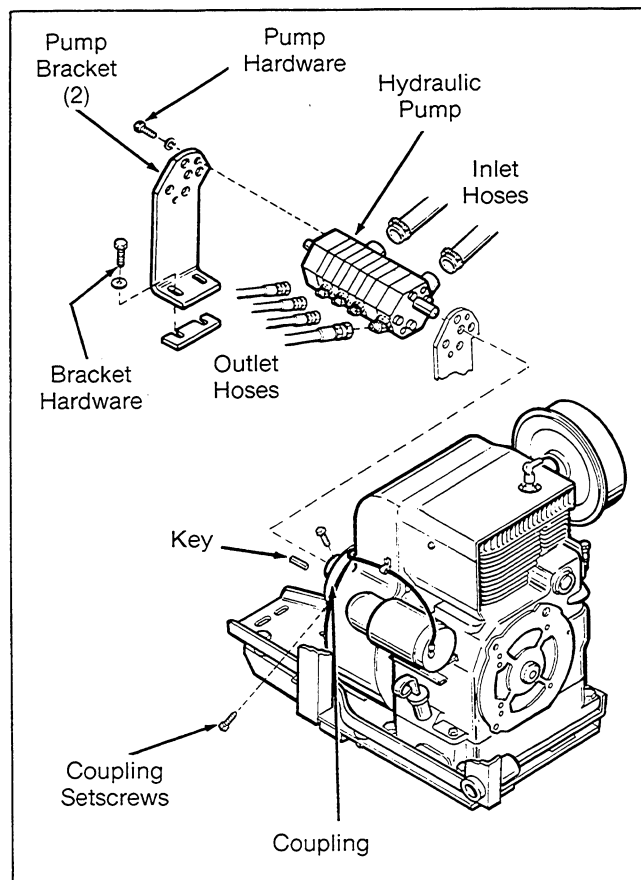
REMOVAL (GAS)

(See "Removal" Illustration)

1. Lower attachments to ground and remove ignition key.
2. Drain hydraulic tank. After tank is drained remove supply hose.
3. Label all outlet hoses at pump for proper identification during installation, disconnect hoses. **Plug pump ports and cap hose fittings!**

NOTE

Pump sections are #1 thru #4 starting at the drive shaft end.



HYDRAULIC PUMP REMOVAL
(GAS PRODUCTS)

SECTION 8C. HYDRAULIC PUMPS

4. Loosen, but do not remove, both coupling set-screws.
5. Remove pump bracket attaching hardware.
6. Remove pump. Do not lose shims. Make sure shims are reinstalled in their original position.
7. Use care not to lose shaft key.

- Before disassembly mark pump sections, starting at drive end, to ensure correct order of part reassembly. Recommended method of marking body sections is to use a fine point metal punch, making one indentation for section #1, two indentations for section #2, etc.

CAUTION

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

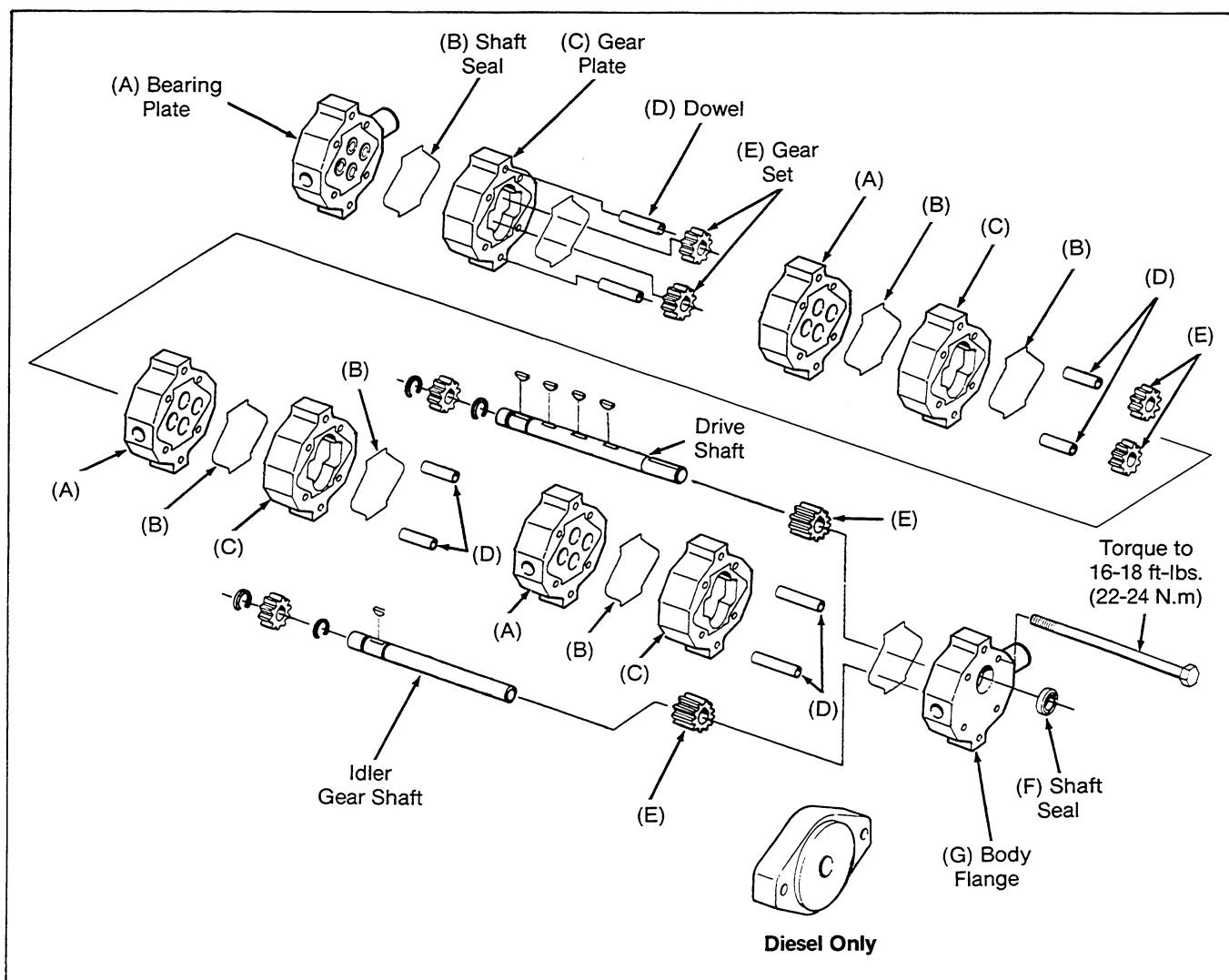
REPAIR (ALL PRODUCTS)

Repair of the hydraulic pump is limited to the replacement of leaking seals and worn or damaged parts. Disassemble and reassemble the pump as shown on the "Repair" illustration adhering to the following important instructions and precautions.

Disassembly

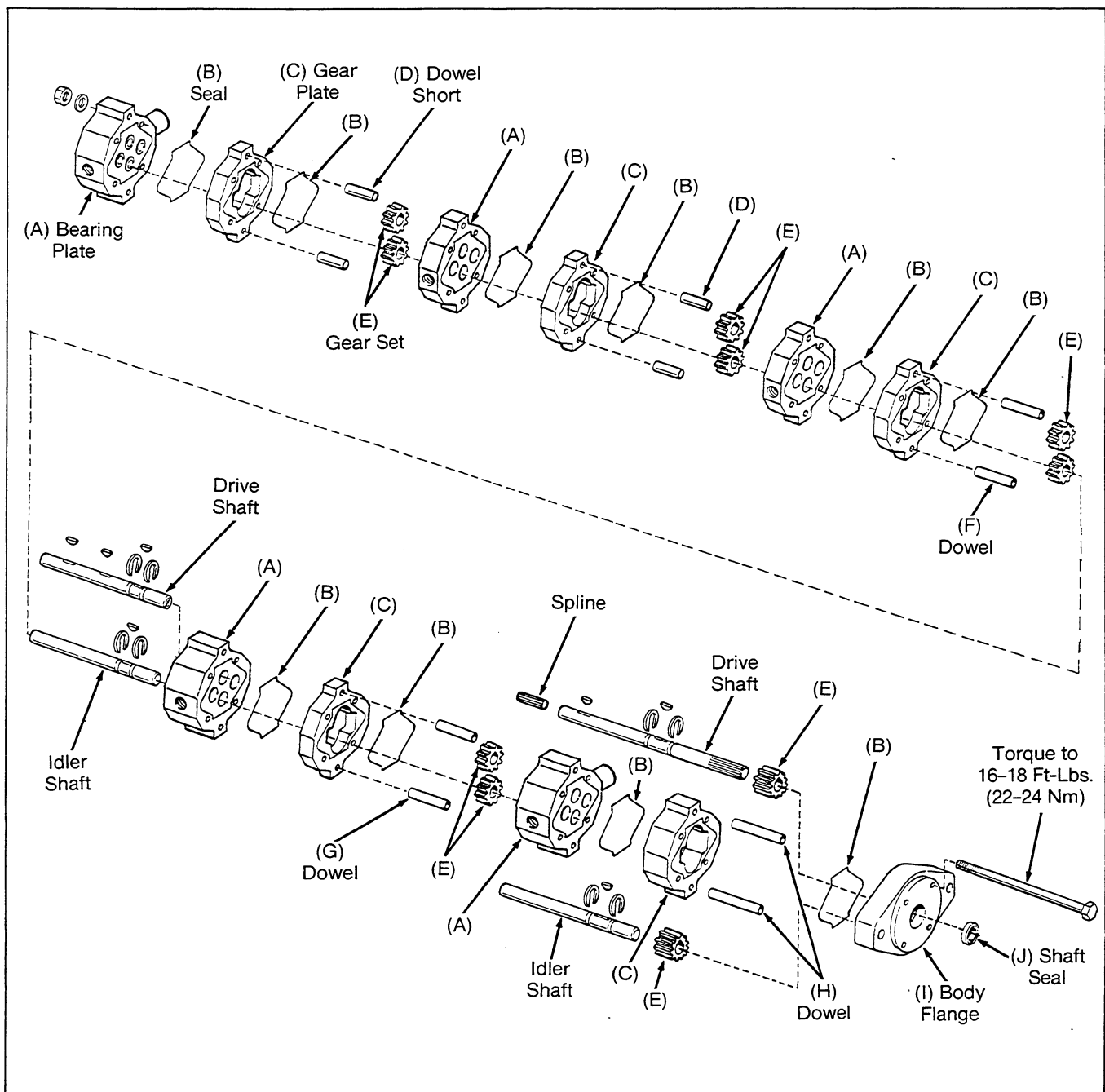
- Clean exterior of pump with suitable solvent before removing tie bolts.

- After removing tie bolts, disassemble pump one section at a time. Before removing gear sets (E), mark a line across meshing teeth to ensure that gears are reassembled in the same position (see "Marking Gear Teeth" illustration).



MAIN HYDRAULIC PUMP REPAIR

SECTION 8C. HYDRAULIC PUMPS



MAIN HYDRAULIC PUMP REPAIR (POWER STEERING)

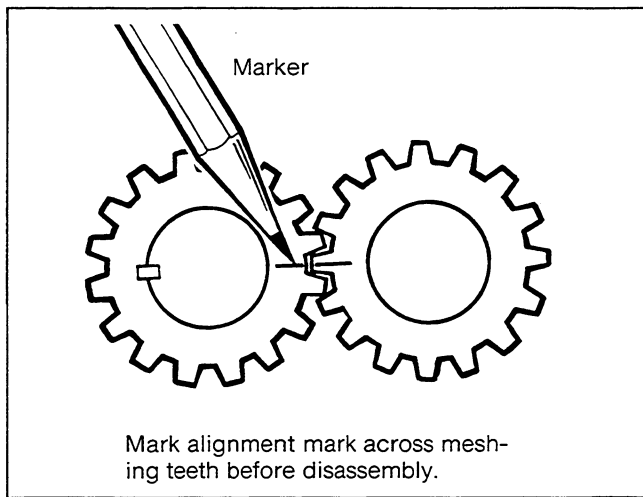
8C

SECTION 8C. HYDRAULIC PUMPS

- Place parts in assembly order, on a clean work area as they are removed.
- Discard seals (B) as they are removed.

Inspection

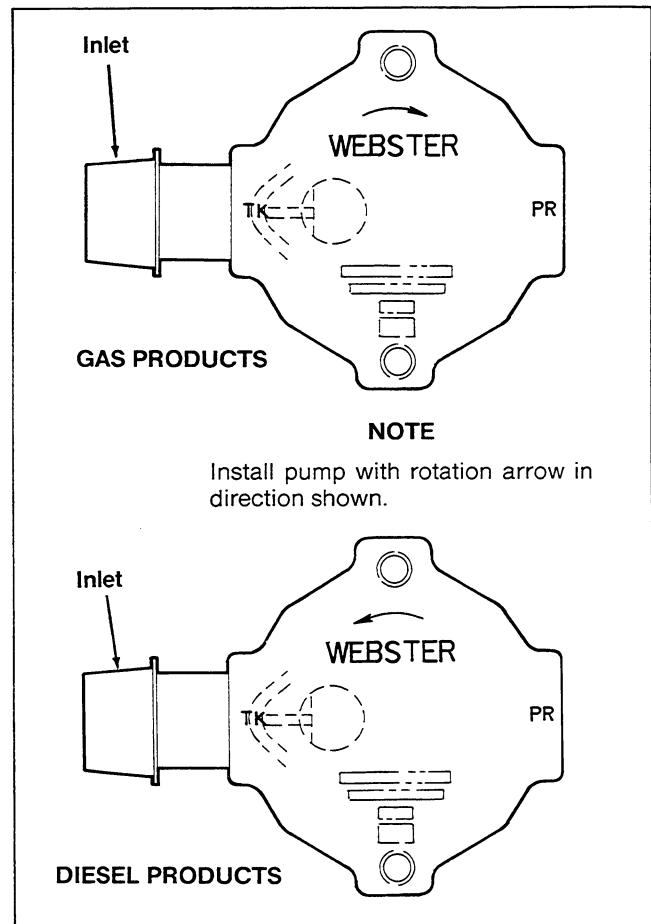
- Keeping parts in assembly order, clean and air dry each for inspection. Look for metal chips or slivers during cleaning (an indication of damage to pump or other hydraulic component).
- Inspect all parts for cracks, nicks, burrs and excessive wear. Replace all damaged parts. Gears must be replaced in sets.

**MARKING GEAR TEETH****Assembly**

- Apply a coat of clean hydraulic oil to all parts to ease assembly.
- Assemble pump one section at a time, building up from section #4 bearing plate (A).
- Use a new seal kit (B) during assembly. Use clean grease to keep seals in position.
- Remove alignment mark from gear sets after they have been installed with teeth in mesh.
- Rotate drive shaft after assembling each section to make sure there is no binding between parts.
- Use extreme care when installing shaft seal (F). It must seat squarely in seal bore with metal casing facing out. Use clean grease on shaft and put tape over keyway to avoid cutting seal during assembly.
- Install the bolts, finger tight and rotate drive shaft to make sure it turns freely. Tighten tie bolts evenly and in steps to a final torque of 16–18 ft-lbs. (22–24 N.m). After final tightening check for free rotation of drive shaft.

**INSTALLATION (DIESEL)
(See “Installation” Illustration)**

1. Install pump and tighten attaching hardware to 27–33 ft-lbs. (37–45 N.m) making sure rotation arrow is in direction shown on “Rotation Installation” illustration.
2. Tighten drive hub setscrews to 15–18 ft-lbs. (20–24 N.m).
3. Connect inlet and outlet hydraulic lines.

**NOTE**

Install pump with rotation arrow in direction shown.

PUMP ROTATION INSTALLATION

4. Fill hydraulic tank with clean oil.
5. Start engine. Check for leaks and hydraulic tank level. Break in new or rebuilt pump slowly.

NOTE

At this point the pump can be tested as described under “Hydraulic Test Procedures” at the back of this section.

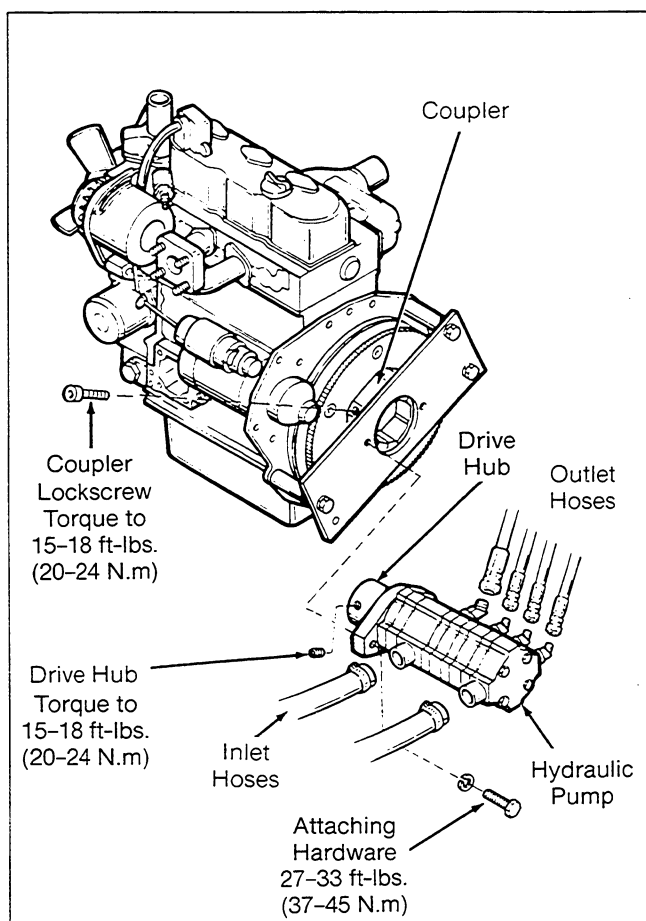
SECTION 8C. HYDRAULIC PUMPS

INSTALLATION (GAS)**(See "Installation" Illustration)**

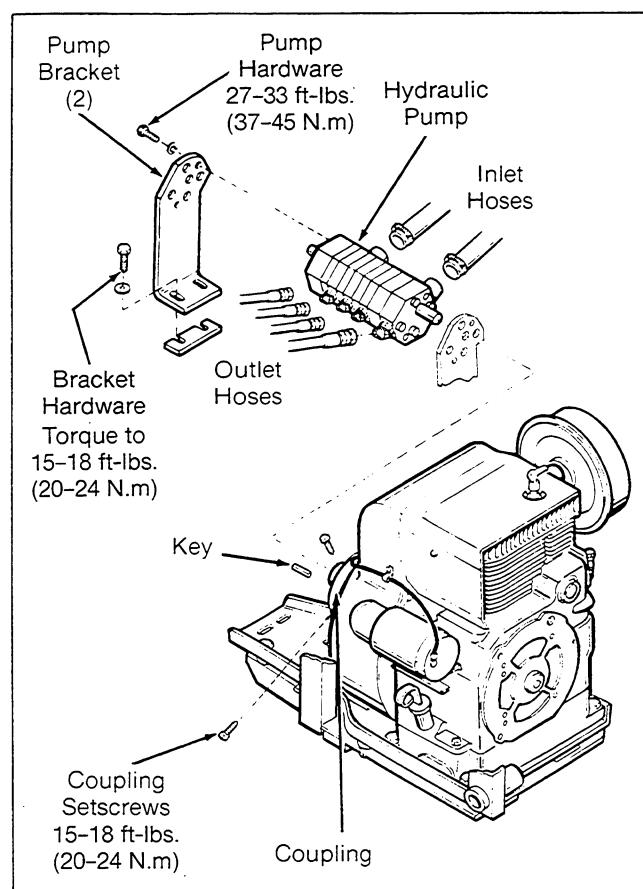
1. Attach rear bracket to pump making sure arrow on pump is in direction shown on the "Rotation Installation" illustration. Tighten hardware to 27–33 ft-lbs. (37–45 N.m).
2. Install shaft key and align pump into coupling. Install shims as necessary to make pump in straight horizontal alignment with coupling.
3. Tighten rear bracket hardware to 15–18 ft-lbs. (20–24 N.m).
4. Tighten coupling setscrews to 15–18 ft-lbs. (20–24 N.m).
5. Connect supply and pressure lines.
6. Fill hydraulic tank with clean oil.
7. Start engine. Check for leaks and hydraulic tank level. Break in new or rebuilt pump slowly.

NOTE

At this point the pump can be tested as described under "Hydraulic Test Procedures" at the back of this section.



**HYDRAULIC PUMP INSTALLATION
(DIESEL PRODUCTS)**



**HYDRAULIC PUMP INSTALLATION
(GAS PRODUCTS)**

8C

SECTION 8D. MAIN CONTROL VALVE (ALL)**GENERAL**

Repair of the main control valve is limited to replacement of seal kits, main relief valve, check plugs, or entire valve sections if a housing or spool is damaged. Unless the complete valve bank is to be overhauled the valve will not have to be removed from the machine for service.

LIFT RELIEF VALVE (ALL PRODUCTS)
 (See "Lift Relief Valve Repair" Illustration)
Removal and Disassembly

1. Lower attachments to ground and remove ignition key.
2. Remove front cowling assembly to gain access to control valve.
3. Remove all dirt from surface around relief valve before proceeding to removing parts.
4. Loosen cap (1) and remove valve body (2).
5. Remove cap (1), spring (3) and poppet (4). Use care not to loosen shims (5).
6. Remove and discard seals (6, 7 and 8).

Inspection

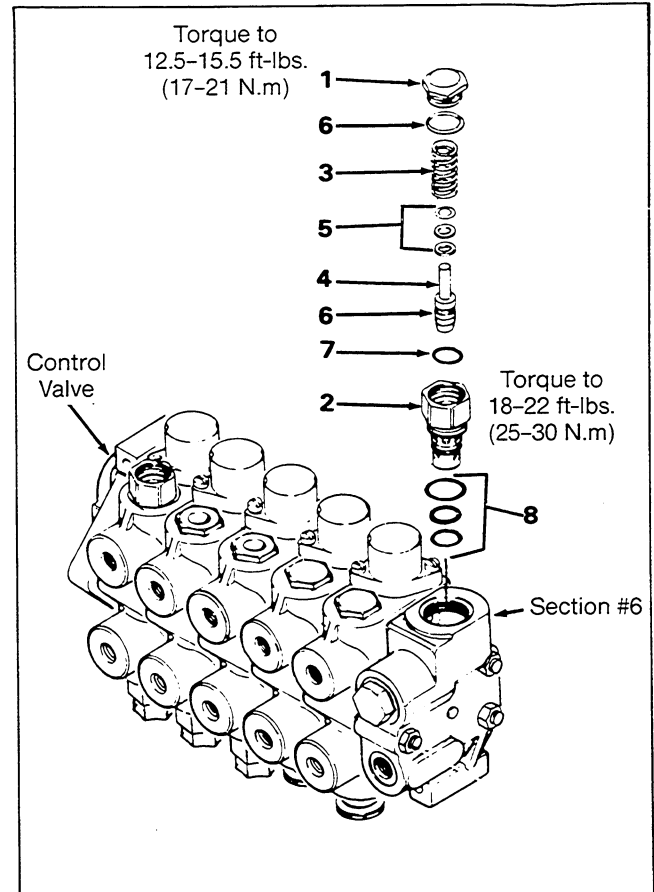
1. Inspect spring for damage or wear.
2. Inspect poppet and valve body bore for pitting, scoring and excessive wear.

NOTE

New valve kits and shims are available from your Jacobsen Dealer.

Assembly and Installation

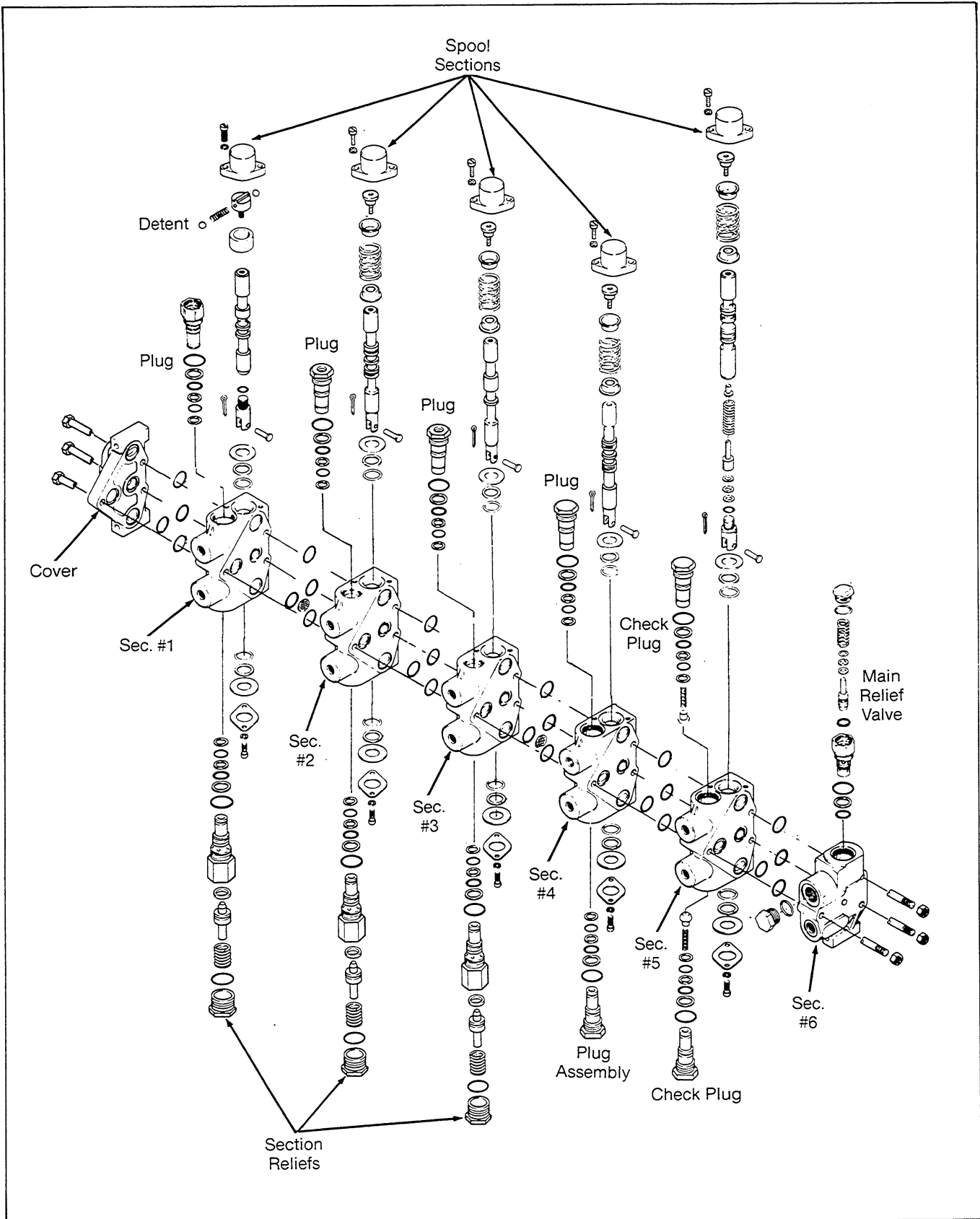
1. Apply a thin coat of clean hydraulic oil to all parts before assembling.
2. Put new seals (6) on valve body (2) and install body in valve section. Tighten body to 18–22 ft-lbs. (23–30 N.m).
3. Install new seal (7) in valve body.
4. Install same amount of shims (5), that were removed, on poppet unless a pressure test (see "Hydraulic Test Procedures") has determined the need for more or less shims to adjust pressure relief.
5. Install new seal (8) on poppet.

**LIFT RELIEF VALVE REPAIR****8D****NOTE**

Products with serial numbers prior to 3600 had a Bunda O-ring (8) installed. Make sure a new Viton O-ring (Jacobsen P/N 549748) is installed during reassembly.

6. Install poppet and spring in valve body.
7. Install new seal (6) on cap. Tighten cap to 12.5–15.5 ft-lbs. (17–21 N.m).
8. Test main relief cartridge as described in "Hydraulic Test Procedures."

SECTION 8D. MAIN CONTROL VALVE (ALL)



MAIN CONTROL VALVE

SECTION 8D. MAIN CONTROL VALVE (ALL)**SECTION 5 CHECK PLUG REPAIR****NOTE**

The section 5 (lift and lower) check plug can be removed without removing the complete main control valve from the machine.

1. Lower attachments to ground and remove ignition key.
2. Remove front cowling assembly to gain access to control valve.
3. Remove check plug cap (1) and parts (2-4). Discard seals (2).

4. Clean all parts with mineral spirits or solvent and air dry.
5. Inspect spring (3). Replace spring if damaged.
6. Inspect poppet (4). Replace poppet if damaged.
7. Inspect inside of check plug valve bore. Replace valve section if bore has excessive scoring.
8. Apply a thin coat of hydraulic oil on all parts before reassembling.
9. Install new seal kit (2) on plug.
10. Install plug, spring and poppet in valve bore. Tighten plug to 18-22 ft-lbs (25-30 N.m).

NOTE

The check plug can be tested as described.

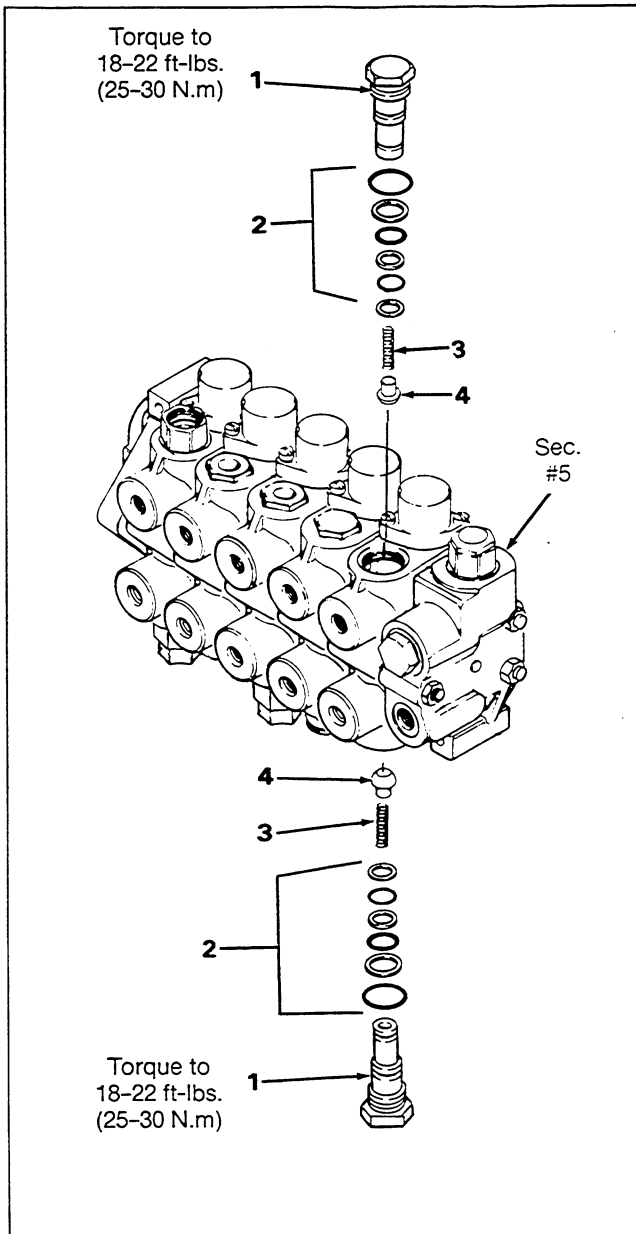
SECTION RELIEF ASSEMBLY REPAIR
(See "Section Relief Assembly Repair" Illustration)**NOTE**

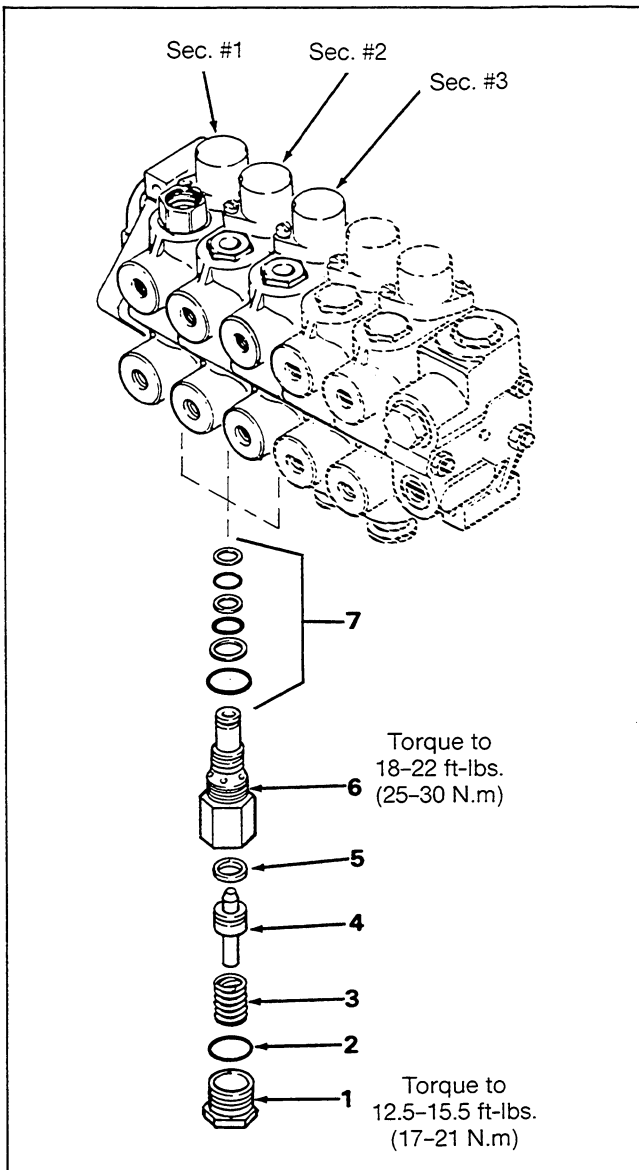
Valve sections 1, 2 and 3 have separate relief assemblies. The control valve does not have to be removed from the tractor to repair a relief assembly.

1. Lower attachments to ground and remove ignition key.
2. Remove front cowling to gain access to control valve.
3. Remove cap (1) and parts (2 thru 5). Discard seals (2 and 5).
4. Remove body (6) and discard seals (7).
5. Clean parts with mineral spirits or solvent and air dry.
6. Inspect all parts for damage or excessive wear. Replace defective parts. Inspect bore in main valve body. Replace entire valve section if bore is scored or otherwise damaged.
7. Apply a coat of clean oil to all parts before assembly.
8. Install new seal kit (7) on body (6). Install body and tighten to 18-22 ft-lbs. (25-30 N.m).
9. Install new seal (5) on poppet (4).
10. Install new O-ring (2) on plug (1).
11. Install poppet, spring and plug. Tighten plug to 12.5-15.5 ft-lbs. (17-21 N.m).

NOTE

The relief assembly can be tested as described under "Hydraulic Test Procedures" later in this section.

**CHECK PLUG REPAIR**

SECTION 8D. MAIN CONTROL VALVE (ALL)**SECTION RELIEF ASSEMBLY REPAIR****VALVE SPOOL REPAIR**
(See "Valve Spool Repair" Illustration)

The spool configuration for each section is different. Additionally, section #1 has a detent assembly for the four positions of the traction lever and section #5 has a spool relief assembly. However, repair instructions for all spool sections are generally the same except as noted in the step below.

NOTE

The complete control valve does not have to be removed to repair a valve spool. If the valve is removed for a complete overhaul do not allow parts from one section to become mixed up with parts from another section. All parts must be installed in the section from which they were removed.

Disassembly

1. Lower attachments to ground and remove ignition keys.
2. Remove front cowlings to gain access to control valve.
3. Disconnect control linkage to section being repaired at valve by removing cotter pin (1) and clevis pin (2).
4. Remove lower retainer plate assembly (3). Discard seal and back-up washer.
5. Remove cap.
6. a. (Section #1 only.) Remove detent assembly by pushing down on detent collar while holding a rag over end to catch balls and spring.

**CAUTION**

Do not attempt to remove spool by pulling it upward through valve housing. Paint and/or nicks on spool clevis can damage spool bore as it passes upward through body.

- b. (Section #2-5 only.) Remove positioner assembly by removing positioner screw while holding spool from turning with a large screwdriver in the clevis end.
7. Remove upper retainer assembly (5). Discard seal and backup washer.
8. Remove spool by pushing it down through spool bore.

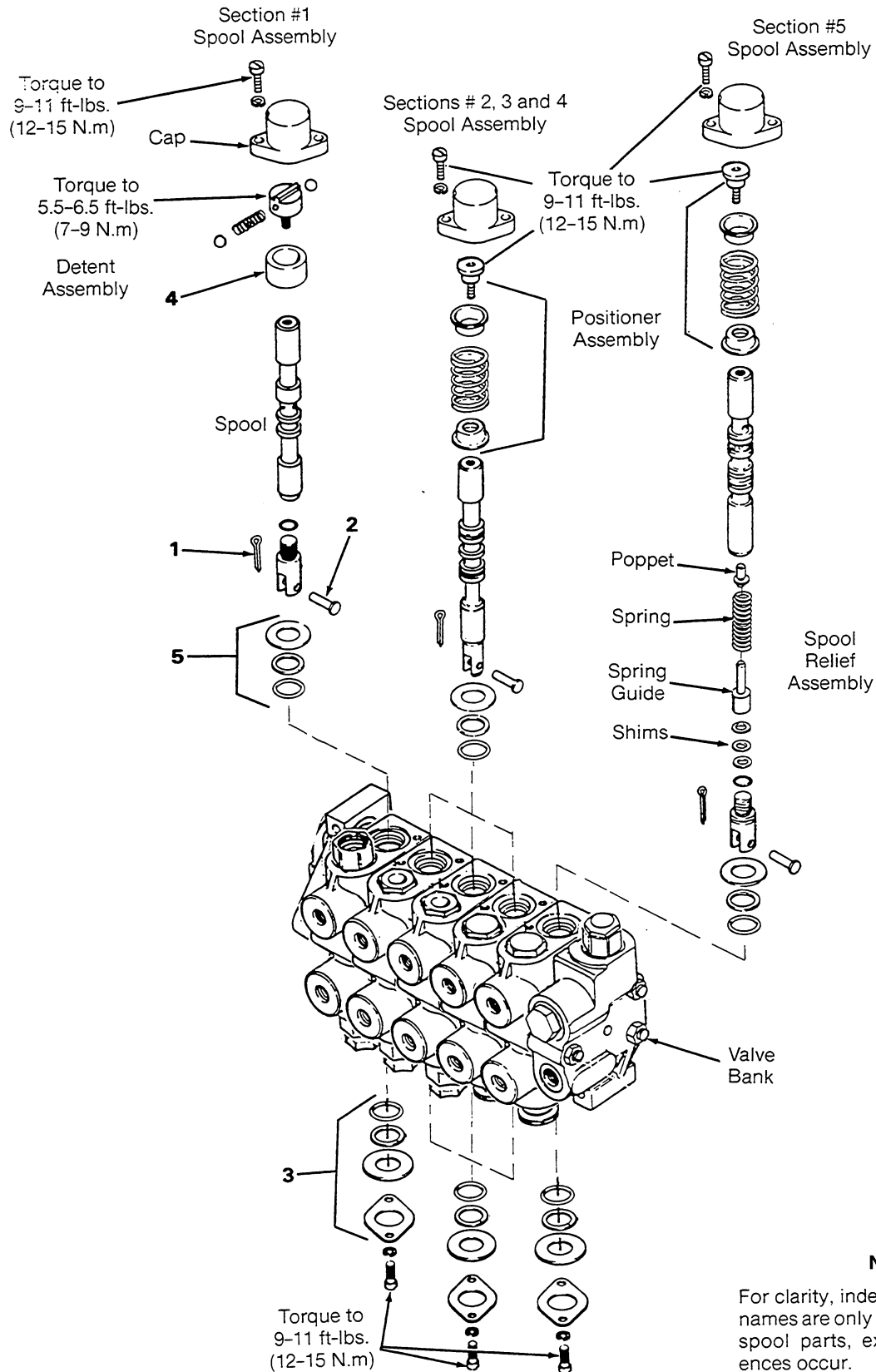
**CAUTION**

Use extreme care to not damage spool surface as spool is removed.

9. (Section #5 spool only.) Disassemble spool relief assembly by removing clevis. Hold spool steady by inserting a punch through a spool hole. Discard clevis O-ring. Do not lose shims.

SECTION 8D. MAIN CONTROL VALVE (ALL)

8D



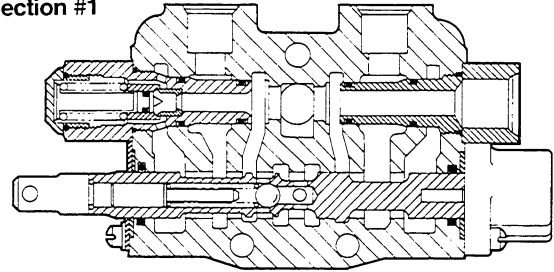
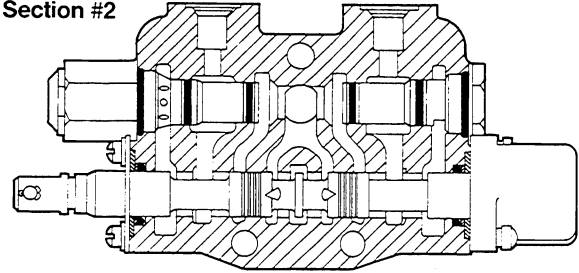
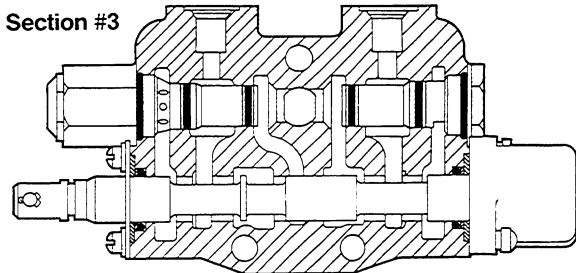
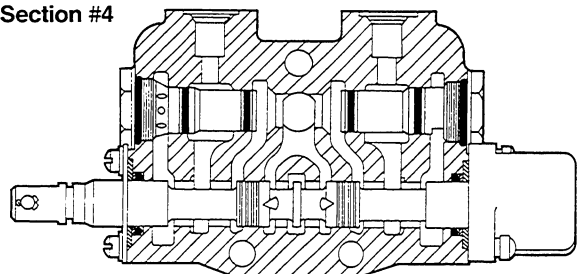
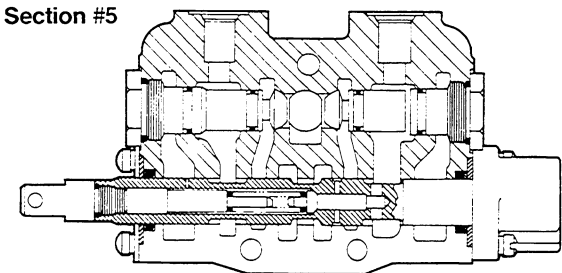
VALVE SPOOL REPAIR

SECTION 8D. MAIN CONTROL VALVE (ALL)**Inspection**

1. Clean all parts with mineral spirits or cleaning solvent and air dry.
2. Inspect all parts for cracks, scoring, excessive wear or other damage. Especially look at spool and spool bore for nicks or scoring. If either spool or spool bore is damaged, the entire section must be replaced.
3. Inspect springs for signs of distortion and breaks.

Assembly (Also See "Control Valve Parts Position" Illustration)

1. (Section #5 only.) Assemble spool relief assembly.
 - a. Install poppet, spring and spring guide in the same position as when they were removed.
 - b. Install the same amount of shims that were removed unless test (in Hydraulic Test Procedures) indicated a need for more or less shims (spool relief pressure).
 - c. Install a new O-ring on clevis and install clevis. Tighten clevis snugly, but use care to not damage O-ring.
2. Install spool into valve body from the bottom so that clevis end does not pass downward through spool bore.
3. Install upper retainer assembly (5) including new O-ring and back-up washer.
4. Positioner/detent assembly.
 - a. (Section #'s 2-5 only.) Install positioner assembly parts. Tighten positioner screw to 9-11 ft-lbs. (12-15 N.m).
 - b. (Section #1 only.) Install collar (4) and detent cap — tighten cap to 5.5-6.5 ft-lbs. (7-9 N.m). Hold detent balls and spring in place on cap using a 1" socket over parts. Slide collar and socket upward at the same time to seat detent balls in collar.
5. Install lower retainer assembly (3) including new O-ring and back-up washer. Tighten retainer plate screws to 9-11 ft-lbs. (12-15 N.m).
6. Install positioner caps and tighten screws to 9-11 ft-lbs. (12-15 N.m).
7. Connect control linkage to spool clevis. Check and adjust control linkage, if necessary, as described in Section 2B.

Section #1**Section #2****Section #3****Section #4****Section #5****CONTROL VALVE PARTS POSITION**

SECTION 8D. MAIN CONTROL VALVE (ALL)

CONTROL VALVE ASSEMBLY

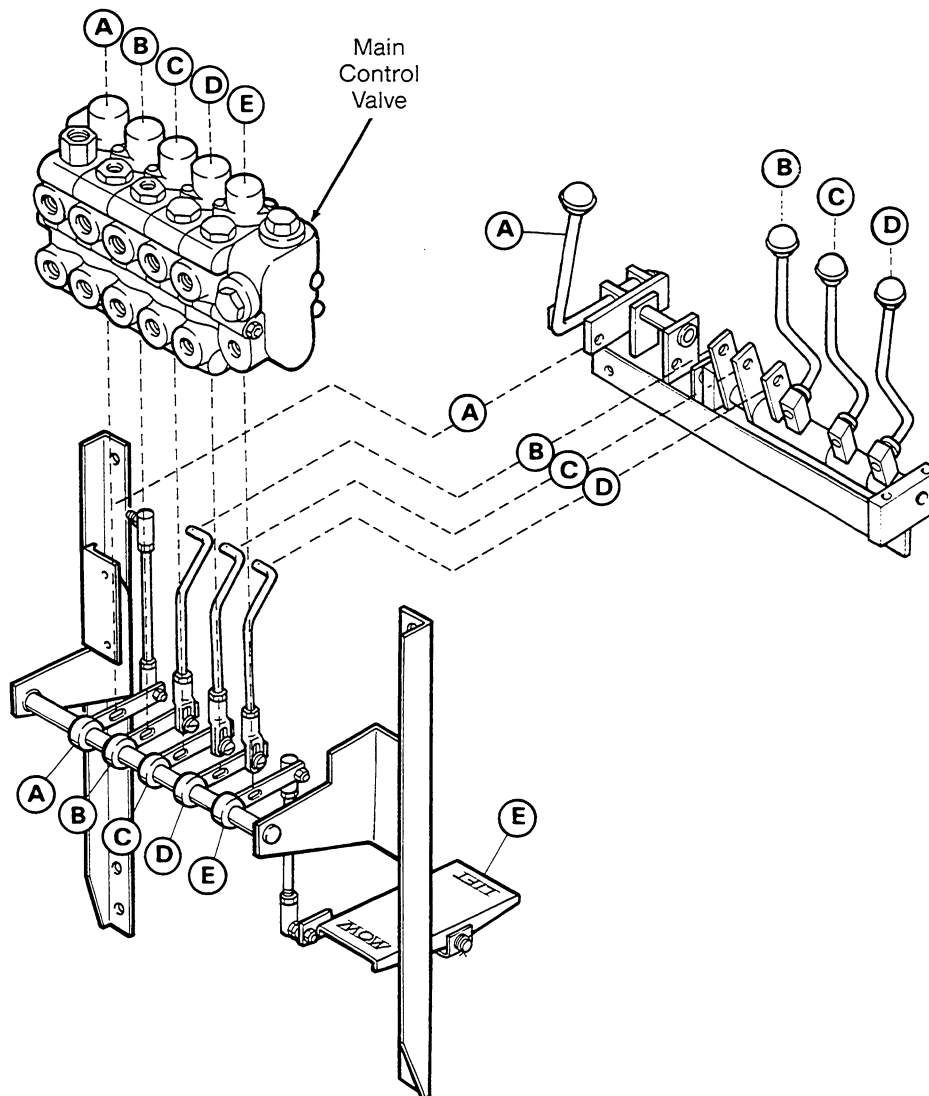
Removal (See "Main Control Valve Removal and Installation" Illustration)

NOTE

It may not be necessary to remove all six valve sections if only one needs to be replaced. In such a case remove only those lines to the section being replaced. Use extreme care to adequately support the other sections and to avoid damaging the seals between sections.

1. Lower attachments to ground and remove ignition key.

2. Remove performance monitor and front cowl assembly to gain access to valve.
3. Identify and label all valve linkage and hydraulic lines to insure correct installation after repair.
4. Disconnect valve linkage at valve.
5. Remove all dirt near hydraulic fittings to prevent dirt from entering the system.
6. Loosen each hydraulic fitting to be disconnected just enough to wriggle the line to relieve pressure. Disconnect hydraulic line. Cap line and plug port to prevent loss of fluid and entry of dirt.



MAIN CONTROL VALVE BANK REMOVAL AND INSTALLATION

SECTION 8D. MAIN CONTROL VALVE (ALL)**Disassembly (See "Main Control Valve Repair" Illustration)**

1. Mark each valve section to insure correct position of parts during reassembly. Recommended method is to use a fine point punch to make an indentation on each section corresponding to its section number (ie. one punch mark for section #1, two punch marks for section #2, and so on).

NOTE

Do not separate valve sections unless there is a leak between sections or a section(s) needs to be replaced.

2. Place control valve on work bench with section #1 down.
3. Remove nuts (2).
4. Remove one section (3-8) at a time from the bolts (2). Discard seals.

Inspection

Inspect all mating surfaces of end plates and valve sections, especially seal areas for nicks, burrs, scoring, or cracks.

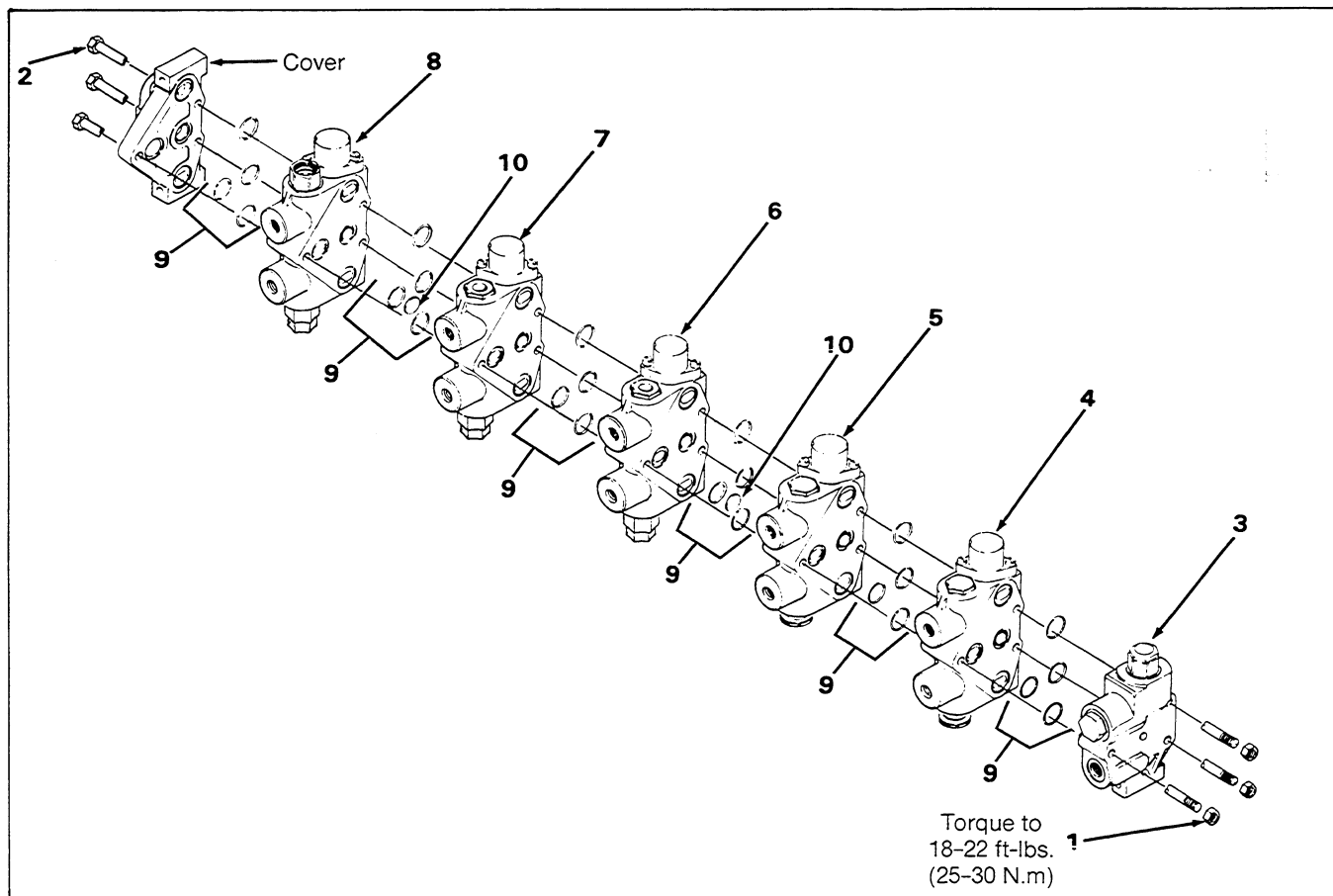
Assembly

1. Apply a thin layer of clean oil to seals (9) and install seals and discs (10) as each section (3-8) is assembled over tie bolts (2).
2. Install nuts (1). Tighten nuts to 18-22 ft-lbs (25-30 N.m).

Installation**NOTE**

If a valve section has been replaced, install hydraulic tube fitting from discarded section onto replacement section. Clean fitting threads and apply loctite.

1. Install valve and connect hydraulic lines.
2. Connect control linkage. Adjust linkage if necessary, as described in Section 2 — CONTROLS.
3. Test control valve as specified in "Hydraulic Test Procedures."

**MAIN CONTROL VALVE REPAIR**

SECTION 8E. SEQUENCE VALVE REPAIR**REPAIR**

Repair of the sequence valve is limited to the replacement of damaged parts and the addition or removal of shims as required to obtain desired movement of lift cylinders.

SEQUENCE VALVE ADJUSTMENT

The sequence valve has been factory pre-set and under normal operating conditions should not require adjustment. The rear mower should raise and lower within 15" (381 mm) or less of the front mowers. Check raising and lowering with engine at operating speed. If for some reason adjustment is desired, the following procedure should be followed:

**WARNING**

To avoid possible serious bodily injury, always lower the reels and stop the engine before making any adjustments to the sequence valve. Extreme care must be used to prevent dirt from entering valve when adding or removing shims. Always wipe the area around the fittings and caps before removing them. Wear eye protection and avoid contact with hot oil.

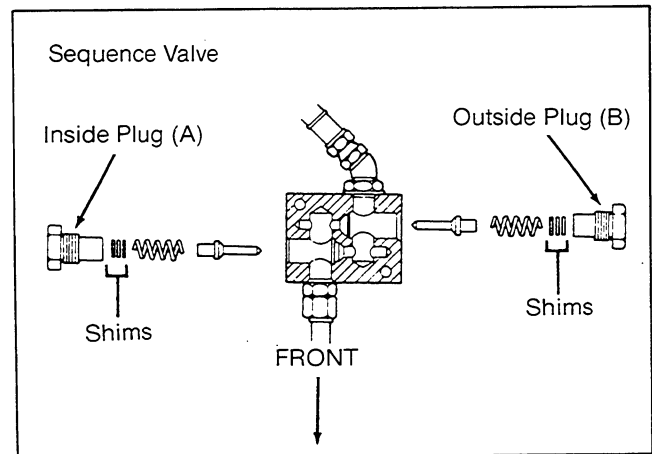
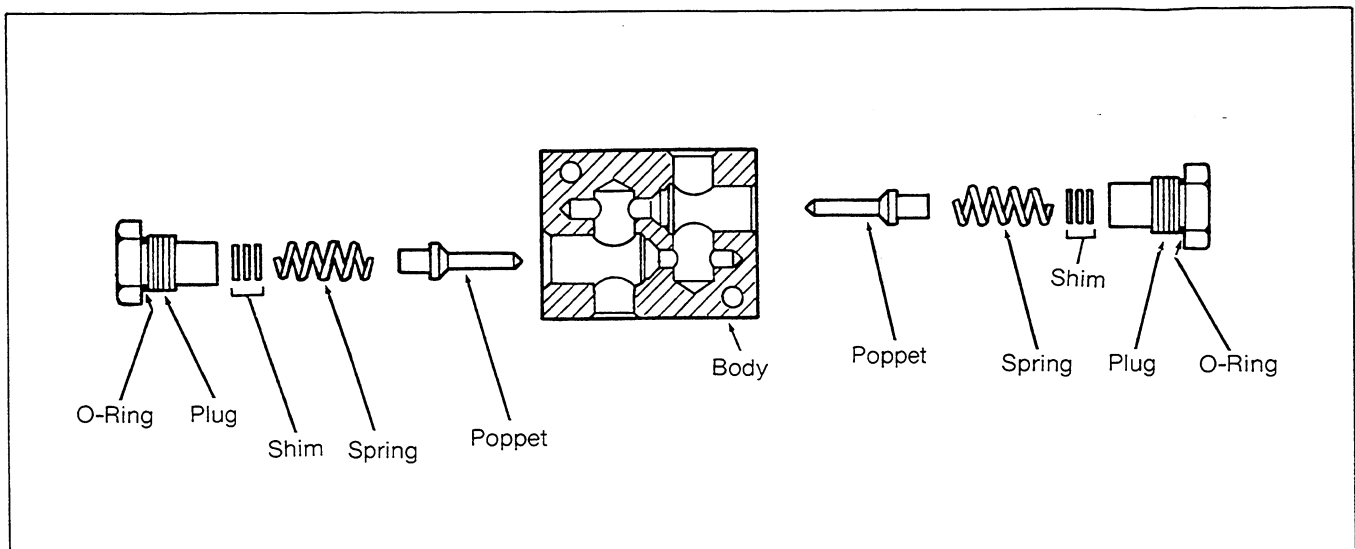
Delayed Lowering Adjustment

1. If the rear mower lowers too soon, remove the inner sequence valve plug (A) and add shims as required between the spring and the plug.

2. If the rear mower lowers too late, remove shims as required from under the inner sequence valve plug (A).

Delayed Raising Adjustment

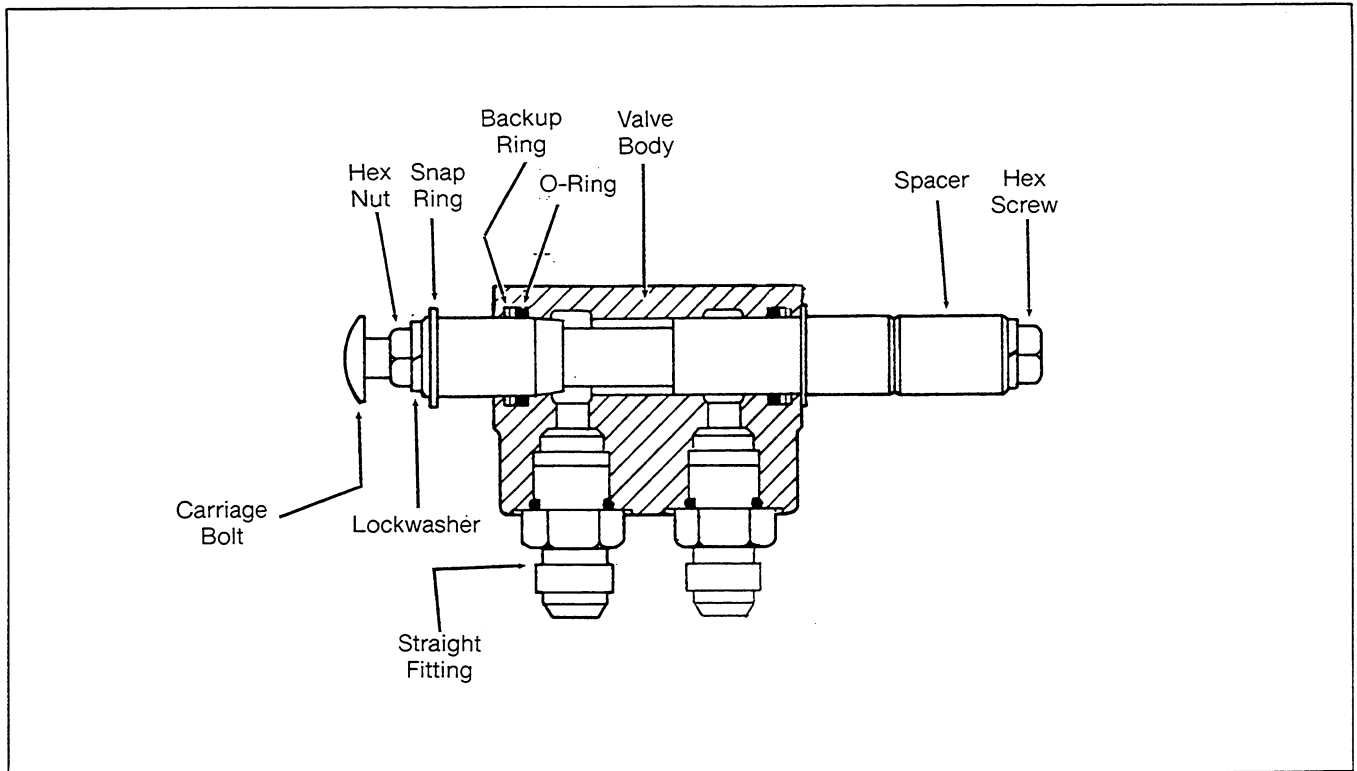
1. If the rear mower lifts too soon, remove the outer sequence valve plug (B) and add shims as required between the spring and plug.
2. If the rear mower lifts too late, or if an objectionable high-pitched squeal is heard, remove shims as required from under the outer sequence valve plug (B).

**SEQUENCE VALVE ADJUSTMENT****8E****SEQUENCE VALVE REPAIR**

SECTION 8F. TRACTION METERING VALVE REPAIR

TRACTION METERING VALVE REPAIR

Repair of the traction metering valve is limited to the replacement of O-rings (leaking valve) and damaged parts.



8F

TRACTION METERING VALVE REPAIR

SECTION 8G. ATTACHMENT LIFT CYLINDERS

GENERAL

All Green King IV and TF-60 tractors use either one of two makes of hydraulic cylinders for attachment lift/lower function. Either make of cylinder may be found on the front or rear (center) attachment location. All cylinders used on the tractor are basically the same except for the method of retaining the seal guide and the barrel clevis (mounting end). Repair of the cylinder is limited to replacement of seals or damaged parts.

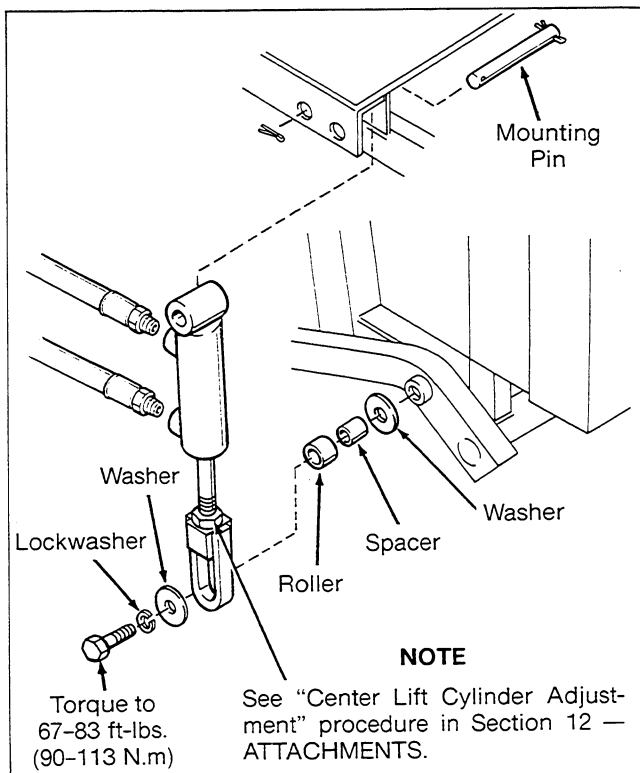


CAUTION

During repair of cylinder use extreme care not to damage rod threads or sealing surfaces of cylinder parts.

REMOVAL (See "Lift Cylinder Removal and Installation" Illustration)

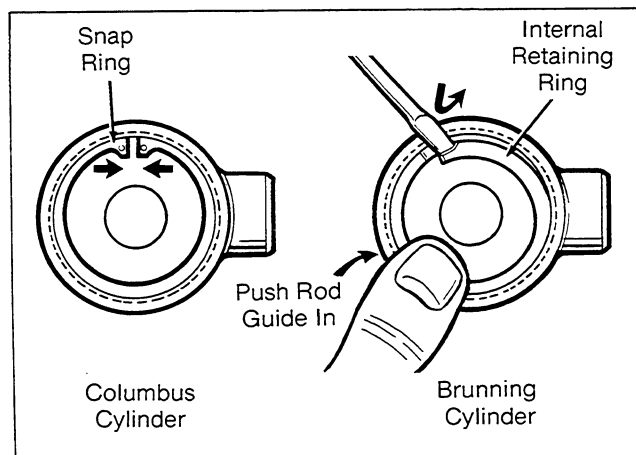
1. Lower attachments to ground and remove ignition key.
2. Clean area around hose fittings. Label hoses to aid in reconnection. Remove hoses, plug cylinder ports and cap hose fittings.
3. Remove attaching hardware as necessary to free cylinder from frame.



CENTER LIFT CYLINDER REMOVAL AND INSTALLATION

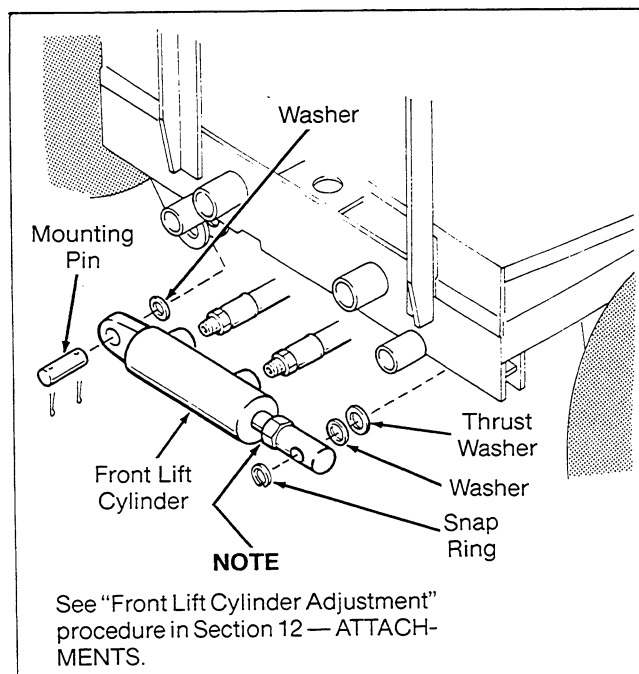
REPAIR (See "Cylinder Repair" Illustration)

1. Clean and air dry complete exterior of cylinder.
2. Remove port plug closest to clevis on barrel end and drain oil.
3. See "Cylinder Retaining Ring Removal" illustration.
 - a. (Columbus cylinders only.) Remove snap ring.
 - b. (Bunning cylinders only.) Remove external retaining ring and spacer. Push rod guide back into cylinder to expose internal retaining ring. Remove internal retaining ring using a screwdriver.



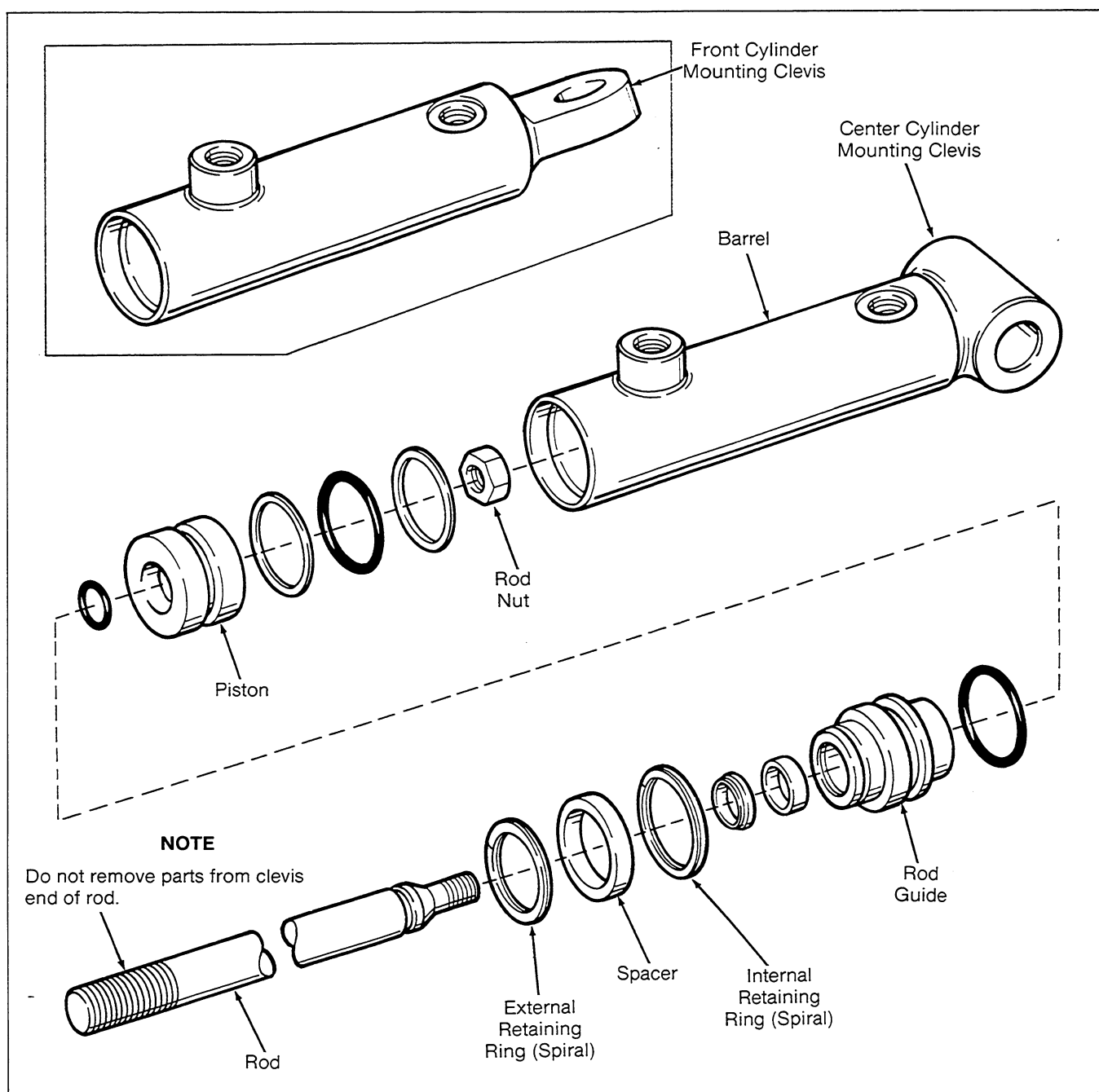
CYLINDER RETAINING RING REMOVAL

8G



FRONT LIFT CYLINDER REMOVAL AND INSTALLATION

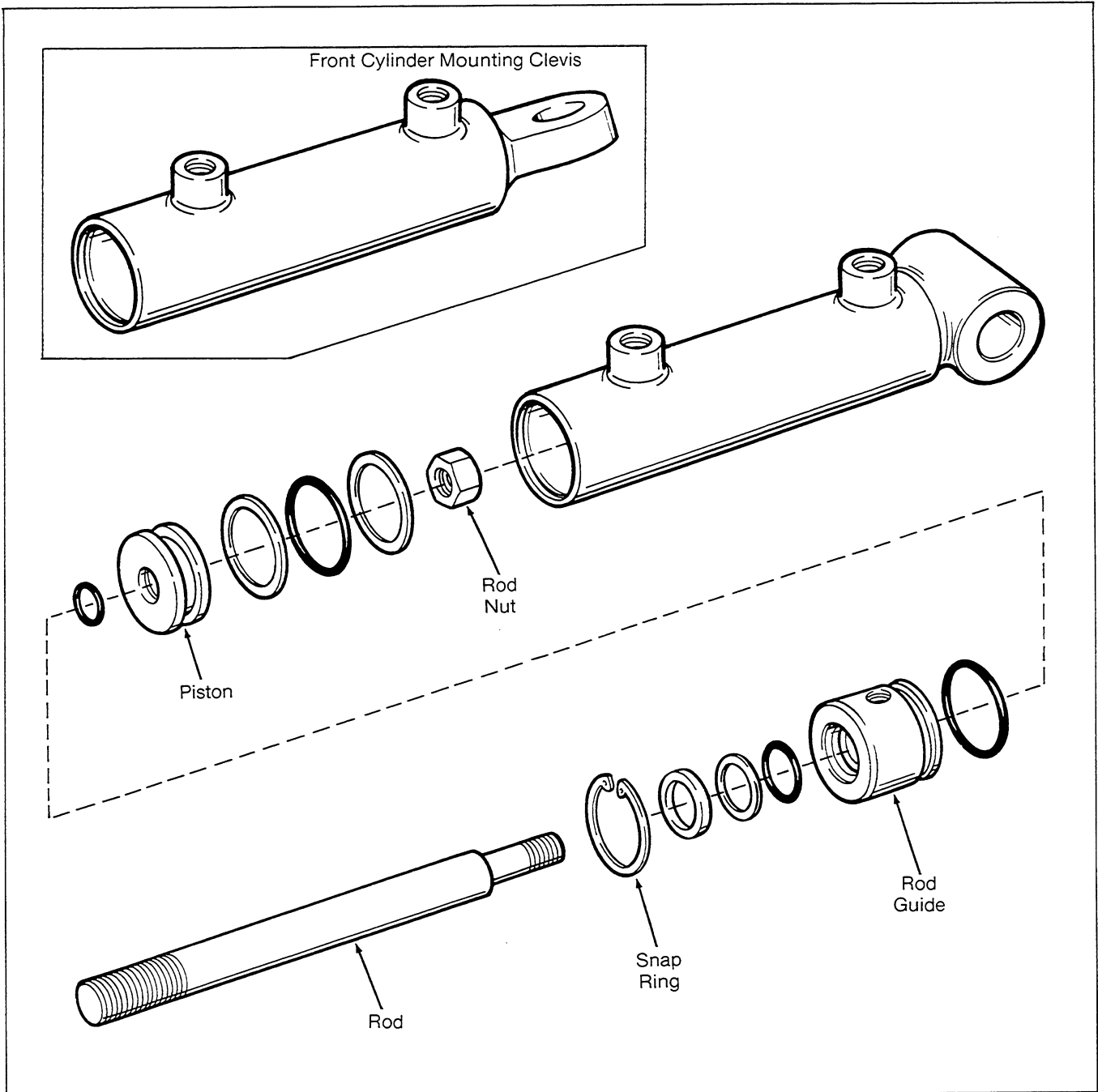
SECTION 8G. ATTACHMENT LIFT CYLINDERS



BRUNNING LIFT CYLINDER REPAIR

4. Secure barrel in a soft jaw vise. Remove entire rod guide and piston assembly by pulling out on rod.
5. Remove rod nut. Slide rod guide and piston assemblies from back of rod. Do not remove the parts from the clevis end of rod.
6. Clean and dry parts. Inspect rod guide and piston for damage. Inspect inside of barrel (especially near ports) and barrel edge for nicks, burrs or scratches that would cause damage to seals or O-rings. Replace damaged parts.
7. Replace all seals, O-rings and back-up washers using a new seal kit (available from your Jacobsen Turf Products distributor). Apply a coat of clean oil to seals and O-rings before assembling.
8. Liberally apply clean oil to all parts and assemble rod guide and piston on rod from the barrel end. Install rod nut.
9. Liberally apply clean oil to inside of barrel and install assembled rod using care to avoid damaging barrel.

SECTION 8G. ATTACHMENT LIFT CYLINDERS



8G

COLUMBUS LIFT CYLINDER REPAIR

10. a. (Columbus cylinders.) Install snap ring.
- b. (Brunning cylinders.) Install internal retaining ring in cylinder groove. Install spacer in cylinder and external retaining ring on rod guide.

INSTALLATION (See "Lift Cylinder Removal and Installation" Illustration)

1. Install cylinder and secure with attaching hardware as shown. Use new cotter pins.
2. Connect hydraulic hoses.
3. Start engine and actuate lift/lower pedal several times to establish oil flow to cylinders.
4. Check, and make adjustments if necessary, as described in Section 12 — ATTACHMENTS.

SECTION 8H. TRACTION MOTOR

GENERAL

The traction motors receive hydraulic pressure from section #1 of the pump through section #1 of the main control valve. The motors provide "Mow" and "Transport" power to the two front wheels.

NOTE

A special tool kit will be required for installation of seals on the traction motor. Order Tool Kit J26905 from your distributor.

REMOVAL (See "Traction Motor Removal" Illustration)

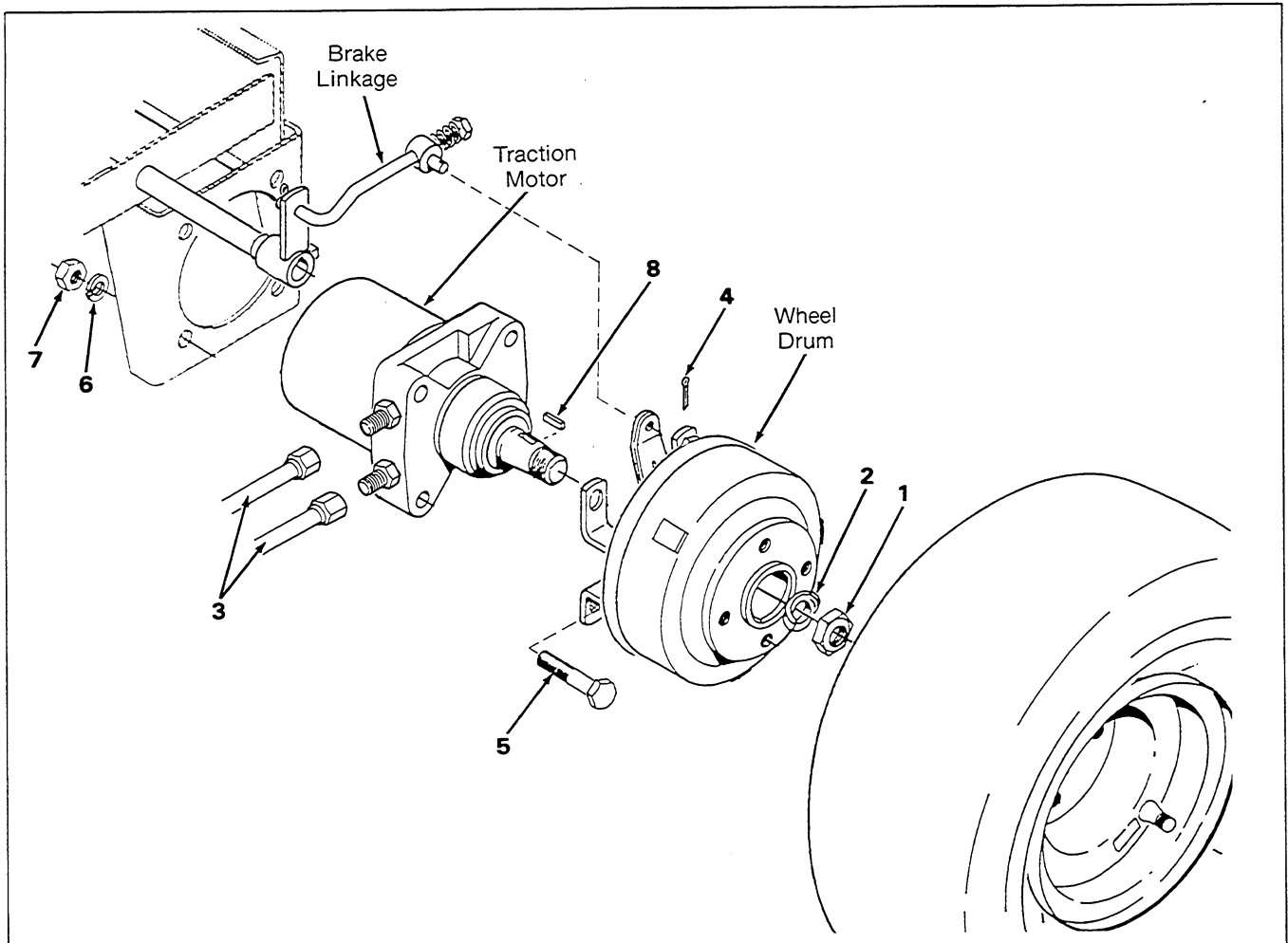
1. With parking brake ON and wheels blocked, loosen nut (1).
2. Remove tire and wheel assembly.
3. Remove all dirt around fittings and disconnect hydraulic lines (3). Cap lines and plug ports.
4. Remove nut (1) and washer (2).

5. Remove cotter pin (4) to disconnect brake linkage.
6. Remove four capscrews, lockwashers and nuts (5, 6, and 7).
7. Remove motor and drum from machine. Separate the motor and drum assemblies. Do not lose key (8).

HIGH PRESSURE SEAL REPLACEMENT (See "Traction Motor Repair" Illustration)

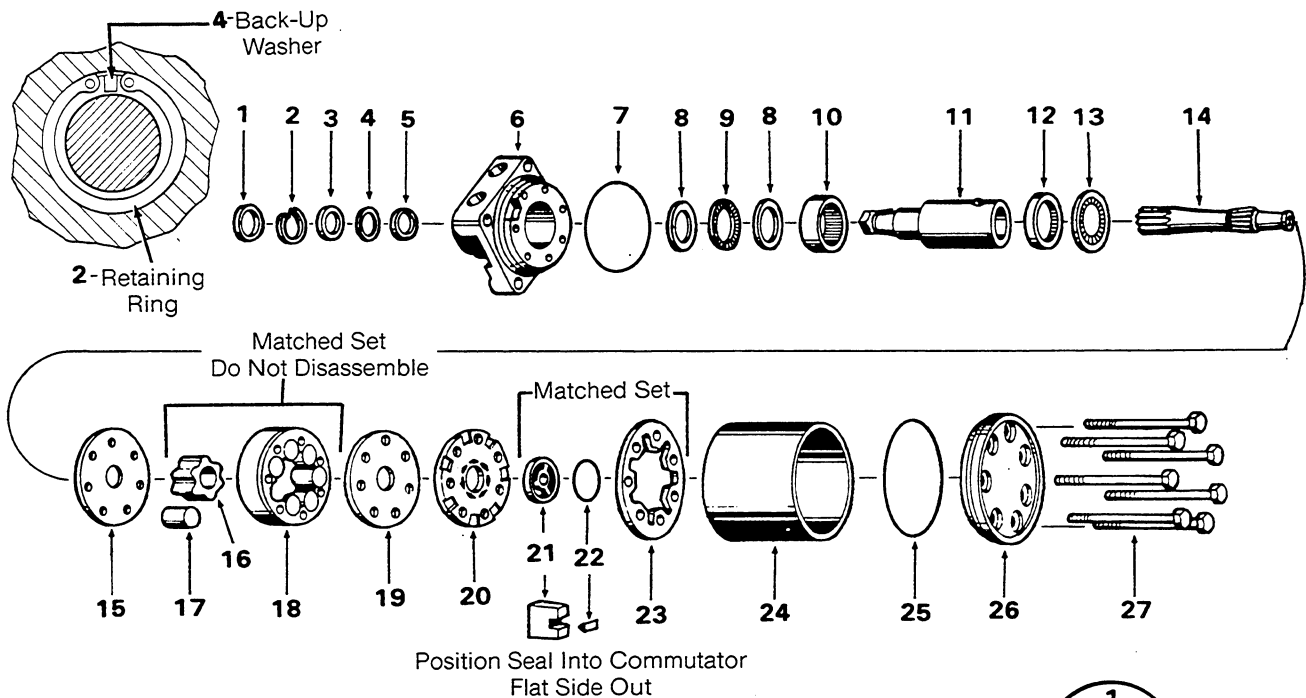
The High Pressure seal (5), if leaking, can be replaced without complete disassembly of the motor, proceed as follows:

1. Remove and discard dirt seal (1) and retaining seal (2).
2. Completely fill motor with oil. Plug ports and set motor in a clean pan. Place a clean rag around the coupling shaft seal area of the housing to prevent oil spray. Rotate coupling shaft rapidly in a counter-clockwise direction. Oil pressure generated by motor will eject backup washer (3), washer (4) and seal (5).

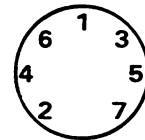


TRACTION MOTOR REMOVAL

SECTION 8H. TRACTION MOTOR

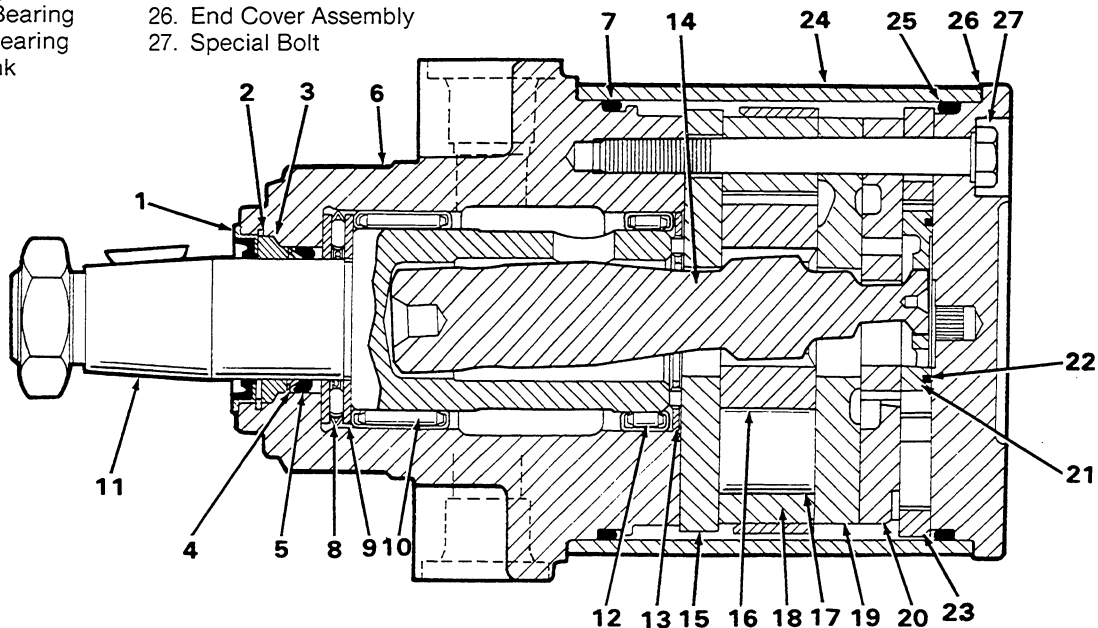


- | | |
|---------------------|------------------------------|
| 1. Dirt Seal | 15. Wear Plate |
| 2. Retaining Ring | 16. Rotor |
| 3. Spacer | 17. Vane |
| 4. Back-up Washer | 18. Stator and Ring Assembly |
| 5. Seal | 19. Manifold Plate |
| 6. Housing Assembly | 20. Manifold |
| 7. Seal Ring | 21. Commutator |
| 8. Thrust Washer | 22. Bonded Ring |
| 9. Thrust Bearing | 23. Commutator Ring |
| 10. Needle Bearing | 24. Sleeve Protector |
| 11. Coupling Shaft | 25. Seal |
| 12. Needle Bearing | 26. End Cover Assembly |
| 13. Thrust Bearing | 27. Special Bolt |
| 14. Drive Link | |



Tightening sequence:

Torque to
45-55 ft-lbs.
(60-72 N.m)



TRACTION MOTOR REPAIR

SECTION 8H. TRACTION MOTOR

3. Use Kent Moore Tool Kit No. J26905 to install new seal.
 - a. Insert seal compression ring tool with chamfered end inward, into housing (6) until it bottoms out. Install seal thimble tool over coupling shaft (11).
 - b. Coat new seal (5) with clean grease and assemble over seal thimble with lip side inward.
 - c. Push new seal into housing (6) with seal driver.
 - d. Remove seal driver, thimble and compression tools.
4. Hold washer (4) between thumb and index finger and slightly collapse washer to assemble into housing (6).
5. Assemble backup washer (3) tab side out, and retaining ring (2). Be sure rounded edge of retaining ring is faced inward, and that backup washer tab is between ends of retaining ring. Be sure the new retaining ring (2) is the same thickness as the one removed. (Seal kit contains two retaining rings to select from.)
6. Apply a small amount of clean grease to the back side of new seal (1) and install in housing.
7. Install motor as described below (see Installation, page 8-23).

DISASSEMBLY

1. Secure motor, in a soft jawed vise, at the housing (6) with shaft facing down.
2. Remove seven bolts (27), and end cover (26). Discard seal (25). It may be necessary to use a hammer and chisel to break end cover loose; be careful not to damage cover or sleeve (24).
3. Install two bolts (27) 180° apart back into the assembly. Lifting the two bolts remove parts (20-23). Discard bonded ring (22). It may be necessary to direct air pressure into ring groove to dislodge bonded ring.
4. Remove manifold (20) and manifold plate (19) again using two bolts as a lifting device.
5. Using care to keep rotor, vanes and stator parts together, remove parts (15-18) by using two bolts for lifting.
6. Remove coupling shaft (11) by pushing up on output end of shaft. Remove parts (13 and 14).
7. Remove sleeve (24) from housing (6) by prying up with a screwdriver.
8. Discard seal (7).
9. Remove parts (1-5) and discard seals and washers. Keep retaining ring (2) for replacement part comparison during reassembly.

10. Do not remove bearings (10 and 12) or parts (8 and 9) unless they are damaged and will be replaced. Inspect bearings for obvious signs of damage. Make sure all bearing rollers are in place and roll freely. Check for signs of corrosion or pitting. If needle bearings, thrust washers or thrust bearings show signs of damage remove as follows:

NOTE

If only outer bearing (12) is damaged, it can be removed with a bearing puller using care not to damage housing wearplate surface.

- a. Measure and record the depth of bearings (10 and 12) from housing wearplate face to insure correct installation of new bearings during reassembly.
- b. Remove housing from vise and place wearplate face down on two wood blocks in press.
- c. Press out bearings and parts (8 and 9) using a maximum 1.488 in. (37.80 mm) O.D. bearing driver. Discard thrust washers (8) and thrust bearing (9).

INSPECTION

1. Clean thoroughly all parts disassembled in a petroleum based solvent and air dry.
2. Inspect all parts carefully. Check for obvious signs of damage or excessive wear. Especially check:
 - a. Commutator (19) and commutator ring (21) for cracks or burrs. Inspect commutator for wear, scoring, or spalling. If either part is damaged, both parts must be replaced as a set.
 - b. Manifold plate (17) and manifold (18) for cracks, surface scoring or spalling. A polished pattern on the ground surfaces from the commutator or rotor rotation is normal.
 - c. Coupling shaft (11) for spalling, nicks, grooves, corrosion or discoloration. Check internal and external splines for damage. Wear near the seal area must not exceed 0.020 (0.51 mm) diametrically.
 - d. Sleeve (22) must be cylindrical and not have a "barrel" or "hour glass" shape. Inspect sleeve ends for severe nicks, burrs or corrosion.
 - e. Retaining ring groove on housing (6) must be free of burrs. Remove burrs or nicks with a scraping tool.
 - f. Housing (6) machined surfaces must be free of nicks, burrs and corrosion.
3. Replace any parts that do not meet the above criteria. Replace any other parts that appear excessively worn or are otherwise in questionable condition.

8H

SECTION 8H. TRACTION MOTOR

REASSEMBLY

Make sure all parts have been thoroughly cleaned, air dried and inspected. Use new seals and seal kits during reassembly. Lubricate all seals with SAE 10W40 oil or clean grease as each is assembled. Do not oil or grease other parts unless otherwise indicated.

1. If bearing components were removed, assemble new thrust washers (8) and new thrust bearing (9) into housing (6) bearing cavity.

NOTE

Press against the lettered end of bearing cage when pressing in a roller bearing assembly.

2. Use an appropriate size bearing driver and press in new bearing (10) which is 1.0 inch (25.4 mm) long, into housing (6) bearing bore to a depth of $2.410 \pm .010$ inch (61.2 ± 0.254 mm), measured from the housing wear plate contact surface.
3. Press in new bearing (12) which is .5 inch (12.7 mm) long into housing bearing bore to a depth of $.115 \pm .010$ inch (2.92 ± 0.254 mm) measured from the housing wear plate contact surface.

**CAUTION**

Bearings (10) and (12) must be assembled to the correct depths to assure the necessary clearance for thrust washer and thrust bearing (13) and to assure required bearing support.

4. Place housing (6) in a vise and clamp down on housing port bosses with small bore end pointed up. Apply clean grease to new seal (5) and assemble into housing with seal lip pointed inward.
5. Hold washer (4) between thumb and index finger and slightly collapse to assemble into housing (6).
6. Assemble backup washer (3) into housing (6) with the anti-rotation tab facing out.
7. Select a new retaining ring (2) from the seal kit, that is the same thickness as the retaining ring removed. Assemble the new retaining ring into housing (6). *Be sure rounded edge of retaining ring is faced inward and that backup washer tab is between ends of retaining ring.*
8. Apply a small amount of clean grease to back side of new seal (1) and assemble into housing (6).
9. Invert housing (6) in vise so that the large bore end is up.
10. Apply cellophane tape around keyway on coupling shaft (11) to prevent damaging seals.
11. Assemble coupling shaft (11), firmly seating it against outside thrust washer (8).

12. Assemble thrust bearing (13) onto end of coupling shaft.
13. Assemble drive link (14) into coupling (11) making sure splines are in mesh.

NOTE

Two alignment studs screwed finger tight into housing (6) bolt holes, approximately 180° apart, will facilitate the assembly and alignment of components in the following step. The studs can be made by cutting off the heads of 3/8-24 UNF 2A bolts that are over .5 inch (12.7 mm) longer than bolts (27).

14. Assemble wear plate (15) over drive link (14) and alignment studs.
15. Install assembled rotor set (16 thru 18) with counterbore in rotor (16) down, if applicable, and splines in mesh with drive link splines.

NOTE

If the rotor parts (16-18) have been disassembled and cannot easily be reassembled by hand proceed as follows:

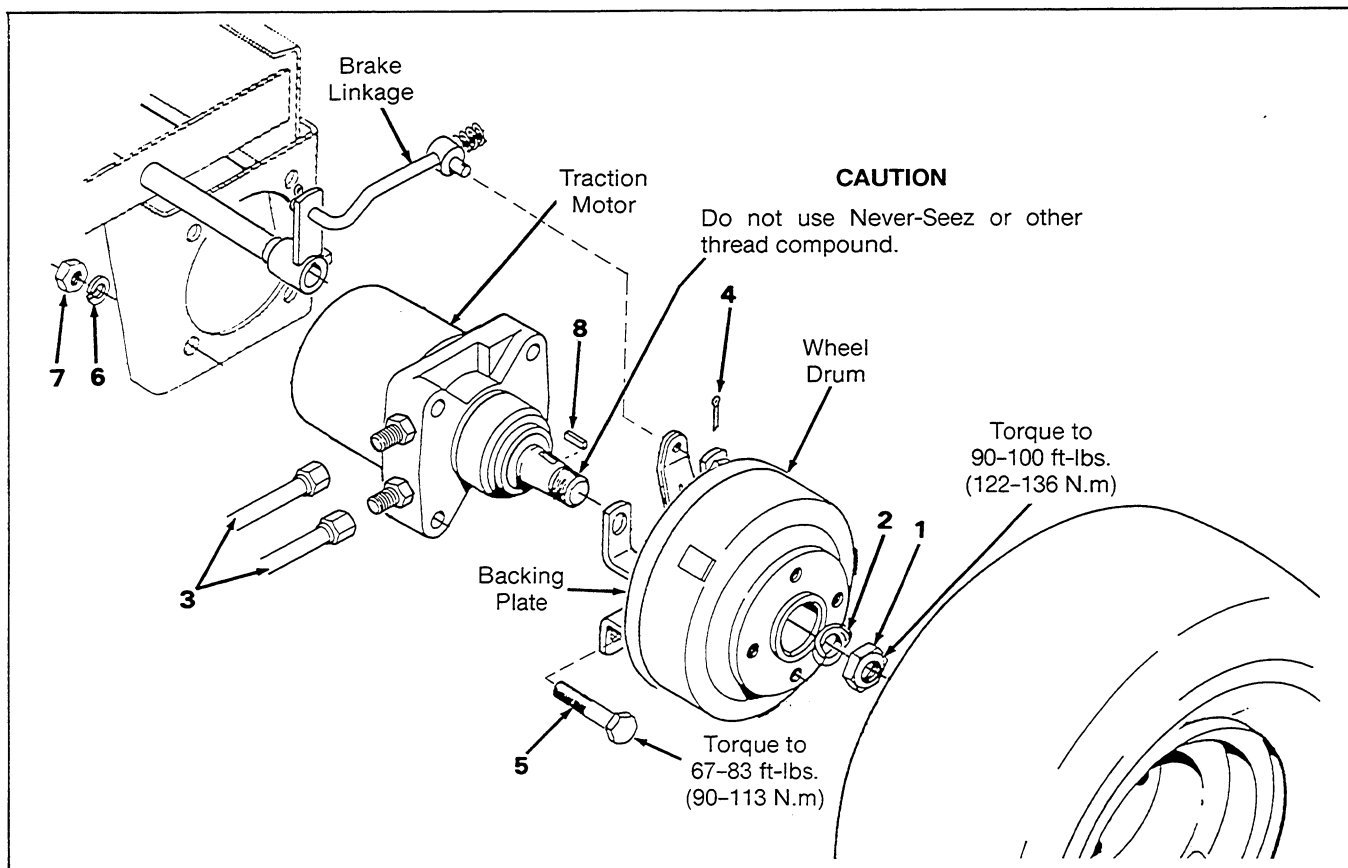
- a. Place stator (18) onto wear plate (15).
- b. If assembly alignment studs are not being utilized, align stator bolt holes with wear plate bolt holes and turn two bolts (27) finger tight into bolt holes 180° apart to keep stator and wear plate stationary.
- c. Assemble six vanes (17) into the stator vane pockets.
- d. Assemble rotor (16), counterbore down into stator (18) and onto wear plate (15) with rotor splines in mesh with drive link splines.
- e. Grasp the output end of coupling shaft (11) with locking pliers and rotate coupling shaft, drive link and rotor to seat the rotor and assembled vanes into stator, creating necessary clearance to assemble seventh vane.
16. Be sure swirls in manifold and manifold plate are faced together. Assemble manifold plate (19), manifold (20) and commutator ring (23) over the drive link (14) onto rotor set.
17. Assemble a new seal ring (20), flat side up, into commutator (19) as shown on exploded view. Install commutator with seal side up.
18. Install a new seal (7) on housing (6).
19. Apply a generous amount of SAE 10W40 to both ends of sleeve (24) and assemble onto housing.
20. Install a new seal ring (7) onto end cover (26) and assemble end cover onto sleeve (24).
21. Install two bolts (27) finger tight. Remove both alignment studs and install remaining five bolts.

SECTION 8H. TRACTION MOTOR

22. Alternately and, in steps, tighten bolts to 45–55 ft-lbs. (60–72 N.m) as shown on exploded view.
23. Use Tool Kit No. J26905 to install new seal.
 - a. Insert seal compression ring tool with chamfered end inward, into housing (6) until it bottoms out. Install seal thimble tool over coupling shaft (11).
 - b. Coat new seal (5) with clean grease and assemble over seal thimble and lip side inward.
 - c. Push new seal into housing (6) with seal driver.
 - d. Remove seal driver, thimble and compression tools.
24. Hold washer (4) between thumb and index finger and slightly collapse washer to assemble into housing (6).
25. Assemble backup washer (3) tab side out, and retaining ring (2). Be sure rounded edge of retaining ring is faced inward, and that backup washer tab is between ends of retaining ring. Be sure the new retaining ring (2) is the same thickness as the one removed. (Seal kit contains two retaining rings to select from.)
26. Apply a small amount of clean grease to the back side of new seal (1) and install in housing.
27. Before installing motor as described below the following checks are recommended:
 - a. Pressurize the motor to 100 psi (6.9 bar) with dry nitrogen and submerge in solvent to check for external leaks.
 - b. Check motor for rotational torque. It should not take more than 50 ft-lbs. (68 N.m) torque to rotate shaft.

INSTALLATION (See “Traction Motor Installation” Illustration)

1. Install key (8).
2. Install motor and wheel backing plate and secure with four capscrews, lockwashers and nuts (5–7). Tighten capscrews to 67–83 ft-lbs. (90–113 N.m).
3. Connect brake linkage with cotter pin (4).
4. Install washer (2) and nut (1). Tighten nut to 90–100 ft-lbs. (122–136 N.m).
5. Connect hydraulic lines. See torque specifications under General Instruction in this section.
6. Install tire and wheel assembly. Torque wheel bolts to 65–85 ft-lbs. (88–115 N.m).

**TRACTOR MOTOR INSTALLATION**

SECTION 8I. REEL MOTOR

GENERAL

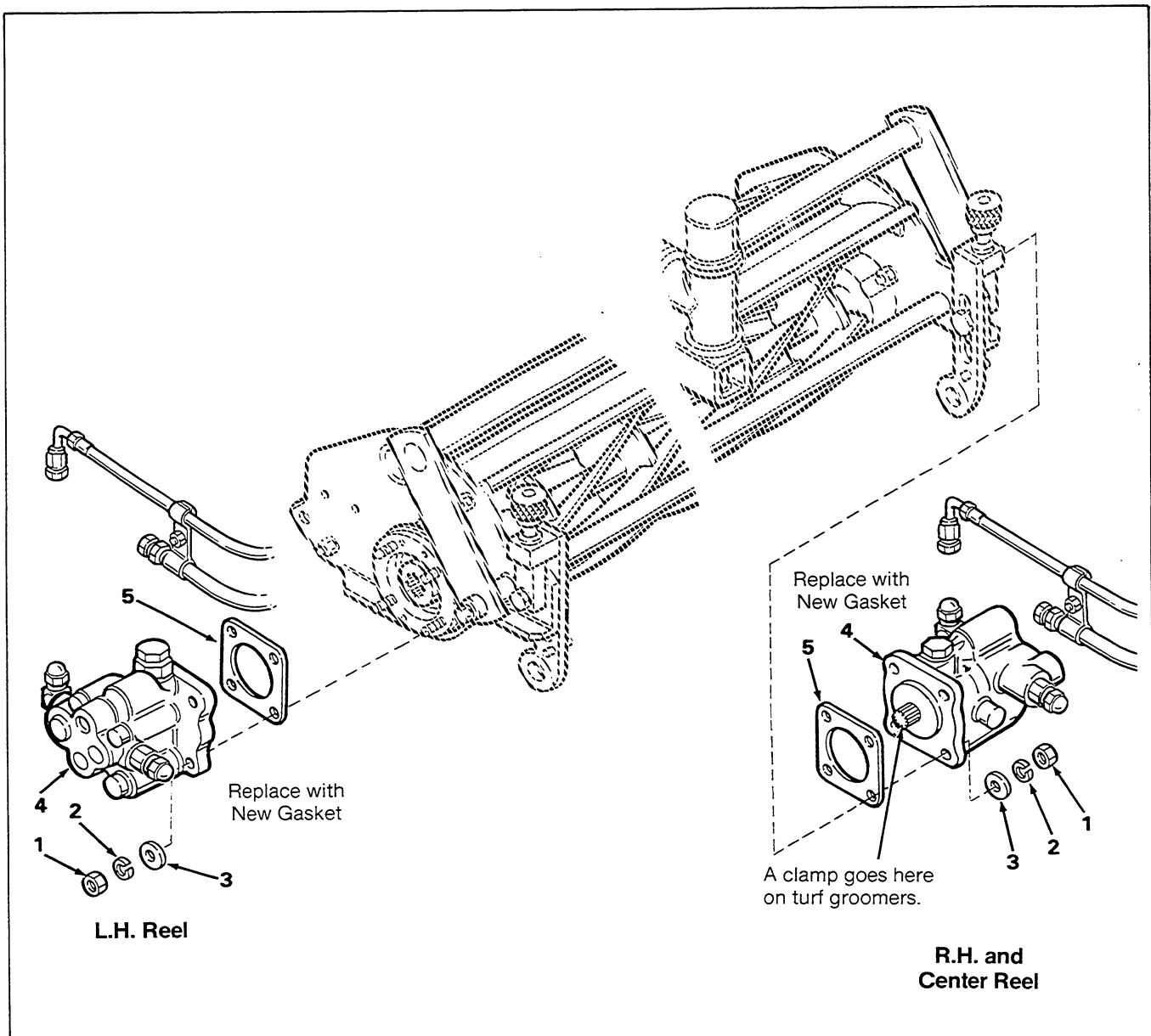
The reel motors for all three attachment reels are the same. Repair for the reel motor is limited to the replacement of seals or replacement of the complete motor if other damage exists.

NOTE

Do not disassemble reel motor until testing unit as described in "Hydraulic Test Procedure."

REMOVAL (See "Reel Motor Removal and Installation" Illustration)

1. Lower attachments to ground and remove ignition key.
2. Clean area around hose connections. Label and disconnect hydraulic lines at motor. Cap motor fittings and plug hose fittings.
3. Remove attaching hardware (1-3) and motor (4). Discard gasket (5).



REEL MOTOR REMOVAL AND INSTALLATION

SECTION 8I. REEL MOTOR**REPAIR (See "Reel Motor Repair" Illustration)****Disassembly**

1. Clean complete exterior of motor.
2. Disassemble motor as shown in "Repair" illustration except, do not remove roller bearings or gerotor assembly.
3. Discard seals.

Inspection

1. Clean and air dry all parts.
2. Inspect parts for damage or sign of excessive wear.

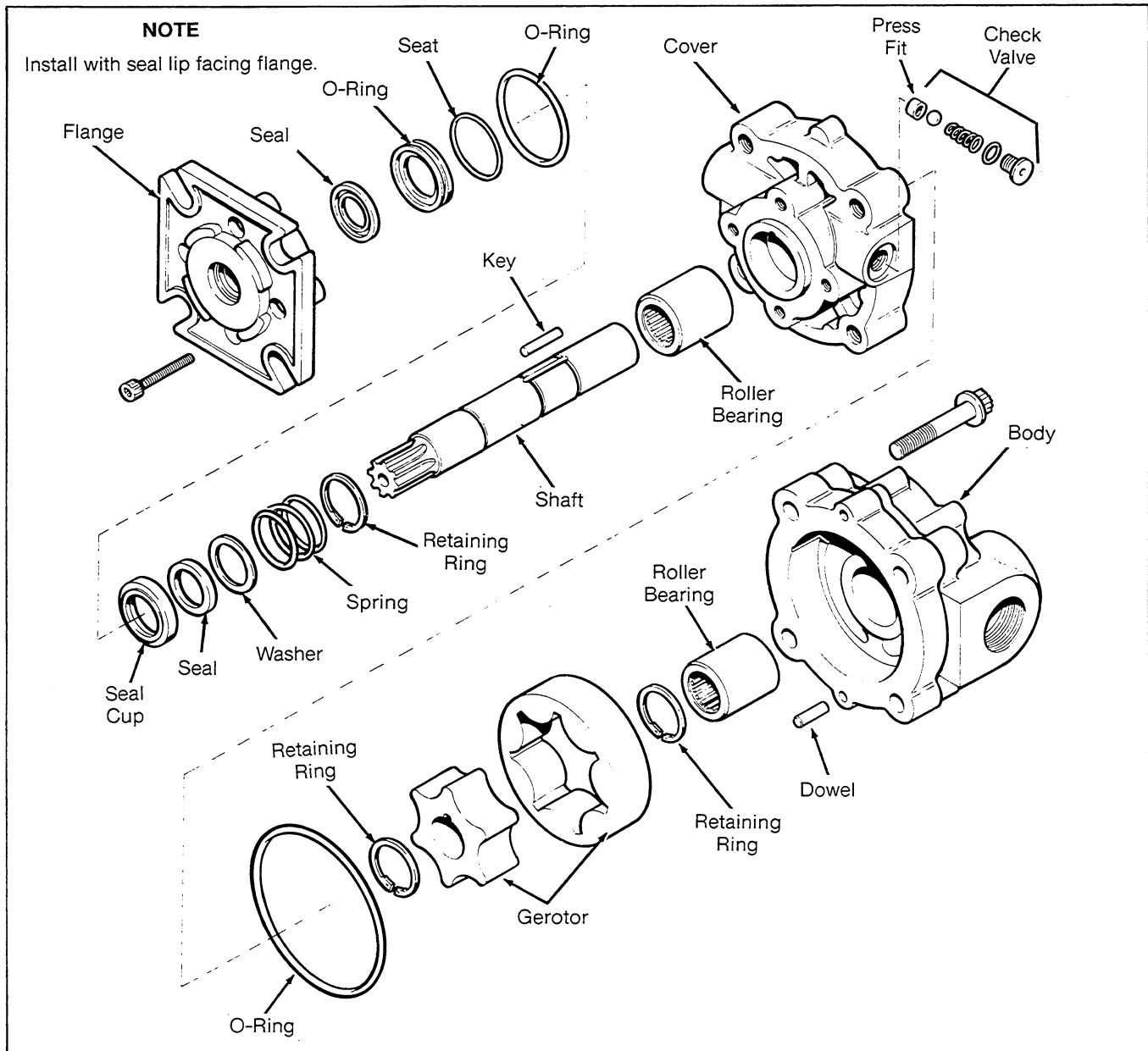
Replace complete motor if roller bearings, shaft, gerotor or check valve is damaged.

Reassembly

1. Assemble with a new seal kit.
2. Apply a coat of clean oil to all parts.
3. Assemble as shown on "Repair" illustration.

NOTE

Make sure seals are positioned as shown. Use care to not damage seals as they are assembled over splined shaft.

**REEL MOTOR REPAIR**

SECTION 8I. REEL MOTOR

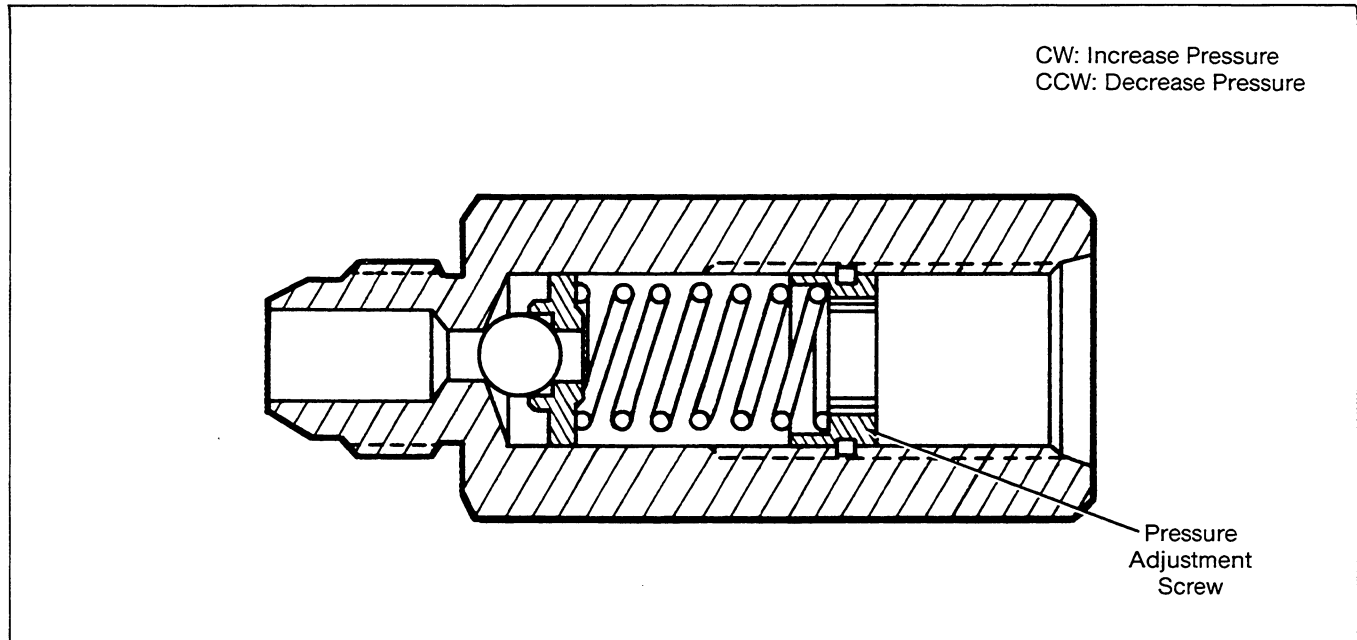
INSTALLATION (See “Reel Motor Removal and Installation” Illustration)

1. Install motor with a new gasket (5) and secure with attaching hardware (1–3).
2. Connect hydraulic lines.
3. Start engine and operate reel motor. Check for leaks.
4. Check hydraulic tank level.

SECTION 8J. POWER STEERING RELIEF VALVE

POWER STEERING RELIEF VALVE REPAIR

Repair of the relief valve is limited to adjusting pressure only. Press set at 900 ± 90 psi.



POWER STEERING RELIEF VALVE

8J

SECTION 8K. HYDRAULIC TEST PROCEDURES**GENERAL**

The purpose of this manual is to provide a guide for testing the Greens King IV hydraulic system. There are two types of hydraulic tests that can be performed: 1) Field tests; and 2) Instrument tests. To avoid reaching faulty conclusions regarding the condition of the components, it is recommended that all tests be completed in the sequence presented. Also, 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.
- Use care working around HOT oil.
- Wear safety glasses at all times.
- Keep hands and feet away from the reels.
- Engine must be shut off and attachments lowered to ground when making adjustments or hydraulic connections.

PRELIMINARY CHECKS

The following preliminary checks should be made before performing any tests.

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

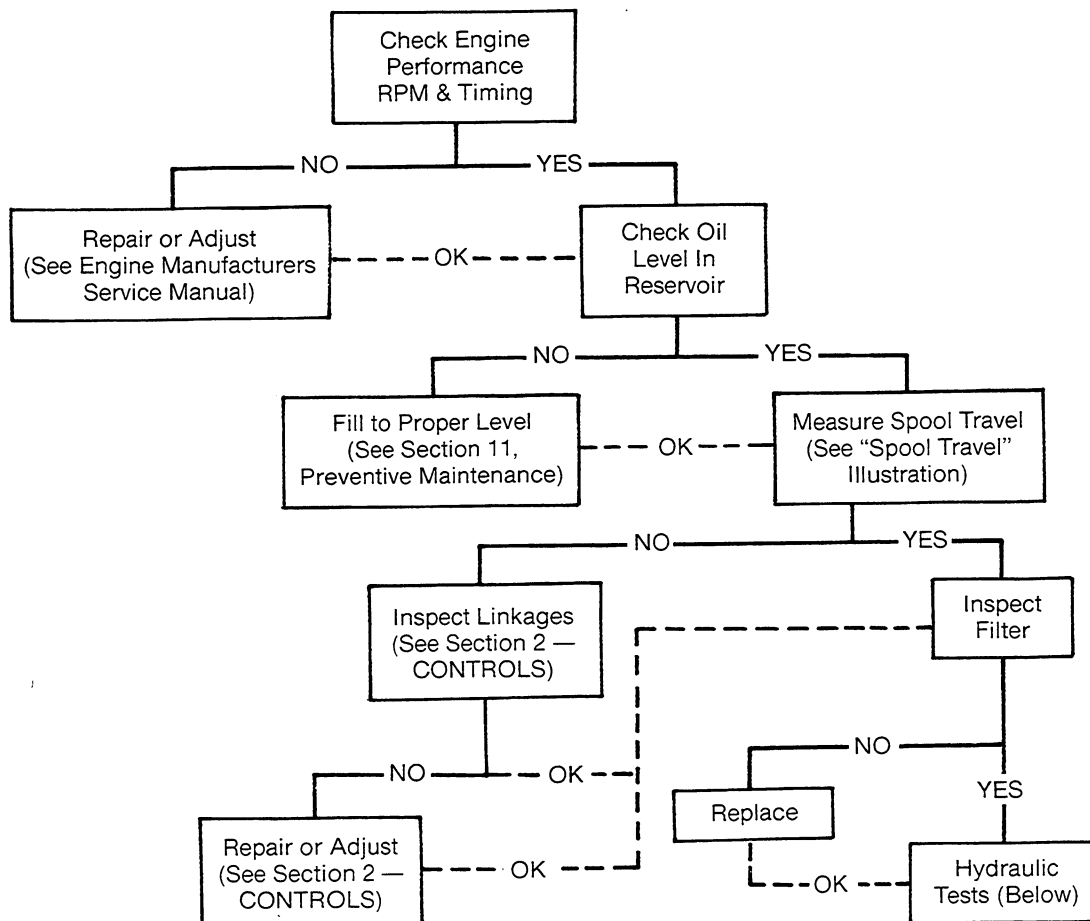
If any of the above symptoms appear, or if the hydraulic oil becomes contaminated, or after a major component failure, the system should be flushed and changed.

NOTE

Use only the recommended hydraulic oil (see Section 11 — Preventive Maintenance). 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.
3. To eliminate all possible mechanical problems first, complete the steps below before starting the hydraulic tests.

**8K**

SECTION 8K. HYDRAULIC TEST PROCEDURES**FIELD TESTS****CAUTION**

Before performing hydraulic tests, back off the bedknife from the reel. This will eliminate damage to the reel and/or bedknife when in operation.

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. If further testing is necessary, proceed to INSTRUMENT TESTS.

PUMP (ALL PRODUCTS)
(See "Pump Field Test" Illustration)

1. Locate pump section supplying the circuit experiencing a problem.

NOTE

This test can be performed for hydraulic circuits supplied by pump sections #2, 3 or 4.

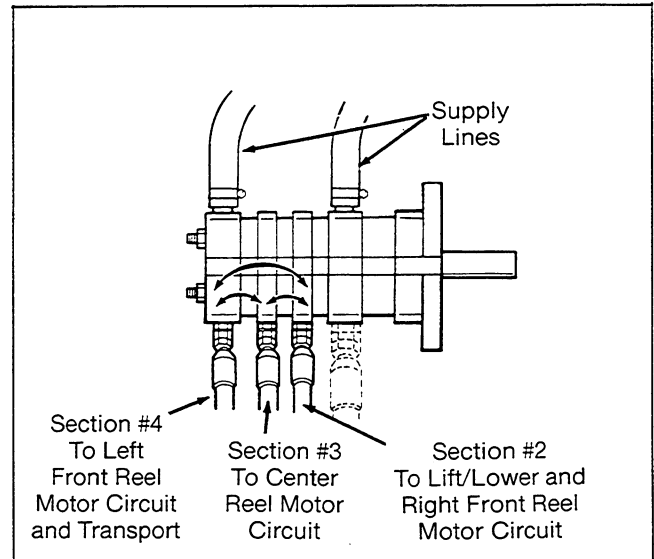
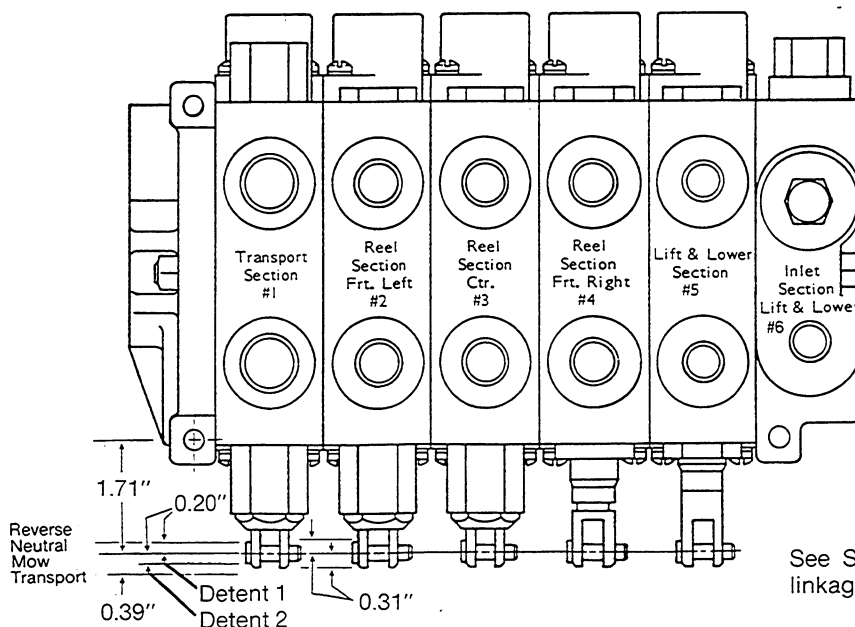
2. Switch the pump outlet hose from the problem circuit with either of the hoses from the other circuits (#2, 3 or 4 only).
3. Start the engine and engage lever for section to which problem hose was switched.

For example:

Assume there was a problem with the center reel motor not working and you switched that hose (at

pump section #3) with the left front reel motor hose (pump section #2):

- If the left front reel motor does not work but the center reel motor works, the problem is at the pump (section #3).
- If after making the switch the center reel motor still does not work, the problem could be in the motor, valve or the hydraulic lines.

**PUMP FIELD TEST****NOTE**

See Section 2 — CONTROLS for linkage adjustment.

SPOOL TRAVEL

SECTION 8K. HYDRAULIC TEST PROCEDURES

**TRACTION METERING VALVE
(PRODUCT 62221 ONLY)**
(See "Traction Metering Valve Field Test
(Product 62221 Only)" Illustration)

**WARNING**

The traction metering valve is now bypassed. The traction will immediately move when the traction lever is engaged.

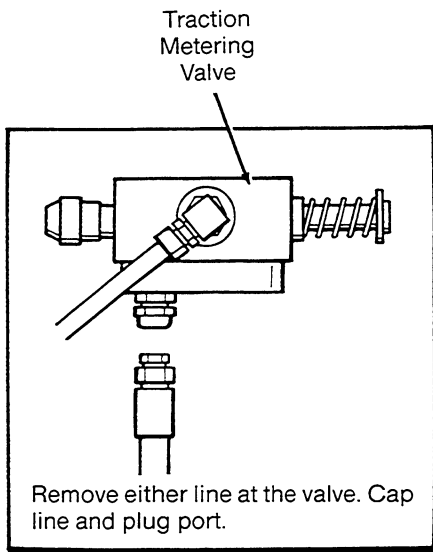
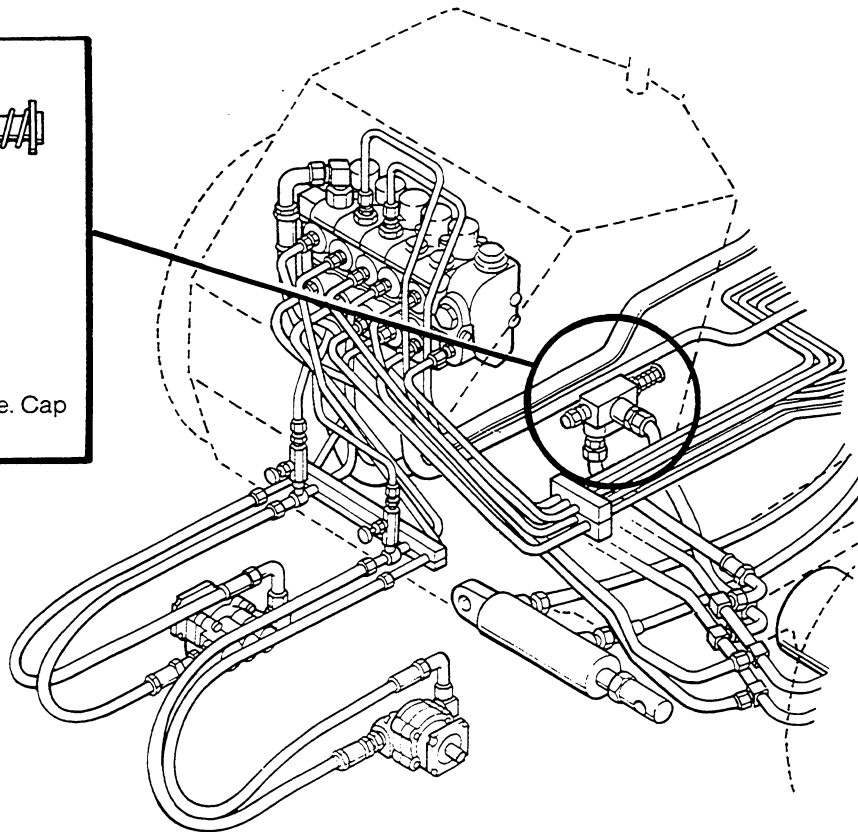
NOTE

This test is performed when a slow ground speed problem exists.

1. Remove either hydraulic line at valve. Cap line and plug valve port.

2. Engage traction lever:

- If ground speed is faster, the valve needs to be cleaned (around carriage bolt), adjusted (see Section 2B), or replaced.

**STEP 1****8K****TRACTION METERING VALVE FIELD TEST (PRODUCT 62221 ONLY)**

SECTION 8K. HYDRAULIC TEST PROCEDURES

TRACTION METERING VALVE
(PRODUCTS 62225, 62226, 62608, 62610 and
62300, 62620 and 62622 ONLY)
(See "Field Test" Illustration)

NOTE

This test is performed when a slow ground speed problem exists.

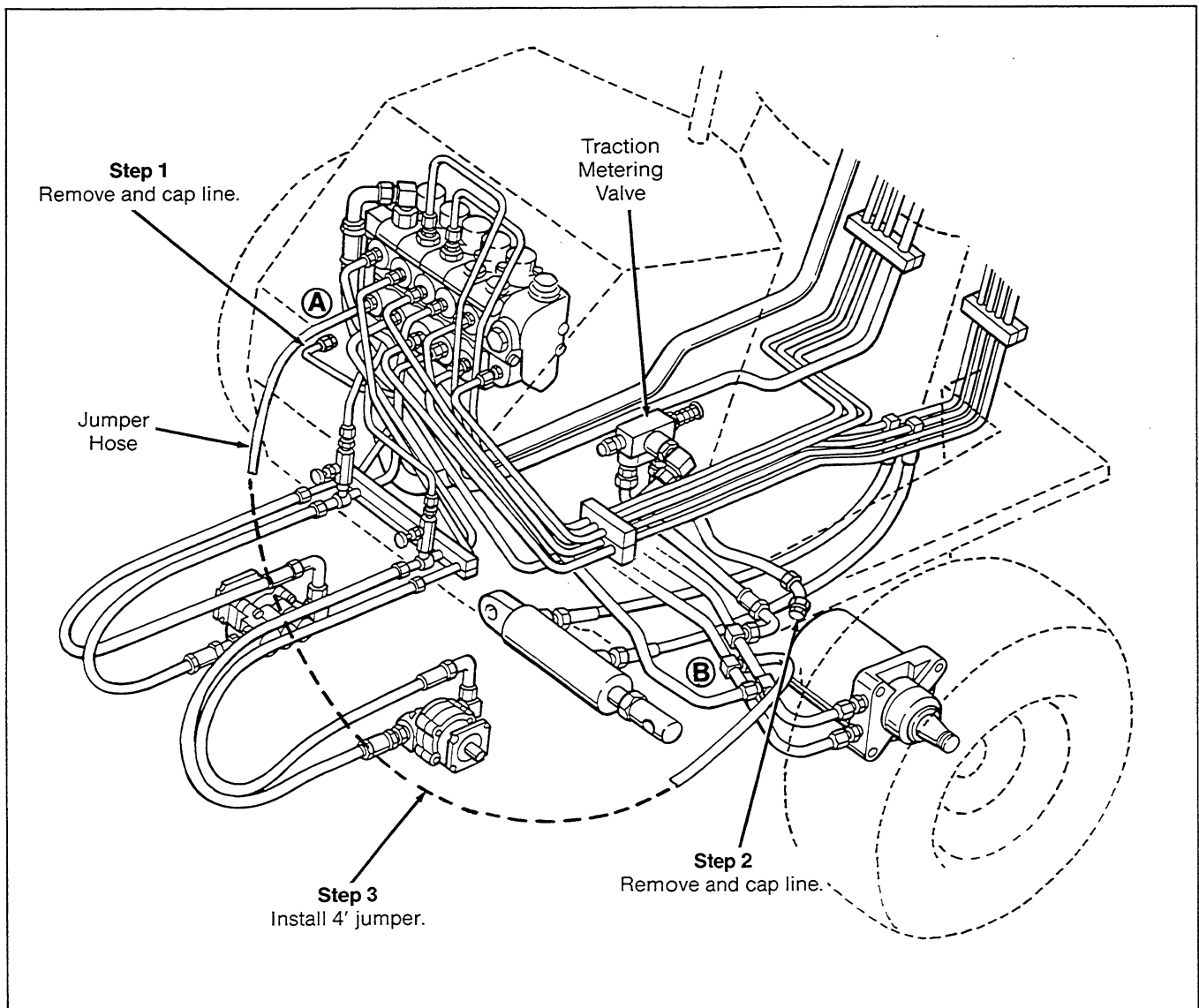
1. Remove and cap bottom hydraulic line at main valve section #1 (A).
2. Remove and cap hose from traction metering valve to motor line at (B).
3. Connect a 4' jumper hose between bottom section #1 valve port (A) and bottom motor line fitting (B).

4. Engage traction lever:

- If ground speed is faster, the valve needs to be cleaned (around carriage bolt), adjusted (see Section 2B), or replaced.

**WARNING**

The tractor metering valve is now bypassed. The tractor will immediately move when the traction lever is engaged.



TRACTION METERING VALVE FIELD TEST (PRODUCTS 62225, 62226, 62608, 62610
and 62300, 62620, 62622 ONLY)

SECTION 8K. HYDRAULIC TEST PROCEDURES

REEL MOTORS (See “Reel Motor Field Test” Illustration)

If a failure is suspected in one of the reel motors, first perform the FIELD PUMP test. If the failure still exists, proceed as follows:

1. Switch the hydraulic supply lines from one front reel motor to the other.

NOTE

The supply line is the smaller diameter hose.

2. Start engine and engage appropriate reel lever.

- If the problem follows the switch, the failure is back in the hydraulic circuit. Proceed to the appropriate INSTRUMENT TEST to isolate the problem.

- If the problem does not follow the switch, the motor, coupling, or reel is faulty.

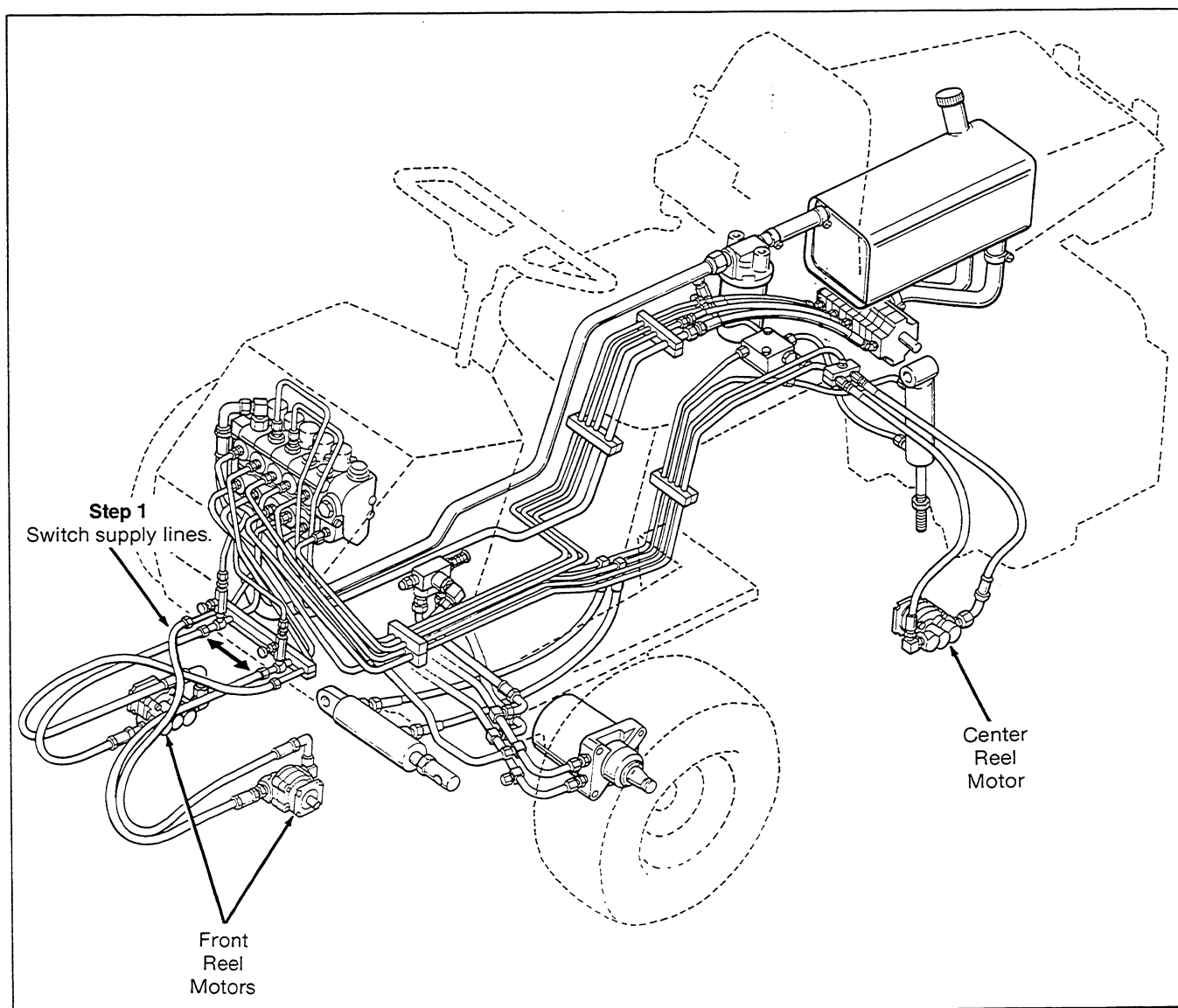
3. Remove the reel motor and exchange it with another reel motor in the system.

NOTE

On the front two reel motors it is not necessary to disconnect hydraulic lines. Just move motor to other reel.

- If the problem follows the switch, the motor is faulty.

- If the problem does not follow the switch, the reel or coupling is faulty.



REEL MOTOR FIELD TEST (ALL)

8K

SECTION 8L. INSTRUMENT TESTS**GENERAL****NOTE**

See the first page of this section for the tools and materials required for the instrument tests described below.

IMPORTANT

All of the tests in this section must be connected to a tester as shown in the "Instrument Test Line Connections" illustration. The test values you obtain will be compared to standard pressure and flow readings as shown in Tables 1 through 5 at the end of this section. When using tester with variable gpm settings, make sure tester is set for the proper flow range to avoid damage to the test instrument. Values obtained during these tests must be recorded on these tables. Therefore, it is important that you accurately run all tests at 3300 engine RPM and 110–130 degrees Fahrenheit oil temperature.

NOTE

Hydraulic hoses and fittings required for instrument tests:

A. Hoses adaptable from the test instrument to the following 37 degrees flare sizes:

- 1) #6 9/16–18
- 2) #8 3/4–16
- 3) #10 7/8–14

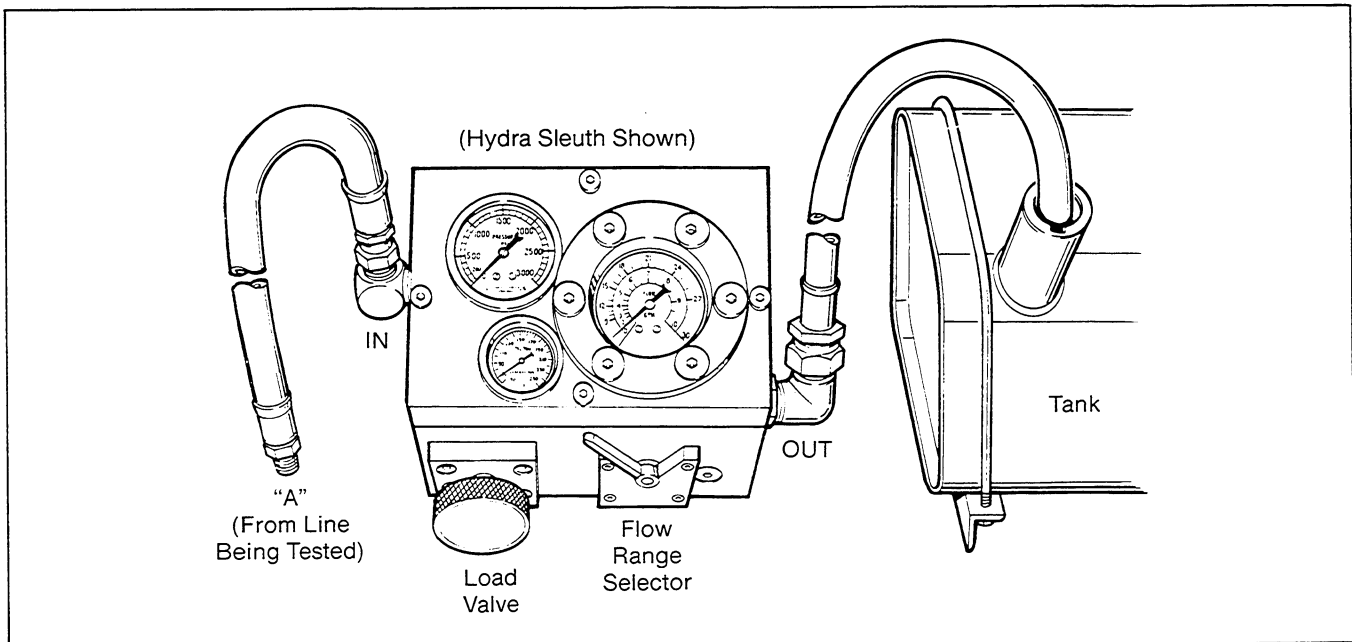
B. A jumper hose 4 feet long, size #8 3/4–16 with #10 7/8–14 female 37 degree flare swivels on each end.

C. #10 nipple.

PUMP (See "Pump Instrument Test Connection" Illustration)**NOTE**

The pump sections are referred to by numbering each section from the shaft end. See "Pump Sections" illustration.

1. Lower attachments to ground, stop engine and remove ignition key.
2. Raise both drive wheels off of the ground and set the parking brake.
3. Disconnect and plug hose from 45 degree elbow at the pump section to be checked.
4. Connect the hose from the "In" port of the tester to the elbow on the pump section.
5. Place the hose from the "Out" port of the tester into the neck of the oil tank and secure.
6. Set the tester flow control to the appropriate flow range. Open the load valve all the way.
7. Make sure traction lever is in neutral and the reel control levers are in the OFF position.
8. Start the engine and advance throttle to obtain 3300 RPM.
9. Slowly turn the load valve in (close) until the pressure gauge on the tester reads 1000 psi. Allow the oil temperature to reach 120 degrees F.

8L**INSTRUMENT TEST LINE CONNECTIONS**

SECTION 8L. INSTRUMENT TESTS

NOTE

DO NOT exceed 1500 psi.

10. Turn load valve in until pressure reaches 1500 psi.
11. Record flow at 1500 psi in Table 1 for the pump section being tested.
12. Fully open the load valve and record the no load flow in Table 1.
13. Stop engine.

Repeat the above steps to test each pump section. Refer to Table 1 for the correct values.

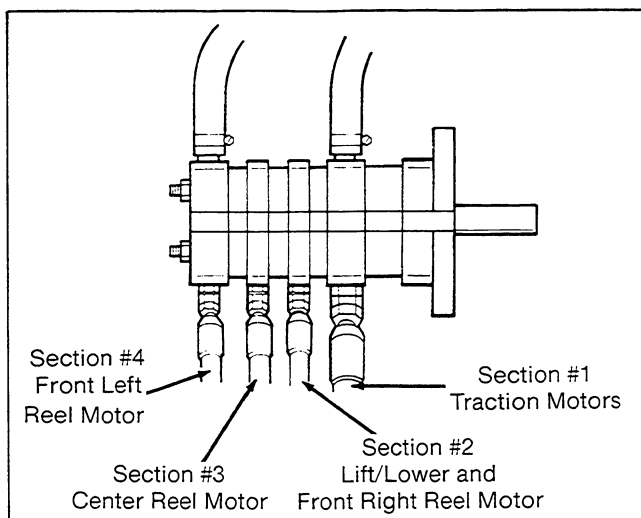
Conclusion

If your values are other than the correct values shown on Table I, replacement of the pump could be necessary. If your values are correct, go on the next test.

TRACTION VALVE**NOTE**

The valve bank sections are numbered from left to right when facing the front of the machine. See "Spool Travel" illustration.

1. Raise both drive wheels off of the ground and set the parking brake.
2. Disconnect and plug the one inch metal line from the top port of the control valve traction section #1.
3. Install a tee at the top port of the control valve traction section and cap one end of the tee.
4. Connect the hose from the "In" port of the tester to the tee at (A).
5. Place the hose from the "Out" port of the tester into the neck of the oil tank and secure in place.
6. Fully open the load valve and place the flow control in the appropriate flow range.

**PUMP SECTION**

7. Start the engine and advance the throttle to 3300 RPM.

**CAUTION**

Be careful not to shift the traction control lever into "TRANSPORT" when the tester is in low flow range or damage to the tester will result.

8. Shift the traction control lever in the "MOW" position.
9. Slowly turn in the load valve until the pressure gauge reads 1000 psi. Allow the oil temperature to reach at least 120 degrees F.
10. Record the flow rate (on tester) at 1500 psi and 120 degrees F. in Table II.
11. Slowly close load valve until pressure gauge needle stops moving. Record this reading (relief valve pressure) on Table II.

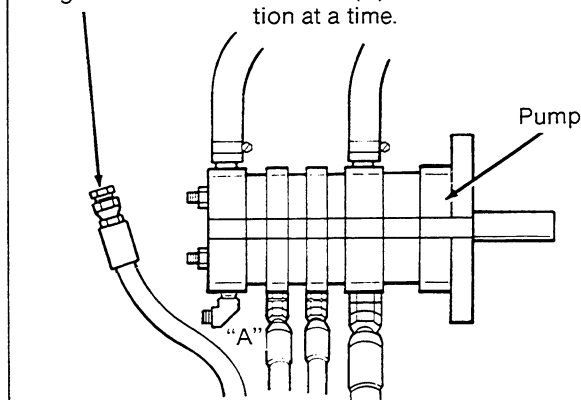
**CAUTION**

Do not exceed 2500 psi, or damage to the hydraulic system may result.

12. Fully open the load valve.
13. Shift the tester flow control to the appropriate flow range for transport flow test.
14. Shift the traction control lever into the "TRANSPORT" position.
15. Slowly turn the load valve in (close) to 500 psi and record the flow rate in Table II under Transport.
16. Open the load valve on tester and stop engine.

NOTE

Plug hose removed. Connect (A) to tester. Test one section at a time.

NOTE**PUMP INSTRUMENT TEST**

SECTION 8L. INSTRUMENT TESTS**Conclusion**

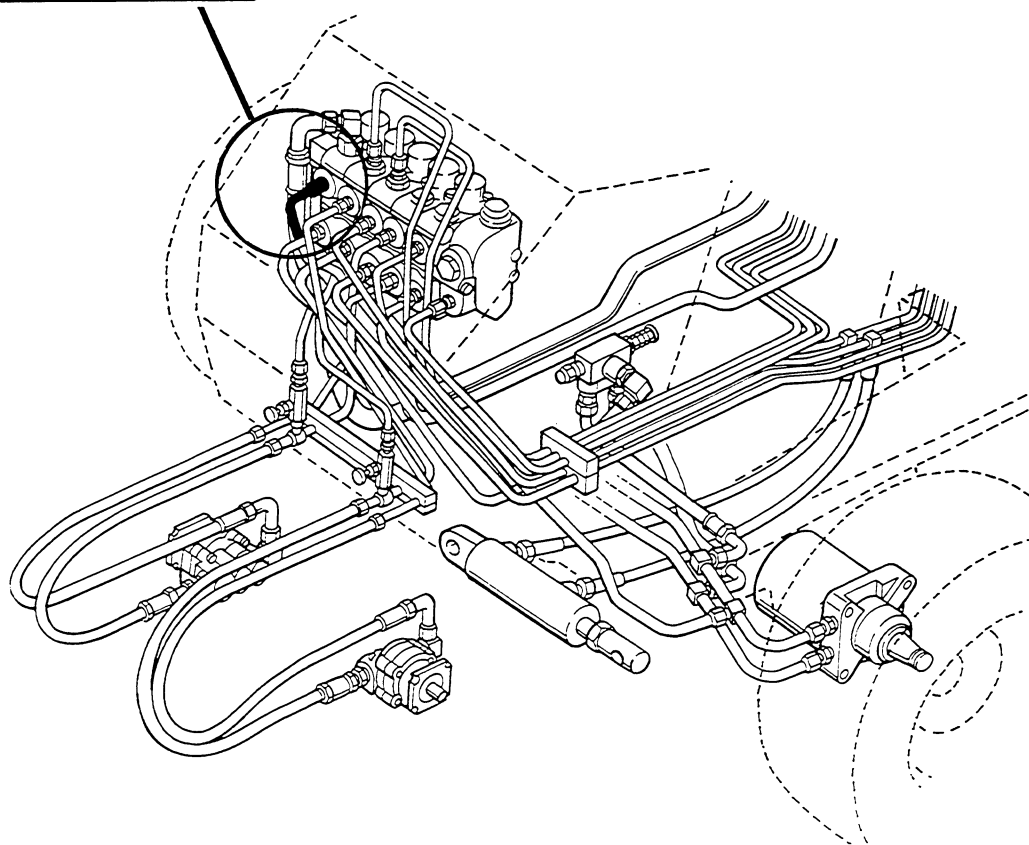
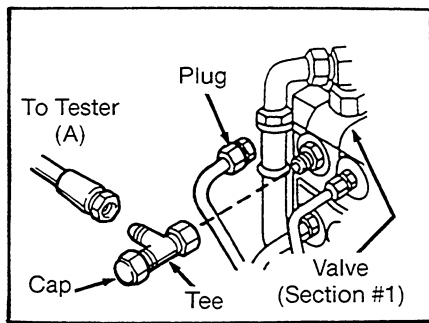
The relief valve setting should be $1500 \text{ psi} \pm 10\%$. If your value is not within the above range, adjust or replace the relief valve cartridge in Section 1 of the control valve. Adjustment is achieved by adding (increase pressure) or removing (decrease pressure) shims in relief cartridge and repeating test until correct relief valve setting is obtained.

The mow reading from Table II should equal your Pump Test reading from Table I, Section I, at 1500 psi.

The transport reading from Table II should equal the sum of your pump test reading from Table I, Sections 1 and 3, at 1500 psi.

If your readings from mow or transport are not within $\pm 10\%$ of your readings from Table 1 at 1500 psi, then repair or replacement of the control valve or control valve sections is required (see Control Valve earlier in this section).

If this section of the valve checks out, it will be necessary to proceed with the next test.

**8L****TRACTION VALVE INSTRUMENT TEST**

SECTION 8L. INSTRUMENT TESTS

**TRACTION METERING VALVE
(PRODUCT NO. 62221 ONLY)
(See "Test" Illustration)**

1. Remove the cap on the tee connected in the previous test to the traction section #1 of the valve. Connect the end of a four foot jumper hose to the tee (B).
2. Remove the metal line from the tee of the top metal line of the traction motors.
3. Connect the other end of the hose to the tee in the top line of the traction motor line (C).
4. Set the parking brake.
5. Turn in (close) the load valve on the tester.
6. Start the engine and advance the throttle to obtain 3250 rpm.
7. Shift the traction lever into the "MOW" position.

8. Slowly step on the accelerator pedal.

NOTE

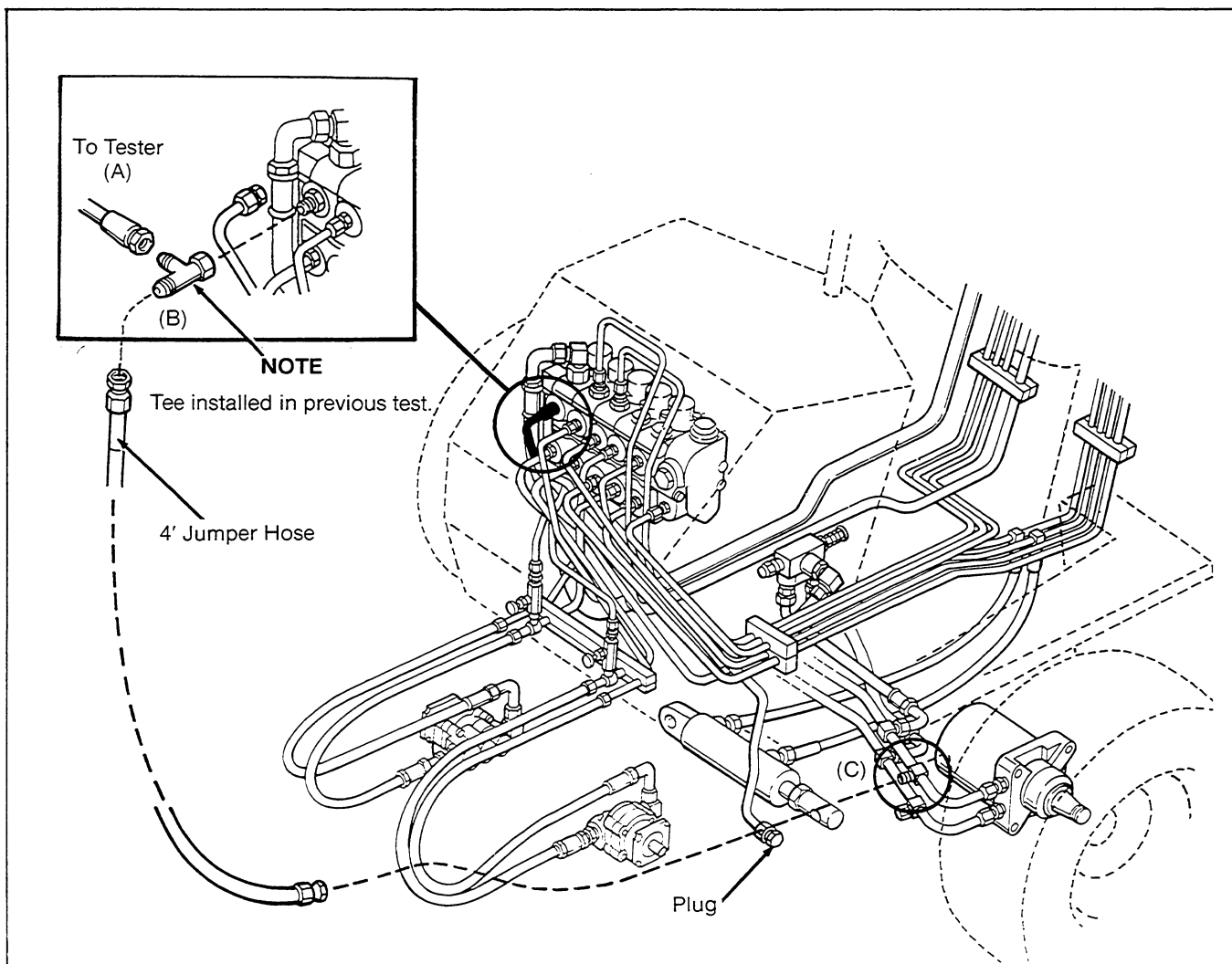
If the parking brake will not hold the wheels from turning, apply foot pressure to the brake pedal.

9. Pressure should read 1500 psi $\pm$ 10%.
10. Release the accelerator pedal. Shift traction to "NEUTRAL" and stop engine.

Conclusion

If the pressure in step 9 was not 1500 psi $\pm$ 10%, the Traction Metering valve has internal leakage and must be corrected. If the pressure in step 9 was 1500 psi $\pm$ 10%, the Traction Metering valve is good and the problem is in the traction motor(s).

It will be necessary to proceed with the INDIVIDUAL TRACTION MOTOR TEST to determine which traction motor is defective.



TRACTION METERING VALVE INSTRUMENT TEST (PRODUCT 62221, 62606 ONLY)

SECTION 8L. INSTRUMENT TESTS

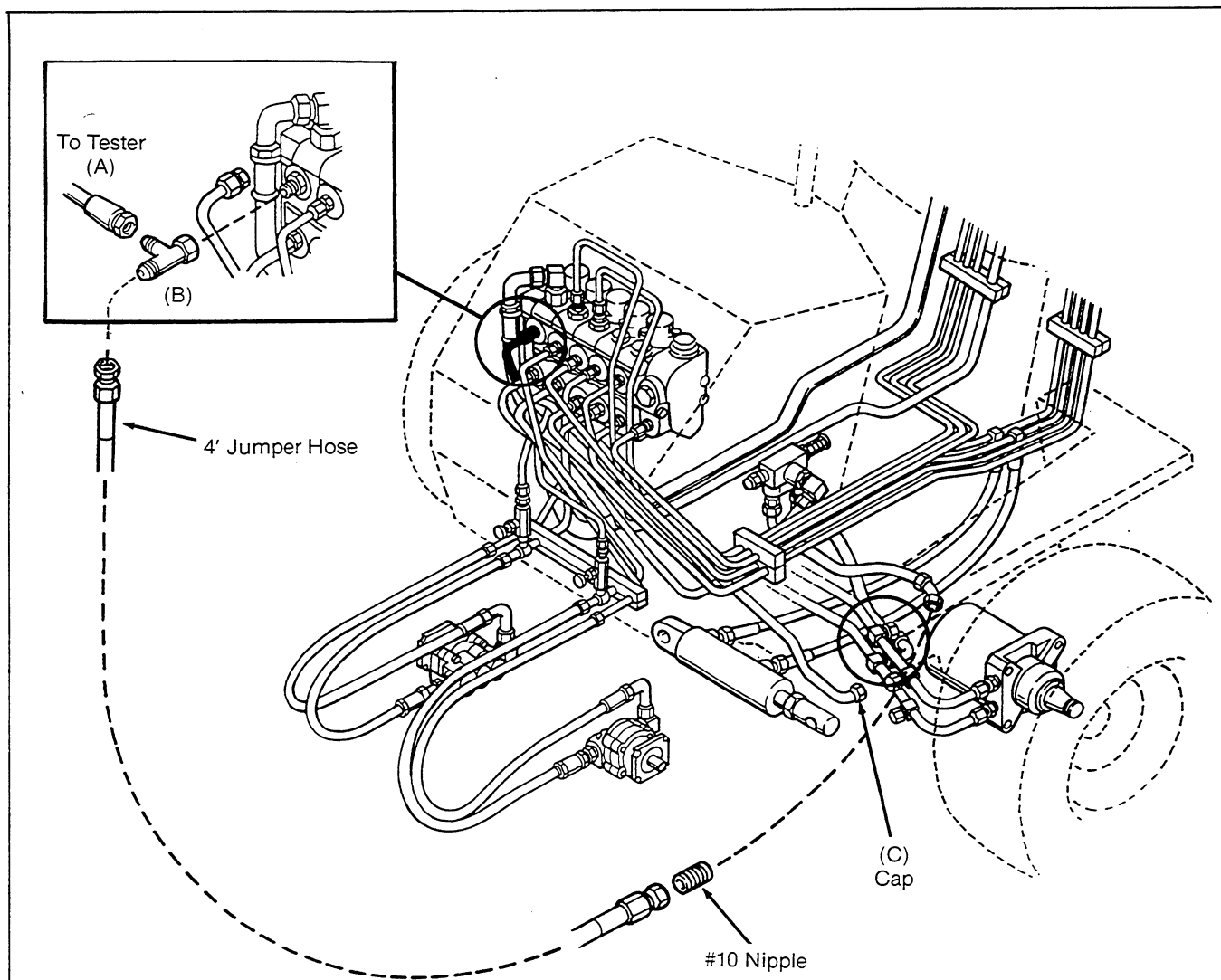
TRACTION METERING VALVE**(PRODUCTS 62225, 62226, 62608, 62610 and 62300, 62620, 62622 ONLY)**

1. Remove the cap from the tee, connected in previous test, to section #1 of the main control valve. Connect one end of a 4' jumper hose to tee at (B).
2. Disconnect the traction valve line at the tee of the top motor line (C). Cap the motor line tee.
3. Using a #10 nipple connect the hose from the tee of the traction valve (section #1) to the hose from the traction metering valve.
4. Set the parking brake.
5. Open the tester load valve.
6. Start the engine and advance the throttle to obtain 3300 rpm.
7. Shift the traction lever to "MOW" position.
8. Completely depress the accelerator valve pedal.
9. While holding the accelerator pedal down, slowly close the tester load valve.
10. The pressure should raise to 1500 psi $\pm$ 10%.
11. Slowly release the accelerator valve and open the load valve. Shift the machine into "NEUTRAL."
12. Shut off the engine.

Conclusion

If the pressure in step 10 was not 1500 psi $\pm$ 10%, the Traction Metering valve has internal leakage and must be corrected. If the pressure in step 10 was 1500 psi $\pm$ 10%, the Traction Metering valve is good and the problem is in the traction motor(s).

It will be necessary to proceed with the INDIVIDUAL MOTOR TEST to determine which traction motor is defective.



TRACTION METERING VALVE INSTRUMENT TEST
(PRODUCTS 62225, 62226, 62608, 62610 and 62300, 62620, 62622 ONLY)

8L

SECTION 8L. INSTRUMENT TESTS

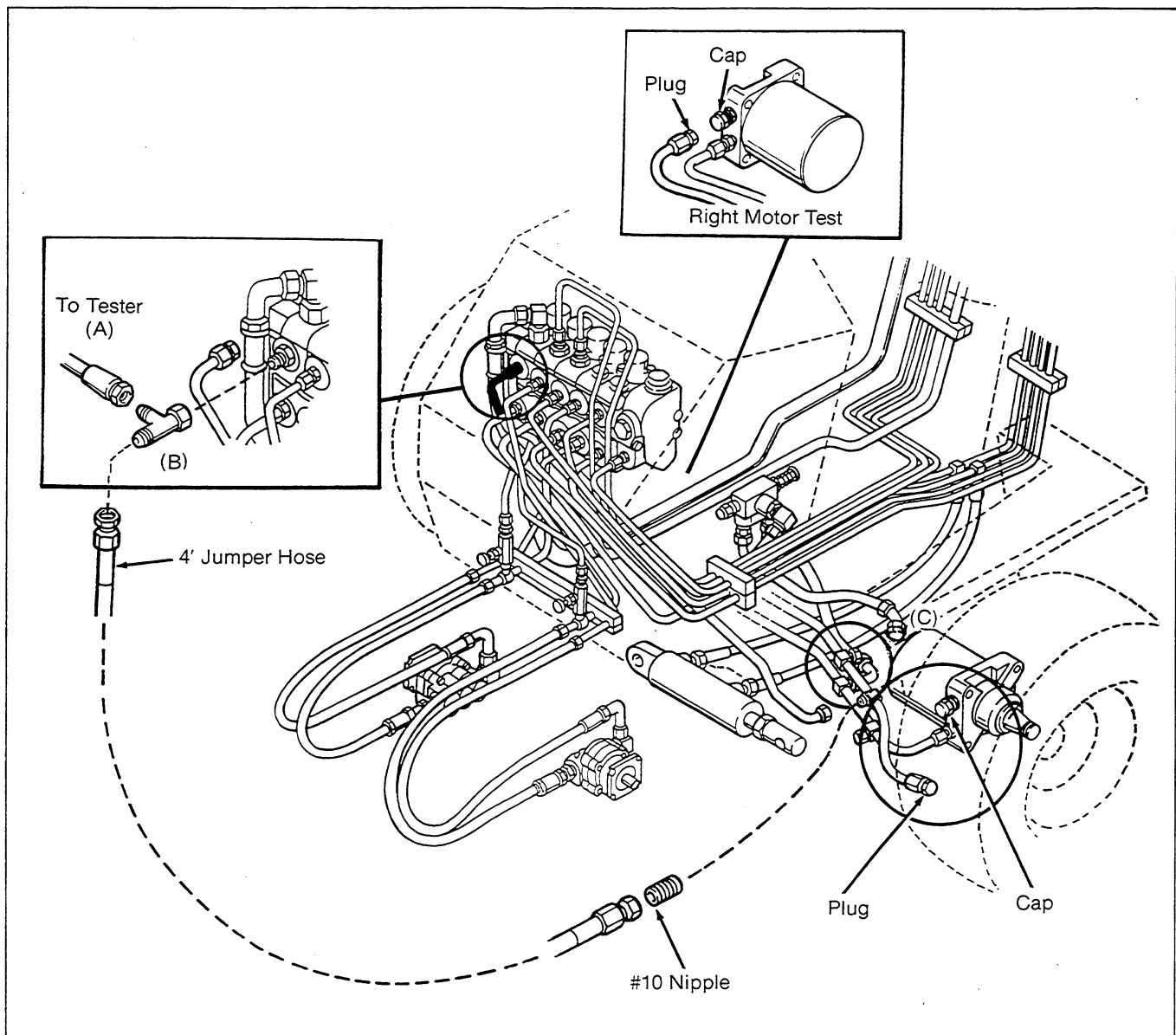
TRACTION MOTOR (ALL PRODUCTS) (See "Traction Motor Instrument Test" Illustration)

NOTE

Leave Tester connected as described in previous
(TRACTION METERING VALVE) test.

Right Traction Motor

1. Set up tractor as follows:
 - a. Drive wheels off the ground.
 - b. Lower attachments to ground.
 - c. Set parking brake.
 - d. Disengage reel levers ("OFF").
2. Disconnect the top metal line from the left traction motor.
3. Plug line and cap the motor fitting.
4. Turn in fully (open) the load valve on the tester.
5. Make sure the parking brake is set.
6. Start the engine and advance the throttle to obtain 3300 rpm.
7. Shift the traction control lever into "MOW" position.
8. Depress the accelerator pedal.



TRACTION MOTOR INSTRUMENT TEST

SECTION 8L. INSTRUMENT TESTS

9. Slowly turn in the load valve to 1000 psi and allow the oil to reach at least 110–130°F.
10. Record the flow rate at 1500 psi, 3300 rpm, and 120°F on Table III.
11. Turn load valve fully out, shift traction lever to “NEUTRAL,” and stop engine.
12. Reconnect top line to left traction motor.

Conclusion

If the reading from step 10 above is within 1-1/2 gpm of the mow reading from Table II, the right traction motor is good. Proceed with the left traction motor test.

If the reading from step 10 is not within 1-1/2 gpm of the mow reading from Table II, the right traction motor is defective. Replace or repair the right traction motor (see Traction Motor Repair in this section).

Left Traction Motor

1. Set up tractor as follows:
 - a. Drive wheels off the ground.
 - b. Lower attachments to ground.
 - c. Set parking brake.
 - d. Disengage reel levers (“OFF”).
 - e. Put traction control lever in “NEUTRAL” position.
2. Disconnect the top line from the right traction motor.
3. Plug line and cap the motor fitting.
4. Fully open the load valve on the tester.
5. Make sure the parking brake is set.
6. Start the engine and advance the throttle to 3300 rpm.
7. Shift the traction control lever into “MOW” position.
8. Depress the accelerator pedal.
9. Slowly turn in the load valve to obtain 1000 psi and allow the oil to reach at least 110–130°F.
10. Record the flow rate at 1500 psi, 3300 rpm, and 110–130°F on Table III.
11. Turn load valve fully out, shift traction lever to neutral and stop engine.
12. Reconnect top line to right traction motor.

Conclusion

If the reading from step 10 above is within 1-1/2 gpm of the mow reading from Table II, the left traction motor is good.

If the reading from step 10 is not within 1-1/2 gpm of the mow reading from Table II, the left traction motor is

defective. Replace or repair the left traction motor as described earlier in this section under Traction Motor.

STEERING SYSTEM (PRODUCT 62229)**Relief Valve Test****NOTE**

A steering pump test should be performed before proceeding with the test.

1. Remove the steering unit supply hose from the pump tee and plug it.
2. Connect the “IN” port hose of the tester to the pump tee.
3. Open tester load valve, set brake, start engine and advance throttle to full open.
4. Slowly close the load valve.
5. Relief should open at 900 psi $\pm$ 10%. Record readings in Table IV.

CAUTION

DO NOT exceed 1000 psi when performing this test.

- If relief opens too soon or does not open, replace relief valve.

Steering Unit Test**NOTE**

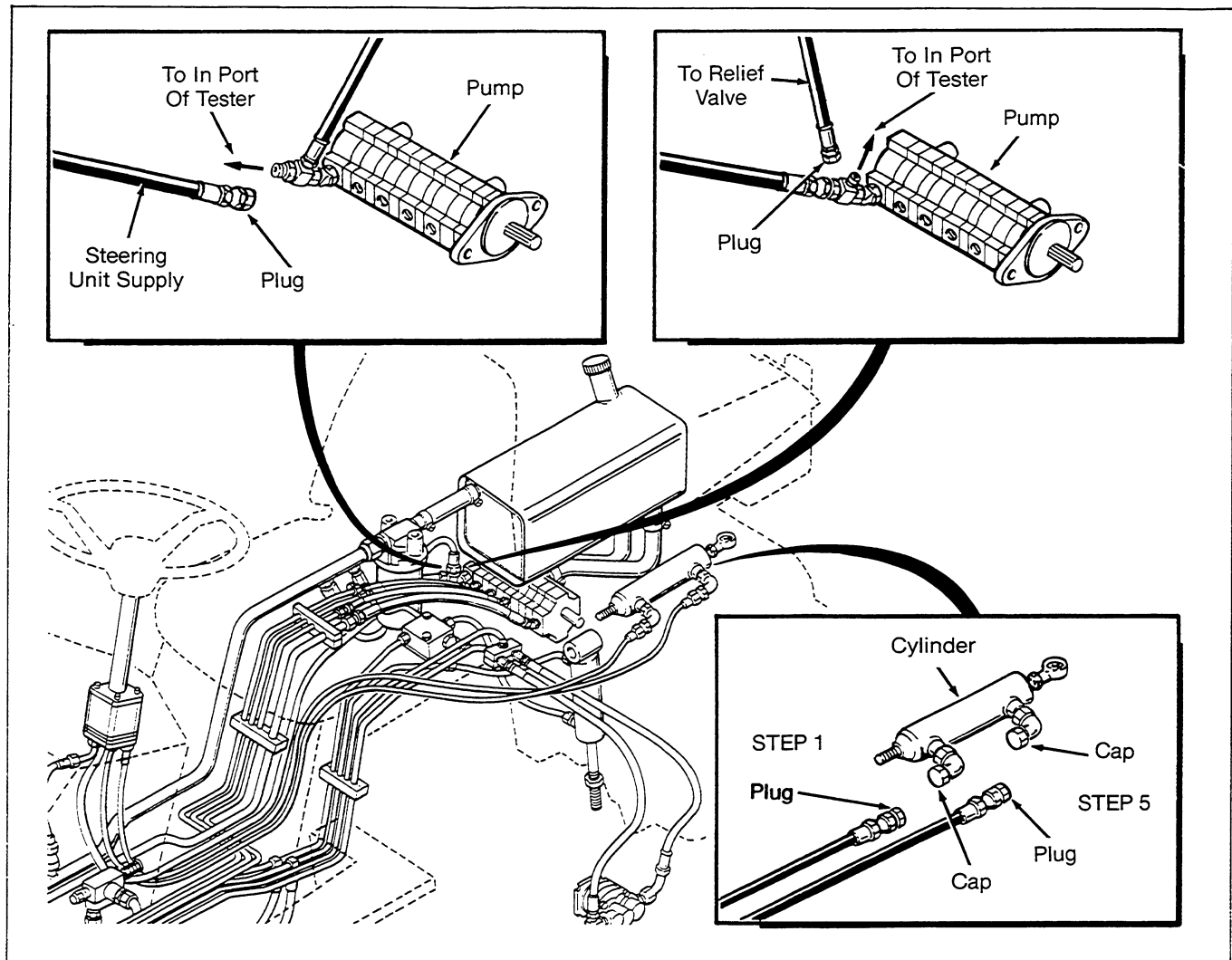
A steering pump and relief valve test should be performed before proceeding with this test.

1. Remove relief valve line from the pump tee and plug the line.
2. Connect the “IN” port line of the tester to the pump tee.
3. Open tester load valve, set parking brake, start engine and advance throttle to full open.
4. Turn and HOLD steering wheel to right turn position.
5. Slowly close the load valve until 800 psi is obtained, read/record the gpm flow in Table IV.
6. Repeat steps 3, 4 and 5 for the left steer position.
 - Flow should not decrease more than 1/2 gpm.
 - If flow drops more than 1/2 gpm, proceed with the steering cylinder test.

Steering Cylinder Test**NOTE**

A steering pump, relief valve and steering unit test should be performed before proceeding with this test.

SECTION 8L. INSTRUMENT TESTS



STEERING SYSTEM INSTRUMENT TESTS

1. Remove the hydraulic line from the head end of the steer cylinder. Plug the line and cap the cylinder port.
2. Open the tester load valve, set the brake, start the engine and advance throttle to full open.
3. Turn and HOLD the steering wheel in the right turn position.
4. Slowly close the load valve until 800 psi is obtained, read/record the flow in Table IV.
5. Repeat Steps 1 through 4 for the rod end-left turn position.
 - If flow does not drop more than 1/2 gpm, steering cylinder is faulty (see Section 6E).
 - If flow drops more than 1/2 gpm, steering unit is faulty.

REEL CONTROL VALVE SECTION

NOTE

The pump test must have been completed before proceeding with this test. Test is the same for any of the reel motor valve sections.

1. Set up tractor for test as follows:
 - a. Drive wheels off the ground.
 - b. Lower attachments to ground.
 - c. Disengage reel levers (OFF).
 - d. Put traction lever in "NEUTRAL".
 - e. Put parking brake on.
2. Disconnect the flexible reel motor pressure hose from the metal line which is connected to the top port of the reel section to be tested (#2, 3 or 4).

SECTION 8L. INSTRUMENT TESTS

3. Plug the end of the hose.
4. Connect a tee to the metal line and cap one end of the tee.
5. Connect the hose from the “In” port of the tester to the tee.
6. Place the hose from the “Out” port of the tester into the neck of the oil tank and tie securely in place.
7. Turn the load valve all the way out. Start the engine, and advance the throttle to obtain 3300 rpm.
8. Engage the reel control lever for the valve section being tested.
9. Slowly turn in the load valve until the pressure gauge reads 1000 psi. Allow the oil to reach 110–130°F.
10. Record flow rate at 3300 rpm, 1500 psi, and 110–130°F in Table IV.
11. Slowly turn in the load valve until the pressure gauge stops moving (relief opens).



CAUTION

Do not exceed 2500 psi or damage to the hydraulic system may result.

12. Record the relief valve pressure in Table IV.

NOTE

Before testing another reel valve section go through reel motor test (next).

Conclusion

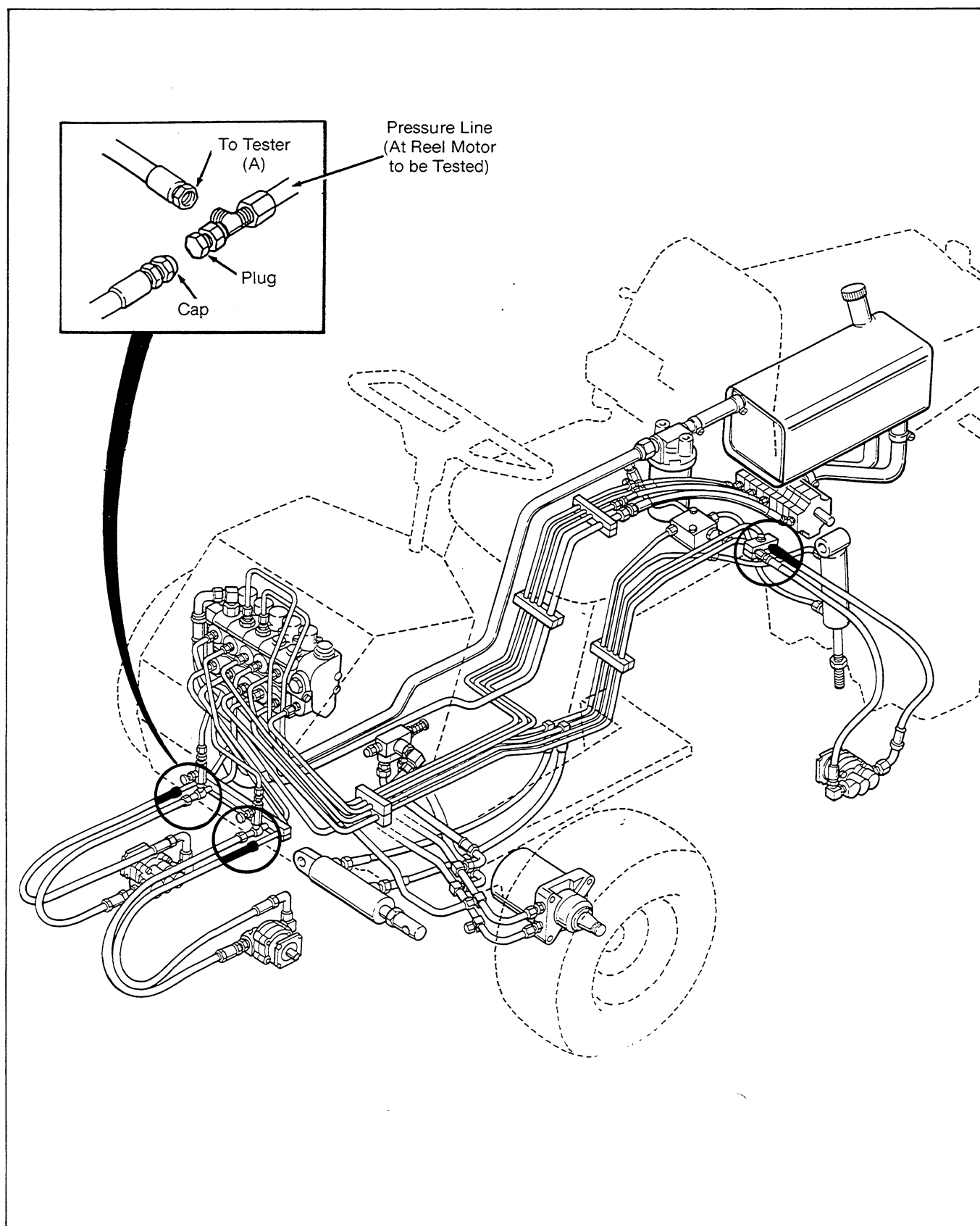
The test values for valve sections 2, 3, and 4 in Table IV should be within 1 GPM of those recorded in Table I for pump sections 2, 3, and 4 respectively.

If any one or more valve sections indicated less than 1 GPM difference, disassemble valve, removing the defective section, and repair or replace as necessary. (See Main Control Valve in this section.)

If the relief valve pressures are not within the range given in Table IV, adjust or replace the relief valve cartridge. The relief valve cartridge for reel valve section #4 is located in section #6 of the valve bank.

If readings are within specifications, proceed to the REEL MOTOR TEST.

SECTION 8L. INSTRUMENT TESTS



CONTROL VALVE REEL SECTION

SECTION 8L. INSTRUMENT TESTS

REEL MOTOR

NOTE

The preceding test for the reel valve sections must have been completed before proceeding with this test.

1. Remove the cap from the tee (installed in step 4 of REEL CONTROL VALVE SECTION test) and the plug from the pressure hose.
2. Connect the pressure hose to the tee.
3. Block the reel being tested with a wooden block.
4. With the tester load valve fully open, start the engine and advance the throttle to obtain 3300 rpm.
5. Engage the reel control lever for the reel motor being tested.

6. Slowly turn in the load valve until the pressure gauge reads 1000 psi and allow the oil to reach 110–130°F.

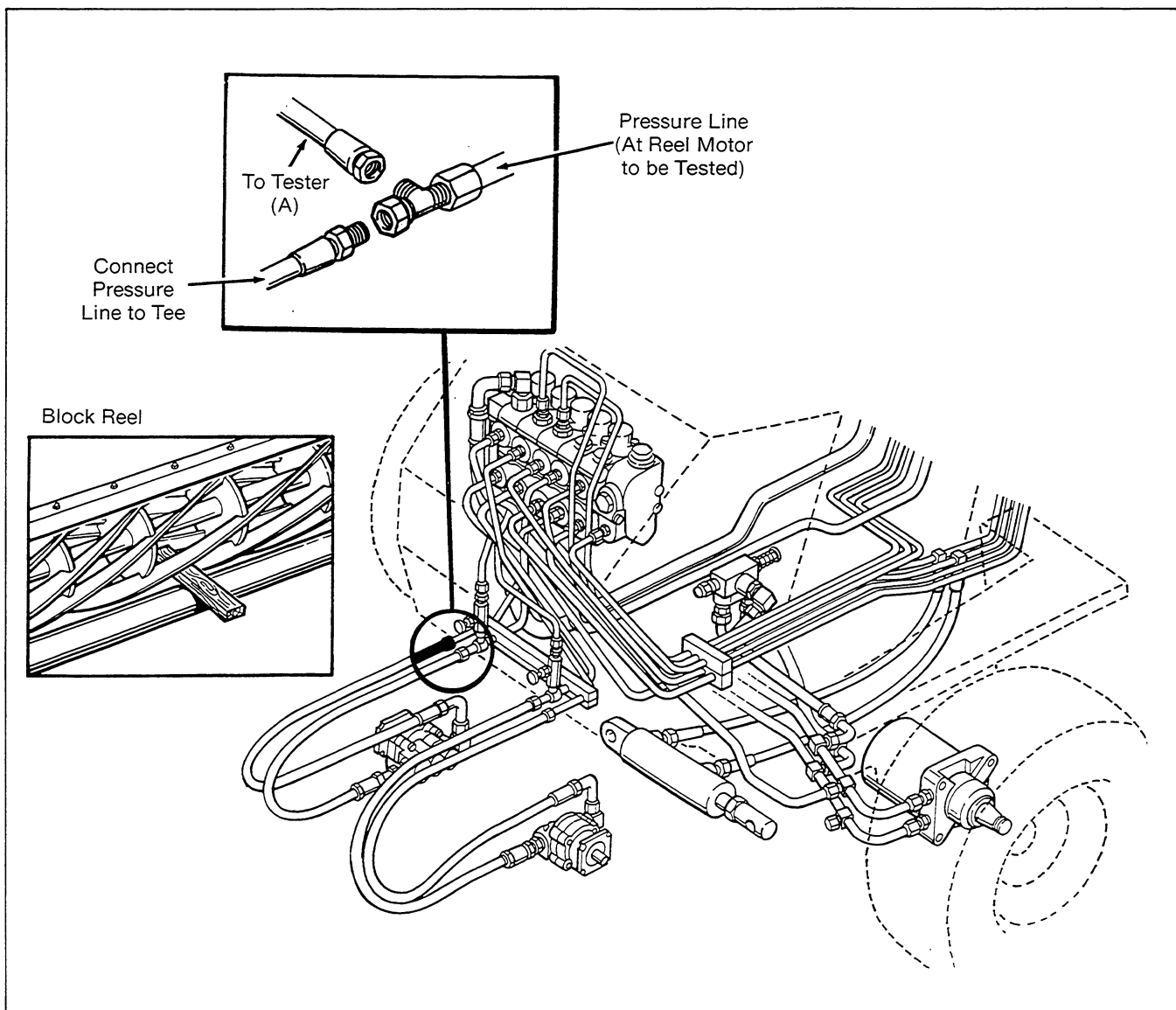
7. Record the flow rate at 1500 psi in Table V.

8. Turn the load valve out completely, disengage the reel control lever, and stop the engine.

Conclusion

The flow readings at 1500 psi in Table IV should be the same as the flow readings at 1500 psi obtained in Table III, REEL VALVE TEST.

If the readings from Table IV are less than 1 gpm of the readings in Table III, the reel motor is defective. Replace defective reel motor as described under REEL MOTOR earlier in this section.



REEL MOTOR INSTRUMENT TEST

SECTION 8L. INSTRUMENT TESTS

LIFT AND LOWER CONTROL VALVE SECTION (Spool Relief Valve Test)

See "Lift and Lower Valve Section Instrument Test" illustration.

1. Set up tractor for test:
 - a. Set the parking brake.
 - b. Lower attachments to ground.
 - c. Put traction lever in "NEUTRAL".
 - d. Put reel levers in "OFF" position.
2. Disconnect the metal line from the top port of #5 valve section.
3. Replace the top adaptor fitting with a straight adaptor (Jacobsen Part No. 351109).
4. Plug the metal line.
5. Connect the hose from the "In" port of the tester to the top valve section port (A).
6. Place the hose from the "Out" port of the tester into the neck of the oil tank and secure in place.
7. Fully open the load valve.
8. Start the engine and advance the throttle to obtain 3300 rpm.
9. Depress the LOWER pedal.
10. Slowly turn in the load valve until 1100 psi is obtained on test gauge and allow the oil to reach 110-130°F,
11. Record the flow rate at 3300 rpm, 1100 psi, in Table IV.

12. Slowly turn in the load valve until the pressure gauge needle stops moving (relief setting).

NOTE

DO NOT exceed 2500 psi or damage to the hydraulic system may result.

13. Record the relief valve pressure in Table IV for the top port.

NOTE

When tester is disconnected from the top port of valve section #5, replace adaptor fitting Part No. 351109 with restrictor fitting Part No. 357921.

14. Repeat test (steps 1-13 above) at lower port of valve section #5. The special fitting is not needed for lower port.

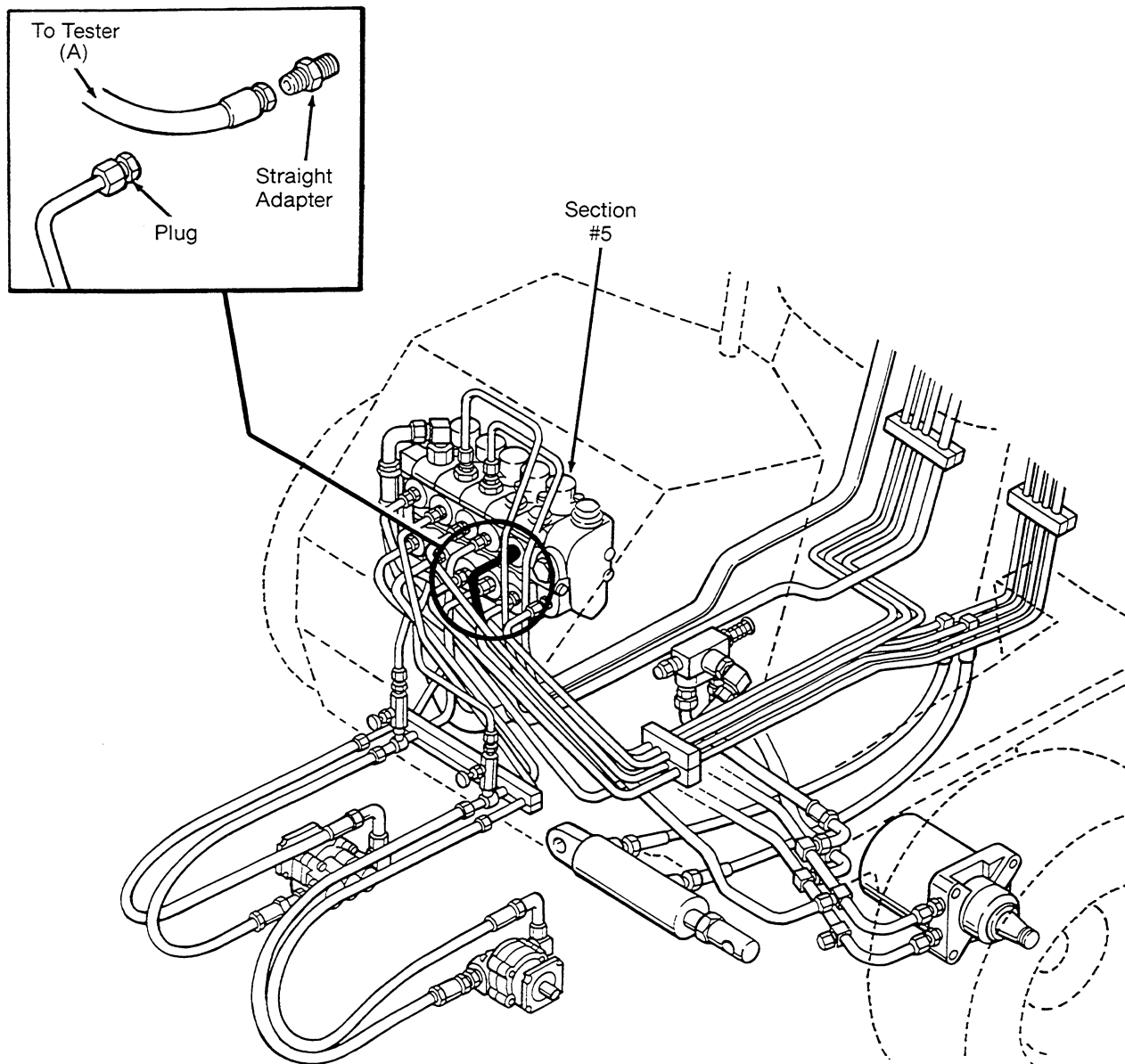
Conclusion

If the reading from step 11 is not within 1 gpm of the flow reading in Table 1, pump section 2, at 1500 psi, the valve section must be repaired or replaced.

The relief valve pressure should be 1150 psi $\pm$ 10%. Since this test reads the relief valve located inside the spool of #5 valve section, a defective reading may require an adjustment of the spool relief valve. If adjustment (adding or removing shims) is not possible, it will be necessary to replace the #5 valve section.

Repeat the above test connecting the tester to the bottom port of the lift and lower valve section.

SECTION 8L. INSTRUMENT TESTS



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LIFT AND LOWER CONTROL VALVE SECTION INSTRUMENT TEST

SECTION 8L. INSTRUMENT TESTS**NOTE**

Copy this page for test readings each time an instrument test is performed.

Model _____ Serial _____ Hours _____ Date _____

TABLE I — PUMP TEST

Correct Readings				Test Readings	
Pump Section #	Function	No Load Flow in GPM	Flow at 1500 PSI	No Load Flow	Flow at 1500 PSI
1	Traction	7.5	7.0	GPM	GPM
2	Lift and R.H. Reel	4.8	4.3	GPM	GPM
3	Center Reel	4.8	4.3	GPM	GPM
4	L.H. Reel	4.8	4.3	GPM	GPM
			Flow at 850 PSI		Flow at 850 PSI
5	Power Steering	4.8	4.3	GPM	GPM

TABLE II — TRACTION VALVE TEST

Traction Lever Position	Flow Rate at 1500 PSI	Relief Valve Setting
Mow	GPM	PSI
	at 500 PSI	
Transport	GPM	PSI

TABLE III — INDIVIDUAL TRACTION MOTOR TEST

	Flow Rate at 1500 PSI	Mow Reading from Table II
Right Traction Motor	GPM	GPM
Left Traction Motor	GPM	GPM

SECTION 8L. INSTRUMENT TESTS

TABLE IV — POWER STEERING

Correct Readings		Test Readings
	Relief Valve Setting PSI	Relief Valve Setting PSI
Relief Valve	900 PSI $\pm$ 10%	PSI

	Pump Flow Rate GPM at 800 PSI	Flow Rate GPM at 800 PSI	Maximum of 1/2 GPM Difference
Steering Unit Right	GPM	GPM	
Steering Unit Left	GPM	GPM	
Steering Cylinder Right			
Steering Cylinder Left			

TABLE V — REEL, LIFT AND LOWER VALVE TEST

Correct Readings			Test Readings	
Section #	Reel Valve Section	Relief Valve Setting PSI	Flow at 1500 PSI	Relief Valve Setting
4	R.H. Reel	1600 $\pm$ 10%	GPM	PSI
3	Center Reel	1500 $\pm$ 10%	GPM	PSI
2	L.H. Reel	1500 $\pm$ 10%	GPM	PSI
5	Lift and Lower	1600 $\pm$ 10%	GPM	Top Port PSI
				Bottom Port PSI

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TABLE VI — REEL MOTOR TEST

Correct Readings		Test Readings
Motor	Relief Valve PSI	Flow at 1500 PSI
R.H.	1600 $\pm$ 10%	GPM
Center	1500 $\pm$ 10%	GPM
L.H.	1500 $\pm$ 10%	GPM

SECTION 9 CHASSIS

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Front Lift Cylinder Adjustment	9G-1

SECTION 9A. REPAIR AND SERVICE TOOLS AND MATERIALS

- Tools required:** Standard automotive hand tools including bearing pullers.
- Cleaning and refinishing materials:** Stoddard or equivalent solvent.
Detergent and water.
Paint, Jacobsen orange.
Anti-rust oil.
- Lubricants:** Grease gun grease (eg. Sunray DX 671 or Gulf Supreme No. 0).
- Other oil options:** Jacobsen Part No. 502693, 5 gal. (19 liter).
Jacobsen Part No. 502696, 2.5 gal. (9.5 liter).
Sunoco H.P. Engine Oil SAE 10W30.
Mobil Delvac (Special) SAE 10W30.

SECTION 9B. FUEL TANK

GENERAL

The fuel tank is a single piece plastic tank which should require no servicing unless punctured or otherwise accidentally damaged. The fuel tank should be drained whenever the machine is to be stored. The fuel tank and its mounting base should be removed to provide access to the engine when the engine is to be removed.

NOTE

The cap used on the tank is a naturally aspirated cap.

REMOVAL AND INSTALLATION

(See "Fuel Tank Removal and Installation" Illustration)

1. Siphon the fuel from the tank and/or drain the tank.

On machines with gasoline engines (Product 62221, 62225 and 62226, 62610), drain the tank by closing the fuel shut-off valve, loosening the clamp, and detaching the fuel-to-carburetor hose at the carburetor. Place the hose in a suitable container and reopen the fuel shut-off valve.

On machines with diesel engine (Product 62300, 62622), close the fuel filter cock (see Section 3D, "Fuel Filter Service"). Position a suitable container under the fuel filter and disconnect the outlet fuel line from the "to engine" side of the fuel filter; then, move the fuel filter cock to the open position and drain the fuel tank.

2. After the tank is drained, remove the two screws, lockwashers, and washers that hold the rear mounting bracket to the rear of the machine. Remove the rear mounting bracket and lift the fuel tank upward and free of the front mounting bracket.
3. To install the fuel tank, reconnect fuel lines, and position the tank in the front mounting bracket.

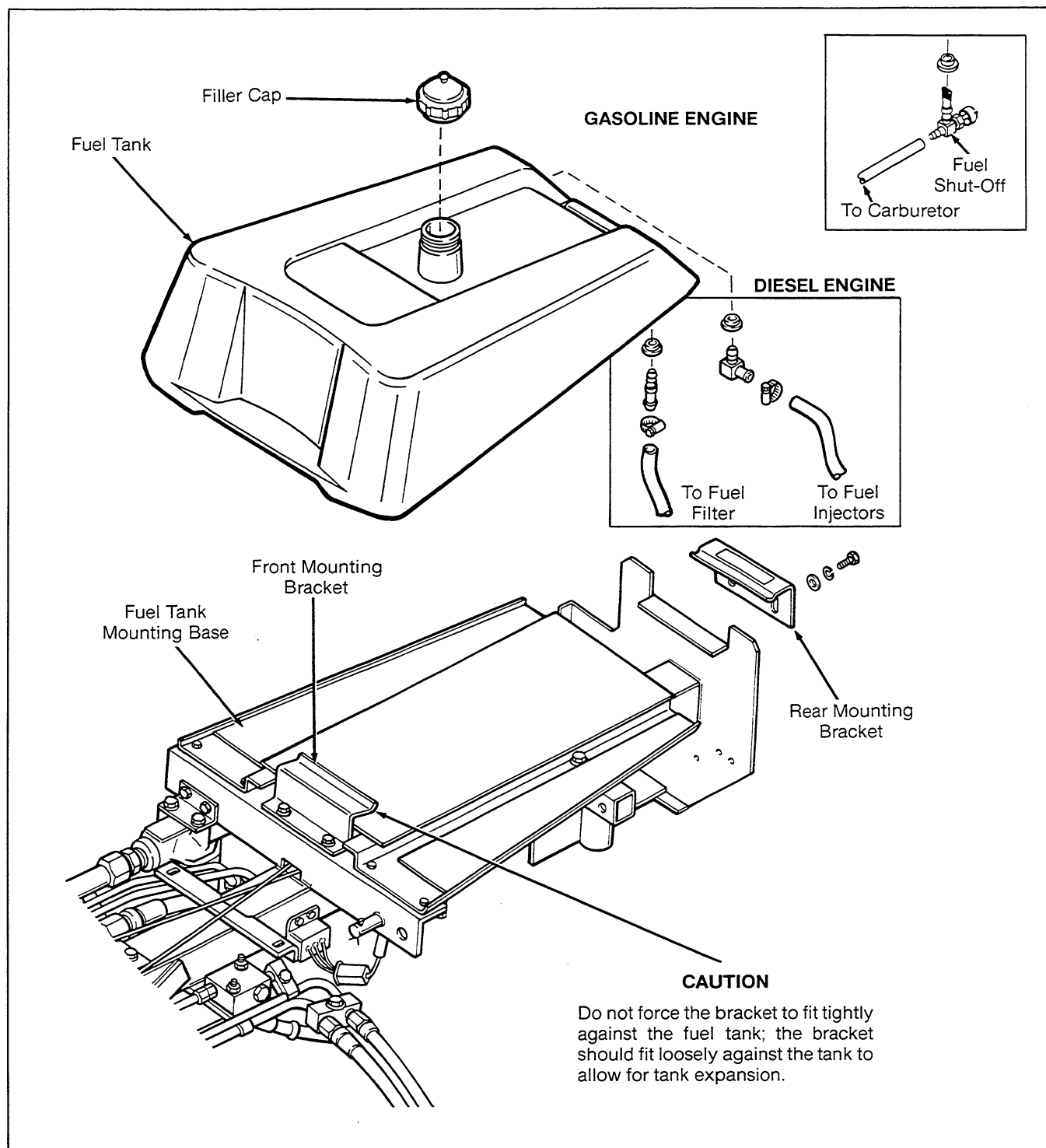


CAUTION

Do not force the bracket against the fuel tank; the bracket should fit loosely against the tank to allow for tank expansion.

4. Position the rear mounting bracket on the fuel tank and frame and secure with screws and washers.
5. Fill the tank (on machines with diesel engines Product 62300, 62622), vent the fuel system as described on page 3-9 of this manual).

SECTION 9B. FUEL TANK



FUEL TANK REMOVAL AND INSTALLATION

SECTION 9C. HYDRAULIC TANK

GENERAL

The hydraulic tank requires little or no service other than adding hydraulic oil when indicated by checking the dipstick. The hydraulic oil level should be checked daily for proper level. Use extreme care when checking oil level to prevent the entry of contaminants.

Oil should be at 60° to 90° F (16° to 32° C) when checking level. Do not check oil level when oil is hot.

Oil level should never be below the low level mark or more than 1/4 in. (6.35 mm) above the high level mark.

If you notice the presence of water (noted by a cloudy or milky appearance), or air (noted by a foamy appearance) or other contaminants, a rancid odor (indicating excessive heat), or after a major component failure, the hydraulic fluid should be changed.

NOTE

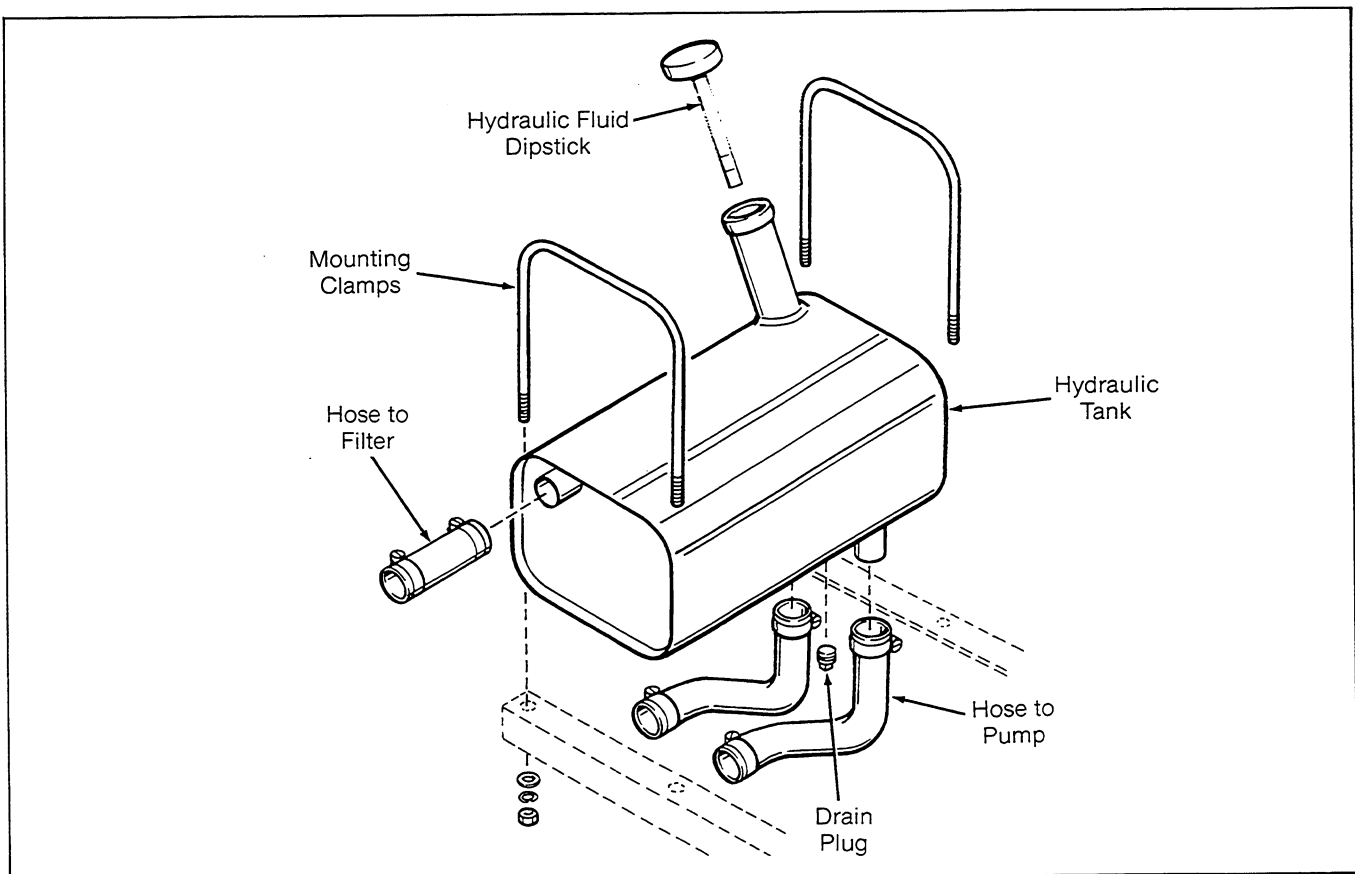
The cap on the hydraulic tank is a naturally aspirated cap.

If water, air, or contamination is indicated, locate the source of the problem and take corrective action (see Section 8).

REMOVAL AND INSTALLATION (See "Hydraulic Tank Removal and Installation" Illustration)

If it is necessary to remove the hydraulic tank, remove the drain plug, drain the fluid into a suitable container, disconnect the hoses to the hydraulic oil filter and disconnect the mounting clamps.

When installing the hydraulic tank, install the drain plug and secure the tank with mounting clamps, connect hydraulic hoses to the filter and hydraulic pump and fill with approximately 5 gallons of fresh hydraulic oil.



HYDRAULIC TANK REMOVAL AND INSTALLATION

SECTION 9D. SEAT**GENERAL**

The seat assembly will normally be removed to gain access to the steering cables, hydraulic lines, valves, switches, and other components mounted beneath it or to remove and replace the seat itself.

REMOVAL AND INSTALLATION
(See "Removal and Installation of Seat Assembly" Illustration)

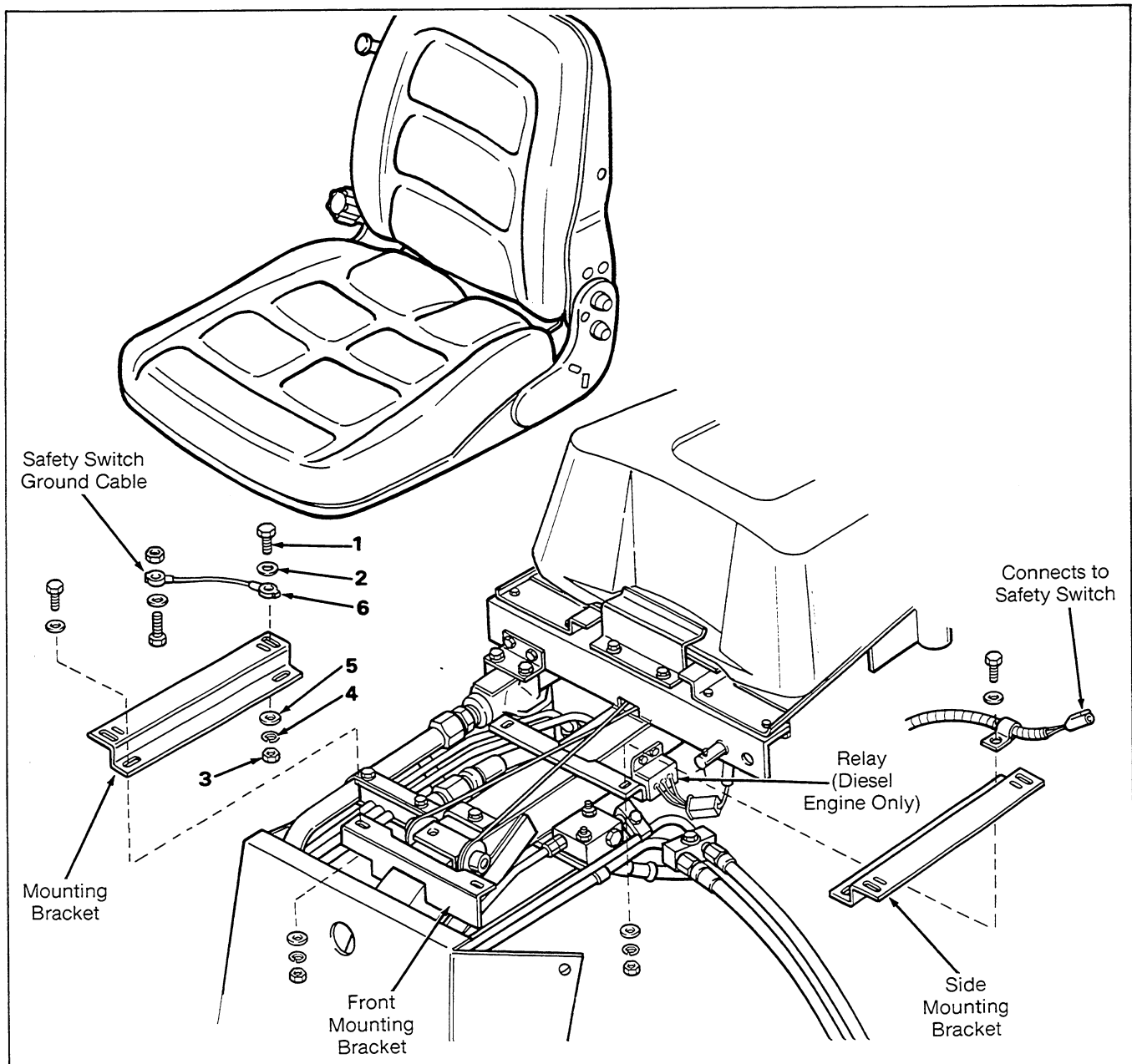
1. Remove the attaching hardware (1 thru 5) and seat switch ground cable (6) from the rear of the side mounting brackets.

2. Remove the attaching hardware from the front of the side mounting brackets.

3. Disconnect the seat switch cable from the seat switch (the seat switch is mounted to the underside of the seat).

4. Lift the seat off the side frames.

To install the seat, reconnect the electrical connections, position the grounding lug (6) as shown and secure the seat assembly with attaching hardware.


SEAT ASSEMBLY REMOVAL AND INSTALLATION
9D

SECTION 9E. LIFT ARMS, STOPS, AND SUPPORTS**GENERAL (See "Lift Arms, Stops, and Supports Disassembly and Reassembly" Illustration)**

The components used for the front lift mechanism are similar on both sides. However, the following components are different for the left and right side.

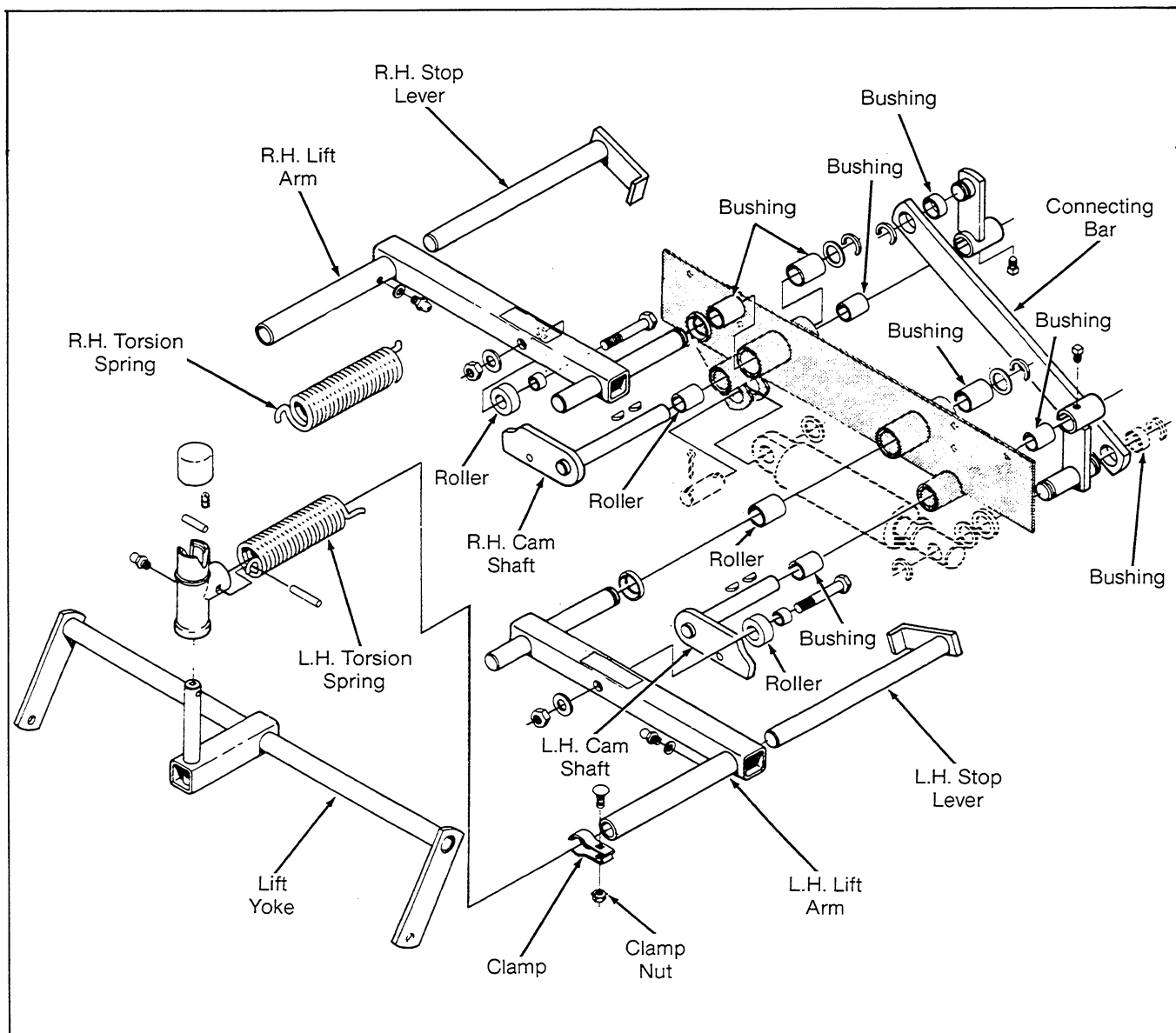
- a. Cam Shafts
- b. Lift Levers
- c. Lift Arms
- d. Torsion Springs
- e. Stop Levers

All other components are the same for both sides.

The center mower lift arms, stops, and supports differ considerably from the front right and left hand lift arms, stops, and supports.

If two or more of these groups of parts are removed at the same time, all parts should be kept with their respective R.H., L.H., or Center groups and tagged.

In addition, the machines may be equipped with either Bruning or Columbus lift cylinders (see "Lift Cylinder Removal and Installation" in Section 8 of this manual. There is one front lift cylinder which actuates the L.H. lift lever assembly which is interconnected to the R.H. lift lever assembly by a connecting bar.

**9E**

FRONT MOWER LIFT ARMS, STOPS, SPRINGS AND BUSHINGS DISASSEMBLY AND REASSEMBLY

SECTION 9E. LIFT ARMS, STOPS, AND SUPPORTS**REPAIR**

1. Remove any damaged or worn lever or spring as shown in the Disassembly and Reassembly illustration.

CAUTION

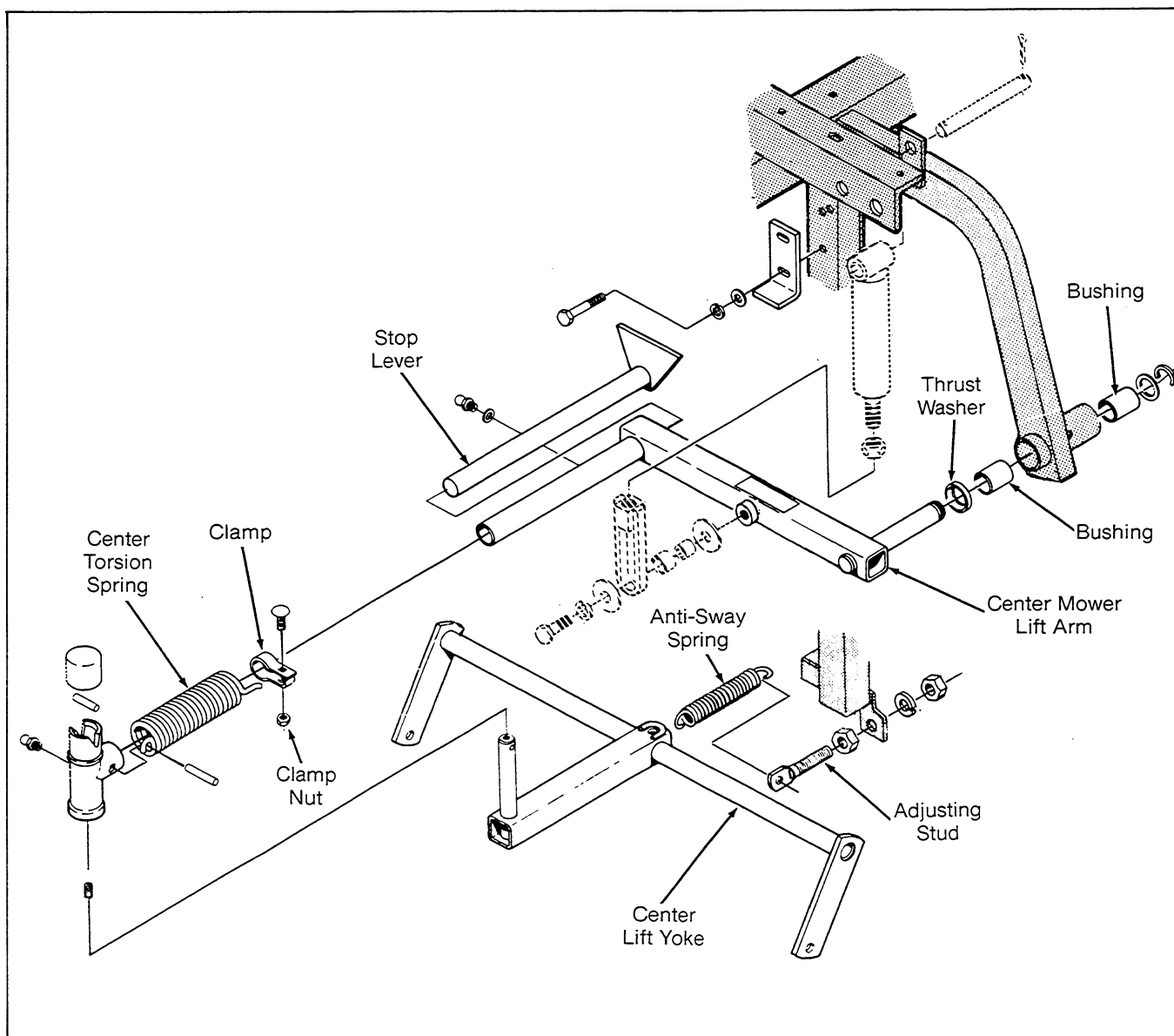
Before the torsion springs are removed, tension must be relieved by loosening the clamp nuts while restraining the clamps to keep the clamp from spinning.

2. Check all rollers and bushings for wear, replace if necessary.

3. Check for worn keyways and replace worn parts as necessary.

4. After removing lift arms, stops, bushings or other parts of the mower lift groups, check and adjust the following:

- a. Bedknife (see Section 12F).
- b. Cutting height (see Section 12E).
- c. Mower leveling (see Section 12E).
- d. Center mower anti-sway spring tension (see Section 12E).
- e. Mower lift cylinder adjustments (see Section 12E).



CENTER ROLLER LIFT ARM, STOP, SPRINGS AND BUSHINGS DISASSEMBLY AND REASSEMBLY

SECTION 9F. MOWER UNIT TORSION SPRING

MOWER UNIT TORSION SPRING (See "Mower Unit Torsion Spring Removal and Installation" Illustration)

⚠ WARNING

Before removing components, disengage reel control lever, lower reels, place traction lever in "Neutral", stop engine, set parking brake and remove key from ignition switch.

Removal

1. Carefully restrain the mounting clamp and slowly loosen the clamp nut to relieve tension on the torsion spring.

NOTE

On the center mower you must also disconnect the anti-sway spring from the lift yoke.

⚠ WARNING

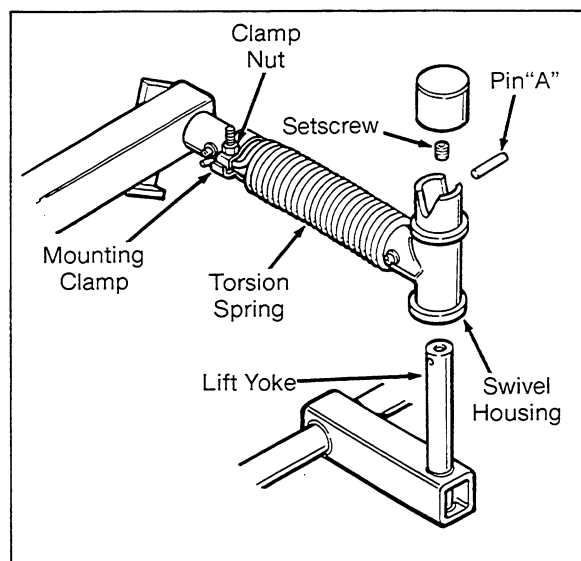
Prior to removing the reel, the tension on the torsion spring must be removed. To avoid possible serious injury, restrain the mounting clamp from rotating freely when loosening. The mounting clamp is under tension and will spin if not held tightly.

2. Remove the torsion spring retaining pin.
3. Remove the protective cap from the swivel housing.
4. Loosen the set screw and remove pin "A" to disconnect the swivel housing from the lift yoke.
5. Lift the swivel housing and lift arm assembly free of the lift yoke.
6. Remove swivel housing and torsion spring.
7. Tag the torsion springs to mark their locations.

Installation

See "Mower Unit Torsion Spring Installation," illustration.

1. Install the torsion spring and mounting clamp onto the mower arm.
2. Install the swivel housing.
3. Install the torsion spring retaining pin.
4. Position the mower and lift yoke assembly beneath the swivel housing. Grease the swivel housing.
5. Secure the lift yoke to the swivel housing with pin "A" and set screw.
6. Raise the cutting units 1-2 inches off the ground.
7. Tighten spring so mower unit is level with ground.
8. Tighten torsion spring clamp.



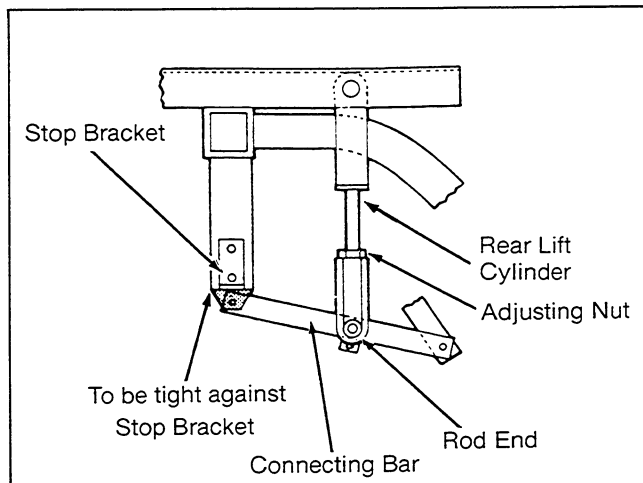
**MOWER UNIT TORSION SPRING
REMOVAL AND INSTALLATION**

9F

SECTION 9G. LIFT CYLINDERS

REAR LIFT CYLINDER ADJUSTMENT

Adjust the nut on the rear lift cylinder until the mower lift arm is tight against stop bracket when the mower is raised.



REAR LIFT CYLINDER ADJUSTMENT

FRONT LIFT CYLINDER ADJUSTMENT

Extend the front cylinder piston fully, then check the cam roller dimension "A". The dimension should be 7/16 to 9/16 in. (11.1 to 14.2 mm). If it is not, adjust the cylinder as follows:

1. Lower the units.

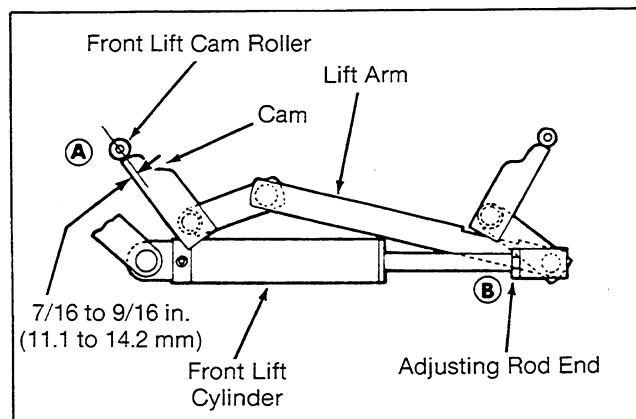
2. Loosen the cylinder lock adjusting nut at "B".
3. With a strap wrench, grip the end of the cylinder close to the adjusting nut and turn until the clearance at cam roller "A" is correct as shown on the illustration.



CAUTION

Care must be taken to avoid damaging the surface of the cylinder rod.

4. Tighten the nut at "B".



FRONT LIFT CYLINDER ADJUSTMENT

9G

SECTION 10 ELECTRICAL SYSTEM

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SECTION 10A. REPAIR AND SERVICE TOOLS AND MATERIALS

Tools required: Multi-meter (VOM) and jumper wire.

Cleaning materials: Baking soda and water.

10A

SECTION 10B. GENERAL INSTRUCTIONS**GENERAL**

Repair of the electrical system, for the most part, is limited to the replacement of defective components or wiring. Wiring diagrams and Component Location illustrations are provided at the end of this section for troubleshooting and/or testing the electrical system. Specific repair and replacement instructions, where applicable, are also provided in this section.

NOTE

See engine manufacturers service manual for information on 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. For instructions see "Wire Continuity Test" illustration.

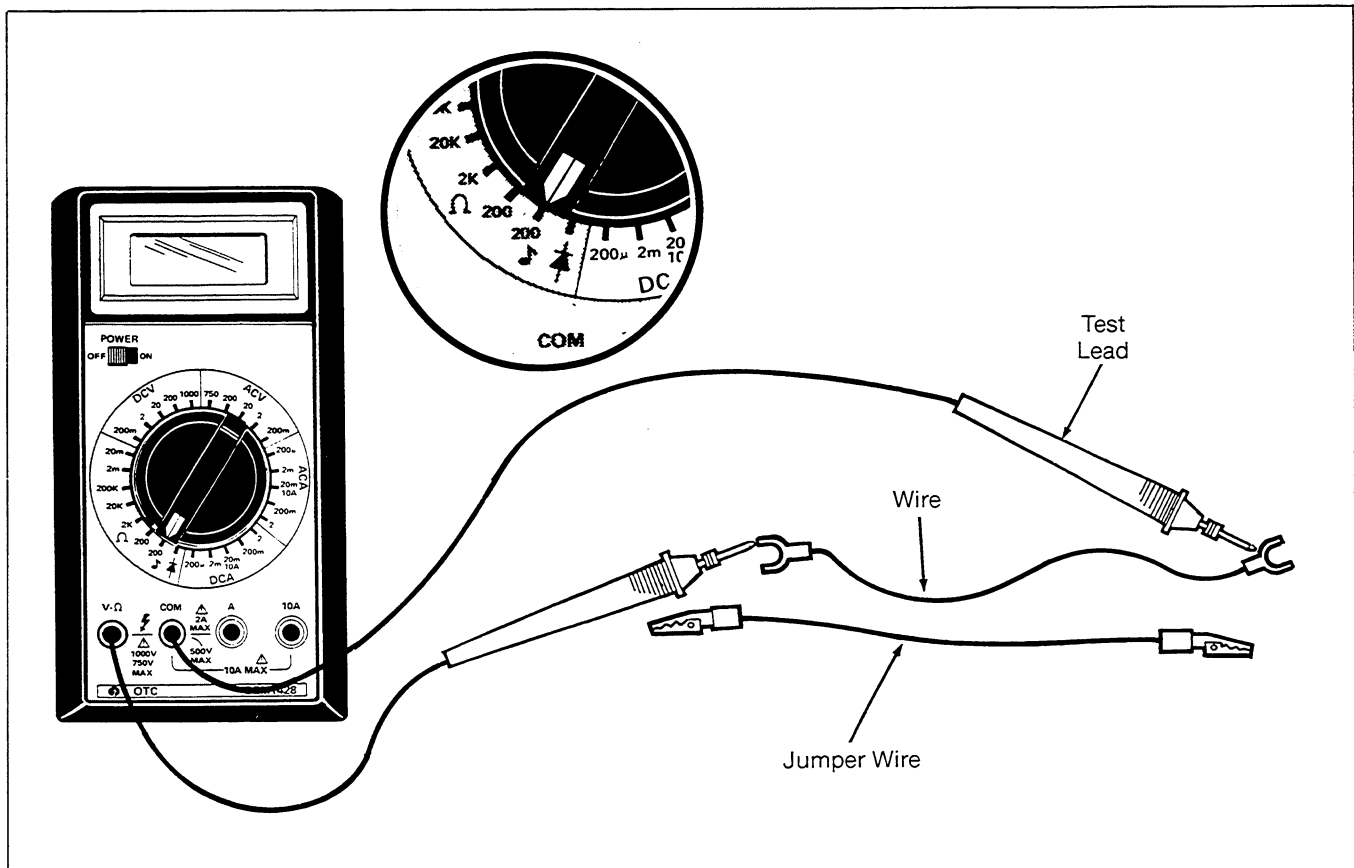
NOTE

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 wires so that the component can be installed correctly.

WIRE CONTINUITY TEST (See Illustration)

1. Identify and locate the wire to be checked on the appropriate "Electrical System" illustration, located at the end of this section.
2. Set VOM to ohms scale and touch leads to ends of wire.
 - There should be a reading (continuity) on the VOM. If not, proceed to 3.
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.

**WIRE CONTINUITY TEST**

SECTION 10C. BATTERY**GENERAL**

For normal service, use a battery rated 12V, 250 cold cranking amps at 0°F (-18°C) AABM Group #22NF. For continuous cold weather operation, use a battery with approximately 400 cold cranking amps at 0°F (-18°C). AABM group 45 GMF batteries meet this specification.

! WARNING

Batteries contain sulfuric acid and 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.

! CAUTION

Always connect the "ground" (black) cable last and remove it first whenever 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 positive terminal cover in place.

CHARGING A MAINTENANCE FREE BATTERY

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

! WARNING

To avoid possible injury, stand away from 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 @ 5 amps	2½ hours @ 20 amps
5 hours @ 10 amps	1½ hours @ 30 amps
	1 hour @ 45 amps

4. If, when charging the battery, violent gassing or spewing of electrolyte occurs, or the battery case feels hot 125°F (52°C), reduce or temporarily halt charging to avoid damaging the battery.
5. Always turn charger to "Off" before removing a charger 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 complete a circuit to drain and exhaust the energy in the battery — 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 level of electrolyte — add water as necessary to maintain level above plates — do not overfill as this can cause poor performance or early failure due to loss of electrolyte.
2. Keep terminals and top of battery clean. Wash with baking soda and rinse with clear water. Do not allow soda solution to enter cells as this will destroy the electrolyte.
3. Make sure battery terminals are tight and cables are in good condition.

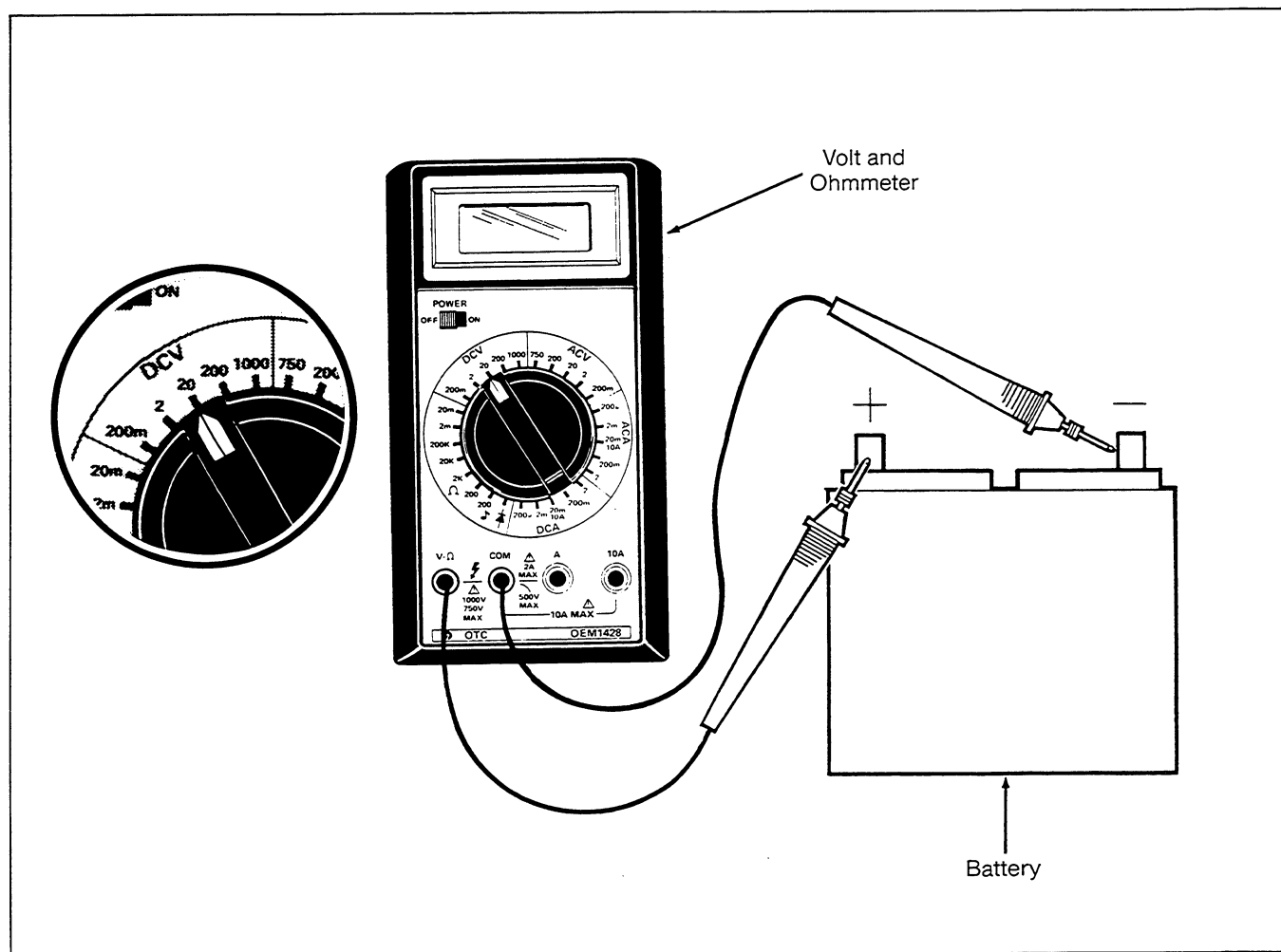
10C

SECTION 10C. BATTERY

TESTING (See “Battery Test” Illustration)

Test battery voltage as follows:

1. Connect DC Voltmeter to battery terminals (follow manufacturers instructions).
2. Turn dial on voltmeter to 20 DCV.
3. Crank the engine — if battery voltage falls below 9 volts while cranking, the battery is run-down or defective.

**BATTERY TEST**

SECTION 10D. CHARGING SYSTEM**ALTERNATOR/RECTIFIER-REGULATOR
(ALL GAS PRODUCTS)****General**

The 15 amp alternator circuit consists of three major components: 1) a ceramic magnet ring which is permanently affixed to an inner rim of the flywheel; 2) the alternator stator mounted on the bearing plate of the engine and; 3) a rectifier-regulator unit which on products 62221, 62606 are mounted on the engine base below the hydraulic pump. On products 62225, 62226, 62608 and 62610 the unit is located on the flywheel cover.

See engine manufacturers service manual for additional information.

Test

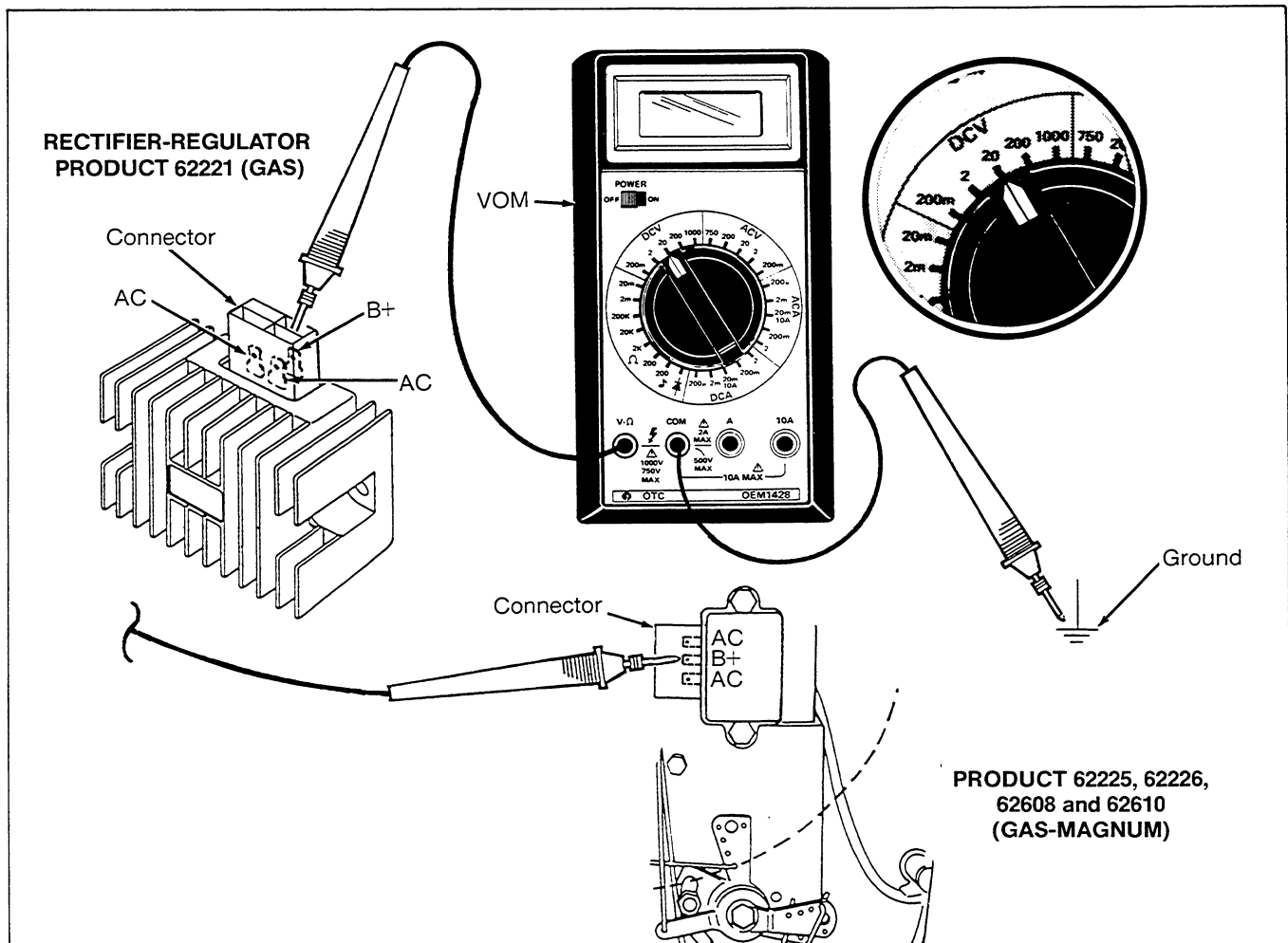
If the ammeter indicates problems with the charging system (ie. no charge or charge rate too high) the following tests should be performed.

CHARGE TEST (See "Charge Test" Illustration)

With engine running at full throttle:

1. Set VOM to 20 DCV.
2. With connector in place, connect pos (+) meter leads to B+ terminal at rectifier. Ground neg (-) lead. VOM should read 13.8 volts or higher.
3. Place a minimum 5 amp load on battery by either;
 - a. turning on lights (if 60 watts or more) or;
 - b. placing a 2.5 ohm, 100 watt resistor across battery terminals.

The reading (charge rate) on VOM will increase if charging system is okay. If not, proceed with test to determine whether stator is defective.

**CHARGE TEST****10D**

SECTION 10D. CHARGING SYSTEM

AC STATOR TEST (See “Stator Test” Illustration)

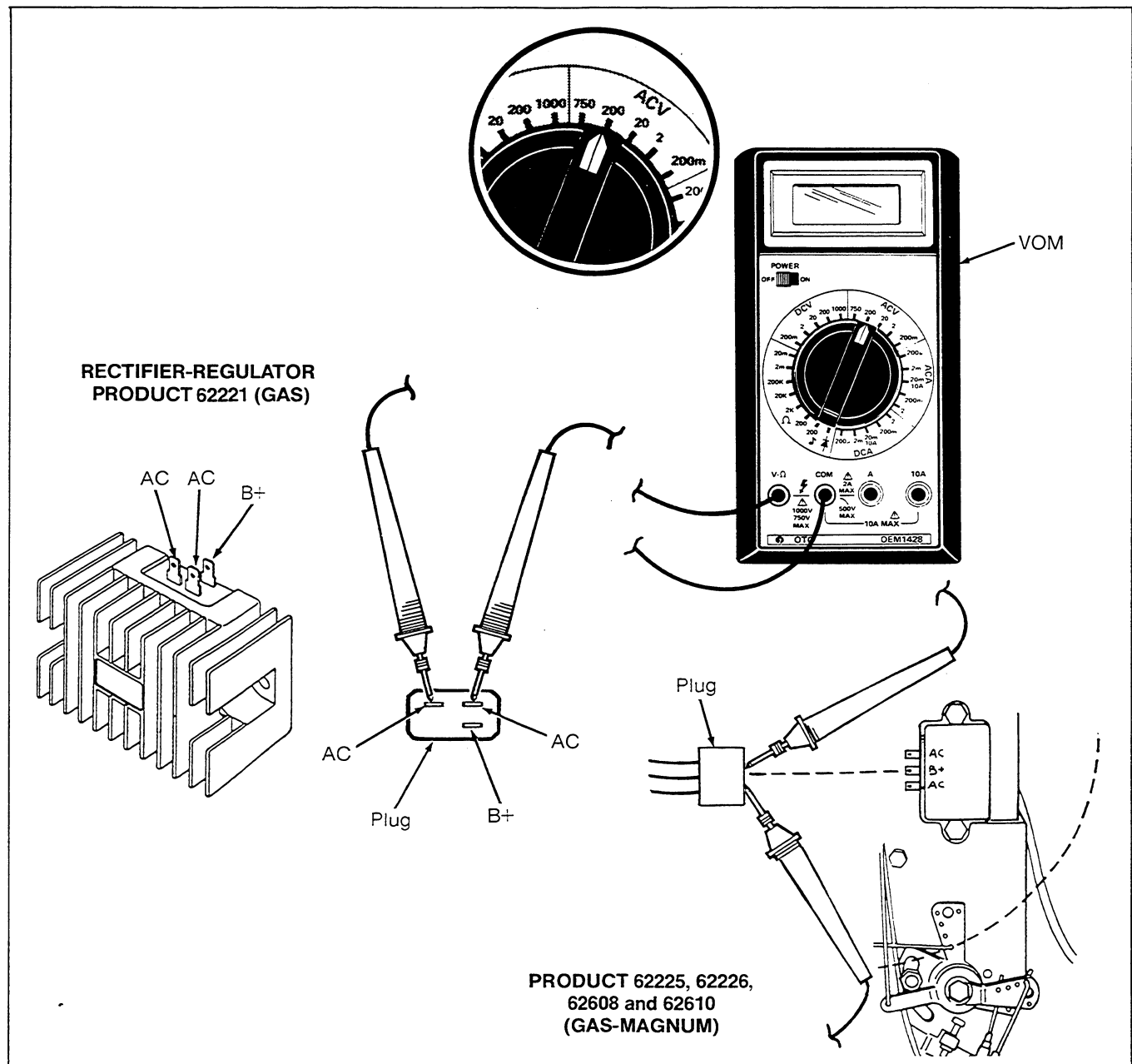
1. Disconnect wire connector from rectifier-regulator.
2. Set VOM to 200 ACV.

3. Connect meter leads to (across) AC terminals in the rectifier-regulator plug. Reading (voltage) on VOM should be 28 volts.

- If less than 28V, the stator is defective and must be replaced.
- If more than 28V, the rectifier-regulator is defective and must be replaced.

**CAUTION**

Damage to the VOM will result if the meter selector is not changed to the ACV range.

**STATOR TEST**

SECTION 10D. CHARGING SYSTEM**ALTERNATOR (DIESEL)**

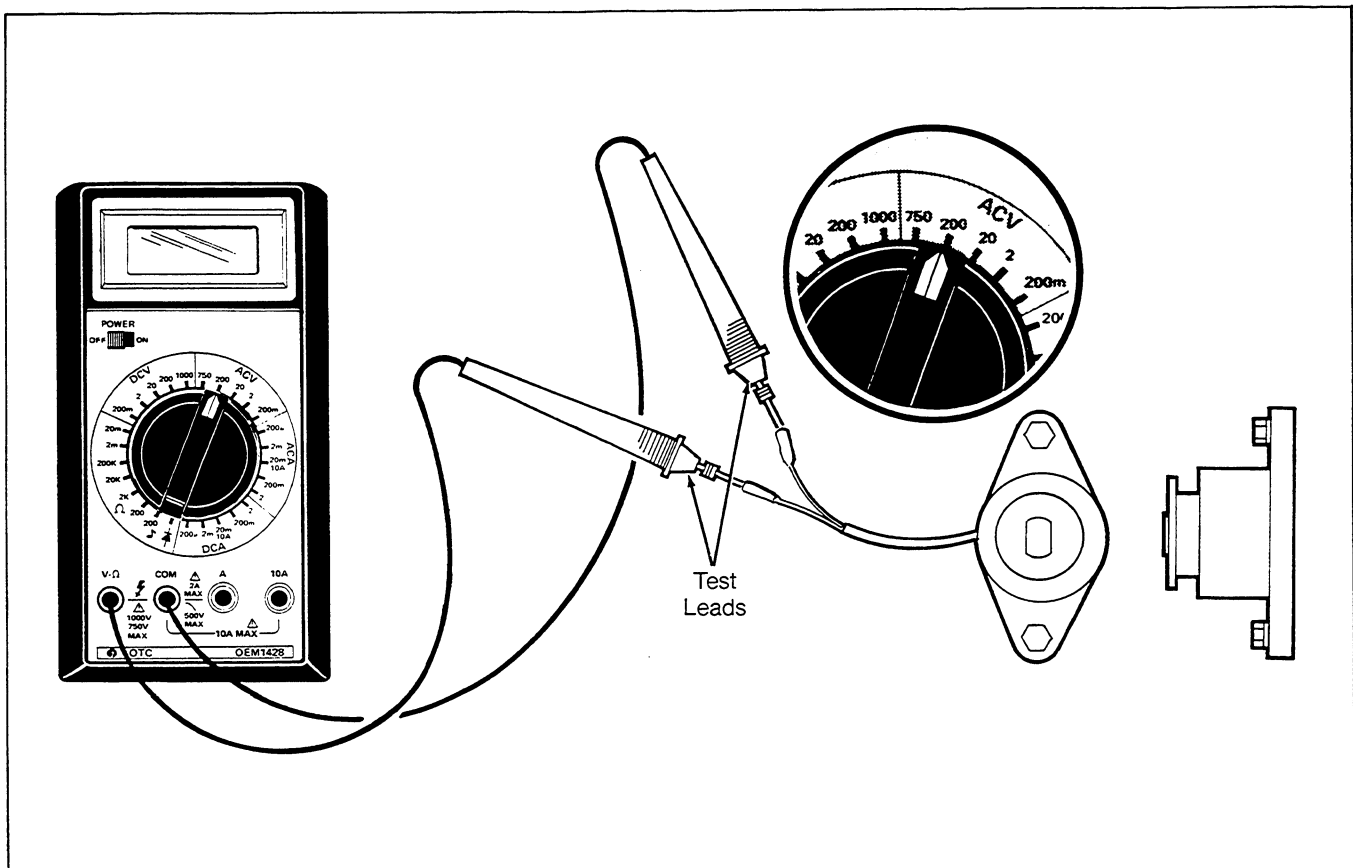
The 15 Amp charging system on diesel engine models consists of a separately mounted alternator and voltage regulator. The alternator is a rotating magnet type consisting of a stator and rotor. See the engine manufacturer's service manual for more information.

ALTERNATOR TEST (See "Alternator Test" Illustration)

1. Disconnect lead wires and connect meter leads to connectors at alternator.
2. Set VOM to ACV 200 scale.
3. Start engine and run at full throttle.
 - There should be a reading of 20 volts or more on VOM. If not, replace alternator.

**CAUTION**

Do not allow meter lead wires or clothing to get near spinning alternator/belt when engine is started.

**Alternator Test****10D**

SECTION 10D. CHARGING SYSTEM

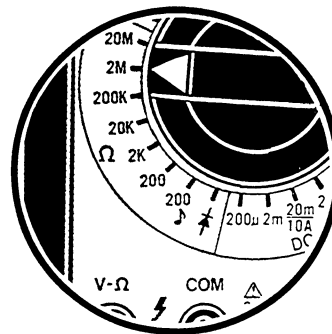
REGULATOR (DIESEL)

The regulator converts AC current from the alternator to DC current for circuit power and battery charging. The regulator also cuts out the charging circuit if the battery voltage exceeds a specified limit to prevent overcharging.

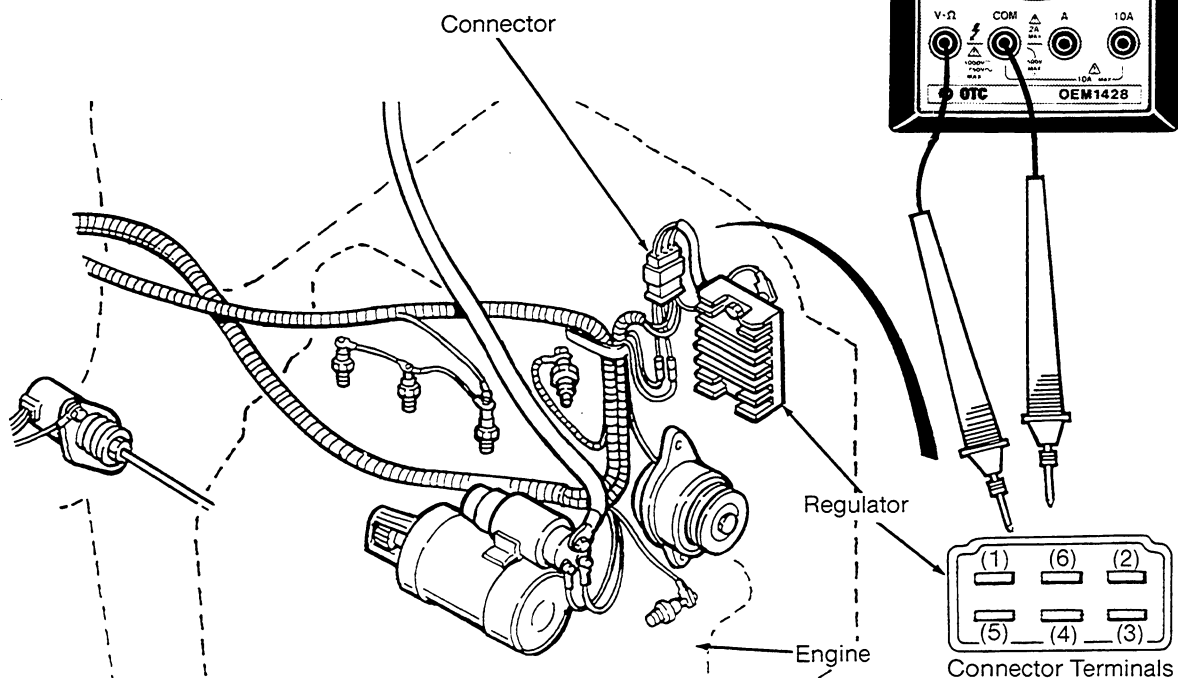
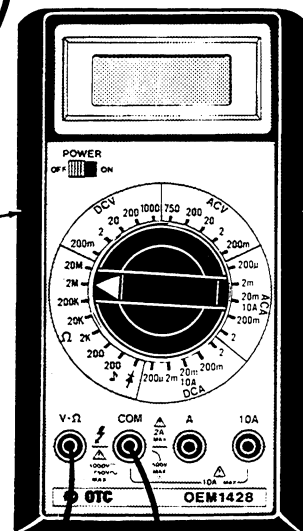
REGULATOR TEST (DIESEL) (See "Regulator Test" Illustration)

1. Disconnect the regulator connector.
2. Set VOM to 2M (Ω) ohms.
3. Connect VOM leads to regulator connector terminals as shown in the chart and observe the VOM readout.
 - Continuity (YES) and no continuity (NO) readings should be as indicated in the chart. If not, the regulator is defective.

Tester + Terminal		Terminal No. & Color Code					
Tester - Terminal	No. 1 Blue	#1 Blue	#2 Blue	#3 Red	#4 Yellow	#5 Green	#6 Black
	No. 1 Blue		NO	YES	NO	NO	NO
	No. 2 Blue	NO		YES	NO	NO	NO
	No. 3 Red	NO	NO		NO	NO	NO
	No. 4 Yellow	YES	YES	YES		NO	YES
	No. 5 Green	NO	NO	NO	NO		NO
	No. 6 Black	NO	NO	NO	NO	NO	



VOM



REGULATOR TEST (DIESEL)

SECTION 10E. STARTER

STARTER (ALL PRODUCTS)

See the engine manufacturers service manual for description and test information.

10E

SECTION 10F. SWITCHES-RELAYS**GENERAL**

This section will provide information on testing the various switches that are part of the electrical system. Repair is limited to replacement of component found defective during testing. Refer to the COMPONENT LOCATION illustration at the back of this section.

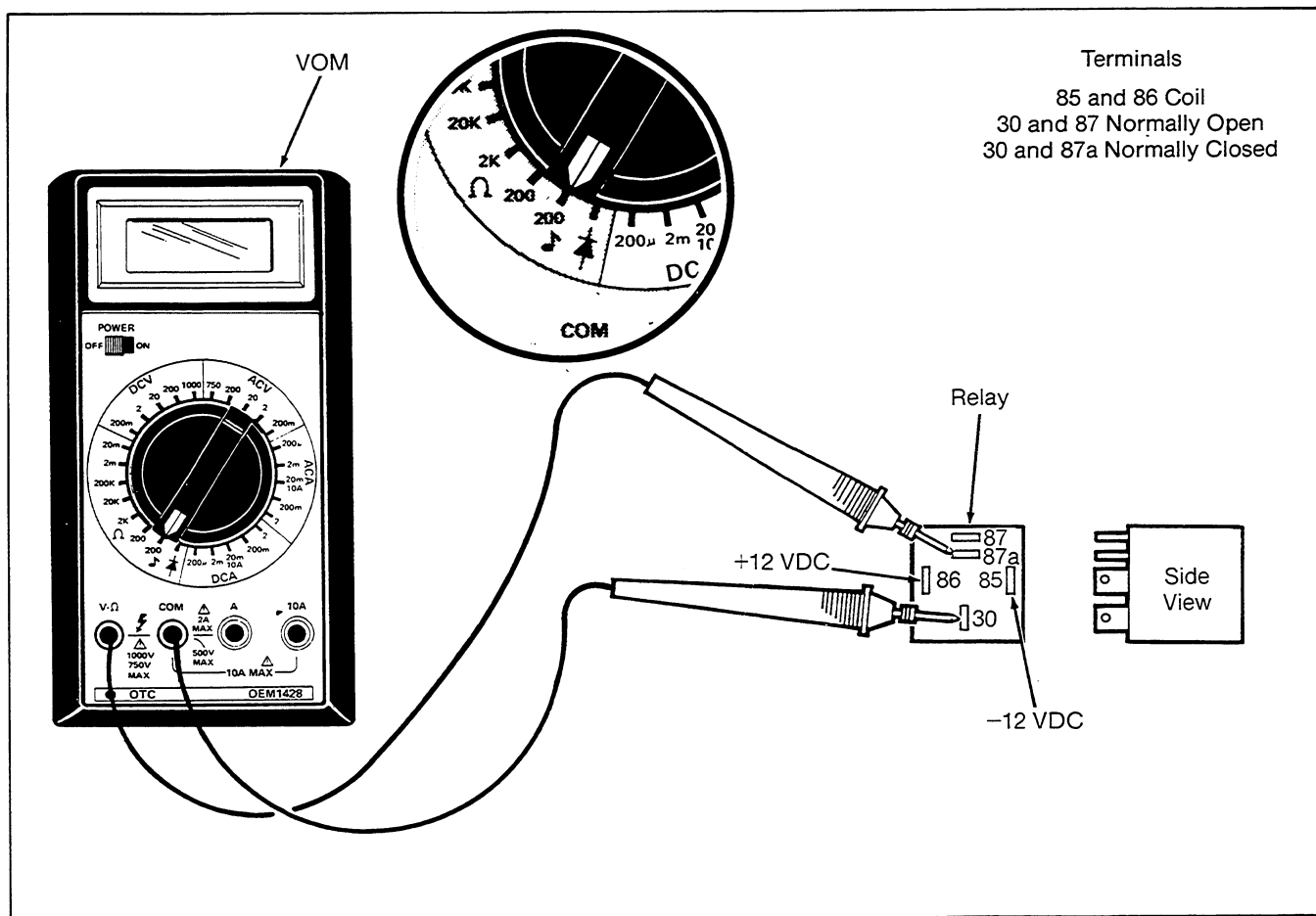
**IGNITION RELAY TEST
(PRODUCTS 62225, 62226 ONLY)
(See "Ignition Relay Test" Illustration)**

NOTE

Identify electrical leads before disconnecting switch.

1. Set multi-meter to 200 Ω (ohms).
2. Connect black lead from multi-meter to terminal 30.

3. Connect red lead from multi-meter to terminal 87a.
 - There should be continuity. If there is no continuity, replace relay.
4. Move the red lead to terminal 87.
 - There should be no reading on multi-meter (no continuity). If there is a reading replace relay.
5. Connect 12V. across terminals 85 and 86. There should be an audible "click".
6. Connect black lead from DMM to terminal 30.
7. Connect red lead from DMM to terminal 87a.
 - Open when coil is energized.
8. Move red lead to terminal 87.
 - Closed when coil is energized.



IGNITION RELAY TEST (PRODUCT NOS. 62225, 62226 and 62610 — GAS ONLY)

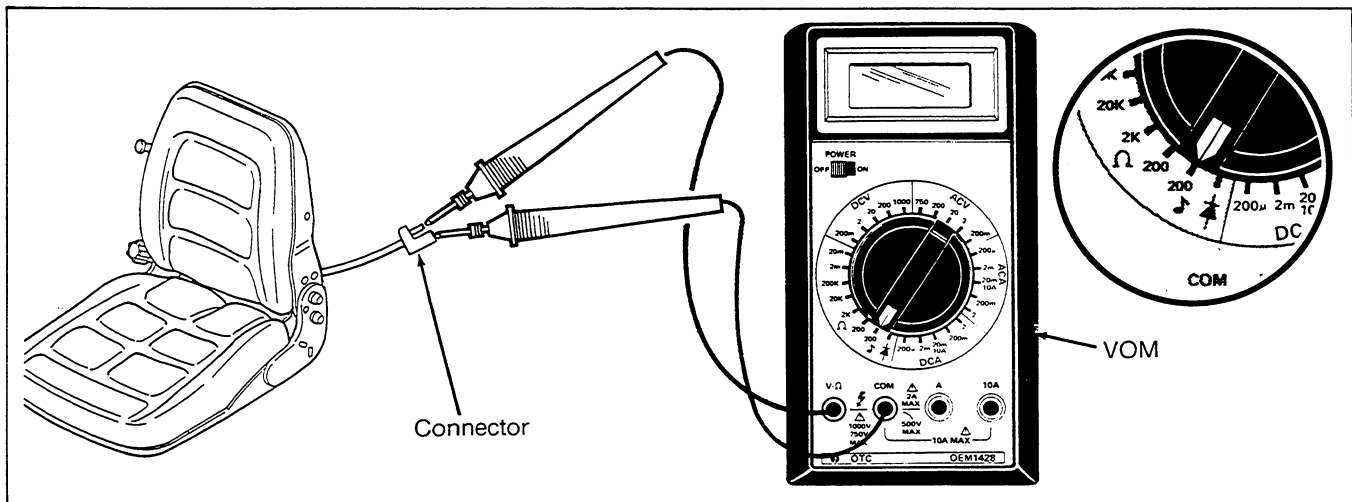
SECTION 10F. SWITCHES-RELAYS

SEAT SWITCH TEST (ALL)

(See "Seat Switch Test" Illustration)

1. Disconnect seat switch connector.
2. Set VOM to 200 Ω (Ω) ohms scale.
3. Connect meter leads to connector terminals.

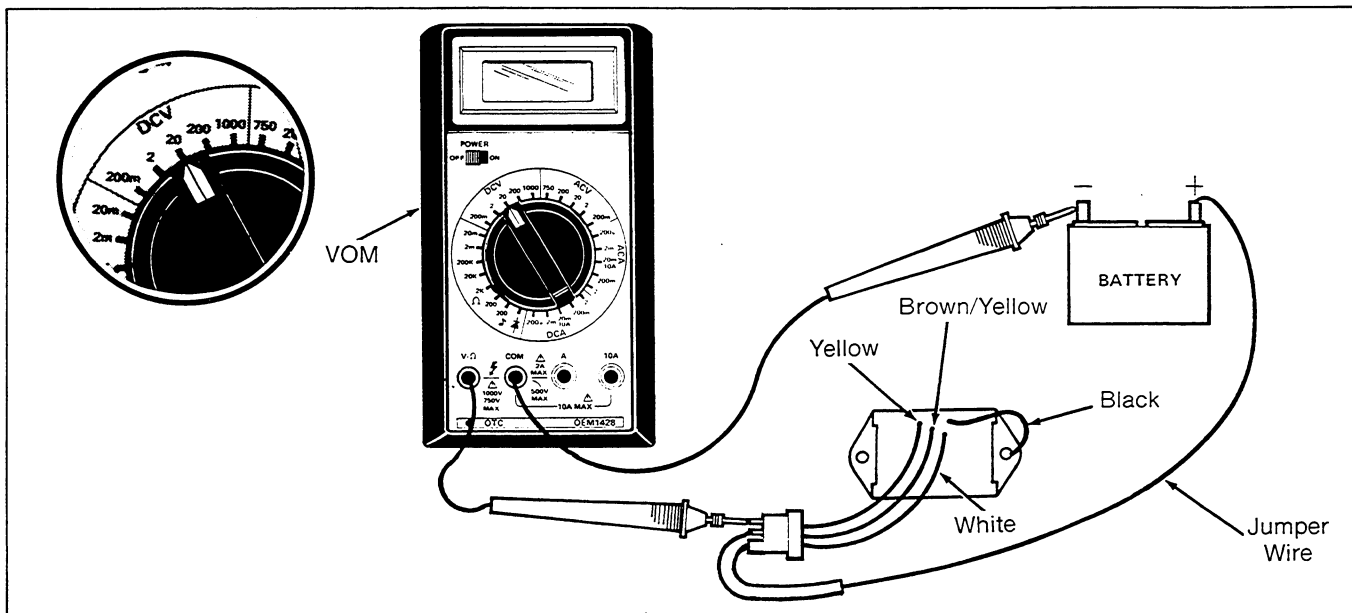
- There should be no reading (no continuity) on VOM.
4. Depress (sit) seat switch.
- There should be a reading (continuity) on VOM.

**SEAT SWITCH TEST (ALL)****SEAT DELAY RELAY TEST (62300, 62620, 62622, OPTIONAL ON 62221, 62225, 62226, 62606, 62608, 62610)**

(See "Seat Delay Relay Test" Illustration)

1. Leave or connect (if relay removed) white and brown wires to +12 VDC (Bat).
2. Leave black wire grounded or connect to BAT - terminal, if relay is removed from machine.

3. Set VOM to 20 VDC.
4. Connect red lead from VOM to yellow wire and black lead to ground – terminal at battery.
 - The VOM should read 12 volts, if not, replace relay.
5. Disconnect white wire from +12V (Bat).
 - After a 1 to 2 second delay voltage reading on VOM should drop out, if not, replace relay.

**SEAT DELAY RELAY TEST (DIESEL AND GAS IF KIT HAS BEEN INSTALLED)**

SECTION 10F. SWITCHES-RELAYS**TRACTION NEUTRAL START INTERLOCK SWITCH TEST (ALL)**

The traction interlock switch prevents machine start-up unless the traction lever is in the NEUTRAL position.

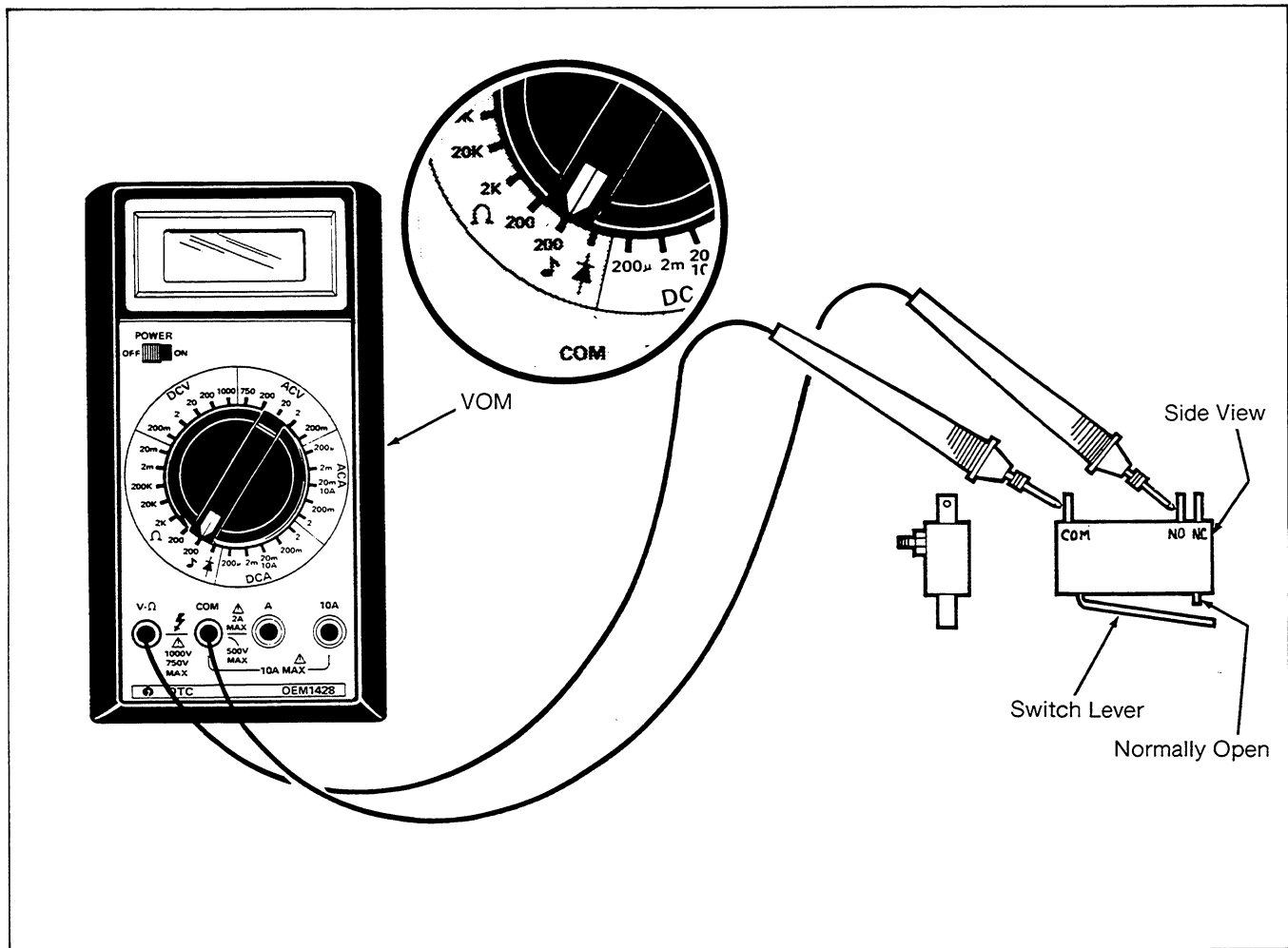
1. Identify (label) and disconnect leads from switch.
2. Set VOM to 200 Ω (Ω) ohms.
3. Connect leads from VOM to switch as shown.
 - There should be no reading on VOM (no continuity). If there is an ohm reading, replace switch.

4. Depress switch lever.

- There should be a reading on VOM. If not, replace switch.

TRACTION NEUTRAL START INTERLOCK SWITCH ADJUSTMENT (ALL)

Install switch so that lever is depressed when traction lever is in NEUTRAL position.

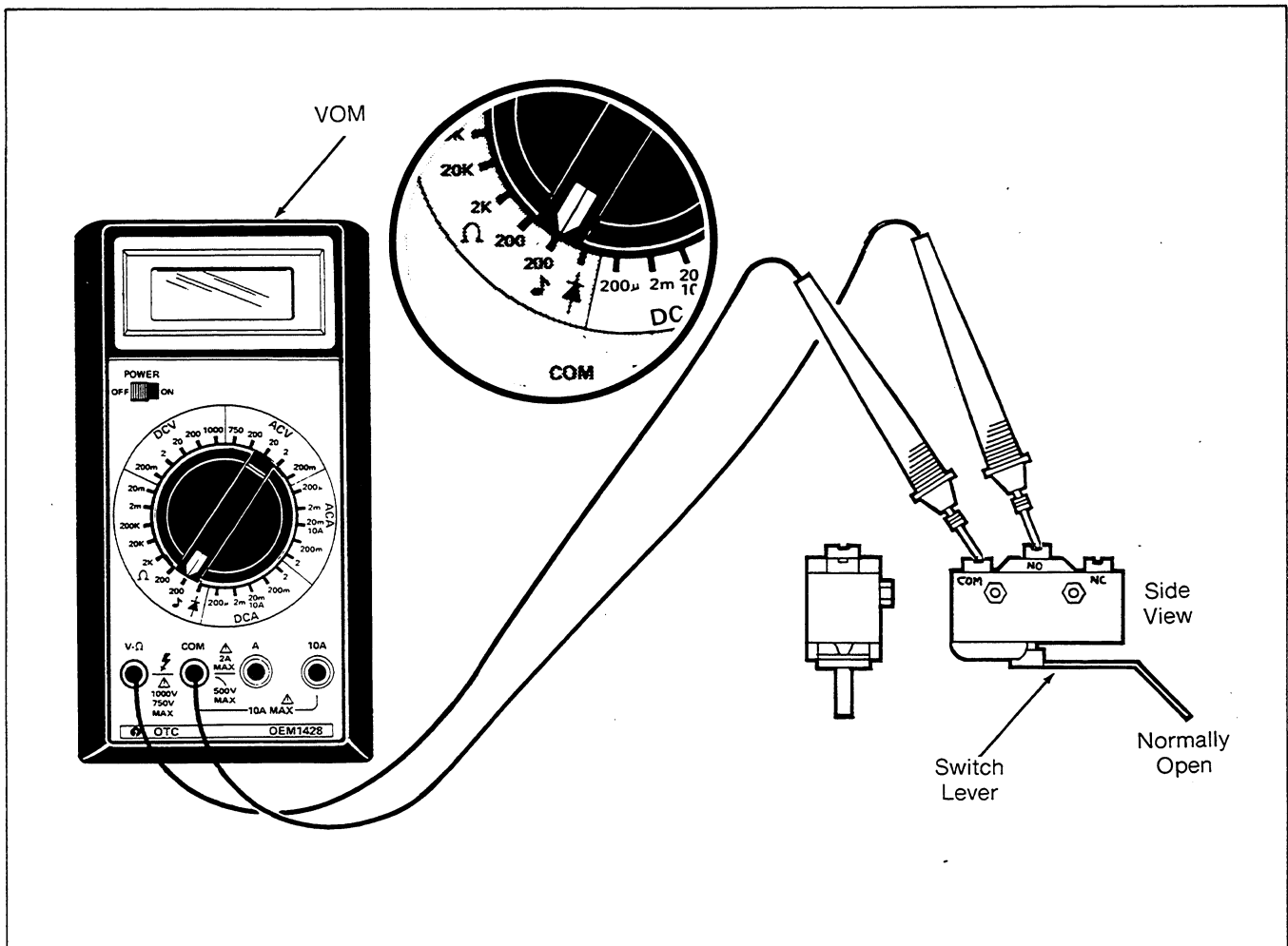
**TRACTION NEUTRAL START INTERLOCK SWITCH TEST (ALL)****10F**

SECTION 10F. SWITCHES-RELAYS

BACKLAP SWITCH TEST (ALL)
(See "Backlap Switch Test" Illustration)

The backlap switch is activated anytime the reel lever(s) is in the BACKLAP position. It allows the reels to run in reverse even if the attachments are in the "raised" position.

1. Disconnect ground cable at battery.
2. Identify (label) and disconnect electrical leads at switch.
3. Set VOM to 200 Ω (ohms) scale.
4. Connect leads as shown.
 - There should be no reading at VOM (no continuity).
5. Depress switch lever.
 - There should be a reading at VOM (continuity).

**BACKLAP SWITCH TEST (ALL)**

SECTION 10F. SWITCHES-RELAYS**REEL LEVER NEUTRAL START SWITCH TEST (ALL)****(See "Reel Lever Neutral Start Switch Test" Illustration)**

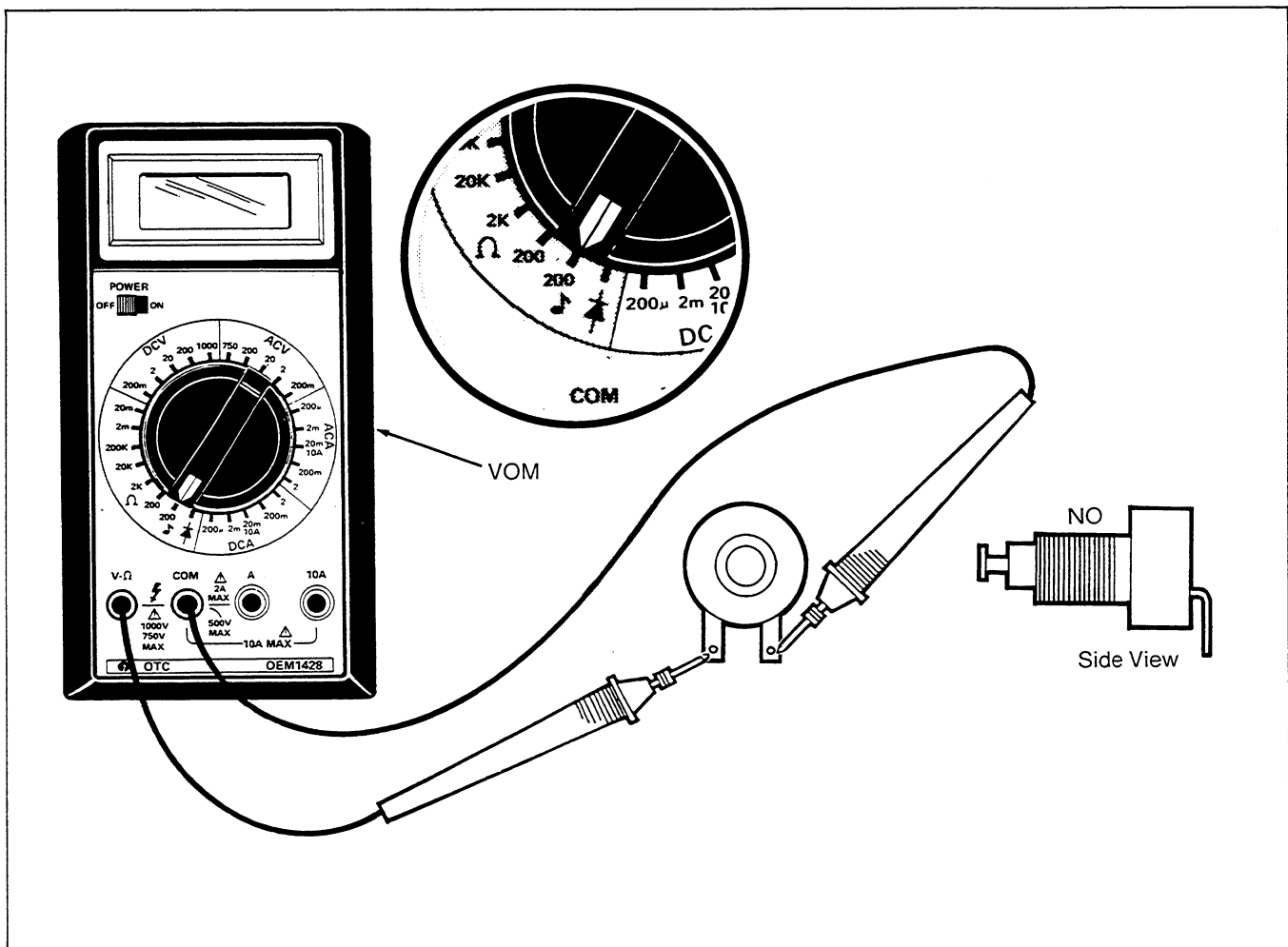
The reel switch is a safety device which allows the machine to be started *only* when the reel lever(s) is in the OFF position.

1. Remove the plug from the switch.
2. Push reel lever to ON position.
3. Set VOM to 200 Ω (Ω) ohms scale.

4. Connect leads to switch as shown.
 - There should be no reading (no continuity) at VOM.
5. Depress switch (simulates reel lever OFF).
 - There should be a reading (continuity) at VOM.

NOTE

See Reel Lever Neutral Start Switch Adjustment procedure on the next page before installing switch.

**REEL LEVER NEUTRAL START SWITCH TEST (ALL)**

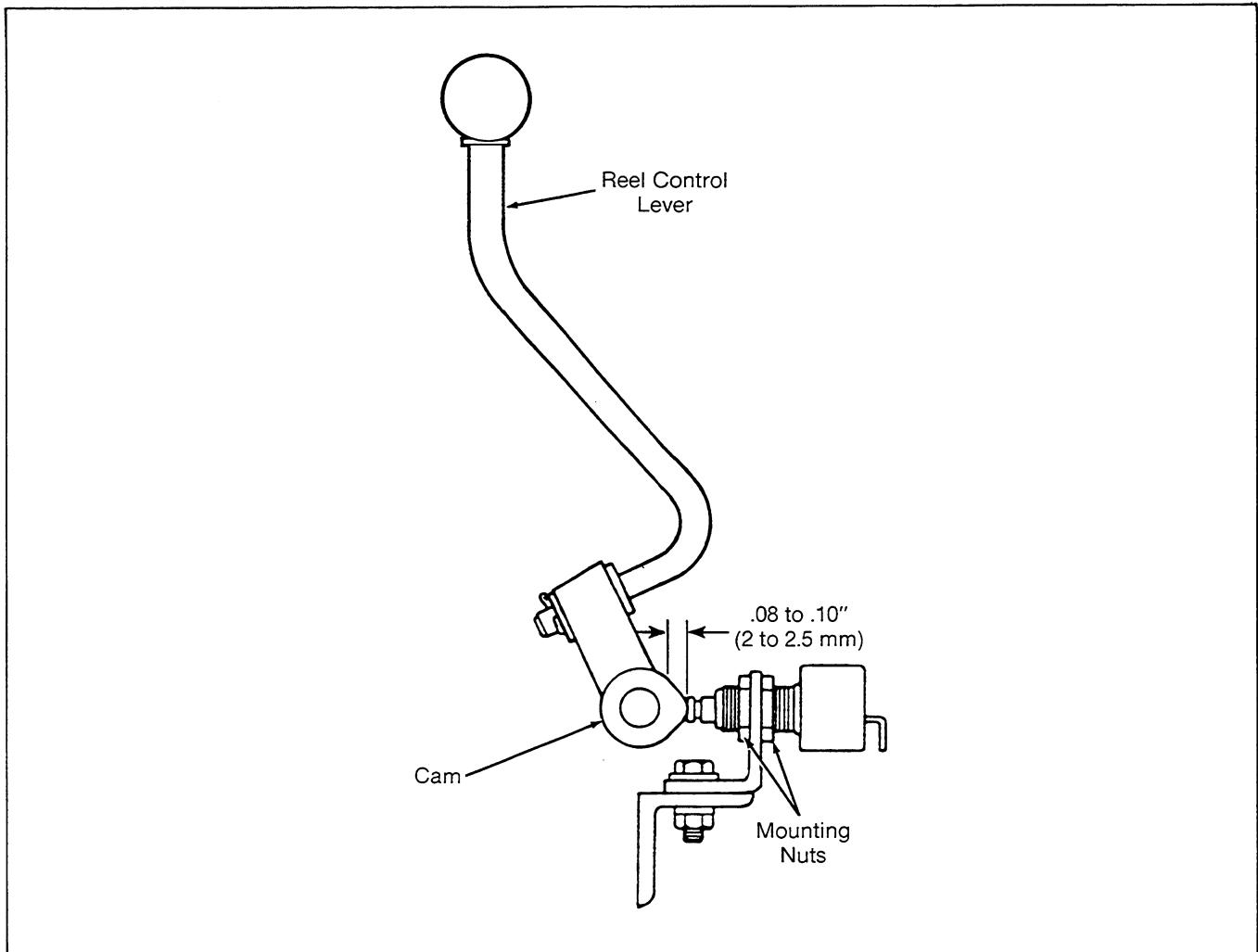
SECTION 10F. SWITCHES-RELAYS

REEL LEVER NEUTRAL START SWITCH ADJUSTMENT (ALL)
(See "Reel Lever Neutral Start Switch Adjustment" Illustration)

The neutral start switch is a device designed to prevent engine start-up, unless the reel lever(s) is in the OFF position. The switch must be adjusted so that the only time the switch is closed is when the reel lever is in the OFF position.

Remove cowling to gain access to switch.

1. Put reel control lever in OFF position.
2. Loosen mounting nuts and position switch so that pushbutton is depressed 0.08 to 0.10 inch (2 to 2.5 mm) against hub. Tighten mounting nuts.
3. Push lever to the ON position while checking to make sure cam does not touch switch.



REEL LEVER NEUTRAL START SWITCH ADJUSTMENT (ALL)

SECTION 10F. SWITCHES-RELAYS**IGNITION SWITCH TEST (ALL)**
(See "Ignition Switch Test" Illustration)

1. Disconnect ground (black) cable at battery.
2. Disconnect wiring connector at switch.
3. Set VOM to 200 Ω (ohms) scale.
4. See Test Step 4 illustration and check all switch positions as follows:
 - a. With key switch in OFF position connect test leads to any two terminals — check all five.
 - There should be no reading (no continuity) on VOM.

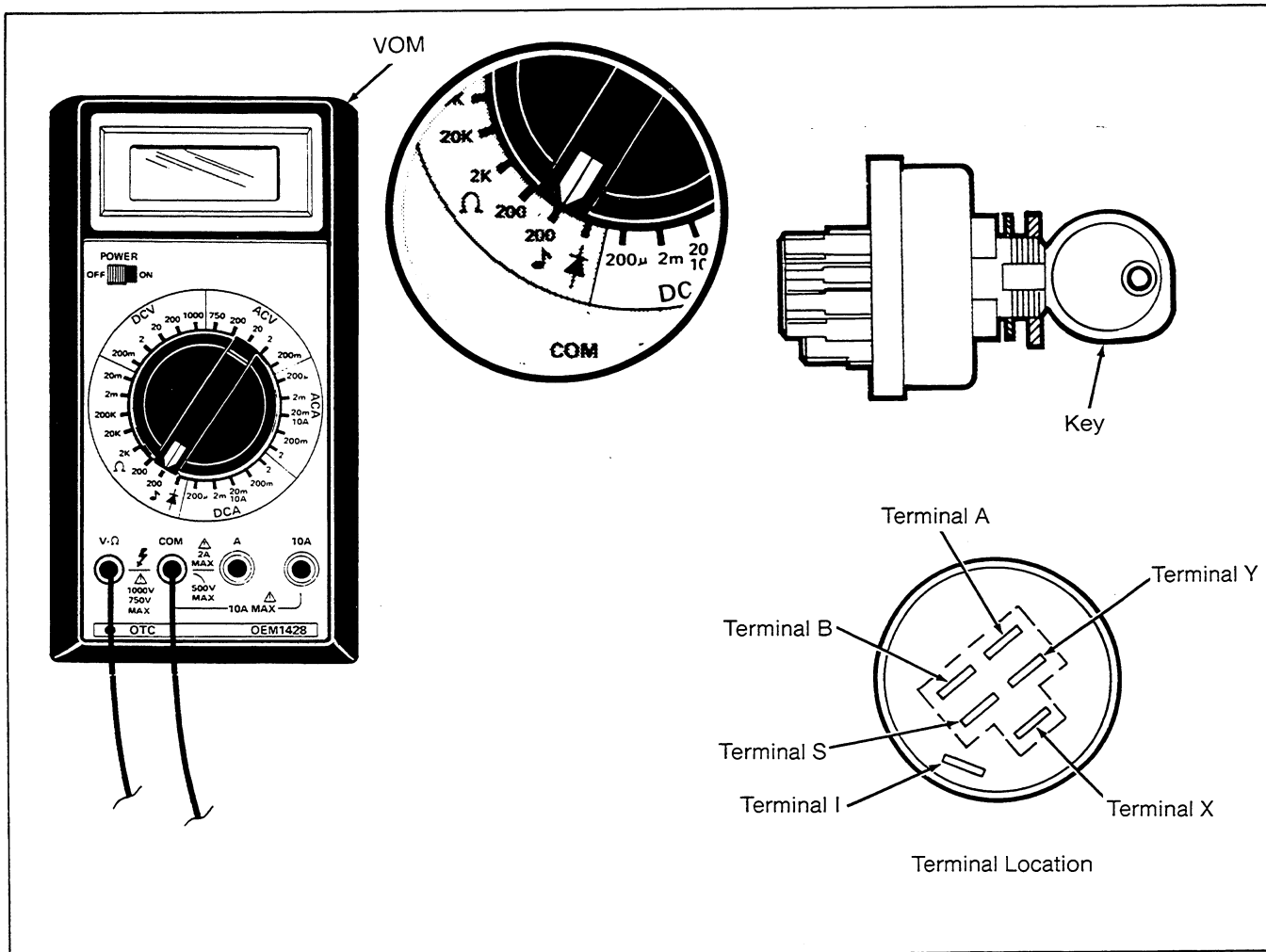
NOTE

If there is a reading of more than 3.0 ohms in any of the following tests the switch is defective and must be replaced.

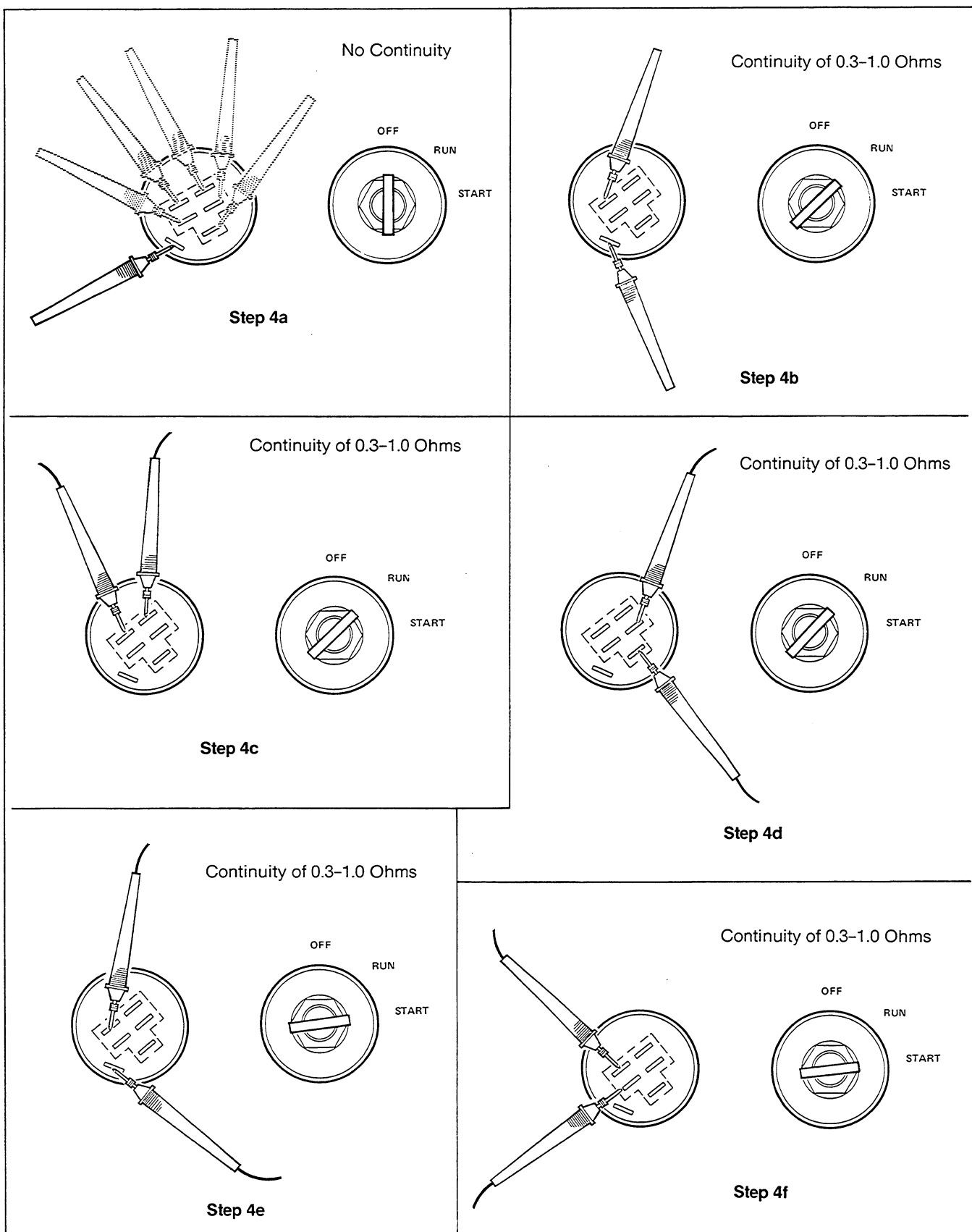
- b. With key switch in RUN position connect black test lead to terminal B and red lead to terminal I.

- c. Move red lead to terminal A.
 - There should be a reading (continuity) of 0.3–1.0 ohms, on the VOM.
- d. Connect black lead to terminal X and red lead to terminal Y.
 - There should be a reading (continuity) of 0.3–1.0 ohms on the VOM.
- e. Hold switch in START position. Connect black lead to terminal B and red lead to terminal I.
 - There should be a reading (continuity) of 0.3–1.0 ohms on VOM.
- f. Move red lead to terminal S.
 - There should be a reading (continuity) of 0.3–1.0 ohms on VOM.

Replace a switch that does not meet all of the above values (VOM readings).

**IGNITION SWITCH TEST (ALL)**

SECTION 10F. SWITCHES-RELAYS



IGNITION SWITCH TEST STEP 4

SECTION 10F. SWITCHES
**BACKLAP INTERLOCK (62257, 62260,
62250 & 62242 ONLY)**
(See Figure 10F-10)

1. Disconnect ground (black) cable at battery.
2. Disconnect wiring connector at switch.
3. Set multi-meter to 200 Ω (ohms) scale.
4. See Test Step 4 illustration and check all switch positions as follows:

NOTE

If there is a reading of more than 2.0 ohms in any of the following tests the switch is defective and must be replaced.

- a. With key switch in OFF position connect test leads to terminals G and M.
 - There should be a reading of 0.3 on multi-meter.
- b. Connect leads to all combinations of the remaining three terminals (B, L and S).

- There should be no reading on the multi-meter.
- c. With key switch in RUN position connect multi-meter test leads to terminals B and terminal L.
 - There should be a reading (continuity) of 0.3-1.0 ohms on the multi-meter.
 - d. Connect test leads to all combinations of the remaining three terminals (G, M and S).
 - There should be no reading on the multi-meter.
 - e. Hold switch in START position. Connect test lead to terminals B and S.
 - There should be a reading (continuity) of 0.3-1.0 ohms on multi-meter.
 - f. Move test lead to terminal L.
 - There should be a reading (continuity) of 0.3-1.0 ohms on multi-meter.

Replace a switch that does not meet all of the above test results.

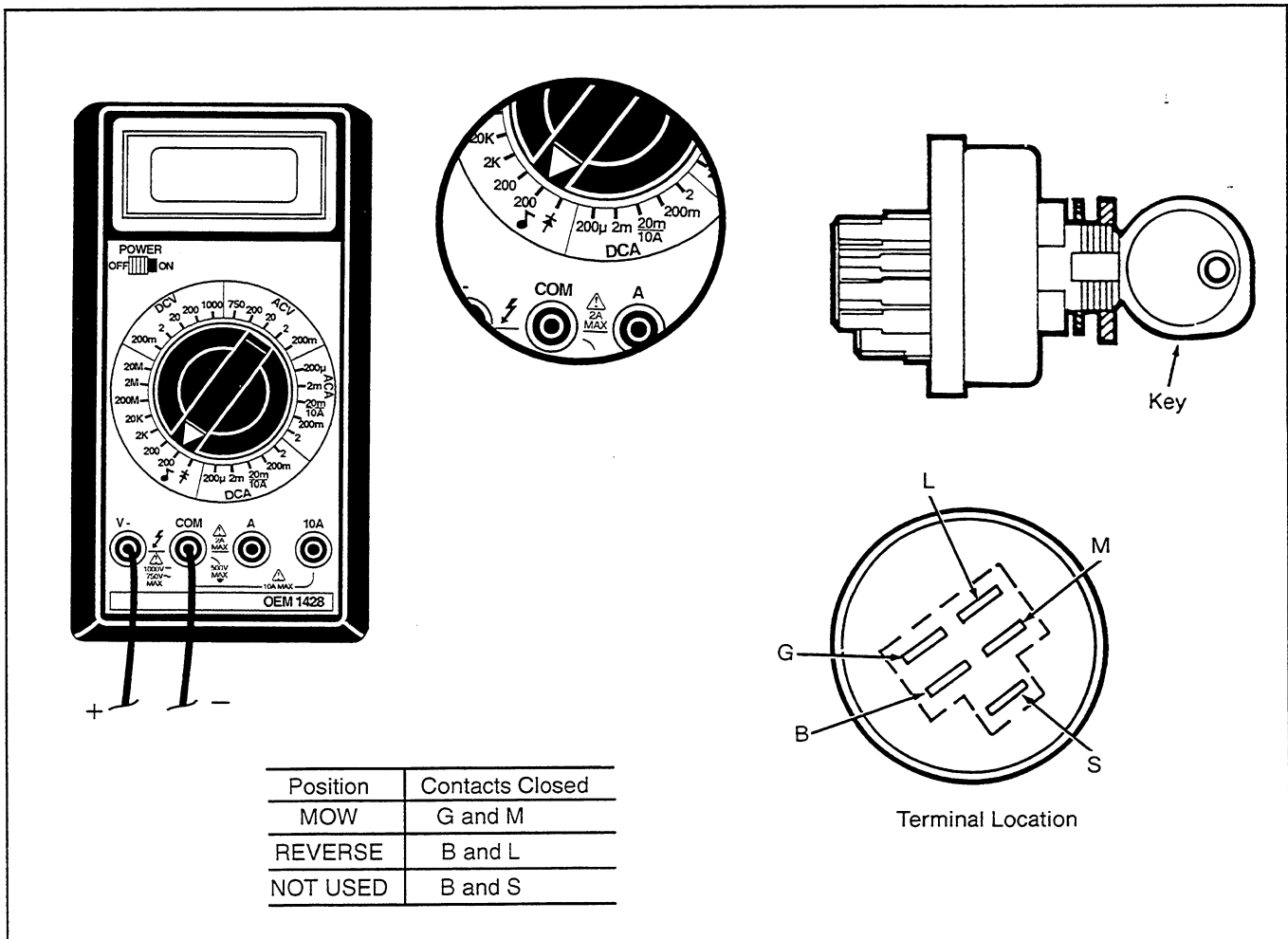
**10F**

Figure 10F-10. Ignition Switch Test (Gas)

SECTION 10F. SWITCHES

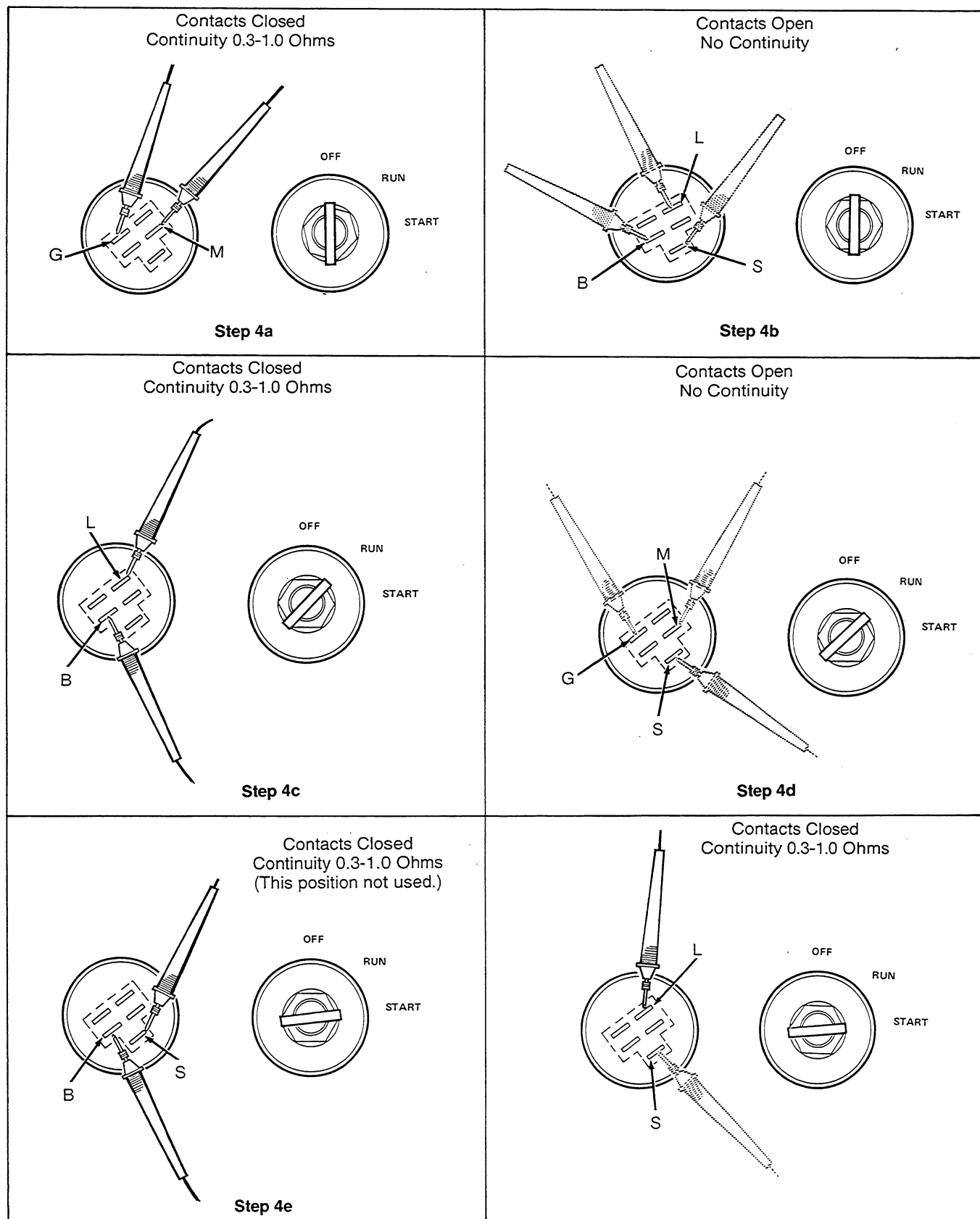


Figure 10F-11. Ignition Switch Test Step 4

SECTION 10G. GAUGES

GENERAL

Repair of gauges and sending units are limited to the replacement of defective components or wiring. Before replacing a gauge that is not working make sure to perform a continuity check on the wire to the gauge as described at the beginning of this section. If the wiring checks okay, assume a gauge that does not work is defective except for a water temperature gauge (diesel products only) which can be tested as described below.

NOTE

See Section 2C for the location of all instruments and gauges.

WATER TEMPERATURE GAUGE TEST (DIESEL ONLY)

Test the water temperature gauge as follows:

1. Turn ignition switch to RUN (ON).
2. Disconnect lead wire to sending unit on engine.
 - The gauge indicator should go all the way up. If not, gauge is defective and must be replaced. If gauge needle does go to upper limit but does not work during operation, sending unit is defective.

SECTION 10H. SOLENOIDS

STARTER SOLENOID TEST

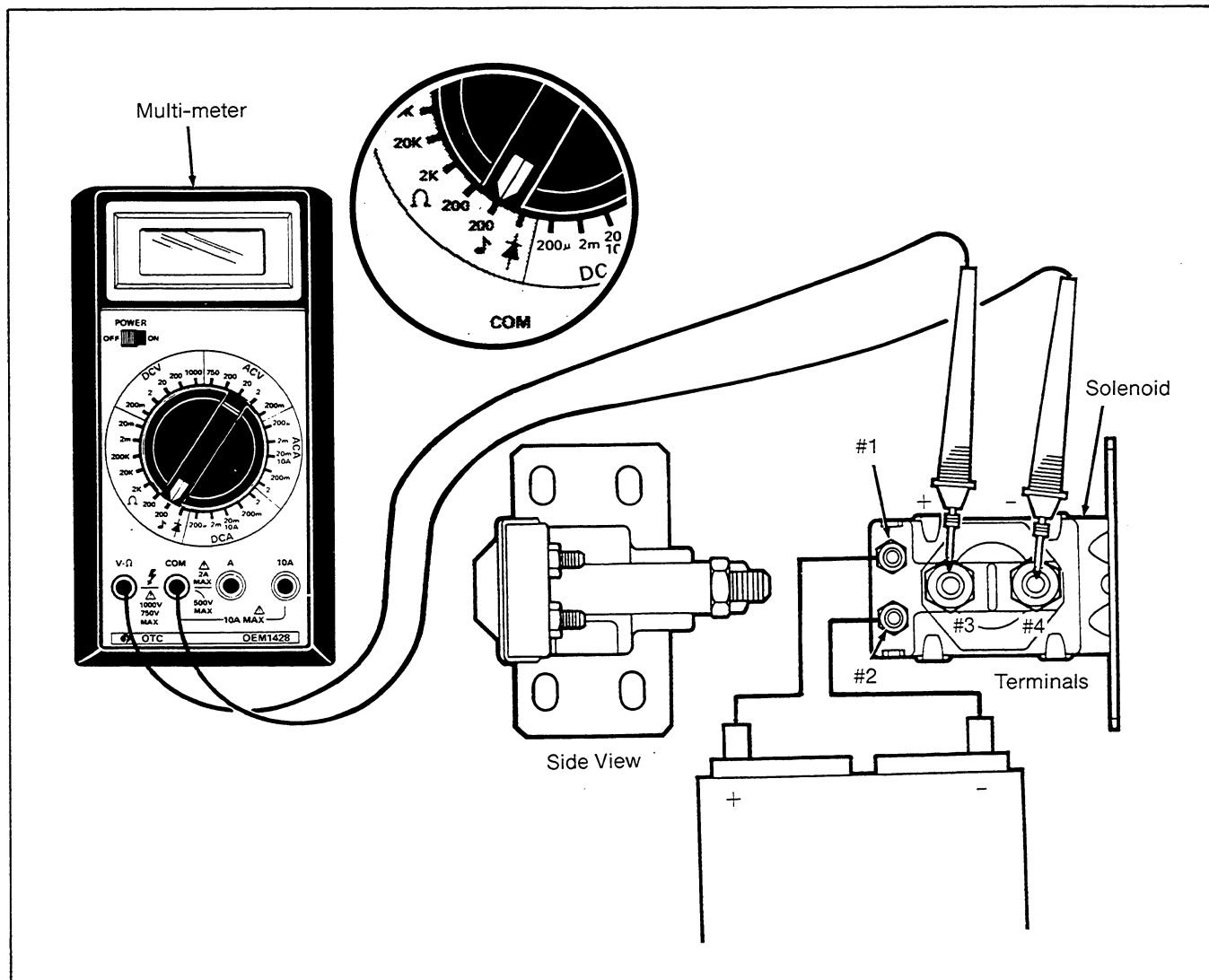
See "Test" Illustration and test the starter solenoid as follows:

1. Connect 12 VDC to terminals 1 and 2.
 - There should be an audible "click".
2. Set multi-meter to 200 Ω (ohms).

3. Connect multi-meter test leads to terminals 3 and 4.

- Multi-meter reading should be less than 1.0 ohms.

Replace a starter that does not meet the above test results.



STARTER SOLENOID TEST

SECTION 10H. SOLENOIDS**FUEL SHUT-OFF SOLENOID (DIESEL)**

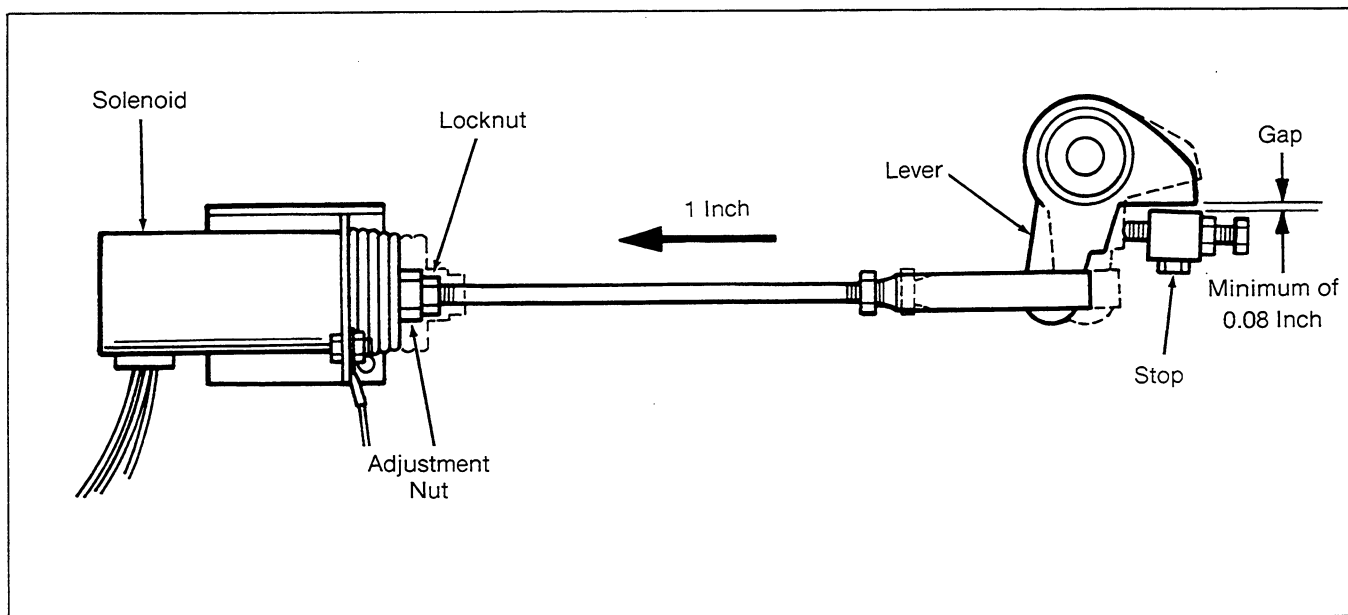
The fuel solenoid will open and shut off fuel supply to the engine if a safety limit is met (ie. seat switch open).

TEST (See "Adjustment" Illustration)

The solenoid plunger must retract 1 inch when the key switch is bumped to the START POSITION. There must be a gap between the lever and stop when the ignition switch is turned to START.

ADJUSTMENT (See "Adjustment" Illustration)

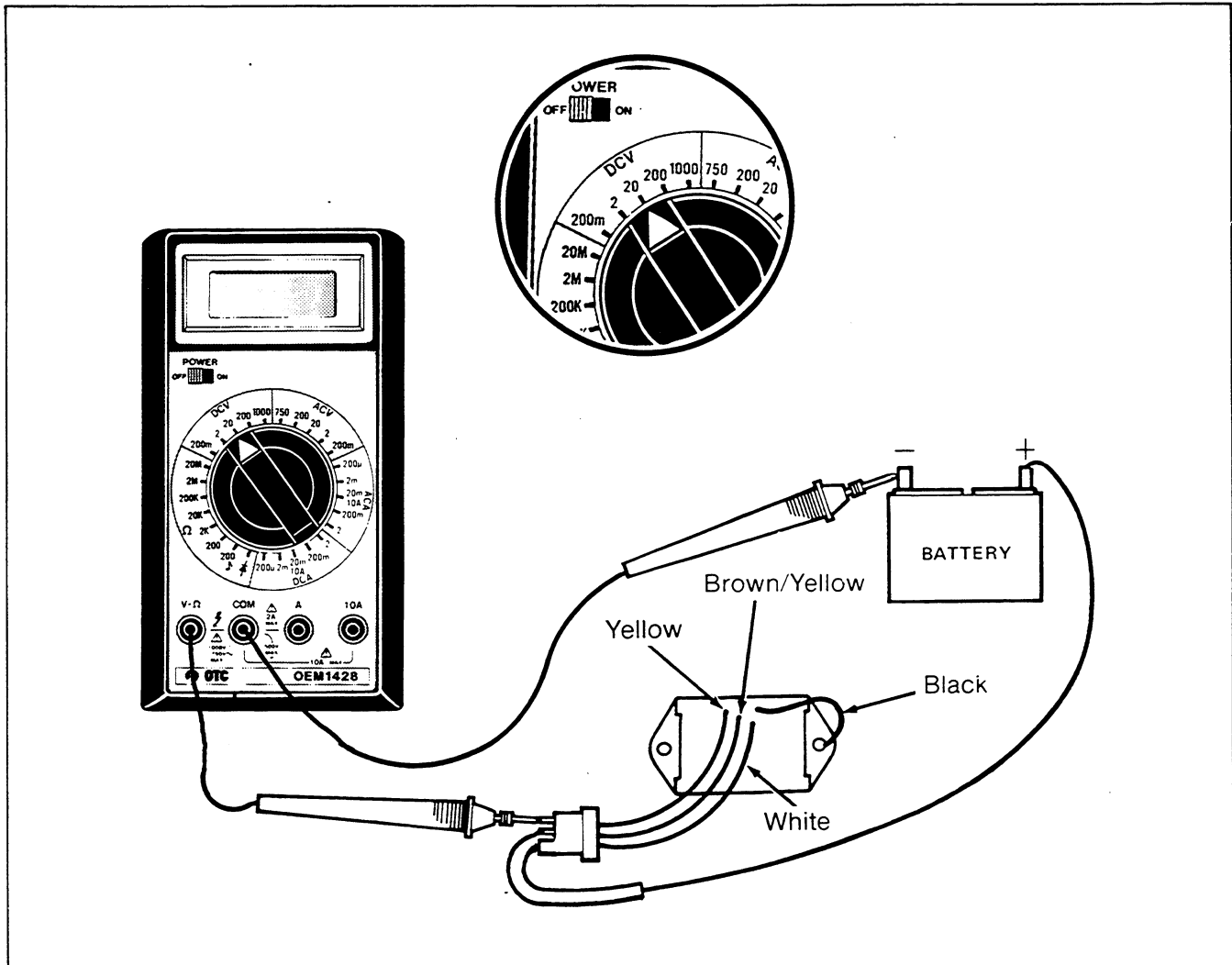
1. Disconnect solenoid rod at lever.
2. Turn ignition switch to START momentarily without starting engine. This will seat solenoid plunger. Leave ignition switch in RUN position.
3. Adjust and connect rod at stop lever as necessary so that there is a gap between lever and stop with solenoid engaged.
4. After adjustment turn ignition switch to OFF.



FUEL SHUT-OFF SOLENOID ADJUSTMENT (DIESEL ONLY)

SECTION 10H. RELAY**SEAT DELAY RELAY TEST
(See Figure 10H-3)**

1. Connect white and brown wires to +12 VDC (Bat).
2. Leave black wire grounded or connect to BAT NEG (-) terminal, if relay is removed from machine.
3. Set DMM to 20 VDC.
4. Connect red lead from DMM to yellow wire and black lead to ground NEG (-) terminal at battery.
 - The DMM should read 12 volts. If not, replace relay.
5. Disconnect white wire from +12V (Bat).
 - After a 1 to 2 second delay, voltage reading on DMM should drop out, if not, replace relay.

**Figure 10H-3. Seat Delay Relay Test**

SECTION 11 PREVENTIVE MAINTENANCE

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SECTION 11A. GENERAL**PREVENTIVE MAINTENANCE**

Preventive Maintenance (PM) is maintenance performed to prevent malfunctions and parts breakdowns by periodically and systematically checking equipment and its systems.

Preventive Maintenance will cut back corrective maintenance.

SCHEDULING

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

Use the manufacturers recommendation of preventive maintenance. These recommendations can then be altered as experience is gained with the type of equipment and the type of environment in which it operates.

While performing preventive maintenance tasks the individual should always be alert to conditions that may seem abnormal. If an abnormal condition is detected a determination must be made to either correct the condition immediately or schedule the tractor in the shop for necessary repairs.

ADMINISTRATION

Record keeping is an important and most often a forgotten part of preventive maintenance.

Jacobsen has developed a PMMRS (Preventive Maintenance Management Record System).

PMMRS PROGRAM KITS

The PMMRS kits and replacement forms (see Figure 11A-1) are available directly from your local Jacobsen Distributor.

Maintenance Summary

MACHINE NUMBER _____ PRODUCT _____ MODEL _____ SERIAL NO. _____

1. Scheduled PM
2. Scheduled Repair
3. Unscheduled Repair
4. Warranty

1. Shop
2. Distributor
3. Outside

1. Preventive Maint.
2. Engine
3. Drive Train
4. Hydraulic
5. Chassis
6. Accessories

Date _____ Hours _____ Service Description _____ Service Code _____ Cost _____ Mech. Init. _____

JACOBSEN
JACOBSEN Division of Textron Inc.

SERVICE ORDER

MACHINE NUMBER _____ MODEL _____ PRODUCT # _____ SERIAL # _____ NO. ACCT. _____

HOURS _____ SCHEDULED PM _____ SCHEDULED REPAIR _____ UNSCHEDULED REPAIR _____ WARRANTY REPAIR _____ SHOP _____ DISTRIBUTION _____ OUTSIDE _____

PM SERVICE: WEEKLY, MONTHLY, QUARTERLY, SEMI-ANNUAL, ANNUAL

REPAIR: Describe Repairs _____ LABOR TIME _____ MECH. INIT. _____

Describe Repairs _____ LABOR TIME _____ MECH. INIT. _____

Describe Repairs _____ LABOR TIME _____ MECH. INIT. _____

SERVICE CHECKS: ENGINE, TRANSMISSION, HYDRAULIC, BATTERY

8476-15

Figure 11A-1. PMMRS Kit Order Forms

PMMRS

PREVENTIVE MAINTENANCE MANAGEMENT RECORD SYSTEM

ORDER BLANK

NAME _____
 ADDRESS _____
 CITY _____
 STATE _____ ZIP _____

DISTRIBUTOR
 P.O. NO. _____

 * CUSTOMER CHECK
 * MUST ACCOMPANY ORDER

 CHECK NO. _____

PMMRS KIT @ \$5.00 per kit QTY. KITS ORDERED _____

Kit consists of: 10 ea. 8476-TS Maintenance Summary Sheets
 20 ea. 8477-TS Service Order Sheets
 5 ea. 8478-TS Folders (check color desired)

___ Orange Turf Tractors
 ___ Gray Reel Mowers
 ___ Lt. Blue Aerators
 ___ Red Rotarys
 ___ Dk. Blue Seeders
 ___ Yellow Sweepers and Blowers
 ___ White Grooming Equipment
 ___ Copper Trucks
 ___ Green Greens Equipment

TO ORDER SEPARATELY	QTY.	PRICE
5 Folders @ \$2.50 (state colors)	_____	_____
10 Maintenance Summary Sheets @ \$1.50	_____	_____
25 Service Order Sheets @ \$2.00	_____	_____

JACOBSEN **TEXTRON**

Jacobsen Division of Textron Inc.
 1721 Packard Avenue
 Racine, Wisconsin 53403-9988

Authorized Signature _____

Price subject to change, contact your Jacobsen Distributor.

PMMRS

PREVENTIVE MAINTENANCE MANAGEMENT RECORD SYSTEM

ORDER BLANK

NAME _____
 ADDRESS _____
 CITY _____
 STATE _____ ZIP _____

DISTRIBUTOR
 P.O. NO. _____

 * CUSTOMER CHECK
 * MUST ACCOMPANY ORDER

 CHECK NO. _____

PMMRS KIT @ \$5.00 per kit QTY. KITS ORDERED _____

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 ___ White Grooming Equipment
 ___ Copper Trucks
 ___ Green Greens Equipment

TO ORDER SEPARATELY	QTY.	PRICE
5 Folders @ \$2.50 (state colors)	_____	_____
10 Maintenance Summary Sheets @ \$1.50	_____	_____
25 Service Order Sheets @ \$2.00	_____	_____

JACOBSEN **TEXTRON**

Jacobsen Division of Textron Inc.
 1721 Packard Avenue
 Racine, Wisconsin 53403-9988

Authorized Signature _____

Price subject to change, contact your Jacobsen Distributor.

SECTION 11B. LUBRICATION SCHEDULES AND CHARTS

LUBRICATION SCHEDULES

The following lubrication charts outline grease and oil intervals. These are suggested intervals only. As experience is gained in operating this machine, the sched-

ule can be tailored to your operating time. Reference numbers are keyed to the illustration on this page. The footnotes on page 11-5 (letters a thru o) give more detailed information.

GREASE CHART (Use a good quality chassis grease)

Ref.	Qty.	Description	Remarks
DAILY			
1	3	Swivel housing lube fittings	Use hand grease gun.
2	3	Mower lift arm lube fittings	Use hand grease gun.
3	3	Mower lift arm assembly grease fittings	Use hand grease gun.
4	2	Cam lift shaft grease fittings	Use hand grease gun.
5	1	Treadle arm grease fitting	Use hand grease gun.
6	6	Roller height adjusting knobs	Apply small amount to threads.
7	3	Swivel housings	Remove caps and coat cam surfaces and pins.
8	6	Reel bearing cavities	Fill before installing reel motor. Pack 2/3 full when assembling bearings. After assembling bearing covers and motors, complete filling with grease gun until grease escapes from fittings.
80 HOURS (Every two weeks)			
9	12	Roller lube fittings	Apply with grease gun.
10	1	Rear wheel steering bushing	Apply with grease gun, pack full.
ANNUALLY			
11	1	Rear wheel thrust bearing	Fill bearing cup cavity, coat felt seat and O-ring.
12	2	Rear wheel bearings	Pack full.
OILING CHART (Use SAE 30 Oil)			
Ref.	Qty.	Description	Remarks
WEEKLY			
13	3	Cam rollers	Apply several drops to both sides of bearings at points indicated.
14	2	Mower lift links	
15	2	Hydraulic cylinders (both ends)	
16	2	Lift and mow treadle	
17	2	Brake linkage	Activate linkage several times and wipe off excess oil.
Not Shown		Parking brake linkage	Activate linkage several times and wipe off excess oil.
		Bushings and pivot points in hydraulic valve.	

11B

SECTION 11C. MAINTENANCE SCHEDULES**GENERAL**

The following charts summarize maintenance to be performed daily, weekly, every two weeks, monthly, every three months, and annually.

The maintenance charts give recommended hours of operation between various procedures. Greens Kin

machines equipped with the performance monitor have direct read outs of operating hours.

Reference numbers are keyed to the illustration on page 11C-4. Footnotes on page 11C-3 give additional information.

MAINTENANCE SCHEDULE CHART

Ref.	Qty.	Description	Daily	Weekly	Every 2 Weeks	Monthly	Every 3 Months	Annually	Remarks and/or Type of Lubricant
HYDRAULIC SYSTEM									
18	1	a Hydraulic reservoir	X						Check dipstick.
	1	b Hydraulic oil filter						X	Change filter the first 25 hours and thereafter every 250 hours.
		c Hydraulic oil	X					X	Check level daily. Change every 250 hours.
		Hydraulic hoses and lines		X					Inspect for loose connections, kinks, worn or cut hoses, etc.
ENGINES — DIESEL									
19	1	Kubota diesel D-600-B fuel	X						Check. Use diesel fuel oil #2 Cetene rating 45.
		Fuel tank					X		Remove sediment.
		d Fuel filter element				X		X	Clean at 100 hours. Replace at 400 hours.
		Fuel pipes and clamp bands		X				X	Check 50 hours. Replace every two years.
		e Engine oil	X		X				Change after the first 35 hours, thereafter every 75 hours.
		Engine oil filter element				X			Change after the first 35 hours, thereafter every 150 hours.
		Pre screen (front of radiator)	X						Check and/or clean.
		f Radiator coolant	X					X	Check, change coolant, 3 qt. volume annually.
		Radiator core		X					Use clean tap water.
		Radiator hoses and clamp bands				X		X	Check and replace every two years.
		Cap (top of air cleaner)	X						Clean area around screen.
		g Dust cup (end of air cleaner)		X					Clean.
		Air cleaner element			X			X	Clean every two weeks and/or replace every year.
		h Battery			X	X			Check electrolyte level. Recharge every one to two months. Replace every two years.

11C

SECTION 11C. MAINTENANCE SCHEDULES

MAINTENANCE SCHEDULE CHART (Continued)

Ref.	Qty.	Description	Daily	Weekly	Every 2 Weeks	Monthly	Every 3 Months	Annually	Remarks and/or Type of Lubricant
ENGINE — DIESEL (Continued)									
		i Fan belt			X				Check tension.
		Glow lamp	X						Preheating time recommended: over 0°C/32°F: 15 sec., below 0°C/32°F: 30 sec.
ENGINE — GAS									
	1	Kohler KS321S 14 HP M14S 14HP (Magnum) M16S 16HP (Magnum)							
		j Air intake screen	X						Clean (located by flywheel).
		Cooling fins and external surfaces		X					Clean.
		Oil level	X						Check (when cool).
		k Oil		X					Change after the first 5 hours, thereafter every 25 hours.
		l Fuel	X						Replenish supply.
		m Foam precleaner (air cleaner)		X		X			Check 50 hours. Check for replacement at 100 hours.
		n Spark plug		X					Remove. Clean and/or replace every 100 hours.
		Breaker points					X		Check K321S, K341S.
		Ignition timing					X		Check K321S, K341S.
		Valve and tappet clearance					X		Check every 500 hours.
		o Cylinder head					X		Service every 500 hours.
		Starter motor drive					X		Service every 500 hours.
		Carburetor							Periodically adjust main fuel 2-1/2; idle fuel 2-1/2
		h Battery			X				Check electrolyte level.
MISCELLANEOUS									
20	12	Wheel Nut		X					Retorque to 65 to 85 ft-lbs. (88-115 N.m) every 20 hours.
21	3	Tires		X					8 to 12 PSI (.55 to .82 Bars) inflation.
Not Shown		Steering wheel bearings					X		Repack bearings.
		Accelerator stop					X		Adjust. Refer to Section 6.
		Hand throttle					X		Adjust. Refer to Section 2.
		Accelerator rod					X		Adjust. Refer to Section 2.
		Brake pedal					X		Adjust. Refer to Section 5.

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SECTION 12A. REPAIR AND SERVICE TOOLS AND MATERIALS

- Tools required:** Standard automotive hand tools, including driving tools and seal spreaders; Reel Grinder; Bedknife Grinder; Lapping Machine; Bearing Puller.
- Cleaning materials:** Stoddard or equivalent solvent.
Detergent and water.
- Lubricants:** Non-metallic additive wheel bearing grease (eg. Sunray DX 692 or Enco Fibrox 280).
Grease gun grease (eg. Sunray DX 671 or Gulf Supreme No. 0 [SAE 30 oil]).
- Other service items:** Newspaper.
Jacobsen lapping compound.
Gauge bar for adjusting cutting height (Part No. 158779).
Bedknife adjusting gauge (Part No. 158568).
Shims for turf groomer cutter shaft assembly (Part No. 364040).
Bedknife shims:
 0.003" thick (Part No. 302711).
 0.007" thick (Part No. 302712).
Bedknives:
 "High Profile" (Part No. 503257) TF-60.
 "High Profile" (Part No. 503027) for 5/32" minimum cut.
 "Low Profile" (Part No. 503028) for 7/64" minimum cut.
 "Tournament" (Part No. 503029) for 3/32" minimum cut.
Groomer shims:
 0.010" thick (Part No. 364040)

SECTION 12B. GENERAL INSTRUCTIONS

CONTENTS

This section covers repairs to the cutting and grooming attachments of the Greens King IV. The products included are:

- Standard mower with 5 in. reel (includes rear roller less front rollers)
- Turf Groomer (Product No. 68582)
- Spiker (Product No. 68519)
- Vertical ("Removable Blade") Accessories (Product Nos. 68549 and 68550).

PREPARATION FOR REPAIR

Thoroughly clean the mower and reel assemblies and other cutting and grooming attachments 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 (used in daily washing), grass clippings, sand, corrosive fertilizers, and foreign objects such as tees. It may be necessary to use bearing pullers and/or wood-

en blocks and hammers to free up some parts such as bearings and spacers.

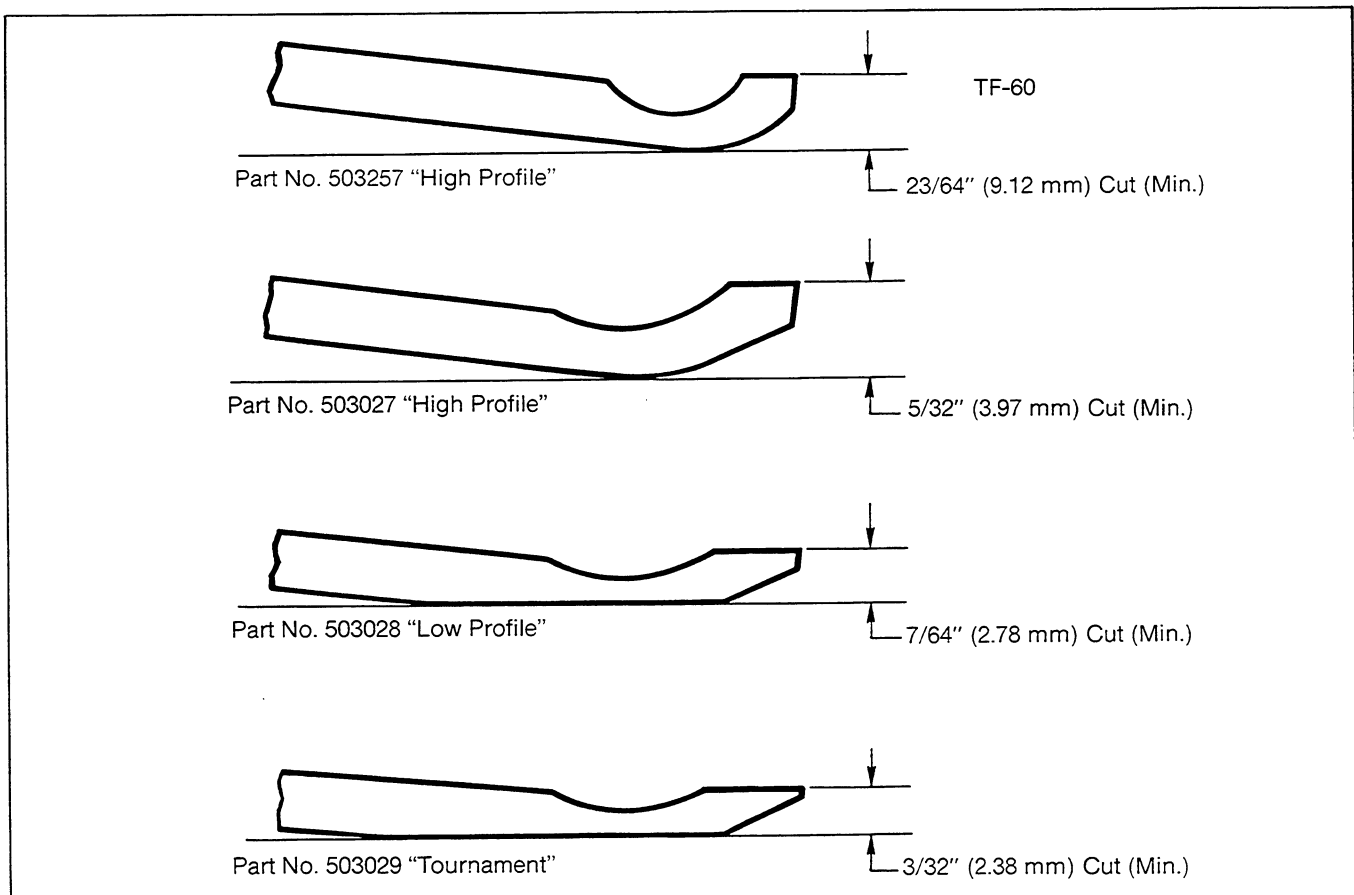
When such force is required to remove parts, those parts should be replaced rather than reinstalled on the machine.

WARNING

Before removing components, disengage reel control levers, lower reels, place traction lever in "Neutral", stop engine, set parking brake and remove key from ignition switch.

BEDKNIFE SELECTION

All attachments may use one of four bedknives shown below. The standard blade for Greens King IV machines shipped from the factory is the low profile (Part No. 503028).



BEDKNIFE SELECTION

SECTION 12C. MOWER UNIT

MOWER UNIT REMOVAL

(See "Mower Unit Removal" Illustration)

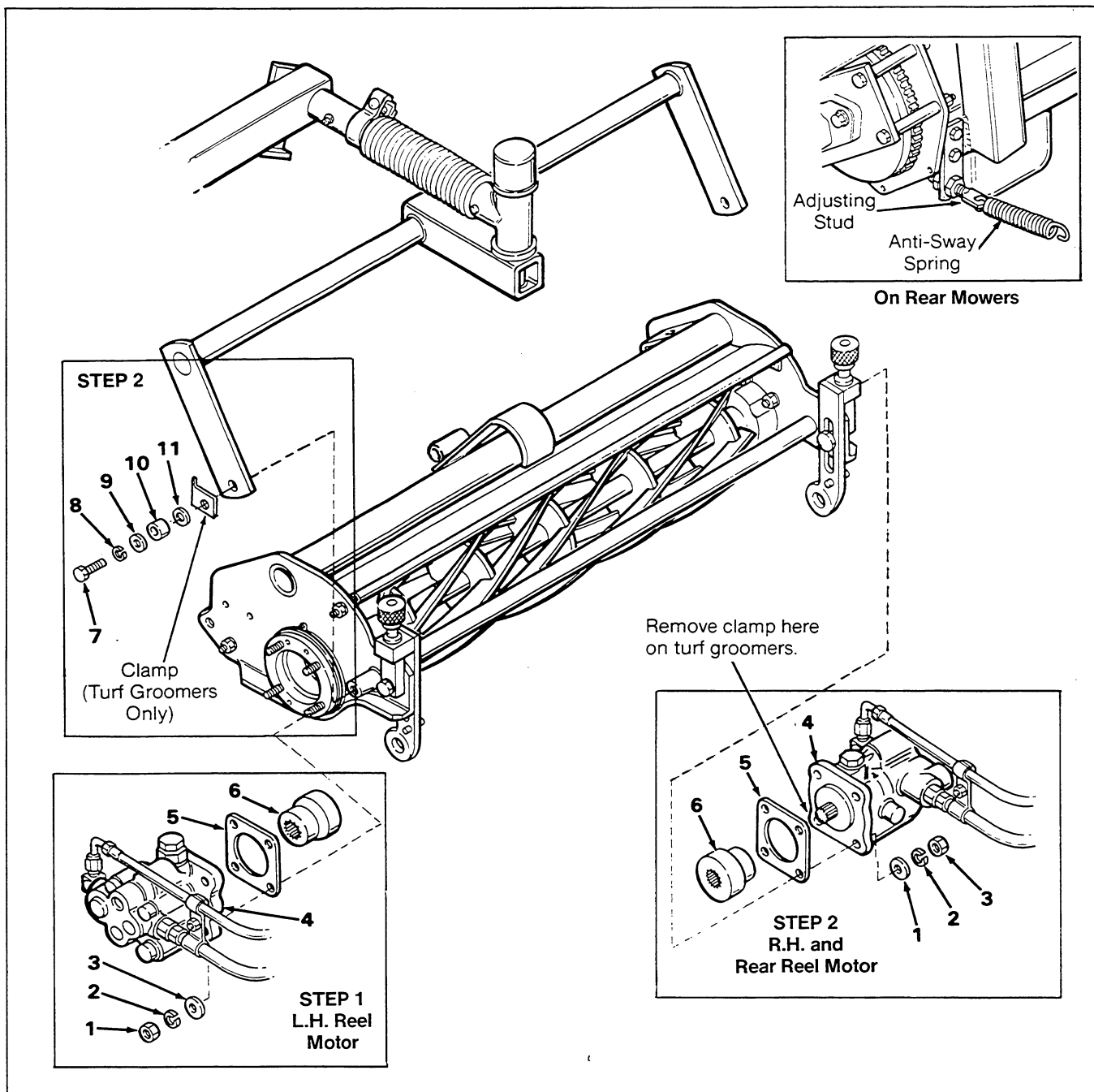
1. At the reel motor, remove the four nuts (1), lock-washers (2), and washers (3).
2. Remove the reel motor (4), gasket (5), and coupling (6). Carefully set aside the reel motor making certain not to crimp or place strain on the connecting hoses.

Protect the splined shaft of the reel motor with clean material.

NOTE

On rear mowers, disconnect anti-sway spring.

3. Remove items 7 thru 11 from each end of the mower frame. The mower unit can now be removed from the lift yoke.

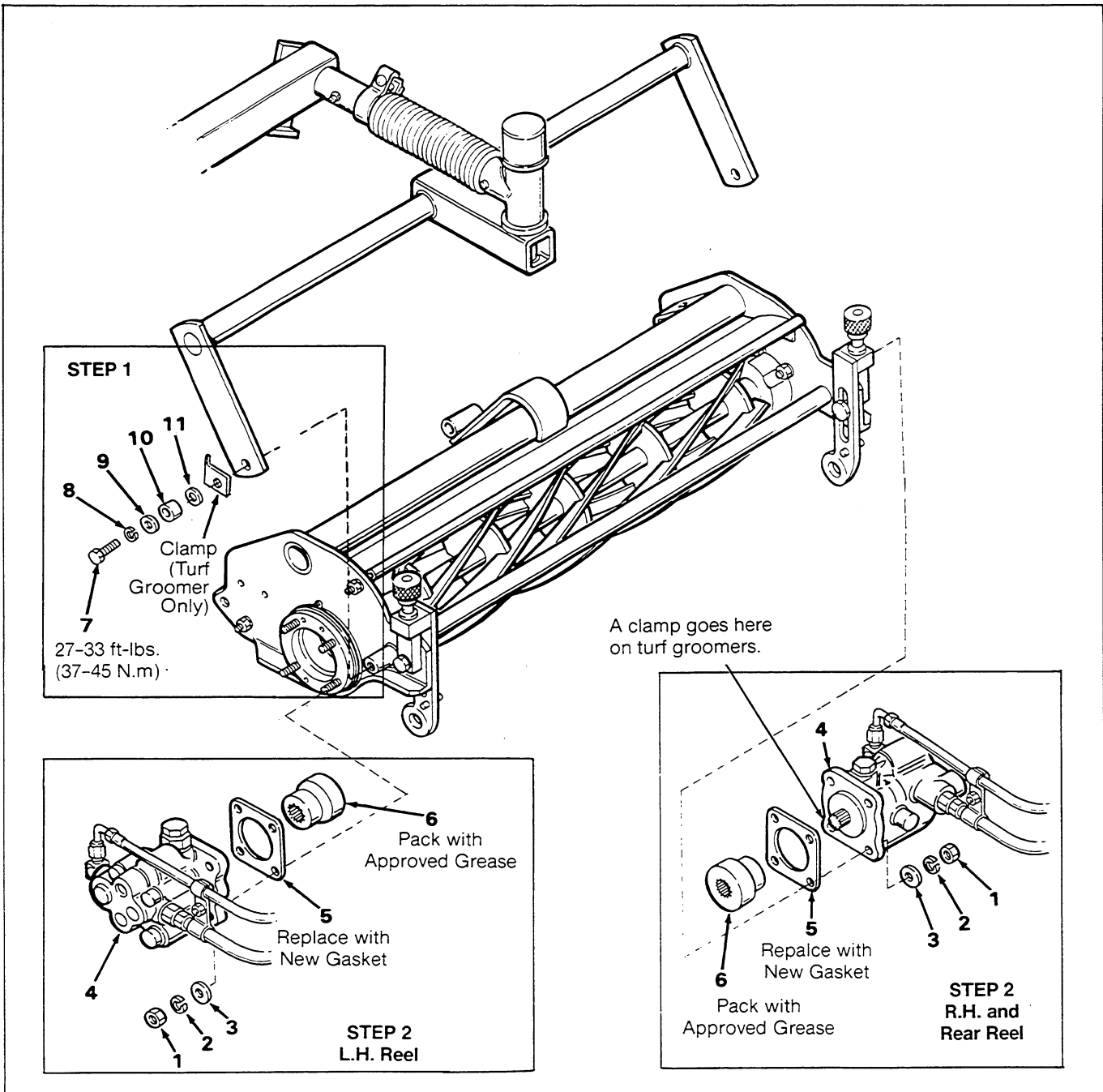
**MOWER UNIT REMOVAL**

SECTION 12C. MOWER UNIT

MOWER UNIT INSTALLATION

(See "Mower Unit Installation" Illustration)

1. Position the mower unit on the lift yoke with spacers (10) and washers (11) positioned as shown. Secure both ends of the mower frame to the lift arm with screws (7), lockwashers (8), washers (9 and 11) and spacer (10).
2. Install coupling (6) (packed with approved grease), new gasket (5), and reel motor (4). Secure with nuts (1), lockwashers (2), and washers (3). On rear mower units, reconnect the anti-sway spring and adjust as shown in Section 12E.



MOWER UNIT INSTALLATION

SECTION 12C. MOWER UNIT

MOWER UNIT LIFT YOKE REMOVAL (See "Mower Unit Lift Yoke Removal and Installation" Illustration)

1. Remove the protective cap from the swivel housing.
2. Loosen the set screw and remove pin "A" to disconnect the swivel housing from the lift yoke.
3. Lift the swivel housing and lift arm assembly free of the lift yoke. On rear mower units, remove the anti-sway spring.

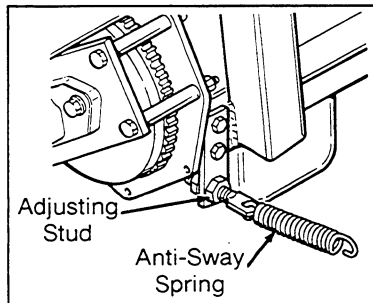
MOWER UNIT LIFT YOKE INSTALLATION (See "Mower Unit Lift Yoke Removal and Installation" Illustration)

1. Position the lift yoke assembly beneath the swivel housing.
2. Pack the swivel housing with grease.
3. Secure the lift yoke to the swivel housing with pin "A" and set screw. On the rear mower units, connect the anti-sway spring.

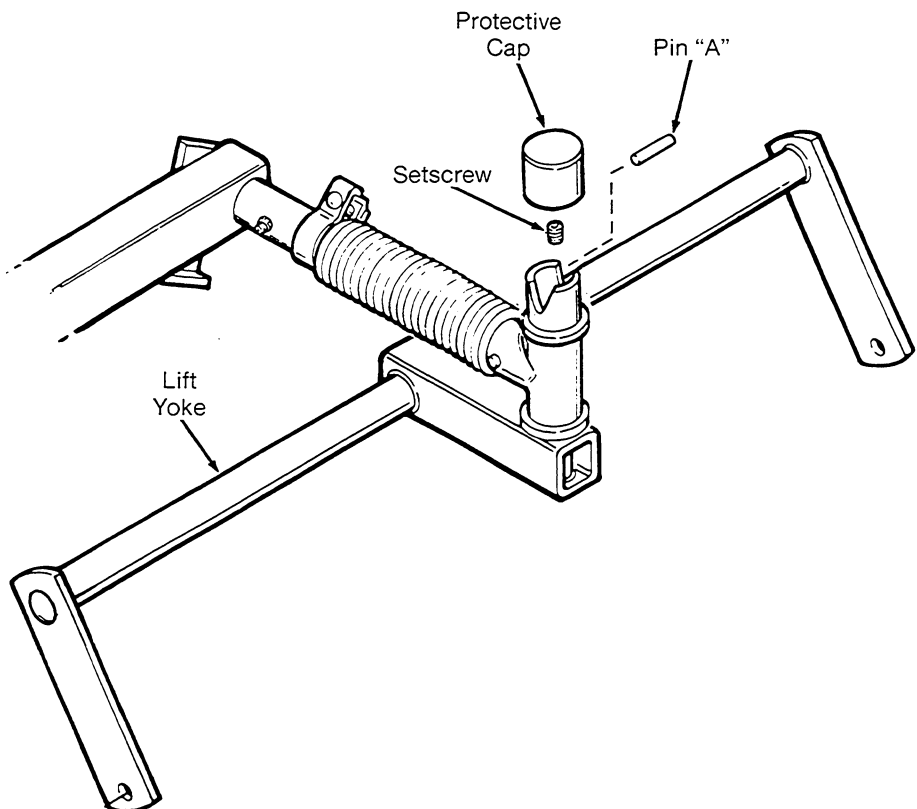
REEL REMOVAL (See "Reel Removal and Installation" Illustration)

After prolonged use, it may be necessary to remove the reel for grinding, repairs, or replacement. This may be done by removing the reel as described below.

1. Loosen the bedknife-to-reel adjusting screws A & B (see upper left inset on illustration).
2. Remove shaft cover (1).
3. Remove bolt (2) and washers (3).
4. Remove seal spacer (4). The seal is installed in the seal spacer.
5. Remove nut (5), spring (6), and bearing (7).
6. Remove snap ring (8) and bearing (9).
7. Remove nuts (10) and washers (11) on both reel bearing assembly housings (12).
8. Remove reel bearing assembly housings (12).
9. Remove the reel from the frame.
10. Each reel bearing assembly housing has a bearing cup (13) and seal (14). They can be removed by pressing them out of the housing.



On Rear Mower Units



MOWER UNIT LIFT YOKE REMOVAL AND INSTALLATION

SECTION 12C. MOWER UNIT

REEL REPAIR

After a reel has been removed from the mower frame it should be inspected for loose or broken blades and replaced if necessary. Bearings and bearing housings should be checked for excessive wear and replaced if necessary.

If the reel does not need to be replaced but requires grinding, proceed as described in Section 12F.

REEL INSTALLATION (See "Reel Removal and Installation" Illustration)

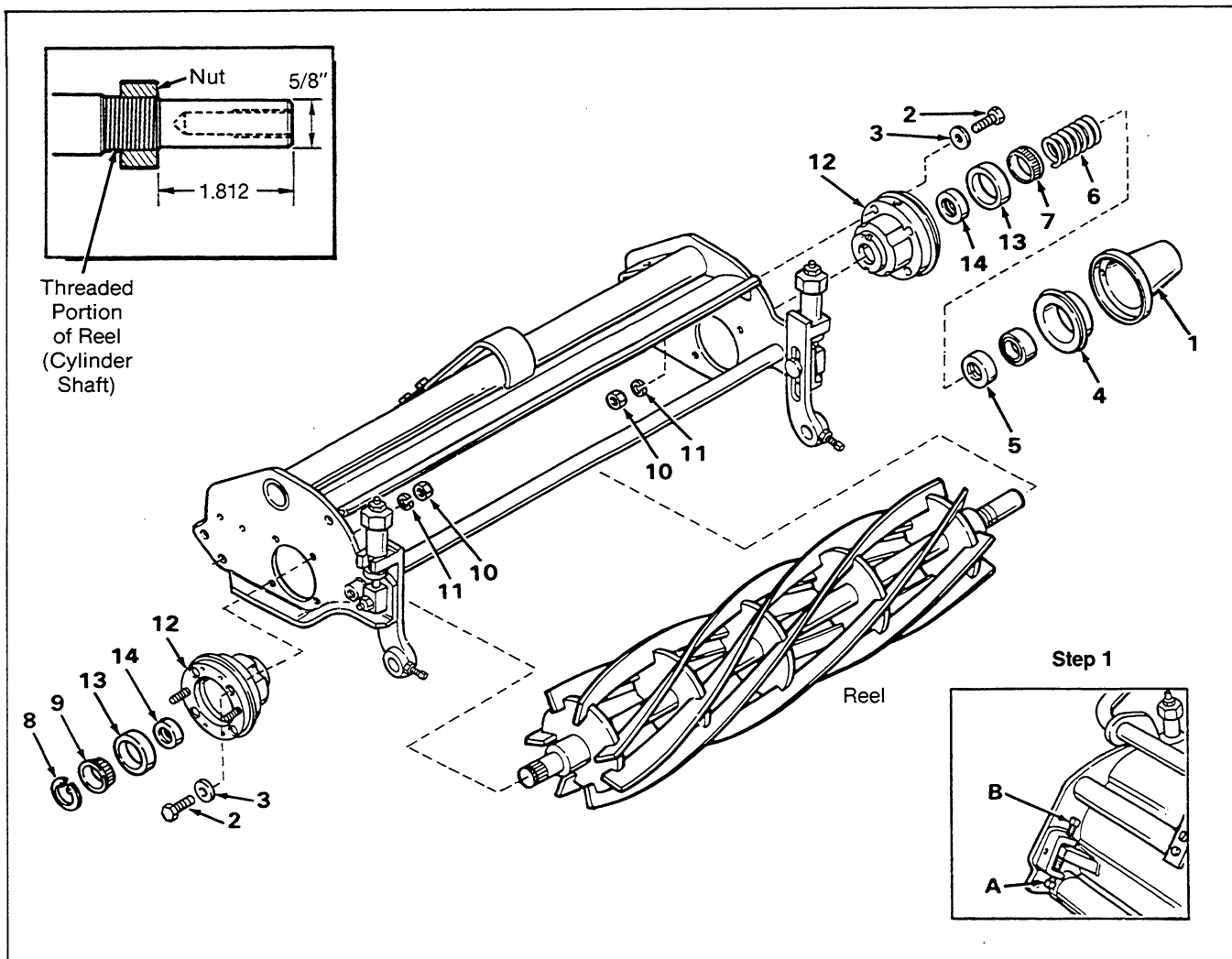
1. Install new seals (13) in reel bearing assembly housings (12).

NOTE

Seal lip to the inside.

2. Press the bearing cups (14) into the reel bearing assembly housing (12).

3. Position the reel in the frame.
4. Install the reel bearing assembly housing in the frame on both ends. Fasten in place with washers (11) and nuts (10).
5. Install bearing (9) and snap ring (8).
6. Install bearing (7) and spring (6).
7. Apply a small amount of LOCTITE to the nut. Install nut so it is 1.812 inch from end of shaft.
8. Install seal (15) in seal spacer (4).
9. Install seal spacer (4) on reel bearing housing assembly (12) fastening it with washers (3) and capscrews (2).
10. Install shaft cover (1).



REEL REMOVAL AND INSTALLATION

SECTION 12D. REAR ROLLER

GENERAL (See "Disassembly and Reassembly" Illustration)

Repair of the rear roller is limited to replacement of worn or damaged parts.

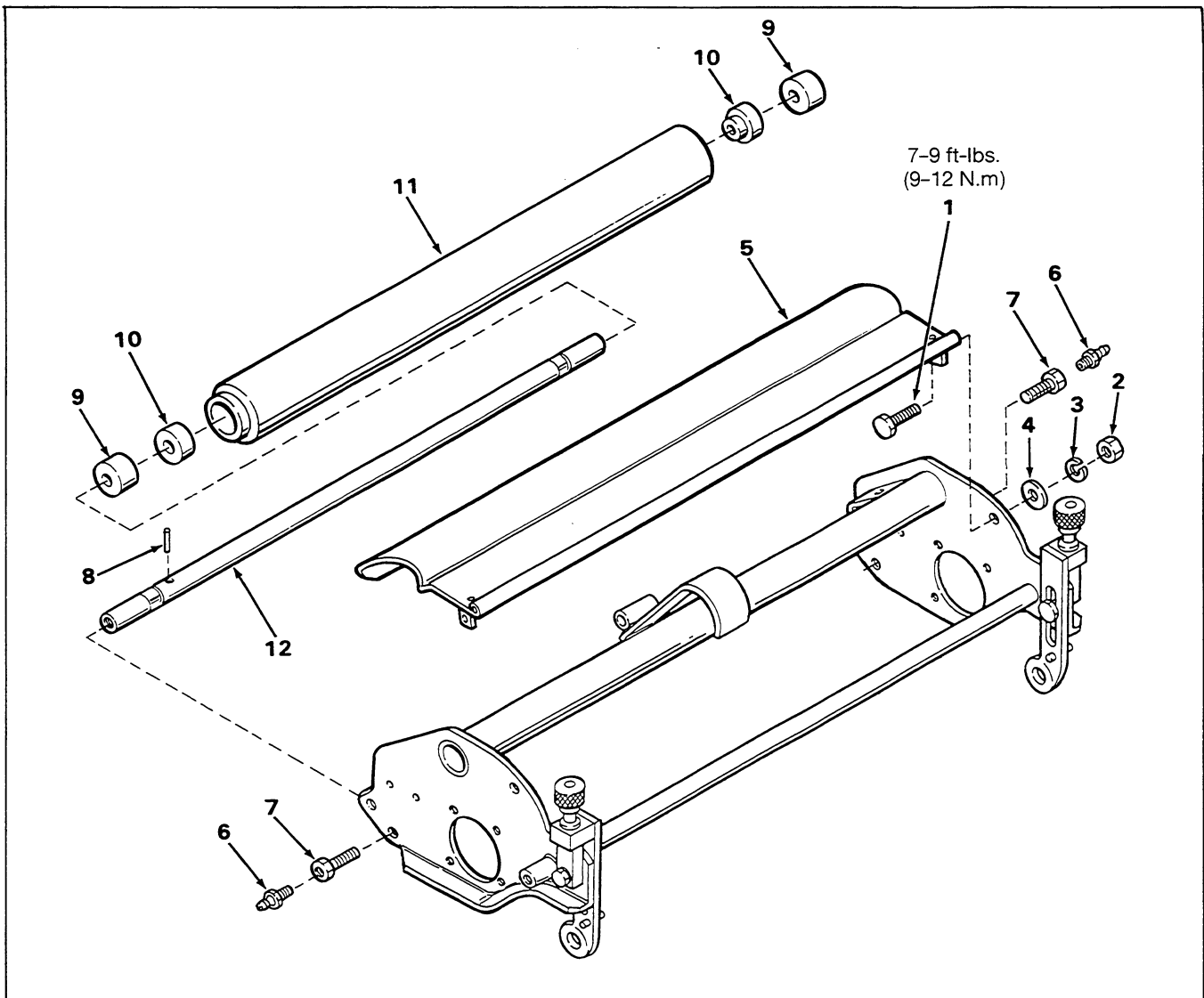
DISASSEMBLY

1. Remove the two bolts (7) with grease fittings (6) that hold the roller assembly items (8 thru 12) in the mower frame.
2. Using a suitable hammer, support one end of roller (11) and drive bearing (10) and seal (9) out of roller by tapping opposite end of shaft (12).
3. Turn roller around, using shaft (12), drive the bearing (10) and seal (9) from the opposite end of the roller.

4. Remove bearing (10) and seal (9) from shaft (12).
5. Remove both roll pins (8).

REASSEMBLY

1. Install two new roll pins (8).
2. Press bearings (10) onto one end of shaft (12) until it contacts pins (8).
3. Install shaft and bearing to roller (11). Press bearing into roller.
4. Support the bearing end of shaft and roller. Press bearing (10) onto shaft until it contacts pin (8) on opposite end.
5. Install seals (9).
6. Position the roller in the mower frame and fasten with studs (7).



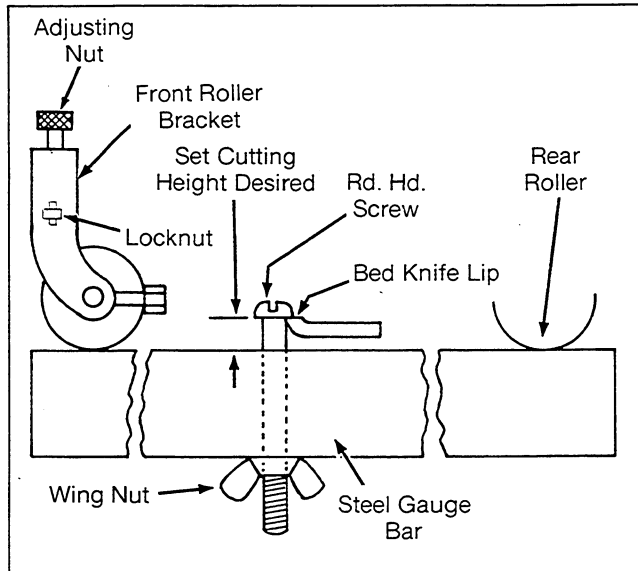
DISASSEMBLY AND REASSEMBLY

12D

SECTION 12E. MOWER AND REEL ADJUSTMENTS

CUTTING HEIGHT ADJUSTMENT

Check the position of each reel for desired cutting height. All reels must be accurately adjusted to exactly the same height for proper cutting.



CUTTING HEIGHT 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 desired height by measuring between the underside of screw head and gauge bar surface and tighten the wing nut.
3. Place gauge bar across bottom of front and rear rollers near one end.
4. Slide the head of gauge screw over the bedknife.
5. Adjust the hand adjusting knob of the front roller to close the gap between the roller and gauge bar. Then tighten locknut.

6. Repeat steps on opposite end.

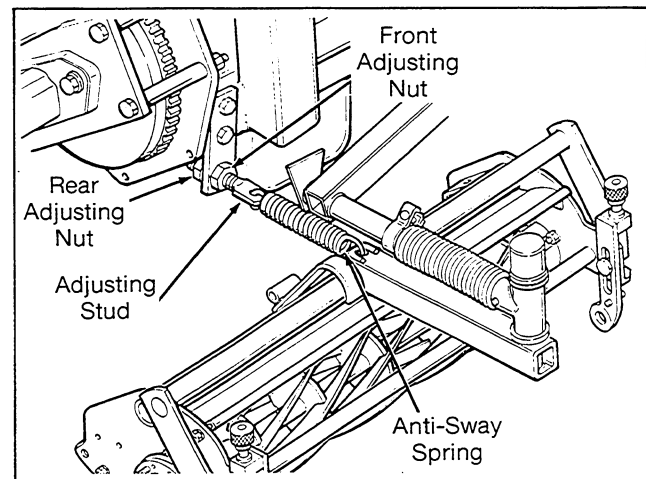
7. After tightening locknuts, recheck each end with gauge for proper adjustment.

ANTI-SWAY SPRING ADJUSTMENT (REAR MOWER ONLY)

NOTE

The rear mower should be in the cutting (fully raised) position and the engine off when the anti-sway spring is adjusted.

The rear mower anti-sway spring should be tight to limit the sway of the rear mower unit. To adjust the spring, loosen the front nut on the adjusting stud and loosen or tighten the rear nut as necessary. To check for proper adjustment, pivot the mower to one side or the other. Let go of the mower; it should automatically return to center.



REAR MOWER ANTI-SWAY SPRING ADJUSTMENT

SECTION 12F. SHARPENING AND ADJUSTING REELS AND BEDKNIVES

GENERAL

A reel mower cuts grass in the same way a scissors cuts cloth or paper. Each blade on the reel acts as one scissor blade, and the bedknife acts as the other scissor blade. Grass is trapped between the reel blade and bedknife and is sheared off as the reel blade rotates over the 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 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 a metal-to-metal contact between the bedknife and 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 be corrected by grinding and lapping.

Bad Bearings, End Play or Radial Play

Check for play in the reel bearings. Greens King IV mowers have self adjusting bearings. Excessive play indicates worn bearings or weak tensioning spring.

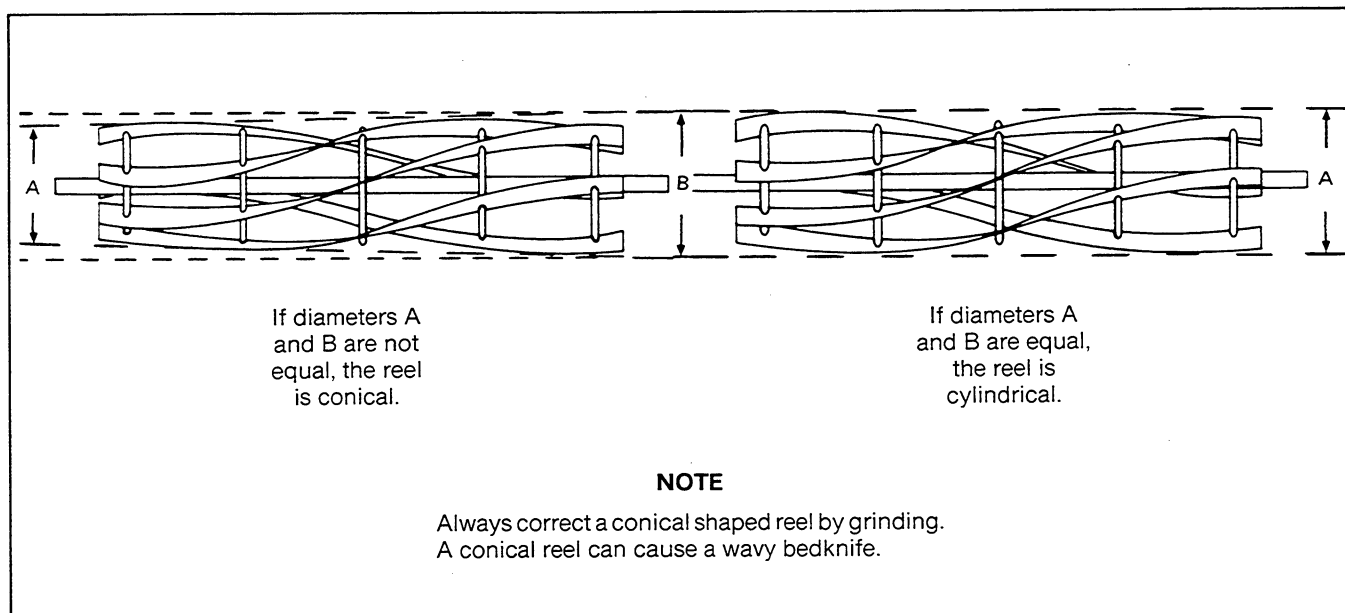


CAUTION

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 reconditioned 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 ground.

A reel worn or incorrectly ground to a conical shape instead of a cylindrical shape will cause a wavy bedknife. See the "Reel Wear" illustration.

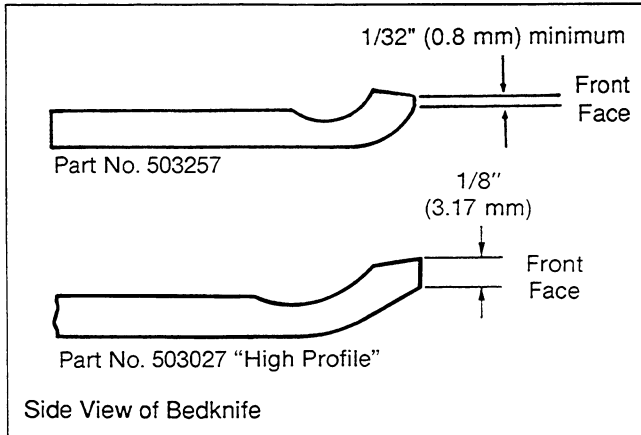


REEL WEAR

12F

SECTION 12F. SHARPENING AND ADJUSTING REELS AND BEDKNIVES

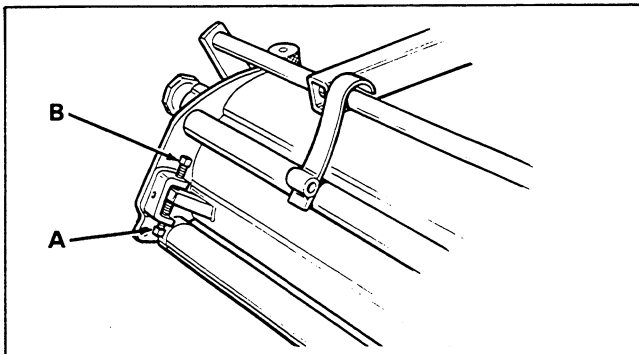
BEDKNIFE DRESSING



DRESSING THE BEDKNIFE

After the unit has been in operation for a period of time it may become necessary to dress the face of the bedknife. A flat front face as shown above should be maintained to insure a good quality of cut. A sharp jagged edge will result in a ragged cut. Cutting units that are being used in sandy conditions or on surfaces with a high sand content top dressing will require more frequent dressing of the bedknife. The front face should be regularly maintained using a flat file or small hand held disc grinder.

BEDKNIFE ADJUSTMENTS



BEDKNIFE ADJUSTMENTS

1. The bedknife to reel adjustment should be made by starting with the leading end of the reel and following with the trailing end.
2. To tighten the bedknife to reel, loosen the lower bedknife adjusting screws ("A") approximately 1/4 turn each (turn counterclockwise). Rotate the reel by hand while tightening the upper adjusting screws ("B") evenly (turn clockwise) until there is approx. .001" (0.25 mm) clearance between the bedknife and the reel blades. It may be necessary to alternate between loosening lower and tightening upper screws. Then tighten the lower screws securely. After tightening screws check the adjustment as

described in Step 6 of "Cutting Height Adjustment" page 12E-1.

3. When correctly adjusted, each blade will cut a strip of newspaper held at approximately 90 degrees to the top face of the bedknife along the full length of the bedknife, and the reel can be revolved freely by hand.

NOTE

Tightening screws after making adjustment may move bedknife. This reduces cutting efficiency of the reel if newspaper can not be cut as indicated above. **AVOID EXCESSIVE TIGHTENING OR SERIOUS DAMAGE MAY RESULT TO BEDKNIFE AND REEL BLADES. REELS MUST REVOLVE FREELY.**

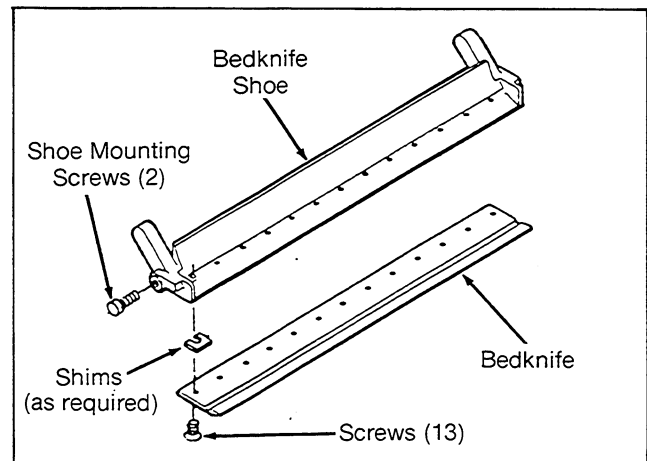
BEDKNIFE REPLACEMENT (See "Bedknife Removal and Replacement" Illustration)

The bedknife (part of the mower assembly) shipped from the factory with the machine is the 7/64" (2.78 mm) minimum cut "low profile" (Part No. 503028) knife. The "high profile" and "tournament" bedknives shown in Section 12B of this manual may be used in place of the "low profile" bedknife. When the Greens King is being used for mowing fairways, tees or other areas above 5/32" (3.97 mm), Jacobsen recommends using the high profile knife.

NOTE

Check the dimensions of alternative bedknives (see "Bedknife Grinding Dimensions" illustration) before attempting to grind your existing bedknife to meet specific needs. A simple replacement may do the job.

Bedknives that cannot be repaired by backlapping should be ground or replaced. The bedknife is held to the bedknife shoe by thirteen screws. When replacing a bedknife the bedknife should be either lightly ground or shimmed to level the cutting edge.



BEDKNIFE REMOVAL AND REPLACEMENT

SECTION 12F. SHARPENING AND ADJUSTING REELS AND BEDKNIVES

When a bedknife is installed, clean the backing prior to installation. Install shims if the backing is warped.

Secure the installed bedknife by tightening the mounting screws, starting with those at the center and working out to the ends.

BEDKNIFE GRINDING



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

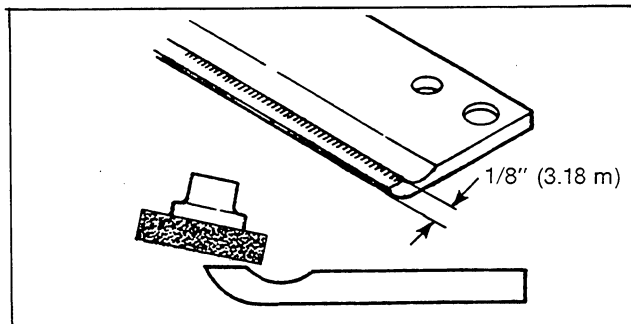
Always install blotter washers between the grinding wheel and the flanges. Do not overtighten the flange nut on the grinding wheel. Do not run a grinding wheel faster than specified on the wheel blotters.



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 especially when the wheel is not rotating.

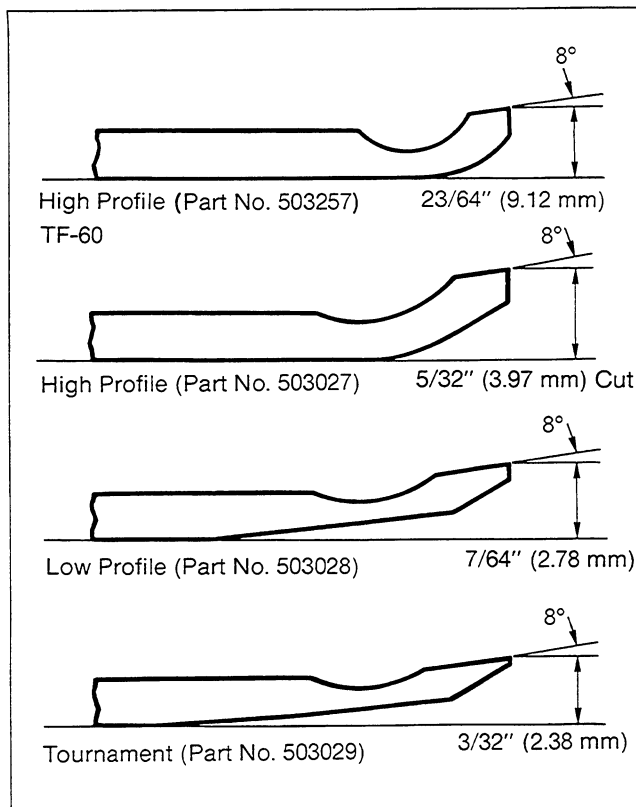
1. Use a wire brush to thoroughly remove dried material, rust, and scale from the bedknife.
2. Refer to the grinding machine manufacturer's instructions for mounting the bedknife and operating the machine.
3. Tilt the grinding head so the stone contacts the bedknife at rear 1/8" (3.18 mm) of top surface. This will give proper set up to grind bedknife correctly (see "Bedknife Grinding Angle" illustration).
4. Grind the bedknife (High Profile, Low Profile, or Tournament) to the dimensions shown in the "Bedknife Dimensions" illustration.



BEDKNIFE GRINDING ANGLE

NOTE

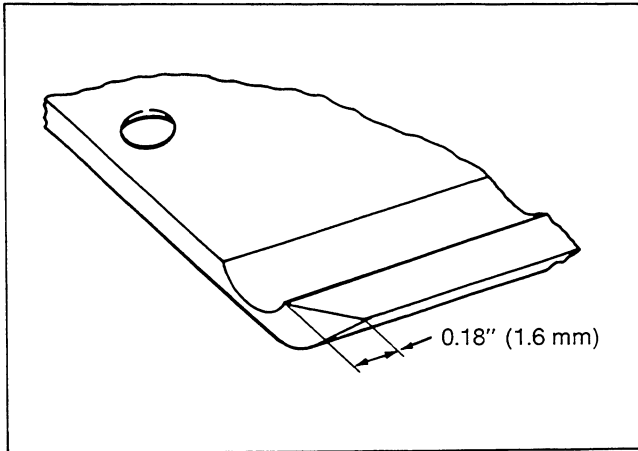
The bedknife end at which the reel first makes contact is called the leading end. A beveled corner (dub) is ground on this end. It is important that the dub be maintained throughout the life of the bedknife. The dub provides an entrance ramp for the reel blade on to the bedknife. If the dub is worn or ground away and not replaced, the reel blade could hook the corner of the bedknife as it begins contact.



BEDKNIFE GRINDING DIMENSIONS

5. After grinding the bedknife, examine the dub. If, through grinding it has become smaller than 0.18" (1.6 mm), hand grind or file the surface to the specified dimensions.

SECTION 12F. SHARPENING AND ADJUSTING REELS AND BEDKNIVES



BEDKNIFE DUB

REEL REPAIR AND GRINDING

Reel blades and a bedknife that are slightly dull or have minor nicks or high spots can be reconditioned 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 ground.

NOTE

A reel worn or incorrectly ground to a conical shape instead of a cylindrical shape will cause a wavy bedknife.

Remove the reel from the mower frame as described in Section 12C of this manual.

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 up 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. Set up and operate the grinding machine in accordance with the manufacturer's instructions.

Exercise the following precautions:

**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**

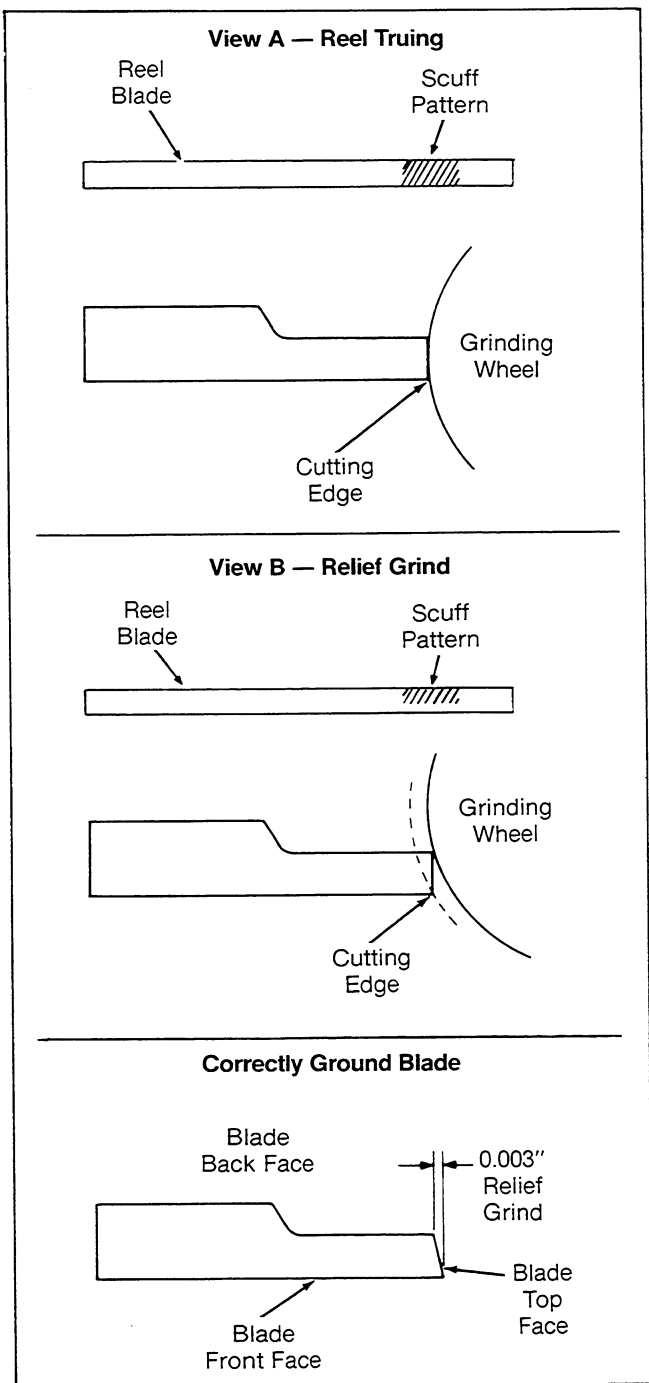
Always install blotter washers between the grinding wheel and the flanges. Do not overtighten the flange nut on the grinding wheel. Do not run a grinding wheel faster than specified on the wheel blotters.

**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 especially when the wheel is not rotating.

1. Grind the reel blades to achieve the results shown in the "Reel Grinding Procedure" illustration.
2. After grinding, dress each blade (new or old) with a fine hone or block of hardwood to remove grinding burrs from the blade.

SECTION 12F. SHARPENING AND ADJUSTING REELS AND BEDKNIVES



REEL GRINDING PROCEDURE

3. Lubricate and install the reel in the frame as described in Section 12C and bench lap the reel as described on page 12F-6.

LAPPING ON THE MACHINE

Routine lapping of the reels is part of the general maintenance plan. Lapping can be performed by either using a mechanical lapping device or by using the backlap of the tractor hydraulic system (if so equipped). When using a mechanical lapping device, follow the respective manufacturers directions. When using the hydraulic backlap feature of the tractor, use the following procedure:

1. Wash the reel and bedknife.
2. Slightly back off on the bedknife adjustments.
3. Place traction lever in "Neutral", engage parking brake, and start engine.

NOTE

Set engine speed at an idle or slightly above idle.



DANGER

Always keep hands and clothing far away from powered reels to prevent severe personal injury. Never backlap reels with the engine running in an enclosed building.

4. Place the reel control lever for the reel you will be working on in "Backlap" position.
5. Adjust needle valve at each reel to desired lapping speed (increase speed by turning knob clockwise). When the blades have been evenly lapped, carefully wash off the remaining mixture.
6. Apply Jacobsen lapping compound (available from your Jacobsen distributor in 1 lb. plastic containers) across the entire reel.
7. Run the lapper backward and continue applying lapping compound, making slight adjustments to the bedknife if necessary (refer to page 12F-2) until there is uniform contact along the full length of the cutting edges.
8. Place reel control lever in "Off" position and stop engine.
9. Check with newspaper for correct cutting adjustment and adjust if necessary. If proper cut can not be obtained by backlapping, the reel must be removed, repaired, ground, or replaced, and bench lapped.

SECTION 12F. SHARPENING AND ADJUSTING REELS AND BEDKNIVES

BENCH LAPPING

Whenever a reel and bedknife have been ground or a new reel and/or bedknife are being installed, the assembled reel should be backlapped using an electric powered bench lapper.

1. The lapper should be connected to the reel shaft at the end opposite the hydraulic reel motor.
2. Apply Jacobsen lapping compound to each reel blade.
3. Run the lapper backward and continue applying lapping compound, making slight adjustments to the bedknife if necessary (refer to page 12F-2) until there is uniform contact along the full length of the cutting edges.

4. Turn off the lapper.
5. Wash off compound.
6. Carefully turn the reel backward slowly by using a wooden or other non-metallic probe. Make necessary reel-to-bedknife clearance adjustments according to feel and sound.
7. As a final check, place a strip of newspaper vertically between the reel and bedknife. Manually rotate the reel slowly forward. The blades should cut the newspaper across entire edge of the bedknife.
8. Lubricate and install the mower unit on the machine as described in Section 12C.
9. Make adjustments in Section 12E.



WARNING

Do not rotate 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.

SECTION 12G. TURF-GROOMER™ (Product No. 68582)

GENERAL

The turf groomer™ attachment consists of a grooved roller, a vertical blade cutter assembly, a clutch to disengage the turf groomer™, and a cutter drive assembly consisting of a cogged drive belt and pulleys.

When the clutch is disengaged the reel rotates without the turf groomer™ cutter assembly rotating. When the clutch is pulled to its extreme outward position and rotated 1/4 turn its shallow slotted surface prevents the clutch hub from engaging the groomer drive pins.

⚠ CAUTION

When engaging and disengaging the clutch, never hold the reel blades. Use a wood block between the reel blade and bedknife to keep the reel from rotating during service procedure.

The most common repairs to turf groomer™ are replacement of the drive belt, pulleys, blades, and roller.

There is no grinding or sharpening procedure for the blades. Bent blades can be straightened; broken blades must be replaced. Bent blades must be straightened to prevent damage to the roller.

The drive belt should be replaced whenever it is frayed or if the cogs are worn.

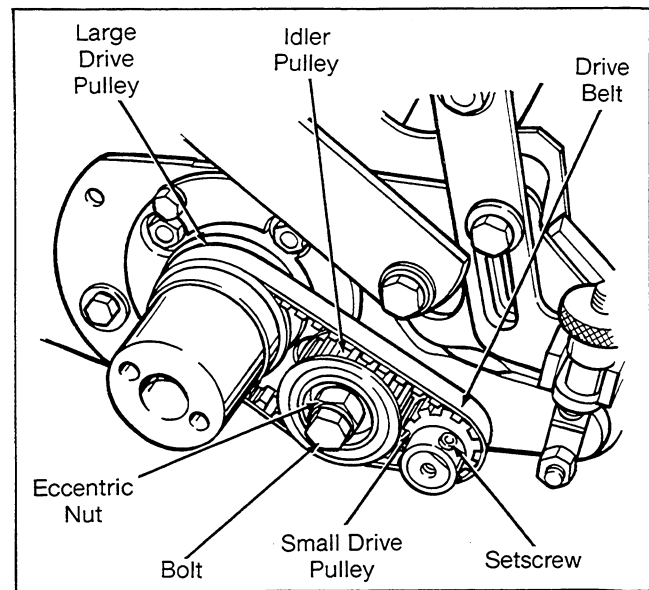
Remove two screws and lockwashers that hold the clutch handle in place and remove the clutch handle.

Remove the end cover attaching hardware and end cover to gain access to the turf groomer components. If your machine is equipped with a performance monitor

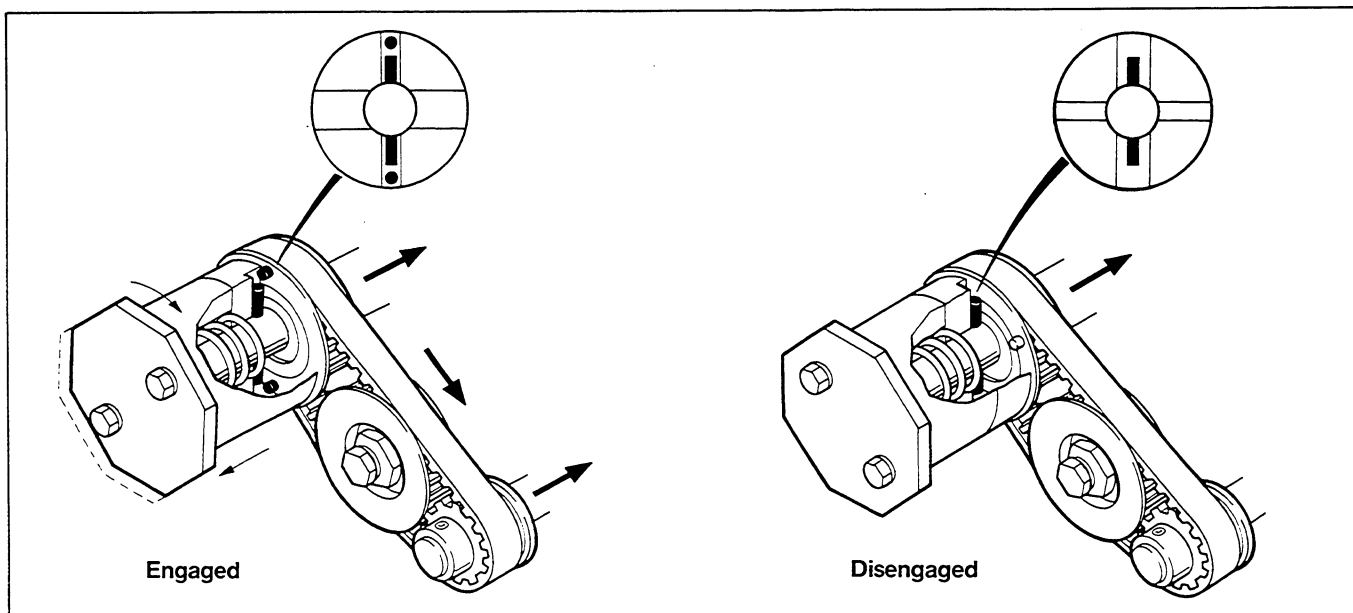
option, remove the bracket that holds the electrical pick up to the right hand front turf groomer cover. Remove the pick up and bracket. See Section 13L.

REPLACING THE DRIVE BELT (See “Drive Belt and Pulley Replacement” Illustration)

A worn or frayed belt is removed and replaced by removing the eccentric belt tightener. The belt can be slipped off the pulleys.



DRIVE BELT AND PULLEY REPLACEMENT



CLUTCH POSITIONS

SECTION 12G. TURF-GROOMER™ (Product No. 68582)**DRIVE BELT ADJUSTMENT**

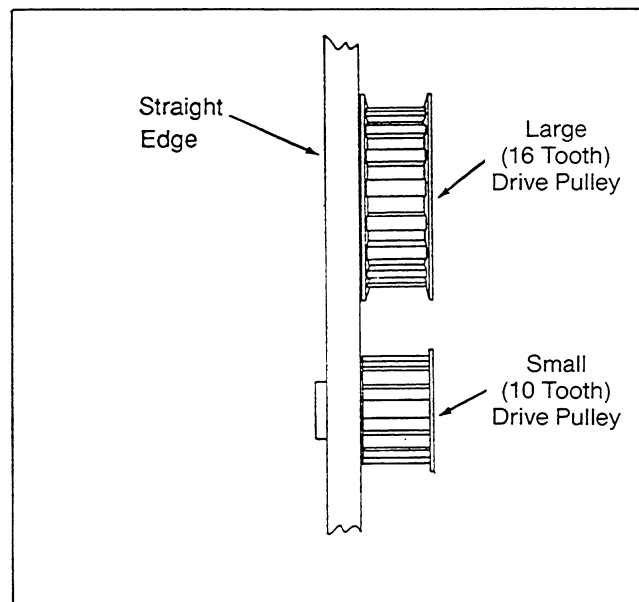
After installing a belt, the eccentric belt tightener should be turned away from the groomer sprocket until the belt fits firmly on the pulleys. Make certain the pulleys do not touch. Do not overtighten the drive belt. Tighten only until cogged drive belt fits into teeth of the pulleys without slipping.

REPLACING THE PULLEYS (See “Drive Belt and Pulley Replacement” Illustration)**Small Drive Pulley**

Remove the drive belt, loosen the setscrew and pull the small drive pulley off the end of the cutter bearing shaft. When replacing, make certain the small drive pulley is positioned on the cutter bearing shaft so that the setscrew can be tightened against the flat on the bearing shaft. Before tightening the setscrew, align the large drive pulley and small drive pulley with a straight edge. Install the belt and adjust the belt tension at the idler pulley (see “Drive Belt Adjustment” above).

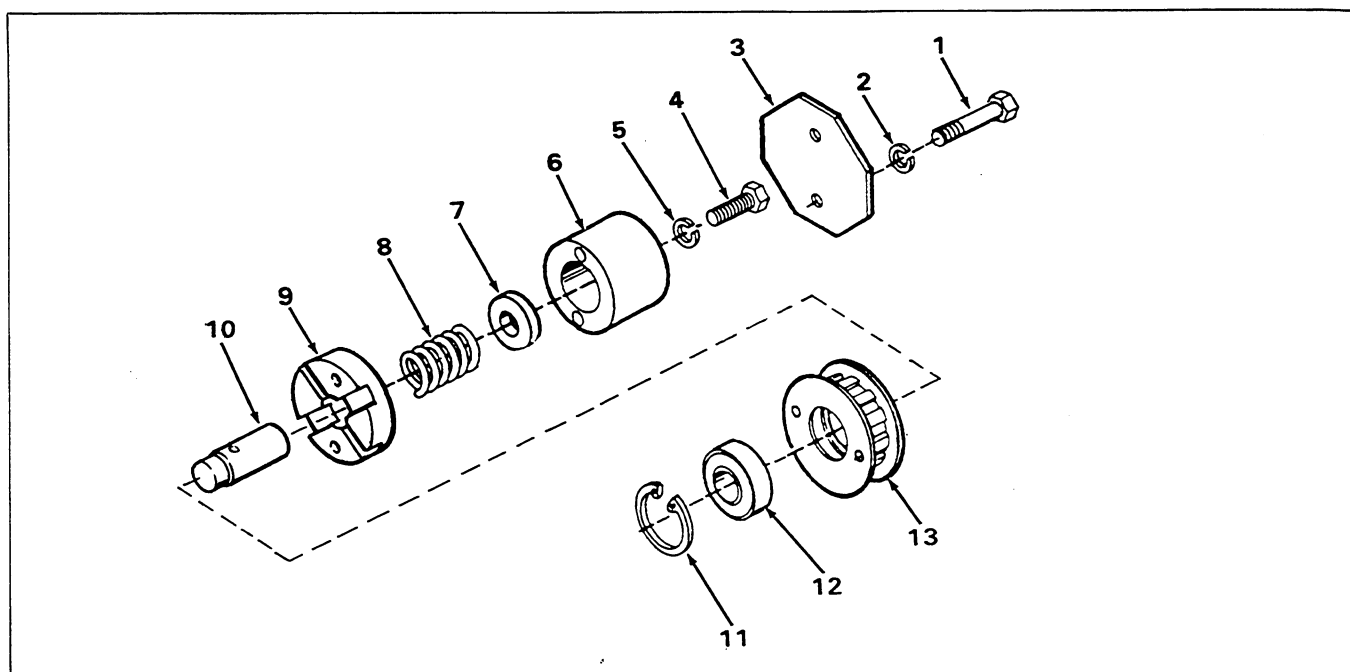
Idler Pulley

Remove the bolt washer, lockwasher, and eccentric nut that hold the idler pulley and idler pulley bearing to the boss on the mounting bracket. The bearing and pulley are held together by a snap ring. Remove the snap ring to separate the bearing from the idler pulley. When replacing the idler pulley, insert the bearing, lock in place with the snap ring, and secure the pulley with the eccentric nut, washer, lockwasher, and bolt. Install and adjust the drive belt (see “Drive Belt Adjustment” above).

**ALIGNING THE DRIVE PULLEYS****Large Drive Pulley (See “Clutch Disassembly and Reassembly” Illustration)**

The large drive pulley is removed and installed as part of the clutch disassembly and reassembly procedure. Remove the drive belt. Remove items 1 thru 10 and remove the drive pulley (13).

The bearing and pulley are held together by a snap ring. Remove the snap ring to separate the bearing from the idler pulley.

**CLUTCH DISASSEMBLY AND REASSEMBLY**

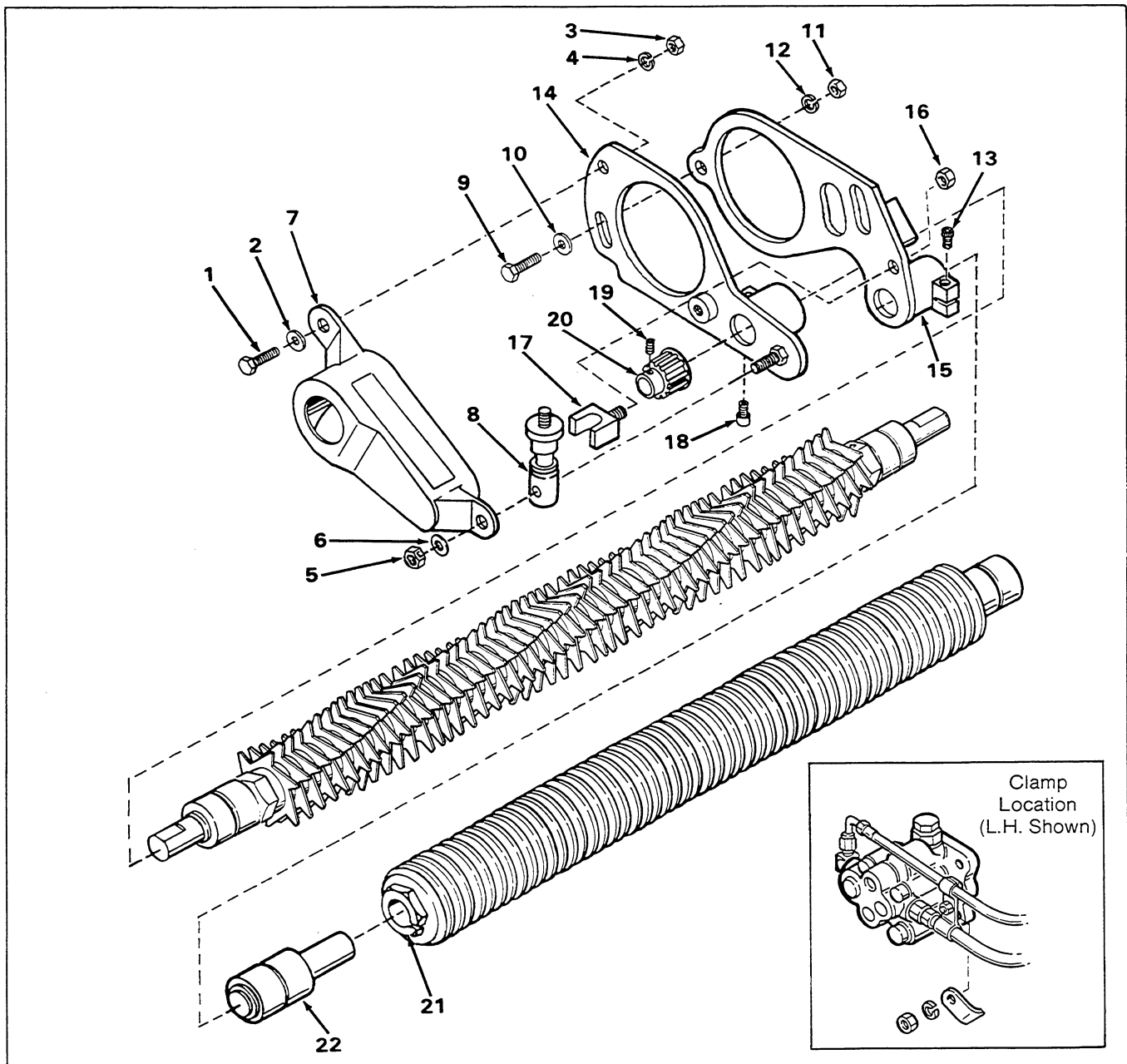
SECTION 12G. TURF-GROOMER™ (Product No. 68582)

ROLLER AND CUTTER REMOVAL (See "Roller and Cutter Removal and Installation" Illustration)

1. Remove the mower unit (as described on page 12C-1). Set the mower and turf groomer assembly upside down on a work bench.
2. Remove the attaching hardware (1 thru 6) and covers (7).
3. Remove the drive belt.
4. Remove the groomer shaft setscrew (19) and sprocket (20).

NOTE

On the motor end, the clamp which holds the cutter mounting bracket (14) against the roller mounting bracket (15) will be removed when the reel motor is removed. Reinstall this clamp with its mounting nut and lockwasher on the stud from which it was removed. If in doubt where these clamps should be reinstalled, refer to the inset on the illustration below. Similar clamps are used to increase mounting rigidity where the mower lift yoke attaches to the mower frame. (see page 12C-2).



ROLLER AND CUTTER REMOVAL AND INSTALLATION

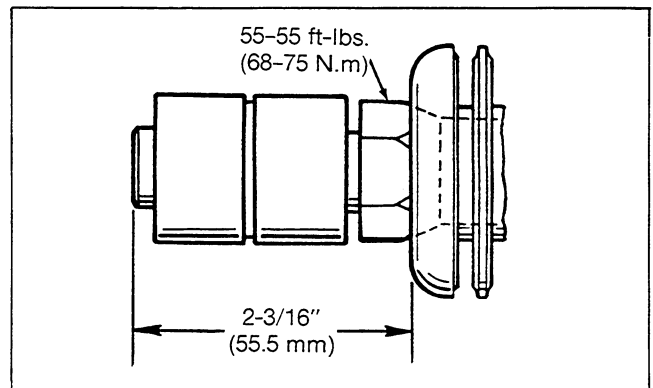
SECTION 12G. TURF-GROOMER™ (Product No. 68582)

- Remove the groomer adjusting nuts and adjusting block (8).
- Remove the nut (16) and height adjusting knob bracket (17).
- Remove the screws (13) from both ends of the groomer roller bracket (15). Remove the screws (18) from the cutter mounting brackets.
- Remove screws (9), washers (10), nuts (11), and lockwashers (12) from the belt end of the groomer.
- Remove the roller mounting bracket and cutter mounting bracket from the belt end of the mower frame.
- Remove the roller and cutter assemblies.
- Clean with solvent and a medium brush. Check for worn or distorted parts; replace if necessary.

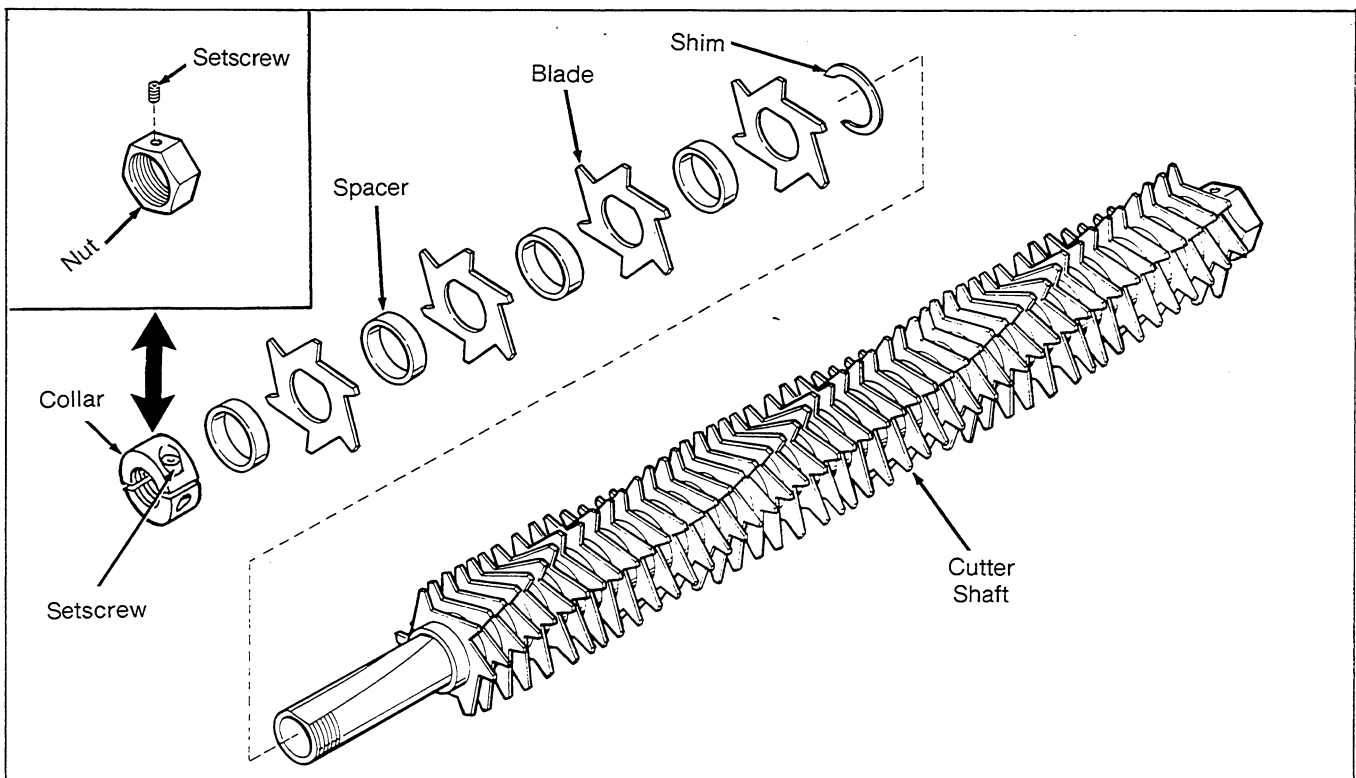
ROLLER ASSEMBLY REPAIR
(See "Roller Cutter Removal and Installation" Illustration)

- Repair is limited to changing the bearings and/or roller if damaged.
- To remove the bearing, loosen hex head retaining collars (21). Slide bearing (22) out of collar.
- To install the bearing, proceed with steps 4 thru 7.
- Install bearing shaft in retaining collar.

- Tighten retaining collar in roller until finger tight. Then back out collar approximately 1/2 turn.
- Position bearing (see Illustration) so that the dimension between the outer end of the bearing shaft and the end of the roller is 2-3/16" (55.5 mm) as shown in the diagram below.
- Tighten retaining collar and torque to 50-55 ft-lbs. (68-75 N.m).

**ROLLER ASSEMBLY REPAIR STEP 6**
CUTTER ASSEMBLY REPAIR
(See "Cutter Repair" Illustration)

Check the condition of blades, straighten bent blades whenever practical. If blades must be replaced, proceed as follows:

**CUTTER ASSEMBLY REPAIR**

SECTION 12G. TURF-GROOMER (Product No. 68582)

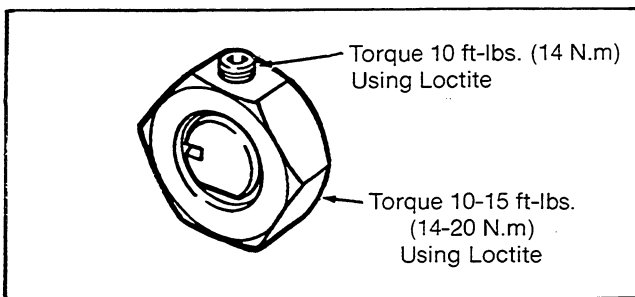
1. Loosen the setscrew and collar (or nut, if so equipped) from one end of the cutter assembly. Be careful to hold remaining parts, blades, spacers, and shims in place on the cutter shaft.
2. Remove broken or damaged blades by alternately removing spacers and blades from the end of the cutter shaft until all necessary replacements have been made.

CUTTER SHAFT ASSEMBLY

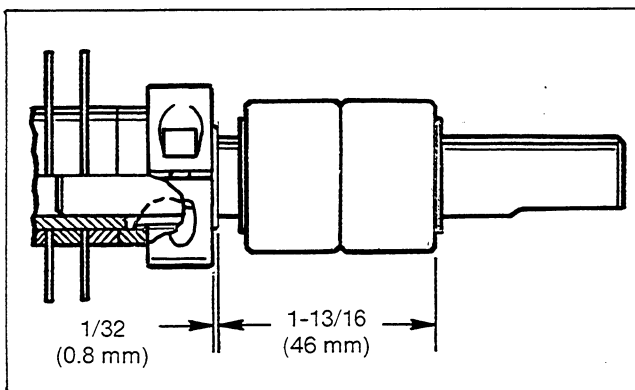
1. Install and position the nut on one end of the shaft so that approximately 1/32 inch (0.7 mm) threads protrude beyond the collar (or nut).

NOTE

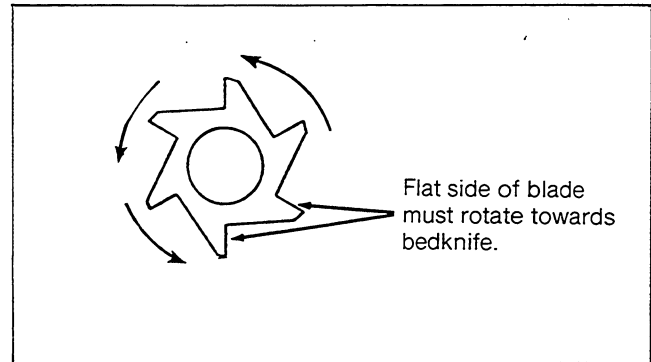
On units with a nut the setscrew in the nut is positioned opposite from the flat machined surface on the groomer shaft as shown below.



2. Install bearing so that the key in the bearing shaft slides in to the groove in the cutter shaft. Position the bearing so that the dimension between the outer end of the bearing race and the end of the threaded shaft is 1-13/16 inch (56.0 mm) as shown below. After positioning the bearing, secure the bearing with the setscrew in the collar (or nut). Torque the setscrew to 10 ft-lbs. (14 N.m).



3. Install blades and spacers on the cutter shaft. There should be two spacers between each end blade and nut and one spacer between each blade. When installing the blades make sure each blade is installed so that the flat side of the blade rotates toward the bedknife (ie, rotates toward the rear of the mower).



PROPER INSTALLATION OF CUTTER BLADES

NOTE

This blade-to-bed knife relationship must also be checked when the assembled cutter assembly is installed to avoid installing the cutter assembly backwards.

4. Before securing the blades and spacers, check the cutter blade to roller alignment as described in the following section.

CUTTER-TO-ROLLER ALIGNMENT (See "Cutter-to-Roller Alignment" Illustration)

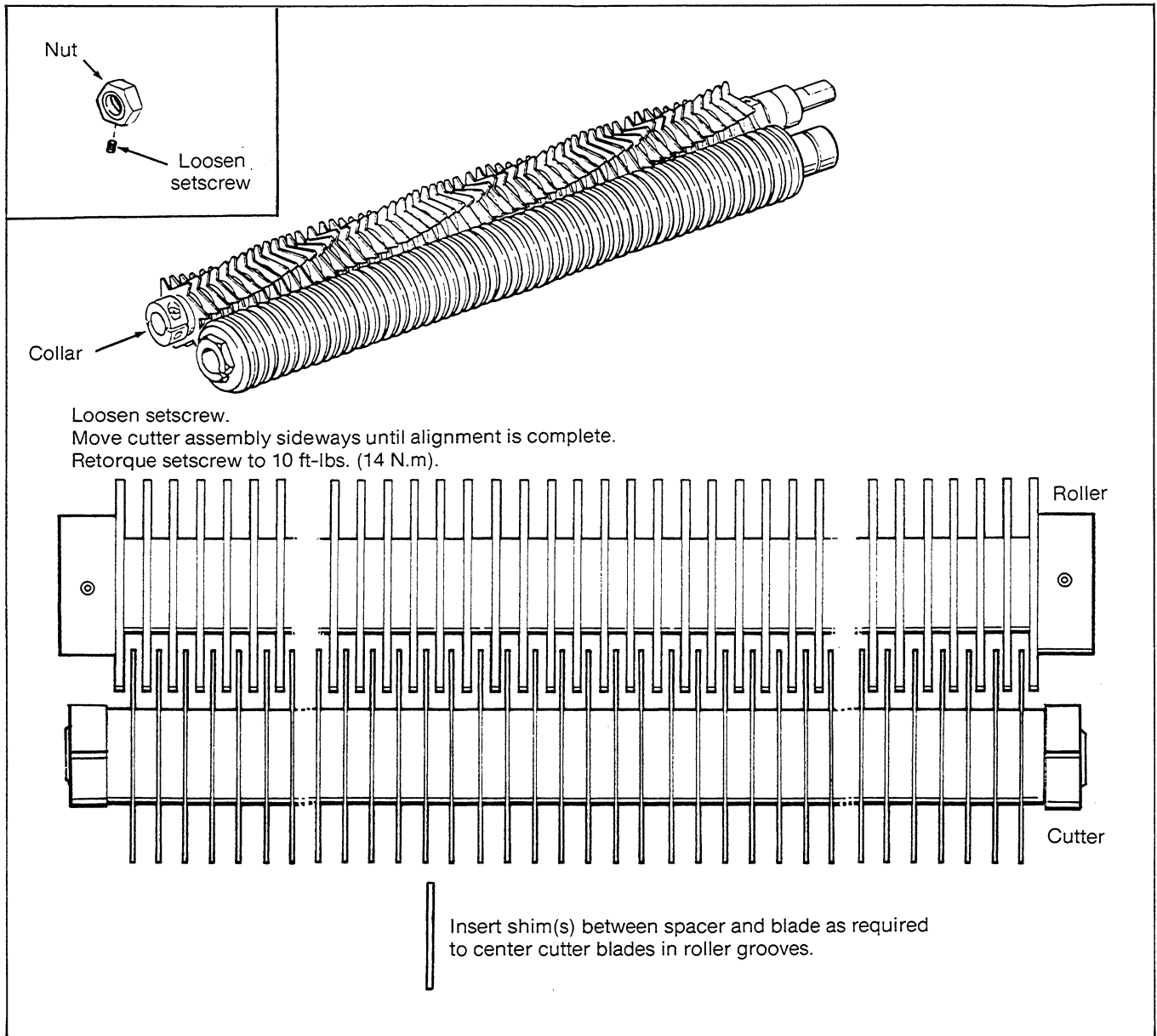
1. After all blades and spacers have been installed, with spacers on the outside at each end of the cutter assembly, align the cutter assembly in the roller as described below:
2. Install and finger tighten the nut on the cutter shaft. (The nut on the other end of the cutter shaft should be secured in place.) Align the blades of cutter assembly in the center of the grooves in the roller. Mark any blades which must be centered. Manually rotate the cutter to check all blades. Add shims where required to center the blades. Special shims are available from your Jacobsen distributor.
3. Tighten the collar (or nut) on the end of the shaft as described in step 1 of "Cutter Shaft Assembly." Torque the nut to 10-15 ft-lbs. (14-20 N.m).



CAUTION

Care should be taken when torquing the retaining collar (or nut). Over torquing will cause deflection of the groomer shaft.

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SECTION 12G. TURF-GROOMER™ (Product No. 68582)**CUTTER-TO-ROLLER ALIGNMENT****NOTE**

For units using a nut vs. a collar.

If the setscrew is not positioned opposite the flat on the shaft once proper torque is achieved, back the nut off and add shim washers between the end blade and outside spacers until proper alignment of the setscrew is obtained when the nut is properly torqued.

4. Install the bearing in the same manner as described in step 2 of "Cutter Shaft Assembly." Secure in place with the setscrew and torque to 10 ft-lbs. (14 N.m).

ROLLER AND CUTTER INSTALLATION
 (See "Roller and Cutter Removal and Installation" Illustration, page 12G-1)

1. Position both the cutter assembly and roller assembly in their respective brackets on the motor end.
2. Install the roller mounting bracket (15) to the cutter mounting bracket (14).
3. Install hardware (9-12) but do not tighten.

SECTION 12G. TURF-GROOMER™ (Product No. 68582)

4. Install the height adjusting knob bracket (17), nut (16), and adjusting block (8).
5. Install the drive belt as described on page 12G-2.
6. Tighten the mounting hardware, except clamping screws (13 and 18).
7. Align the cutter assembly in the center of the grooves of the roller.
8. Tighten screws (13 and 18) to 5–6 ft-lbs. (7–9 N.m).
9. Install the belt cover (7) and fasten in position.

NOTE

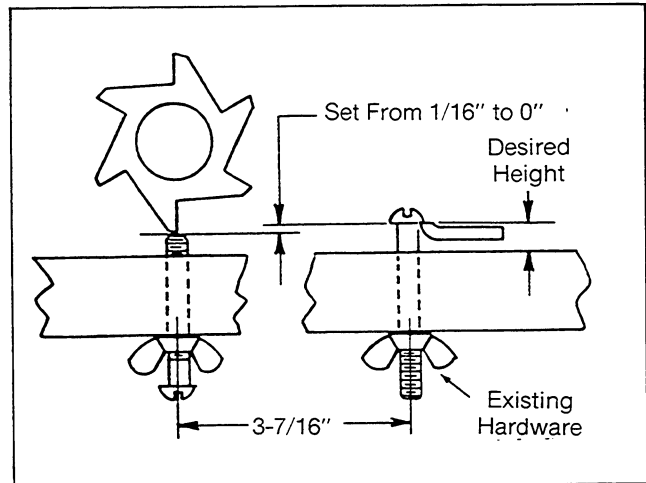
Refer to Turf Groomer Adjustments for proper setup of groomer.

10. Install cutting unit on the tractor.

TURF GROOMER ADJUSTMENTS

Mowers equipped with the turf groomer attachment are adjusted the same as standard mower and reel assem-

blies (see page 12E-1 of this manual) except that the cutter height adjustment should be as shown below:



**CUTTING HEIGHT ADJUSTMENT FOR
TURF GROOMER CUTTER BLADES**

SECTION 12H. VERTICAL MOWER (L.H. Product No. 68549, R.H. and Rear Product No. 68550)

GENERAL

Vertical mower attachments are normally used as replacements for standard reel mowers when thatch removal and grain control is the primary greens 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. The rear roller and rear roller grass shield assemblies are identical to those used on the standard reel mower.

REPAIR AND SERVICE

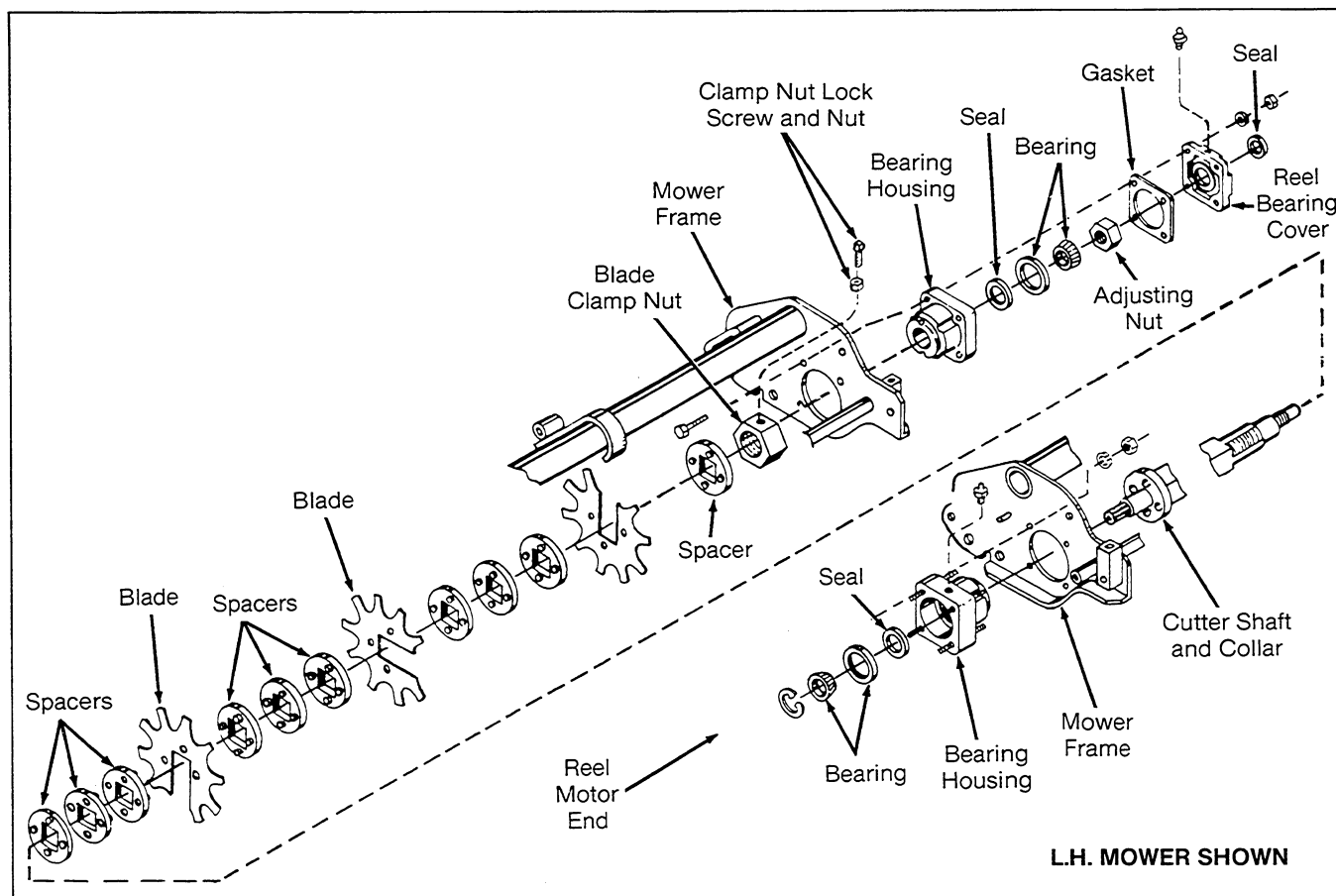
Normal repairs and servicing of vertical mowers consist of blade replacement and cleaning and lubricating or replacement of bearings.

Individual blades are readily removed without removing the reel from the frame. To replace blades, back off the blade clamp nut $1/4$ to $3/8$ " (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 slotted blade from the shaft. Install replacement blade with the slot in blade in same position as blade that was removed and retighten the blade clamp nut 12-15 ft-lbs. (16-20 N.m). Retighten clamp nut lock screw and nut.

NOTE

When replacing all blades, starting from one end rotate each blade 90 degrees in the same direction.

1. Remove reel motor and disconnect the mower from the lift yoke.
2. Disassemble and reassemble the cutter assembly as shown in the following illustration.

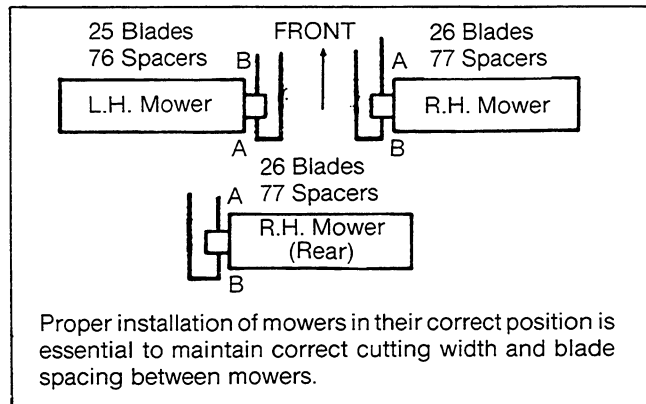


DISASSEMBLY AND REASSEMBLY OF CUTTER ASSEMBLY

SECTION 12H. VERTICAL MOWER

(L.H. Product No. 68549, R.H. and Rear Product No. 68550)

3. Clean bearings in solvent and dry. Replace worn or badly pitted bearings. Pack bearing cups and cones with grease and reassemble. Grease all lube fittings after reassembly.
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 end of shaft with a soft hammer, if turning resistance is still present, back off the adjusting nut 1/8 turn and tap with hammer. Repeat if necessary. The adjustment is correct when the reel can be revolved freely and end play does not exceed 0.010" (.25 mm).
5. Install the mower on the machine as described in Section 12C.



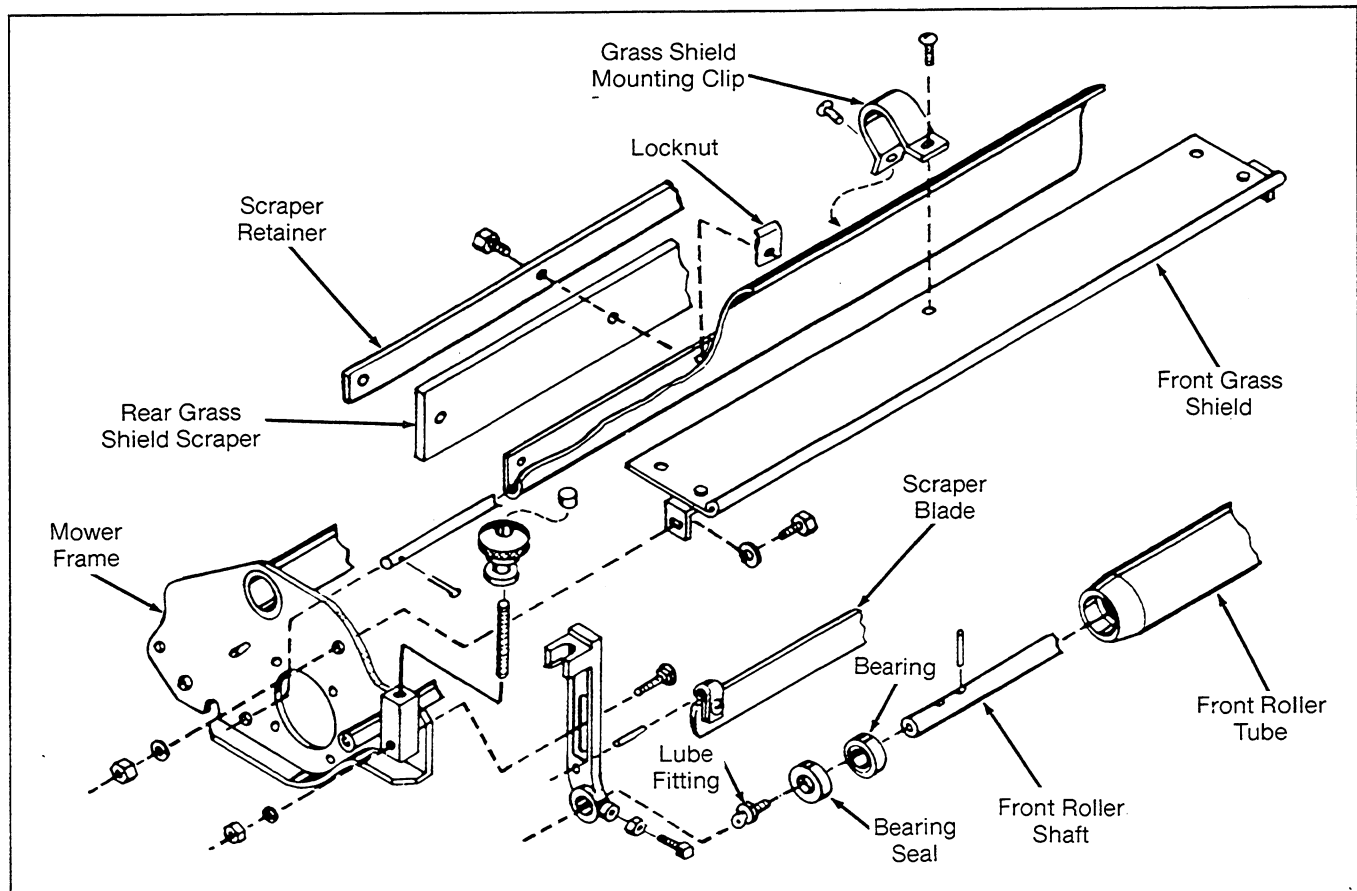
BLADE SPACING ADJUSTMENT

CHANGING BLADE SPACING

Blade spacing of 3/4" (19 mm) is standard on factory built mowers. Cutting widths can be reduced or increased between 1/2 and 1-1/2" (12.7 and 38 mm) in 1/4" (19 mm) increments by adding or removing individual blades. To do this, follow instructions on removal of individual blades.

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 the following illustration. Replace worn or badly pitted bearings. Clean in solvent, dry, and pack (with grease gun grease) bearings and bearing seals before installing. Fill lube fittings on the front roller after reassembling.

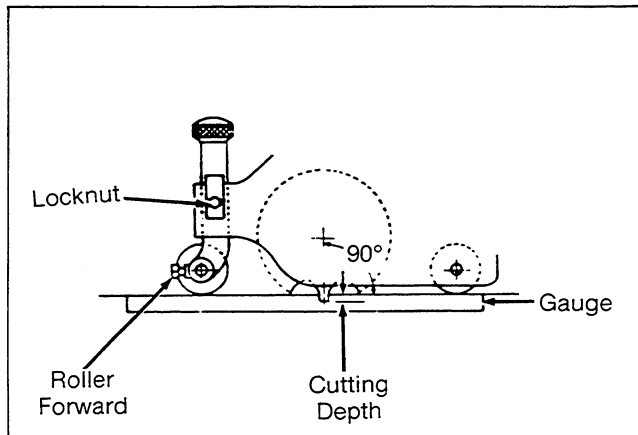


DISASSEMBLY AND REASSEMBLY OF FRONT ROLLER, GRASS SHIELDS, AND GRASS SHIELD SCRAPERS

SECTION 12H. VERTICAL MOWER (L.H. Product No. 68549, R.H. and Rear Product No. 68550)

NOTE

When installing the front roller in a vertical reel mower, the roller brackets must be assembled with the roller in forward position as shown below.



CUTTING DEPTH ADJUSTMENT

CUTTING DEPTH ADJUSTMENT

With engine stopped, reels raised and reel valve in the "Off" position, adjust reels to desired cutting depth before using mower. Optimum cutting depth is 1/8 to 3/16" (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 1/64" (.39 mm) from end to end.

To make a cutting depth adjustment, loosen locknuts on both sides enough to allow the hand knobs to move the front roller brackets freely in the side frames. Place a greens mower 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 reel visually to the approximate depth desired. Check and make final adjustment with a scale to measure the distance the tooth projects below the roller contacting edge of the gauge. Repeat the above on the opposite end of the reel and tighten locknuts.

SECTION 12I. SPIKER (Product No. 68519)**GENERAL**

Spiker attachments are normally used on a temporary basis.

Spikers rotate with machine motion and are not driven by hydraulic reel motors. Reel motors are repositioned for storage when the spiker attachment is used.

Spikers have their own lift yoke and frame assembly and completely replace any installed reel, turf groomer, or vertical blade attachments.

Spikers do not utilize front or rear rollers or any other optional attachments.

Spikers are to be operated in forward only.

SPIKER REPAIRS**NOTE**

If you are attaching a spiker assembly for the first time, refer to Spiker Accessory Operator's Manual and Parts List available from your Jacobsen distributor.

Spiker repairs are normally limited to replacement of blades and bearings. Blades may be straightened but not sharpened.

Assuming that your Greens King IV has been modified to mount Spiker attachments and that Spikers are attached when the machine is in shop for service and repair, proceed as follows:

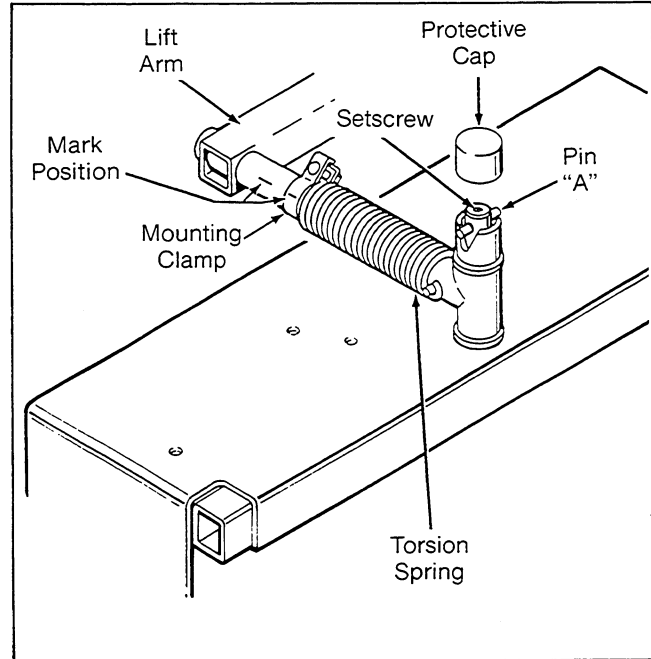
⚠ **WARNING**

Spiker blade points are very sharp. Be extremely careful when handling the spiker assembly or blades.

1. Mark the position of the torsion spring mounting clamp on the lift arms and release the clamp by loosening the clamp mounting nut. The purpose of marking the position of the clamp is so the torsion spring can be returned to the same position when reinstalling the reel mowers.

⚠ **WARNING**

To avoid possible serious bodily injury restrain clamp from rotating when loosening as spring force will spin clamp.

**SPIKER REMOVAL FROM LIFT YOKE**

2. Remove plastic protective cap from swivel housing, loosen setscrew and remove mounting pin "A" from lift yoke shaft.

NOTE

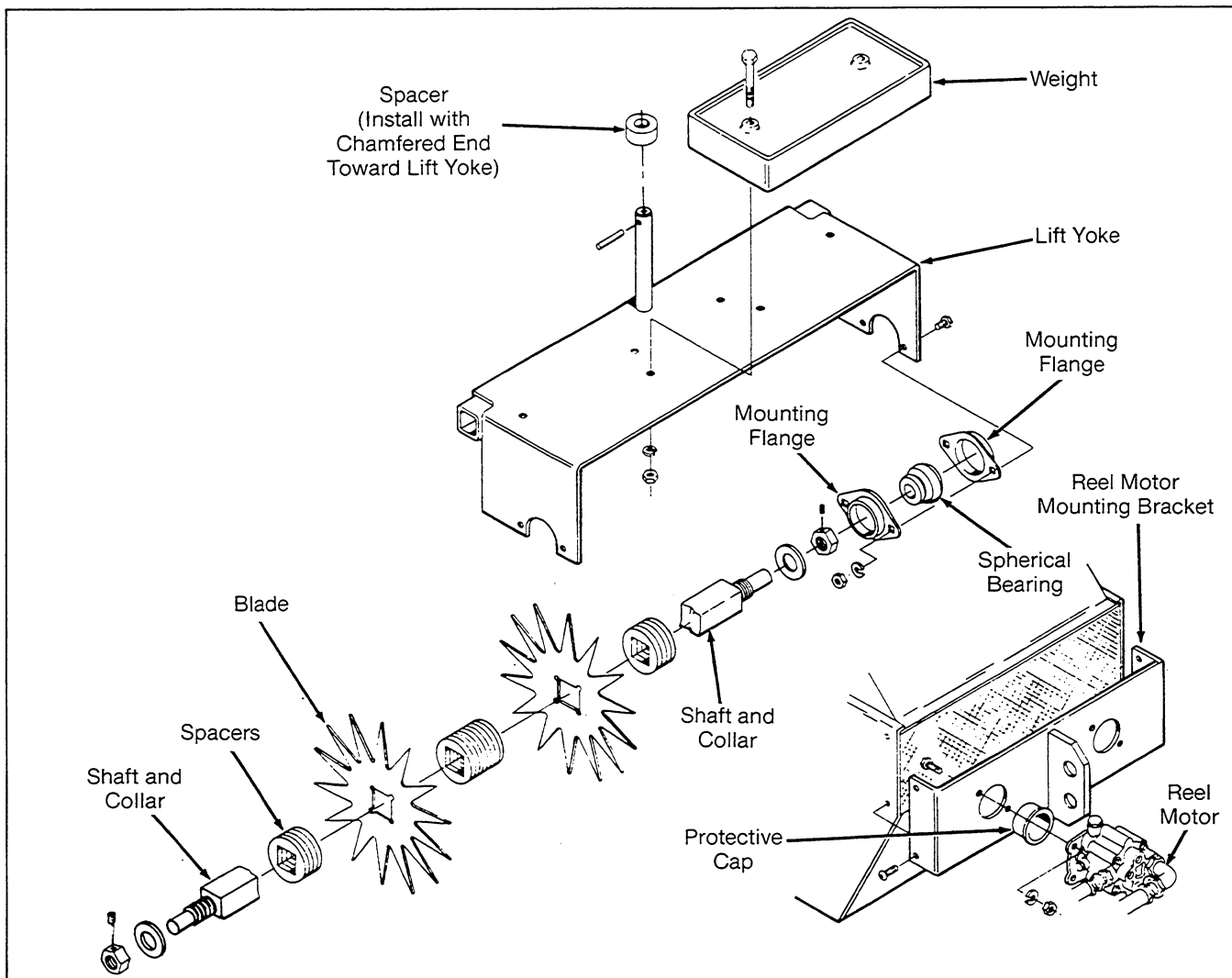
On center mowers, disconnect the anti-sway torsion spring from the lift yoke.

3. Remove the spiker assemblies from the machine. Turn the assembly upside-down on a work bench.

BLADE AND BEARING REPAIR

1. See "Spiker Disassembly and Reassembly" illustration. Remove the screws, nuts, and lockwashers that hold the mounting flanges to the lift yoke. Remove the assembled spiker assembly from the lift yoke.
2. Remove the setscrew and nut closest to the blades or spherical bearing to be replaced. Remove and replace damaged blades and/or bearings.
3. Tighten the nut at each end of the spiker assembly and lock to the shaft and collar with setscrews.
4. Install the spiker assembly on the lift yoke and secure with mounting brackets, spherical bearings, and attaching screws, nuts, and lockwashers at each end of the lift yoke.

SECTION 12I. SPIKER (Product No. 68519)

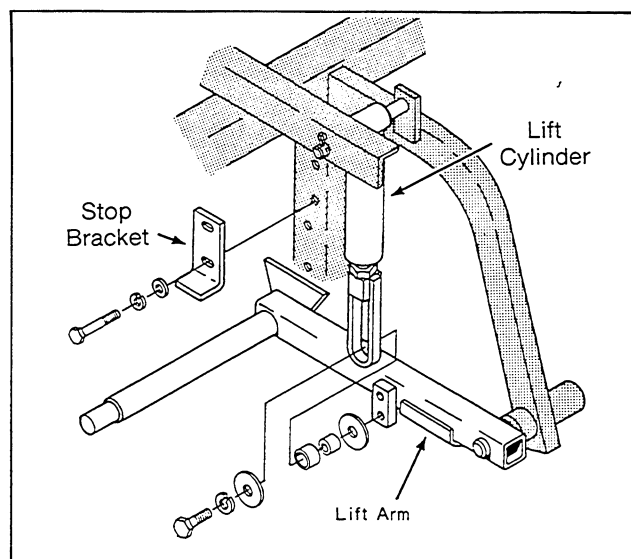


SPIKER DISASSEMBLY AND REASSEMBLY

CENTER SPIKER CLEARANCE (See "Center Spike Clearance Adjustments" Illustration)

Unless the spiker is to be used or transported over extremely *smooth* terrain it will be necessary to perform the following steps to provide center spiker clearance.

1. Remove the two screws, lockwashers, and washers that hold the mower stop bracket to the rear frame assembly and move the stop bracket up to next set of holes.
2. Remove the screw that holds the rear mower lift cylinder to the bracket on the lift arm and reassemble it in the lower hole in the bracket.



CENTER SPIKER CLEARANCE ADJUSTMENTS

SECTION 12J. TURF GROOMER (Product Nos. 68598 and 68603)

GROOVED ROLLER (See Figure 12J-2)

Removal

1. Loosen setscrews on outer roller shaft nuts.
2. Remove roller shaft nuts and spacer(s).
3. On the motor end, remove the groomer side plates.
4. Remove roller.

Repair

1. Remove snap ring (1).
2. Using a puller, remove shaft assembly (2).
3. Bearing (6), nilos ring (7) and seal (8) can be removed by first removing nut (3) and associated hardware (4) and (5).

NOTE

Grease fitting (9) and shaft nuts (10) should be removed before reassembly.

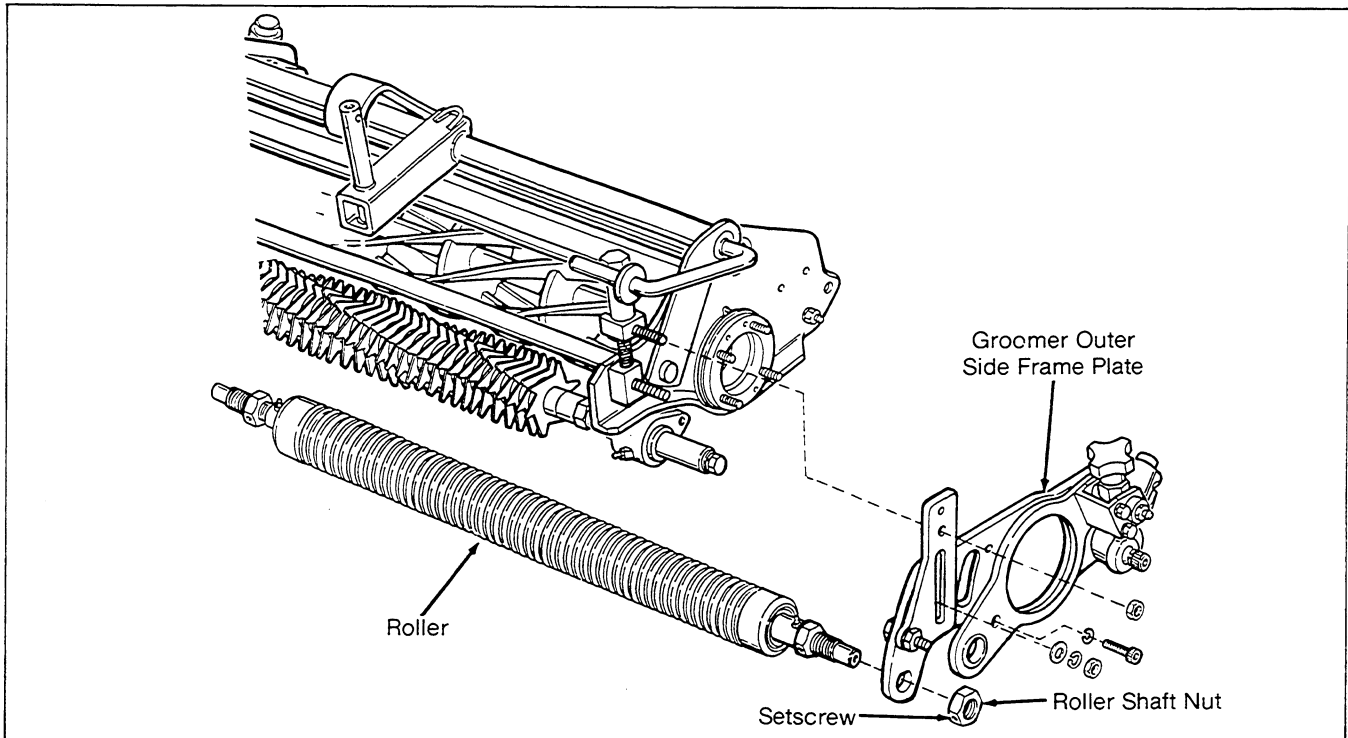


Figure 12J-1. Roller Removal

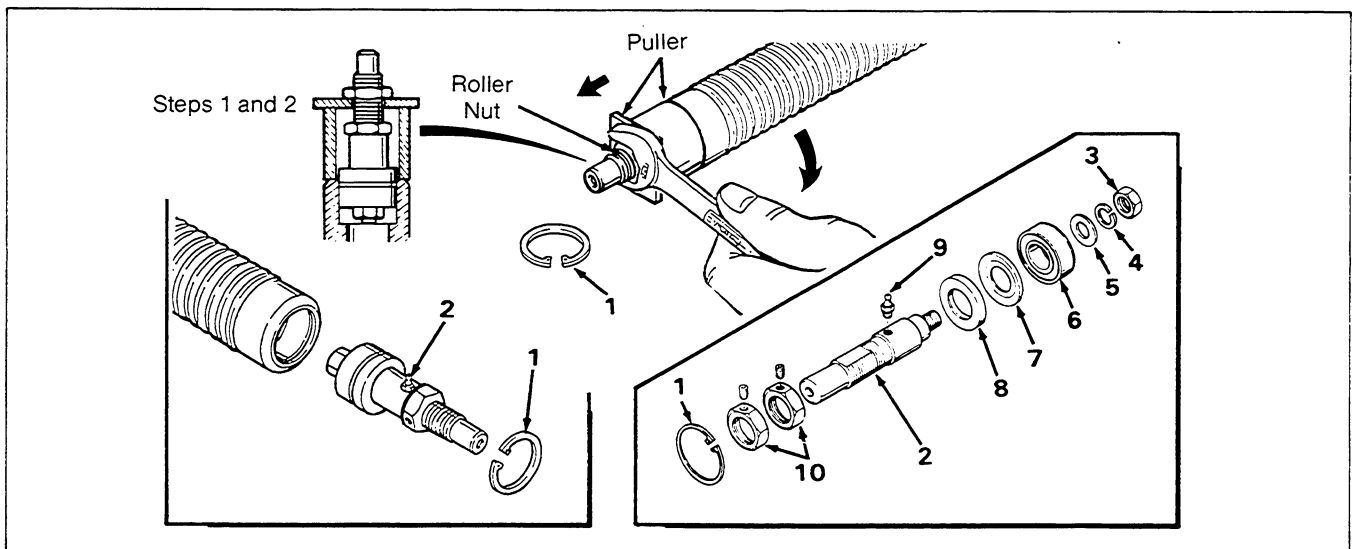


Figure 12J-2. Roller Repair

SECTION 12J. TURF GROOMER (Product Nos. 68598 and 68603)

4. Install nilos ring (7) onto shaft (2).
5. Install bearing (6), seal side first, onto shaft (2).
6. Install flat washer (5), lockwasher (4) and nut (3). Torque nut to 20 ft-lbs.
7. Press shaft (2) subassembly into the roller.

NOTE

Seal must be pressed so it just clears the snap ring groove in roller.

8. Press seal (8) (seal lip to the inside) into roller.
9. Install snap ring (1).
10. Install grease fitting (9) and one shaft nut (10).

Installation

1. Loosen setscrews in roller nuts.
2. Position roller end in groomer side frame.
3. Install groomer side frame on motor end, tighten hardware as shown.
4. Using the two inside roller nuts, center groomer blades between roller discs.
5. Install shims and 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 inch thick.

6. Tighten roller shaft outer nuts, tighten nut setscrews.

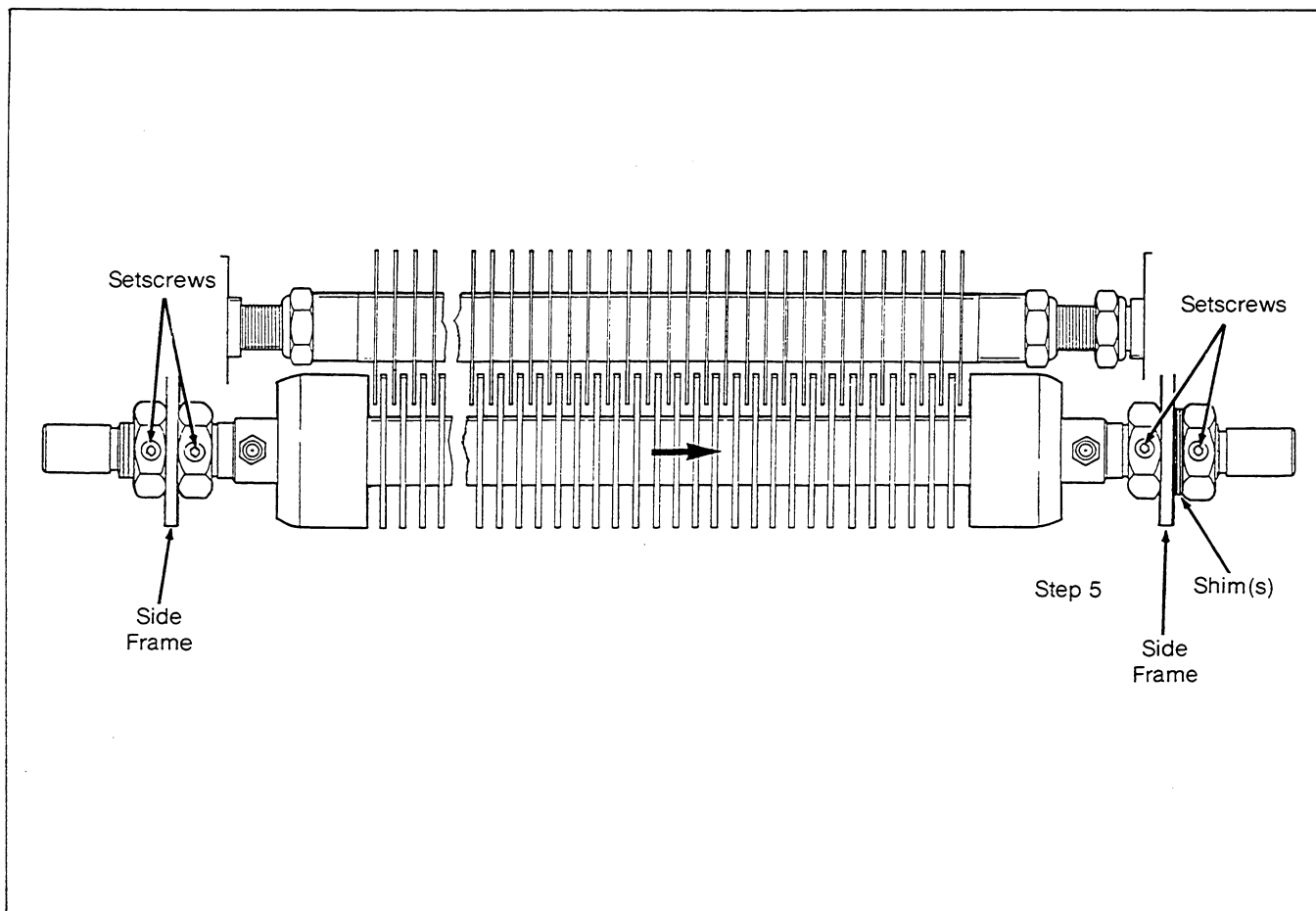


Figure 12J-3. Roller Installation Alignment

SECTION 12J. TURF GROOMER (Product Nos. 68598 and 68603)

GROOMER SHAFT ASSEMBLY (See Figure 12J-4)

NOTE

Do not pry on pulley flange.

Removal

1. Remove belt case cover and loosen belt adjusting eccentric.
2. Remove clutch, drive key and spacer.
3. Remove drive gear and belt.
4. On motor end remove bearing retainer capscrew.
5. Remove quick height pivot screw and nylon clamp.
6. Remove groomer mounting bracket and groomer shaft.

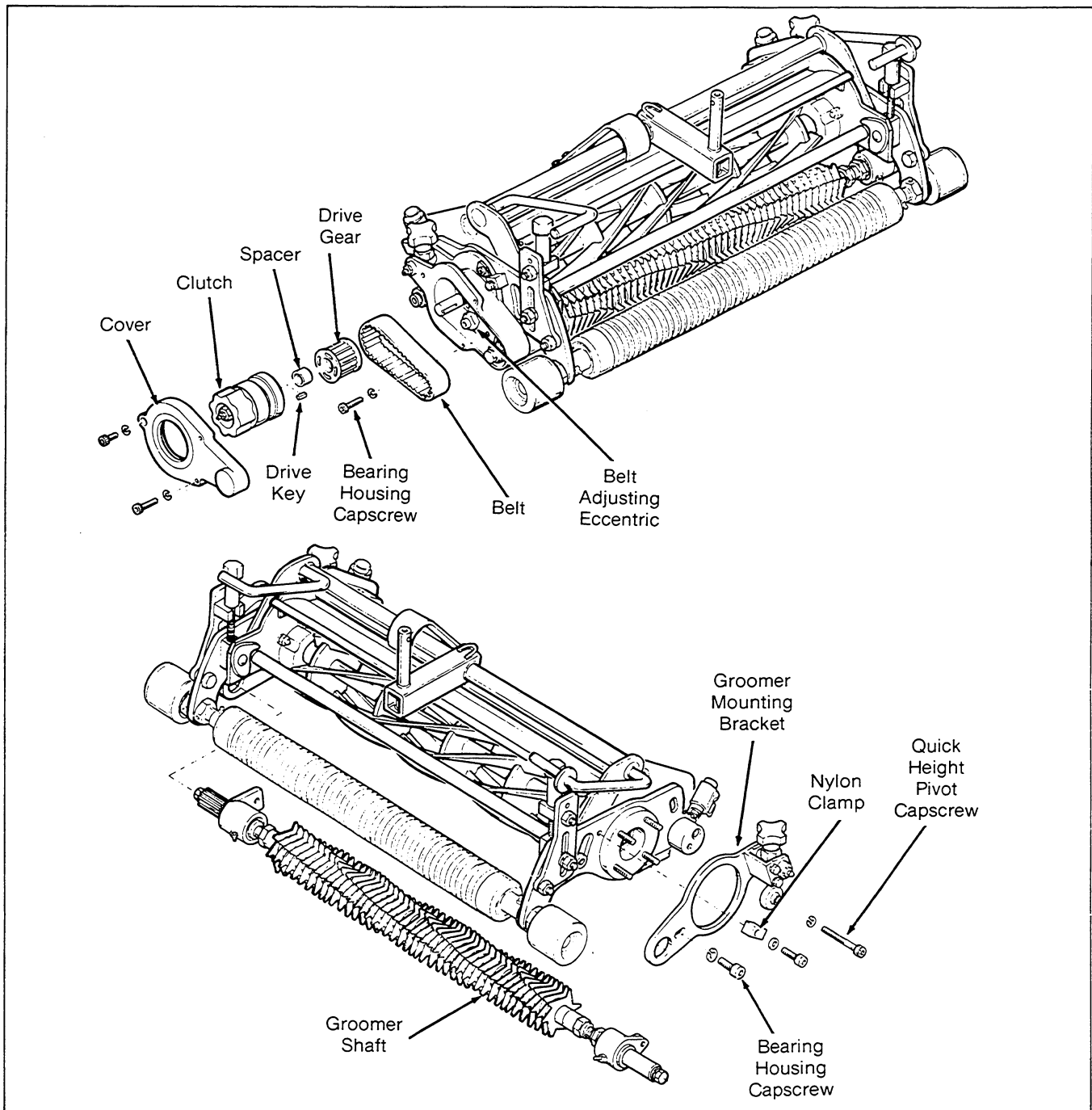


Figure 12J-4. Groomer Shaft Assembly

SECTION 12J. TURF GROOMER (Product Nos. 68598 and 68603)**Bearing Repair (See Figure 12J-5)****DISASSEMBLY**

1. Remove hardware as shown from ends of groomer shaft.
2. Remove bearing housing.
3. Remove outer snap ring from bearing housing.
4. Remove seal and inner snap ring.
5. Press bearing from bearing housing.

NOTE

Discard old seal and bearings.

REASSEMBLY**CAUTION**

Properly support retainer to prevent damage.

1. Press new bearing into retainer.
2. Install inner snap ring and press in new seal (lip to the outside).
3. Install outer snap ring and spacer.
4. On drive end install spacer, square drive key and driven gear.
5. Install hardware on both ends, torque to 20 ft-lbs.

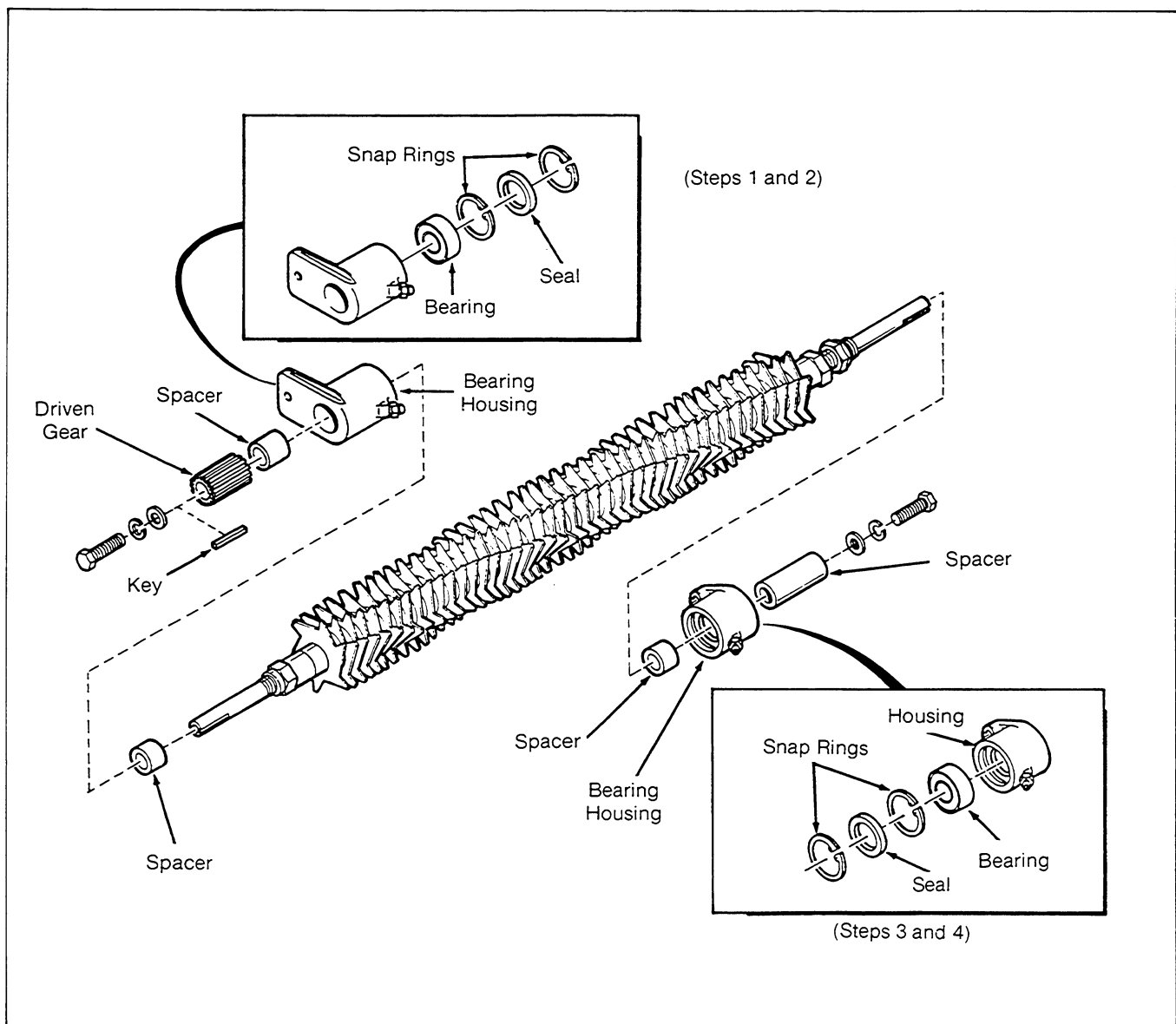


Figure 12J-5. Bearing Repair

SECTION 12J. TURF GROOMER (Product Nos. 68598 and 68603)

Blade Repair

Check condition of blades, straighten bent blades whenever practical. If blades must be replaced, proceed as described below.

DISASSEMBLY (See Figure 12J-6)

1. Remove groomer shaft assembly as described in Groomer Shaft Assembly, Removal.
2. On motor end of groomer shaft, remove capscrew, spacer, bearing housing and bearing adjustment nut.
3. Remove blade retaining nut and spacer.
4. Remove spacers and damaged blade(s) as necessary.

REASSEMBLY

1. Install and set the blade retainer nut on drive end 1 inch from the shoulder of shaft to inside of nut (see Figure 12J-6 inset).
2. Install a 3/4 inch spacer, 1/4 inch spacer and a blade.

NOTE

Blade must be positioned so flat of blade rotates toward bedknife (see Figure 12J-6).

3. Alternately install a spacer and blade until 70 spacers and 71 blades have been installed.
4. Install blade retaining nut, torque to 10-15 ft-lbs.

NOTE

It is necessary to align the blades with the grooves of the roller. This can be done after installing groomer shaft assembly.

5. Install Groomer Shaft Assembly as described in Groomer Shaft Assembly, Installation.

Installation (See Figure 12J-1)

1. Install groomer shaft drive end into belt case aligning bearing housing flat in belt case groove.
2. Install bearing housing capscrew, do not tighten.
3. Install groomer mounting bracket and bearing housing capscrew, do not tighten.

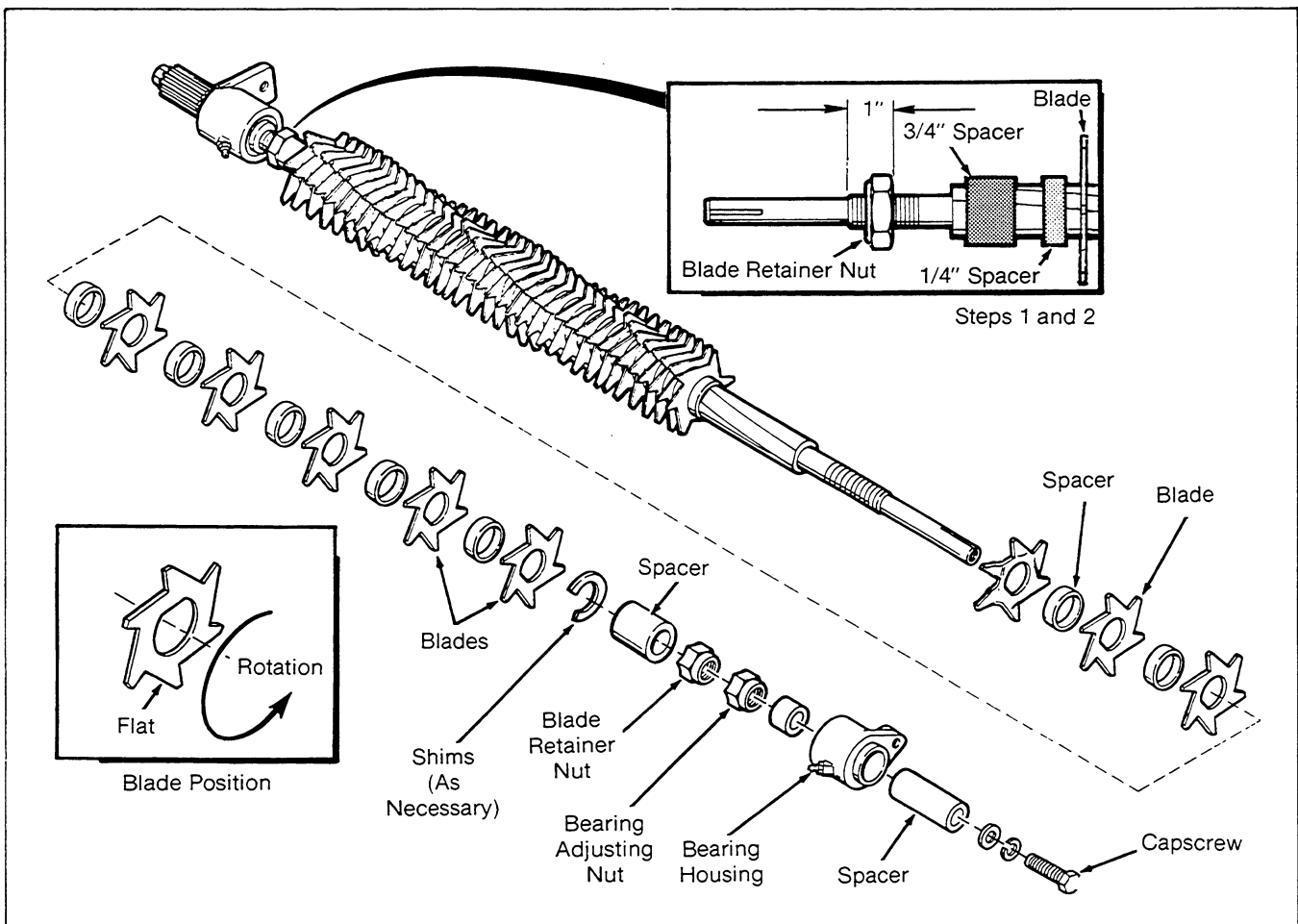


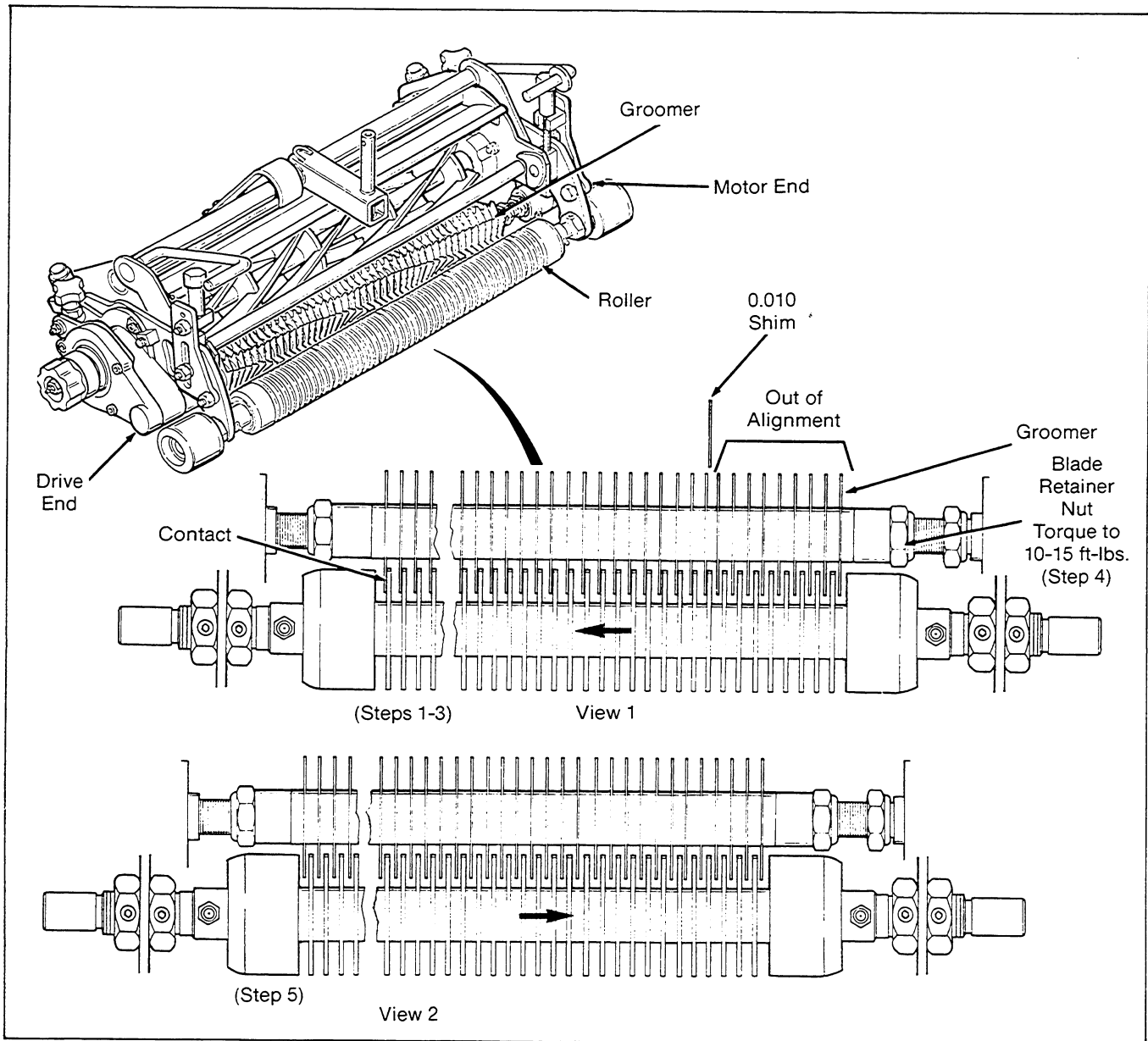
Figure 12J-6. Groomer Blade Repair

SECTION 12J. TURF GROOMER (Product Nos. 68598 and 68603)

4. Install quick height pivot screw, tighten then back off 1/8th turn.
5. Adjust groomer shaft bearing as described in Groomer Shaft Assembly, Bearing Adjustment.
6. Install drive gear and belt.
7. Install spacer, drive key and clutch, torque clutch bolt to 20 ft-lbs.
8. Adjust belt as described in Drive, Belt Adjustment.
9. Install cover, torque capscrews to 6-8 ft-lbs.
10. Align blades to roller as described in Blade to Roller Alignment.

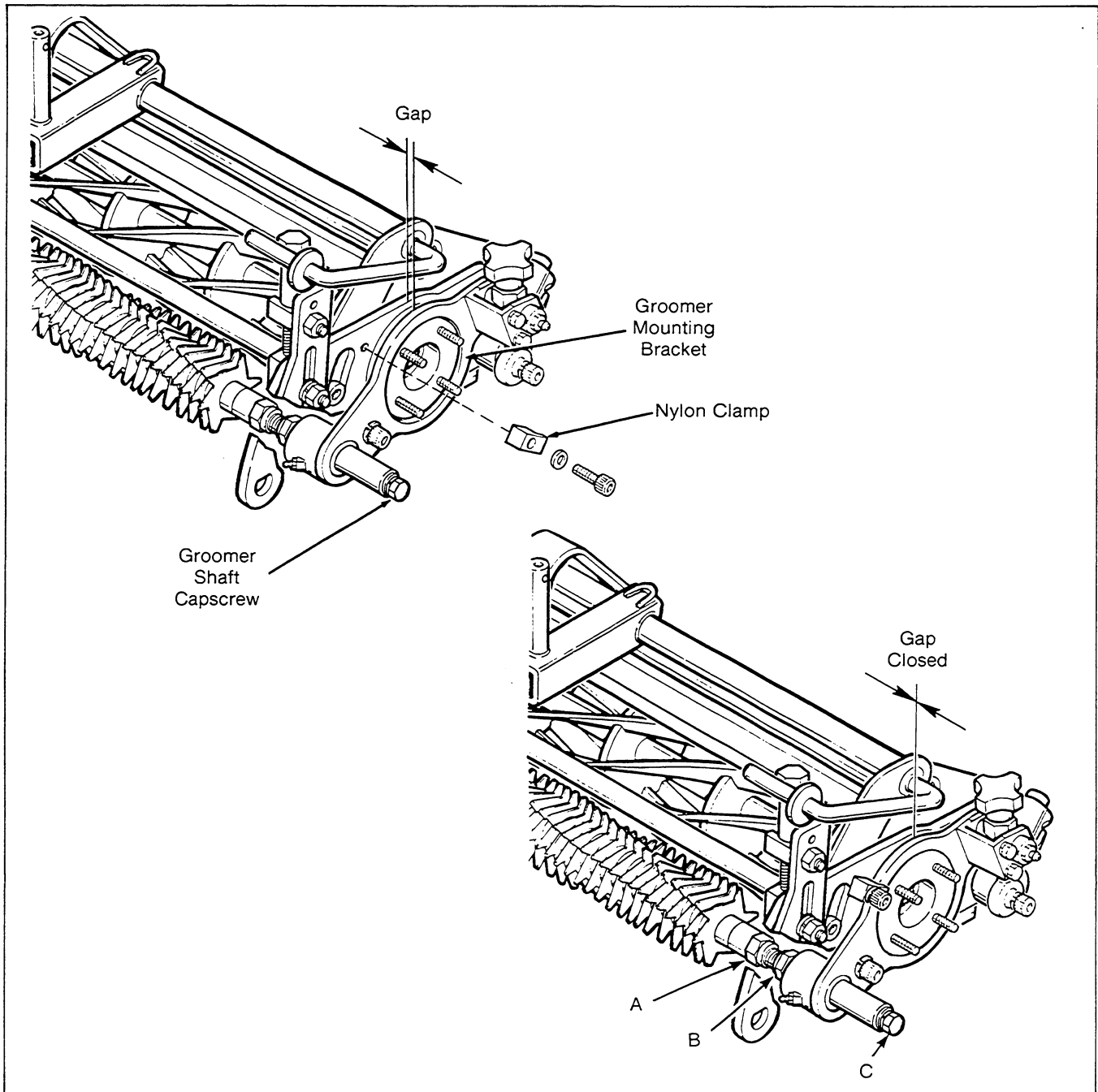
Blade to Roller Alignment (See Figure 12J-7)

1. The groomer shaft should be installed to properly align groomer cutter to roller.
2. Loosen front roller locknuts. Slide roller toward belt case end until cutters contact roller discs.
3. Starting on the drive end check that all blades touch roller disks. If there is a space, install 0.010 shim Part No. 364040 until all blades touch roller disks.
4. Torque blade retainer nut to 10-15 ft-lbs.
5. Slide roller toward motor end so blades are centered between each disc. Fasten roller retaining locknuts on each end.

**Figure 12J-7. Blade to Roller Alignment**

SECTION 12J. TURF GROOMER (Product Nos. 68598 and 68603)**Bearing Adjustment (See Figure 12J-8)**

1. Remove nylon clamp and loosen capscrew on end of groomer shaft.
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 capscrew (C) on end of groomer shaft until outer groomer bracket is pulled in against inner bracket and 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. A slight resistance will be felt.
5. Torque capscrew (C) on end of groomer shaft to 20 ft-lbs.
6. Install nylon clamp, torque to 5 ft-lbs.

**Figure 12J-8. Bearing Adjust****12J**

SECTION 12J. TURF GROOMER (Product Nos. 68598 and 68603)**DRIVE****Drive Pulley Repair (See Figure 12J-9)**

1. Remove the belt case cover, clutch and drive key.
2. Loosen the drive belt.
3. Remove drive pulley, spacer and belt.

**CAUTION**

Do not support drive pulley on outer flange. Support on solid part of gear.

4. Using a drift punch, drive the outer bearing from drive gear (see Figure 12J-10).

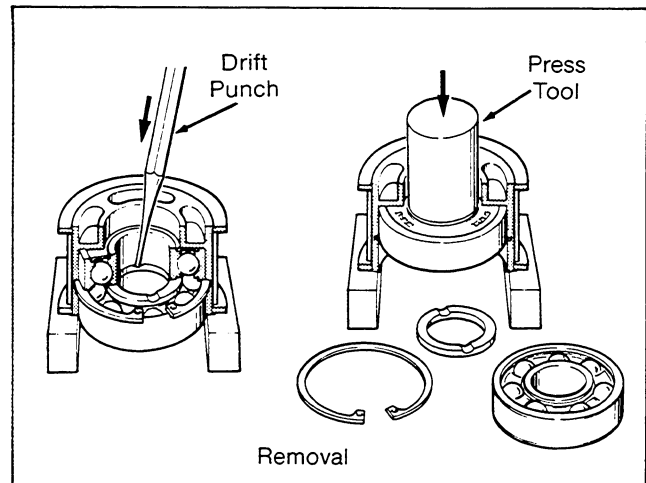
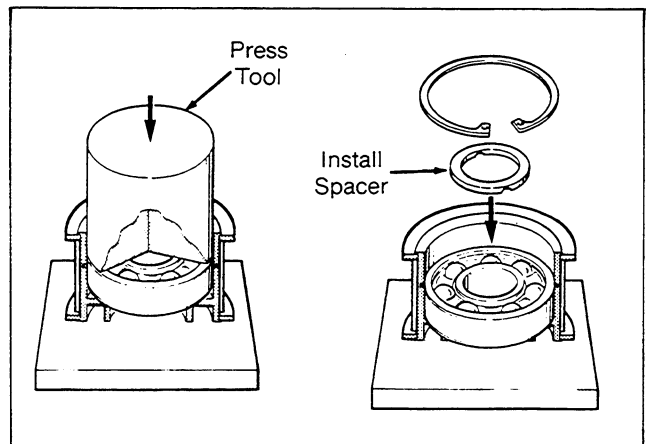
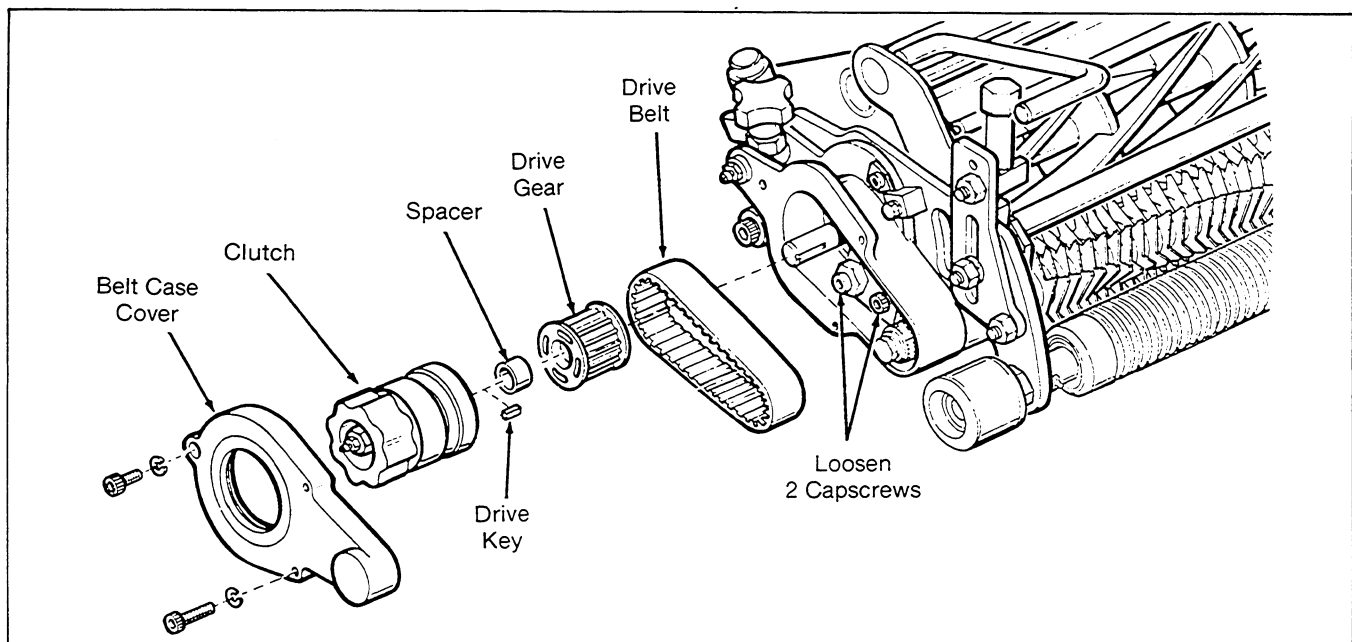
NOTE

Spacer will be damaged during bearing removal, discard and install a new spacer.

5. Remove snap ring and press out inner bearing.
6. Press a new bearing seal side first into drive gear (see Figure 12J-11).

**CAUTION**

When pressing new bearings, always use a flat or round mandrel the diameter of the bearing outer race. Do not press on inner race only.

**Figure 12J-10. Drift Punch****Figure 12J-11. Press Tool****Figure 12J-9. Drive Pulley Repair**

SECTION 12J. TURF GROOMER (Product Nos. 68598 and 68603)

7. Install snap ring and new spacer.

NOTE

Spacer does not have to be centered at this point.

8. Install outer bearing with seal side out (see Figure 12J-12).

NOTE

When installing outer bearing, use a flat plate across top of bearing.

9. When bearing has been pressed 3/4 of the way in drive gear, center spacer. Continue pressing bearing until it contacts center spacer.
10. Install drive gear and belt into belt case (see Figure 12J-8).
11. Install spacer, drive key and clutch, torque clutch bolt to 20 ft-lbs.
12. Adjust drive belt as described in Belt Adjustment.
13. Install belt case cover, torque capscrews to 6-8 ft-lbs.

Belt Replacement (See Figure 12J-13)

1. Remove belt case cover.
2. Remove clutch and drive key.
3. Loosen belt adjuster eccentric and bearing retainer capscrew.

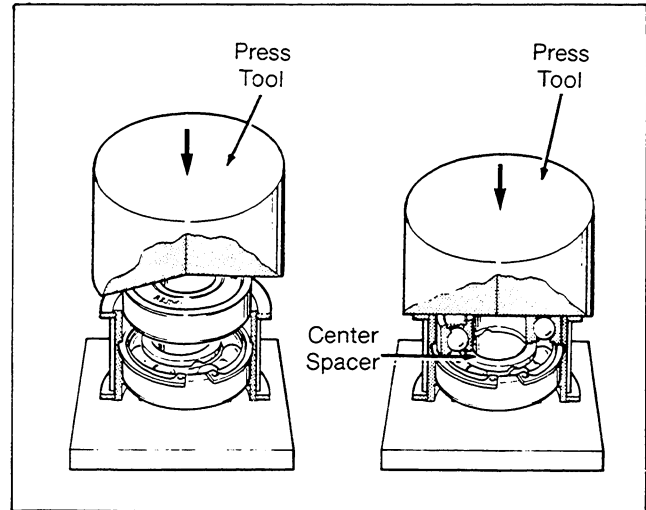


Figure 12J-12. Drive Groomer Installation

4. Remove spacer, drive pulley and belt.
5. Install drive gear, bearing toward the inside and belt over reel shaft. Work end of belt over groomer shaft drive gear.
6. Install spacer, drive key and clutch, torque clutch bolt to 20 ft-lbs.
7. Proceed with step 3 of Belt Adjustment.

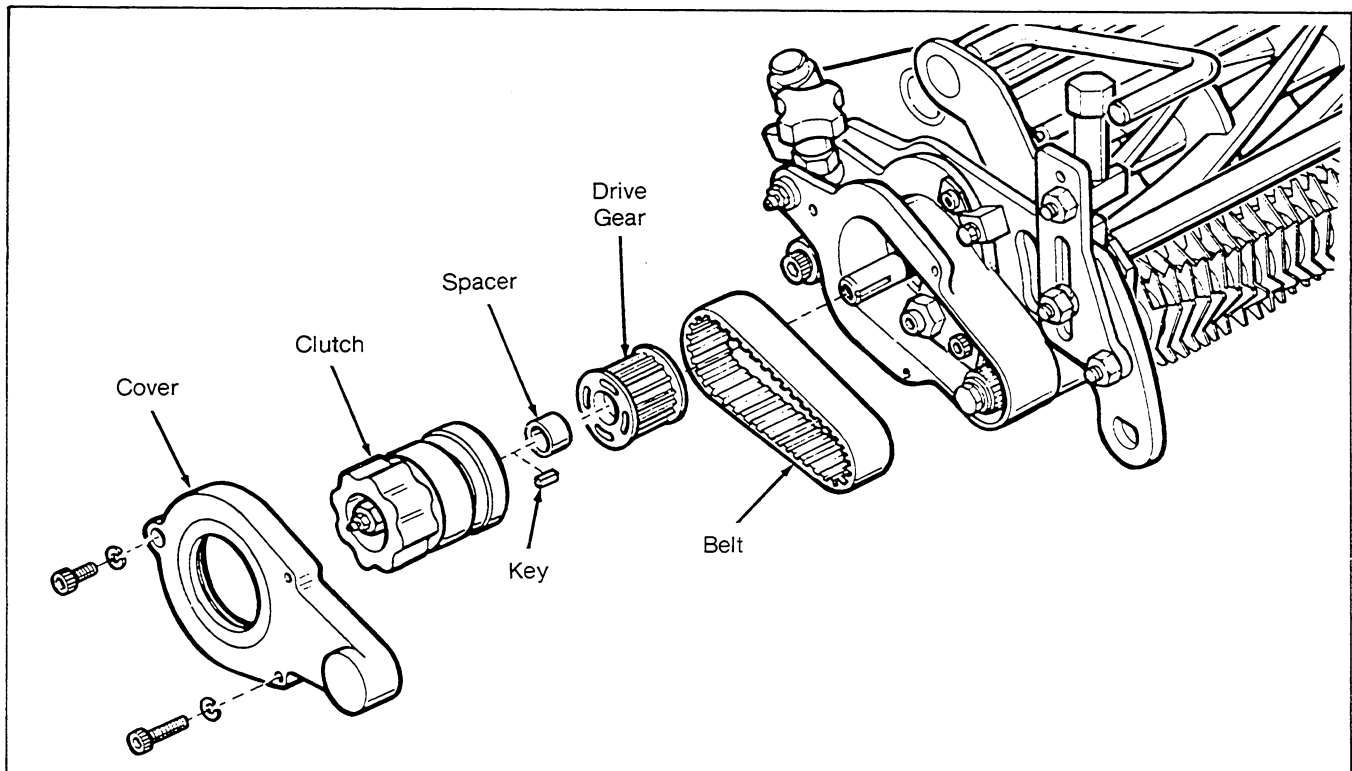


Figure 12J-13. Belt Replacement

SECTION 12J. TURF GROOMER (Product Nos. 68598 and 68603)**Belt Adjustment (See Figure 12J-14)**

1. Remove belt case cover.
2. Slightly loosen tightener eccentric and bearing housing capscrews.
3. Using a deep socket, turn eccentric tightener by hand until belt just becomes tight.
4. Hold the adjustment and tighten bearing housing capscrew. Remove socket and tighten eccentric capscrew.
5. Torque both capscrews to 10 ft-lbs.
6. Install belt case cover, torque to 6-8 ft-lbs.

**CAUTION**

DO NOT OVERTIGHTEN BELT. Belt and/or bearing may be damaged.

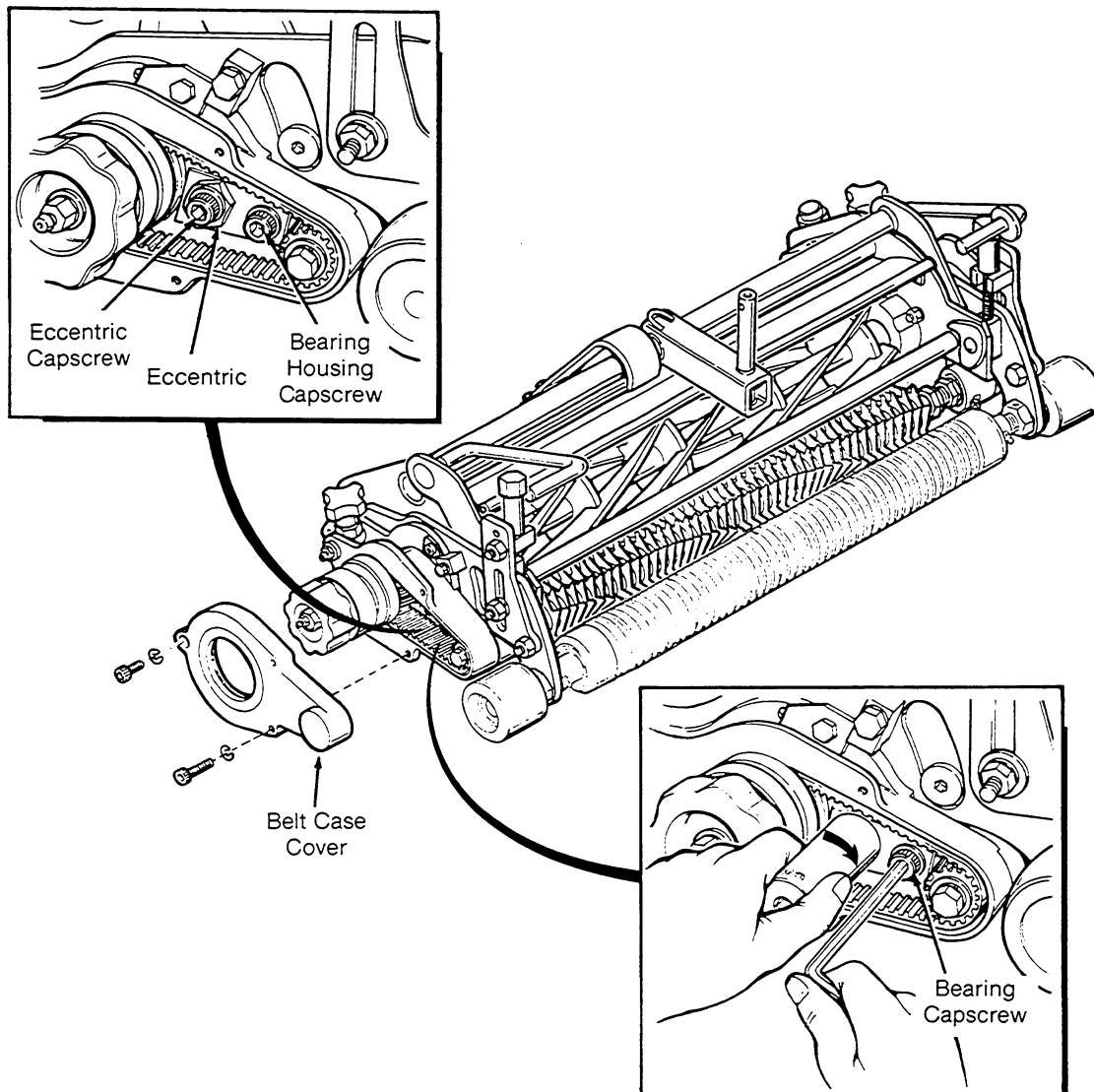


Figure 12J-14. Groomer Belt Adjustment

SECTION 12J. TURF GROOMER (Product Nos. 68598 and 68603)

CLUTCH ASSEMBLY (See Figure 12J-15)

Clutch repair is limited to replacing worn or broken springs and/or clutch pins.

When working on clutch, place it pulley side down on a work bench.

QUICK HEIGHT ADJUST ASSEMBLY

Repair (See Figure 12J-16)

Inspect, replace any parts that are questionable. Follow disassembly/reassembly as shown in illustration.

Adjustment (See Figure 12J-16)

Each notch the quick height adjust is moved, changes the groomer shaft 1/8 inch.

If the control is loose when locked in a notch, proceed as follows:

1. Remove knob by loosening setscrew.
2. Using an open end wrench hold bolt. Turn nut on top counterclockwise (CCW) until control is tight in notch.
3. Install knob and tighten setscrew.

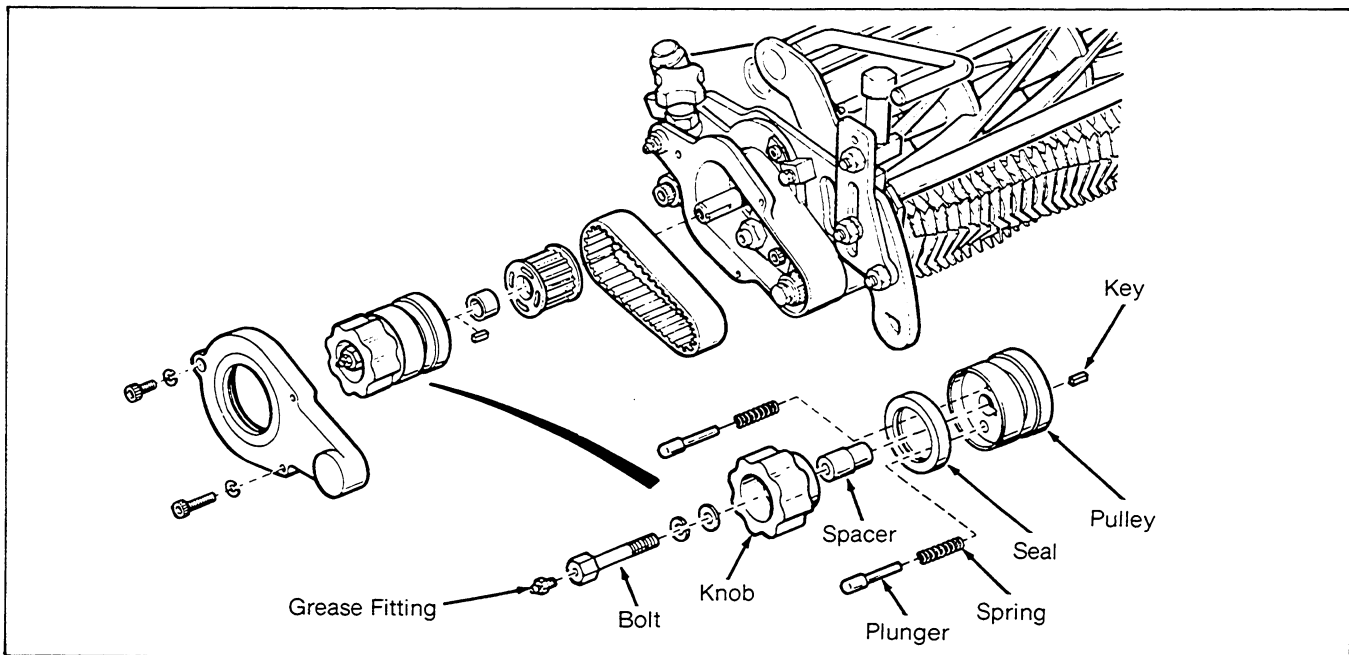


Figure 12J-15. Clutch Assembly

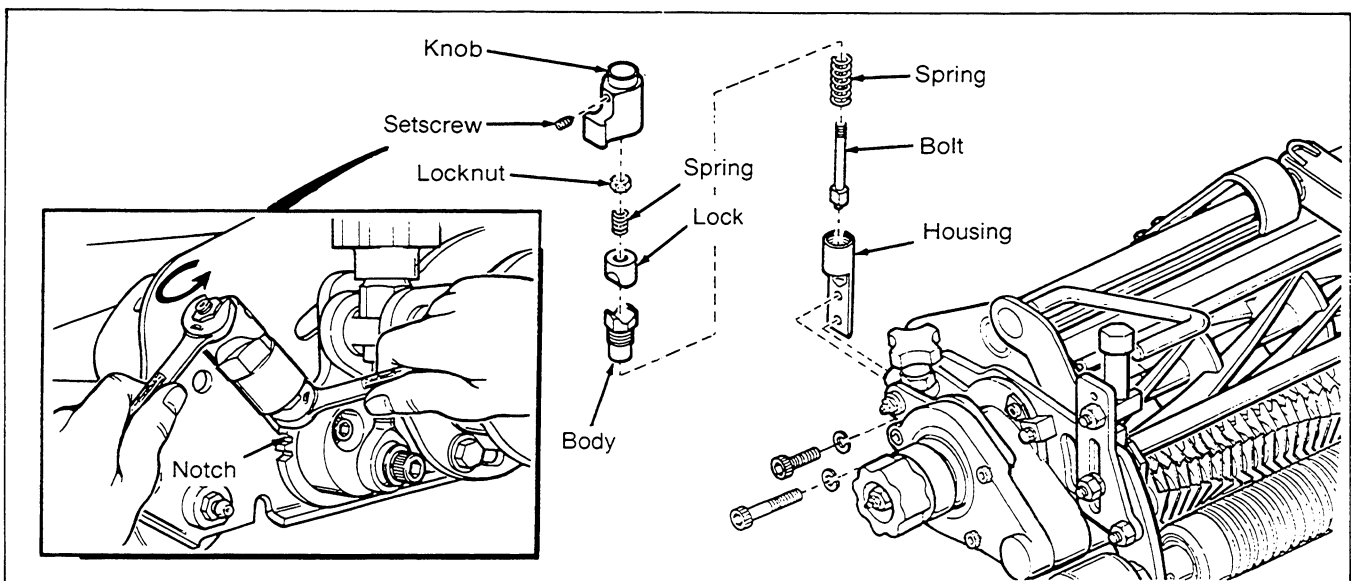


Figure 12J-16. Quick Heat Adjust

SECTION 12J. TURF GROOMER (Product Nos. 68598 and 68603)**MICRO HEIGHT ADJUST ASSEMBLY
(See Figure 12J-17)**

The micro height adjust can be disassembled for repairs as shown.

At time of assembly make sure roll pin in pin assembly is on TOP when installing pin assembly in pivot block.

LUBRICATION (See Figure 12J-18)

Use a hand grease gun when lubricating Turf Groomer components.

Pump the gun slowly and carefully until a slight amount of pressure is felt, then stop — DO NOT over grease.

Lubricate groomer shaft bearings (1), roller shaft bearings (2) and clutch (3) monthly.

Lubricate micro adjusters (4) monthly. Wipe off excess grease.

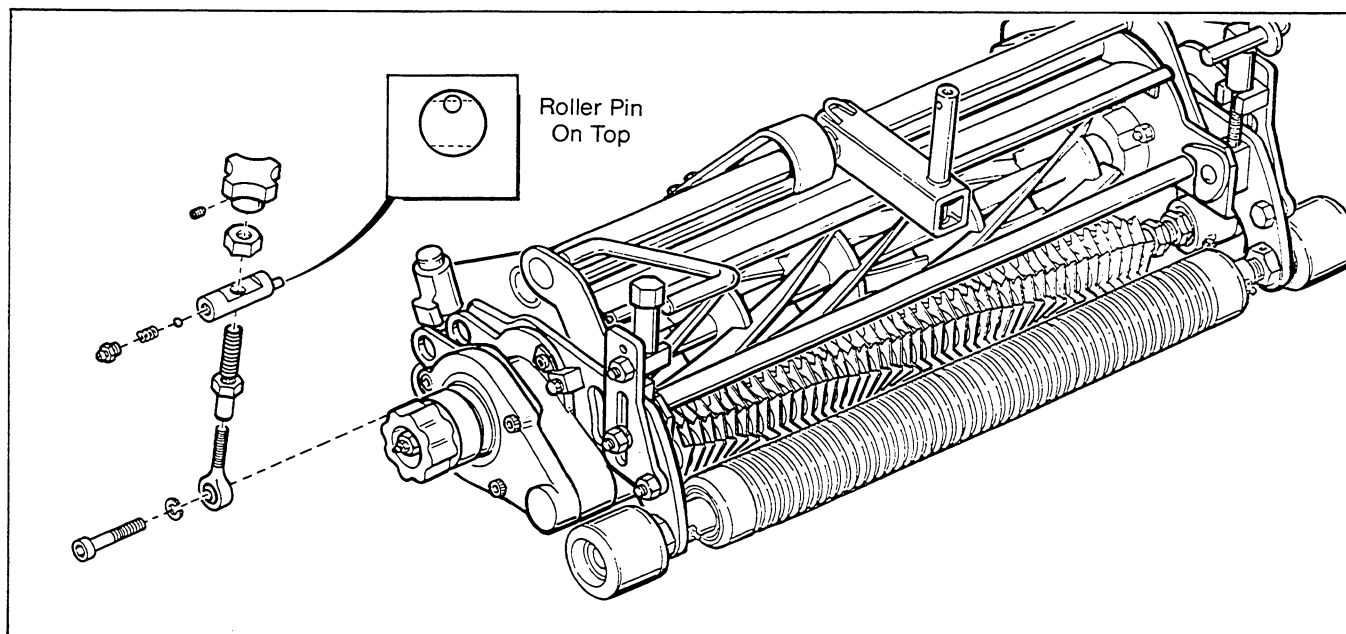


Figure 12J-17. Micro Height Adjust

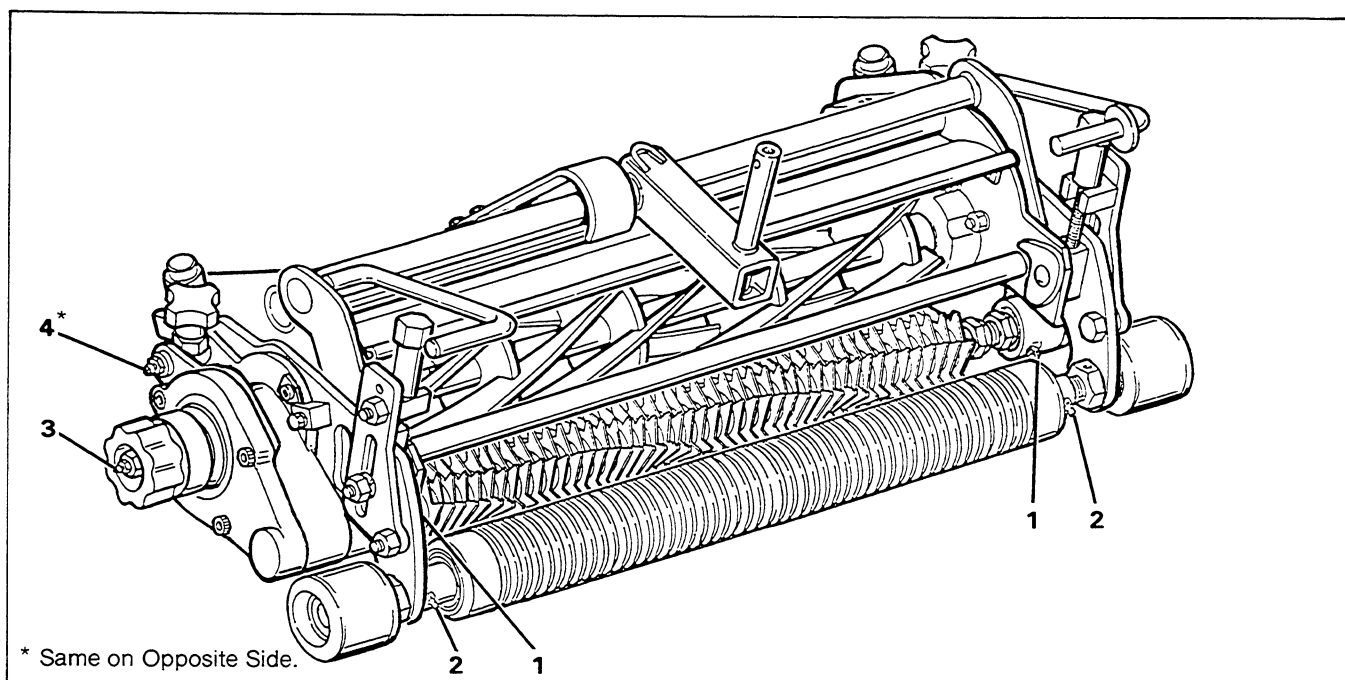


Figure 12J-18. Lubrication

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SECTION 13A. REPAIR AND SERVICE TOOLS AND MATERIALS

- Tools required:** Standard automotive hand tools, including driving tools, bearing pullers and seal spreaders.
- Cleaning materials:** Stoddard or equivalent solvent.
Detergent and water.
- Lubricants:** Non-metallic additive wheel bearing grease (eg. Sunray DX 692 or Enco Fibrox 280).
Grease gun grease (eg. Sunray DX 671 or Gulf Supreme No. 0 [SAE 30 oil]).
- Other service items:** Gauge block for adjusting cutting height (Part No. 158779).

SECTION 13B. FULL WIDTH FRONT BRUSH (Product No. 68547)

GENERAL (See "Disassembly and Reassembly" Illustration)

There are few repairs other than replacing the brush (6) and caster (16). Disassemble and reassemble parts as shown in the illustration below. Disassemble and replace items 17 thru 32 only if they are damaged.

BRUSH ADJUSTMENT

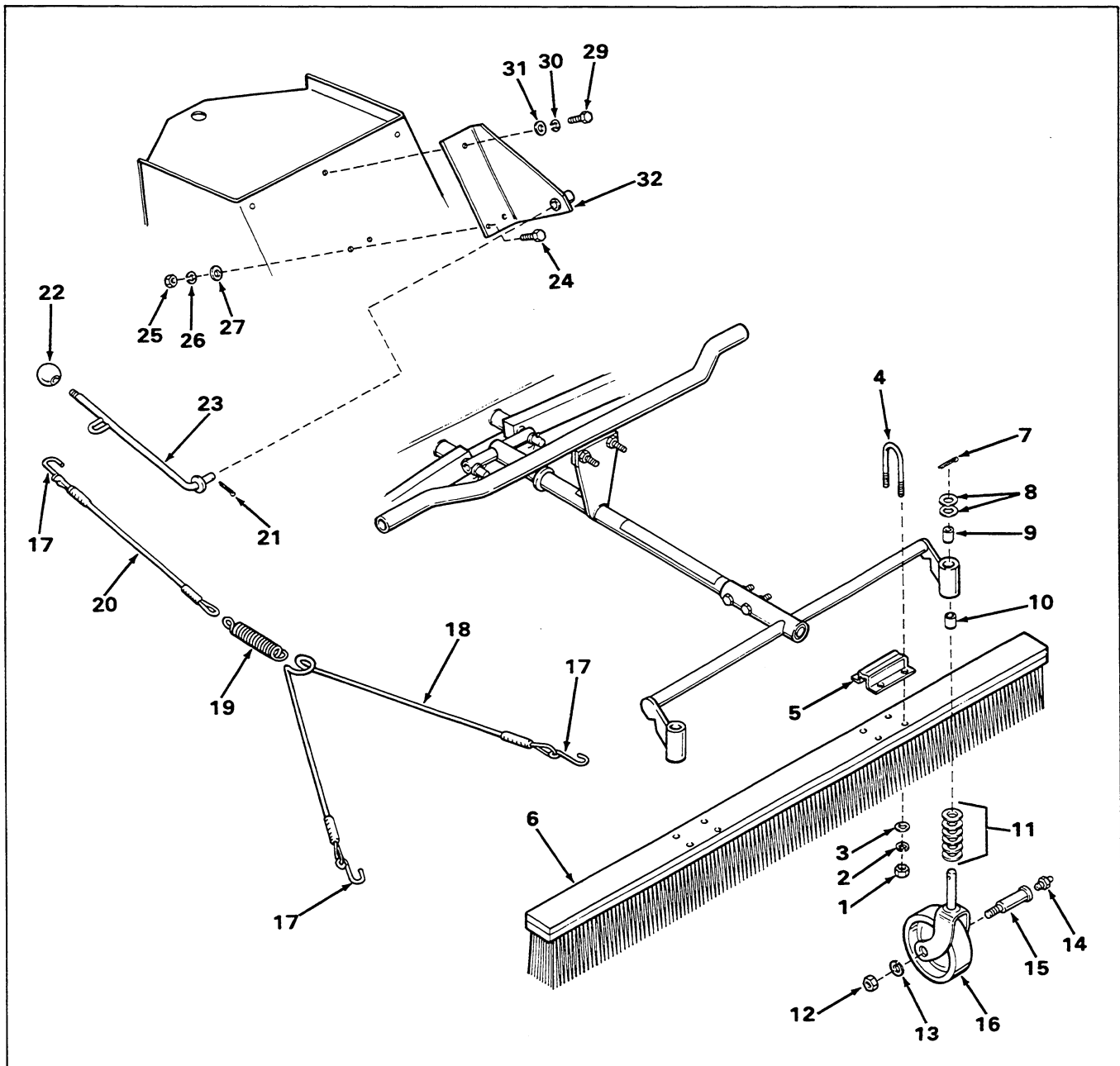
The brush is adjustable to meet all turf conditions. It can be set by adjusting U-bolts, rearward tilt for light brushings, vertical for full brush contact or forward for

deepest penetration. This should be done in conjunction with lowering and raising the casters.

To lower the brush, remove the cotter pins (7) and take washers (8) from under the caster pivots and place them on top as shown on the illustration. To raise the brush, take washers (8) from the top of caster pivots and place them underneath.

NOTE

Both caster wheels must be adjusted to same height. Make sure cotter pins are secure.



DISASSEMBLY AND REASSEMBLY

SECTION 13C. SOLID FRONT ROLLER (Product No. 68530)

GENERAL (See "Disassembly and Reassembly" Illustration)

Repairs of the solid front roller attachment consist of replacement of worn or damaged parts.

DISASSEMBLY

Remove the carriage bolt (1), spacer (2), lockwasher (3), and nut (4) holding either the right or left hand front roller bracket to the mower. (It is necessary to remove only one front roller bracket.)

Disengage the scraper blade (5) and roller shaft from the bracket and remove bracket.

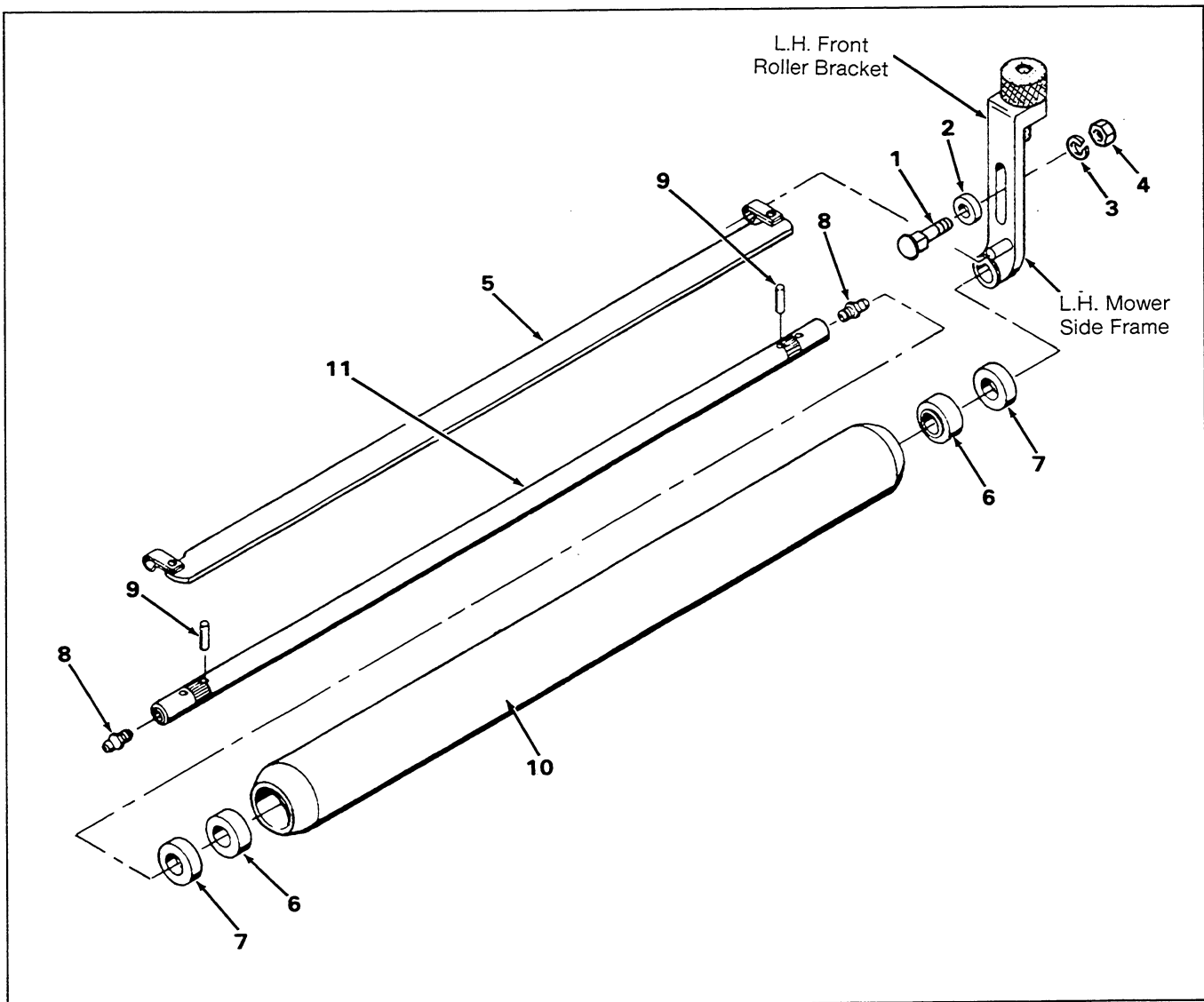
Remove the assembled roller (items 6 thru 11). Disassemble as described below if repairs or replacements are required.

1. Using a soft faced hammer, support one end of roller (10) and drive bearing (6) and seal (7) out of roller by tapping opposite end of shaft (11).
2. Turn roller around and using shaft (11), drive the other bearing (16) and seal (7) from the opposite end of the roller.
3. Remove both roll pins (9).
4. Clean the bearings (6) and bearing seals (7) in solvent and dry. Replace worn or badly pitted bearings. Pack bearings with grease gun grease.

REASSEMBLY

Assemble parts of the roller assembly (6 thru 11) as described below:

1. Install two new roll pins (9).



DISASSEMBLY AND REASSEMBLY

SECTION 13C. SOLID FRONT ROLLER (Product No. 68530)

2. Press bearing (6) onto one end of shaft (11) until it contacts pins (9).
3. Install shaft and bearing in to roller (10). Press bearing into roller.
4. Support the bearing end of shaft and roller. Press bearing (6) on to shaft until it contacts pin (9) on opposite end.
5. Install seals (7).
6. Align the front roller bracket which was removed in disassembly with the ends of the scraper and roller shaft (11) back on the mower. Attach with items 1 thru 4. It may be necessary to bend the front roller bracket slightly away from the side frame when installing the front mower bracket to secure the roller assembly (6 thru 11).
7. Grease both lube fittings after reassembly.

SECTION 13D. SECTIONAL FRONT ROLLER (Product No. 68535)

GENERAL (See "Disassembly and Reassembly" Illustration)

Repairs of the sectional front roller attachment consist of replacement of worn or damaged parts.

DISASSEMBLY

Remove the carriage bolt (1), spacer (2), lockwasher (3), and nut (4) holding either the right or left hand front roller bracket to the mower. (It is necessary to remove only one front roller bracket.) Disengage the scraper blade (5) and roller shaft (16) from the bracket and remove bracket.

Remove the assembled roller (items 6 thru 16). Disassemble as shown if repairs or replacements are required.

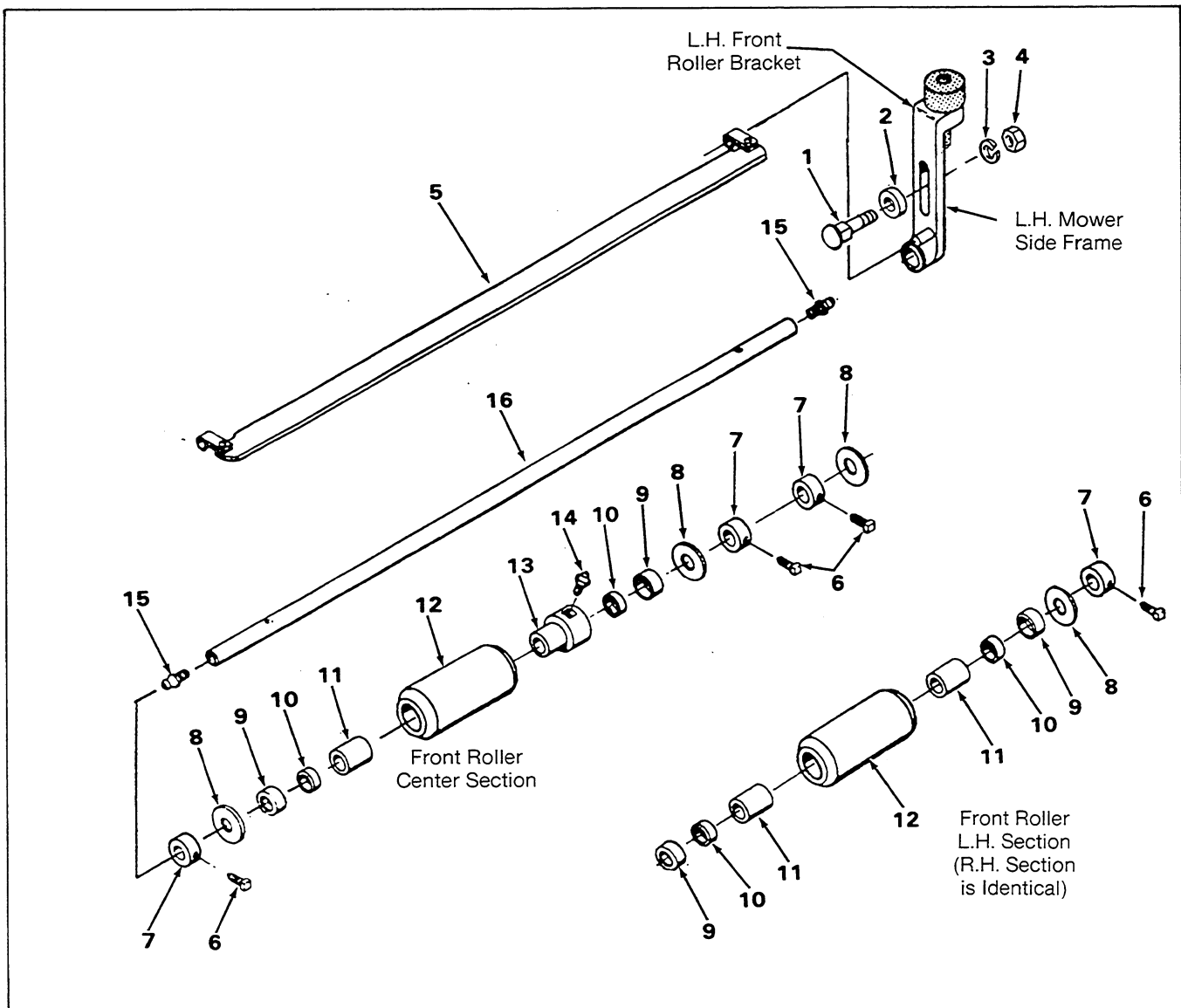
Check condition of oil seals (10), oil seal retainers (9), and bushings (11) and (13). Replace if necessary.

REASSEMBLY

Assemble parts of the roller assembly (6 thru 16) in the front roller bracket remaining on the mower frame.

Align the front roller bracket which was removed in disassembly with the ends of the scraper and roller shaft (16) back on the mower. Attach with items 1 thru 4. It may be necessary to bend the front roller bracket slightly away from the side frame when installing the front mower bracket to secure the roller assembly (6 thru 16).

Fill all lube fittings (items 14 and 15) after reassembly.



DISASSEMBLY AND REASSEMBLY

SECTION 13E. GROOVED FRONT ROLLER (Product No. 68527)

GENERAL (See "Disassembly and Reassembly" Illustration)

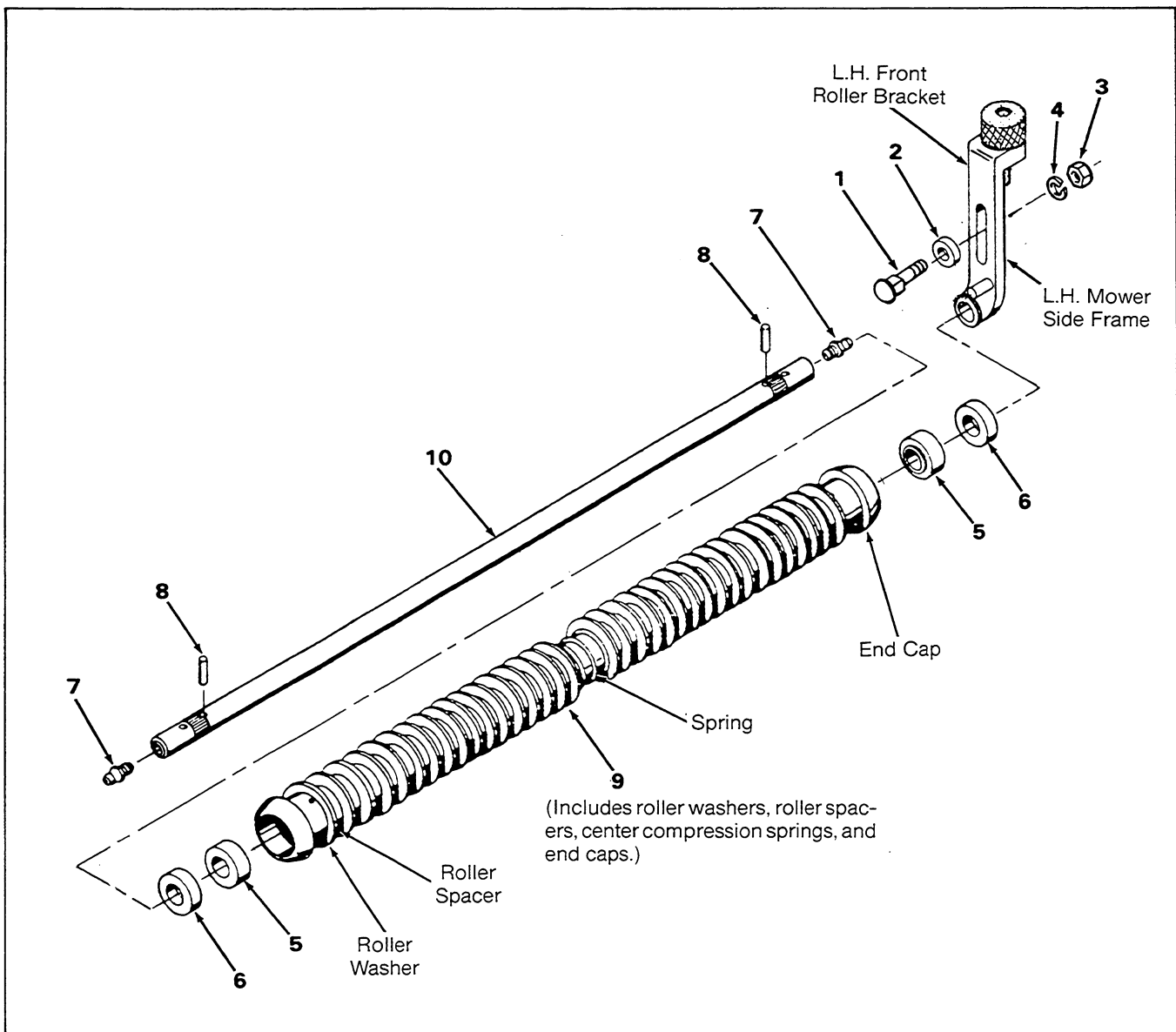
Repairs of the solid front roller attachment consist of replacement of worn or damaged parts.

DISASSEMBLY

Remove the carriage bolt (1), spacer (2), lockwasher (4), and nut (3) holding either the right or left hand front roller bracket to the mower. (It is necessary to remove only one front roller bracket.) Disengage the roller shaft (10) from the bracket and remove bracket.

Remove the assembled roller (items 5 thru 10). Disassemble as described below if repairs or replacements are required.

1. Using a suitable hammer, support one end of roller (9) and drive bearing (5) and seal (6) out of roller by tapping opposite end of shaft (10).
2. Turn roller around and using shaft (10), drive the other bearing (5) and seal (6) from the opposite end of the roller.
3. Remove both roll pins (8).
4. Clean the bearings (5) and bearing seals (6) in solvent and dry. Replace worn or badly pitted bearings. Pack the bearings with grease gun grease.



DISASSEMBLY AND REASSEMBLY

SECTION 13E. GROOVED FRONT ROLLER (Product No. 68527)

REASSEMBLY

Assemble parts of the roller assembly (5 thru 10) as described below:

1. Install two new roll pins (8).
2. Press one bearing (5) onto end of shaft (10) until it contacts pin (8).
3. Install shaft and bearing to roller (9). Press bearing into roller.
4. Support the bearing end of shaft and roller. Press other bearing (5) on to shaft until it contacts pin (8).
5. Install seals (6).
6. Align the front roller bracket which was removed in disassembly with the end of the roller shaft (10) back on the mower. Attach with items 1 thru 4. It may be necessary to bend the front roller bracket slightly away from the side frame when installing the front mower bracket to secure the roller assembly (5 thru 10).
7. Grease both lube fittings after reassembly.

SECTION 13F. SPRING TOOTH COMB (Product No. 68514)

GENERAL (See "Disassembly and Reassembly" Illustration)

The spring tooth comb is used with the grooved front roller (see page 13-4). Special mounting brackets must be used with the spring tooth comb.

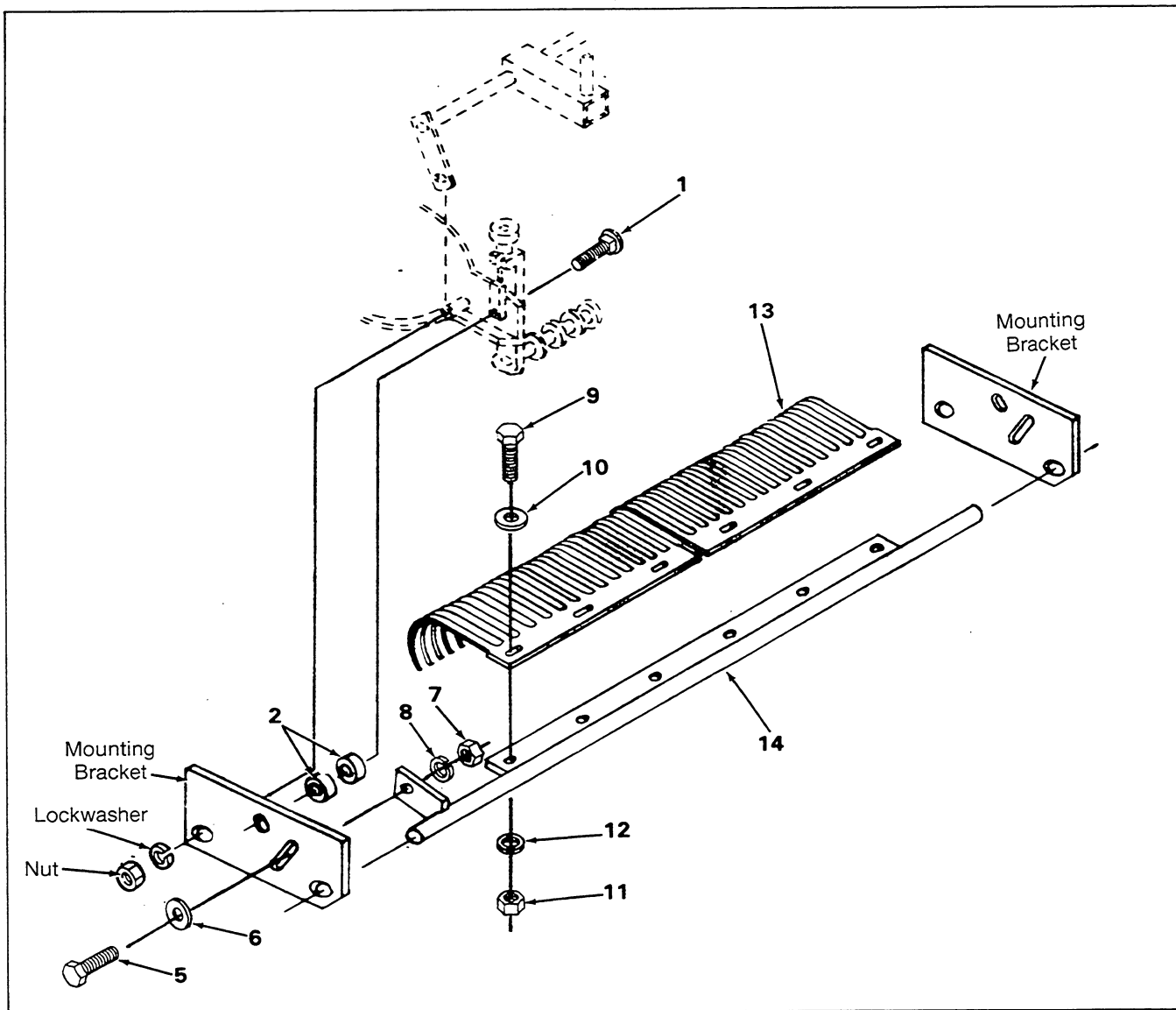
When mowers are equipped with spring tooth combs, the lift yoke-to-mower frame mounting bolts are 2" long rather than the standard 1-3/4" bolts. The comb mounting brackets are mounted to the roller brackets with bolts (1), two spacers (2), nuts (3) and lockwashers (4) (rather than the mounting hardware shown on page 13-4 for a grooved roller only).

There are two combs per roller, both are identical. If combs are bent they can normally be straightened. Broken combs should be replaced as shown in the disassembly and reassembly illustration.

COMB ALIGNMENT AND ADJUSTMENT

Whenever either the combs or the grooved roller are removed, the combs should be aligned and adjusted as follows:

1. Install the grooved roller as shown on page 13-4.
2. Loosen the adjusting screws (9) and slide the combs until the comb tines are centered between the roller washers. Tighten the adjusting screws (9).
3. Loosen the nuts (7) that hold the comb shaft assembly (14) to the mounting brackets. Pivot the comb assembly toward or away from the roller to obtain the desired comb penetration. Make certain the comb tines do not touch the roller washers; if they do, repeat adjustment in step 2 above. Tighten the nuts (7) to the bolts (5) when adjustments are completed.



DISASSEMBLY AND REASSEMBLY

SECTION 13G. FINE BRISTLE FRONT ROLLER BRUSH (Product No. 68536)**GENERAL**

Fine bristle front roller brushes are used to lift runners and control graining conditions. These brushes may be cleaned using a wire brush but are essentially non-repairable and should be removed and replaced as required.

REMOVAL AND REPLACEMENT

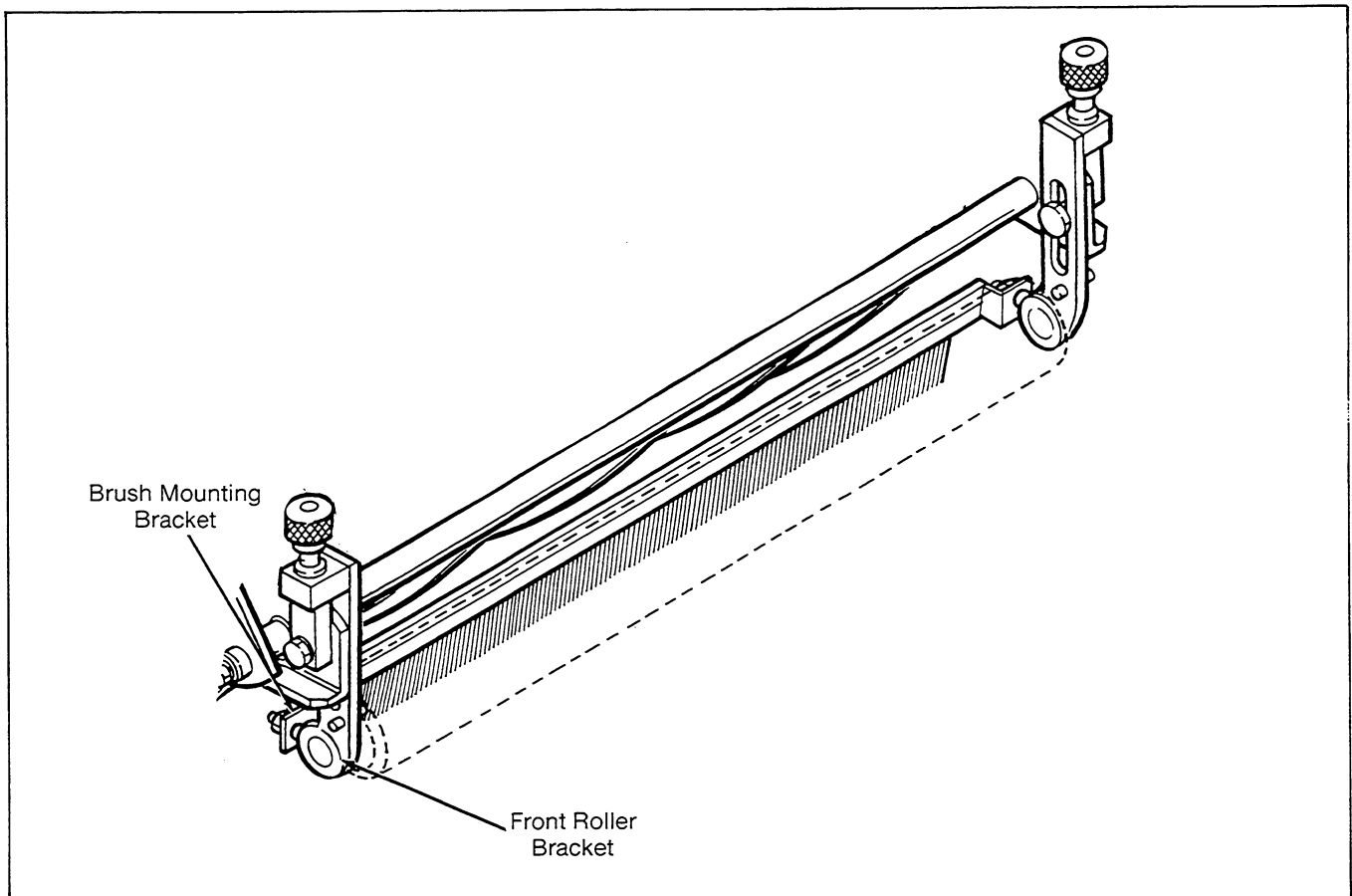
This brush is attached to the front roller brackets as shown in the Removal and Replacement illustration below. The front roller brackets must be positioned as shown in the illustration to accommodate the brush mounting brackets. After installing the brush, leave the mounting screws and locknuts finger tight until the

brush is adjusted evenly at both ends to the desired depth, then tighten the mounting hardware.

NOTE

Depth of setting should be tried on small area for desired results. If the brush is set too deep, grass will be torn up and/or the mower will lift and cut unevenly. Usually, the desired result will be obtained with the brush adjusted flush to within 1/16" (1.59 mm) below the rollers.

The brush should be raised to clear the turf and tightened securely in place when not in use. Check to be sure that the brush is not contacting the reel in the raised position.

**REMOVAL AND REPLACEMENT**

SECTION 13H. STEP CUT ASSEMBLY (Product No. 68551)

GENERAL (See "Disassembly and Reassembly" Illustration)

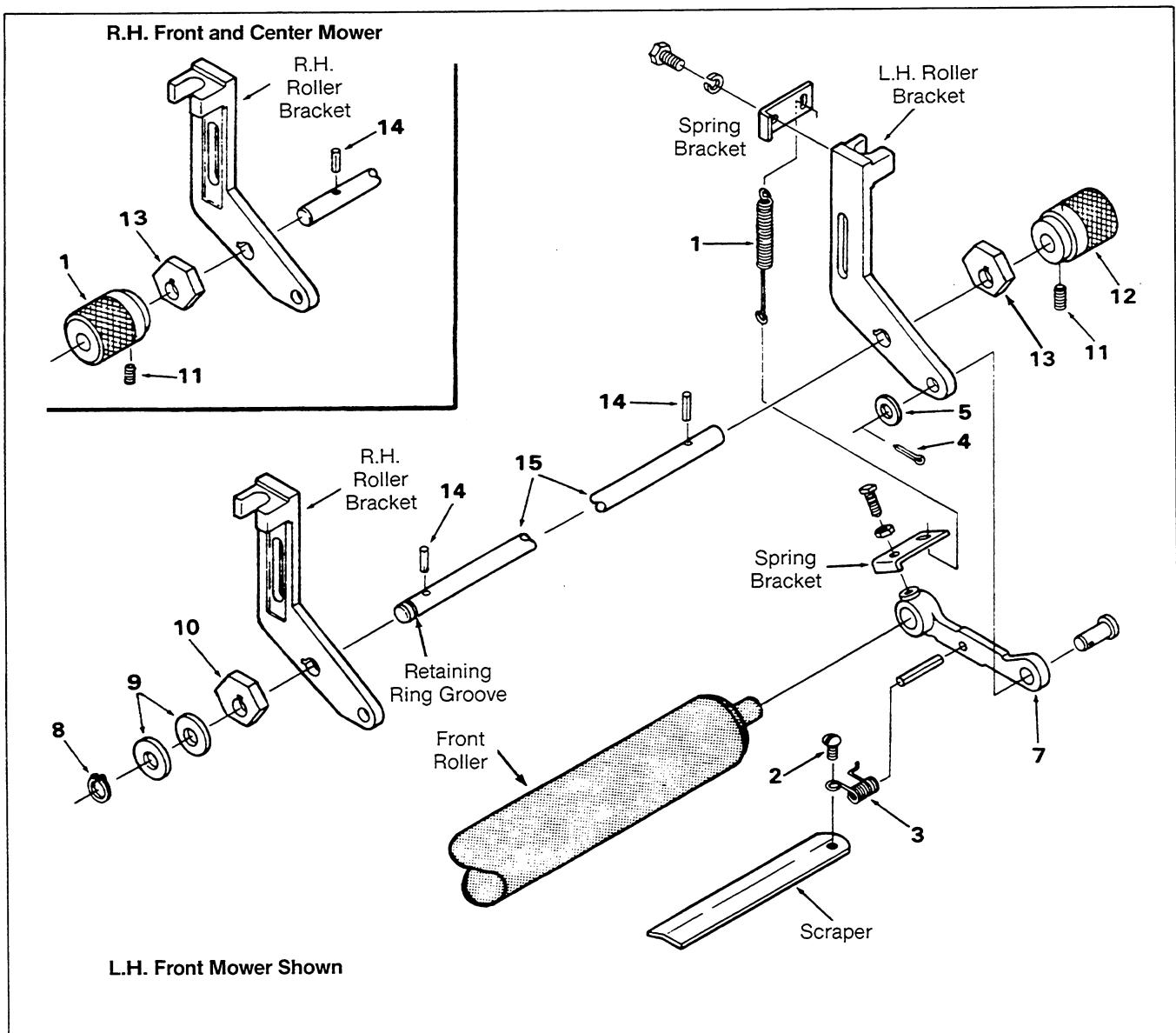
Step cut assemblies allow for five cutting height adjustments to the basic cutting height adjustment. They are used with standard 9-blade reel mower assemblies and any of the front roller options available for the Greens King IV.

Mowers with step cut assemblies have different front roller brackets than the standard mowers.

The service and repair of step cut assemblies consists of replacing springs and keeping the cams and adjusting knobs free of clippings which might bind up the adjusting mechanism.

DISASSEMBLY

1. Unhook the tension springs (1) from their mounting brackets.
2. Remove the screws (2) and right and left scraper springs (3) (these springs are not interchangeable).
3. Remove cotter pin (4), washer (5), and clevis pin (6) from either step cut link (7). Remove the step cut link, the scraper, and the front roller.
4. If further disassembly is required, remove items 9 thru 15 as shown.



DISASSEMBLY AND REASSEMBLY

SECTION 13H. STEP CUT ASSEMBLY (Product No. 68551)

REASSEMBLY

- Slide the adjusting shaft (15) into the roller brackets; install grooved pins (14). The retaining ring groove in the shaft must be on the same side as the reel motor.
- Assemble the cams (10) and (13), adjusting knob (12), setscrew (11), washers (9), and retainer ring (8) onto the adjusting shaft (15) making certain that the key ways in the cams align with the grooved pins (14).

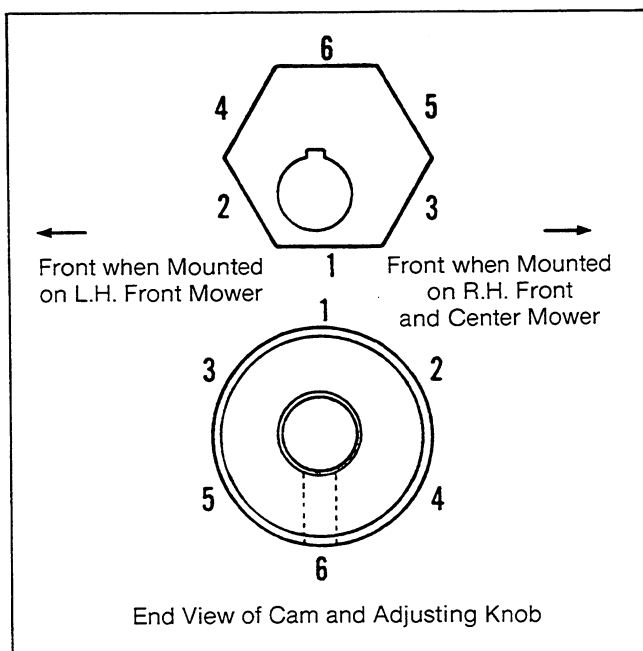
NOTE

On left front mower cam must be assembled with key way pointing up and with the second position of cam toward front of mower.

On right front and center mowers cam must be assembled with key way pointing up and with the second position of cam toward rear of mower.

Adjusting knob must be assembled so setscrew is on bottom and will be threaded into recessed hole in shaft.

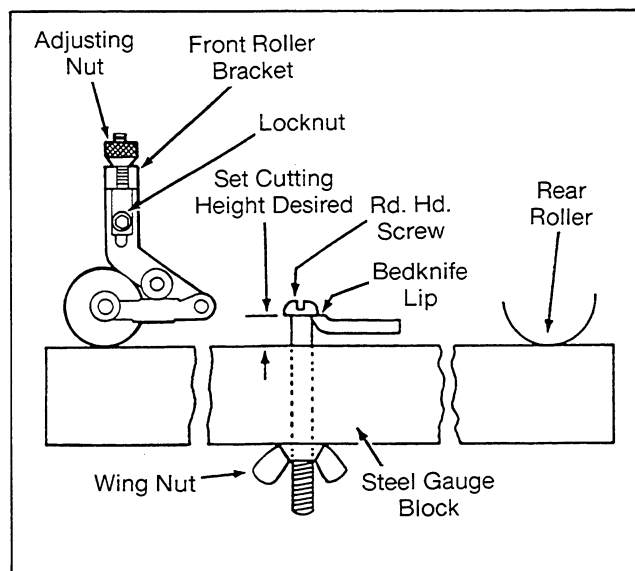
- Add washers (9) as required to minimize free play of the cam (10).
- Install the scraper, front roller, and step cut link and secure with clevis pin (6), washer (5), and cotter pin (4).
- Attach springs (3) and (1). The bottom hook of the tension spring (1) must be placed over the front of the spring bracket with the open end of the hook toward the rear of the mower.



CAM AND ADJUSTING KNOB POSITIONS

CUTTING HEIGHT ADJUSTMENT

Check the position of each reel for desired cutting height. All reels must be accurately adjusted to exactly the same height for proper cutting. Place the adjusting knob in position 1.



CUTTING HEIGHT ADJUSTMENT

- Loosen the locknut on the side of the front roller brackets just enough to allow the adjusting nut to raise or lower the bracket.
- Set cutting height gauge to desired height by measuring between the underside of screw head and gauge block surface and tighten the wing nut.
- Place gauge across bottom of front and rear rollers near one end.
- Slide the head of gauge screw over the bedknife and adjust the hand knob to close the gap between the screwhead and bedknife. Then tighten locknut.
- Repeat steps on opposite end. Complete adjustment to one end before adjusting opposite end.
- After tightening locknuts, recheck each end with gauge for proper adjustment.
- The 6 steps above establish the setting for adjusting knob position 1. The step cut assembly will provide the following cutting height variations:

Knob Position	Cutting Height Variation
1	Set Height (steps 1-6 above)
2	Position 1 plus 0.08" (2.03 mm)
3	Position 1 plus 0.23" (5.84 mm)
4	Position 1 plus 0.39" (9.91 mm)
5	Position 1 plus 0.54" (13.72 mm)
6	Position 1 plus 0.62" (15.75 mm)

SECTION 13I. STEP CUT BRUSH (Product No. 68552)

GENERAL

This fine bristle brush is used only with the step cut assembly (Product No. 68551). It is located on the front of mounting brackets attached to each side of the frame at the reel. These brushes may be cleaned using a wire brush but are essentially non-repairable.

REMOVAL AND REPLACEMENT

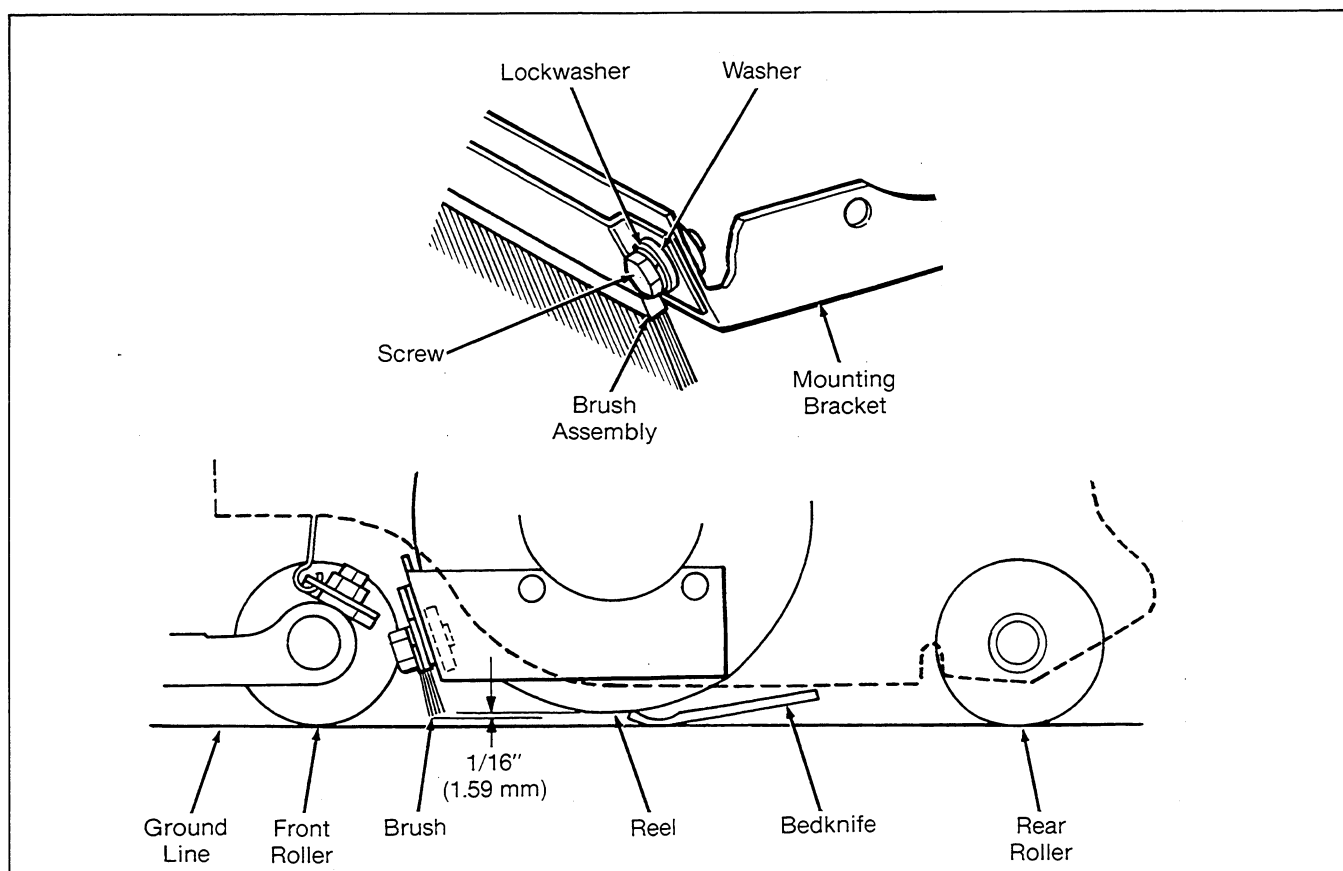
Remove the screws, lockwashers, and washers that hold the brush retainer to weld nuts at the front of each mounting bracket. Remove and replace the brush.

Install the replacement brush and mounting hardware but leave hardware finger tight until the brush is mounted evenly at both ends to the desired depth.

NOTE

Depth of setting should be tried on small area for desired results, if the brush is set too deep, grass will be torn up and/or the mower will lift and cut unevenly. Usually, the desired result will be obtained with the brush adjusted flush to within $1/16''$ (1.59 mm) below the rollers.

The brush should be raised to clear the turf and tightened securely in place when not in use. Check to be sure that the brush is not contacting the reel or the front roller.



REMOVAL AND REPLACEMENT

SECTION 13J. REAR ROLLER CLEANER (Product Nos. 68506 and 68507)

GENERAL

These roller cleaners are used to keep the mower rear rollers free of grass build up. These brushes are chain driven; a sprocket on the reel shaft drives the sprocket on the brush shaft.

The L.H. mower rear roller cleaner (Product No. 68507) and R.H. and Center mower rear rollers cleaner (Product No. 68506) are identical except for their mounting brackets. These chain driven rear roller brushes are not used with the turf groomer attachment.

SERVICE AND REPAIR (See "Disassembly and Reassembly" Illustration)

Service and repairs to the roller brush consist of bearing and bushing lubrication, cleaning and lubrication of the chain and sprockets, cleaning the brush and shaft with a wire brush, adjusting the chain tension, and replacement of bushings, bearings, and the brush and shaft assembly.

The brush and shaft are not repairable; when the brush is too worn to be adjusted, the brush and shaft are replaced as an assembly.

Replace worn sprockets as required.

The bearings in the mounting brackets and reel sprocket should be checked for wear and replaced as required whenever the sprockets are removed or replaced.

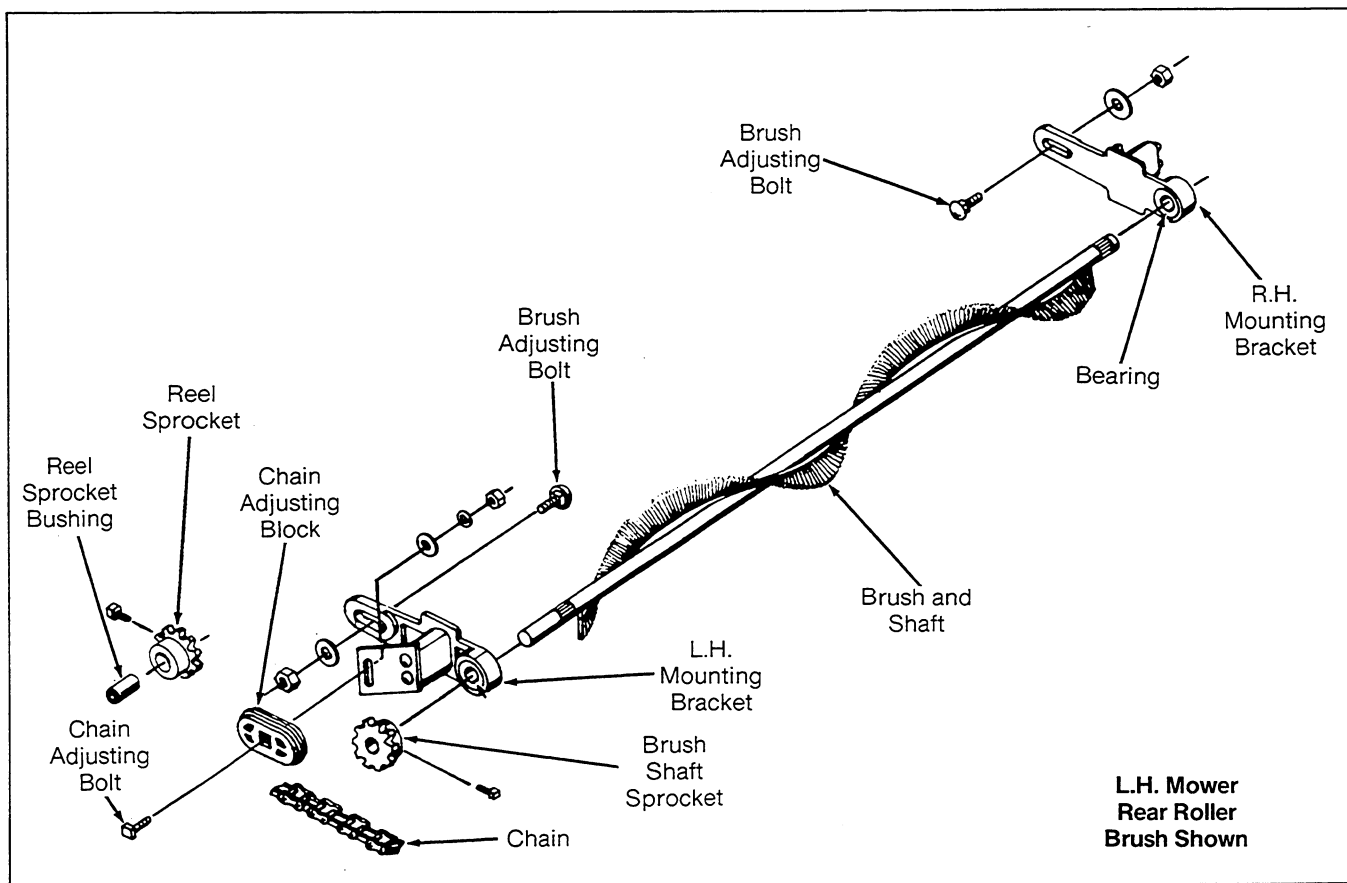
BRUSH-TO-ROLLER ADJUSTMENT

When replacing the brush and shaft or adjusting contact to the roller to compensate for wear:

1. Loosen the nuts on the brush adjusting bolts until the mounting brackets can be moved.
2. Slide the brush and shaft toward the roller until the brush and roller are in contact with each other, then tighten the nuts and washers on the brush adjusting bolts. The mounting brackets should touch the nuts which attach the roller to the mower frame.
3. Adjust chain tension as described below.

ADJUSTING CHAIN TENSION

1. Loosen the chain adjusting bolt; line up the sprockets, chain, and chain adjusting block; set the chain adjusting block against the chain and slide the adjusting block into the slot until the chain is taut.
2. Take up slack in the chain with the adjusting block, then securely tighten the chain adjusting bolt.



DISASSEMBLY AND REASSEMBLY

SECTION 13K. BELT DRIVEN REAR ROLLER CLEANER (Product No. 68571)

GENERAL

These roller cleaners are used to keep the mower rear rollers free of grass build up. These brushes are belt driven and are of later design than the chain driven units.

SERVICE AND REPAIR (See "Disassembly and Reassembly" Illustration)

Service and repairs to the roller cleaner consist of adjusting belt tension, belt replacement, pulley cleaning and replacement, bearing replacement, and cleaning the brush and shaft with a wire brush.

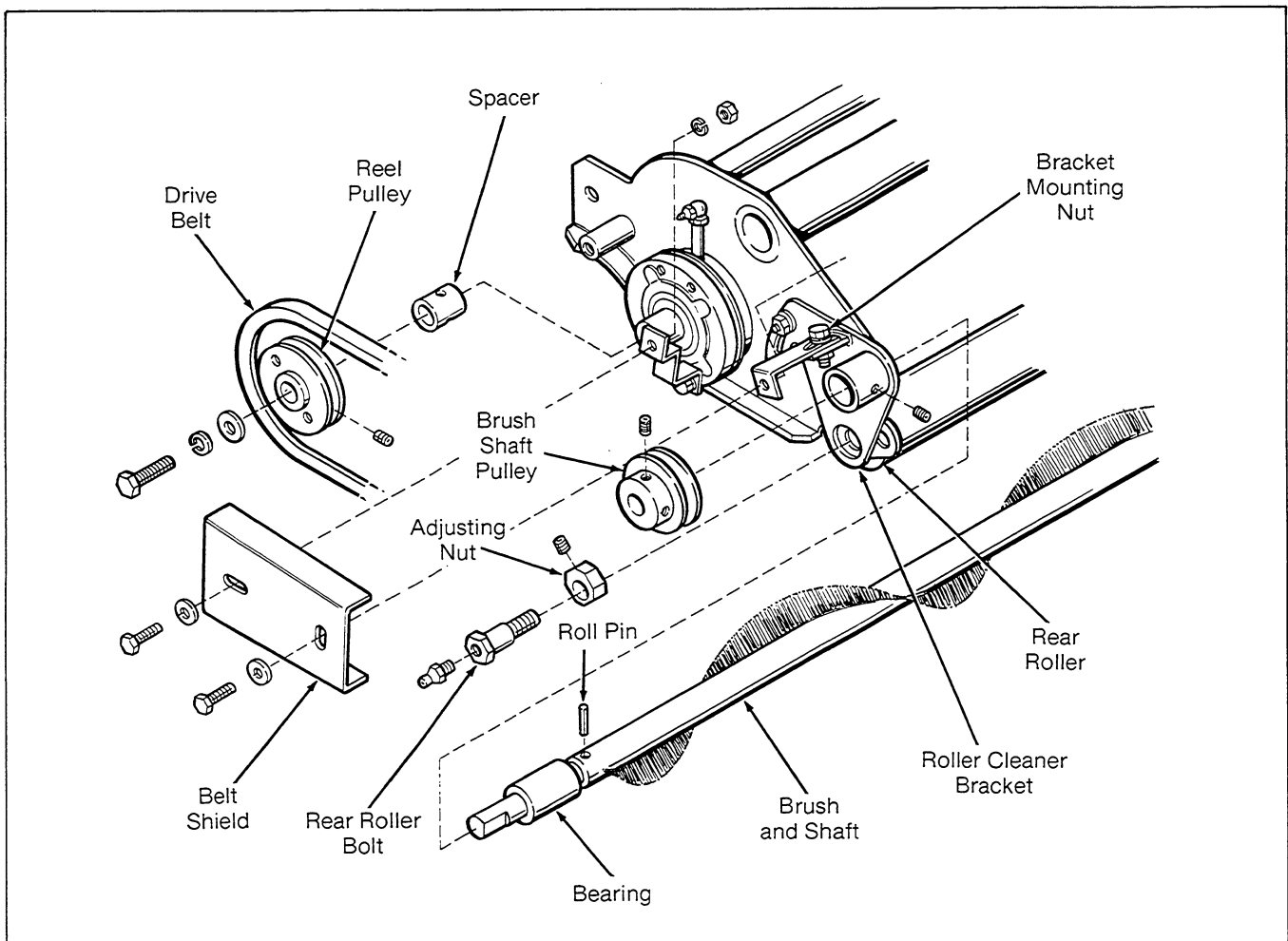
The brush and shaft are not repairable; when a brush is too worn to be adjusted, the brush and shaft are replaced as an assembly.

BELT ADJUSTMENT

Loosen the bracket mounting nut shown in the illustration and rotate the bracket inwards or outwards until the belt is taut. Then tighten the bracket mounting nut.

BELT AND PULLEY REMOVAL AND REPLACEMENT

1. Remove the belt shield mounting hardware and the belt shield.
2. Loosen roller cleaner bracket mounting nut and rotate the bracket until the belt is loose on its pulleys. Remove the belt.
3. Remove or completely back off the setscrews that hold the brush shaft pulley to the brush shaft and the roller cleaner bracket. Remove the brush shaft pulley.
4. Remove the bolt, lockwasher, and washer that hold the reel pulley to the reel shaft. Remove the setscrews that hold the reel pulley to the spacer. Remove the reel pulley.
5. When installing the pulleys, check alignment with a straight edge and tighten pulley mounting hardware. Make certain that one of the setscrews used to mount the brush shaft pulley seats against the flat on the brush shaft.



REAR ROLLER CLEANER DISASSEMBLY AND REASSEMBLY

SECTION 13K. BELT DRIVEN REAR ROLLER CLEANER (Product No. 68571)

6. Install a belt and adjust as described above in "Belt Adjustment."

**BRUSH AND SHAFT REMOVAL
AND REPLACEMENT**

1. Remove the roller cleaner bracket mounting nuts and roller cleaner bracket at the side opposite the belt and pulleys (side not shown in the illustration).
2. Loosen the setscrews that hold the brush shaft pulley to the brush shaft. Pull the brush and shaft with assembled bearings out of the roller cleaner bracket remaining on the mower frame (the bracket shown in the illustration).
3. Drive out the roll pins and remove the bearings from the ends of the brush shaft. Clean the bearings in solvent and air dry. Replace worn or badly corroded bearings.

4. Replace the brush and shaft assembly.
5. Install the bearings, roll pins, roller cleaner bracket and mounting hardware. Do not tighten the bracket mounting nuts.
6. Align the brush cleaner and roller by moving the roller cleaner brackets until the brush and roller are parallel to each other but not touching. Check the belt tension, then tighten the bracket mounting nuts at each side of the reel. Adjust the brush-to-roller as described below.

BRUSH-TO-ROLLER ADJUSTMENT

Loosen the setscrews in the rear roller adjusting nuts on both sides of the rear roller. Turn the adjusting nuts until the roller and brush are in contact along the full length of the roller, then tighten the setscrews.

SECTION 13L. PERFORMANCE MONITOR (Product No. 68528)

GENERAL

The performance monitor consists of an electronic unit which digitally displays engine speed, ground speed, reel speed, frequency of cut, and total operating hours. The monitor display unit also has indicators which light up when it is time to change oil and filters.

The monitor display unit receives its signals and read-outs from magnetic pick-ups at the R.H. front reel (reel speed), rear wheel axle (ground speed), and at the engine crankshaft for gasoline engines or flywheel for diesel engines (engine speed).

All performance monitor magnetic pick-ups (except the diesel engine speed unit) have splined discs or splined spacers which act as "targets" for the magnetic pick-ups. Keep the "target" splines clean so that accurate rotation speed can be registered by the magnetic pick-ups. Splined spacers or discs should be replaced if they have broken teeth or are otherwise warped or damaged.

Resistor spark plugs are required for gasoline engine powered tractors equipped with the performance monitor option.

When a performance monitor is mounted on your machine, the sensors and readouts must be removed when removing:

1. The right front mower assembly or reel.
2. The rear (steering) wheel.
3. The engine.
4. The control panel cowling (monitor display is mounted to right side).

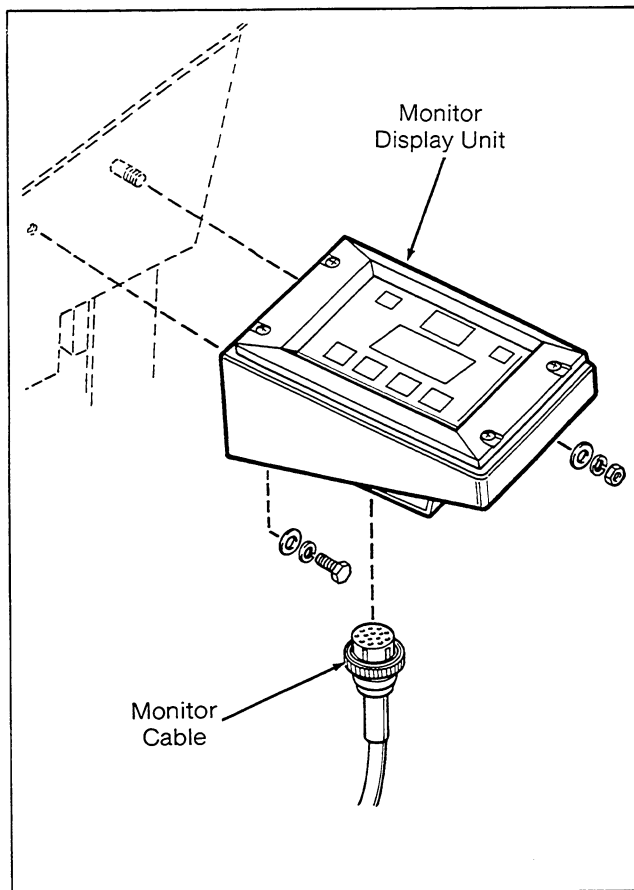
DISPLAY UNIT REMOVAL AND REPLACEMENT

The monitor display unit is non-repairable; if the monitor is defective it should be removed and replaced. Send defective monitor display units to your Jacobsen dealer for replacement. Disconnect the monitor cable and remove the mounting hardware.

REEL SPEED PICK-UPS REMOVAL AND INSTALLATION

There are three configurations of reel speed pick-up mounting.

1. "Old style" bearing housings (see illustration A below). When installing the pick-up turn it into the

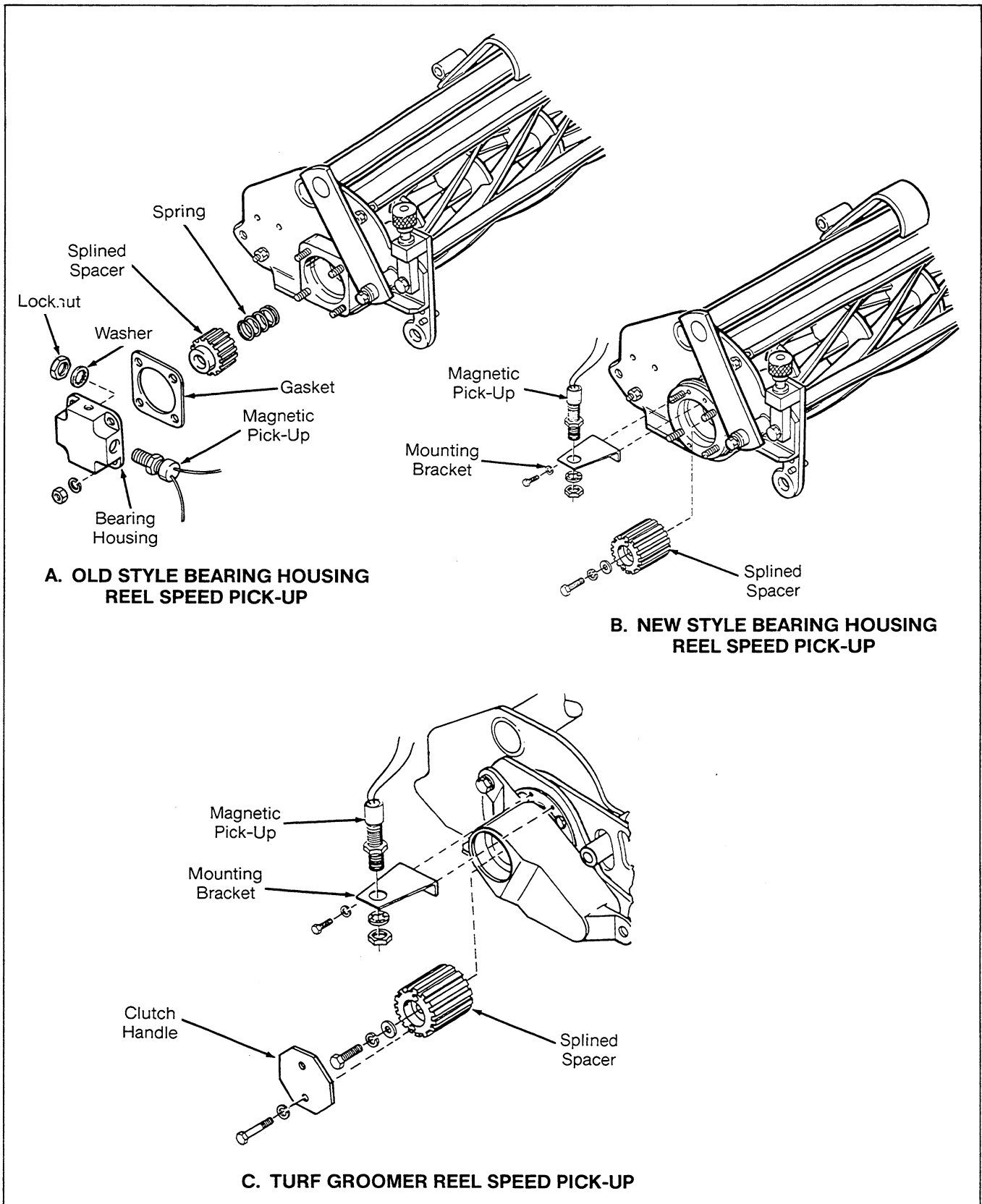


DISPLAY UNIT REMOVAL AND INSTALLATION

bearing housing until it touches the splined spacer, then back the pick-up off one half turn and tighten the mounting nut and washer.

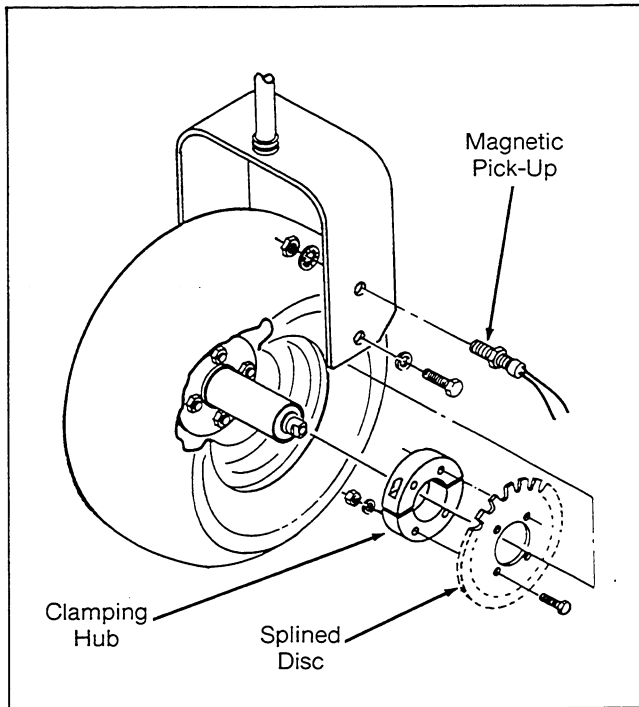
2. "New style" bearing housings (see illustration B below). When installing the pick-up, turn it into the bracket to within 0.030" to 0.050" (0.762 to 1.270 mm) of the splined spacer. Secure with lockwasher and nut.
3. Turf groomer reel speed pick-up (see illustration C below). When installing the pick-up, turn it into the bracket to within 0.030" to 0.050" (0.762 to 1.270 mm) of the splined spacer. Secure with lockwasher and nut.

SECTION 13L. PERFORMANCE MONITOR (Product No. 68528)



SECTION 13L. PERFORMANCE MONITOR (Product No. 68528)**GROUND SPEED PICK-UP**

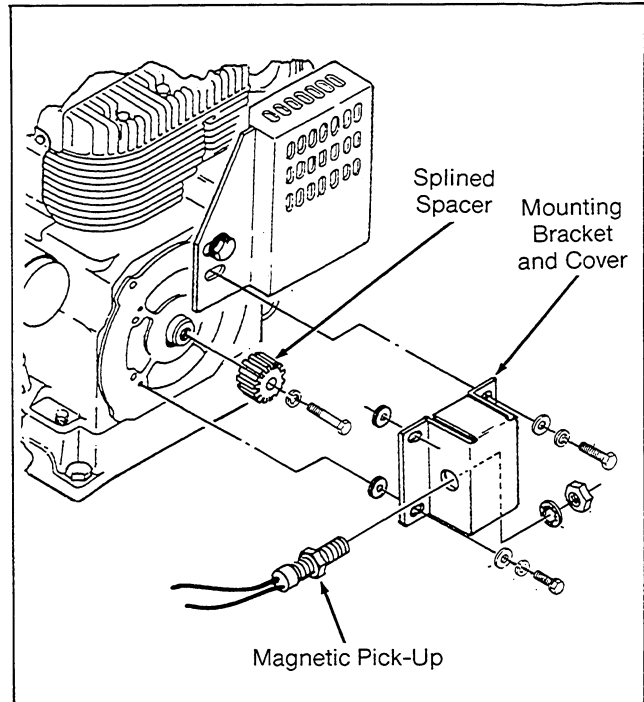
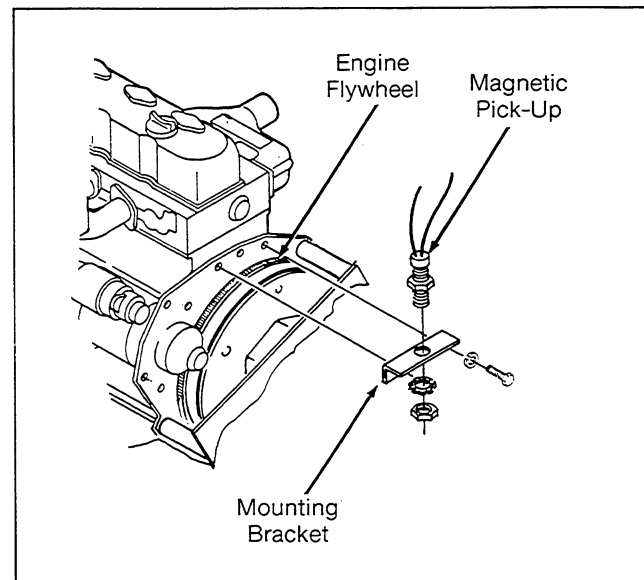
Remove and replace the magnetic pick-up and/or splined disc as shown in the following illustration. When installing the pick-up and/or disc, adjust the clearance between them to 0.030" to 0.050" (0.762 to 1.270 mm), then tighten the mounting hardware. Spin the disc to recheck clearance. Whenever the disc can not be adjusted to less than 0.060" (1.524 mm) out of round, it should be replaced.

**GROUND SPEED PICK-UP****GASOLINE ENGINE SPEED PICK-UP**

Remove and replace the magnetic pick-up and/or splined spacer as shown in the following illustration. When installing the pick-up or splined spacer, adjust the clearance between them to 0.030" to 0.050" (0.762 to 1.270 mm), then tighten the mounting hardware.

DIESEL ENGINE SPEED PICK-UP

The diesel engine magnetic pick-up uses the flywheel as a target. Remove and replace the magnetic pick-up as shown in the following illustration. When installing the pick-up adjust the clearance between the pick-up and the flywheel to 0.030" to 0.050" (0.762 to 1.270 mm).

**GASOLINE ENGINE SPEED PICK-UP****DIESEL ENGINE SPEED PICK-UP**

SECTION 13M. MISCELLANEOUS

HYDRAULIC BACKLAPPING KIT (PRODUCT NO. 68573)

This hydraulic backlapping kit is used with Greens King IV, Product No. 62225 only. All other Greens King IV models (Product Nos. 62221, 62226, 62606, 62608, 62610 and 62300, 62622) have the adjustable speed backlapping feature as factory installed equipment.

SEAT OPTIONS

Three seat options are available from your Jacobsen distributor.

1. Padded low-back.
 2. Deluxe padded high-back.
 3. Deluxe Grammer seat with adjustable back angle.
- See page 9-1 of this manual for removal and replacement of the seat assembly.

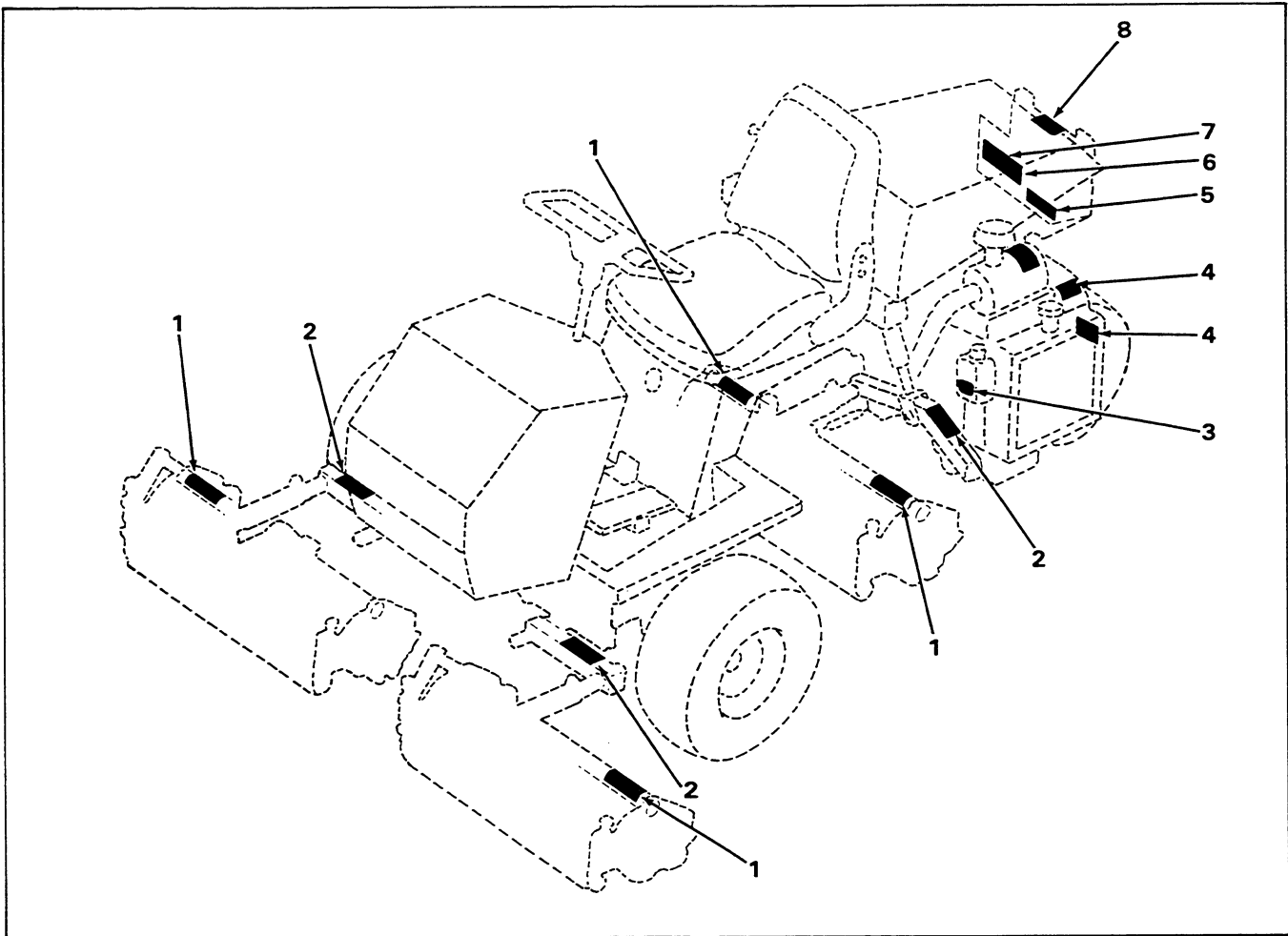
STEERING WHEEL

An optional padded steering wheel may be ordered from your Jacobsen distributor (see page 6-1 for removal and replacement of the steering wheel).

SECTION 14 MISCELLANEOUS

Precaution Decal Locations	14-1
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SECTION 14A. PRECAUTION DECAL LOCATIONS



1

⚠ DANGER

TO AVOID SERIOUS BODILY INJURY STOP ENGINE AND DISENGAGE REELS BEFORE WORKING ON MOWER OR EMPTYING BASKETS.

Part No. 361877

2

⚠ CAUTION DISCONNECT

TORSION SPRING BEFORE REMOVING MOWER

Part No. 354084

3

CAUTION

A solution of 50% antifreeze and 50% water must be used in this engine. (Freezing point about -34°F) Do not use 100% antifreeze, or severe damage will occur.

Part No. 361612 (Diesel Only)

19426-07001

4

⚠ WARNING

MUFFLER AND MUFFLER SHIELDS MAY EXCEED 150°F

Part No. 339237 (Diesel Only)

5

⚠ CAUTION

DO NOT USE STARTING ASSIST FLUIDS.

USE OF STARTING ASSIST FLUIDS IN THE AIR INTAKE SYSTEM MAY BE POTENTIALLY EXPLOSIVE OR CAUSE A "RUNAWAY" ENGINE CONDITION. THIS COULD RESULT IN SERIOUS ENGINE DAMAGE AND/OR PERSONAL INJURY.

Part No. 363134

6

⚠ WARNING

DO NOT USE FOR TOWING

Part No. 361175

7

⚠ DANGER

ALWAYS REMOVE BATTERY GROUND CABLE FIRST (BLACK) REPLACE BATTERY GROUND CABLE LAST (BLACK)

ARCING CAUSED BY: (1) CONTACT BETWEEN SUPPORT RAILS AND TOOLS USED TO LOOSEN TERMINALS; (2) REMOVING WRONG CABLE FROM BATTERY TERMINAL FIRST; (3) STRIKING BATTERY TERMINALS AGAINST METAL RAILS WHILE INSTALLING OR REMOVING; OR (4) CONTACT WITH JUMPER CABLES MAY IGNITE FUMES FROM BATTERY, VAPOR FROM FUEL TANK, OR BOTH, CAUSING EXPLOSION AND/OR FIRE.

TO REMOVE BATTERY

1. DISCONNECT (-) NEGATIVE TERMINAL (BLACK)
2. DISCONNECT (+) POSITIVE TERMINAL (RED)
3. LOOSEN AND REMOVE BATTERY HOLDDOWN CLAMP
4. CAREFULLY REMOVE BATTERY

TO INSTALL BATTERY

1. PLACE TERMINALS TOWARD FRAME CENTER AND CAREFULLY INSTALL BATTERY
2. CLAMP BATTERY HOLDDOWN TO SUPPORT
3. CONNECT (+) POSITIVE TERMINAL (RED)
4. CONNECT (-) NEGATIVE TERMINAL (BLACK)

TO USE JUMPER CABLES: FIRST, CAREFULLY ATTACH POSITIVE CABLE TO SOLENOID (TERMINAL WITH CABLE TO BATTERY); ATTACH NEGATIVE CABLE TO TRACTOR FRAME. DO NOT USE JUMPER CABLES ON BATTERY.

Part No. 361172

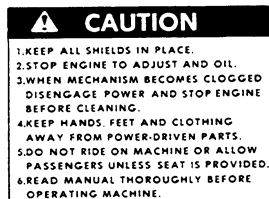
8

⚠ CAUTION

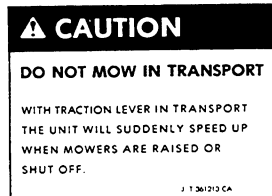
FILL FUEL TANK TO 1 INCH BELOW FILLER NECK. DO NOT OVERFILL

Part No. 361169

SECTION 14A. PRECAUTION DECAL LOCATIONS



Part No. 361854

Part No. 361904
or 361213

Part No. 337302



Part No. 338038



Part No. 337305