



Service Manual

Reelmaster® 216/216-D

Preface

This publication provides the service technician with information for troubleshooting, testing, and repair of major systems and components on the Reelmaster 216 and Reelmaster 216-D

REFER TO THE REELMASTER 216 OR 216-D OPERATOR'S MANUAL FOR OPERATING, MAINTENANCE AND ADJUSTMENT INSTRUCTIONS. Space is provided at the end of Chapter 2 in this publication to insert the Operator's Manuals and Parts Catalogs for your machine. Replacement Operator's Manuals are available by sending complete Model and Serial Number of traction unit and cutting unit to:

The Toro Company
8111 Lyndale Avenue South
Minneapolis, MN 55420

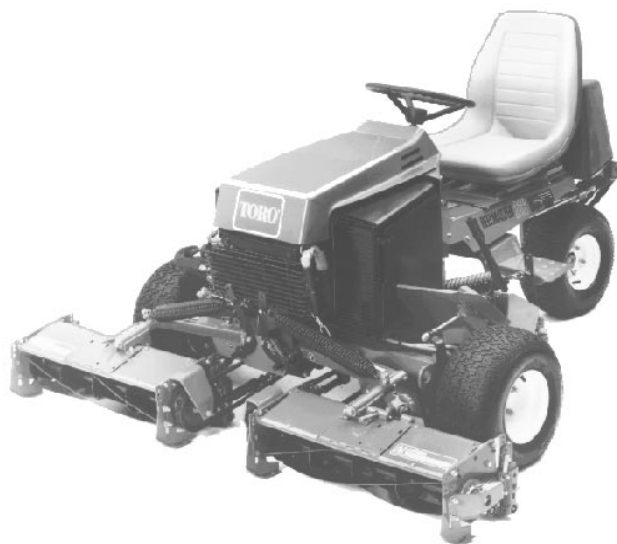
The Toro Company reserves the right to change product specifications or this publication without notice.



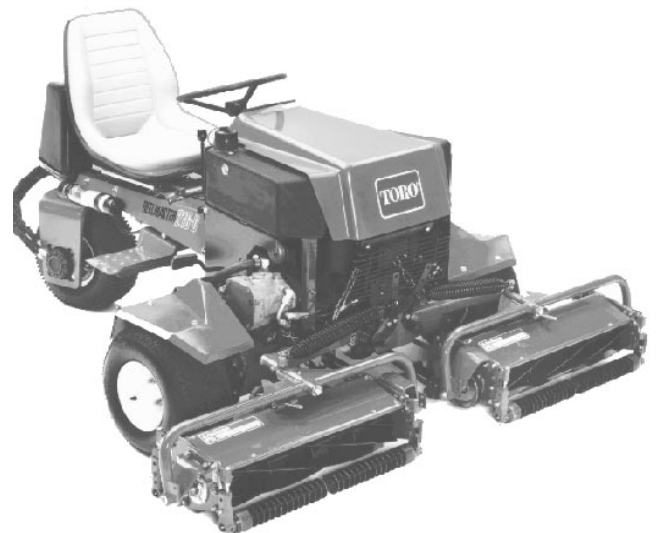
This safety symbol means DANGER, WARNING, or CAUTION, PERSONAL SAFETY INSTRUCTION. When you see this symbol, carefully read the instructions that follow. Failure to obey the instructions may result in personal injury.

NOTE: A NOTE will give general information about the correct operation, maintenance, service, testing or repair of the machine.

IMPORTANT: The IMPORTANT notice will give important instructions which must be followed to prevent damage to systems or components on the machine.



Reelmaster 216



Reelmaster 216-D

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Safety Instructions

The Reelmaster 216/216-D has been tested and verified for compliance with the B71.4-1984 specifications of the American National Standards Institute (ANSI) for riding mowers when equipped with rear ballast (see Operator's Manual). Although hazard control and accident prevention are partially dependent upon the design and configuration of the machine, these factors are also dependent upon the awareness, concern, and proper training of the personnel involved in the operation, transport maintenance, and storage of the machine. Improper use or maintenance of the machine can result in injury or death.



CAUTION

Obey the following safety instructions. Read and understand these instructions before operating the Reelmaster 216/216-D or doing maintenance, troubleshooting, testing, adjustments or repairs. Failure to comply with the safety instructions may result in personal injury.

Before Operating

1. Read and understand the Operator's Manual before starting, operating, maintaining or repairing the machine. Become familiar with the controls and know how to stop the machine and engine quickly. Replacement Operator's Manuals are available by sending complete Model and Serial Number of traction unit and cutting units to:

The Toro Company
8111 Lyndale Avenue South
Minneapolis, MN 55420

Use the Model and Serial Number when referring to your machine. If you have questions about this Service Information, please contact:

The Toro Company
Commercial Service Department
8111 Lyndale Avenue South
Minneapolis, MN 55420

- Never allow children to operate the machine or adults to operate it without proper instruction. Only trained operators who have read this manual should operate this machine.
- Become familiar with the controls and know how to stop the machine and engine quickly.
- Never operate the machine while under the influence of drugs or alcohol.
- Keep all shields, safety devices and decals in place. If a shield, safety device or decal is defective or damaged, repair or replace it before operating the machine.
- Always wear substantial shoes. Do not operate machine wearing sandals, tennis shoes, sneakers or when barefoot. Do not wear loose fitting clothing that could get caught in moving parts and possibly cause personal injury. Wearing safety glasses, safety shoes, long pants and a helmet is advisable and required by some local ordinances and insurance regulations.

7. Make sure interlock switches are adjusted correctly so engine cannot be started unless traction pedal is in NEUTRAL and cutting units are DISENGAGED.

8. Remove all debris or other objects that might be picked up and thrown by the reels or fast moving components from other attached implements. Keep all bystanders away from operating area.

9. Since gasoline and diesel fuel is flammable, handle it carefully:

- A. Use an approved fuel container.
- B. Do not remove fuel tank cap while engine is hot or running.
- C. Do not smoke while handling fuel.
- D. Fill fuel tank outdoors and only to within an inch (25 mm) from the top of the tank, not the filler neck. Do not overfill.
- E. Wipe up any spilled fuel.

While Operating

10. Sit on the seat when starting and operating the machine.

11. Before starting the engine:

- A. Engage the parking brake.
- B. Make sure traction pedal is in NEUTRAL and cutting units are DISENGAGED.
- C. After engine is started, release parking brake and keep foot off traction pedal. Machine must not move. If movement is evident, the neutral return mechanism is adjusted incorrectly; therefore, shut engine off and adjust until machine does not move when traction pedal is released.

12. Seating capacity is one person. Never carry passengers.

13. Do not run engine in a confined area without adequate ventilation. Exhaust fumes are hazardous and could possibly be deadly.

14. Check interlock switches daily for proper operation. If a switch fails, replace it before operating the machine. Replace all four interlock switches in wiring system every two years, regardless if they are working properly or not.

15. Using the machine demands attention. To prevent loss of control:

- A. Operate only in daylight, or when there is good artificial light.
- B. Drive slowly.
- C. Watch for holes or other hidden hazards.
- D. Look behind machine before backing up.
- E. Do not drive close to a sand trap, ditch, creek or other hazard.
- F. Reduce speed when making sharp turns and turning on a hillside.
- G. Avoid sudden stops and starts.

16. Keep hands, feet and clothing away from moving parts and reel discharge area. If so equipped, grass baskets must be in place during operation of reels for maximum safety.

17. Traverse slopes carefully. Do not start or stop suddenly when traveling uphill or downhill.

18. Operator must be skilled and trained in how to drive on hillsides. Failure to use caution on slopes or hills may cause loss of control and vehicle to tip or roll, possibly resulting in personal injury or death.

19. If engine stalls or wheels loose traction and cannot make it to the top of a slope, do not turn machine around. Always back slowly straight down the slope.

20. Raise cutting units before driving from one work area to another.

21. **DON'T TAKE AN INJURY RISK!** When a person or pet appears unexpectedly in or near the mowing area, **STOP MOWING**. Careless operation, combined with terrain angles, ricochets, or improperly positioned guards can lead to thrown object injuries. Do not resume mowing until area is cleared.

22. Do not touch engine, muffler or exhaust pipe while engine is running or soon after it is stopped. These areas could be hot enough to cause burns.

23. If cutting unit strikes a solid object or vibrates abnormally, stop immediately, turn engine off, set parking brake and wait for all motion to stop. Inspect for damage. If reel or bedknife is damaged, repair or replace it before operating.

24. Before getting off of the seat:

- A. Move traction pedal to neutral.
- B. Set parking brake.
- C. Disengage cutting units and wait for reels to stop.
- D. Stop engine and remove key from switch.

While Doing Maintenance, Troubleshooting, Testing, Adjustments or Repairs

25. Before servicing or making any adjustments, stop engine and remove key from switch.
26. Make sure machine is in safe operating condition by keeping all nuts, bolts and screws tight.
27. Make sure all hydraulic line connections are tight, and all hydraulic hoses and lines are in good condition before applying pressure to the system.
28. Keep body and hands away from pin hole leaks or nozzles that eject high pressure hydraulic fluid. Use cardboard or paper to find hydraulic leaks. Hydraulic fluid escaping under pressure can penetrate skin and cause injury. Fluid accidentally injected into the skin must be surgically removed within a few hours by a doctor familiar with this form of injury or gangrene may result.
29. Before disconnecting or performing any work on the hydraulic system, all pressure in system must be relieved by lowering cutting units to the ground and stopping the engine.
30. To reduce potential fire hazard, keep engine area free of excessive grease, grass, leaves and dirt.
31. If engine must be running to perform maintenance or an adjustment, keep hands, feet, clothing and other parts of the body away from cutting units and other moving parts. Keep all bystanders away.
32. Do not overspeed engine by changing governor setting. To assure safety and accuracy, have an Authorized Toro Distributor check maximum engine speed.
33. Shut engine off before checking or adding oil to engine crankcase.
34. Disconnect battery before checking or adding oil to the crankcase.
35. At the time of manufacture, the machine conformed to the safety standards for riding mowers. To assure optimum performance and continued safety certification of the machine, use genuine Toro replacement parts and accessories. Replacement parts and accessories made by other manufacturers may result in non-conformance with the safety standards, and the warranty may be voided.



Product Records and Manuals

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Product Records

Record information about your Reelmaster 216/216-D on the SERVICE HISTORY REPORT form. Use this information when referring to your machine.

Insert the Operator's Manuals and Parts Catalogs for your Reelmaster 216/216-D at the end of this section.

Equivalents and Conversions

Decimal and Millimeter Equivalents

| Fractions | Decimals | mm | Fractions | Decimals | mm | |
|-----------|---------------------------|----------|-----------|------------------------------|----------|----------|
| | 1/64 | 0.015625 | — 0.397 | 33/64 | 0.515625 | — 13.097 |
| | 1/32 | 0.03125 | — 0.794 | 17/32 | 0.53125 | — 13.494 |
| | 3/64 | 0.046875 | — 1.191 | 35/64 | 0.546875 | — 13.891 |
| 1/16 | 0.0625 | — 1.588 | 9/16 | 0.5625 | — 14.288 | |
| | 5/64 | 0.078125 | — 1.984 | 37/64 | 0.578125 | — 14.684 |
| | 3/32 | 0.09375 | — 2.381 | 19/32 | 0.59375 | — 15.081 |
| | 7/64 | 0.109275 | — 2.778 | 39/64 | 0.609375 | — 15.478 |
| 1/8 | 0.1250 | — 3.175 | 5/8 | 0.6250 | — 15.875 | |
| | 9/64 | 0.140625 | — 3.572 | 41/64 | 0.640625 | — 16.272 |
| | 5/32 | 0.15625 | — 3.969 | 21/32 | 0.65625 | — 16.669 |
| | 11/64 | 0.171875 | — 4.366 | 43/64 | 0.671875 | — 17.066 |
| 3/16 | 0.1875 | — 4.762 | 11/16 | 0.6875 | — 17.462 | |
| | 13/64 | 0.203125 | — 5.159 | 45/64 | 0.703125 | — 17.859 |
| | 7/32 | 0.21875 | — 5.556 | 23/32 | 0.71875 | — 18.256 |
| | 15/64 | 0.234375 | — 5.953 | 47/64 | 0.734375 | — 18.653 |
| 1/4 | 0.2500 | — 6.350 | 3/4 | 0.7500 | — 19.050 | |
| | 17/64 | 0.265625 | — 6.747 | 49/64 | 0.765625 | — 19.447 |
| | 9/32 | 0.28125 | — 7.144 | 25/32 | 0.78125 | — 19.844 |
| | 19/64 | 0.296875 | — 7.541 | 51/64 | 0.796875 | — 20.241 |
| 5/16 | 0.3125 | — 7.938 | 13/16 | 0.8125 | — 20.638 | |
| | 21/64 | 0.328125 | — 8.334 | 53/64 | 0.828125 | — 21.034 |
| | 11/32 | 0.34375 | — 8.731 | 27/32 | 0.84375 | — 21.431 |
| | 23/64 | 0.359375 | — 9.128 | 55/64 | 0.859375 | — 21.828 |
| 3/8 | 0.3750 | — 9.525 | 7/8 | 0.8750 | — 22.225 | |
| | 25/64 | 0.390625 | — 9.922 | 57/64 | 0.890625 | — 22.622 |
| | 13/32 | 0.40625 | — 10.319 | 29/32 | 0.90625 | — 23.019 |
| | 27/64 | 0.421875 | — 10.716 | 59/64 | 0.921875 | — 23.416 |
| 7/16 | 0.4375 | — 11.112 | 15/16 | 0.9375 | — 23.812 | |
| | 29/64 | 0.453125 | — 11.509 | 61/64 | 0.953125 | — 24.209 |
| | 15/32 | 0.46875 | — 11.906 | 31/32 | 0.96875 | — 24.606 |
| | 31/64 | 0.484375 | — 12.303 | 63/64 | 0.984375 | — 25.003 |
| 1/2 | 0.5000 | — 12.700 | 1 | 1.000 | — 25.400 | |
| | 1 mm = 0.03937 in. | | | 0.001 in. = 0.0254 mm | | |

U.S to Metric Conversions



| | To Convert | Into | Multiply By |
|---------------------------|----------------|----------------------|--------------------|
| Linear Measurement | Miles | Kilometers | 1.609 |
| | Yards | Meters | 0.9144 |
| | Feet | Meters | 0.3048 |
| | Feet | Centimeters | 30.48 |
| | Inches | Meters | 0.0254 |
| | Inches | Centimeters | 2.54 |
| | Inches | Millimeters | 25.4 |
| Area | Square Miles | Square Kilometers | 2.59 |
| | Square Feet | Square Meters | 0.0929 |
| | Square Inches | Square Centimeters | 6.452 |
| | Acre | Hectare | 0.4047 |
| Volume | Cubic Yards | Cubic Meters | 0.7646 |
| | Cubic Feet | Cubic Meters | 0.02832 |
| | Cubic Inches | Cubic Centimeters | 16.39 |
| Weight | Tons (Short) | Metric Tons | 0.9078 |
| | Pounds | Kilograms | 0.4536 |
| | Ounces (Avdp.) | Grams | 28.3495 |
| Pressure | Pounds/Sq. In. | Kilopascal | 6.895 |
| Work | Foot-pounds | Newton-Meters | 1.356 |
| | Foot-pounds | Kilogram-Meters | 0.1383 |
| | Inch-pounds | Kilogram-Centimeters | 1.152144 |
| Liquid Volume | Quarts | Liters | 0.9463 |
| | Gallons | Liters | 3.785 |
| Liquid Flow | Gallons/Minute | Liters/Minute | 3.785 |
| Temperature | Fahrenheit | Celsius | 1. Subtract 32° |
| | | | 2. Multiply by 5/9 |

Torque Specifications

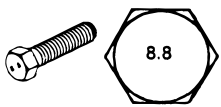
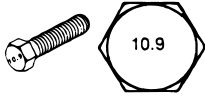
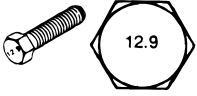
Use these torque values when specific torque values are not given. DO NOT use these values in place of specified values.

The torque values listed below are for lubricated threads. Plated threads are considered to be lubricated.

Capscrew Markings and Torque Values - U.S. Customary

| SAE Grade Number | 5 | | | | 8 | | | |
|------------------------|---|-----|----------|-----|---|------|----------|-----|
| Capscrew Head Markings |  | | | |  | | | |
| Capscrew Body Size | Capscrew Torque - Grade 5 | | | | Capscrew Torque - Grade 8 | | | |
| | Cast Iron | | Aluminum | | Cast Iron | | Aluminum | |
| | ft-lb | Nm | ft-lb | Nm | ft-lb | Nm | ft-lb | Nm |
| 1/4-20 -28 | 7 | 9 | 6 | 8 | 11 | 15 | 9 | 12 |
| | 9 | 12 | 7 | 9 | 13 | 18 | 10 | 14 |
| 5/16-18 -24 | 15 | 20 | 12 | 16 | 22 | 30 | 18 | 24 |
| | 17 | 23 | 14 | 19 | 24 | 33 | 19 | 25 |
| 3/8-16 -24 | 30 | 40 | 20 | 25 | 40 | 55 | 30 | 40 |
| | 30 | 40 | 25 | 35 | 45 | 60 | 35 | 45 |
| 7/16-14 -20 | 45 | 60 | 35 | 45 | 65 | 90 | 50 | 65 |
| | 50 | 65 | 40 | 55 | 70 | 95 | 55 | 75 |
| 1/2-13 -20 | 70 | 95 | 55 | 75 | 95 | 130 | 75 | 100 |
| | 75 | 100 | 60 | 80 | 110 | 150 | 90 | 120 |
| 9/16-12 -18 | 100 | 135 | 80 | 110 | 140 | 190 | 110 | 150 |
| | 110 | 150 | 85 | 115 | 155 | 210 | 125 | 170 |
| 5/8-11 -18 | 135 | 180 | 110 | 150 | 190 | 255 | 150 | 205 |
| | 155 | 210 | 120 | 160 | 215 | 290 | 170 | 230 |
| 3/4-10 -16 | 240 | 325 | 190 | 255 | 340 | 460 | 270 | 365 |
| | 270 | 365 | 210 | 285 | 380 | 515 | 300 | 410 |
| 7/8-9 -14 | 360 | 490 | 280 | 380 | 550 | 745 | 440 | 600 |
| | 390 | 530 | 310 | 420 | 610 | 825 | 490 | 660 |
| 1-8 -14 | 530 | 720 | 420 | 570 | 820 | 1100 | 660 | 890 |
| | 590 | 800 | 480 | 650 | 890 | 1200 | 710 | 960 |

Capscrew Markings and Torque Values – Metric

| Commercial Steel Class | | 8.8 | | | | 10.9 | | | | 12.9 | | | |
|------------------------|-----------------------------|---|----------|-----|------------------------------|---|----------|-----|------------------------------|---|----------|-----|--|
| Capscrew Head Markings | |  | | | |  | | | |  | | | |
| Thread Diameter mm | Capscrew Torque - Class 8.8 | | | | Capscrew Torque - Class 10.9 | | | | Capscrew Torque - Class 12.9 | | | | |
| | Cast Iron | | Aluminum | | Cast Iron | | Aluminum | | Cast Iron | | Aluminum | | |
| | ft-lb | Nm | ft-lb | Nm | ft-lb | Nm | ft-lb | Nm | ft-lb | Nm | ft-lb | Nm | |
| 6 | 5 | 9 | 4 | 7 | 9 | 14 | 7 | 11 | 9 | 14 | 7 | 11 | |
| 7 | 9 | 14 | 7 | 11 | 14 | 18 | 11 | 14 | 18 | 23 | 14 | 18 | |
| 8 | 18 | 25 | 14 | 18 | 23 | 32 | 18 | 25 | 27 | 36 | 21 | 28 | |
| 10 | 30 | 40 | 25 | 30 | 45 | 60 | 35 | 45 | 50 | 70 | 40 | 55 | |
| 12 | 55 | 70 | 40 | 55 | 75 | 105 | 60 | 80 | 95 | 125 | 75 | 100 | |
| 14 | 85 | 115 | 65 | 90 | 120 | 160 | 95 | 125 | 145 | 195 | 110 | 150 | |
| 16 | 130 | 180 | 100 | 140 | 175 | 240 | 135 | 190 | 210 | 290 | 165 | 220 | |
| 18 | 170 | 230 | 135 | 180 | 240 | 320 | 185 | 250 | 290 | 400 | 230 | 310 | |



EQUIPMENT OPERATION AND SERVICE HISTORY REPORT
for
REELMASTER® 216

TORO Model and Serial Number: _____ - _____

Engine Numbers: _____

Transmission Numbers: _____

Date Purchased: _____ Warranty Expires _____

Purchased From: _____

| | | | | |
|-----------|---------|-------|-------|-------|
| Contacts: | Parts | _____ | Phone | _____ |
| | Service | _____ | Phone | _____ |
| | Sales | _____ | Phone | _____ |

See your TORO Distributor/Dealer for other Publications, Manuals, and Videos from The TORO Company.

REELMASTER® 216 Maintenance Schedule

Minimum Recommended Maintenance Intervals:

| Maintenance Procedure | Maintenance Interval & Service | | | | |
|---|--|----------------|-----------------|-----------------|-----------------|
| Check Battery Fluid/Connections | Every 25hrs | Every 50hrs | Every 100hrs | Every 200hrs | Every 400hrs |
| Lubricate Grease Fittings | | | | | |
| Service Air Filter Pre-Cleaner | <i>A Level Service</i> | | | | |
| † Change Engine Oil | | | | | |
| † Check Traction Belt Tension | <i>B Level Service</i> | | | | |
| Service Air Filter Paper Element | | | | | |
| Service Spark Plug | <i>C Level Service</i> | | | | |
| † Torque Wheel Lug Nuts | | | | | |
| † Replace Hydraulic Filter | | | | | |
| Adjust Electric Clutch | <i>D Level Service</i> | | | | |
| Inspect Traction Linkage Movement | | | | | |
| Change Hydraulic Fluid | | | | | |
| Decarbon Combustion Chamber | | | | | |
| Adjust Valves and Torque Head Bolts | <i>E Level Service</i> | | | | |
| ‡ Check Engine RPM (idle and full throttle) | | | | | |
| † Initial break in at 5 hours | | | | | |
| ‡ Initial break in at 50 hours | | | | | |
| Replace Moving Hoses | <p>Annual Recommendations: <i>Items listed are recommended every 1000 hours or 2 years whichever occurs first.</i></p> | | | | |
| Replace Safety Switches | | | | | |
| Fuel Tank - Drain/Flush | | | | | |
| Replace Fuel Filter | | | | | |
| Hydraulic Tank - Drain/Flush | | | | | |

(See Operator's and Service Manual for specifications and procedures)

REELMASTER® 216 Daily Maintenance Check List

Unit Designation: _____

Daily Maintenance: (duplicate this page for routine use)

TORO ID#: _____ - _____

| Maintenance Check Item | Daily Maintenance Check For Week Of | | | | | | |
|--|--|-----------|-----------|-----------|-----------|-----------|-----------|
| | MON | TUES | WED | THURS | FRI | SAT | SUN |
| | _____ HRS | _____ HRS | _____ HRS | _____ HRS | _____ HRS | _____ HRS | _____ HRS |
| ✓ Safety Interlock Operation | | | | | | | |
| ✓ Brake Operation | | | | | | | |
| ✓ Engine Oil Level | | | | | | | |
| ✓ Air Filter Pre-Cleaner | | | | | | | |
| Clean Engine Cooling Fins | | | | | | | |
| ✓ Unusual Engine Noises | | | | | | | |
| ✓ Unusual Operating Noises | | | | | | | |
| ✓ Hydraulic System Oil Level | | | | | | | |
| ✓ Hydraulic Hoses for Damage | | | | | | | |
| ✓ Fluid Leaks | | | | | | | |
| ✓ Fuel Level | | | | | | | |
| ✓ Tire Pressure | | | | | | | |
| ✓ Instrument Operation | | | | | | | |
| ✓ Reel-to-Bedknife Adjustment | | | | | | | |
| ✓ Height-of-Cut Adjustment | | | | | | | |
| ✓ Cutting Unit Belt Adjustment | | | | | | | |
| Lubricate All Grease Fittings ¹ | | | | | | | |
| Touch-up damaged paint | | | | | | | |

¹ = Immediately after every washing, regardless of the interval listed.

Notation for areas of concern: Inspection performed by: _____

| Item | Date | Information |
|------|------|-------------|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |

(See Operator's and Service Manual for specifications and procedures)

REELMASTER® 216 Supervisor Maintenance Work Order

Date: _____

(duplicate this page for routine use)

| | | |
|-------------------|------------------------------|----------|
| Unit Designation: | TORO I.D. #: _____ | Remarks: |
| Hours: | Service to perform (circle): | |
| Technician: | A B C D E Other | |

A -Service (every 25 hours)

- Check Battery Fluid/Connections
- Lubricate Grease Fittings
- Service Air Filter Pre-Cleaner
- Change Engine Oil
- _____
- _____
- _____
- _____
- _____
- _____

B -Service (every 50 hours)

- Check Traction Belt Tension
- Service Air Filter Paper Element
- A-Service** required
- _____
- _____
- _____
- _____
- _____
- _____
- _____

C -Service (every 100 hours)

- Service Spark Plug
- Torque Wheel Lug Nuts
- A and B Service** required
- _____
- _____
- _____
- _____
- _____
- _____
- _____

D -Service (every 200 hours)

- Replace Hydraulic Filter
- Adjust Electric Clutch
- Inspect Traction Linkage Movement
- A, B, and C Service** required
- _____
- _____
- _____
- _____
- _____
- _____

E - Service (every 400 hours)

- Change Hydraulic Fluid
- Decarbon Combustion Chamber
- Adjust Valves and Torque Head Bolts
- Check Engine RPM (idle & full throttle)
- A, B, C, and D Service** required
- _____
- _____
- _____
- _____
- _____

Other - Annual Service and Specials

- Replace Moving Hoses
- Replace Safety Switches
- Fuel Tank - Drain/Flush
- Replace Fuel Filter
- Hydraulic Tank - Drain/Flush
- _____
- _____
- _____
- _____
- _____

(See Operator's and Service Manual for specifications and procedures)

Form No. 95-845-SL



EQUIPMENT OPERATION AND SERVICE HISTORY REPORT
for
REELMASTER® 216-D

TORO Model and Serial Number: _____ - _____

Engine Numbers: _____

Transmission Numbers: _____

Date Purchased: _____ Warranty Expires _____

Purchased From: _____

| | | | | |
|-----------|---------|-------|-------|-------|
| Contacts: | Parts | _____ | Phone | _____ |
| | Service | _____ | Phone | _____ |
| | Sales | _____ | Phone | _____ |

See your TORO Distributor/Dealer for other Publications, Manuals, and Videos from The TORO Company.

REELMASTER® 216-D Maintenance Schedule

Minimum Recommended Maintenance Intervals:

| Maintenance Procedure | Maintenance Interval & Service | | | |
|---|--|-----------------|-----------------|-----------------|
| Inspect Air Filter, Dust Cup, and Baffle | Every 50hrs | Every 100hrs | Every 200hrs | Every 400hrs |
| Lubricate All Grease Fittings | | | | |
| † Change Engine Oil | <i>A Level Service</i> | | | |
| † Check Fan and Alternator Belt Tension | | | | |
| † Change Engine Oil Filter | <i>B Level Service</i> | | | |
| † Check Traction Belt Tension | | | | |
| Service Air Filter | | | | |
| Replace Fuel Filter/Water Separator | | | | |
| † Replace Hydraulic Filter | <i>C Level Service</i> | | | |
| † Torque Wheel Lug Nuts | | | | |
| Replace Hydraulic Fluid | | | | |
| Check Battery Level/Connections | | | | |
| Inspect Traction Linkage Movement | | | | |
| ‡ Torque Head Bolts and Adjust Valves | <i>D Level Service</i> | | | |
| ‡ Check Engine RPM (idle and full throttle) | | | | |
| † Initial break in at 10 hours | | | | |
| ‡ Initial break in at 50 hours | | | | |
| Replace Moving Hoses | <p>Annual Recommendations: <i>Items listed are recommended every 1000 hours or 2 years whichever occurs first.</i></p> | | | |
| Replace Safety Switches | | | | |
| Cooling System - Flush / Replace Fluid | | | | |
| Replace Thermostat | | | | |
| Fuel Tank - Drain/Flush | | | | |
| Hydraulic Tank - Drain/Flush | | | | |

(See Operator's and Service Manual for specifications and procedures)

REELMASTER® 216-D Daily Maintenance Check List

Unit Designation: _____

Daily Maintenance:(duplicate this page for routine use)

TORO ID#: _____ - _____

| Maintenance Check Item | Daily Maintenance Check For Week Of | | | | | | |
|--|--|-----------|-----------|-----------|-----------|-----------|-----------|
| | MON | TUES | WED | THURS | FRI | SAT | SUN |
| | _____ HRS | _____ HRS | _____ HRS | _____ HRS | _____ HRS | _____ HRS | _____ HRS |
| ✓ Safety Interlock Operation | | | | | | | |
| ✓ Brake Operation | | | | | | | |
| ✓ Engine Oil Level | | | | | | | |
| ✓ Cooling System Fluid Level | | | | | | | |
| Drain Water/Fuel Separator | | | | | | | |
| ✓ Air Filter, Dust Cup, Baffle | | | | | | | |
| ✓ Radiator & Screen for Debris | | | | | | | |
| ✓ Unusual Engine Noises ¹ | | | | | | | |
| ✓ Unusual Operating Noises | | | | | | | |
| ✓ Hydraulic System Oil Level | | | | | | | |
| ✓ Hydraulic Hoses for Damage | | | | | | | |
| ✓ Fluid Leaks | | | | | | | |
| ✓ Fuel Level | | | | | | | |
| ✓ Tire Pressure | | | | | | | |
| ✓ Instrument Operation | | | | | | | |
| ✓ Reel-to-Bedknife Adjustment | | | | | | | |
| ✓ Height-of-Cut Adjustment | | | | | | | |
| ✓ Cutting Unit Belt Adjustment | | | | | | | |
| Lubricate All Grease Fittings ² | | | | | | | |
| Touch-up damaged paint | | | | | | | |

¹ = Check glow plug and injector nozzles, if hard starting, excess smoke, or rough running is noted.

² = Immediately after every washing, regardless of the interval listed.

Inspection performed by: _____

| Item | Date | Information |
|------|------|-------------|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |

(See Operator's and Service Manual for specifications and procedures)

REELMASTER® 216-D Supervisor Maintenance Work Order

Date: _____

(duplicate this page for routine use)

| | |
|-------------------|--|
| Unit Designation: | TORO I.D. #: _____ |
| Hours: | Service to perform (circle): A B C D Other |
| Technician: | |

Remarks:

A -Service (every 50 hours)

- Inspect Air Filter, Dust Cup, and Baffle
- Lubricate All Grease Fittings
- Change Engine Oil
- Check Fan and Alternator Belt Tension
- _____
- _____
- _____
- _____
- _____

B -Service (every 100 hours)

- Change Engine Oil Filter
- Check Traction Belt Tension
- A-Service** required
- _____
- _____
- _____
- _____
- _____
- _____

C -Service (every 200 hours)

- Service Air Filter
- Replace Fuel Filter/Water Separator
- Replace Hydraulic Filter
- Torque Wheel Lug Nuts
- A and B Service** required
- _____
- _____
- _____
- _____

D -Service (every 400 hours)

- Replace Hydraulic Fluid
- Check Battery Level/Connections
- Inspect Traction Linkage Movement
- Torque Head Bolts and Adjust Valves
- Check Engine RPM (Idle & Full Throttle)
- A, B, and C Service** required
- _____
- _____
- _____

Other - Annual Service and Specials

- Replace Moving Hoses
- Replace Safety Switches
- Cooling System - Flush/Replace Fluid
- Replace Thermostat
- Fuel Tank - Drain/Flush
- Hydraulic Tank - Drain/Flush
- _____
- _____
- _____

Additional Service Items

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

(See Operator's and Service Manual for specifications and procedures)

Form No. 95-846-SL



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ADJUSTMENTS..... 2
 Carburetor Adjustments..... 2
KOHLER MAGNUM ENGINE SERVICE MANUAL

Specifications

| Item | Specification |
|----------------------------|---|
| Make/Designation | Kohler M16S Air cooled, single cylinder, gasoline, horizontal shaft |
| Weight (approximate) | 129 lb. |
| Crankcase Oil Capacity | 5.25 pints |
| Oil | API Classification SF or SG SAE 30W recommended or SAE 10W-30 or 10W-40 as a substitute |
| Above +32° F (0° C) | |
| Below +32° F (0° C) | SAE 5W-20 or 5W-30 recommended or SAE 10W-30 or 10W-40 as a substitute |
| Fuel | Unleaded Regular Gasoline |
| High RPM Setting (no load) | 3600 ± 100 RPM |
| Low RPM Setting (no load) | 1200 ± 100 RPM |

Adjustments

Carburetor Adjustments

Lack of power accompanied by black sooty exhaust smoke is usually caused by a rich carburetor setting. Since a dirty air cleaner element causes the same conditions, check it before adjusting carburetor.

| | |
|------------------|------------|
| High RPM Setting | 3600 ± 100 |
| Low RPM Setting | 1200 ± 100 |

IMPORTANT: Check to make sure the choke is operating correctly before the carburetor is adjusted.

1. Main fuel screw – Close screw by gently rotating it clockwise.

IMPORTANT: Do not close the screw too tight because the screw will likely be damaged.

2. Rotate – open – the main fuel screw 3-1/2 turns counterclockwise.

3. Idle fuel adjusting screw – Close screw by gently rotating it clockwise. Open screw by rotating it 2-1/2 turns counterclockwise.



CAUTION

Engine must be running so final adjustment of the carburetor can be performed. To guard against possible personal injury, keep hands, feet, face and other parts of the body away from the muffler, other hot parts of the engine, and other moving or rotating parts of the engine. Assure reel switch is in **DISENGAGE** position and cutting units are on the shop floor. Also engage parking brake.

IMPORTANT: Do not close the screw too tightly because the screw will likely be damaged.

Note: These settings are approximate - however, the settings will allow engine to be started so carburetor can be fine tuned – steps 4 - 7.

4. Start engine and let it run for 5 to 10 minutes at half throttle to warm up. Engine must be warm before making final adjustments.

5. Move throttle to **TRANSPORT** position. Turn main fuel screw in until speed decreases and note position of screw. Now turn screw out – the engine speed may first increase, then it will decrease as screw is turned. Note the position of screw when engine speed starts to decrease. Set the screw at the midpoint of the two positions noted.

6. To adjust idle fuel adjusting screw, follow same procedure as for main fuel but more throttle to **IDLE** after 5 to 10 minute warm up and make adjustment.

7. Idle Speed Setting – Run engine at half-throttle for 5 to 10 minutes to warm up. Move throttle to **IDLE** and set engine speed to 1200 RPM by turning the idle speed adjusting screw clockwise or counterclockwise.

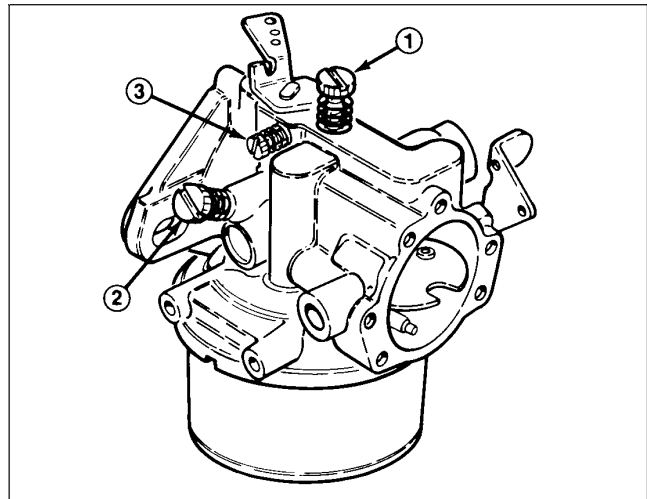


Figure 2

- 1. Main fuel screw
- 2. Idle fuel adjusting screw
- 3. Idle speed screw



Perkins Diesel Engine

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| GENERAL INFORMATION | 2 | Throttle Linkage Adjustment | 3 |
| Bleeding the Fuel System | 2 | PERKINS 100 SERIES WORKSHOP MANUAL | |

Specifications

| Item | Specification |
|----------------------------|---|
| Make/Designation | Perkins, vertical in-line, 3 cylinder, liquid cooled Diesel Type 103-06 KB70238 |
| Firing Order | 1 - 2 - 3 |
| Injection Timing | 27° - 29° BTDC |
| Weight (approximate) | 141 lb. (64 Kg) |
| Crankcase Oil Capacity | 3.0 liter (3.2 U.S. qt.) including filter |
| Oil | API CD SAE 10W-30 |
| Fuel | No. 2 Diesel |
| High RPM Setting (no load) | 3200 ± 100 RPM |
| Low RPM Setting (no load) | 1250 ± 50 RPM |

General Information

Bleeding The Fuel System (Fig. 1, 2)



CAUTION

Because diesel fuel is flammable, use caution when storing or handling it. Do not smoke while filling the fuel tank. Do not fill fuel tank while engine is running, hot or when machine is in an enclosed area. Always fill fuel tank outside and wipe up any spilled diesel fuel before starting the engine. Store fuel in a clean, safety-approved container and keep cap in place. Use diesel fuel for the engine only; not for any other purpose.

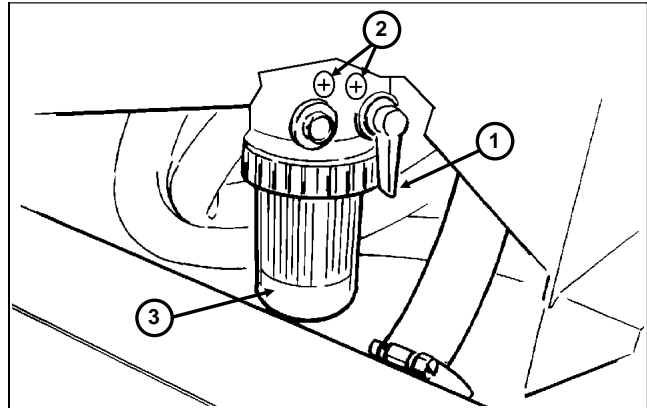


Figure 1

1. Fuel shut-off (behind engine)
2. Bleed screws (2)
3. Bowl

1. Park machine on a level surface. Make sure fuel tank is at least half full.

2. Unlatch and raise hood.

2. Open fuel shut-off valve under fuel tank and on fuel filter.

3. Open two (2) bleed screws, on side of fuel filter mounting head, allowing bowl to re-fill with fuel. Close bleed screws when bowl is filled.

4. On left side of engine (below alternator) locate transfer pump inlet screw. Note angle of fitting on transfer pump inlet and loosen screw (left screw only).

5. When a steady stream of fuel flows out of transfer pump screw, tighten screw, retaining angle of fitting before loosening.

6. Loosen injection pump inlet screw on right side of engine.

7. Pump priming lever until a steady stream of fuel flows out of injector pump inlet screw, then tighten screw.

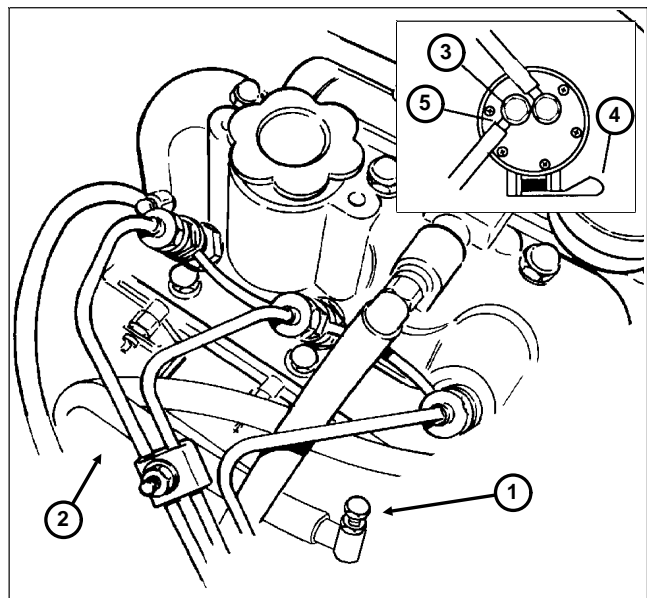


Figure 2

1. Transfer pump screw
2. Injection pump inlet screw location
3. Injection pump inlet screw
4. Priming lever
5. Note fitting angle

Adjustments

Throttle Linkage Adjustment

1. Adjust low engine speed to 1250 ± 50 RPM at engine.
2. With the engine off, adjust throttle stop on back side of control panel so throttle lever on engine goes against low speed adjustment screw at the same time throttle lever on control panel bottoms out.
3. Adjust high engine speed to 3200 ± 100 RPM at engine.
4. With engine off, move throttle control lever on control panel up to high speed position. Loosen capscrew and nut securing throttle cable clamp near engine. Pull cable toward frame until throttle lever on engine is up against high speed adjustment screw. Tighten capscrew and nut securing throttle cable clamp.
5. Check to make sure throttle lever on engine goes against high speed adjustment screw when throttle on control panel is moved up to high speed position. When throttle lever on control panel is moved down to low speed position, throttle lever on engine should go against low speed adjustment screw at the same time throttle lever on control panel bottoms out.



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 Lift Control Valve 42

 Lift Cylinder 43

 3WD Selector Valve 45

Specifications

| Item | Description |
|---|---|
| Pump (Fig. 1) Charge pressure Implement relief pressure | Sauer-Sundstrand, variable axial piston pump 70 - 150 PSI 700 - 800 PSI |
| Wheel Motors | Nichols-Gray, orbit rotor type |
| Lift Control Valve | Spool type directional control valve |
| Hydraulic Filter | Spin-on cartridge type, 25 micron |
| Hydraulic Oil | * Mobil DTE 26 or equivalent |
| Reservoir Reelmaster 216 (Fig. 2) Reelmaster 216-D (Fig. 3) | Approximately 3.5 gal. U.S. Approximately 3.3 gal. U.S. |

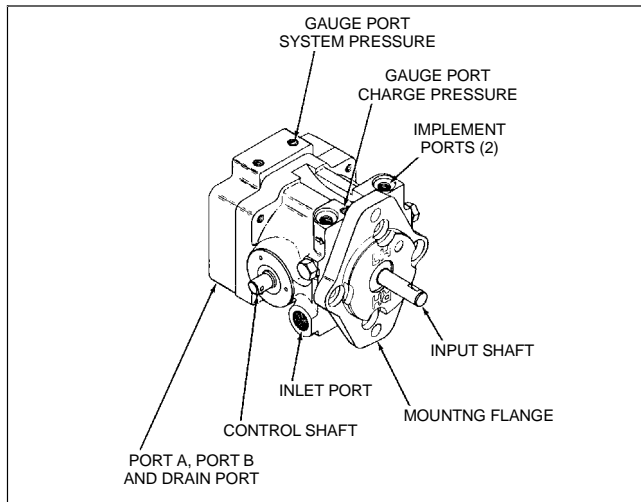


Figure 1

*** Equivalent Hydraulic Oils (interchangeable):**

- Shell Tellus 68
- Amoco Rykon Oil 68
- Conoco Super Hydraulic Oil 68
- Exxon Nuto H 68
- Kendall Kenoil R & O AW 68
- Pennzoil Penreco 68
- Phillips Magnus A 68
- Standard Energol HLP 68
- Sun Sunvis 831 WR
- Union Unax AW 68
- Chevron AW Hydraulic Oil 68

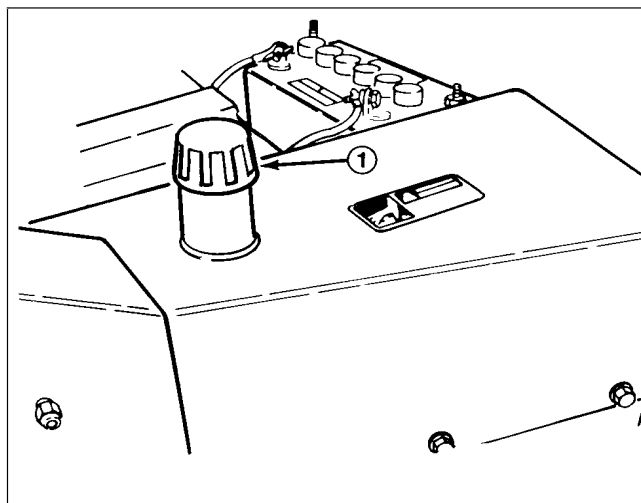


Figure 2
(Reelmaster 216)

1. Dipstick filler cap

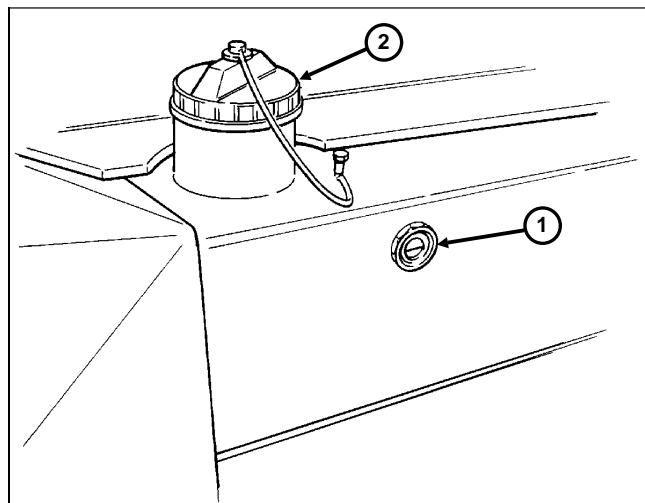


Figure 3
(Reelmaster 216-D)

1. Sight gauge 2. Hydraulic reservoir cap

General Information

Hydraulic Hoses

Hydraulic hoses are subject to extreme conditions such as, pressure differentials during operation and exposure to weather, sun, chemicals, very warm storage conditions or mishandling during operation or maintenance. These conditions can cause damage or premature deterioration. Inspect the hoses frequently for signs of deterioration or damage.

When replacing a hydraulic hose, be sure that the hose is straight (not twisted) before tightening the fittings. This can be done by observing the imprint on the hose. Use two wrenches; one to hold the hose straight and one to tighten the hose swivel nut onto the fitting.



CAUTION

Before disconnecting or performing any work on the hydraulic system, all pressure in the system must be relieved by lowering the cutting units, stopping the engine and opening the bypass valve.

Keep body and hands away from pin hole leaks or nozzles that eject hydraulic fluid under high pressure. Use paper or cardboard, not hands, to search for leaks. Hydraulic fluid escaping under pressure can have sufficient force to penetrate the skin and do serious damage. If fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type of injury or gangrene may result.

Hydraulic Fitting Installation

O-Ring Face Seal (Fig. 4, 5)

1. Make sure both threads and sealing surfaces are free of burrs, nicks, scratches, or any foreign material.
2. Make sure the O-ring is installed and properly seated in the groove. It is recommended that the O-ring be replaced any time the connection is opened.
3. Lubricate the O-ring with a light coating of oil.
4. Put the tube and nut squarely into position on the face seal end of the fitting and tighten the nut until finger tight.
5. Mark the nut and fitting body. Hold the body with a wrench. Use another wrench to tighten the nut to the correct flats from finger tight (F.F.F.T.). The markings on the nut and fitting body will verify that the connection has been tightened.

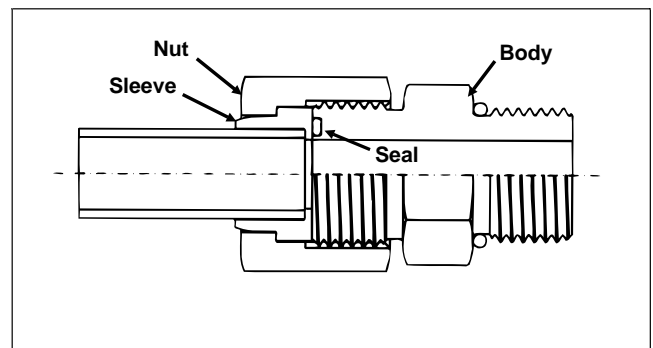


Figure 4

| Size | F.F.F.T. |
|------------------------------------|------------|
| 4 (1/4 in. nominal hose or tubing) | .75 ± .25 |
| 6 (3/8 in.) | .75 ± .25 |
| 8 (1/2 in.) | .75 ± .25 |
| 10 (5/8 in.) | 1.00 ± .25 |
| 12 (3/4 in.) | .75 ± .25 |
| 16 (1 in.) | .75 ± .25 |

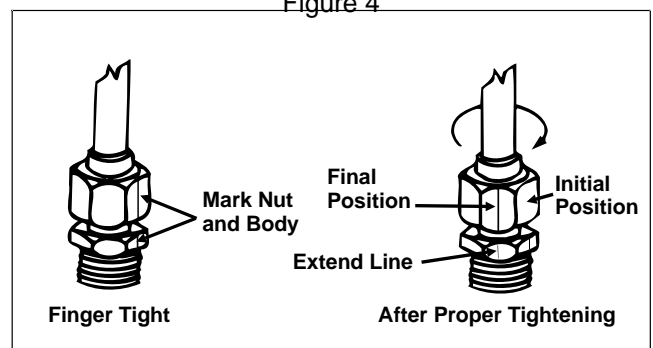


Figure 5

**SAE Straight Thread
O-Ring Port - Non-adjustable (Fig. 6)**

1. Make sure both threads and sealing surfaces are free of burrs, nicks, scratches, or any foreign material.
2. Always replace the O-ring seal when this type of fitting shows signs of leakage.
3. Lubricate the O-ring with a light coating of oil.
4. Install the fitting into the port and tighten it down full length until finger tight.
5. Tighten the fitting to the correct flats from finger tight (F.F.F.T.).

| Size | F.F.F.T. |
|------------------------------------|------------|
| 4 (1/4 in. nominal hose or tubing) | 1.00 ± .25 |
| 6 (3/8 in.) | 1.50 ± .25 |
| 8 (1/2 in.) | 1.50 ± .25 |
| 10 (5/8 in.) | 1.50 ± .25 |
| 12 (3/4 in.) | 1.50 ± .25 |
| 16 (1 in.) | 1.50 ± .25 |

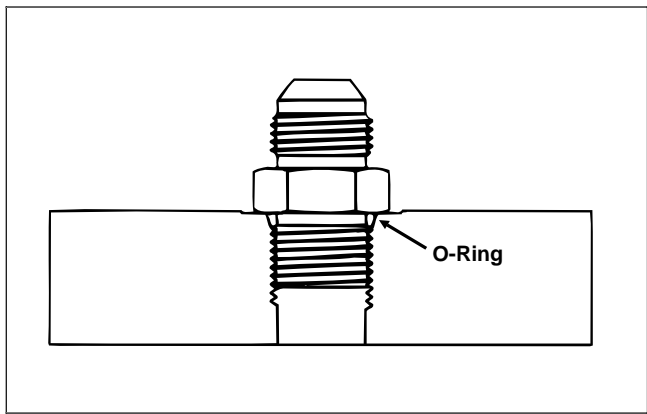


Figure 6

**SAE Straight Thread
O-Ring Port - Adjustable (Fig. 7, 8)**

1. Make sure both threads and sealing surfaces are free of burrs, nicks, scratches, or any foreign material.
2. Always replace the O-ring seal when this type of fitting shows signs of leakage.
3. Lubricate the O-ring with a light coating of oil.
4. Turn back the jam nut as far as possible. Make sure the back up washer is not loose and is pushed up as far as possible (Step 1).
5. Install the fitting into the port and tighten finger tight until the washer contacts the face of the port (Step 2).
6. To put the fitting in the desired position, unscrew it by the required amount, but no more than one full turn (Step 3).
7. Hold the fitting in the desired position with a wrench and turn the jam nut with another wrench to the correct flats from finger tight (F.F.F.T.) (Step 4)

| Size | F.F.F.T. |
|------------------------------------|------------|
| 4 (1/4 in. nominal hose or tubing) | 1.00 ± .25 |
| 6 (3/8 in.) | 1.50 ± .25 |
| 8 (1/2 in.) | 1.50 ± .25 |
| 10 (5/8 in.) | 1.50 ± .25 |
| 12 (3/4 in.) | 1.50 ± .25 |
| 16 (1 in.) | 1.50 ± .25 |

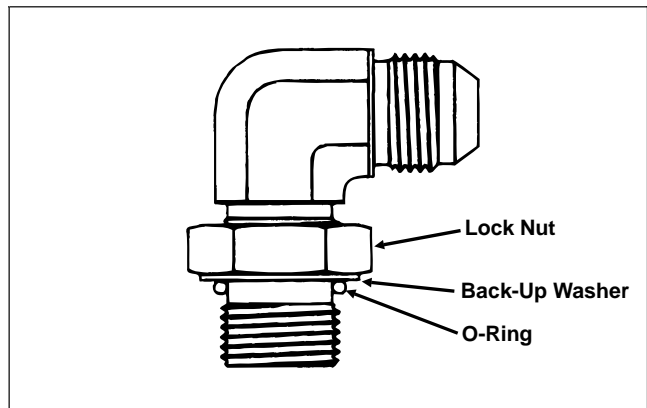


Figure 7

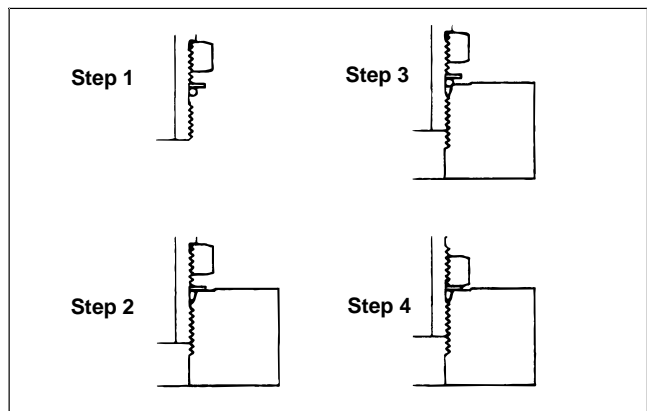


Figure 8

Towing (Fig. 9)

In case of an emergency, the Reelmaster 216/216-D can be towed for a short distance. However, Toro does not recommend this as a standard procedure.

IMPORTANT: Do not tow the machine faster than 2 to 3 MPH because drive system may be damaged. If machine must be towed a longer distance, transport it on a truck or trailer.

1. To tow machine rotate by-pass valve on pump counterclockwise until it is fully open.

2. Before starting engine, close by-pass valve securely by rotating it clockwise. Do not exceed 5 to 8 ft-lb of torque. Do not start engine while valve is open.

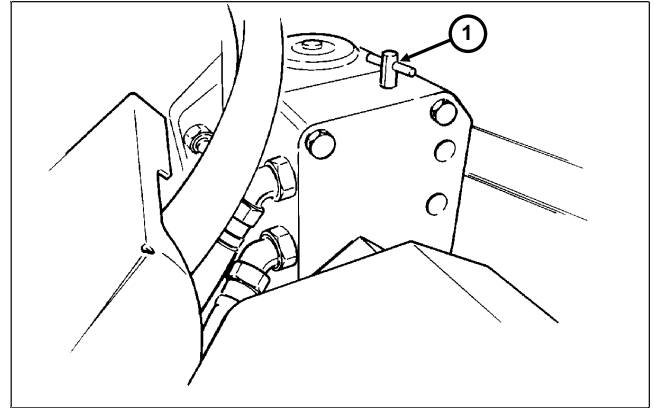
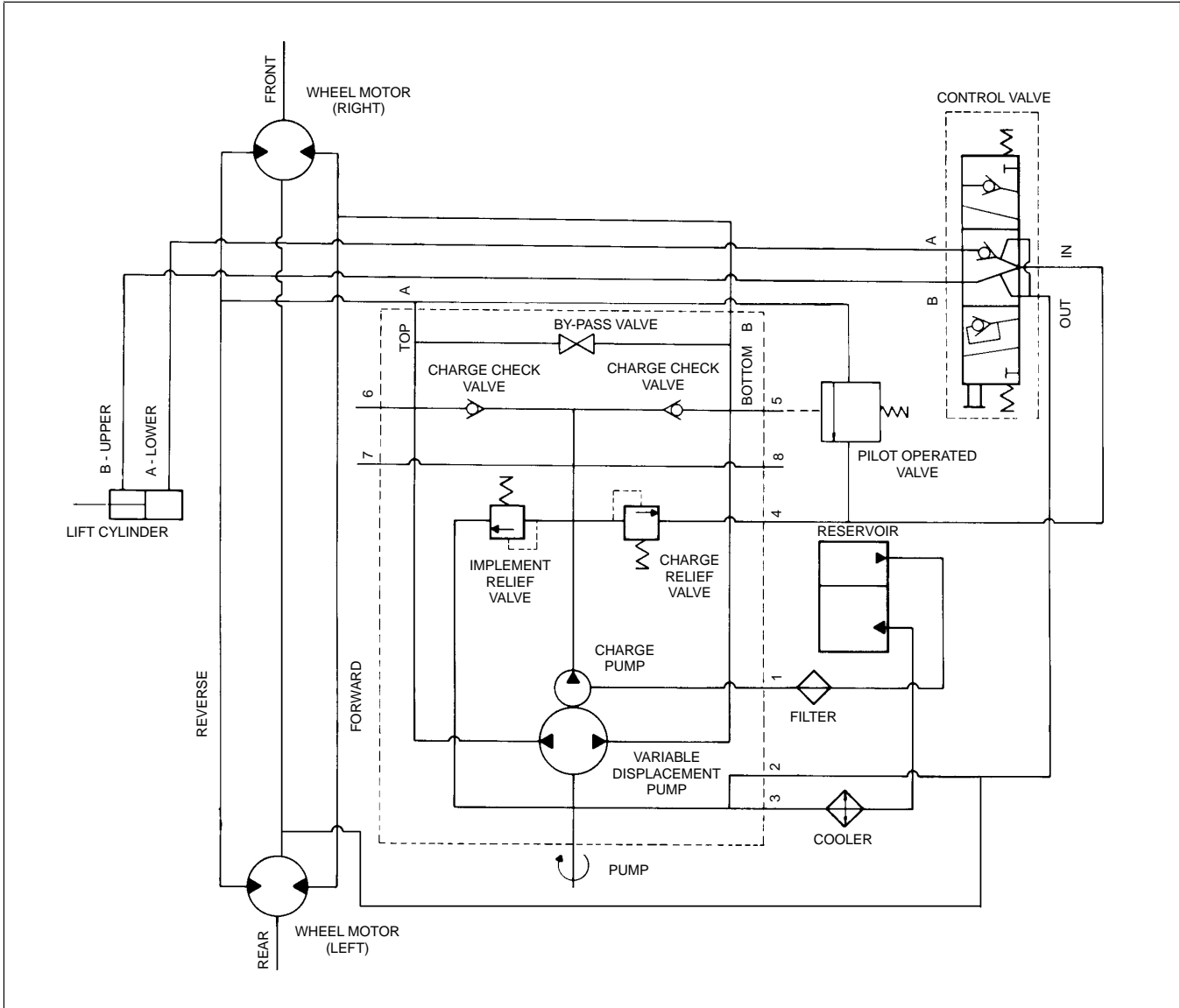


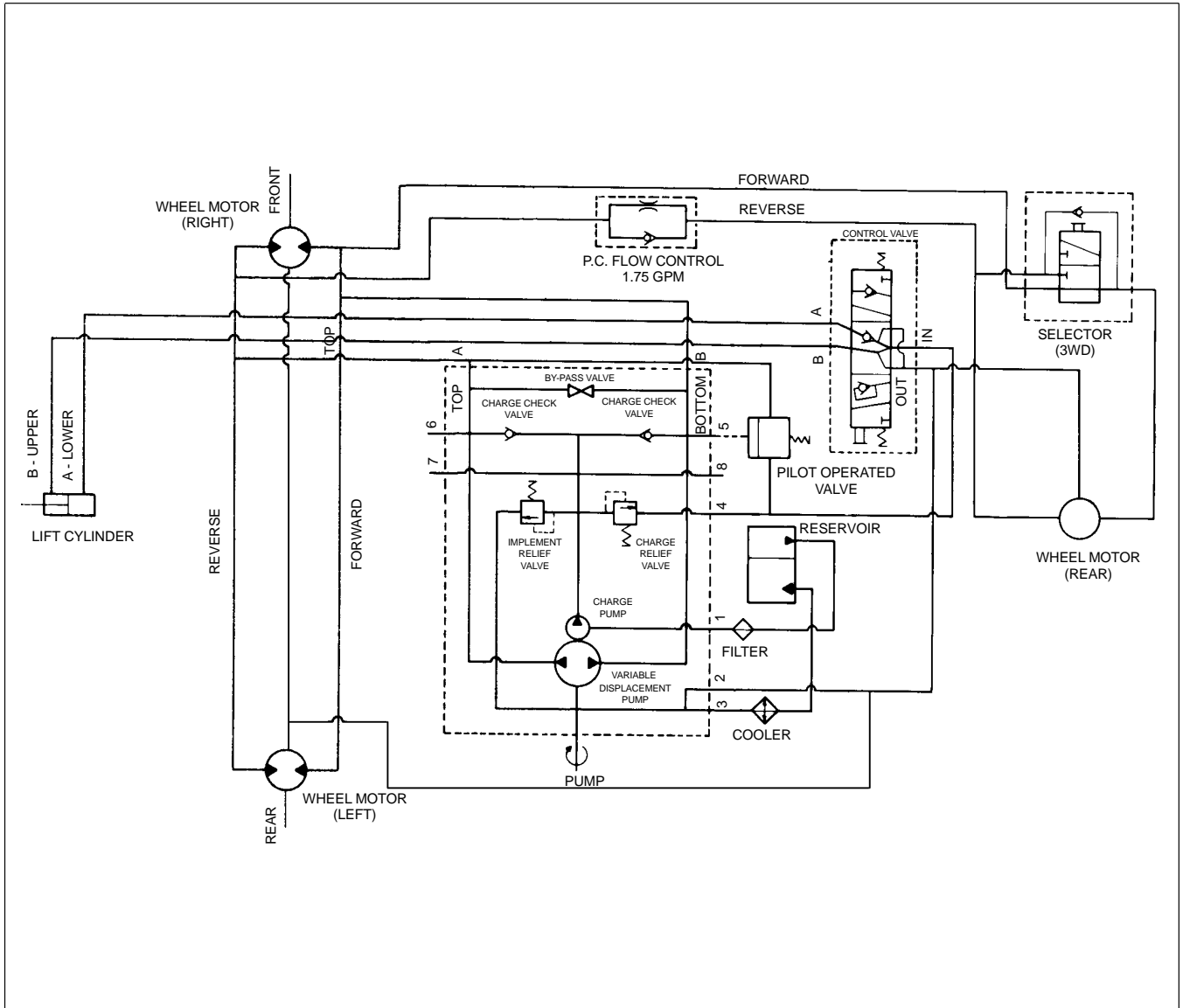
Figure 9
(Reelmaster 216-D shown)

1. By-pass valve

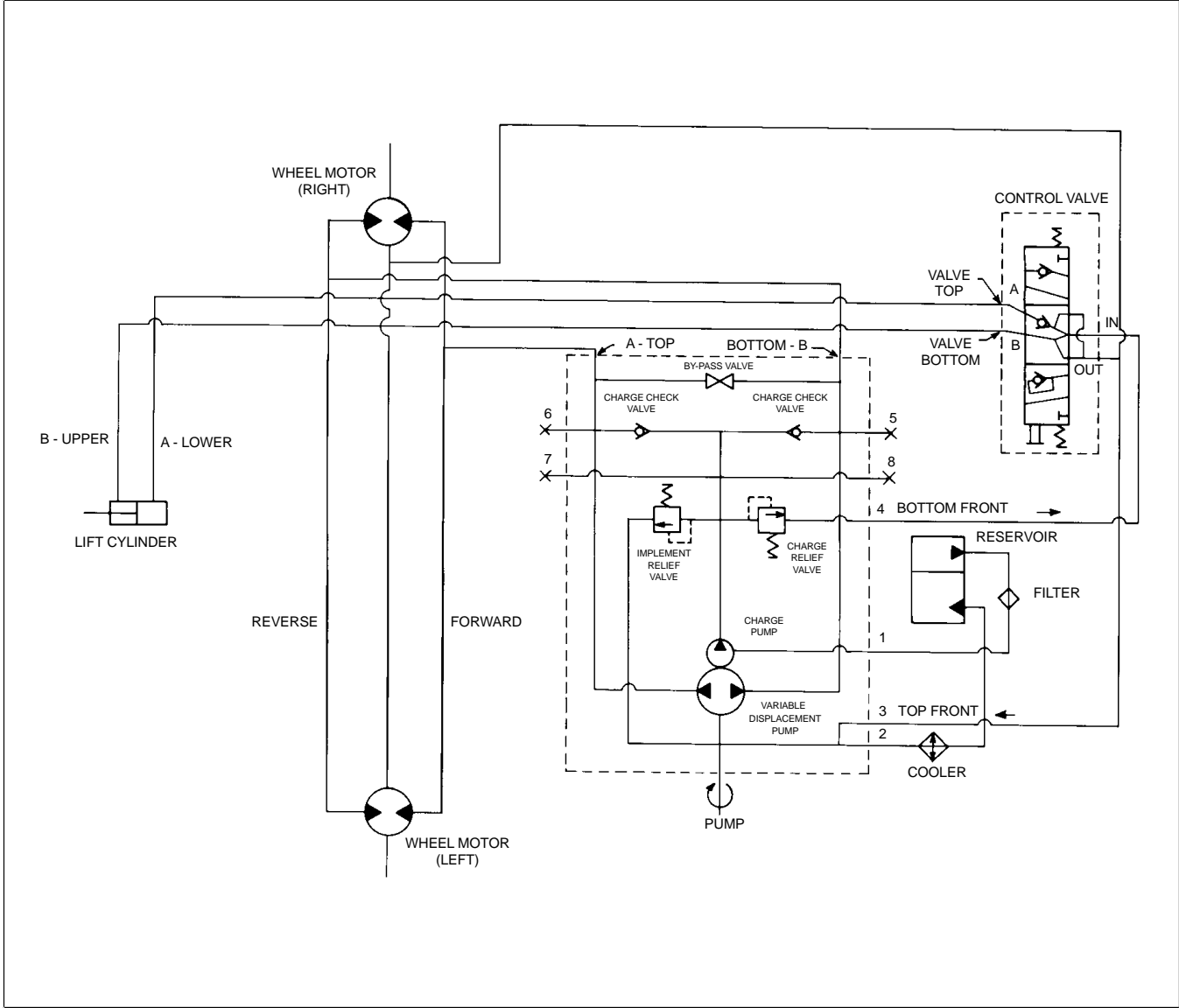
Hydraulic Schematic (Reelmaster 216)



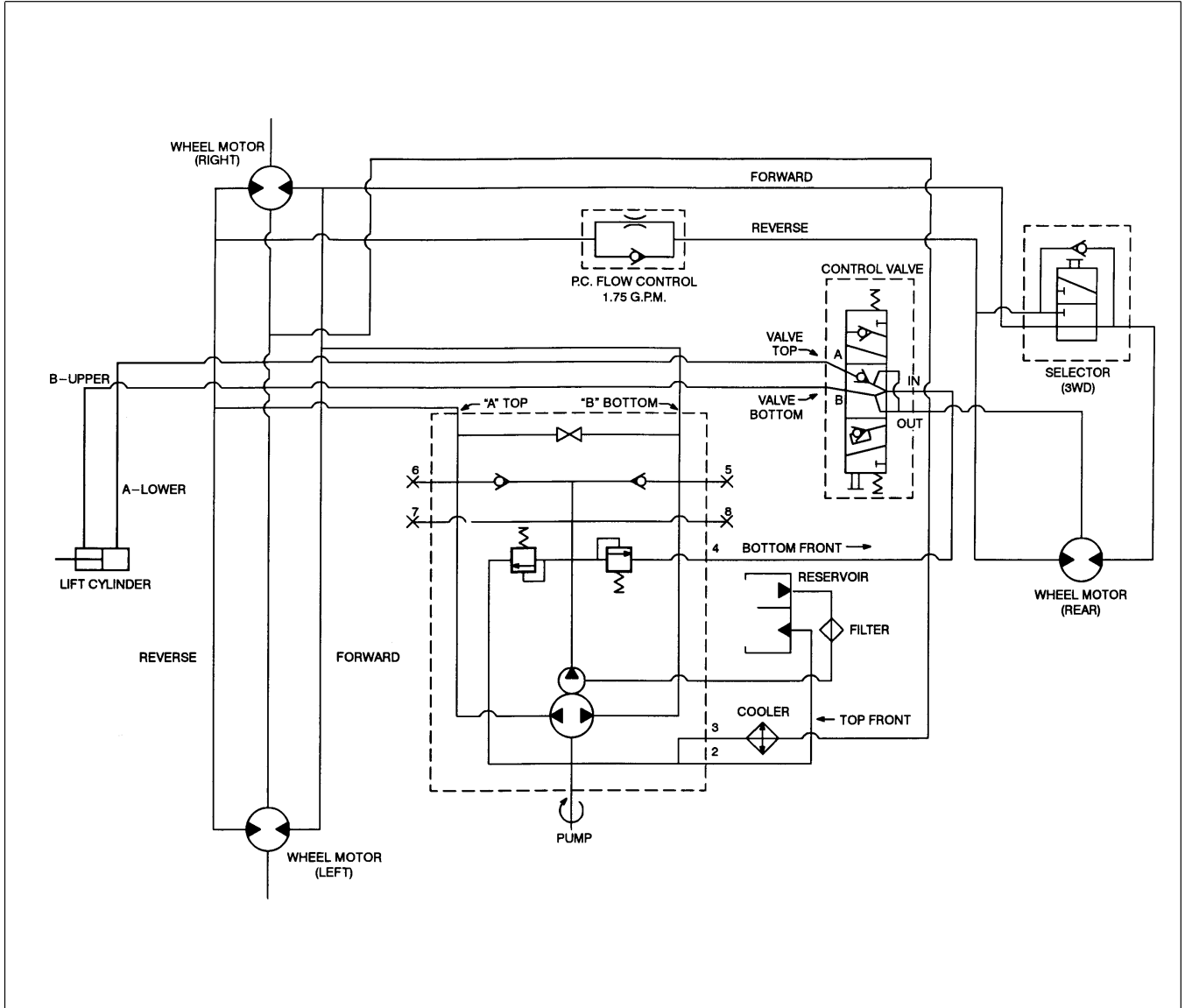
Hydraulic Schematic (Reelmaster 216 3WD)



Hydraulic Schematic (Reelmaster 216-D)



Hydraulic Schematic (Reelmaster 216-D 3WD)



Special Tools

NOTE: Order special tools from the *TORO SPECIAL TOOLS AND APPLICATIONS GUIDE (COMMERCIAL PRODUCTS)*. Some tools may be listed in the Reelmaster 216 or Reelmaster 216-D Parts Catalog. Some tools may also be available from a local supplier.

Hydraulic Pressure Test Kit (Fig. 10)

Used to take various pressure readings for diagnostic tests. Quick disconnect fittings provided attach directly to mating fittings on machine test ports (if equipped) without tools. A high pressure hose is provided for remote readings. Contains one each, 1000, 5000 and 10000 PSI gauges. Use gauges as recommended in Testing section of this chapter.



Figure 10

Hydraulic Tester - With Pressure and Flow Capabilities (Fig. 11)

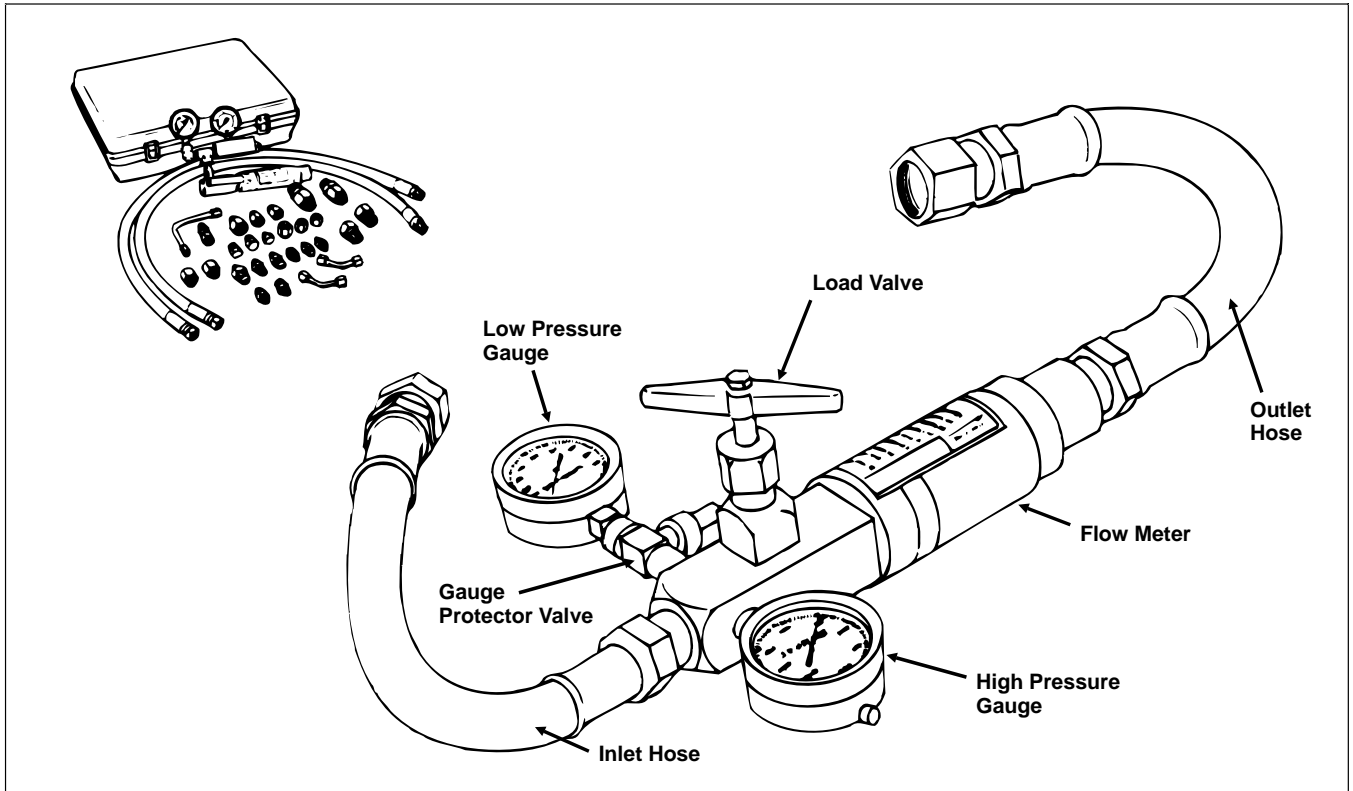


Figure 11

You must have o-ring face seal (ORFS) adapter fittings for this tester to use it on the Reelmaster 216/216-D.

1. **INLET HOSE:** Hose connected from the system circuit to the inlet side of the hydraulic tester.
2. **LOAD VALVE:** If required, upon turning the valve to restrict flow, a simulated working load is created in the circuit.
3. **LOW PRESSURE GAUGE:** Low range gauge to provide accurate reading at low pressure, 0 - 1000 PSI.

This gauge has a protector valve which cuts out when pressure is about to exceed the normal range for the gauge. The cutout pressure is adjustable.

4. **HIGH PRESSURE GAUGE:** High range gauge to accommodate pressure beyond the capacity of the low pressure gauge, 0 - 5000 PSI.
5. **FLOW METER:** This meter measures actual oil flow in the operation circuit, with a gauge rated at 15 GPM.
6. **OUTLET HOSE:** Hose from the outlet side of the hydraulic tester to be connected to the hydraulic system circuit.

Hydraulic Oil Reservoir Plug (Fig. 13)

Used to temporarily plug the outlet of the hydraulic tank to retain most of the fluid when the hydraulic filter is removed.

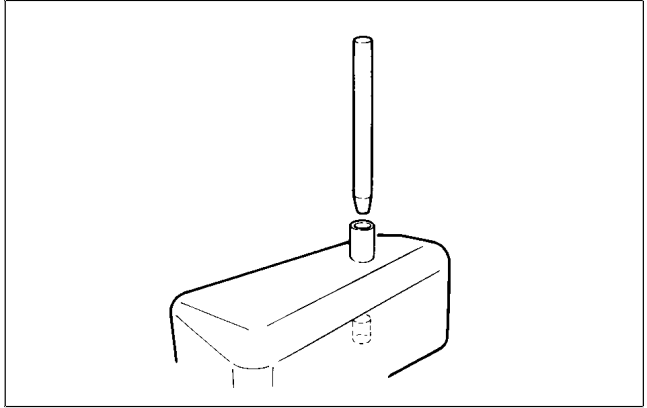


Figure 13

Troubleshooting

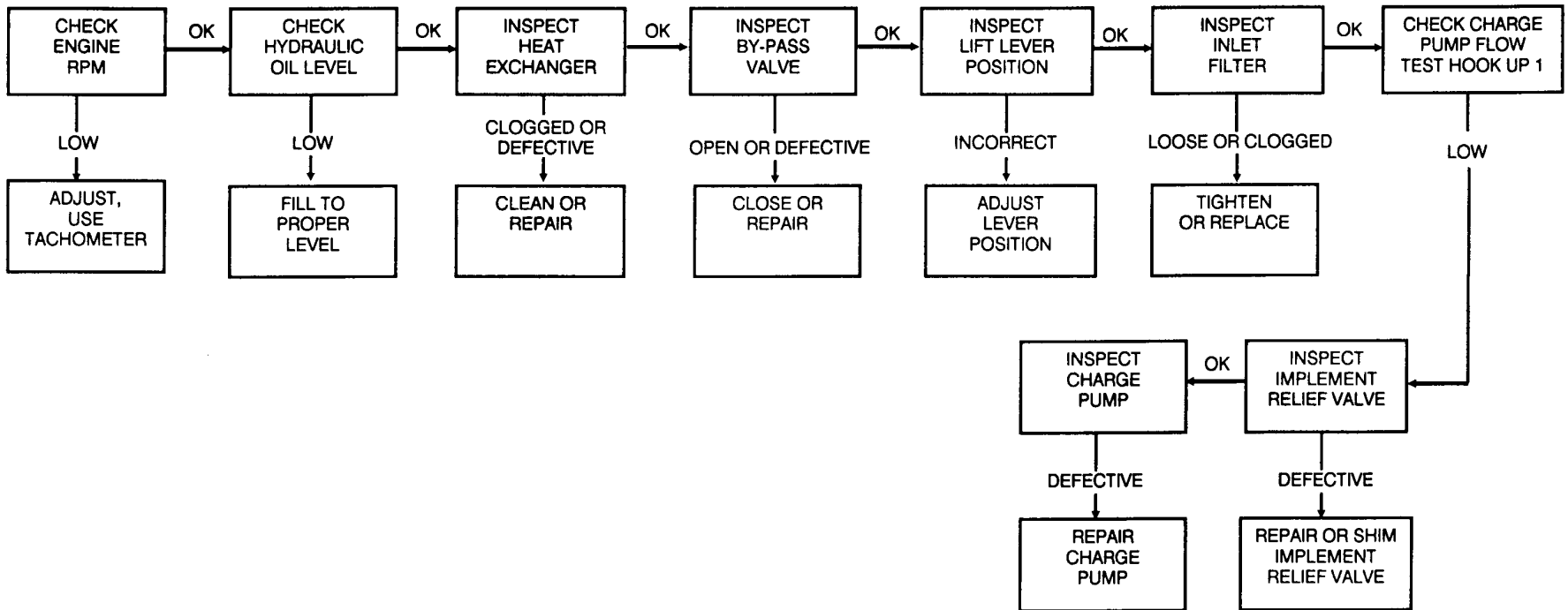
The cause of an improperly functioning hydraulic system is best diagnosed with the use of proper testing equipment and a thorough understanding of the complete hydraulic system.

A hydraulic system with an excessive increase in heat or noise is a potential failure. Should either of these conditions be noticed, immediately stop the machine, turn off the engine, locate the cause of the trouble, and correct it before allowing the machine to be used again. Continued use of an improperly functioning hydraulic system could lead to extensive internal component damage.

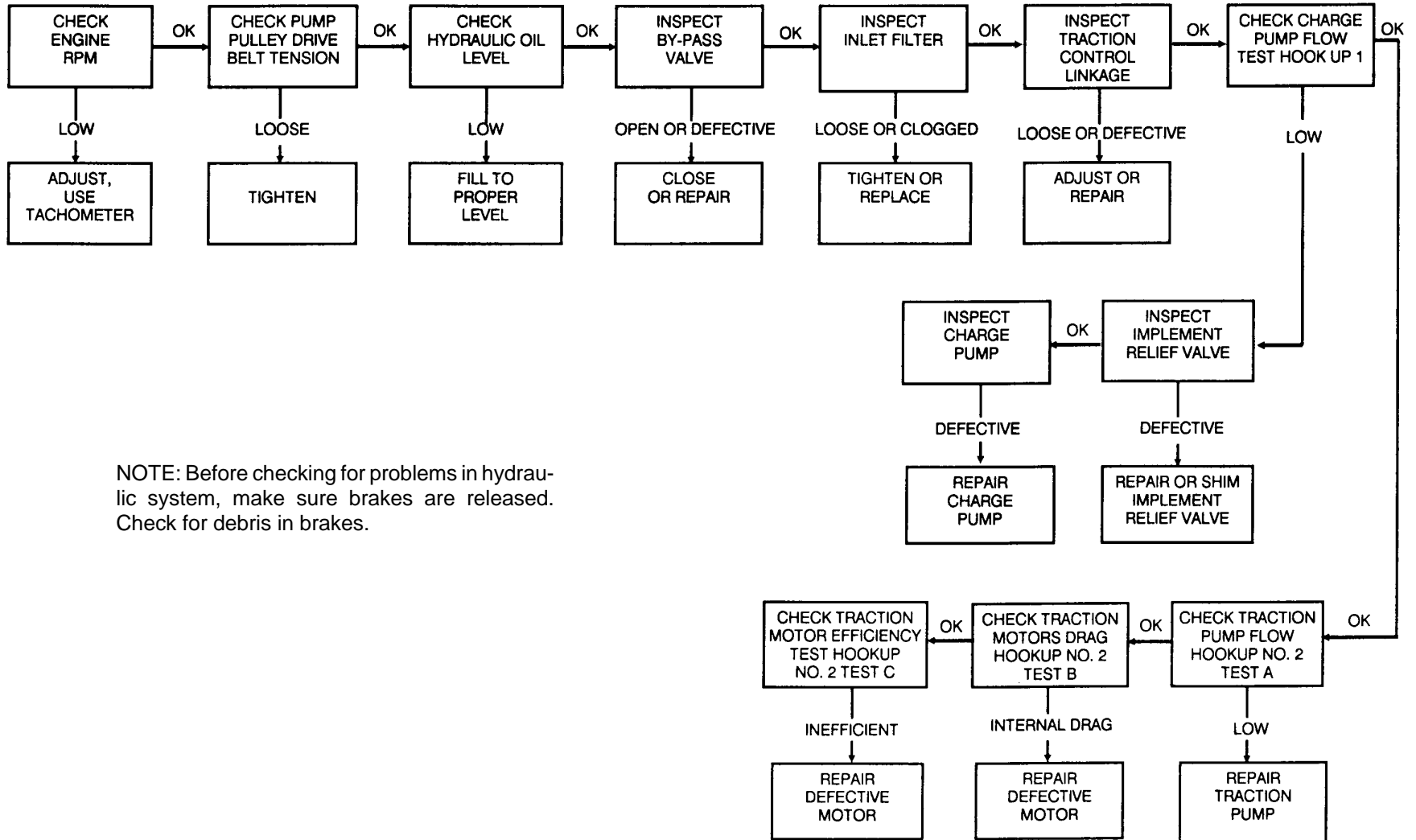
The charts that follow contain detailed information to assist in troubleshooting. There may possibly be more than one cause for a machine malfunction. All causes should be checked in the order in which they are listed on the charts.

Refer to the Testing section of this Chapter for precautions and specific test procedures.

SYSTEM OPERATES HOT

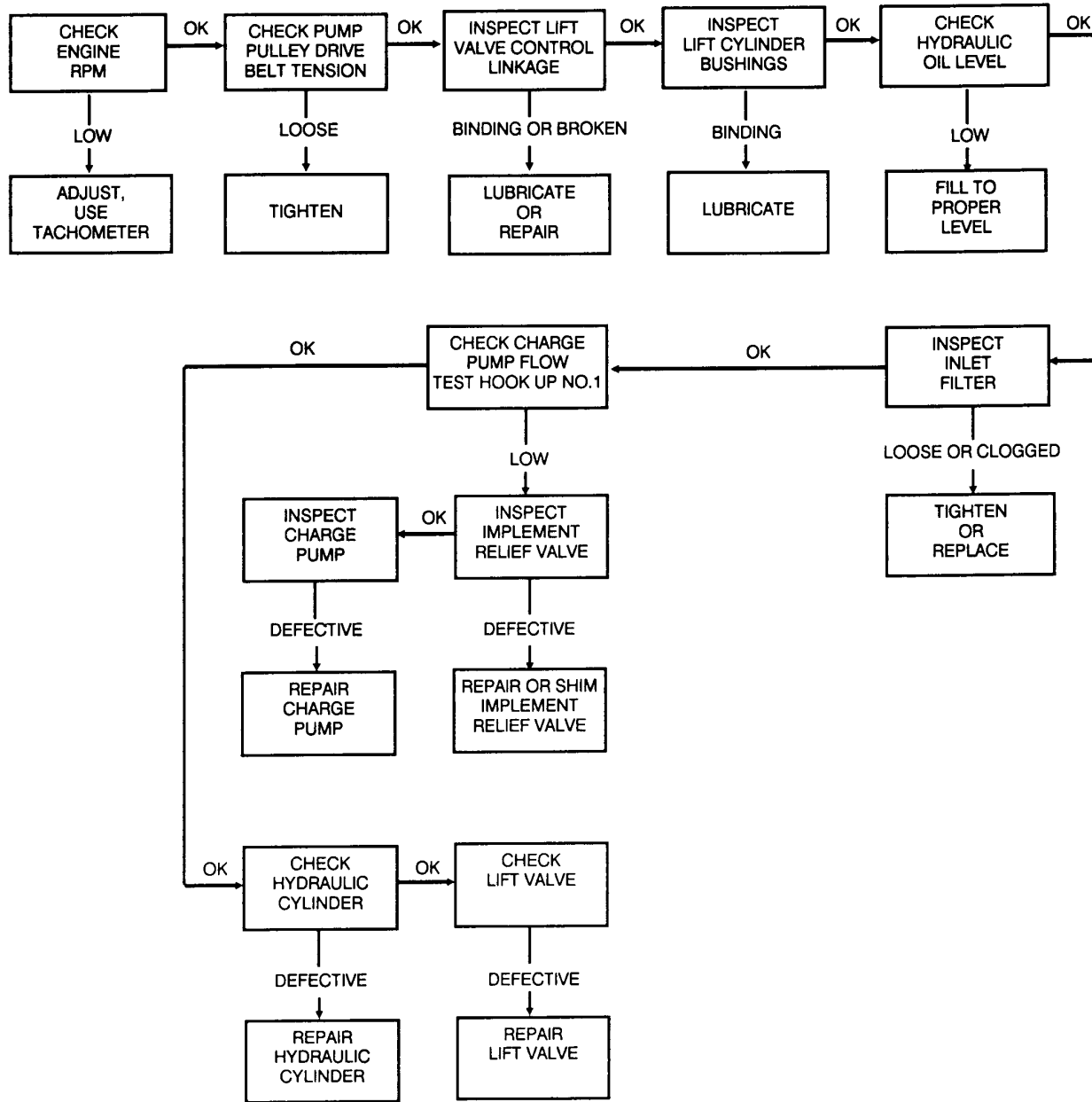


LOSS OF POWER OR UNIT WILL NOT OPERATE IN EITHER DIRECTION



NOTE: Before checking for problems in hydraulic system, make sure brakes are released. Check for debris in brakes.

UNIT WILL NOT LIFT OR LIFTS SLOWLY



Testing

The most effective method for isolating problems in the hydraulic system is by using hydraulic test equipment such as pressure gauges and flow meters in the circuits during various operational checks. (See the Special Tools section in this Chapter.)



CAUTION

Failure to use gauges with the recommended pressure (psi) rating as listed in the test procedures could result in damage to the gauge and possible personal injury from leaking hot oil.

Before Performing Hydraulic Tests

All obvious areas such as oil supply, filter, binding linkage, loose fasteners, or improper adjustments must be checked before assuming that a hydraulic component is the source of the problem being experienced.



WARNING

Before disconnecting or performing any work on the hydraulic system, all pressure in the system must be relieved by stopping the engine and lowering the cutting units.

Keep body and hands away from pin hole leaks or nozzles that eject hydraulic fluid under high pressure. Use paper or cardboard, not hands, to search for leaks. Hydraulic fluid escaping under pressure can have sufficient force to penetrate skin and do serious damage. If fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type of injury or gangrene may result.

1. Thoroughly clean the machine before disconnecting or disassembling any hydraulic components. Always keep in mind the need for cleanliness when working on hydraulic equipment.

2. Put caps or plugs on any hydraulic lines left open or exposed during testing or removal of components.

3. The engine must be in good operating condition. Use a tachometer to check engine RPM before doing hydraulic tests. Engine speed can affect the accuracy of the tester readings.

4. To prevent damage to tester or components, the inlet and the outlet hoses must be properly connected, and not reversed (tester with pressure and flow capabilities).

5. To minimize the possibility of damaging components, completely open the load valve by turning it counter-clockwise (tester with pressure and flow capabilities).

6. Install fittings finger tight, far enough to insure that they are not cross-threaded, before tightening with a wrench.

7. Position the tester hoses so that rotating machine parts will not make contact with them and result in hose or tester damage.

8. Check the oil level in the reservoir.

9. Check the control linkage for improper adjustment, binding or broken parts.

10. All hydraulic tests should be made with the hydraulic oil at normal operating temperature.

TEST HOOK-UP NO. 1: Charge Pump Flow and Implement Relief Pressure (Fig. 14, 15, 16) (Using Tester With Pressure and Flow Capabilities)

Tester Connection

Connect tester in series between implement pressure port of hydrostatic pump and pressure inlet port of lift valve (Flow Control Open).

Reelmaster 216: Install tester between hose and fitting at front of valve.

Reelmaster 216-D: Install tester between hose and fitting at bottom front of pump.

TEST A: Charge Pump Flow and Implement Relief Pressure

1. Operate engine at full speed:

Reelmaster 216: 3600 ± 100 RPM
 Reelmaster 216-D: 3200 ± 100 RPM

2. Make sure hydraulic oil is at operating temperature.
3. Traction pedal and lift valve in neutral. Parking brake engaged.
4. While watching flow and pressure gauges, slowly close flow control valve until flow gauge reads 1 GPM.

TESTER READINGS: GPM Flow — Not less than 1 GPM at Minimum 500 PSI.



CAUTION
 Implement relief pressure should not exceed 800 PSI.

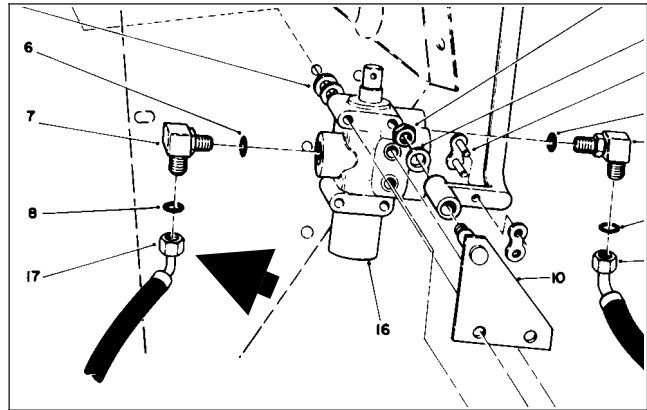


Figure 14
 Reelmaster 216 valve connections

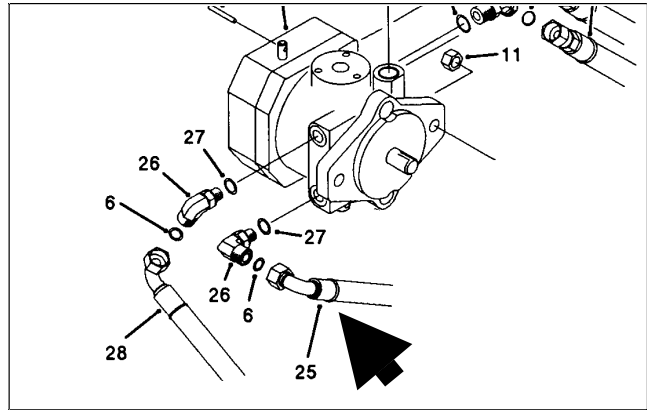


Figure 15
 Reelmaster 216-D pump connections

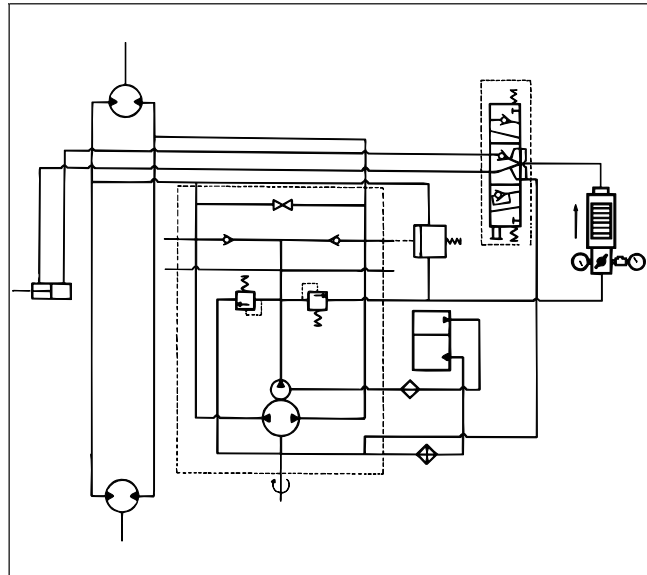


Figure 16
 (Reelmaster 216 2WD shown)

TEST HOOK-UP NO. 2: Traction Pump Flow, Traction Motors Mechanical Drag and Traction Motors Efficiency (Fig. 17, 18, 19) (Using Tester With Pressure and Flow Capabilities)

Tester Connection

Connect tester in series between traction forward pressure port of hydrostatic pump and tee connection (Flow Control Open).

Reelmaster 216: Install tester between hose coming from bottom front of pump and T-connection on tube line.

Reelmaster 216-D: Remove (4) screws securing right fender to frame and remove fender (Fig. 24). Install tester between hose and fitting at top rear of pump.

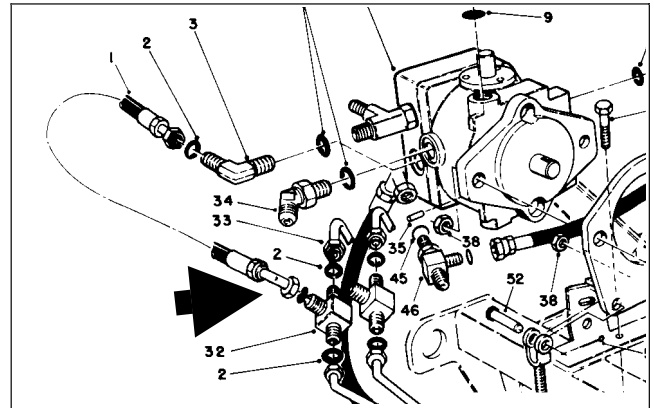



Figure 17
Reelmaster 216 pump connections



CAUTION

Keep everyone clear from the front of unit during traction system tests. Operator must be on seat or the safety interlock will stop the engine when the traction pedal is depressed.

NOTE: For traction system tests, attach log chain to rear frame and then to something solid in shop.

TEST A: Traction Pump Flow

1. Make sure hydraulic oil is at operating temperature.
2. Block up one front traction wheel off floor. Place blocks in front of remaining wheels.
3. Operate engine at full speed:

| | |
|-------------------|----------------|
| Reelmaster 216: | 3600 ± 100 RPM |
| Reelmaster 216-D: | 3200 ± 100 RPM |
4. While watching flow and pressure gauges, slowly push traction pedal into forward until 7 GPM is obtained.
5. If pressure rises above 600 PSI, proceed to Test B. If pressure remains below 600 PSI proceed to step 5..
6. Use flow control valve to obtain 800 PSI at 7 GPM. It may be necessary to depress the pedal farther to maintain 7 GPM as pressure rises.

TESTER READINGS: GPM Flow — Not less than 7 GPM at min. 800 PSI. RPM — 3000 minimum.

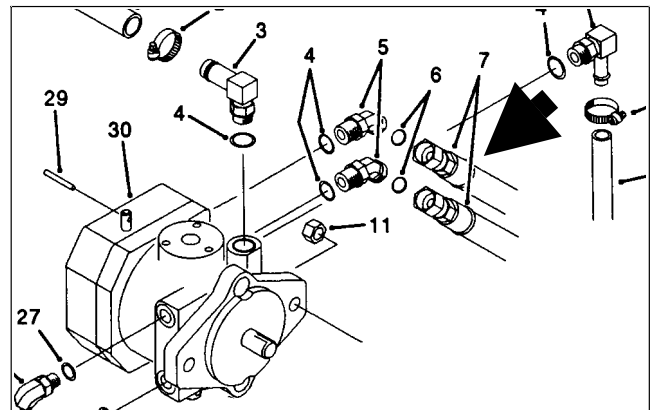


Figure 18
Reelmaster 216-D pump connections

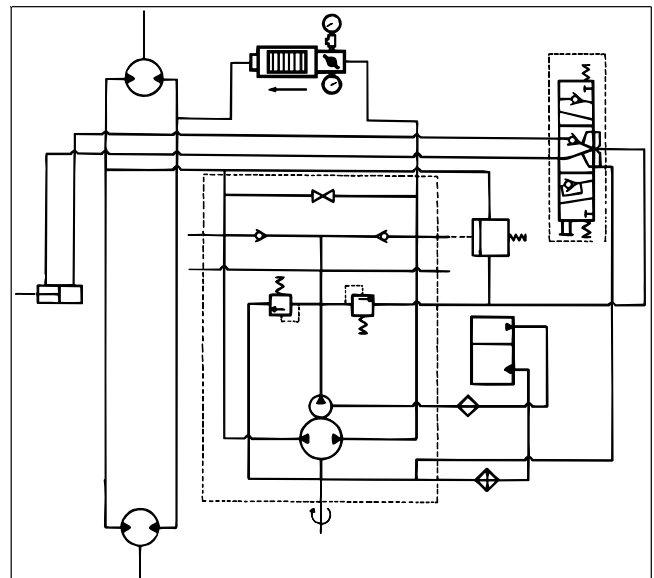


Figure 19
(Reelmaster 216 2WD shown)

TEST B: Traction Motors Mechanical Drag

1. Make sure hydraulic oil is at operating temperature.
2. Block up one traction wheel off floor.
3. Place blocks in front of two remaining wheels.
4. Operate engine at full speed:

Reelmaster 216: 3600 ± 100 RPM
Reelmaster 216-D: 3200 ± 100 RPM

5. While watching flow and pressure gauges, slowly push traction pedal into forward, until 5 GPM is obtained.

TESTER READINGS: At 5 GPM, pressure not to exceed 400 PSI.

If pressure rises above 400 PSI, check:

- A. For restriction in lines to or from rear motor.
- B. For internal motor drag. If internal drag, remove motor and repair as necessary.

6. Repeat steps 1 - 5 for other wheel(s).

TEST C: Traction Motors Efficiency

1. Make sure hydraulic oil is at operating temperature.
2. All wheels on floor.
3. Block front of all wheels.
4. Operate engine at full speed:

Reelmaster 216: 3600 ± 100 RPM
Reelmaster 216-D: 3200 ± 100 RPM

5. While watching pressure gauges, slowly push traction pedal into forward until 1000 PSI is obtained, read flow gauge.

TESTER READINGS: GPM Flow — Not more than 2 GPM at 1000 PSI.

If flow reading is higher than 2 GPM, tester must be connected in series between pressure line and individual wheel motor to isolate defective motor. Repeat steps 1 - 5 in above test for each motor.

Test Hook-up No. 3: Charge Pressure and Implement Relief Pressure (Fig. 20)

Gauge Connection

Connect a 1000 PSI hydraulic pressure gauge to charge pressure gauge port.

TEST A: Charge Pressure

1. Make sure hydraulic oil is at operating temperature.
2. Operate engine at full speed:

Reelmaster 216: 3600 ± 100 RPM
Reelmaster 216-D: 3200 ± 100 RPM

3. Traction pedal and lift valve in neutral. Parking brake engaged.

TESTER READINGS: 70 – 150 PSI.

TEST B: Implement Relief Pressure

1. Make sure hydraulic oil is at operating temperature.
2. Operate engine at full speed:

Reelmaster 216: 3600 ± 100 RPM
Reelmaster 216-D: 3200 ± 100 RPM

3. Traction pedal in neutral and parking brake engaged.
4. Pull lift valve lever to raise cutting units and hold lever so systems goes over relief.

TESTER READINGS: 700 – 800 PSI.



CAUTION

Implement relief pressure should not exceed 800 PSI.

NOTE: If pressure is within specification but the cutting units do not lift or lift slowly, check for mechanical binding, or internal leakage of lift cylinder.

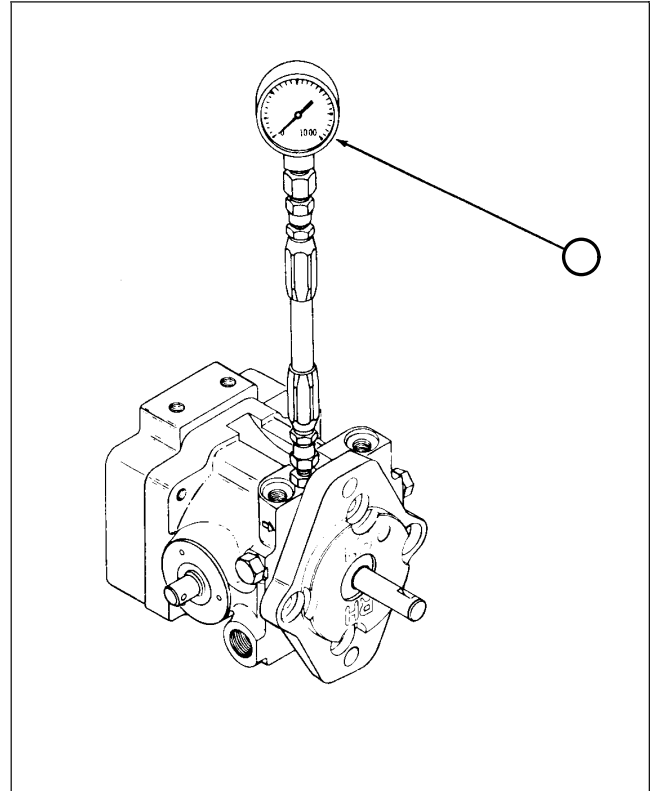


Figure 20

1. 1000 PSI hydraulic pressure gauge

Test Hook-up No. 4: Traction Pressure (Fig. 21)

Gauge Connection

Connect a 10,000 PSI hydraulic pressure gauge to forward traction pressure gauge port.

TEST A: Traction Pressure

1. Make sure pump drive belt is properly adjusted and in good condition.

2. Make sure hydraulic oil is at operating temperature.

3. Operate engine at full speed:

Reelmaster 216: 3600 ± 100 RPM

Reelmaster 216-D: 3200 ± 100 RPM

4. Attach a heavy chain to rear frame of machine and then to something solid in shop. Engage parking brake.



CAUTION

Keep everyone clear from the front of unit during traction system tests. Operator must be on seat or the safety interlock will stop the engine when the traction pedal is depressed.

5. While watching pressure gauges, slowly push traction pedal into forward until maximum pressure is obtained.

GAUGE READING: 4000 – 4500 PSI.

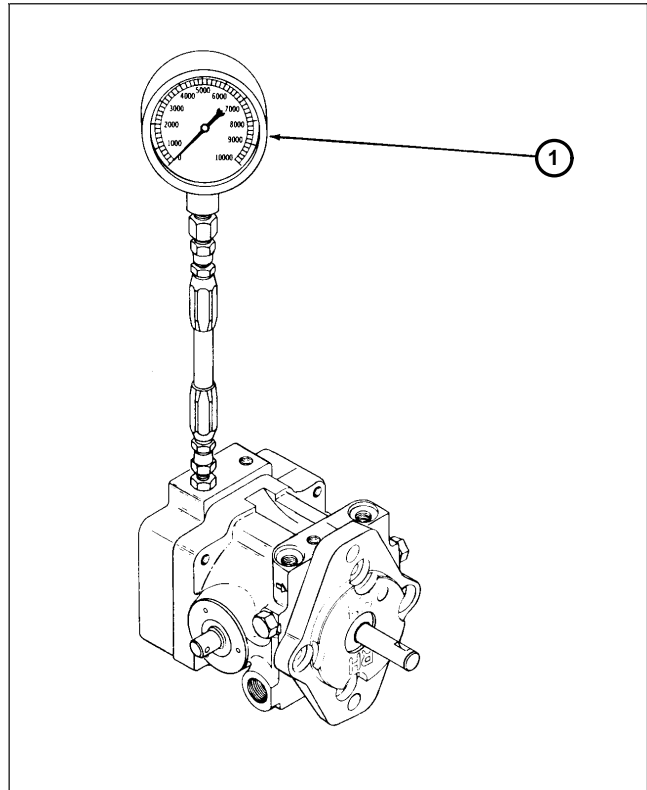


Figure 21

1. 10,000 PSI hydraulic pressure gauge

Test Hook-up No. 5: Traction Pressure (Reelmaster 216-D only) (Fig. 22)

Gauge Connection

Connect a 10,000 PSI hydraulic pressure gauge with extension hose to forward traction pressure quick disconnect fitting on hydraulic tube line.

TEST A: Traction Pressure

1. Make sure pump drive belt is properly adjusted and in good condition.
2. Make sure hydraulic oil is at operating temperature.
3. Operate engine at full speed:

Reelmaster 216: 3600 ± 100 RPM
Reelmaster 216-D: 3200 ± 100 RPM

4. Attach a heavy chain to rear frame of machine and then to something solid in shop. Engage parking brake.



CAUTION

Keep everyone clear from the front of unit during traction system tests. Operator must be on seat or the safety interlock will stop the engine when the traction pedal is depressed.

5. While watching pressure gauges, slowly push traction pedal into forward until maximum pressure is obtained.

GAUGE READING: 4000 – 4500 PSI.

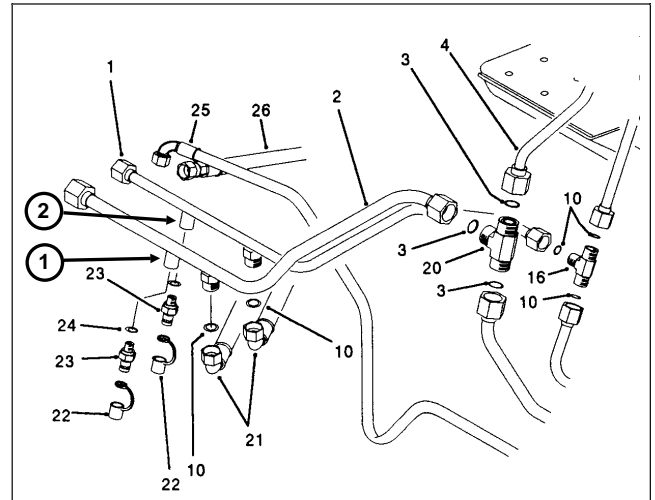


Figure 22

1. Forward traction test port
2. Reverse traction test port

Adjustments

Adjusting Transmission For Neutral (Reelmaster 216) (Fig. 23)

If the machine “creeps” when the traction control pedal is in the neutral position, the spring leaf assembly must be adjusted.

1. Block up under the frame so one of the front wheels is off the floor. Place selector control in two wheel drive position.

2. Start engine, move throttle to SLOW and check front wheel that is off shop floor; it must not be rotating. If wheel is rotating forward, loosen capscrews and lightly tap bottom of pump plate counterclockwise (as viewed while facing pump plate). Lightly tap pump plate clockwise if wheel is rotating backward. When wheel stops rotating, tighten capscrews holding pump plate against side of pump. Verify the adjustment with throttle in SLOW and FAST position.

3. Should the wheel continue to rotate, check for the following:

- A. Ball bearing is loose or worn out.
- B. Plunger on interlock switch is sticking.
- C. loose or missing fasteners.
- D. Worn missing fasteners.
- E. Pump lever loose on control shaft. (Correct by applying Loctite 271 or 601 to shaft).
- F. Weak or damaged leaf springs. Replace.
- G. Internal pump component malfunction.

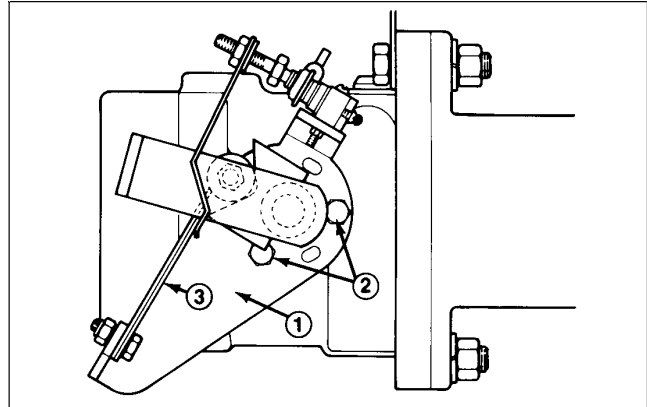


Figure 23

- 1. Pump plate
- 2. Capscrews
- 3. Leaf springs

Adjusting Transmission For Neutral (Reelmaster 216-D) (Fig. 24, 25)

If the machine “creeps” when the traction control pedal is in the neutral position, the spring leaf assembly must be adjusted.

1. Block up under the frame so one of the front wheels is off the floor. Place selector control in two wheel drive position.

2. To expose spring leaf assembly, remove (4) screws securing right fender to frame and remove fender.

3. Start engine, move throttle to SLOW and check front wheel that is off shop floor; it must not be rotating. If wheel is rotating forward, loosen capscrews and lightly tap bottom of pump plate counterclockwise (as viewed while facing pump plate). Lightly tap pump plate clockwise if wheel is rotating backward. When wheel stops rotating, tighten capscrews holding pump plate against side of pump. Verify the adjustment with throttle in SLOW and FAST position.

4. Should the wheel continue to rotate, check for the following:

- A. Ball bearing is loose or worn out.
- B. Plunger on interlock switch is sticking.
- C. Loose or missing fasteners.
- D. Worn fasteners.
- E. Pump lever loose on control shaft. (Correct by applying Loctite 271 or 601 to shaft).
- F. Weak or damaged leaf springs. Replace.
- G. Internal pump component malfunction.

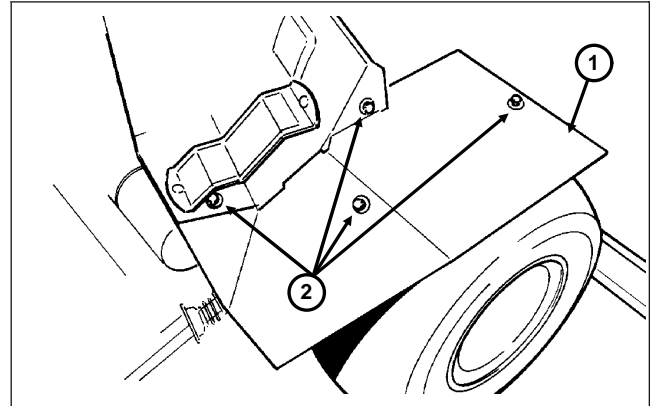


Figure 24

- 1. Right fender
- 2. Fender mounting screws

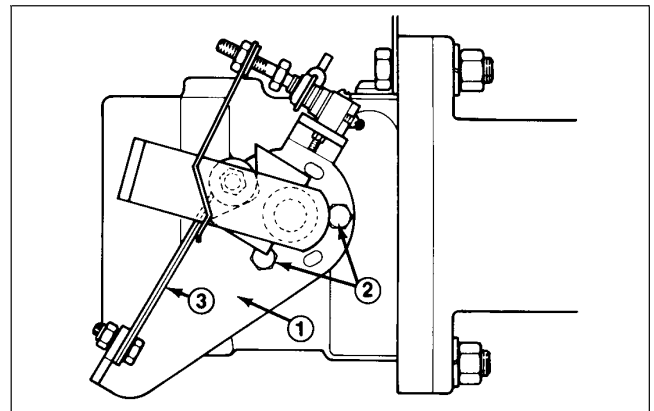


Figure 25
(View from bottom)

- 1. Pump plate
- 2. Capscrews
- 3. Leaf springs

Adjusting Tracton Pedal (Reelmaster 216) (Fig. 26, 27)

If traction pedal contacts footrest when pushed fully forward or you cannot get maximum forward traction speed, an adjustment to the traction pedal linkage is required. There should be 3/8 inch clearance between pedal shaft and footrest when pedal is pushed fully forward.

1. Remove (3) self-tapping screws securing support screen to hydraulic support panel. Remove screen.
2. Loosen jam nuts on each end of traction rod.
3. Rotate rod to get a dimension of 3/8 inch between traction pedal shaft and R.H. footrest when pedal is pushed fully forward.
4. Re-tighten jam nuts securing traction rod and reinstall support screen.
5. The stop for reverse travel (under pedal) may be adjusted for slower travel. Speeds in excess of 3 M.P.H. are not recommended.

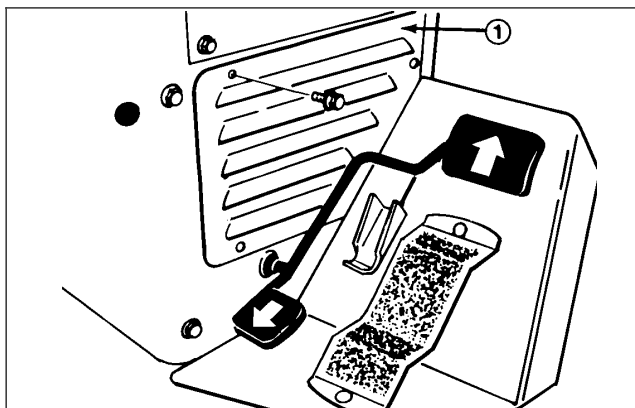


Figure 26

1. Support screen

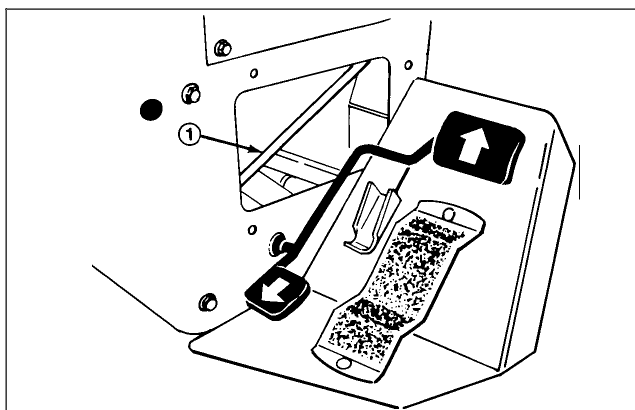


Figure 27

1. Traction rod

Adjusting Traction Pedal (Reelmaster 216-D) (Fig. 28, 29)

If traction pedal contacts footrest when pushed fully forward or you cannot get maximum forward traction speed, an adjustment to the traction pedal linkage is required. There should be 1/16 inch between pedal stop cam and R.H. footrest when pedal is pushed fully forward.

1. To expose traction rod, remove (4) screws securing right fender (Fig. 58) to frame and remove fender.
2. Loosen jam nuts on each end of traction rod.
3. Rotate rod until required to get a dimension of 1/16 inch between pedal stop cam and R.H. footrest when pedal is pushed fully forward.
4. Re-tighten jam nuts securing traction rod adjustment.
5. The stop for reverse travel (under pedal) may be adjusted for slower travel. Speeds in excess of 3 MPH are not recommended.

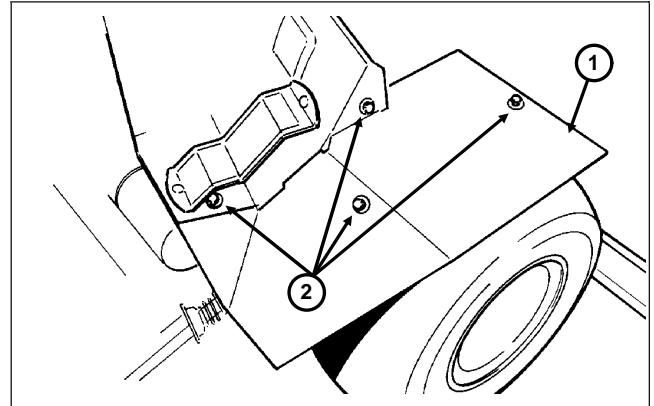


Figure 28

1. Right fender
2. Fender mounting screws

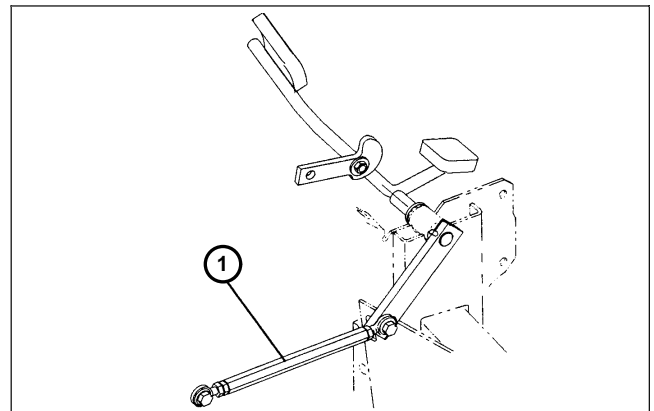


Figure 29

1. Traction rod

Pump Belt Adjustment (Fig. 30)

Make sure belts are properly tensioned to assure proper operation of the machine and unnecessary wear. Check belt midway in span of belt. Check tension again on new belts after 8 hours of operation.

Tighten nut on adjustment rod until desired belt tension is attained. Belt should be tightened to 140 lbs. of tension.

NOTE: Tighten belt to eliminate slippage (squeeling under load) but do not overtighten.

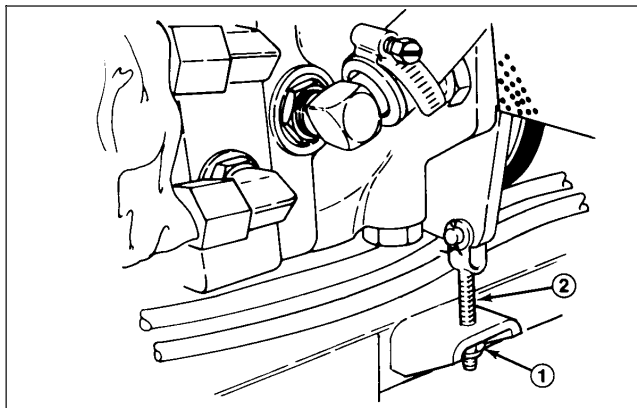


Figure 30

- 1. Nut
- 2. Adjustment rod

Repairs

Removing Hydraulic System Components

1. Thoroughly clean the machine before disconnecting, removing or disassembling any hydraulic components. Always keep in mind the need for cleanliness when working on hydraulic equipment.
2. Put caps or plugs on any hydraulic lines or fittings left open or exposed.
3. Put labels on disconnected hydraulic lines and hoses for proper installation after repairs are completed.

After Repair or Replacement of Components

1. Check oil level in hydraulic reservoir and add correct oil if necessary. Drain and refill hydraulic system reservoir and change oil filter if component failure was severe or system is contaminated.
2. After repairs, check control linkage for proper adjustment, binding or broken parts.

3. If a pump was disconnected or removed, prime system before operating. Disconnect fuel stop solenoid electrical connector on diesel engine or disconnect ignition wires on gasoline engine. Turn ignition switch to engage starter for five (5) seconds to prime pump. Repeat cranking procedure again. Connect injection pump fuel stop solenoid electrical connector on diesel engine or connect ignition wires on gasoline engine. Start engine and run at idle speed for a minimum of two (2) minutes.

4. After disconnecting or replacing any hydraulic components, operate machine functions slowly until air is out of system.

5. Check for hydraulic oil leaks. Shut off engine and correct leaks if necessary. Check oil level in hydraulic reservoir and add correct oil if necessary.

Charge Pump (Fig. 31)

1. Note orientation of charge pump housing to adjacent housing. Scribe a line or make punch marks to assure proper re-installation.

2. Clean the shaft extension to remove all sharp edges, burrs and abrasive residue to prevent shaft seal damage.

3. Remove hex head screws (Item 24) and slide the housing assembly (Item 21, 22, & 23) over shaft holding the charge pump (gerotor) cartridge and remove drive pin (Item 26).

4. Remove the shaft seal (Item 23) and bearing (Item 22) from housing only if replacement is necessary.

5. Examine the wear surfaces of pump cartridge for excessive scratching or heavy wear patterns. Replace both parts of this cartridge, if necessary. Do not replace or interchange individual parts within the cartridge. The drive pin should always be replaced.

6. Visually inspect bearing (Item 22), O-ring (Item 27), and shaft seal (Item 23) and replace as required.

7. Coat both sides of pump cartridge (Item 25) and housing face with hydraulic oil. Install drive pin (Item 26) into hole in shaft, then slide pump cartridge (Item 25) into place.

8. Wrap the shaft extension with plastic and then coat with hydraulic oil to prevent damage to shaft seal.

9. Place O-ring into housing assembly (Item 21, 22, & 23), then slide assembly into position over shaft. Line up location marks, then insert torque screws (Item 24).

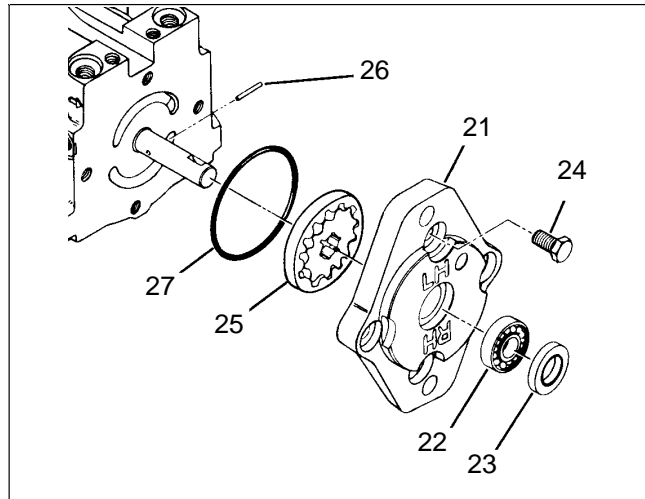


Figure 31

Pump Shaft & Trunnion Seals (Fig. 32)

Lip type seals are used throughout the pump. These seals can be replaced without disassembly of the pump; however, replacement of either the input or output seal requires removal of the pump from the machine.

1. Pry the seal carefully out of the housing bore, using care not to distort the housing or damage the bore or shaft. Once removed, the seal is not reusable.

2. Before installing the new seal, polish the shaft extension, wrap it in thin plastic and lubricate with hydraulic oil to insure that the seal is not damaged during assembly. Slide the seal over the shaft and press it into the housing bore.

3. To service the trunnion shaft seals it is necessary that the retaining rings (Item 13) and washers (Item 11) be removed before removing the seals. The washer should be replaced if it is noticeably bent or distorted.

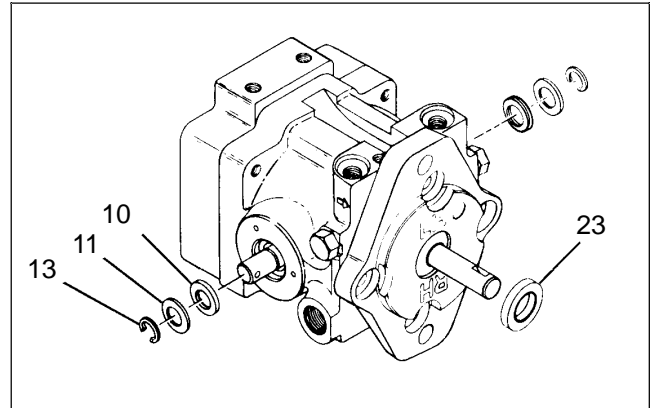


Figure 32

Pump Check Valves (Fig. 33)

1. Remove plug (Item 50) then slide the spring (Item 48) and ball (Item 47) out of the housing.

2. Inspect the ball and seat in housing for damage and remove any foreign material in the valve area.

3. Replace parts as required and reinstall into housing bore.

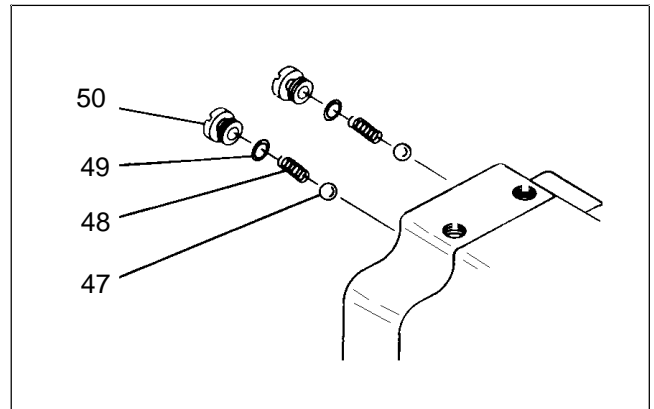


Figure 33

Pump Relief Valves (Fig. 34)

1. Remove plug ,then slide the spring and poppet out of the housing.

IMPORTANT: Do not interchange parts between charge and implement relief valves. Do not alter shims unless adjusting pressure setting of valve.

2. Inspect the poppet and seat in housing for damage and remove any foreign material in the valve area.

3. Replace parts as required and reinstall into housing bore.

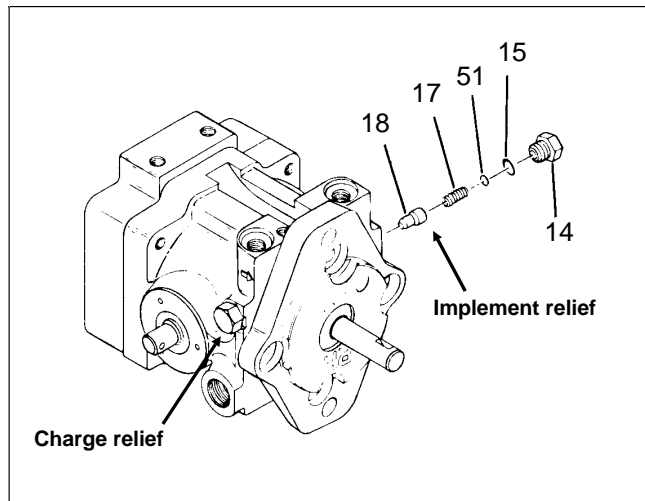


Figure 34

Pump Disassembly (Fig. 35, 36, 37, 38)

The following procedures are for major repair of the variable displacement pump. These instructions begin with the removal of the end cap. Remove the charge pump, seals, check valves and relief valves before doing major disassembly (See procedures on previous pages of this section).

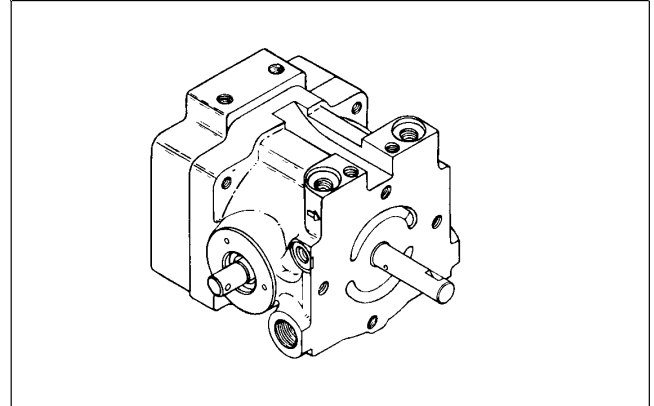


Figure 35

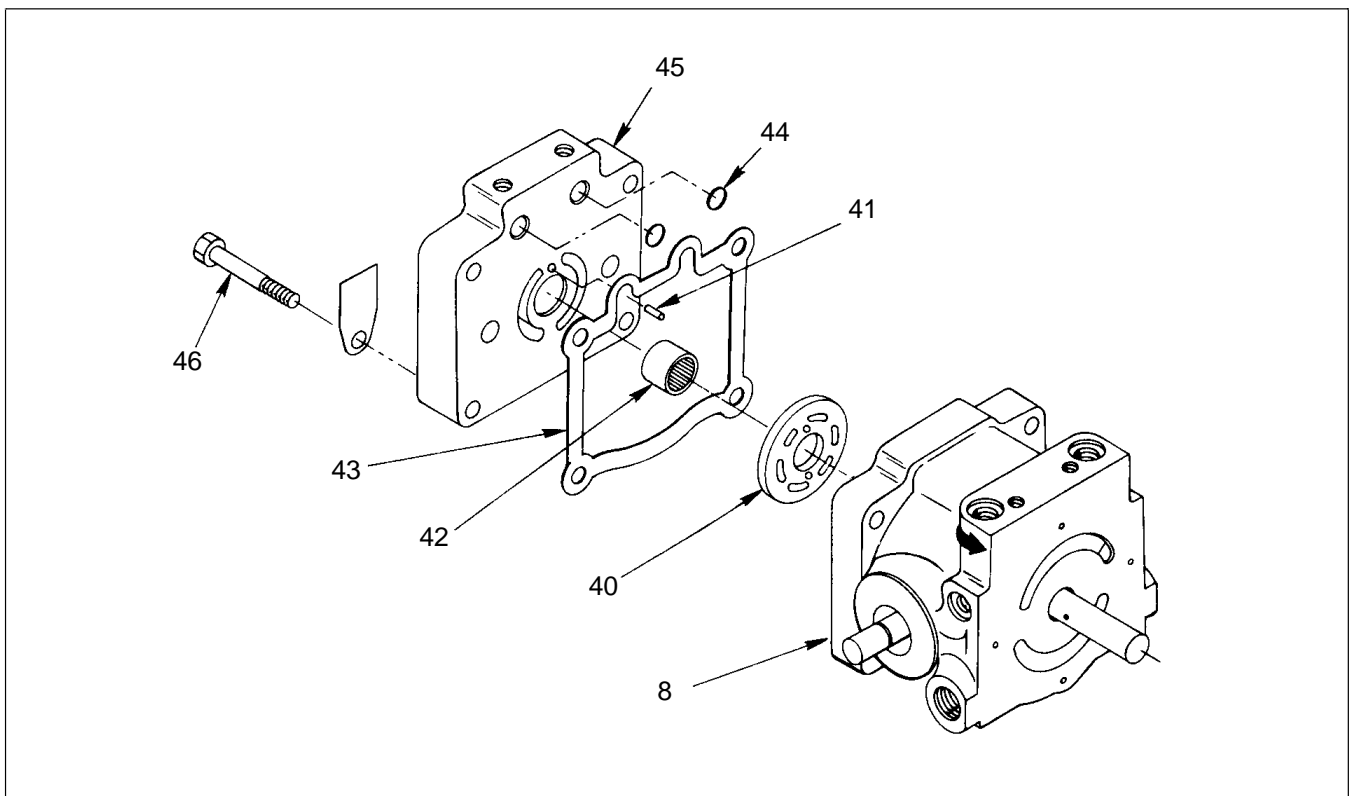


Figure 36

1. When cap screws (Item 46) are loosened, internal spring loading will cause end cap (Item 45) to separate slightly. Loosen screws evenly to prevent distortion of parts. If separation does not occur as screws are loosened, tap end cap with soft hammer until parts separate.

IMPORTANT: Most parts have critical, high tolerance surfaces. Use caution to prevent damage to these surfaces during assembly. Protect exposed surfaces, opens and ports from damage and foreign material.

2. Remove end cap (Item 45), however, make sure valve plate (Item 40) does not fall and become damaged. If valve plate tends to lift off with end cap, hold it in place on end cap and remove both parts together. If valve plate remains on cylinder block, remove it at this time.

3. The end cap is an assembly consisting of a needle bearing which is a press fit in the end cap and the valve plate locating pin (Item 41). Inspect bearing (Item 42) and remove if replacement is required.

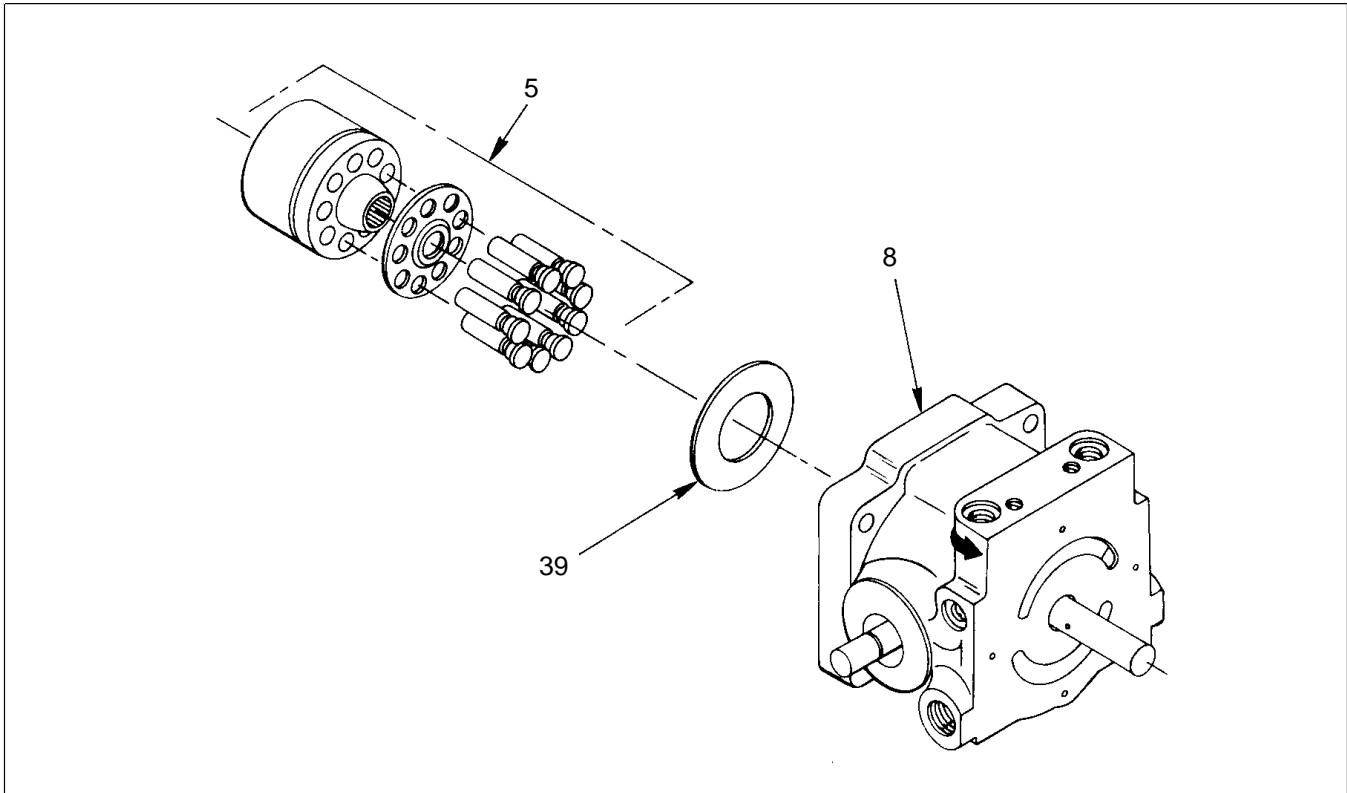


Figure 37

4. Lift out the cylinder block assembly (Item 5). The pistons may come out of the cylinder block. There is no special orientation of piston to bore that needs to be maintained. Do not attempt to disassemble the spring and other parts from the center bore of the cylinder block. The entire cylinder block assembly (Item 5) should be replaced if any of its components are damaged.

5. Visually inspect wear surfaces of valve plate, cylinder block and slippers for damage. Check to be sure pistons are free in bores.

6. Remove thrust plate (Item 39) from counterbore in face of swashplate (Item 37). Visually inspect both sides for damage and flatness.

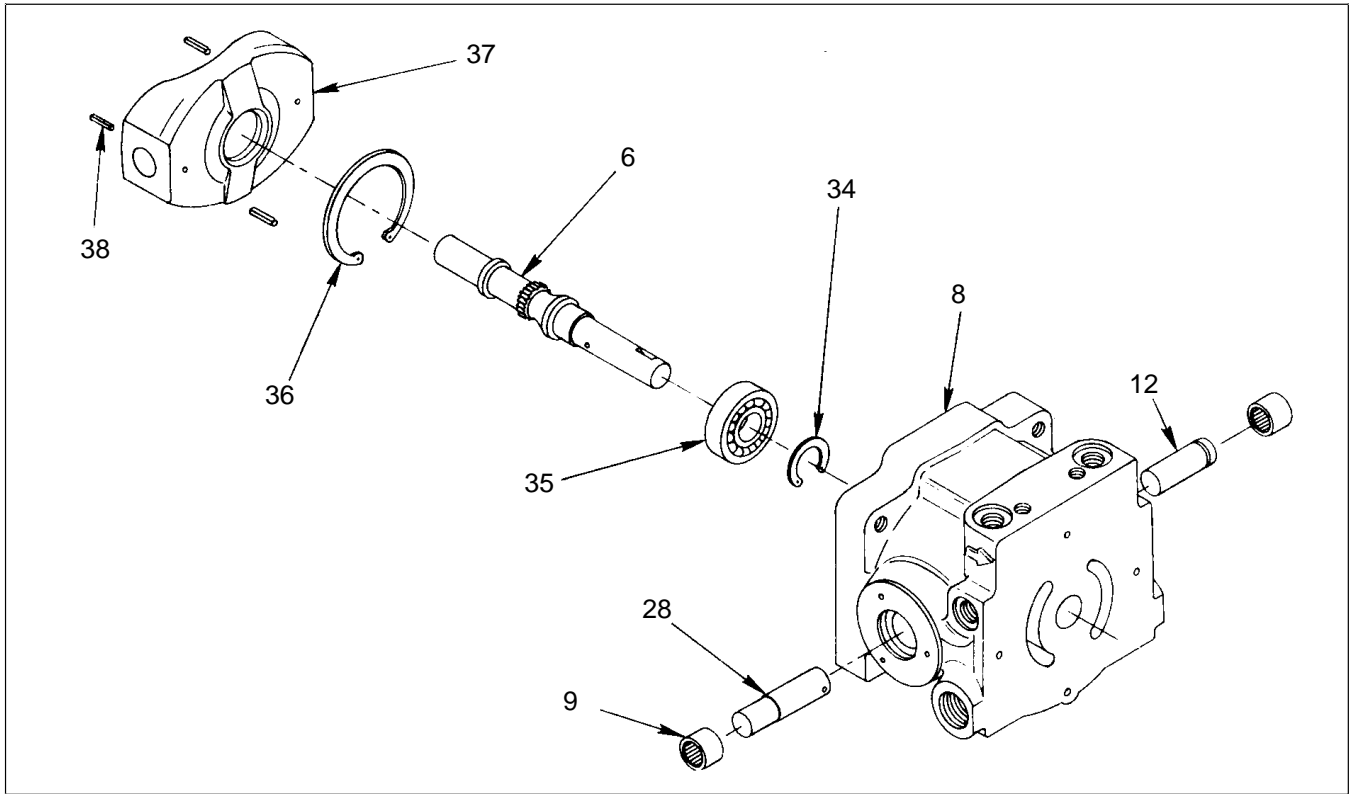


Figure 38

7. Place the pump housing (Item 8) with the large cavity up. Use care not to scratch the port face surface.
8. Using a 3/16 in. diameter drift punch, drive spring pin (Item 38) out of trunnion and control shafts (Item 12 & 28). The pump housing is provided with a cast recess so that the pins can be driven free of trunnion and control shafts.
9. Drive each trunnion shaft out of swashplate bore toward outside of housing. Once clear of swashplate

bore, the shaft can be removed easily. The swashplate (Item 37) is then removed from the pump housing.

10. Inspect the needle bearings (Item 9). If replacement is required press out the old bearings.
11. Remove retaining ring (Item 36) from housing, then press out shaft and bearing assembly (Item 6, 34 & 35). The bearing (Item 35) can be removed from shaft, if necessary, after removing retaining ring (Item 34).

Assembly of Pump (Fig. 39, 40, 41, 42)

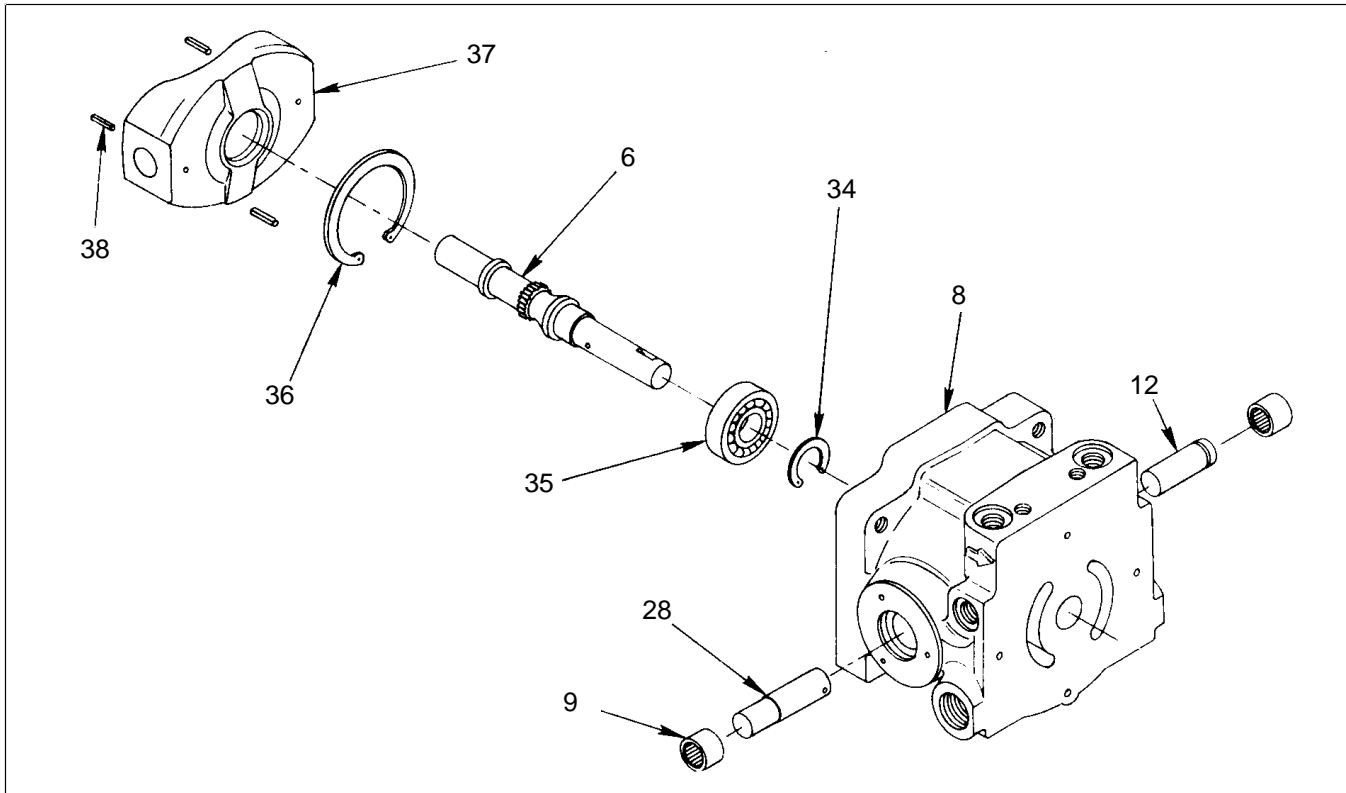


Figure 39

1. Before assembling, wash parts in solvent. Dry parts with compressed air. Do not wipe them dry with a cloth or paper as lint and dirt may remain. Apply a light coating of hydraulic oil to parts before assembling.

IMPORTANT: Most parts have critical, high tolerance surfaces. Use caution to prevent damage to these surfaces during assembly. Protect exposed surfaces, opens and ports from damage and foreign material.

2. Assemble shaft (Item 6), bearing (Item 35) and retaining ring (Item 34) then press into housing (Item 8). Install retaining ring (Item 36) in groove in housing.

3. Place housing (Item 8) with large cavity up. Use care not to scratch the port face surface.

4. Press needle bearings (Item 9) into each side of housing until flush to 1/64 inch below counterbore for lip seals.

5. Place swashplate (Item 37) into housing with counterbore for thrust plate up. Install control shaft (Item 28) and trunnion shaft (Item 12) being certain control shaft is on proper side. Align holes in swashplate and shafts.

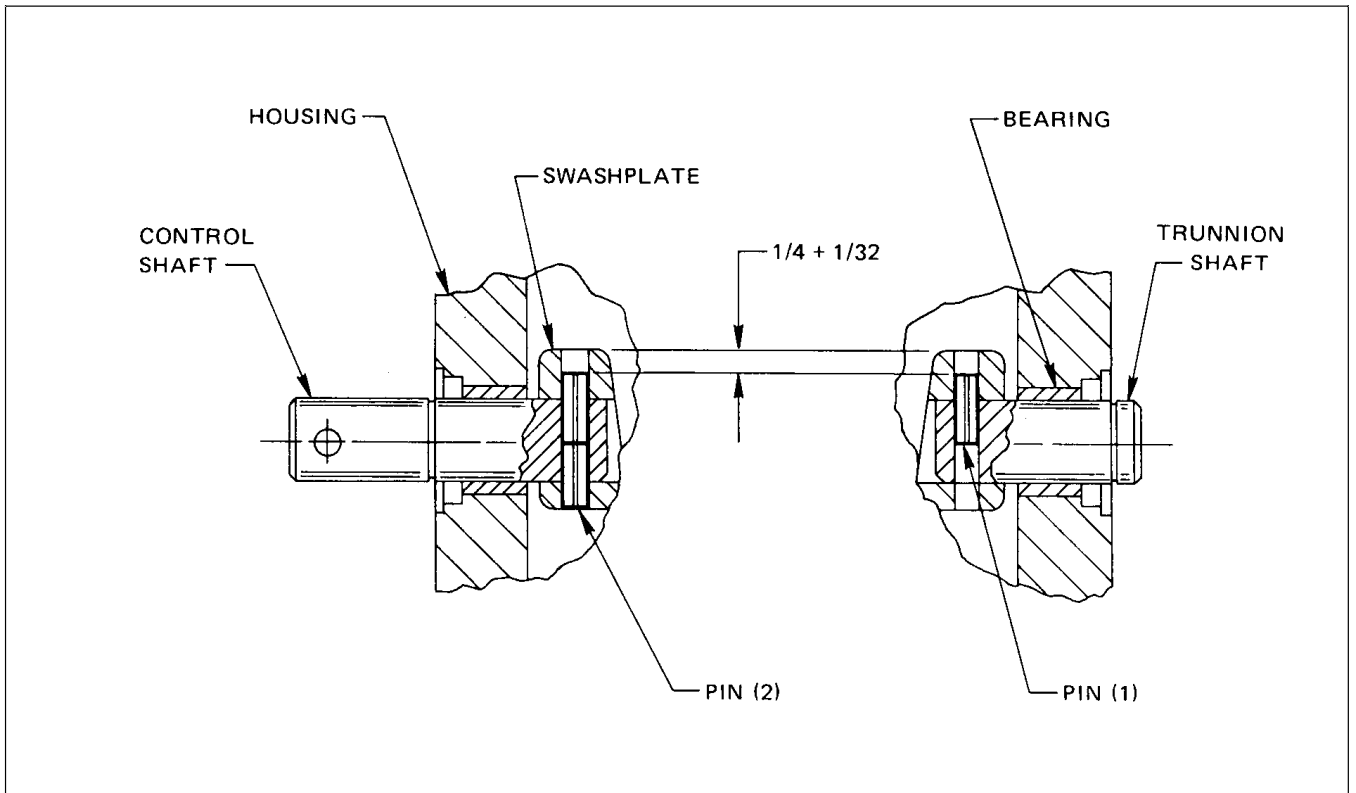


Figure 40

6. Install new pins through swashplate and shaft. Use two (2) pins in control shaft (Item 28), installing first pin until second pin can be started, then driving in both pins together until the last pin is $1/4$ inch below swashplate.

7. Install one (1) pin in trunnion shaft (Item 12), driving it in until it is $1/4$ inch below swashplate.

8. The swashplate should swing freely in the pump housing to 150° each side of center.

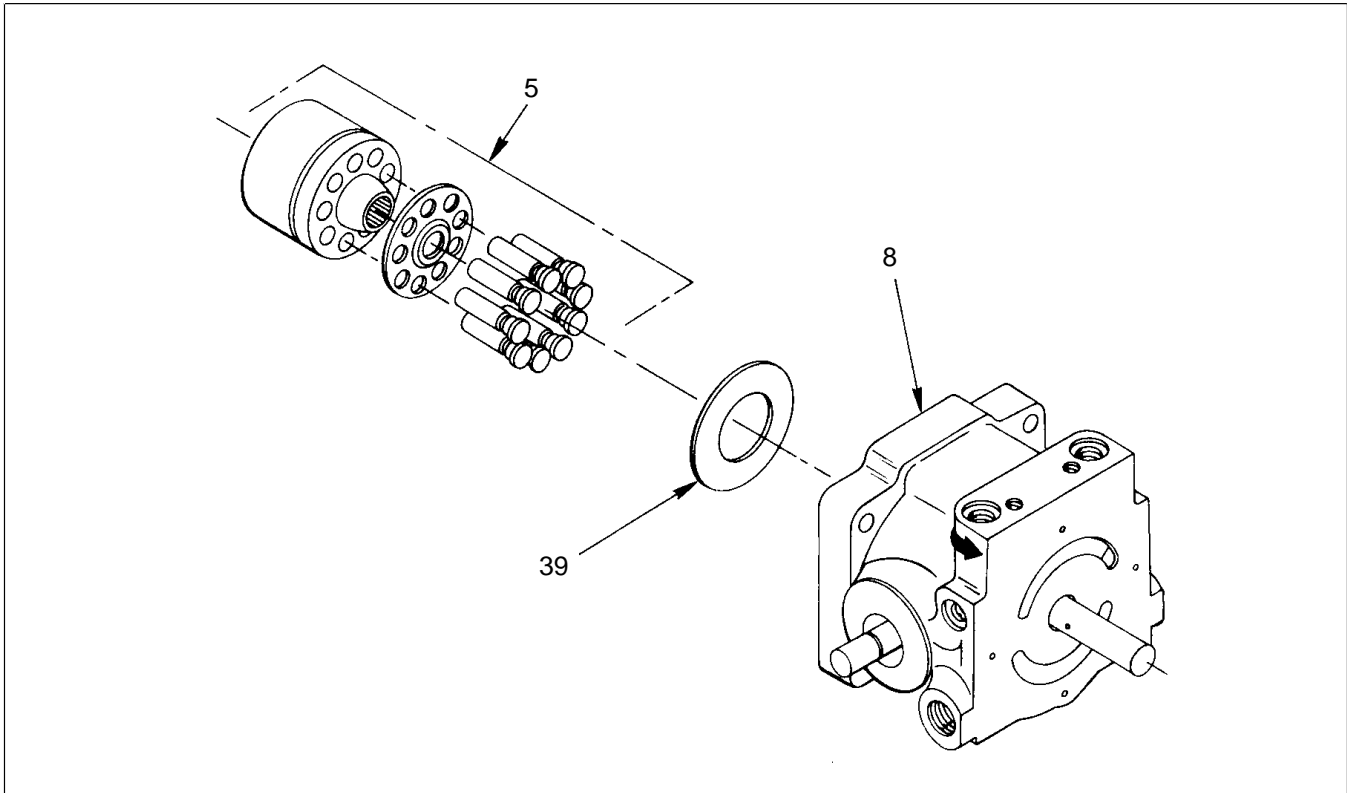


Figure 41

9. Lubricate thrust plate (Item 39) with clean hydraulic oil and insert in counterbore of swashplate.

10. Assemble cylinder block parts if necessary and lubricate with clean hydraulic oil. There is no special orientation of piston to bore that needs to be maintained.

11. Place the housing assembly in a horizontal position.

12. Slide cylinder block assembly (Item 5) over shaft and engage spline. Be certain that pistons and thrust plate remain in place. When properly installed a slight spring tension can be felt when pushing on cylinder block.

13. Lubricate exposed face of cylinder block with clean hydraulic oil.

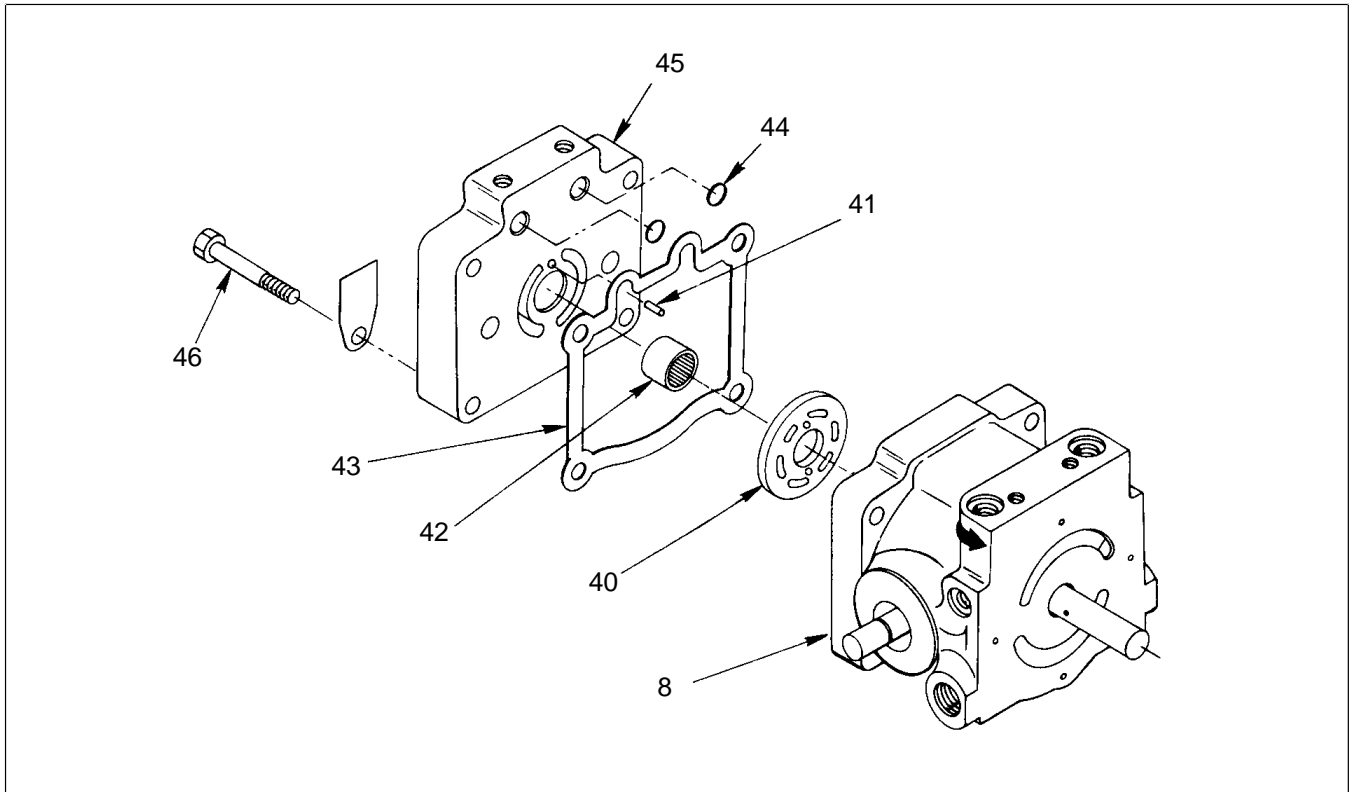


Figure 42

14. Properly orient the end cap (Item 45) and housing (Item 8). Align the O-rings (Item 44) with the mating holes in the housing.

15. Press bearing (Item 42) into end cap leaving $\frac{3}{32}$ to $\frac{1}{8}$ inch protruding beyond face. The valve plate (Item 40) pilots on this bearing.

16. Insert locating pin (Item 41) into end cap. Lubricate the slotted side of the pump valve plate (Item 40) and slip it over the pin and protruding bearing.

17. Place the gasket (Item 42) on housing (Item 8) then install end cap and valve plate. Hold the valve plate so it does not drop off during assembly.

18. Install four (4) screws (Item 46) and tighten alternately until the end cap and housing are pulled completely together. Torque to 27-37 ft. lbs. Check for proper internal assembly by slowly rotating pump and control shafts while tightening these screws.

19. The remaining components (charge pump, charge relief valve, seals, etc.) can now be assembled described on previous pages.

Wheel Motor (Fig. 43)

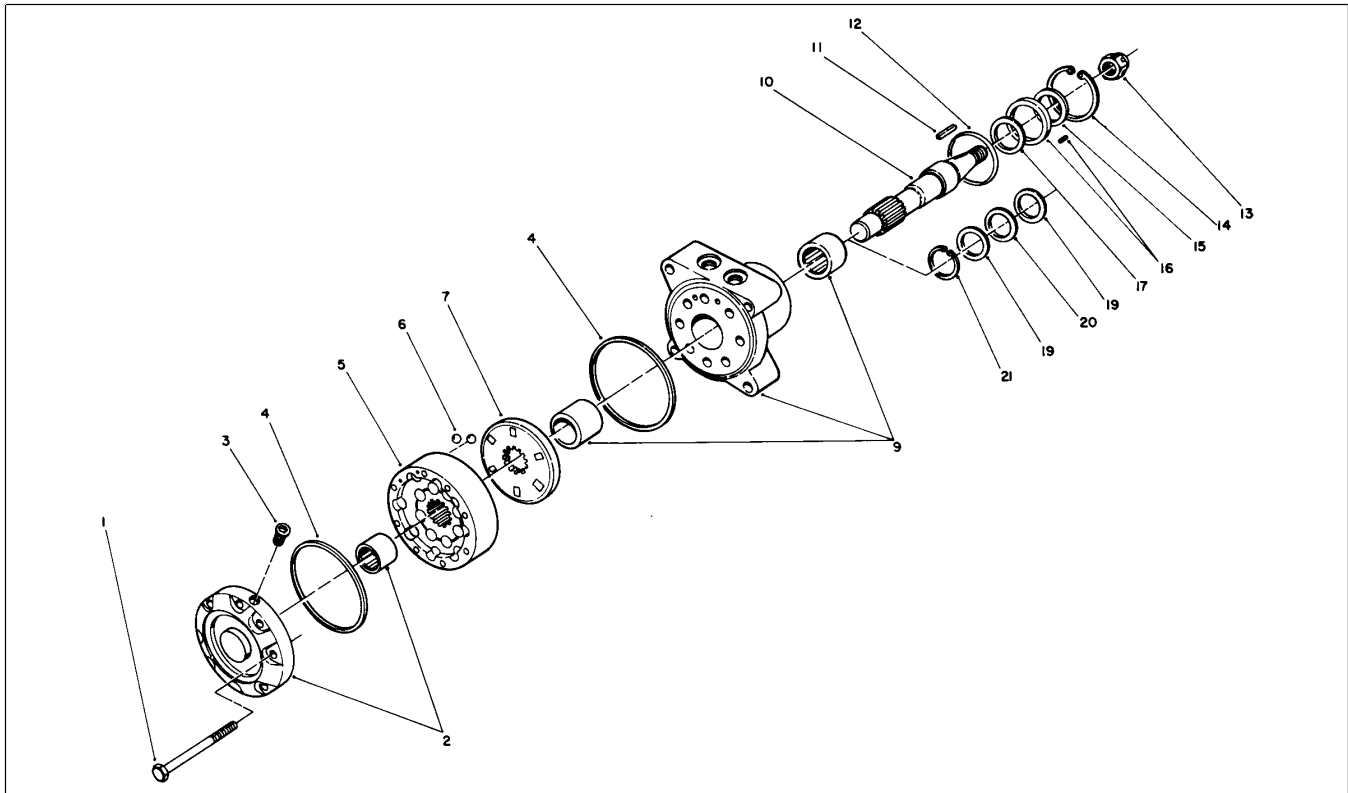


Figure 43

- | | | |
|--------------------------|----------------------------|--------------------|
| 1. Screw | 9. Body & bearing assembly | 16. Retainer pin |
| 2. Cover & bearing ass'y | 10. Shaft | 17. Lip seal |
| 3. Plug | 11. Key | 19. Thrust washer |
| 4. Seal | 12. O-ring | 20. Thrust bearing |
| 5. IGR assembly | 13. Nut | 21. Snap ring |
| 6. Check ball | 14. Snap ring | |
| 7. Valve plate | 15. Dust seal | |

Disassembly of Shaft and Front Seal Assembly

- Put the motor on a clean, flat surface with the shaft facing up. Clean the front end of the motor to avoid contaminating the internal parts during the procedure.
- Remove key (Item 11) from the shaft.
- Remove the snap ring (Item 14) using a snap ring pliers.
- Pull the shaft (Item 10) out vertically.

IMPORTANT: When pulling shaft vertically, do not rotate the shaft or move the motor as this may alter internal timing.

5. With the seal retainer assembly and shaft assembly removed, remove all the parts from the shaft and inspect the various parts of the seal assembly (Item 15, 16, 17), shaft (Item 10) and thrust bearing assembly (Item 19, 20, 21). Replace any worn or damaged parts. Always replace the seal retainer assembly (Item 15, 16, 17). The

shaft should have smooth polished surfaces in the bearing and seal areas. If the shaft is lightly scratched in these areas, polish with fine emery paper in a circumferential direction. However, if the shaft has any pitting or deep scratches, the entire motor should be disassembled for inspection.

Assembly of Shaft and Front Seal Assembly

- Assemble the thrust washers (Item 19) and thrust bearing (Item 20) on the shaft using the snap ring (Item 21). The snap ring sharp edges **MUST** face away from the thrust washers with the thrust bearing (Item 20) between the washers.
- Slowly lower the spline end of the shaft (Item 10) assembly into the motor body using caution not to rotate the internal parts once the shaft spline starts to engage.
- Put the lightly oiled o-ring (Item 12) into the groove in the body bore.

4. Gently slide the oiled seal retainer assembly (Item 15, 16, 17) over the shaft, chamfered side first, and press into the body bore. When fully in place, the body snap ring groove will be visible.

5. Install the snap ring (Item 14) into its body groove with the snap ring's sharp edges facing outward and the retainer pin between the snap ring lugs, Be sure the snap ring is completely seated in the groove.

Disassembly of Cover Section of Motor

IMPORTANT: Before DISASSEMBLING the motor, plug open ports and clean all dirt from the outside of the motor.

1. Remove the key (Item 11) from the shaft.

2. Mount the motor in a vice or other holding device with the shaft facing down.

3. Remove the eight bolts (Item 1).

4. Remove the cover/bearing assembly (Item 2) and the square ring seal (Item 4).

5. Remove the IGR set components (Item 5) starting with the outer locating ring, rollers, outer rolls, inner rotor and valve plate (Item 7). If any of these components are damaged, the entire IGR assembly must be replaced.

6. Remove the two check balls (Item 6).

NOTE: The check balls may fall into the body tapered holes or into the body valve ports during disassembly. Be sure that the check balls are removed.

Disassembly of Shaft Section of Motor

(See Disassembly of Shaft and Front Seal Assembly under Main Shaft Seal and/or Shaft Replacement.)

Assembly of Complete Motor

IMPORTANT: Before ASSEMBLING the motor, lightly oil all seals, rollers and threaded bolt ends.

1. Before assembly, all parts must be clean free of nicks and burrs. Wash parts in solvent. Dry parts with compressed air. Do not wipe them dry with a cloth or paper as lint and dirt may remain.

2. Mount the body with the pilot and bearing facing up in a vise or other holding mechanism.

3. Insert the shaft (Figure 37, Item 10) and install seals and thrust bearings. (See Assembly of Shaft and Front Seal Assembly under Main Shaft Seal and/or Shaft Replacement.)

4. Mount the body with the pilot and bearing facing down in a vise or other holding fixture.

5. Put the rotary valve (Item 7) on the shaft spline with "T" shaped slots on first.

6. Next put the IGR inner member on the shaft spline with the semi-circular roll pockets between the rotary valve ports. NOTE: This step "times" the motor for rotation.

7. Put the contour member of the IGR over the inner and insert seven rolls into the inner pockets (large diameter rolls).

8. Lightly oil the square ring seal (Item 4) and put in the body groove.

9. Put the check balls (Item 6) over the two 1/8" inch diameter holes in the body. Be sure the check balls do not fall into the body tapped holes.

10. Put the locating ring section (4.5 inch diameter) of the IGR (Item 5) onto the body with the check ball holes facing downward over the balls. Align the eight bolt holes in the locating ring with the eight holes in the body. The holes align in only one position.

NOTE: Be sure not to dislodge the body square ring seal while moving the locating ring.

11. Install the eight locating ring rollers (small diameter rolls) into their pockets and oil lightly.

12. Put the other lightly oiled square ring seal (Item 4) into the groove in the cover and put the cover over the shaft end and align the bolt holes.

13. Install the eight bolts with the lightly oiled thread ends into the bolt holes and tighten diagonally to 30 ft-lb. The motor is now ready for installation.

NOTE: The shaft may not turn freely after assembly. A short running period may be required.

When installing the wheel hub onto the motor shaft, tighten the castle nut (Item 13) to 80-90 ft-lb, then continue tightening until the cotter pin slot lines up the hole in the shaft.

Lift Control Valve (Fig. 44)

1. After removing control valve from machine, wash valve in solvent and dry it thoroughly.

2. Carefully mount control valve into a vise so that control valve mounting pads are against jaws of vise. The control valve spool snap ring (Item 14) should be facing up.

3. Remove plug (Item 1) from side of valve body. Inside the valve body, under the plug, there is a spring (Item 3), ball (Item 4), and cam pin (Item 6); remove these parts.

4. Repeat step 3 for the other plug.

5. Remove snap ring (Item 14) located in bottom of valve body. This snap ring retains spool centering spring assembly. Remove spool snap ring (Item 13), spring retainer (Item 10), spacer (Item 12), and spring (Item 11).

6. Carefully push and twist control valve spool to remove it from valve body. Set spool assembly aside.

7. Use a hooked scribe or thin screwdriver to remove O-rings (Item 9) from inside bore of valve body (be careful not to scratch valve bore finish).

8. Inspect all components of control valve assembly for wear, paying special attention to valve spool. Signs of wear on one side of spool may indicate a bent spool. Inspect spool for flatness, and replace it if necessary.

9. Wash parts in solvent. Dry parts with compressed air. Do not wipe them dry with a cloth or paper as lint and dirt may remain.

10. Prior to reassembly, coat all O-rings with oil. Install spool into valve body before inserting cam pin (Item 6), ball (Item 4), spring (Item 3), and hex plug (Item 1).

11. Complete reassembly by reversing these procedures and installing new O-rings and seals.

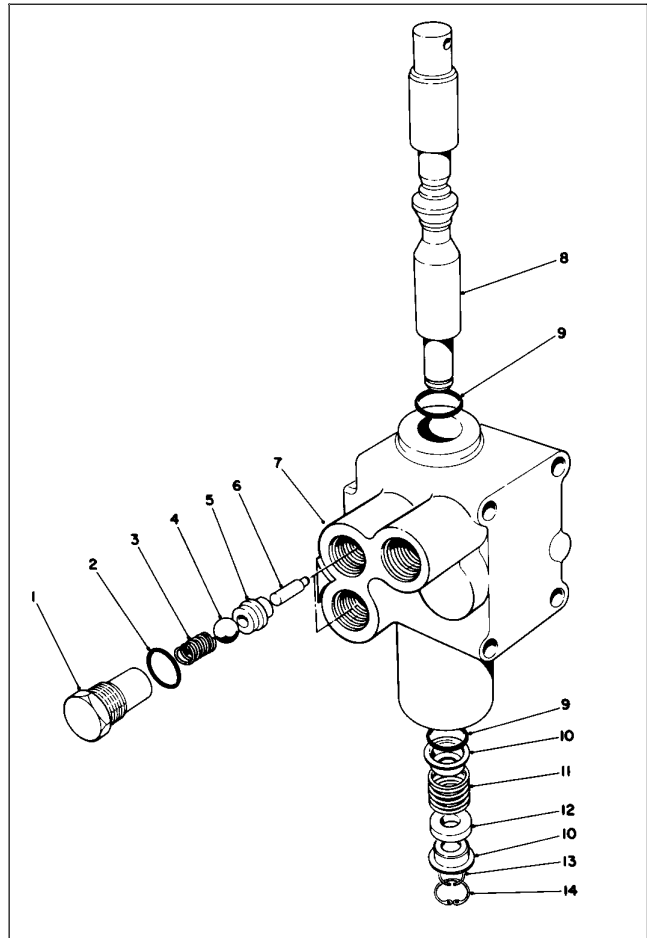


Figure 44

Lift Cylinder (Fig. 45, 46, 47)

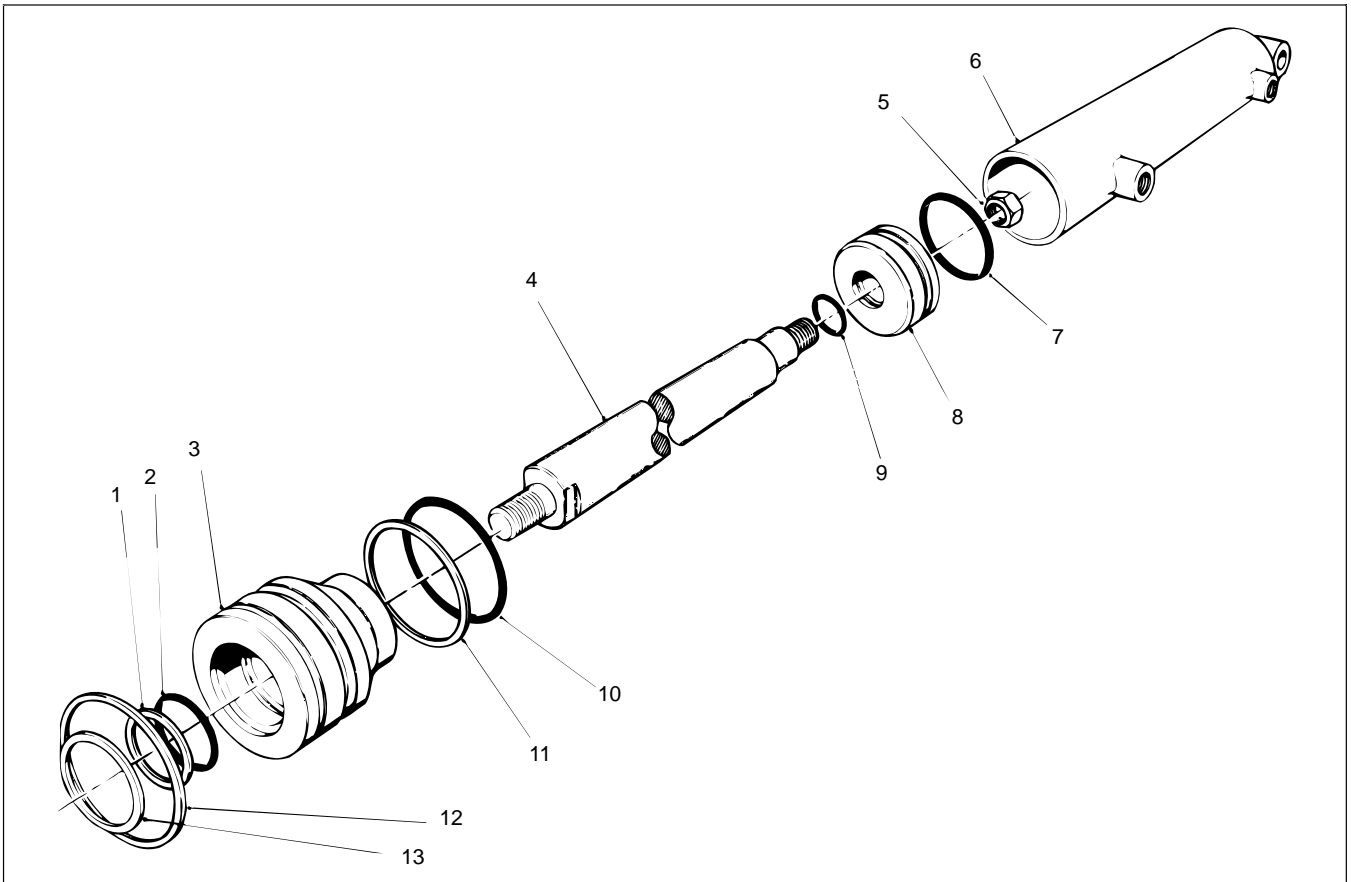


Figure 45

1. After removing cylinder, pump oil out of cylinder into a drain pan by SLOWLY moving cylinder's piston in and out of cylinder bore.

2. Plug ports and clean the outside of cylinder.

IMPORTANT: To prevent damage when clamping cylinder barrel in a vise, clamp only on pivot end.

3. Mount cylinder in a vise so shaft end of cylinder is tilted up slightly. Do not close vise so firmly that the barrel could become distorted.

4. Use a spanner wrench to rotate head (Item 3) and remove retaining ring (Item 12).

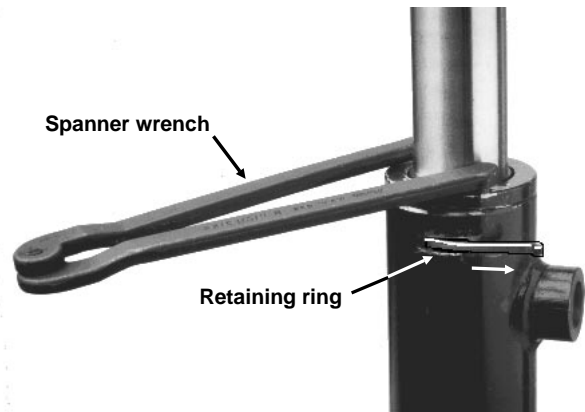


Figure 46

Removing retaining ring

5. Grasp end of shaft (Item 4) and use a twisting and pulling motion to carefully extract piston (Item 8), shaft (Item 4), and head (Item 3) from barrel (Item 6).

IMPORTANT: Do not clamp vise jaws against shaft surface. Protect shaft surface before mounting in vise.

6. Securely mount shaft (Item 4) in a vise, clamping vise on flats of shaft. Remove lock nut (Item 5) from the piston end of shaft. Remove the piston. Slide head (Item 3) off of shaft.

7. Remove and discard all seals and back-up rings (Items 1–2, 7, 9–11, 13).

8. Wash parts in solvent. Dry parts with compressed air. Do not wipe them dry with a cloth or paper as lint and dirt may remain.

9. Inspect internal surface of barrel (Item 6) for damage (deep scratches, out-of-round, etc.). Inspect head (Item 3), shaft (Item 4) and piston (Item 8) for evidence of excessive scoring, pitting, or wear. Replace any defective parts.

10. Use new seals (Items 1–2, 7, 9–11, 13) when reassembling. Put a light coating of hydraulic oil on all new seals and back-up washers. Install the new seals and back-up washers. Install head (Item 3) onto shaft (Item 4). Install piston (Item 8) onto shaft and tighten lock nut (Item 5).

11. Put a light coating of hydraulic oil on all cylinder parts to ease assembly. Slide shaft assembly and head into barrel being careful not to damage seals.

12. Install retaining ring (Item 12) to secure assembly in barrel. Align key slot in head with access groove in barrel. Rotate head clockwise as far as the retaining ring will allow. The offset end of the retaining ring will be against the left side of the barrel groove as shown (Fig. 47).

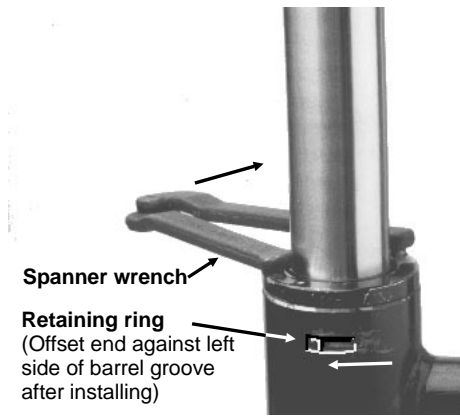


Figure 47

Installing retaining ring

3WD Selector Valve (Fig. 48)

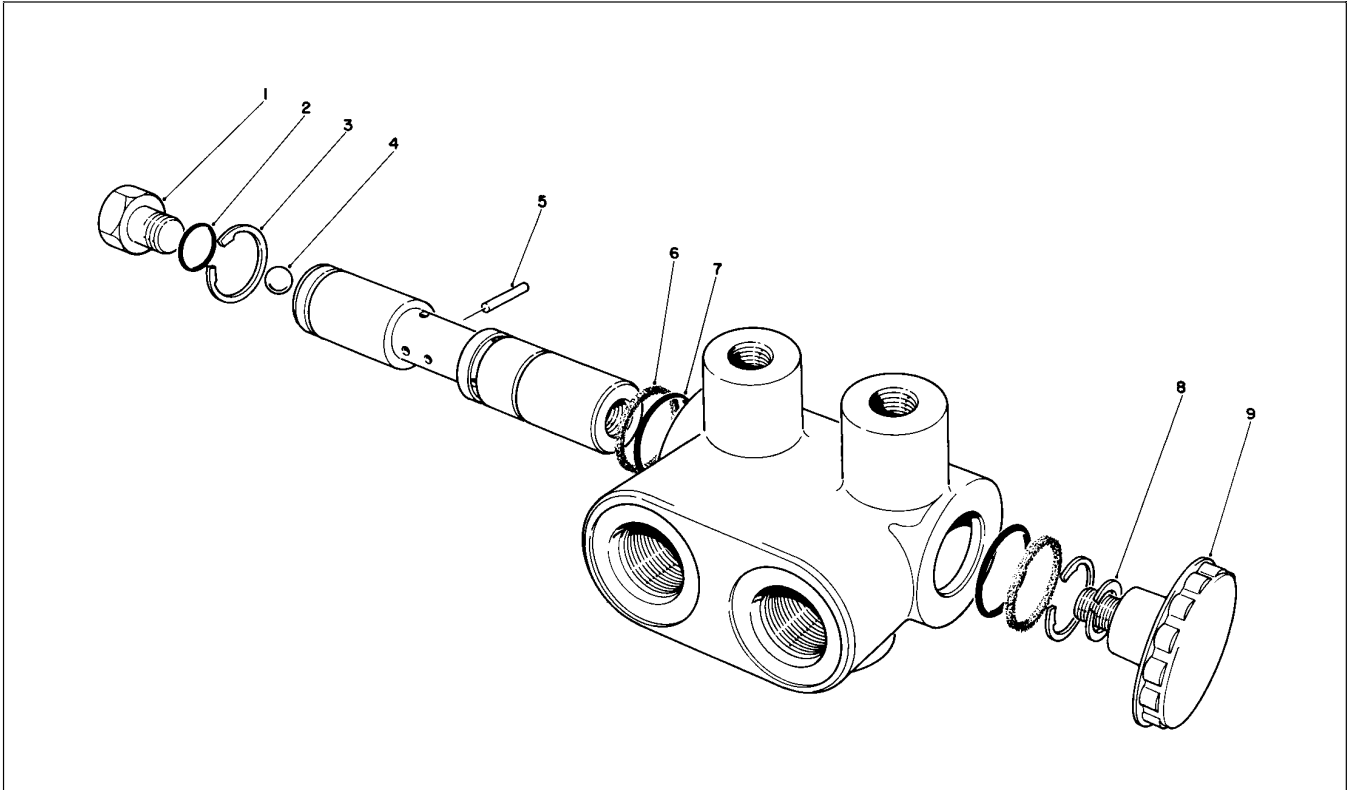


Figure 48

1. After removing selector valve from machine, wash valve in solvent and dry it thoroughly.
2. Carefully mount valve assembly into a vise so that control valve mounting pads are against jaws of vise.
3. Remove retaining ring (Item 3) from end of spool.
4. Use knob (Item 9) to carefully pull and twist valve spool out of the valve body.
5. Remove roll pin (Item 5). Be careful not to scratch or damage spool.
6. Remove plug (Item 1) from end of spool (be careful not to drop ball (Item 4) which can fall out after plug is removed. Hold the spool with one hand and allow check ball fall into your other hand..
7. Use a hooked scribe or thin screwdriver to remove back-up washers (Item 6) and O-rings (Item 7) from inside bore of valve body (be careful not to scratch valve bore finish).
8. Inspect all components of control valve assembly for wear, paying special attention to valve spool. Signs of wear on one side of spool may indicate a bent spool. Inspect spool for flatness, and replace it if necessary.
9. Wash parts in solvent. Dry parts with compressed air. Do not wipe them dry with a cloth or paper as lint and dirt may remain.
10. Use new seals (Items 2, 6, 7). Before assembling, coat all O-rings and back-up rings with hydraulic oil. Install new seals (Items 2, 6, 7).
11. Install check ball (Item 4) and roll pin (Item 5). Install plug (Item 1) with new O-ring (Item 2).
12. Coat spool with hydraulic oil and install into valve body, being careful not to damage the seals.
13. Install snap ring (Item 3).

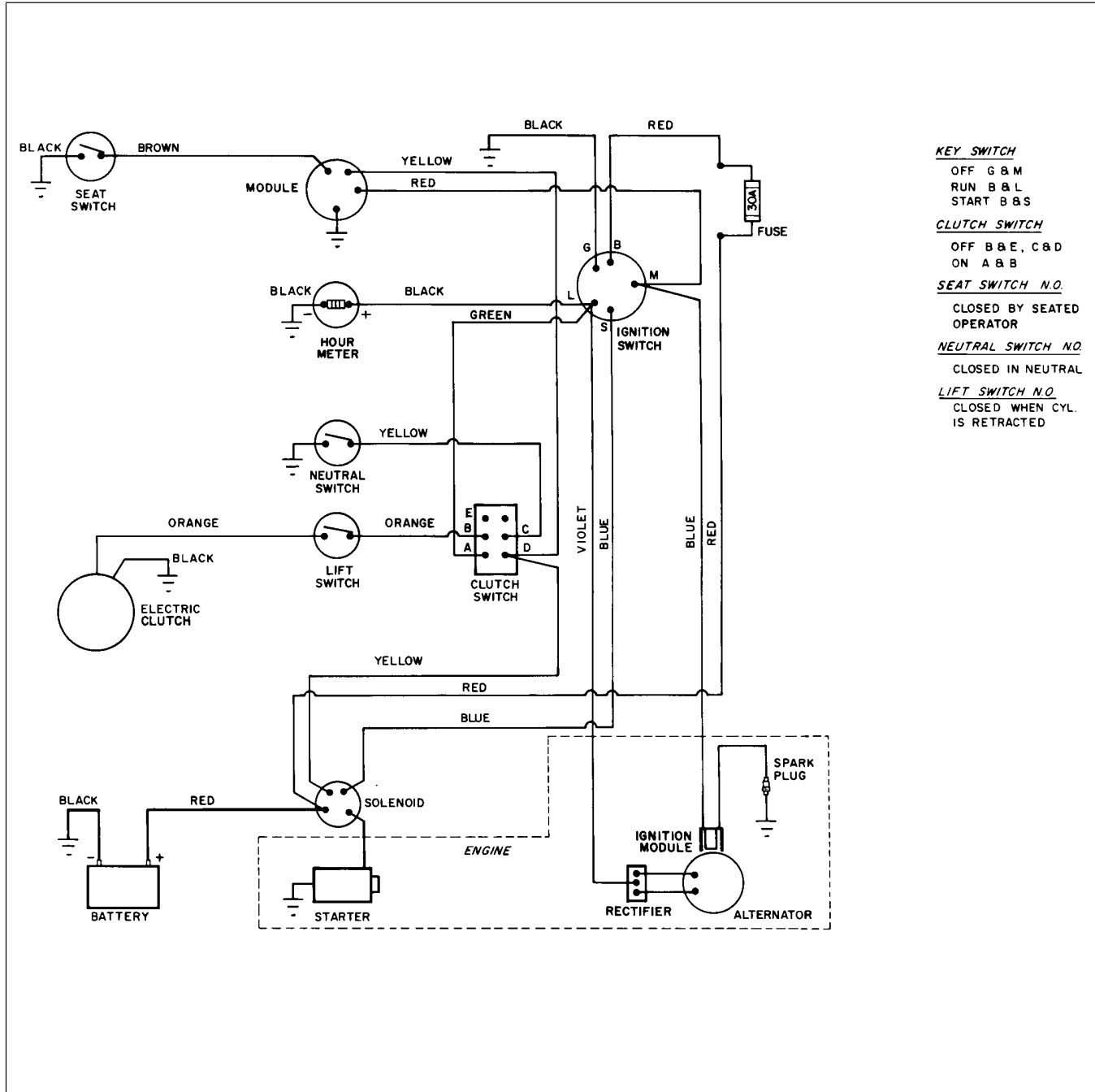


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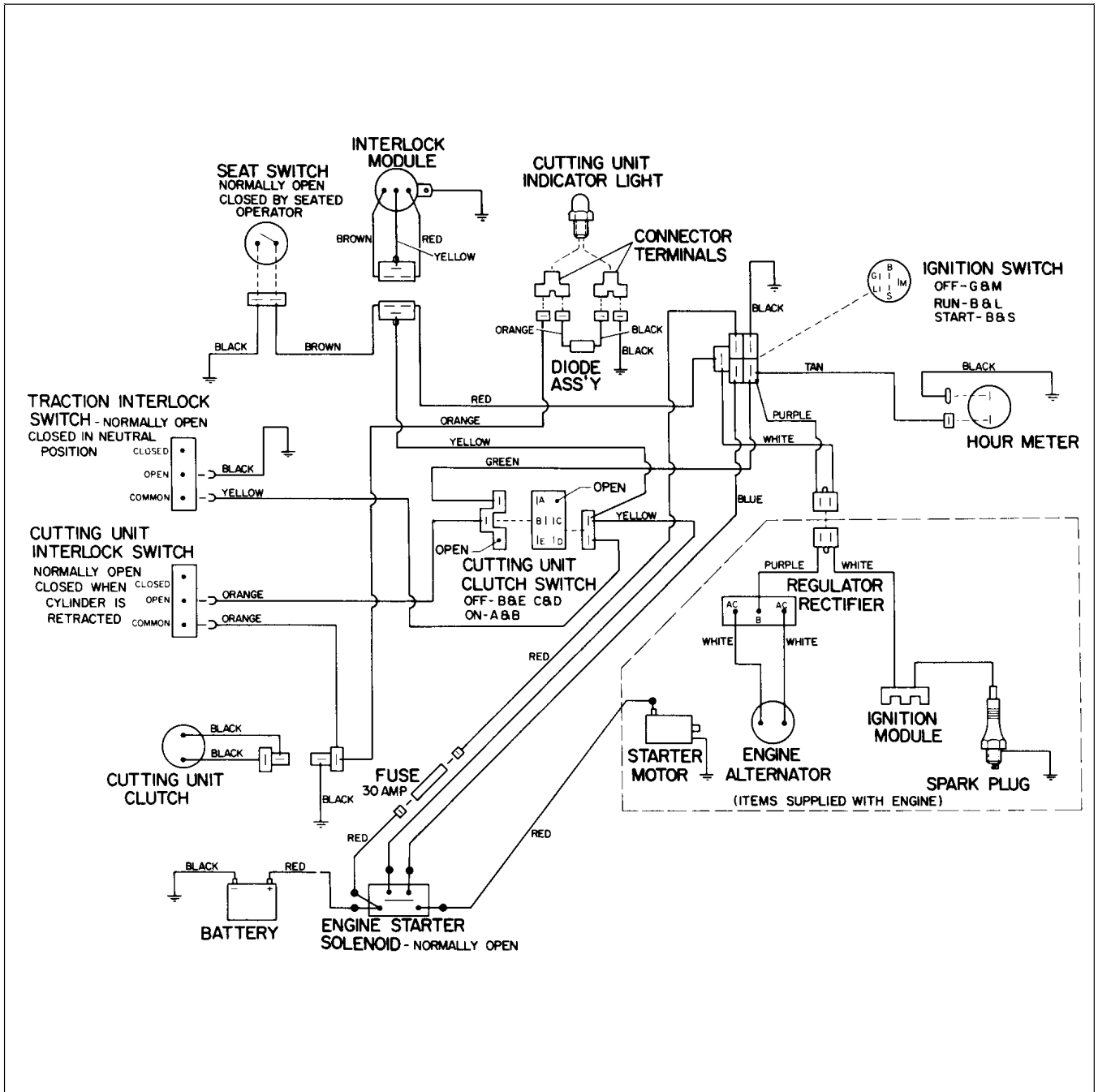
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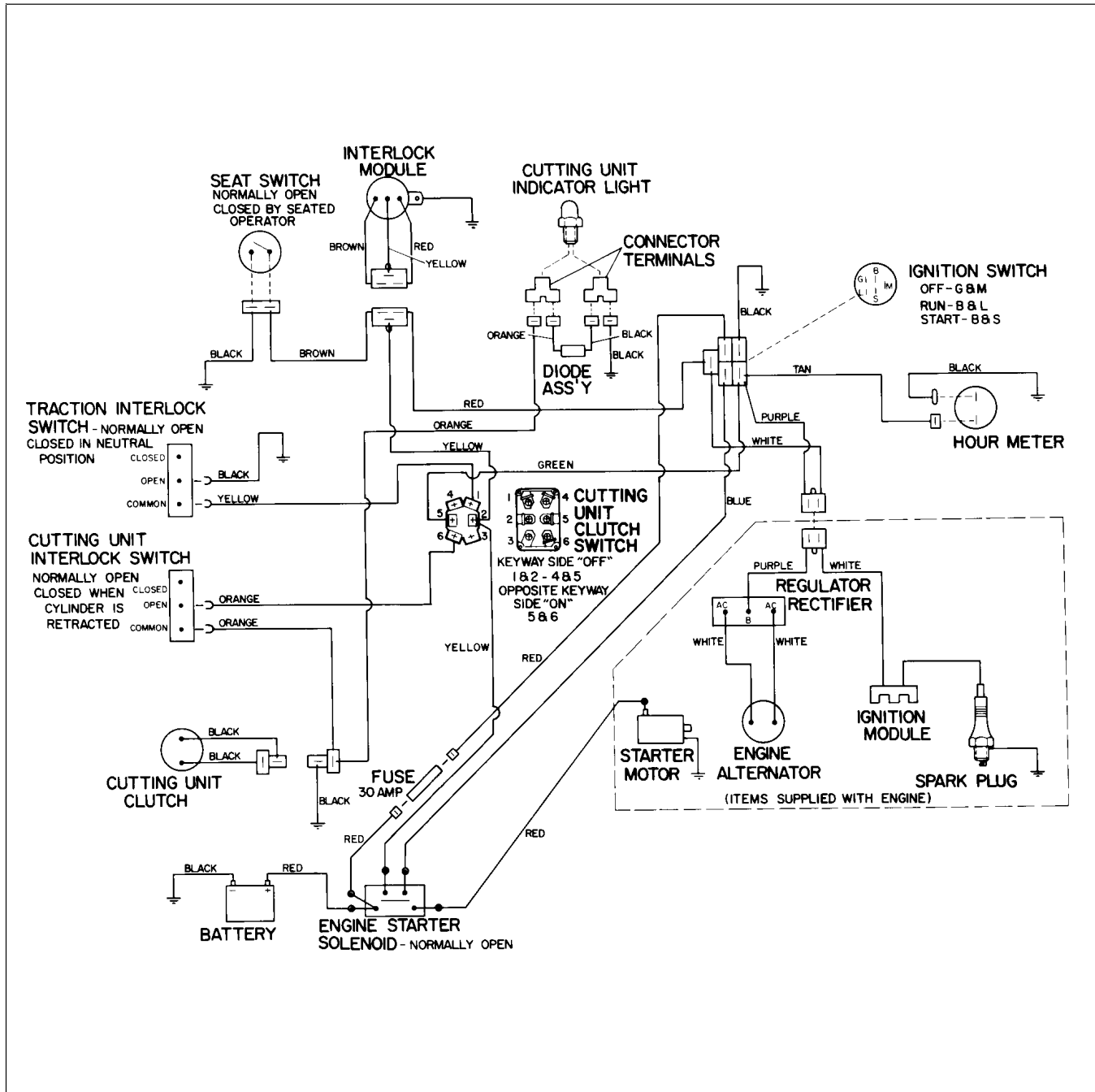
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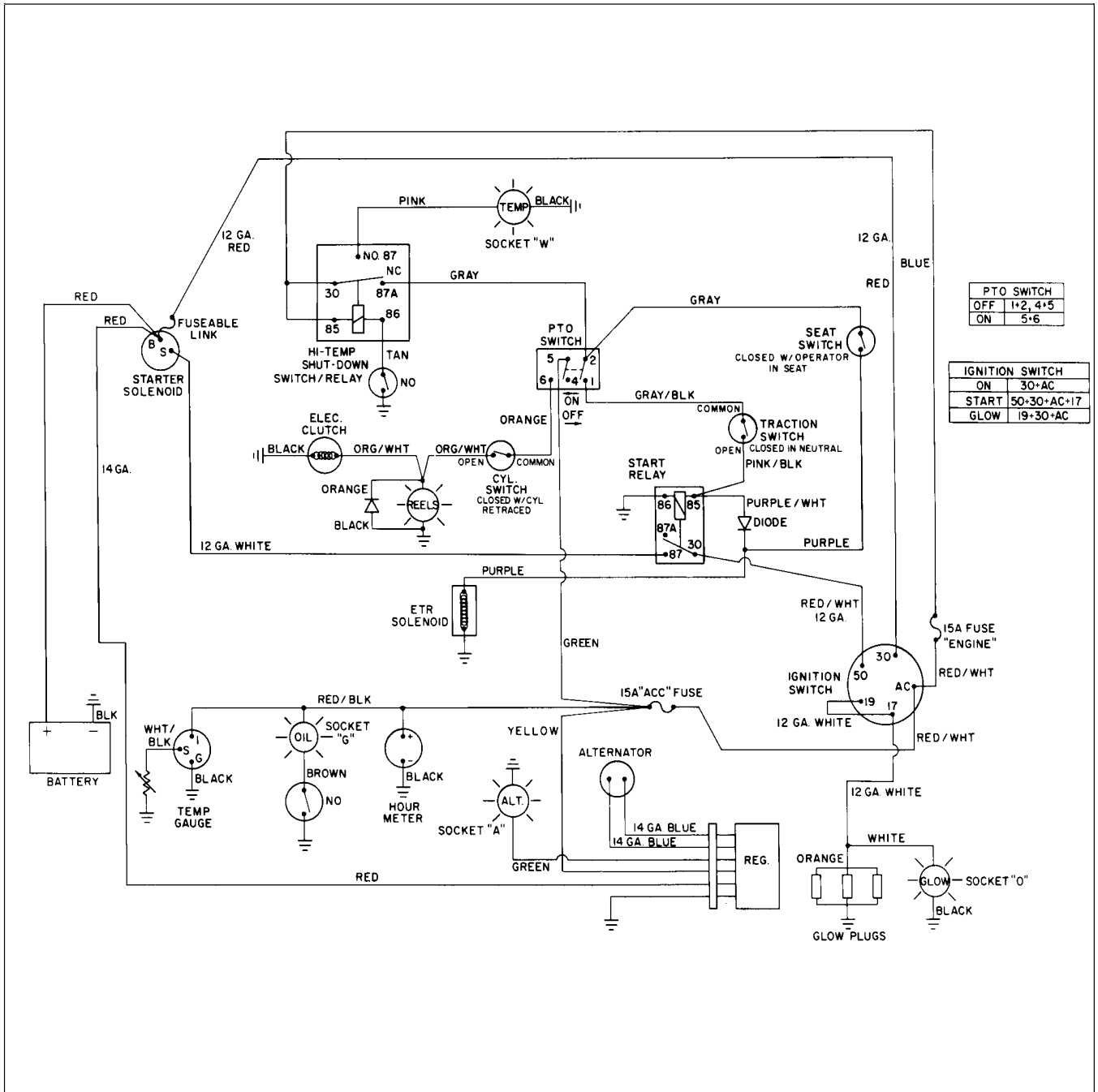
Reelmaster 216 (S/N 10001 – 19999)



Reelmaster 216 (S/N 20001 & Up)



Reelmaster 216-D



Special Tools

NOTE: Order special tools from the *TORO SPECIAL TOOLS AND APPLICATIONS GUIDE (COMMERCIAL PRODUCTS)*. Some tools may be available from a local supplier.

Continuity Tester

Battery powered test lamp which is helpful in testing for continuity of circuits and electrical components when the current is off.

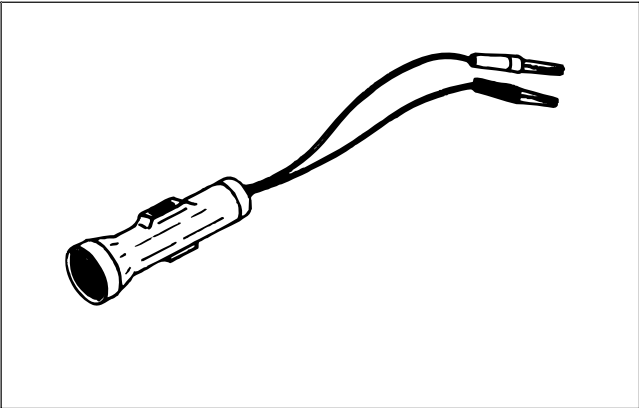


Figure 1

Volt - Ohm - Amp Meter

The meter can test electrical components and circuits for current, resistance, or voltage draw.

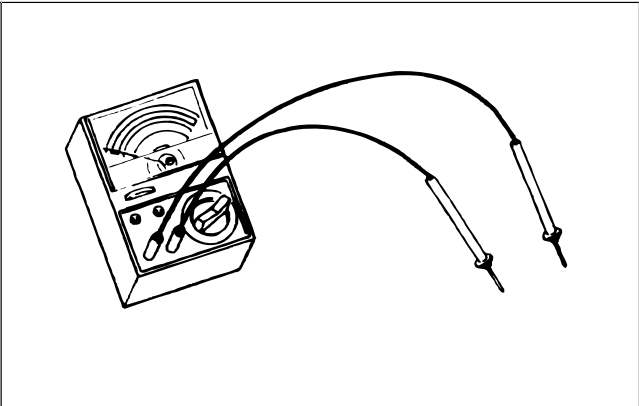


Figure 2

Skin-Over Grease

Special non-conductive grease which forms a light protective skin to help waterproof electrical switches and contacts.



Figure 3

Troubleshooting (Reelmaster 216)



CAUTION

Remove all jewelry, especially rings and watches, before doing any electrical troubleshooting or testing. Disconnect the battery cables unless the test requires battery voltage.

For effective troubleshooting and repairs, you **MUST** have a good understanding of the electrical circuits and components used on this machine. (See Electrical Schematics and Diagrams section of this chapter.)

Study the operating characteristics preceding the electrical failure to help identify the area of difficulty. Try to isolate the failure to a specific functional system; then check that area, repairing one component at a time. Attempting to repair more than one system at one time will lead to confusion.

Possible Causes and Corrections in the troubleshooting charts should be checked in the order in which they are listed.

If the machine being repaired has any interlock switches by-passed, they must be reconnected for proper troubleshooting and safety.

Engine Starting Problems

| Condition | Possible Cause | Correction |
|---|--|---|
| Starter solenoid clicks, but engine will not crank. (If solenoid clicks, problem is not in interlock system.) | Low battery charge | Charge battery. Replace battery if it will not hold a charge. |
| | Loose or corroded battery cables. Loose or corroded ground. | Clean and tighten, or repair as necessary. |
| | Faulty wiring at starter. | Repair wiring. |
| | Loose starter mounting bolts. | Clean mounting surface and tighten bolts. |
| | Faulty starter. | Repair or replace starter. |
| | Faulty starter solenoid. | Replace starter solenoid. |
| | Engine seized. | Repair engine. |

Starting Problems (continued)

| Condition | Possible Cause | Correction |
|--|--|--|
| Nothing happens when start attempt is made. | Battery is dead. | Charge battery. Replace battery if it will not hold a charge. |
| | Loose or corroded battery cables. Loose or corroded ground. | Clean and tighten or repair as necessary. |
| | Fuse open. | Check fuse and replace if fuse is open. If fuse burns out often, find and correct cause. |
| | Traction neutral switch out of adjustment or faulty. | Test switch and replace if faulty. Make sure wires are connected to "COMMON" and "NORMALLY OPEN" (N.O.) terminals. |
| | Traction neutral switch wiring loose, corroded or damaged. | Repair wiring. |
| | Cutting unit clutch switch engaged or faulty. | Make sure switch is OFF. Test switch and replace if faulty. |
| | Cutting unit clutch switch wiring loose, corroded or damaged. | Repair wiring. |
| | Ignition switch faulty. | Test ignition switch. Replace if faulty. |
| | Ignition switch wiring loose, corroded or damaged. | Repair wiring. |
| | Starter solenoid faulty. | Test starter solenoid. Replace if faulty. |
| Starter solenoid wires loose, corroded or damaged. | Clean and tighten or repair as necessary. | |

Starting Problems (continued)

| Condition | Possible Cause | Correction |
|--|---|---|
| Engine cranks, but does not start. | <p>Engine wiring connector or wires loose, corroded or damaged.</p> <p>Engine, engine ignition, or fuel system problem.</p> <p>Interlock module faulty.</p> | <p>Repair wiring.</p> <p>See Troubleshooting section of Kohler Magnum Engine Service Manual.</p> <p>Replace interlock module.</p> |
| Engine cranks (but should not) with traction pedal out of neutral. | Traction neutral switch out of adjustment or faulty. | Test switch and replace if faulty. Make sure wires are connected to "COMMON" and "NORMALLY OPEN" (N.O.) terminals. |
| Engine cranks (but should not) with cutting unit clutch switch ON. | Cutting unit clutch switch faulty. | Replace switch. |

General Run and Transport Problems

| Condition | Possible Cause | Correction |
|--|---|---|
| <p>Engine continues to run (but should not) when traction pedal is depressed with no operator on seat.</p> | <p>Seat switch plunger depressed with no operator on seat.</p> <p>Seat switch faulty or out of adjustment.</p> <p>Traction neutral switch faulty or out of adjustment.</p> <p>Interlock module faulty.</p> | <p>Check for seat support spring that is broken, missing or stuck in down position.</p> <p>Check for binding seat pivot hinge.</p> <p>Check for waterlogged seat.</p> <p>Test seat switch. Adjust or replace if faulty.</p> <p>Test switch, Adjust or replace if faulty. Check for correct terminal connections.</p> <p>Replace interlock module.</p> |
| <p>Engine kills when traction pedal is depressed or cutting unit clutch switch is turned ON.</p> | <p>Operator sitting too far forward on seat (seat switch not depressed).</p> <p>Seat hinge, support pin or spring binding, preventing seat switch from closing.</p> <p>Seat switch is faulty or out of adjustment.</p> <p>Seat switch wiring loose, corroded or damaged.</p> <p>Interlock module wiring loose, corroded or damaged.</p> <p>Interlock module faulty.</p> | <p>Instruct operator.</p> <p>Repair seat pivot and support.</p> <p>Test seat switch. Adjust or replace if faulty.</p> <p>Repair wiring.</p> <p>Repair wiring.</p> <p>Replace interlock module.</p> |
| <p>Battery does not charge.</p> | <p>Loose, corroded or broken wire(s).</p> <p>Faulty alternator.</p> <p>Dead battery.</p> | <p>Repair wiring.</p> <p>Test alternator and replace if faulty.</p> <p>Charge battery. Replace battery if it will not hold a charge.</p> |
| <p>Battery continuously charges at high rate.</p> | <p>Regulator / rectifier faulty.</p> | <p>Replace regulator / rectifier.</p> |

Cutting Unit Operation Problems

| Condition | Possible Cause | Correction |
|---|--|--|
| <p>Engine continues to run (but should not) when cutting unit clutch switch is ON with no operator on the seat.</p> | <p>Seat switch plunger depressed with no operator on seat.</p> <p>Seat switch faulty or out of adjustment.</p> <p>Interlock module faulty.</p> | <p>Check for seat support spring that is broken, missing or stuck in down position.</p> <p>Check for binding seat pivot hinge.</p> <p>Check for waterlogged seat.</p> <p>Test seat switch. Adjust or replace if faulty.</p> <p>Interlock module faulty.</p> |
| <p>Cutting units run (but should not) when raised, but shut off with cutting unit engage switch.</p> | <p>Cutting unit interlock switch faulty.</p> | <p>Test switch and replace if faulty. Make sure wires are connected to "COMMON" and "NORMALLY OPEN" (N.O.) terminals.</p> |
| <p>Cutting units shut off when raised, but do not shut off with cutting unit engage switch.</p> | <p>Cutting unit engage switch faulty.</p> | <p>Test switch. Replace if faulty.</p> |
| <p>Cutting units do not engage.</p> | <p>Fuse open. (NOTE: Hourmeter will also fail to operate.)</p> <p>Cutting unit clutch switch faulty.</p> <p>Cutting unit clutch switch wiring loose, corroded or damaged.</p> <p>Cutting unit interlock switch faulty.</p> <p>Cutting unit interlock switch wiring faulty.</p> <p>Clutch faulty or out of adjustment.</p> <p>Clutch wiring faulty.</p> | <p>Check fuse and replace if fuse is open. If fuse burns out often, find and correct cause.</p> <p>Test switch. Replace if faulty..</p> <p>Repair wiring.</p> <p>Test switch. Replace if faulty. Make sure wires are connected to "COMMON" and "NORMALLY OPEN" (N.O.) terminals.</p> <p>Repair wiring.</p> <p>Test clutch. Make sure clutch air gap is properly adjusted..</p> <p>Repair wiring.</p> |

Verify Interlock System Operation

The purpose of the interlock system is to prevent the engine from cranking or starting unless the traction pedal is in NEUTRAL and the cutting unit engagement switch is DISENGAGED. In addition, the engine will stop when the cutting unit engagement switch is engaged or traction pedal is depressed with the operator off the seat.



CAUTION

The interlock switches are for the operator's protection, so do not disconnect them. Check operation of the switches daily to assure interlock system is operating. If a switch is defective, replace it before operating. Regardless if switches are operating properly or not, replace them every two years to assure maximum safety. do not rely entirely on safety switches - use common sense!

To check interlock system operation:

1. Move machine to a wide open area free of debris and bystanders. Raise cutting units and stop engine. Engage parking brake.
2. Sit on seat. Move Reel Drive switch to ENGAGE position. Try to start engine. If engine cranks, there may be a malfunction in interlock system. Repair immediately. If engine does not crank, proceed to step 3.
3. Sit on seat. Depress traction pedal in forward and reverse directions while trying to start engine. If engine cranks while pedal is in forward or reverse position, there may be a malfunction in interlock system. Repair immediately. If engine does not crank, proceed to step 4.
4. With cutting units in raised position, sit on seat and start engine. Move Reel Drive switch to ENGAGE position. Lower cutting units to ground. Cutting unit reels should start turning when cutting units are lowered. Raise cutting units and verify that they stop. If they do not stop, there may be a malfunction in interlock system. Repair immediately. If cutting units stop, proceed to step 5.
5. While sitting on seat with cutting units in raised position and engine running, move Reel Drive switch to ENGAGE position. Hold on to steering wheel and raise up off of seat. Engine should stop. If engine does not stop, there is a malfunction in interlock system. Repair immediately. If engine stops, seat switch is operating correctly.

Troubleshooting (Reelmaster 216-D)



CAUTION

Remove all jewelry, especially rings and watches, before doing any electrical troubleshooting or testing. Disconnect the battery cables unless the test requires battery voltage.

For effective troubleshooting and repairs, you **MUST** have a good understanding of the electrical circuits and components used on this machine. (See Electrical Schematics and Diagrams section of this chapter.)

Study the operating characteristics preceding the electrical failure to help identify the area of difficulty. Try to isolate the failure to a specific functional system; then check that area, repairing one component at a time. Attempting to repair more than one system at one time will lead to confusion.

Possible Causes and Corrections in the troubleshooting charts should be checked in the order in which they are listed.

If the machine being repaired has any interlock switches by-passed, they must be reconnected for proper troubleshooting and safety.

Starting Problems

| Condition | Possible Cause | Correction |
|--|--|---|
| Starter solenoid clicks, but starter will not crank. (If solenoid clicks, problem is not in interlock system.) | Low battery charge | Charge battery. Replace battery if it will not hold a charge. |
| | Loose or corroded battery cables. Loose or corroded ground. | Clean and tighten, or repair as necessary. |
| | Faulty wiring at starter. | Repair wiring. |
| | Loose starter mounting bolts. | Clean mounting surface and tighten bolts. |
| | Faulty starter. | Repair or replace starter. |
| | Faulty starter solenoid. | Replace starter solenoid. |

Starting Problems (continued)

| Condition | Possible Cause | Correction |
|---|--|--|
| Nothing happens when start attempt is made. | Battery is dead. | Charge battery. Replace battery if it will not hold a charge. |
| | Loose or corroded battery cables. Loose or corroded ground. | Clean and tighten or repair as necessary. |
| | "Engine" fuse open. | Check fuse and replace if fuse is open. If fuse burns out often, find and correct cause. |
| | Fusible link open. | Replace fusible link. |
| | Temp. switch or relay faulty. | Test temp. switch and relay. Replace if faulty. |
| | Temp relay wiring loose, corroded or damaged. | Repair wiring. |
| | Traction neutral switch out of adjustment or faulty. | Test switch and replace if faulty. Make sure wires are connected to "COMMON" and "NORMALLY OPEN" (N.O.) terminals. |
| | Traction neutral switch wiring loose, corroded or damaged. | Repair wiring. |
| | Cutting unit clutch switch engaged or faulty. | Make sure switch is OFF. Test switch and replace if faulty. |
| | Cutting unit clutch switch wiring loose, corroded or damaged. | Repair wiring. |
| | Ignition switch faulty. | Test ignition switch. Replace if faulty. |
| | Ignition switch wiring loose, corroded or damaged. | Repair wiring. |
| | Start relay faulty. | Test start relay. Replace if faulty. |
| | Start relay wires loose, corroded or damaged. | Repair wiring. |
| Starter solenoid wiring loose, corroded or damaged. | Repair wiring. | |
| Starter solenoid faulty. | Replace starter. | |

Starting Problems (continued)

| Condition | Possible Cause | Correction |
|---|---|--|
| <p>Engine cranks, but does not start (if engine cranks, cause of problem is not in interlock system).</p> | <p>Injection pump ETR solenoid wiring loose, corroded or damaged.</p> <p>Injection pump ETR solenoid faulty.</p> <p>Glow glow plug wiring loose, corroded or damaged.</p> <p>Glow plugs faulty.</p> <p>Engine or fuel system problem.</p> | <p>Repair wiring.</p> <p>Test solenoid. Replace if faulty.</p> <p>Repair wiring.</p> <p>Test glow plugs and replace if faulty.</p> <p>See Troubleshooting section of Perkins Engine Workshop Manual.</p> |
| <p>Engine cranks (but should not) with traction pedal out of neutral.</p> | <p>Traction neutral switch out of adjustment or faulty.</p> <p>Diode faulty (engine will also crank with cutting unit clutch switch ON in this situation).</p> | <p>Test switch and replace if faulty. Make sure wires are connected to "COMMON" and "NORMALLY OPEN" (N.O.) terminals.</p> <p>Replace diode.</p> |
| <p>Engine cranks (but should not) with cutting unit clutch switch ON.</p> | <p>Cutting unit clutch switch faulty.</p> <p>Diode faulty (engine will also crank with traction pedal out of neutral in this situation).</p> | <p>Replace cutting unit clutch switch.</p> <p>Replace diode.</p> |

General Run and Transport Problems

| Condition | Possible Cause | Correction |
|--|--|---|
| <p>Engine continues to run (but should not) when traction pedal is depressed with no operator on seat.</p> | <p>Seat switch plunger depressed with no operator on seat.</p> <p>Seat switch faulty or out of adjustment.</p> | <p>Check for seat support spring that is broken, missing or stuck in down position.</p> <p>Check for binding seat pivot hinge.</p> <p>Check for waterlogged seat.</p> <p>Test seat switch. Adjust or replace if faulty.</p> |
| <p>Engine kills when traction pedal is depressed or cutting unit clutch switch is turned ON.</p> | <p>Operator sitting too far forward on seat (seat switch not depressed).</p> <p>Seat hinge, support pin or spring binding, preventing seat switch from closing.</p> <p>Seat switch is faulty or out of adjustment.</p> <p>Seat switch wiring loose, corroded or damaged.</p> | <p>Instruct operator.</p> <p>Repair seat pivot and support.</p> <p>Test seat switch. Adjust or replace if faulty.</p> <p>Repair wiring.</p> |
| <p>Battery does not charge.</p> | <p>Loose, corroded or damaged wire(s).</p> <p>Faulty alternator.</p> <p>Dead battery.</p> | <p>Repair wiring.</p> <p>Check alternator belt tension. Test alternator and replace if faulty.</p> <p>Charge battery. Replace battery if it will not hold a charge.</p> |

Cutting Unit Operation Problems

| Condition | Possible Cause | Correction |
|--|--|---|
| Engine continues to run (but should not) when cutting unit clutch switch is ON with no operator on the seat. | <p>Seat switch plunger depressed with no operator on seat.</p> <p>Seat switch faulty or out of adjustment.</p> | <p>Check for seat support spring that is broken, missing or stuck in down position.</p> <p>Check for binding seat pivot hinge.</p> <p>Check for waterlogged seat.</p> <p>Test seat switch. Adjust or replace if faulty.</p> |
| Cutting units run (but should not) when raised, but shut off with cutting unit clutch switch. | Cutting unit interlock switch faulty. | Test switch and replace if faulty. Make sure wires are connected to "COMMON" and "NORMALLY OPEN" (N.O.) terminals. |
| Cutting units shut off when raised, but do not shut off with cutting unit clutch switch. | Cutting unit clutch switch faulty. | Test switch. Replace if faulty. |
| Cutting units do not engage. | <p>"ACC" fuse open. (NOTE: Hourmeter and temp. gauge will also fail to operate.)</p> <p>Cutting unit clutch switch faulty.</p> <p>Cutting unit clutch switch wiring loose, corroded or damaged.</p> <p>Cutting unit interlock switch faulty.</p> <p>Cutting unit interlock switch wiring loose, corroded or damaged.</p> <p>Clutch faulty or out of adjustment.</p> <p>Clutch wiring loose, corroded or damaged.</p> | <p>Check fuse and replace if fuse is open. If fuse burns out often, find and correct cause.</p> <p>Test switch. Replace if faulty..</p> <p>Repair wiring.</p> <p>Test switch and replace if faulty. Make sure wires are connected to "COMMON" and "NORMALLY OPEN" (N.O.) terminals.</p> <p>Repair wiring.</p> <p>Test clutch. Make sure clutch air gap is properly adjusted..</p> <p>Repair wiring.</p> |

Verify Interlock System Operation

The purpose of the interlock system is to prevent the engine from cranking or starting unless the traction pedal is in NEUTRAL and the cutting unit engagement switch is DISENGAGED. In addition, the engine will stop when the cutting unit engagement switch is engaged or traction pedal is depressed with the operator off the seat.



CAUTION

The interlock switches are for the operator's protection, so do not disconnect them. Check operation of the switches daily to assure interlock system is operating. If a switch is defective, replace it before operating. Regardless if switches are operating properly or not, replace them every two years to assure maximum safety. do not rely entirely on safety switches - use common sense!

To check interlock system operation:


1. Move machine to a wide open area free of debris and bystanders. Raise cutting units and stop engine. Engage parking brake.
2. Sit on seat. Move Reel Drive switch to ENGAGE position. Try to start engine. If engine cranks, there may be a malfunction in interlock system. Repair immediately. If engine does not crank, proceed to step 3.
3. Sit on seat. Depress traction pedal in forward and reverse directions while trying to start engine. If engine cranks while pedal is in forward or reverse position, there may be a malfunction in interlock system. Repair immediately. If engine does not crank, proceed to step 4.
4. With cutting units in raised position, sit on seat and start engine. Move Reel Drive switch to ENGAGE position. Lower cutting units to ground. Cutting unit reels should start turning when cutting units are lowered. Raise cutting units and verify that they stop. If they do not stop, there may be a malfunction in interlock system. Repair immediately. If cutting units stop, proceed to step 5.
5. While sitting on seat with cutting units in raised position and engine running, move Reel Drive switch to ENGAGE position. Hold on to steering wheel and raise up off of seat. Engine should stop. If engine does not stop, there is a malfunction in interlock system. Repair immediately. If engine stops, seat switch is operating correctly.

Testing

This section will define components, and the tests that can be performed on those components, when those parts are disconnected from the electrical system.

For accurate resistance and/or continuity checks, electrically disconnect the component being tested from the circuit (e.g. unplug the seat switch connector before doing a continuity check).

NOTE: Electrical troubleshooting of any 12 Volt power connection can also be performed through voltage drop tests without disconnection of the component.



CAUTION

When testing electrical components for continuity with a volt-ohm meter or continuity tester, make sure that power to the circuit has been disconnected.

Ignition Key Switch

The circuitry of the ignition switch is shown in the charts. With the use of a continuity tester, the switch functions may be tested to determine whether all circuits are being completed while the key is moved to each position.

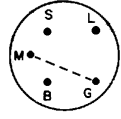
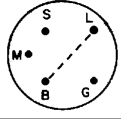
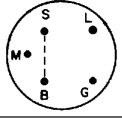
| POSITION | CONTINUITY AMONG TERMINALS | CIRCUITS MADE |
|----------|---|------------------|
| 1. OFF |  G + M | GROUND & MAGNETO |
| 2. RUN |  B + L | BATTERY & LIGHTS |
| 3. START |  B + S | BATTERY & START |

Figure 4
(Reelmaster 216)

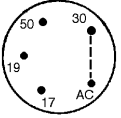
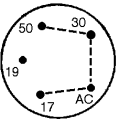
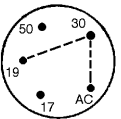
| POSITION | CONTINUITY AMONG TERMINALS |
|----------|---|
| 1. OFF | NONE |
| 2. ON |  30 + AC |
| 3. START |  50 + 30 + AC + 17 |
| 4. GLOW |  19 + 30 + AC |

Figure 5
(Reelmaster 216-D)

Seat Switch (Fig. 6, 7)

The seat switch is a normally open (N.O.) switch that closes when the operator is on the seat. If the cutting unit clutch (reel drive) switch or traction switch is open and the operator raises off the seat, the engine will stop.

1. Raise the seat to get access to the seat switch wiring connector.
2. Disconnect the seat switch wiring connector and install a continuity tester or ohm meter between the two leads of the seat switch.
3. Lower the seat. The continuity tester should show no continuity.

NOTE: Make sure the compression spring and pin holds the seat up off the seat switch when there is no operator on the seat.

4. Have the operator sit on the seat, slowly depressing the seat switch. The continuity tester should show continuity as the seat approaches the bottom of its travel.

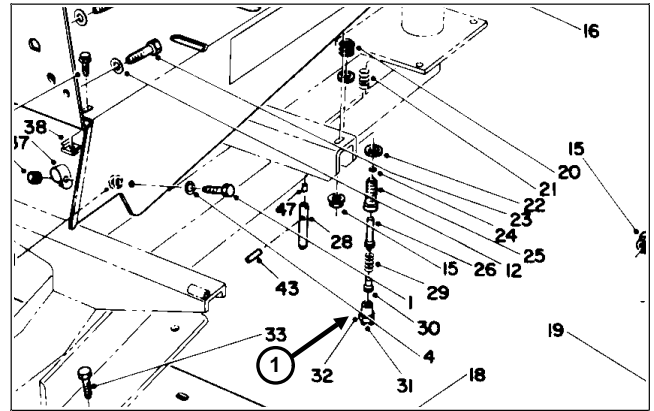


Figure 6
(Reelmaster 216)

1. Seat switch (Item 32)

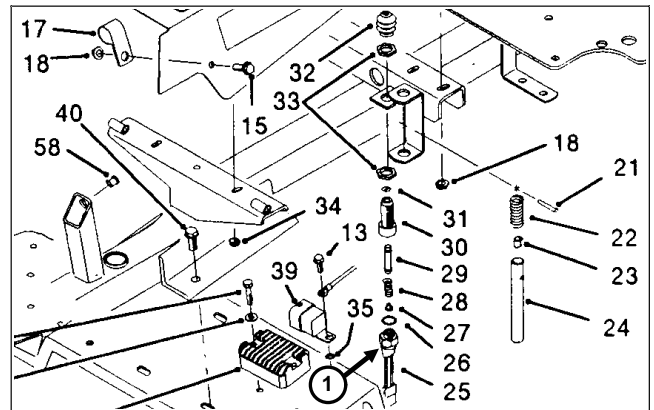


Figure 7
(Reelmaster 216-D)

1. Seat switch (Item 25)

Traction (Neutral) Switch (Fig. 8)

The traction switch is normally open and closes when traction pedal is in neutral.

IMPORTANT: The traction switch has three (3) terminals. Make sure the wires are connected to the “COMMON” and “N.O.” terminals.

Test switch by disconnecting wires from switch terminals and connecting a continuity tester across COMMON and N.O. terminals. With engine off, slowly push traction pedal in forward and reverse direction while watching continuity tester. There should be indications that traction switch is opening and closing. Allow traction pedal to return to neutral. There should be continuity across the terminals. (See Replacing Traction Switch in Repairs section of this chapter for replacement and adjustment procedures.)

NOTE: Apply “Loctite 271” or equivalent to threads of switch screws before installing.

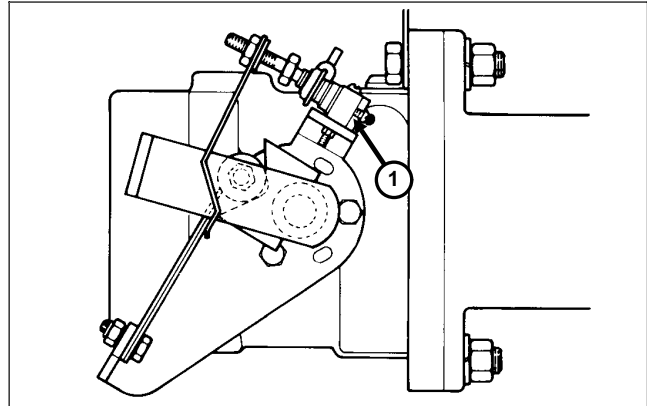


Figure 8

1. Traction (neutral) switch

Cutting Unit Interlock Switch (Fig. 9, 10)

The cutting unit interlock switch is normally open and closes with the lift cylinder is retracted (cutting units lowered).

IMPORTANT: The traction switch has three (3) terminals. Make sure the wires are connected to the “COMMON” and “N.O.” terminals.

Test the switch by disconnecting the wires from the switch terminals and connecting a continuity tester across the COMMON and N.O. terminals. With the cutting units lowered and lift cylinder fully retracted, there should be continuity across the terminals. With the cutting units raised and lift cylinder extended there should be no continuity across the terminals. (See Replacing the Cutting Unit Interlock Switch in the Repairs section of this chapter for replacement procedures).

NOTE: Apply “Loctite 271” or equivalent to threads of switch screws before installing.

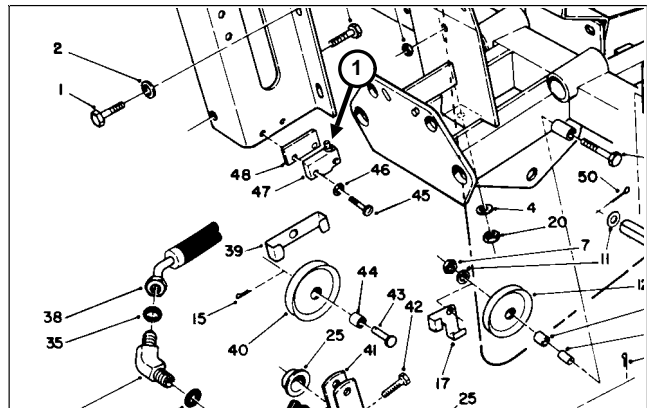


Figure 9

(Reelmaster 216)

1. Cutting unit interlock switch (Item 47)

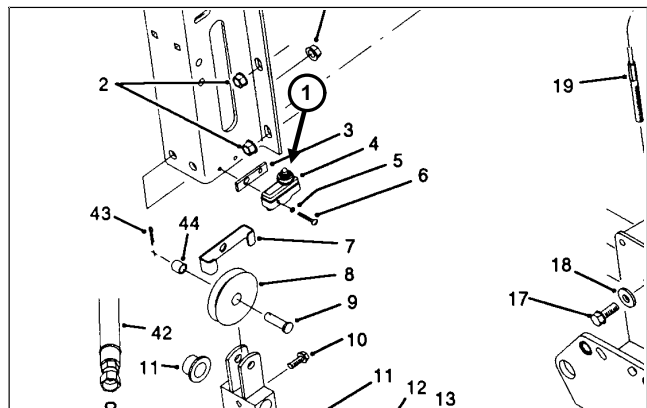


Figure 10

(Reelmaster 216-D)

1. Cutting unit interlock switch (Item 4)

Cutting Unit Clutch (Reel Drive) Switch (Fig. 11, 12)

Reelmaster 216 (S/N 19999 and below)

To test switch independent of wiring harness, disconnect wire harness connector(s) from switch terminals. When the switch is ON (Engage), there should be continuity between terminals A – B only. When the switch is OFF (Disengage), terminals C – D and B – E should show continuity.

Reelmaster 216 (S/N 20001 and up)

Reelmaster 216-D

To test switch independent of wiring harness, disconnect wire connector(s) from switch terminals. When the switch is ON (Engage), there should be continuity between terminals 5 – 6 only. When the switch is OFF (Disengage), terminals 1 – 2 and 4 – 5 should show continuity.

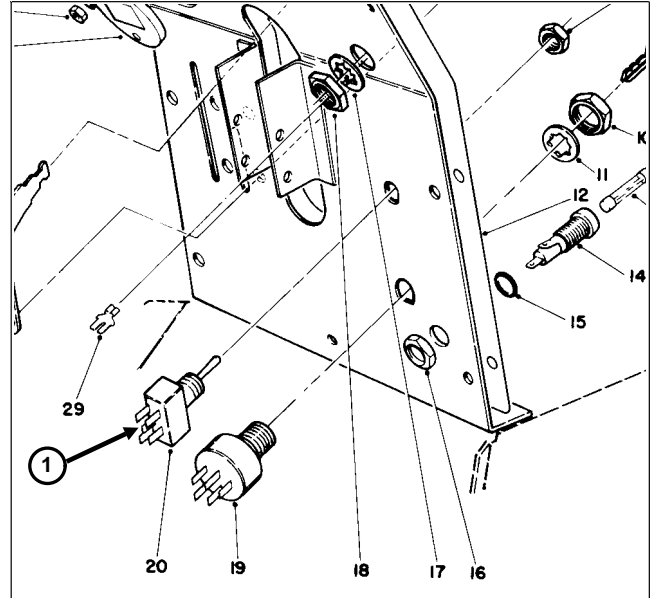


Figure 11
(Reelmaster 216)

1. Cutting unit clutch (Reel) switch (Item 20)

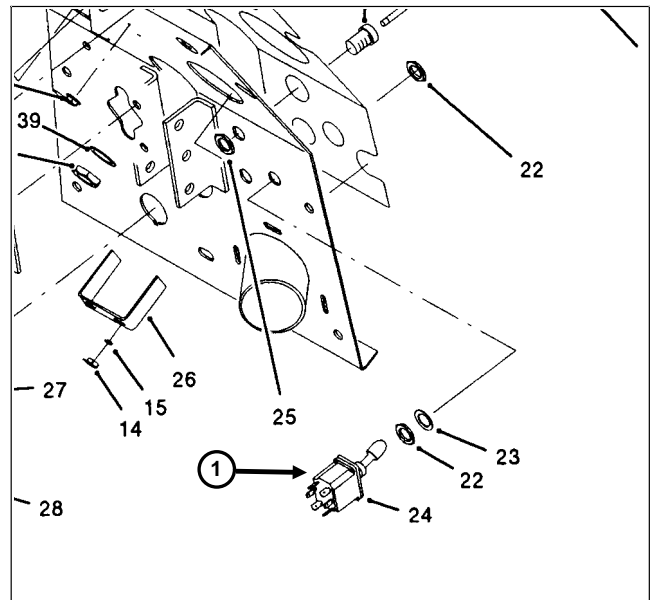


Figure 12
(Reelmaster 216-D)

1. Cutting unit clutch (Reel) switch (Item 24)

Start and High Temp. Relays (Reelmaster 216-D only) (Fig. 13, 14, 15)

To test the relay, disconnect the relay wire connector and install a continuity tester between the relay terminals (terminals 30 and 87). The relay should make and break continuity at terminals 30 and 87 as 12 V.D.C. is connected and disconnected to terminal 85 with terminal 86 connected to ground.

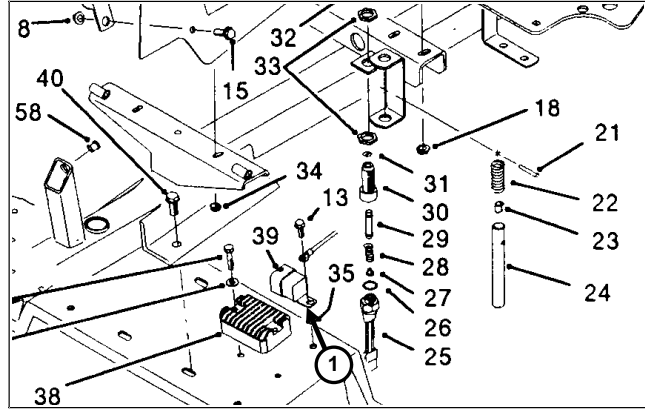


Figure 13

1. Start relay (Item 39)

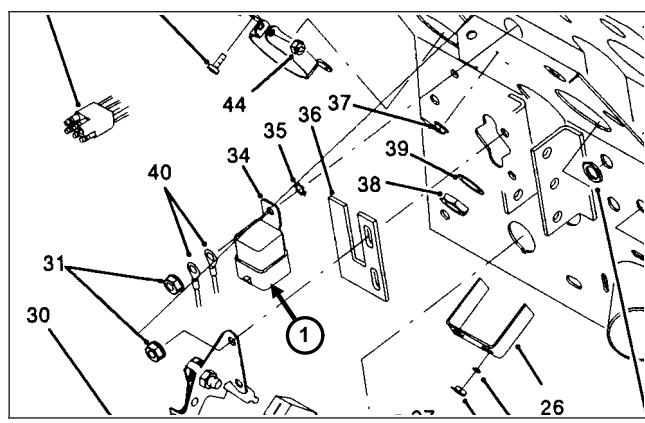


Figure 14

1. High temp. relay (Item 34)

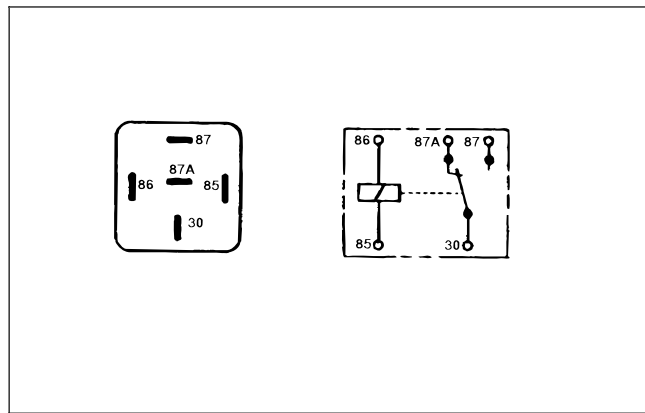


Figure 15

Glow Plugs (Reelmaster 216-D only)

Check for continuity between plug terminal and body. If there is no continuity, heat wire in glow plug is broken.

Measure resistance between plug terminal and ground. Resistance should be 1.6 ± 0.16 OHM. Resistance of 0 indicates a short circuit.

Battery (Fig. 17, 18)

Use a hydrometer to test the battery. Charge the battery if necessary (see Battery Service).

Electrolyte specific gravity

Fully charged: 1.250 - 1.280

Discharged: less than 1.240

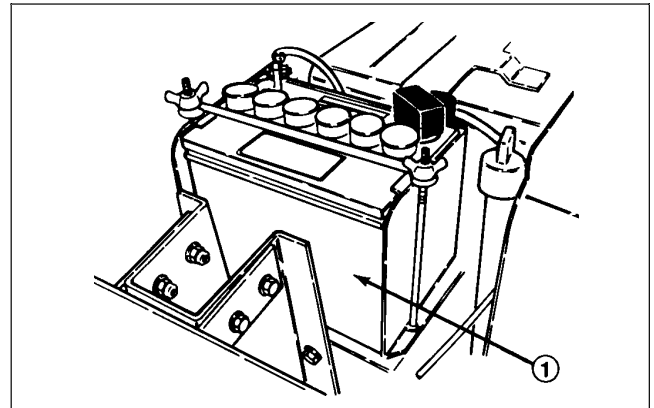


Figure 17
(Reelmaster 216)

1. Battery

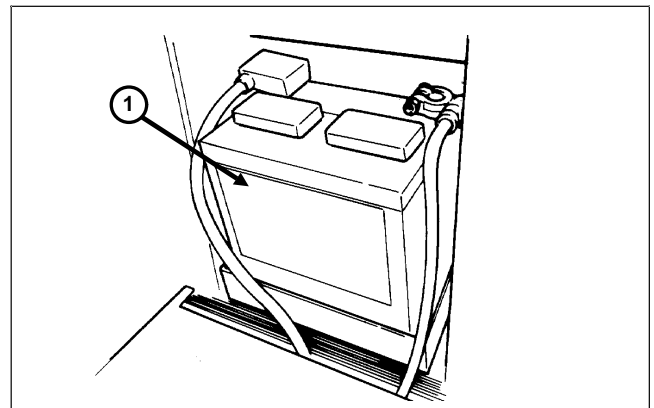


Figure 18
(Reelmaster 216-D)

1. Battery

Injection Pump (ETR) Solenoid (Reelmaster 216-D only) (Fig. 19)

The Reelmaster[®] 216-D has an energize-to-run (ETR) fuel stop solenoid mounted on the engine block next to the fuel injection pump with a purple wire attached. The solenoid will stop injector pump fuel delivery with any electrical failure in the RUN circuit.

1. Disconnect the wire from the solenoid.
2. Remove the solenoid from the injector pump.
3. Connect a 12 volt battery so that a wire from positive (+) battery terminal is connected to switch terminal. Touch a wire from the negative (-) battery terminal to solenoid body. The plunger should retract.

NOTE: You can also test operation without removing the solenoid from the injector pump. Listen for an audible “click” as the solenoid extends and retracts while doing step 3 of the above procedure. This will not show if the solenoid is fully extending and retracting.

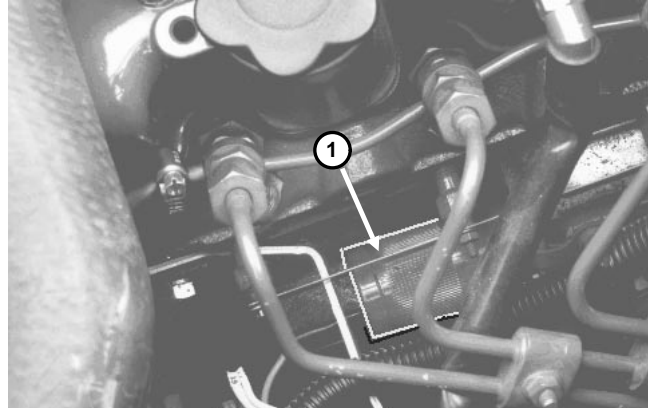


Figure 19

1. Fuel stop solenoid

Gauges and Indicator Lights

Oil Pressure Light (Reelmaster 216-D only)

Oil pressure lamp should come on when the ignition key switch is in the RUN position with the engine not running or if the oil pressure switch closes during operation - oil pressure below 7 psi (0.5 kg/cm²).

Test the lamp by disconnecting the wire from oil pressure switch and grounding it against the engine. The light should come on when the wire is grounded with the ignition switch in the ON position.

Amp Light (Reelmaster 216-D only)

The amp light should come on when the ignition key switch is in the RUN position with the engine not running or if the charging circuit is not operating properly during operation.

Test the lamp by disconnecting the wires and applying 12 V.D.C. between the lamp wiring terminals.

Glow Light (Reelmaster 216-D only)

The glow light should come on for 5 to 12 seconds after the ignition key switch is turned ON.

Test the lamp by disconnecting the wires and applying 12 V.D.C. between the lamp wiring terminals.

Temperature Light (Reelmaster 216-D only)

The temperature light should come on only if the high temperature shut-down switch and relay has stopped the engine - coolant temperature above 221° F (105°C).

Test the lamp and relay by disconnecting the wire from high temperature shut-down switch and grounding it against the engine. The light should come on when the wire is grounded with the ignition switch in the ON position.

Reels Turning light

The reels turning light should come on when the cutting unit drive switch is engaged and the cutting units are lowered.

Test the lamp by disconnecting the wires and applying 12 V.D.C. between the lamp wiring terminals.

Hourmeter

Test the hourmeter by connecting a 12 volt battery so the positive (+) battery terminal is connected to the positive terminal on the hourmeter. Connect the negative (-) battery terminal to the negative (-) terminal on the alternator. The hourmeter should operate as 12 V.D.C. is applied between the terminals.

Engine Coolant Temperature Gauge (Reelmaster 216-D only)

To test a gauge, use a commercial gauge tester. If a commercial gauge tester is not available, substitute a new gauge or test the sending unit.

High Temperature Shut-Down Switch (Fig. 20, 21) (Reelmaster 216-D only)

Switch is located on cylinder head facing front of machine with tan wire attached.

1. Lower the coolant level in the engine and remove the high temperature shut-down switch.
2. Put the switch in a container of oil with a thermometer and heat the oil.
3. The switch is normally open (N.O.) and should close at 213 - 228° F (101 - 109° C).

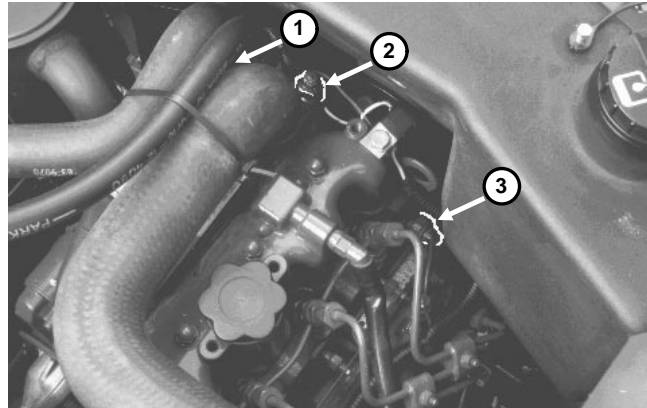


Figure 20

1. High temp. shut-down switch
2. Temp. gauge sender
3. Oil press. switch



CAUTION

Handle hot oil with special care to prevent personal injury or fire.

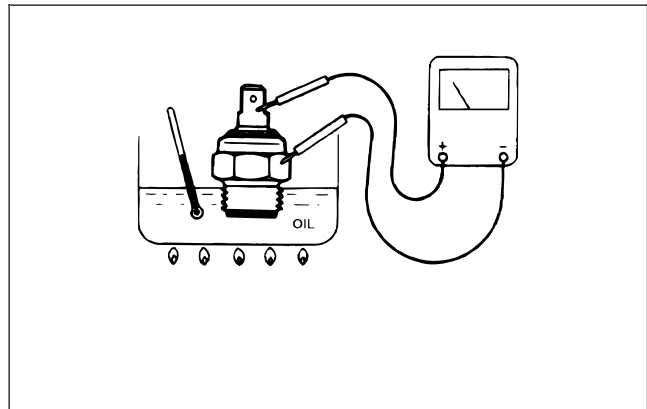


Figure 21

Temperature Gauge Sender (Reelmaster 216-D only) (Fig. 20, 22)

Switch is located on top of cylinder head with white/black wire attached.

1. Lower the coolant level in the engine and remove the temperature gauge sender.
2. Put the switch in a container of oil with a thermometer and heat the oil.
3. With an Ohm meter connected as shown, the following resistance readings should be indicated.

180 ± 22 OHM at 130° F (54° C)
71 ± 8 OHM at 180° F (82° C)

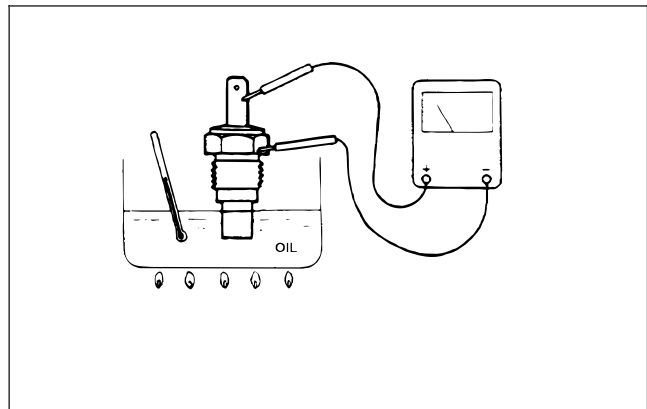


Figure 22



CAUTION

Handle hot oil with special care to prevent personal injury or fire.

Engine Oil Pressure Switch (Reelmaster 216-D only) (Fig. 20)

Switch is located on cylinder head facing rear of machine with brown wire attached.

The switch is normally closed (NC) and opens with pressure.

Oil pressure switch operating range:

2.8 - 5.7 psi (0.2 - 0.4 kg/cm²).

1. Turn ignition key switch ON. Oil pressure lamp should be on.

If lamp is not on:

1. Disconnect wire from switch and touch wire to a good ground, such as the engine block.

2. If lamp comes on, replace switch.

3. If lamp does not come on check wiring between lamp and switch for continuity.

If lamp is on with engine running:

1. Shut off engine immediately.

2. Check switch by disconnecting wire with ignition switch in ON position. Light should go out.

3. If light is still on, check for short circuit in wiring.

4. Install test gauge in engine oil pressure switch port. Start engine and check for 30 psi minimum at 1500 rpm. If engine pressure is good, replace switch. If engine pressure is low, DO NOT operate the engine.

Starter Solenoid (Reelmaster 216 only) (Fig. 24)

To test the starter solenoid, disconnect the wires from the solenoid terminals and install a continuity tester between the large diameter terminals. The large diameter terminals should show continuity when a 12 V.D.C. battery is connected to the small diameter terminals.

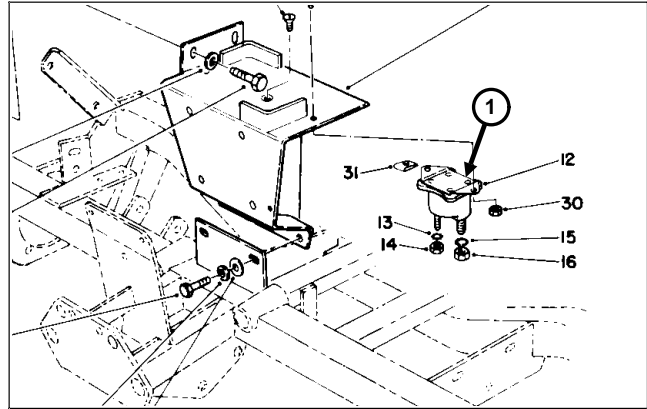


Figure 24

1. Starter solenoid (Item 12)

Cutting Unit Clutch

To test the clutch, disconnect the wire connector and connect a continuity tester or ohm meter across the terminals on the clutch wire connector. There should be continuity across the terminals of the clutch connector. Resistance measured through the clutch coil should be approximately 3 ohms.

The clutch can also be tested by connecting a 12 VDC battery across the clutch connector terminals. The clutch should engage as 12 VDC is connected to the clutch connector terminals.

Interlock Module (Reelmaster 216 only) (Fig. 27)

The interlock module senses the condition of the seat switch, traction (neutral) switch, and cutting unit clutch (reel engage) switch (Fig. 12). The seat switch must remain CLOSED while the traction switch or cutting unit clutch switch is OPEN or the engine will not run.

The “closed to operate” requirement of the interlock module makes sure that the engine will not run if switch leads are broken or become disconnected.

Because of the solid-state circuitry built into the interlock module, there is no direct method to test it directly. The module may be damaged if an attempt is made to test it with an electrical test device such as a volt-ohm meter.

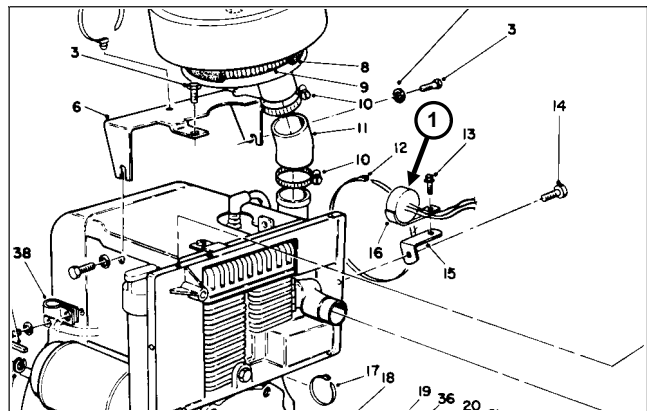


Figure 27

1. Interlock module (Item 16)

Repairs

IMPORTANT: Before welding on the machine, disconnect both battery cables from the battery and disconnect the terminal connector from the alternator to prevent damage to the electrical system.

Battery Service (Fig. 28)

IMPORTANT: To prevent damage to electrical components, do not operate the engine with the battery cables disconnected.

Keep the terminals and entire battery case clean. To clean the battery, wash the entire case with a solution of baking soda and water. Rinse with clear water. Do not get the soda solution into the battery because damage to the battery will result. Coat the battery posts and cable connectors with skin-over grease, or petroleum jelly to prevent corrosion.

Check for loose battery hold-downs. A loose battery may crack or cause the container to wear and leak acid.

Check the electrolyte solution to make sure the level is above the plates. If the level is low (but above the plates inside the battery), add water so the level is to the bottom of the cap tubes. If the level is below the plates, add water only until the plates are covered and then charge the battery. After charging, fill the battery to the proper level.

Electrolyte Specific Gravity

Fully charged: 1.250 - 1.280

Discharged: less than 1.240



CAUTION

Do not charge a frozen battery because it can explode and cause injury. Let the battery warm to 60° F (16° C) before connecting to a charger.

Charge the battery in a well-ventilated place so that gases produced while charging can dissipate. Since the gases are explosive, keep open flame and electrical spark away from the battery; do not smoke. Nausea may result if the gases are inhaled. Unplug the charger from the electrical outlet before connecting or disconnecting the charger leads from the battery posts.

Reelmaster 216 Battery Specifications

BCI Group U1 Battery
200 Amp Cranking Performance at 0° F (17° C)
32 min. Reserve Capacity at 80° F (27° C)

Reelmaster 216-D Battery Specifications

BCI Group 26 SMF-5 Battery
530 Amp Cranking Performance at 0° F (-17° C)
85 min. Reserve Capacity at 80° F (27° C)

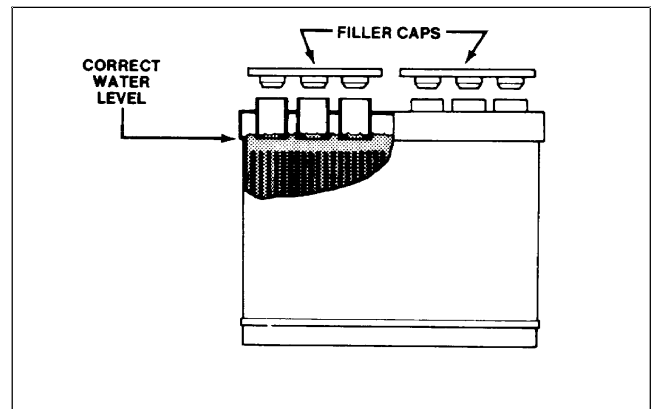


Figure 28

Fuses

Reelmaster 216 (Fig. 29)

The starter circuit is protected by a 30A fuse located on the dash panel.

Reelmaster 216 (Fig. 30)

The electrical system is protected by a 15A "ACC" fuse located on the dash panel, a 15A "ENGINE" fuse in the wiring harness near the ignition switch and a fusible link in the wiring harness near the starter solenoid.

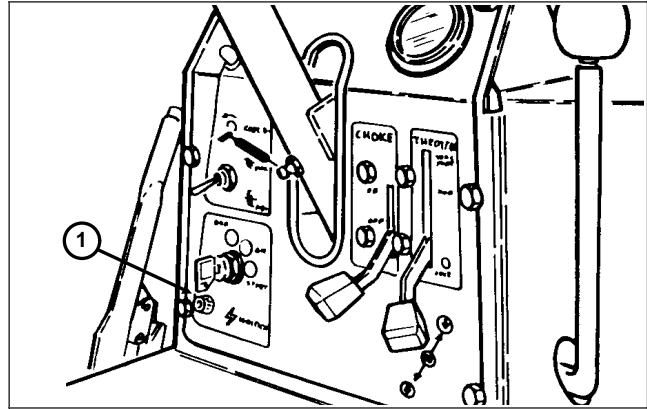


Figure 29
(Reelmaster 216)

1. Fuse holder

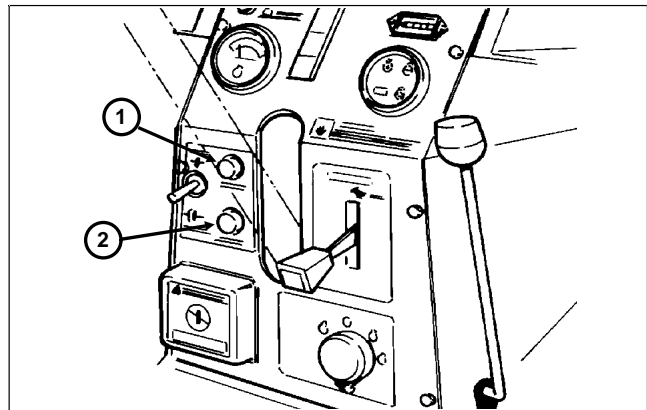


Figure 30
(Reelmaster 216-D)

1. Accessory fuse
2. Engine fuse

Traction (Neutral) Switch Replacement (Fig. 31)

1. Remove the two wires that are connected to the traction switch.

2. Have a helper push the traction pedal down into either the FORWARD or REVERSE position; this will take the switch arm tension off of the switch. Loosen two (2) screws and remove the switch.

3. Install new switch. DO NOT over-tighten screws as the switch case could break.

NOTE: Apply "Loctite 271" or equivalent to threads of switch screws before installing.

NOTE: Have a helper hold the traction pedal down while installing the switch.

4. Reconnect the two wires to the new switch. Make sure that one wire is connected to the "COMMON" terminal, and one wire is connected to the "NORMALLY OPEN" (N.O.) terminal.

IMPORTANT: The traction switch has three (3) terminals. If the two (2) wires are not connected to the "COMMON" and "NORMALLY OPEN" (N.O.) terminals, the engine will be unable to start and the safety interlock circuit will not function properly.



CAUTION

If the wires are not correctly installed to the switch, the engine could start with the traction pedal in forward or reverse.

5. Coat the switch terminals and wires with skin-over grease.

6. Check traction control neutral adjustment. (See Traction Control Neutral Adjustment in the Adjustments section of Chapter 4 - HYDRAULIC SYSTEM.)

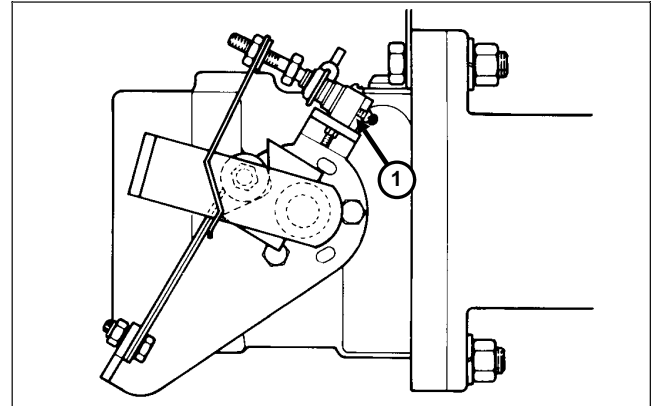


Figure 31

1. Traction (neutral) switch

Cutting Unit Interlock Switch Replacement (Fig. 32, 33)

1. Raise cutting units and stop the engine. Engage the parking brake. Raising the cutting units will take tension off of the switch.

2. Remove the two wires that are connected to the cutting unit interlock switch.

3. Loosen two (2) screws and remove the switch (located on left side of machine on bottom of hydraulic lift cylinder).

3. Install new switch. DO NOT over-tighten screws as the switch case could break.

NOTE: Apply "Loctite 271" or equivalent to threads of switch screws before installing.

4. Reconnect the two wires to the new switch. Make sure that one wire is connected to the "COMMON" terminal, and one wire is connected to the "NORMALLY OPEN" (N.O.) terminal.

IMPORTANT: The cutting unit interlock switch has three (3) terminals. If the two (2) wires are not connected to the "COMMON" and "NORMALLY OPEN" (N.O.) terminals, the safety interlock circuit will not function properly.



CAUTION

If the wires are not correctly installed to the switch, the cutting units could engage when in the raised position.

5. Coat the switch terminals and wires with skin-over grease.

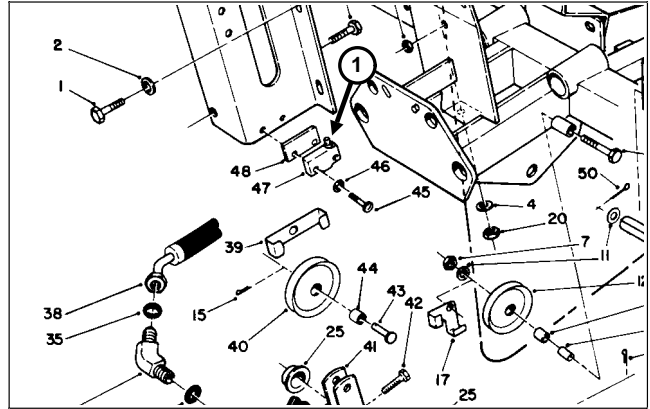


Figure 32
(Reelmaster 216)

1. Cutting unit interlock switch (Item 47)

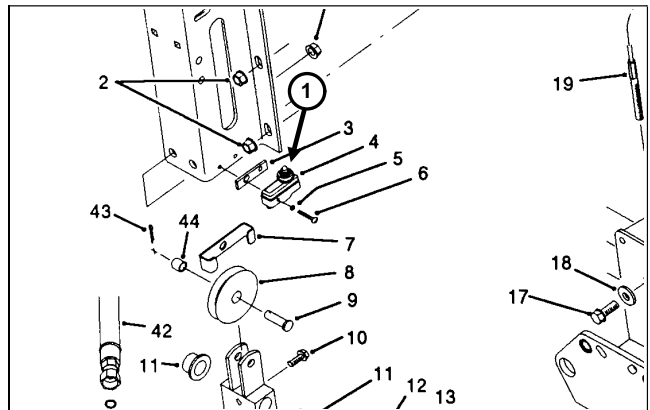


Figure 33
(Reelmaster 216-D)

1. Cutting unit interlock switch (Item 4)



Wheels, Brakes & Steering

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Specifications

| Item | Specification |
|--------------------------------|----------------------|
| Tire pressure | 12 - 16 PSI |
| Wheel lug nut torque | 45 - 65 ft-lb |
| Wheel motor spindle nut torque | 250 - 400 ft-lb |

Adjustments

Hand Brake Adjustment (Fig. 1) (Reelmaster 216 - S/N 19999 & Below)

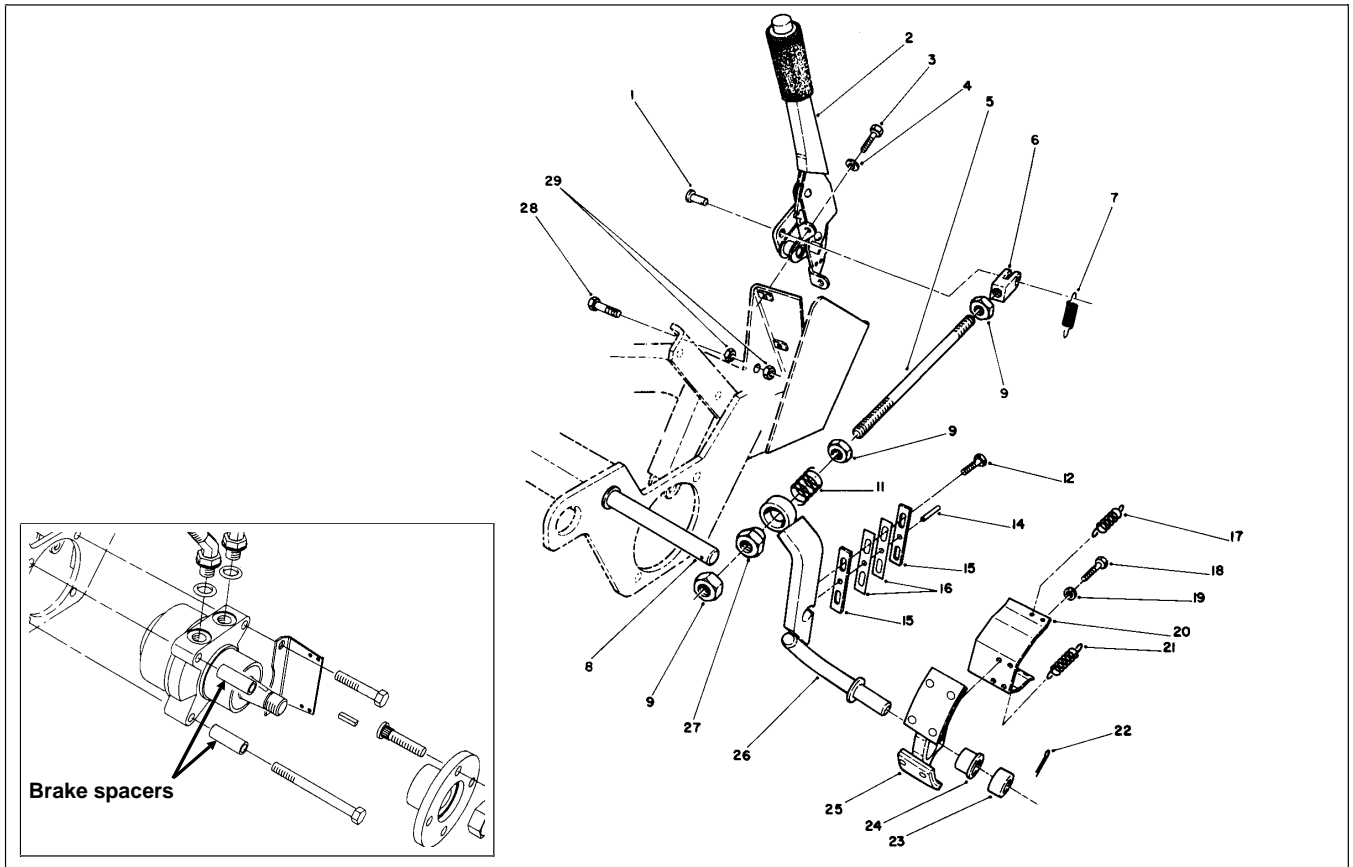


Figure 1

1. Jack up front of machine and support under frame with jack stands. Remove both front wheels.

2. Make sure there are four (4) return springs on each return spring bracket.

NOTE: The upper two (2) springs (Item 17) are stronger than the lower springs (Item 21).

3. Check operation of brake lever and linkage to make sure it moves freely without binding.

4. A properly adjusted brake will have the following clearances:

A. With handle fully released, left brake shoe should rest solidly against upper and lower brake spacers in an approximately centered position.

B. There should be approximately 1/32 in. clearance between L.H. brake arm and lug nut (Item 27).

C. Spring (Item 11) should be compressed with the nut to a length of 3/4 in.

D. Right brake shoe should have approximately 1/16 in. clearance from upper and lower brake spacers in an approximately centered position. Use the following procedure to adjust:

- 1) Loosen two (2) capscrews (Item 12) on left brake arm which hold slide plates (Item 15, 16).
- 2) Put shims between right brake shoe and upper and lower brake spacers.
- 3) While holding left brake shoe against brake spacers, tap slide plates down against roll pin and secure slide plates in this position.
- 4) Remove shims from behind right brake shoe.

5. Clean any rust or debris from inside of wheel rims. Install wheels and tighten wheel nuts evenly in a crossing pattern to a torque of 45 to 65 ft-lb.

6. After any brake adjustment, operate vehicle at low speed (one MPH or less) and check that brakes engage equally on both wheels. Adjust again as necessary.

Hand Brake Adjustment (Fig. 2)

(Reelmaster 216, S/N 20001 & Up, Reelmaster 216-D)

1. Jack up front of machine and support under frame with jack stands. Remove both front wheels.
2. Make sure brake is in OFF position.
3. Loosen jam nut on clevis. Remove cotter pin securing of clevis to lower brake lever. Rotate clevis, one turn at a time, to decrease distance between upper and lower brake levers.
4. Install clevis to lower brake lever and tighten jam nut. Repeat procedure on opposite side of machine.
5. Check brake adjustment and adjust again if necessary.
6. Install wheels and tighten wheel nuts evenly in a crossing pattern to a torque of 45 to 65 ft-lb.
7. After any brake adjustment, operate vehicle at low speed (one MPH or less) and check that brakes engage equally on both wheels. Adjust again as necessary.

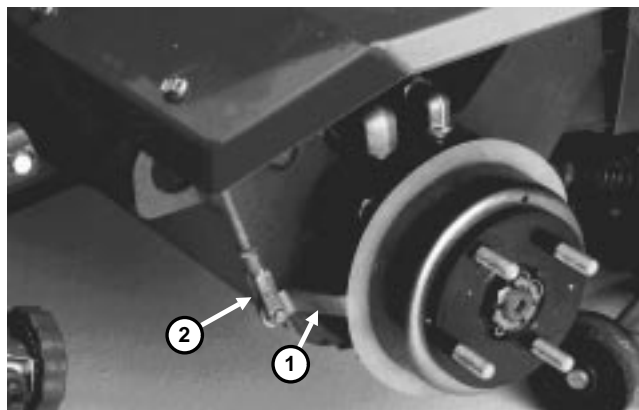


Figure 2

1. Lower brake lever
2. Clevis

Steering Column Adjustment (Fig. 3)

1. Unlatch and raise hood.
2. Remove capscrew securing steering column to frame bracket.
3. Adjust steering column to desired operating position and install capscrew. Do not use top set of mounting holes in frame bracket.

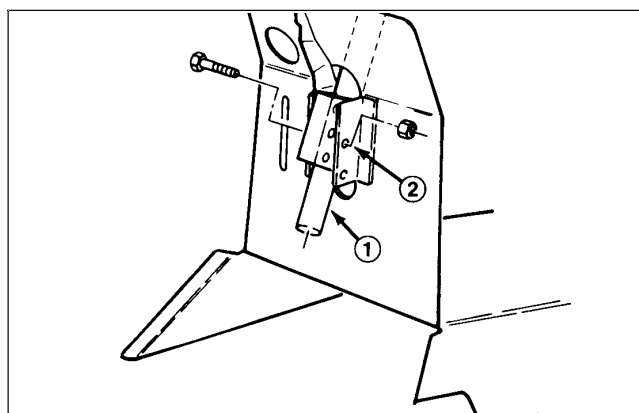


Figure 3

1. Steering column
2. Frame bracket

Steering Stop Adjustment (Fig. 4)

To increase or decrease turning radius of machine when steering wheel is turned fully left or right, adjust steering stop screws.

1. Loosen locknuts securing stop screws to tabs on steering sector.
2. Thread stop screws in or out until desired turning radius is attained.
3. Check adjustment and tighten locknuts.

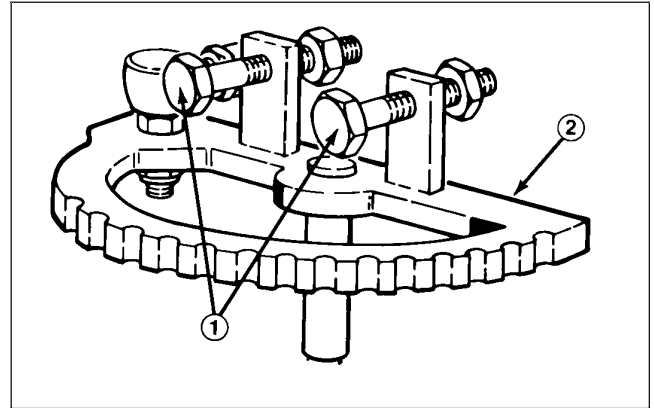


Figure 4

1. Stop screws
2. Steering sector

Repairs

Brake Service (Fig. 5)

(Reelmaster 216 — S/N 19999 & below)

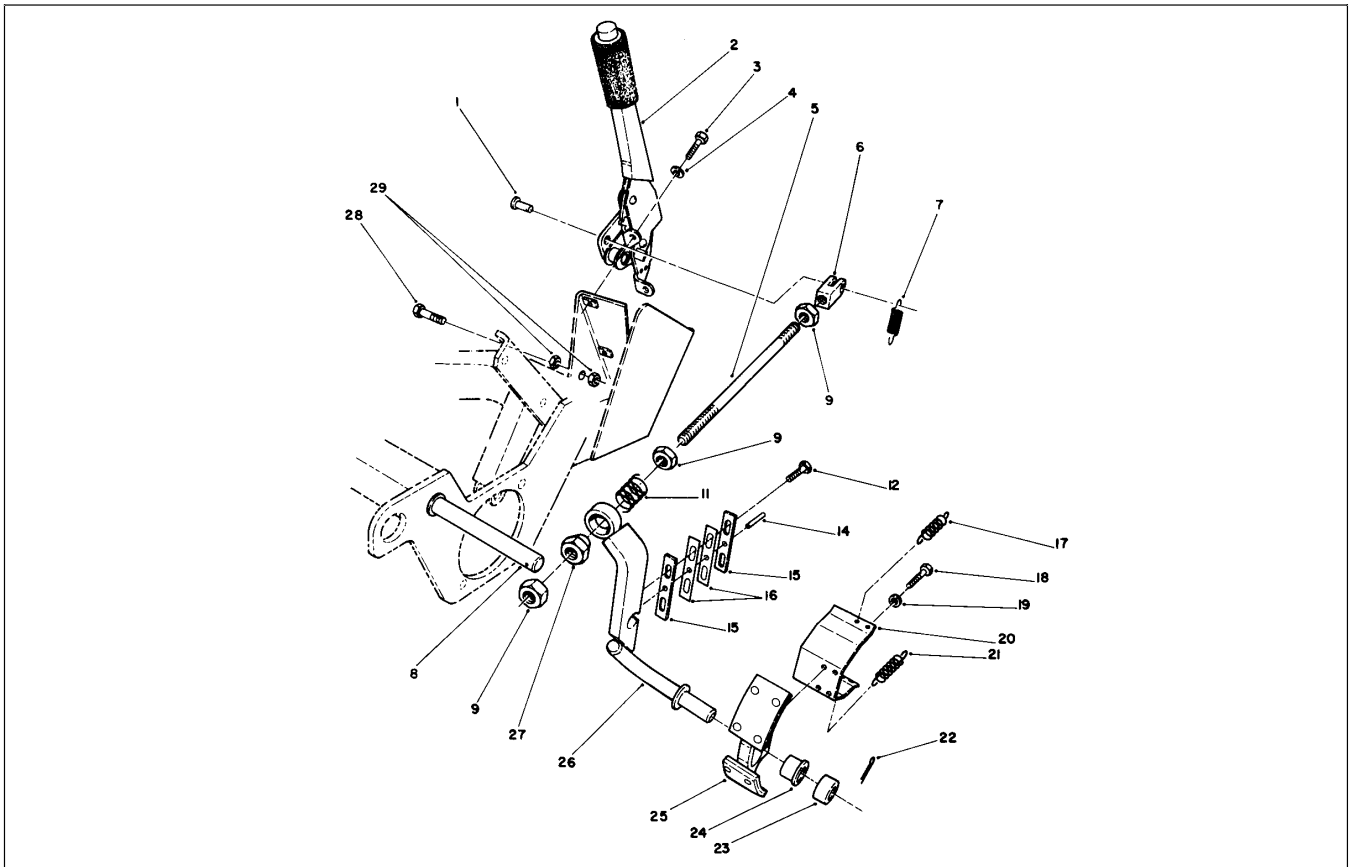


Figure 5

1. Park machine on a level surface. Jack up front of machine and support under frame with jack stands. Remove both front wheels.

2. Remove extension springs (Item 17, 21).

3. Remove cotter pin (Item 22). Remove spacer (Item 23), bushing (Item 24) and brake shoe (Item 25) from brake arm.

4. Remove capscrews and lockwashers to remove return spring bracket (Item 20) from brake shoe.

5. Replace parts that are worn or damaged.

6. After installing brake shoes, install extension springs. NOTE: Stronger springs (Item 17) go on top.

7. Do steps 2 - 6 under Hand (Parking) Brake Adjustment (Reelmaster 216 - S/N 19999 & Below) in the Adjustments section of this chapter.

Brake Service (Fig. 6)
 (Reelmaster 216 — S/N 20001 & Up, Reelmaster 216-D)

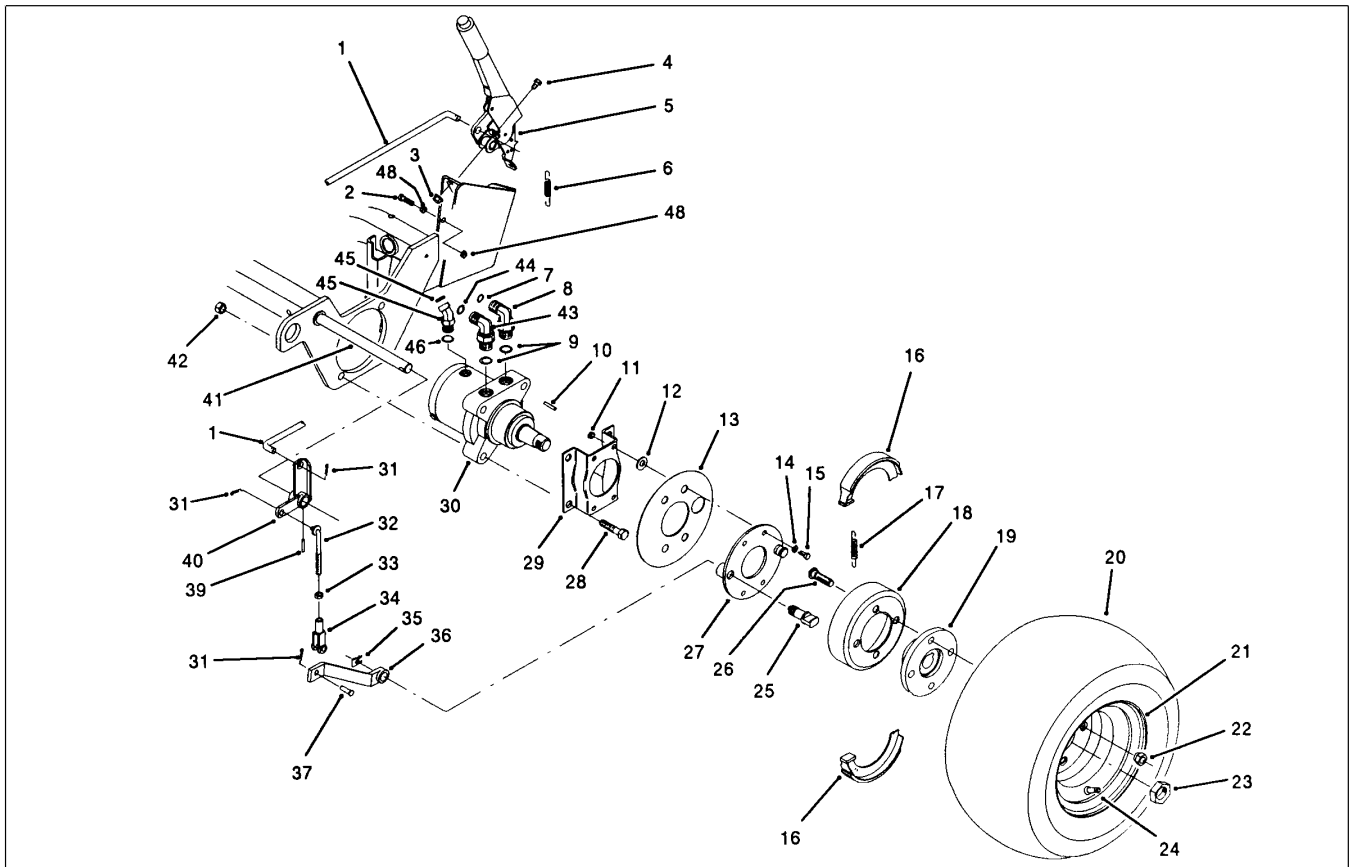


Figure 6

1. Park machine on a level surface. Lift front wheel off the ground using a jack. Block front and rear of other wheels.

2. Remove wheel nuts (Item 22) and remove wheel. Remove spindle nut (Item 23) from wheel hub.

3. Mount a wheel puller to wheel mount studs and remove wheel hub (Item 19) and brake drum (Item 18). Remove key (Item 10) from wheel motor shaft.

IMPORTANT: To prevent damage to wheel motor, DO NOT hit wheel hub with a hammer during removal or installation.

4. Remove brake shoe springs (Item 17) and brake shoes (Item 16).

5. Replace worn or damaged parts.

6. After installing brake shoes, install brake shoe springs (Item 17) into holes on each brake shoe plate from the outside. Springs should be installed in opposite direction of each other.

7. Mount key (Item 10) in wheel motor shaft so top of key is in line with taper in shaft, then install wheel hub and brake drum.

8. Install spindle nut (item 23) and tighten to a torque of 250 - 400 ft-lb.

9. Install wheel and secure with wheel nuts. Tighten wheel nuts evenly in a crossing pattern to a torque of 45 to 65 ft-lb.

10. Adjust and check brakes.



Cutting Unit Drive System

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Adjustments

Cutting Unit Belt Adjustment

Cutting unit drive belts should have a maximum deflection of 1/2 in. with 10 lb. load applied to middle of belt span.

NOTE: When new belts have been installed, check tension again after the first 8 hours of operation.

Old Style Belt Tensioner Assembly (Fig. 3)

Loosen jam nut on front end of belt tension rod. Rotate rod to lengthen or shorten rod to desired length. Tighten jam nut.

To release belt tension to cutting units:

- A. Remove hair pin cotter and pivot belt tension rod handle outward (away from cutting unit).
- B. Turn handle 1/2 turn (180°) so the angle cut (beveled edges) of tension rods are parallel. Belt tension is now released.
- C. To tighten the belt, turn belt tension rod handle 1/2 turn (180°) back to its previous position and install hair pin cotter. Angle cuts (beveled edges) must be oriented toward cutting unit and ends must make contact when belt is tensioned.

NOTE: For smooth operation, occasionally clean sliding pin at center of tension rod and coat with anti-seize compound.

NOTE: Old style belt tension rods can be replaced with the new style assemblies.

New Style Belt Tensioner Assembly (Fig. 4)

Loosen jam nut on front end of belt tension rod. Rotate rod to lengthen or shorten rod to desired length. Tighten jam nut.

To release belt tension to cutting units push retaining cup rearward and pivot yoke downward.

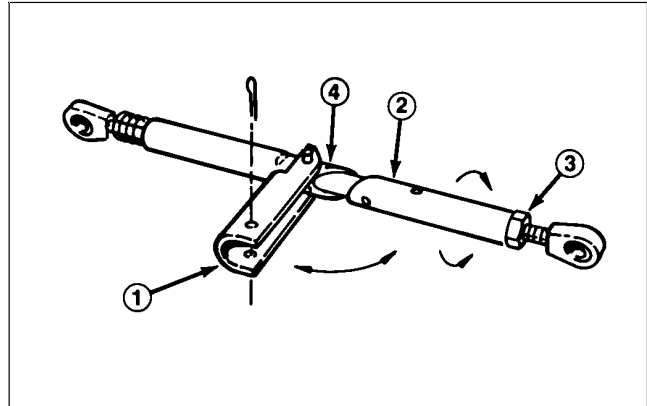


Figure 3
(Old Style Belt Tensioner)

- 1. Belt tension rod handle
- 2. Belt tension rod
- 3. Jam nut
- 4. Angle cut

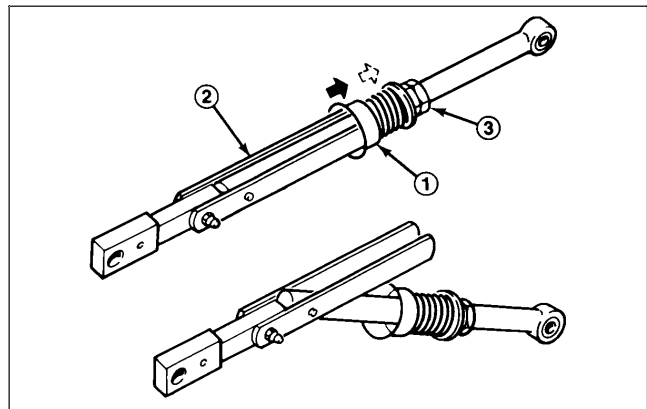


Figure 4
(New Style Belt Tensioner)

- 1. Belt tension rod cup retainer
- 2. Belt tension rod
- 3. Jam nut

Clutch Adjustment (Reelmaster 216) (Fig. 7)

1. Check adjustment by inserting a feeler gauge through slots next to flange studs on clutch (Item 21).

2. Correct disengaged clearance between clutch plates is 0.006 to 0.012 in. It will be necessary to check this clearance at each of the three slots to make sure the plates are parallel to each other and equal at all three locations.

3. Adjust by tightening or loosening locknuts on flange studs.

Jackshaft Belt Adjustment (Reelmaster 216) (Fig. 5)

NOTE: When a new belt has been installed, check tension again after the first 8 hours of operation.

1. Make sure the idler bracket (Item 11) and belt tensioner (Item 6) are free to move.

2. Adjust nut (Item 7) on belt tensioner to compress spring (Item 9) to a length of 3/4 in.

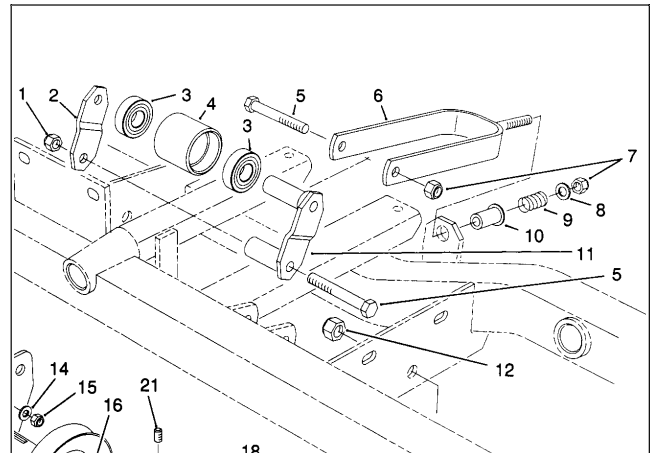


Figure 5

Jackshaft Belt Adjustment (Reelmaster 216-D) (Fig. 6)

NOTE: When a new belt has been installed, check tension again after the first 8 hours of operation.

1. Make sure the idler bracket and belt tension yoke are free to move.

2. Adjust capscrew to compress spring to a length of 3/4 in.

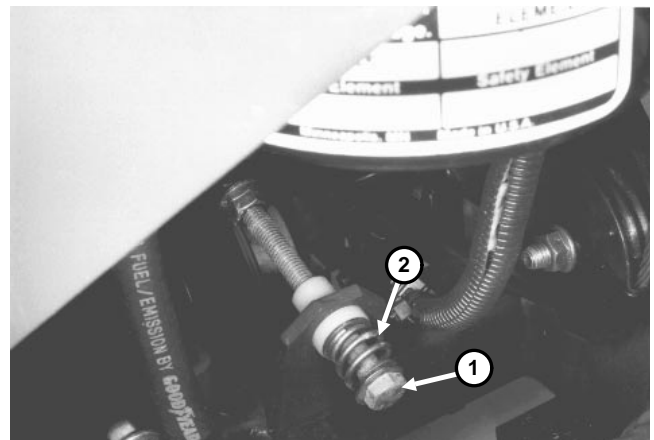


Figure 6

1. Capscrew

2. Spring

Repairs

Clutch Replacement (Reelmaster 216) (Fig. 7)

Removing Clutch

1. Loosen tension on jackshaft drive belt (Item 25) and slip belt off of clutch pulley.
2. Disconnect clutch electrical connector.
3. Remove capscrew (Item 24) and washers.
4. Remove clutch (Item 21) from engine shaft.

NOTE: Anti-seize compound is applied to engine shaft at factory. After a period of time anti-seize compound can dry up causing clutch to rust to shaft. If this happens try the following:

1. Apply penetrating oil to loosen the shaft to rotor connection. Apply penetrating oil to field rotor side of clutch (side facing engine) and also apply through hole in bearing carrier directly to shaft. Be careful not to get excess lubricant on clutch, especially the armature and rotor.
2. Hit bearing collar (on pulley side) a few times to loosen connection between rotor and shaft. Apply more penetrating oil.
3. Attempt to pull clutch off of shaft by hand. If clutch does not come off, use a three-jaw puller. Try have puller jaws connect as close to bearing as possible. If clutch does not come off, apply more penetrating oil, then hit center screw on puller a number of times. At this point some movement may occur. Apply more penetrating oil and continue trying to pull clutch off shaft.

Installing Clutch

1. Make sure clutch stop (Item 19) is installed in engine block. Clutch stop should extend 0.75 ± 0.03 inch. Tighten nut (Item 20) to 38 - 32 ft-lb.
2. Install clutch spacer (Item 18) onto engine shaft with CHAMFER TOWARD ENGINE.
3. Install key (Item 36) in shaft keyway. Apply anti-seize compound to engine shaft and key.
4. Make sure keyways in clutch and pulley are aligned and install clutch onto engine shaft. Make sure clutch stop (Item 19) engages in slot provided in clutch.
5. Secure clutch to engine shaft with capscrew and washers. Tighten capscrew to a torque of 85 - 90 ft-lb.
6. Check to make sure clutch stop (Item 19) does not contact any rotating clutch components.
7. Install and adjust jackshaft drive belt.

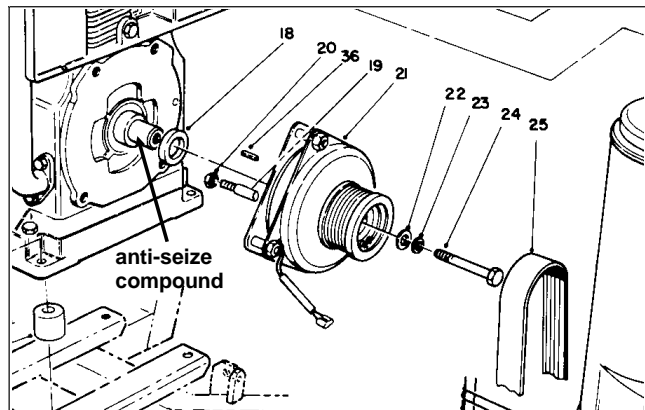


Figure 7

Jackshaft and Bearing Service (Reelmaster 216) (Fig. 8)

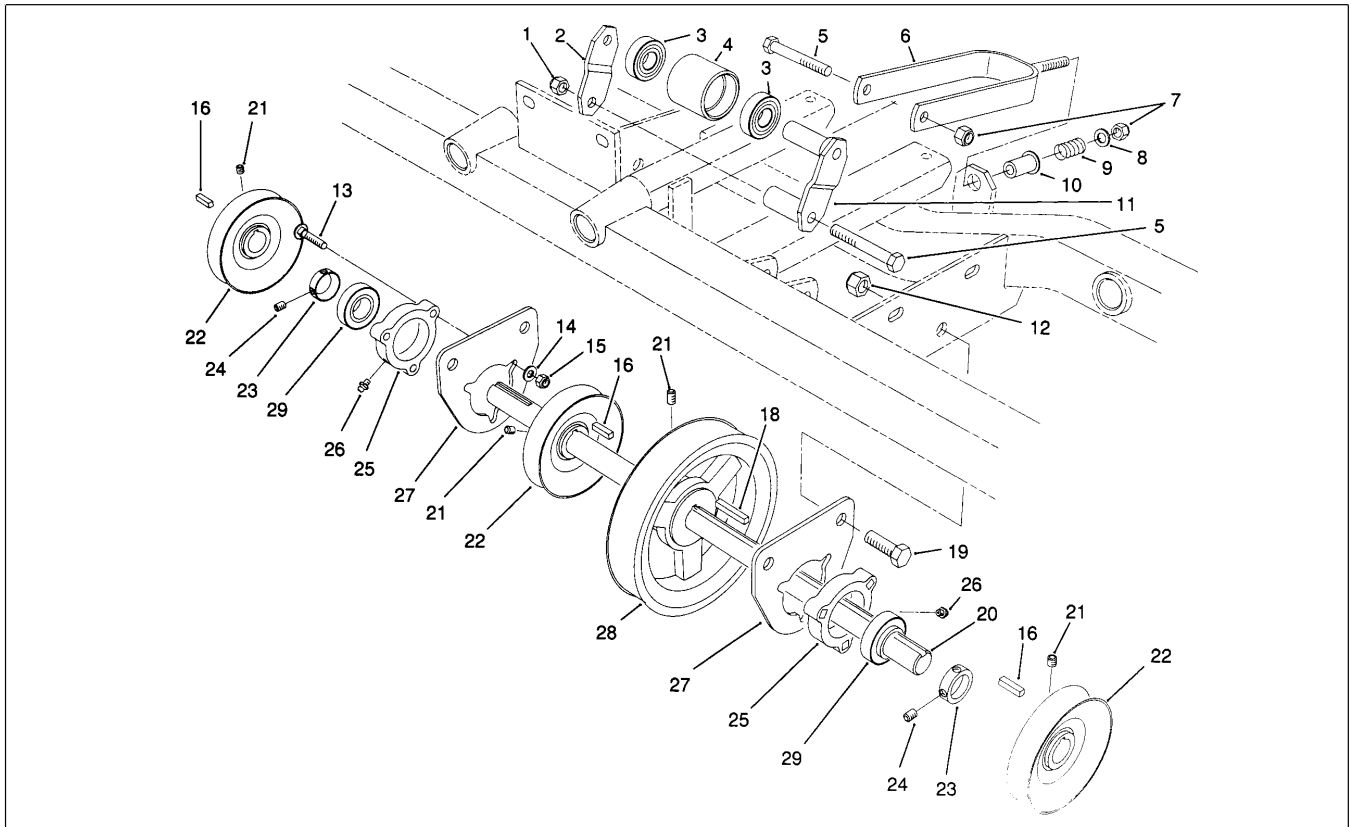


Figure 8

1. Remove tension from cutting unit drive belts and jackshaft drive belt.

2. With cutting unit belts off pulleys, remove capscrews (Item 19) and locknuts (Item 12) securing bearing mounts (Item 27) to the frame.

3. Slip jackshaft drive belt off electric clutch pulley, lower jackshaft assembly and slide it from under the machine.

4. Loosen pulley set screws (Item 21). Remove pulleys (Item 22), keys (Item 16), bearing assemblies (Item 25) and locking collars (Item 23) from shaft (Item 20). To remove eccentric locking collars, loosen setscrew (Item 24) and turn collar in opposite direction from shaft rotation..

5. Inspect bearings (Item 29) and replace if necessary. If replacing bearing, remove bearing assembly (Item 25) from bearing mount (Item 27). Install bearing flanges so grease zerks are accessible from front of machine on right side and from rear on left side.

NOTE: Old style flange bearings can be replaced with the cast housing type bearings used on newer machines.

6. Apply anti-seize compound to keys, then assemble parts to jackshaft. Do not tighten locking collars (Item 23). Do not tighten pulley setscrews.

7. Put belts around pulleys and mount jackshaft assembly to frame. Bearing assemblies (Item 25) should be mounted to bearing mounts (Item 27) with nuts (Item 15) snug, but not tightened.

8. Rotate shaft so self-aligning bearings can find the proper alignment position. Tighten bearing mounting nuts. Set eccentric lock collars against bearings by turning lock collars in direction of shaft rotation, then tighten the set screws.

9. Align jackshaft driven pulley so its lead-in side is in line with the clutch pulley within 0.30 in., then tighten set screw. Align cutting unit pulleys and tighten pulley set screws.

10. Slip jackshaft drive belt onto electric clutch pulley. Install cutting unit drive belts to cutting unit pulley. Adjust tension of jackshaft drive belt and cutting unit drive belts.

11. Operate machine and observe pulleys and belts in operation to check for proper alignment. Make sure jackshaft drive belt has no tendency to jump grooves when engine is run at full speed. Stop engine and re-adjust pulley alignment if necessary.

Jackshaft, Bearing and Clutch Service (Reelmaster 216-D) (Fig. 9)

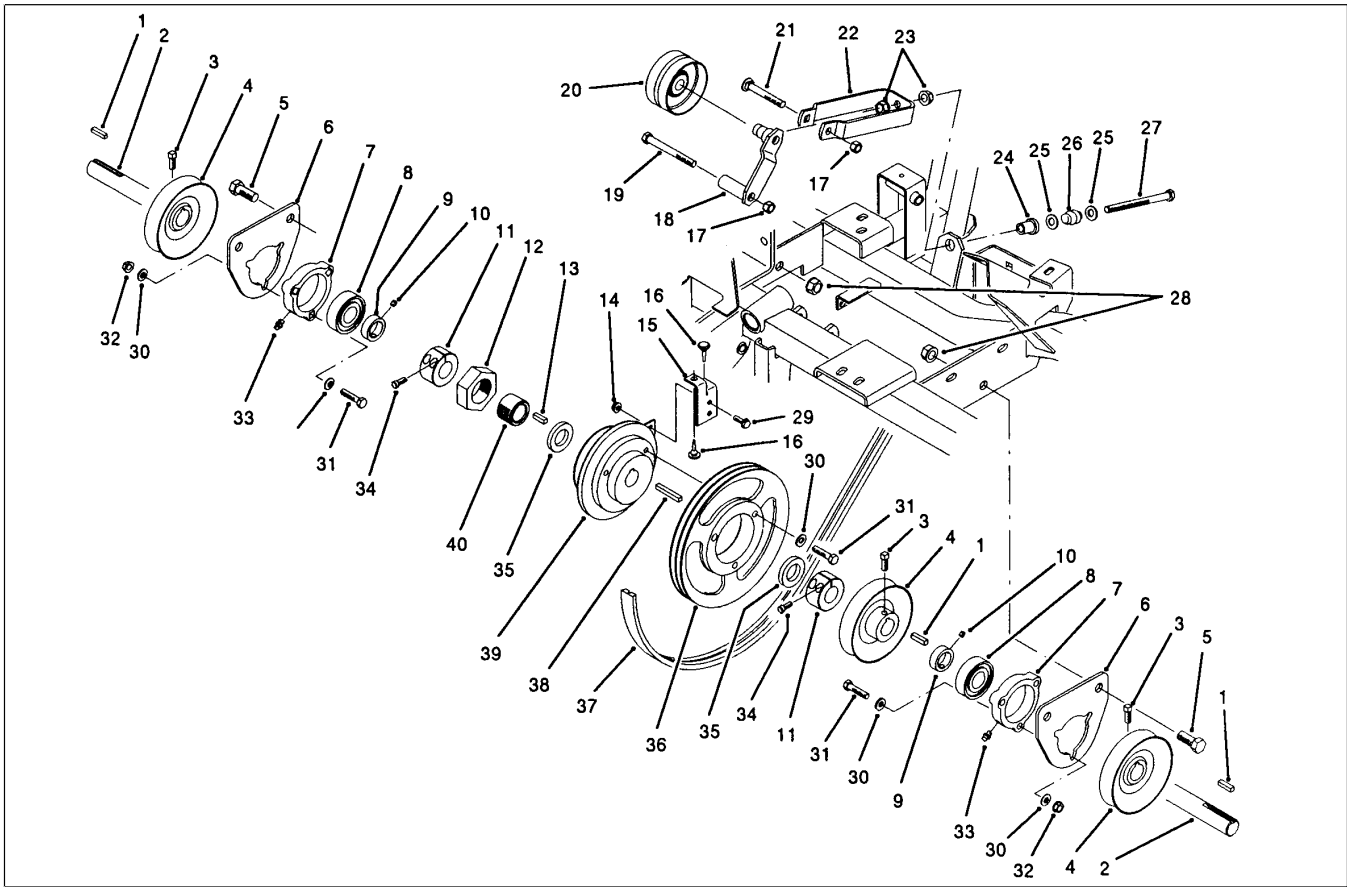


Figure 9

1. Remove tension from cutting unit drive belts and jackshaft drive belt.

2. Remove nut (Item 14) and screw (Item 29) securing clutch to clutch retainer.

3. With cutting unit belts off of pulleys, remove cap-screws (Item 5) and locknuts (Item 28) securing bearing supports (Item 6) to frame. Slip jackshaft drive belt (Item 37) off of clutch pulley (Item 36), lower jackshaft assembly and slide it out from under the machine.

4. Loosen pulley set screws (Item 3). Remove pulleys (Item 4), keys (Item 1), bearing assemblies (Item 7) and locking collars (Item 9) from shaft (Item 2). To remove eccentric locking collars, loosen setscrew (Item 10) and turn locking collar in opposite direction of shaft rotation.

5. Loosen nut (Item 12). Loosen screws (Item 34). Remove collars (Item 11), sleeve with nut, (Item 40), spacers (Item 35) and clutch/pulley assembly (Item 39, 36)

6. Inspect bearings (Item 8) and replace if necessary. If replacing bearing, remove bearing assembly (Item 7) from bearing support (Item 6). Install bearing flanges so grease zerks are accessible from front of machine on right side and from rear on left side.

7. Thoroughly clean jackshaft with solvent - degreaser before assembling. Apply anti-seize compound to keys, then assemble parts to jackshaft. Do not tighten collars (Item 11) or locking collars (Item 9). Do not tighten pulley setscrews.

8. Put belts around pulleys and mount jackshaft assembly to frame. Bearing assemblies (Item 7) should be mounted to bearing supports (Item 6) with cap screws (Item 31) snug, but not tightened.

9. Rotate shaft so self-aligning bearings can find the proper alignment position. Tighten bearing mounting cap screws. Set eccentric lock collars against bearings by turning lock collars in direction of shaft rotation, then tighten the set screws.

10. Align clutch pulley with engine pulley so a straight edge laid across engine pulley face will not have more than a 0.30 in. gap with flanges on clutch pulley, then tighten collars (Item 11) to secure clutch and pulley in position. Tighten nut (Item 12) against collar (Item 11) to a torque of 60 - 70 ft-lb.

11. Install screw (Item 29) and nut (Item 14) to secure clutch to clutch retainer.

12. Align cutting unit pulleys and tighten setscrews.

13. Slip jackshaft drive belt onto engine pulley. Install cutting unit drive belts to cutting unit pulleys. Adjust tension of jackshaft drive belt and cutting unit drive belts.

14. Operate machine and observe pulleys and belts in operation to check for proper alignment. Make sure jackshaft drive belt has no tendency to jump grooves when engine is run at full speed. Stop engine and re-adjust pulley alignment if necessary.

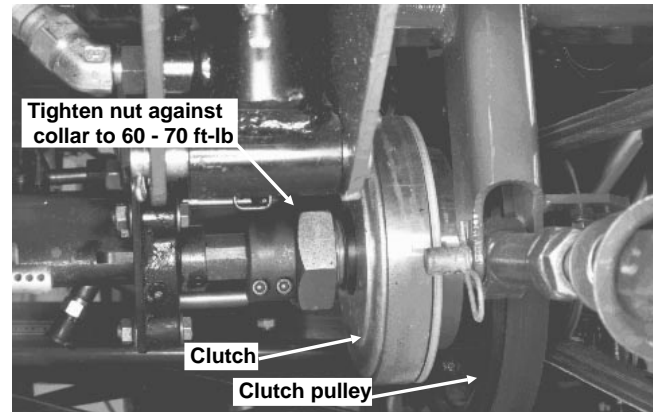


Figure 10

Clutch Service (Reelmaster 216) (Fig. 11)

The clutch has a rotor that is driven by the engine crankshaft. When the reel engagement circuit is energized, and electromagnet pulls the armature into contact with the rotor to drive the pulley.

Failure to get clutch engagement would likely be caused by a clutch air gap that is too large (see Clutch Adjustment), a circuit fault in the clutch electromagnet, or other electrical problem (see Troubleshooting section of Chapter 6 - Electrical System).

It is recommended that the clutch be serviced in sub-assemblies, however, individual parts of the clutch can be replaced.

1. Remove three (3) locknuts (Item 9) and springs (Item 10).

2. Separate the clutch into two halves: field coil, rotor & bearing assembly (Items 1 - 4) and armature & pulley assembly (Items 5 - 8, 3).

3. To replace pulley bearings (Item 8):

A. Remove retaining ring (Item 3).

B. Put armature and pulley assembly, pulley side down, in an arbor press. Press on bearing collar (Item 7) to remove bearings and collar. If bearings are removed, they MUST be replaced.

C. Press collar out of bearings.

D. Make sure both inside and outside race of one bearing is on a flat surface and press collar into bearing. Press collar and bearing into other bearing.

E. Put armature and pulley assembly in arbor press, pulley side up. Put spacers in three (3) locations between pulley and armature plate to prevent damage to springs. Three (3) stacks of flat washers can be used for spacers. Make sure extended part of collar is facing down and press on outer bearing race to install bearing and collar.

F. Install retaining ring.

4. Assemble clutch halves, install on engine shaft and adjust air gap. (See Clutch Adjustment and Clutch Replacement (Reelmaster 216)).

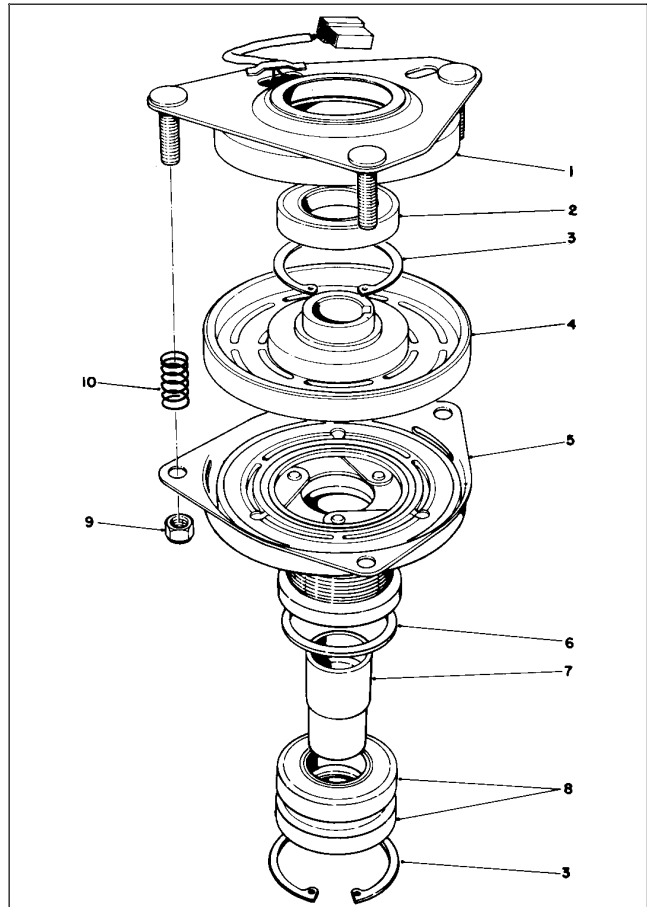


Figure 11

Clutch Service (Reelmaster 216-D) (Fig. 12)

The clutch has a rotor and pulley that is driven from the engine crankshaft by a belt . When the reel engagement circuit is energized, an electromagnet pulls the armature into contact with the rotor to drive the jackshaft.

Failure to get clutch engagement would likely be caused by a clutch air gap that is too large, a circuit fault in the clutch electromagnet, or other electrical problem (see Troubleshooting section of Chapter 6 - Electrical System).

NOTE: The air gap is not adjustable on this clutch.

The clutch must be serviced in sub-assemblies. Individual parts of the clutch can be replaced. See Jackshaft, Bearing and Clutch Service (Reelmaster 216-D) for more information.

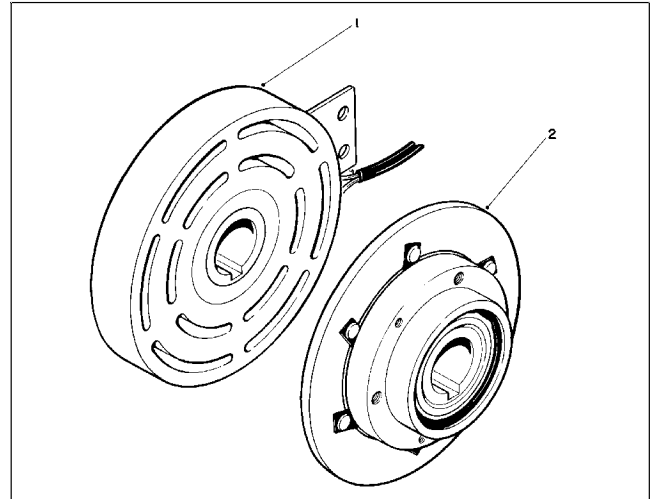


Figure 12

1. Field & rotor assembly
2. Armature assembly



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Specifications

Width/Height of Cut: 72 in. (183 cm) width of cut. 5, 8, or 11 blade floating: 1/4 – 1-3/4 in. (6.4 – 44.4 mm); 5 blade fixed: 1/2 – 2-5/8 in. (12.7 – 65.6 mm).

Frequency of Clip:

| Standard Cutting Unit Drive Pulley | | | |
|---|---|------------------------------------|-------------------------------------|
| | 5 blade fixed or floating @ 795 reel rpm | 8 blade floating @ 860 reel rpm | 11 blade floating @ 860 reel rpm |
| @ 4 mph (6.4 km/h) | 1.06 in. (27 mm) | .61 in. (15.5 mm) | .45 in. (11.4 mm) |
| @ 5 mph (8 km/h) | 1.32 in. (33.5 mm) | .77 in. (19.5 mm) | .56 in. (14.2 mm) |

| Optional Large Cutting Unit Drive Pulley | | | |
|---|---|------------------------------------|-------------------------------------|
| | 5 blade fixed or floating @ 646 reel rpm | 8 blade floating @ 646 reel rpm | 11 blade floating @ 646 reel rpm |
| @ 4 mph (6.4 km/h) | 1.31 (33.2 mm) | .82 in. (20.8 mm) | .59 in. (15 mm) |
| @ 5 mph (8 km/h) | 1.64 in. (41.6 mm) | 1.02 (25.9 mm) | .74 in. (18.7 mm) |

Height of Cut Adjustment: Positive position settings with separate fine adjustments for leveling either end of roller, or extending height range.

Bedknife To Reel Adjustment: Single knob screw adjustment for bedknife to reel, located at center of bedbar. Adjustment knob detent with .001 in. movement of bedknife for each indexed position.

Bedknife Screw Torque: 200 in-lb.

Special Tools

NOTE: Order special tools from the *TORO SPECIAL TOOLS AND APPLICATIONS GUIDE (COMMERCIAL PRODUCTS)*. Some tools may be listed in the Reelmaster 216 or Reelmaster 216-D Parts Catalog. Some tools may also be available from a local supplier.

Handle Assembly (Fig. 1)

For applying lapping compound to cutting units while keeping hands a safe distance from the rotating reel assembly.

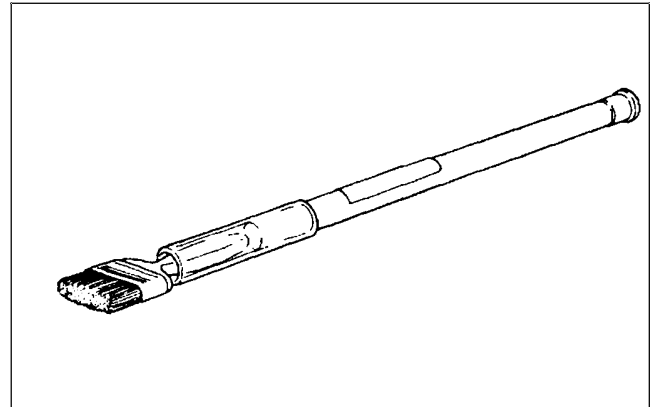


Figure 1

Bedknife Screw Tool (Fig. 2)

Fits Toro bedknife attaching screws. Use with torque wrench to secure bedknife to bedbar. With clean bedbar threads and new screws, tighten to a torque of 200 in-lb.

NOTE: Remove all rust, scale and corrosion from bedbar surface before installing bedknife.

DO NOT use an air impact wrench with this tool.

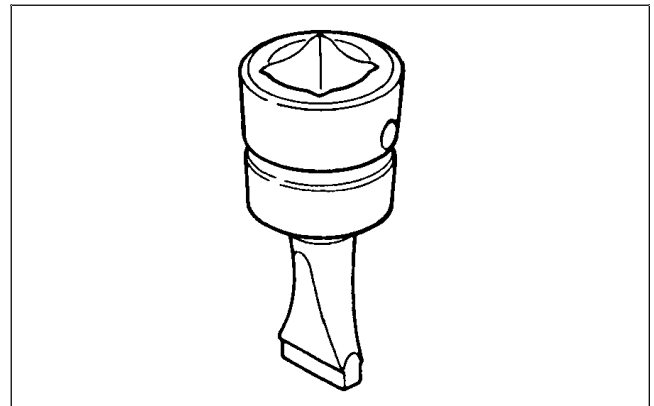


Figure 2

Troubleshooting

There are a number of factors that can contribute to unsatisfactory quality of cut, some of which may be turf conditions. Turf conditions such as excessive thatch, “sponginess” or attempting to cut off too much grass

height may not always be overcome by adjusting the machine. It is important to remember that the lower the height of cut, the more critical these factors are.

Factors Affecting Quality of Cut

| Factor | Possible Problem/Correction |
|--|---|
| 1. Engine maximum governed speed. | Check maximum governed engine speed. Adjust to specification if necessary — affects reel speed. |
| 2. Reel speed and ground speed. | Select proper reel pulley size and use proper ground speed to get optimum clip frequency for selected height of cut. See Troubleshooting in Chapter 5 - Hydraulic System. |
| 3. Tire pressure. | Check tire pressure and adjust if necessary. Must be equal in both front tires. |
| 4. Reel bearing condition and alignment. | Replace bearings if worn or damaged. |
| 5. Reel and bedknife sharpness. | Reel and/or bedknife that has rounded edge CANNOT be corrected by tightening bedknife to reel contact. Grind reel to remove taper (cone shape) and/or rifling (grooved or ribbed appearance). Grind bedknife to sharpen and/or remove rifling. (Most common cause of rifling is bedknife to reel contact that is too tight.) NOTE: New bedknife must be ground after installing on bedbar to match bedknife to bedbar. |
| 6. Bedknife parallel to reel. | Check and adjust as necessary. |
| 7. Bedknife to reel contact. | Check before operating with cutting unit on ground. Remove belt tension and rotate reel by hand. TURN ADJUSTING KNOB ONE (1) CLICK AT A TIME UNTIL FIRST CONTACT BETWEEN REEL AND BEDKNIFE IS FELT OR HEARD, THEN TIGHTEN ONE (1) MORE CLICK TO GET LIGHT CONTACT. No contact dulls cutting edges. Excessive contact increases wear. |

| Factor | Possible Problem/Correction |
|---|--|
| 8. Height of cut. | All cutting units set at same height of cut. Bench set height of cut and actual (effective) height of cut are different. Effective height of cut depends on cutting unit weight, counterbalance spring adjustment, cutting unit accessories and turf conditions. |
| 9. Rear roller parallel to reel. | Check and adjust as necessary. |
| 10. Front roller adjustment. | Check and adjust as necessary. |
| 11. Roller scraper and comb adjustment. | Set scraper for 1/32 in. clearance from roller. Set comb the same on all cutting units for height of cut and turf conditions. Must be same height at both ends of comb. |
| 12. Stability and position of bedbar. | <p>Check bedbar bushings and nylon flange bushings for wear or damage and replace if necessary.</p> <p>Check adjustment knob to make sure detent holds adjustment. Repair if necessary.</p> <p>Check to make sure adjustment knob/pivot assembly is centered in bedbar arm yoke so that an equal gap exists on each side of pivot housing before pivot screws are installed. Make sure bedknife adjustment knob/pivot assembly is held firmly in place between bedbar arm yoke. Tighten pivot set screws if necessary.</p> |
| 13. Number of reel blades/reel speed. | Use cutting unit model with correct number of blades and proper pulley size for clip frequency and optimum height of cut range. |
| 14. Cutting unit alignment. | Check alignment on all cutting units. Adjust or repair as necessary. Check lift arms for damage, binding or bushing wear. Repair if necessary. |
| 15. Roller condition | All rollers must rotate freely. Grease when needed or repair bearings if necessary. |

Set Up and Adjustments

Adjustment Summary and Check List

DETAILED ADJUSTMENT INSTRUCTIONS FOLLOW THIS SUMMARY AND CHECK LIST. Study this information and refer to it often to get maximum life and performance from the cutting units.

Daily Performance Checks

NOTE: It is not necessary to remove the cutting units from the traction unit to perform these daily checks. It is recommended that mowers be washed after each use. Always remove key from ignition switch when working on the machine.

1. Purge all water and debris from all of the bearings by greasing them. Use No. 2 multi-purpose lithium base grease.

2. Visually check for sharp reel and bedknife.

- Remove burrs, nicks, and rounded edges.

3. Lower cutting units to ground (setting on rollers) and remove belt tension. Rotate the reel by hand. TURN ADJUSTING KNOB ONE (1) CLICK AT A TIME UNTIL FIRST CONTACT BETWEEN REEL AND BEDKNIFE IS FELT AND HEARD THEN TIGHTEN ONE (1) MORE CLICK TO GET LIGHT CONTACT *.

- No contact will dull the cutting edges.
- Excessive contact accelerates wear; quality of cut may be adversely affected.

* It is best to make the reel to bedknife adjustment in the morning, immediately before each day of mowing.

Weekly Checks

1. Check reel bearing condition — rotate reel by hand with no bedknife to reel contact.

2. Make sure bedknife adjustment knob/pivot assembly is held FIRMLY in place between bedbar yoke.

3. Using a gauge bar, verify correct height of cut setting.

Monthly Adjustments

NOTE: Remove cutting unit from traction unit.

1. Visually check for sharp reel and bedknife. Backlap or grind reel and bedknife if necessary.

2. Set height of cut adjustment and level rear roller.

3. Adjust bedknife parallel to reel.

5. Floating cutting units only – use gauge bar to verify height of cut adjustment and adjust front roller.

6. Adjust roller scraper (if equipped) to 1/32 in. from roller.

- * Check to make sure both front and rear rollers contact the ground for their entire length and that the bedknife cutting edge is parallel with the ground. Do adjustments again if necessary.

7. Set comb (if equipped) for desired action on turf.

8. After installing cutting units on machine, lower cutting units to ground and adjust reel to bedknife contact (see Step 3 under Daily Performance Checks).

Special Notes

1. Replace the bedbar bushings and nylon flange bushings every two years.

2. A “rifled” reel and/or bedknife must be corrected by grinding.

3. After extended running, a ridge will eventually develop at both ends of the bedknife. These ridges must be ground off or filed flush with cutting edge of bedknife to assure smooth operation.

4. Adjust large jam nut on reel shaft to get 0.060 in. clearance from reel blades to end of bedbar when capscrew on end of reel shaft is tightened. Tighten capscrew on end of reel shaft to 35 ft-lb.

5. To get proper bearing alignment, leave nuts on bearing flanges loose and adjust reel parallel to bedknife. Rotate reel by hand and tap end of reel shaft with a soft face hammer so self-aligning reel bearings can find the proper alignment position. Tighten nuts to clamp and retain bearings.

Cutting Unit Characteristics

The single knob bedknife-to-reel adjustment system incorporated in this cutting unit simplifies the adjustment procedure needed to deliver optimum mowing performance. The precise adjustment possible with the single knob/bedbar design gives the necessary control to provide a continual self-sharpening action — thus maintain-

ing sharp cutting edges, assuring good quality-of-cut, and greatly reducing the need for routine backlapping.

In addition, the rear roller positioning system permits optimum bedknife attitude and location for varying height-of-cuts and turf conditions.

Bedknife to Reel Contact (Fig. 3)

Prior to each day's mowing, or as required, each cutting unit must be checked to verify proper bedknife-to-reel contact. This must be performed even though quality of cut is acceptable.

1. Shut off engine and lower cutting units onto a hard surface.
2. Release belt tension to cutting units.
3. Slowly rotate reel in reverse direction listening for reel-to-bedknife contact. If no contact is evident, turn bedknife adjusting knob clockwise, one click at a time, until light contact is felt and heard.
4. If excessive contact is felt, turn bedknife adjusting knob counterclockwise, one click at a time until no contact is evident. Then turn bedknife adjusting knob one click at a time clockwise, until light contact is felt and heard.

IMPORTANT: Light contact is preferred at all times. If light contact is not maintained, bedknife / reel edges will not sufficiently self-sharpen and dull cutting edges will result after a period of operation. If excessive contact is maintained, bedknife / reel wear will be accelerated, uneven wear can result, and quality of cut may be adversely affected.

NOTE: As the reel blades continue to run against the bedknife a slight burr will appear on the front cutting edge surface the full length of the bedknife. If a file is occasionally run across the front edge to remove this burr, improved cutting can be obtained.

After extended running, a ridge will eventually develop at both ends of the bedknife. These ridges must be ground off or filed flush with cutting edge of bedknife to assure smooth operation.

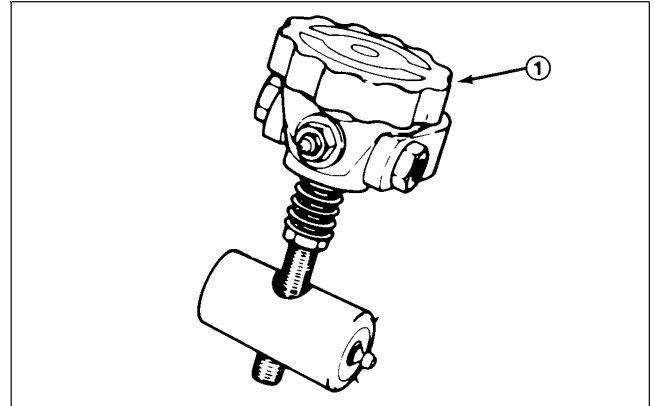


Figure 3

1. Bedknife adjusting knob

Height of Cut Adjustment and Leveling Rear Roller (Fig. 4) (Floating Cutting Units)

1. Position cutting unit on a flat level table or board.
2. Slightly loosen (crack) nut securing each roller bracket to angle bracket.
3. Adjust support capscrew to achieve 1-1/16 in. dimension between Height-of-Cut support and front roller bracket (2 places).
4. Adjust support capscrew to achieve $5/8 \pm 1/16$ in. dimension between Height-of-Cut support and rear roller bracket (2 places).
5. Remove hair pin cotters securing rear Height-of-Cut pins and reinstall in the 1/2 in. setting as indicated on Height-of-Cut plate.
6. Remove hair pin cotters securing front Height-of-Cut pins and reinstall in the 1/4 in. setting as indicated on Height-of-Cut plate to allow clearance between roller and table.
7. Position a 1/2 in. or thicker bar under the reel blades and against the front face of the bedknife. Make sure bar covers the full length of reel blades.
8. Verify if rear roller is level, by inserting a piece of paper under each end of roller.
9. Level roller by adjusting appropriate support capscrew on rear roller supports until roller is parallel and entire length of roller contacts table.
10. When roller is level, adjust both rollers to desired position with Height-of-Cut pins. Tighten nuts securing roller brackets.

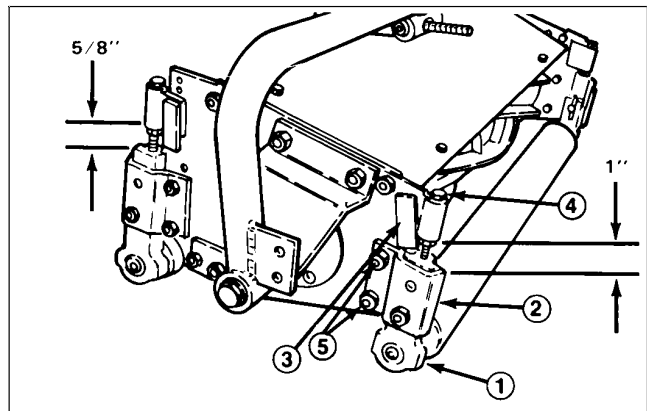


Figure 4

- | | |
|----------------------|---------------------|
| 1. Roller bracket | 4. Support capscrew |
| 2. Angle bracket | 5. Locknuts |
| 3. Height of cut pin | |

Height of Cut Adjustment and Leveling Rear Roller (Fig. 5) (Fixed Cutting Units)

1. Position cutting unit on flat level surface or board.
2. Slightly loosen (crack) nuts securing roller brackets to angle brackets.
3. Adjust support capscrews to achieve $5/8 \pm 1/16$ in. dimension between Height-of-Cut support and roller bracket (2 places).
4. Remove hairpin cotters securing Height-of-Cut pins and reinstall in hole at desired setting as indicated on Height-of-Cut plate.
5. Use a gage block with a height equal to the desired height-of-cut and position it against the front edge of the bedknife at one end. Turn the support capscrew to adjust the height of the bedknife equal to the gage block.
6. Repeat the procedure at the other end, then recheck the original end.
7. Tighten nuts securing roller brackets.
8. After initial set-up, height-of-cut may be changed by repositioning Height-of-Cut pins to desired setting.

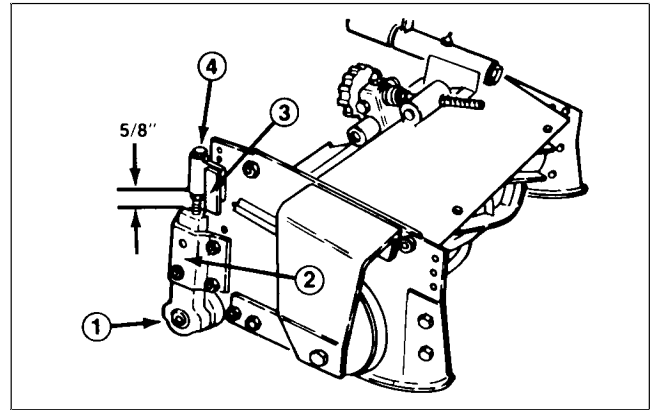


Figure 5

1. Roller bracket
2. Angle bracket
3. Height of cut pin
4. Support capscrew

Parallel Bedknife to Reel (Fig. 6, 7, 8) (Floating or Fixed Cutting Units)

1. Make sure reel contact is removed by turning bedknife adjustment knob counterclockwise. Tip cutting unit to gain access to reel and bedknife.

2. On either end of reel, insert a long strip of dry newspaper between reel and bedknife. While slowly rotating reel into bedknife, turn bedknife adjusting knob clockwise, one click at a time until paper is pinched lightly, which results in a slight drag when paper is pulled.

3. Check for light contact at other end of reel using paper. If light contact is not evident, proceed to next step.

4. Loosen (2) carriage bolts on bedbar adjuster.

5. Adjust nuts to move bedbar adjuster up or down until paper is pinched along entire bedknife surface, when bedknife adjustment knob is adjusted to no more than two clicks beyond first contact of reel bedknife.

6. Tighten nuts and carriage bolts and verify adjustment.

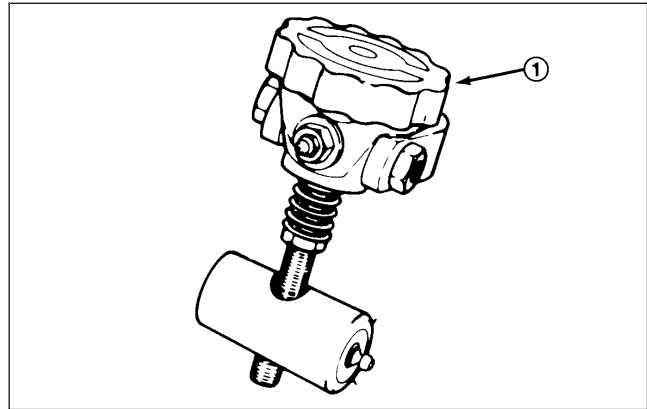


Figure 6

1. Bedknife adjusting knob

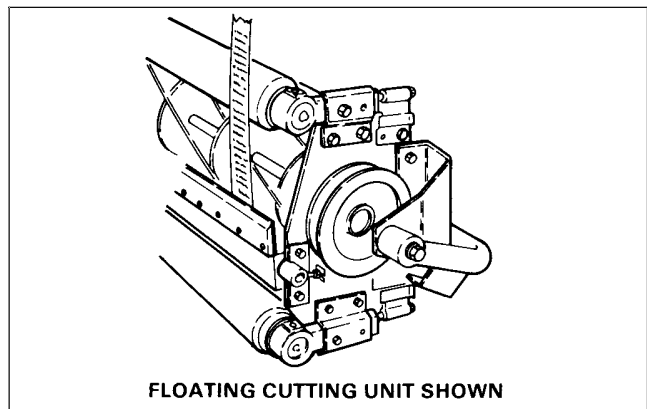


Figure 7

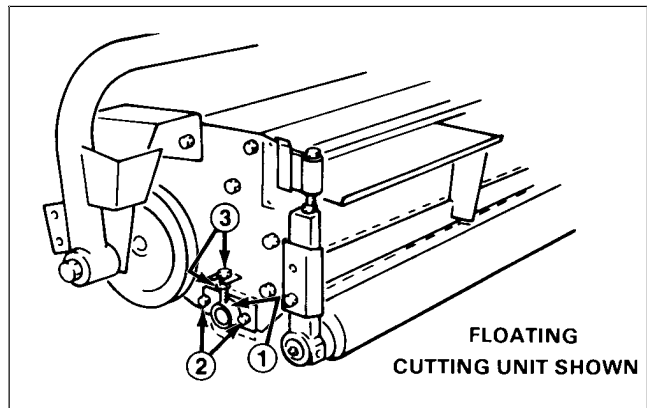


Figure 8

1. Bedbar adjuster
2. Carriage bolts
3. Adjustment nuts

Verifying Height of Cut Adjustment and Leveling Front Roller (Fig. 9) (Floating Cutting Units)

1. On gauge bar, set head of screw to desired Height-of-Cut. This measurement is from bar face to underside of screw head. Gauge bar (Toro Part No. 13-8199) may be obtained from your local Toro Distributor.
2. Slightly loosen (crack) nut securing each front roller bracket to angle bracket.
3. Place the bar across the front and rear rollers and adjust the front roller support screws until the underside of screw head engages the bedknife cutting edge. Do this on both ends of reel.
4. Tighten nuts securing roller brackets.

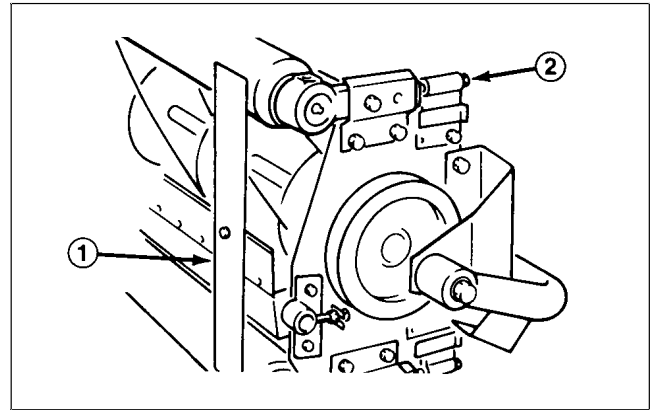


Figure 9

1. Gauge bar
2. Front roller support screw

Pulley Cleaner Adjustment (Fig. 10)

1. Adjust cleaner bracket so it is centered in groove of pulley and tighten carriage bolt and locknut.
2. Adjust cleaner bracket so there is approximately .030 – .060 in. clearance between bracket and pulley, then tighten capscrew and locknut.

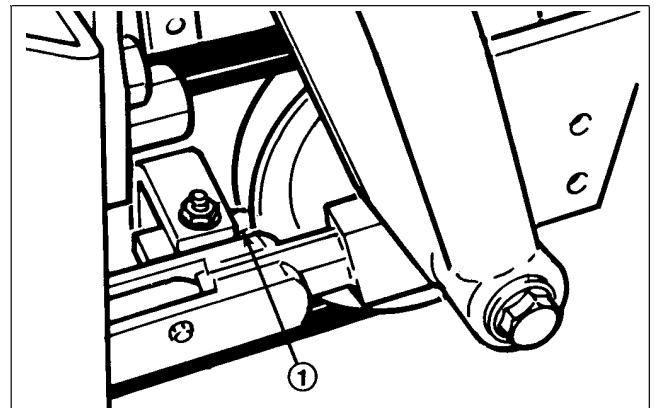


Figure 10

1. Cleaner bracket

Counterbalance Spring Adjustment

See Counterbalance Spring Installation in Repairs section of this chapter.

Service and Repairs

Front Roller Installation (Fig. 11) (Floating Cutting Units)

1. Remove (2) locknuts securing each angle bracket to cutting unit.
2. Remove height-of-cut pins.
3. Insert smaller diameter shaft end of roller into white bushing in roller bracket, making sure flanged end of nylon bushing faces inside toward roller. **Hex of roller bracket must mate with hex of nut adjustment.**
4. Press roller bracket onto shaft end of roller. **Hex of roller bracket must mate with hex of nut adjustment.**
5. Hold one roller bracket stationary and use other bracket as a wrench to loosen or tighten bearing clearance to allow roller to rotate freely and to eliminate bearing end play.
6. Roller brackets must be aligned for installation onto cutting unit. If necessary to align after bearing adjustment, remove roller bracket on side with flanged nylon, align with opposite roller bracket within \pm one hex flat and replace.
7. Reinstall Height-of-Cut pins.
8. Reinstall (2) locknuts securing each angle bracket to cutting unit.

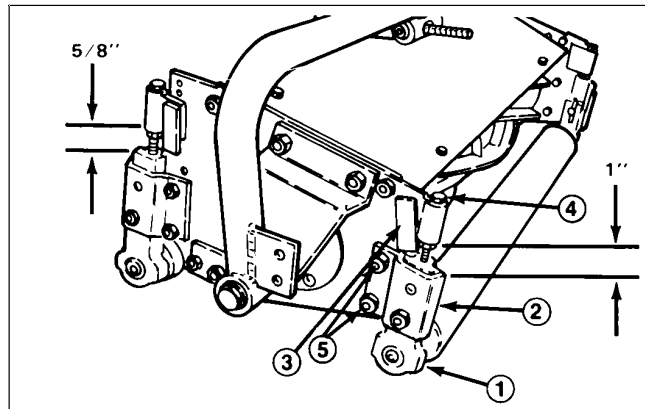


Figure 11

- | | |
|----------------------|---------------------|
| 1. Roller bracket | 4. Support capscrow |
| 2. Angle bracket | 5. Locknuts |
| 3. Height of cut pin | |

Installing Cutting Units (Fig. 12) (Floating Cutting Units)

1. Slide a thrust washer onto lift arm pivot rod.
2. Slide cutting unit carrier frame onto pivot rod and secure with a flat washer, lockwasher and capscrew.

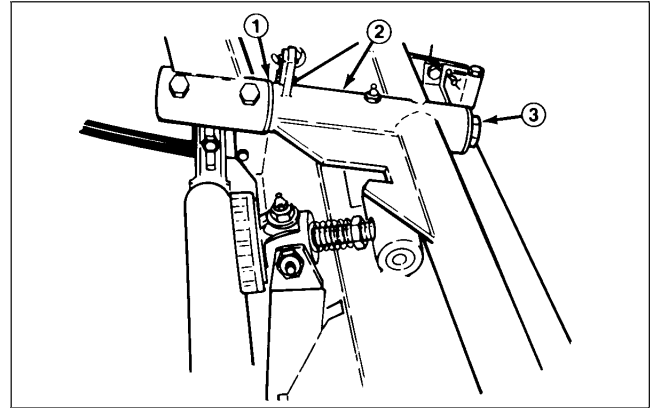


Figure 12

1. Thrust washer
2. Carrier frame
3. Flat washer, lockwasher, capscrew

Installing Cutting Units (Fig. 13) (Fixed Cutting Units)

1. Slide a thrust washer onto lift arm pivot rod.
2. Slide cutting unit support onto pivot rod and secure with a flat washer, lockwasher, and capscrew.
3. Front cutting units should be parallel to front wheels. To adjust, loosen capscrews securing supports to cutting units, adjust cutting units until parallel, then, re-tighten screws.

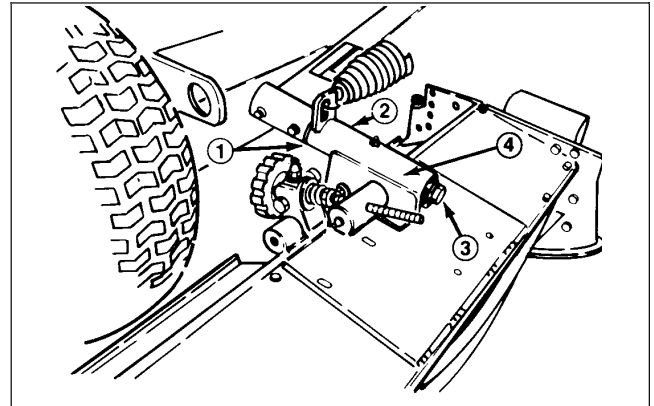


Figure 13

1. Thrust washer
2. Cutting unit support
3. Flat washer, lockwasher, capscrew
4. Spring

Drive Belt and Belt Tensioner Installation (Fig. 14) (Floating Cutting Units)

1. Route V-belts around jackshaft pulleys and reel pulleys.

2. On pulley end of front cutting units and both ends of rear cutting unit, remove nut from bolt securing carrier frame to tensioner bracket.

3. Install a spacer, belt tension rod and washer onto capscrew.

NOTE: Belt tension rods to be in locked position when installing. Loosen jam nut and rotate rod to adjust rod length for installation.

4. Reinstall nut previously removed.

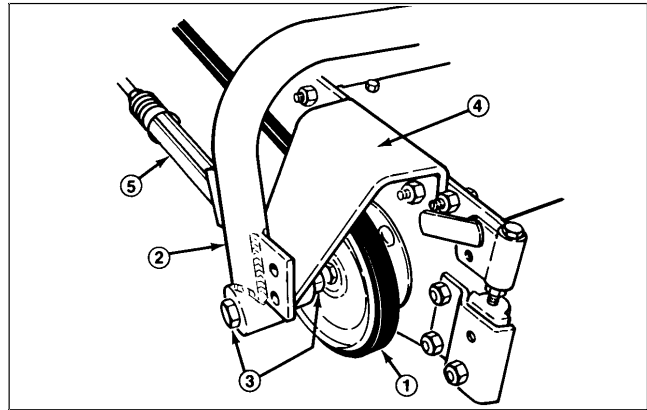


Figure 14

- | | |
|--|----------------------|
| 1. Cutting unit drive belt | 4. Tensioner bracket |
| 2. Carrier frame | 5. Belt tensioner |
| 3. Shoulder bolt, (2) flatwashers, nut | |

Drive Belt and Belt Tensioner Installation (Fig. 15) (Fixed Cutting Units)

1. Route V-belts around jackshaft pulleys and reel pulleys.

2. On pulley end of front cutting units and both ends of rear cutting unit, install a washer, spacer, belt tension rod and spacer on capscrew.

NOTE: Belt tension rods to be in locked position when installing. Loosen jam nut and rotate rod to adjust rod length for installation.

3. Secure with nut.

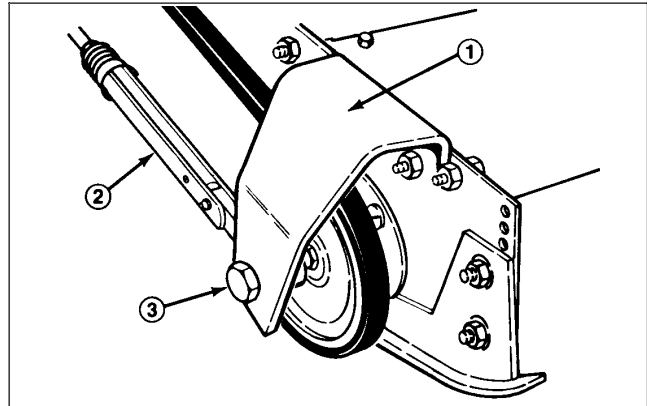


Figure 15

- | |
|------------------------------------|
| 1. Tensioner bracket |
| 2. Belt tensioner |
| 3. Capscrew, (2) flat washers, nut |

Counterbalance Spring Installation (Figs. 16, 17, 18)

1. Remove capscrew securing counterbalance arm to frame.
2. Remove hairpin cotter and clevis pin next to arm.
3. Pivot front arms outward and rear arm inward.
4. Hook one end of spring into second hole (from bottom) on cutting unit lift tab.

Note: On rear counterbalance spring install vinyl cover over spring before installing.

5. On front cutting units secure other end of spring to appropriate hole (see chart below) on counterbalance arm with clevis, clevis pin and hairpin cotter.

6. On rear cutting unit secure other end of spring to appropriate hole in counterbalance arm with (2) chain links, (5, 8 & 11 Blade Floating Cutting units) or (3) chain links (5 Blade Fixed Cutting units), clevis, clevis pin and hairpin cotter.

- A. Bottom hole — for 5 blade reel application
- B. Middle hole — for 8 blade reels without baskets
- C. Top hole — for 8 blade reels using baskets

IMPORTANT: These are recommended settings. Re-adjust spring positions to attain optimum performance. By raising spring locations on counterbalance arms, cutting unit weight on ground is reduced and traction is increased.

7. To tension the counterbalance springs proceed as follows:

- A. Insert a 3/4 in. socket with long extension bar onto counterbalance arm pivot hex.
- B. Pivot arms back until clevis pin and hairpin cotter can be reinstalled in frame.
- C. Reinstall capscrew to lock arms in position.



CAUTION

Use caution when tensioning springs as they are under heavy load.

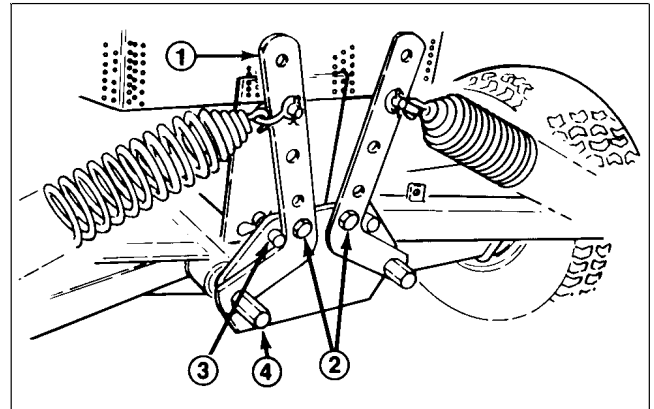


Figure 16

- 1. Counterbalance arm
- 2. Capscrew securing counterbalance arm
- 3. Capscrew, (2) flatwashers, spacer, nut
- 4. Counterbalance arm pivot hex

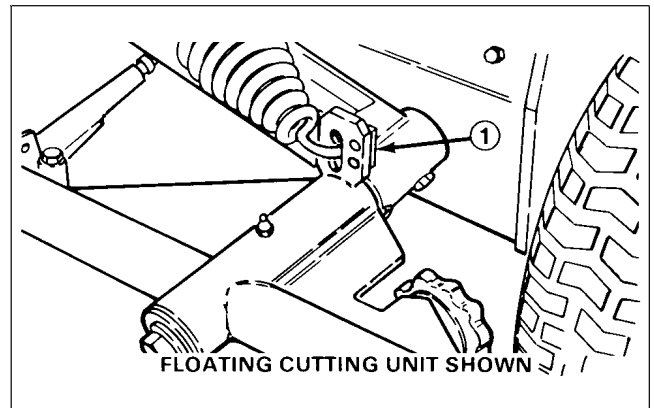


Figure 17

- 1. Cutting unit lift tab

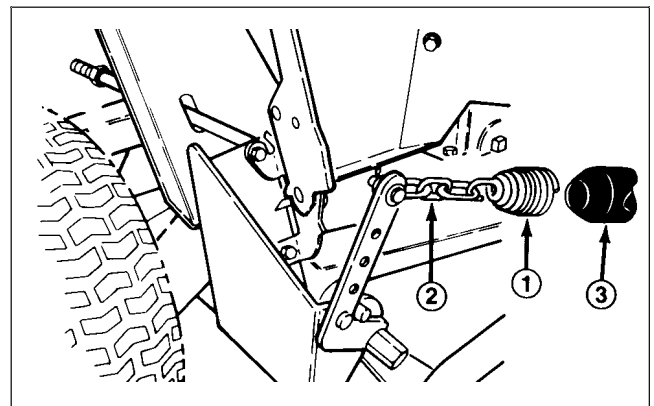


Figure 18

- 1. Rear counterbalance spring
- 2. Chain links
- 3. Vinyl cover

Cutting Unit Overhaul (Fig. 19, 20)

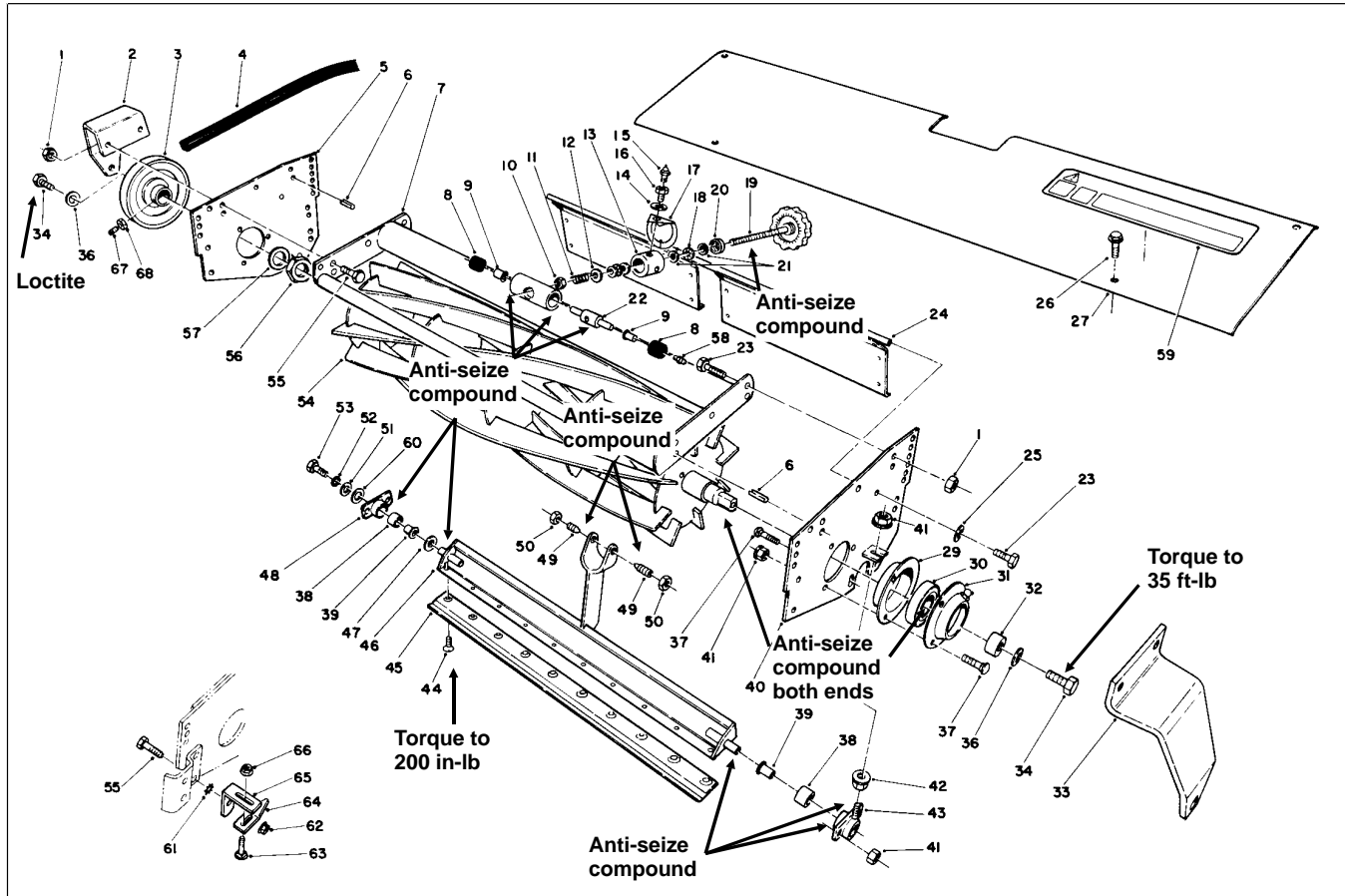


Figure 19
(8 blade floating cutting unit shown)

It is recommended that the following new parts be installed when overhauling a cutting unit. These parts are available in an overhaul kit (Fig. 19):

- Rubber bushings (Item 8)
- Nylon flanged bushings (Item 9)
- Thrust bearings (Item 18)
- Seals (Item 20)
- Bearings (Item 30)
- Bushing assemblies (Item 38)
- Flanged bushings (Item 39)
- Special screws (Item 44)

When assembling cutting unit, apply anti-seize compound in the following locations (Fig. 19):

- Pivot pins on both ends of bedbar (Item 46).
- Tapered end of setscrew (Item 49).
- Stud on bedbar housing (Item 43).
- Both ends of reel shaft (Item 54).
- Handle threads (Item 19).
- Threaded hole in S.P.A. pin (Item 22).
- To bores before installing bushings (Item 8, 38)
- Bore of reel bearings (Item 30).

Use Loctite on capscrew (Item 34) that retains pulley and spacer.

When assembling reel (Fig. 19):

Tighten large jam nut (Item 56) on reel shaft against washer (Item 57) and bearing (Item 30) so that when capscrew (Item 34) on end of reel shaft is tightened, there will be a 0.060 in. gap between end of bedbar and reel blades. Tighten capscrew (Item 34) on end of reel shaft to 35 ft-lb.

To get proper bearing alignment, leave nuts (Item 41) on bearing flanges (Item 29, 31) loose and adjust reel parallel to bedknife. Rotate reel by hand and tap each bearing with a soft-faced hammer so it will self-align in flanges. Tighten nuts to clamp and retain bearings.

When assembling S.P.A. handle (Fig. 19):

Tighten locknut (Item 10) so compression spring (Item 11) is 0.86 in. long.

Pivot (Item 13) must be centered in bedbar arm yoke so a gap exists on both sides of yoke. S.P.A. pin (Item 22) can be moved left or right so handle assembly is straight with no side load. Tighten hex socket set screws (Item 49) until firmly seated (slight pre-load) in tapered seats, then tighten jam nuts.

Position spring arm (Item 17) and fasten so good solid clicking sound is achieved when turning handle.

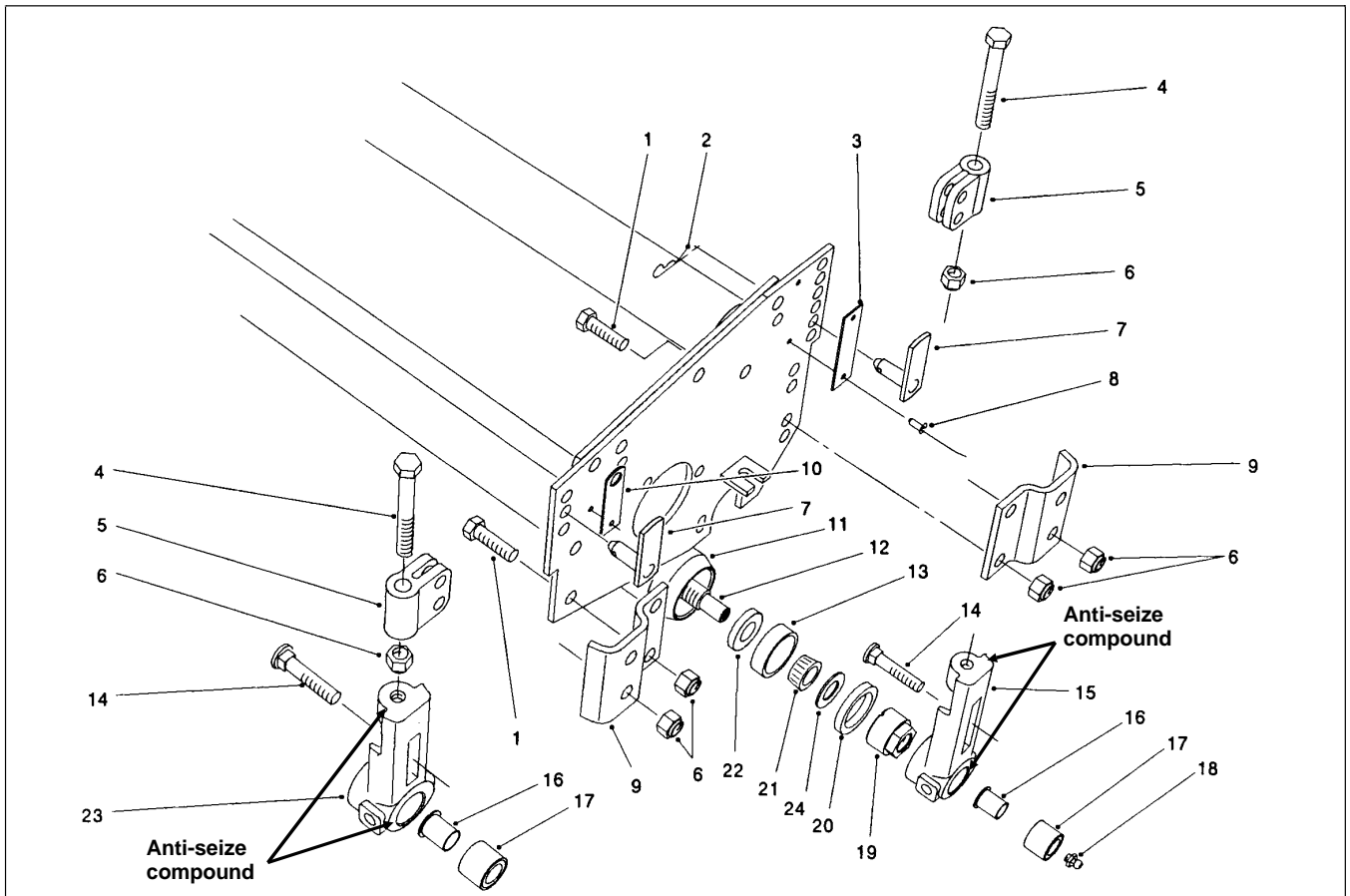


Figure 20
(Floating cutting unit shown)

When assembling rollers (Fig. 20):

Apply anti-seize compound in the following locations:

- Threaded holes on top of brackets (Items 15, 23).
- To bores before installing bushings (Item 17).

Assemble roller bracket (Item 15), bushing (Item 17) and flanged bushing (Item 16) onto smaller diameter shaft end of roller, making sure flanged part of bushing faces inside towards roller. Press other roller bracket onto opposite shaft end of roller. Hex of roller brackets must mate with hex of adjustment nut (Item 19) on roller.

Hold one roller bracket stationary and use opposite roller bracket as a wrench to loosen or tighten adjustment nut (Item 19). Maximum roller rolling torque is 5 in-lb after adjustment and installation.

Roller brackets must be aligned for installation onto cutting unit. If necessary to align after bearing adjustment, remove roller bracket on side with flanged bushing, align with opposite roller bracket within \pm one hex flat and replace.

Backlapping

The cutting units may be backlapped in position on the machine by releasing tensioning to the drive belts and removing the capscrew securing the left end of the carrier frame to the cutting unit. Otherwise, remove cutting units completely before backlapping.

Connect a lapping machine to the capscrew on the left end of reel shaft with an extension coupler and a 9/16 in. socket. Backlap according to procedures in the Toro Sharpening Reel and Rotary Mowers Manual Form No. 80-300-SL.



CAUTION

Be careful when lapping the reel because contact with the reel or other moving parts can result in personal injury.



DANGER

Under no circumstances use a short handled paint brush. 29-9100 Handle assembly complete or individual parts are available from your local Authorized TORO Distributor.

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Commercial Products