



Count on it.

Form No. 12188SL Rev. D

Service Manual

Greensmaster[®]

Flex 1800/1820/2100/2120

(Models 04040, 04041, 04044 and 04045)

Revision History

| Revision | Date | Description |
|----------|---------|---|
| -- | 2012 | Initial Issue. |
| A | 02/2018 | Added revision history. |
| B | 04/2018 | Added 1820/2120 models, revised bedknife installation procedure, added Universal Groomer chapter. |
| C | 06/2018 | Added 1820/2120 wet clutch fluid specifications |
| D | 04/2020 | Added new schematic, wire harness, optional light switch |
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Reader Comments

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NOTES



Service Manual

(Models 04040, 04041, 04044 and 04045)

Greensmaster[®] Flex 1800/1820/2100/2120

Preface

The purpose of this publication is to provide the service technician with information for troubleshooting, testing and repairing assemblies and components on the Greensmaster Flex 1800 (Model 04041), Flex 1820 (Model 04045), Flex 2100 (Model 04040) and Flex 2120 (Model 04044).

REFER TO THE OPERATOR'S MANUAL FOR OPERATING, MAINTENANCE AND ADJUSTMENT INSTRUCTIONS. Space is provided in Chapter 2 of this book to insert the Operator's Manual and Parts Catalogs for your machine. Replacement Operator's Manuals and Parts Catalogs are available on the internet at www.toro.com

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.



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Safety

Product Records
and Maintenance

Engine

Traction and Reel
Drive System

Electrical
System

Chassis and
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Cutting Unit

Groomer
Universal
Groomer

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Safety Instructions

Greensmaster Flex machines have been tested and certified by TORO for compliance with existing safety standards and specifications. 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. To reduce the potential for injury or death, comply with the following safety instructions.



Before Operating

1. Operate the machine only after reviewing and understanding the contents of the Operator's Manual and Operator Training DVD. A replacement Operator's Manual is available on the internet at www.toro.com
2. Never allow children to operate the machine or allow adults to operate it without proper instructions.
3. Become familiar with the controls and know how to stop the machine and engine quickly.
4. Keep all shields, safety devices and decals in place. If a shield, safety device or decal is malfunctioning, illegible or damaged, repair or replace it before operating the machine.
5. Always wear substantial shoes. Do not operate machine while wearing sandals, tennis shoes or sneakers. Do not wear loose fitting clothing which could get caught in moving parts and cause personal injury.
6. Wearing safety glasses, safety shoes, long pants, ear protection and a hard hat is advisable and required by some local safety and insurance regulations.
7. Ensure work area is clear of objects which might be picked up and thrown by the cutting reel.
8. Keep everyone, especially children and pets, away from the areas of operation.
9. Since gasoline is highly flammable; handle it carefully.
 - A. Use an approved gasoline container.
 - B. Do not remove cap from fuel tank when engine is hot or running.
 - C. Do not smoke while handling gasoline.
 - D. Fill fuel tank outdoors and no higher than to the bottom of filter screen. Do not overfill fuel tank.
 - E. Wipe up any spilled gasoline.
 - F. Fuel may leak from filler neck when mower is tilted for servicing if tank is over filled.
10. The safety interlock switches are for the operator's protection; do not disconnect them. Check the operation of the switches daily to assure the interlock system is operating. If a switch is defective, replace it before operating the machine. See Component Testing in Chapter 5 – Electrical System.

While Operating

1. Do not run the engine in a confined area without adequate ventilation. Exhaust fumes are hazardous and could be deadly.
2. Always stand behind the handle when starting and operating the machine.
3. To start the engine:
 - A. Open fuel shut-off valve. Make sure spark plug wire is connected to spark plug.
 - B. Verify that the control lever on handle is in NEUTRAL position for both traction and reel drives.
 - C. Move on/off switch to ON position, set choke to full choke position (cold start) and throttle to half throttle.
 - D. Pull starter cord to start engine.
4. To stop the engine:
 - A. Disengage reel and traction drives and reduce engine speed to SLOW.
 - B. Move on/off switch to OFF position to stop engine.
5. Before emptying basket of clippings, disengage traction and reel drives, reduce engine speed and move on/off switch to OFF position to stop engine. Wait for all machine motion to stop before removing basket.
6. Do not touch engine, muffler or exhaust pipe while engine is running or soon after it has stopped because these areas are hot enough to cause burns.
7. If the cutting unit strikes a solid object or vibrates abnormally, stop machine operation immediately, turn engine off, wait for all machine motion to stop and inspect for damage. A damaged reel or bedknife must be repaired or replaced before operation is commenced.
8. Whenever machine is left unattended, be sure engine is stopped and cutting unit reel is not spinning.
9. Close fuel shut-off valve if machine is not to be used for an extended period of time. Also, close fuel shut-off valve if machine is to be transported on a trailer or in a vehicle.

Maintenance and Service

1. The Traction Unit and Cutting Unit Operator's Manuals provide information regarding the operation, general maintenance and maintenance intervals for your Greensmaster machine. Refer to these publications for additional information when servicing the machine.
2. Before servicing or making adjustments to the machine, stop the engine and wait for all machine motion to stop. Remove the spark plug wire from the spark plug to prevent accidental starting of the engine.
3. To make sure entire machine is in good condition, keep all nuts, bolts, screws and belts properly tightened.
4. To reduce potential fire hazard, keep the engine area free of excessive grease, grass, leaves and accumulation of dirt.
5. Wear heavy gloves and use caution when checking or servicing the cutting unit.
6. If the engine must be running to perform maintenance or make an adjustment, keep hands, feet, clothing and all parts of the body away from the cutting unit and all moving parts. Keep bystanders away.
7. Do not overspeed the engine by changing governor settings. Recommended engine high idle speed is from 3190 to 3340 RPM. To ensure safety and accuracy, check engine speed with a tachometer.
8. Engine must be shut off and cooled down before checking oil or adding oil to the engine crankcase.
9. If major repairs are ever needed or assistance is required, contact your Authorized TORO Distributor.
10. At the time of manufacture, the machine conformed to all applicable safety standards. 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.

Safety and Instruction Decals

Safety decals and instructions are easily visible to the operator and are located near any area of potential danger. Replace any decal that is damaged or lost. Decal part numbers are listed in your Parts Catalog. Order replacement decals from your Authorized TORO Distributor.



Product Records and Maintenance

Product Records and Maintenance

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Product Records

Insert Operator’s Manual and Parts Catalog for your Greensmaster Flex machine at the end of this section. Additionally, if any optional equipment or accessories have been installed to your machine, insert the Installation Instructions, Operator’s Manuals and Parts Catalogs for those options at the end of this chapter.

Maintenance

Maintenance procedures and recommended service intervals for the Greensmaster Flex machines are covered in the Operator’s Manual. Refer to that publication when performing regular equipment maintenance.

Equivalents and Conversions

Decimal and Millimeter Equivalents

| Fractions | Decimals | mm | Fractions | Decimals | mm |
|-----------|---------------------------|----------|-----------|------------------------------|----|
| | 1/64 | 0.015625 | — | 0.397 | |
| | 1/32 | 0.03125 | — | 0.794 | |
| | 3/64 | 0.046875 | — | 1.191 | |
| 1/16 | — | 0.0625 | — | 1.588 | |
| | 5/64 | 0.078125 | — | 1.984 | |
| | 3/32 | 0.09375 | — | 2.381 | |
| | 7/64 | 0.109275 | — | 2.778 | |
| 1/8 | — | 0.1250 | — | 3.175 | |
| | 9/64 | 0.140625 | — | 3.572 | |
| | 5/32 | 0.15625 | — | 3.969 | |
| | 11/64 | 0.171875 | — | 4.366 | |
| 3/16 | — | 0.1875 | — | 4.762 | |
| | 13/64 | 0.203125 | — | 5.159 | |
| | 7/32 | 0.21875 | — | 5.556 | |
| | 15/64 | 0.234375 | — | 5.953 | |
| 1/4 | — | 0.2500 | — | 6.350 | |
| | 17/64 | 0.265625 | — | 6.747 | |
| | 9/32 | 0.28125 | — | 7.144 | |
| | 19/64 | 0.296875 | — | 7.541 | |
| 5/16 | — | 0.3125 | — | 7.938 | |
| | 21/64 | 0.328125 | — | 8.334 | |
| | 11/32 | 0.34375 | — | 8.731 | |
| | 23/64 | 0.359375 | — | 9.128 | |
| 3/8 | — | 0.3750 | — | 9.525 | |
| | 25/64 | 0.390625 | — | 9.922 | |
| | 13/32 | 0.40625 | — | 10.319 | |
| | 27/64 | 0.421875 | — | 10.716 | |
| 7/16 | — | 0.4375 | — | 11.112 | |
| | 29/64 | 0.453125 | — | 11.509 | |
| | 15/32 | 0.46875 | — | 11.906 | |
| | 31/64 | 0.484375 | — | 12.303 | |
| 1/2 | — | 0.5000 | — | 12.700 | |
| | 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 |
| | Pounds/Sq. In. | Bar | 0.069 |
| 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

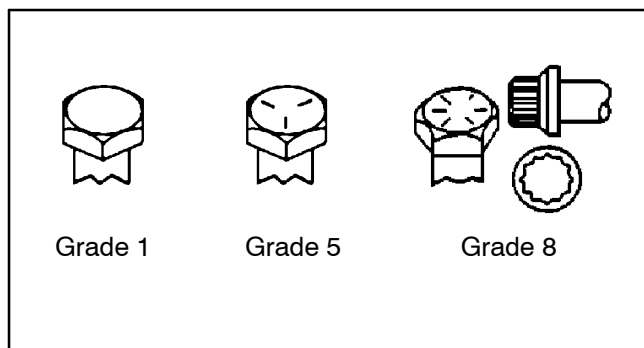
Recommended fastener torque values are listed in the following tables. For critical applications, as determined by Toro, either the recommended torque or a torque that is unique to the application is clearly identified and specified in this Service Manual.

These Torque Specifications for the installation and tightening of fasteners shall apply to all fasteners which do not have a specific requirement identified in this Service Manual. The following factors shall be considered when applying torque: cleanliness of the fastener, use of a thread sealant (e.g. Loctite), degree of lubrication on the fastener, presence of a prevailing torque feature (e.g. Nylock nut), hardness of the surface underneath the fastener's head or similar condition which affects the installation.

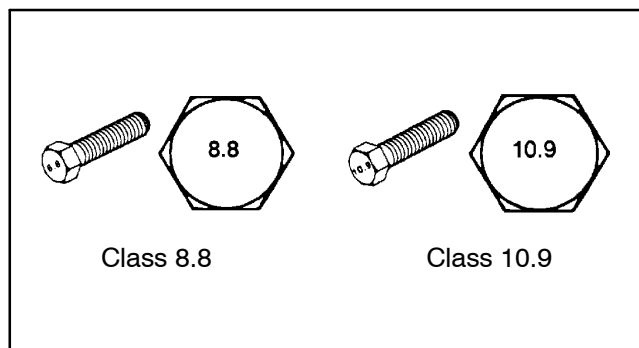
As noted in the following tables, torque values should be **reduced by 25% for lubricated fasteners** to achieve the similar stress as a dry fastener. Torque values may also have to be reduced when the fastener is threaded into aluminum or brass. The specific torque value should be determined based on the aluminum or brass material strength, fastener size, length of thread engagement, etc.

The standard method of verifying torque shall be performed by marking a line on the fastener (head or nut) and mating part, then back off fastener 1/4 of a turn. Measure the torque required to tighten the fastener until the lines match up.

Fastener Identification



Inch Series Bolts and Screws



Metric Bolts and Screws

Standard Torque for Dry, Zinc Plated and Steel Fasteners (Inch Series Fasteners)

| Thread Size | Grade 1, 5 & 8 with Thin Height Nuts | SAE Grade 1 Bolts, Screws, Studs & Sems with Regular Height Nuts (SAE J995 Grade 2 or Stronger Nuts) | | SAE Grade 5 Bolts, Screws, Studs & Sems with Regular Height Nuts (SAE J995 Grade 2 or Stronger Nuts) | | SAE Grade 8 Bolts, Screws, Studs & Sems with Regular Height Nuts (SAE J995 Grade 5 or Stronger Nuts) | |
|---------------|--------------------------------------|--|------------|--|------------|--|------------|
| | in-lb | in-lb | N-cm | in-lb | N-cm | in-lb | N-cm |
| # 6 - 32 UNC | 10 ± 2 | 13 ± 2 | 147 ± 23 | 15 ± 2 | 169 ± 23 | 23 ± 3 | 262 ± 34 |
| # 6 - 40 UNF | | | | 17 ± 2 | 192 ± 23 | 25 ± 3 | 282 ± 34 |
| # 8 - 32 UNC | 13 ± 2 | 25 ± 5 | 282 ± 30 | 29 ± 3 | 328 ± 34 | 41 ± 5 | 463 ± 56 |
| # 8 - 36 UNF | | | | 31 ± 4 | 350 ± 45 | 43 ± 5 | 486 ± 56 |
| # 10 - 24 UNC | 18 ± 2 | 30 ± 5 | 339 ± 56 | 42 ± 5 | 475 ± 56 | 60 ± 6 | 678 ± 68 |
| # 10 - 32 UNF | | | | 48 ± 5 | 542 ± 56 | 68 ± 7 | 768 ± 79 |
| 1/4 - 20 UNC | 48 ± 7 | 53 ± 7 | 599 ± 79 | 100 ± 10 | 1130 ± 113 | 140 ± 15 | 1582 ± 169 |
| 1/4 - 28 UNF | 53 ± 7 | 65 ± 10 | 734 ± 113 | 115 ± 12 | 1299 ± 136 | 160 ± 17 | 1808 ± 192 |
| 5/16 - 18 UNC | 115 ± 15 | 105 ± 15 | 1186 ± 169 | 200 ± 25 | 2260 ± 282 | 300 ± 30 | 3390 ± 339 |
| 5/16 - 24 UNF | 138 ± 17 | 128 ± 17 | 1446 ± 192 | 225 ± 25 | 2542 ± 282 | 325 ± 33 | 3672 ± 373 |
| | ft-lb | ft-lb | N-m | ft-lb | N-m | ft-lb | N-m |
| 3/8 - 16 UNC | 16 ± 2 | 16 ± 2 | 22 ± 3 | 30 ± 3 | 41 ± 4 | 43 ± 5 | 58 ± 7 |
| 3/8 - 24 UNF | 17 ± 2 | 18 ± 2 | 24 ± 3 | 35 ± 4 | 47 ± 5 | 50 ± 6 | 68 ± 8 |
| 7/16 - 14 UNC | 27 ± 3 | 27 ± 3 | 37 ± 4 | 50 ± 5 | 68 ± 7 | 70 ± 7 | 95 ± 9 |
| 7/16 - 20 UNF | 29 ± 3 | 29 ± 3 | 39 ± 4 | 55 ± 6 | 75 ± 8 | 77 ± 8 | 104 ± 11 |
| 1/2 - 13 UNC | 30 ± 3 | 48 ± 7 | 65 ± 9 | 75 ± 8 | 102 ± 11 | 105 ± 11 | 142 ± 15 |
| 1/2 - 20 UNF | 32 ± 4 | 53 ± 7 | 72 ± 9 | 85 ± 9 | 115 ± 12 | 120 ± 12 | 163 ± 16 |
| 5/8 - 11 UNC | 65 ± 10 | 88 ± 12 | 119 ± 16 | 150 ± 15 | 203 ± 20 | 210 ± 21 | 285 ± 28 |
| 5/8 - 18 UNF | 75 ± 10 | 95 ± 15 | 129 ± 20 | 170 ± 18 | 230 ± 24 | 240 ± 24 | 325 ± 33 |
| 3/4 - 10 UNC | 93 ± 12 | 140 ± 20 | 190 ± 27 | 265 ± 27 | 359 ± 37 | 375 ± 38 | 508 ± 52 |
| 3/4 - 16 UNF | 115 ± 15 | 165 ± 25 | 224 ± 34 | 300 ± 30 | 407 ± 41 | 420 ± 43 | 569 ± 58 |
| 7/8 - 9 UNC | 140 ± 20 | 225 ± 25 | 305 ± 34 | 430 ± 45 | 583 ± 61 | 600 ± 60 | 813 ± 81 |
| 7/8 - 14 UNF | 155 ± 25 | 260 ± 30 | 353 ± 41 | 475 ± 48 | 644 ± 65 | 667 ± 66 | 904 ± 89 |

NOTE: Torque values may have to be reduced when installing fasteners into threaded aluminum or brass. The specific torque value should be determined based on the fastener size, the aluminum or base material strength, length of thread engagement, etc.

NOTE: Reduce torque values listed in the table above by 25% for lubricated fasteners. Lubricated fasteners are defined as threads coated with a lubricant such as engine oil or thread sealant such as Loctite.

NOTE: The nominal torque values listed above for Grade 5 and 8 fasteners are based on 75% of the minimum proof load specified in SAE J429. The tolerance is approximately ± 10% of the nominal torque value. Thin height nuts include jam nuts.

Standard Torque for Dry, Zinc Plated and Steel Fasteners (Metric Fasteners)

| Thread Size | Class 8.8 Bolts, Screws and Studs with Regular Height Nuts (Class 8 or Stronger Nuts) | | Class 10.9 Bolts, Screws and Studs with Regular Height Nuts (Class 10 or Stronger Nuts) | |
|-------------|---|-----------------|---|-----------------|
| | | | | |
| M5 X 0.8 | 57 ± 6 in-lb | 644 ± 68 N-cm | 78 ± 8 in-lb | 881 ± 90 N-cm |
| M6 X 1.0 | 96 ± 10 in-lb | 1085 ± 113 N-cm | 133 ± 14 in-lb | 1503 ± 158 N-cm |
| M8 X 1.25 | 19 ± 2 ft-lb | 26 ± 3 N-m | 28 ± 3 ft-lb | 38 ± 4 N-m |
| M10 X 1.5 | 38 ± 4 ft-lb | 52 ± 5 N-m | 54 ± 6 ft-lb | 73 ± 8 N-m |
| M12 X 1.75 | 66 ± 7 ft-lb | 90 ± 10 N-m | 93 ± 10 ft-lb | 126 ± 14 N-m |
| M16 X 2.0 | 166 ± 17 ft-lb | 225 ± 23 N-m | 229 ± 23 ft-lb | 310 ± 31 N-m |
| M20 X 2.5 | 325 ± 33 ft-lb | 440 ± 45 N-m | 450 ± 46 ft-lb | 610 ± 62 N-m |

NOTE: Torque values may have to be reduced when installing fasteners into threaded aluminum or brass. The specific torque value should be determined based on the fastener size, the aluminum or base material strength, length of thread engagement, etc.

NOTE: The nominal torque values listed above are based on 75% of the minimum proof load specified in SAE J1199. The tolerance is approximately ± 10% of the nominal torque value.

NOTE: Reduce torque values listed in the table above by 25% for lubricated fasteners. Lubricated fasteners are defined as threads coated with a lubricant such as engine oil or thread sealant such as Loctite.

Other Torque Specifications

SAE Grade 8 Steel Set Screws

| Thread Size | Recommended Torque | |
|---------------|--------------------|----------------|
| | Square Head | Hex Socket |
| 1/4 – 20 UNC | 140 ± 20 in-lb | 73 ± 12 in-lb |
| 5/16 – 18 UNC | 215 ± 35 in-lb | 145 ± 20 in-lb |
| 3/8 – 16 UNC | 35 ± 10 ft-lb | 18 ± 3 ft-lb |
| 1/2 – 13 UNC | 75 ± 15 ft-lb | 50 ± 10 ft-lb |

Wheel Bolts and Lug Nuts

| Thread Size | Recommended Torque** | |
|--------------------------|----------------------|--------------|
| 7/16 – 20 UNF Grade 5 | 65 ± 10 ft-lb | 88 ± 14 N-m |
| 1/2 – 20 UNF Grade 5 | 80 ± 10 ft-lb | 108 ± 14 N-m |
| M12 X 1.25 Class 8.8 | 80 ± 10 ft-lb | 108 ± 14 N-m |
| M12 X 1.5 Class 8.8 | 80 ± 10 ft-lb | 108 ± 14 N-m |

** For steel wheels and non-lubricated fasteners.

Thread Cutting Screws (Zinc Plated Steel)

| Type 1, Type 23 or Type F | |
|---------------------------|------------------|
| Thread Size | Baseline Torque* |
| No. 6 – 32 UNC | 20 ± 5 in-lb |
| No. 8 – 32 UNC | 30 ± 5 in-lb |
| No. 10 – 24 UNC | 38 ± 7 in-lb |
| 1/4 – 20 UNC | 85 ± 15 in-lb |
| 5/16 – 18 UNC | 110 ± 20 in-lb |
| 3/8 – 16 UNC | 200 ± 100 in-lb |

Thread Cutting Screws (Zinc Plated Steel)

| Thread Size | Threads per Inch | | Baseline Torque* |
|-------------|------------------|--------|------------------|
| | Type A | Type B | |
| No. 6 | 18 | 20 | 20 ± 5 in-lb |
| No. 8 | 15 | 18 | 30 ± 5 in-lb |
| No. 10 | 12 | 16 | 38 ± 7 in-lb |
| No. 12 | 11 | 14 | 85 ± 15 in-lb |

* Hole size, material strength, material thickness & finish must be considered when determining specific torque values. All torque values are based on non-lubricated fasteners.

Conversion Factors

$$\text{in-lb} \times 11.2985 = \text{N-cm}$$

$$\text{ft-lb} \times 1.3558 = \text{N-m}$$

$$\text{N-cm} \times 0.08851 = \text{in-lb}$$

$$\text{N-m} \times 0.7376 = \text{ft-lb}$$



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Specifications

| Item | Description |
|---------------------------|--|
| Make / Designation | Subaru, 4-stroke, OHC single cylinder, air-cooled, gasoline engine with gear reduction |
| Bore x Stroke | 2.28 in x 1.89 in (58 mm x 48 mm) |
| Total Displacement | 7.69 in ³ (126 cc) |
| Carburetor | Float feed, fixed main jet |
| Governor | Mechanical flyweight |
| Low Idle Speed (no load) | 1465 to 1665 RPM |
| High Idle Speed (no load) | 3190 to 3340 RPM |
| Direction of rotation | Clockwise (facing PTO shaft) |
| Fuel | Unleaded, automotive grade gasoline |
| Fuel Tank Capacity | 2.85 U.S. qt (2.7 l) |
| Engine Oil | See Operator's Manual |
| Lubrication System | Splash type |
| Oil Capacity | 0.63 U.S. qt (0.6 l) |
| Air Cleaner | Dual element |
| Ignition System | Electronic flywheel magneto |
| Spark Plug | NGK BR-6HS |
| Spark Plug Gap | 0.024" to 0.028" (0.6 to 0.7 mm) |
| Lighting Coil | 12 V AC / 15 Watt |
| Dry Weight | 34.2 lbs (15.5 kg) |

General Information

This Chapter gives information about specifications, maintenance, troubleshooting, testing and repair of the Subaru gasoline engine used on the Greensmaster Flex 1800/1820/2100 and 2120 mowers.

Most repairs and adjustments require tools which are commonly available in many service shops. Several special tools are described in the Subaru Service Manual. The use of some specialized test equipment is ex-

plained. However, the cost of the test equipment and the specialized nature of some repairs may dictate that the work be done at an engine repair facility.

Service and repair parts for the Subaru engine used on Greensmaster Flex mowers are supplied through your local Toro distributor. Be prepared to provide your distributor with the Toro model and serial number.

Operator's Manual

The Operator's Manual provides information regarding the operation, general maintenance and maintenance intervals for your Greensmaster machine. Refer to the Operator's Manual for additional information when servicing the machine.

Fuel Evaporative Control System

To meet worldwide emission requirements, the engine that powers your Flex mower is equipped with a fuel cap that has an integrated carbon canister. This fuel cap captures fuel vapors from the fuel tank prior to venting to atmosphere.

To prevent saturating the carbon cannister in the fuel cap, it is important to make sure that the fuel tank is not overfilled. The recommended level for a full fuel tank is flush with the top of the plastic fill screen in the tank. Do not overfill the tank when refueling.

Adjustments

Throttle Cable Adjustment

If a new throttle cable must be installed or the cable is out of adjustment, adjust the cable as follows:

1. Park machine on a level surface. Make sure engine is OFF. Remove spark plug wire from the spark plug.
2. Move throttle control on the machine handle to the FAST position.
3. Loosen throttle cable screw that secures the throttle cable to the governor lever.
4. Make sure throttle control is in the FAST position and the governor lever is against the high speed screw.
5. Tighten screw to secure the throttle cable to the governor lever.
6. After cable adjustment, connect spark plug wire to spark plug, start engine and allow it to warm to operating temperature. Check engine speed with a tachometer:
 - A. Low idle speed should be **1465 to 1665 RPM**. Adjust low idle screw on carburetor to attain the correct low idle speed setting.
 - B. High idle speed should be **3190 to 3340 RPM**. Adjust throttle cable position on engine to attain the correct high idle speed setting.

IMPORTANT: The engine governor control is equipped with a tamper resistant cap to prevent adjustment of high idle speed. Modification to this cap will void the engine warranty and likely will make the engine non-compliant with emission certification of the engine.

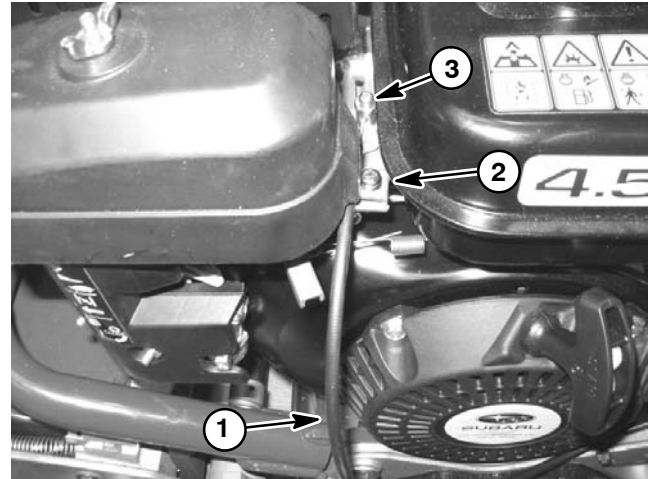


Figure 1

1. Throttle cable
2. Throttle cable clamp
3. Governor lever

Service and Repairs

Cooling System

IMPORTANT: The engine that powers the machine is air-cooled. Operating the engine with dirty or plugged cooling fins or a plugged or dirty blower housing will result in engine overheating and damage.

1. Park machine on a level surface. Make sure engine is OFF. Remove spark plug wire from the spark plug.

IMPORTANT: Never clean engine with pressurized water. Water could enter and contaminate the fuel system.

2. Clean cooling fins on cylinder and cylinder head. Remove engine cylinder shroud from engine for more thorough cleaning (Fig. 2).

3. Clean blower housing of dirt and debris (Fig. 3). Remove housing if necessary.

IMPORTANT: Never operate engine with the cylinder shroud and blower housing removed. Overheating and engine damage will result.

4. Make sure blower housing and/or engine cylinder shroud are installed to the engine if removed.

5. Attach spark plug wire to spark plug.

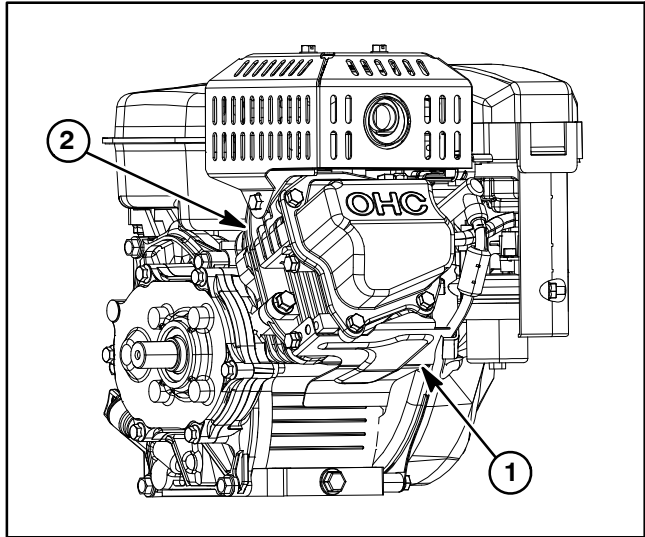


Figure 2

- 1. Engine cylinder shroud
- 2. Cooling fins

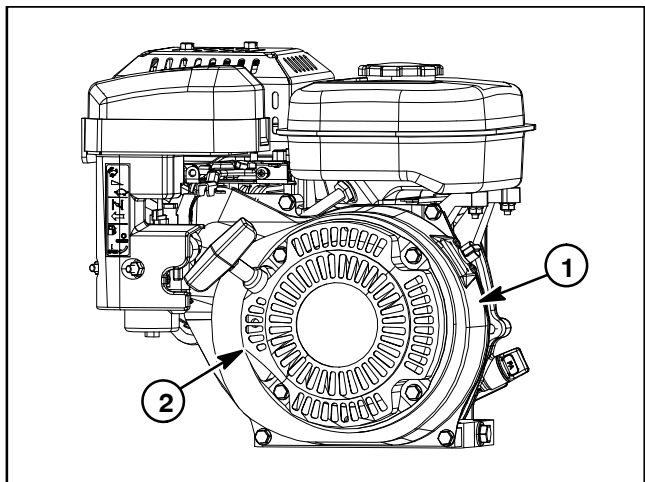


Figure 3

- 1. Blower housing
- 2. Rewind starter

Spark Plug

Use a NGK BR-6HS spark plug or equivalent.

1. Make sure engine is OFF. Carefully remove spark plug wire from the spark plug.
2. Clean cylinder head area around spark plug and remove plug from the cylinder head.
3. Inspect the spark plug.

IMPORTANT: Replace a cracked, fouled or dirty spark plug. Do not sand blast, scrape or clean spark plug electrodes because engine damage could result from grit entering cylinder.

4. Set spark plug electrode gap from 0.024" to 0.028" (0.6 to 0.7 mm).
5. Install correctly gapped spark plug into cylinder head and torque plug **17 ft-lb (23 N-m)**.
6. Connect spark plug wire to spark plug.

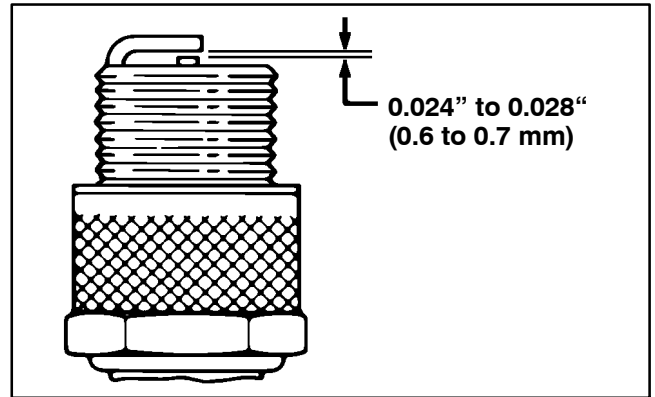


Figure 4

Ignition Components

Engine ignition component information is included in the Subaru Service Manual.

Engine

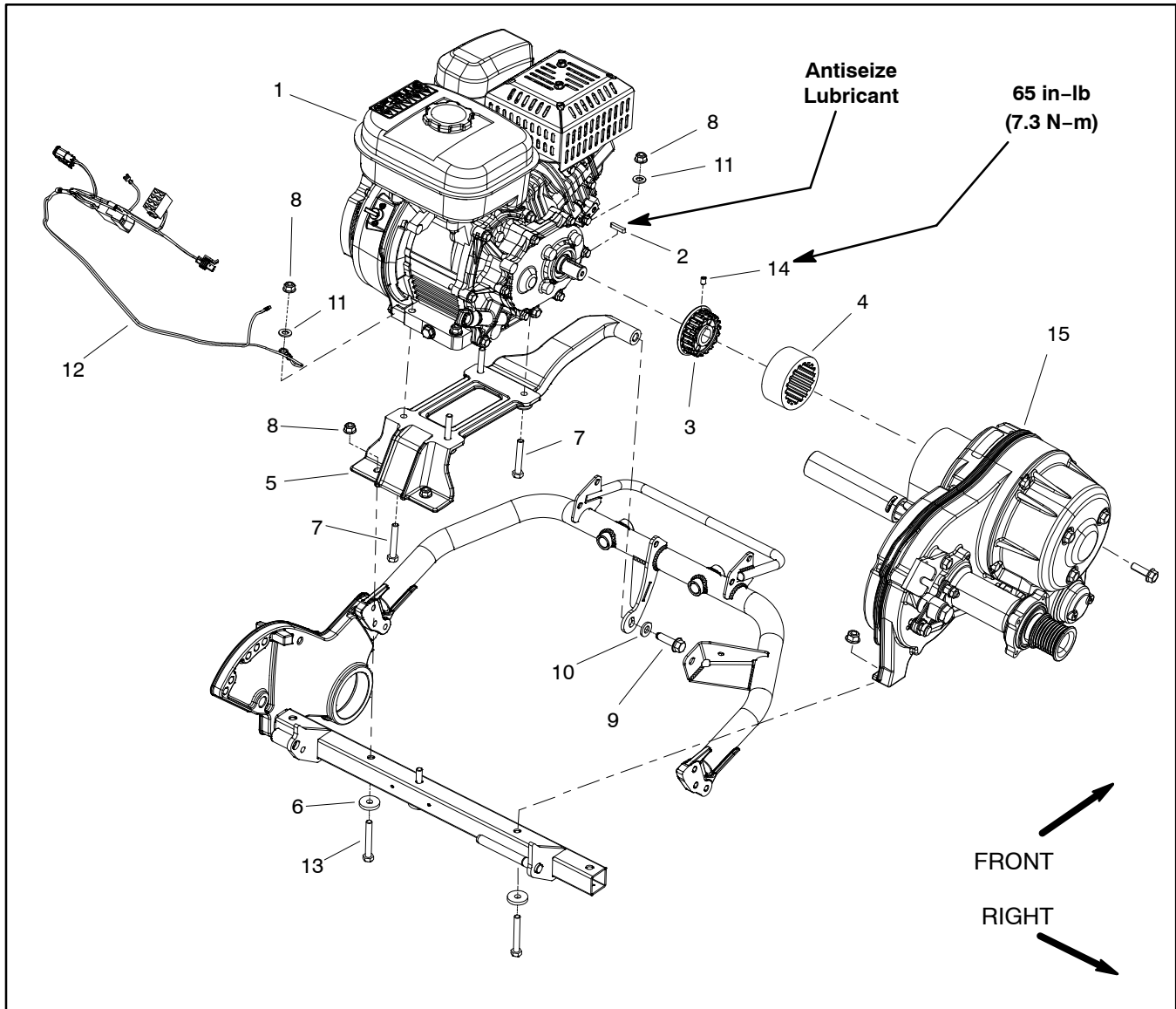


Figure 5

- | | | |
|-------------------|-----------------------------|---------------------------|
| 1. Engine | 6. Hardened washer (2 used) | 11. Flat washer (4 used) |
| 2. Square key | 7. Cap screw (4 used) | 12. Wire harness |
| 3. Engine coupler | 8. Flange nut (6 used) | 13. Cap screw (2 used) |
| 4. Coupler sleeve | 9. Flange head screw | 14. Set screw (2 used) |
| 5. Engine base | 10. Hardened washer | 15. Transmission assembly |

Engine Removal (Fig. 5)

1. Park machine on a level surface with the engine OFF. Remove spark plug wire from the spark plug to prevent the engine from starting. Close fuel shut-off valve on engine.

2. If engine is to be disassembled, it may be easier to drain oil from engine before removing engine from traction unit.

3. Remove throttle cable from engine (Fig. 6):

- Loosen screw that secures cable clamp to engine bracket. Remove cable from clamp.
- Loosen screw that secures throttle cable to governor lever. Slide cable from governor lever.
- Position throttle cable away from engine.

4. Disconnect electrical connections from engine (Fig. 7):

A. Unplug wire harness connector from engine armature wire.

B. Disconnect wire harness ground wire from engine by removing LH rear cap screw (item 7 in Fig. 5), flat washer (item 11 in Fig. 5) and flange nut (item 8 in Fig. 5).

C. If machine is equipped with optional lighting kit, disconnect wire harness connectors from engine alternator wires.

5. Remove engine base assembly (with engine attached) from machine:

A. Remove two (2) cap screws (item 13), hardened washers (item 6) and flange nuts (item 8) that secure rear of engine base to rear frame.

B. Support front of engine base to prevent it from moving.

C. Remove flange head screw (item 9) and hardened washer (item 10) that secure engine base to frame.

D. Carefully move engine and engine base assembly away from transmission so that engine coupler (item 3) slides out of coupler sleeve (item 4). Once engine coupler is removed from sleeve, remove engine base assembly from machine.

6. If necessary, remove engine from engine base:

A. Remove cap screws (item 7), flat washers (item 11) and flange nuts (item 8) that secure engine to engine base.

B. Remove engine from engine base.

7. If necessary, remove two (2) set screws (item 14) that secure engine coupler (item 3) to engine output shaft. Slide coupler from shaft. Remove square key (item 2) from engine output shaft keyway.

Engine Installation (Fig. 5)

1. Position machine on a level surface. Make sure that spark plug wire is not connected to engine spark plug.

2. Make sure that all parts removed from the engine during maintenance or rebuilding are properly installed to the engine.

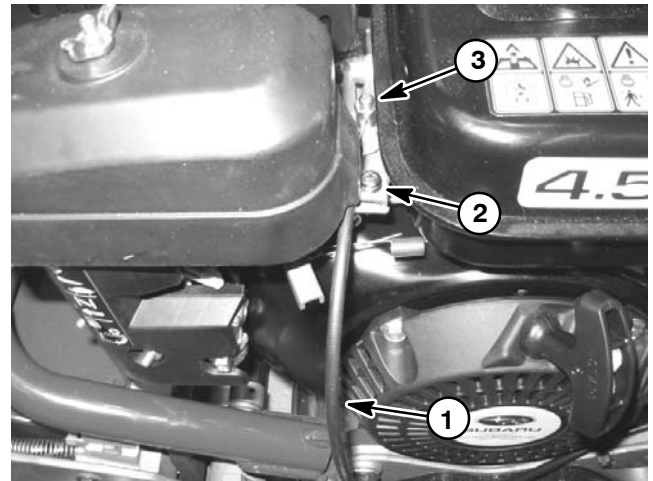


Figure 6

1. Throttle cable
2. Cable clamp

3. Governor lever screw

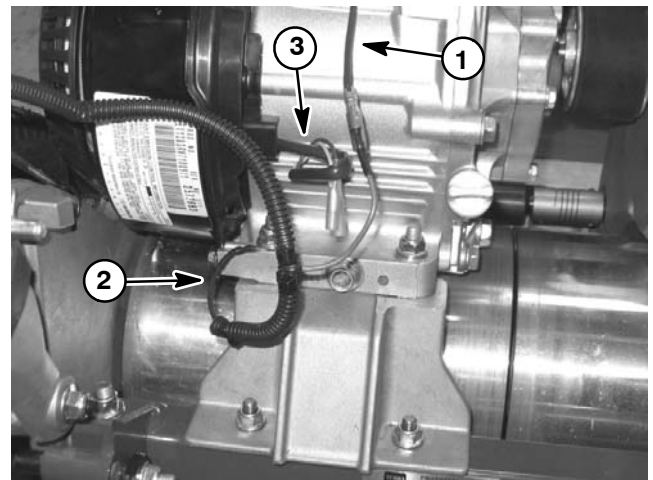


Figure 7

1. Armature wire
2. Harness ground wire

3. Alternator wires

3. If engine coupler (item 3) was removed from engine output shaft, install coupler.

A. Position square key in output shaft keyway. Apply antiseize lubricant to top surface of key.

B. Slide coupler onto output shaft until it contacts shoulder on shaft.

C. Secure coupler to output shaft with two (2) set screws (item 14). Torque set screws **65 in-lb (7.3 N-m)**.

4. Install engine to engine base if it was removed:

A. Position engine on the engine base.

NOTE: When installing engine to engine base, do not install fastener in LH rear engine mounting hole. Ground wire connection is made at this location when engine base is attached to machine frame (Fig. 7).

B. Install and tighten three (3) cap screws (item 7), flat washers (item 11) and flange nuts (item 8) to secure engine to engine base. Do not install fastener in LH rear engine mounting hole.

C. Fully tighten flange nuts that secure engine to engine base.

5. Install engine base assembly (with engine attached) to machine:

A. Make sure that coupler sleeve (item 4) is placed on transmission input shaft coupler.

B. Position engine base assembly to machine.

C. Carefully slide engine base assembly toward transmission allowing engine coupler to be inserted into coupler sleeve on transmission. Engine output shaft may have to be turned to align engine coupler with coupler sleeve.

D. Support engine base assembly to allow fasteners to be installed.

E. Install and finger tighten two (2) cap screws (item 13), hardened washers (item 6) and flange nuts (item 8) that secure rear of engine base to rear frame.

F. Align frame hole with front mounting boss of engine base. Install and finger tighten flange head screw (item 9) and hardened washer (item 10) that secure engine base to frame.

G. Position front of engine base to align engine and transmission couplers. Fully tighten flange head screw (item 9) to secure front of engine base.

H. Fully tighten fasteners at rear of engine base.

6. Connect electrical connections to engine (Fig. 7):

A. Apply dielectric gel (see Special Tools in Chapter 5 – Electrical System) to wire harness connectors.

B. Connect wire harness connector to engine armature wire.

C. Connect wire harness ground wire to engine by installing LH rear cap screw (item 7 in Fig. 5), flat washer (item 11 in Fig. 5) and flange nut (item 8 in Fig. 5). Apply skin-over grease (see Special Tools in Chapter 5 – Electrical System) to prevent corrosion.

D. If machine is equipped with optional lighting kit, connect wire harness connectors to engine alternator wires.

7. Connect throttle cable to engine (Fig. 6):

A. Slide throttle cable end into governor lever.

B. Place throttle cable under cable clamp and secure with screw.

C. Adjust throttle cable (See Throttle Cable Adjustment in the Adjustment section of this chapter). Make sure that all fasteners are tightened after cable adjustment.

8. Check and adjust engine oil level as needed.

9. Attach spark plug wire to the spark plug. Open fuel shut-off valve on fuel tank.

10. Start engine and allow it to warm to operating temperature. Check high and low idle speeds and adjust if necessary.

Engine Coupler Sleeve

The coupler sleeve used on Greensmaster Flex machines allows a positive coupling between the engine and transmission while also providing vibration damping and quiet operation. The outer surface of the coupler sleeve includes a series of curved lines that can be used to gauge the condition of the internal coupler cogs that are used to connect the engine and transmission couplers.

When the coupler sleeve is new, the center line on the outer surface of the sleeve is basically straight while the lines above and below are curved in different directions (Fig. 9). As the coupler wears with normal machine use, the curved lines may visually straighten indicated that the coupler has distorted. When removed from the machine, the inner cogs of a used coupler may exhibit some offset as shown in Figure 10. This type of offset will generally not impact normal machine operation. The cog offset can be 0.250" (6.4 mm) before coupler replacement is necessary.

If a coupler sleeve has torn or missing cogs, the coupler should be replaced.

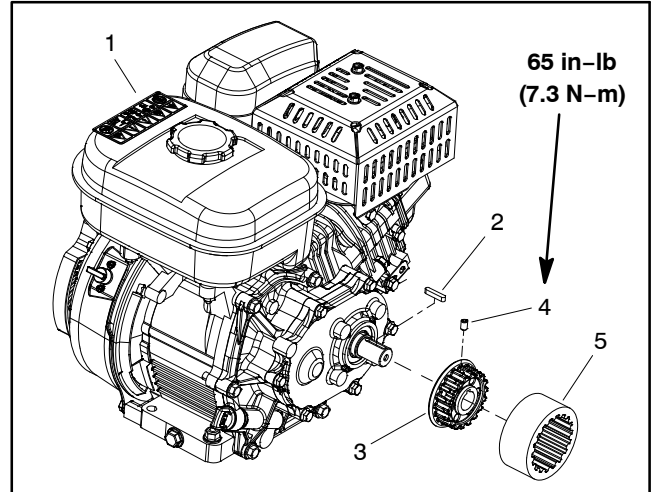


Figure 8

1. Engine
2. Key
3. Engine coupler
4. Set screw (2 used)
5. Coupler sleeve



Figure 9

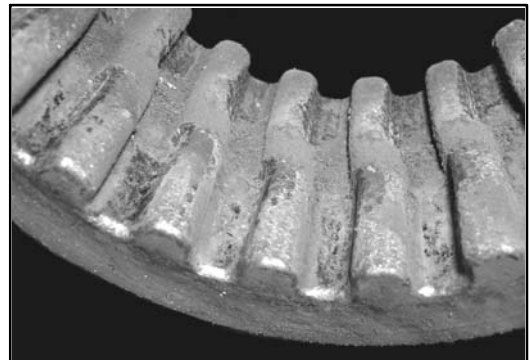


Figure 10

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Traction and Reel Drive System

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Traction and Reel
Drive System

Specifications

| Item | Description |
|--|---|
| Transmission | Ramp Engagement Style Friction Clutch (1800/2100) Multi-Disk Wet Clutch (1820/2120) Transmission Drive uses Multi-Ribbed Poly-V Belt Belt Tension Maintained by Spring Loaded Idler Pulley |
| Multi-Disk Wet Clutch (1820/2120) Fluid/Capacity | Mobil D/M Multi-Purpose Automatic Transmission Fluid or equivalent - 10 oz. (296 ml) |
| Traction Drive | Transmission to Traction Drive uses Multi-Ribbed Poly-V Belt Belt Tension Maintained by Spring Loaded Idler Pulley |
| Differential | Spur Gear Planetary Differential |
| Parking Brake | Band Style (at differential shaft drive) |
| Traction Drum | Dual Cast Aluminum, 7.5 inch (19 cm) Diameter |
| Cutting Reel Drive | Transmission Reel Clutch Shaft to Telescoping Drive Shaft Two Beam Style Couplers Used in Reel Drive System Final Reel Drive has Three (3) Pulleys with Positive Drive Belt Pulley Configuration Allows Six (6) Clip Adjustments |

General Information


Operator's Manuals

The Traction Unit and Cutting Unit Operator's Manuals provide information regarding the operation, general maintenance and maintenance intervals for your Greensmaster machine. Refer to these Operator's Manuals for additional information when servicing the machine.

Disengaging Drum Drive From Transmission

The traction drum is driven by a multi-ribbed belt that is tensioned with a spring loaded idler assembly. To disengage the traction drum drive from the transmission, follow the following procedure:

1. Park machine on a level surface. Make sure engine is OFF. Remove spark plug wire from the engine spark plug.
2. Locate the traction engage/disengage lever next to the RH drive housing drum (Fig. 1).

**CAUTION**

Be careful when rotating the traction engage/disengage lever. The lever is spring loaded and may cause personal injury. Push lever from the front when removing belt tension to prevent unexpected movement of the lever.

3. Rotate traction engage/disengage lever toward the rear of the machine to the disengaged position to remove tension from the drum drive belt.
4. To engage the drum drive, rotate traction engage/disengage lever to the engaged position by rotating the lever toward the front of the machine.
5. Connect spark plug wire to spark plug.

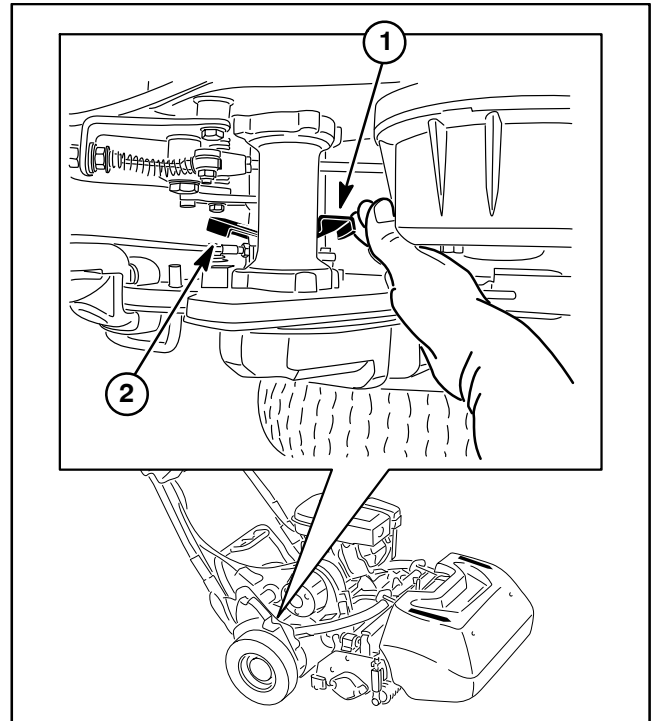


Figure 1

1. Engaged position

2. Disengaged position

Transmission Belt Tensioner

The transmission pulleys are driven by a multi-ribbed belt that is tensioned with a spring loaded idler assembly. If the transmission belt tension needs to be engaged or disengaged, follow the following procedure:

1. Park machine on a level surface. Make sure engine is OFF. Remove spark plug wire from the engine spark plug.
2. Locate the transmission engage/disengage shaft next to the engine (Fig. 2).



CAUTION

Be careful when rotating the transmission engage/disengage lever. The lever is spring loaded and may cause personal injury.

3. To disengage the spring loaded idler from the transmission drive belt, use a 3/8" wrench to rotate the engage/disengage shaft 1/4 turn clockwise.
4. To engage the idler into the transmission drive belt, use a 3/8" wrench to rotate the engage/disengage shaft 1/4 turn counter-clockwise. The transmission belt is properly tensioned when the alignment marks on the engage/disengage shaft and the transmission cover are aligned (Fig. 3).
5. Connect spark plug wire to spark plug.

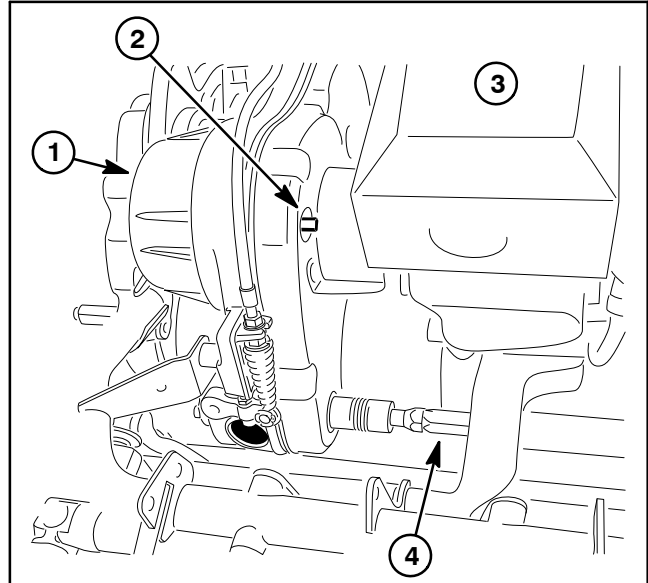


Figure 2

- | | |
|---------------------------|-----------------------|
| 1. Transmission | 3. Engine |
| 2. Engage/disengage shaft | 4. Cutting unit drive |

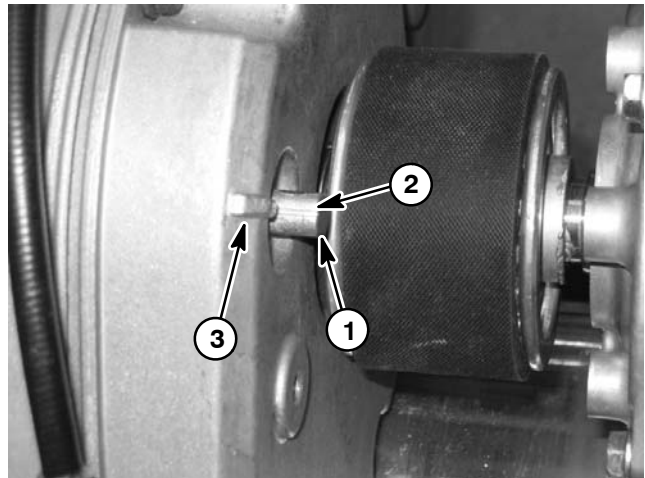


Figure 3

- | | |
|---------------------------|-------------------------|
| 1. Engage/disengage shaft | 3. Cover alignment mark |
| 2. Alignment mark | |

Special Tools

Modified Socket for Reel Clutch Bearing Collar

The modified socket is used to remove and install the reel clutch bearing collar when servicing the transmission reel clutch shaft (Fig. 4). Refer to Transmission Reel Drive System in the Service and Repairs section of this chapter for complete information on servicing the reel clutch shaft assembly.

Socket Modification

1. Make sure that socket (9/16" or 15mm) to be modified fits over the reel clutch shaft bearing collar.
2. Drill a hole or grind slots in socket walls to allow a 5/32" pin to extend through socket. A modified socket with ground slots is shown in Figure 5.

Modified Socket Use (Fig. 6)

IMPORTANT: Avoid using excessive clamping pressure on the reel clutch shaft assembly to prevent damage.

1. Use flats on reel drive hub to carefully secure reel clutch shaft assembly in a vise. Use a vise with soft jaws to prevent damage to clutch shaft assembly components.
2. Slide modified socket over bearing collar.
3. Align modified socket so that 5/32" pin can be inserted through socket and hole in bearing collar.
4. Use modified socket and socket wrench to loosen or tighten bearing collar.

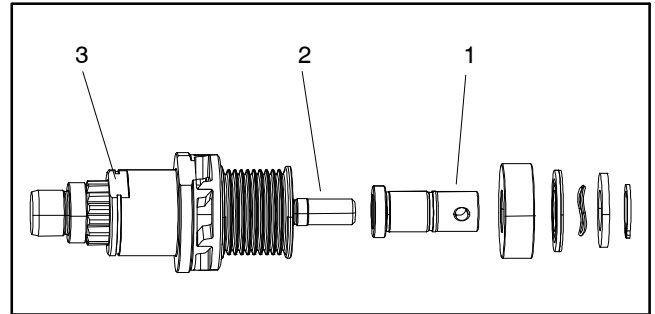


Figure 4

1. Bearing collar
2. Reel clutch shaft
3. Hub flat location



Figure 5

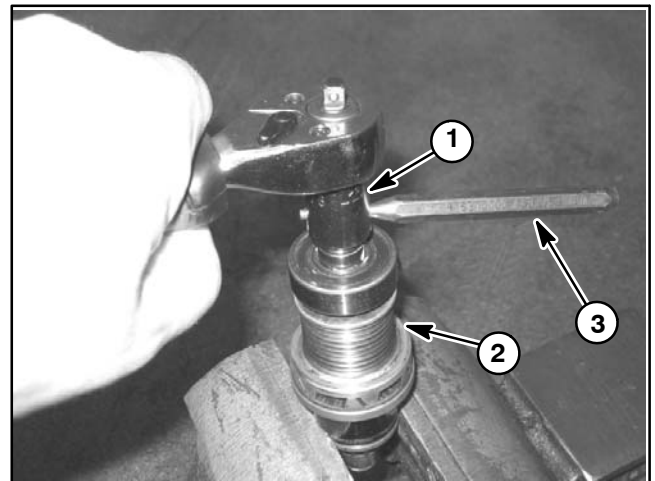


Figure 6

1. Modified socket
2. Reel clutch shaft assy
3. Pin

Adjustments

Cutting Unit Clip Adjustment

Cutting unit clip adjustment on the Flex machines can be changed by installing the cutting unit drive pulleys to the appropriate locations on the reel drive assembly. Clip frequency pulley locations for 11 blade and 14 blade cutting units are shown in Figure 8 below.

To adjust clip frequency, follow the following steps:

1. Park machine on a level surface. Make sure engine is OFF. Remove spark plug wire from the engine spark plug.
2. Remove reel drive cover and reel drive belt from side of cutting unit (see Reel Drive Belt in the Service and Repairs section of this chapter).
3. Loosen two (2) set screws from drive pulleys that are to be removed. Slide pulleys from shafts.
4. Apply antiseize lubricant to top of woodruff keys. Arrange pulleys on reel drive assembly as needed for desired clip frequency (Fig. 8).
5. Secure all pulleys with two (2) set screws. Torque screws from **60 to 65 in-lb (6.8 to 7.3 N-m)**.
6. Install reel drive belt and reel drive cover to cutting unit (see Reel Drive Belt in the Service and Repairs section of this chapter).
7. Connect spark plug wire to spark plug.

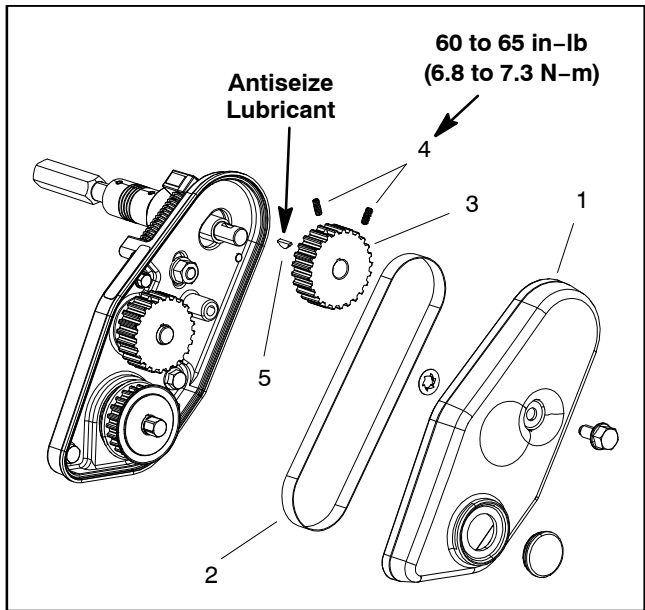


Figure 7

- 1. Reel drive cover
- 2. Reel drive belt
- 3. Pulley
- 4. Set screw
- 5. Woodruff key

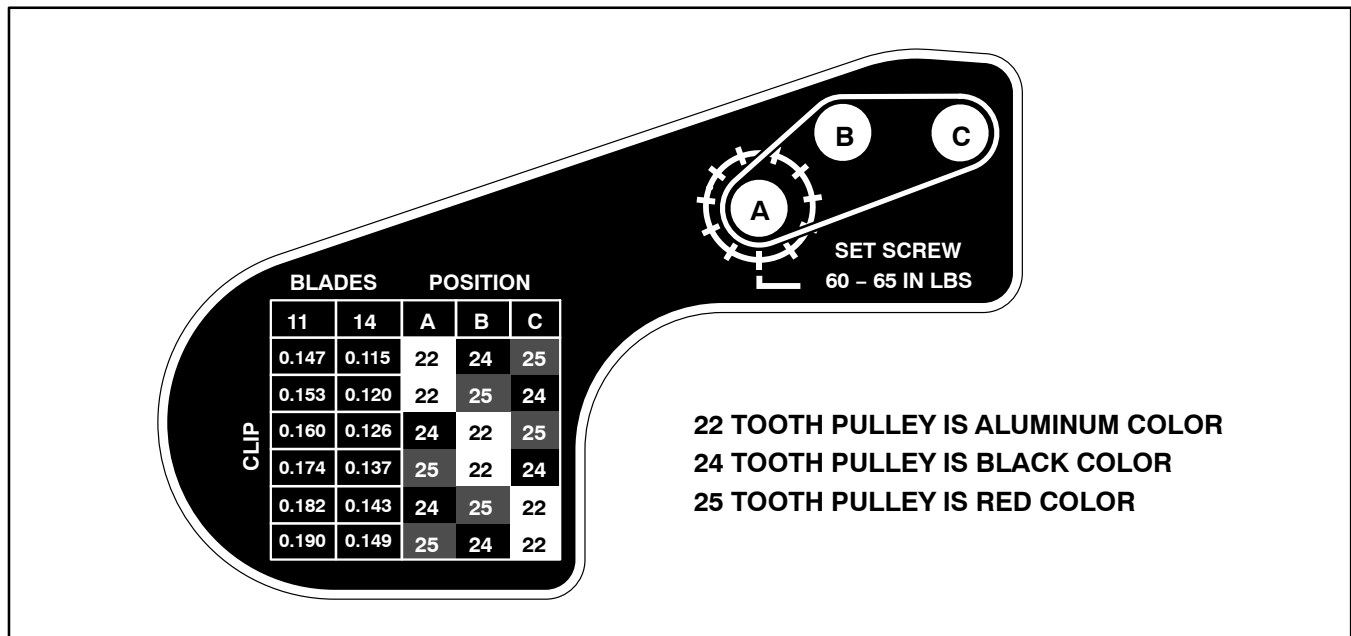


Figure 8

Reel Clutch Adjustment

To adjust the reel clutch, follow the following steps:

1. Park machine on a level surface. Make sure engine is OFF. Remove spark plug wire from the engine spark plug.

2. Remove rubber plug from front of transmission to allow viewing of reel drive clutch components (Fig. 9).

3. Release clutch cable spring tension by removing reel clutch cable from casting slot of transmission:

A. Loosen upper jam nut that secures reel cable to casting slot of transmission.

B. Lift cable free from casting slot of transmission.

4. Loosen jam nut that secures set screw position in reel clutch lever (Fig. 9).

5. Apply light upward pressure against the reel clutch lever.

6. Back out set screw in reel clutch lever until reel clutch hub causes the tips of the reel drive hub teeth to contact the mating reel clutch pulley.

7. While maintaining light pressure on reel clutch lever, rotate set screw clockwise until a gap of 0.040" to 0.060" (1.0 to 1.5 mm) is attained between the reel drive hub and reel clutch hub.

8. Tighten jam nut to secure adjustment. Make sure that set screw does not rotate while tightening jam nut.

9. Install rubber plug into front of transmission.

10. Install reel cable to casting slot of transmission and confirm that cable spring length is properly set (see Reel Clutch Cable Replacement in Chapter 5 – Chassis and Controls).

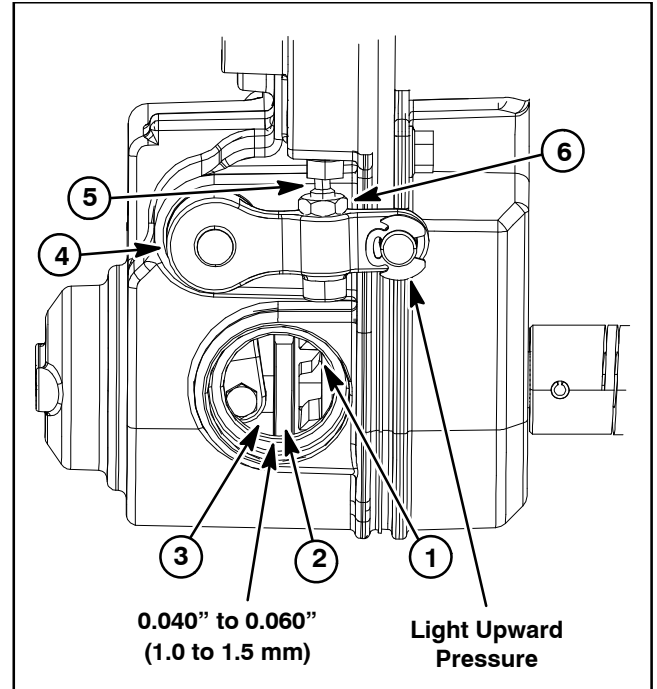


Figure 9

- | | |
|-------------------------|----------------------|
| 1. Reel drive hub tooth | 4. Reel clutch lever |
| 2. Reel drive hub | 5. Set screw |
| 3. Reel clutch hub | 6. Jam nut |

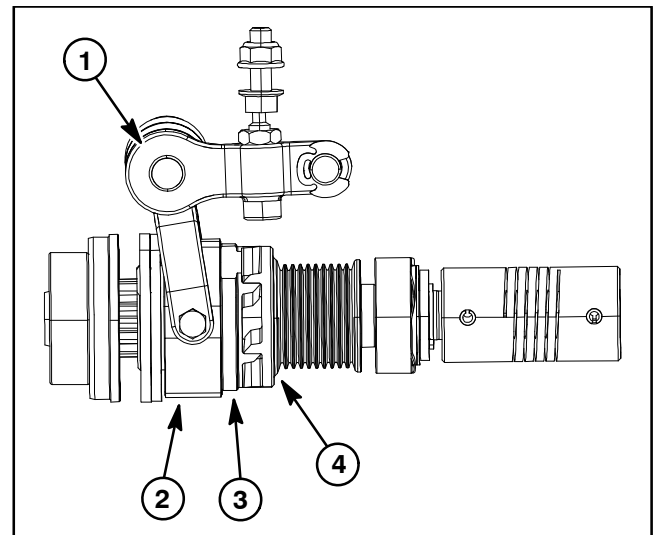


Figure 10

- | | |
|----------------------|-----------------------|
| 1. Reel clutch lever | 3. Reel drive hub |
| 2. Reel clutch hub | 4. Reel clutch pulley |

Transmission Clutch Adjustment (1800/2100)

1. Measure rotation angle of clutch lever (Fig. 11). If lever can be rotated more than 22° , the clutch assembly is worn beyond adjustment and clutch replacement is necessary (see Transmission Clutch System – 1800/2100 in this Chapter).

2. Measure clearance between thrust friction assembly and mounting plate (Fig. 12). Clearance should be from 0.025" to 0.045" (0.7 to 1.1 mm).

3. To adjust clearance, remove mounting plate (item 5 in Fig. 12) assembly and change shim locations (item 6 in Fig. 12). Moving shims from outside the bearing to inside the bearing decreases clearance. Moving shims from inside the bearing to outside the bearing increases clearance.

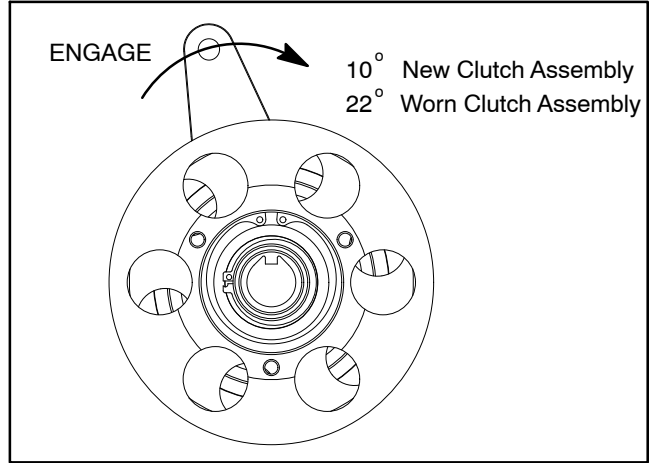


Figure 11

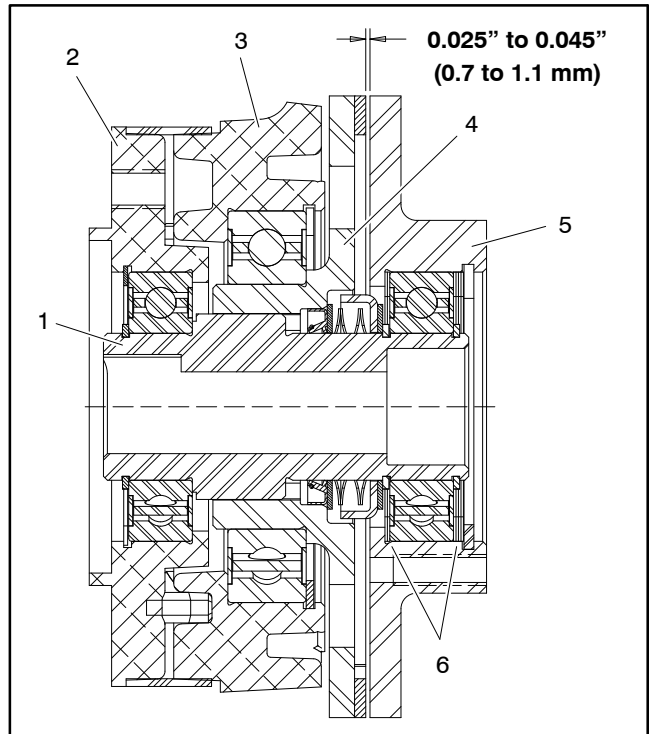


Figure 12

- | | |
|---------------------|-------------------------|
| 1. Hub | 4. Thrust friction assy |
| 2. Fixed housing | 5. Mounting plate |
| 3. Rotating housing | 6. Shim locations |

Transmission Clutch Adjustment (1820/2120)

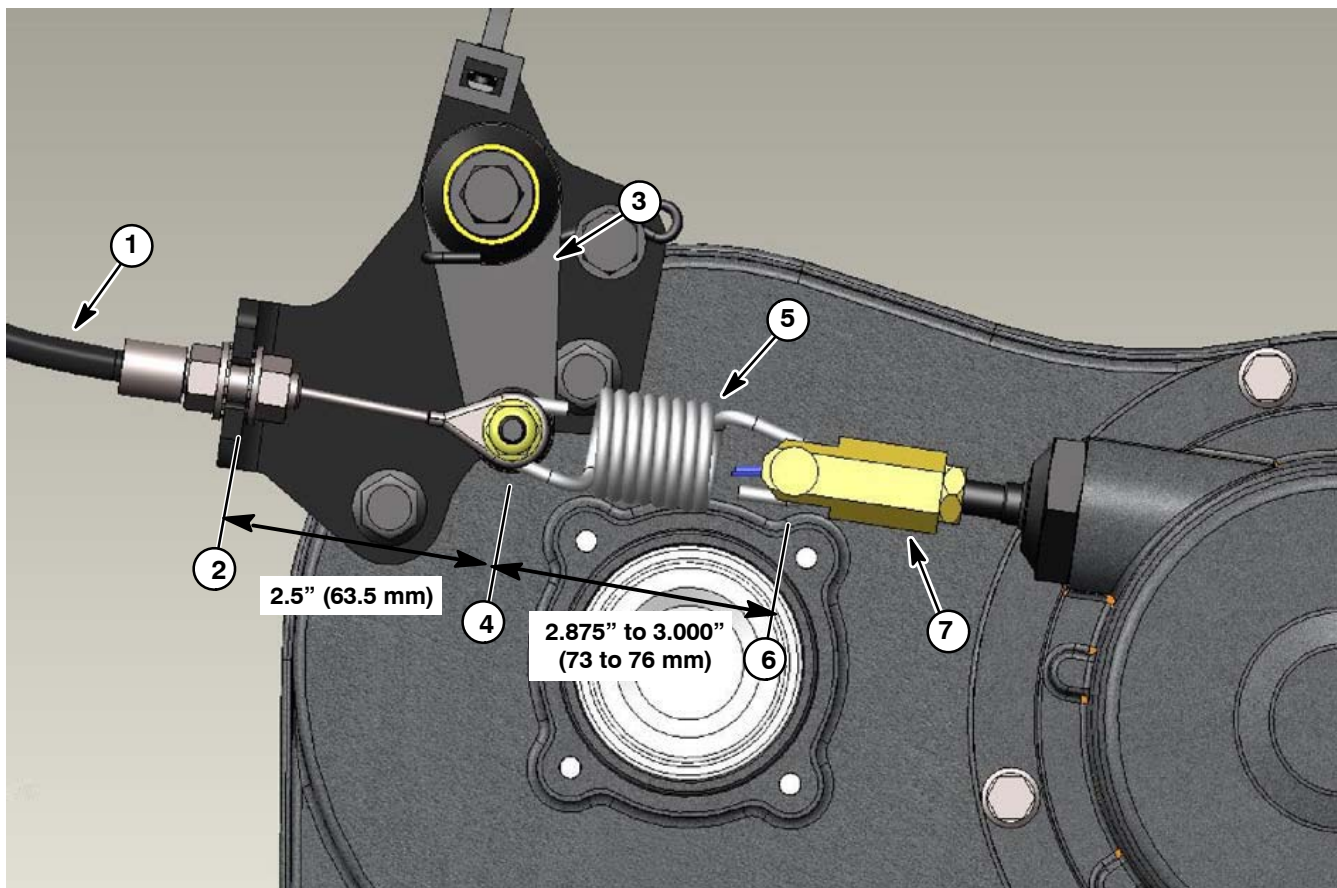


Figure 13

- 1. Clutch cable
- 2. Cable bracket
- 3. Clutch lever

- 4. Clutch lever pin
- 5. Extension spring

- 6. Clevis pin
- 7. Spring anchor

1. The traction clutch cable must be installed to clutch lever on transmission and lever assembly on handle of machine.

2. Adjust cable nuts at cable bracket on transmission to remove slack in cable without extending the extension spring (up to 0.030" (0.8 mm) slack is permissible). The distance from the cable bracket to the clutch lever pin center should be 2.5" (63.5 mm) when the clutch lever is disengaged.

3. Adjust spring anchor on transmission actuator pin to obtain a distance from the clutch lever pin center to the spring anchor clevis pin center from 2.875" to 3.000" (73 to 76 mm) when the clutch lever is engaged. After adjustment of spring anchor, use a wrench to hold spring anchor and tighten jam nut with second wrench.

4. Make sure that clutch has proper level of multi-purpose ATF before returning the machine to operation (see the machine Operator's Manual).

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Service and Repairs

Reel Drive Belt

Flex machines use a positive drive belt on the left side of the machine to operate the cutting unit.

Removal

1. Park machine on a level surface. Make sure engine is OFF. Remove spark plug wire from the engine spark plug.
2. Remove reel drive cover to expose reel drive belt (Fig. 14).
3. Loosen the bearing housing mounting nut (Fig. 15).
4. Using a 5/8" (16mm) wrench, rotate the bearing housing to release tension on reel drive belt (Fig. 15).
5. Remove reel drive belt from the pulleys.

Installation

1. Park machine on a level surface. Make sure engine is OFF. Remove spark plug wire from the spark plug.
2. Using a 5/8" (16mm) wrench, rotate and hold the bearing housing to allow reel drive belt installation (Fig. 15).
3. Place a new drive belt onto the pulleys.
4. Release bearing housing to apply tension to reel drive belt. Make sure that bearing housing rotates freely which will allow accurate belt tension.
5. Rotate reel drive at least one (1) full turn to ensure that drive belt is properly tensioned.
6. Tighten the bearing housing mounting nut (Fig. 15).
7. Install reel drive cover to machine and secure with flange head screw (Fig. 14).
8. Connect spark plug wire to spark plug.

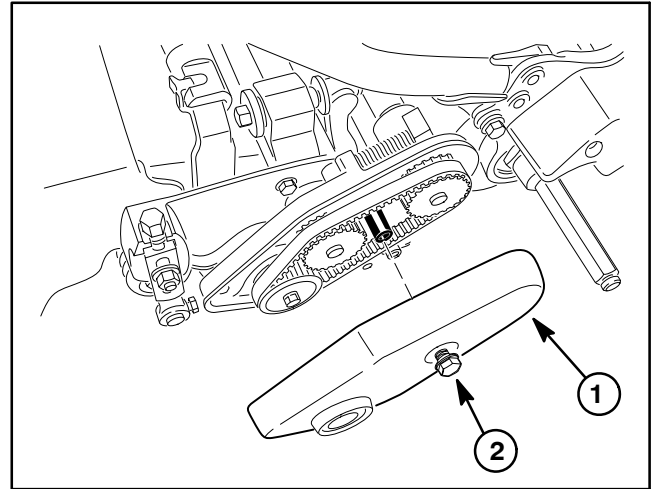


Figure 14

1. Reel drive cover
2. Flange head screw

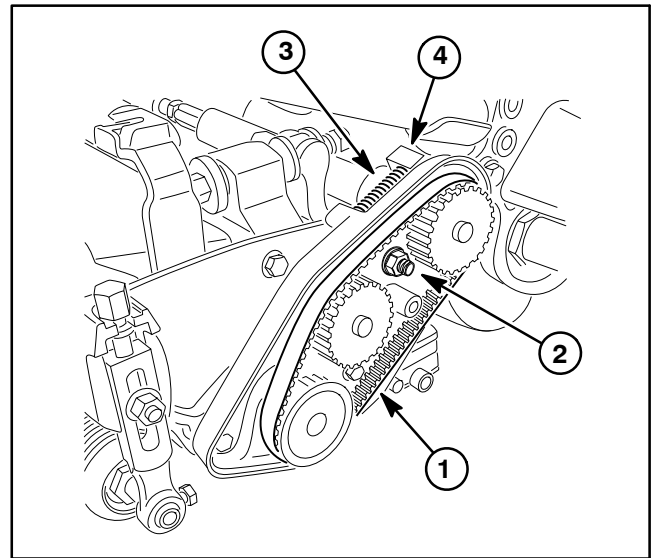


Figure 15

1. Reel drive belt
2. Bearing housing nut
3. Compression spring
4. Bearing housing

Reel Drive Assembly

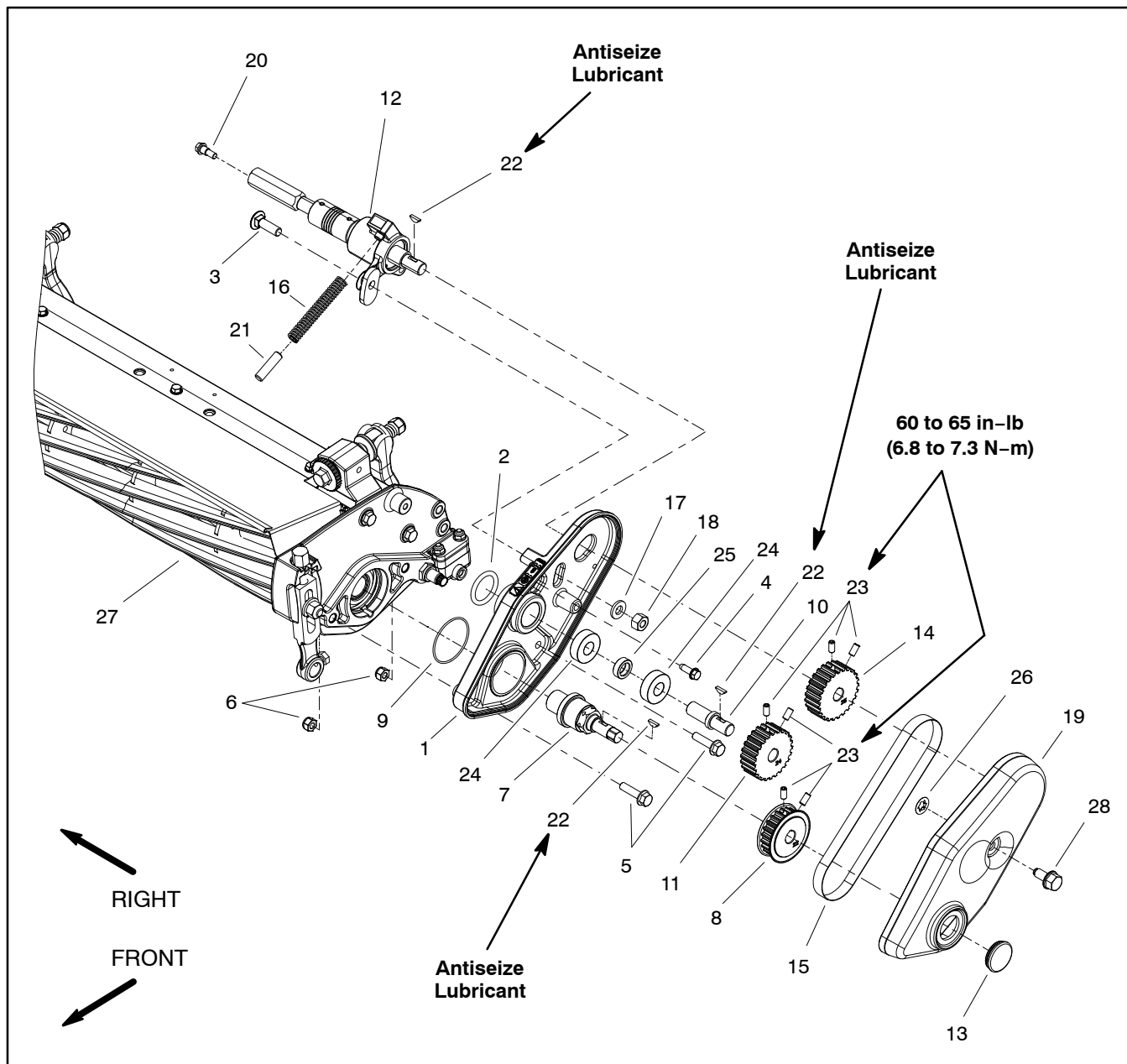


Figure 16

- | | | |
|--------------------------------------|------------------------------------|-----------------------------------|
| 1. Reel drive housing | 11. Reel pulley (24 tooth) (black) | 20. Shoulder bolt |
| 2. O-ring | 12. Bearing housing assembly | 21. Spring pin |
| 3. Carriage screw | 13. Cover plug | 22. Woodruff key (3 used) |
| 4. Washer head screw | 14. Reel pulley (25 tooth) (red) | 23. Set screw (2 used per pulley) |
| 5. Flange head screw (2 used) | 15. Belt | 24. Ball bearing (2 used) |
| 6. Hex nut (2 used) | 16. Compression spring | 25. Spacer |
| 7. Reel drive shaft | 17. Hardened washer | 26. Push nut |
| 8. Reel pulley (22 tooth) (aluminum) | 18. Hex nut | 27. Cutting unit |
| 9. O-ring | 19. Reel drive cover | 28. Flange head screw |
| 10. Reel idler shaft | | |

NOTE: Cutting unit clip adjustment on the Flex machine is adjusted by installing the cutting unit drive pulleys (items 8, 11 and 14) to the appropriate locations on the reel drive assembly (see Cutting Unit Clip Adjustment in the Adjustments section of this chapter).

Reel Drive Assembly Removal (Fig. 16)

1. Park mower on a level surface. Make sure engine is OFF. Remove spark plug wire from the engine spark plug.
2. Slide the telescoping coupler off the cutting unit hex shaft (Fig. 17).
3. Remove reel drive belt (see Reel Drive Belt Replacement in this section).
4. Loosen two (2) set screws (item 23) that secure reel pulley (item 8) to reel drive shaft (item 7). Slide pulley from drive shaft. Locate and retrieve woodruff key (item 22) from shaft.
5. Remove washer head screw (item 4) that secures reel drive housing to cutting unit side plate.

NOTE: Hex nuts (item 6) have adhesive applied during cutting unit production. The nuts should remain in cutting unit side plate during reel drive housing removal.

6. Remove two (2) flange head screws (item 5) that secure reel drive housing to cutting unit side plate.
7. Remove reel drive assembly from cutting unit.
8. Remove components from reel drive housing as necessary using Figure 16 as a guide.

A. If idler shaft bearings (item 24) are to be removed, use press to remove bearings and bearing spacer from shaft. Discard bearings after removal.

NOTE: See Reel Drive Bearing Housing in this section for disassembly and assembly information of bearing housing assembly (item 12).

NOTE: Reel pulleys (items 8, 11 and 14) can be identified by color and number of teeth. Pulley location can vary based on desired cutting unit clip frequency (see Cutting Unit Clip Adjustment in the Adjustments section of this chapter).

Reel Drive Assembly Installation (Fig. 16)

1. Install all removed components to reel drive housing using Figure 16 as a guide.
 - A. If bearings (item 24) were removed from idler shaft, use press to install bearings and bearing spacer onto shaft.
2. Apply light coating of grease on reel drive housing O-rings (items 2 and 9).

3. Position reel drive assembly to cutting unit. Make sure that spring pin (item 21) and compression spring (item 16) are positioned between reel drive housing and bearing housing assembly.

4. Secure reel drive assembly with two (2) flange head screws (item 5) and washer head screw (item 4).

5. Install woodruff key (item 22) to reel drive shaft (item 7). Apply antiseize lubricant to top of key.

6. Slide reel pulley (item 8) onto reel drive shaft until it contacts shoulder on shaft. Secure reel pulley with two (2) set screws (item 23). Torque set screws from **60 to 65 in-lb (6.8 to 7.3 N-m)**.

7. Install reel drive belt (see Reel Drive Belt Replacement in this section). Make sure that reel drive cover is secured to housing after belt installation.

8. Slide the telescoping coupler onto the cutting unit hex shaft (Fig. 17).

9. Connect spark plug wire to spark plug.

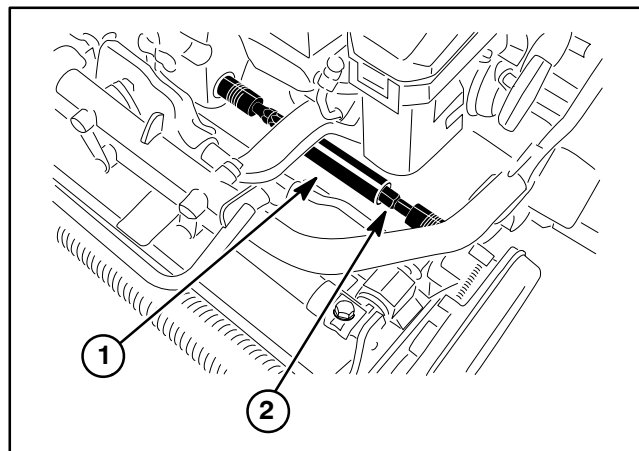


Figure 17

1. Telescoping coupler
2. Cutting unit hex shaft

Reel Drive Bearing Housing

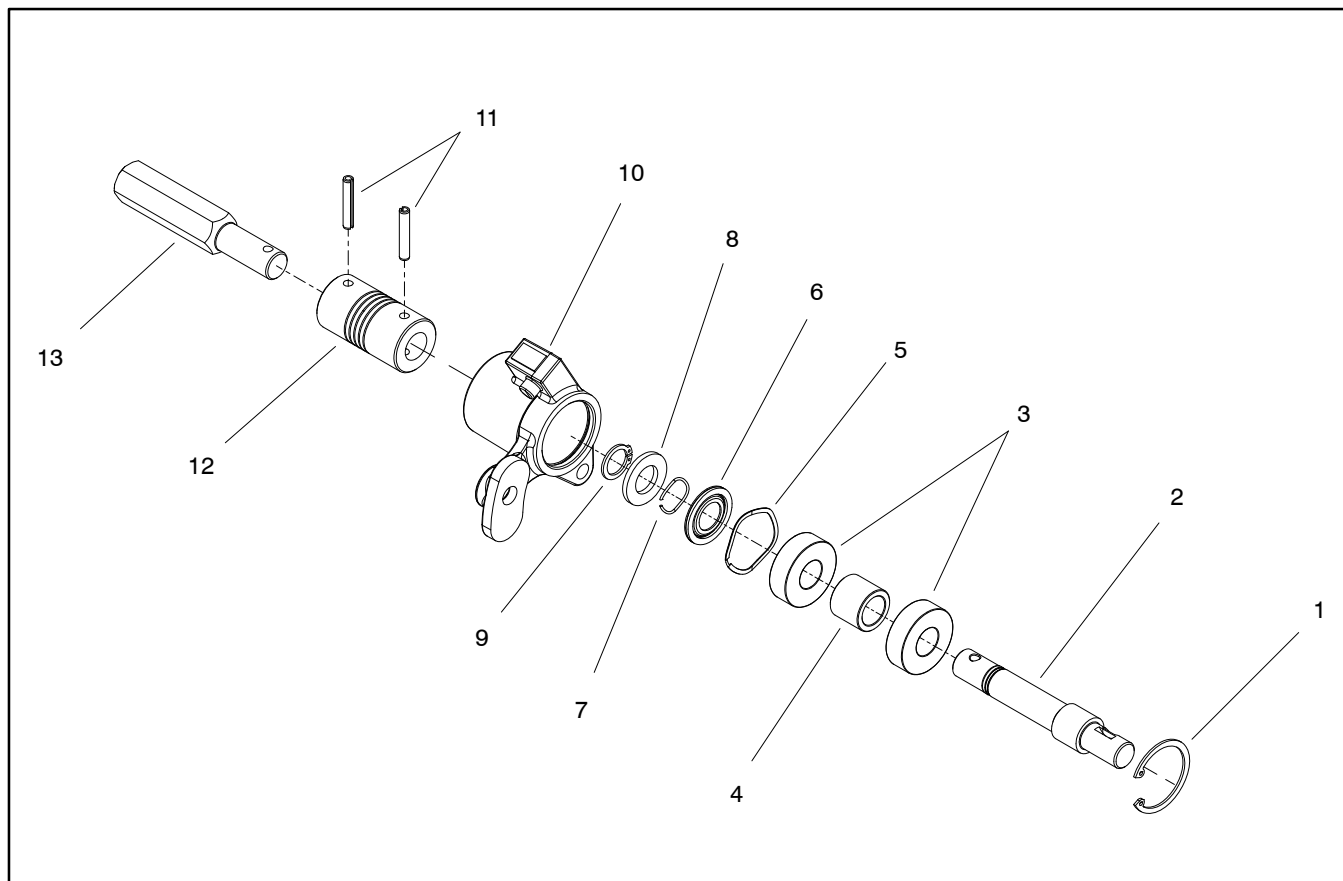


Figure 18

- 1. Retaining ring
- 2. Reel input shaft
- 3. Bearing (2 used)
- 4. Bearing spacer
- 5. Wave washer

- 6. Flocked bearing shield
- 7. Wave spring
- 8. Flat washer
- 9. Retaining ring

- 10. Bearing housing
- 11. Spring pin (2 used)
- 12. Flex coupling
- 13. Reel hex shaft

Disassembly (Fig. 18)

1. Park mower on a level surface. Make sure engine is OFF. Remove spark plug wire from the engine spark plug.
2. Remove reel drive bearing housing from reel drive housing (see Reel Drive Assembly in this section).
3. Remove retaining ring (item 1) from bearing housing.
4. Slide reel input shaft assembly from bearing housing. Remove wave washer (item 5) from bearing housing.

IMPORTANT: When removing flex coupler (item 12) from reel input shaft (item 2), do not mar outer surface of coupler (e.g. grasping with pliers or mounting in vise) as coupler may be damaged and fail prematurely.

5. Support flex coupler (item 12) to prevent it from being damaged during spring pin removal. Push spring pin from flex coupler and reel input shaft. Slide coupler from shaft and discard spring pin.
6. Remove retaining ring (item 9) from shaft. Then remove flat washer (item 8), wave spring (item 7) and flocked bearing shield (item 6) from shaft. Note orientation of flocked shield for assembly purposes.
7. Press bearings and bearing spacer from shaft if necessary. Discard bearings if removed.
8. Clean all bearing housing components.

Assembly (Fig. 18)

1. If bearings were removed from reel input shaft, install new bearings onto shaft. Press first bearing fully onto shaft. Position spacer on shaft and then press second bearing onto shaft.
2. Install flocked bearing shield (item 6), wave spring (item 7) and then flat washer (item 8) onto reel input shaft. Secure components to shaft with retaining ring (item 9). It may be necessary to drive the retaining ring onto the input shaft with a tubular tool and mallet. Make sure that retaining ring is fully seated into shaft groove after installation.
3. Place wave washer (item 5) into bearing housing.
4. Fill cavity between bearings with Mobil High Temperature XHP-222 grease (or equivalent).
5. Install reel input shaft assembly into bearing housing and secure with retaining ring (item 1).

IMPORTANT: When installing flex coupler (item 12) onto reel input shaft (item 2), do not mar outer surface of coupler (e.g. grasping with pliers or mounting in vise) as coupler may be damaged and fail prematurely.

6. Slide flex coupler onto reel input shaft, support coupler to prevent it from being damaged during spring pin installation. Install new spring pin into coupler to secure it to shaft.
7. Install reel drive bearing housing to reel drive housing (see Reel Drive Assembly in this section).
8. Connect spark plug wire to spark plug.

Drum Drive Belt

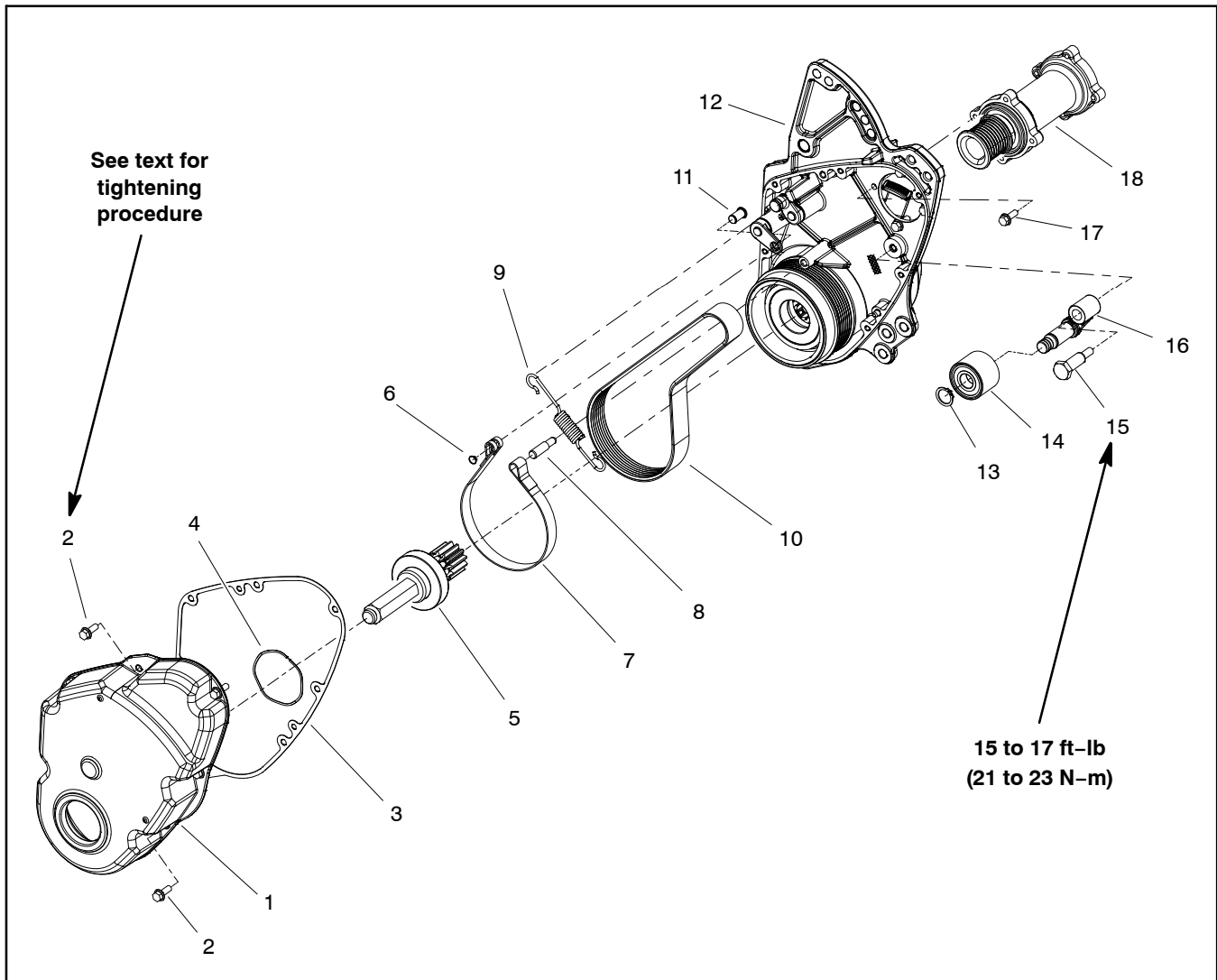


Figure 19

- | | | |
|-------------------------------|------------------------|--------------------------------------|
| 1. Drum drive cover | 7. Brake band | 13. Retaining ring |
| 2. Washer head screw (7 used) | 8. Brake mount pin | 14. Idler pulley assembly |
| 3. Gasket | 9. Extension spring | 15. Shoulder screw |
| 4. Wave washer | 10. Drum drive belt | 16. Idler arm assembly |
| 5. Gear assembly | 11. Brake clevis pin | 17. Washer head screw (4 used) |
| 6. Retaining ring | 12. Drum drive housing | 18. Drive pulley (from transmission) |

The drum drive system on Flex machines uses a multi-ribbed poly-V drive belt on the right side of the traction drum.

Removal (Fig. 19)

1. Park machine on a level surface. Make sure engine is OFF. Remove spark plug wire from the engine spark plug.

2. Remove transport wheels if attached (see Transport Wheels in the Service and Repairs section of Chapter 6 – Chassis and Controls).

3. Rotate traction engage/disengage lever to the disengaged position to remove tension from the drum drive belt (Fig. 20) (see Disengaging Drum Drive From Transmission in the General Information section of this chapter).

4. Remove seven (7) washer head screws that secure the drum drive cover. Remove cover to expose the traction drive belt.

5. Remove and discard gasket (item 3) from between cover and housing.

6. Remove retaining ring (item 6) that secures brake band to brake clevis pin. Slide brake band from brake clevis and brake mount pins and remove band from drum drive housing.

7. Carefully remove one end of extension spring (item 9) from anchor point and rotate spring away from drive belt.

8. Pivot the idler pulley away from the drum drive belt to loosen belt tension (Fig. 21).

9. Remove drum drive belt from both pulleys.

Installation (Fig. 19)

1. Park machine on a level surface. Make sure engine is OFF. Remove spark plug wire from the spark plug.

2. Place drum drive belt onto differential pulley and then fit belt to drive pulley. Make sure that belt is on rear side of idler pulley (Fig. 21).

3. Carefully install removed end of extension spring (item 9) to anchor point.

4. Install brake band over brake surface of differential pulley. Slide ends of brake band onto brake clevis and brake mount pins. Secure brake band to brake clevis pin with retaining ring (item 6).

5. Make sure that wave washer (item 4) is pressed into bore of drum drive cover.

6. Position new gasket (item 3) to housing surface.

7. Slide drum drive cover onto drum drive assembly.

8. Install seven (7) washer head screws to secure cover to housing. Tighten screws as follows:

A. First, using an alternating crossing pattern, torque all screws from **15 to 40 in-lb (1.7 to 4.5 N-m)**.

B. Again using an alternating crossing pattern, torque all screws from **85 to 95 in-lb (9.6 to 10.7 N-m)**.

9. Rotate traction engage/disengage lever to the engaged position to tension the drum drive belt (Fig. 20).

10. Install transport wheels if they were attached (see Transport Wheels in the Service and Repairs section of Chapter 6 – Chassis and Controls).

11. Connect spark plug wire to spark plug.

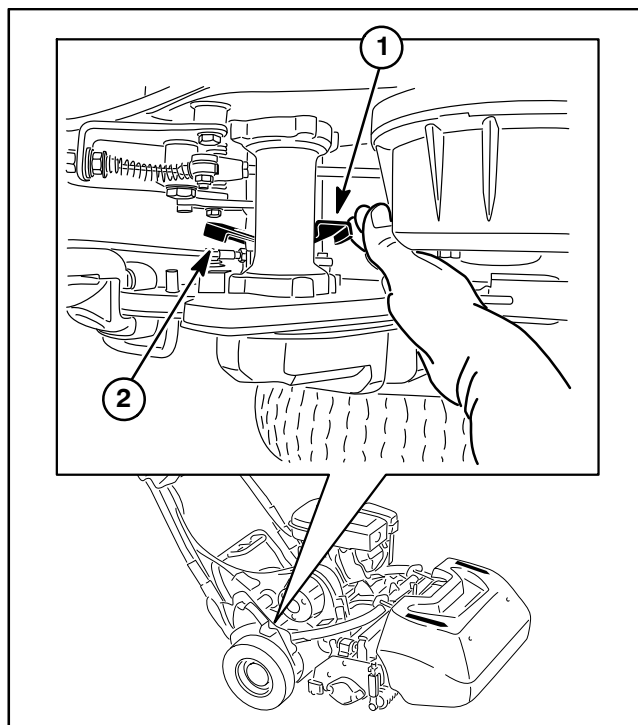


Figure 20

1. Engaged position 2. Disengaged position

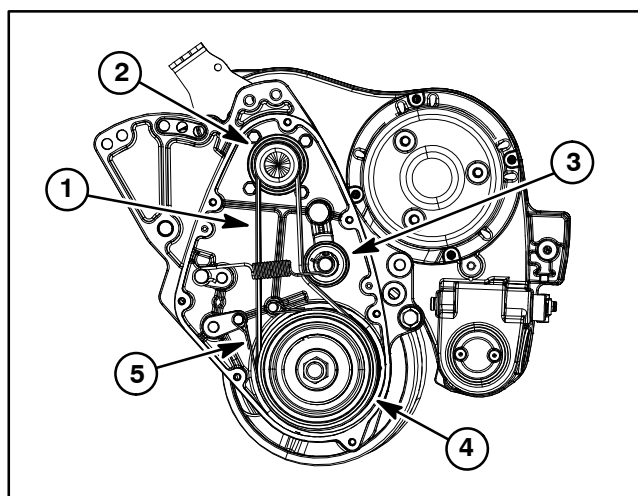


Figure 21

1. Traction drive belt 4. Differential pulley
 2. Drive pulley 5. Brake band
 3. Idler pulley

Drum Drive Idler Assembly

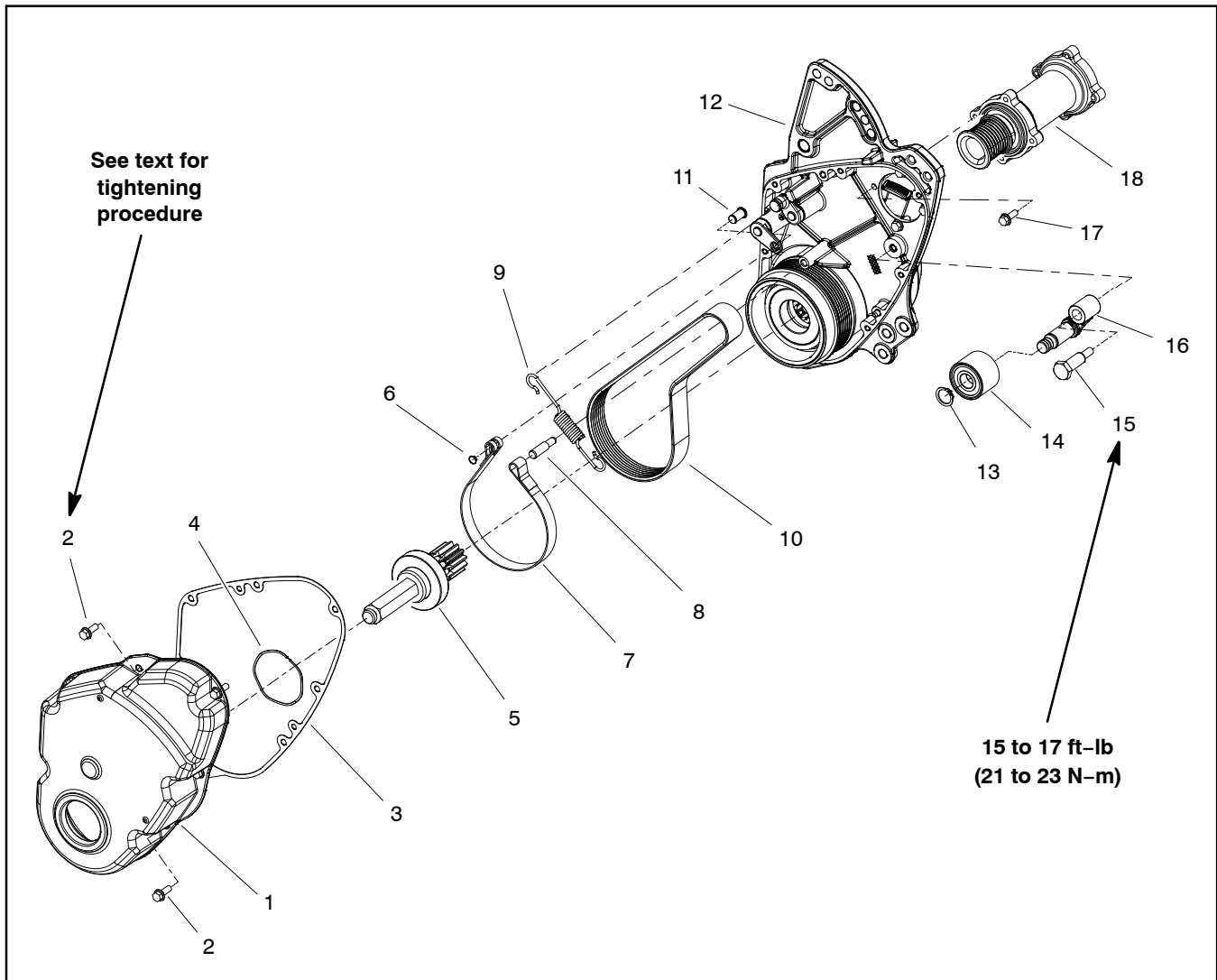


Figure 22

- | | | |
|-------------------------------|------------------------|--------------------------------------|
| 1. Drum drive cover | 7. Brake band | 13. Retaining ring |
| 2. Washer head screw (7 used) | 8. Brake mount pin | 14. Idler pulley assembly |
| 3. Gasket | 9. Extension spring | 15. Shoulder screw |
| 4. Wave washer | 10. Drum drive belt | 16. Idler arm assembly |
| 5. Gear assembly | 11. Brake clevis pin | 17. Washer head screw (4 used) |
| 6. Retaining ring | 12. Drum drive housing | 18. Drive pulley (from transmission) |

Removal

1. Park machine on a level surface. Make sure engine is OFF. Remove spark plug wire from the engine spark plug.
2. Remove transport wheels if attached (see Transport Wheels in the Service and Repairs section of Chapter 6 – Chassis and Controls).
3. Rotate traction engage/disengage lever to the disengaged position to remove tension from the drum drive belt (see Disengaging Drum Drive From Transmission in the General Information section of this chapter).
4. Remove seven (7) washer head screws that secure the drum drive cover. Remove cover to expose the drum drive system.
5. Remove and discard gasket (item 3) from between cover and housing.
6. Carefully remove the end of the extension spring (item 9) from idler arm.
7. Remove shoulder screw (item 15) that secures the idler arm assembly to the drum drive housing. Remove idler arm assembly from housing.

8. Disassemble idler arm assembly as needed (Fig. 23). Replace worn or damaged bearings and bushings.

A. Remove flange bushings from idler bracket. Discard removed bushings.

B. Remove retaining ring from idler bracket. Slide idler pulley from bracket shaft. Press ball bearings from idler pulley. Discard removed bearings.

Installation

1. If idler arm assembly was disassembled:

A. Press new flange bushings into idler bracket.

B. Press new ball bearings fully into idler pulley making sure to apply pressure to outer bearing race only. Slide pulley assembly onto idler bracket and secure with retaining ring.

2. Position idler arm assembly to drum drive housing and secure with shoulder screw (item 15). Torque shoulder screw from **15 to 17 ft-lb (21 to 23 N-m)**. Check that idler arm assembly can pivot freely after tightening shoulder screw.

3. Carefully secure the end of the extension spring (item 9) to idler arm.

4. Make sure that wave washer (item 4) is pressed into bore of drum drive cover.

5. Position new gasket (item 3) to housing surface.

6. Slide drum drive cover onto drum drive assembly.

7. Install seven (7) washer head screws to secure cover to housing. Tighten screws as follows:

A. First, using an alternating crossing pattern, torque all screws from **15 to 40 in-lb (1.7 to 4.5 N-m)**.

B. Again using an alternating crossing pattern, torque all screws from **85 to 95 in-lb (9.6 to 10.7 N-m)**.

8. Rotate traction engage/disengage lever to the engaged position to tension the drum drive belt (see Disengaging Drum Drive From Transmission in the General Information section of this chapter).

9. Install transport wheels if they were attached (see Transport Wheels in the Service and Repairs section of Chapter 6 – Chassis and Controls).

10. Connect spark plug wire to spark plug.

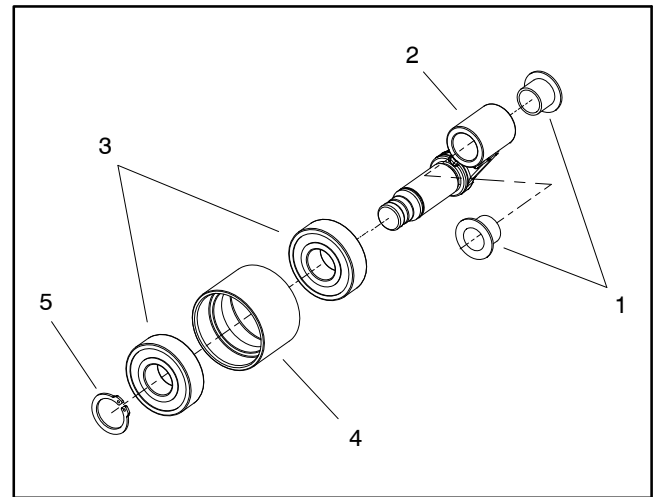


Figure 23

- | | |
|----------------------------|-------------------|
| 1. Flange bushing (2 used) | 4. Idler pulley |
| 2. Idler bracket | 5. Retaining ring |
| 3. Ball bearing (2 used) | |

Traction Drums

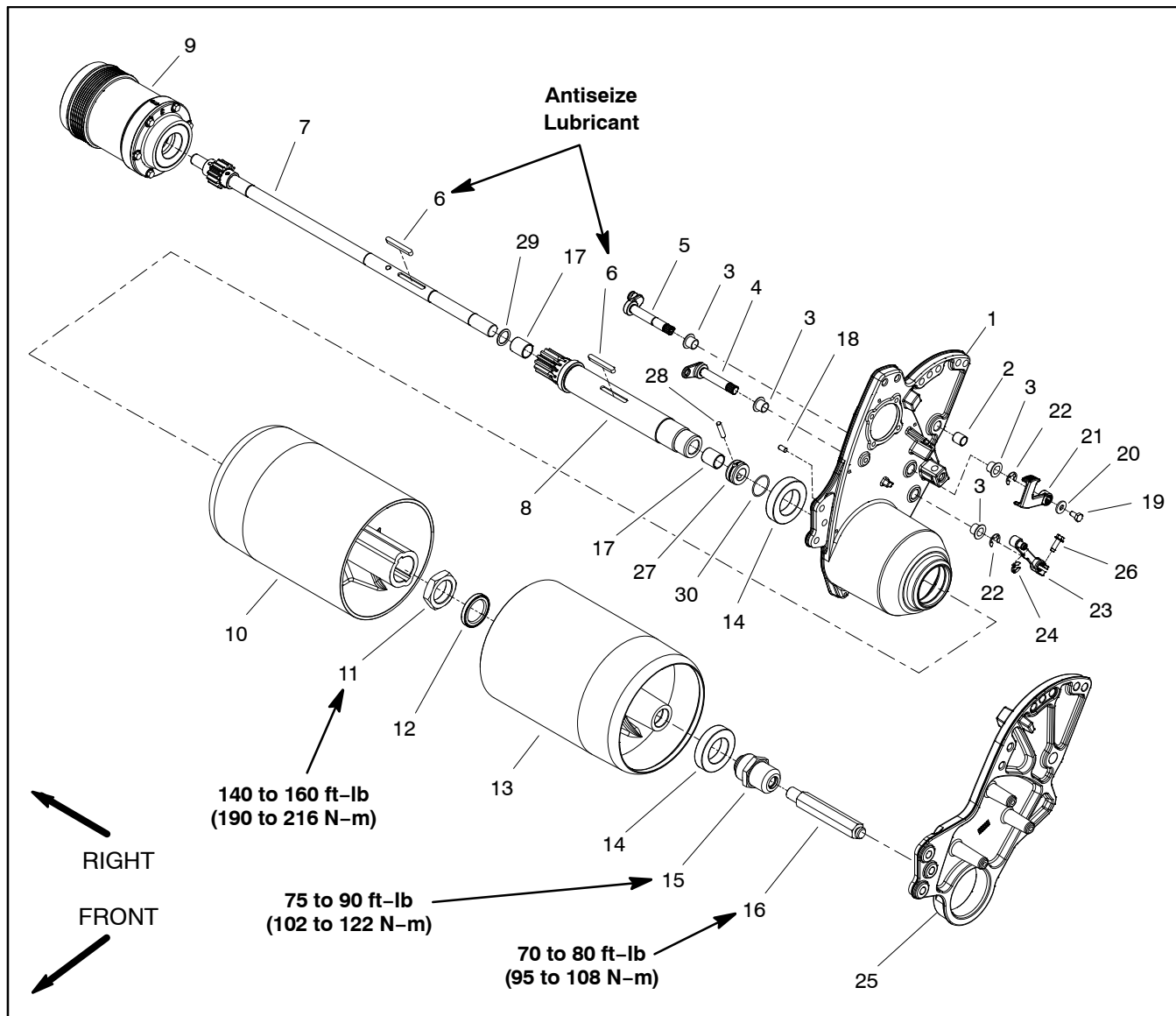


Figure 24

- | | | |
|----------------------------|-------------------------------|-----------------------------|
| 1. Drum drive housing | 11. Jam nut | 21. Traction engage lever |
| 2. Straight bushing | 12. Grease seal | 22. Retaining ring (2 used) |
| 3. Flange bushing (4 used) | 13. LH traction drum | 23. Brake lever |
| 4. Brake lever | 14. Ball bearing (2 used) | 24. Retaining ring |
| 5. Traction lever | 15. Bearing nut | 25. LH side plate |
| 6. Square key (2 used) | 16. LH hex shaft | 26. Washer head screw |
| 7. Drum shaft | 17. Straight bushing (2 used) | 27. Lock collar |
| 8. Long spur gear | 18. Dowel pin (2 used) | 28. Pin |
| 9. Differential assembly | 19. Cap screw | 29. Thrust washer |
| 10. RH traction drum | 20. Flat washer | 30. O-ring |

Traction Drum Removal (Fig. 24)

1. Park machine on a level surface. Make sure engine is OFF. Remove spark plug wire from the engine spark plug.

2. If installed, remove transport wheels (see Transport Wheels in the Service and Repairs section of Chapter 6 – Chassis and Controls).

3. Remove handle assembly from machine (see Handle Assembly in the Service and Repairs section of Chapter 6 – Chassis and Controls).

4. Support both sides of machine frame with jackstands or suitable blocking to prevent the machine from moving.

5. Separate LH side plate (item 25) from machine (Fig. 25):

A. Remove flange nut, hardened washer and carriage screw (items 3, 4 and 6 in Fig. 25) that secure LH side plate to rear frame.

B. Remove three (3) flange screws and hardened washers (items 8 and 4 in Fig. 25) that secure LH side plate to frame.

C. Slide LH side plate from supporting bearing and remove from machine.

6. Insert bar stock or other suitable tool through spokes of LH traction drum to keep drum from turning.

7. While retaining LH drum, loosen and remove bearing nut (item 15) from traction drum assembly. The ball bearing (item 14) is pressed onto the bearing nut so it will be removed with the nut.

8. Slide LH traction drum (item 13) from drum shaft. Locate and retrieve square key from shaft.

9. If necessary, carefully remove grease seal (item 12) from LH traction drum taking care to not damage bore of drum. Discard removed seal.

10. If necessary, remove LH hex shaft (item 16) and ball bearing (item 14) from bearing nut.

11. Insert bar stock or other suitable tool through spokes of RH traction drum to keep drum from turning.

12. Remove O-ring (item 30), pin (item 28) and lock collar (item 27) from drum shaft.

13. While retaining remaining drum, loosen and remove jam nut (item 11) from long spur gear.

14. Remove RH traction drum (item 10) from machine. Locate and retrieve square key from spur gear.

NOTE: If removal of the drum shaft (item 7), long spur gear (item 8) or differential assembly (Item 9) is necessary, see Differential Assembly in this section.

Traction Drum Installation (Fig. 24)

1. Make sure that drum shaft (item 7), long spur gear (item 8) and differential assembly (Item 9) are installed to drum drive housing (refer to Differential Assembly in this section).

2. Install LH hex shaft (item 16) and ball bearing (item 14) to bearing nut (item 15) if they were removed. Press bearing fully onto bearing nut. Torque hex shaft from **70 to 80 ft-lb (95 to 108 N-m)**.

3. Place square key (item 6) into slot of long spur gear (item 8). Apply antiseize lubricant to top surface of key.

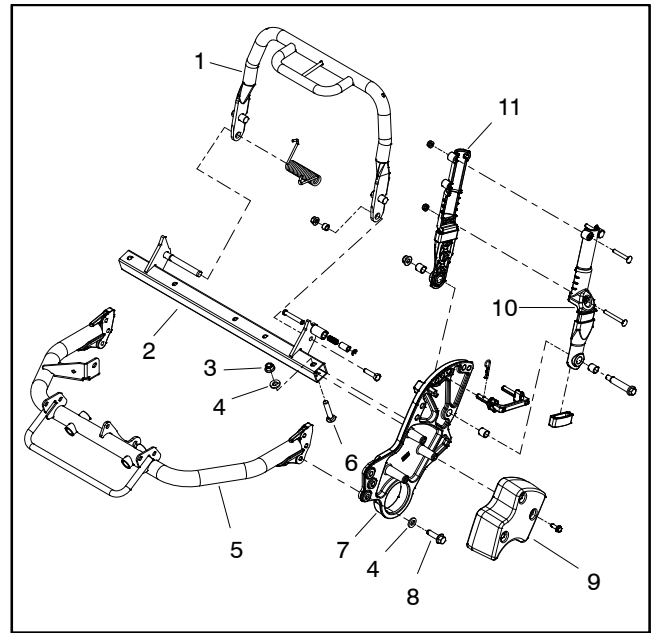


Figure 25

- | | |
|--------------------|--------------------------|
| 1. Kickstand | 7. LH side plate |
| 2. Rear frame | 8. Flange screw (3 used) |
| 3. Flange nut | 9. Counterweight |
| 4. Hardened washer | 10. Offset handle clamp |
| 5. Frame | 11. Handle clamp |
| 6. Carriage screw | |

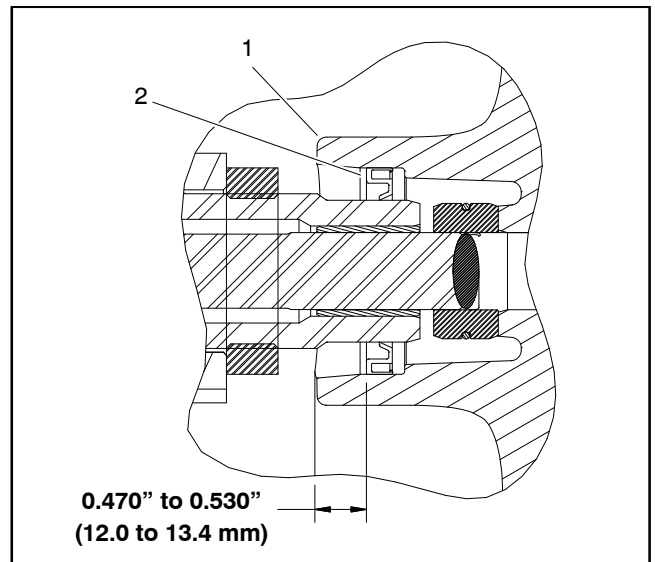


Figure 26

- | | |
|---------------------|----------------|
| 1. LH traction drum | 2. Grease seal |
|---------------------|----------------|
4. Align slot in RH traction drum (item 10) with key on long spur gear and slide traction drum onto gear.
 5. Insert bar stock or other suitable tool through spokes of RH traction drum to keep drum from turning.
 6. Install jam nut (item 11) onto threads of long spur gear to secure RH traction drum. Torque jam nut from **140 to 160 ft-lb (190 to 216 N-m)**.

7. Slide lock collar (item 27) onto drum shaft. Align holes in collar and shaft and then install pin (item 28). Fit O-ring (item 30) to slot in collar.

8. If grease seal (item 12) was removed from LH traction drum, install new grease seal into drum. Make sure that seal lip is orientated toward center of drum. Press seal into drum bore so that seal is recessed from 0.470" to 0.530" (12.0 to 13.4 mm) from edge of drum (Fig. 26).

9. Place square key (item 6) into slot of drum shaft. Apply antiseize lubricant to top surface of key.

10. Align slot in LH traction drum (item 13) with key on drum shaft and carefully slide traction drum onto shaft taking care to not damage grease seal in drum.

11. Insert bar stock or other suitable tool through spokes of LH traction drum to keep drum from turning.

12. Make sure that ball bearing (item 14) is pressed onto the bearing nut (item 15). While retaining LH drum, secure drum to traction drum assembly with bearing nut (item 15). Torque bearing nut from **75 to 90 ft-lb (102 to 122 N-m)**.

13. Secure LH side plate (item 25) to machine (Fig. 25):

A. Slide LH side plate onto supporting bearing.

B. Secure LH side plate to frame with three (3) flange screws and hardened washers.

C. Secure LH side plate to rear frame with carriage screw, hardened washer and flange nut.

14. Install handle assembly to machine (see Handle Assembly in the Service and Repairs section of Chapter 6 – Chassis and Controls). Make sure that all cable adjustments are correct.

15. Install transport wheels if necessary (see Transport Wheels in the Service and Repairs section of Chapter 6 – Chassis and Controls).

16. Connect spark plug wire to spark plug.

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Differential Assembly

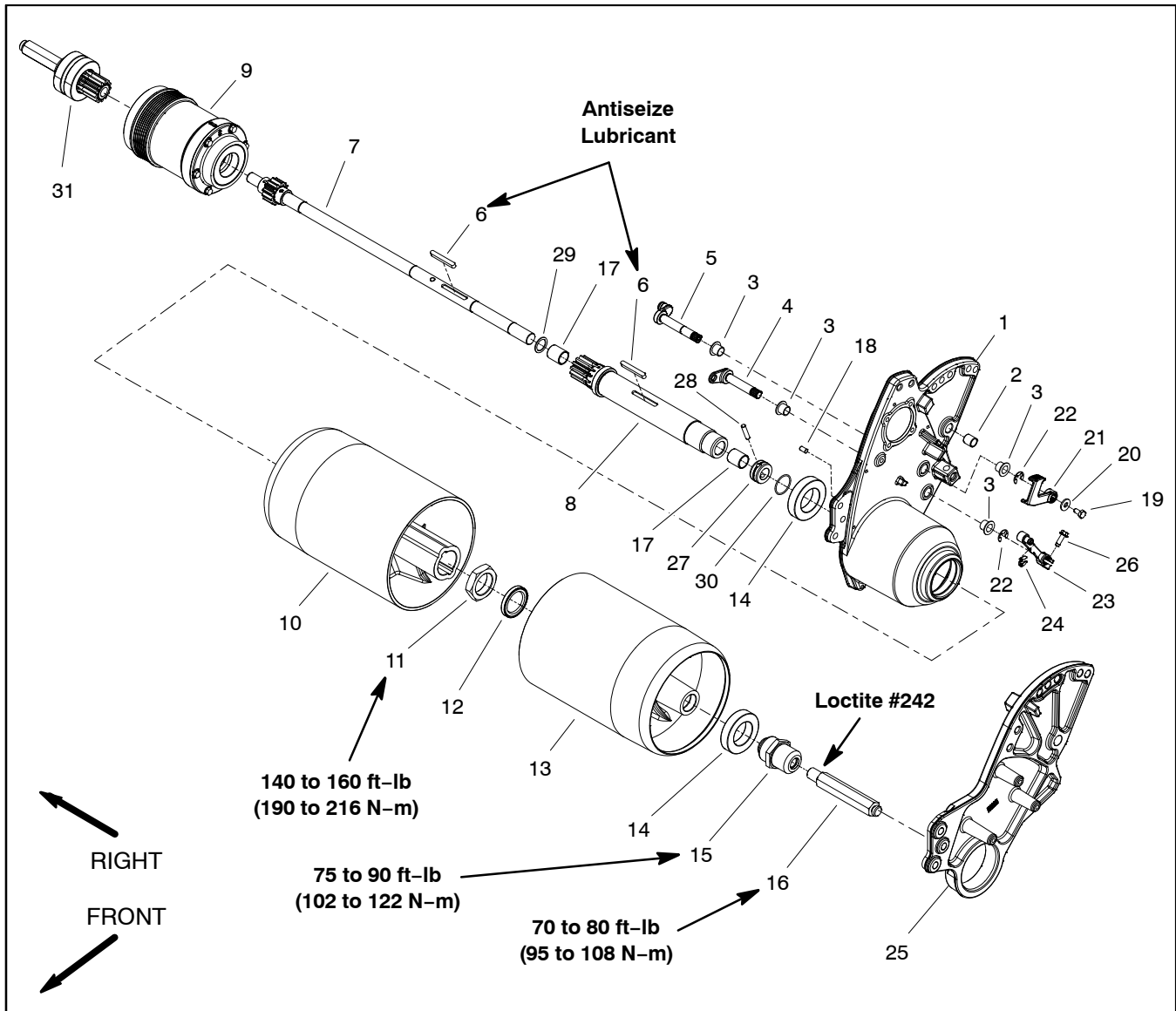


Figure 27

- | | | |
|----------------------------|-------------------------------|-----------------------------|
| 1. Drum drive housing | 12. Grease seal | 22. Retaining ring (2 used) |
| 2. Straight bushing | 13. LH traction drum | 23. Brake lever |
| 3. Flange bushing (4 used) | 14. Ball bearing (2 used) | 24. Retaining ring |
| 4. Brake lever | 15. Bearing nut | 25. LH side plate |
| 5. Traction lever | 16. LH hex shaft (LH threads) | 26. Washer head screw |
| 6. Square key (2 used) | 17. Straight bushing (2 used) | 27. Lock collar |
| 7. Drum shaft | 18. Dowel pin (2 used) | 28. Pin |
| 8. Long spur gear | 19. Cap screw | 29. Thrust washer |
| 9. Differential assembly | 20. Flat washer | 30. O-ring |
| 10. RH traction drum | 21. Traction engage lever | 31. Spur gear assembly |
| 11. Jam nut | | |

Disassembly (Fig. 27)

1. Park machine on a level surface. Make sure engine is OFF. Remove spark plug wire from the engine spark plug.

2. Remove traction drums from machine (see Traction Drums in this section).

3. Slide spur gear assembly from differential assembly in drum drive housing (Fig. 28).

4. If necessary, disassemble spur gear assembly (Fig. 29).

A. The hex shaft has left hand threads. The shaft also has thread locking compound on threads.

B. Press ball bearing and flange bushing from spur gear as needed.

IMPORTANT: As drum shaft (item 7) and differential assembly (item 9) are removed, make sure to retrieve and note location of thrust washer (item 29) for assembly purposes.

5. Push drum shaft (item 7) out of differential assembly. Make sure to locate and retrieve thrust washer (item 29).

6. Slide differential assembly from long spur gear (item 8) and drum drive housing (item 1).

NOTE: For differential service procedure, see Differential Assembly Service in this section.

7. If necessary, slide long spur gear (item 8) from drum drive housing. Straight bushings (item 17) in long spur gear should be inspected for wear or damage and replaced if needed.

8. Ball bearing (item 14) that supports long spur gear is pressed into drum drive housing. Make sure that bearing is in good condition and is pressed fully to shoulder of housing.

Assembly (Fig. 27)

1. If long spur gear (item 8) was removed from drum drive housing, slide gear into ball bearing in drive housing.

2. If spur gear assembly (Fig. 29) was taken apart, assemble as necessary:

A. Press new ball bearing fully onto spur gear if removed.

B. Press new flange bushing into spur gear if removed.

C. If the hex shaft was removed from the spur gear, apply Loctite #242 (or equivalent) to threads of hex shaft. Install hex shaft (left hand threads) into spur gear and torque from **70 to 80 ft-lb (95 to 108 N-m)**.

3. Make sure that differential housing cavity is packed 20% to 30% full of high temperature Mobil XHP-222 grease (or equivalent). Slide differential assembly into drum drive housing (item 1) and onto long spur gear (item 8). Make sure that spur gear properly engages differential gears.

4. Place thrust washer (item 29) onto drum shaft (item 7). Insert drum shaft into differential assembly. Make sure that drum shaft properly engages differential gears.

5. Install traction drums to machine (see Traction Drums in this section).

6. Install drum drive belt from machine (see Drum Drive Belt in this section).

7. Connect spark plug wire to spark plug.

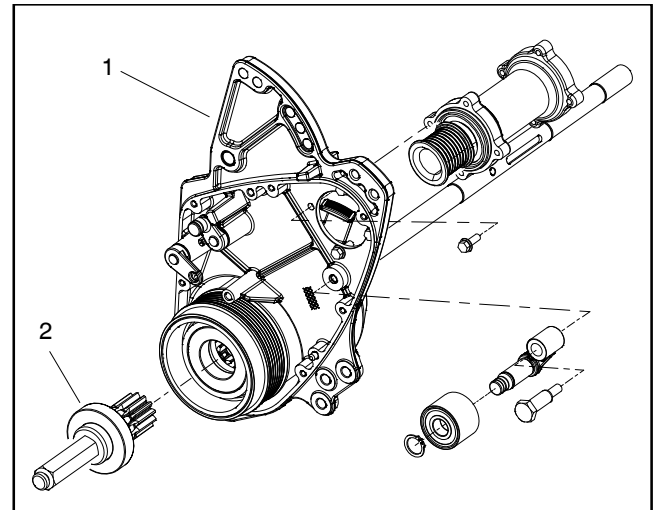


Figure 28

1. Drum drive housing 2. Spur gear assembly

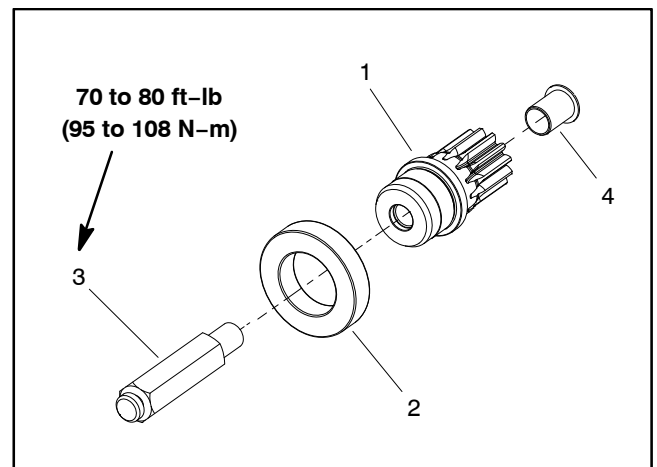


Figure 29

1. Spur gear 3. Hex shaft (LH threads)
2. Ball bearing 4. Flange bushing

Differential Assembly Service

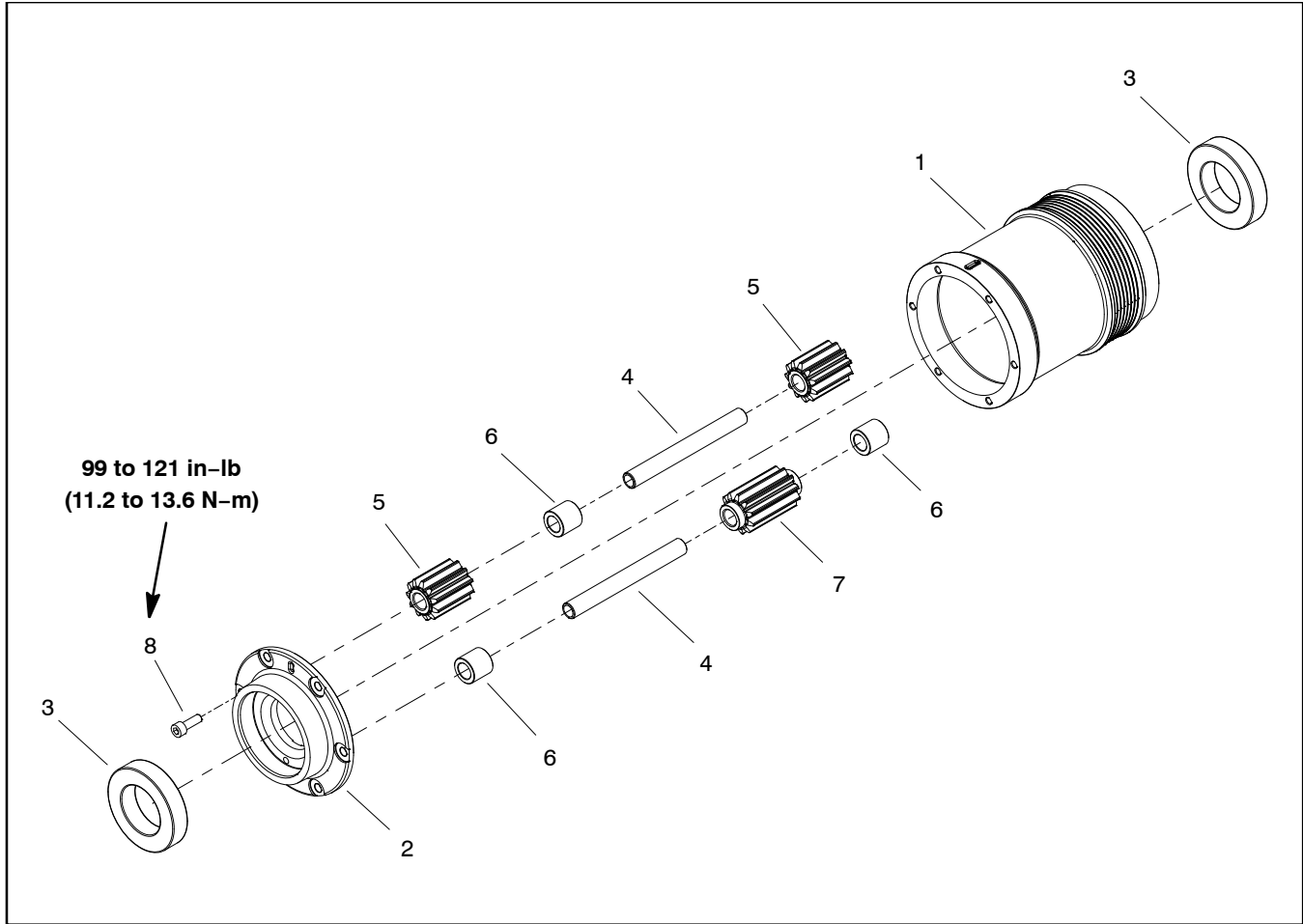


Figure 30

- | | | |
|--------------------------|----------------------------|-------------------------------|
| 1. Housing | 4. Gear pin (6 used) | 7. Spur gear (3 used) |
| 2. Cover | 5. Dual spur gear (6 used) | 8. Socket head screw (6 used) |
| 3. Ball bearing (2 used) | 6. Spacer (9 used) | |

Disassembly (Fig. 30)

1. Remove differential assembly from machine (see Differential Assembly in this section).
2. Remove six (6) socket head screws that secure cover to housing. Note alignment of index marks on housing and cover for assembly purposes (Fig. 31).
3. Place differential assembly on workbench so that the differential is resting on the cover with housing orientated up.
4. Lift housing from differential assembly leaving internal components positioned on cover. For assembly purposes, note that index mark on housing is aligned with a gear pin that has one (1) gear (Fig. 33).
5. Note locations of projections on inside of cover for assembly purposes. The projections need to be aligned with the gear pins that have one (1) gear (Fig. 32).

6. Slide each gear pin with gears and spacers from cover. Note location of gears and spacers on each of the six (6) gear pins.

7. If necessary, remove ball bearings from cover and housing. There are two (2) holes in the cover and housing that allow use of a pin punch to remove bearings. Discard removed bearings.

Inspection (Fig. 30)

1. Clean all differential components.
2. Inspect all differential gears carefully looking for chipped teeth, wear or other damage. Because gear tooth damage is rarely isolated to one gear, replace gears as a complete set.
3. Inspect gear pins (item 4) for scoring or wear.
4. Replace all worn or damaged differential assembly components.

Assembly (Fig. 30)

1. If ball bearing was removed from either cover or housing, press new ball bearing into bearing bore. Make sure that bearing is fully pressed to shoulder of bore.

2. Place cover (with bearing installed) on workbench.

3. Slide each gear pin with gears and spacers into cover. Make sure that projections on inside of cover are aligned with the pins that have one (1) gear (Fig. 32).

4. Position housing onto assembly making sure that gear pin with one (1) gear is positioned next to index mark on housing (Fig. 33). Also, align index marks on housing and cover during assembly (Fig. 31).

5. After housing is installed, use one of the spur gears (see Differential Assembly in this section) to rotate differential gears making sure that they rotate freely without binding. If binding is noted, identify and correct cause before securing the cover.

6. Secure cover to housing with six (6) socket head screws. Torque screws from **99 to 121 in-lb (11.2 to 13.6 N-m)**.

7. Pack differential housing cavity 20% to 30% full of high temperature Mobil XHP-222 grease (or equivalent).

8. Install differential assembly to machine (see Differential Assembly in this section).

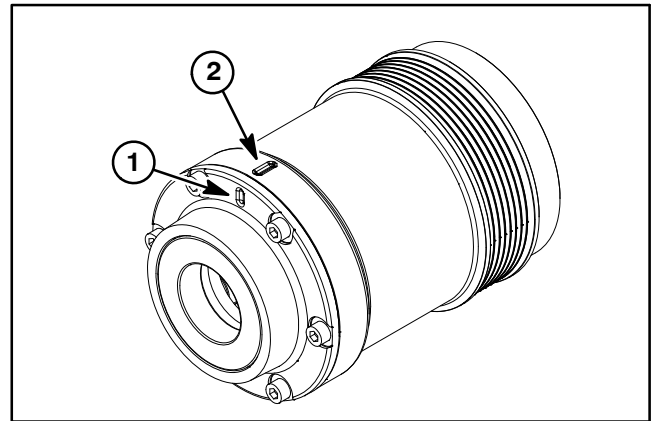


Figure 31

1. Cover index mark

2. Housing index mark

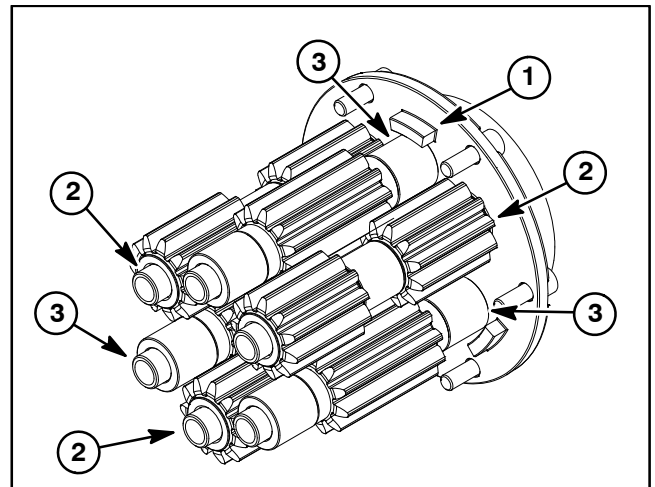


Figure 32

1. Projection on cover

2. Gear pin with 2 gears

3. Gear pin with 1 gear

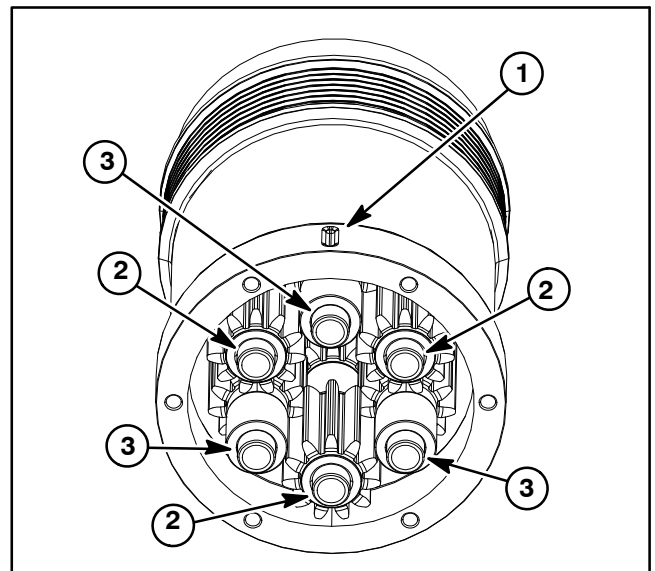


Figure 33

1. Housing index mark

2. Gear pin with 2 gears

3. Gear pin with 1 gear

Transmission Drive Belt

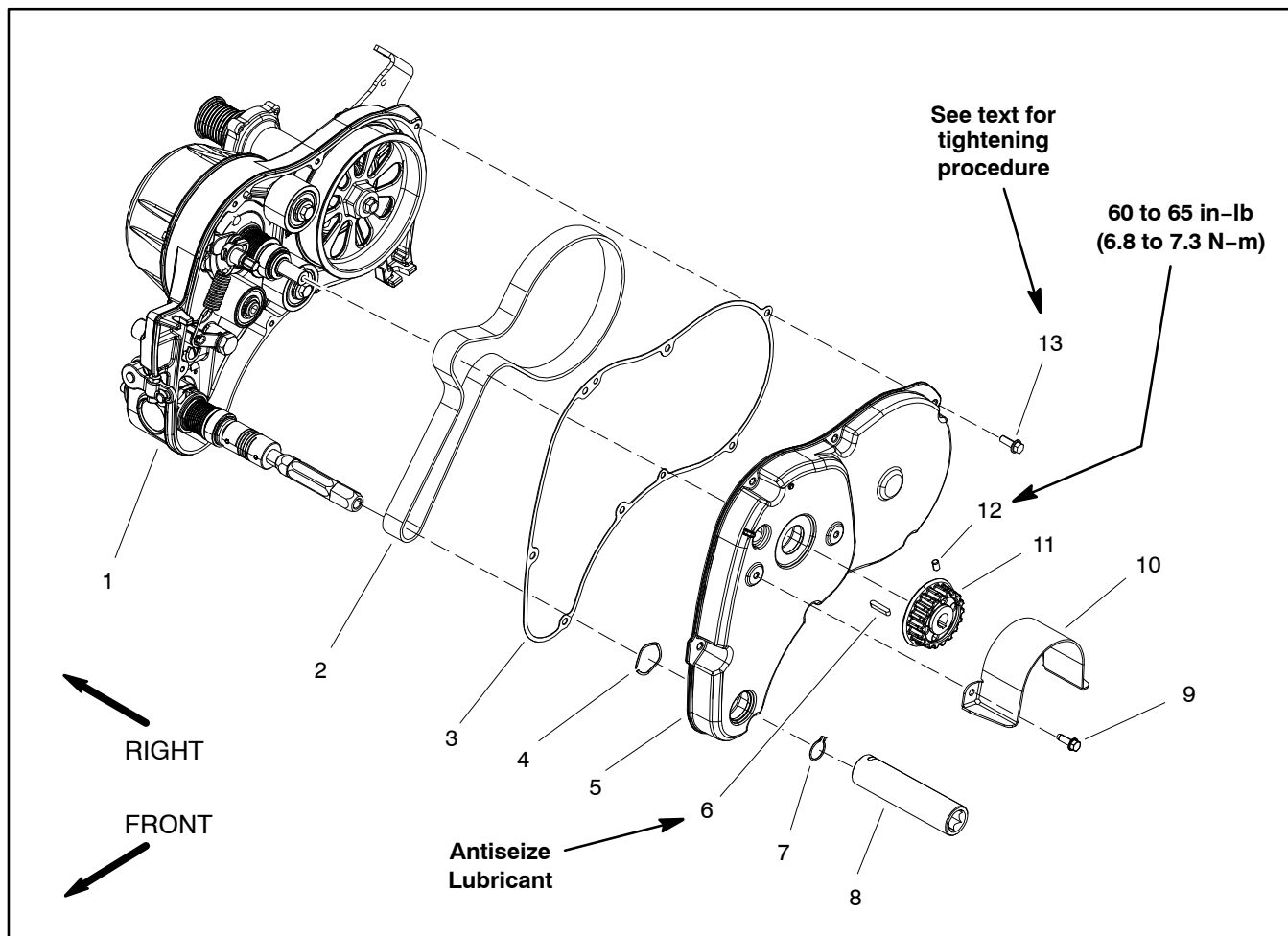


Figure 34

- | | | |
|--------------------------|-------------------------------|--------------------------------|
| 1. Transmission assembly | 6. Key | 10. Coupler guard |
| 2. Transmission belt | 7. Drive shaft wire | 11. Coupler |
| 3. Gasket | 8. Telescoping coupler | 12. Set screw (2 used) |
| 4. Wave washer | 9. Washer head screw (2 used) | 13. Washer head screw (7 used) |
| 5. Transmission cover | | |

Transmission removal from the machine is not necessary to service the transmission drive belt. The transmission drive belt can be replaced by removing the engine from the frame, removing the transmission cover and then removing the drive belt.

Drive Belt Removal (Fig. 34)

1. Park machine on a level surface. Make sure engine is OFF.
2. Remove engine from machine (see Engine Removal in the Service and Repairs section of Chapter 3 – Engine).
3. Use tips of needle nose pliers to spread ends of drive shaft wire (item 7) in telescoping coupler (item 8). With wire ends spread, slide coupler from transmission shaft.

4. Remove coupler guard (item 10) from transmission.
5. Loosen two (2) set screws (item 12) that secure coupler (item 11) to transmission shaft. Slide coupler from transmission shaft. Locate and retrieve key (item 6).

IMPORTANT: During disassembly, make sure that tension is released from transmission belt before removing transmission cover.

6. Remove tension on transmission belt by rotating the engage/disengage shaft clockwise (see Transmission Belt Tensioner in the General Information section of this chapter).
7. Remove seven (7) washer head screws that secure transmission cover to transmission. Carefully remove cover from transmission. Remove and discard gasket (item 3).

8. Make sure that wave washer (item 4) is pressed into reel drive shaft bore of transmission cover.
9. Note transmission belt routing for assembly purposes (Fig. 35).
10. Remove transmission belt from drive and idler pulleys in transmission.
11. Check condition of all pulleys and idler components.
12. Clean inside of transmission before reinstalling new belt.

Drive Belt Installation (Fig. 34)

IMPORTANT: During assembly, make sure that transmission cover is installed with fasteners properly torqued before applying tension to transmission belt.

1. Install new transmission belt onto pulleys in transmission. Make sure that belt is correctly routed around drive and idler pulleys (Fig. 35).
2. Make sure that wave washer (item 4) is pressed into bearing bores of transmission cover. Also, make sure that two (2) dowel pins are pressed into bores in the transmission housing.
3. Position new gasket to transmission assembly. Align gasket to two (2) dowel pins in transmission housing.
4. Install transmission cover. If necessary, use a rubber mallet at dowel locations (Fig. 36) to seat cover to transmission.
5. Install seven (7) washer head screws to secure cover to transmission. Tighten screws as follows:
 - A. First, using an alternating crossing pattern, torque all screws from **15 to 40 in-lb (1.7 to 4.5 N-m)**.
 - B. Again using an alternating crossing pattern, torque all screws from **85 to 95 in-lb (9.6 to 10.7 N-m)**.
6. Apply tension to transmission belt by rotating the engage/disengage shaft counter-clockwise (see Transmission Belt Tensioner in the General Information section of this chapter).
7. Install key (item 6) to transmission shaft. Apply anti-seize lubricant to top of key.
8. Slide coupler (item 11) onto transmission shaft until it is flush with the end of the shaft. Secure coupler with two (2) set screws (item 12). Torque set screws from **60 to 65 in-lb (6.8 to 7.3 N-m)**.

9. Secure coupler guard (item 10) to transmission.
10. Slide telescoping coupler onto transmission shaft so that drive shaft wire engages hex shaft on transmission. Make sure that telescoping coupler is properly attached to cutting unit hex shaft.
11. Install engine to machine (see Engine Installation in the Service and Repairs section of Chapter 3 – Engine).

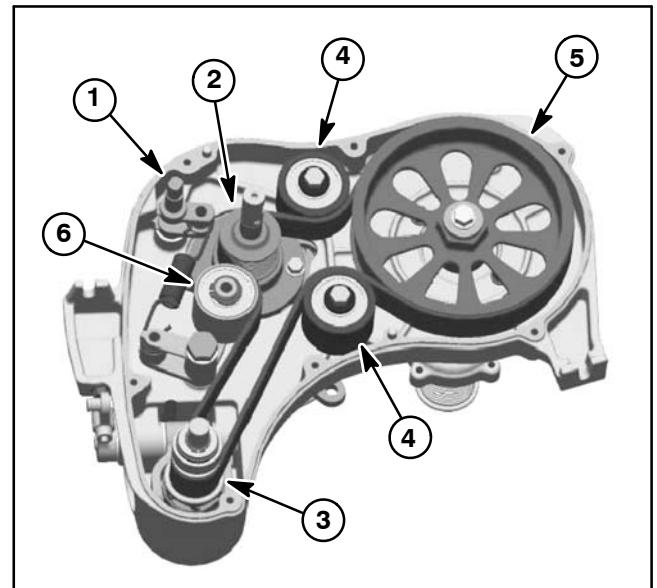


Figure 35

- | | |
|---------------------------|----------------------|
| 1. Engage/disengage shaft | 4. Idler pulley |
| 2. Drive pulley | 5. Drum drive pulley |
| 3. Reel clutch pulley | 6. Idler pulley |

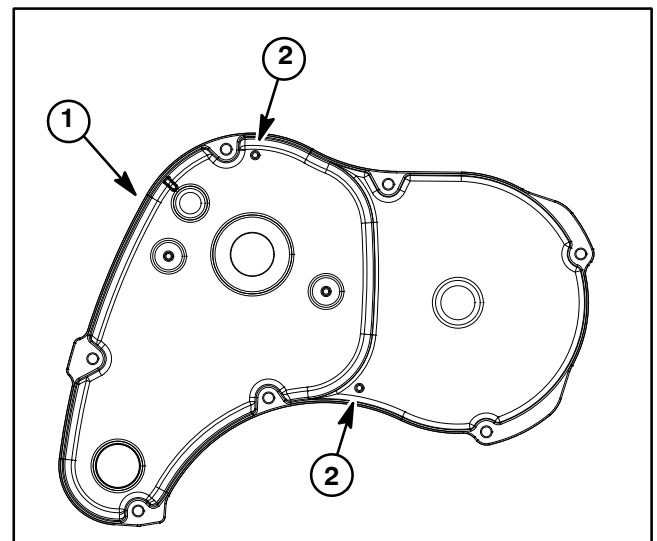


Figure 36

- | | |
|-----------------------|-------------------|
| 1. Transmission cover | 2. Dowel location |
|-----------------------|-------------------|

Transmission Idler System

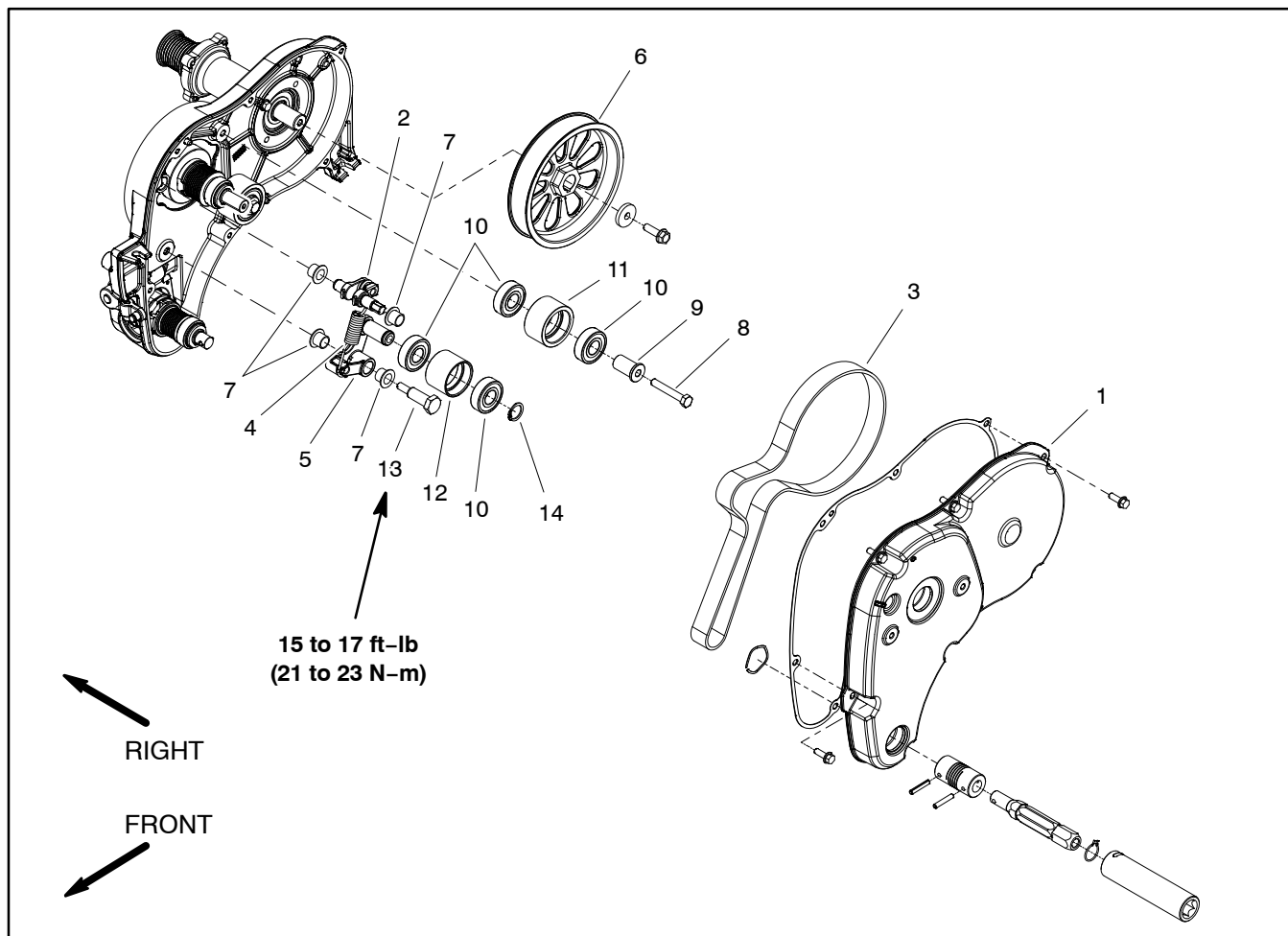


Figure 37

- | | | |
|---------------------------|----------------------------------|---------------------------|
| 1. Transmission cover | 6. Driven pulley (drum drive) | 11. Idler pulley (2 used) |
| 2. Engage/disengage shaft | 7. Flange bushing (4 used) | 12. Idler pulley |
| 3. Transmission belt | 8. Cap screw (2 used) | 13. Shoulder screw |
| 4. Extension spring | 9. Idler pulley bushing (2 used) | 14. Retaining ring |
| 5. Main drive idler | 10. Ball bearing (6 used) | |

Transmission removal from the machine is not necessary to service the transmission idler system. Transmission idler components can be accessed by removing the engine from the frame, removing the transmission cover and then removing the drive belt.

Disassembly (Fig. 37)

1. Park machine on a level surface. Make sure engine is OFF.
2. Remove transmission drive belt (see Transmission Drive Belt in this section).
3. Disassemble idler system as required using Figure 37 as a guide. Discard ball bearings if they are removed from idler pulleys.
4. Check bushings (items 7 and 9) for wear or damage. Replace bushings if necessary. Bushings for engage/disengage shaft (item 2) are pressed into the transmission housing and cover.

Assembly (Fig. 37)

1. Assemble idler system as required using Figure 37 as a guide. Ball bearings that support idler pulleys are pressed into the pulleys.

A. If bearings were removed from idler pulleys, press new bearings fully to shoulder of idler pulleys.

B. If extension spring (item 4) was removed, make sure that ends of spring are orientated as shown in Fig. 38.

C. If main drive idler (item 5) was removed, secure idler to transmission housing with shoulder screw (item 13). Torque shoulder screw from **15 to 17 ft-lb (21 to 23 N-m)**.

D. After securing idler components to transmission housing, make sure that all idler pulleys rotate smoothly.

2. Install transmission drive belt and all machine components removed for idler system service (see Transmission Drive Belt in this section).

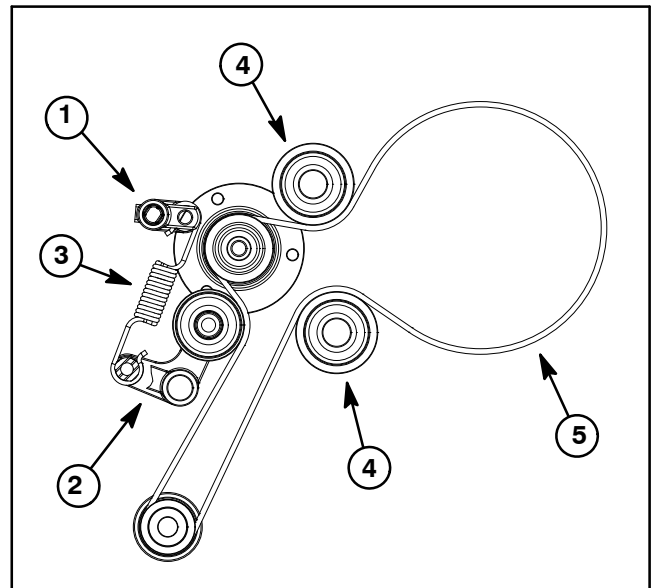


Figure 38

- | | |
|---------------------------|----------------------|
| 1. Engage/disengage shaft | 4. Idler pulley |
| 2. Main drive idler | 5. Transmission belt |
| 3. Extension spring | |

Transmission Reel Drive System

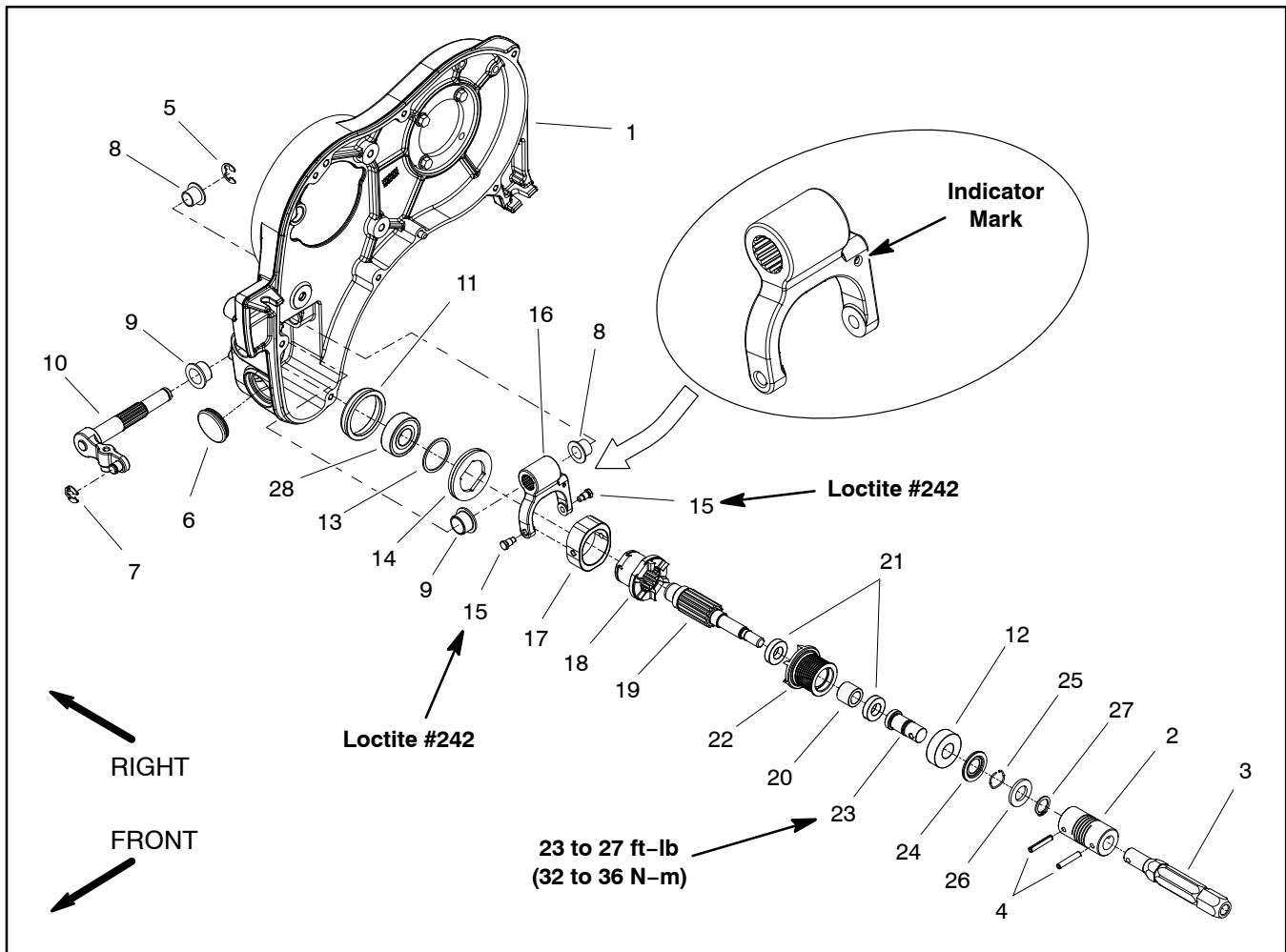


Figure 39

- | | | |
|---------------------------------------|-------------------------------|----------------------------|
| 1. Transmission housing | 11. Reel brake ring | 20. Spacer |
| 2. Flex coupler | 12. Ball bearing | 21. Ball bearing (2 used) |
| 3. Hex shaft | 13. Retaining ring | 22. Reel clutch pulley |
| 4. Spring pin (2 used) | 14. Reel brake disc | 23. Bearing collar |
| 5. Retaining ring | 15. Clutch pivot pin (2 used) | 24. Flocked bearing shield |
| 6. Plug | 16. Reel clutch fork | 25. Wave spring |
| 7. Retaining ring (reel clutch cable) | 17. Reel clutch hub | 26. Flat washer |
| 8. Flange bushing (2 used) | 18. Reel drive hub | 27. Retaining ring |
| 9. Flange bushing (2 used) | 19. Clutch shaft | 28. Ball bearing |
| 10. Reel clutch lever | | |

Transmission removal from the machine is not necessary to service the transmission reel drive system. Transmission reel drive components can be accessed by removing the battery pack from the frame, removing the transmission cover and then removing the drive belt.

Reel Clutch Shaft Removal (Fig. 39)

1. Park machine on a level surface. Make sure engine is OFF.
2. Disconnect reel clutch cable from transmission (see Reel Clutch Cable Replacement in the Service and Repairs section of Chapter 6 – Chassis and Controls).

3. Remove transmission drive belt (see Transmission Drive Belt in this section).

4. Remove retaining ring (item 5) that secures reel clutch lever (item 10) in transmission housing. Slide reel clutch lever from housing. Note missing tooth in spline area of lever which is used for alignment with reel clutch fork (item 16).

5. Pull reel clutch shaft assembly from transmission housing. NOTE: If ball bearing (item 28) on reel clutch shaft assembly is seized in housing, refer to Removing Seized Reel Clutch Shaft From Transmission in this section for removal procedure.

6. Inspect flange bushings and reel brake ring for wear or damage (Fig. 40). Replace bushings and brake ring if necessary.

Reel Clutch Shaft Disassembly (Fig. 39)

NOTE: The following procedure covers complete disassembly of reel clutch shaft assembly. Depending on service needs of machine, it may not be necessary to perform every step of this procedure.

IMPORTANT: When removing flex coupler (item 2) from clutch shaft, do not mar outer surface of coupler (e.g. grasping with pliers or mounting in vise) as coupler may be damaged and fail prematurely.

1. Support flex coupler (item 2) to prevent it from being damaged during spring pin removal. Push spring pin from flex coupler and bearing collar (item 23). Slide coupler with hex shaft (item 3) from collar. Discard removed spring pin.

2. Press ball bearing (item 28) from end of reel clutch shaft. Discard removed bearing.

3. Carefully remove retaining ring (item 13) that secures reel brake disc (item 14) to reel drive hub (item 18). Take care to not damage brake disc friction material when removing retaining ring.

4. Remove reel brake disc (item 14) from reel drive hub noting orientation of disc for assembly purposes. Friction material side of disc needs to be positioned toward the reel brake ring (item 11) which is pressed into the transmission housing.

5. Slide reel clutch hub (item 17) and reel clutch fork (item 16) assembly from reel drive hub (item 18). Note correct orientation of indicator mark on fork for assembly purposes. If necessary, remove pivot pins (item 15) and separate fork from hub.

6. Use modified socket (see Special Tools in this chapter) to remove bearing collar assembly from clutch shaft (Fig. 41).

IMPORTANT: To prevent damage, avoid using excessive clamping pressure on the reel clutch shaft assembly.

A. Use flats on reel drive hub to carefully secure reel clutch shaft assembly in a vise. Use a vise with soft jaws to prevent damage to clutch shaft assembly components.

B. Slide modified socket over bearing collar. Align modified socket so that 5/32" pin can be inserted through socket and hole in bearing collar.

C. Use modified socket and socket wrench to remove bearing collar assembly from clutch shaft.

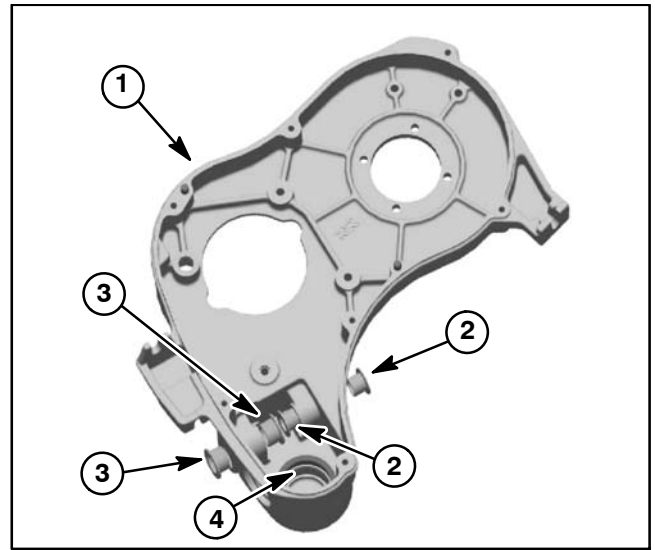


Figure 40

- | | |
|-------------------------|--------------------|
| 1. Transmission housing | 3. Flange bushing |
| 2. Flange bushing | 4. Reel brake ring |

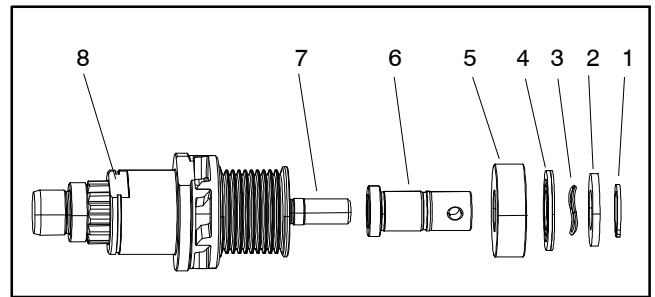


Figure 41

- | | |
|-------------------------|----------------------|
| 1. Retaining ring | 5. Ball bearing |
| 2. Flat washer | 6. Bearing collar |
| 3. Wave spring | 7. Reel clutch shaft |
| 4. Flocked bearing seal | 8. Hub flat location |

7. Remove retaining ring (item 27), flat washer (item 26), wave spring (item 25) and flocked bearing shield (item 24) from bearing collar. Note orientation of flocked shield for assembly purposes.

8. Press bearing (item 12) from bearing collar. Discard removed bearing.

9. Slide reel clutch pulley assembly and reel drive hub from clutch shaft.

10. If necessary, remove ball bearings and spacer from pulley. Discard removed bearings.

Reel Clutch Shaft Assembly (Fig. 39)

1. If ball bearings were removed from reel clutch pulley, press new inner bearing fully to bottom of bore in pulley. Install spacer into pulley and then press new outer bearing into pulley until it contacts spacer.

2. If bearing was removed from bearing collar, press new bearing fully onto collar.

3. Slide reel clutch pulley assembly and reel drive hub onto clutch shaft.
4. Use modified socket (see Special Tools in this chapter) to install bearing collar assembly onto clutch shaft (Fig. 41).

IMPORTANT: To prevent damage, avoid using excessive clamping pressure on the reel clutch shaft assembly.

- A. Use flats on reel drive hub to carefully secure reel clutch shaft assembly in a vise. Use a vise with soft jaws to prevent damage to clutch shaft assembly components.
 - B. Use modified socket, 5/32" pin and socket wrench to install bearing collar assembly to clutch shaft. Torque bearing collar from **23 to 27 ft-lb (32 to 36 N-m)**.
5. Install flocked bearing shield (item 24) (flocked side orientated toward bearing location), wave spring (item 25), flat washer (item 26) and retaining ring (item 27) onto bearing collar.
 6. If reel clutch fork (item 16) was separated from reel clutch hub (item 17), clutch pivot pins (item 15) should either be replaced (new pins have patchlock on threads) or have Loctite #242 (or equivalent) applied to threads before installation. Secure fork to clutch hub with two (2) pivot pins.
 7. Slide reel clutch hub (item 17) and reel clutch fork (item 16) assembly onto reel drive hub (item 18). Make sure that indicator mark on fork is toward the rear of the transmission.
 8. Install reel brake disc (item 14) onto reel drive hub. Friction material side of disc needs to be positioned toward the reel brake ring (item 11) which is pressed into the transmission housing.

9. Carefully secure reel brake disc (item 14) to reel drive hub (item 18) with retaining ring (item 13). Take care to not damage brake disc friction material when installing retaining ring.

10. Press new ball bearing (item 28) fully to shoulder of reel clutch shaft.

IMPORTANT: When installing flex coupler (item 2) onto shaft, do not mar outer surface of coupler (e.g. grasping with pliers or mounting in vise) as coupler may be damaged and fail prematurely.

11. Slide flex coupler onto bearing collar (item 23), support coupler to prevent it from being damaged during spring pin installation. Install new spring pin into coupler to secure coupler to collar.

Reel Clutch Shaft Installation (Fig. 39)

1. Before inserting reel clutch assembly into transmission housing, thoroughly clean reel brake ring (item 11) that is pressed into housing.
2. Slide reel clutch shaft assembly into transmission housing.
3. Align missing tooth in spline area of reel clutch lever (item 10) with reel clutch fork (item 16). Insert lever through housing and fork. Secure lever with retaining ring (item 5).
4. Install transmission drive belt and all machine components removed for reel drive system service (see Transmission Drive Belt in this section).
5. Check reel clutch adjustment (see Reel Clutch Adjustment in the Adjustments section of this chapter). Adjust as needed.
6. Connect reel clutch cable to transmission (see Reel Clutch Cable Replacement in the Service and Repairs section of Chapter 6 – Chassis and Controls). Make sure that clutch cable is properly adjusted.

Removing Seized Reel Clutch Shaft From Transmission

If reel clutch shaft assembly cannot be easily removed from transmission housing due to bearing seizure, the following procedure can be followed to remove the reel clutch shaft assembly.

1. Make sure that transmission drive belt and reel clutch lever are removed from housing (see Transmission Drive Belt and Transmission Reel Drive System in this section).

2. Carefully drill two (2) No. 7 (0.201" diameter) holes in the transmission housing using the dimples in the housing as centers for the holes (Fig. 43). Holes should be drilled completely through the housing allowing external access to the ball bearing on the reel shaft.

3. Use a 3/16" punch through the drilled holes to carefully drive the bearing and reel clutch shaft from the transmission housing.

IMPORTANT: Ball bearing will be damaged during this procedure. Remove ball bearing from reel clutch shaft and discard bearing after shaft has been removed from housing (see Transmission Reel Drive System in this section for bearing removal information).

4. Clean and inspect bearing bore in housing. If damage is severe in housing, replace transmission housing.

5. Use a 1/4"-20 UNC tap to install threads in the two (2) holes drilled in the transmission housing.

6. Install two (2) 1/4"-20 cap screws with flat washers into tapped holes in the transmission housing. Cap screws no longer than 3/8" in length should be used. After screw installation, make sure that the ends of the screws DO NOT extend into the ball bearing bore in the housing.

7. Service the reel clutch shaft assembly as needed (see Transmission Reel Drive System in this section). Make sure that new ball bearing is installed on reel clutch shaft.

8. Install reel clutch shaft assembly into transmission housing and assemble transmission (see Transmission Reel Drive System in this section).

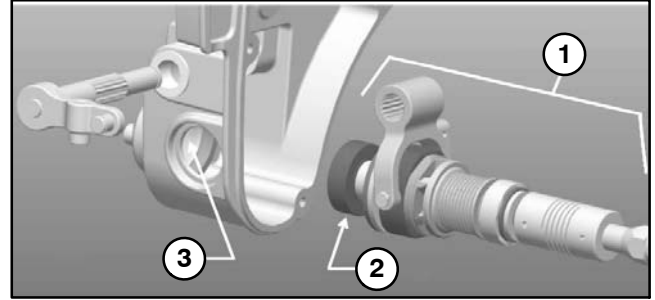


Figure 42

- 1. Reel clutch shaft
- 2. Ball bearing
- 3. Housing bearing bore

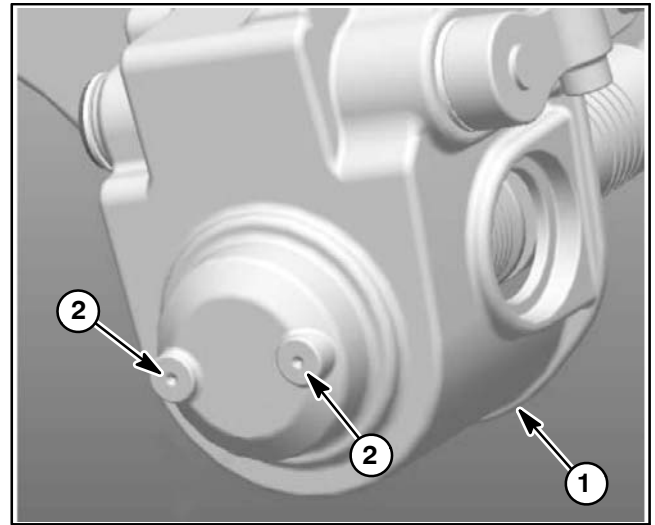


Figure 43

- 1. Transmission housing
- 2. Housing dimple

Transmission Clutch System (1800/2100)

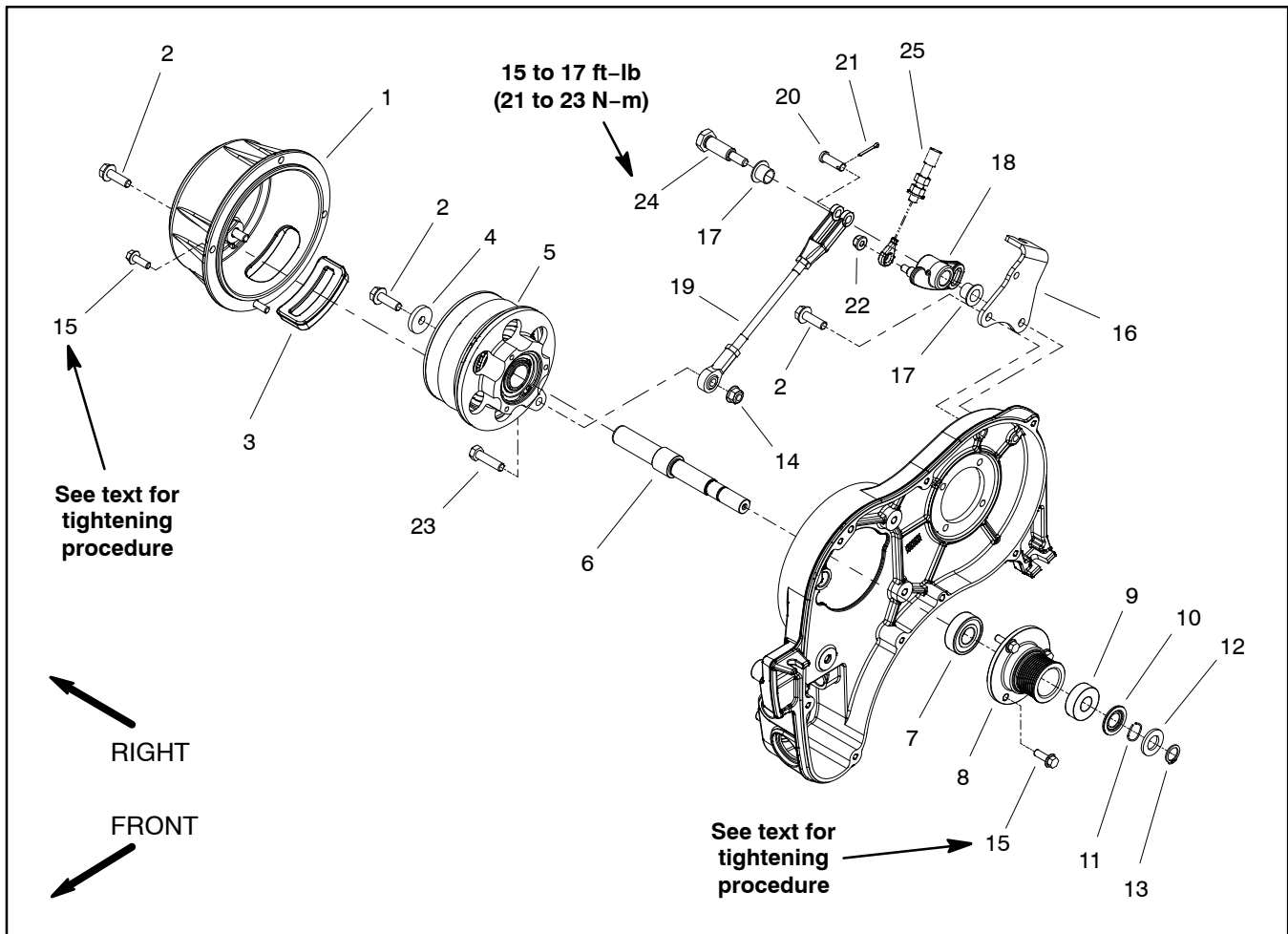


Figure 44

- | | | |
|-------------------------------|--------------------------------|----------------------------|
| 1. Clutch housing | 10. Flocked bearing shield | 18. Bellcrank lever |
| 2. Flange head screw (5 used) | 11. Wave spring | 19. Bellcrank rod assembly |
| 3. Grommet | 12. Flat washer | 20. Clevis pin |
| 4. Hardened washer | 13. Retaining ring | 21. Cotter pin |
| 5. Clutch assembly | 14. Flange nut | 22. Flange nut |
| 6. Clutch shaft | 15. Washer head screw (7 used) | 23. Cap screw |
| 7. Ball bearing | 16. Cable bracket | 24. Shoulder screw |
| 8. Drive pulley | 17. Flange bushing (2 used) | 25. Traction clutch cable |
| 9. Ball bearing | | |

Transmission removal from the machine is not necessary to service the transmission clutch system. Transmission clutch components can be accessed by removing the engine from the frame, removing the transmission cover and then removing the drive belt.

Disassembly (Fig. 44)

1. Park machine on a level surface. Make sure engine is OFF.
2. Remove transmission drive belt (see Transmission Drive Belt in this section).
3. Remove flange nut (item 14) and cap screw (item 23) that secure bellcrank rod assembly (item 19) to clutch lever. Separate rod from clutch lever.
4. Support clutch housing to prevent it from falling.
5. Remove four (4) washer head screws (item 15) that secure clutch housing to transmission housing.
6. Remove entire clutch assembly (including items 1, 5, 6 and 8) from transmission housing.

7. Remove three (3) flange head screws (item 2) that secure clutch housing to clutch assembly. Remove clutch housing from clutch.
8. Remove flange head screw (item 2) and washer (item 4) that secure clutch to clutch shaft.
9. Remove three (3) washer head screws that secure drive pulley to clutch. Slide clutch from clutch shaft.
10. If necessary, remove drive pulley (item 8) from clutch shaft:
 - A. Remove retaining ring (item 13), flat washer (item 12), wave spring (item 11) and flocked bearing shield (item 10) from clutch shaft. Note orientation of flocked shield for assembly purposes.
 - B. Use bearing puller to remove outer ball bearing (item 9) from clutch shaft. Discard bearing.
 - C. Slide drive pulley (item 8) from clutch shaft.
 - D. If necessary, remove inner ball bearing (item 7) from clutch shaft. Discard bearing.

Assembly (Fig. 44)

1. If bellcrank rod (item 19) was disassembled, thread rod into clevis until the end of the rod is flush with the inside of the clevis. Then, install balljoint so the centers are from 8.150" to 8.210" (207.0 to 208.5 mm) as shown in Figure 46. Also, make sure that sides of clevis and balljoint are parallel to prevent binding during operation.
2. If drive pulley (item 8) was removed from clutch shaft, install components on shaft:
 - A. If inner ball bearing (item 7) was removed from clutch shaft, press new bearing onto shaft.
 - B. Slide drive pulley (item 8) onto bearing on clutch shaft.
 - C. Press new outer ball bearing (item 9) onto clutch shaft.
 - D. Install flocked bearing shield (item 10), wave spring (item 11) and flat washer (item 12) onto clutch shaft. Secure with retaining ring (item 13)
3. Align clutch to clutch shaft and slide clutch onto clutch shaft. Secure clutch to shaft with flange head screw (item 2) and washer (item 4).
4. Secure drive pulley to clutch with three (3) washer head screws. First, torque all three (3) screws from **15 to 40 in-lb (1.7 to 4.5 N-m)**. Then, torque all screws from **95 to 105 in-lb (10.7 to 11.8 N-m)**.

5. Position clutch housing to clutch and secure with three (3) flange head screws (item 2). Make sure that grommet (item 3) is secure on housing.
6. Install clutch assembly into transmission housing. Secure clutch housing to transmission housing with four (4) washer head screws (item 15). Tighten screws as follows:
 - A. First, torque all four (4) screws from **15 to 40 in-lb (1.7 to 4.5 N-m)**.
 - B. Then, torque all screws from **85 to 95 in-lb (9.6 to 10.7 N-m)**.
7. Secure bellcrank rod (item 19) to clutch lever with cap screw (item 23) and flange nut (item 14).
8. Install transmission drive belt and all machine components removed for clutch system disassembly (see Transmission Drive Belt in this section).
9. Verify that traction clutch cable is properly adjusted (see Traction Clutch Cable Replacement in the Service and Repairs section of Chapter 6 – Chassis and Controls).

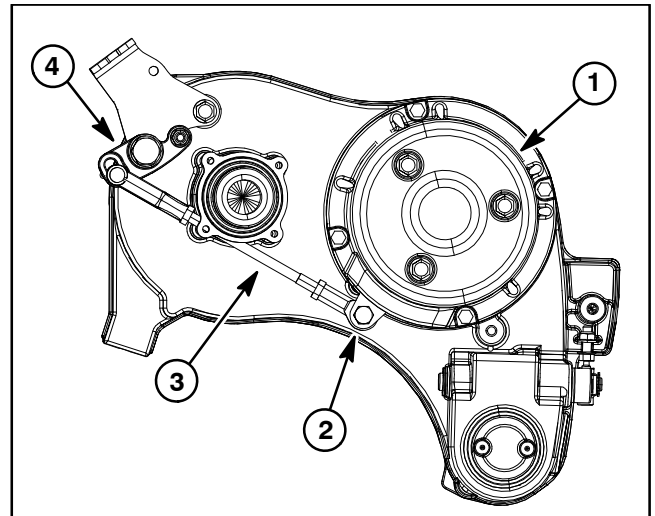


Figure 45

- | | |
|-------------------|---------------------------|
| 1. Clutch housing | 3. Bellcrank rod assembly |
| 2. Clutch lever | 4. Bellcrank lever |

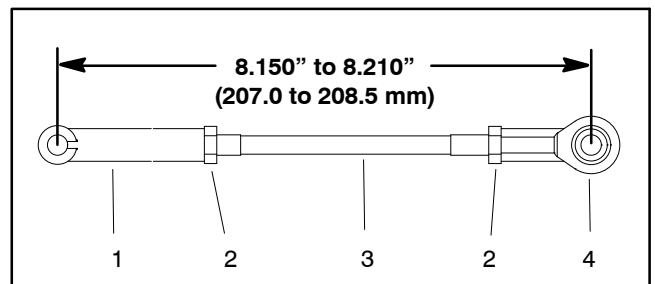


Figure 46

- | | |
|---------------------|------------------|
| 1. Clevis | 3. Bellcrank rod |
| 2. Jam nut (2 used) | 4. Balljoint |

Clutch Assembly Service (1800/2100)

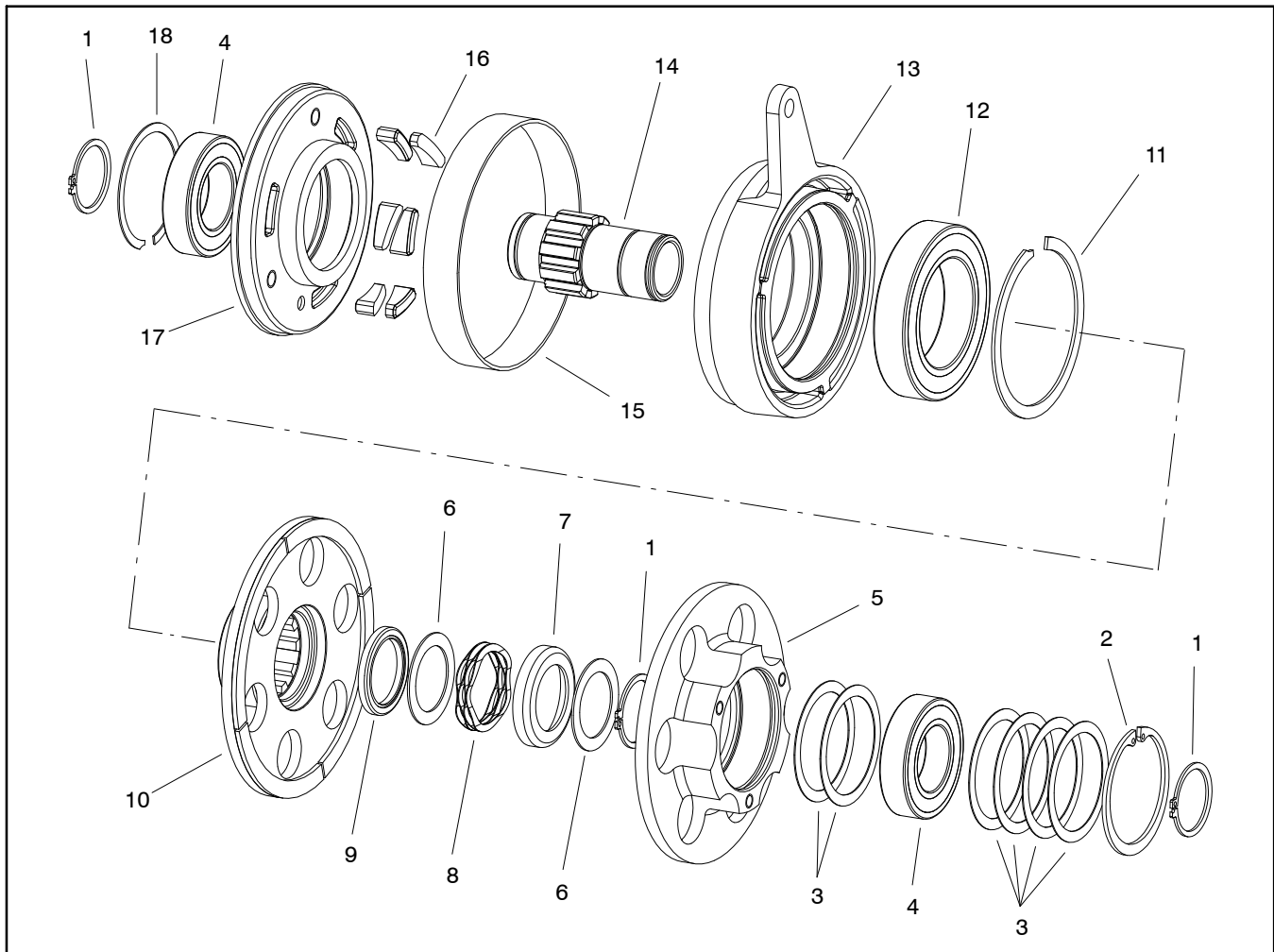


Figure 47

- | | | |
|----------------------------|------------------------------|---------------------------------|
| 1. Retaining ring (3 used) | 7. Spring cup | 13. Rotating housing |
| 2. Retaining ring | 8. Wave spring | 14. Hub |
| 3. Shim (6 used) | 9. Oil seal | 15. Airgap cover |
| 4. Ball bearing (2 used) | 10. Thrust friction assembly | 16. Fixed drive insert (6 used) |
| 5. Mounting plate | 11. Retaining ring | 17. Fixed housing |
| 6. Shim (2 used) | 12. Ball bearing | 18. Retaining ring |

NOTE: Mounting plate (item 5), thrust friction assembly (item 10), rotating housing (item 13), hub (item 14), drive inserts (item 16) and fixed housing (item 17) are not available separately. If any of these clutch components are worn or damaged, replace complete clutch assembly.

Clutch Inspection

1. Before disassembling clutch, measure rotation angle of clutch lever (Fig. 48). If lever can be rotated more than 22°, the clutch assembly is worn and clutch replacement is necessary.

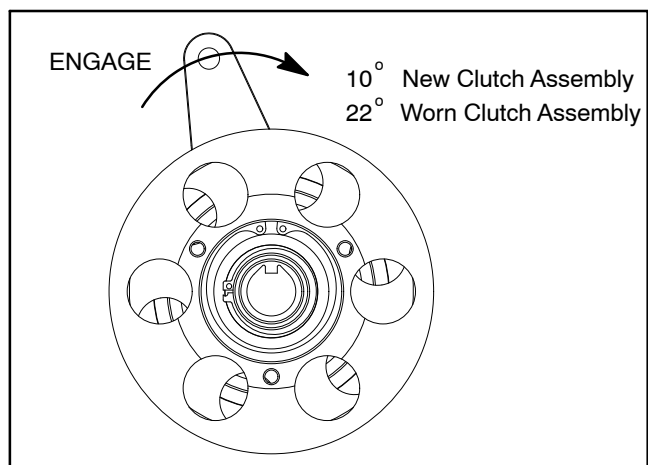


Figure 48

Clutch Disassembly (Fig. 47)

NOTE: Ball bearings (items 4 and 12) are a pressed fit on both races. A press is required to disassemble clutch.

1. Remove both retaining rings (item 1) from ends of hub (item 14).
2. Press mounting plate (item 5) assembly from hub. Remove retaining ring and then remove shims (item 3) and ball bearing from mounting plate. Note location of shims for assembly purposes. Discard removed bearing.
3. Remove retaining ring (item 1), two (2) shims (item 6), spring cup (item 7) and wave spring (item 8) from hub.
4. Slide thrust friction assembly (item 10) (with rotating housing (item 13) attached) from hub. Remove airgap cover (item 15).
5. Press rotating housing assembly from thrust friction assembly. Remove retaining ring and ball bearing from rotating housing. Discard removed bearing.
6. Remove oil seal (item 9) from thrust friction assembly. Note orientation of oil seal for assembly purposes. Discard removed oil seal.
7. Press fixed housing (item 17) assembly from hub. Remove retaining ring and then remove ball bearing from housing. Discard removed bearing.
8. Inspect clutch components for wear or damage. If mounting plate (item 5), thrust friction assembly (item 10), rotating housing (item 13), hub (item 14), drive inserts (item 16) or fixed housing (item 17) is worn or damaged, replace clutch assembly.

Clutch Assembly (Fig. 47)

1. Press new ball bearing into fixed housing (item 17) and secure with retaining ring. Then, press fixed housing (item 17) assembly onto hub and secure with retaining ring (item 1).
2. Install new oil seal (item 9) into thrust friction assembly.
3. Press new ball bearing into rotating housing (item 13) and secure with retaining ring. Then press rotating housing assembly onto thrust friction assembly (item 10).
4. Apply coating of high temperature Mobil XHP-222 grease (or equivalent) to spline area of hub (item 14).
5. Install airgap cover (item 15) and then thrust friction assembly (item 10) (with rotating housing (item 13) attached) onto hub. Take care to not damage oil seal during assembly.
6. Slide shim (item 6), wave spring (item 8), spring cup (item 7) and second shim (item 6) onto hub. Secure assembly with retaining ring (item 1).
7. Install shims (item 3) and new ball bearing into mounting plate (item 5). Position shims in same location as noted during disassembly. Secure assembly with retaining ring.
8. Press mounting plate (item 5) assembly onto hub and secure with retaining ring (item 1).
9. After clutch assembly, adjust transmission clutch (see Transmission Clutch Adjustment – 1800/2100 in this Chapter).

Transmission Clutch System (1820/2120)

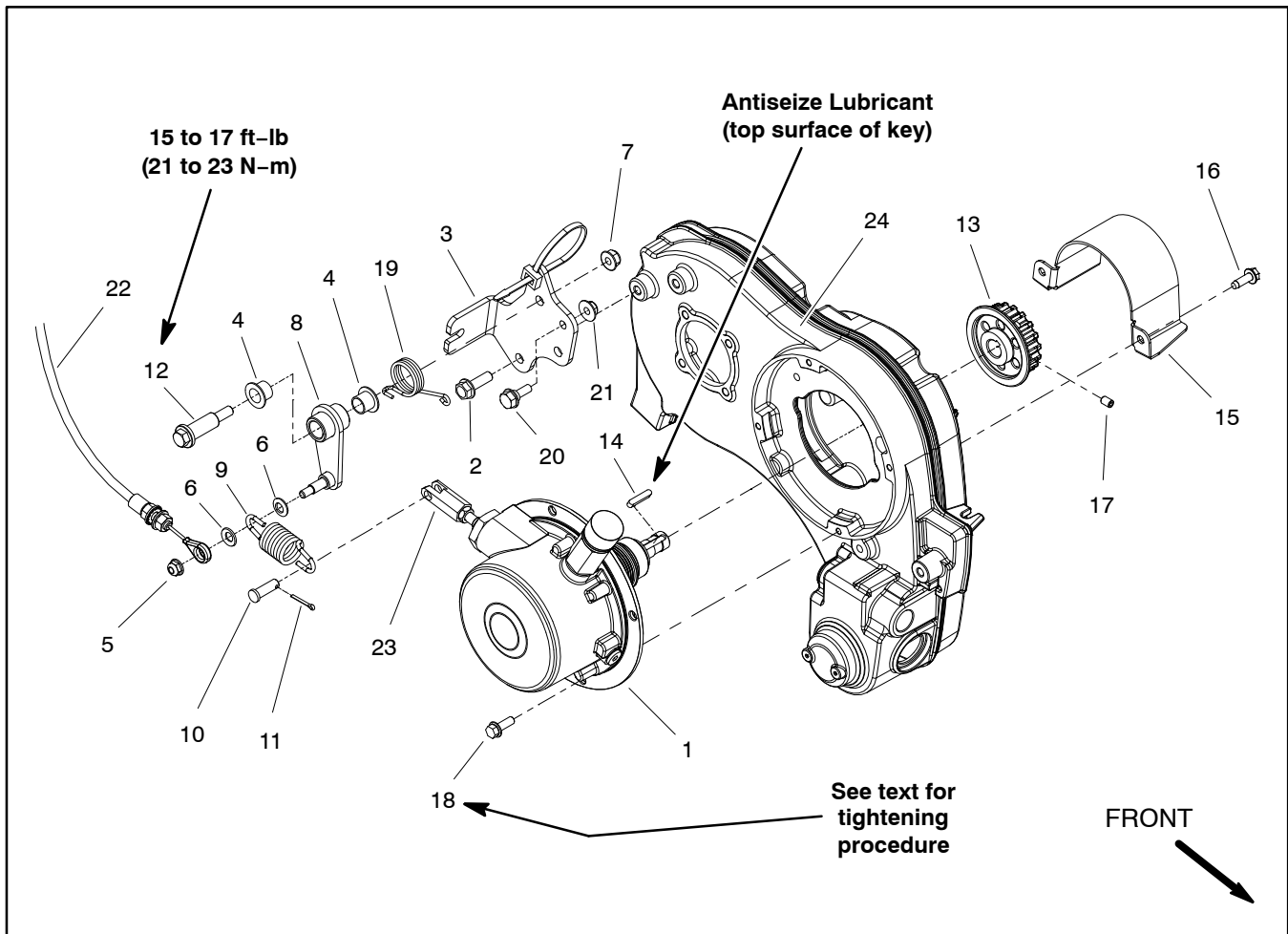


Figure 49

- | | | |
|-------------------------------|--------------------------------|--------------------------------|
| 1. Clutch assembly | 9. Extension spring | 17. Set screw (2 used) |
| 2. Flange head screw (2 used) | 10. Clevis pin | 18. Washer head screw (4 used) |
| 3. Traction cable bracket | 11. Cotter pin | 19. Torsion spring |
| 4. Flange bushing (2 used) | 12. Shoulder screw | 20. Shoulder screw |
| 5. Flange nut (2 used) | 13. Drive coupler | 21. Lock nut |
| 6. Belleville washer (2 used) | 14. Key | 22. Traction clutch cable |
| 7. Flange nut | 15. Coupler guard | 23. Spring anchor |
| 8. Clutch lever | 16. Washer head screw (2 used) | 24. Transmission housing |

Transmission removal from the machine is not necessary to remove the clutch assembly from the transmission. Transmission components (including the clutch assembly) can be accessed by removing the engine from the frame, removing the transmission cover and then removing the transmission drive belt.

Removal (Fig. 44)

1. Park machine on a level surface. Make sure engine is OFF.
2. Remove transmission drive belt (refer to Transmission Drive Belt in this manual).
3. Remove cotter pin (item 11) and clevis pin (item 10) that secure extension spring to clutch assembly spring anchor. Separate spring from anchor.
4. Support clutch assembly to prevent it from falling.
5. Remove four (4) washer head screws (item 18) that secure clutch assembly to transmission housing.
6. Remove entire clutch assembly from transmission housing.

Installation (Fig. 44)

1. Position clutch assembly to transmission housing and secure with four (4) washer head screws (item 18). Tighten screws as follows:
 - A. First, torque all four (4) screws from **15 to 40 in-lb (1.7 to 4.5 N-m)**.
 - B. Then, torque all screws from **85 to 95 in-lb (9.6 to 10.7 N-m)**.
2. Position extension spring to clutch assembly spring anchor. Secure spring to anchor with clevis pin (item 10) and cotter pin (item 11).
3. Install transmission drive belt and all machine components removed for clutch system removal (refer to Transmission Drive Belt in this manual).
4. Verify that traction clutch cable is properly adjusted (see Reel Clutch Adjustment - 1820/2120 in this Chapter).
5. Check clutch fluid level:
 - A. With cutting unit attached, position machine on a level surface with drive drums and cutting unit rollers on the ground.
 - B. Fluid level should be within 0.06 inch (1.5 mm) from the bottom of the clutch housing check hole plug.

Clutch Assembly Service (1820/2120)

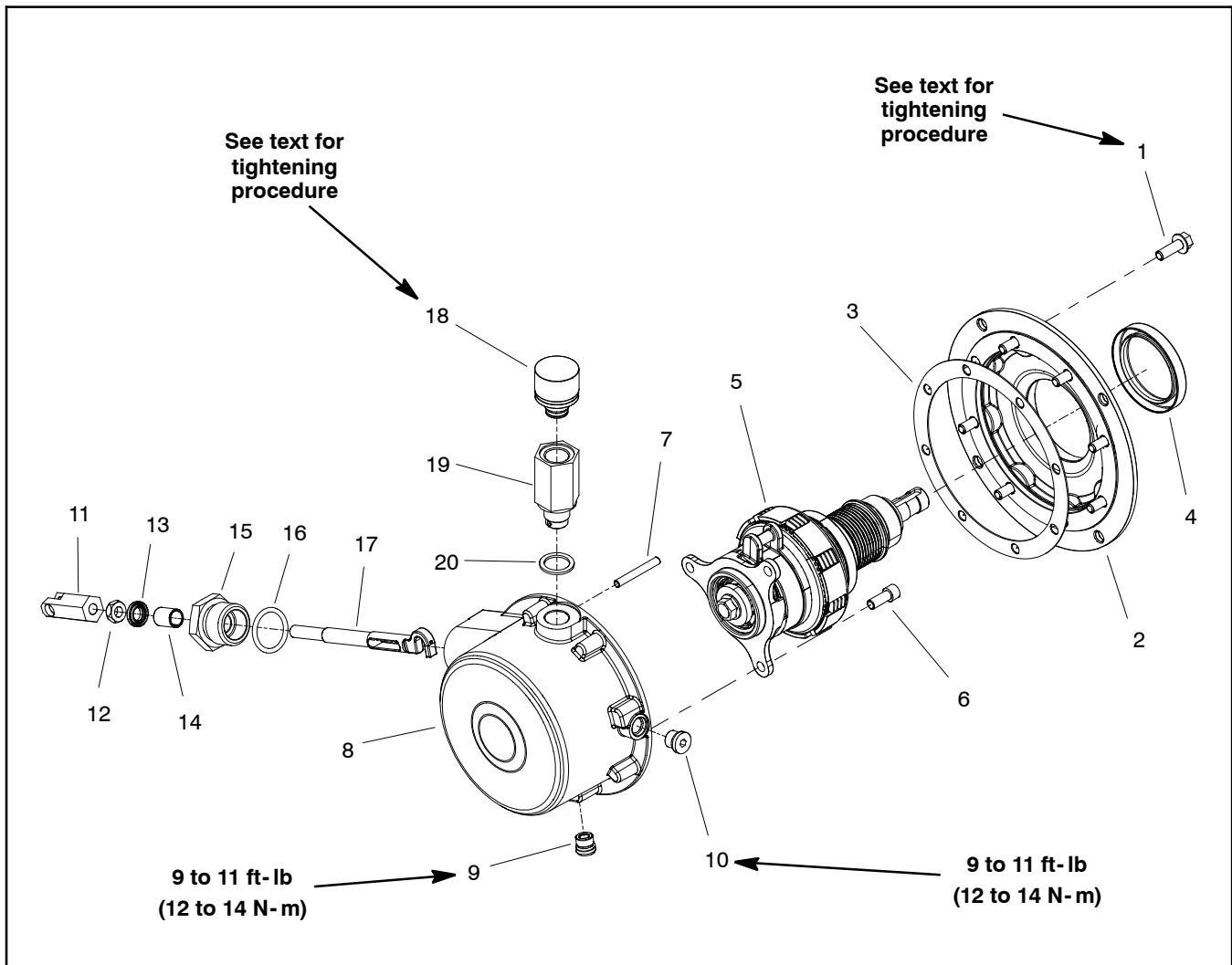


Figure 50

- | | | |
|-------------------------------|--|-------------------|
| 1. Washer head screw (8 used) | 8. Clutch housing | 15. Actuator plug |
| 2. Clutch cover | 9. Plug - drain (with magnet and O-ring) | 16. O-ring |
| 3. Gasket | 10. Plug - check hole (with O-ring) | 17. Actuator pin |
| 4. Oil seal | 11. Spring anchor | 18. Breather vent |
| 5. Clutch shaft assembly | 12. Jam nut | 19. Vent adapter |
| 6. Socket head screw (3 used) | 13. Oil seal | 20. Rubber washer |
| 7. Locator pin | 14. Bushing | |

The following procedure can be used to remove the clutch shaft assembly from the clutch. If the clutch shaft assembly requires service, see Clutch Shaft Service in this section.

Disassembly (Fig. 50)

1. Remove clutch assembly from transmission housing (see Transmission Clutch System in this section).
2. Drain lubricant from transmission.

3. Remove eight (8) washer head screws that secure clutch cover to clutch housing. Carefully separate and remove cover from housing. Remove and discard gasket.

4. Using two wrenches, retain spring anchor (item 11) and loosen jam nut (item 12). Remove spring anchor and jam nut from actuator pin.

5. Loosen and remove actuator plug (item 15) from clutch housing taking care to not damage oil seal on threads of actuator pin.
6. Remove locator pin (item 7) from clutch housing.
7. Remove three (3) socket head screws that secure clutch shaft assembly to clutch housing.
8. Disconnect actuator pin (item 17) from actuator on clutch shaft assembly and remove actuator pin from clutch housing.
9. Remove clutch shaft assembly from clutch housing.
10. Carefully remove oil seal from clutch cover taking care to not damage seal bore in cover. Discard removed seal.
11. If necessary, remove breather vent, vent adapter and rubber washer from clutch housing.

NOTE: The disassembly and assembly procedure for the clutch shaft assembly is included on the following pages of this section.

Assembly (Fig. 50)

1. Make sure that all clutch components are clean before assembly.

IMPORTANT: Make sure that all threaded holes in clutch housing are clean. The housing holes used for attaching the clutch assembly and the clutch cover are blind holes so any oil, cleaning solvent or debris in the holes could cause housing damage during installation of screws used to secure clutch cover.

2. Position clutch shaft assembly into clutch housing. Orientate actuator on clutch shaft assembly so that actuator pin (item 17) can be connected to the actuator during assembly.
3. Insert actuator pin through hole in clutch housing and connect hook on actuator pin to actuator on clutch shaft assembly (Fig. 51).
4. Secure actuator pin into clutch housing with locator pin (item 7). Make sure that locator pin is inserted in slot in actuator pin.
5. Secure clutch shaft assembly in clutch housing with three (3) socket head screws.
6. Make sure that O-ring is placed on actuator plug (item 15). Carefully install plug to actuator pin and clutch housing taking care to not damage oil seal in plug during assembly.

7. Install new oil seal into clutch cover. Oil seal should be installed to shoulder in cover. Take care during seal installation to prevent damage to seal bore or shoulder in cover.

8. Place new gasket on clutch housing surface and then carefully install clutch cover. Take care during cover installation that oil seal is not damaged.

9. Align holes of clutch housing, gasket and cover. Secure cover to housing with eight (8) washer head screws. Tighten screws as follows:

A. First, using an alternating crossing pattern, torque all screws from **15 to 40 in-lb (1.7 to 4.5 N-m)**.

B. Again using an alternating crossing pattern, torque all screws from **84 to 95 in-lb (9.6 to 10.7 N-m)**.

10. Thread jam nut (item 12) and then spring anchor (item 11) onto actuator pin. Do not tighten jam nut until after clutch has been installed onto transmission housing.

11. Fill clutch housing with 10 oz. (296 ml) Mobil D/M multi-purpose automatic transmission fluid or equivalent.

12. If removed, install rubber washer, vent adapter and breather vent. When installing breather vent, tighten until vent gasket contacts top surface of vent adapter and then tighten an additional 75° to 85°.

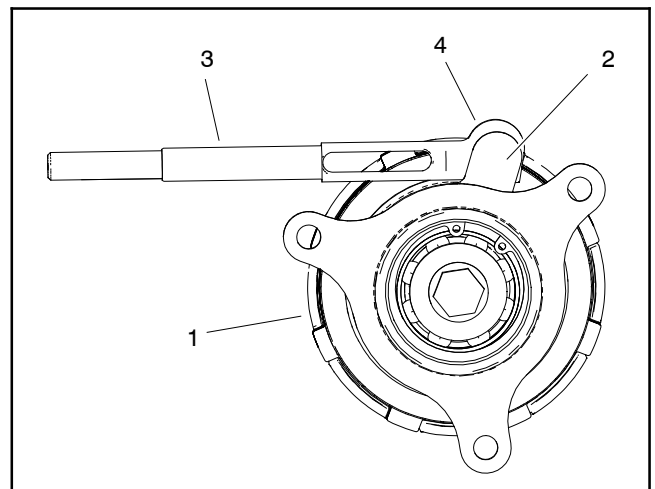


Figure 51

- | | |
|--------------------------|----------------------|
| 1. Clutch shaft assembly | 3. Actuator pin |
| 2. Clutch shaft actuator | 4. Actuator pin hook |

Clutch Shaft Service (1820/2120)

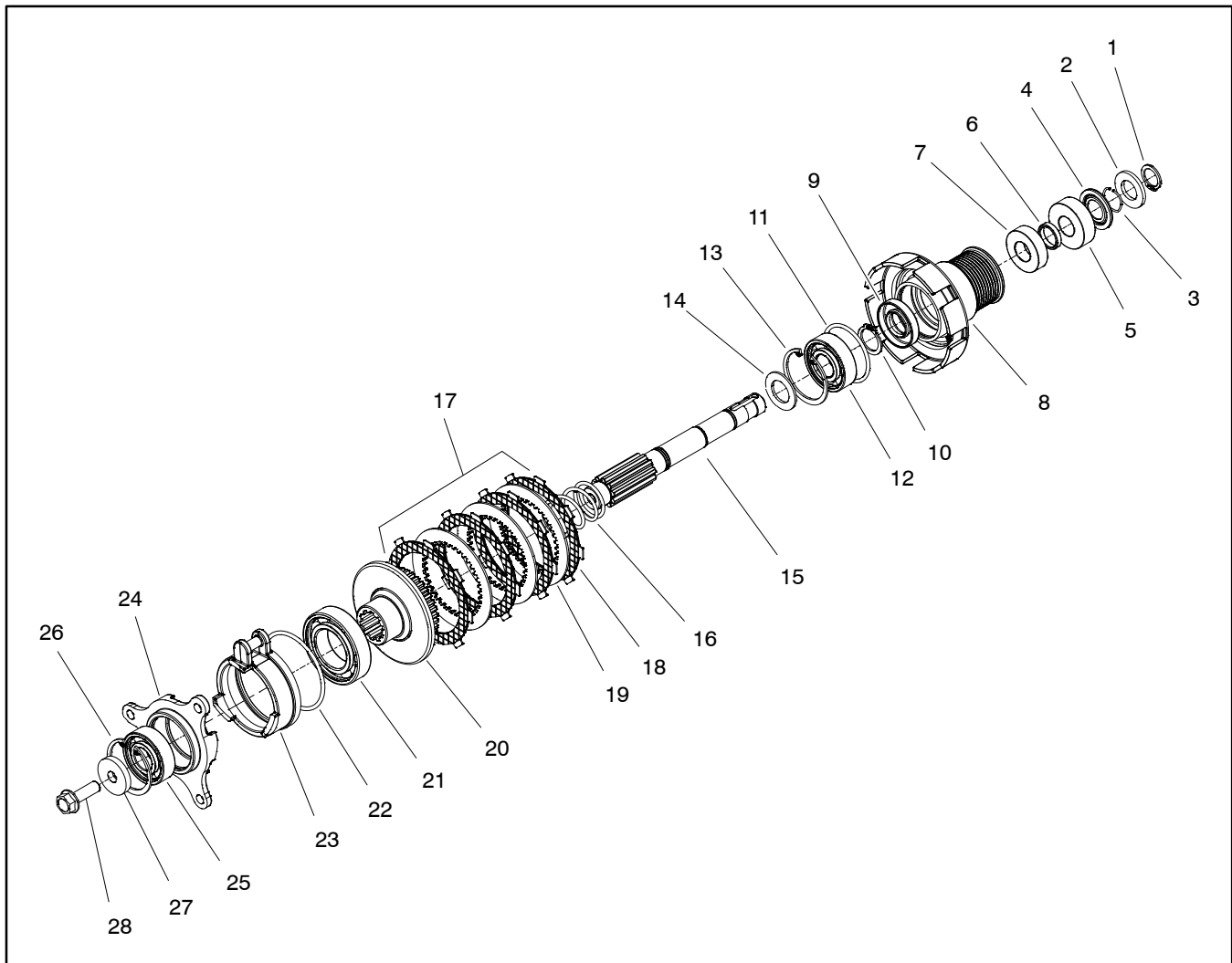


Figure 52

- | | | |
|--------------------|---------------------------|-----------------------|
| 1. Retaining ring | 11. O-ring | 20. Pressure plate |
| 2. Flat washer | 12. Ball bearing | 21. Ball bearing |
| 3. Wave spring | 13. Retaining ring | 22. O-ring |
| 4. Flocked seal | 14. Bearing spacer | 23. Clutch actuator |
| 5. Ball bearing | 15. Clutch shaft | 24. Clutch cam |
| 6. Bearing spacer | 16. Compression spring | 25. Ball bearing |
| 7. Ball bearing | 17. Clutch pack | 26. Retaining ring |
| 8. Clutch pulley | 18. Clutch disc (4 used) | 27. Washer |
| 9. Oil seal | 19. Clutch plate (3 used) | 28. Flange head screw |
| 10. Retaining ring | | |

Clutch Shaft Disassembly (Fig. 52)

NOTE: Several bearings used in the clutch shaft assembly are a pressed fit so a press is required to service the clutch shaft assembly.

1. To allow removal of flange head screw (item 26) that secures clutch assembly to shaft, carefully secure end of clutch shaft in vise. Use a vise with soft jaws to prevent damage to clutch shaft.

2. To prevent compression spring (item 16) extension during flange head screw removal, use a suitable hand clamp to keep pressure plate (item 20) and clutch pulley housing (item 8) secured and spring compressed.

3. Remove flange head screw (item 26) and washer that secure clutch shaft assembly.

4. Slide clutch cam (item 24) with bearing from end of clutch shaft.

5. Carefully release and remove hand clamp from pressure plate (item 20) and clutch pulley housing (item 8) to allow compression spring to extend.

6. Remove clutch actuator (item 23), clutch pack (item 17) and pressure plate (item 20) assembly from clutch shaft.

7. Slide compression spring (item 16) from clutch shaft.

8. Remove retaining ring (item 1), flat washer (item 2), wave spring (item 3) and flocked seal (item 4) from clutch shaft. Note orientation of flocked seal for assembly purposes.

9. Remove retaining ring (item 13) that secures ball bearing in clutch pulley.

10. Remove clutch shaft from bearings in clutch pulley (Fig. 53):

A. Support clutch pulley in a press from below to allow removal of clutch shaft from pulley. The bearing on lower side of pulley will remain on shaft as shaft is pressed from pulley so make sure that supports are positioned outside of bearing.

B. Carefully press clutch shaft down so that shaft is removed through both bearings at upper side of pulley.

C. Remove bearings (items 5 and 7) and bearing spacer (item 6) from upper side of pulley. Discard removed bearings.

11. Remove oil seal (item 9) from clutch pulley taking care to not damage seal bore in pulley. Note orientation of oil seal for assembly purposes. Discard removed oil seal.

12. Remove O-ring (item 11) from bearing bore in clutch pulley. Discard O-ring.

13. If necessary, remove bearing (item 12) from clutch shaft:

A. Remove retaining ring (item 10) from clutch shaft.

B. Use press to remove bearing from clutch shaft. Discard removed bearing.

C. Remove bearing spacer (item 14) from clutch shaft.

14. If necessary, remove retaining ring (item 26) and then press bearing (item 25) from clutch cam. Discard removed bearing.

15. If necessary, remove clutch actuator (item 23) and bearing (item 21) from pressure plate (item 20):

A. Remove clutch actuator from bearing that is pressed onto pressure plate. Actuator is a slip fit onto bearing with resistance from the O-ring (item 22) that is installed in actuator.

B. Remove and discard O-ring from clutch actuator.

C. Use press to remove bearing from pressure plate. Discard removed bearing.

16. Inspect all clutch shaft components for wear or damage. Replace components as necessary.

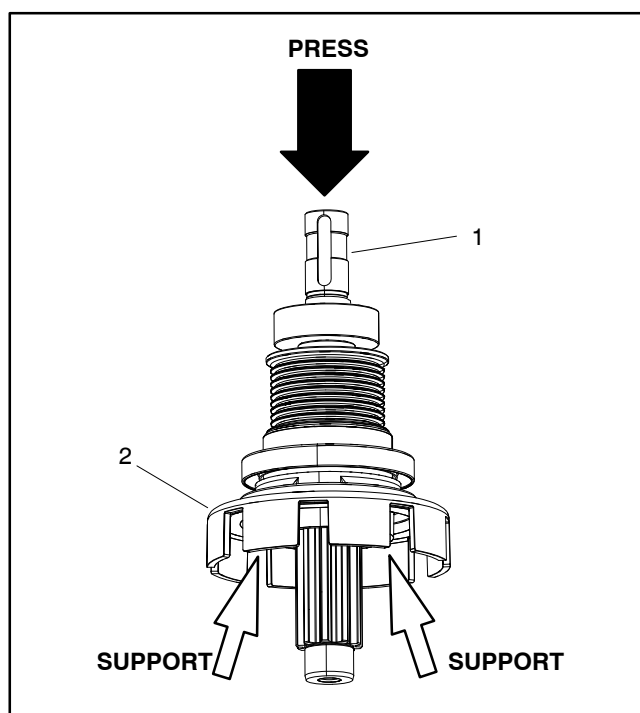


Figure 53

1. Clutch shaft

2. Clutch pulley

Clutch Shaft Assembly (Fig. 52)

IMPORTANT: Apply a light coating of multi-purpose ATF to all O-rings and rubber portions of oil seals during assembly of clutch shaft components.

1. Make sure that all clutch shaft assembly components are cleaned before assembly.
2. If removed, assemble clutch actuator (item 23) and bearing (item 21) to pressure plate (item 20)
 - A. Lubricate and install O-ring (item 22) into clutch actuator groove.
 - B. Install bearing into clutch actuator bore.
 - C. Use press to install clutch actuator with bearing onto pressure plate.
3. If removed, press bearing (item 25) into clutch cam (item 24) and secure with retaining ring (item 26).
4. If removed, install bearing (item 12) onto clutch shaft:
 - A. Slide bearing spacer (item 14) onto clutch shaft.
 - B. Use press to install bearing onto clutch shaft.
 - C. Secure bearing to clutch shaft with retaining ring (item 10).
5. Install oil seal (item 9) into clutch pulley making sure that seal is fully pressed to shoulder of pulley bore.
6. Lubricate and install O-ring (item 11) into bearing bore groove in clutch pulley.
7. Install bearing spacer (item 14) onto clutch shaft and then press new bearing (item 12) onto shaft. Make sure that bearing is fully installed onto shaft. Secure bearing onto shaft with retaining ring.
8. Install clutch pulley onto clutch shaft making sure that shaft does not damage oil seal already installed in pulley. Bearing fit into pulley is a slip fit until resistance will be felt when O-ring in pulley contacts bearing. Once bearing is fully installed to shoulder of pulley, install retaining ring (item 13) to secure bearing.
9. Press bearing (item 7) onto clutch shaft and into clutch pulley. Bearing should be pressed fully until it contacts shoulder on shaft.
10. Slide bearing spacer (item 6) onto shaft and then press bearing (item 5) onto shaft.

IMPORTANT: The flocked seal should be installed so the flocked side of the seal is toward the bearing location.

11. Slide flocked seal onto clutch shaft with flocked side orientated toward bearing location. Then, install wave spring (item 3) and flat washer (item 2) onto shaft and secure with retaining ring (item 1).

12. Starting with a clutch disc, install complete clutch pack onto pressure plate (item 20) with attached clutch actuator (item 23) and bearing (item 21).

13. Slide compression spring (item 16) onto clutch shaft.

14. Install pressure plate assembly onto clutch shaft and align tabs on clutch disc with slots in clutch pulley. As pressure plate is installed, compression spring will be compressed.

15. Use a suitable hand clamp to keep pressure plate (item 20) and clutch pulley housing (item 8) secured and spring compressed.

16. Slide clutch cam (item 24) with bearing onto end of clutch shaft. Make sure that ramps of clutch cam align with ramps of clutch actuator (Fig. 54).

17. To allow installation of flange head screw (item 26) that secures clutch assembly to shaft, carefully secure end of clutch shaft in vise. Use a vise with soft jaws to prevent damage to clutch shaft.

18. Secure clutch shaft assembly with washer and flange head screw (item 26).

19. Remove hand clamp from clutch shaft assembly.

20. After clutch shaft assembly, make sure that clutch plates can be moved between pressure plate and clutch pulley. The clutch should be disengaged when the clutch shaft assembly has been properly assembled.

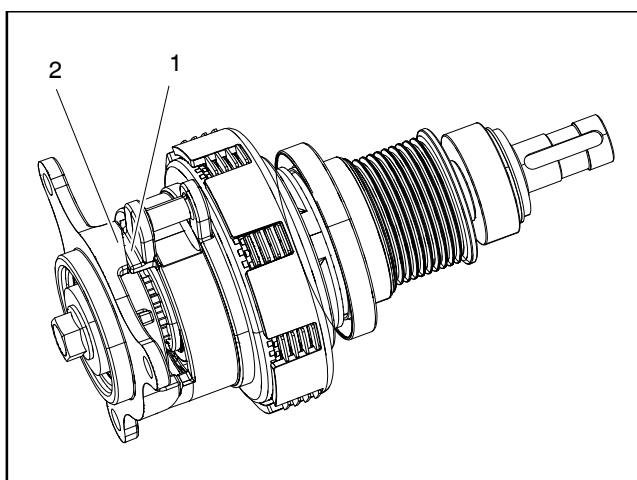


Figure 54

1. Clutch actuator ramp 2. Clutch cam ramp

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Transmission Drum Drive System

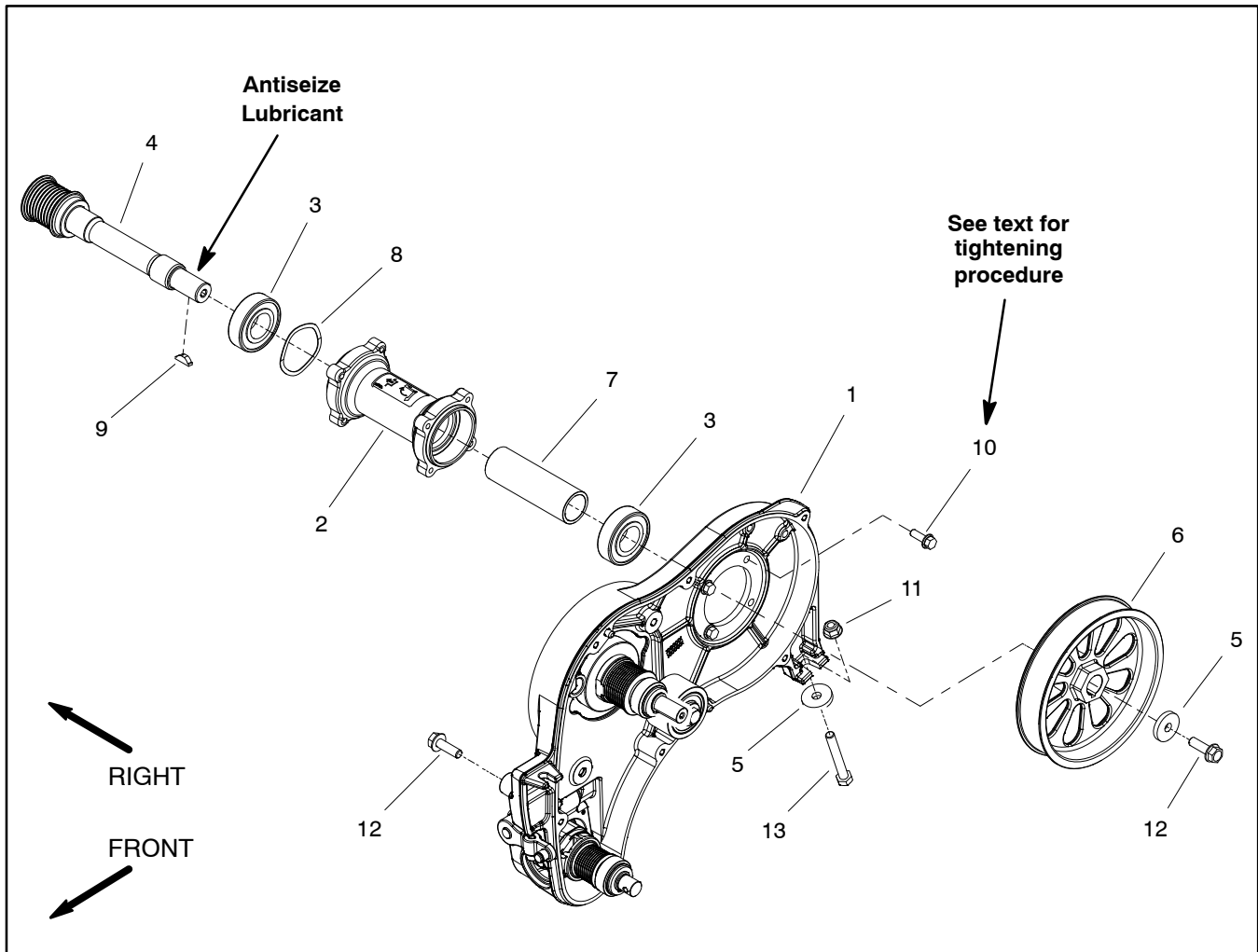


Figure 55

- | | | |
|--|------------------|--------------------------------|
| 1. Transmission housing | 6. Driven pulley | 10. Washer head screw (4 used) |
| 2. Extension housing | 7. Spacer | 11. Flange nut |
| 3. Ball bearing (2 used) | 8. Wave washer | 12. Flange head screw (2 used) |
| 4. Driven pulley (traction drum drive) | 9. Woodruff key | 13. Cap screw |
| 5. Hardened washer (2 used) | | |

Transmission removal from the machine is not necessary to service the transmission drum drive system shown in Figure 55. Transmission drum drive components can be accessed by removing the engine from the frame, removing the transmission cover and then removing the drive belt.

Disassembly (Fig. 55)

1. Park machine on a level surface. Make sure engine is OFF.
2. Remove transmission drive belt (see Transmission Drive Belt in this section).

3. Remove flange head screw (item 12) and hardened washer (item 5) that secure driven pulley (item 6) to shaft. Slide pulley from shaft. Locate and retrieve woodruff key (item 9).

4. Remove drum drive belt from machine (see Drum Drive Belt in this section).

5. Slide traction drum drive driven pulley (item 4) from extension housing.

6. If necessary, remove ball bearings (item 3), spacer (item 7) and wave washer (item 8) from extension housing.

7. If it is necessary to remove extension housing (item 2):

A. Loosen fasteners (items 12, 11 and 13) that secure transmission housing to machine frame.

B. Remove four (4) washer head screws that secure extension housing to transmission housing and RH drum drive housing.

C. Remove four (4) washer head screws that secure extension housing to RH drum drive housing (Fig. 56).

D. Carefully shift position of transmission housing to allow removal of the extension housing.

Assembly (Fig. 55)

1. If extension housing was removed:

A. Position the extension housing between transmission housing and RH drum drive housing.

B. Align extension housing with RH drum drive housing. Install four (4) washer head screws finger tight to hold extension housing in position.

C. Position transmission housing to the extension housing. Install four (4) washer head screws finger tight to hold extension housing in position.

D. Secure extension housing to transmission housing and RH drum drive housing with washer head screws. First, torque all washer head screws from **15 to 40 in-lb (1.7 to 4.5 N-m)**. Then, using an alternating crossing pattern, torque all screws from **85 to 95 in-lb (9.6 to 10.7 N-m)**.

E. Secure transmission housing to machine frame by tightening fasteners (items 12, 11 and 13). If fasteners were removed, make sure that washer (item 5) is below frame tube.

2. If removed, slide wave washer (item 8), spacer (item 7) and ball bearings (item 3) into extension housing.

3. Slide shaft of traction drum drive driven pulley (item 4) through extension housing bearings and spacer.

4. Apply antiseize lubricant to pulley surface of drum drive driven pulley (item 4).

5. Install woodruff key (item 9) in shaft and slide driven pulley (item 6) onto shaft. Secure pulley (item 6) with hardened washer (item 5) and flange head screw (item 12).

6. Install drum drive belt to machine (see Drum Drive Belt in this section).

7. Install transmission drive belt and all machine components removed for drum drive system service (see Transmission Drive Belt in this section).

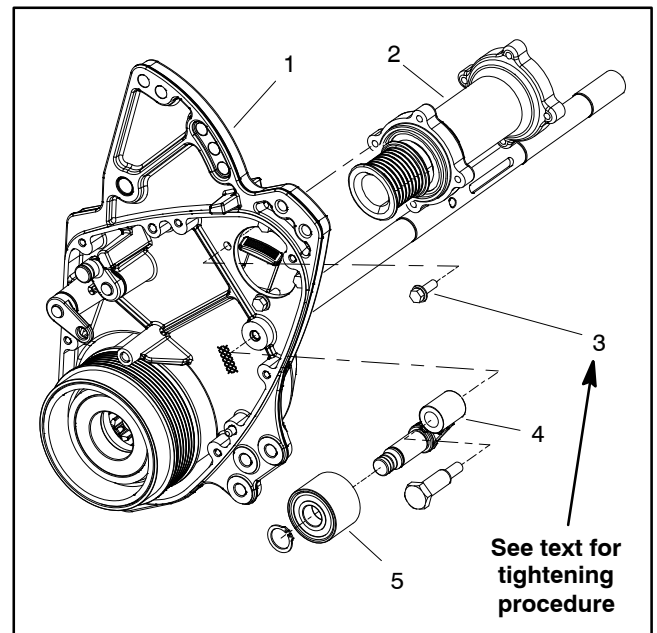


Figure 56

- | | |
|---------------------------|--------------------------|
| 1. RH drum drive housing | 4. Idler arm assembly |
| 2. Extension housing assy | 5. Idler pulley assembly |
| 3. Screw (4 used) | |

Transmission

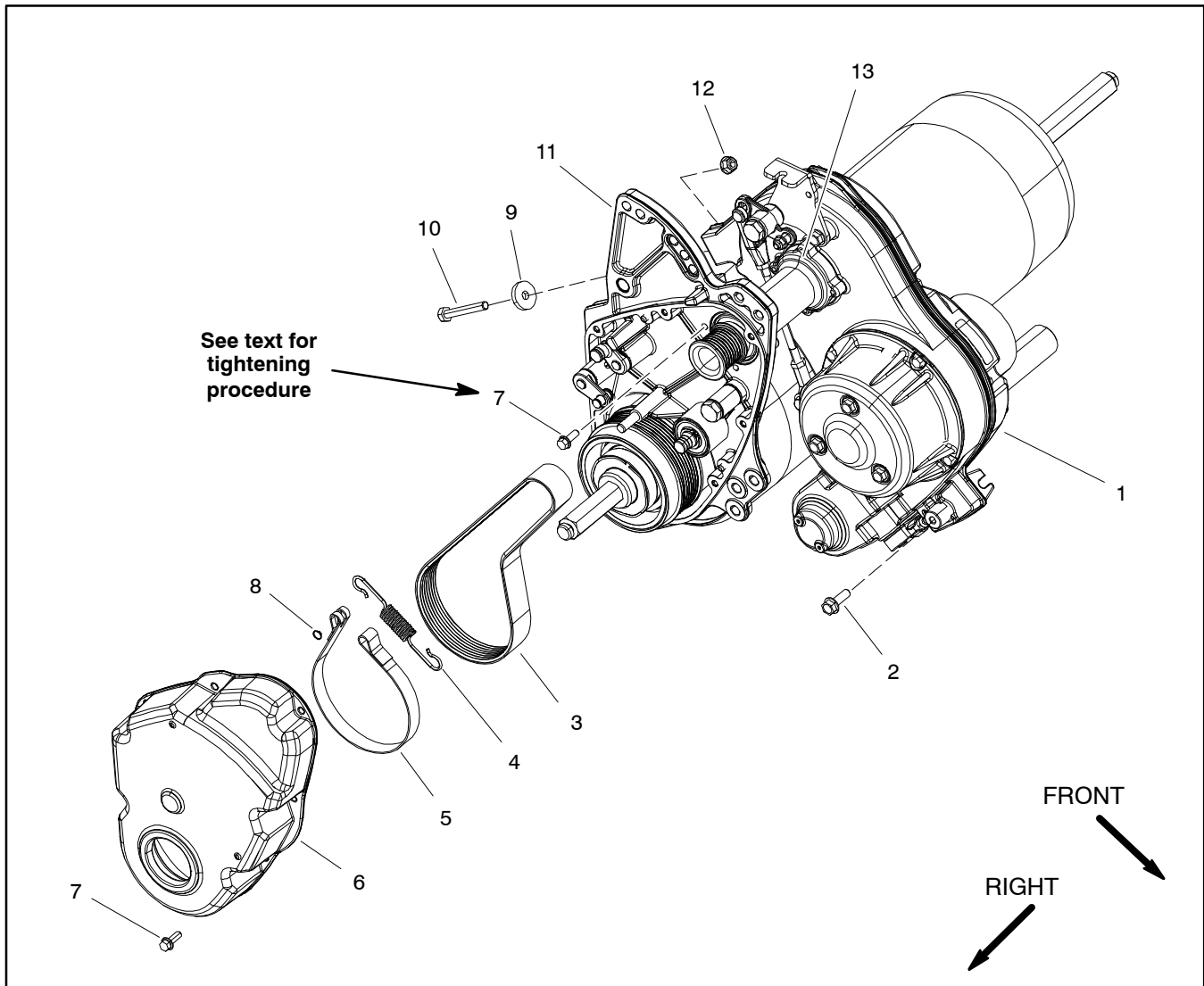


Figure 57

- | | | |
|--------------------------|--------------------------------|---------------------------|
| 1. Transmission assembly | 6. Drum drive cover | 10. Cap screw |
| 2. Flange head screw | 7. Washer head screw (11 used) | 11. RH drum drive housing |
| 3. Drum drive belt | 8. Retaining ring | 12. Flange nut |
| 4. Extension spring | 9. Hardened washer | 13. Extension housing |
| 5. Brake band | | |

Transmission removal from the machine is not necessary in order to service internal transmission components. Transmission components can be accessed by removing the engine from the frame, removing the transmission cover and then removing the drive belt. If transmission removal is desired, proceed with the following steps. Once the transmission has been removed from the machine, service procedures for internal components are described earlier in this section.

Transmission Removal

1. Park machine on a level surface. Make sure engine is OFF.

2. Disconnect reel clutch cable from transmission (see Reel Clutch Cable Replacement in the Service and Repairs section of Chapter 6 – Chassis and Controls).

3. Disconnect traction clutch cable from transmission (see Traction Clutch Cable Replacement in the Service and Repairs section of Chapter 6 – Chassis and Controls).

4. Slide the telescoping coupler off the cutting unit hex shaft (Fig. 58).

5. Remove RH drum drive cover and belt from machine (see Drum Drive Belt in this section).

6. Remove engine from machine (see Engine Removal in the Service and Repairs section of Chapter 3 – Engine).
 7. Remove four (4) washer head screws (item 7) that secure extension housing (item 13) to RH drum housing.
 8. Support transmission to prevent it from falling.
 9. Remove fasteners that secure transmission to machine frame.
 - A. Flange head screw (item 2) that secures front of transmission to frame.
 - B. Cap screw (item 10), hardened washer (item 9) and flange nut (item 12) that secure rear of transmission to frame.
 10. Carefully move transmission assembly toward left side of machine until extension housing is clear of RH drum housing. Lift transmission from machine.
 11. To disassemble transmission, refer to Transmission Drive Belt, Transmission Idler System, Transmission Reel Drive System, Transmission Clutch System and Transmission Drum Drive System in this section.
4. Once all fasteners have been installed, fully tighten fasteners in the following order:
 - A. Four (4) washer head screws (item 7). First, torque all screws from **15 to 40 in-lb (1.7 to 4.5 N-m)**. Then, using an alternating crossing pattern, torque screws from **85 to 95 in-lb (9.6 to 10.7 N-m)**.
 - B. Cap screw (item 10) and flange nut (item 12) that secure rear of transmission to frame.
 - C. Flange head screw (item 2) that secures front of transmission to frame.
 5. Install engine to machine (see Engine Installation in the Service and Repairs section of Chapter 3 – Engine).
 6. Install drum drive belt and RH drum drive cover to machine (see Drum Drive Belt in this section).
 7. Slide the telescoping coupler onto the cutting unit hex shaft (Fig. 58).
 8. Connect traction clutch and reel clutch cables to transmission (see Traction Clutch Cable Replacement and Reel Clutch Cable Replacement in the Service and Repairs section of Chapter 6 – Chassis and Controls).

Transmission Installation

1. Make sure that all transmission components are correctly installed before transmission is installed to machine frame.
2. Carefully install transmission assembly toward right side of machine so that extension housing is inserted into RH drum housing.
3. Align transmission mounting holes with frame and RH drum housing. Install and finger tighten fasteners to secure transmission to machine.
 - A. Four (4) washer head screws (item 7) that secure extension housing (item 13) to RH drum housing.
 - B. Cap screw (item 10), hardened washer (item 9) and flange nut (item 12) that secure rear of transmission to frame. Make sure that washer (item 9) is below frame tube.
 - C. Flange head screw (item 2) that secures front of transmission to frame.

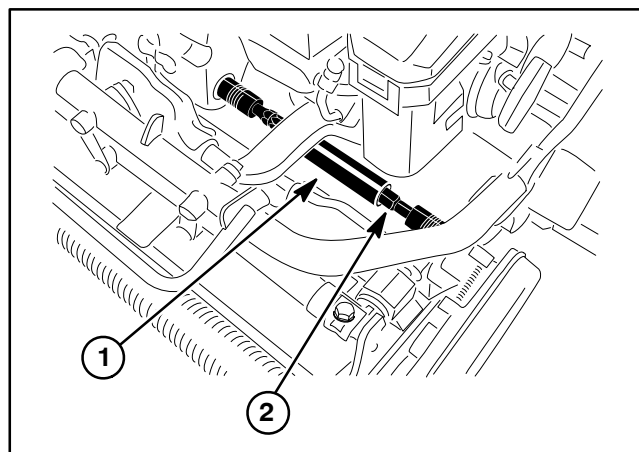


Figure 58

1. Telescoping coupler
2. Cutting unit hex shaft

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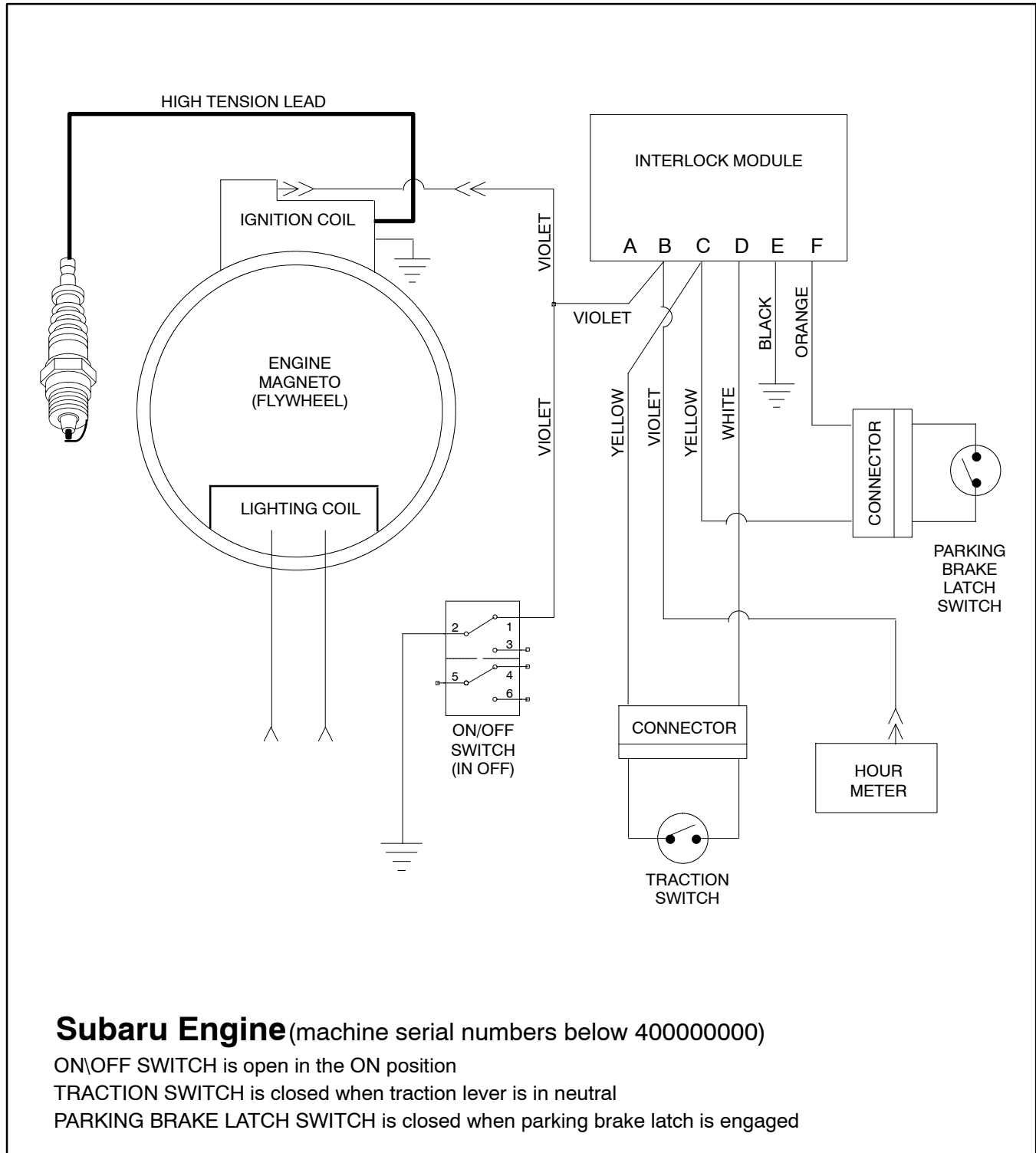
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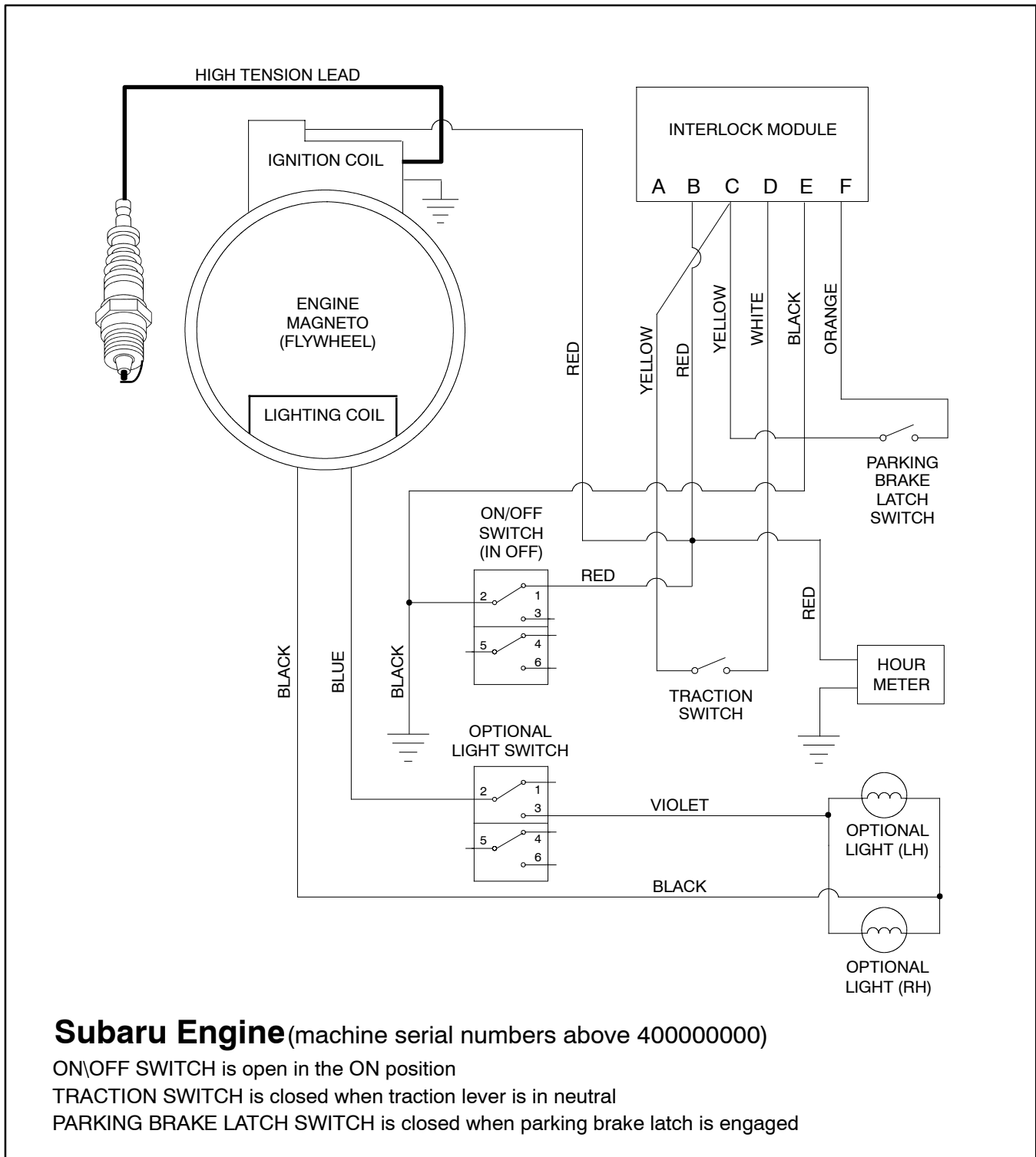
General Information

Operator's Manual

The Traction Unit Operator's Manual provide information regarding the operation, general maintenance and maintenance intervals for your Greensmaster machine. Refer to this Operator's Manual for additional information when servicing the machine.

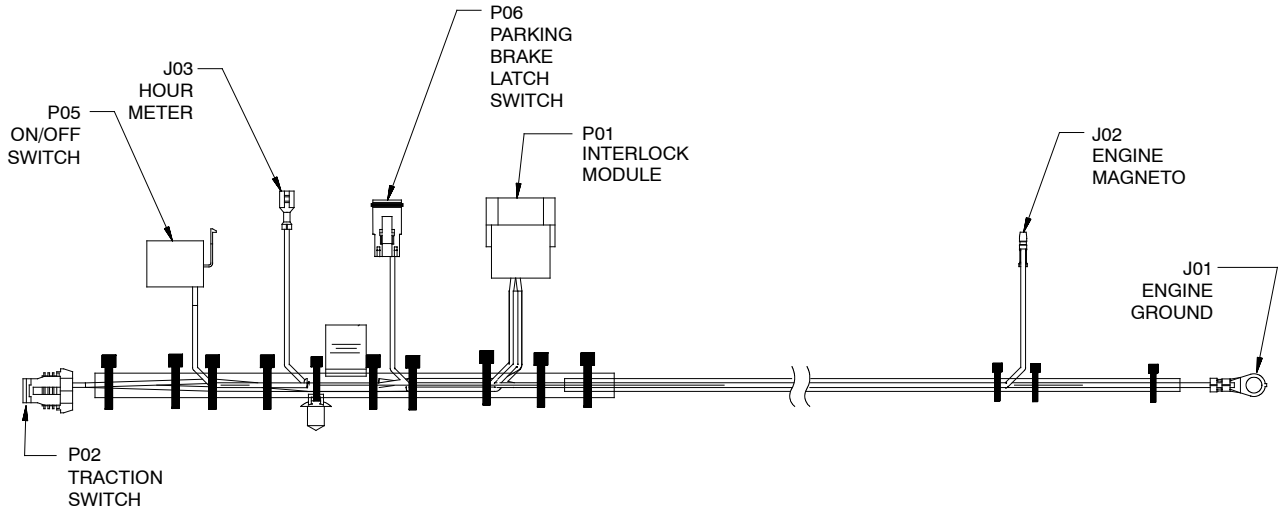
Wiring Schematics





Wire Harnesses

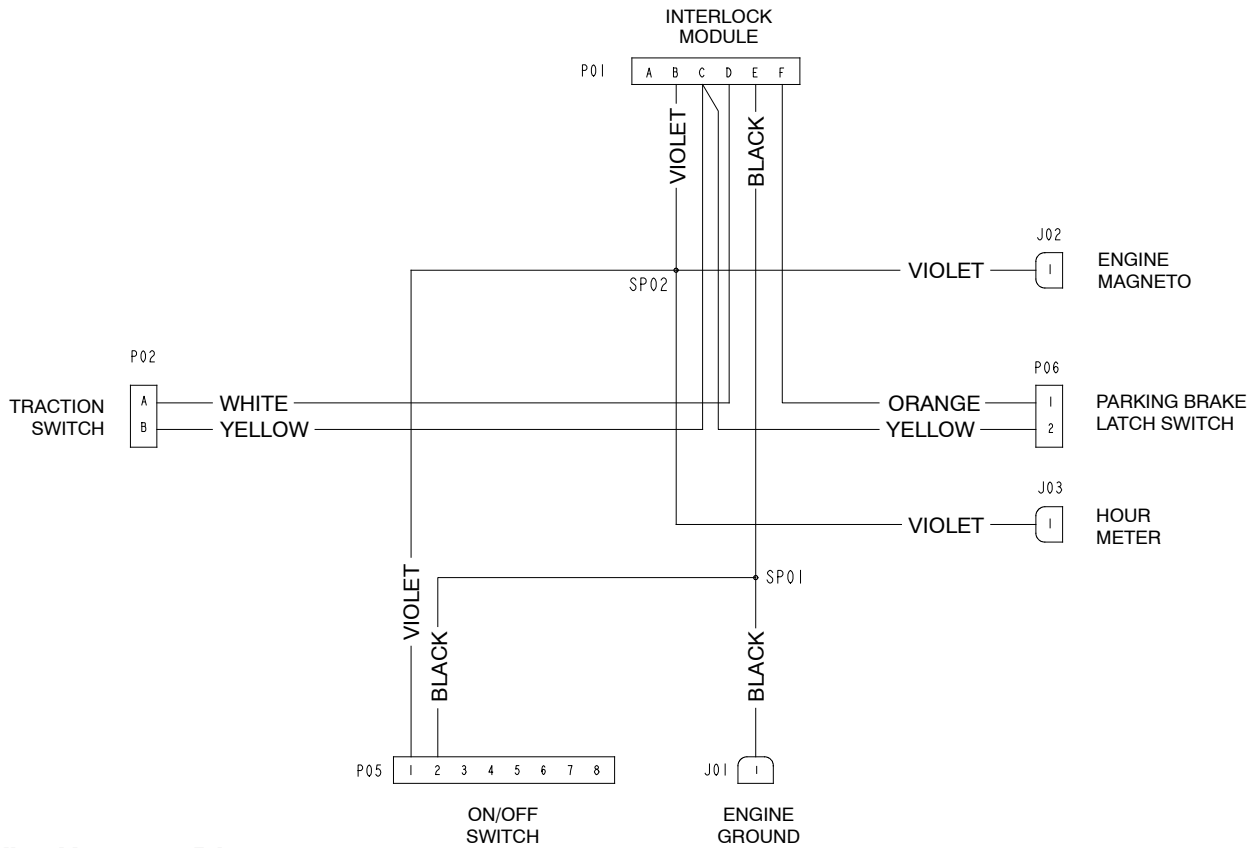
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Wire Harness Drawing

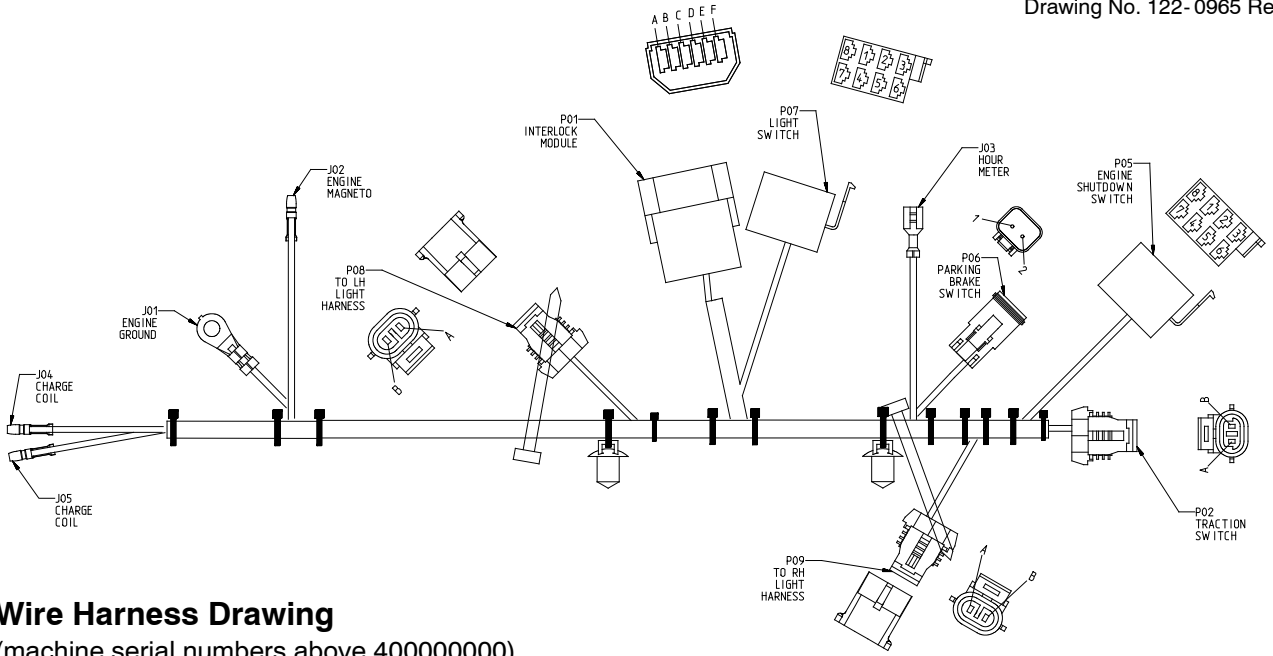
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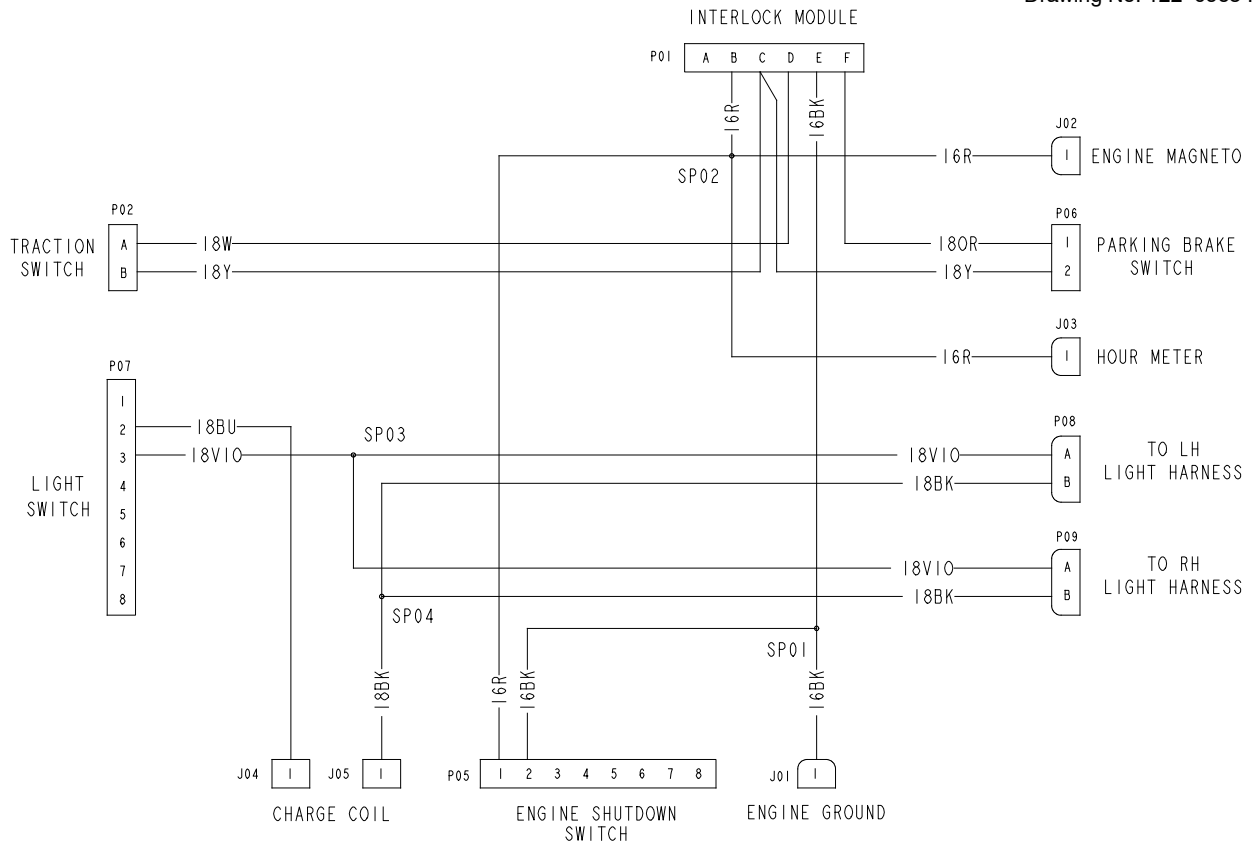


Wire Harness Diagram

(machine serial numbers below 400000000)



Wire Harness Drawing
(machine serial numbers above 400000000)



Wire Harness Diagram
(machine serial numbers above 400000000)

Electrical System

Special Tools

Order special tools from your Toro Distributor. Some tools may also be available from a local supplier.

Multimeter

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

NOTE: Toro recommends the use of a DIGITAL Volt-Ohm-Amp multimeter when testing electrical circuits. The high impedance (internal resistance) of a digital meter in the voltage mode will make sure that excess current is not allowed through the meter. This excess current can cause damage to circuits not designed to carry it.

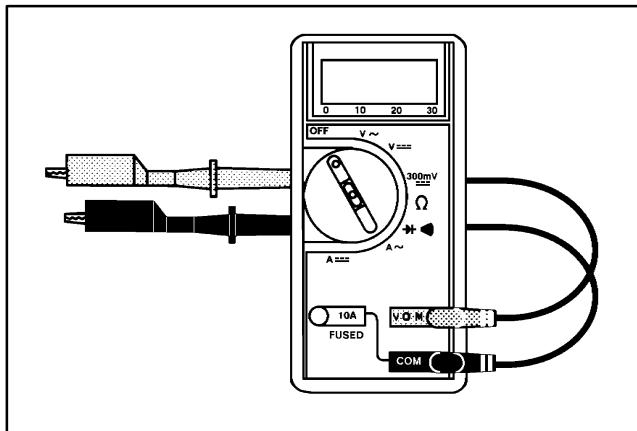


Figure 1

Skin-Over Grease

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

Toro Part Number: **TOR50547**



Figure 2

Dielectric Gel

Dielectric gel should be used to prevent corrosion of connection terminals. To ensure complete coating of terminals, liberally apply gel to both component and wire harness connector, plug connector to component, unplug connector, reapply gel to both surfaces and reconnect harness connector to component. Connectors should be thoroughly packed with gel for effective results.

Toro Part Number: **107-0342**



Figure 3

Spark Tester

For testing electronic ignitions. Saves time because you will know if the ignition is causing the problem on a non-starting engine. The tester determines if ignition spark is present.

Toro Part Number: **TOR4036**

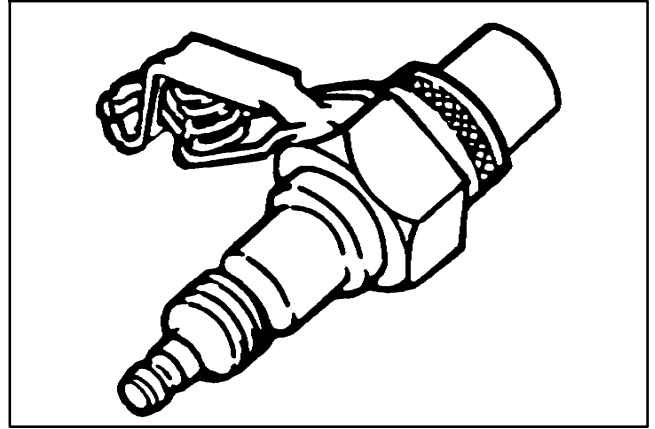


Figure 4

Troubleshooting

| |
|--|
|  CAUTION |
| Remove all jewelry, especially rings and watches, before doing any electrical testing or troubleshooting. |

The interlock switches must not be by-passed, they must be connected for proper electrical troubleshooting and safety.

NOTE: For engine component testing information, refer to the Subaru Service Manual.

For effective troubleshooting and repairs, there must be a good understanding of the electrical circuits and components used on this machine (see Wiring Schematic and Wire Harness Drawing sections of this chapter).

Starting Problems

| Problem | Possible Causes | Correction |
|--|--|--|
| Engine will not start. | ON/OFF switch is in the OFF position. Ignition spark plug wire is not connected to spark plug. Traction lever is not in the NEUTRAL position. An engine problem exists that prevents the engine from running. ON/OFF switch is faulty. Electrical wires are loose or damaged. Traction switch is not adjusted or is faulty. Interlock module is faulty. | Turn switch to ON. Connect spark plug wire to spark plug. Place traction lever in the NEUTRAL position. Repair engine. Replace ON/OFF switch. Check electrical connections. Repair wiring as needed. Adjust or replace traction switch. Replace interlock module. |
| Engine will start, but will not continue to run. | Parking brake latch is engaged. Electrical wires are loose or damaged. Traction switch is not adjusted or is faulty. An engine problem exists that causes the engine to stop. Interlock module is faulty. | Disengage parking brake latch. Check electrical connections. Repair wiring as needed. Adjust or replace traction switch. Repair engine. Replace interlock module. |

Component Testing

For accurate resistance and/or continuity checks, electrically disconnect the component being tested from the circuit (e.g. unplug the ON/OFF switch connector before doing a continuity check on switch). Individual components should be electrically isolated (e.g. disconnect all leads or remove from circuit) from the circuit when tested.

NOTE: For engine component testing information, refer to the Subaru Service Manual.



CAUTION

When testing electrical components for continuity with a multimeter (ohms setting), make sure that engine is not running to prevent current flow through the component.



WARNING

The ignition system produces a dangerously high voltage. Do not touch the spark plug, ignition coil or spark plug lead when the engine is running; you can receive a severe electrical shock.

Ignition System Operation

The engine on Greensmaster Flex machines has a magneto ignition system consisting of an ignition coil, a spark plug and permanent flywheel magnets. A flywheel key maintains proper ignition timing.

Testing the Ignition System

NOTE: Do not remove spark plug from the engine when testing the ignition system. The spark plug is necessary to maintain normal starting speeds.

1. With engine not running, remove spark plug wire from the spark plug and connect it to the spark tester (see Special Tools in this chapter).
2. Connect spring clip of tester to a good, unpainted ground on the engine block.
3. Make sure ON/OFF switch is in the ON position. Also, make sure that the traction lever is in the NEUTRAL position.
4. Pull the engine starter rope and observe the spark tester. Visible and audible sparks should be produced if the ignition system is operating properly.

NOTE: If a sheared flywheel key exists, the spark tester may indicate an operating ignition system but ignition timing will be incorrect.

5. If visible and audible sparks are not produced, a problem exists either with engine ignition components or with machine components. To identify whether the problem exists with the engine or the machine, disconnect the wire harness connector (violet wire) from the engine primary wire and repeat step 4 above.

A. If visible and audible sparks are not produced with the engine primary wire disconnected, the engine ignition system is not operating properly. Refer to the Subaru Service Manual for engine information.

B. If visible and audible sparks are produced with the engine primary wire disconnected, machine components (e.g. on/off switch, parking brake latch switch, traction switch, interlock module, machine wire harness) are damaged or faulty. Refer to machine component testing information in this section.

On/Off Switch

The on/off switch is located on the console on the handle. This rocker switch allows the engine to be turned on and off.

Testing

1. Make sure the engine is OFF and the traction lever is in the NEUTRAL position.
2. Remove console cover from handle to allow access to on/off switch (Fig. 5).
3. Disconnect wire harness electrical connector from the on/off switch.
4. With the use of a multimeter (ohms setting), the switch functions may be tested to determine whether continuity exists between the various terminals for each switch position. The switch terminals are marked as shown in Figure 6. The circuitry of the on/off switch is shown in the chart below. Verify continuity between switch terminals.

| SWITCH POSITION | NORMAL CIRCUITS | OTHER CIRCUITS |
|-----------------|-----------------|----------------|
| OFF | 2 + 1 | 5 + 4 |
| ON | 2 + 3 | 5 + 6 |

5. Replace switch if necessary.
6. When switch testing is complete, connect wire harness electrical connector to the on/off switch.
7. Install console cover to handle.

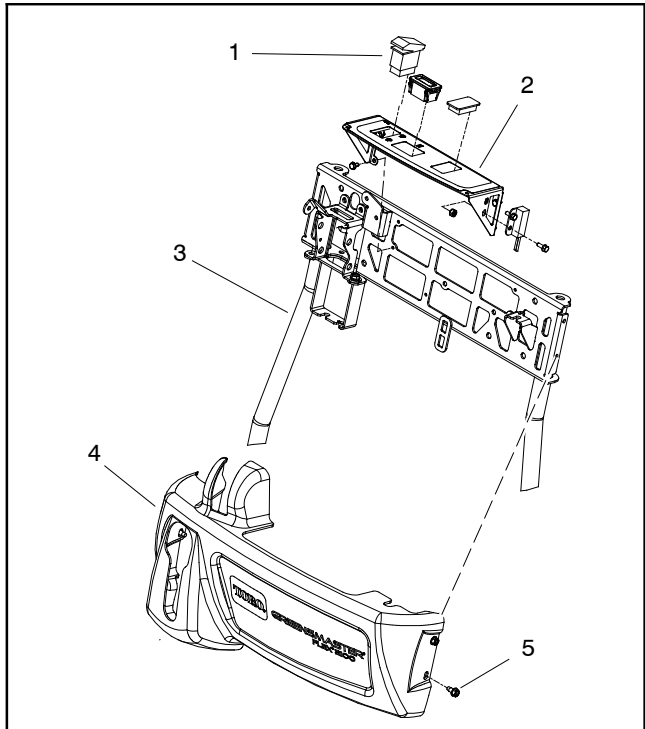


Figure 5

- | | |
|------------------|-------------------|
| 1. On/Off switch | 4. Console cover |
| 2. Switch panel | 5. Screw (4 used) |
| 3. Lower handle | |

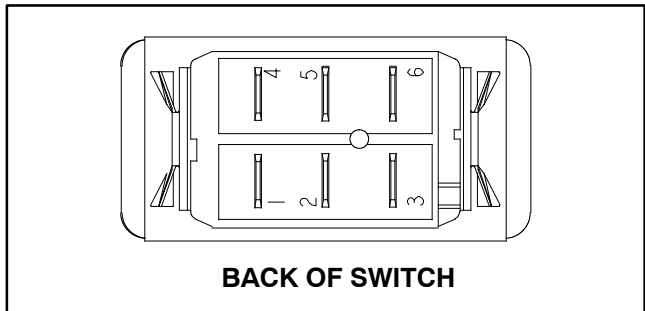


Figure 6

NOTE: On/Off switch terminals 3, 4, 5 and 6 are not used on Greensmaster Flex machines.

Optional Light Switch

The optional light switch is located on the console on the handle. This rocker switch allows the optional work lights to be turned on and off.

Testing

1. Make sure the engine is OFF and the traction lever is in the NEUTRAL position.
2. Remove console cover from handle to allow access to light switch (Fig. 7).
3. Disconnect wire harness electrical connector from the light switch.
4. With the use of a multimeter (ohms setting), the switch functions may be tested to determine whether continuity exists between the various terminals for each switch position. The switch terminals are marked as shown in Figure 8. The circuitry of the light switch is shown in the chart below. Verify continuity between switch terminals.

| SWITCH POSITION | NORMAL CIRCUITS | OTHER CIRCUITS |
|-----------------|-----------------|----------------|
| OFF | 2 + 1 | 5 + 4 |
| ON | 2 + 3 | 5 + 6 |

5. Replace switch if necessary.
6. When switch testing is complete, connect wire harness electrical connector to the light switch.
7. Install console cover to handle.

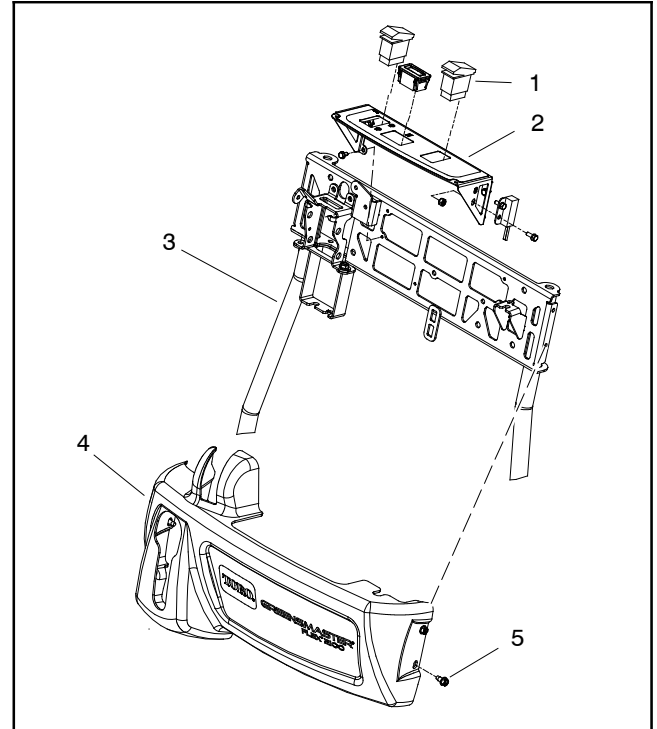


Figure 7

- | | |
|-----------------|-------------------|
| 1. Light switch | 4. Console cover |
| 2. Switch panel | 5. Screw (4 used) |
| 3. Lower handle | |

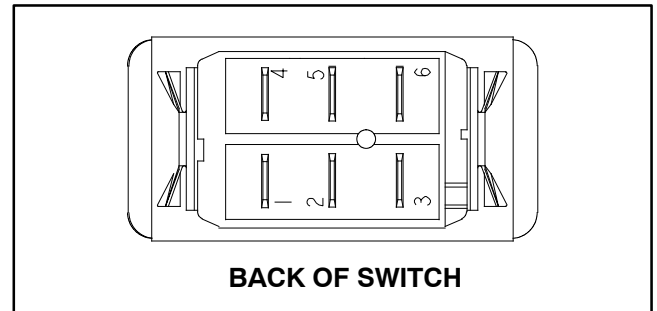


Figure 8

NOTE: Optional light switch terminals 1, 4, 5 and 6 are not used on Greensmaster Flex machines.

Parking Brake Latch Switch

Switch Adjustment

1. Make sure the engine is OFF and the traction lever is in the NEUTRAL position.
2. Remove console cover from handle to allow access to parking brake latch switch (Fig. 10).
3. Engage the parking brake lever and engage the parking brake latch.
4. With the parking brake latch applied, there should be from 0.030" to 0.090" (0.8 to 2.3 mm) clearance between the parking brake latch and the parking brake latch switch (Fig. 9).
5. If clearance is incorrect, loosen brake latch switch mounting fasteners, adjust clearance and tighten fasteners. Recheck clearance between lever and switch after tightening fasteners. The parking brake latch must not contact the switch.

Switch Testing

1. Make sure the engine is OFF and the traction lever is in the NEUTRAL position. Disconnect parking brake latch switch connector from the machine wire harness.
2. Check the continuity of the brake latch switch by connecting a multimeter (ohms setting) across the connector terminals.
3. With the parking brake latch released, there should be no continuity (infinite ohms) across the switch terminals.
4. Verify that the switch closes (zero ohms) as the service brake lever and parking brake latch are engaged.
5. Replace switch if necessary.

Switch Removal/Installation

1. Disconnect parking brake latch switch from the machine wire harness.
2. Remove screws and lock nuts that mount switch to switch panel on handle (Fig. 10). Remove switch from machine.

NOTE: For proper parking brake latch switch operation, the screws and lock nuts used to secure the brake latch switch are stainless steel. If these fasteners are replaced, make sure to use correct fasteners.

3. Position switch to switch panel and secure with screws and lock nuts (Fig. 10).

4. Adjust brake latch switch as necessary (see Switch Adjustment above).
5. Connect switch to machine wire harness. Secure console cover to handle.

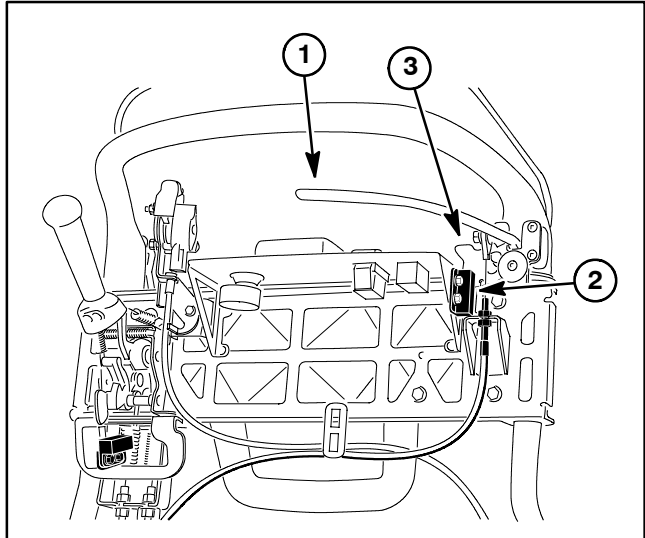


Figure 9

1. Service brake lever
2. Park brake latch switch
3. Parking brake latch

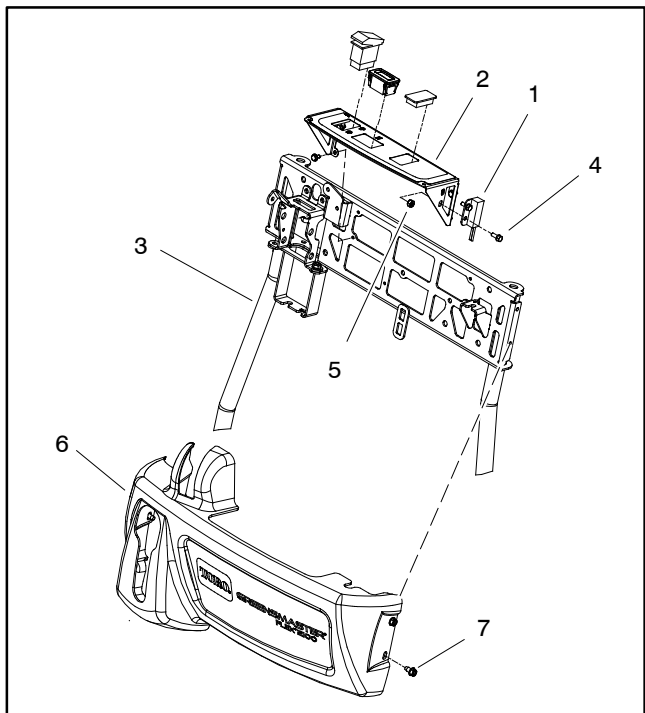


Figure 10

1. Park brake latch switch
2. Switch panel
3. Lower handle
4. Screw (2 used)
5. Lock nut (2 used)
6. Console cover
7. Screw (4 used)

Traction Switch

Switch Adjustment

1. Make sure the engine is OFF and the traction lever is in the NEUTRAL position.
2. Remove console cover from handle to allow access to traction switch (Fig. 12).
3. Move the traction lever forward to engage the traction drive.
4. With the traction drive engaged, there should be from 0.030" to 0.090" (0.8 to 2.3 mm) clearance between the head of the cap screw in the traction lever and the traction switch (Fig. 11).
5. If clearance is incorrect, loosen traction switch mounting fasteners, adjust clearance and tighten fasteners. Recheck clearance between cap screw head and switch after tightening fasteners. The cap screw in the traction lever must not contact the switch.

Switch Testing

1. Make sure the engine is OFF and the traction lever is in the NEUTRAL position. Disconnect traction switch connector from the machine wire harness.
2. Check the continuity of the traction switch by connecting a multimeter (ohms setting) across the connector terminals.
3. With the traction lever in the NEUTRAL position, there should be continuity (zero ohms) across the switch terminals.
4. Verify that the switch opens (infinite ohms) as the traction lever is engaged.
5. Replace switch if necessary.

Switch Removal/Installation

1. Disconnect traction switch from the machine wire harness.
2. Remove screws and lock nuts that mount switch to switch mount bracket on handle (Fig. 12). Remove switch from machine.

NOTE: For proper traction switch operation, the screws and lock nuts used to secure the interlock switch are stainless steel. If these fasteners are replaced, make sure to use correct fasteners.

3. Position traction switch to switch bracket and secure with screws and lock nuts (Fig. 12).

4. Adjust traction switch as necessary (see Switch Adjustment above). Make sure that switch fasteners are securely tightened after adjustment.
5. Connect switch to machine wire harness. Secure console cover to handle.

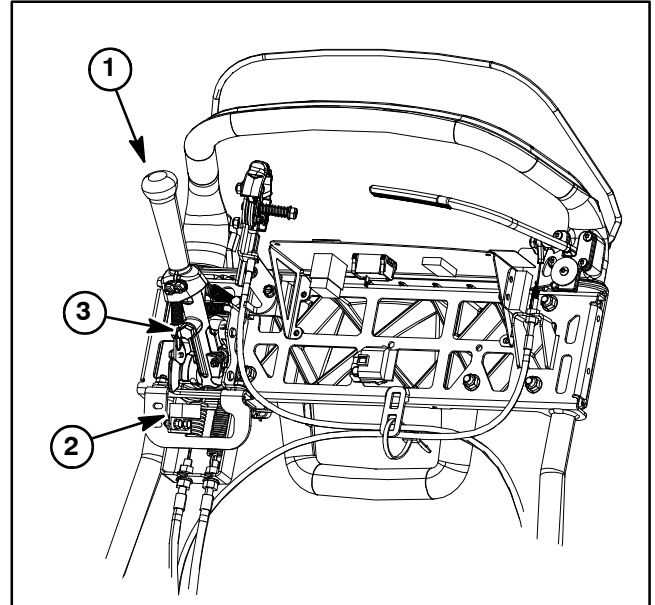


Figure 11

- | | |
|--------------------|-------------------|
| 1. Traction lever | 3. Cap screw head |
| 2. Traction switch | |

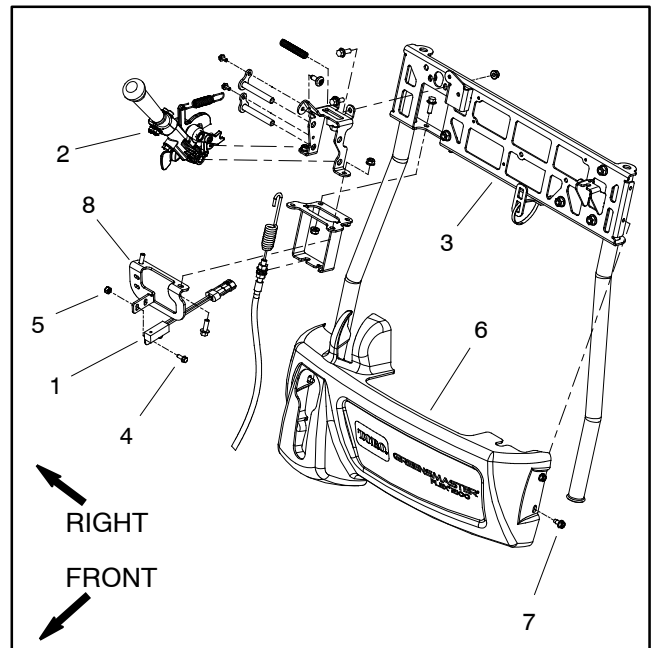


Figure 12

- | | |
|----------------------------|-------------------------|
| 1. Traction switch | 5. Lock nut (2 used) |
| 2. Traction lever assembly | 6. Console cover |
| 3. Lower handle | 7. Screw (4 used) |
| 4. Screw (2 used) | 8. Switch mount bracket |

Interlock Module

The interlock module prevents the engine from starting unless the traction lever is disengaged. Once the engine is running, the engine will continue to run with the traction lever engaged or disengaged as long as the parking brake latch is not applied. The module also allows the engine to run if the parking brake latch is applied and traction is not engaged.

The interlock module controls grounding of the engine ignition system. When the engine starter rope is pulled, the engine magneto will begin to create current. The interlock module uses that current through the traction and parking brake latch switches to determine the state of the switches. If switch state is correct, the interlock module opens the magneto to ground circuit so the engine can start and run. Once running, the interlock module allows the engine to continue to operate unless the parking brake latch is applied and traction is engaged.

If the engine will not start, perform the following tests to determine if the interlock module is at fault.

1. Check operation of the engine ignition system (see Ignition System Operation in this section).
2. Check the operation of both the parking brake latch and traction switches (see Parking Brake Latch Switch and Traction Switch in this section). Adjust or replace switch if necessary.
3. Check wire harness for damage (see Wiring Schematic and Wire Harness Drawings in this chapter). Repair or replace any damaged wire harness components.
4. If the engine ignition system, parking brake latch switch, traction switch and wire harness all prove to be operating correctly and engine does not start, replace interlock module.

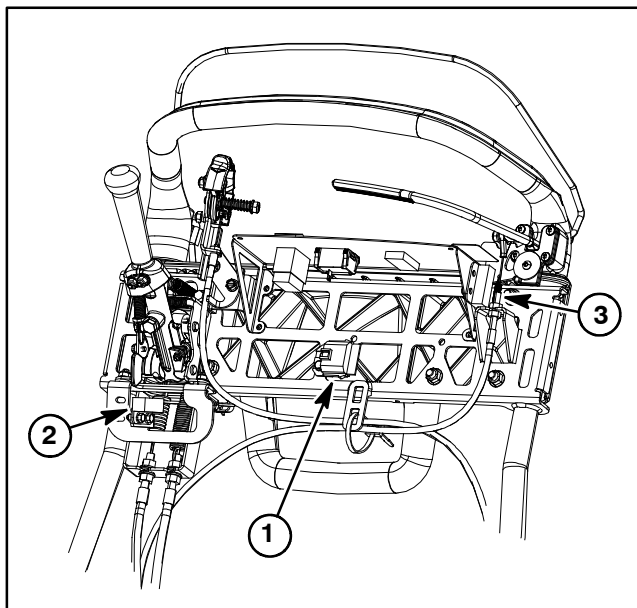


Figure 13

- | | |
|---------------------|----------------------------|
| 1. Interlock module | 3. Park brake latch switch |
| 2. Traction switch | |

Lighting Coil

The engine on Greensmaster Flex machines is equipped with a lighting coil to provide electrical current for an optional LED light kit. The coil is located under the engine flywheel and uses permanent magnets on the flywheel to operate. The lighting coil has a 12VAC output that is rated at 15 watts. See the Subaru Service Manual for additional lighting coil information.

NOTE: If lights are desired on the Flex machine, use the recommended Toro LED light kit that is available from your Toro Distributor. Incandescent or halogen lights will not operate with the engine lighting coil that is on these machines.

NOTE: If lighting coil output is to be measured with a multimeter, a load has to be applied to the circuit.



Chassis and Controls

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Specifications

| Item | Description |
|--|------------------------------|
| Transport Wheel (Optional) Tire Pressure | 12 to 15 PSI (83 to 103 kPa) |

General Information

Operator's Manual

The Operator's Manual provides information regarding the operation, adjustment procedures and general maintenance for your Greensmaster machine. Refer to the Operator's Manual for additional information when servicing the machine.

Service and Repairs

Handle Assembly

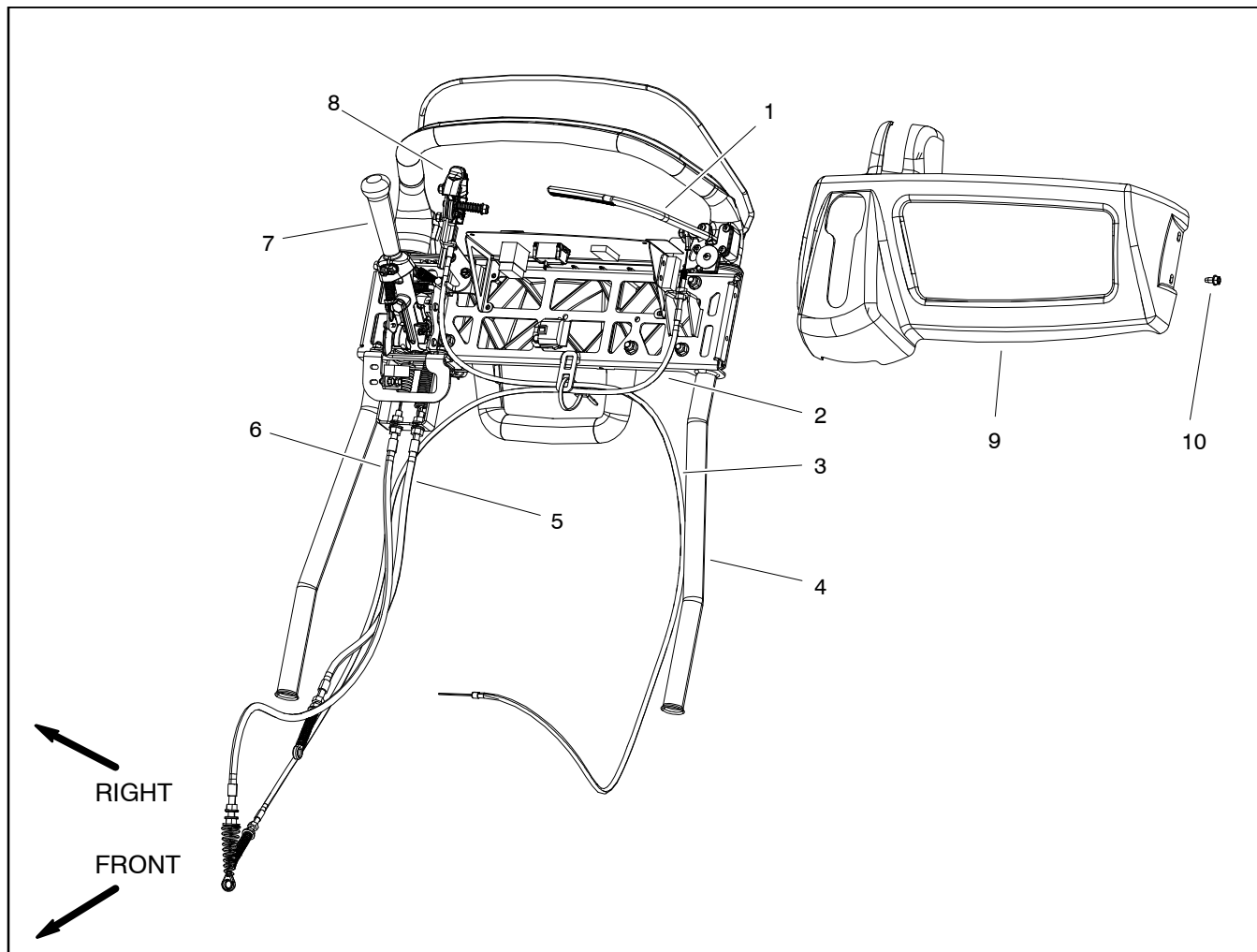


Figure 1

- | | | |
|-------------------|----------------------------------|--------------------------------|
| 1. Brake lever | 5. Traction clutch cable | 8. Throttle assembly |
| 2. Brake cable | 6. Reel clutch cable | 9. Console cover |
| 3. Throttle cable | 7. Traction and reel drive lever | 10. Washer head screw (4 used) |
| 4. Handle | | |

Handle Removal (Fig. 1)

1. Park machine on a level surface. Make sure engine is OFF. Remove spark plug wire from the engine spark plug.
2. Remove console cover from handle assembly.
3. Disconnect reel clutch, traction clutch and brake cables from transmission (see Cable Replacement in this section).
4. Disconnect throttle cable from engine (see Throttle Cable Replacement in this section).

5. Disconnect wire harness connections from electrical components on handle. Position wire harness away from handle.

6. Note height adjustment of handle for assembly purposes.

7. Support handle assembly to prevent it from moving.

NOTE: The offset handle clamps on Flex 2100/2120 machines are mounted on the outside of the side plates (Fig. 2). On Flex 1800/1820 machines, the offset handle clamps are mounted on the inside of the side plates (Fig. 3).

8. Remove handle clamps from handle assembly (Fig. 2 or 3):

A. Remove carriage screws and flange nuts that secure handle clamps to offset handle clamps.

B. Remove flange nuts that secure shoulder bolts at bottom of handle clamps.

C. Remove inner handle clamps. Leave shoulder bolts and outer handle clamps in place on handle.

9. Remove the handle assembly from the machine.

10. If rubber bumpers (item 7 in Fig. 2 or 3) need to be replaced, cut bumpers to remove from handle clamps. Apply soapy water to inside of new bumpers to ease installation onto clamps.

Handle Installation (Fig. 1)

1. Position handle assembly to outer handle clamps on machine.

2. Fit inner handle clamps to the handle assembly and secure with removed fasteners (Fig. 2 or 3). Adjust handle height before fully tightening the fasteners.

NOTE: The handle is traditionally operated with the handle adjusted to the maximum height.

3. Attach reel clutch, traction clutch and brake cables to transmission (see Cable Replacement in this section). Check cable operation and adjust if necessary.

4. Attach throttle cable to engine (see Throttle Cable Replacement in this section). Check cable operation and adjust if necessary.

5. Attach wire harness connections to electrical components on handle.

6. Secure console cover to handle assembly.

7. Attach spark plug wire to spark plug.

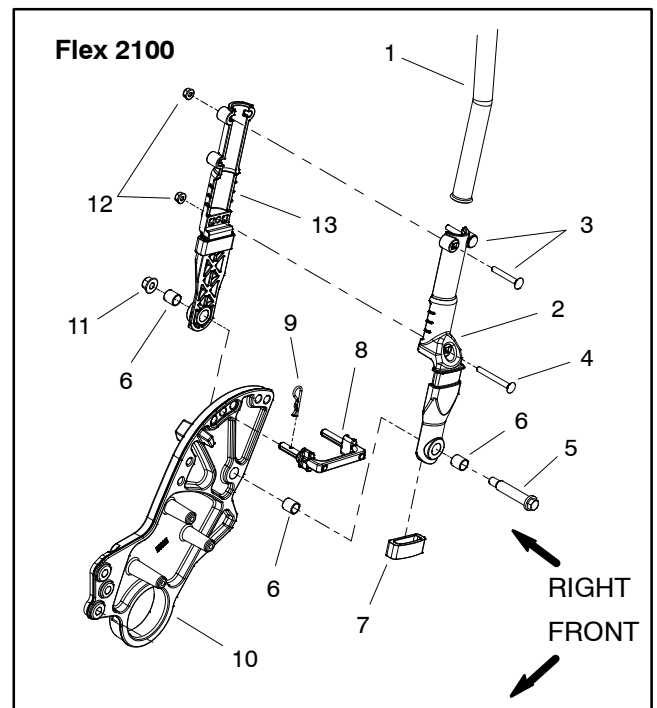


Figure 2

- | | |
|------------------------|---------------------------|
| 1. Handle | 8. Handle retainer |
| 2. Offset handle clamp | 9. Hair pin |
| 3. Carriage screw | 10. Side plate (LH shown) |
| 4. Carriage screw | 11. Flange nut |
| 5. Shoulder bolt | 12. Flange nut |
| 6. Bushing | 13. Handle clamp |
| 7. Rubber bumper | |

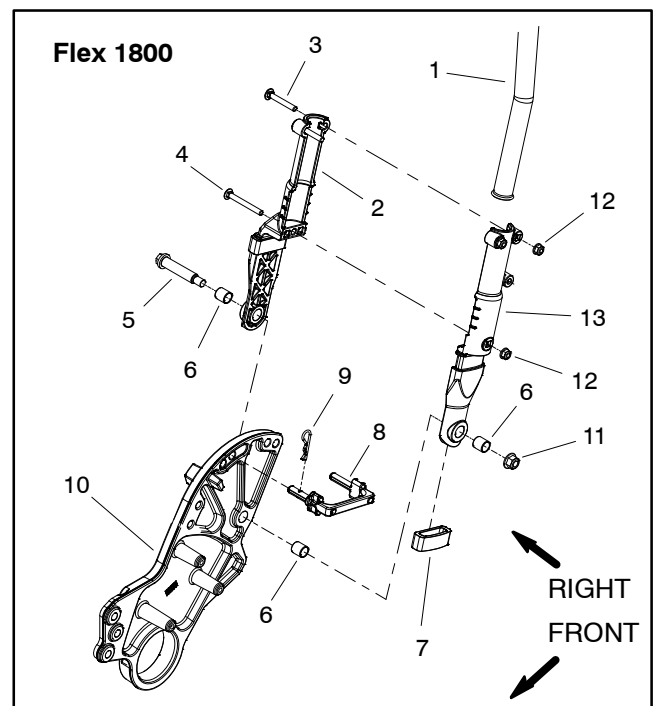


Figure 3

- | | |
|------------------------|---------------------------|
| 1. Handle | 8. Handle retainer |
| 2. Offset handle clamp | 9. Hair pin |
| 3. Carriage screw | 10. Side plate (LH shown) |
| 4. Carriage screw | 11. Flange nut |
| 5. Shoulder bolt | 12. Flange nut |
| 6. Bushing | 13. Handle clamp |
| 7. Rubber bumper | |

Throttle Cable Replacement

Removal

1. Park machine on a level surface. Make sure the engine is OFF and the traction lever is in NEUTRAL.

2. Remove throttle cable from the engine governor linkage (Fig. 4):

A. Loosen screw that secures cable clamp to engine bracket. Remove cable from clamp.

B. Loosen screw that secures throttle cable to governor lever. Slide cable from governor lever.

C. Separate throttle cable from engine.

3. Remove console cover from handle assembly to allow access to upper end of throttle cable.

4. Remove throttle cable from the throttle control assembly (Fig. 5):

A. Remove retaining ring and flat washer that secure throttle cable end to pin on throttle control. Slide cable end from throttle control.

B. Remove the cable housing from the throttle mount.

5. Remove throttle cable from the machine.

Installation

1. Connect throttle cable to throttle control assembly (Fig. 5).

A. Secure throttle cable end to pin on throttle control with flat washer and retaining ring.

B. Secure cable housing to throttle mount.

2. Route throttle cable to the engine. Make sure that cable is routed on right side of throttle mount cable guide (item 7 in Fig. 5).

3. Install cable to the engine governor linkage as follows (Fig. 4):

A. Slide throttle cable end into governor lever.

B. Place throttle cable under cable clamp.

C. Make sure throttle control is in the FAST position and the governor lever is against the high speed screw on governor linkage.

D. Tighten screw on cable clamp to secure the throttle cable.

4. Check throttle cable adjustment (see Throttle Cable Adjustment in the Adjustments section of Chapter 3 – Engine).

5. Install console cover to handle assembly.

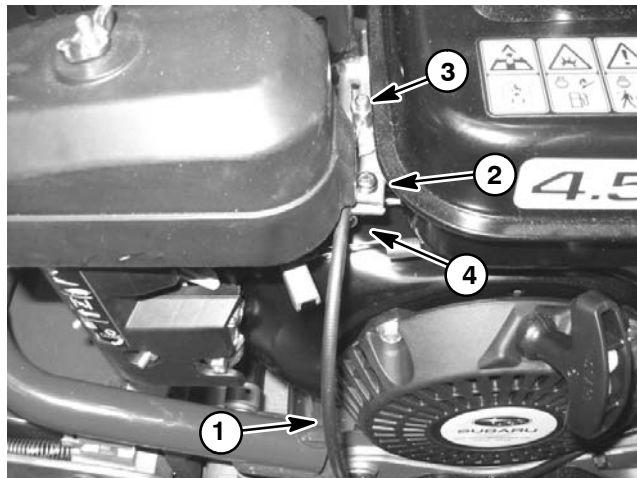


Figure 4

- | | |
|-------------------------|---------------------|
| 1. Throttle cable | 3. Governor lever |
| 2. Throttle cable clamp | 4. High speed screw |

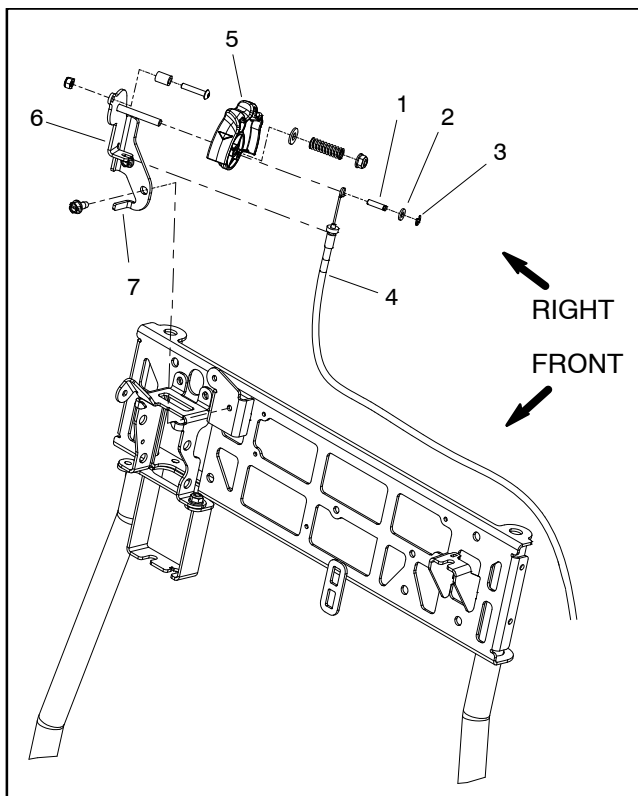


Figure 5

- | | |
|-------------------|----------------------|
| 1. Pin | 5. Throttle control |
| 2. Flat washer | 6. Throttle mount |
| 3. Retaining ring | 7. Mount cable guide |
| 4. Throttle cable | |

Brake Cable Replacement

Removal

1. Park machine on a level surface. Make sure the engine is OFF, the traction lever is in NEUTRAL and parking brake is released.
2. Remove brake cable from the brake lever shaft on the drum drive housing (Fig. 6):
 - A. Loosen front cable jam nut that secures cable to casting slot on drum drive housing. Separate cable from slot.
 - B. Remove retaining ring that secures cable eyelet to the brake shaft on drum drive housing.
 - C. Remove brake cable eyelet from brake lever shaft.
3. Remove console cover from handle assembly to allow access to upper end of brake cable.
4. Remove flange nut that secures brake cable eyelet to brake lever on machine handle (Fig. 7).
5. Loosen lower brake cable jam nut and lift cable free from brake cable bracket on lower handle assembly. Remove cable from the bracket.
6. Remove brake cable from the machine.

Installation

1. Secure brake cable eyelet to the brake lever on the machine handle with flange nut (Fig. 7).
2. Attach brake cable to brake cable bracket on handle assembly with a washer and jam nut on each side of the bracket. Adjust jam nuts so that equal amount of cable threads are visible above and below jam nuts. Leave jam nuts snug until final cable adjustment.

10.5 to 12.5 in-lb
(1.2 to 1.4 N-m)
3. Route brake cable to the drum drive housing and secure brake cable to the brake lever shaft on the drum drive housing (Fig. 6):
 - A. Install cable eyelet to the brake lever and secure with retaining ring.
 - B. Attach brake cable to the casting slot on drum drive housing with a washer and jam nut on each side of the slot. Adjust jam nuts so that equal amount of cable threads are visible above and below jam nuts.

4. Adjust cable jam nuts at brake cable bracket on handle assembly so that it requires 35 pounds (156 N) applied to the brake lever to release the parking brake latch. After final cable adjustment, make sure that brake does not drag.
5. Install console cover to handle assembly.

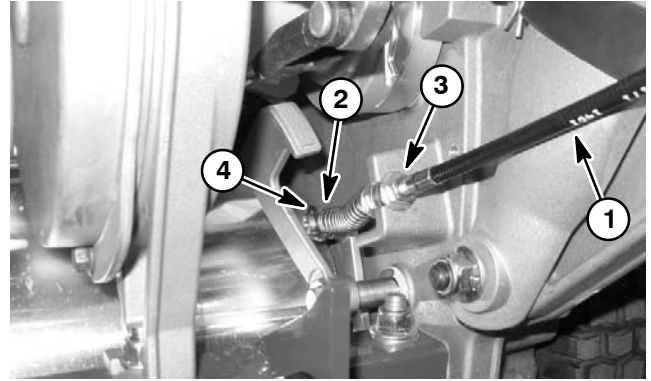


Figure 6

- | | |
|-----------------|---------------------------|
| 1. Brake cable | 3. Cable jam nut location |
| 2. Cable eyelet | 4. Retaining ring |

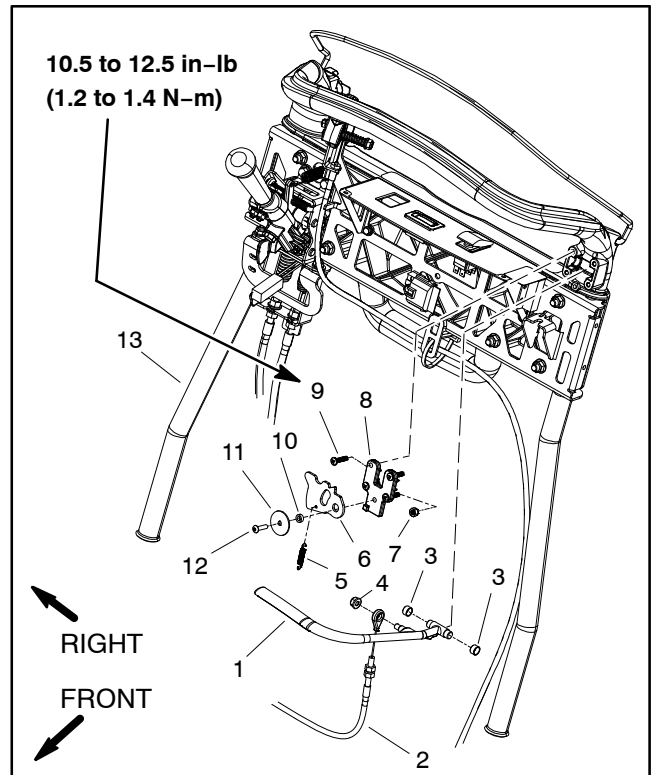


Figure 7

- | | |
|------------------------|-----------------------|
| 1. Brake lever | 8. Brake lever keeper |
| 2. Brake cable | 9. Screw (4 used) |
| 3. Bushing (2 used) | 10. Spacer |
| 4. Flange nut | 11. Washer |
| 5. Spring | 12. Screw |
| 6. Parking brake latch | 13. Handle assembly |
| 7. Lock nut | |

Traction Clutch Cable Replacement

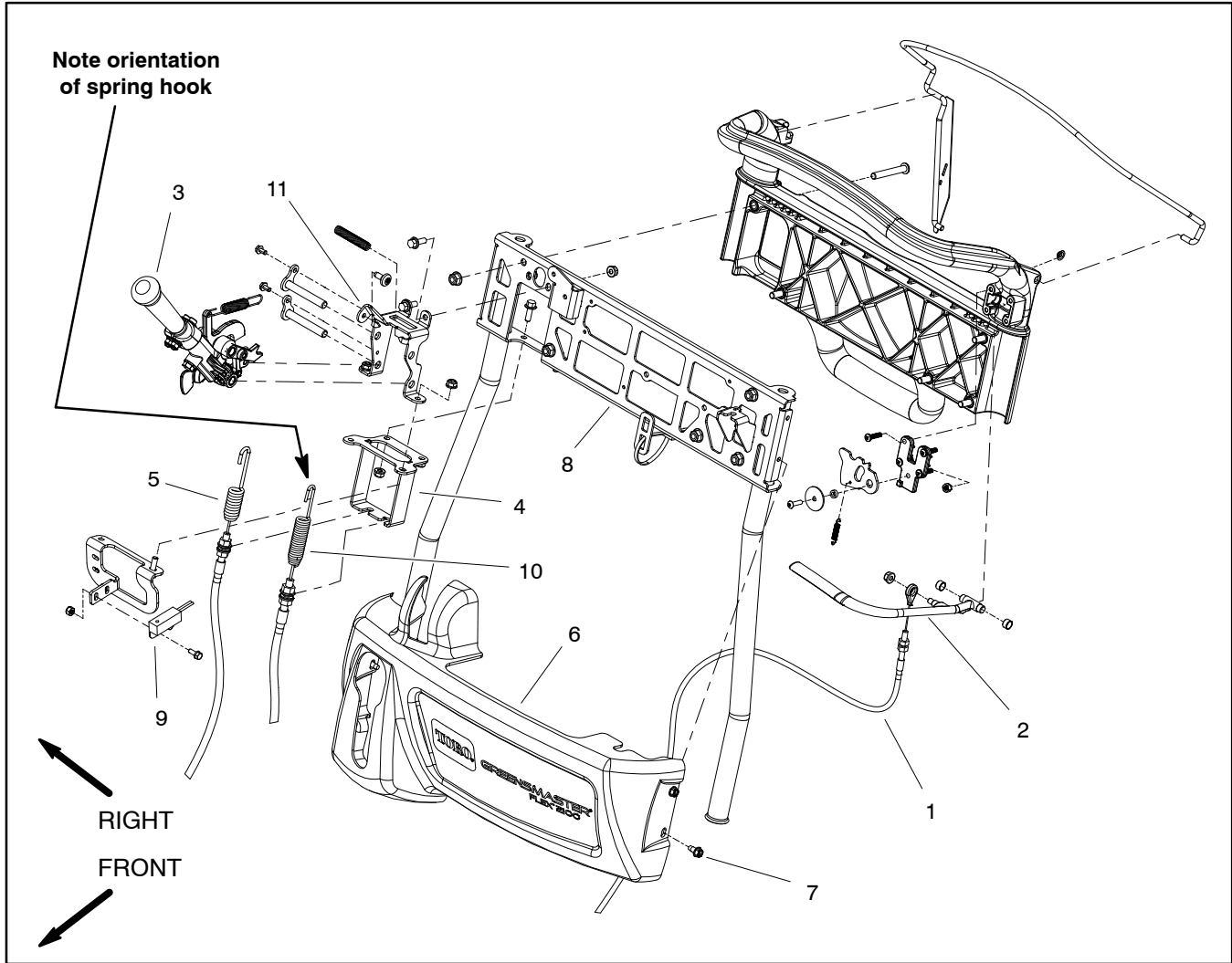


Figure 8

- | | | |
|-------------------|-------------------------------|---------------------------|
| 1. Brake cable | 5. Reel clutch cable | 9. Traction switch |
| 2. Brake lever | 6. Console cover | 10. Traction clutch cable |
| 3. Lever assembly | 7. Washer head screw (4 used) | 11. Shifter bracket |
| 4. Shift mount | 8. Lower handle | |

Removal

1. Park machine on a level surface. Make sure the engine is OFF and the traction lever is in NEUTRAL.
2. Remove traction clutch cable from the transmission (Fig. 9):
 - A. Loosen front cable jam nut that secures cable to traction cable bracket on transmission. Lift cable from bracket.
 - B. Remove flange nut that secures cable eyelet to transmission bellcrank lever and slide cable eyelet from lever.
3. Remove console cover from handle assembly to allow access to upper end of traction clutch cable.
4. Remove traction clutch cable from the traction lever assembly (Fig. 10):
 - A. Loosen lower cable jam nut that secures traction clutch cable to shift mount bracket on handle. Slide cable from bracket.
 - B. Remove cable spring from spring anchor on lever assembly. Note orientation of cable spring hook on lever assembly for assembly purposes.
5. Remove traction clutch cable from machine.

Installation

1. Secure traction clutch cable to the traction lever assembly (Fig. 10):

A. Install cable spring to spring anchor on lever assembly.

B. Slide the cable housing into the shift mount bracket slot. Make sure that a jam nut, flat washer and lock washer are on both sides of bracket. Adjust jam nuts so that equal amount of cable threads are visible above and below jam nuts. Leave jam nuts snug until final cable adjustment.

2. Route traction clutch cable to the transmission and install cable to transmission (Fig. 9):

A. Secure cable eyelet to transmission traction lever with flange nut.

B. Position traction cable to the casting slot of transmission with a jam nut, flat washer and lock washer on each side of the slot. Adjust and tighten jam nuts so that equal amount of cable threads are visible above and below jam nuts.

3. Make final traction clutch cable adjustment at traction lever assembly. Adjust cable jam nuts to remove slack in cable without rotating the transmission bellcrank lever more than 3° (approximately 0.060" (1.5 mm) at slot).

4. Install console cover to handle assembly.

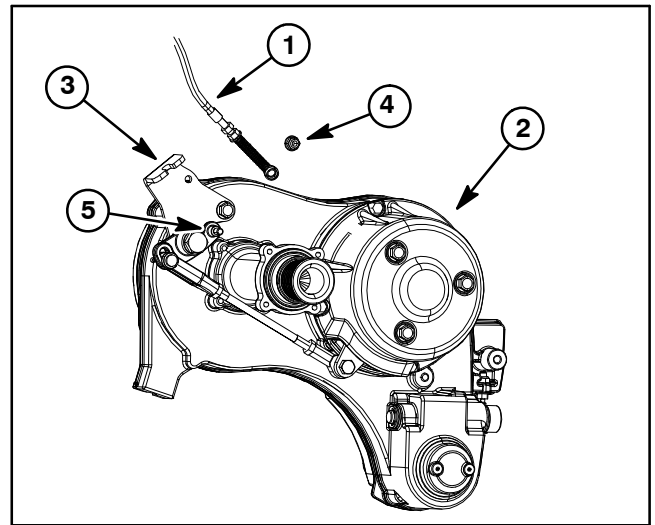


Figure 9

- | | |
|---------------------------|--------------------|
| 1. Traction clutch cable | 4. Flange nut |
| 2. Transmission | 5. Bellcrank lever |
| 3. Traction cable bracket | |

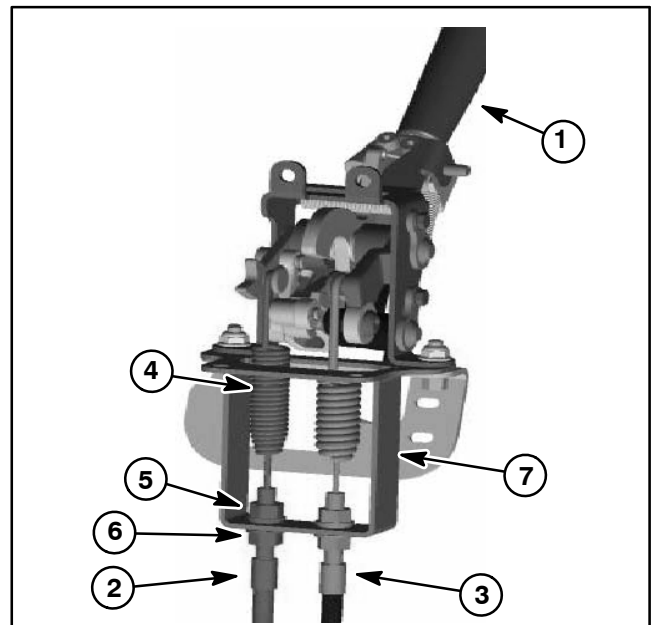


Figure 10

- | | |
|--------------------------|------------------------|
| 1. Shift handle | 5. Upper cable jam nut |
| 2. Traction clutch cable | 6. Lower cable jam nut |
| 3. Reel clutch cable | 7. Shift mount bracket |
| 4. Traction cable spring | |

Reel Clutch Cable Replacement

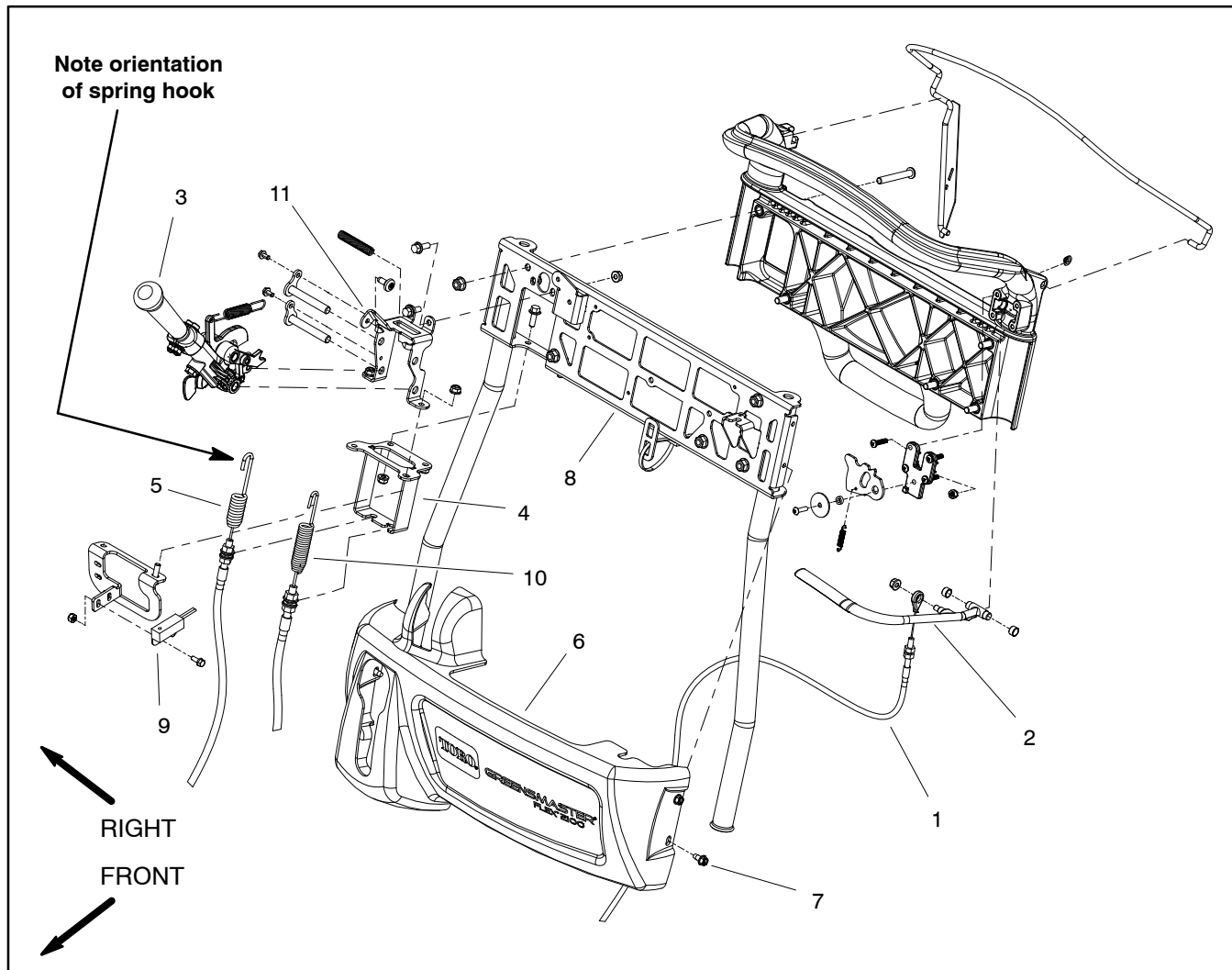


Figure 11

- | | | |
|-------------------|-------------------------------|---------------------------|
| 1. Brake cable | 5. Reel clutch cable | 9. Traction switch |
| 2. Brake lever | 6. Console cover | 10. Traction clutch cable |
| 3. Lever assembly | 7. Washer head screw (4 used) | 11. Shifter bracket |
| 4. Shift mount | 8. Lower handle | |

Removal

1. Park machine on a level surface. Make sure the engine is OFF and the traction lever is in NEUTRAL.
2. Remove reel clutch cable from transmission (Fig. 12):
 - A. Loosen front cable jam nut and lift cable free from casting slot of transmission.
 - B. Remove retaining ring that secures cable eyelet to reel clutch lever and slide cable eyelet from lever.
 - C. Remove cable tie that secures reel drive cable to transmission bracket.
3. Remove console cover from handle assembly to allow access to upper end of reel clutch cable.
4. Remove reel clutch cable from traction lever assembly (Fig. 13):
 - A. Loosen lower cable jam nut that secures reel clutch cable to shift mount bracket on handle. Slide cable from bracket.
 - B. Remove cable spring from spring anchor on lever assembly. Note orientation of cable spring hook on lever assembly for assembly purposes.
5. Remove reel clutch cable from machine.

Installation

1. Secure reel clutch cable to traction lever assembly (Fig. 13):

A. Install cable spring to spring anchor on lever assembly. Orientate cable spring hook end toward front of machine.

B. Slide the cable housing into the shift mount bracket slot. Make sure that a jam nut, flat washer and lock washer are on both sides of bracket. Adjust jam nuts so that equal amount of cable threads are visible above and below jam nuts. Leave jam nuts snug until final cable adjustment.

2. Route reel clutch cable to transmission and install cable (Fig. 12):

A. Secure cable eyelet to transmission reel clutch lever with retaining ring.

B. Position reel cable to the casting slot of transmission with a jam nut, flat washer and lock washer on each side of the slot.

C. Adjust and tighten jam nuts to compress cable spring to a length of **2.780" to 2.850" (70.6 to 72.4 mm)**.

D. Remove rubber plug at front of transmission to view reel clutch. Make sure that reel clutch teeth disengage when the clutch is released. Also, verify that clutch teeth do not bottom out when clutch is engaged.

E. Secure reel drive cable to transmission bracket with cable tie.

3. Make final reel clutch cable adjustment at traction lever assembly (Fig. 13):

A. Loosen both top and bottom cable jam nuts at shift mount bracket.

B. Pull down lightly on outer sheath of clutch cable.

C. Rotate bottom cable jam nut up on cable threads until the bottom lock washer just contacts the shift mount bracket.

D. While holding the bottom jam nut in place, tighten top cable jam nut.

4. Install console cover to handle assembly.

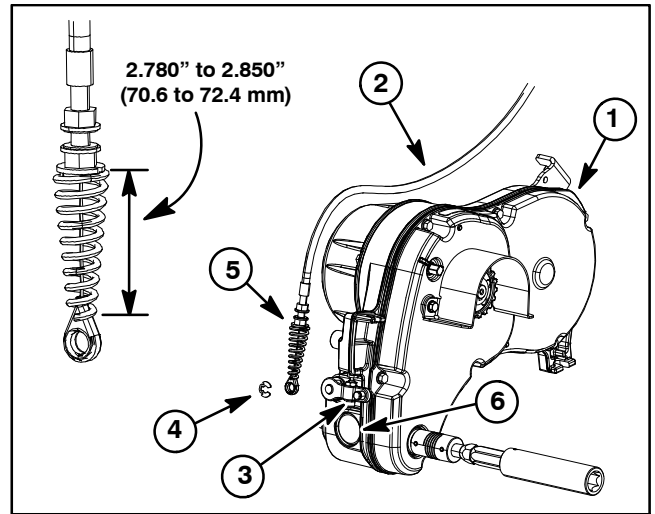


Figure 12

- | | |
|----------------------|-------------------|
| 1. Transmission | 4. Retaining ring |
| 2. Reel clutch cable | 5. Cable spring |
| 3. Reel clutch lever | 6. Rubber plug |

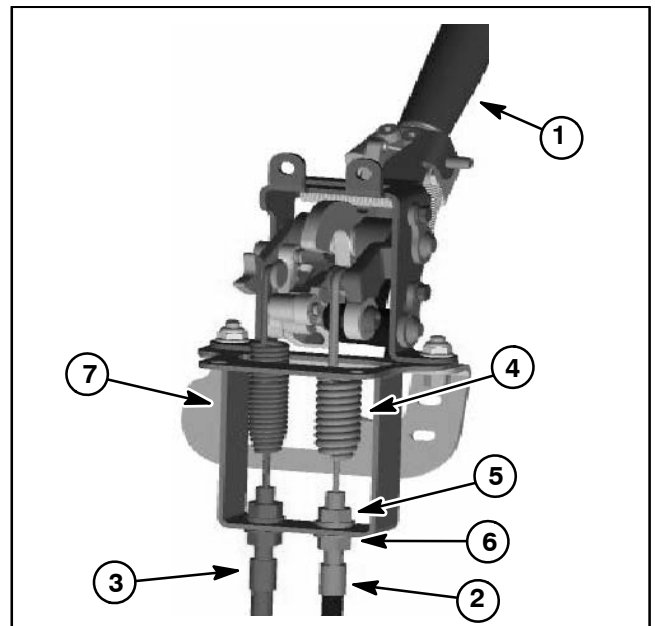


Figure 13

- | | |
|--------------------------|------------------------|
| 1. Shift handle | 5. Upper cable jam nut |
| 2. Reel clutch cable | 6. Lower cable jam nut |
| 3. Traction clutch cable | 7. Shift mount bracket |
| 4. Reel cable spring | |

Traction and Reel Drive Engagement Lever Assembly

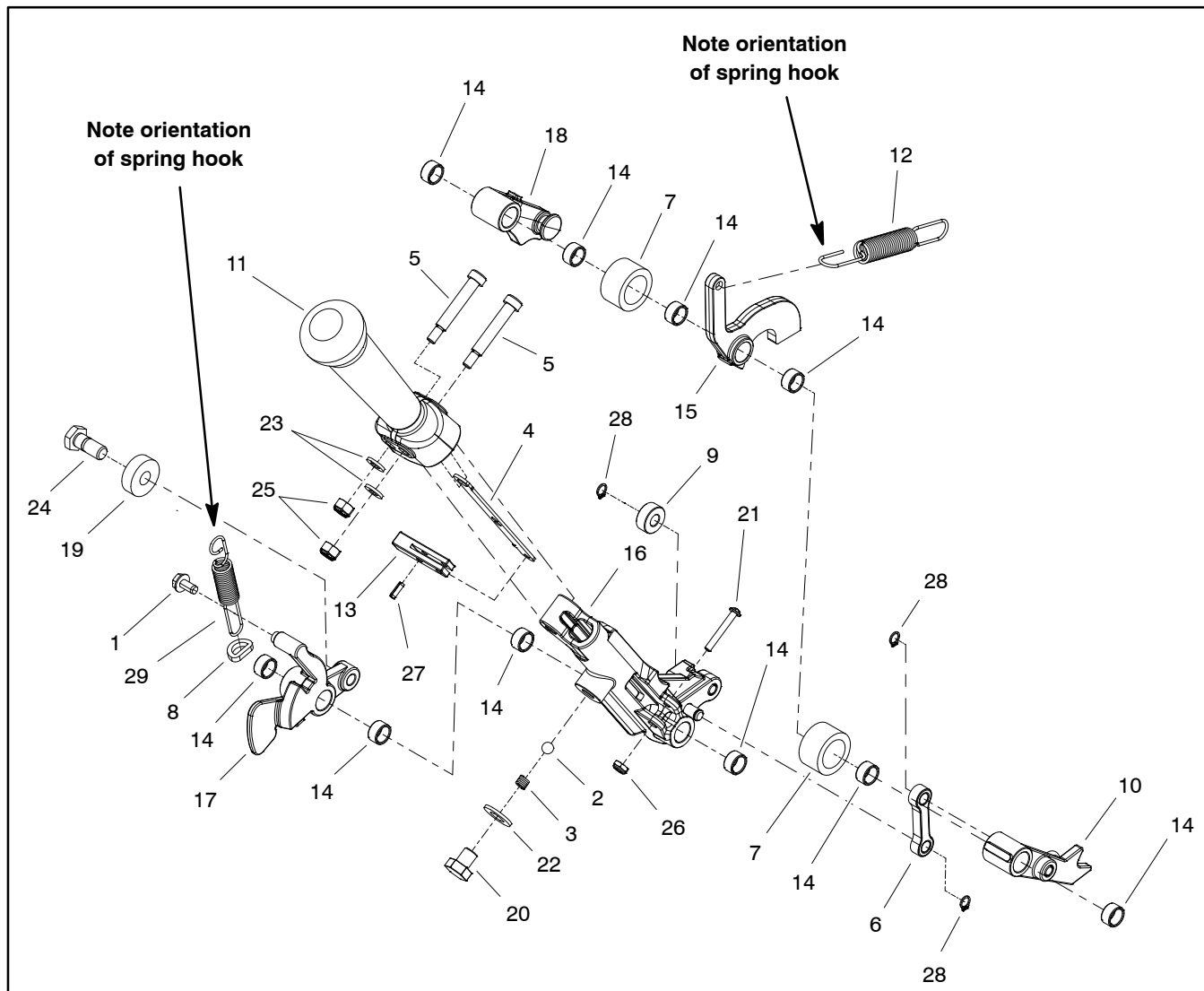


Figure 14

- | | | |
|----------------------------|-----------------------|-----------------------------|
| 1. Washer head screw | 11. Shift handle | 21. Screw |
| 2. Detent ball | 12. Extension spring | 22. Flat washer |
| 3. Detent spring | 13. Latch pin | 23. Flat washer |
| 4. Shift arm link | 14. Bushing (10 used) | 24. Shoulder screw |
| 5. Shoulder screw (2 used) | 15. Shifter latch | 25. Lock nut (2 used) |
| 6. Shifter link | 16. Transport lever | 26. Lock nut |
| 7. Bumper (2 used) | 17. Reel shift lever | 27. Roll pin |
| 8. Spring collar | 18. Reel cam lever | 28. Retaining ring (3 used) |
| 9. Spacer | 19. Ball bearing | 29. Extension spring |
| 10. Spring lever | 20. Cap screw | |

Disassembly

1. Make sure the engine is OFF and the traction lever is in the NEUTRAL position.
2. Remove console cover from handle to allow access to lever assembly (Fig. 15).
3. Disconnect reel clutch and traction clutch cables from lever assembly (see Cable Replacement in this section). Position ends of cables away from lever assembly.
4. Disconnect wire harness connector from traction switch (Fig. 15).
5. Disconnect spring (item 11 in Figure 15) that connects operator presence control with traction lever assembly.
6. Remove four (4) flange head screws and flange nuts that secure lever assembly and brackets to handle. Remove assembly (including lever assembly, shifter bracket, shift mount and switch mount bracket) from handle.
7. Remove two (2) flange head screws and flange nuts that secure switch mount bracket and shift mount to shifter bracket. Separate brackets to allow disassembly of lever assembly.
8. Disassemble lever assembly as necessary using Figures 14 and 15 as guides. Note orientation of end hooks on all springs for assembly purposes.

Assembly

1. Assemble lever assembly using Figures 14 and 15 as guides.
 - A. If shift arm link (item 4 in Figure 14) was removed from transport lever, make sure that tab on shift arm link is positioned toward solid end of latch pin (Fig. 16).

NOTE: One of the mounting holes in both the switch mount bracket and shift mount is elongated to allow for adjustment of clearance between transport lever (item 16 in Figure 14) and reel shift lever (item 17 in Figure 14).

2. Secure switch mount bracket and shift mount to shifter bracket with two (2) flange head screws and flange nuts. Before fully tightening fasteners, position legs of shifter bracket to allow 0.040" (1.0 mm) clearance between transport lever and reel shift lever (Fig. 17).

3. Position lever assembly (including lever assembly, shifter bracket, shift mount and switch mount bracket) to handle. Secure assembly in place with four (4) flange head screws and flange nuts.

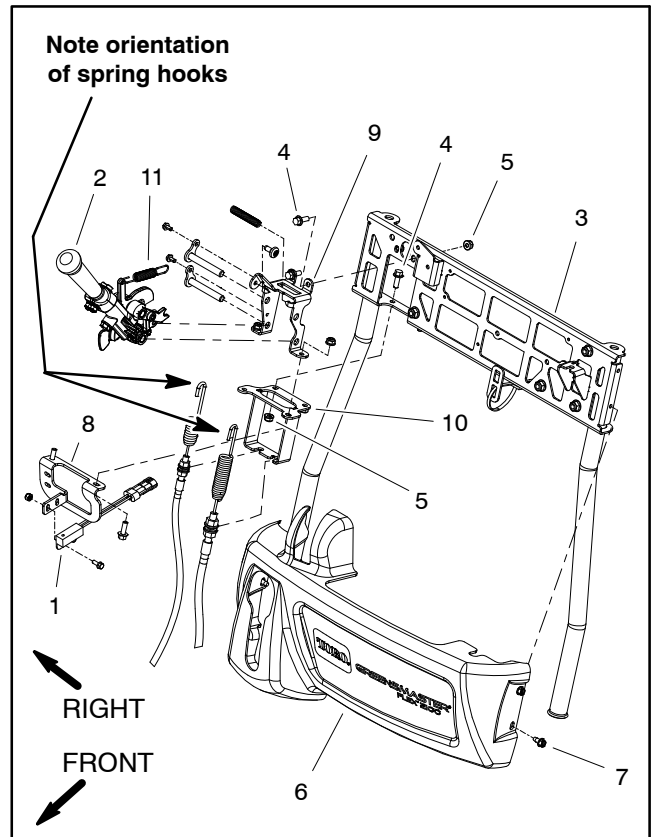


Figure 15

- | | |
|----------------------------|-------------------------|
| 1. Traction switch | 7. Screw (4 used) |
| 2. Traction lever assembly | 8. Switch mount bracket |
| 3. Lower handle | 9. Shifter bracket |
| 4. Flange screw (4 used) | 10. Shift mount |
| 5. Flange nut (4 used) | 11. Spring |
| 6. Console cover | |

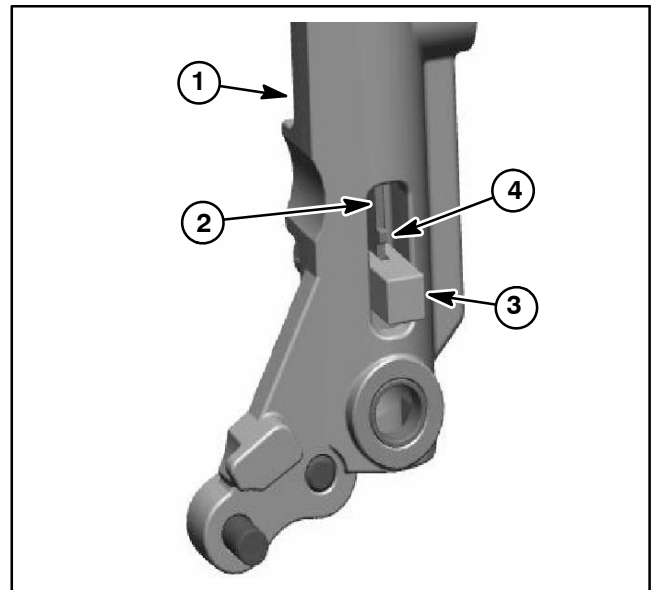


Figure 16

- | | |
|--------------------|-------------------|
| 1. Transport lever | 3. Latch pin |
| 2. Shift arm link | 4. Shift link tab |

4. Connect spring (item 11 in Figure 15) between traction lever assembly and operator presence control.
5. Connect wire harness connector to traction switch (Fig. 15).
6. Connect reel clutch and traction clutch cables to lever assembly (see Cable Replacement in this section). Check cable operation and adjust as necessary.
7. Check adjustment of traction switch (see Traction Switch in the Adjustments section of Chapter 5 – Electrical System). Adjust switch if necessary.
8. Install console cover to handle.

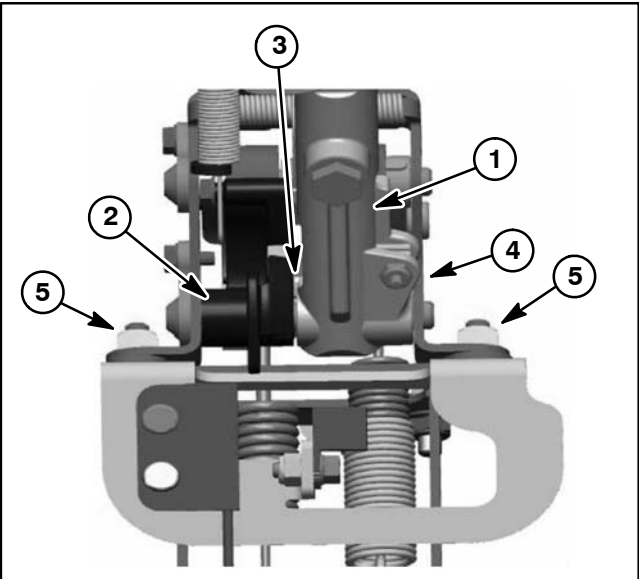


Figure 17

- | | |
|-----------------------|--------------------|
| 1. Transport lever | 4. Shifter bracket |
| 2. Reel shaft lever | 5. Screw and nut |
| 3. Clearance location | |

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Kickstand

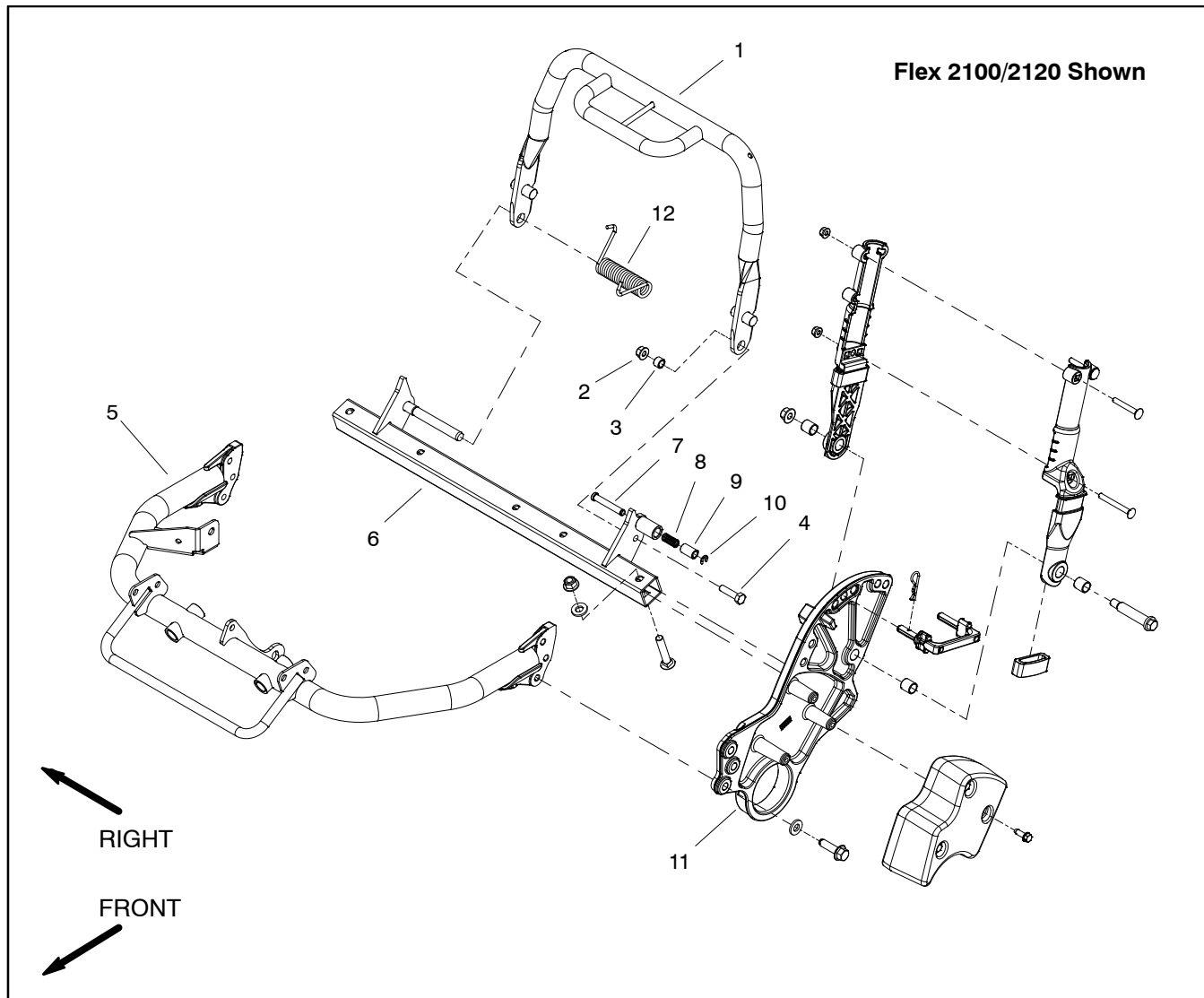


Figure 18

- | | | |
|---------------|---------------------------------|--------------------|
| 1. Kickstand | 5. Frame | 9. Spacer |
| 2. Flange nut | 6. Rear frame | 10. Retaining ring |
| 3. Spacer | 7. Service position locking pin | 11. LH side plate |
| 4. Cap screw | 8. Compression spring | 12. Torsion spring |

NOTE: The offset handle clamps on Flex 2100/2120 machines are mounted on the outside of the side plates. On Flex 1800/1820 machines, the offset handle clamps are mounted on the inside of the side plates.

Removal (Fig. 18)

1. Park machine on a level surface. Make sure the engine is OFF.
2. Pivot kickstand up and hold against the frame stops.



3. Use a nutdriver or small diameter pipe over the end of the torsion spring. Push the torsion spring down and in to release spring tension (Fig. 19). Slide torsion spring from pin on rear frame.
4. Remove cap screw, spacer and flange nut that secure left side of kickstand to rear frame.
5. Remove kickstand from the machine.
6. If necessary, disassemble and remove service position locking pin assembly (items 7, 8, 9 and 10) from rear frame.

Installation (Fig. 18)

1. Make sure machine is parked on a level surface and the engine is OFF.
2. If service position locking pin assembly (items 7, 8, 9 and 10) was removed from rear frame, install removed locking pin components.
3. Position kickstand inside the machine frame. Insert cap screw (item 4) through the rear frame, kickstand and spacer. Thread flange nut on cap screw and tighten to secure kickstand.
4. Slide torsion spring onto pin on rear frame. Place end of spring in slotted hole in bottom of rear frame.
5. Pivot kickstand up and hold against the frame stops. Use a nutdriver or small diameter pipe over the end of the torsion spring. Push the spring end down and out to install spring (Fig. 19).

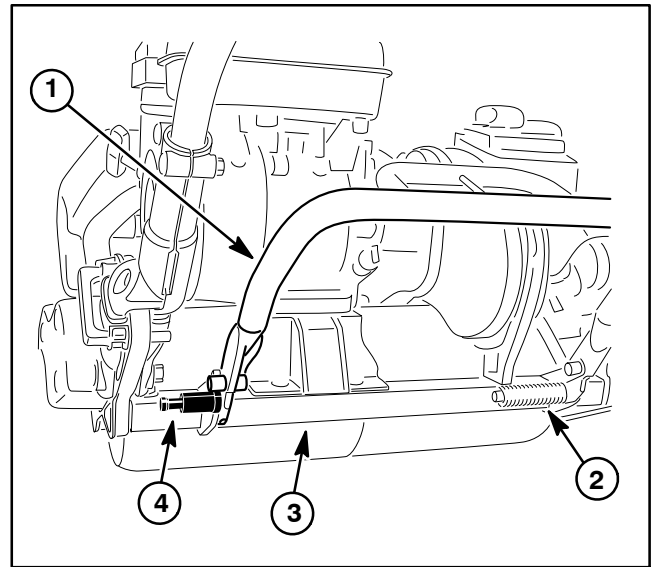


Figure 19

- | | |
|-------------------|------------------------|
| 1. Kickstand | 3. Rear frame |
| 2. Torsion spring | 4. Service locking pin |

Transport Wheels (Optional)

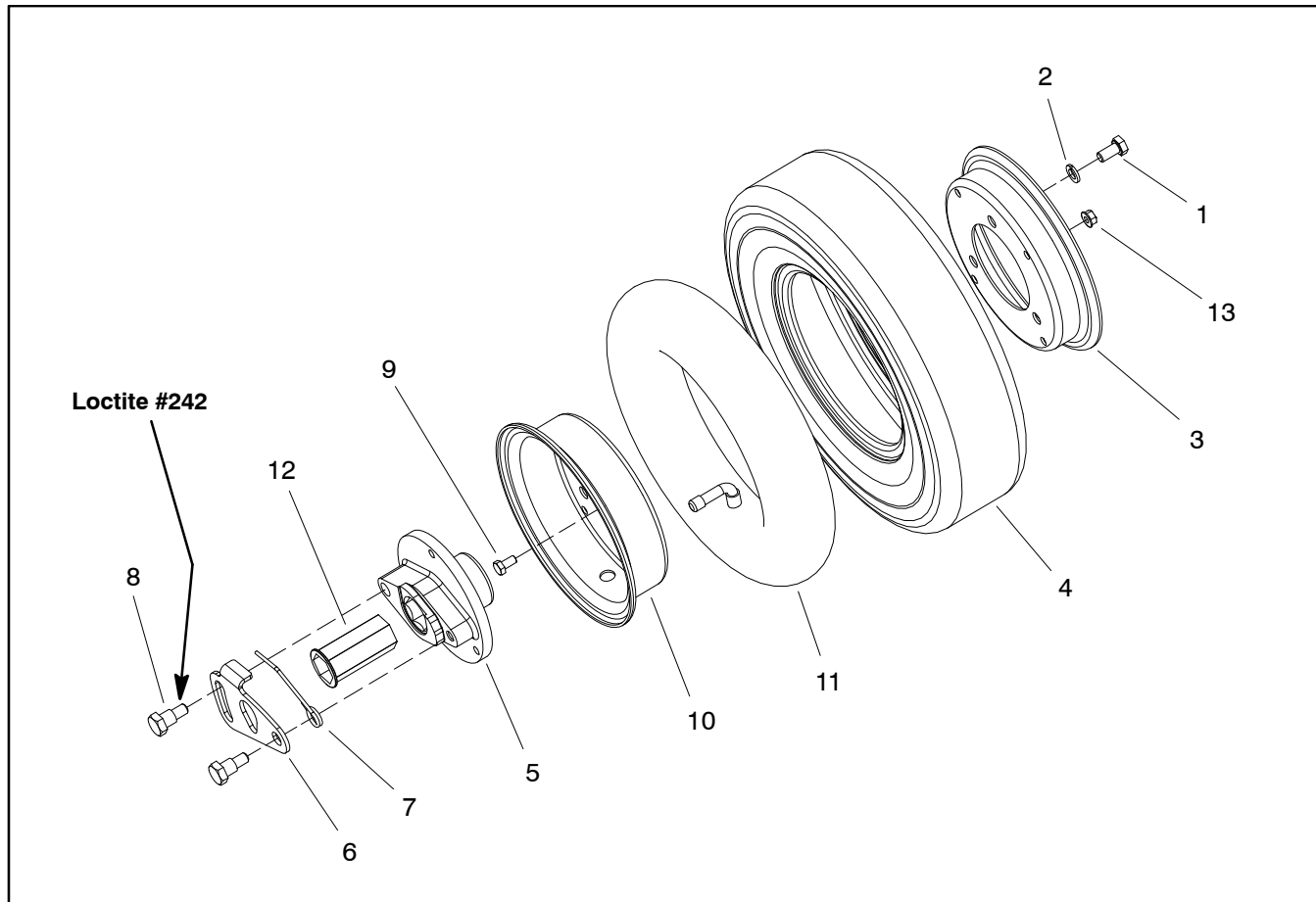


Figure 20

- 1. Cap screw (3 used)
- 2. Lock washer (3 used)
- 3. Shallow rim
- 4. Tire
- 5. Hub

- 6. Wheel retaining lever
- 7. Torsion spring
- 8. Shoulder screw (2 used)
- 9. Cap screw (4 used)

- 10. Deep rim
- 11. Inner tube
- 12. Hub bushing
- 13. Flange nut (4 used)

Wheel Removal (Fig. 21)

1. Park machine on a level surface. Make sure the engine is OFF.
2. Support the machine on the kickstand.
3. Pivot wheel retaining lever away from the center of the wheel. Slide transport wheel off the wheel hex shaft.

Wheel Disassembly (Fig. 20)

1. Make sure that tire is fully deflated before disassembly of wheel.
2. Remove three (3) cap screws and lock washers from the shallow rim and hub. Remove hub from deep rim.
3. Inspect hub bushing (item 12). If worn or damaged, replace bushing.
4. Remove four (4) cap screws and flange nuts from the deep rim and shallow rim. Remove shallow rim from the deep rim.
5. Separate tire, tube and deep rim.
6. If necessary, remove shoulder screws, torsion spring and retaining lever from the hub.

Wheel Assembly (Fig. 20)

1. If shoulder screws were removed from hub, apply Loctite #242 (or equivalent) to threads of shoulder screws. Secure torsion spring and retaining lever to the hub with shoulder screws.
2. Assemble tire, tube and deep rim.
3. Install shallow rim into the tire. Align and secure shallow rim to the deep rim with four (4) cap screws and flange nuts. Tighten fasteners.
4. Install hub into deep rim. Secure hub to deep rim with three (3) cap screws and lock washers. Tighten fasteners.
5. Inflate tire from 12 to 15 PSI (83 to 103 kPa).

Wheel Installation (Fig. 21)

1. Make sure machine is parked on a level surface and the engine is OFF.
2. Support the machine on the kick stand.
3. Slide transport wheel completely onto the wheel hex shaft until the wheel retaining lever is secured into the groove on the wheel hex shaft.

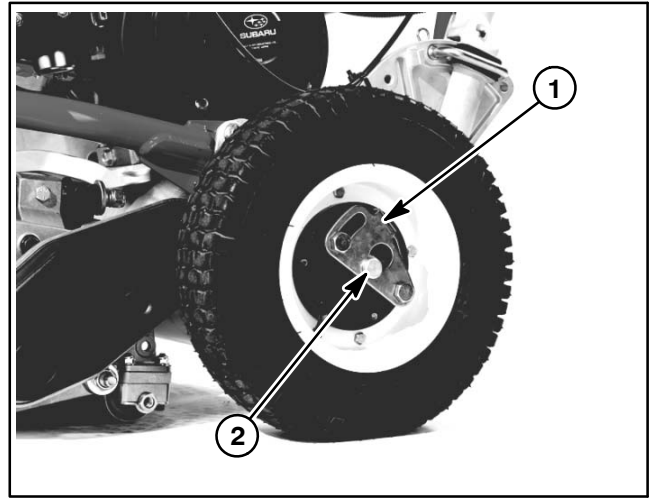


Figure 21

1. Wheel retaining lever
2. Wheel hex shaft

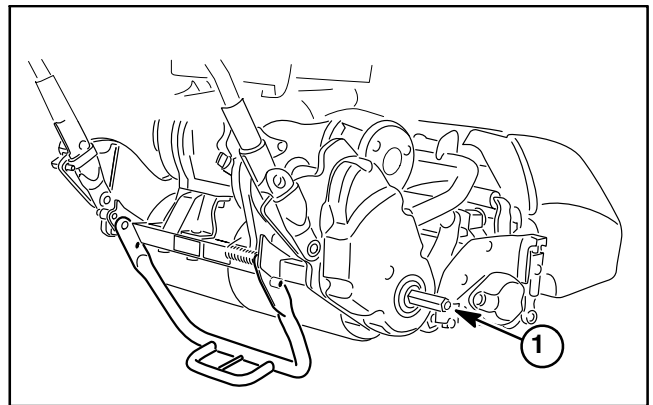


Figure 22

1. Wheel hex shaft

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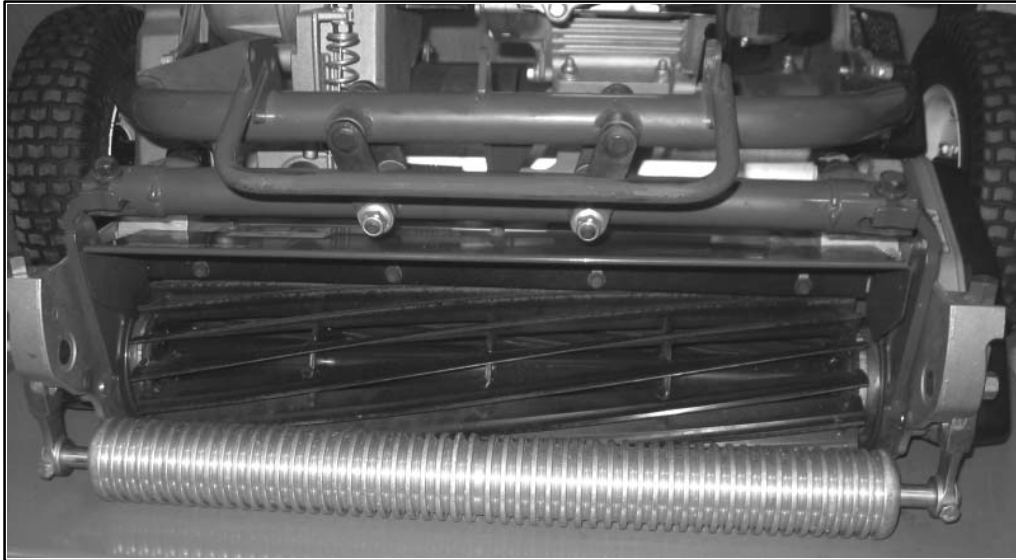


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NOTE: This chapter includes service information for Flex cutting units with serial number above 312000000. If an older production Flex cutting unit (serial number below 312000000) has been installed on a newer Flex 21 traction unit, use information from the appropriate Flex 21 service manual when servicing that cutting unit.

Specifications



REEL CONSTRUCTION: 5-inch (12.7 cm) diameter, 11 or 14 carbon steel blades welded to 5 stamped steel spiders. High strength low alloy steel blades are thru hardened and impact resistant.

FRAME CONSTRUCTION: Precision machined die cast aluminum cross member with two bolt-on die-cast aluminum side plates.

HEIGHT-OF-CUT: Cutting height is adjusted on the front roller by two vertical screws and held by two lock nuts. Standard bench height of cut range is 0.062 to 0.500 inch (1.6 to 12.7 mm) depending on type of bedknife installed. An optional High Height of Cut Kit is available for higher HOC adjustments. Effective HOC may vary depending on turf conditions, type of bedknife, rollers and attachments installed.

CLIP: Clip frequency is adjusted by moving the pulleys on the cutting unit reel drive housing. 6-clip adjustments are possible based on pulley configuration.

ROLLERS: The rear roller is a 2.000" (5.1 cm) diameter aluminum full roller. The front roller is a 2.500" (6.3 cm) diameter roller that is chosen from a variety of configurations (narrow spaced Weihle front roller is shown).

BEDKNIFE AND BEDBAR: Single edged Edgemax™ bedknife (solid tool steel construction) used with 11 and 14 blade cutting unit. A cast iron bedbar is fastened to the cutting unit. Other optional bedknives and a less aggressive bedbar are available.

GRASS SHIELD: Non-adjustable shield with adjustable cut-off bar to improve grass discharge from reel in wet conditions.

COUNTERBALANCE WEIGHT: A cast iron weight mounted on right end of cutting unit balances the cutting unit.

APPROXIMATE CUTTING UNIT WEIGHT:

| | |
|---------------------------|------------------|
| 18" CU with 11 Blade Reel | 68 lb. (30.8 kg) |
| 18" CU with 14 Blade Reel | 71 lb. (32.2 kg) |
| 21" CU with 11 Blade Reel | 71 lb. (32.2 kg) |
| 21" CU with 14 Blade Reel | 74 lb. (33.5 kg) |

(NOTE: weights listed do not include front roller or groomer)

General Information

Operator's Manual

The Cutting Unit Operator's Manual provides information regarding the operation, general maintenance and maintenance intervals for the cutting unit on your Greensmaster machine. Additionally, if optional kits have been installed on the cutting unit (e.g. grooming reel), the installation instructions for the kit includes set-up and operation information. Refer to those publications for additional information when servicing the cutting unit.

Supporting Cutting Unit when Servicing

Whenever the cutting unit has to be tipped to expose the bedknife or cutting reel, support the rear of the cutting unit to make sure the lock nuts on the back of the bedbar adjuster screws are not resting on the work surface.

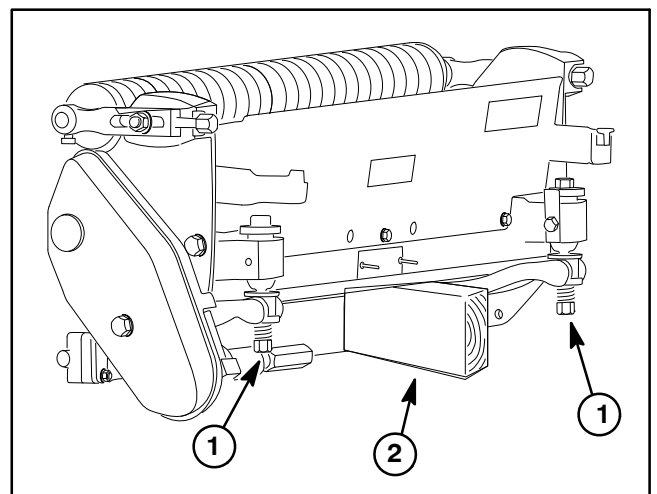


Figure 1

1. Lock nut

2. Support

Separating Cutting Unit from Traction Unit

1. Position mower on a flat, level work surface. Make sure engine is OFF. Remove spark plug wire from the engine spark plug.
2. Lower the kickstand and push in the locking pin to lock the kickstand in the service position (Fig. 2). Allow the kickstand and machine to rest against the locking pin.
3. Remove grass basket from cutting unit, if installed.
4. Slide the telescoping coupler off the cutting unit hex shaft (Fig. 3).
5. Loosen two (2) flange head screws that secure cutting unit pitch arms to traction unit roll frame (Fig. 4). It is not necessary to completely remove the screws.
6. Rotate pitch arms forward and rest traction unit against the kickstand.
7. Roll cutting unit away from machine.
8. Reverse procedure to install cutting unit to traction unit.
9. After cutting unit is installed to traction unit, attach spark plug wire to engine spark plug.

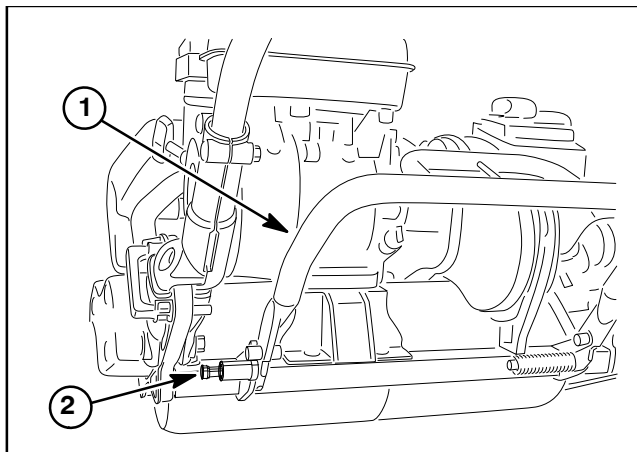


Figure 2

1. Kickstand
2. Locking pin

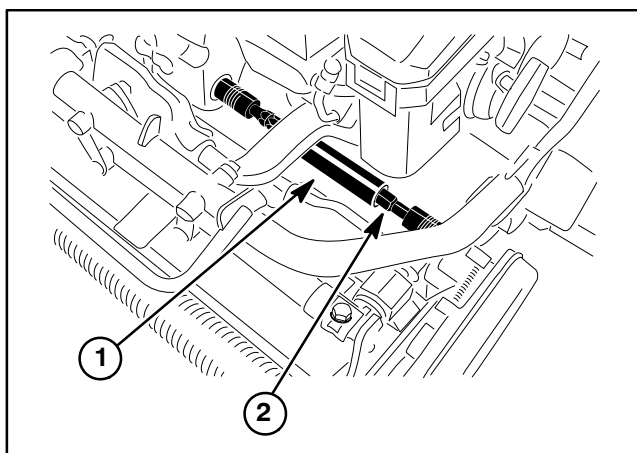


Figure 3

1. Telescoping coupler
2. Cutting unit hex shaft

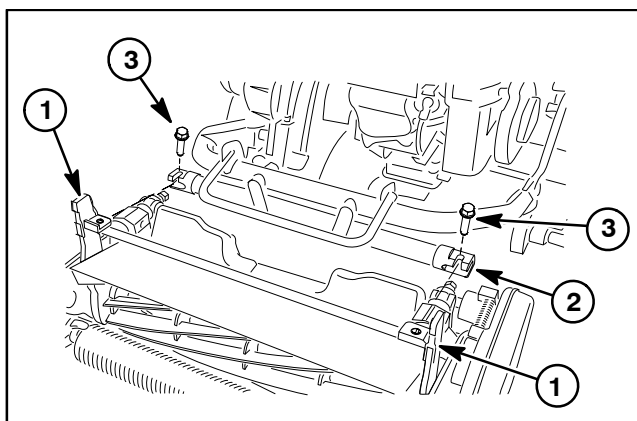


Figure 4

1. Cutting unit pitch arm
2. Traction unit roll frame
3. Flange head screw

Special Tools

Some special tools may have been supplied with your mower or are available as TORO parts. Order special tools from your Toro Distributor. Some tools may also be available from a local supplier.

Gauge Bar Assembly

Toro Part Number: **13-8199**

Used to verify height-of-cut.

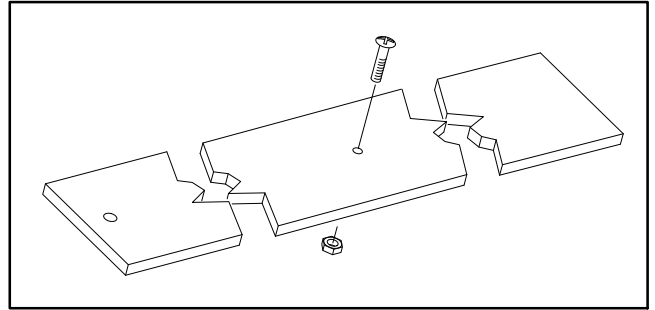


Figure 5

Backlapping Brush Assembly

Toro Part Number: **TOR299100**

Used to apply lapping compound to cutting unit while keeping the operator's hands at a safe distance from the rotating reel.

Components for the brush assembly are available individually as follows:

| | |
|------------|---------|
| Brush | 36-4310 |
| Handle | 29-9080 |
| Handle cap | 2410-18 |

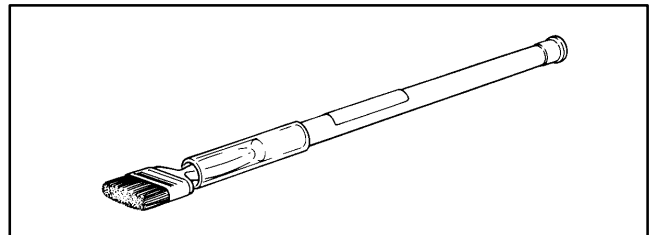


Figure 6

Bedknife Screw Tool

Toro Part Number: **TOR510880**

This screwdriver-type bit is made to fit Toro bedknife attaching screws. Use this bit with a 3/8" drive torque wrench to secure the bedknife to the bedbar.

DO NOT use an air or manual impact wrench with this tool.

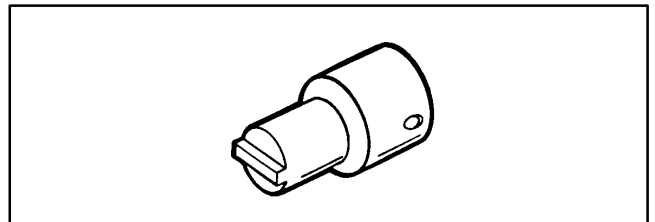


Figure 7

Cutting Unit

Roller Bearing Installation Tools

Washers and spacer used to install bearings and seals into front and rear rollers (Fig. 8).

Seal installation washer: **107-8133**

Seal installation spacer: **107-3505**

Bearing installation washer: **104-6126**

As an alternative to using washers and spacers listed above, a special tool set is available that can be used for roller bearing and seal installation (Fig. 9).

Toro Part Number: **TOR4105**

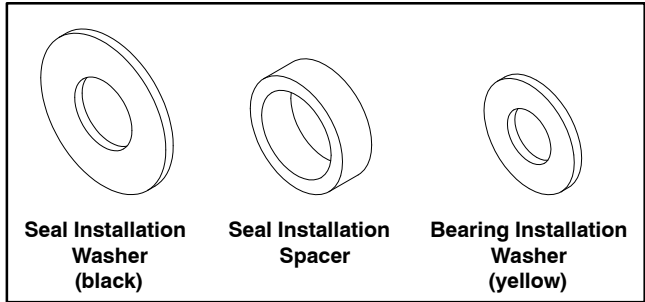


Figure 8



Figure 9

Diameter/Circumference Measuring Tape

Toro Part Number: **TOR6023**

Spring steel measuring tape for accurately measuring the circumference and outside diameter of cutting reel and other spherical components. Tape calibration is in fixed inch readings (no adjustments).



Figure 10

Turf Evaluator Tool

Toro Model Number: **04399**

Many turf discrepancies are subtle and require closer examination. In these instances, the Turf Evaluator grass viewing tool is helpful. It can assist turf managers and service technicians in determining causes for poor reel mower performance and in comparing the effective height-of-cut of one mowed surface to another. This tool should be used with the Toro Guide to Evaluation Reel Mower Performance and Using the Turf Evaluator (Toro part no. 97931SL).



Figure 11

Bedknife Top Angle Indicator and Mount

Toro Part Numbers: **131-6828** and **131-6829**

Because the top grind angle on bedknives is critical for edge retention, and therefore after-cut appearance, Toro has developed these service tools for accurately measuring the top grind angle on all bedknives.

Since there can be variations in the mounting surface of the bedbar, it is necessary to grind the bedknife after installing it to the bedbar.

1. Place the angle indicator on the bottom side of the bedknife with the digital display facing you as shown (Fig. 12).

2. Press the Alt Zero button on the angle indicator.

3. Remove the angle indicator and place the angle-indicator mount on the edge of the bedknife so the face of the magnet is flat against the top of the bedknife (Fig. 13).

4. Place the angle indicator on the mount with the digital display facing you as shown (Fig. 13). The angle displayed on the indicator is the current bedknife top angle.

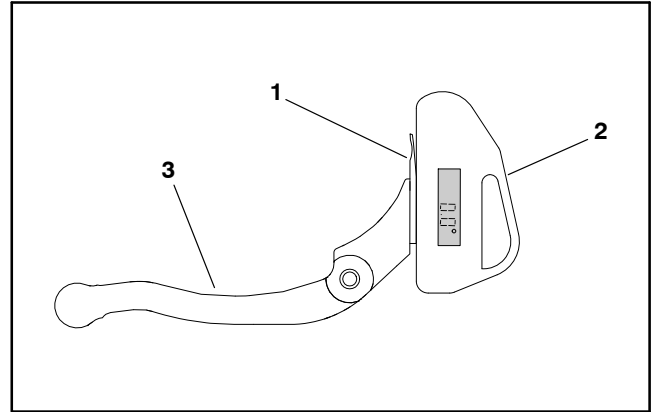


Figure 12

- 1. Bedknife
- 2. Angle indicator
- 3. Bedbar

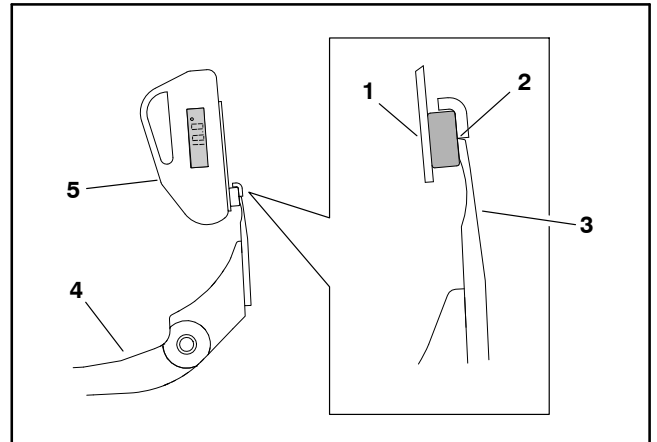


Figure 13

- 1. Angle indicator mount
- 2. Magnet
- 3. Bedknife
- 4. Angle indicator
- 5. Bedbar

Factors That Can Affect Quality of Cut

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

cutting unit. It is important to remember that the lower the height-of-cut, the more critical these factors are. See Cutting Unit Operator’s Manual and the Adjustments section and Service and Repairs section of this chapter for detailed adjustment and repair information.

| Factor | Possible Problem/Correction |
|------------------------------------|---|
| Governed engine speed. | Check maximum governed engine speed. Adjust engine to specifications if necessary (see Adjustments section in Chapter 3 – Engine). |
| Reel bearing condition. | Check and replace reel bearings if necessary (see Cutting Reel in the Service and Repairs section of this chapter). |
| Reel and bedknife sharpness. | <p>A reel and/or bedknife that has rounded cutting edges or “rifling” (grooved or wavy appearance) cannot be corrected by tightening the bedknife to reel contact. Grind reel to remove taper and/or rifling. Grind bedknife to sharpen and/or remove rifling.</p> <p>The most common cause of rifling is bedknife to reel contact that is too tight.</p> <p>A new bedknife must be ground or backlapped after installation to the bedbar.</p> |
| Bedknife to reel adjustment. | <p>Check bedknife to reel contact daily. The bedknife must have light contact across the entire reel. No contact will dull the cutting edges. Excessive contact accelerates wear of both edges. Quality of cut is adversely affected by both conditions.</p> <p>Slightly dull cutting edges may be corrected by backlapping (see Backlapping in the Service and Repairs section of this chapter).</p> <p>Excessively dull cutting edges must be corrected by grinding the reel and bedknife (see Preparing Reel for Grinding in the Service and Repairs section of this chapter).</p> |
| Height-of-cut. | “Effective” or actual height-of-cut depends on the mower weight and turf conditions. Effective height-of-cut will be different than the bench set height-of-cut. |
| Proper bedknife for height-of-cut. | If the bedknife is too thick for effective height-of-cut, poor quality of cut will result. |
| Stability of bedbar. | Make sure bedbar pivot bolts are securely seated (see Bedbar in Service and Repairs section of this chapter). |
| Number of reel blades. | Use correct number of blades for clip frequency and optimum height-of-cut range. |

| Factor | Possible Problem/Correction |
|-------------------------|--|
| Rear roller level. | Reel and rear roller should be parallel for proper cutting performance (see Leveling Rear Roller in Adjustments section of this chapter). |
| Roller condition. | Make sure rollers rotate freely. Repair roller bearings if necessary (see Roller Service in Service and Repairs section of this chapter). |
| Traction speed. | <p>Check maximum governed engine speed. Adjust engine to specifications if necessary (see Adjustments section in Chapter 3 – Engine).</p> <p>The traction drive belt may be loose or worn. Check the condition of the traction belt. Replace traction drive belt if necessary.</p> |
| Groomer reel operation. | See Troubleshooting section of Chapter 8 – Groomer. |

Adjustments



CAUTION

Never work on the cutting unit with the engine running. Always stop the engine and remove the spark plug wire from the spark plug first.



DANGER

Contact with the reel, bedknife or other cutting unit parts can result in personal injury. Use heavy gloves when handling the cutting reel or bedknife.

Leveling Rear Roller

The precision machined components of the cutting unit frame keep the rear roller and cutting reel in alignment (parallel). If the side plates are disassembled or as the cutting reel wears, a limited amount of side plate adjustment is possible to make sure that the cutting unit is properly aligned.

1. Place the assembled cutting unit on a surface plate.
2. Make sure that bedknife is properly adjusted to cutting reel.
3. Using the surface plate, check if rear roller is level to cutting reel by using a 0.005" (0.13 mm) shim at each end of rear roller. If the shim will pass under the roller at one end but not the other, a frame adjustment should be made.
4. Loosen, but do not remove, the two (2) shoulder bolts that secure the side plate to the frame opposite the side that is not level (Fig. 14).
5. Adjust the position of the side plate to parallel the rear roller and cutting reel. Then, tighten the shoulder bolts to a torque from **210 to 240 in-lb (24 to 27 N-m)**.
6. After tightening the side plate, recheck the rear roller. If necessary, loosen and adjust second side plate.
7. After leveling rear roller, complete cutting unit set-up and adjustment sequence.

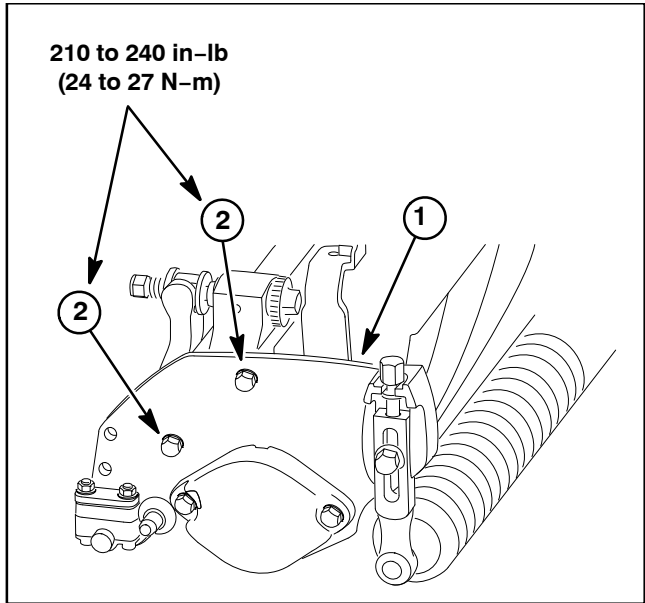


Figure 14

1. Side plate (RH shown) 2. Shoulder bolt

Service and Repairs

Backlapping

**DANGER**

TO AVOID PERSONAL INJURY OR DEATH:

- Never place hands or feet in the reel area while backlapping. Stay away from the reel when backlapping.
- Do not attempt to restart reel by hand or foot.
- Do not adjust cutting reel while backlapping.
- Never use a short handled paint brush for applying lapping compound. Part Number TOR299100 backlapping brush assembly (see Special Tools) is available from your local Authorized Toro Distributor.

NOTE: Additional instructions and procedures on backlapping are available in the Toro General Service Training Book, Reel Mower Basics (part no. 09168SL).

1. Park machine on a level surface. Make sure the engine is OFF and the traction lever is in NEUTRAL.

2. The backlapping operation can be done with the cutting unit either removed or attached to the traction unit.

A. If cutting unit is attached to the traction unit, slide the telescoping coupler off the cutting unit hex shaft before backlapping. Also, remove spark plug wire from the engine spark plug and make sure reel drive lever is DISENGAGED.

3. Make initial reel to bedknife adjustments appropriate for backlapping on cutting unit.

4. Remove plug from the reel drive cover on the left side of the reel assembly (Fig. 16).

5. Insert a 1/2" socket onto hex of reel drive shaft.

6. Backlap according to procedure in Toro General Service Training Book, Reel Mower Basics (part no. 09168SL).

7. When the backlapping operation is completed and cutting reel is stopped, run a file across the front face of the bedknife (Fig. 17). This will remove any burrs or rough edges that may have built up on the cutting edge.

8. Install reel drive cover plug when backlapping operation is completed (Fig. 16).

9. Adjust cutting unit reel to bedknife as needed.

10. If cutting unit is attached to the traction unit, slide the telescoping coupler onto the cutting unit hex shaft. Attach spark plug wire to the engine spark plug.

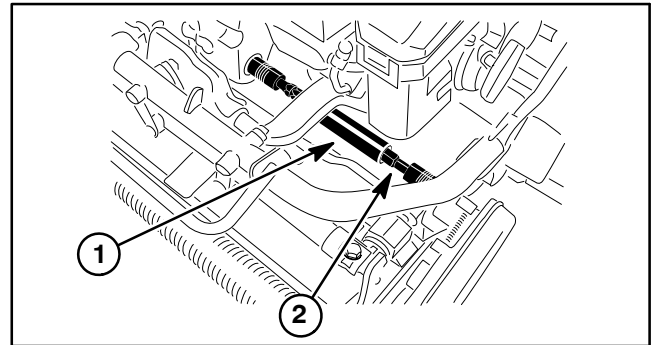


Figure 15

1. Telescoping coupler 2. Cutting unit hex shaft

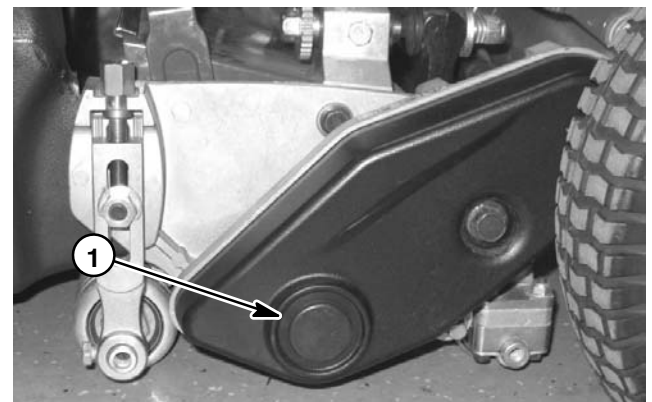


Figure 16

1. Cover plug

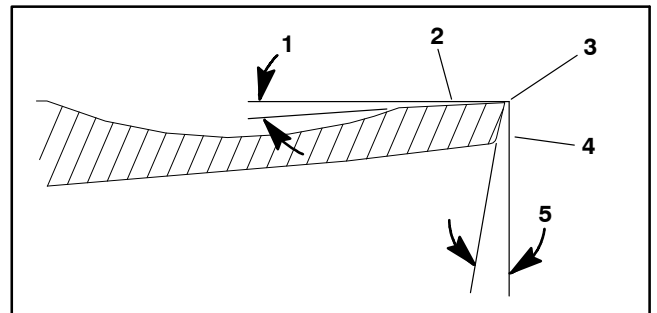


Figure 17

1. Top angle 4. Front surface
2. Top surface 5. Front angle
3. Remove burr

Cutting Unit

Bedbar Assembly

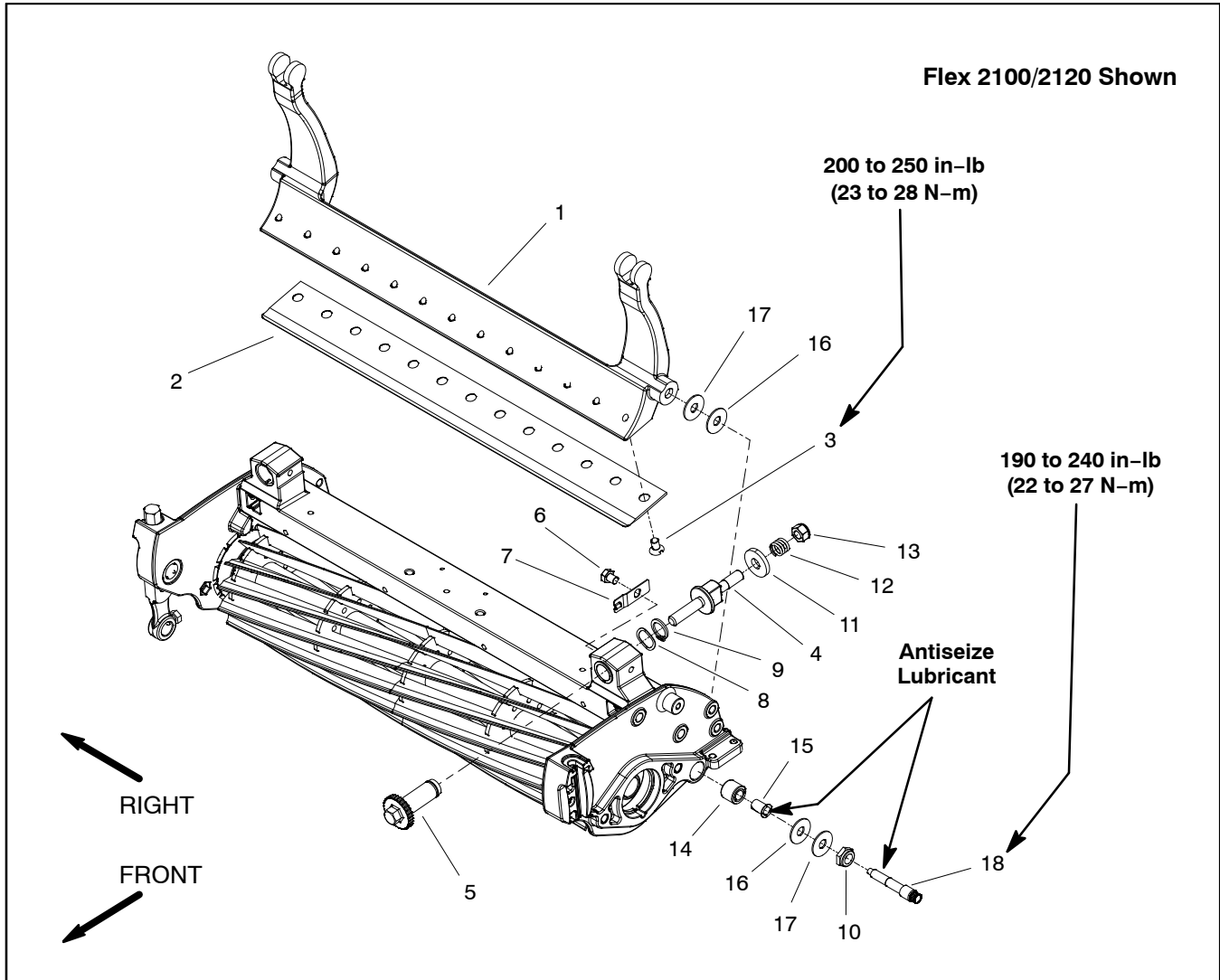


Figure 18

- | | | |
|-----------------------------------|---------------------------------|--------------------------------|
| 1. Bedbar | 7. Detent (2 used) | 13. Lock nut (2 used) |
| 2. Bedknife | 8. Wave washer (2 used) | 14. Rubber bushing (2 used) |
| 3. Screw (13 used) | 9. Retaining ring (2 used) | 15. Nylon bushing (2 used) |
| 4. Bedbar adjuster screw (2 used) | 10. Lock nut (2 used) | 16. Plastic washer (4 used) |
| 5. Bedbar adjuster shaft (2 used) | 11. Washer (2 used) | 17. Metal washer (4 used) |
| 6. Cap screw (2 used) | 12. Compression spring (2 used) | 18. Bedbar pivot bolt (2 used) |

Bedbar Removal (Fig. 18)

1. Park machine on a level surface. Make sure the engine is OFF and the traction lever is in NEUTRAL.
2. Remove the cutting unit from the machine and place cutting unit on a flat work area.
3. Tip the cutting unit to expose the bedknife. Support the rear of the cutting unit (see Supporting Cutting Unit when Servicing in the General Information section of this chapter).
4. Loosen the lock nuts (item 13) on the end of each bedbar adjuster assembly until washer (item 11) is loose.
5. Loosen the lock nuts (item 10) on each bedbar pivot bolt (item 18).
6. Remove two (2) bedbar pivot bolts (item 18), four (4) metal washers (item 17) and four (4) plastic washers (item 16) from the cutting unit side plates.



CAUTION

Contact with the reel, bedknife or other cutting unit parts can result in personal injury. Use heavy gloves when handling the bedbar.

7. Remove bedbar assembly from cutting unit.

8. Inspect nylon bushings (item 15) and rubber bushings (item 14) in side plates for wear or damage. Remove bushings and replace if necessary.

Bedbar Installation (Fig. 18)

1. If rubber bushing was removed from either cutting unit side plate, apply grease to outside surface of new bushing and install into side plate. The bushing should be installed flush with the inside of the side plate (Fig. 19).

2. If removed, install the nylon bushings (item 15) with flange facing outward. Apply antiseize lubricant to inside of flange bushing.

3. Apply antiseize lubricant to the bedbar threads and the shoulder area of each bedbar pivot bolt (Fig. 19).

IMPORTANT: When installing washers (items 16 and 17), make sure that plastic washers are positioned on either side of the cutting unit sideplate (Fig. 19).

4. Slide one (1) metal washer (item 17) and then one (1) plastic washer (item 16) onto each bedbar pivot bolt.



CAUTION

Contact with the reel, bedknife or other cutting unit parts can result in personal injury. Use heavy gloves when handling the bedbar.

5. Position bedbar into cutting unit. Make sure that the top of each bedbar arm is between washer (item 11) and adjuster screw flange (item 4).

6. Position one (1) metal washer (item 17) and one (1) plastic washer (item 16) between bedbar and each cutting unit side plate (Fig. 19).

7. Install the bedbar pivot bolt assemblies. Make sure that plastic washers are not caught on the threads of the pivot bolts. Torque each bedbar pivot bolt from **190 to 240 in-lb (22 to 27 N-m)**.

8. Tighten both lock nuts (item 10) until outside washers do not have any endplay but still can be rotated. Do not over tighten the lock nuts as this can distort the side plates and affect reel bearing adjustment. When the lock nut is correctly tightened, there may be a gap at the inside washers.

9. Tighten the lock nut (item 13) on each bedbar adjuster assembly until the adjuster spring is fully compressed, then loosen lock nut 1/2 turn.

10. Adjust cutting unit (see Cutting Unit Operator's Manual).

11. Install cutting unit to machine.

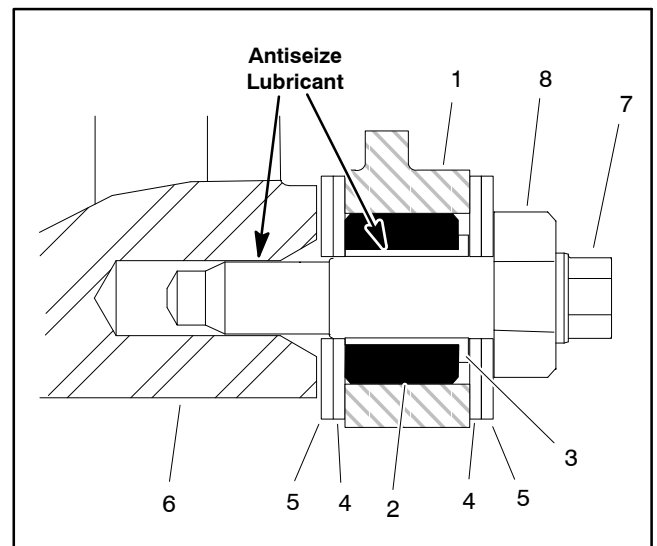


Figure 19

- | | |
|---------------------------|----------------------|
| 1. Cutting unit sideplate | 5. Metal washer |
| 2. Rubber bushing | 6. Bedbar |
| 3. Nylon bushing | 7. Bedbar pivot bolt |
| 4. Plastic washer | 8. Lock nut |

Bedknife Replacement and Grinding

Bedknife Removal

1. Remove bedbar from cutting unit (see Bedbar Removal in this section).

NOTE: Flex 1800/1820 cutting units use 11 screws to secure bedknife to bedbar. Flex 2100/2120 cutting units use 13 screws to secure bedknife to bedbar (Fig. 20).

2. Remove screws from bedbar using a socket wrench and bedknife screw tool (see Special Tools in this chapter). Discard screws. Remove bedknife from the bedbar.

3. See bedknife grinding information on the following pages.

Bedknife Installation

1. Use scraper to remove all rust, scale and corrosion from bedbar surface. Lightly oil bedbar surface before installing bedknife.

2. Make sure that screw threads in bedbar (5/16-18UNC-2A) are clean.

IMPORTANT: Do not use an impact wrench to tighten screws into the bedbar.

3. Use new screws to secure bedknife to bedbar. Apply antiseize lubricant to the threads of new screws. Do not apply antiseize lubricant to the taper of the screw heads.

4. Install all screws but do not tighten.

5. Using a torque wrench and bedknife screw tool, tighten the 2 outer screws to **10 in-lb (1 N-m)**.

6. Working from the center of the bedknife toward each end (Fig. 21), tighten screws from **200 to 250 in-lb (23 to 28 N-m)**.

7. After installing bedknife to bedbar, grind bedknife.

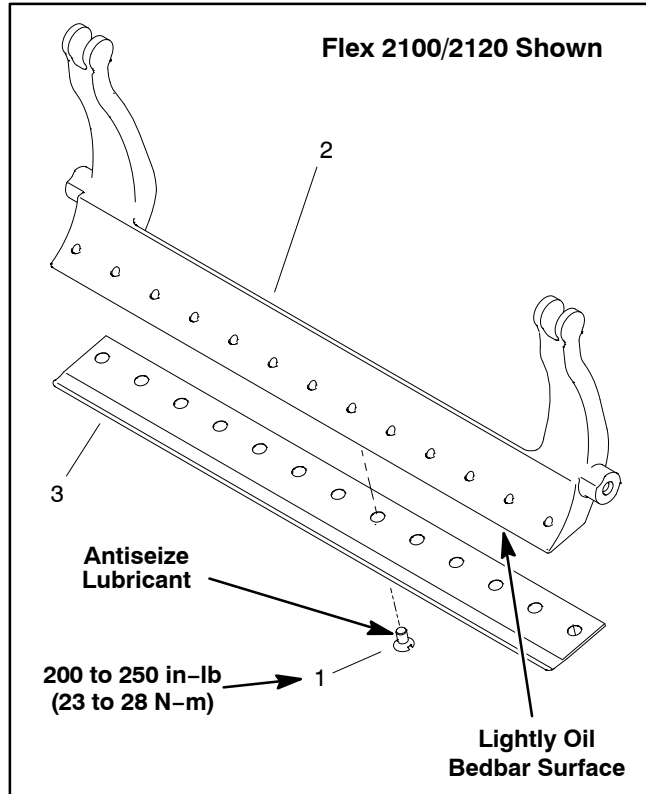


Figure 20

- 1. Screw (11 or 13)
- 2. Bedbar
- 3. Bedknife

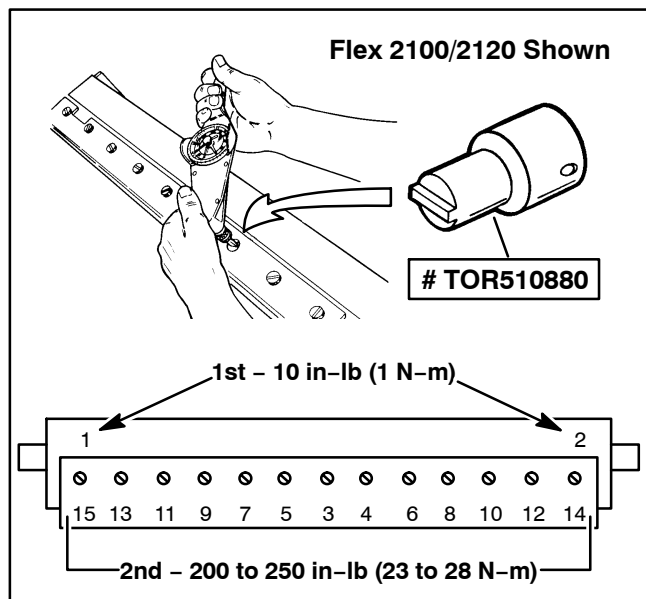


Figure 21

Bedknife Grinding

Since there can be variations in the mounting surface of the bedbar, it is necessary to grind the bedknife after installing it to the bedbar. Follow the bedknife grinding specifications provided (Fig. 22). Grind only enough so the top surface of the bedknife is true (Fig. 23).

IMPORTANT: Do Not grind the bedknife below its service limit (Fig 24). Operating the cutting unit with the bedknife below the service limit may result in poor after-cut appearance and reduce the structural integrity of the bedknife.

The bedknife service limit occurs when the reel contacts the back of the bedknife scallop during operation. Check for reel contact marks at the back of the bedknife scallop prior to grinding. The bedknife service limit may also occur when the bottom of the bedknife scallop is reached when grinding the bedknife.

When grinding the bedknife, be careful to not overheat the bedknife. Remove small amounts of material with each pass of the grinder. **Also, clean and dress grinding stone often during the grinding process.**

NOTE: EdgeMax[®] bedknives are extremely hard. Using a diamond grinding wheel is recommended to prevent overheating or damaging the bedknife edge while grinding.

Because the top grind angle on bedknives is critical for edge retention, and therefore after-cut appearance, Toro has developed special service tools for accurately measuring the top grind angle on all bedknives; refer to the Angle Indicator and Magnetic Mount in the Special Tools section of this Chapter.

1. Use Toro General Service Training Book, Reel Mower Basics (part no. 09168SL) and grinder manufacturer's instructions for bedknife grinding information.

2. After bedknife grinding is complete, install bedbar to cutting unit (see Bedbar Installation in this section).

NOTE: Always adjust the cutting unit after grinding the reel and/or bedknife; refer to the Cutting Unit Operator's Manual. If a properly adjusted cutting unit does not cut paper cleanly after grinding, the grind angle may be incorrect. To extend the cutting unit performance by allowing the reel and the bedknife to hold their edge longer, an additional adjustment may be required after the first few minutes of operation as the reel and bedknife conform to each other.

| Bedknife Grinding Specifications (see Fig. 23) | |
|--|------------|
| Standard bedknife relief angle | 3° minimum |
| Extended bedknife relief angle | 7° minimum |
| Front Angle Range | 13° to 17° |

Figure 22

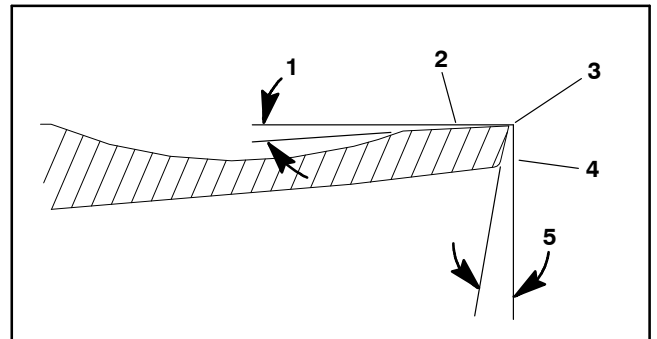


Figure 23

1. Top angle
2. Top surface
3. Remove burr (without dulling sharp corner)
4. Front surface
5. Front angle

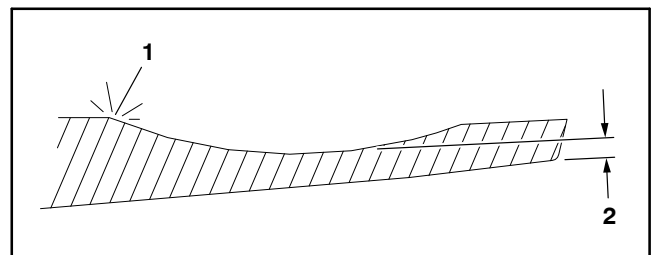


Figure 24

1. Service limit (reel contacts back of bedknife scallop during operation)
2. Service limit (bottom of bedknife scallop reached when grinding)

Bedbar Adjuster Service

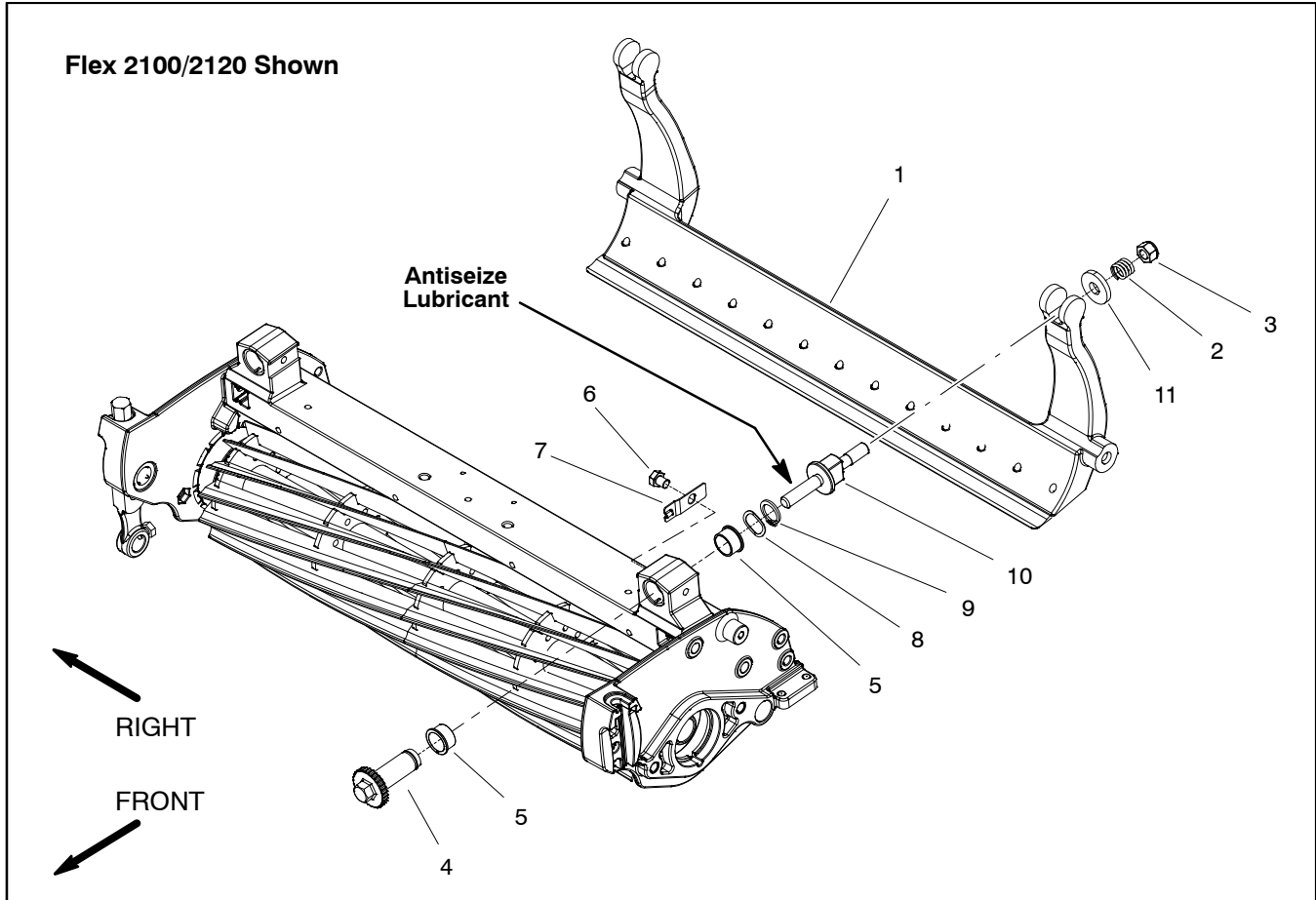


Figure 25

- | | | |
|--------------------------|-------------------|---------------------------|
| 1. Bedbar assembly | 5. Flange bushing | 9. Retaining ring |
| 2. Compression spring | 6. Cap screw | 10. Bedbar adjuster screw |
| 3. Lock nut | 7. Detent | 11. Washer |
| 4. Bedbar adjuster shaft | 8. Wave washer | |

NOTE: The detent (item 7) used on Flex 2100/2120 is toward the center of the cutting unit as shown in Figure 25. On Flex 1800/1820 cutting units, the detent is mounted on the outside of the cutting unit crossmember (Fig. 26). Cutting unit service procedures are the same on both models.

Removal (Fig. 25)

1. Remove lock nut (item 3), compression spring (item 2) and washer (item 11) from bedbar adjuster screw.

2. Remove bedbar (see Bedbar Removal in this section).

NOTE: Bedbar adjuster shaft (item 4) has left-hand threads.

3. Unscrew bedbar adjuster shaft (item 4) from the bedbar adjuster screw.

4. Remove retaining ring (item 9) and wave washer (item 8) from bedbar adjuster shaft and remove adjuster shaft from cutting unit frame.

5. Inspect flange bushings (item 5) in cutting unit side plate and remove if necessary.

6. If detent (item 7) is damaged, remove it from cutting unit side plate by removing the cap screw (item 6).

Installation (Fig. 25)

1. If detent (item 7) was removed, secure detent to cutting unit side plate with cap screw.

2. If flange bushings (item 5) were removed, align key on bushing to slot in frame and install bushings.

3. Slide bedbar adjuster shaft (item 4) into flange bushings in cutting unit side plate. Secure adjuster shaft with wave washer (item 8) and retaining ring (item 9).

NOTE: Bedbar adjuster shaft (item 4) has left-hand threads.

4. Apply antiseize lubricant to threads of bedbar adjuster screw that fit into adjuster shaft. Thread bedbar adjuster screw (item 10) into adjuster shaft.

5. Install bedbar (see Bedbar Installation in this section).

6. Install washer (item 11), spring (item 2) and lock nut (item 3) onto adjuster screw. Tighten the lock nut on each bedbar adjuster assembly until the compression spring is fully compressed, then loosen lock nut 1/2 turn.

7. Adjust cutting unit (see Cutting Unit Operator's Manual).

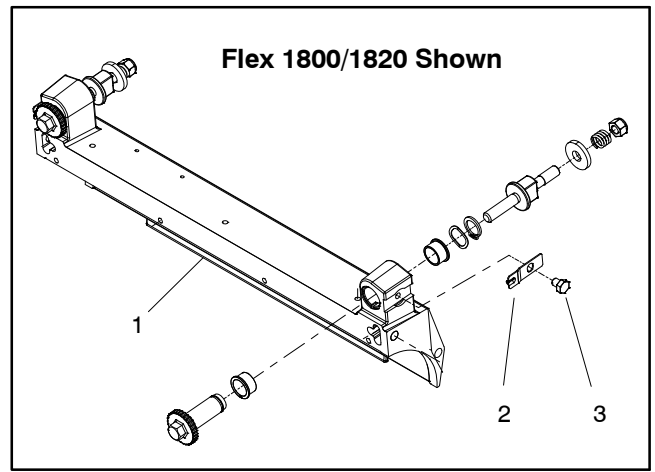


Figure 26

1. Crossmember
2. Detent

3. Cap screw

Reel Assembly

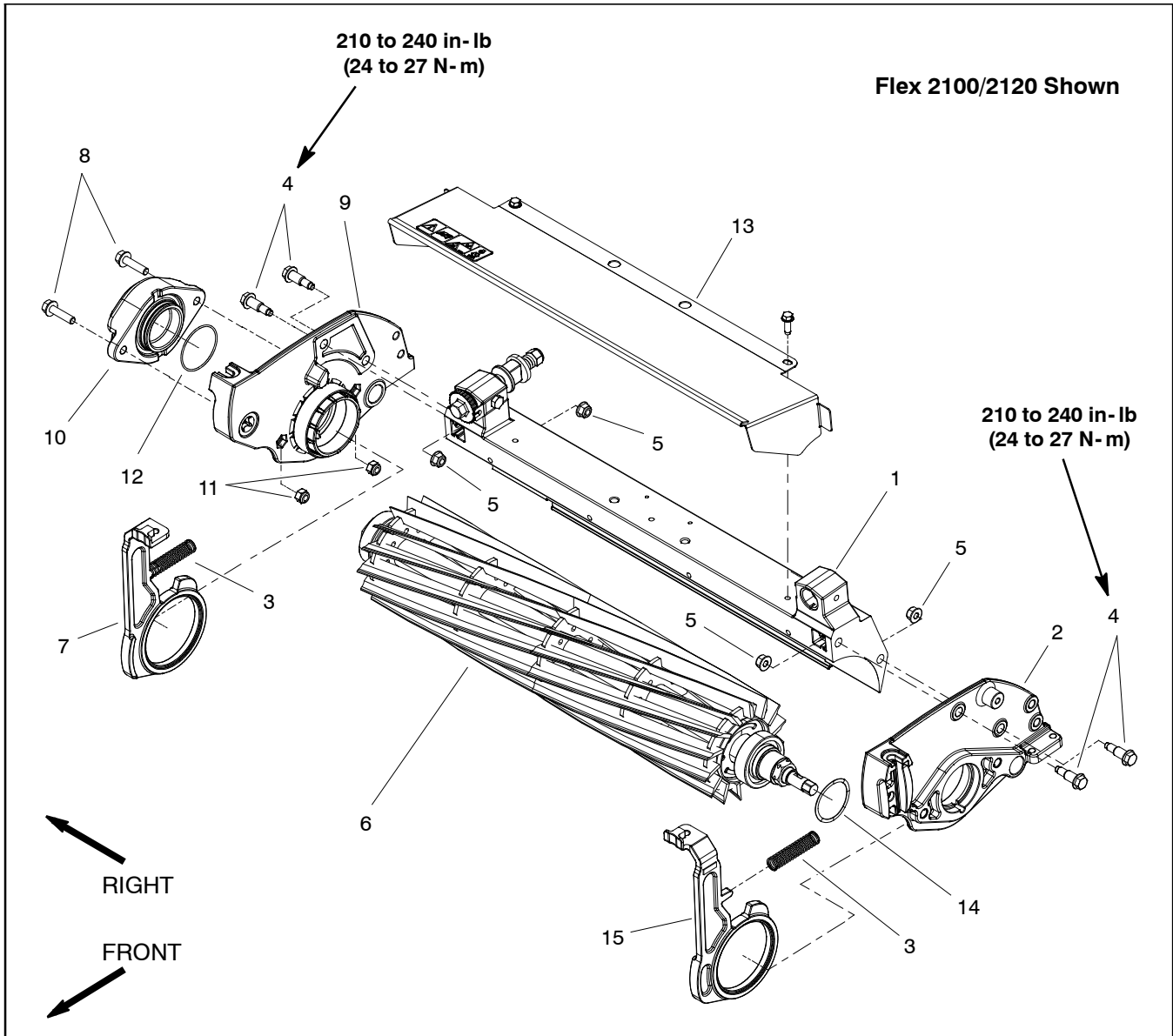


Figure 27

- | | | |
|--|-------------------------------|----------------------|
| 1. Crossmember | 6. Cutting reel assembly | 11. Hex nut |
| 2. LH side plate | 7. RH pitch arm | 12. O-ring |
| 3. Compression spring (2 used) | 8. Flange head screw (2 used) | 13. Grass shield |
| 4. Shoulder bolt (2 used per side plate) | 9. RH side plate | 14. Flat wire spring |
| 5. Flange nut (2 used per side plate) | 10. Weight | 15. LH pitch arm |

NOTE: This section provides the procedure for removing and installing the cutting reel assembly (cutting reel, flocked seals, reel bearings, bearing lock screw and reel nut) from the cutting unit. Refer to Cutting Reel Assembly Service in this section for information on servicing the cutting reel assembly.

NOTE: Flex 2100/2120 cutting units use shoulder bolts (item 4) and flange nuts (item 5) to secure the side plates to the crossmember as shown in Figure 27. On Flex 1800/1820 cutting units, square nuts are used instead of flange nuts. Cutting unit service procedures are the same on both models.

Reel Assembly Removal (Fig. 27)

NOTE: Removal of the cutting reel can be completed by removing the RH side plate from the cutting unit crossmember. The LH side plate (including the reel drive assembly) does not have to be removed from the crossmember when using the following procedure.



CAUTION

Contact with the reel, bedknife or other cutting unit parts can result in personal injury. Use heavy gloves when removing the cutting reel.

1. Park machine on a level surface. Make sure the engine is OFF and the traction lever is in NEUTRAL.
2. Remove the cutting unit from the machine and place cutting unit on a flat work area.
3. Remove reel drive cover and belt from reel drive assembly. Then, remove reel pulley from reel drive shaft. Refer to Reel Drive Assembly in the Service and Repairs section of Chapter 4 - Traction and Reel Drive System for procedure to remove these components.

IMPORTANT: If the reel bearings or seals are being replaced, the bearing lock screw and the reel drive shaft must be removed. Use the following procedure to restrain the reel and loosen the components before removing the rollers.

4. Loosen the bearing lock screw and the reel drive shaft (Fig. 29):

A. Tip up the cutting unit to access the bottom of the reel.

B. Insert a long-handled pry bar (3/8 x 12 inch with screwdriver handle recommended) through the bottom of the cutting unit. The pry bar should pass between the top of the reel shaft and the backs of the reel blades so that the reel will not move (Fig. 30).

IMPORTANT: To avoid grinding the reel, do not contact the cutting edge of any blade with the pry bar as this may damage the cutting edge and/or cause a high blade.

C. Move the pry bar against the weld side of the reel support plate closest to the bearing lock screw.

IMPORTANT: The reel drive shaft on the left end of the cutting reel has left-hand threads. The bearing lock screw on the right end of the cutting reel has right-hand threads.

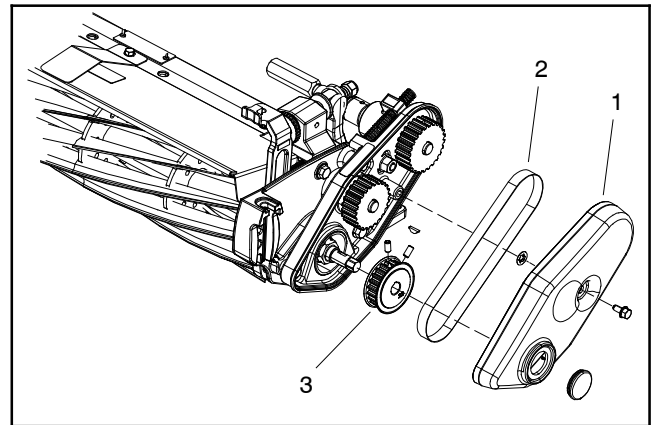


Figure 28

- | | |
|---------------------|----------------|
| 1. Reel drive cover | 3. Reel pulley |
| 2. Belt | |

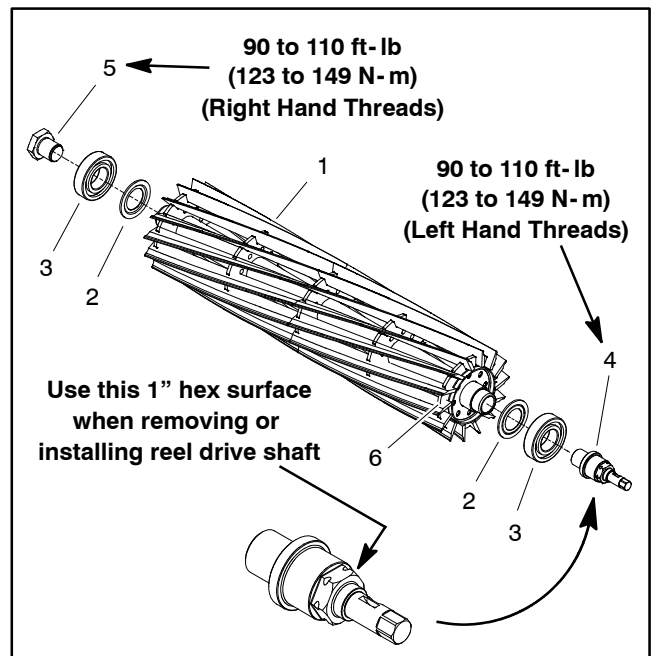


Figure 29

- | | |
|--------------------------|-------------------------|
| 1. Cutting reel | 4. Reel drive shaft |
| 2. Flocked seal (2 used) | 5. Bearing lock screw |
| 3. Bearing (2 used) | 6. Reel groove location |

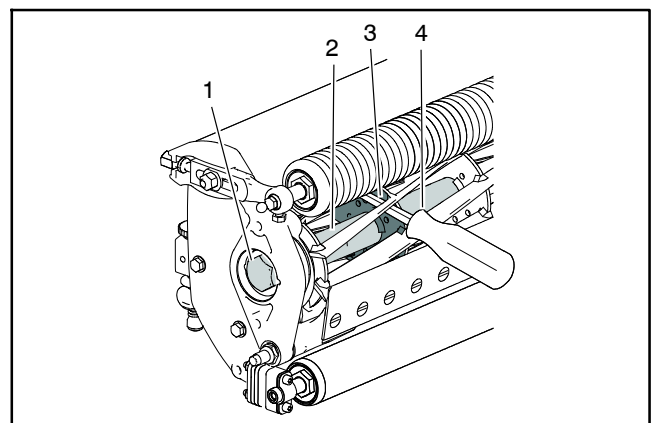


Figure 30

- | | |
|-----------------------|-----------------------------|
| 1. Bearing lock screw | 3. Support plate, weld side |
| 2. Reel shaft | 4. Pry bar |

D. Rest the handle of the pry bar against the front roller and loosen the bearing lock screw.

IMPORTANT: Do not use 1/2" extension on end of reel drive shaft when loosening or tightening drive shaft. The 1/2" hex is intended for backlapping only.

E. Position the pry bar in the same manner on the opposite end of the reel and use the appropriate wrench or socket on the 1" hex portion of the shaft to loosen the reel drive shaft.

F. Tip the cutting unit back onto its rollers.

5. Remove the bedbar pivot bolt and washers from the RH side plate. Note location of plastic and steel washers for assembly purposes (see Bedbar Removal in this section).

6. Loosen fasteners that secure front and rear rollers to RH side plate (see Front Roller Removal and Rear Roller Removal in this section).

7. Support cutting reel to prevent it from shifting or falling.

8. Remove shoulder bolts (item 4) and flange nuts (item 5) that secure the RH side plate to the cutting unit crossmember. Remove the RH side plate from the reel shaft, rollers, bedbar and cutting unit crossmember. Remove pitch arm (item 7) and compression spring (item 3) from RH side plate.

9. Carefully slide the cutting reel assembly (with flocked seals, reel bearings, bearing lock screw and reel drive shaft) from the LH side plate. Locate and remove flat wire spring (item 14).

Reel Assembly Installation (Fig. 27)

1. Thoroughly clean side plates and other cutting unit components. Inspect side plates and pitch arms for wear or damage and replace components if needed.

2. Make sure that flocked seals, reel bearings, bearing lock screw and reel drive shaft are properly positioned on cutting reel (see Reel Assembly Service in this section).

**CAUTION**

Contact with the reel, bedknife or other cutting unit parts can result in personal injury. Use heavy gloves when installing the cutting reel.

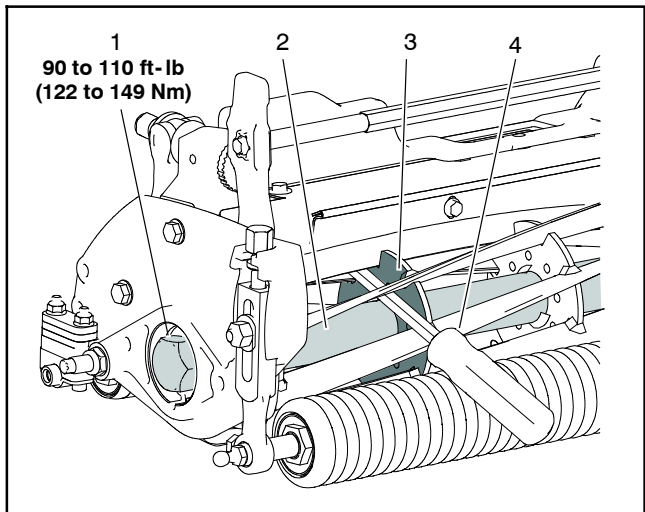


Figure 31

- | | |
|-----------------------|-----------------------------|
| 1. Bearing lock screw | 3. Support plate, weld side |
| 2. Reel shaft | 4. Pry bar |

3. Position the cutting unit on a flat work area. The rollers, bedbar and cutting unit crossmember should be attached to LH side plate. Make sure that pitch arm (item 15) and compression spring (item 3) is fitted to LH side plate.

4. Place flat wire spring into bearing bore of LH side plate. Carefully slide the cutting reel assembly (with flocked seals, reel bearings, bearing lock screw and reel drive shaft) into the LH side plate. Make sure that bearing is fully seated into side plate.

5. Carefully slide the RH side plate with pitch arm (item 7) and compression spring (item 3) onto the cutting reel assembly, front roller and rear roller. Make sure that side plate is fully seated onto bearing on reel shaft.

6. Install shoulder bolts (item 4) and flange nuts (item 5) to secure the RH side plates to the crossmember. Torque the shoulder bolts from **210 to 240 in-lb (24 to 27 N-m)**.

7. Secure front and rear rollers to RH side plate (see Front Roller Installation and Rear Roller Installation in this section).

8. Secure the bedbar assembly to RH side plate (see Bedbar Installation in this section). Make sure that plastic and steel washers are properly positioned.

9. If loosened during cutting reel service, tighten the bearing lock screw and the reel drive shaft (Fig. 29).

A. Insert a long-handled pry bar (3/8 x 12 inch with a screwdriver handle recommended) through the front of the cutting unit. The pry bar should pass between the top of the reel shaft and the backs of the reel blades so that the reel will not move (Fig. 31).

IMPORTANT: To avoid grinding the reel, do not contact the cutting edge of any blade with the pry bar as this may damage the cutting edge and/or cause a high blade.

B. Move the pry bar against the weld side of the reel support plate closest to the bearing lock screw.

IMPORTANT: The reel drive shaft on the left end of the cutting reel has left-hand threads. The bearing lock screw on the right end of the cutting reel has right-hand threads.

C. Rest the handle of the pry bar against the front roller and tighten the bearing lock screw from **90 to 110 ft-lb (123 to 149 N-m)**.

IMPORTANT: Do not use 1/2" extension on end of reel drive shaft when loosening or tightening drive shaft. The 1/2" hex is intended for backlapping only.

D. Position the pry bar in the same manner on the opposite end of the reel and use the appropriate wrench or socket on the 1" hex portion of the shaft to tighten the reel drive shaft from **90 to 110 ft-lb (123 to 149 N-m)**.

10. Adjust cutting unit (see Cutting Unit Operator's Manual).

NOTE: The parallel position of the rear roller to the cutting reel is controlled by the precision machined cross-member and side plates of the cutting unit. If necessary, the cutting unit side plates can be loosened and a slight adjustment can be made to parallel the rear roller with the cutting reel (see Leveling Rear Roller in the Set-Up and Adjustments section of this Chapter).

11. Install reel pulley, belt and reel drive cover to reel drive assembly. Refer to Reel Drive Assembly in the Service and Repairs section of Chapter 4 - Traction and Reel Drive System for procedure to install and adjust these components.

12. Install cutting unit to the machine.

Reel Assembly Service

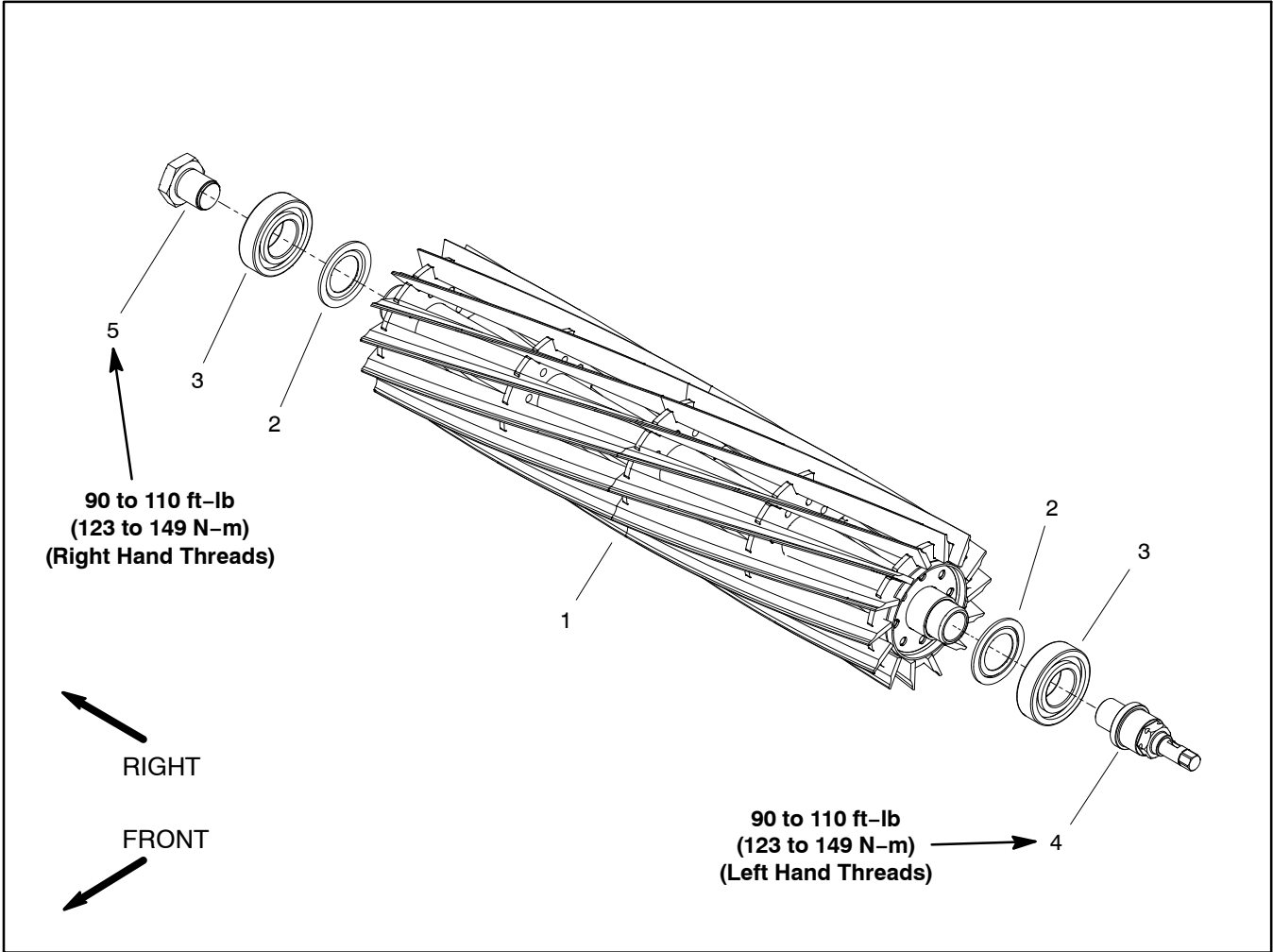


Figure 30

- 1. Cutting reel
- 2. Flocked seal (2 used)
- 3. Bearing (2 used)
- 4. Reel drive shaft (LH threads)
- 5. Bearing lock screw (RH threads)

Disassembly of Cutting Reel (Fig. 30)

IMPORTANT: When removing reel drive shaft (item 4), use appropriate wrench or socket on 1" hex surface of shaft. Do not use 1/2" extension on end of reel drive shaft when loosening or tightening drive shaft. The 1/2" hex is intended for backlapping only.

1. Remove bearing lock screw (item 5) and reel drive shaft (item 4) from cutting reel. Reel drive shaft has LH threads and is in end of reel shaft identified with a groove that is just inside of reel spider (Fig. 31).
2. Slide bearings from reel shaft.
3. Note orientation of flocked seals for assembly purposes. Remove seals from reel shaft.

Inspection of Cutting Reel (Fig. 30)

1. Inspect reel bearings to insure that they spin freely and have minimal axial play.
2. Inspect the reel shaft as follows. If reel damage is detected, replace cutting reel.
 - A. Check the reel shaft for bending and distortion by placing the shaft ends in V-blocks.
 - B. Check the reel blades for bending or cracking.
 - C. Check the service limit of the reel diameter (see Preparing a Reel for Grinding in this section).
 - D. Check threads in ends of reel shaft.
3. Check the woodruff key slot and hex drive on the reel drive shaft (item 4) for excessive wear or distortion. Replace drive shaft if damage is evident.

Assembly of Cutting Reel (Fig. 30)

1. If bearings and/or flocked seals were removed from reel shaft, discard removed components and replace.

IMPORTANT: The flocked seal should be installed so the flocked side of the seal is toward the bearing location.

2. Press flocked seals onto reel shaft with flocked side orientated toward bearing location. Seal should be perpendicular to reel shaft after installation.

3. Slide bearings fully onto reel shaft. Bearings should bottom on reel shaft shoulder.

IMPORTANT: When installing reel drive shaft (item 4), use appropriate wrench or socket on 1" hex surface of shaft. Do not use 1/2" extension on end of reel drive shaft when loosening or tightening drive shaft. The 1/2" hex is intended for backlapping only.

4. Install bearing lock screw (item 5) and reel drive shaft (item 4) into reel shaft to secure bearings. Reel drive shaft has LH threads and should be installed in end of reel shaft identified with a groove that is just inside of reel spider (Fig. 31).

NOTE: Installation torque for bearing lock screw and reel drive shaft is from **90 to 110 ft-lb (123 to 149 N-m)**. It is easiest to torque these items after the cutting reel is installed in the cutting unit frame (see Reel Assembly Removal and Installation in this section).

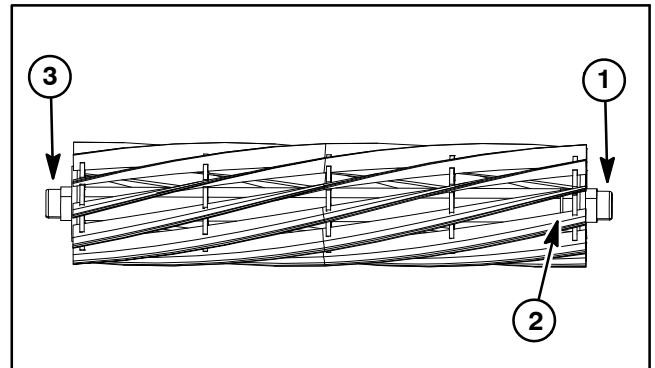


Figure 31

1. LH threads
2. Groove

3. RH threads

Preparing Reel for Grinding

NOTE: Before grinding a cutting reel, make sure that all cutting unit components are in good condition. Depending on type of grinder used, faulty cutting unit components can affect grinding results.

NOTE: When grinding, be careful to not overheat the cutting reel blades. Remove small amounts of material with each pass of the grinder.

1. Follow reel grinder manufacturer's instructions to grind cutting reel to Toro specifications (see Reel Grinding Specifications chart to the right). Additional reel grinding information can be found in the Toro General Service Training Book, Reel Mower Basics (part no. 09168SL).

2. After completing the reel grinding process, adjust cutting unit (see Cutting Unit Operator's Manual).

| Reel Grinding Specifications | |
|-------------------------------------|-----------------------------------|
| Reel Diameter (New) | 5.060 in (128.5 mm) |
| Service Limit - Reel Diameter | 4.500 in (114.3 mm) |
| Reel Shaft Diameter (OD) | 1.375 in (34.9 mm) |
| Blade Relief Angle | 30° |
| Blade Relief Angle Range | 28° to 32° |
| Blade Land Width | 0.040 in (1.0 mm) |
| Blade Land Width Range | 0.030 to 0.050 in (0.8 to 1.2 mm) |
| Service Limit - Reel Diameter Taper | 0.010 in (0.25 mm) |

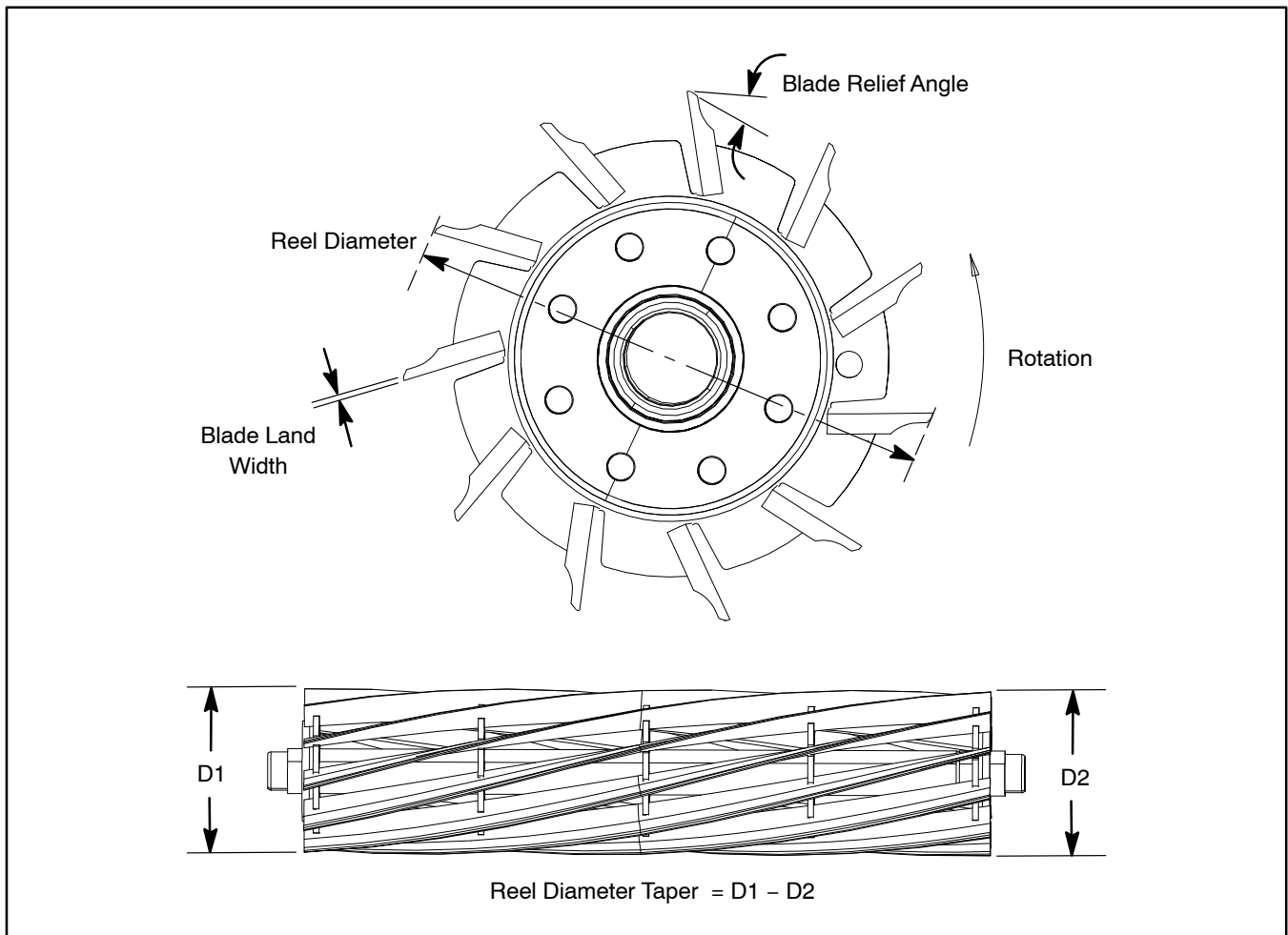


Figure 32

Front Roller

Removal (Fig. 33)

1. Park machine on a level surface. Make sure the engine is OFF and the traction lever is in NEUTRAL.
2. Remove the cutting unit from the machine and place on a level working surface. Use appropriate support to raise front roller from work surface.
3. Loosen cap screw (item 1) that secures the front roller shaft to each front height-of-cut arm.
4. On one of the height-of-cut arms, remove HOC nut (item 7), HOC washer (item 6) and plow bolt (item 4) that secure HOC arm to the cutting unit side plate. Remove the HOC arm from the cutting unit.
5. Slide the front roller assembly from the remaining HOC arm on the cutting unit.
6. If necessary, remove the second HOC arm from the cutting unit.

Installation (Fig. 33)

1. Place cutting unit on a level working surface and use appropriate support to support front of cutting unit.
2. Inspect condition of HOC screws (item 5) in both HOC arms. If necessary, apply antiseize lubricant to threads of new HOC screw. Thread new HOC screw into HOC arm.

NOTE: When assembling HOC arms to side plates, make sure that ring on HOC screw fits into the notch on the side plate.

3. If both HOC arms were removed from cutting unit side plate, position one of the arms to side plate. Secure arm to side plate with plow bolt (item 4), HOC washer (item 6) and HOC nut (item 7). Tab on HOC washer should be positioned into HOC arm slot and orientated down toward the roller.

4. Slide front roller shaft into arm attached to the cutting unit. Slide second HOC arm onto the other end of roller shaft. Secure second arm to cutting unit side plate with plow bolt (item 4), HOC washer (item 6) and HOC nut (item 7).

5. Center front roller to the cutting reel and secure to HOC arms with cap screws (item 1).

6. Adjust cutting unit (see Cutting Unit Operator's Manual).

7. Install cutting unit to machine.

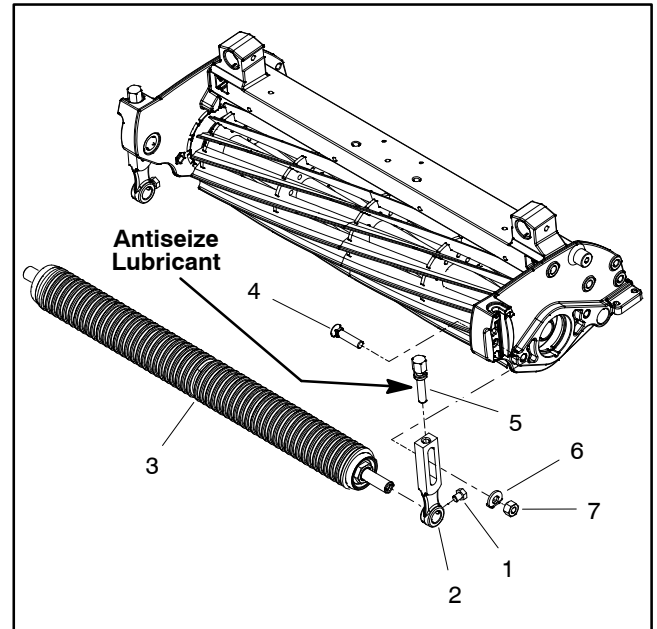


Figure 33

- | | |
|--------------------------|---------------|
| 1. Cap screw | 5. HOC screw |
| 2. HOC arm | 6. HOC washer |
| 3. Front roller assembly | 7. HOC nut |
| 4. Plow bolt | |

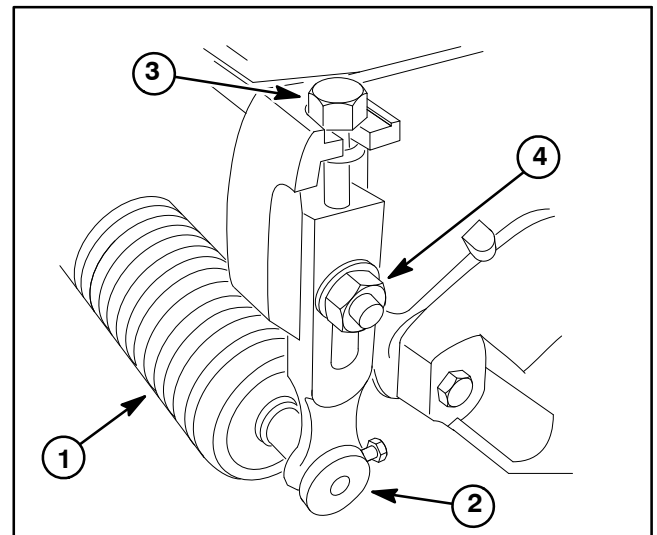


Figure 34

- | | |
|--------------------------|---------------------|
| 1. Front roller assembly | 3. HOC screw |
| 2. HOC arm | 4. HOC washer & nut |

Rear Roller

Removal (Fig. 35)

1. Park machine on a level surface. Make sure the engine is OFF and the traction lever is in NEUTRAL.
2. Remove the cutting unit from the machine and place on a level working surface. Place support blocks under bedbar to raise rear roller from work surface.
3. Loosen two (2) flange nuts that secure the rear roller shaft to each rear roller bracket.
4. On one of the rear roller brackets:

NOTE: On cutting units equipped with optional High Height of Cut Kit, there will be additional roller shims installed between rear roller bracket and cutting unit side plate.

- A. Note quantity and location of roller shims for assembly purposes.
 - B. Remove flange nuts and socket head screws that secure rear roller bracket and roller shims to the cutting unit side plate.
 - C. Remove the roller bracket and roller shims from the rear roller and cutting unit.
5. Slide the rear roller assembly from the remaining rear roller bracket on the cutting unit.
 6. If necessary, remove the second rear roller bracket and roller shims from the cutting unit.

Installation (Fig. 35)

1. Place cutting unit on a level working surface.

NOTE: Refer to Cutting Unit Operator's Manual for number of roller shims required for various height of cut settings.

2. If both rear roller brackets were removed from cutting unit side plate, position brackets and roller shims to one of the side plates. Install two (2) carriage screws and flange nuts to retain bracket in position. Do not fully tighten flange nuts.

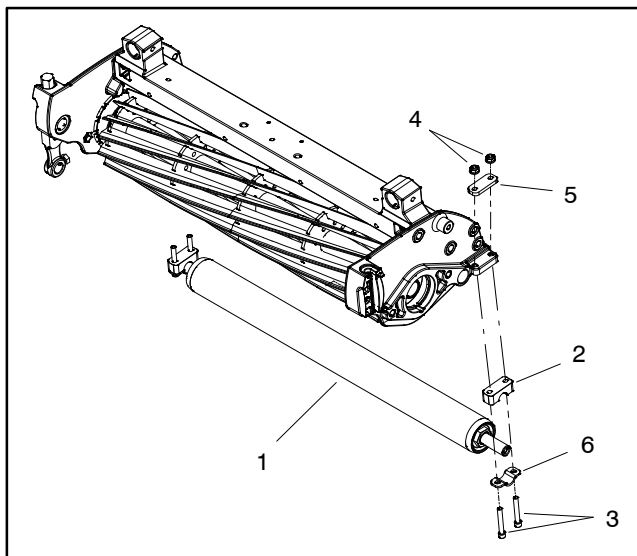


Figure 35

- | | |
|-------------------------|-------------------|
| 1. Rear roller assembly | 4. Flange nut |
| 2. Roller height spacer | 5. Roller shim |
| 3. Socket head screw | 6. Shaft retainer |

3. Slide rear roller shaft into the rear roller bracket attached to the cutting unit. Slide second rear roller bracket onto the other end of roller shaft. Secure second roller bracket and shims to cutting unit side plate with two (2) carriage screws and flange nuts. Do not fully tighten flange nuts.
4. Center rear roller to the cutting reel and secure in place by tightening four (4) flange nuts.
5. Adjust cutting unit (see Cutting Unit Operator's Manual).
6. Install cutting unit to machine.

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Roller Service

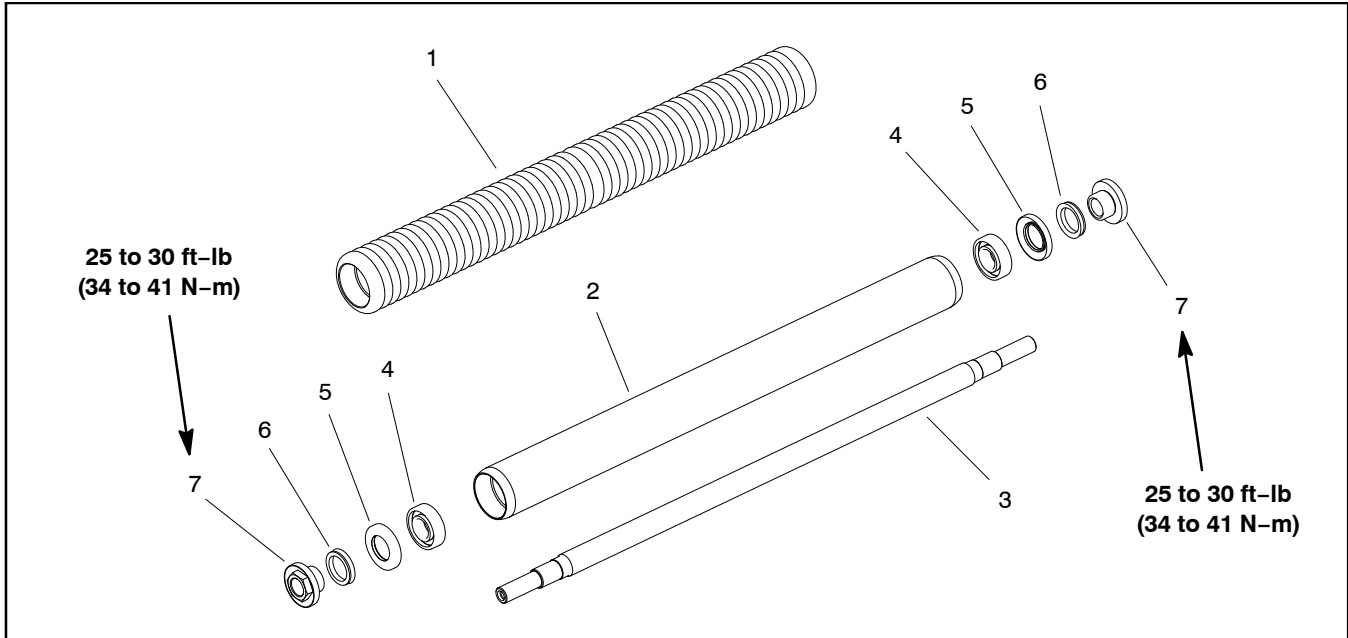


Figure 36

- | | | |
|------------------|-----------------|---------------------|
| 1. Weihle roller | 4. Ball bearing | 6. V-ring |
| 2. Smooth roller | 5. Seal | 7. Bearing lock nut |
| 3. Roller shaft | | |

Disassembly

1. To hold roller shaft for bearing lock nut removal, install a 3/8–24 UNF 2B screw into threaded end of roller shaft and secure screw in place with jam nut. While retaining shaft, remove bearing lock nut from each end of roller shaft.

2. Remove V-ring from each end of roller.

3. Carefully inspect seating surface and threads of bearing lock nuts. Replace lock nut if any damage is found.

4. Loosely secure roller assembly in bench vise and lightly tap one end of roller shaft until seal and bearing are removed from roller cavity. Remove second seal and bearing from roller cavity by tapping on shaft.

5. Clean bearing cavity in roller and remove any rust with crocus cloth.

Assembly

1. Place roller shaft into roller.

NOTE: If bearing lock nuts are being replaced, use original lock nuts for assembly purposes, if possible. This will preserve the patch lock feature in the new lock nuts. Use the new nuts only after new bearings and seals have been installed.

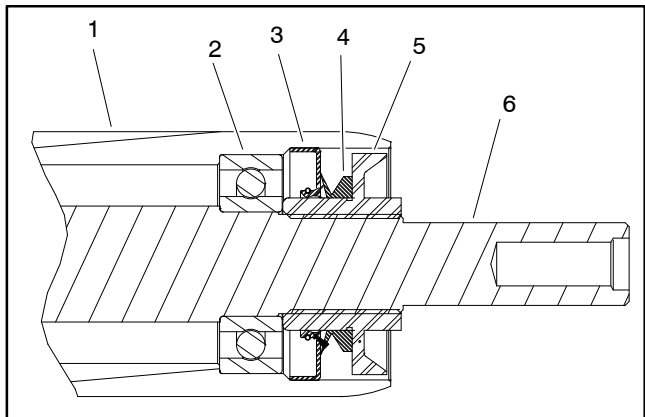


Figure 37

- | | |
|-----------------|---------------------|
| 1. Roller | 4. V-ring |
| 2. Ball bearing | 5. Bearing lock nut |
| 3. Seal | 6. Roller shaft |

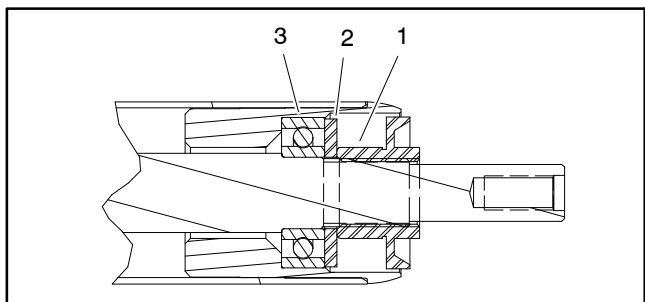


Figure 38

- | | |
|--------------------------|------------|
| 1. Bearing lock nut | 3. Bearing |
| 2. Black assembly washer | |

NOTE: Special tool TOR4105 (see Special Tools) can be used instead of washers and spacer when installing bearings and seals in roller.

2. Position a new bearing, black assembly washer (see Special Tools) and original lock nut onto each end of the roller shaft (Fig. 38).

3. Tighten nuts until the bearings are seated into each end of the roller.

4. Remove nut and black assembly washer from each end of the roller.

IMPORTANT: Failure to grease bearing lock nut before seal installation may result in seal damage.

5. Apply a coating of grease to the nut surface to prevent seal damage during seal installation (Fig. 39).

6. Carefully install seals onto bearing lock nuts. Pack the back of the seal 75 to 90% full with #2 grease (Fig. 39).

7. Install a nut with seal onto each end of the roller shaft. Tighten nuts until they bottom against bearings (Fig. 40). Remove nuts from roller shaft.

8. Position an assembly spacer and yellow assembly washer (see Special Tools) on each end of roller shaft (Fig. 41). Thread nut onto each end of shaft.

9. Tighten each nut until the yellow assembly washers bottom out against the roller housing. Remove nuts, assembly washers and assembly spacers from roller shaft.

10. Lubricate lips of installed seals with #2 grease.

11. Carefully slide a dry V-ring onto each bearing lock nut. The V-rings should be installed without any lubrication.

NOTE: If original bearing lock nut(s) are being used, apply Loctite #242 (or equivalent) to threads of lock nut(s).

12. Install bearing lock nut with V-ring onto each end of the roller shaft. Torque lock nuts from **25 to 30 ft-lb (34 to 41 N-m)**.

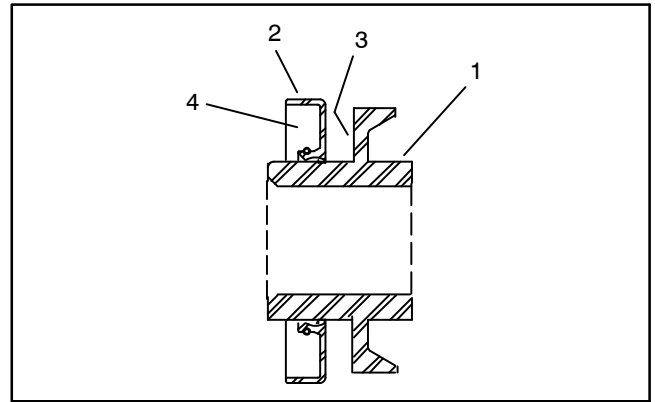


Figure 39

- | | |
|---------------------|-----------------------|
| 1. Bearing lock nut | 3. Grease nut surface |
| 2. Seal | 4. Pack with grease |

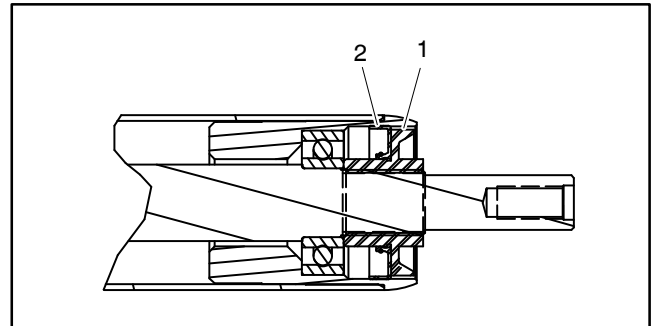


Figure 40

- | | |
|---------------------|---------|
| 1. Bearing lock nut | 2. Seal |
|---------------------|---------|

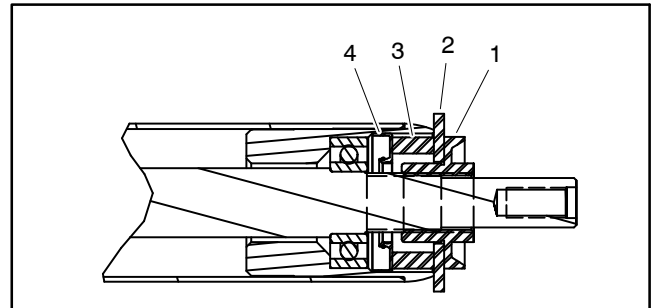


Figure 41

- | | |
|---------------------------|--------------------|
| 1. Bearing lock nut | 3. Assembly spacer |
| 2. Yellow assembly washer | 4. Seal |

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Belt Driven Groomer (Optional)

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Groomer

Specifications



MOUNTING: The groomer is mounted to the cutting unit side plates.

GROOMING REEL CONSTRUCTION: 2.375 inch (6 cm) diameter, 41 steel blades with 1/2 inch blade spacing. Blade spacing can be adjusted to 1/4 inch or 3/4 inch by altering the number and position of blade spacers on the groomer. Grooming reel is available with either steel or carbide tipped blades. The groomer brush can be installed in place of grooming reel.

GROOMER HEIGHT SETTING: From 0.030 to 0.620 inch (0.8 to 15.7 mm) at mowing HOC range of 0.060 to 0.750 inch (1.5 to 19.1 mm).

WIDTH-OF-GROOMER: 19.380 inches (50.3 cm).

HEIGHT ADJUSTMENT KNOB: Allows a 0.003 inch (0.08 mm) increment of height adjustment for each click of the adjuster.

UP-DOWN FEATURE: Allows grooming reel to be raised above the height/depth adjustment for no grooming reel action while mowing.

GROOMER DRIVE: Both forward rotating and counter rotating groomer drive systems are available for the Flex machines. The groomer drive assembly is attached to the right side of the cutting unit.

General Information

Installation Instructions

The Installation Instructions for the groomer provide information regarding the operation, general maintenance procedures and maintenance intervals for the groomer assembly on your Greensmaster Flex machine. Refer to this publication for additional information when servicing the groomer assembly.

Troubleshooting

Factors Affecting Grooming

There are a number of factors that can affect the performance of grooming. These factors vary for different golf courses and from green to green. It is important to inspect the turf frequently and vary the grooming practice with turf needs.

It is important to remember that factors affecting quality of cut also affect grooming performance.

Variables That Affect the Use and Performance of Grooming Reels:

1. The growing season and weather conditions.
2. General turf conditions.
3. The frequency of grooming/cutting – number of cuttings per week and how many passes per cutting.
4. The blade spacing on the grooming reel.
5. The height-of-cut.
6. The grooming depth.
7. The type of grass on the green.
8. The amount of time that a grooming reel has been in use on a particular turf area.
9. The amount of traffic on the turf.
10. The overall turf management program (e.g. irrigation, fertilizing, weed control, coring, overseeding, disease control, sand dressing and pest control).
11. Stress periods for turf (e.g. high temperatures, high humidity, unusually high traffic).

IMPORTANT: Improper or overaggressive use of the grooming reel, such as too deep or frequent grooming, may cause unnecessary stress on the turf leading to severe turf damage. Use the groomer carefully. READ AND UNDERSTAND THE INSTALLATION INSTRUCTIONS BEFORE OPERATING OR TESTING GROOMER PERFORMANCE.

Grooming Reel Mechanical Problems

| Problem | Possible Causes | Correction |
|--|---|---|
| The grooming reel rotates when it is in the raised, transport position (forward rotating groomer drive). | The grooming reel should rotate whenever the cutting reel is engaged. | Normal operation. |
| No rotation of the grooming reel (forward rotating groomer drive). | Seized grooming reel or idler bearing(s) in groomer side plate(s). Broken or damaged drive belt idler spring. The groomer drive belt is worn, broken or damaged. | Identify and replace faulty bearing(s). Replace idler spring. If the belt slips, it probably is worn and must be replaced. Repair or replace belt if necessary. A broken or worn belt could be the result of improper belt routing or seized bearings in groomer assembly. |
| No rotation of the grooming reel (counter rotating groomer drive). | Handle on groomer cover is rotated rearward so that groomer drive is disengaged. Seized grooming reel or idler bearing(s) in groomer side plate(s). Broken or damaged drive idler spring. Groomer drive gears are worn or damaged. | Handle needs to be rotated toward the front of the machine to engage the groomer drive. Identify and replace faulty bearing(s). Replace idler spring. Inspect groomer drive assembly and replace damaged drive components. |
| The turf is damaged or has uneven grooming. | The groomer is set too aggressively. The grooming reel blades are bent, damaged or missing. The grooming reel shaft is bent or damaged. Grooming depth is not equal on both ends of grooming reel. | Refer to groomer Installation Instructions for groomer set-up information. Repair or replace blades if necessary. Replace grooming reel shaft. Adjust depth if necessary. Check and adjust cutting unit set up (level bedknife to reel, level rear roller to reel, set height-of-cut, etc.). |

Adjustments



CAUTION

Never work on the cutting unit with the engine running. Always stop the engine and remove spark plug wire from the engine spark plug, before working on the cutting unit.

NOTE: See the Groomer Installation Instructions for adjustment procedures for the groomer on your Greensmaster.

Height/Depth of Groomer Adjustment

NOTE: Grooming is performed above the soil level. When adjusting groomer height/depth, groomer blades should never penetrate the soil.

1. Position machine on a clean and level surface with engine stopped. Engage parking brake.
2. Make sure rollers are clean and cutting reel is set to the desired height-of-cut (see Cutting Unit Operator's Manual for cutting unit adjustment procedures).
3. Position the grooming reel to the lowered, grooming position (Fig. 1).

NOTE: Improper or over-aggressive use of the grooming reel (i.e. too deep or too frequent grooming) may cause unnecessary stress on the turf leading to severe greens damage. Use the groomer cautiously.

4. On one end of the grooming reel, measure the distance from the lowest tip of the groomer blade to the working surface. Lift and turn height adjustment knob to raise or lower the blade tip (Fig. 1). Each notch on the adjustment knob changes the groomer height approximately 0.003 inch (0.08 mm).
5. Repeat step 4 on the opposite end of the groomer. Then, recheck setting on the first side of groomer. Height setting on both ends of groomer should be identical.

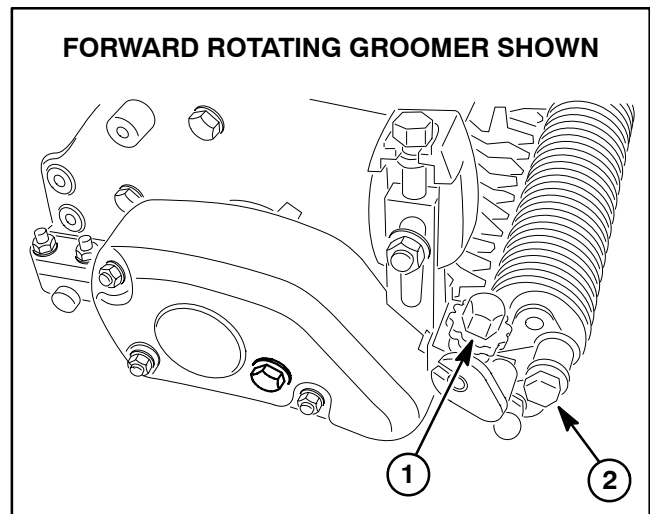


Figure 1

1. Height adjustment knob 2. Lock screw

Service and Repairs

Groomer Belt Replacement (Forward Rotating Groomer Drive)

1. Position machine on a clean and level surface with engine stopped. Engage parking brake.
2. Remove three (3) lock nuts that secure groomer drive cover, then remove cover (Fig. 2).
3. Pivot idler pulley by placing a 12mm wrench on pulley nut and rotating idler bracket to relax belt tension. Slip groomer drive belt off pulleys (Fig. 3). Carefully release idler bracket.

IMPORTANT: Make sure that the drive belt is centered on the pulleys and correctly aligned with pulley grooves after installation.

4. Install new drive belt to drive pulley, idler pulley and driven pulley observing correct belt routing (Fig. 3).
5. Secure belt cover to machine with three (3) lock nuts (Fig. 2).

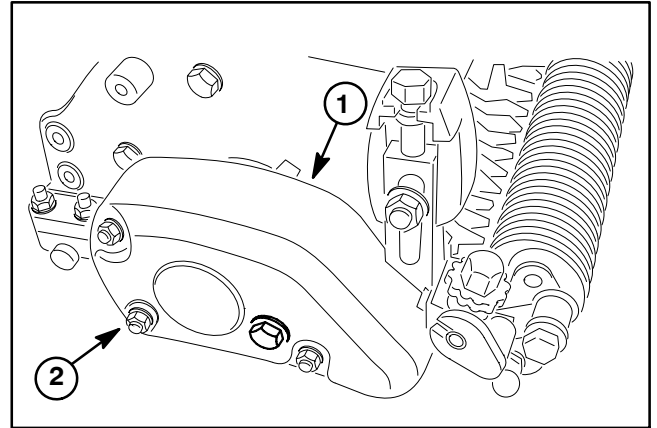


Figure 2

1. Groomer drive cover
2. Lock nut (3 used)

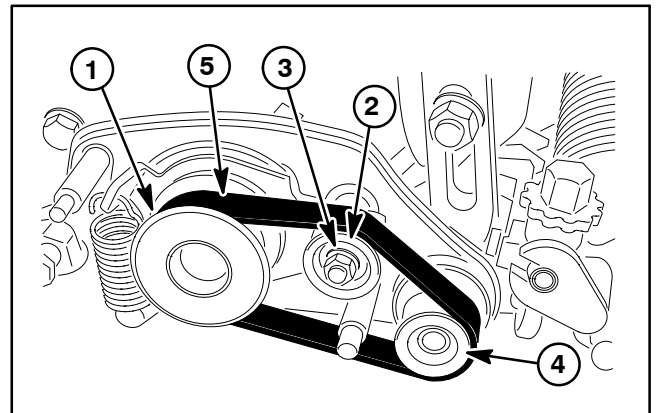


Figure 3

1. Drive pulley
2. Idler pulley
3. Idler pulley nut
4. Driven pulley
5. Groomer drive belt

Groomer Cover (Counter Rotating Groomer Drive)

On Flex machines with the counter rotating groomer, the groomer cover includes a handle which engages and disengages the groomer drive. When the handle is rotated toward the front of the machine, the groomer is engaged.

Removal

1. Position machine on a clean and level surface with engine stopped. Engage parking brake.
2. Make sure that handle on groomer cover is rotated toward front of machine so that groomer drive is engaged.
3. Remove groomer cover assembly from machine (Fig. 4):

A. Remove five (5) flange head screws that secure groomer cover assembly to RH drive plate.

B. Remove groomer cover assembly and gasket from machine. Discard gasket.

4. If necessary, remove shaft from groomer cover (Fig. 5):

A. Loosen set screw (item 9) on top of shaft and slide handle from shaft.

B. Remove retaining ring (item 8) and thrust washer (item 5) from shaft.

C. Remove plunger detent (item 6) from groomer cover.

D. Slide shaft out of groomer cover. Remove and discard O-ring (item 4) from shaft.

5. Remove grease from inside groomer cover and RH drive plate on cutting unit. Thoroughly clean and inspect all groomer drive components.

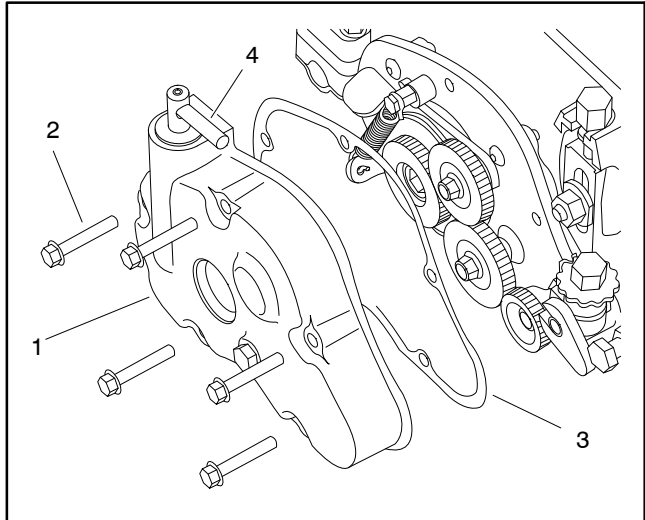


Figure 4

- | | |
|---------------------------|-----------|
| 1. Groomer cover assembly | 3. Gasket |
| 2. Screw (5 used) | 4. Handle |

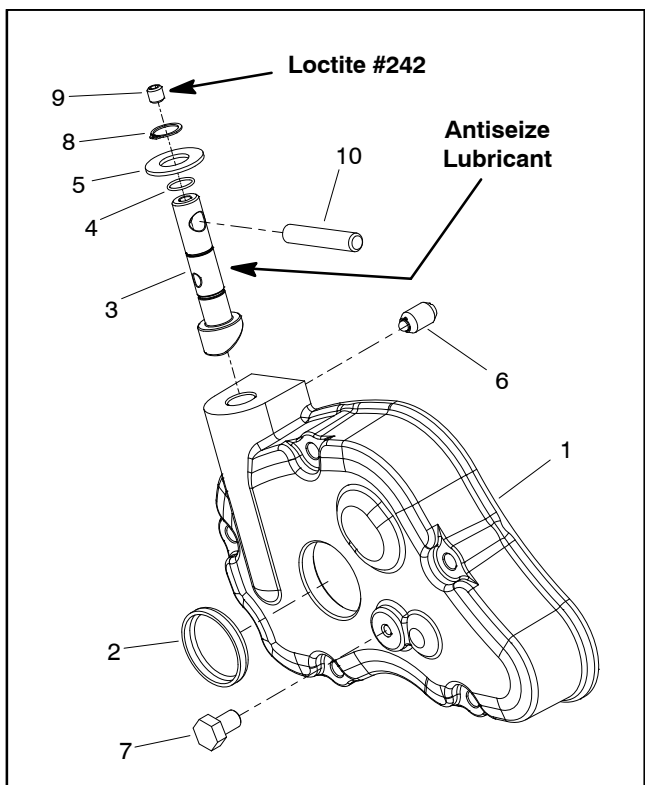


Figure 5

- | | |
|------------------|-------------------|
| 1. Groomer cover | 6. Plunger detent |
| 2. Plug | 7. Cap screw |
| 3. Shaft | 8. Retaining ring |
| 4. O-ring | 9. Set screw |
| 5. Thrust washer | 10. Handle |

Installation

1. If removed, install shaft into groomer cover (Fig. 5):

A. Install new O-ring into groove of shaft.

B. Apply antiseize lubricant to shaft surface that is below the retaining ring groove.

C. Slide shaft up through bore of cover and secure with thrust washer and retaining ring.

D. Position shaft in cover so that cam point of shaft is located away from the gasket surface (Fig. 6).

E. Install plunger detent into groomer cover so that end of plunger is flush to 0.020" (0.5 mm) extending from cover surface (Fig. 6).

F. Slide handle into shaft so that it extends toward the front of the cover.

G. Apply Loctite #242 (or equivalent) to threads of set screw. Install set screw into end of shaft to secure handle in place.

2. Install groomer cover assembly to RH drive plate assembly (Fig. 4):

A. Make sure that handle on groomer cover is rotated toward the front of the machine.

B. Fill groomer cover with approximately five (5) ounces (142 grams) of Mobil XHP221 grease (or equivalent).

C. Install new gasket and then groomer cover assembly to RH drive plate. Secure cover with five (5) flange head screws.

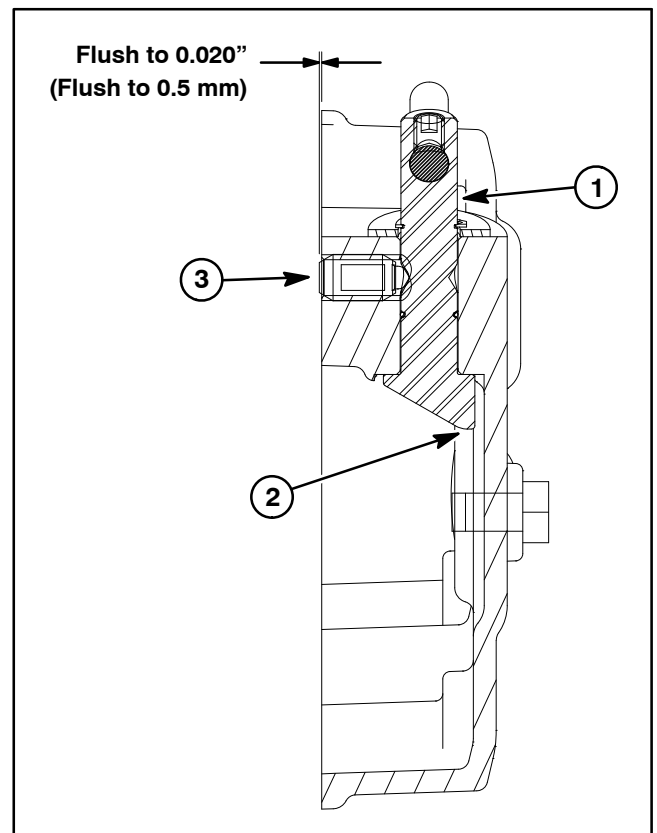


Figure 6

1. Shaft
2. Cam point

3. Plunger detent

Grooming Reel (Forward Rotating Groomer Drive)

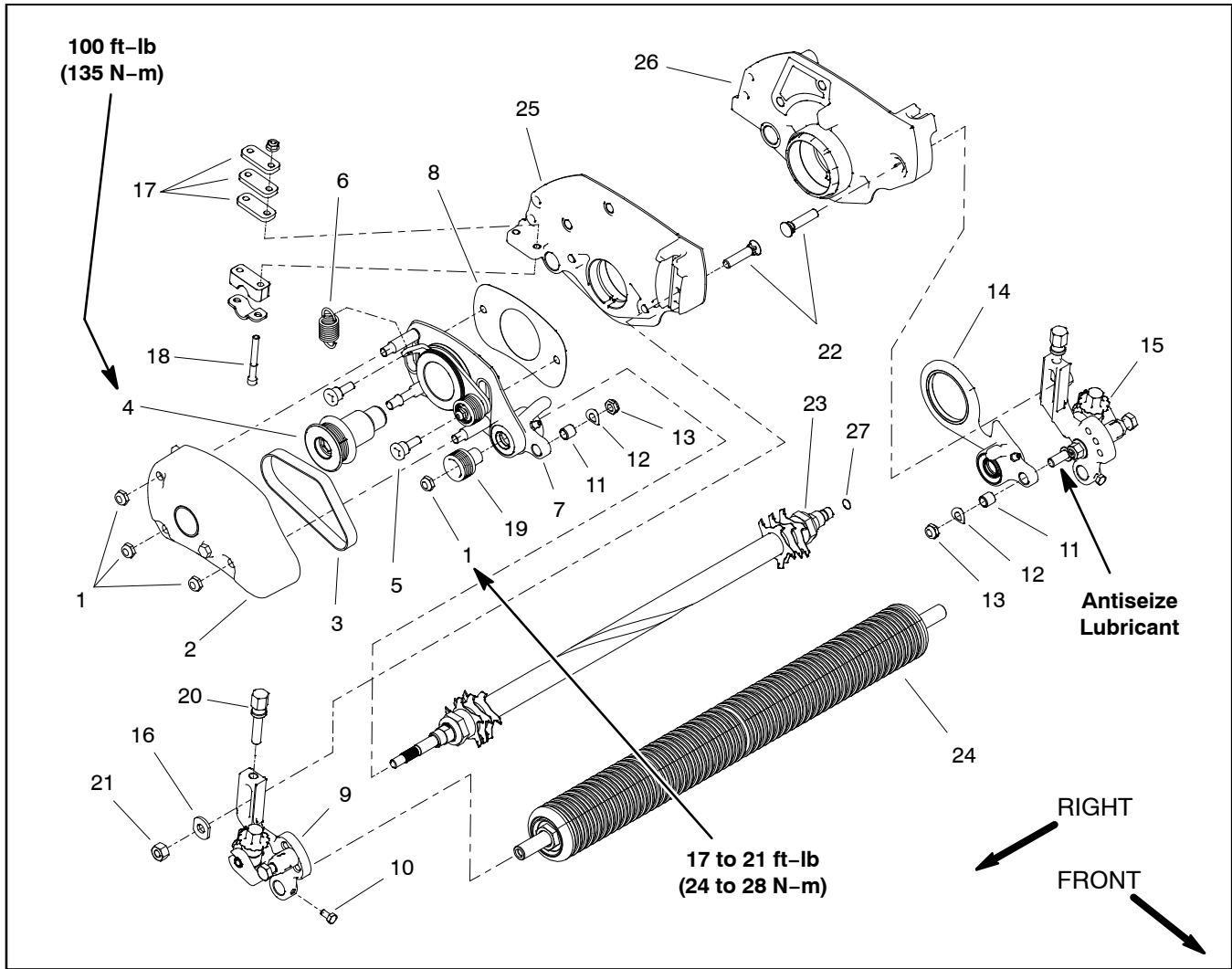


Figure 7

- | | | |
|----------------------------|--------------------------------|-------------------------------|
| 1. Lock nut (4 used) | 10. Cap screw (2 used) | 19. Driven pulley |
| 2. Drive cover | 11. Bushing (2 used) | 20. HOC screw (2 used) |
| 3. Groomer drive belt | 12. Spring washer (2 used) | 21. HOC nut (2 used) |
| 4. Drive pulley | 13. Lock nut (2 used) | 22. Plow bolt (2 used) |
| 5. Shoulder bolt (2 used) | 14. LH support plate assembly | 23. Grooming reel assembly |
| 6. Spring | 15. LH groomer arm assembly | 24. Front roller assembly |
| 7. RH drive plate assembly | 16. HOC washer (2 used) | 25. RH cutting unit sideplate |
| 8. Groomer shim | 17. Rear roller height shim | 26. LH cutting unit sideplate |
| 9. RH groomer arm assembly | 18. Socket head screw (4 used) | 27. O-ring |

Remove the grooming reel to replace individual blades, to replace worn groomer components, to reverse the blades on the shaft (if not equipped with carbide blades) or to replace the grooming shaft.

Removal (Fig. 7)

1. Position machine on a clean and level surface with engine stopped. Engage parking brake.
2. Remove the cutting unit from the machine and place cutting unit on a flat work area.

3. Remove groomer drive cover (item 2) and groomer drive belt (item 3) from groomer drive (see Groomer Belt Replacement in this section).

4. Loosen cap screws (item 10) that secure front roller shaft to groomer arms.

5. Remove lock nut and spring washer that secure RH groomer arm lift rod to RH drive plate assembly (Fig. 8).

6. Remove HOC nut (item 21), HOC washer (item 16) and plow bolt (item 22) that secure RH groomer arm assembly to RH support plate assembly. Do not change height-of-cut screw adjustment. Remove RH groomer arm assembly from cutting unit.

7. Remove front roller assembly from cutting unit.

NOTE: To prevent grooming reel shaft from turning when removing driven pulley (item 19), use wrench on shaft flats to hold shaft.

8. Remove the lock nut (item 1) that secures driven pulley (item 19) to grooming reel shaft. Remove driven pulley from shaft.

NOTE: To prevent cutting reel from turning when removing drive pulley (item 4), use a 1/2" socket on hex of reel drive shaft that is used for backlapping the cutting reel.

9. Loosen and remove drive pulley (item 4) from the cutting reel shaft.

10. Remove two (2) shoulder bolts (item 5) that secure the RH drive plate assembly (item 7) to the cutting unit frame. Remove the groomer drive plate assembly from grooming shaft and cutting unit. Locate and retrieve groomer shim (item 8).

11. Carefully pull the grooming reel from the LH support plate assembly.

12. Inspect seals, bushings and bearings in RH drive plate, LH support plate and groomer arms for wear or damage. Replace components as needed.

Installation (Fig. 7)

1. Apply a light coating of grease to ends of grooming shaft and also to seal lips in drive side and support plates. Make sure that all bearings, bushings and seals are properly installed.

2. Make sure that O-ring (item 27) is installed on grooming shaft. Apply light coating of grease to O-ring.

3. Carefully place grooming reel assembly into the LH support plate taking care to not damage seal in support plate or O-ring on shaft.

4. Apply light coating of grease to O-ring on RH drive plate assembly pivot hub and pilot bore of cutting unit side plate.

5. Position groomer shim (item 8) to RH drive plate assembly.

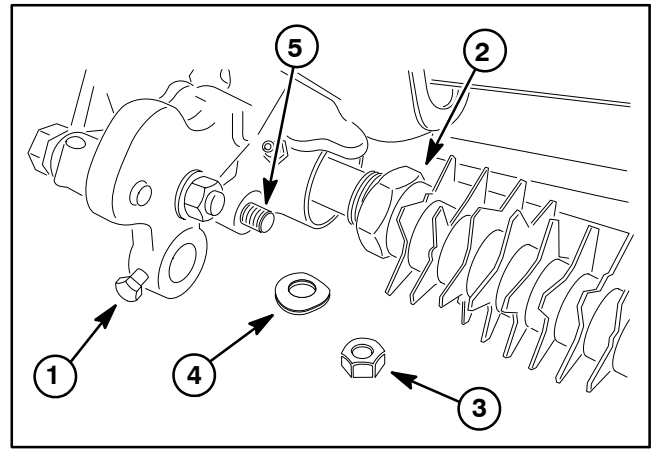


Figure 8

- | | |
|---------------------------|-------------------------|
| 1. Roller cap screw | 4. Spring washer |
| 2. Grooming reel assembly | 5. Groomer arm lift rod |
| 3. Lock nut | |

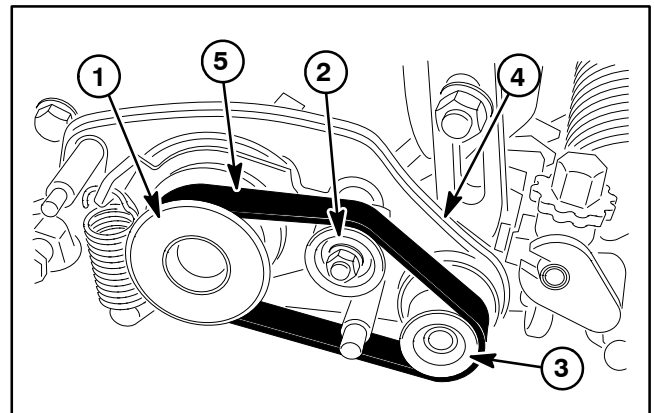


Figure 9

- | | |
|------------------|------------------------|
| 1. Drive pulley | 4. RH drive plate assy |
| 2. Idler pulley | 5. Groomer drive belt |
| 3. Driven pulley | |

6. Carefully place RH drive plate onto groomer shaft taking care not to damage seals in drive plate. Position drive plate to the cutting unit frame and secure with two (2) shoulder bolts (item 5). Make sure that RH drive plate rotates freely after installation.

7. Apply light coating of grease to hub on driven pulley (item 19) taking care to not get grease on belt surface of pulley. Slide driven pulley onto the grooming reel shaft taking care to not damage seal in RH drive plate.

NOTE: To prevent grooming reel shaft from turning when securing driven pulley, use wrench on shaft flats to hold shaft.

8. Secure driven pulley (item 19) to grooming reel shaft with lock nut (item 1). Torque lock nut from **17 to 21 ft-lb (24 to 28 N-m)**.

NOTE: To prevent cutting reel from turning when installing drive pulley, use a 1/2" socket on hex of reel drive shaft that is used for backlapping the cutting reel.

9. Secure drive pulley (item 4) to cutting reel shaft. Torque pulley to **100 ft-lb (135 N-m)**.

10. Insert front roller into LH groomer arm assembly.

11. Make sure that bushing (item 11) is installed in RH drive plate assembly.

12. Apply antiseize lubricant to threads of RH groomer arm lift rod.

13. Position RH groomer arm assembly to front roller, groomer RH drive plate and cutting unit frame. Secure groomer arm to cutting unit with plow bolt (item 22), HOC washer (item 16) and HOC nut (item 21).

14. Secure RH groomer arm assembly to RH drive plate with spring washer (item 12) and lock nut (item 13).

15. Center front roller to cutting unit and tighten cap screws (item 10) to secure roller.

16. Install groomer drive belt (item 3) and groomer drive cover (item 2) to RH drive plate (see Groomer Belt Replacement in this section).

17. Check grooming reel height and mower height-of-cut settings. Adjust as needed.

18. Install cutting unit to the machine.

19. Lubricate groomer bearings (see Groomer Installation Instructions).

NOTE: After greasing groomer bearings, operate groomer for 30 seconds, stop machine and wipe excess grease from groomer shaft and seals.

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Grooming Reel (Counter Rotating Groomer Drive)

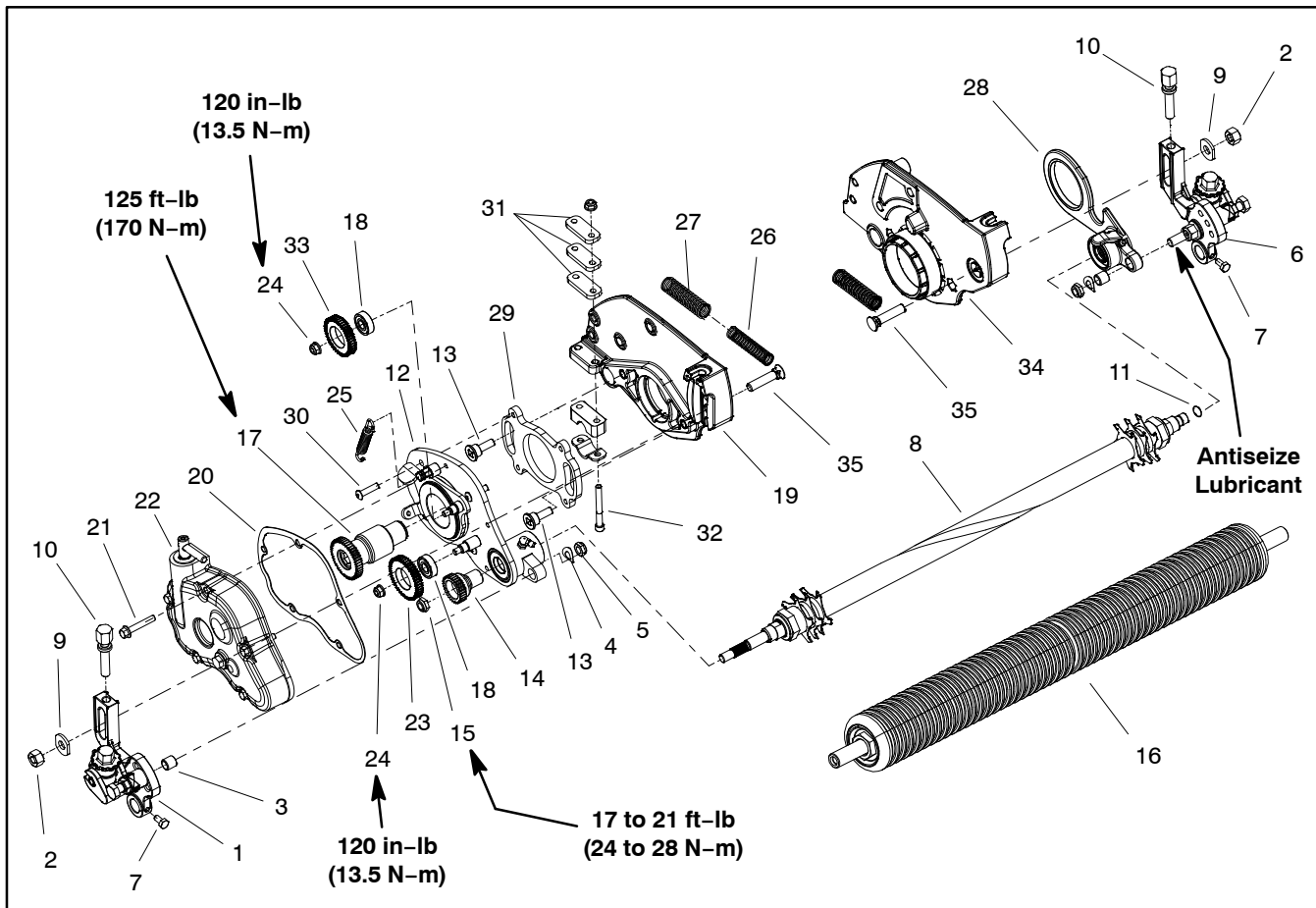


Figure 10

- | | | |
|-----------------------------|--------------------------------|--------------------------------|
| 1. RH groomer arm assembly | 13. Shoulder bolt (2 used) | 25. Extension spring |
| 2. HOC nut (2 used) | 14. Driven gear (30T) | 26. Inner spring (2 used) |
| 3. Bushing (2 used) | 15. Lock nut | 27. Outer spring (2 used) |
| 4. Spring washer (2 used) | 16. Front roller | 28. LH support plate assembly |
| 5. Lock nut (2 used) | 17. Groomer drive gear (45T) | 29. Support plate |
| 6. LH groomer arm assembly | 18. Bearing (2 used) | 30. Button head screw (4 used) |
| 7. Cap screw (2 used) | 19. RH cutting unit side plate | 31. Roller shim |
| 8. Grooming reel assembly | 20. Gasket | 32. Socket head screw (4 used) |
| 9. HOC washer (2 used) | 21. Flange head screw (5 used) | 33. 43T idler gear |
| 10. HOC screw (2 used) | 22. Groomer cover assembly | 34. LH cutting unit side plate |
| 11. O-ring | 23. 47T idler gear | 35. Plow bolt (2 used) |
| 12. RH drive plate assembly | 24. Flange nut (2 used) | |

Remove the grooming reel to replace individual blades, to replace worn groomer components, to reverse the blades on the shaft (if not equipped with carbide blades) or to replace the grooming shaft.

Removal (Fig. 10)

1. Position machine on a clean and level surface with engine stopped. Engage parking brake.
2. Remove the cutting unit from the machine and place cutting unit on a flat work area.
3. Make sure that handle on groomer cover is rotated toward front of machine so that groomer drive is engaged.

4. Remove groomer cover assembly (item 22) and gasket (item 20) from machine (see Groomer Cover (Counter Rotating Groomer Drive) in this section). Discard gasket.

5. Carefully remove extension spring from anchor points on RH drive plate (Fig. 11).

6. Remove the two (2) idler gears (43T and 47T) from the RH drive plate assembly (Fig. 12). The bearings are pressed into the gears.

7. Loosen cap screws (item 7) that secure front roller shaft to groomer arms.

8. Remove lock nut and spring washer that secure RH groomer arm lift rod to RH drive plate assembly (Fig. 13).

9. Remove HOC nut (item 2), HOC washer (item 9) and plow bolt (item 35) that secure RH groomer arm assembly to RH drive plate assembly. Do not change height-of-cut screw adjustment. Remove RH groomer arm assembly from cutting unit.

10. Remove front roller from cutting unit.

NOTE: To prevent grooming reel shaft from turning when removing driven gear (item 14), use wrench on shaft flats to hold shaft.

11. Remove the lock nut (item 15) that secures driven gear (item 14) to grooming reel shaft. Remove driven gear from shaft.

NOTE: To prevent cutting reel from turning when removing groomer drive gear (item 17), use a 1/2" socket on hex of reel drive shaft that is used for backlapping the cutting reel.

12. Loosen and remove groomer drive gear (item 17) from the cutting reel shaft.

13. Remove four (4) button head screws (item 30) that secure the RH drive plate assembly (item 12) to the support plate on the cutting unit frame. Remove the RH drive plate assembly from grooming shaft and cutting unit.

14. Carefully pull the grooming reel from the LH support plate.

15. Inspect seals, bushings and bearings in RH drive plate, LH support plate and groomer arms for wear or damage. Also, inspect gears and idler components for wear or damage. Replace components as needed.

Installation (Fig. 10)

1. Apply a light coating of grease to ends of grooming reel shaft and also to seal lips in RH drive plate and LH support plate. Make sure that all bearings, bushings and seals are properly installed.

2. Make sure that O-ring (item 11) is installed on grooming reel shaft. Apply light coating of grease to O-ring.

3. Carefully place grooming reel assembly into the LH support plate taking care to not damage seal in support plate or O-ring on shaft.

4. Apply light coating of grease to O-ring on RH drive plate assembly pivot hub and pilot bore of cutting unit side plate.

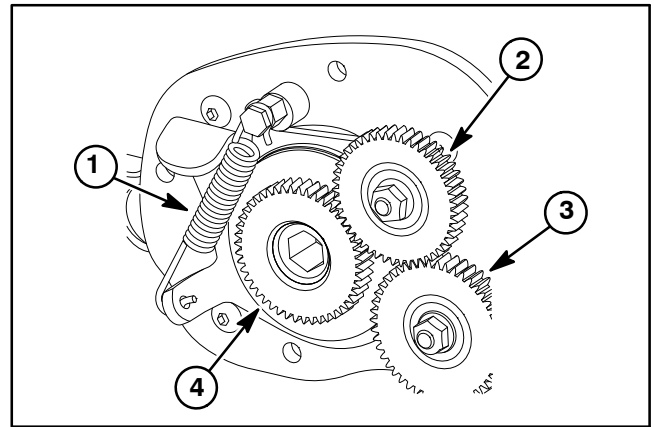


Figure 11

- | | |
|---------------------|-----------------------|
| 1. Extension spring | 3. 47T idler gear |
| 2. 43T idler gear | 4. Groomer drive gear |

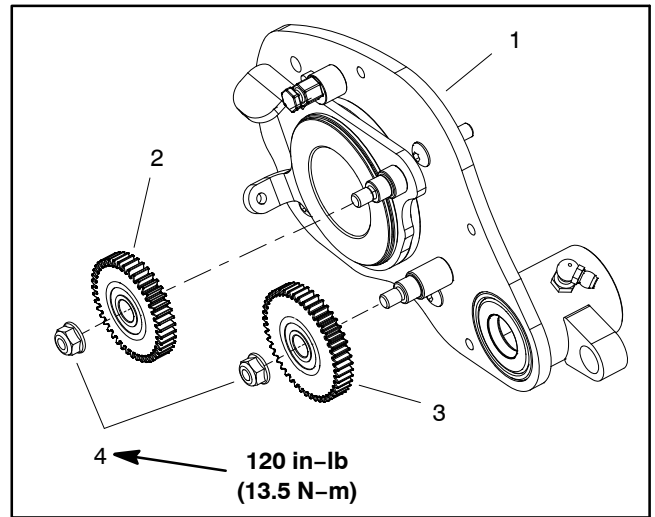


Figure 12

- | | |
|------------------------|---------------------|
| 1. RH drive plate assy | 3. 47T gear/bearing |
| 2. 43T gear/bearing | 4. Flange nut |

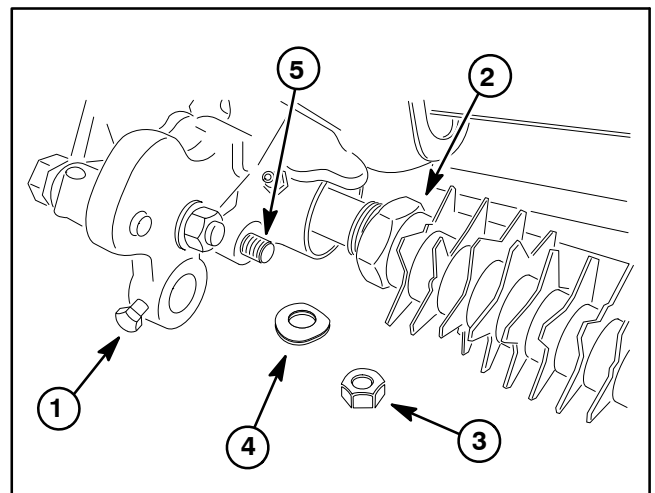


Figure 13

- | | |
|---------------------------|-------------------------|
| 1. Roller cap screw | 4. Spring washer |
| 2. Grooming reel assembly | 5. Groomer arm lift rod |
| 3. Lock nut | |

5. Carefully slide RH drive plate onto grooming reel shaft taking care to not damage seals in drive plate. Position drive plate to the support plate on the cutting unit frame and secure with four (4) button head screws (item 30). Make sure that drive plate rotates freely after installation.

6. Install driven gear (item 14) onto grooming reel shaft:

A. Apply light coating of grease to hub on driven gear (item 14).

B. Carefully slide driven gear onto the grooming reel shaft taking care to not damage seal in drive plate.

NOTE: To prevent grooming reel shaft from turning when installing driven gear, use wrench on shaft flats to hold shaft.

C. Secure gear to shaft with lock nut (item 15). Torque lock nut from **17 to 21 ft-lb (24 to 28 N-m)**.

NOTE: To prevent cutting reel from turning when installing groomer drive gear (item 17), use a 1/2" socket on hex of reel drive shaft that is used for backlapping the cutting reel.

7. Secure groomer drive gear (item 17) to cutting reel shaft. Torque gear to **125 ft-lb (170 N-m)**.

8. Install the two (2) idler gears (43T and 47T) to RH drive plate assembly (Fig. 12). Secure gears with flange nuts and torque flange nuts **120 in-lb (13.5 N-m)**.

9. Install extension spring to RH drive plate assembly (Fig. 11).

10. Insert front roller into LH groomer arm assembly.

11. Make sure that bushing (item 3) is installed in RH drive plate assembly.

12. Apply antiseize lubricant to threads of RH groomer arm lift rod.

13. Position RH groomer arm assembly to front roller, RH drive plate and cutting unit frame. Secure groomer arm to cutting unit with plow bolt (item 35), HOC washer (item 9) and HOC nut (item 2).

14. Secure RH groomer arm assembly to drive plate with spring washer (item 4) and lock nut (item 5).

15. Center front roller to cutting unit and tighten cap screws (item 7) to secure roller.

16. Fill groomer cover with approximately five (5) ounces (142 grams) of Mobil XHP221 grease (or equivalent). Install new gasket and then groomer cover assembly to RH drive plate (see Groomer Cover (Counter Rotating Groomer Drive) in this section).

17. Check grooming reel height and mower height-of-cut settings. Adjust as needed.

18. Install cutting unit to the machine.

19. Lubricate groomer bearings (see Groomer Installation Instructions).

NOTE: After greasing groomer bearings, operate groomer for 30 seconds, stop machine and wipe excess grease from groomer shaft and seals.

Grooming Reel Service

Inspect grooming reel blades frequently for damage and wear. Straighten bent blades with a pliers. Replace blades that are worn or damaged.

Carbide tipped grooming blades (Fig. 15) should be replaced if the carbide tip is worn, loose or missing. Also, if the blade is eroded around the carbide insert, the blade should be replaced.

Grooming blades without a carbide tip (Fig. 16) should be replaced if worn or damaged. Blades without a carbide tip that are rounded to the midpoint of the blade tip can be reversed on the grooming shaft to extend the life of the blade.

Disassembly (Fig. 14)

1. Remove grooming reel from cutting unit (see Grooming Reel Removal in this section).
2. Remove lock nut from either end of the shaft (Fig. 14).
3. Remove spacers and blades from groomer shaft as necessary.

Assembly (Fig. 14)

1. Start by placing thick spacer against the lock nut installed on one end of groomer shaft. Then, place first blade against installed spacer (Fig. 14).

IMPORTANT: If groomer is equipped with blades with carbide tips, make sure that blades are installed with the tips in the same direction.

2. For 1/2 inch (1.3 cm) blade spacing, make sure there are two (2) blade spacers between blades (Fig. 14).
3. When all blades have been installed, place second thick spacer on shaft and then thread second lock nut onto the shaft.
4. Position lock nuts to allow blades and spacers to be centered on the shaft (Fig. 17). Torque lock nuts from **200 to 250 in-lb (23 to 28 N-m)** so spacers are **not** free to rotate.
5. Install grooming reel back onto cutting unit (see Grooming Reel Installation in this section).

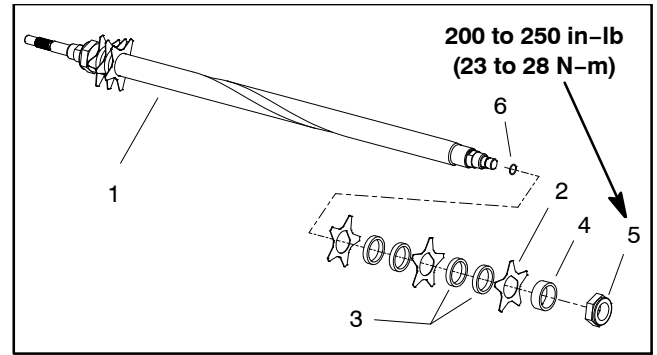


Figure 14

- | | |
|------------------------|--------------------------|
| 1. Grooming reel shaft | 4. Thick spacer (2 used) |
| 2. Groomer blade | 5. Lock nut (2 used) |
| 3. Blade spacer | 6. O-ring |

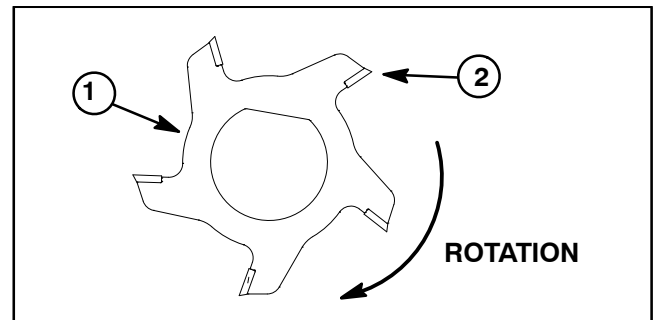


Figure 15

- | | |
|-------------------|----------------|
| 1. Grooming blade | 2. Carbide tip |
|-------------------|----------------|

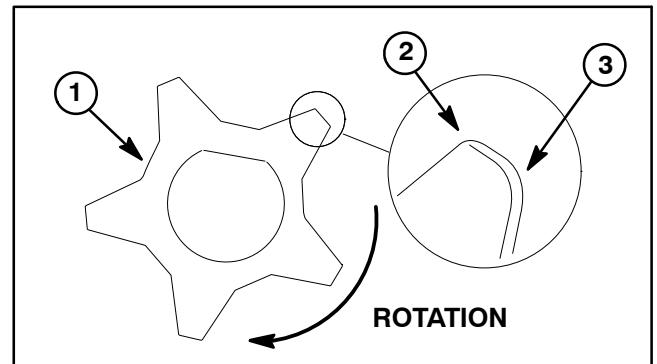


Figure 16

- | | |
|-------------------|------------------------|
| 1. Grooming blade | 3. Dull (rounded) edge |
| 2. Sharp edge | |

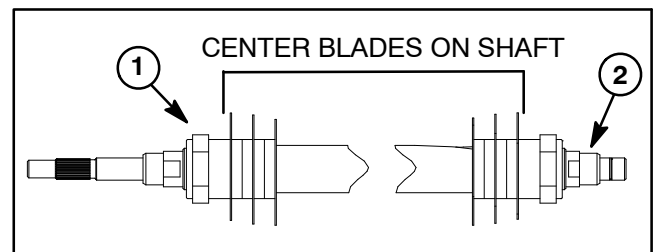


Figure 17

- | | |
|-------------|-------------------|
| 1. Lock nut | 2. Grooming shaft |
|-------------|-------------------|

Grooming Reel Bearing Replacement

Bearing Removal

1. Position machine on a clean and level surface with engine stopped. Engage parking brake.
2. Remove the cutting unit from the machine and place cutting unit on a flat work area.
3. To remove groomer RH drive plate assembly from right side of cutting unit, remove front roller, grooming reel and then drive plate assembly (see Grooming Reel (Forward Rotating or Counter Rotating) in this section).
4. To remove LH support plate assembly from left side of cutting unit (Fig. 18):

A. Remove reel drive cover, drive belt, reel pulley and then reel drive assembly from cutting unit (see Reel Drive Assembly in the Service and Repairs section of Chapter 4 – Traction and Reel Drive System).

B. Remove lock nut and spring washer that secure LH groomer arm lift rod to LH support plate (Fig. 19). Remove support plate from cutting unit.

5. Remove grooming reel seals and bearings from RH drive plate and LH support plate assemblies (Figs. 20, 21 and 22). Discard all removed seals and bearings.

Bearing Installation

1. Install new grooming reel bearings and seals into RH drive plate and LH support plate assemblies (Fig. 23):

IMPORTANT: Bearings should be installed with extended inner races toward center of housing. Also, apply pressure equally to inner and outer bearing races when installing bearings.

A. Press new outer bearing fully to shoulder of RH drive plate bore. Then, install new inner bearing until inner race contacts outer bearing race.

B. Press new bearing into LH support plate until it is flush with shoulder of bearing bore.

C. Install new seals into groomer side plates. **NOTE:** Seals should be installed so the lip side of the seal will face the center of the cutting reel. When bearings are greased, grease will purge from inner seals.

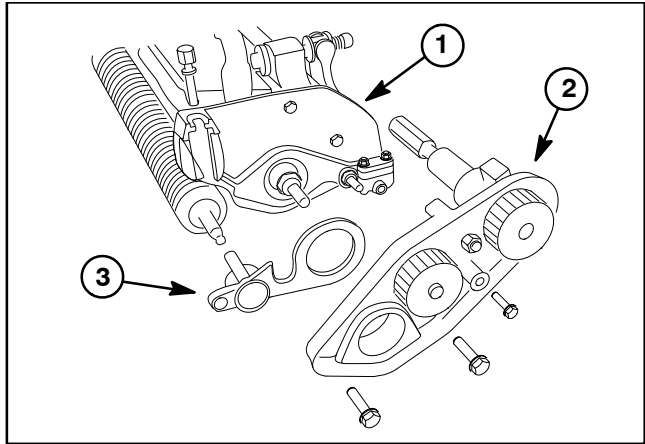


Figure 18

1. Cutting unit
2. Reel drive assembly
3. LH support plate

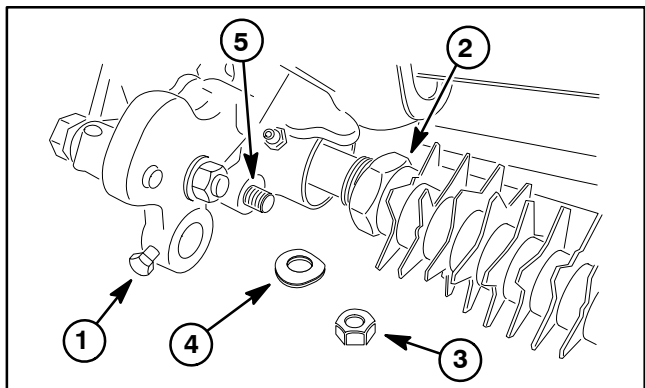


Figure 19

1. Roller cap screw
2. Grooming reel assembly
3. Lock nut
4. Spring washer
5. Groomer arm lift rod

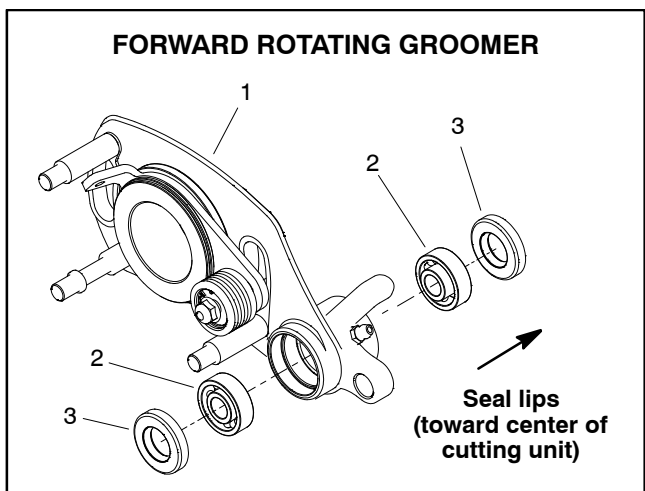


Figure 20

1. RH drive plate assy
2. Bearing (2 used)
3. Seal (2 used)

2. Install LH support plate to left side of cutting unit:

A. Apply antiseize lubricant to threads of LH groomer arm lift rod.

B. Position LH support plate to cutting unit making sure that LH groomer arm lift rod is positioned through bushing in support plate.

C. Place spring washer and lock nut on lift rod threads (Fig. 19). Tighten lock nut.

D. Install reel drive assembly, reel pulley, reel drive belt and then reel drive cover to left side of cutting unit (see Reel Drive Assembly in the Service and Repairs section of Chapter 4 – Traction and Reel Drive System).

3. Install grooming reel, front roller and RH drive plate to right side of cutting unit (see Grooming Reel (Forward Rotating or Counter Rotating) in this section).

4. Check and adjust grooming reel height and mower height-of-cut settings.

5. Install cutting unit to the machine.

6. Lubricate groomer bearings.

NOTE: After greasing groomer bearings, operate groomer for 30 seconds, stop machine and wipe any excess grease from groomer shaft and seals.

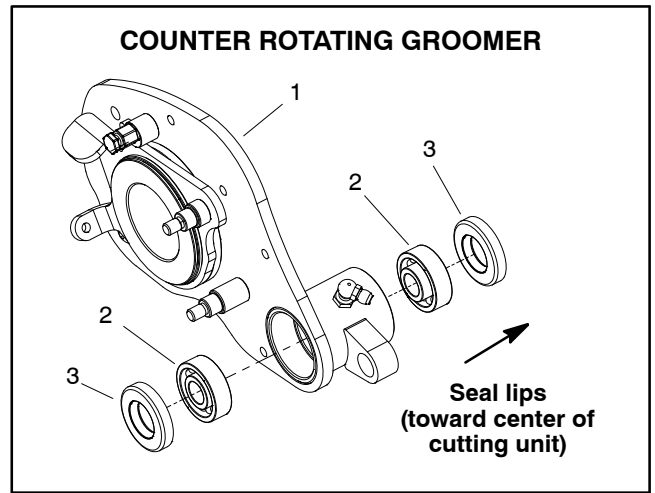


Figure 21

- 1. RH drive plate assy
- 2. Bearing (2 used)
- 3. Seal (2 used)

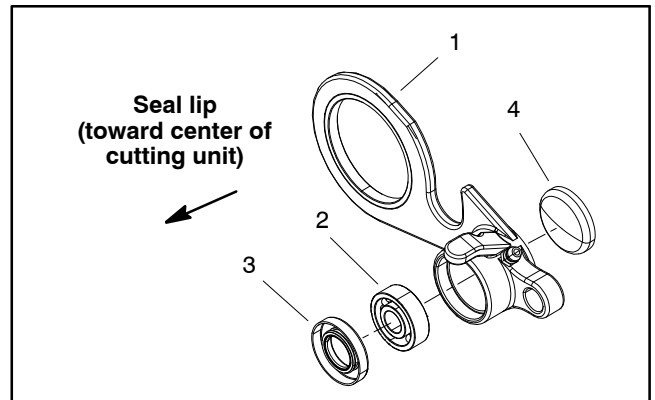


Figure 22

- 1. LH support plate
- 2. Bearing
- 3. Seal
- 4. Plug

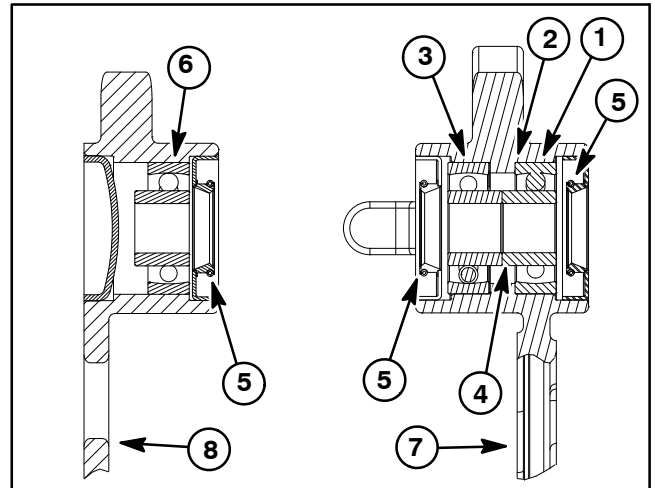


Figure 23

- 1. Outer bearing
- 2. Drive plate shoulder
- 3. Inner bearing
- 4. Inner race
- 5. Seal lip
- 6. Support plate bearing
- 7. Drive plate (RH side)
- 8. Support plate (LH side)

Groomer

Idler Assembly (Forward Rotating Groomer Drive)

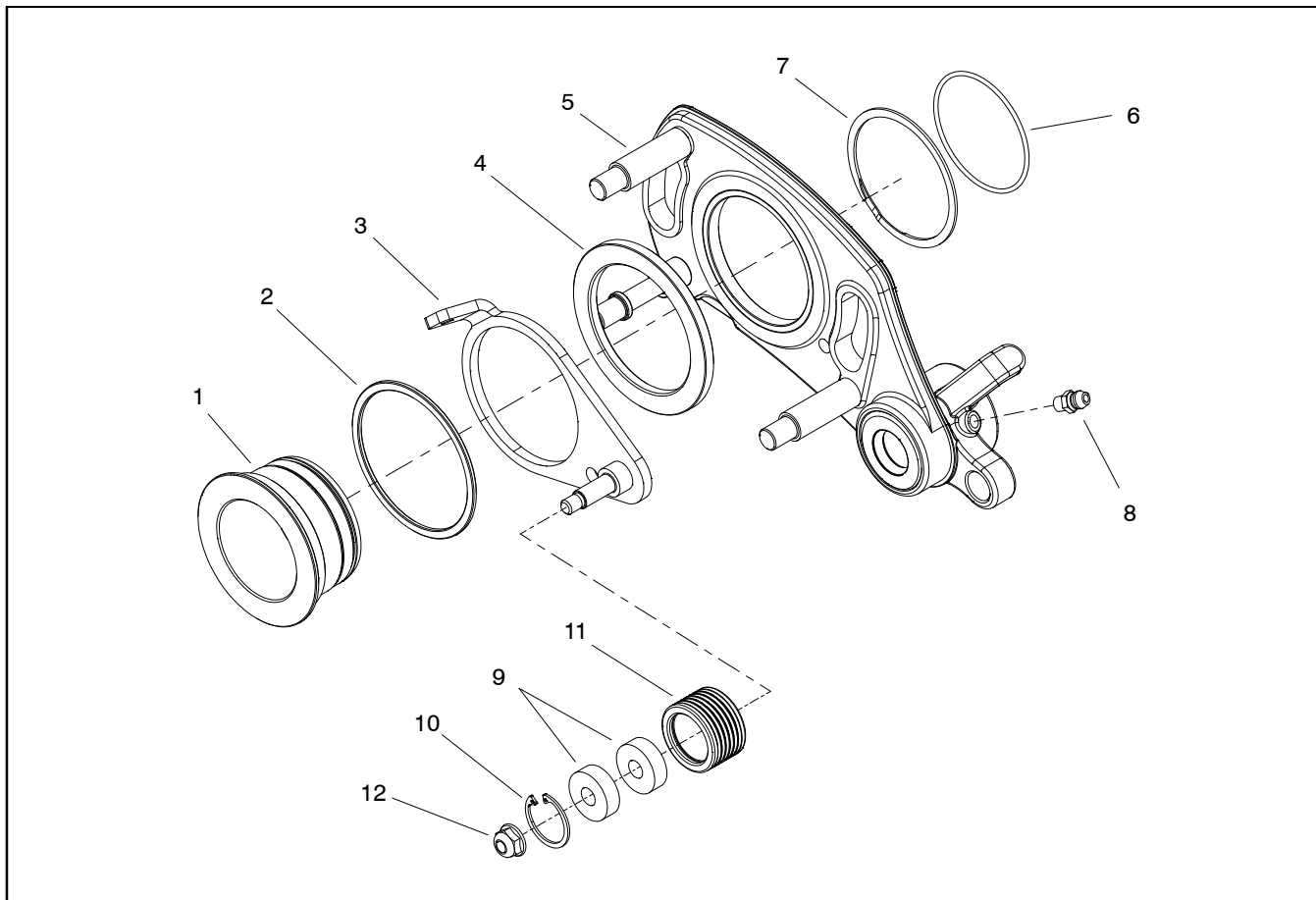


Figure 24

- 1. Pivot hub
- 2. Spacer
- 3. Idler bracket
- 4. Spacer

- 5. RH drive plate
- 6. O-ring
- 7. Retaining ring
- 8. Grease fitting

- 9. Bearing (2 used)
- 10. Retaining ring
- 11. Idler pulley
- 12. Lock nut

The groomer RH drive plate assembly incorporates the idler system for tensioning the groomer drive belt. The idler system uses a spring to maintain proper belt tension.

Removal

1. Position machine on a clean and level surface with engine stopped. Engage parking brake.
2. Remove groomer belt cover, drive belt and drive pulley from groomer drive side of mower (see Grooming Reel Removal in this section).
3. Using Figures 24 and 25 as guides, remove idler bracket, idler pulley and/or idler bearings as needed.

Installation

1. Assemble components using Figures 24 and 25 as guides.

NOTE: When properly installed, the idler pulley should move freely from side to side on the idler bracket pin.

2. Install drive pulley, drive belt and belt cover to right side of mower (see Grooming Reel Installation in this section).

3. Check and adjust grooming reel height and mower height-of-cut settings.

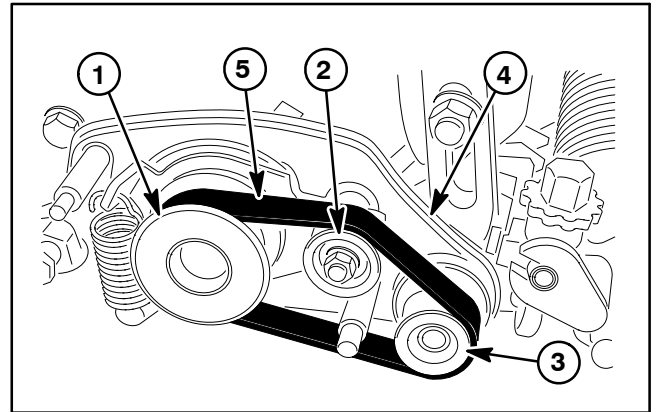


Figure 25

- | | |
|--------------------------|------------------------|
| 1. Drive pulley | 4. RH drive plate assy |
| 2. Idler pulley assembly | 5. Groomer drive belt |
| 3. Driven pulley | |

Idler Assembly (Counter Rotating Groomer Drive)

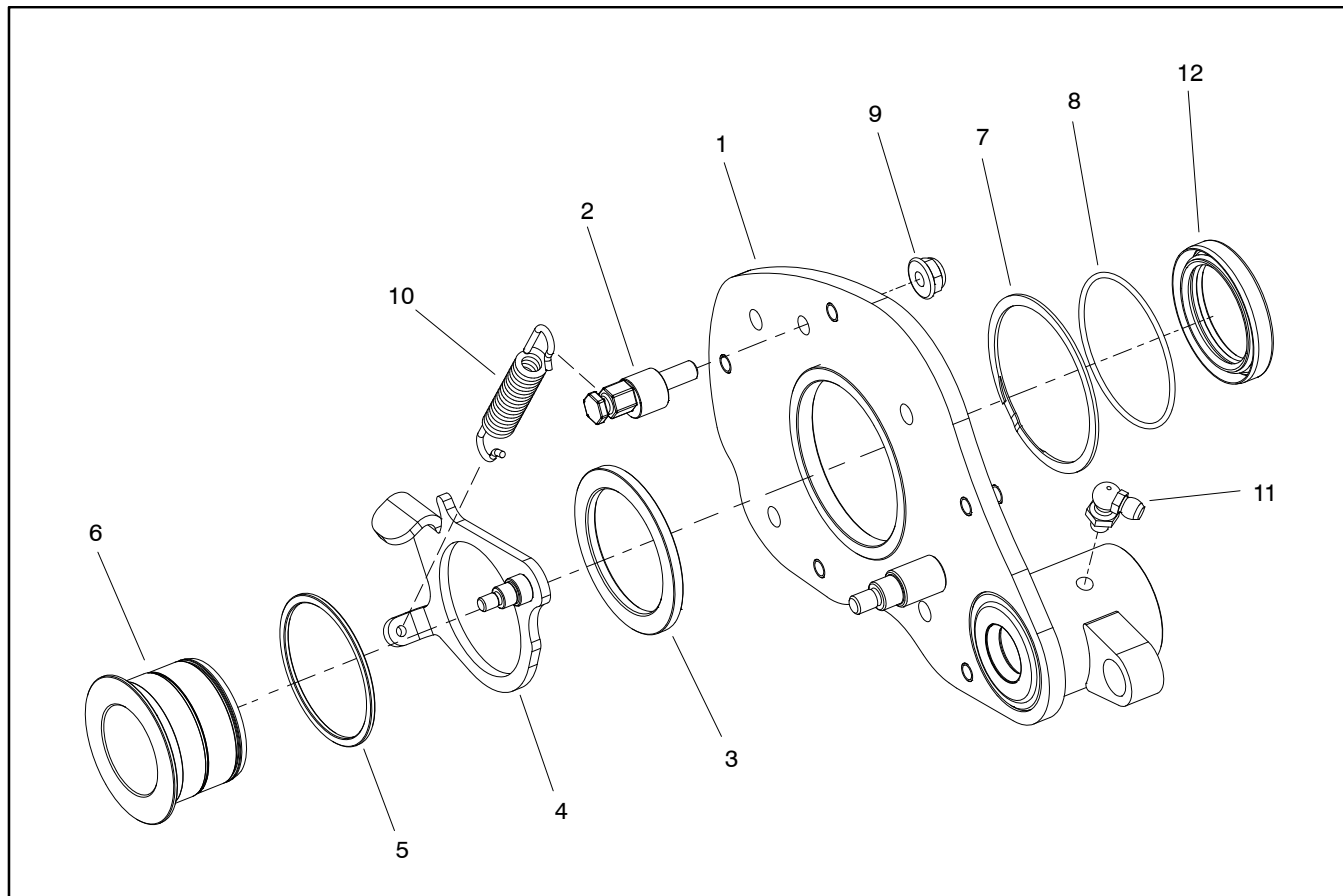


Figure 26

- | | | |
|-------------------|-------------------|----------------------|
| 1. RH drive plate | 5. Spacer | 9. Flange nut |
| 2. Adjustment cam | 6. Reel hub | 10. Extension spring |
| 3. Spacer | 7. Retaining ring | 11. Grease fitting |
| 4. Idler bracket | 8. O-ring | 12. Grease seal |

The groomer RH drive plate assembly incorporates the idler system for engaging the groomer gear drive.

Disassembly (Fig. 26)

1. Position machine on a clean and level surface with engine stopped. Engage parking brake.
2. Make sure that handle on groomer cover is rotated toward front of machine so that groomer drive is engaged.
3. Remove groomer cover assembly and gasket from machine (see Groomer Cover (Counter Rotating Groomer Drive) in this section).
4. Remove RH drive plate assembly from right side of cutting unit (see Grooming Reel (Counter Rotating Groomer Drive) in this section).

5. Using Figure 26 as a guide, remove idler components from RH drive plate as needed.

Assembly (Fig. 26)

1. Assemble idler components to RH drive plate using Figure 26 as a guide. Make sure that retaining ring (item 7) is fully seated in groove of reel hub after assembly.

NOTE: When properly installed, the idler bracket (item 4) should pivot freely on reel hub.

2. Install RH drive plate assembly to right side of cutting unit (see Grooming Reel (Counter Rotating Groomer Drive) in this section). Make sure that groomer drive gear and grooming reel driven gear are properly torqued. Do not install idler gears, extension spring or groomer cover assembly to drive plate assembly.

3. Check adjustment of adjustment cam (Fig. 28):

A. Rotate idler bracket so the bracket stop is against the adjustment cam.

B. While holding bracket stop against the cam, measure the distance between the idler gear bearing surfaces on the idler bracket and the drive plate. This distance should be 1.484" (37.7 mm).

C. If distance is incorrect, loosen flange nut that secures adjustment cam to drive plate. Rotate the adjustment cam until distance is correct. Then, tighten flange nut to secure adjustment. Make sure that distance is still correct after tightening the nut.

4. Install idler gears to drive plate assembly (Fig. 29). Torque flange nuts that secure idler gears **120 in-lb (13.5 N-m)**.

5. Install extension spring to idler bracket and adjustment cam.

6. Fill groomer cover with approximately five (5) ounces (142 grams) of Mobil XHP221 grease (or equivalent). Install new gasket and then groomer cover assembly to RH drive plate (see Groomer Cover (Counter Rotating Groomer Drive) in this section).

7. Check and adjust grooming reel height and mower height-of-cut settings.

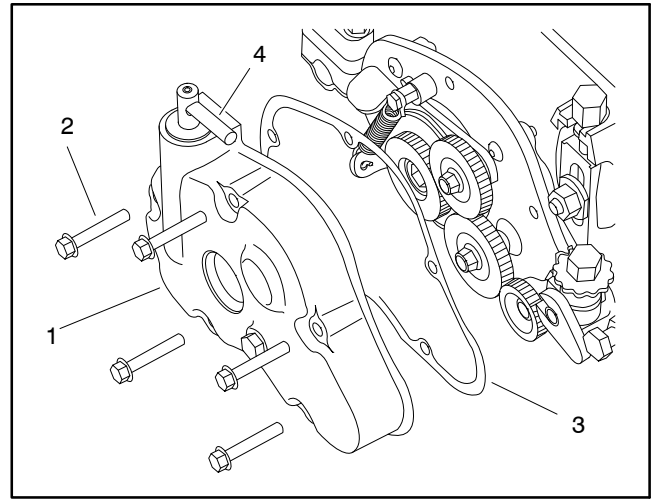


Figure 27

- | | |
|---------------------------|-----------|
| 1. Groomer cover assembly | 3. Gasket |
| 2. Screw (5 used) | 4. Handle |

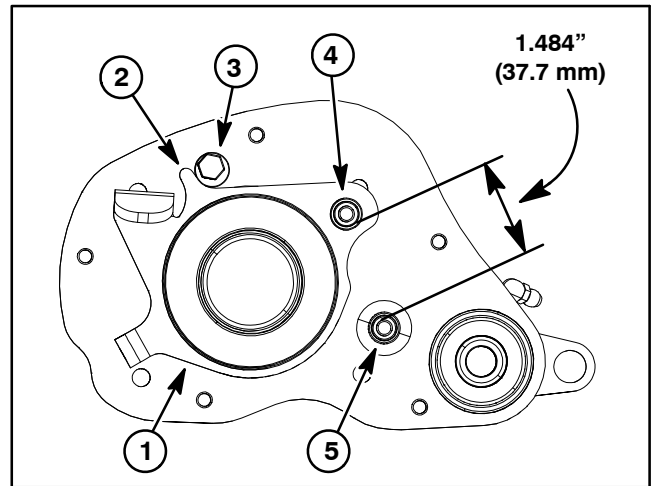


Figure 28

- | | |
|-----------------------|---------------------------|
| 1. Idler bracket | 4. Idler bearing location |
| 2. Idler bracket stop | 5. Plate bearing location |
| 3. Adjustment cam | |

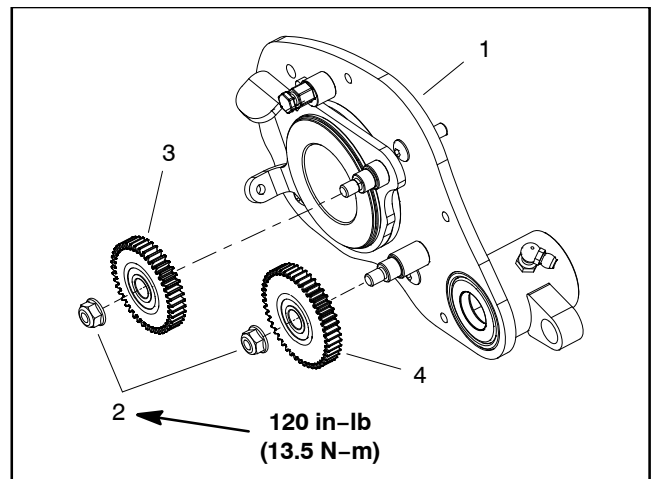


Figure 29

- | | |
|------------------------|---------------------------|
| 1. RH drive plate assy | 3. 43T idler gear/bearing |
| 2. Flange nut | 4. 47T idler gear/bearing |

Lift Arm Assembly

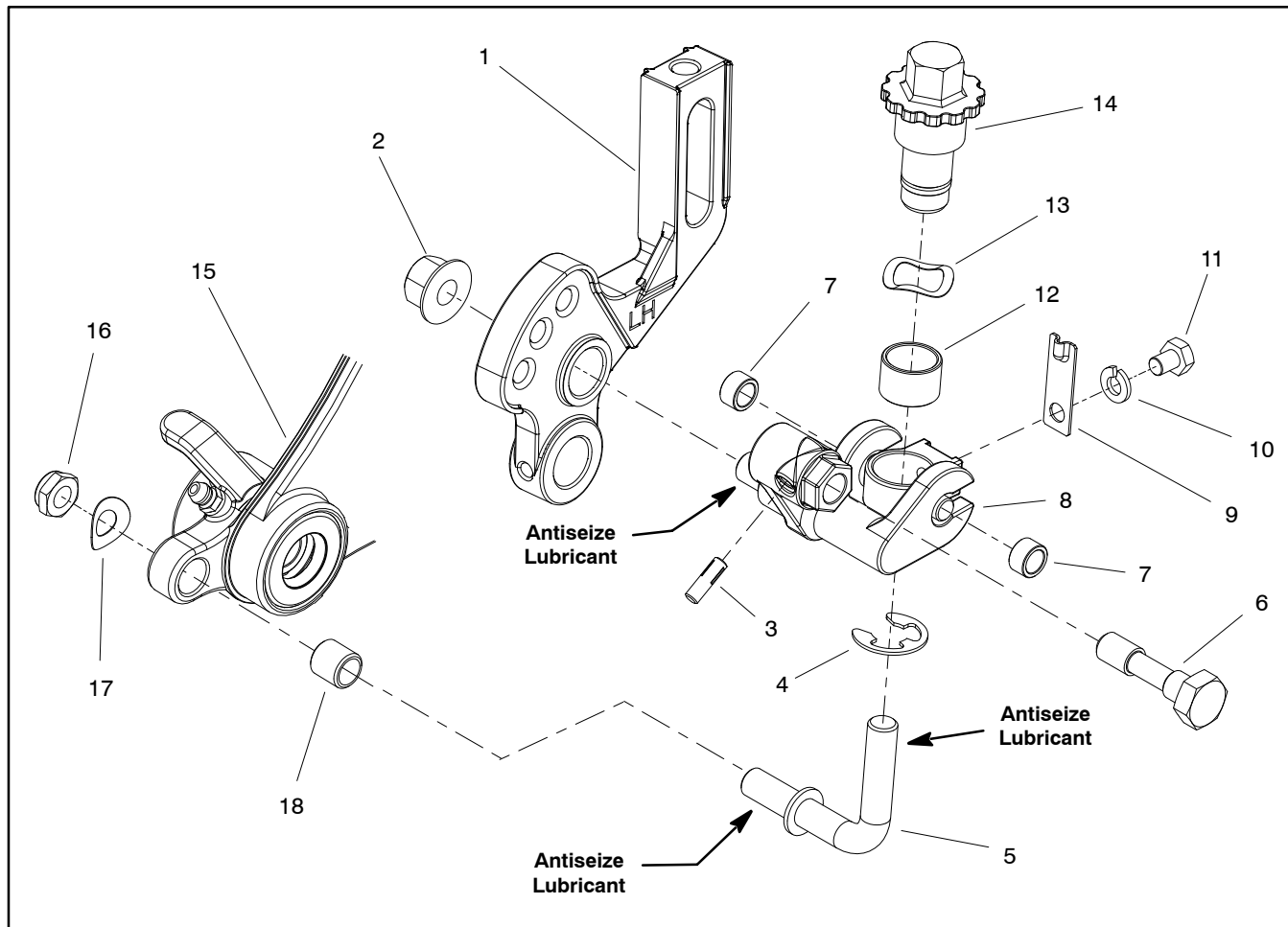


Figure 30

- 1. HOC groomer arm (LH shown)
- 2. Flange nut
- 3. Grooved pin
- 4. E-ring
- 5. Groomer lift rod
- 6. Lock screw

- 7. Bushing
- 8. Lift arm assembly (LH shown)
- 9. Detent spring
- 10. Spring washer
- 11. Cap screw
- 12. Bushing

- 13. Wave washer
- 14. Groomer adjuster
- 15. Groomer plate (LH shown)
- 16. Lock nut
- 17. Spring washer
- 18. Bushing

Disassembly (Fig. 30)

1. Position machine on a clean and level surface with engine stopped. Engage parking brake.
2. Remove flange nut (item 2) that secures lift arm to HOC groomer arm. Remove lock nut (item 16) and spring washer (item 17) that secure lift arm to groomer plate. Loosen lock screw (item 6) completely.
3. Remove lift arm from cutting unit.
4. Disassemble lift arm using Figure 30 as a guide.

NOTE: Right and left side HOC groomer arms (item 1) and lift arm assemblies (item 8) are different; other components shown in Figure 30 are the same on both sides of cutting unit.

NOTE: Grooved pin (item 3) is used to retain lock screw (item 6) to lift arm assembly.

Assembly (Fig. 30)

1. Assemble lift arm using Figure 30 as a guide.
2. Apply antiseize lubricant to threads of groomer lift rod (item 5) and lift arm assembly stud (item 8).
3. Install lift arm onto cutting unit. Secure with flange nut (item 2) and lock nut (item 16) with spring washer (item 17).
4. Secure groomer in raised or lowered position with lock screw (item 6).
5. Check and adjust grooming reel height and mower height-of-cut settings.

Groomer Brush

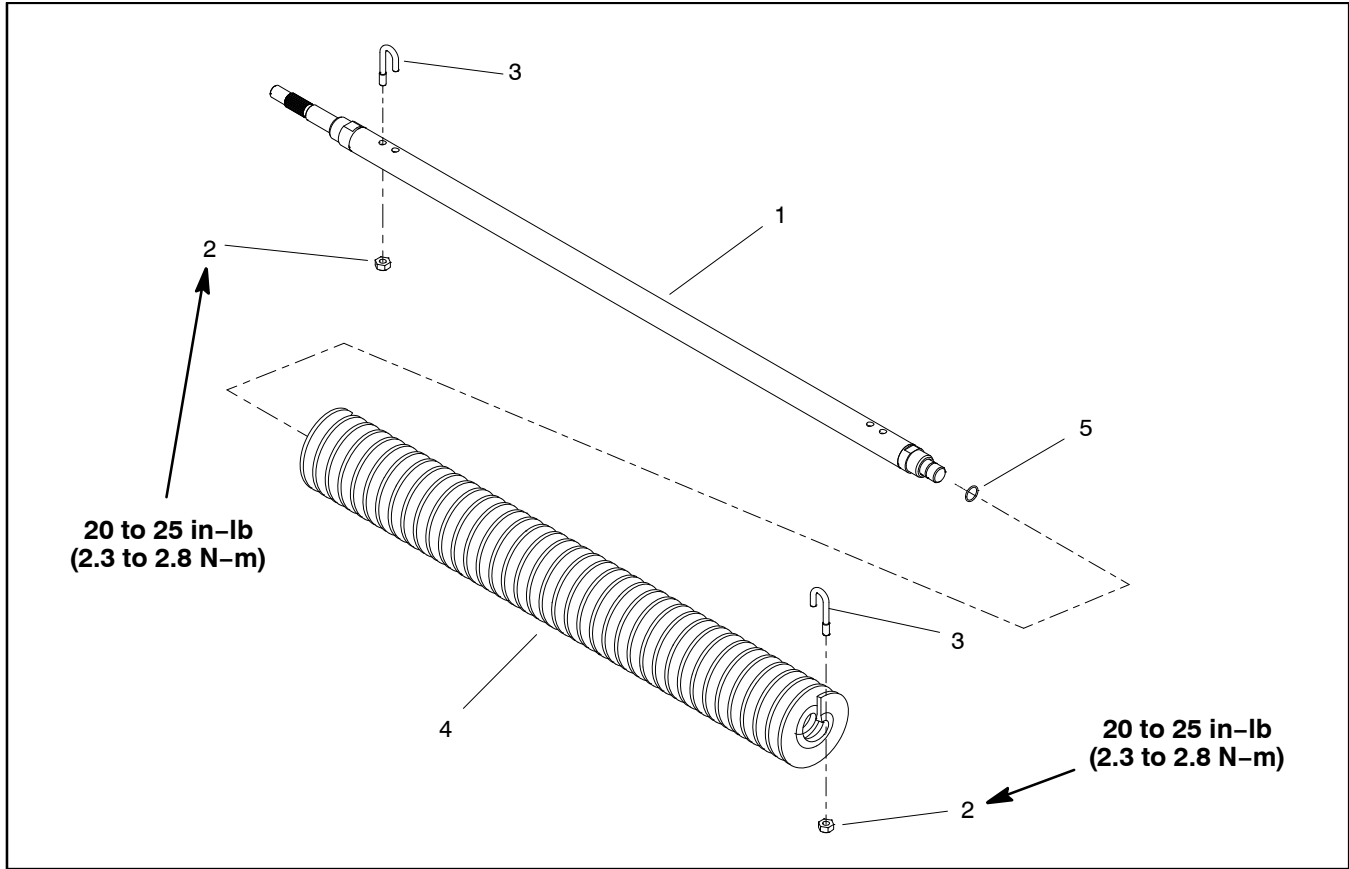


Figure 31

- 1. Groomer brush shaft
- 2. Lock nut

- 3. J-bolt
- 4. Groomer brush

- 5. O-ring

The groomer brush attaches to the groomer drive in place of the grooming reel. Removal and installation of the groomer brush uses the same procedure as removal and installation of the grooming reel (see Grooming Reel (Forward Rotating or Counter Rotating) in this section).

To remove the groomer brush from the shaft, remove the lock nut and J-bolt from both ends of the brush and slide the brush from the shaft. When assembling the brush to the shaft, secure the assembly with J-bolts and lock nuts. Make sure that the J-bolts are installed with the threaded portion on the outside of the brush (Fig. 32). Torque lock nuts from **20 to 25 in-lb (2.3 to 2.8 N-m)**.

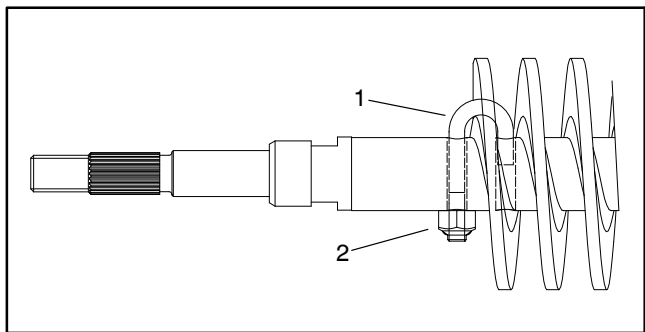


Figure 32

- 1. J-bolt

- 2. Lock nut



Universal Groomer (Optional)

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Specifications

Universal Groomer

| Item | Description |
|------------------------|--|
| Grooming reel diameter | 6 cm (2.375 inches) |
| Groomer blade type | <p>Spring Steel: 40 steel blades with 1/2 inch blade spacing.</p> <p>Carbide: 40 steel blades with 1/2 inch blade spacing.</p> <p>Thin blade: 81 steel blades with 1/4 inch blade spacing.</p> <p>The groomer brush can be installed in place of grooming reel.</p> |
| Groomer mounting | The groomer is mounted to the cutting unit side plates. |
| Groomer height setting | <p>Mowing: 0.8 to 15.7 mm (0.030 to 0.620 inch).</p> <p>HOC range: 1.5 to 19.1 mm (0.060 to 0.750 inch).</p> |
| Width-of-groomer | 54.6 cm (21.5 inches). |
| Height adjustment knob | Allows a 0.003 inch (0.08 mm) increment of height adjustment for each click of the adjuster. |
| Quick-up feature | Allows grooming reel to be raised above the height/depth adjustment for no grooming reel action while mowing. |
| Groomer drive | The groomer drive assembly is attached to the right side of the cutting unit. |

General Information

Installation Instructions

The installation instructions for the groomer provide information regarding the operation, general maintenance procedures, and maintenance intervals for the groomer assembly on your Greensmaster eFlex machine. Refer to this publication for additional information when servicing the groomer assembly.

Troubleshooting

Factors Affecting Grooming

There are a number of factors that can affect the performance of grooming. These factors vary for different golf courses and from green to green. It is important to inspect the turf frequently and vary the grooming practice with turf needs.

IMPORTANT

Improper or overaggressive use of the groomer (e.g., too deep or too frequent grooming) may cause unnecessary stress on the turf leading to severe turf damage. Use the groomer carefully. Read and understand the groomer operation instruction before operating or testing the groomer performance.

It is important to remember that factors affecting quality of cut also affect grooming performance.

Variables that Affect the Use and Performance of the Groomers:

1. The growing season and weather conditions.
2. General turf conditions.
3. The frequency of grooming/cutting—number of cuttings per week and how many passes per cutting.
4. The height-of-cut.
5. The grooming depth.
6. The type of grass.
7. The amount of time that a groomer reel has been in use on a particular turf area.
8. The amount of traffic on the turf.
9. The overall turf management program—irrigation, fertilizing, weed control, coring, over-seeding, sand dressing, disease control, and pest control.
10. Stress periods for turf—high temperatures, high humidity, and unusually high traffic.

Groomer Reel Mechanical Problems

| Problem | Possible Causes | Correction |
|---|---|--|
| The groomer reel does not rotate. | The groomer drive is in neutral. | Engage the groomer drive to forward or reverse. |
| | The groomer drive gears are damaged or seized. | Repair the groomer drive. |
| The turf is damaged or has uneven grooming. | The groomer is set too aggressively. | Refer to the groomer <i>Installation Instructions</i> for groomer set-up information. |
| | The groomer reel blades are bent, damaged, or missing. | Repair or replace the blades if necessary. |
| | The groomer reel shaft is bent or damaged. | Replace the groomer reel shaft. |
| | Grooming depth is not equal on both ends of the groomer reel. | Adjust the depth if necessary. Check and adjust the cutting unit set up (level bed knife to reel, level rear roller to reel, set the height-of-cut, etc.). |

Special Tools

Special tools for servicing Toro Commercial Products are available from your Toro Distributor. Some of these tools may have been supplied with your machine, are available as Toro parts, or may also be available from a local tool supplier.

Reel Thread Repair Taps

**15/16–16 Right-Hand Thread –
Toro Part No. 137–0926**

**15/16–16 Left-Hand Thread – Toro
Part No. 137–0927**

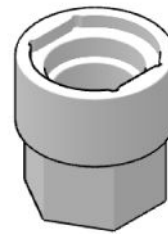
Use to clean or repair the internal threads of cutting unit reels.



Drive Shaft Removal Tool

Toro Part No. 137–0920

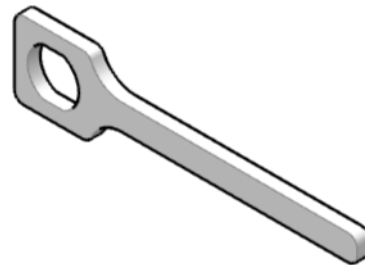
Use to remove the optional Universal Groomer drive shaft from the reel if the drive shaft hex is damaged.



Adapter Wrench

Toro Part No. 137-0921

Use to hold the optional Universal Groomer drive shaft securely when removing or installing the drive adapter.



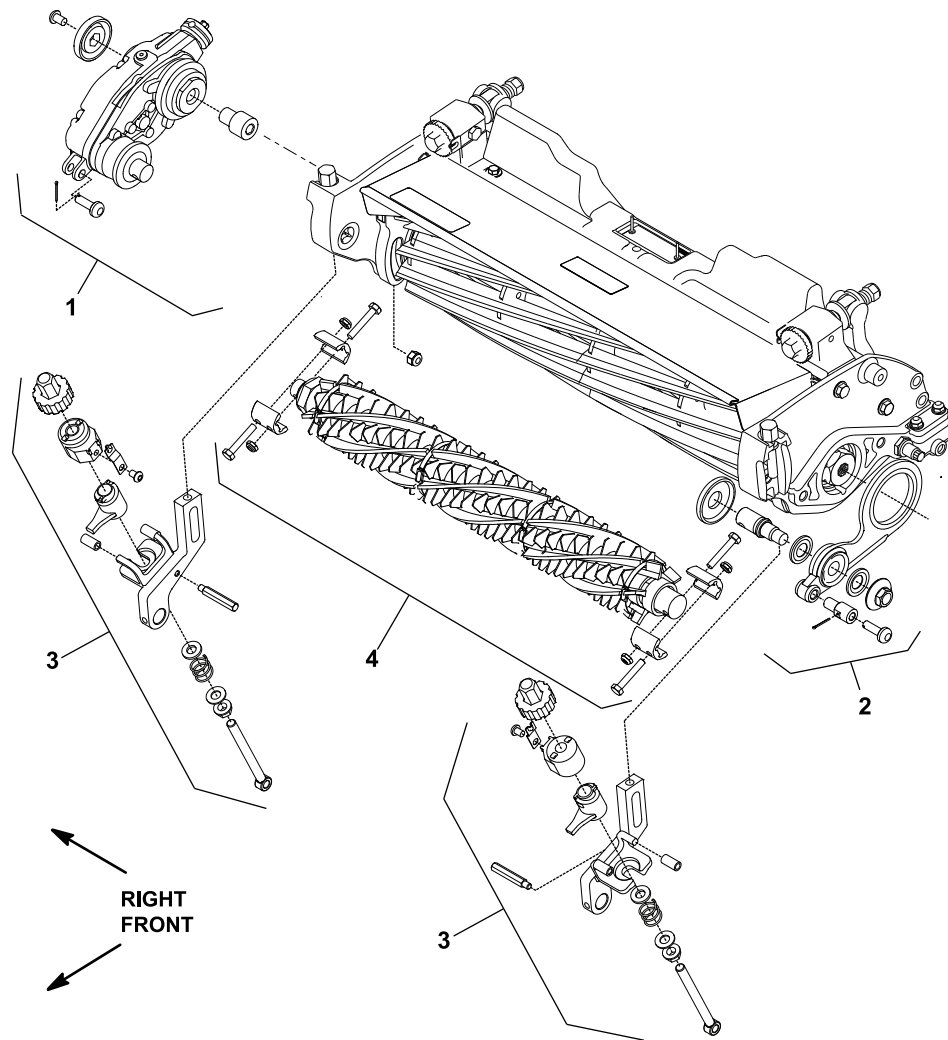
Syringe – 50cc (2 ounce)

Toro Part No. 137-0872

Aids in accurately filling the optional
Universal Groomer gear box with
oil.



Service and Repairs



g324622

Figure 1

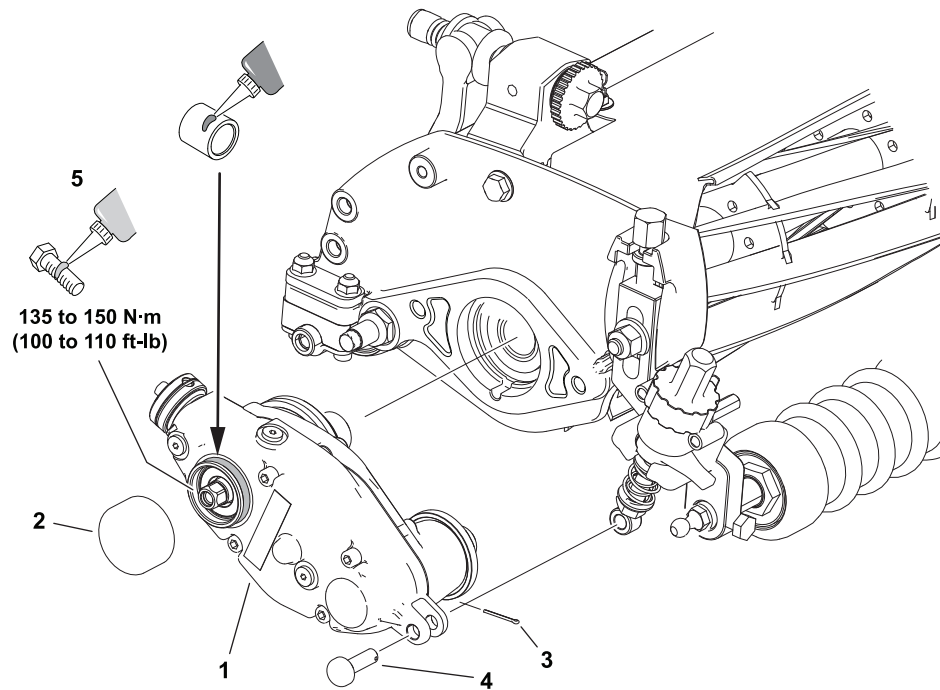
- | | |
|----------------------|--------------------------------------|
| 1. Gear box assembly | 3. Height adjuster assembly (2 each) |
| 2. Idler assembly | 4. Groomer reel |

⚠ CAUTION ⚠

Do not work on the groomer with the engine running. Always shut off the engine, remove the key from the key switch and wait for all machine movement to stop before working on the groomer.

Note: The *Groomer Operator's Manual* provides information regarding the installation, set-up, operation, and maintenance of the universal groomer on your machine. Refer to these instructions for additional information when servicing the groomer.

The Gear Box Assembly



g323289

Figure 2

- | | |
|----------------------|----------------|
| 1. Gear box assembly | 4. Clevis pin |
| 2. Drive shield | 5. Input shaft |
| 3. Cotter pin | |

The groomer gear box assembly is located on the right side of the cutting unit.

Removing the Gear Box Assembly

Refer to [Figure 2](#) for this procedure.

1. Remove the cutting unit from the machine and place it on a level work surface.
2. Remove the groomer reel assembly; refer to [Removing the Groomer Reel \(page 9–19\)](#).
3. Remove the drive shield.
4. Install a 5/16–18 X 5/8 inch square head set screw (Toro p/n 1-803022) in the end of the drive shaft and tighten to **13 N·m (120 in-lb)**; refer to [Figure 3](#).
5. Remove the cotter pin and clevis pin from the height adjustment rod at the front of the groomer gear box. Discard the cotter pin.
6. Tip up the cutting unit to access the bottom of the reel to remove the drive shaft assembly.



Removing the Gear Box Assembly (continued)

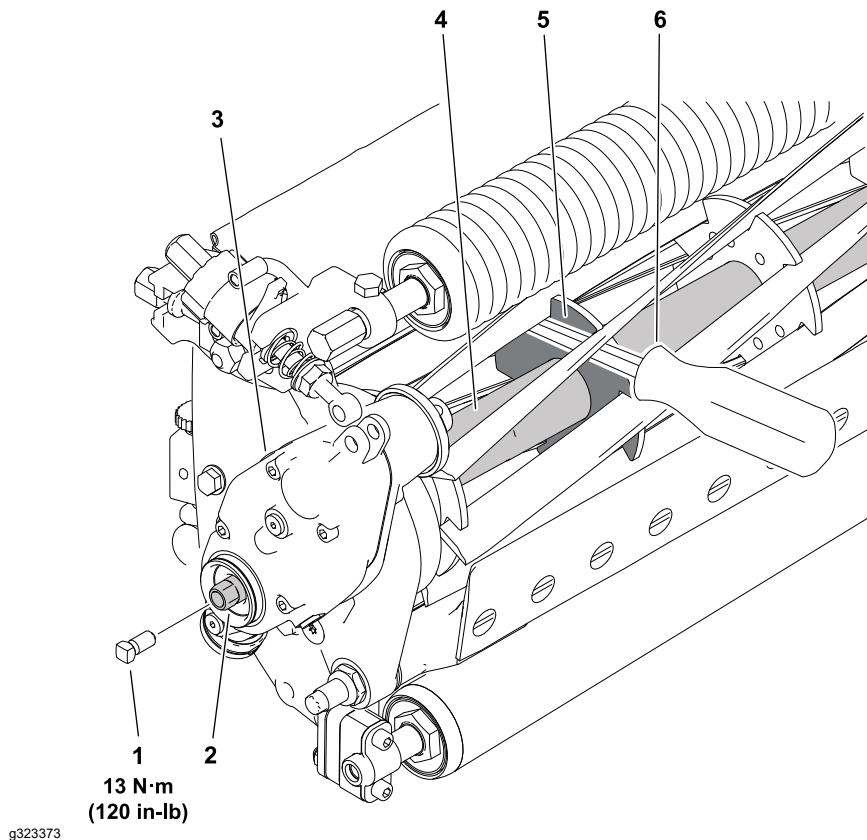


Figure 3

- | | |
|---|------------------------------------|
| 1. 5/16–18 X 5/8 inch square head set screw | 4. Reel shaft |
| 2. Input shaft assembly | 5. Weld side of reel support plate |
| 3. Groomer gear box assembly | 6. Pry bar |

-
7. Insert a long-handled pry bar (3/8 x 12 inch with screwdriver handle recommended) through the bottom of the cutting unit. The pry bar should pass between the top of the reel shaft and the backs of the reel blades so that the reel will not move.

IMPORTANT

To avoid grinding the reel, do not contact the cutting edge of any blade with the pry bar as this may damage the cutting edge and/or cause a high blade.

8. Move the pry bar against the weld side of the reel support plate closest to the groomer gear box.

IMPORTANT

You must use a 6-point socket with a heavy wall to remove the gear box from the reel. Do not use an impact wrench. Groomer gear boxes installed on the right side of the cutting unit use a standard right hand thread; turn the drive shaft counterclockwise to remove the gear box.

Removing the Gear Box Assembly (continued)

9. Rest the handle of the pry bar against the front roller and turn the drive shaft counterclockwise to loosen it from the reel. Continue to unscrew the drive shaft and remove the gear box from the cutting unit.
10. If the hex head on the end of the drive shaft is damaged during removal:
 - A. Remove the drain/fill plug and drain the oil from the gear box.

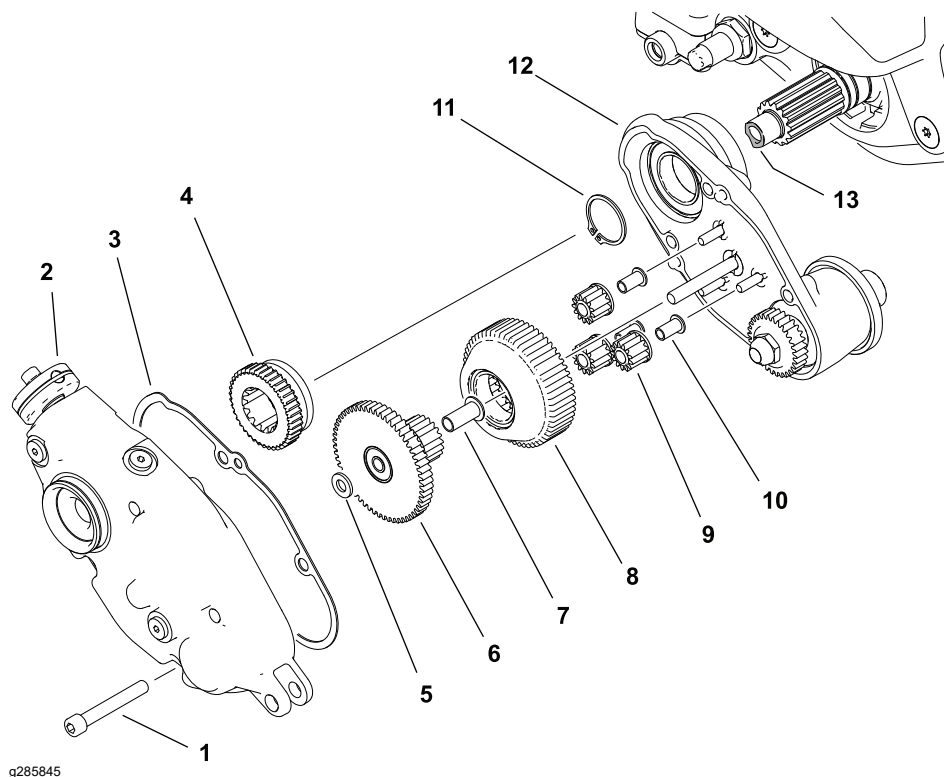


Figure 4

- | | |
|-------------------------------|-------------------------------|
| 1. Socket head screw (4 each) | 8. Sun gear |
| 2. Gear box cover assembly | 9. Planet gear (3 each) |
| 3. Cover gasket | 10. Flange bushing (3 each) |
| 4. Driven gear | 11. Retaining ring |
| 5. Thrust washer | 12. Gear box housing assembly |
| 6. Ring gear | 13. Damaged drive shaft |
| 7. Flange bushing | |

-
- B. Remove the 4 socket-head screws and remove the gear box cover assembly and driven gear. Remove and discard the cover gasket.
 - C. Slide the thrust washer, ring gear and bushing from the gear box housing.
 - D. Slide the sun gear, and planet gears and bushings from the pins on the gear box housing.
 - E. Remove the retaining ring from the drive shaft.
 - F. Slide the groomer housing assembly from the drive shaft.
 - G. Tip up the cutting unit to access the bottom of the reel to remove the drive shaft assembly.

Removing the Gear Box Assembly (continued)

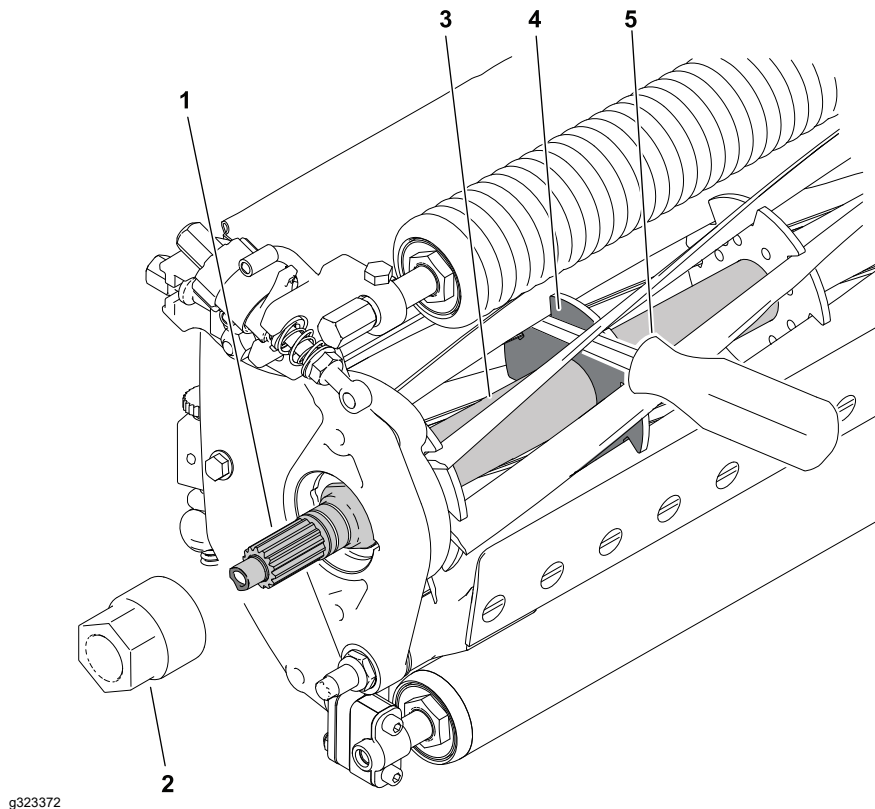


Figure 5

- | | |
|---------------------------------|------------------------------------|
| 1. Damaged input shaft assembly | 4. Weld side of reel support plate |
| 2. Drive shaft removal tool | 5. Pry bar |
| 3. Reel shaft | |

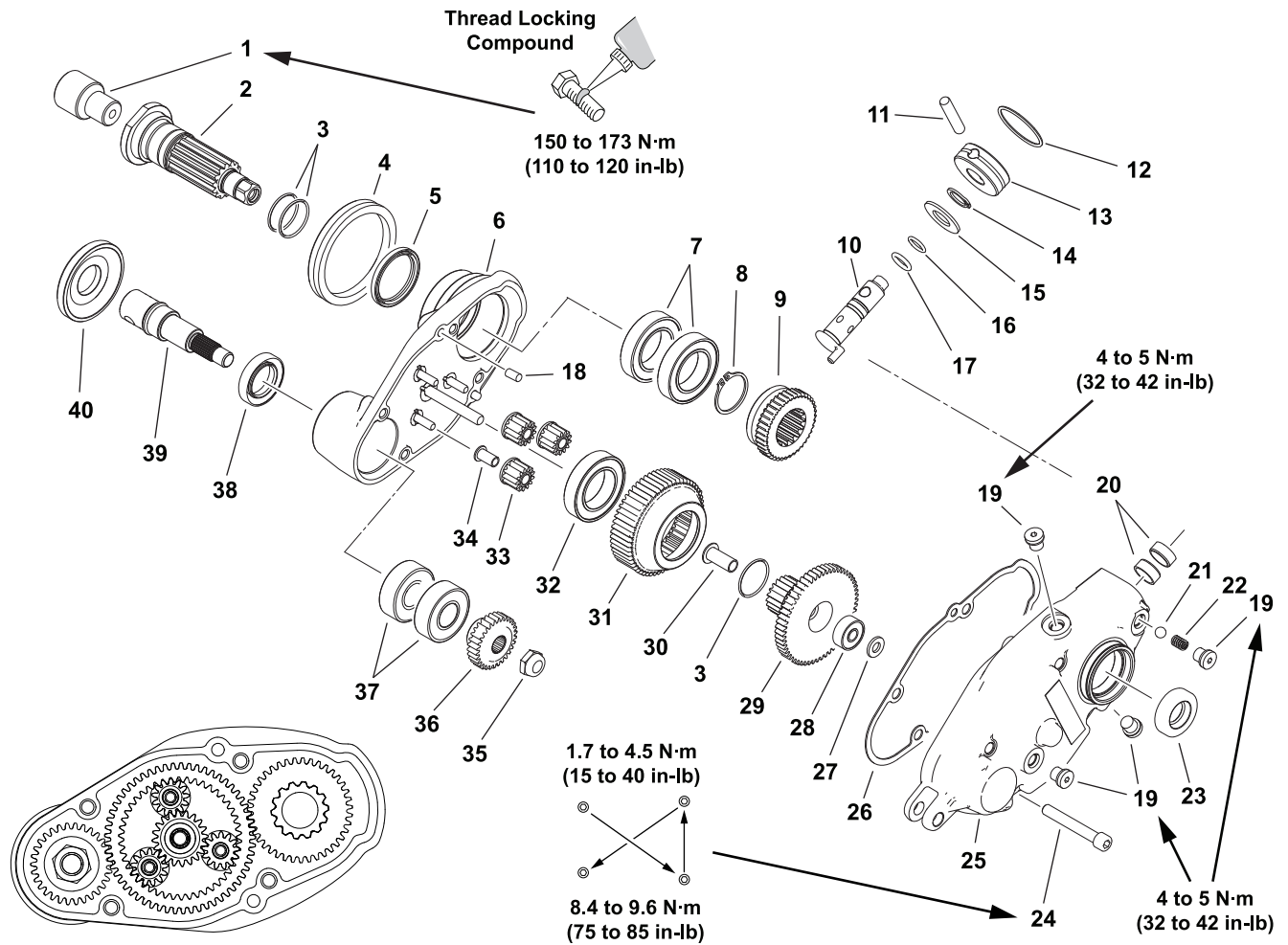
H. Insert a long-handled pry bar (3/8 x 12 inch with screwdriver handle recommended) through the bottom of the cutting unit. The pry bar should pass between the top of the reel shaft and the backs of the reel blades so that the reel will not move.

IMPORTANT

To avoid grinding the reel, do not contact the cutting edge of any blade with the pry bar as this may damage the cutting edge and/or cause a high blade.

- I. Move the pry bar against the weld side of the reel support plate closest to the drive shaft assembly.
- J. Use the drive shaft removal tool on the large flats of the drive shaft assembly; refer to [Drive Shaft Removal Tool \(page 9–6\)](#).
- K. Rest the handle of the pry bar against the front roller and turn the drive shaft counterclockwise to loosen it from the reel.
11. Tip the cutting unit back onto its rollers.
12. Clean the threads in the end of the reel shaft. A right-hand thread and left-hand thread tap is available to clean or repair the threads if necessary; refer to [Reel Thread Repair Taps \(page 9–6\)](#).

Servicing the Gear Box



g251182

Figure 6

- | | |
|-------------------------------|--------------------------------|
| 1. Drive adapter – silver | 21. Detent ball |
| 2. Input shaft | 22. Detent spring |
| 3. O-ring (3 each) | 23. Oil seal |
| 4. V-ring | 24. Socket-head screw (4 each) |
| 5. Oil seal | 25. Groomer cover |
| 6. Groomer housing | 26. Cover gasket |
| 7. Ball bearing (2 each) | 27. Thrust washer |
| 8. Retaining ring | 28. Ball bearing |
| 9. Driven gear | 29. Ring gear |
| 10. Actuator shaft | 30. Flange bushing |
| 11. Pin | 31. Sun gear |
| 12. O-ring | 32. Bearing |
| 13. Knob | 33. Planet gear (3 each) |
| 14. Retaining ring | 34. Flange bushing (3 each) |
| 15. Thrust washer | 35. Locknut |
| 16. O-ring | 36. Driver gear |
| 17. O-ring | 37. Bearing (2 each) |
| 18. Dowel pin (2 each) | 38. Oil seal |
| 19. Drain/fill plug (4 each) | 39. Driven shaft |
| 20. Straight bushing (2 each) | 40. Shield |

Servicing the Gear Box (continued)

1. Remove the drain/fill plug and drain the oil from the gear box.
2. Remove the 4 socket-head screws and separate the gear box cover and housing. Remove and discard the cover gasket.
3. Slide the sun gear, ring gear, and planet gears from the pins on the gear box housing.
4. Continue to disassemble the gear box as necessary.
5. If the drive adapter requires replacement, apply medium strength thread locking compound (Loctite 243 or equivalent) to the internal threads of the drive shaft and the larger threads of the drive adapter (reel end). Allow the thread locking compound to cure for 15 minutes before continuing this procedure.



CAUTION



Use the large 1.375 inch flats on the drive shaft to prevent the drive shaft from rotating during drive adapter removal and installation. DO NOT use the 0.5 inch hex head on the drive shaft for drive adapter removal or installation as drive shaft damage may occur.

Note: A special tool is available to hold the drive shaft if necessary; refer to [Adapter Wrench \(page 9–6\)](#).



6. Tighten the drive adapter from **150 to 163 N·m (110 to 120 ft-lb)**.
7. Carefully clean all the gasket material from the gear box housing and cover.
8. Inspect the V-ring, seals, bearings, gears, and bushings in the gear box assembly. Replace the damaged or worn components as necessary.
9. If the sun gear, ring gear, or the gear box housing bearings are replaced, press the bearings all the way to shoulder into the part.
10. If the flange bushings are replaced, ensure that the flange bushing is fully seated against the part.
11. Assembly the gear box.
 - Ensure that all the retaining rings and O-rings are fully seated in the ring groove during assembly.
 - Lubricate the seal lips and O-rings before installing the shafts.
 - Lubricate the planet gear and sun gear pins in the gear box housing with the gear oil prior to installing the gears.
12. Clean the gasket surface on the gear box housing and cover with the solvent and install new gasket.



13. Fit the gear box cover over dowel pins and install the 4 socket-head screws. Tighten the screws from **1.7 to 4.5 N·m (15 to 40 in-lb)**. In an alternating cross pattern, tighten the screws from **8.4 to 9.6 N·m (75 to 85 in-lb)**.
14. Fill the gear box with 80W–90 gear oil and tighten the drain/fill plug from **4 to 5 N·m (32 to 42 in-lb)**.
The gear box oil capacity is **50 ml (1.7 fluid ounces)**.
15. Operate the groomer gear box by hand to check for proper operation prior to installation.

Installing the Gear Box Assembly

Refer to [Figure 2](#) for this procedure.

1. Apply medium strength thread locking compound (Loctite 243 or equivalent) to the threads in the reel and allow the thread locking compound to cure for 15 minutes before continuing this procedure.
2. Insert a long-handled pry bar through the front of the cutting unit. The pry bar should pass between the top of the reel shaft and the backs of the reel blades so that the reel will not move.

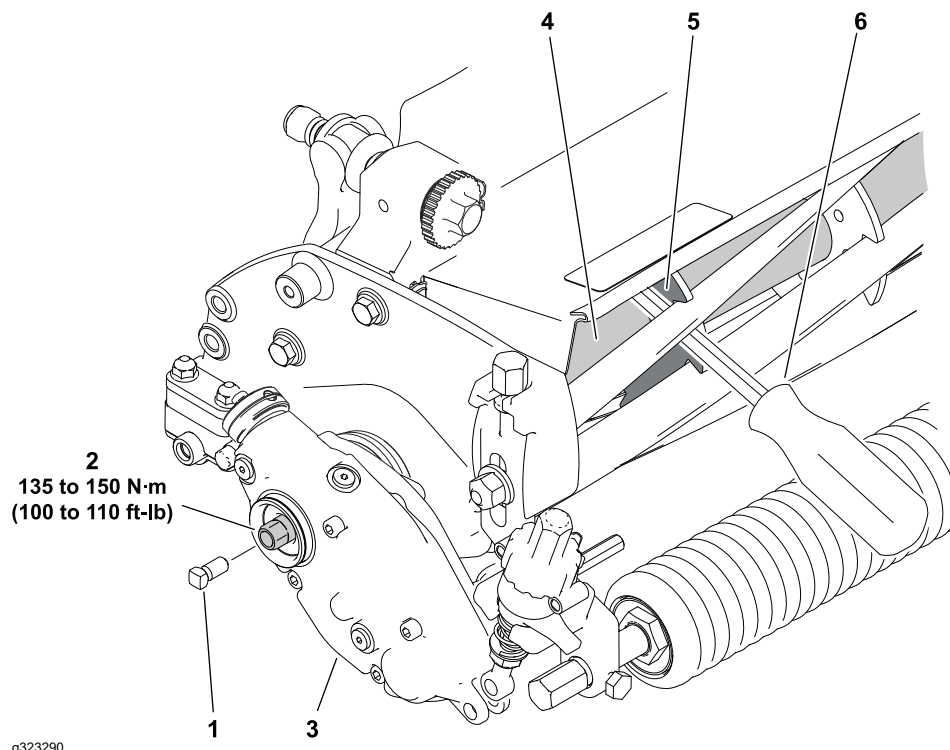


Figure 7

- | | |
|---|------------------------------------|
| 1. 5/16–18 X 5/8 inch square head set screw | 4. Reel shaft |
| 2. Input shaft assembly | 5. Weld side of reel support plate |
| 3. Groomer gear box assembly | 6. Pry bar |

3. Move the pry bar against the weld side of the reel support plate closest to the gear box assembly and rest the handle of the pry bar against the front roller.
4. Position the gear box assembly against the cutting unit and turn the drive shaft assembly clockwise until it is seated against the reel.

IMPORTANT

You must use a 6-point socket with a heavy wall to install the gear box to the reel. Do not use an impact wrench. Groomer gear boxes installed on the right side of the cutting unit use a standard right hand thread; turn the drive shaft clockwise to install the gear box.



5. Tighten the drive shaft assembly from **135 to 150 N·m (100 to 110 ft-lb)**.
6. Remove the square head set screw from the end of the drive shaft.
7. Install the clevis pin and a new cotter pin to secure the height adjustment rod to the front of the groomer gear box.

Installing the Gear Box Assembly (continued)

8. Apply a retaining compound (Loctite 609 or equivalent) to the lip of the drive housing and install the drive shield.
9. Install the groomer reel assembly; refer to [Installing the Groomer Reel \(page 9–19\)](#).

Idler Assembly

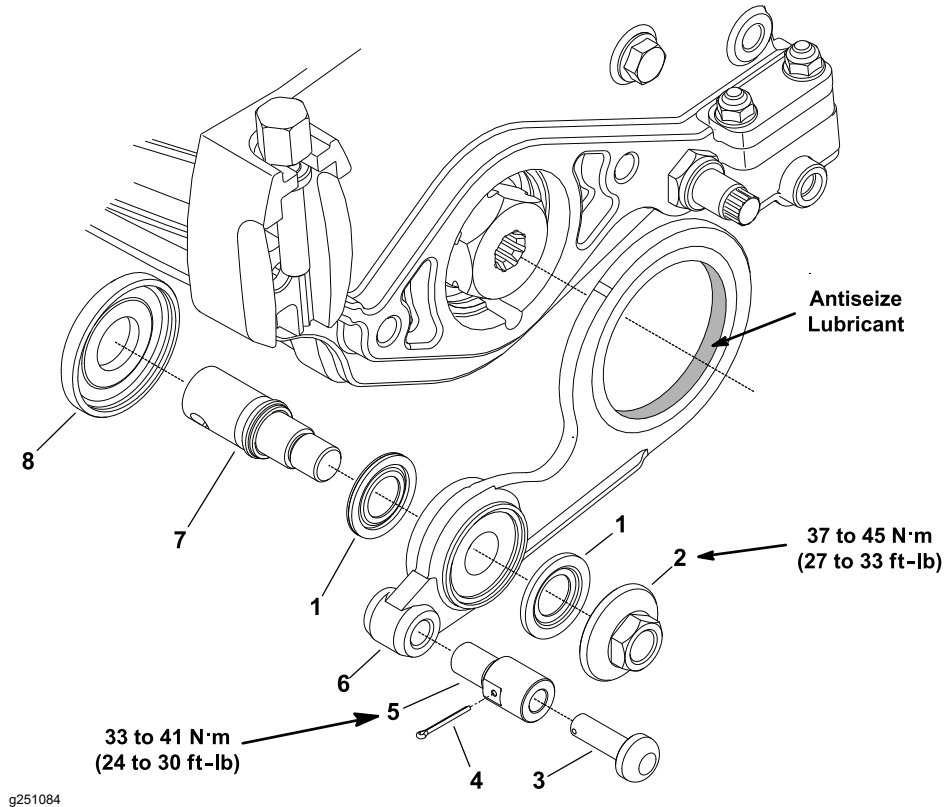


Figure 8

- | | |
|------------------------------------|---------------|
| 1. Flocked bearing shield (2 each) | 5. Collar |
| 2. Flange nut | 6. Idler arm |
| 3. Clevis pin | 7. Stub shaft |
| 4. Cotter pin | 8. Shield |

Note: The groomer idler assembly is located on the opposite side of the groomer gearbox assembly.

Removing the Idler Assembly

1. Park the machine on a clean and level surface, lower the cutting units completely to the ground, set the parking brake, and remove the key from the key switch.
2. Remove reel drive cover, drive belt, reel pulley and then reel drive assembly from cutting unit (see Reel Drive Assembly in the Service and Repairs section of Chapter 4 – Traction and Reel Drive System).
3. Remove the groomer reel assembly; refer to [Removing the Groomer Reel \(page 9–19\)](#).
4. Remove the cotter pin and clevis pin from the height adjustment rod at the front of the idler arm and remove the idler assembly from the cutting unit. Discard the cotter pin.

Removing the Idler Assembly (continued)

5. Inspect the shields, bearing, and bushing in the idler assembly. Remove and discard the components that are worn or damaged.

Installing the Idler Assembly

1. If the shields, bearing, or bushing was removed from the idler arm, install new components as follows:
 - A. Press the bushing into a groomer plate until the bushing is centered in the idler arm bore.
 - B. Press the bearing into the idler arm so that the bearing contacts the shoulder in idler arm bore and install the bearing retaining ring.
 - C. Install the bearing shields with flocked side of shield toward the bearing.
 - D. Check the idler arm orientation and insert the stub shaft through shields and bearing. Use the through hole in the shaft to prevent shaft from rotating, tighten the flange nut to **37 to 45 N·m (27 to 33 ft-lb)**.
 - E. If the collar was removed from the idler arm, install the collar and tighten to **33 to 41 N·m (24 to 30 ft-lb)**.
2. Apply anti-seize lubricant to the inside diameter of the idler arm.
3. Install a new cotter pin and clevis pin and secure the height adjustment rod to the front of the idler arm.
4. Install reel drive assembly, reel pulley, reel drive belt and then reel drive cover to left side of cutting unit (see Reel Drive Assembly in the Service and Repairs section of Chapter 4 - Traction and Reel Drive System).

Groomer Reel

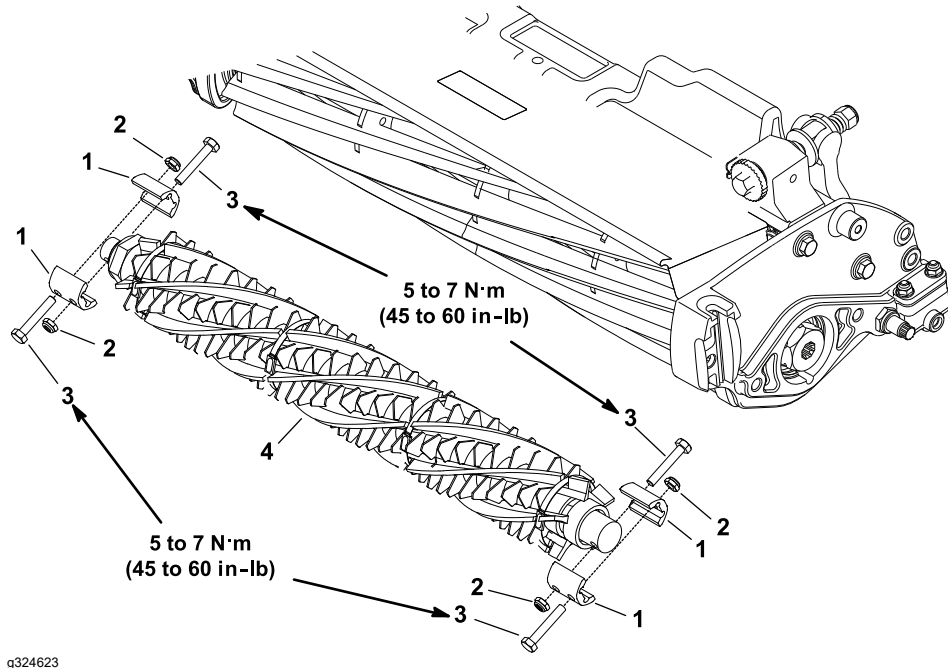


Figure 9

- | | |
|-------------------------|------------------|
| 1. Shaft clamp (4 each) | 3. Bolt (4 each) |
| 2. Jam nut (4 each) | 4. Groomer reel |

Remove the groomer reel to replace individual groomer blades or replace the shaft. The groomer reel can be reversed to provide additional blade life.

Removing the Groomer Reel

1. Park the machine on a clean and level surface, lower the cutting units completely to the ground, set the parking brake, and remove the key from the key switch. If necessary, remove the cutting unit from the machine; refer to the *Traction Unit Operator's Manual*.

CAUTION

Contact with the reel or other cutting unit parts can result in personal injury.

Use heavy gloves when handling the groomer reel.

2. Carefully remove the 4 jam nuts (item 2 in [Figure 9](#)), 4 bolts, and 4 shaft clamps that secure the groomer reel to the output and stub shafts.
3. Lift the groomer reel from the cutting unit.
4. Inspect the seal, shields, bushing, and bearings for wear or damage. Replace the components as necessary; refer to [The Gear Box Assembly \(page 9–9\)](#) and [Idler Assembly \(page 9–16\)](#).

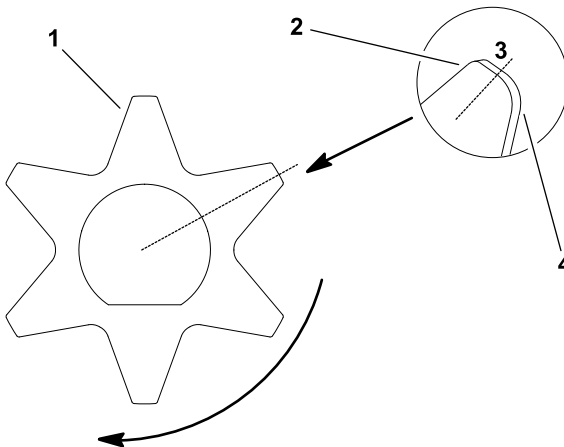
Installing the Groomer Reel

1. Position the cutting unit on a level surface. If the cutting unit is attached to the traction unit, set the parking brake, and remove the key from the key switch.
2. Position the groomer reel between the groomer output and stub shafts.

Installing the Groomer Reel (continued)

3. Secure the groomer reel to the cutting unit with the 4 jam nuts, 4 bolts, and 4 shaft clamps; torque the bolts to **5 to 7 N·m (45 to 60 in-lb)**.
4. Check the groomer reel height and mower height-of-cut settings. Adjust as necessary.

Servicing the Groomer Reel



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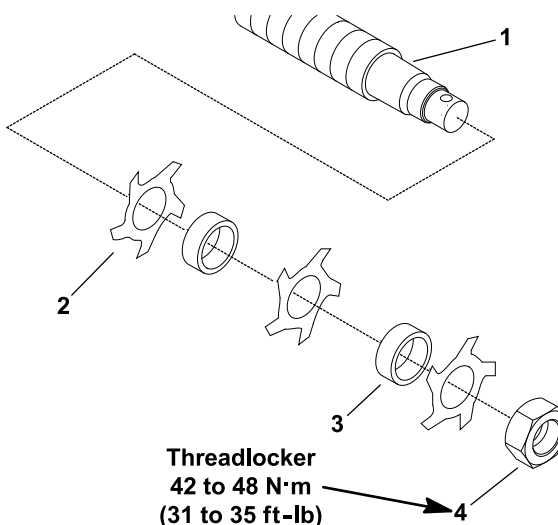
Figure 10

- | | |
|------------------|------------------------|
| 1. Groomer blade | 3. Midpoint |
| 2. Sharp edge | 4. Dull (rounded) edge |

Inspect the groomer reel blades frequently for any damage and wear. Straighten the bent blades. Either replace the worn blades or reverse the individual blades to put the sharpest blade edge forward ([Figure 10](#)). The blades that are rounded to the midpoint of the blade tip must be reversed or replaced for best groomer performance.

Disassembling the Groomer Reel

1. Park the machine on a clean and level surface, lower the cutting units completely to the ground, set the parking brake, and remove the key from the key switch.
2. Remove the groomer reel from the cutting unit; refer to [Removing the Groomer Reel \(page 9–18\)](#).



g229841

Figure 11

- | | |
|----------------------------|---------------------|
| 1. Groomer reel shaft | 3. Spacer (39 each) |
| 2. Groomer blade (40 each) | 4. Locknut (2 each) |

3. Remove the locknut from either end of the shaft ([Figure 11](#)).

Disassembling the Groomer Reel (continued)

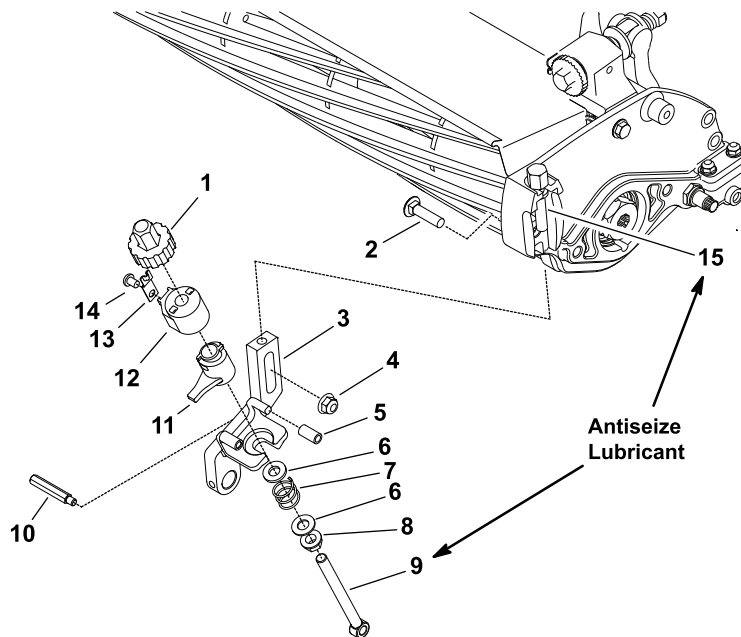
4. Remove the spacers and blades from the groomer shaft. If necessary, remove second locknut from the shaft.
5. Inspect and replace the components that are worn or damaged.

Assembling the Groomer Reel

Note: New locknuts have an adhesive patch to prevent the locknut from loosening. If a used locknut is being installed, apply a medium strength threadlocker (Loctite #242 or equivalent) to the threads of the locknut.

1. Install the locknut on drive end of the groomer shaft. Place the groomer blade on the groomer shaft.
2. Alternately install 11.6 mm (0.46 inch) spacers and blades, ensure that all the blades are separated by a spacer.
3. When all the blades have been installed, install the second locknut onto the shaft. Center the blades on shaft by adjusting locknuts.
4. Use the through holes in shaft to prevent the shaft from rotating, tighten the second locknut to **42 to 48 N·m (31 to 35 ft-lb)**. After tightening the locknut, spacers should not be free to rotate and the groomer blades should be centered on the shaft.
5. Install the O-ring on the non-drive end of the groomer shaft.
6. Install the groomer reel back onto the cutting unit; refer to [Installing the Groomer Reel \(page 9–18\)](#).

Height Adjuster Assembly



g324624

Figure 12

- | | |
|--------------------------|--------------------------|
| 1. Height adjuster knob | 8. Flange nut |
| 2. Carriage bolt | 9. Height adjustment rod |
| 3. Height-of-cut bracket | 10. Groomer pin |
| 4. Flange nut | 11. Quick up lever |
| 5. Groomer hose | 12. Quick up cover |
| 6. Washer (2 each) | 13. Detent spring |
| 7. Compression spring | 14. Button-head screw |

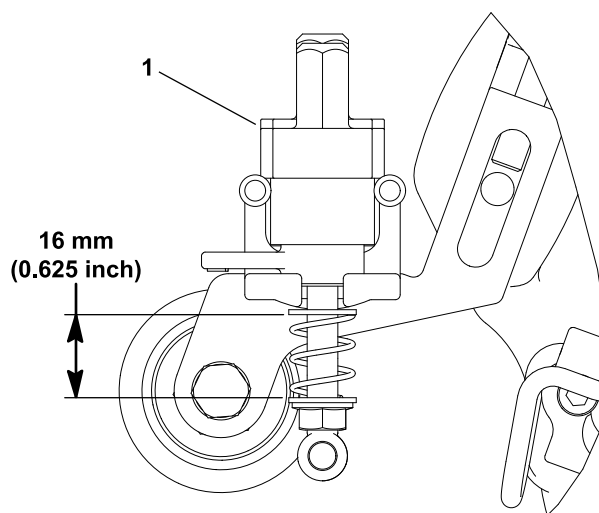
Note: Early universal groomers used 2 compression springs on non-adjustable height adjustment rods. Retrofitting the assemblies on each side of the cutting unit with new compression springs, height adjustment rods, and adding flange nuts to enable spring adjustment is recommended ([Figure 12](#)).

Disassembling the Height Adjuster Assembly

1. Park the machine on a clean and level surface, lower the cutting units completely to the ground, set the parking brake, and remove the key from the key switch.
2. Remove the cotter pins and clevis pins that secure the height adjustment rods to the groomer gear box and idler arm. Discard the cotter pins.
3. Loosen the 2 height adjustment bolts (item 15 in [Figure 12](#)) and 2 locknuts.
4. Remove the flange nut (item 4 in [Figure 12](#)) and carriage bolt that secure the height adjuster assembly to the cutting unit side plate, and remove the front roller and height adjuster from the cutting unit.
5. Disassemble the height adjuster assembly ([Figure 12](#)).
6. Clean all the components and inspect for wear or damage. Replace all the components that are worn or damaged.

Assembling the Height Adjuster Assembly

1. Apply anti-seize lubricant to the upper threads of the adjustment rod and lower threads of the height adjusters. Assemble the height adjuster assembly (Figure 12).
2. If both the height adjusters are removed, fit 1 height adjuster assembly to the cutting unit side plate and secure it with the carriage bolt and flange nut. Do not tighten the flange nut at this time. Ensure that the height adjustment bolt and 1 washer is above the slot in the side plate and 1 washer and locknut is below the slot in the side plate.
3. Position front roller between the height adjuster assemblies and secure height adjuster assembly to cutting unit side plate with carriage bolt and flange nut. Do not tighten the flange nut at this time. Ensure the height adjustment bolt and 1 washer is above slot in side plate and 1 washer and locknut is below slot in side plate.
4. Install new cotter pins and clevis pins and secure the height adjustment rods to the groomer gear box and idler arm.
5. Adjust the cutting unit height-of-cut; refer to *Cutting Unit Operators Manual*.
6. Check the groomer reel height and adjust as necessary.



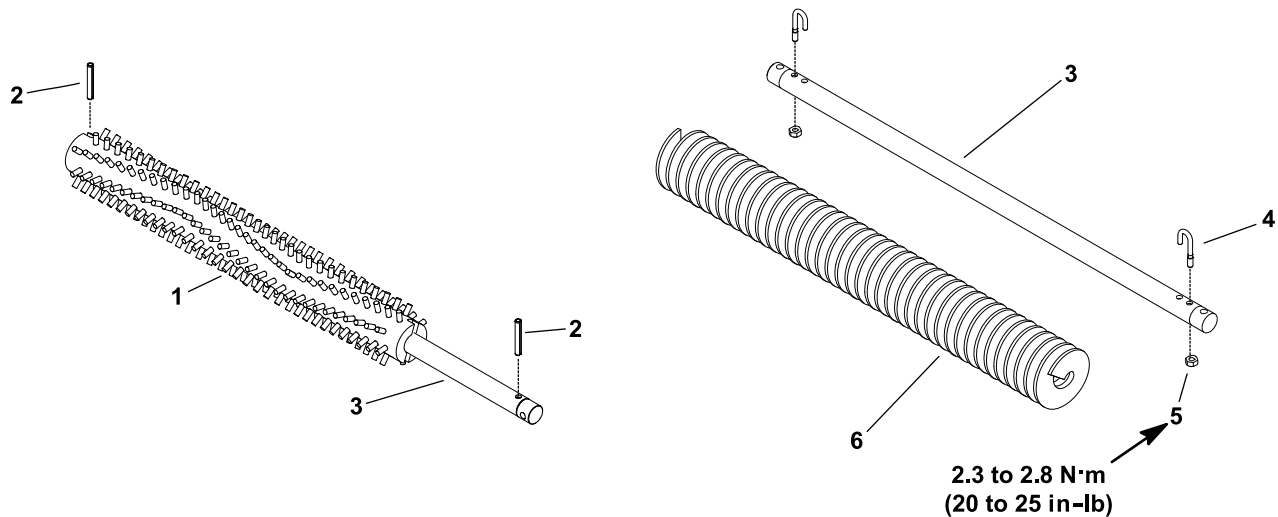
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Figure 13

1. Height adjustment knob

-
7. Adjust the flange nuts (item 8 in Figure 12) on the groomer height adjustment rods until the springs are compressed to 16 mm (0.625 inch).

Servicing the Grooming Brush (Optional)



g229842

Figure 14

- | | | |
|----------------------|--------------------|---------------------|
| 1. Brush element | 3. Brush shaft | 5. Locknut (2 each) |
| 2. Roll pin (2 each) | 4. J-bolt (2 each) | 6. Spiral brush |

The optional grooming brush attaches to the groomer in place of the groomer reel. The grooming brush is removed and installed from the groomer in the same manner as the groomer reel; refer to [Groomer Reel \(page 9–18\)](#).

The grooming brush element or shaft can be serviced separately ([Figure 14](#)).

To remove the spiral grooming brush from the shaft, remove the locknut and J-bolt from both ends of the brush assembly and slide the brush from the shaft. When assembling the spiral brush to the shaft, ensure that the J-bolts are installed with the threaded portion on the outside of the brush and tighten the locknuts to **2.3 to 2.8 N·m (20 to 25 in-lb)**.