



Count on it.

Form No. 20247SL Rev B

Service Manual

Greensmaster® Flex 1018/1021
(Models 04850 and 04860)

Revision History

[illegible]

Revision History (continued)

Revision	Date	Description

Reader Comments

The Toro Company Technical Assistance Center maintains a continuous effort to improve the quality and usefulness of its publications. To do this effectively, we encourage user feedback. Please comment on the completeness, accuracy, organization, usability, and readability of this manual by an e-mail to servicemanuals@toro.com

or Mail to:

Technical Publication Manager, Commercial
The Toro Company
8111 Lyndale Avenue South
Bloomington, MN 55420-1196
Phone: +1 952-887-8495

NOTES

Preface

The purpose of this publication is to provide the service technician with the information for troubleshooting, testing, and repair of the major systems and components on the Greensmaster Flex 1018/1021 (Models 04850 and 04860).

Refer to the *Operator's Manuals* and *Installation Instructions* for installing, operating, maintenance, and adjustment instructions. Keep a copy of the *Operator's Manuals*, *Installation Instructions* and *Parts Catalogs* for your machine and its accessories with this *Service Manual* for reference. Additional copies of the *Operator's Manuals*, *Installation Instructions* and *Parts Catalogs* are available at www.toro.com.

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



DANGER



This safety symbol means danger. When you see this symbol, carefully read the instructions that follow. Failure to obey the instructions could kill or cause serious permanent injury or disability.



WARNING



This safety symbol means warning. When you see this symbol, carefully read the instructions that follow. Failure to obey the instructions can result in serious injury.



CAUTION

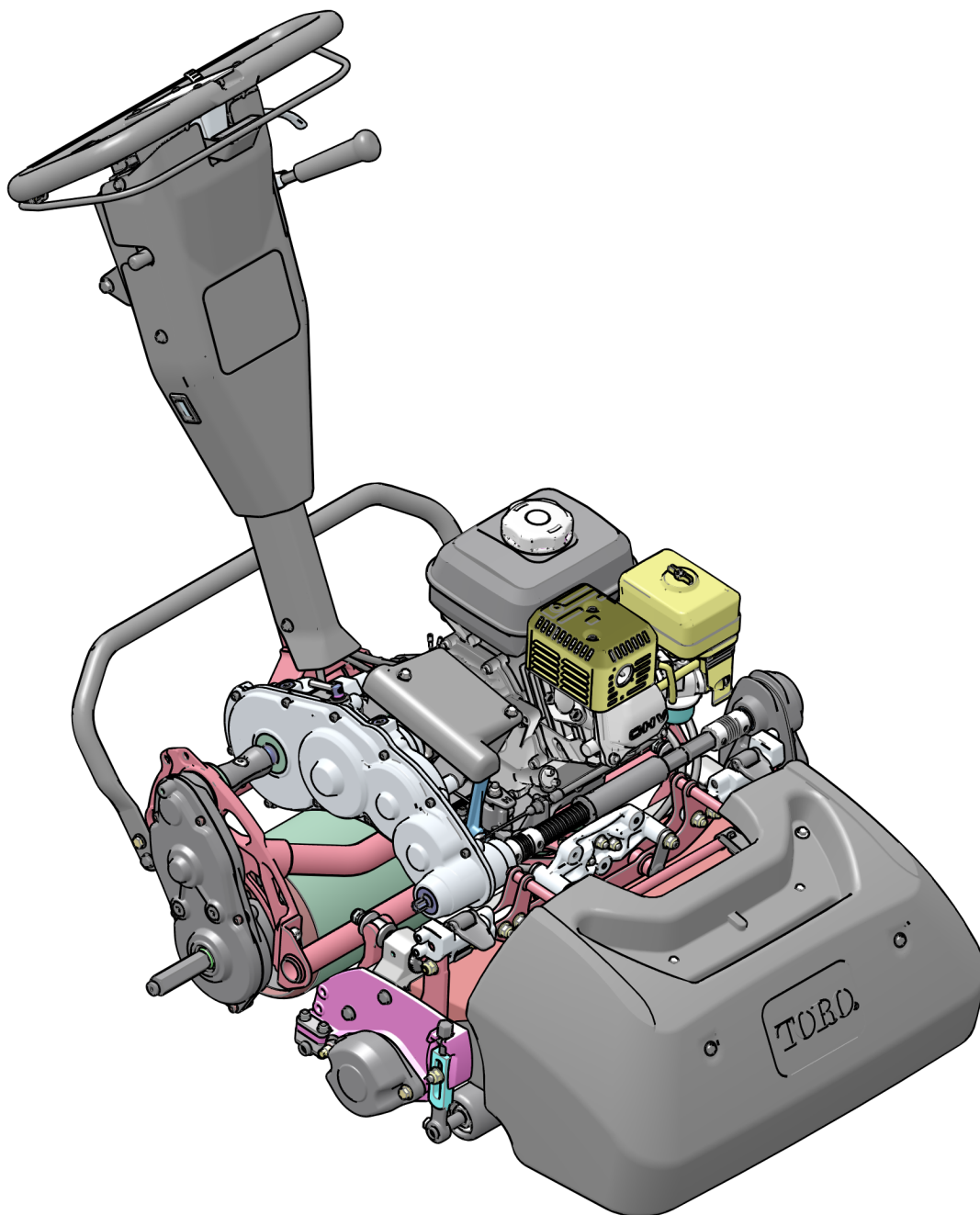


This safety symbol means caution. When you see this symbol, carefully read the instructions that follow. Failure to obey the instructions can result in minor to moderate injury.

IMPORTANT

The *Important* notice will give the important instructions which you must follow to prevent damage to the systems or components on the machine.

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



g311923

Figure 1

Service Procedure Icons

The following icons appear throughout this Service Manual to bring attention to specific important details of a service procedure.



Critical Process

This icon is used to highlight:

- installing safety equipment (shields, guards, seat belts, brakes and R.O.P.S. components) that may have been removed.
- dimensions or settings that must be maintained for proper machine operation.
- a specific fastener tightening sequence.
- component orientation that may not be obvious.



Critical Torque

This icon is used to highlight an assembly torque requirement that is different than what is recommended in the Standard Torque Tables; refer to [Torque Specifications \(page 2–6\)](#).



Fluid Specifications

This icon is used to highlight fluid specifications and capacities that are less common, and may not appear on the machine service decal or in the machine *Operator's Manual*.

Note: Refer to the service decal on the machine and the machine *Operator's Manual* for commonly used fluid specifications and capacities.

Table of Contents

Preface	7
Chapter 1: Safety	1-1
Safety Instructions	1-2
Safety and Instructional Decals	1-6
Chapter 2: Specifications and Maintenance	2-1
Specifications	2-2
Torque Specifications	2-6
Shop Supplies	2-12
Special Tools	2-14
Chapter 3: Troubleshooting	3-1
GEARS – The Systematic Approach to Defining, Diagnosing and Solving Problems	3-2
Starting Problems	3-3
Aftercut Appearance	3-4
Factors Affecting Grooming	3-5
Grooming Reel Mechanical Problems	3-6
Chapter 4: Gasoline Engine	4-1
General Information	4-2
Adjustments	4-4
Service and Repairs	4-5
Chapter 5: Traction and Reel Drive Systems	5-1
General Information	5-2
Adjustments	5-3
Service and Repairs	5-5
Chapter 6: Electrical System	6-1
General Information	6-2
Wiring Schematic	6-3
Component Testing	6-4
Chapter 7: Controls, Wheels, and Accessories	7-1
General Information	7-2
Service and Repairs	7-3
Chapter 8: DPA Cutting Units	8-1
General Information	8-2
Adjustments	8-3
Service and Repairs	8-6
Chapter 9: Universal Groomer (Optional)	9-1
General Information	9-2
Service and Repairs	9-3



Table of Contents

Safety Instructions	1-2
Before Operating the Machine	1-3
While Operating the Machine	1-4
Maintenance and Service.....	1-5
Safety and Instructional Decals	1-6

Safety Instructions

The Greensmaster Flex 1018/1021 machine is 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 on the awareness, concern, and proper training of the personnel involved in the operation, transport, maintenance, and storage of the machine. The improper use or maintenance of the machine can result in injury or death.



WARNING



To reduce the potential of injury or death, comply with the following safety instructions as well as information found in the *Operator's Manuals* and the *Operator and Safety Training Videos* found on www.toro.com.

Before Operating the Machine

- Review and understand the contents of the *Operator's Manuals* before starting and operating the machine. Become familiar with the controls and know how to stop the machine and engine quickly. Additional copies of the *Operator's Manuals* are available at www.toro.com.
- Never allow children to operate the machine. Never allow adults to operate the machine without proper instructions.
- Become familiar with the controls and know how to stop the machine and tractor engine quickly.
- Keep all the shields, safety devices, and decals in place. If a shield, safety device, or decal is illegible or damaged, repair or replace it before operating the machine.
- 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.
- Wearing safety glasses, safety shoes, long pants and a helmet is advisable and required by some local safety and insurance regulations.
- Make sure work area is clear of objects which might be picked up and thrown by the attachments.
- Keep everyone, especially children and pets, away from the areas of operation.
- Since the gasoline is highly flammable; handle it carefully.
 - Use an approved gasoline container.
 - Do not remove cap from fuel tank when engine is hot or running.
 - Do not smoke while handling gasoline.
 - Fill fuel tank outdoors and no higher than to the bottom of filter screen. Do not overfill fuel tank.
 - Wipe up any spilled gasoline.
 - Fuel may leak from filler neck when mower is tilted for servicing if tank is over filled.
- 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 the switch is defective, replace it before operating the machine; refer to [Interlock Module \(For backlap kit only\) \(page 6–10\)](#).

While Operating the Machine

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 that the spark plug wire is connected to the 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 the reel and traction drives and reduce engine speed to SLOW.
 - B. Move ON/OFF switch to OFF position to stop the engine.
5. Before emptying the basket of clippings, disengage the traction and reel drives, reduce the engine speed, and move ON/OFF switch to OFF position to stop the engine. Wait for all machine motion to stop before removing basket.
6. Do not touch the 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 the 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 the fuel shut-off valve if the machine is not used for an extended period. Also, close fuel shut-off valve if the machine is to be transported on a trailer or in a vehicle.

Maintenance and Service

- The *Traction Unit Operator's Manual*, *Cutting Unit Operator's Manual* and *Groomer Operator's Manual* provides the information regarding the operation, general maintenance, and maintenance intervals for your Greensmaster machine. Refer to these publications for additional information when servicing the machine.
- 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.
- To make sure that the entire machine is in good condition, keep all nuts, bolts, screws, and belts properly tightened.
- To reduce the potential fire hazard, keep the engine area free of excessive grease, grass, leaves and accumulation of dirt.
- Wear heavy gloves and use caution when checking or servicing the cutting unit.
- 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 the bystanders away.
- Do not overspeed the engine by changing the governor settings. Recommended engine high idle speed is from 3,350 to 3,550 RPM. To ensure safety and accuracy, check the engine speed with a tachometer.
- Engine must be shut off and cooled down before checking oil or adding oil to the engine crankcase.
- If major repairs are ever needed or assistance is required, contact your Authorized Toro distributor.
- 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 of parts and accessories made by other manufacturers may result in non-conformance with the safety standards and can void the warranty.

Safety and Instructional Decals

Numerous safety and instruction decals are affixed to the traction unit and cutting units of your Groundsmaster. If any decal becomes illegible or damaged, install a new decal. Decal part numbers are listed in your *Parts Catalog*. Order replacement decals from Authorized Toro Distributor.



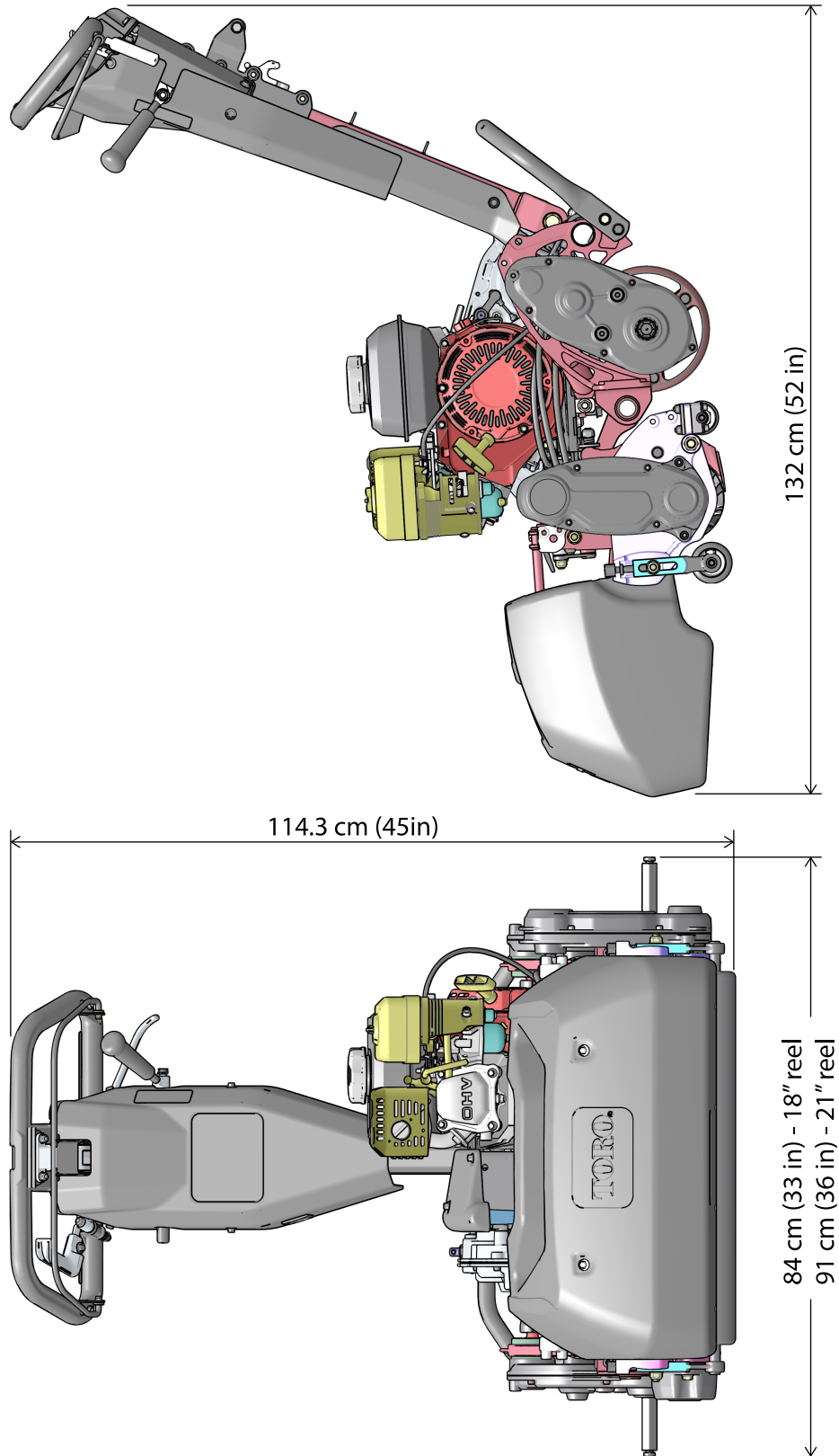
Specifications and Maintenance

Table of Contents

Specifications	2-2
Overall Dimensions	2-2
Engine	2-3
Traction and Reel Drive Systems	2-4
Controls, Wheels, and Accessories	2-4
DPA Cutting Units	2-4
Universal Groomer	2-5
Torque Specifications	2-6
Calculating the Torque Values When Using a Drive-Adapter Wrench	2-7
Identifying the Fastener	2-8
Standard Torque for Dry, Zinc Plated, and Steel Fasteners (Inch Series)	2-9
Standard Torque for Dry, Zinc Plated, and Steel Fasteners (Metric Fasteners)	2-10
Other Torque Specifications	2-11
Conversion Factors	2-11
Shop Supplies	2-12
Special Tools	2-14

Specifications

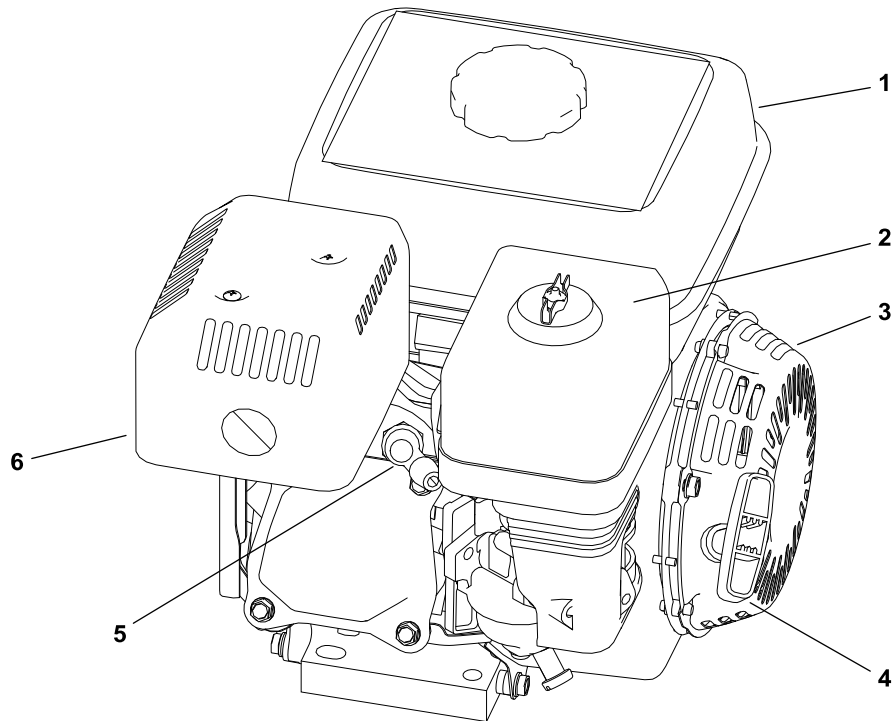
Overall Dimensions



g312133

Figure 2

Engine



g238094

Figure 3

- | | | |
|----------------|------------------------|---------------|
| 1. Fuel tank | 3. Recoil starter | 5. Spark plug |
| 2. Air cleaner | 4. Recoil-start handle | 6. Muffler |

Item	Description
Make/Designation	Honda, 4-stroke, OHV single cylinder, air-cooled gasoline engine, GX120
Bore x Stroke	60 mm x 42 mm (2.36 x 1.65 inches)
Total displacement	118 cm ³ (7.2 in ³)
Compression ratio	8.5:1
Carburetor	Butterfly
Governor	Mechanical flyweight
Low-idle speed (no load)	1,800 to 2,000 rpm
High-idle speed (no load)	3,350 to 3,550 rpm
Direction of rotation	Counterclockwise (facing PTO shaft)
Fuel	unleaded gasoline fuel with an octane rating of 87 or higher with no more than 10% Ethanol
Fuel tank capacity	2 L (0.53 US gallons)
Engine oil	Refer to the <i>Operator's Manual</i>
Lubrication system	Splash type
Oil capacity	0.56 L (0.14 US gallons)
Air cleaner	Dual element
Ignition system	Transistorized magneto
Spark plug	NGK BPR6ES
Spark plug gap	0.7 to 0.8 mm (0.028 to 0.031 inch)
Engine weight (dry)	13 kg (28.7 lb)

Traction and Reel Drive Systems

Item	Description
Transmission	Engine to friction clutch Transmission drive uses spur gears
Traction Drive	Transmission to traction drive uses a series of spur gears
Differential	Spur gear planetary differential
Parking Brake	Band style (at differential shaft drive)
Traction Drum	Dual aluminum, 19.1 cm (7.5 inch) diameter
Cutting Reel Drive	Transmission reel output shaft with disconnect and sliding coupler Final reel drive has 2 pulleys with positive drive belt Belt tension maintained by an idler

Controls, Wheels, and Accessories

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

DPA Cutting Units

Frame construction:	Precision machined die cast aluminum crossmember with 2 bolt-on die-cast aluminum side plates.
Reel construction:	12.7 cm (5 inches) diameter, 11 or 14 carbon steel blades welded to 5 stamped steel spiders. High strength low alloy steel blades are through hardened.
Height-of-cut:	Cutting height is adjusted on the front roller by two vertical screws. Standard bench height-of-cut range is 1.6 to 12.7 mm (0.062 to 0.500 inch) depending on type of bedknife installed. Effective HOC may vary depending on turf conditions, type of bedknife, rollers, attachments installed and rear drum position.
Bedknife and bedbar:	Replaceable single edged Edgemax™ bedknife (solid tool steel construction) is standard. Bedknife is fastened to the bedbar with thirteen bedknife screws. A variety of optional bedknives are available.
Bedknife adjustment	Dual adjustment (one on each side of the bedbar) with 0.018 mm (0.0007 inch) bedknife movement for each detent.
Rollers:	The rear roller is a 5.1 cm (2 inches) diameter aluminum full roller. The front roller is a 6.3 cm (2.5 inches) diameter roller that is chosen from a variety of configurations.
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 at right side of the cutting unit balances the cutting unit.

DPA Cutting Units (continued)

Cutting unit weight (approximate):

	18 inch	21 inch
11 blade	33.5 kg (74 lbs)	35 kg (77 lbs)
14 blade	35 kg (77 lbs)	36.3 kg (80 lbs)

Options: Refer to the *Cutting Unit Parts Catalog* or contact your local Authorized Toro Distributor for available cutting unit options.

Universal Groomer

Item	Description
Grooming reel diameter	6 cm (2.375 inch)
Groomer mounting	The drive assembly for the grooming reel is located at the right side of the cutting unit.
Groomer height setting	Height-of-cut range: 0.8 to 15.7 mm (0.030 to 0.620 inch). Height of groom range: 0.381 to 19.1 mm (0.015 to 0.750 inch).
Width-of-groomer	54.6 cm (21.5 inch).
Height adjustment knob	Allows a 0.08 mm (0.003 inch) 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.

Torque Specifications

The 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 the fasteners will apply to all the fasteners which do not have a specific requirement identified in this *Service Manual*. The following factors must be considered when applying the 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., nylocknut), hardness of the surface underneath the head of the fastener, or similar condition which affects the installation.

As noted in the following tables, the torque values should be reduced by 25% for the lubricated fasteners to achieve the similar stress as a dry fastener. The torque values must be reduced when the fastener is threaded into the 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 checking the torque can be performed by marking a line on the fastener (head or nut) and mating part, then back off the fastener 1/4 of a turn. Measure the torque necessary to tighten the fastener until the lines match up.

Calculating the Torque Values When Using a Drive-Adapter Wrench

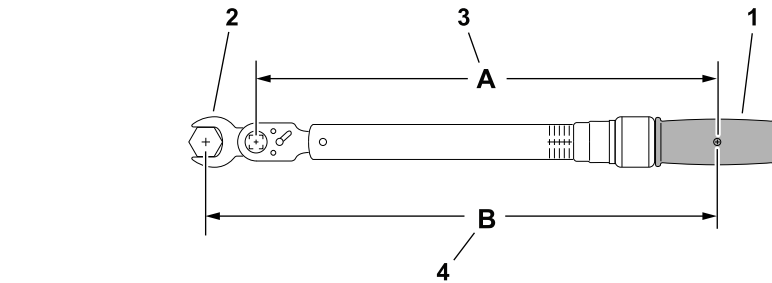


Figure 4

Torque Conversion Factor = A / B

- | | |
|-------------------------------------|---|
| 1. Torque wrench | 3. A (effective length of torque wrench) |
| 2. Drive-adapter wrench (crowsfoot) | 4. B (effective length of torque wrench and drive-adapter wrench) |

Using a drive-adapter wrench (e.g., crowfoot wrench) in any position other than 90° and 270° to the frame of the torque wrench will affect the torque value measured by the torque wrench because of the effective length (lever) of the torque wrench changes. When using a torque wrench with a drive-adapter wrench, multiply the listed torque recommendation by the calculated torque conversion factor (Figure 4) to determine proper tightening torque. When using a torque wrench with a drive-adapter wrench, the calculated torque will be lower than the listed torque recommendation.

Example: The measured effective length of the torque wrench (distance from the center of the handle to the center of the square drive) is 457 mm (18 inches).

The measured effective length of the torque wrench with the drive-adapter wrench installed (distance from the center of the handle to the center of the drive-adapter wrench) is 483 mm (19 inches).

The calculated torque conversion factor for this torque wrench with this drive-adapter wrench would be $18/19 = 0.947$.

If the listed torque recommendation for a fastener is **103 to 127 N·m (76 to 94 ft-lb)**, the proper torque when using this torque wrench with a drive-adapter wrench would be **98 to 121 N·m (72 to 89 ft-lb)**.

Identifying the Fastener

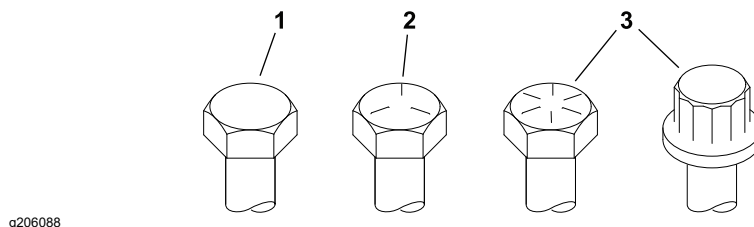


Figure 5

Inch Series Bolts and Screws

- | | | |
|------------|------------|------------|
| 1. Grade 1 | 2. Grade 5 | 3. Grade 8 |
|------------|------------|------------|

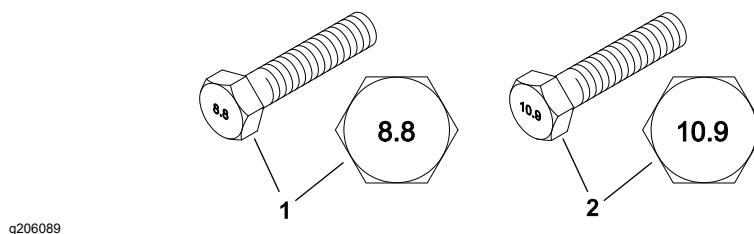


Figure 6

Metric Bolts and Screws

- | | |
|--------------|---------------|
| 1. Class 8.8 | 2. Class 10.9 |
|--------------|---------------|

Fasteners with a Locking Feature

IMPORTANT

If a fastener with a locking feature or previously applied thread locking compound is reused, clean the fastener threads and apply new thread locker to the fastener during installation.

Locking features are designed to create friction and prevent a fastener from loosening. Locking features can be found on externally or internally threaded fasteners. Common examples are plastic inserts incorporated into the fastener and pre-applied “dry” thread locking compound. Keep in mind, a fastener with a locking feature usually means there will be friction during initial installation and during removal.

Toro recommends replacing fasteners with a locking feature once they have been removed because the effectiveness of the locking feature diminishes with each reuse. If it is necessary to reuse a fastener with a locking feature; apply a thread locking compound (Loctite for example) to the fastener during installation. Use the appropriate strength and type of thread locking compound based on application, fastener size or information found in the product *Operators Manual*, *Service Manual*, or *Installation Instructions*.

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

Thread Size	Grade 1, 5 and 8 with Thin Height Nuts	SAE Grade 1 Bolts, Screws, Studs, and Sems with Regular Height Nuts (SAE J995 Grade 2 or Stronger Nuts)		SAE Grade 5 Bolts, Screws, Studs, and Sems with Regular Height Nuts (SAE J995 Grade 2 or Stronger Nuts)		SAE Grade 8 Bolts, Screws, Studs, and Sems with Regular Height Nuts (SAE J995 Grade 2 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 ± 56	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	1146 ± 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: Reduce the 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 a thread sealant, such as Loctite.

Note: The torque values must be reduced when installing the fasteners into threaded aluminum or brass. The specified torque value should be determined based on the aluminum or base material strength, fastener size, length of thread engagement, etc.

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. The 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: Reduce the 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 a thread sealant, such as Loctite.

Note: The torque values must be reduced when installing the fasteners into threaded aluminum or brass. The specified torque value should be determined based on the aluminum or base material strength, fastener size, 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.

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

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

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)

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

**The hole size, material strength, material thickness, and material finish must be considered when determining the specified torque values. All the torque values are based on the non-lubricated fasteners.

Conversion Factors

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

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

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

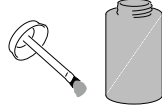

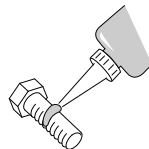
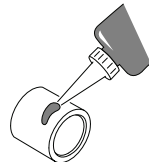

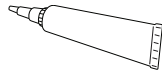
$$\text{N·m} \times 0.7376 = \text{ft-lb}$$

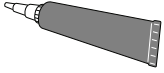

Shop Supplies

The procedures found in this *Service Manual* may recommend the use of commonly used shop supplies (lubricants, sealants, and adhesives). A symbol denoting the use of a shop supply may appear in figures that support a procedure. Always refer to the written procedure for specific information regarding the type and the application of a shop supply.

IMPORTANT

Always follow manufacturers instructions when using or storing shop supplies.

<p>ANTI-SEIZE LUBRICANT</p> <p>Used to prevent corrosion, galling and seizure between metal parts. Most often applied to shafts and bores during assembly. Unless otherwise specified, high viscosity regular grade lithium-graphite based anti-seize lubricant should be used.</p>	
<p>GREASE</p> <p>Can be used to pre-fill (pack) bearings, boots and seals prior to assembly, ease installation of components during assembly, or fill cavities between moving parts through grease fittings after assembly. Unless otherwise noted, refer to the machine <i>Operator's Manual</i> or <i>Installation Instructions</i> for grease specifications.</p>	
<p>THREAD LOCKING COMPOUND (Thread Locker)</p> <p>Used to lock threaded fasteners in position. Available in low, medium, and high strength for various size fasteners and applications. Most thread locking compounds are applied immediately prior to fastener installation. Some thread locking compounds use a "Wicking" feature, and can be applied after fastener installation. Most thread locking compounds allow the fastener to be removed with standard tools once cured. High strength thread locking compounds may require applying heat to the fastener and the surrounding area to allow fastener removal.</p> <p>Note: Some fasteners have a dry thread locking compound pre-applied (Patch-Loc) so no additional thread locking compound is necessary when installing a "new" fastener. These fasteners are designed to be removed and re-installed only once before applying additional thread locking compound is necessary.</p>	
<p>RETAINING COMPOUND (bearings and sleeves)</p> <p>An adhesive used to secure bearings, bushings, and cylindrical parts into housings or onto shafts. When cured, bearing and sleeve retaining compound fills the gap between mating parts with a hard resin that increases load distribution and protects against corrosion.</p>	
<p>ADHESIVE</p> <p>Used to secure a variety of components immediately prior to assembly. May be recommended for installing new components or when reusing a component that had a pre-applied adhesive such as hood seals, moldings and weather-stripping.</p>	
<p>THREAD SEALANT</p> <p>Used to seal threaded fittings and sensors from air, fuel and oil pressure leaks and prevent galling and seizure between threaded parts. A thread sealant in paste form is preferred over sealant tape. The sealant should remain semi-pliable to allow for component removal with standard tools. Some thread sealants may require the use of a cleaner or primer prior to use.</p>	

<p>GASKET COMPOUND</p> <p>Used to create a seal between mating parts. Gasket compounds may be used with or without the presence of a pre-formed gasket. Gasket compounds may be solvent or silicone based, and cure when exposed to air or designed to cure in an air-less environment (anaerobic). Most gasket compounds are designed to be applied to clean surfaces free of oil, chemical residue and previously used gaskets or gasket compounds.</p>	
<p>SILICONE SEALANT</p> <p>Designed for a broad variety of sealing and bonding requirements, silicone sealants are usually room temperature vulcanizing (RTV) which form a flexible silicone rubber that bonds to a wide variety of smooth or porous materials when cured. Standard silicone sealants are designed to perform in temperatures from -51F to 232C (-60F to 400F), while high temperature variants can preform in temperatures up to 343C (650F).</p>	

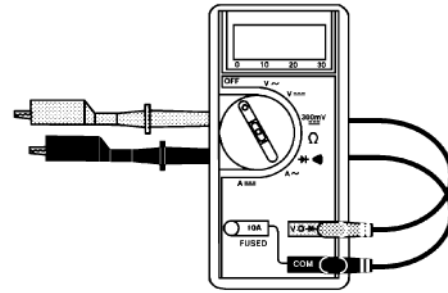
Special Tools

Multimeter

Obtain this tool locally

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

Note: Use a digital multimeter when testing the electrical circuits. The high impedance (internal resistance) of a digital meter in the voltage mode ensures that the excess current is not allowed through the meter. This excess current can damage the circuits that are not designed to carry it.



Dielectric Gel

Toro Part No. 107-0342

Use the dielectric gel to prevent corrosion of unsealed connection terminals. To ensure complete coating of the terminals, liberally apply the gel to the component and wire harness connector, plug the connector into the component, unplug the connector, apply the gel to both surfaces again, and connect the harness connector to the component again. The connectors must be fully packed with gel for effective results.

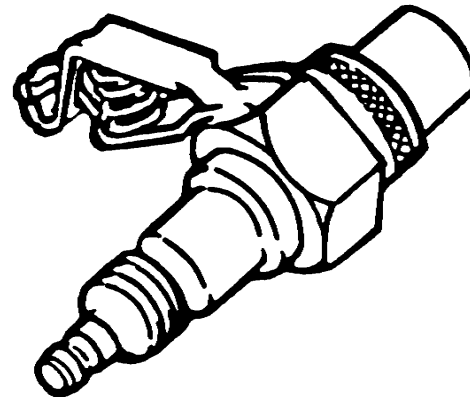
Note: Do not use the dielectric gel on the sealed connection terminals as the gel can unseat the connector seals during assembly.



Spark Tester

K Line Part No. TOR4036

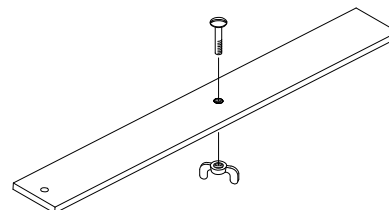
For testing electronic ignitions. Saves time because you will know if the ignition is causing the problem on a non-starting engine. The tester determines if ignition spark is present.



Gauge Bar Assembly

K Line Part No. 94-9010

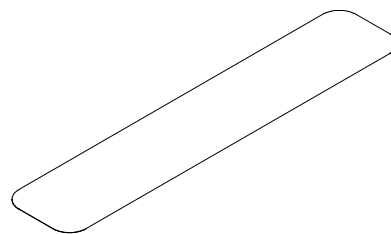
Use gauge bar to verify height-of-cut adjustment.



Cutting Reel Shim

Toro Part No. 125–5611

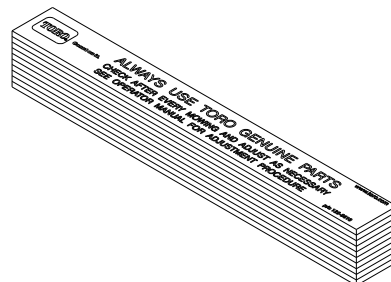
Use the 0.05 mm (0.002 in) shim like a feeler gauge to measure the gap between the reel and the bedknife during reel adjustment.



Cutting Performance Paper

Toro Part No. 125–5610 (300 strips)

Cutting performance paper is used to test the cutting reel performance after adjusting the reel to bedknife clearance.



Backlapping Brush Assembly

K Line Part No. 29–9100

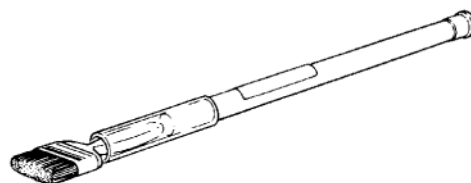
For applying lapping compound to cutting units while keeping hands a safe distance from the rotating reel.

Components for the brush assembly are also available individually.

Brush 36-4310

Handle 29-9080

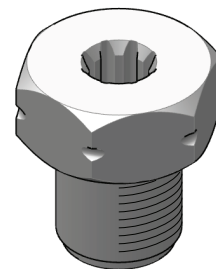
Handle cap 2410-18



Spline Adapter Tool

Toro Part No. 120–3221 or 120–3222

Use either part number (current riding Greensmaster cutting unit reel nut) as a tool to remove and install the spline adapter on the cutting unit reel.



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.



Angle Indicator and Magnetic Mount

Angle Indicator: Toro Part No. 131-6828

Magnetic Mount: Toro Part No. 131-6829

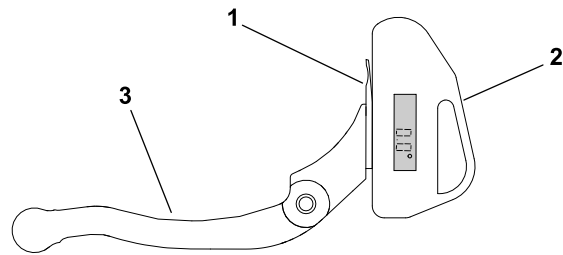
Because the top grind angle on bedknives is critical for edge retention, and therefore after-cut appearance, Toro developed these service tools for accurately measuring the top grind angle on all bedknives.

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

3. Remove the angle indicator and place the magnetic mount on the edge of the bedknife so the face of the magnet is flat against the top angle of the bedknife.

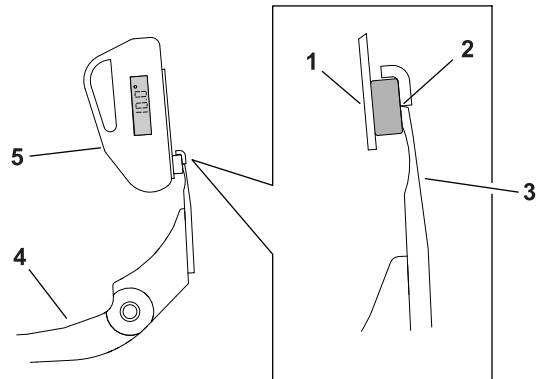
4. Place the angle indicator on the mount with the digital display facing you as shown. The angle displayed on the indicator is the current bedknife top angle.



g223327

Figure 7

- | | |
|--------------------|-----------|
| 1. Bedknife | 3. Bedbar |
| 2. Angle Indicator | |



g223326

Figure 8

- | | |
|----------------------------|--------------------|
| 1. Angle indicator surface | 4. Bedbar |
| 2. Magnetic mount | 5. Angle indicator |
| 3. Bedknife | |

Bedknife Screw Tool

K-Line Part No. TOR510880A

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

IMPORTANT

Important: To prevent damage to the bedbar, DO NOT use an air or manual impact wrench with this tool.



Diameter/Circumference Measuring Tape

K Line Part No. 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).



Roller Rebuilding Tools

The following combination of washers and spacers can be used to install bearings and seals into the front and rear rollers (2 each required).

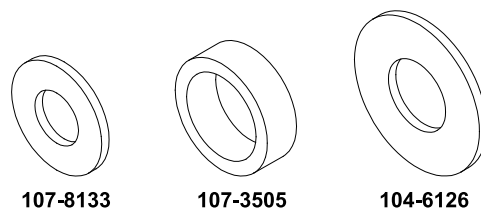
Bearing installation washer: 107-8133 (black)

Seal installation spacer: 107-3505

Seal installation washer: 104-6126 (yellow)

K-Line Part No. TOR4105

As an alternative to using the washers and spacer listed above, this special tool set can be used to install bearings and seals into the front and rear rollers.



Turf Evaluator Tool

K Line Part No. 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) available from your local authorized Toro Distributor.



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.



Syringe – 50cc (2 ounce)

Toro Part No. 137-0872

Aids in accurately filling the optional Universal Groomer gear box with oil.





Troubleshooting

Table of Contents

GEARS – The Systematic Approach to Defining, Diagnosing and Solving Problems	3-2
Starting Problems	3-3
Aftercut Appearance	3-4
Factors Affecting Grooming	3-5
Grooming Reel Mechanical Problems	3-6

GEARS – The Systematic Approach to Defining, Diagnosing and Solving Problems

1. **Gather Information**

- Information reported by the customer
- Information observed by you
- Establish the “what, where and when” of the issue

2. **Evaluate Potential Causes**

- Consider possible causes of the problem to develop a hypothesis
- Narrow down the focus of the problem

3. **Assess Performance**

- Ensure that you have all the necessary tools for testing
- Test all potential causes of the failure
- Reevaluate and create a new hypothesis if necessary

4. **Repair**

- Return the unit to service by repairing, rebuilding, or replacing

5. **Solution Confirmation**

- Did the issue go away?
- Was the root cause of the issue correctly repaired?
- Are there any other new symptoms?

Starting Problems

For effective troubleshooting and repairs, you must have a good understanding of the electrical circuits and components that are used on this machine; refer to the Electrical schematics in this chapter.

If the machine has any interlock switches that are bypassed, connect the switches for the correct troubleshooting and safety.

Note: For engine component testing information, refer to the Honda Service Manual.

Problem	Possible Cause	Correction
Engine will not start	ON/OFF switch is in the OFF position. Ignition spark plug wire is not connected to the spark plug. An engine problem exists that prevents the engine from running. ON/OFF switch is faulty. Electrical wires are loose or damaged. The fuel tank is empty. The ON/OFF switch is damaged.	Turn the switch to ON. Connect the spark plug wire to the spark plug. Repair the engine. Replace the ON/OFF switch. Check the electrical connections. Repair the wiring as needed. Fill the fuel tank with fuel. Replace the ON/OFF switch.
Engine will start, but will not continue to run.	Electrical wires are loose or damaged. An engine problem exists that causes the engine to stop.	Refer to <i>Engine Maintenance Manual</i> . Refer to Chapter 6: Electrical System (page 6–1) .

Aftercut Appearance

There are several 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.

Refer to the *Cutting Unit Operator's Manual* detailed adjustment procedures. Refer to [Service and Repairs \(page 8–6\)](#) for cutting unit repair information.

Note: For additional information regarding cutting unit troubleshooting, several Reel Mower and Aftercut Appearance General Training Books can be found on the Service Reference Set available from your Authorized Toro Distributor.

Factors That Can Affect Quality of Cut

Factor	Possible Problem/Correction
Engine RPM and mow speed	For best cutting performance and appearance, the engine should be run at high idle speed while cutting. Check and adjust the high idle speed as necessary; refer to the <i>Traction Unit Operator's Manual</i> .
Reel bearing condition	Check and replace the reel bearings if necessary; refer to Reel Assembly (page 8–18) .
Bedknife to reel adjustment	Check the 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.
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 the reel to remove taper and/or rifling. Grind the bedknife to sharpen and/or remove rifling.</p> <p>A new bedknife must be ground or backlapped after installation to the bedbar. Refer to Troubleshooting Bedknife Grinding (page 8–16) for grinding information or the <i>Traction Unit Operator's Manual</i> for backlapping information.</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 desired	If the bedknife is too thick for effective height-of-cut, poor quality of cut will result.
Stability of bedbar	Ensure that the bedbar pivot bolts are securely seated and washer free to rotate; refer to Bedbar Assembly (page 8–6) .
Number of reel blades	Use correct number of blades for clip frequency and optimum height-of-cut range.
Roller type and condition	<p>A variety of cutting unit rollers are available. Refer to the <i>Cutting Unit Parts Manual</i> for a listing of available accessories, or contact your local Authorized Toro Distributor for additional information.</p> <p>Ensure that the rollers rotate freely. Repair the roller bearings if necessary; refer to Roller Assemblies (page 8–27).</p>
Cutting unit accessories	A variety of cutting unit accessories are available that can be used to enhance aftercut appearance. Refer to the <i>Cutting Unit Parts Manual</i> for a listing of available accessories, or contact your local Authorized Toro Distributor for additional information.

Factors Affecting Grooming

There are several 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 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.

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, over-seeding, disease control, sand dressing, and pest control).
11. Stress periods for turf (e.g., high temperatures, high humidity, and unusually high traffic).

Grooming Reel Mechanical Problems

Problem	Possible Causes	Correction
No rotation of the grooming reel.	Groomer drive gears are worn or damaged.	Inspect groomer drive assembly and replace damaged drive components.
The turf is damaged or has uneven grooming.	The groomer is set too aggressively.	Refer to groomer Installation Instructions for groomer set-up information.
	The grooming reel blades are bent, damaged or missing.	Repair or replace blades if necessary.
	The grooming reel shaft is bent or damaged.	Replace grooming reel shaft.
	Grooming depth is not equal on both ends of grooming reel.	Adjust depth if necessary. Check and adjust cutting unit set up (level bed knife to reel, set height-of-cut, etc.).



Gasoline Engine

Table of Contents

General Information	4-2
Operator's Manual	4-2
Engine Owner's Manual	4-2
Engine Service Manual	4-2
Engine Identification.....	4-2
Fuel Evaporative Control System.....	4-3
Adjustments	4-4
Throttle Cable Adjustment.....	4-4
Service and Repairs	4-5
Cooling System.....	4-5
Spark Plug	4-7
Engine.....	4-8
Engine Base.....	4-12

General Information

This chapter gives the information about specifications and repair of the Honda GX120 gasoline engine used in the Greensmaster. Described adjustments and repairs require tools that are commonly available in many service shops.

When disposing of hazardous waste products (fuel, engine oil, hydraulic fluid, filters, etc.), take them to an authorized disposal site. Waste products must not be allowed to contaminate surface water, drains, or sewer systems.

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.

Engine Owner's Manual

The *Engine Owner's Manual* provides information regarding the operation, general maintenance, and maintenance intervals for the Honda GX120 engine used on your Greensmaster machines. Contact your local Honda Engine Dealer or visit <http://engines.honda.com> to obtain a copy of the *Engine Owner's Manual*. Refer to the *Engine Owner's Manual* for additional information when servicing the machine.

Engine Service Manual

Detailed information on engine troubleshooting, testing, disassembly, and assembly is given in the *Honda Service Manual*. The use of some specialized tools and test equipment is explained in the *Honda Service Manual*. Contact your local Honda Engine Dealer to obtain a copy of the engine Service Manual. However, the specialized nature of some engine repairs may dictate that the work be done at a Honda engine repair facility.

Engine Identification

The engine serial number and type are stamped on the engine near the oil filler dipstick. The engine serial number and type will assist in identifying the correct parts and service information for the Honda engine in your Greensmaster machine.

Fuel Evaporative Control System

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



g282215

Figure 9

1. Fuel tank insert

Note: To prevent saturating the carbon canister in the fuel cap, it is important to ensure that the fuel tank is not overfilled. The maximum fuel level for the fuel tank is to the bottom of the fuel tank insert ([Figure 9](#)).

The insert also prevents the fuel from saturating the fuel cap during machine movement. Do not overfill the tank when refueling. Refer to the *Honda GX120 Owner's Manual* for additional information.

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 the mower on a level surface.

Note: Make sure that the engine is at normal operating temperature before you adjust the throttle cable.

2. Start the engine and move the throttle lever to the SLOW position.
3. Loosen the clamp retaining cable conduit.
4. Make sure that the throttle control is in the SLOW position and move the cable conduit until 1900 rpm.
5. Tighten the screw to secure the throttle cable conduit.
6. Check the engine speed with a tachometer:
 - A. Low idle speed should be **1,800 to 2,000 RPM**; refer to *Operator's Manual*.
 - B. High idle speed should be **3,350 to 3,550 RPM**. Adjust the throttle stop at throttle lever to attain the correct high idle speed setting; refer to *Operator's Manual*.

IMPORTANT

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

Service and Repairs

Cooling System

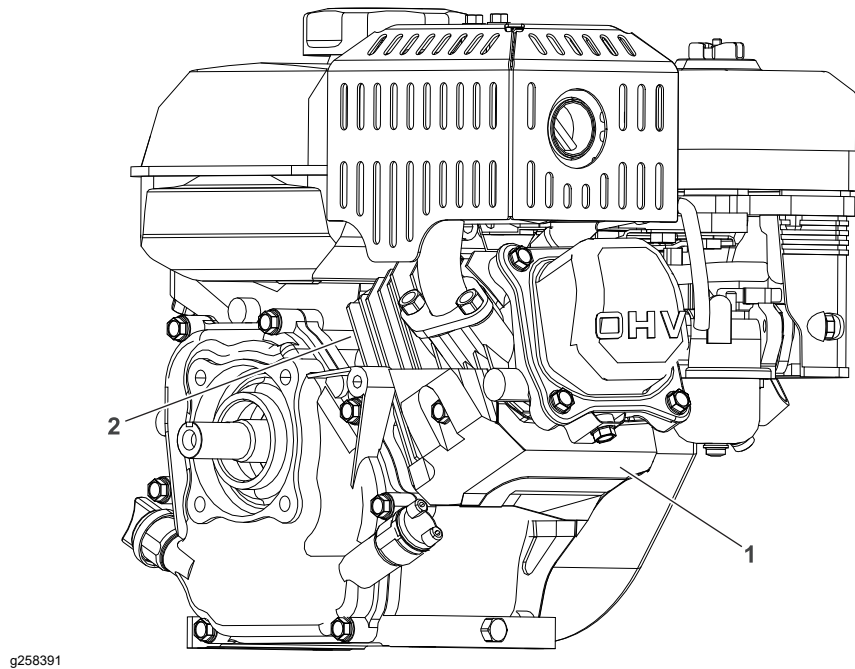


Figure 10

1. Engine cylinder shroud
2. Cooling fins

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. Ensure that the cutting-unit-drive lever is in the **DISENGAGE** position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.
-

IMPORTANT

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

2. Clean the cooling fins on the cylinder and cylinder head. Remove the engine cylinder shroud from the engine for more thorough cleaning; refer to [Figure 10](#).

Cooling System (continued)

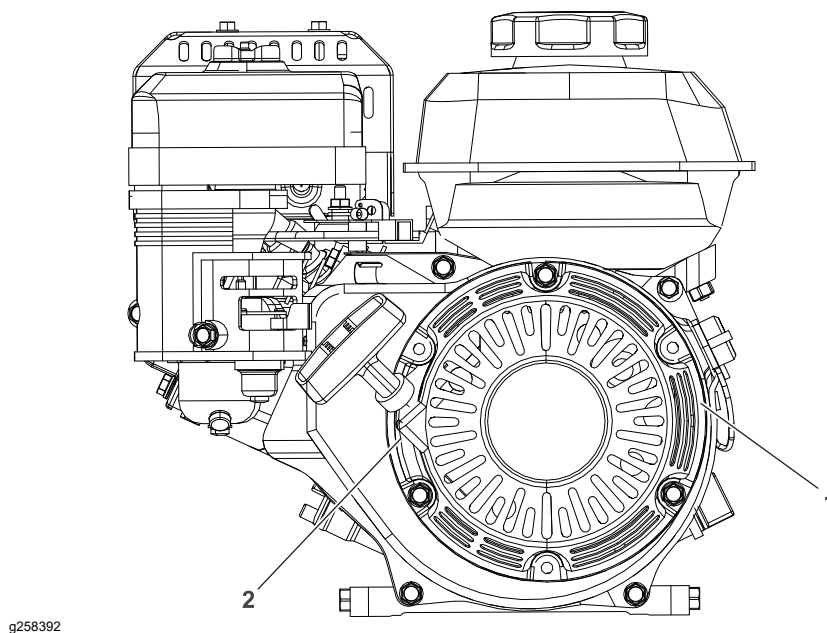


Figure 11

1. Blower housing 2. Rewind starter

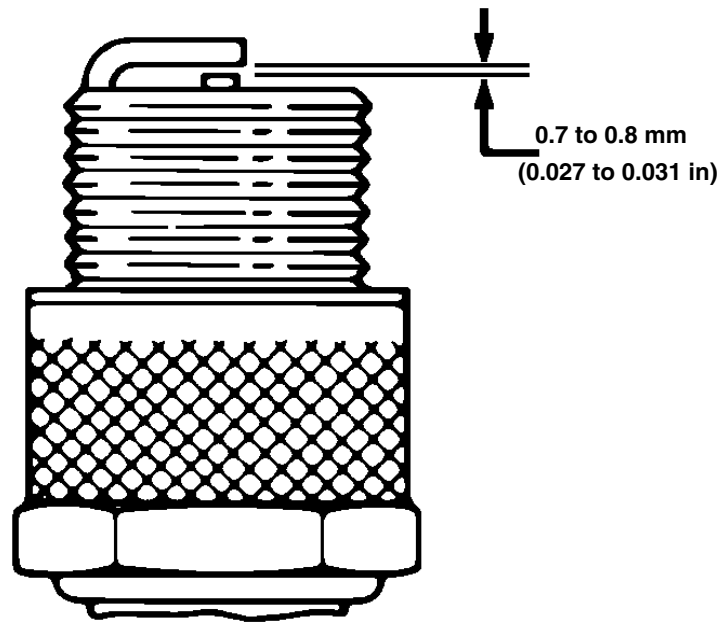
-
3. Clean the blower housing of dirt and debris; refer to [Figure 11](#). Remove the housing if necessary.
-

IMPORTANT

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

4. Ensure that the blower housing and/or engine cylinder shroud are installed to the engine if removed.
5. Attach the spark plug wire to the spark plug.

Spark Plug



g258393

Figure 12

Use an NGK BPR6ES spark plug or equivalent.

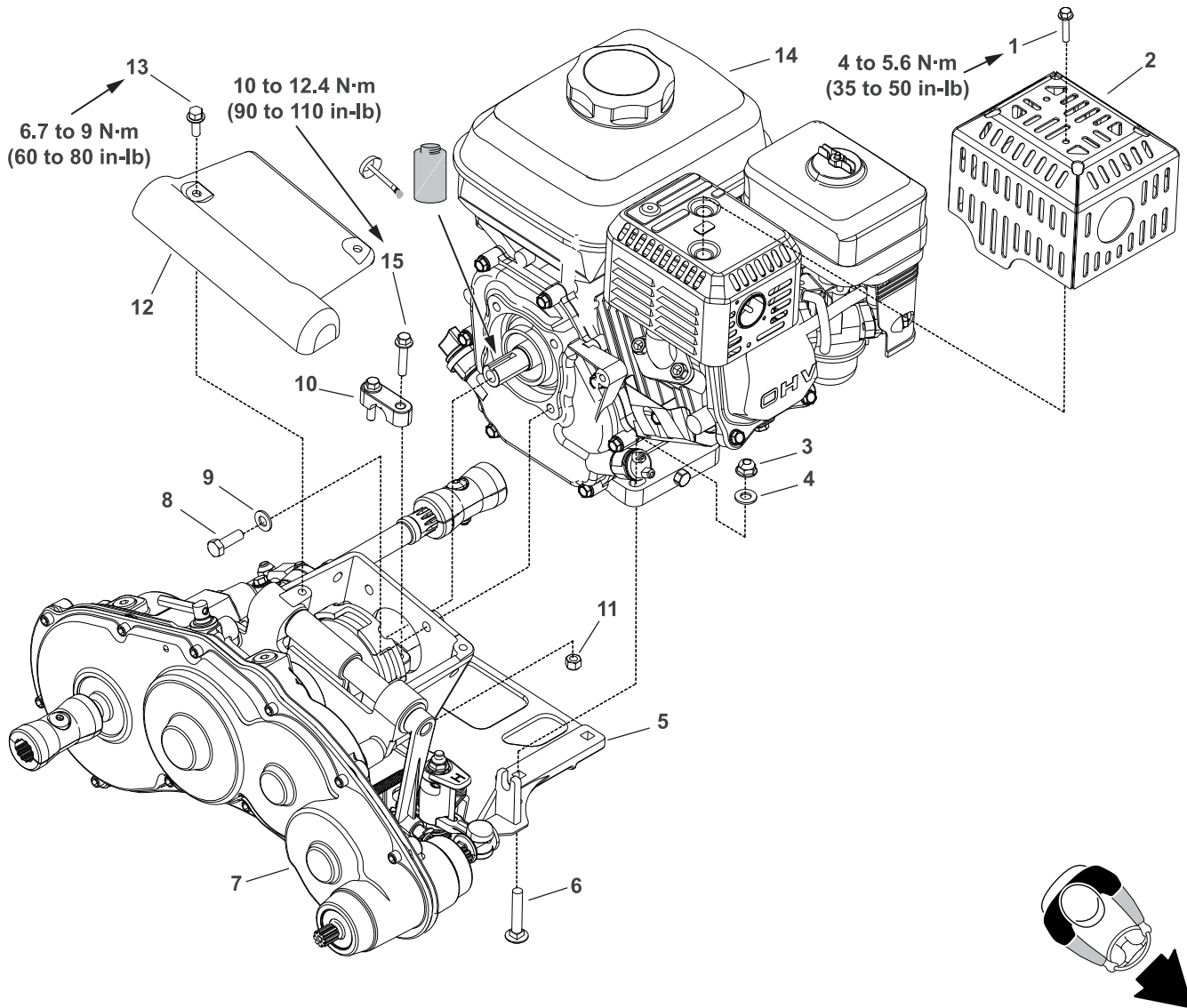
1. Park the machine on a level surface, shut off the engine, and ensure that the traction control is in NEUTRAL. Remove the spark plug wire from the spark plug.
2. Clean the cylinder head area around the spark plug and remove the plug from the cylinder head.
3. Inspect the spark plug.

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 enter cylinder.

4. Set spark plug electrode gap from **0.7 to 0.8 mm**.
5. Install correctly gapped spark plug into the cylinder head and torque the spark plug to **23 N·m (17 ft-lb)**.
6. Connect the spark plug wire to the spark plug.

Engine



g255888

Figure 13

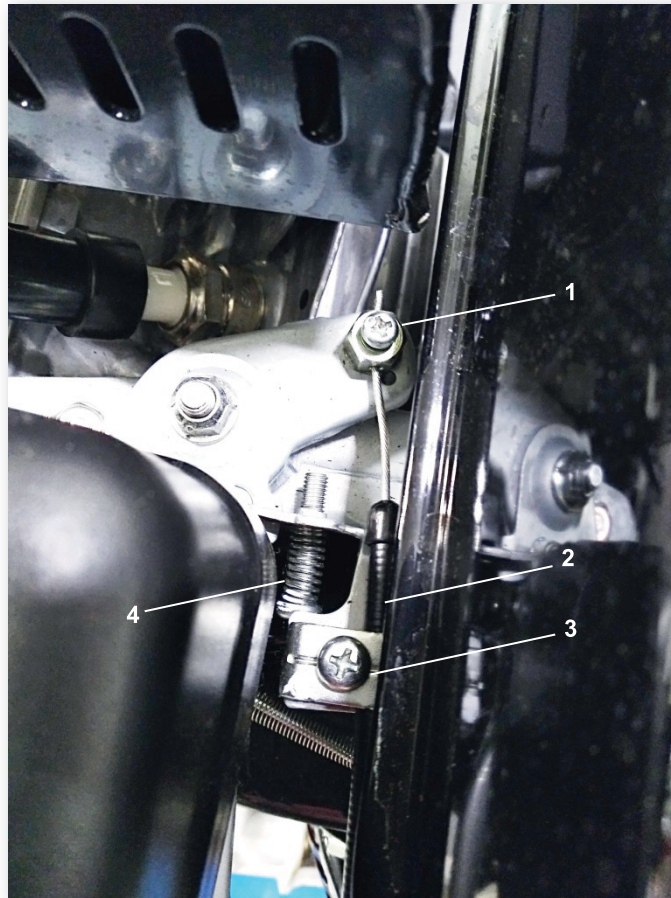
- | | | |
|-------------------------|----------------------------|-----------------------|
| 1. Bolts (2 each) | 6. Carriage bolts (4 each) | 11. Locknuts (2 each) |
| 2. Muffler guard | 7. Transmission gear box | 12. Clutch cover |
| 3. Nuts (4 each) | 8. Bolt (4 each) | 13. Bolt (2 each) |
| 4. Flat washer (4 each) | 9. Washer (4 each) | 14. Engine |
| 5. Engine base | 10. Clutch hub clamp | 15. Bolt (2 each) |

Removing the Engine

Note: Refer to [Figure 13](#) during this procedure.

1. Park the machine on a level surface, shut off the engine, and ensure that the traction control is in NEUTRAL.
2. Remove the spark plug wire from the spark plug and close the fuel shut-off valve on the engine.
3. If the engine is to be disassembled, it may be easier to drain oil from the engine before removing the engine from the traction unit.

Removing the Engine (continued)

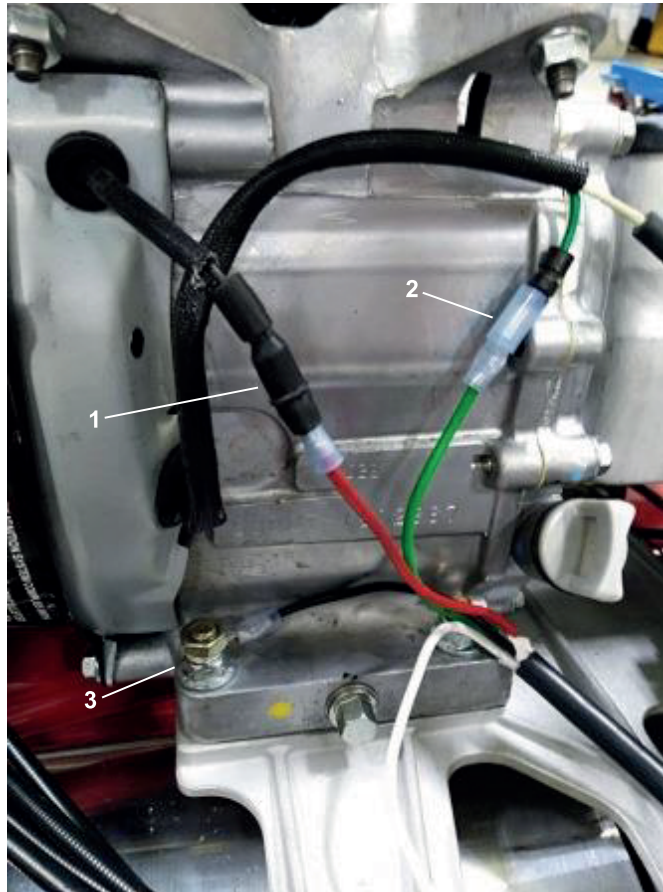


g261801

Figure 14

- | | |
|-------------------|---------------------|
| 1. Governor lever | 3. Cable clamp |
| 2. Throttle cable | 4. High speed screw |
-
4. Remove the throttle cable (2) from the engine:
- A. Loosen the screw that secures the cable clamp (3) to the engine. Remove the cable clamp.
 - B. Loosen the screw that secures the throttle cable (2) to the governor lever (1). Slide and remove the throttle cable from the governor lever.
 - C. Position the throttle cable (2) away from the engine.

Removing the Engine (continued)



g262386

Figure 15

- | | | |
|------------------|--------------------|------------------------|
| 1. Armature wire | 2. Alternator wire | 3. Harness ground wire |
|------------------|--------------------|------------------------|

-
5. Disconnect the electrical connections from the engine:
 - A. Unplug the wire harness connector from the engine armature wire (1).
 - B. Disconnect the wire harness ground wire (3) from the engine by removing the LH rear cap screw, flat washer, and a flange nut.
 - C. If the machine is equipped with optional lighting kit, disconnect the wire harness connectors from the engine alternator wires (2).
 6. Remove the 2 bolts (13) that secures the clutch cover (12) to the bell housing. Remove the clutch cover from the bell housing.
 7. Remove the 2 bolts (15) and 2 nuts (11) that secures the clutch hub clamp (10) to the external clutch hub. Remove the clutch hub clamp from the external clutch hub.
 8. Remove the 4 bolts (8) and 4 washers (9) that secures the engine (14) to the bell housing.
 9. Remove the 4 nuts (3), 4 washers (4) and 4 carriage bolts (6) that secures the engine (14) to the engine base (5). Remove the engine from the engine base.
 10. If necessary, remove the muffler (2) from the engine (14) by removing the 2 bolts (1).

Installing the Engine

1. If removed, install the muffler (2) onto the engine (14) and secure with the 2 bolts (1).

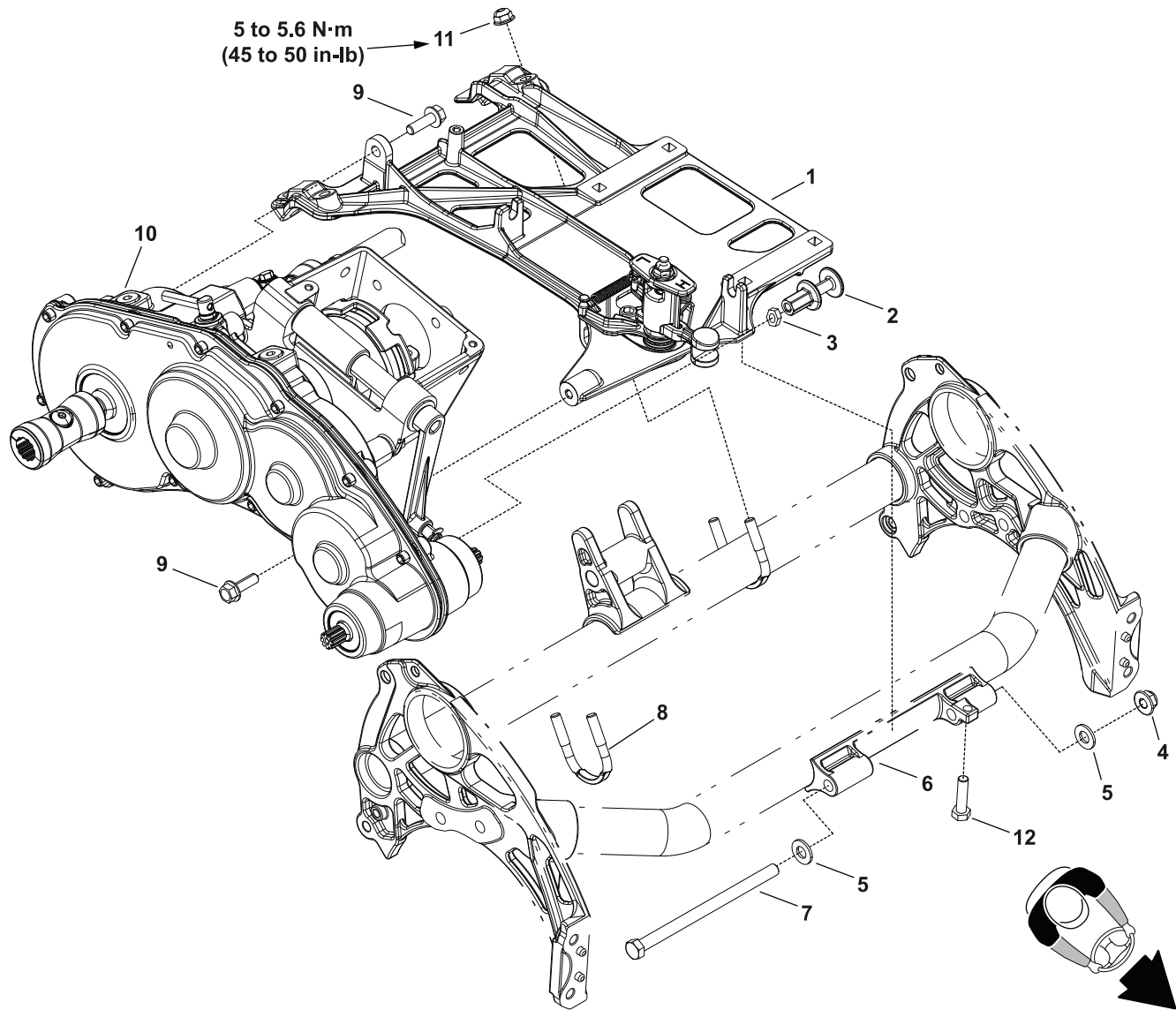


2. Torque tighten the bolts (1) from **4 to 5.6 N·m (35 to 50 in-lb)**.
3. Position the engine (14) onto the engine base (5) and engine output shaft in the bell housing and external clutch hub.
4. Secure the engine (14) onto the bell housing with the 4 bolts (8) and 4 washers (9). In an alternating cross pattern, torque tighten the bolts (8) from **10 to 11.3 N·m (90 to 100 in-lb)**.
5. Secure the engine (14) to the engine base (5) with the 4 carriage bolts (6), 4 washers (4) and 4 nuts (3).
6. Apply the anti-seize lubricant to the engine shaft key.
7. Install the clutch hub clamp (10) onto the external clutch hub and make sure that the clutch hub clamp integral key is aligned to the engine shaft keyway. Secure the clutch hub clamp (10) with the 2 bolts (15) and 2 nuts (11).



8. Torque tighten the bolts (15) from **10 to 12.4 N·m (90 to 110 in-lb)**.
9. Install the clutch cover (12) onto the bell housing and secure with the 2 bolts (13). Torque tighten the bolts (13) from **6.7 to 9 N·m (60 to 80 in-lb)**.
10. Connect the electrical connections to the engine:
 - A. Apply dielectric gel to wire harness connectors.
 - B. Connect the wire harness connectors to the engine armature wire (item 1 in [Figure 15](#)).
 - C. Connect the wire harness ground wire (3) to the engine by installing the LH rear cap screw, flat washer, and a flange nut.
 - D. Apply a coat of dielectric grease to the wire harness ground terminal to prevent corrosion.
 - E. If the machine is equipped with optional lighting kit, connect the wire harness connectors to the engine alternator wires.
11. Connect the throttle cable (item 2 in [Figure 14](#)) to the engine:
 - A. Slide the throttle cable end into the governor lever (1).
 - B. Place throttle cable (2) under the cable clamp (3) and secure with a screw.
 - C. Adjust the throttle cable; refer to [Throttle Cable Adjustment \(page 4–4\)](#). Ensure that all fasteners are tightened after the cable adjustment.
12. Check and adjust the engine oil level as needed; refer to *Operator's Manual*.
13. Attach the spark plug wire to the spark plug. Open the fuel shut-off valve on the fuel tank.
14. Start the engine and allow it to warm to operating temperature. Check high and low idle speeds and adjust if necessary.

Engine Base



g256199

Figure 16

- | | | |
|-------------------|-------------------------|------------------------------------|
| 1. Engine base | 5. Flat washer (2 each) | 9. Flat head bolt (5 each) |
| 2. Slider adapter | 6. Frame assembly | 10. Transmission gear box assembly |
| 3. Jam nut | 7. Bolt | 11. Nut |
| 4. Flat head nut | 8. Tube clamp | 12. Jack screw |

Removing the Engine Base

Note: Refer to [Figure 16](#) during this procedure.

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.
2. Remove the throttle cable; refer to [Removing the Throttle Cable \(page 7-3\)](#).
3. Remove the clutch cable; refer to [Removing the Clutch Cable \(page 7-9\)](#).
4. Remove the brake cable; refer to [Removing the Brake Cable \(page 7-6\)](#).
5. Remove the reel cable; refer to [Removing the Reel Cable \(page 7-11\)](#).

Removing the Engine Base (continued)

6. Slide the telescopic coupler on the reel drive assembly and disconnect the reel drive shaft from the transmission drive shaft.
7. Remove the truss screw, nut and washer that secures the 2 splined couplers to the transmission gear box assembly and drum drive gear box assembly.
8. Loosen the jam nut (3) and remove the slider adaptor (2) from the transmission gear box assembly (10).
9. Remove the nut (4), washers (5) and bolt (7) that secures the engine base (1) to front side of the frame assembly (6).
10. Remove the 4 nuts (11) and 2 tube clamps (8) that secures the engine base (1) to rear side of the frame assembly (6).



WARNING



Support the engine and transmission to prevent it from dropping and causing personal injury when removing.

11. Lift the engine base with engine and transmission together from the frame assembly.
12. Remove the 4 carriage bolts that secures the engine to the engine base.
13. Remove the 2 bolts (9) that secures the transmission gear box assembly to the engine base.



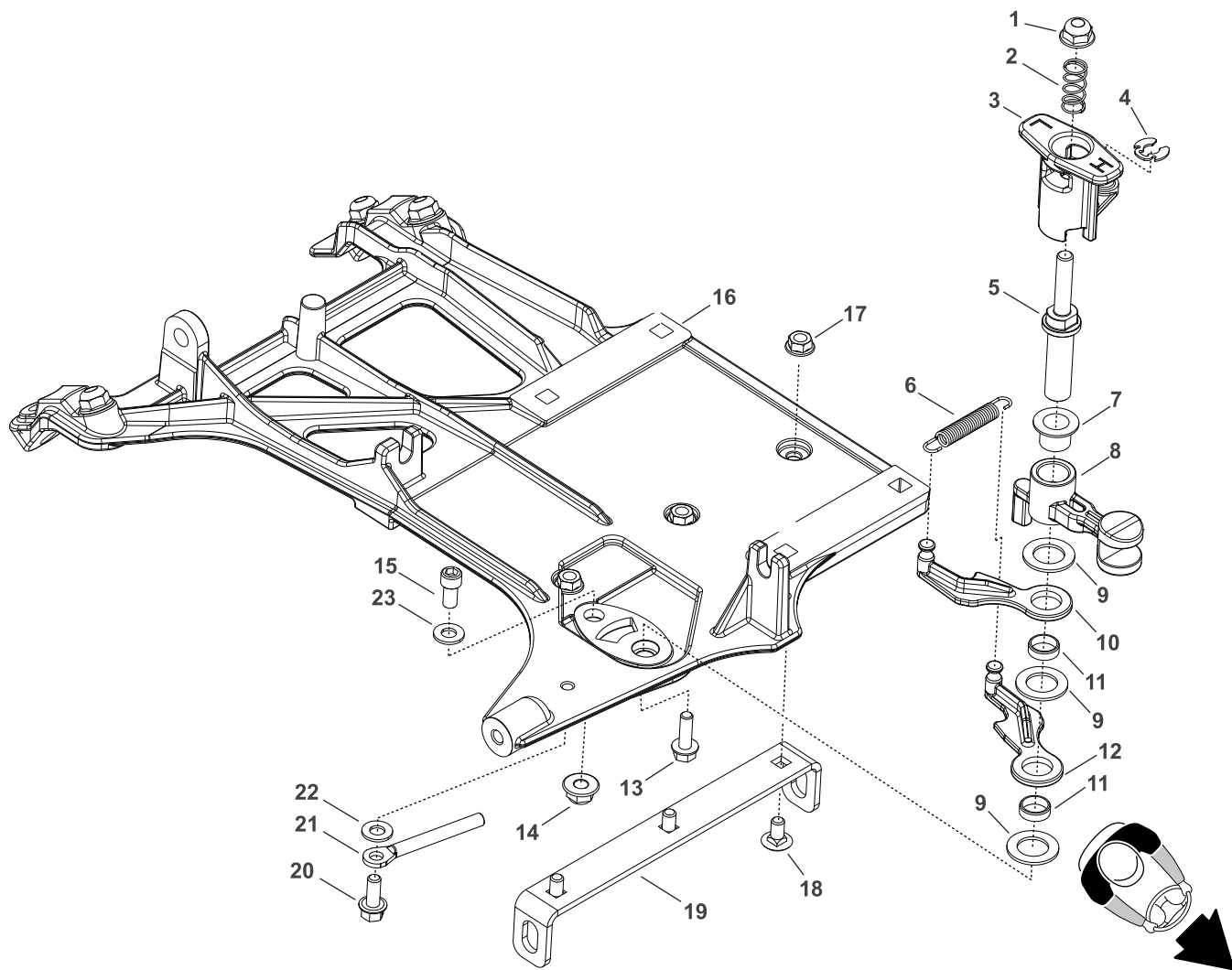
WARNING



Support the engine and transmission to prevent it from dropping and causing personal injury when removing.

14. Separate the engine base from the engine and transmission gear box assembly.

Removing the Engine Base (continued)



g256200

Figure 17

- | | | |
|------------------------|-----------------------|--------------------------|
| 1. Flat head nut | 9. Washer (3 each) | 17. Nut |
| 2. Compression spring | 10. Long reel lever | 18. Carriage bolt |
| 3. Reel selector hub | 11. Straight bushing | 19. Engine mount bracket |
| 4. Retaining ring | 12. Short reel lever | 20. Bolt |
| 5. Reel selector shaft | 13. Flat head bolt | 21. Cable guide |
| 6. Extension spring | 14. Nut | 22. Washer |
| 7. Flange bushing | 15. Socket head screw | 23. Washer |
| 8. Reel bellcrank | 16. Engine base | |

15. Carefully remove the nut (item 1 in [Figure 17](#)) and compression spring (2) that secures the reel selector hub (3) to the reel selector shaft (5). Remove the reel selector hub.

16. Carefully remove the extension spring (6) from the long and short reel levers (10 and 12).

17. Remove the bolt (13) that secures the reel selector shaft (5) to the engine base (16).

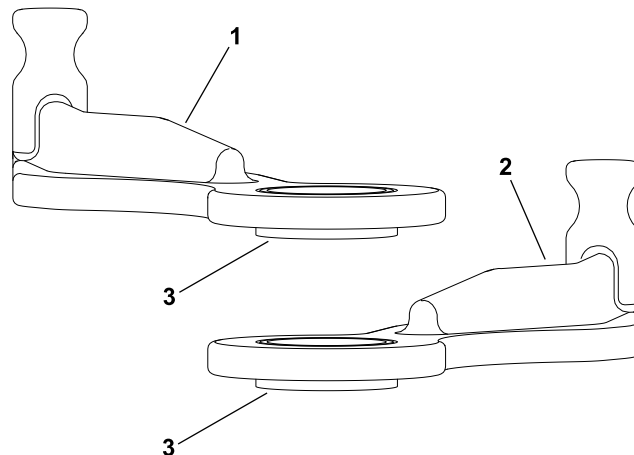
18. Remove the washer (9), long reel lever (10), washer (9), short reel lever (12), washer (9) and reel bellcrank (8) from the reel selector shaft (5).

Removing the Engine Base (continued)

19. If necessary, remove the flange bushing (7) from the reel bellcrank (8).
Remove the straight bushing (11) from the long and short reel lever (10 and 12).
20. If necessary, remove the nut (14), washer (23) and socket head screw (15) from the engine base (16).

Installing the Engine Base

1. If removed, install the socket head screw (item 15 in [Figure 17](#)), washer (23) and nut (14) into the engine base (16).



g262534

Figure 18

- | | | |
|--------------------|---------------------|---------------------|
| 1. Long reel lever | 2. Short reel lever | 3. Straight bushing |
|--------------------|---------------------|---------------------|

IMPORTANT

Straight bushings in the long and short reel levers must be inspected for wear or damage and replace if needed.

2. If removed, install the straight bushings (11) into the long and short reel levers (10 and 12) using an arbor press. Ensure that the straight bushings (3) are flush to top of the long and short reel levers (1 and 2); refer to [Figure 18](#).
3. If removed, install the flange bushing (7) into the reel bellcrank (8) using an arbor press.
4. Slide the reel bellcrank (8), washer (9), short reel lever (12), washer (9), long reel lever (10) and washer (9) onto the reel selector shaft (5).
5. Install the reel selector shaft (5) onto engine base (16) and secure with the bolt (13).
6. Carefully position the extension spring (6) onto the long and short reel levers (10 and 12).
7. Install the reel selector hub (3) and compression spring (2) onto the reel selector shaft (5) and secure with the nut (1).



WARNING



Support the engine and transmission to prevent it from dropping and causing personal injury when installing.

Installing the Engine Base (continued)

8. Install the engine and transmission gear box assembly on the engine base.
9. Secure the transmission gear box to engine base with 2 bolts (9). Do not tighten the bolts (9).
10. Secure the engine to the engine base with 4 carriage bolts, washers, and nuts.
11. Secure the engine base (item 1 in [Figure 16](#)) to the frame assembly (6) with a bolt (7), 2 washers (5) and nut (4) in front side and 2 tube clamps (8) and 4 nuts (11) in rear side of the frame assembly (6). Do not tighten the nuts (4 and 11).



12. Tighten the nut (4). Torque tighten the nuts (11) in a alternating cross pattern from **3.4 to 4 N·m (30 to 35 in-lb)** and then using the same pattern apply the torque from **5.6 to 6.2 N·m (50 to 55 in-lb)**.

13. Tighten the 2 bolts (9) that secure the transmission gear box to engine base.
14. Install the slider adapter (item 2 in [Figure 16](#)) and secure with a jam nut (3) onto the transmission gear box assembly (10). Adjust the slider adapter to make sure that the transmission output shaft is in neutral position.
15. Install the 2 splined couplers onto the transmission gear box assembly and drum drive gear box assembly and secure with the truss screw, 2 washers and nut.



16. Torque tighten the truss screw to **10 to 12.4 N·m (90 to 110 in-lb)**.
17. Install the reel cable; refer to [Installing the Reel Cable \(page 7–13\)](#).
18. Install the brake cable; refer to [Installing the Brake Cable \(page 7–8\)](#).
19. Install the clutch cable; refer to [Installing the Clutch Cable \(page 7–10\)](#).
20. Install the throttle cable; refer to [Installing the Throttle Cable \(page 7–5\)](#).
21. Attach the spark plug wire to the spark plug. Open the fuel shut-off valve on the fuel tank.
22. Start the engine and allow it to warm to operating temperature. Check high and low idle speeds and adjust if necessary.



Traction and Reel Drive Systems

Table of Contents

General Information	5-2
Disengaging The Drum Drive From Transmission	5-2
Adjustments	5-3
Adjusting the Reel Drive Belt.....	5-3
Service and Repairs	5-5
Reel Drive Belt	5-5
Reel Drive Assembly.....	5-7
Drum Drive Gear Box Assembly	5-11
Drum Assembly.....	5-17
Clutch Bearing	5-21
Transmission Gear Box Assembly	5-24
Differential Assembly	5-36

General Information

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

Disengaging The Drum Drive From Transmission

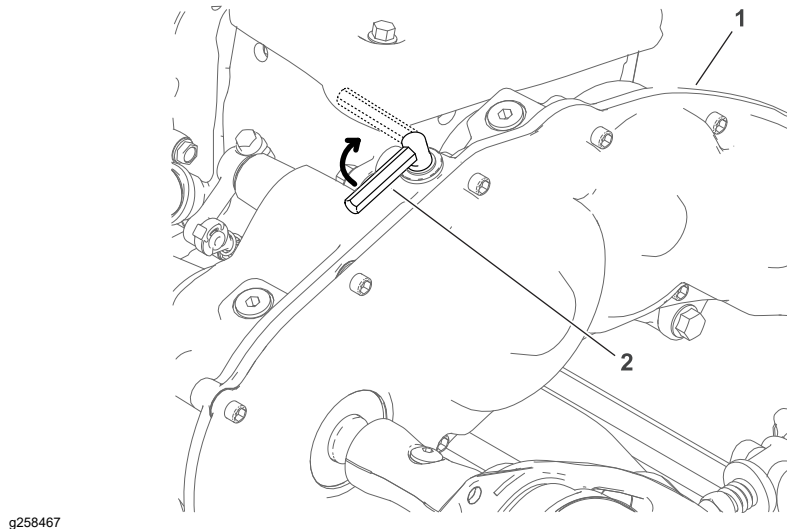


Figure 19

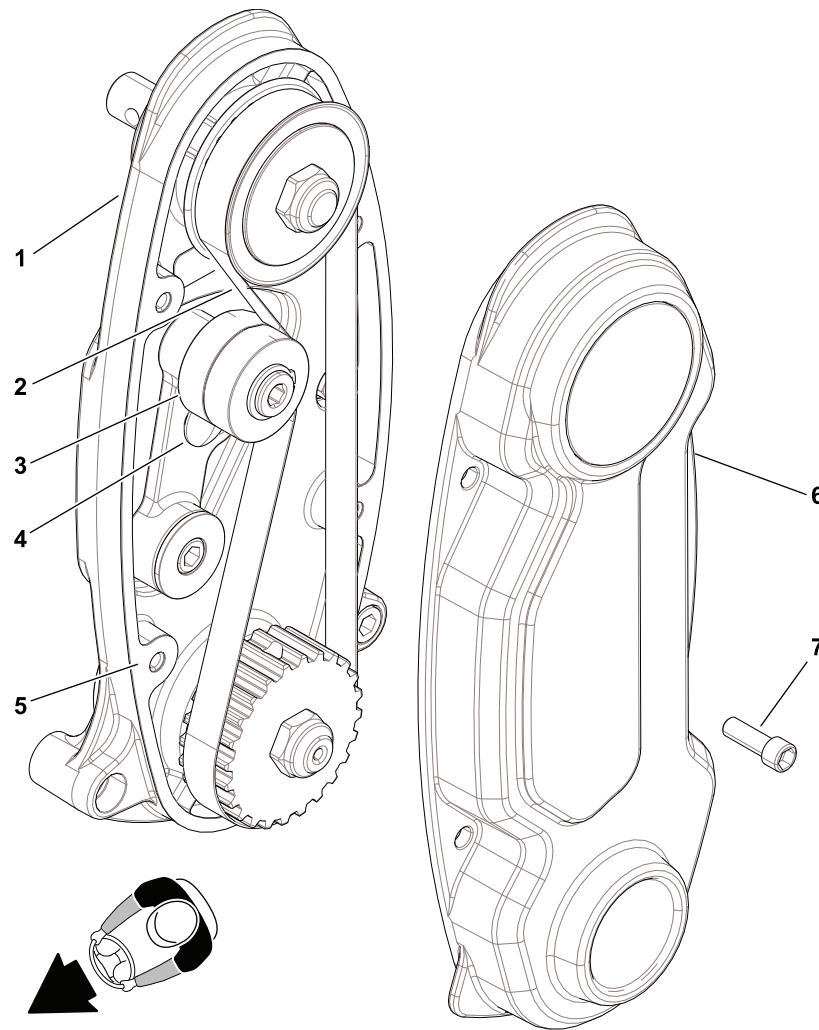
- | | |
|-----------------------------------|------------------------------------|
| 1. Transmission gear box assembly | 2. Traction engage/disengage lever |
|-----------------------------------|------------------------------------|

The traction drum is driven by series of spur gears inside the transmission gear box assembly. To disengage the traction drum drive from the transmission, do the following procedure:

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.
2. Locate the traction engage/disengage lever on top of the transmission gear box assembly.
3. To disengage the drum drive, rotate the traction engage/disengage lever to clockwise direction (away from the center of transmission gear box assembly).
4. To engage the drum drive, rotate the traction engage/disengage lever to anti-clockwise direction (towards the center of the transmission gear box assembly).
5. Attach the spark plug wire to the spark plug.

Adjustments

Adjusting the Reel Drive Belt



g312311

Figure 20

- | | | |
|-----------------------|---------------------|-------------------------------|
| 1. Reel drive housing | 4. Carriage Bolt | 7. Socket head screw (4 each) |
| 2. Reel drive belt | 5. Gasket | |
| 3. Idler arm | 6. Reel drive cover | |

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.
2. Remove the 4 socket head screws (7) that secure the reel drive cover (6) to the reel drive housing (1), and remove the cover to expose the reel drive belt (2).
3. Check the tension of the belt (item 2 in [Figure 20](#)) by pressing it at mid span between pulleys with **18 to 22 N (4 to 5 lbs)** of force. If the belt deflects **6.35 mm (0.25 inch)**, belt tension is correct - continue operation. If belt tension is not correct, proceed to next step.

Adjusting the Reel Drive Belt (continued)

4. Adjust belt tension as follows:

A. Loosen the nut securing carriage bolt (4) and the idler arm (3), and rotate the arm to remove tension from the belt (2).



B. Use a beam-style torque wrench to apply **6 to 7 N·m (55 to 60 in-lb)** of force to the upper idler-arm socket-head screw as shown in [Figure 21](#), and tighten the nut to secure the carriage bolt (4) and the idler arm (3). Check the belt tension; refer to step 3.

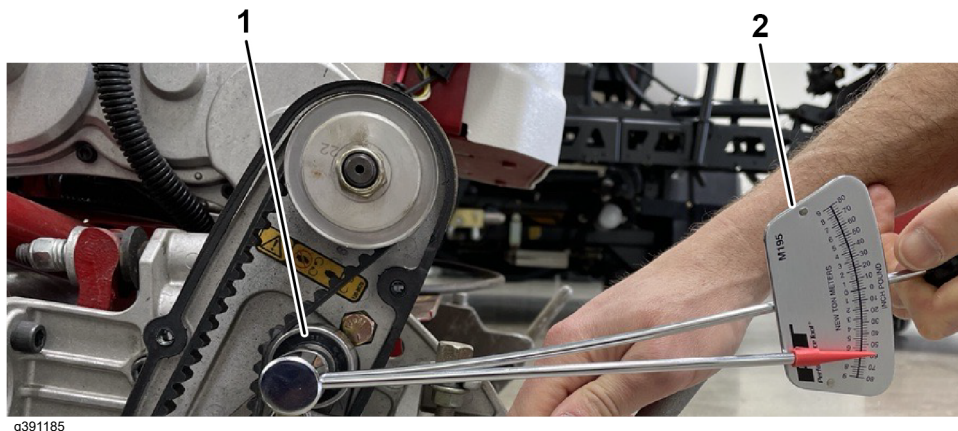


Figure 21

1. Upper idler-arm socket-head screw

2. Beam-style torque wrench

C. Ensure that the reel drive gasket (5) is in position, and assemble the reel drive cover (6) to the reel drive housing (1) with the 4 socket head screws (7).



D. Initially torque the socket head screws to **1.7 to 4.5 N·m (15 to 40 in-lb)**. Then using an alternating pattern torque the screws to **9.6 to 10.7 N·m (85 to 95 in-lb)**.

5. Attach the spark plug wire to the spark plug.

Service and Repairs

Reel Drive Belt

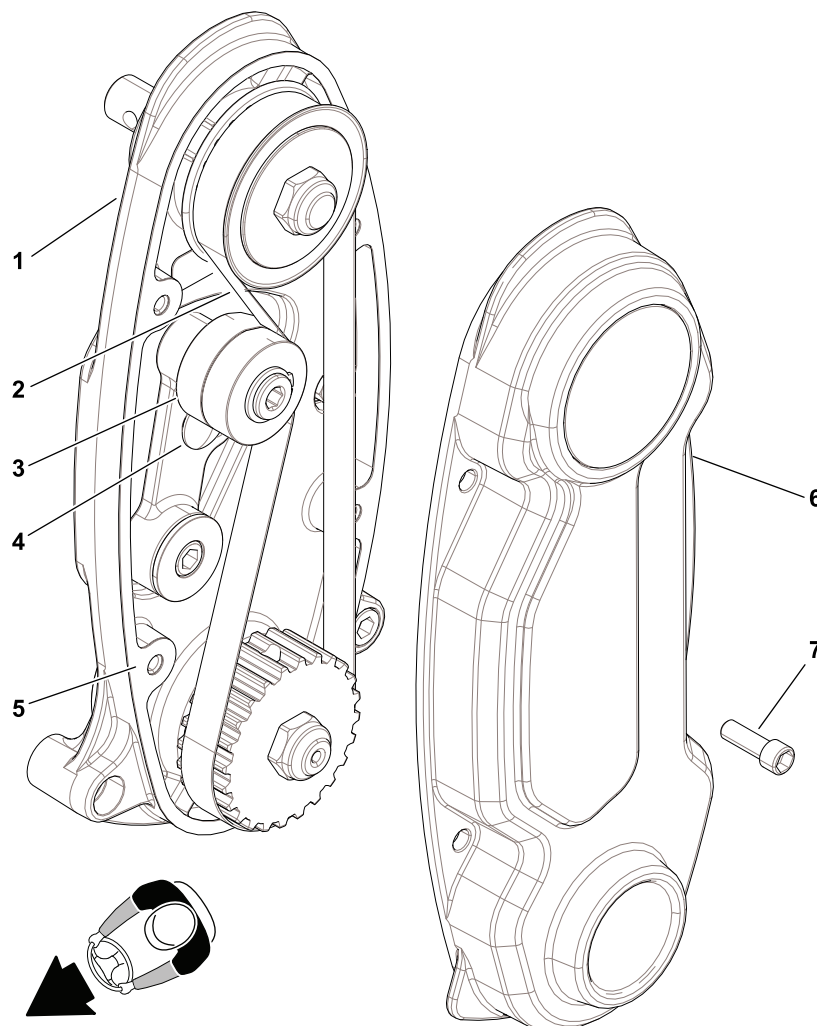


Figure 22

- | | | |
|-----------------------|---------------------|-------------------------------|
| 1. Reel drive housing | 4. Carriage Bolt | 7. Socket head screw (4 each) |
| 2. Reel drive belt | 5. Gasket | |
| 3. Idler arm | 6. Reel drive cover | |

The Greensmaster machines use a positive drive belt on the right side of the machine to operate the cutting unit.

Removing the Reel Drive Belt

Note: Refer to [Figure 22](#) during this procedure.

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.
2. Remove the 4 socket head screws (7) that secure the reel drive cover (6) to the reel drive housing (1), and remove the cover to expose the reel drive belt (2).
3. Remove and inspect the reel drive gasket (5) from the reel drive housing (1). Replace the reel drive gasket (5) if it is worn or damaged.

Removing the Reel Drive Belt (continued)

4. Loosen the nut securing carriage bolt (4) and the idler arm (3), and rotate the arm to remove tension from the belt (2).
5. Remove the belt (2) from the pulleys.

Installing the Reel Drive Belt

1. Ensure that the nut and carriage bolt (4) are loose enough to freely move the idler arm (3).
2. Place the new drive belt (2) over the pulleys.
3. Adjust the reel belt tension; refer to [Adjusting the Reel Drive Belt \(page 5–3\)](#).
4. Align the reel drive gasket (5) to the reel drive housing (1), and install the reel drive cover (6) to the housing with the 4 socket head screws (7).



5. Initially torque the socket head screws to **1.7 to 4.5 N·m (15 to 40 in-lb)**. Then using an alternating pattern torque the socket head screws to **9.6 to 10.7 N·m (85 to 95 in-lb)**.
6. Attach the spark plug wire to the spark plug.

Reel Drive Assembly

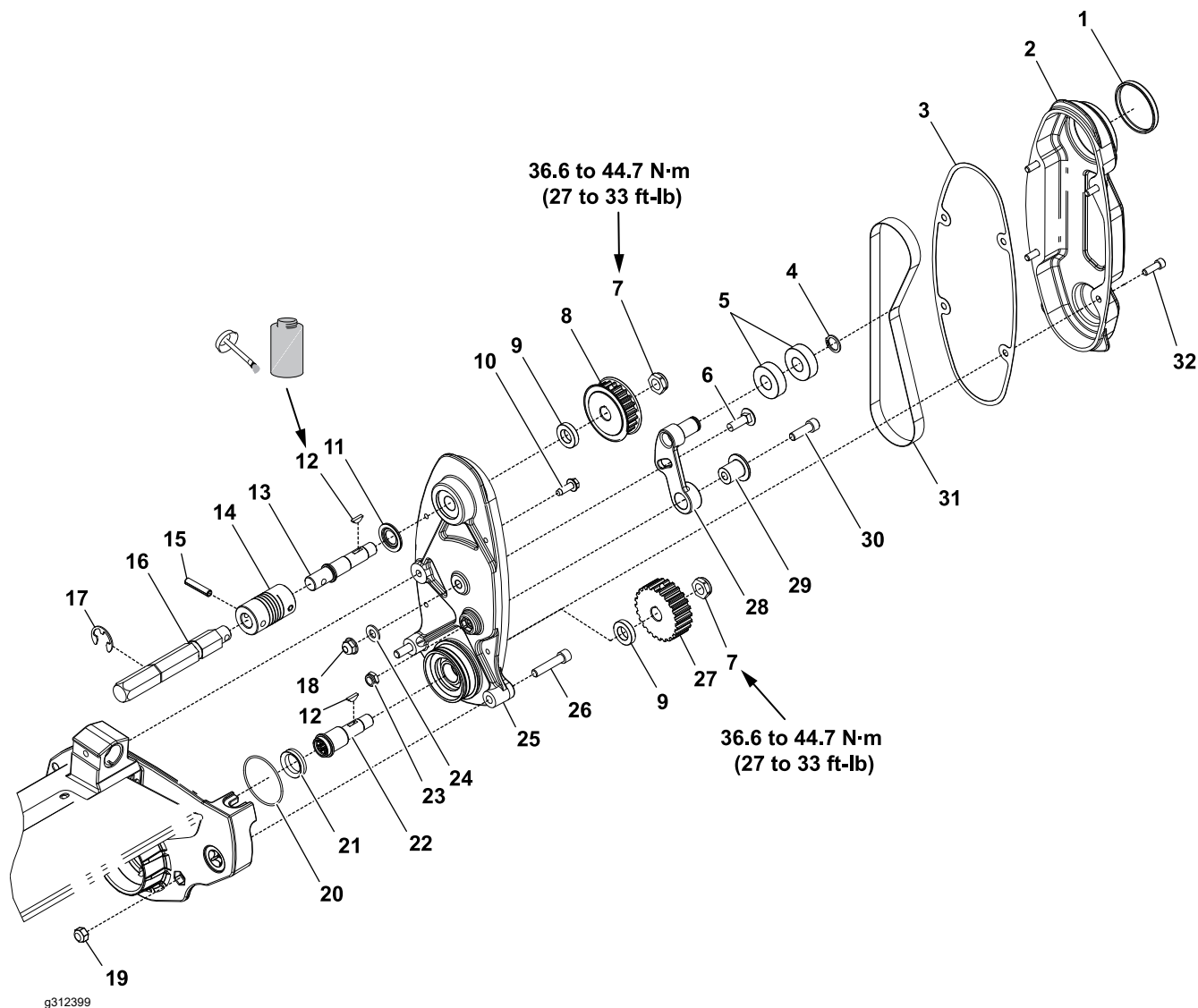


Figure 23

- | | | |
|--------------------------------|-------------------------|--------------------------------|
| 1. Expansion plug | 12. Hipro key | 23. Nut |
| 2. Reel drive cover | 13. Reel shaft-driver | 24. Washer |
| 3. Reel drive gasket | 14. Helical coupling | 25. Reel drive housing |
| 4. Retaining ring | 15. Spring pin (2 each) | 26. Socket head screw (2 each) |
| 5. Ball bearing (2 each) | 16. Coupler shaft | 27. Reel pulley - 24 tooth |
| 6. Carriage bolt | 17. Snap ring | 28. Idler arm |
| 7. Locknut | 18. Nut | 29. Idler bushing |
| 8. Reel pulley - 22 tooth | 19. Nut | 30. Socket head screw |
| 9. Reel pulley spacer (2 each) | 20. O-ring | 31. Reel belt |
| 10. Bolt | 21. V-ring seal | 32. Socket head screw (4 each) |
| 11. Bearing shield | 22. Reel shaft-driven | |

Removing the Reel Drive Assembly

Note: Refer to [Figure 23](#) during this procedure.

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and

Removing the Reel Drive Assembly (continued)

parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.

2. Remove the cutting unit from the machine; refer to *Operator's Manual*.
3. Remove the reel drive belt; refer to [Removing the Reel Drive Assembly \(page 5–7\)](#).
4. Remove and discard the reel drive gasket (3) from the housing (25).
5. If necessary, remove the expansion plug (1) from the reel drive cover (2).
6. Remove the nuts (19), socket head screws (26) and bolt (10) that secures the reel drive housing (25) to the cutting unit.
7. Remove the reel drive housing assembly from the cutting unit.
8. Remove the V-ring seal (21) from the reel shaft driven (22).
9. Remove the nut (18) and washer (24) from the reel drive housing (25) and carriage bolt (6) from the idler arm (28).
10. Remove the socket head screw (30) that secures the idler arm (28) to the reel drive housing (25).
11. If necessary, remove the idler bushing (29) from the idler arm (28).
12. Remove the retaining ring (4) and use a press to remove the 2 ball bearings (5) from the idler arm (28). Discard the ball bearings after removal.
13. Remove the locknut (7), reel pulley (27), hipro key (12) and spacer (9) from the reel shaft driven (22).
14. Slide and remove the reel shaft driven (22) from the reel drive housing (25).
15. Remove the locknut (7), reel pulley (8), hipro key (12) and spacer (9) from the reel shaft driver (13).
16. Slide and remove the reel shaft driver (13), helical coupling (14) and coupler shaft (16) from the reel drive housing (25).
17. Remove and discard the bearing shield (11) from the reel drive housing (25).
18. Remove and discard the O-ring (20) from the reel drive housing (25).

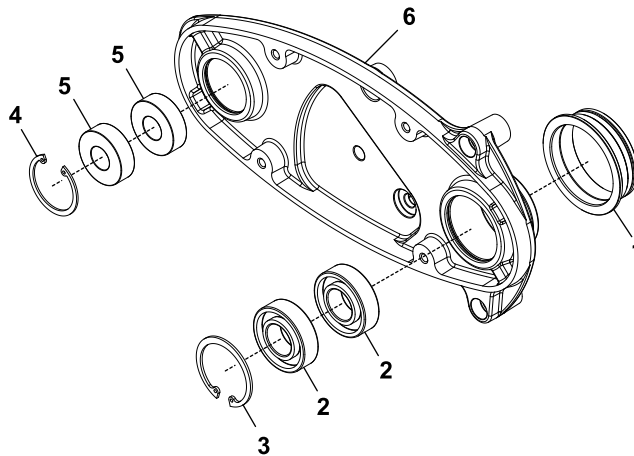


Figure 24

1. Pivot sleeve
2. Ball bearing
3. Retaining ring
4. Retaining ring
5. Ball bearing
6. Reel drive housing

19. If necessary, remove the retaining rings (3 and 4) from the reel drive housing (6).

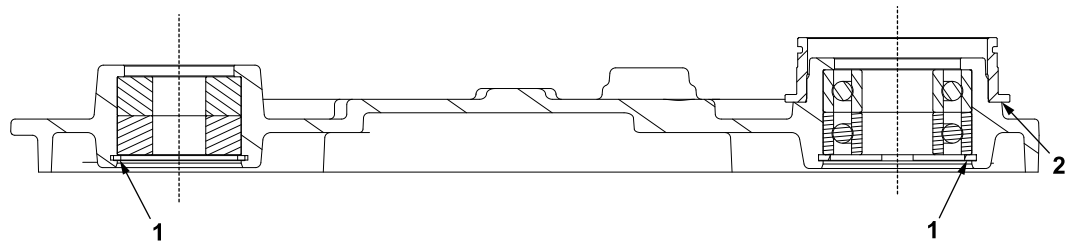
Removing the Reel Drive Assembly (continued)

20. Use a press to remove the 4 ball bearings (2 and 5) from the reel drive housing (6). Discard the ball bearings after removal.

Installing the Reel Drive Assembly

Note: Refer to [Figure 23](#) during the procedure.

1. Use a press to install the 4 ball bearings (items 2 and 5 in [Figure 24](#)) into the reel drive housing (6).
2. Secure the ball bearings with 2 retaining rings (item 3 and 4 in [Figure 24](#)) into the reel drive housing (6).



g312504

Figure 25

1. Retaining ring must be fully seated

2. Press sleeve to shoulder

3. Install the bearing shield (11) into the reel drive housing (25).
4. Slide the reel shaft driver (13) into the reel drive housing (25).
5. Slide the spacer (9) into the reel drive housing (25).
6. Install the hipro key (12) onto the reel shaft driver (13). Apply anti-seize lubricant on top of the key.
7. Install the reel pulley (8) onto the reel shaft driver (13). Secure the reel pulley (8) with the locknut (7).



8. Torque tighten the locknut to **36.6 to 44.7 N·m (27 to 33 ft-lb)**.

9. If removed, install the new O-ring (20) onto the pivot sleeve.
10. Slide the reel shaft driven (22) into the reel drive housing (25).
11. Slide the spacer (9) into the reel drive housing (25).
12. Install the hipro key (12) onto the reel shaft driven (22). Apply anti-seize lubricant on top of the key.
13. Install the reel pulley (27) onto the reel shaft driven (22). Secure the reel pulley (27) with the locknut (7).



14. Torque tighten the locknut to **36.6 to 44.7 N·m (27 to 33 ft-lb)**.

15. If removed, install the bushing (29) into the idler arm (28).
16. If removed, use a press to install the 2 ball bearings (5) onto the idler arm (28) and secure the ball bearings with a retaining ring (4).
17. Install and secure the idler arm (28) into the reel drive housing (25) with socket head screw (30) and nut (23).
18. Install the carriage bolt (6), washer (24) and nut (18) to the idler arm (28) and reel drive housing (25). Do not tighten the nut (18).
19. Place the V-ring seal (21) into the reel drive housing (25).
20. Attach a new gasket (3) onto the reel drive housing (25).

Installing the Reel Drive Assembly (continued)

21. Install the reel drive housing (25) onto the cutting deck and secure with the bolt (10), 2 socket head screws (26) and nuts (19).
22. If removed, install the expansion plug (1) into the reel drive cover (2).
23. Install the reel drive belt; refer to [Installing the Reel Drive Belt \(page 5–6\)](#).
24. Adjust the reel drive belt; refer to [Adjusting the Reel Drive Belt \(page 5–3\)](#).
25. Install the cutting unit onto the machine; refer to the *Operator's Manual*.
26. Attach the spark plug wire to the spark plug.

Drum Drive Gear Box Assembly

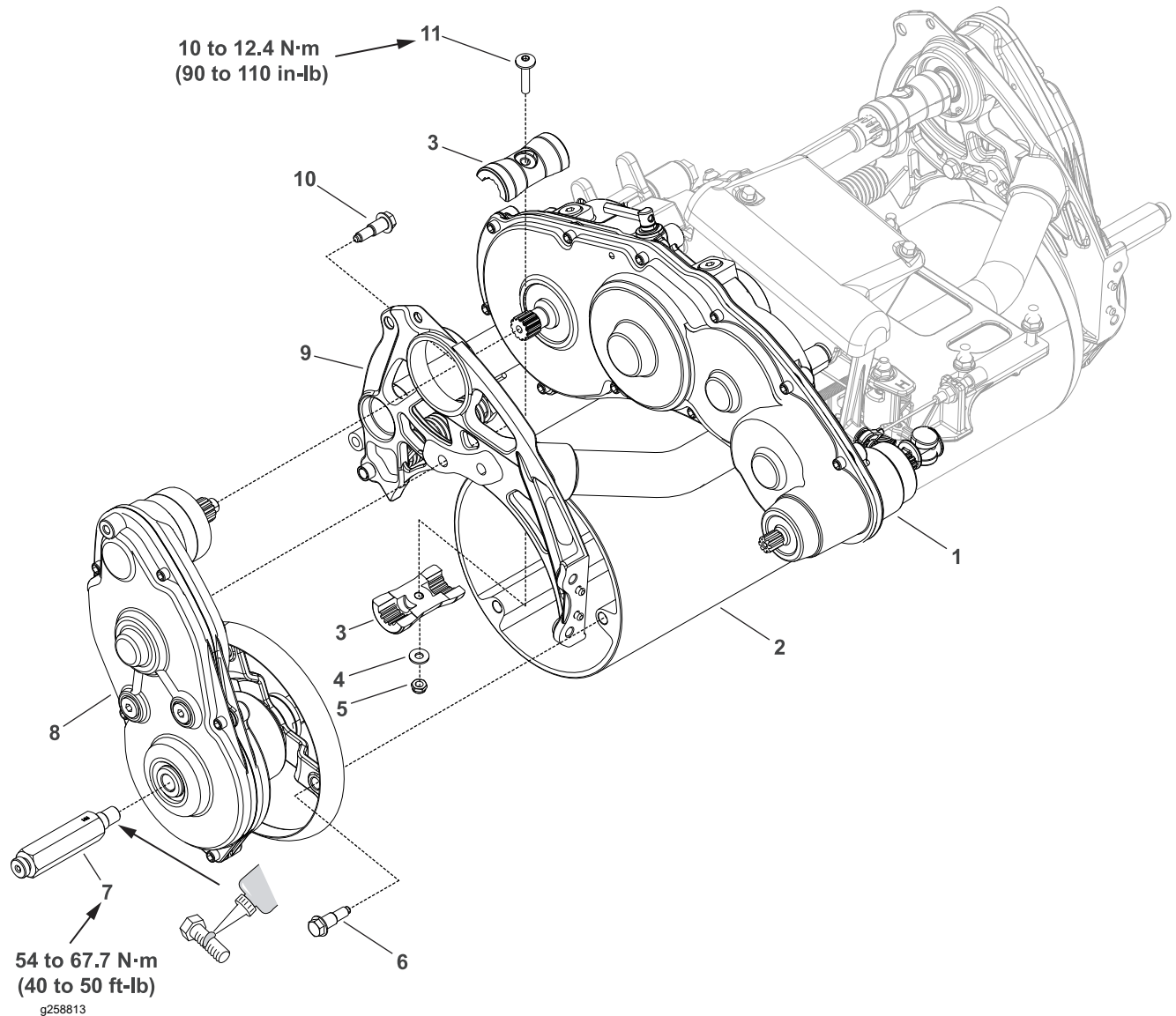


Figure 26

- | | | |
|-----------------------------------|---------------------------------|-------------------|
| 1. Transmission gear box assembly | 5. Locknut | 9. Frame assembly |
| 2. Traction drum | 6. Shoulder bolt (3 each) | 10. Shoulder bolt |
| 3. Splined coupler (2 each) | 7. RH hex shaft | 11. Truss screw |
| 4. Washer | 8. Drum drive gear box assembly | |

Removing the Drum Drive Gear Box Assembly

Note: Refer to [Figure 26](#) during this procedure.

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.
2. Remove the transport wheel if attached; refer to [Removing the Transport Wheel \(page 7–26\)](#).

Note: Support the machine on kickstand during this operation.

3. Move the traction engage/disengage lever to the disengage position to remove torque from the drum drive gears.

Removing the Drum Drive Gear Box Assembly (continued)

4. Remove the truss screw (11), nut (5) and washer (4) that secures the 2 splined couplers (3) to the transmission gear box assembly (1) and drum drive gear box assembly (8).
5. Remove the shoulder bolt (10) that secures the drum drive gear box assembly (8) to the frame assembly (9).
6. Remove the 3 shoulder bolts (6) that secures the drum drive gear box assembly (8) to the traction drum (2). Remove the drum drive gear box assembly from the frame assembly. Support the drum assembly.
7. If necessary, remove the hexagonal shaft (7) from the drum drive gear box assembly (8).

Disassembly of Drum Drive Gear Box Assembly

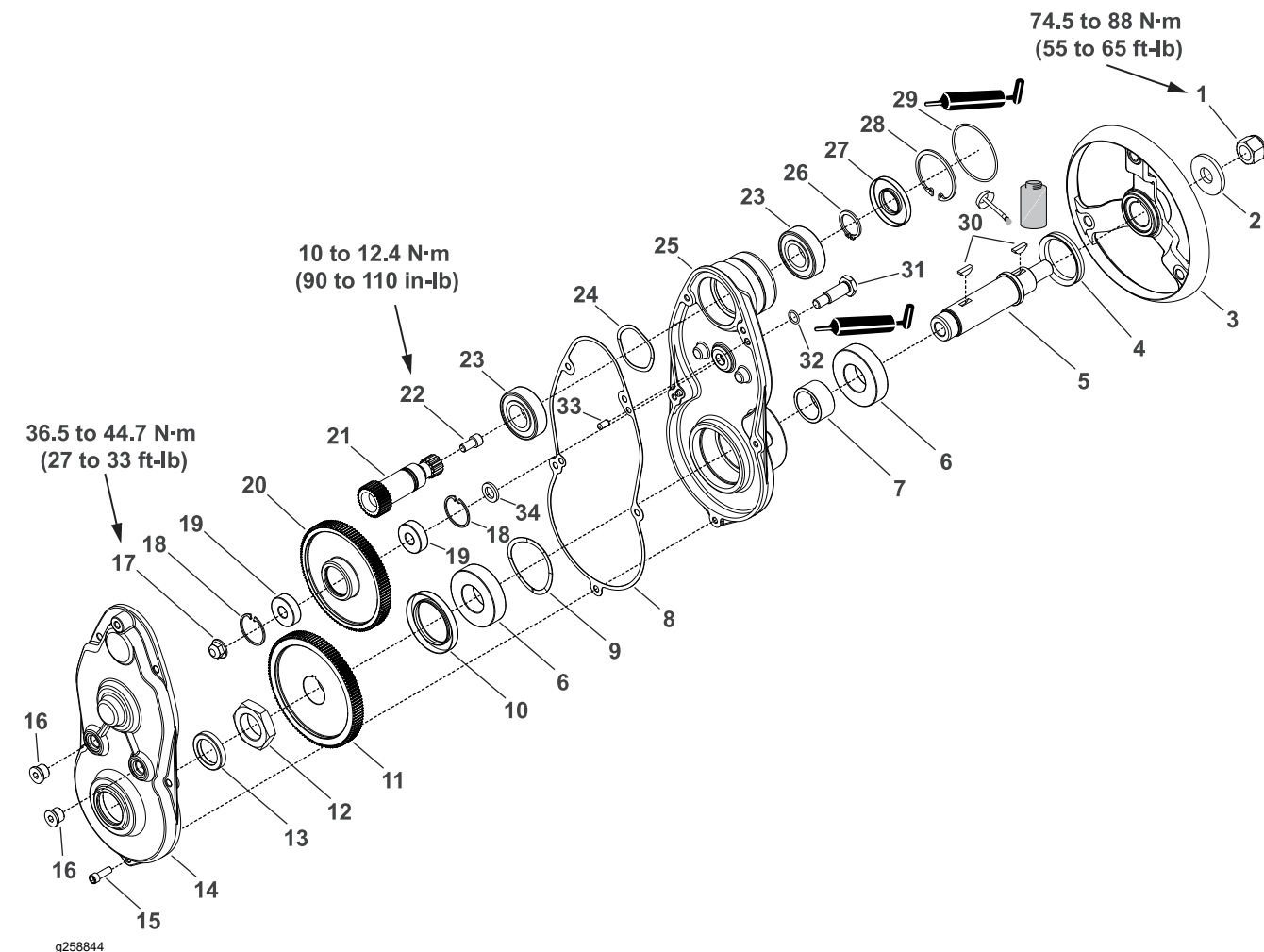


Figure 27

- | | | |
|--------------------------|--------------------------------|------------------------|
| 1. Nut | 13. Oil seal | 25. Drum drive housing |
| 2. Washer | 14. Drum drive cover | 26. Retaining ring |
| 3. Outer drum hub | 15. Socket head screw (5 each) | 27. Oil seal |
| 4. V-ring seal | 16. Plug (2 each) | 28. Retaining ring |
| 5. Drum drive shaft | 17. Flange nut | 29. O-ring |
| 6. Ball bearing (2 each) | 18. Retaining ring | 30. Key |
| 7. Spacer | 19. Ball bearing (2 each) | 31. Short bearing pin |
| 8. Drum driver gasket | 20. Spur gear | 32. O-ring |
| 9. Wire spring | 21. Spur gear | 33. Dowel pin (2 each) |
| 10. Oil seal | 22. Socket head screw | 34. Bearing spacer |
| 11. Spur gear | 23. Ball bearing (2 each) | |
| 12. Nut | 24. Wave washer | |

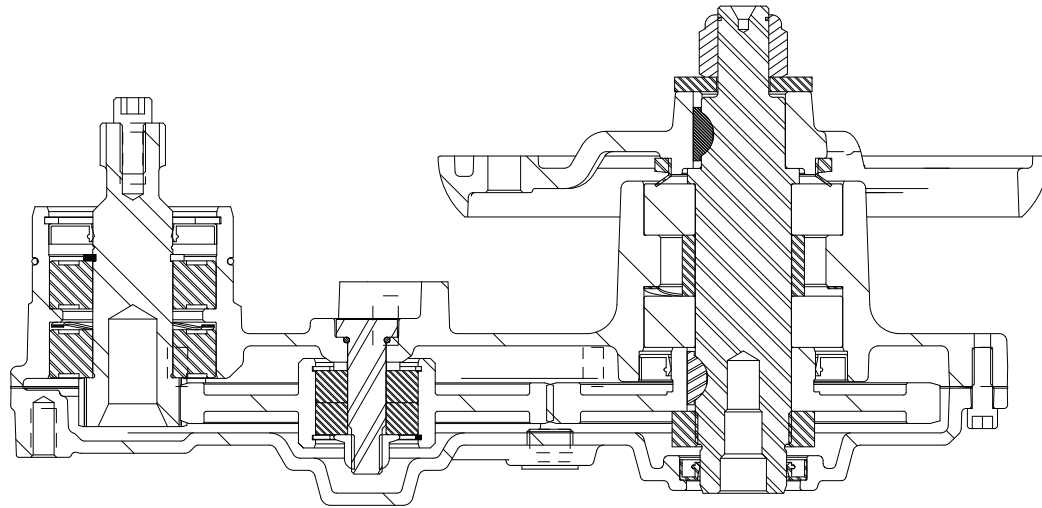
Note: Refer to [Figure 27](#) during this procedure.

1. Remove the 5 socket head screws (15) that secures the drum drive cover (14) to the drum drive housing (25).
2. Remove and discard the gasket (8) from the drum drive housing (25).
3. If necessary, remove the hollow plugs (16) from the drum drive cover (14).
4. If necessary, remove and discard the oil seal (13) from the drum drive cover (14).

Disassembly of Drum Drive Gear Box Assembly (continued)

5. Remove the nut (12) that secures the spur gear (11) to the drum drive shaft (5). Slide and remove the spur gear (11) from the drum drive shaft (5). Locate and retrieve the key (30) from the drum drive shaft (5).
6. Remove the nut (1) and washer (2) that secures the outer drum hub (3) to the drum drive shaft (5). Slide and remove the outer drum hub (3) and V-ring seal (4) from the drum drive shaft (5). Locate and retrieve the key (30) from the drum drive shaft (5).
7. If the ball bearings (6) are to be removed, use a press to remove the oil seal (10), ball bearings (6), bearing spacer (7), spring washer (9) and drum drive shaft (5) from the drum drive housing (25). Discard the ball bearings after removal.
8. Remove the nut (17) and bearing pin (31) that secures the spur gear (20) to the drum drive housing (25).
9. Remove the spur gear (20) and bearing spacer (34) from the drum drive housing (25).
10. Remove and discard the O-ring (32) from the bearing pin (31).
11. If the spur gear bearings (19) are to be removed, remove the retaining rings (18) and use a press to remove the ball bearings (19). Discard the bearings after removal.
12. Remove the retaining ring (28) and oil seal (27) from the drum drive housing (25). Discard the oil seal (27). Remove the retaining ring (26) from the spur gear (21).
13. Use a press to remove ball bearings (23), spur gear (21) and wave washer (24) from the drum drive housing (25). Discard the ball bearings after removal.
14. Remove and discard the O-ring (29) from the drum drive housing (25).

Assembly of Drum Drive Gear Box Assembly



g263151

Figure 28

1. Install the ball bearings (23), wave washer (24) and spur gear (21) to the drum drive housing (25).
Note: The outer diameter and inner diameter of the ball bearings (23) must be slip fit.
2. Install the retaining ring (26) to the spur gear (21). Apply a light coat of oil to the oil seal (27). Install the oil seal (27) and retaining ring (28) to the drum driving housing (25).
3. Use a press to install the ball bearings (19) to the spur gear (20). Install the retaining rings (18) to spur gear (20).
Note: The inner diameter of the ball bearing (19) must be slip fit.
4. Apply a light coat of grease and install the O-ring (32) to the bearing pin (31). Install the bearing spacer (34), spur gear (20) onto the drum drive housing (25) and secure with the bearing pin (31) and nut (17).
5. Install the ball bearings (6), bearing spacer (7), spring washer (9) and drum drive shaft (5) to the drum drive housing (25).
Note: The outer diameter and inner diameter of the ball bearings (6) must be slip fit.
6. Install the V-ring seal (4) onto the drum outer hub (3). Install the key (30) to the drum drive shaft (5) and apply anti-seize lubricant at the top of the key. Slide the drum outer hub (3) to the drum drive shaft (5) and secure with the washer (2) and nut (1).
7. Install the oil seal (10) into the drum drive housing (25). Install the key (30) to the drum drive shaft (5) and apply anti-seize lubricant at the top of the key. Slide the spur gear (11) to the drum drive shaft (5) and secure with the nut (12).
8. Torque tighten the nut (17) from **36.5 to 44.7 N·m (27 to 33 ft-lb)**.
9. Hold the nut (12) and torque tighten the nut (1) from **74.5 to 88 N·m (55 to 65 ft-lb)**.
10. If removed, install the oil seal (13) to the drum drive cover (14).
11. If removed, install the hollow plugs (16) to the drum drive cover (14). Lubricate the O-rings.



Assembly of Drum Drive Gear Box Assembly (continued)



12. Torque tighten the hollow plugs (16) from **12.4 to 14.6 N·m (110 to 130 in-lb)**.

13. Install the gasket (8) to the drum drive housing.



14. Install the drum drive cover (14) to the drum drive housing (25) and secure with 5 socket head screws (15). Torque tighten the socket head screws to **1.7 to 4.5 N·m (15 to 40 in-lb)**. Use an alternation pattern and torque tighten the socket head screws to **9.6 to 10.7 N·m (85 to 95 in-lb)**.

Installing the Drum Drive Gear Box Assembly

1. If removed, apply a coat of Loctite (blue) to threads of the hexagonal shaft (7). Install the hexagonal shaft (item 7 in [Figure 26](#)) to the drum drive gear box assembly (8). Torque tighten the hexagonal shaft to **54 to 67.7 N·m (40 to 50 ft-lb)**.

2. Apply a light coat of grease and install the O-ring (29) to the drum drive housing (25).

3. Install the drum drive gear box assembly (8) to the frame assembly (9) and secure with the shoulder bolt (10).

4. Install the drum drive gear box assembly (8) to the traction drum (2) and secure with the 3 shoulder bolts (6).

5. Install the 2 splined couplers onto the transmission gear box assembly (1) and drum drive gear box assembly (8) and secure with the truss screw (11), 2 washers (4) and nut (5).



6. Torque tighten the truss screw (11) to **10 to 12.4 N·m (90 to 110 in-lb)**.

7. If required, install the transport wheels; refer to [Installing the Transport Wheel \(page 7–28\)](#).

8. Attach the spark plug wire to the spark plug.

Drum Assembly

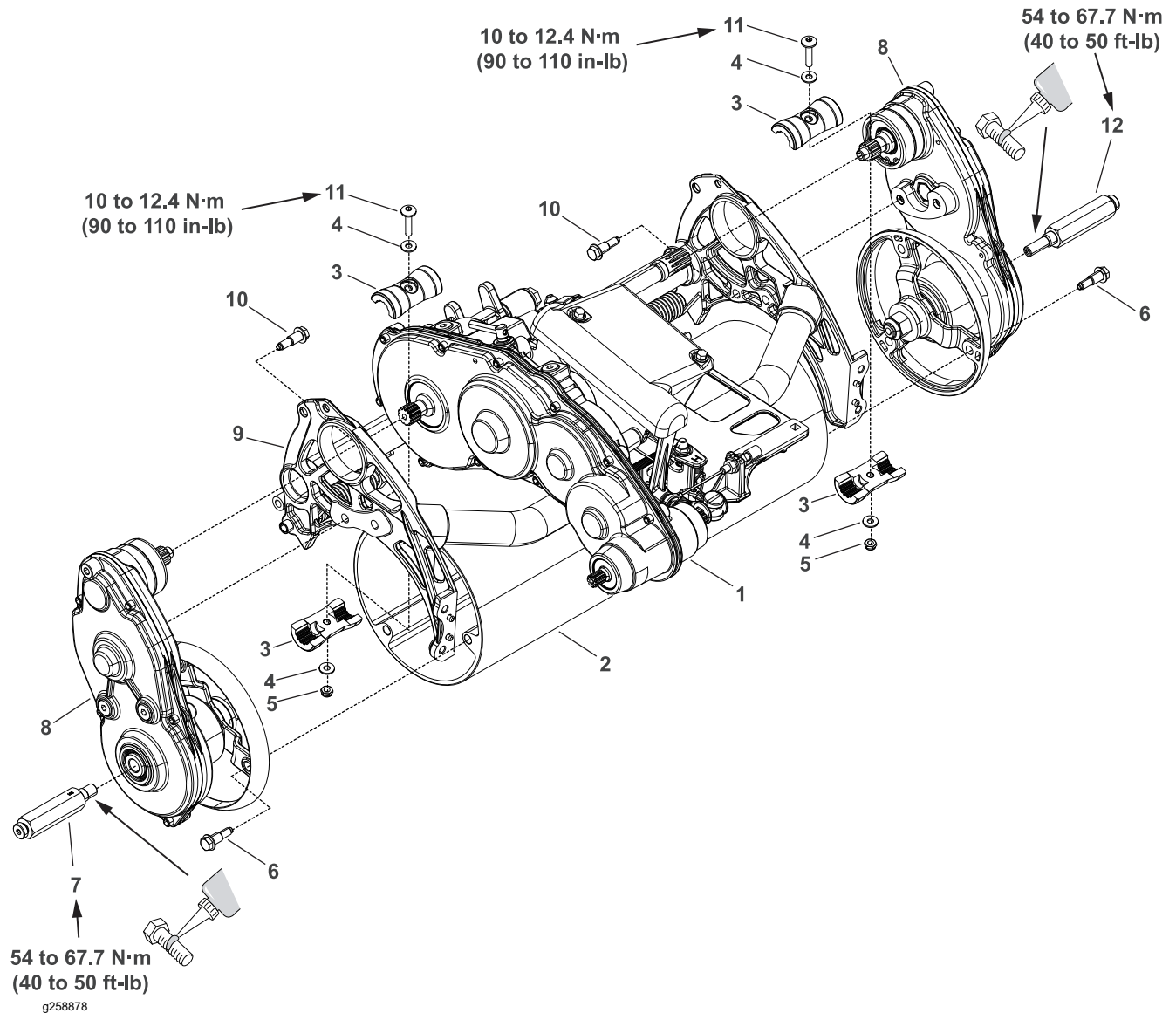


Figure 29

- | | | |
|-----------------------------------|--|----------------------------|
| 1. Transmission gear box assembly | 5. Locknut (2 each) | 9. Frame assembly |
| 2. Traction drum | 6. Shoulder bolt (6 each) | 10. Shoulder bolt (2 each) |
| 3. Splined coupler (4 each) | 7. RH hex shaft | 11. Truss screw |
| 4. Washer (4 each) | 8. Drum drive gear box assembly (2 each) | 12. LH hex shaft |

Removing the Drum Assembly

Note: Refer to [Figure 29](#) during this procedure.

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.
2. Remove the LH and RH drum drive gear box assemblies (item 8 in [Figure 29](#)); refer to [Removing the Drum Drive Gear Box Assembly \(page 5–11\)](#).
3. Remove the traction drum (2) from the frame assembly (9).

Disassembly of Drum Drive Assembly

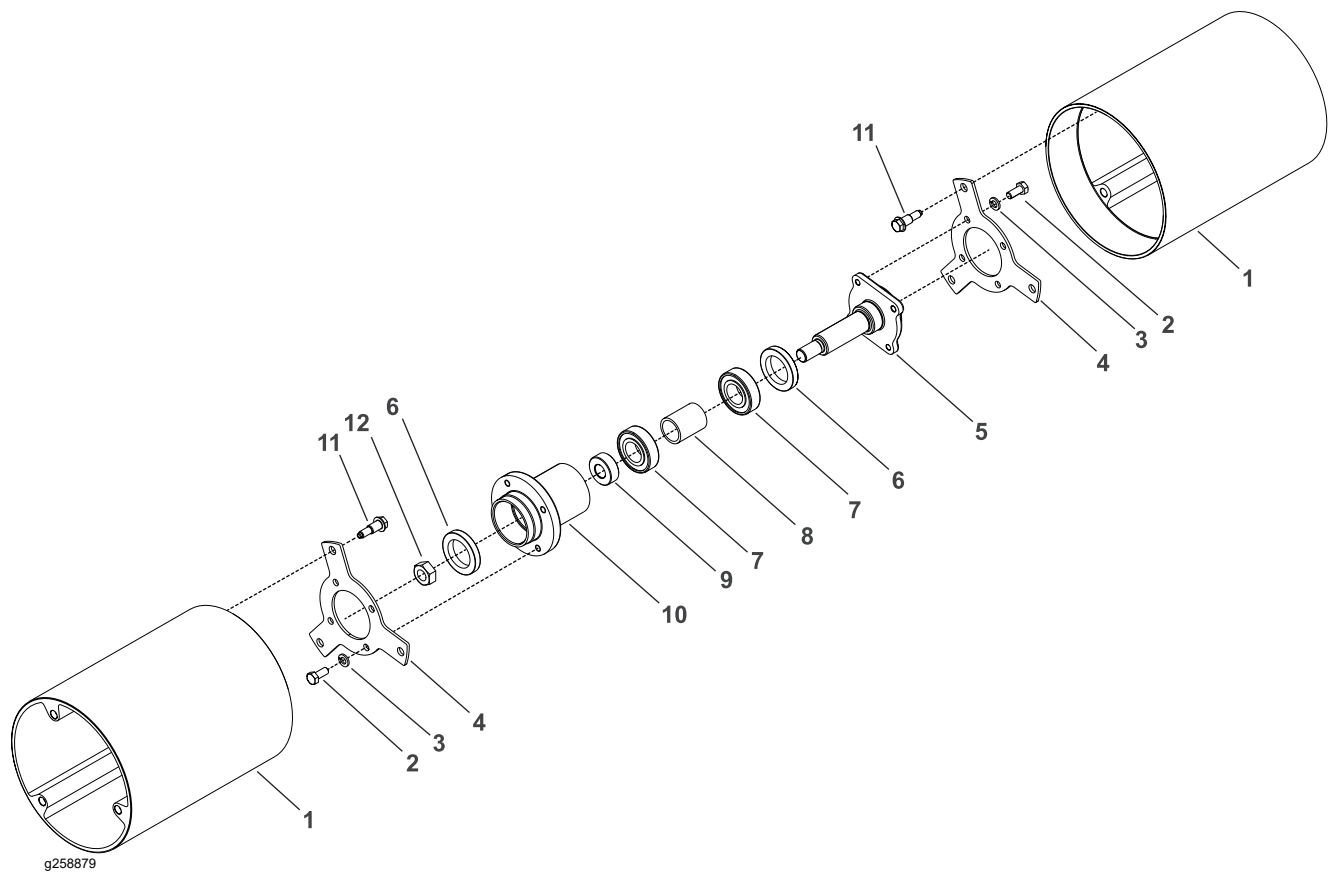


Figure 30

- | | | |
|----------------------------|--------------------------|----------------------------|
| 1. Traction drum (2 each) | 5. Drum spindle | 9. Spacer |
| 2. Bolt (8 each) | 6. Seal (2 each) | 10. Drum hub |
| 3. Lock washer (8 each) | 7. Ball bearing (2 each) | 11. Shoulder bolt (6 each) |
| 4. Drum hub plate (2 each) | 8. Spacer | 12. Locknut |

Note: Refer to [Figure 30](#) during this procedure.

1. Remove the 4 bolts (item 2 in [Figure 30](#)) and lock washers (3) that secures the drum hub plate (4) to the drum spindle (5).
2. Remove 4 bolts (2) and lock washers (3) that secures the drum hub plate (4) to the drum hub (10).
3. Remove the shoulder bolts (11) that secures the drum hub plate (4) to the traction drum (1).
4. Remove the locknut (12) that secures the drum spindle (5) and drum hub (10) together. Carefully slide and remove the drum spindle (5) out of the drum hub (10).
5. Remove the 2 seals (6) from the drum hub (10). Use a press to remove the 2 ball bearings (7) and a bearing spacer (8) from the drum hub (10). Discard the ball bearings.

Assembly of Drum Drive Assembly

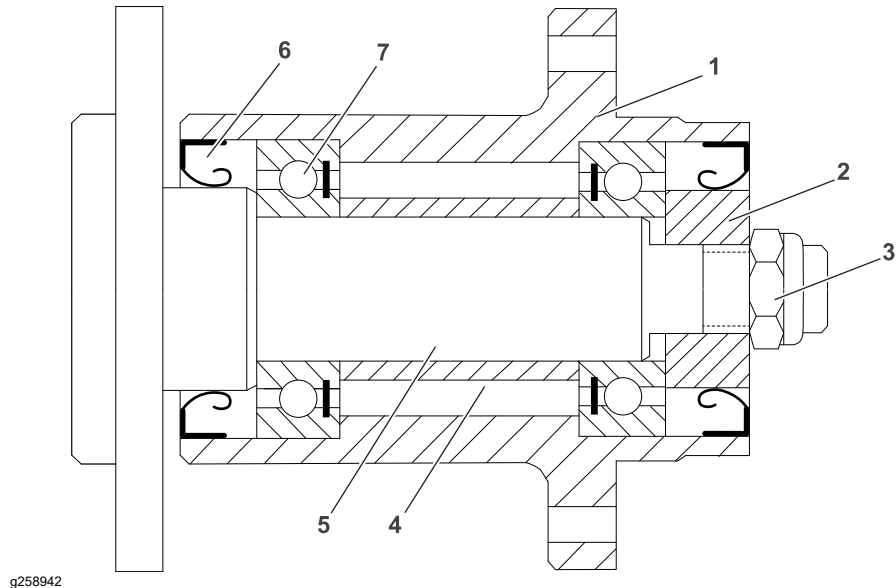


Figure 31

- | | | |
|-------------|------------------|--------------------------|
| 1. Drum hub | 4. Spacer | 7. Ball bearing (2 each) |
| 2. Spacer | 5. Drum spindle | |
| 3. Locknut | 6. Seal (2 each) | |

Note: The seal side of each bearing (item 7 in [Figure 31](#)) should face inside of the drum hub; refer to [Figure 31](#).

1. Use a press to install the bearings (7) and spacer (8) into the drum hub (10). Pack the bearings with grease. Fill outside space of the bearing with the grease.
2. Apply a coat of grease to the seals (6). Press the seals (6) into the drum hub (1) with its flat side facing outside; refer to [Figure 31](#).
3. Apply grease to the shaft of the drum spindle (5). Carefully slide the drum spindle into the drum hub bearings (7). Secure the drum spindle and drum hub (1) with a spacer (2) and locknut (3). Make sure that the drum spindle (5) can move axially relative to the drum hub (1).

Note: The locknut (3) turns hard on the drum spindle (5) when tightened. Ensure that all rotation has stopped when tightening. A good solid sound indicates the nut is full tight.

4. Install the drum hub plate (4) into the traction drum (1) and secure with shoulder bolt (11).

Note: The fit between the drum hub plate (item 4 in [Figure 30](#)) and drum (1) is a close tolerance and can be easily jammed. The hub can be rotated when seated properly in the bore of the drum.

5. Secure the drum hub plate (4) to the drum hub (10) with the 4 bolts (2) and washers (3). Tighten the bolts using an alternating pattern. Repeat tightening sequence a second time.
6. Secure the drum hub plate (4) to the drum spindle (5) with the 4 bolts (2) and washers (3). Tighten the bolts using an alternating pattern. Repeat tightening sequence a second time.

Installing the Drum Drive Assembly

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.
2. Position the LH and RH drum drive gear box assembly (item 8 in [Figure 29](#)) and traction drum (2) onto the frame assembly (9).
3. Secure the LH and RH drum drive gear box assembly (8) to the traction drum (2); refer to [Installing the Drum Drive Gear Box Assembly \(page 5–16\)](#).
4. Attach the spark plug wire to the spark plug.

Clutch Bearing

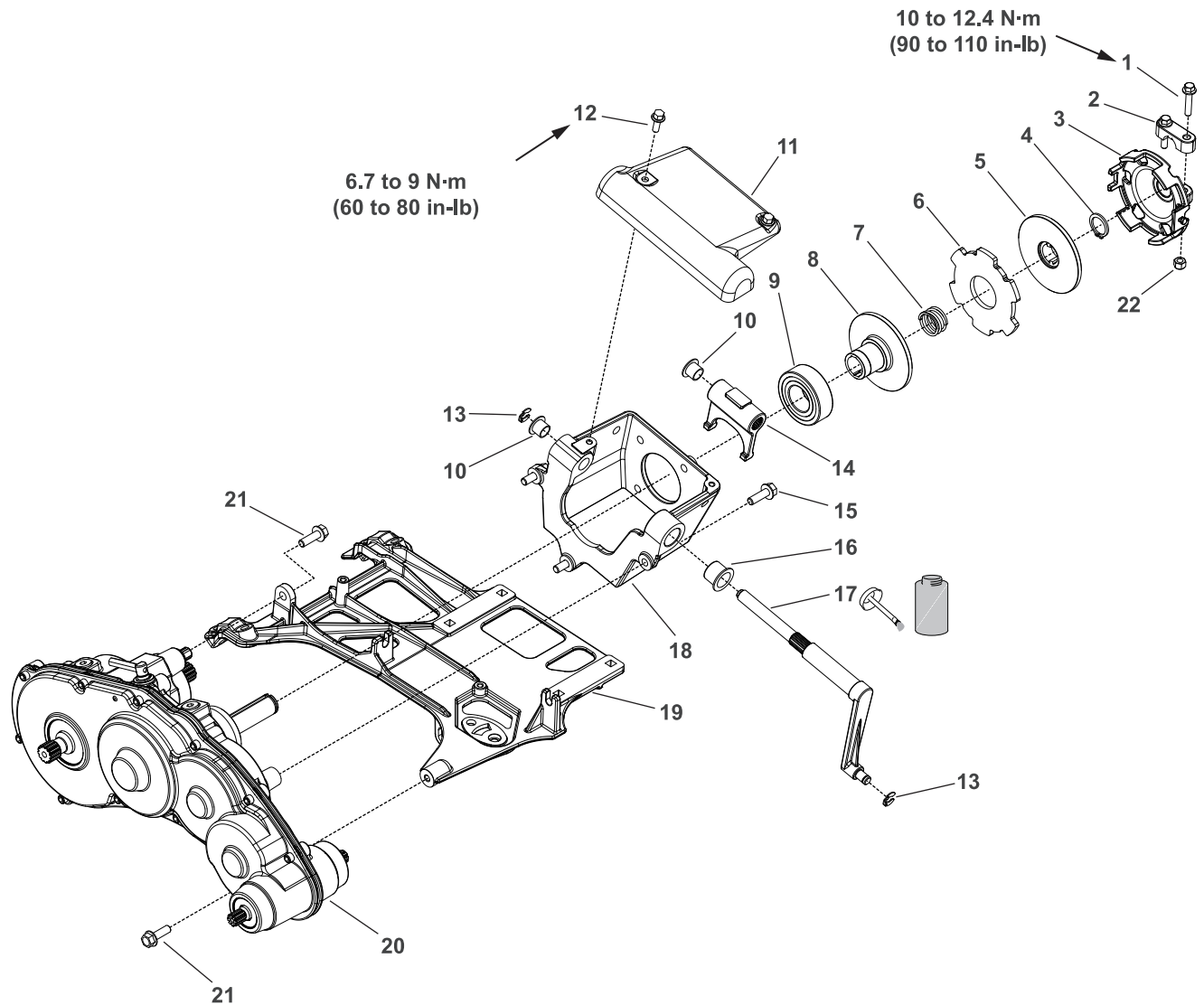


Figure 32

- | | | |
|------------------------------|---------------------------------|------------------------------------|
| 1. Bolt (2 each) | 9. Self aligning sealed bearing | 17. Fork shaft |
| 2. Clutch hub clamp | 10. Flange bush (2 each) | 18. Bell housing |
| 3. External clutch hub | 11. Clutch cover | 19. Engine base |
| 4. Retaining ring | 12. Bolt (2 each) | 20. Transmission gear box assembly |
| 5. Clutch disc | 13. Retaining ring (2 each) | 21. Bolt (2 each) |
| 6. Friction plate | 14. Clutch fork | 22. Locknut (2 each) |
| 7. Clutch compression spring | 15. Bolt (3 each) | |
| 8. Slider clutch disc | 16. Bushing | |

Removing the Clutch Bearing

Note: Refer to [Figure 32](#) during this procedure.

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.
2. Remove the 2 bolts (12) that secures the clutch cover (11) to the bell housing (18). Remove the clutch cover from the bell housing.

Removing the Clutch Bearing (continued)

3. Remove the clutch cable from the fork shaft (17); refer to [Removing the Clutch Cable \(page 7–9\)](#).
4. Remove the retaining ring (13) from the fork shaft (17).
5. Slide and remove the fork shaft (17) and clutch fork (14) from the bell housing (18).
6. If necessary, remove the flange bushing (10) from the clutch fork (14).
7. Remove the 2 locknuts (22), 2 bolts (1) and clutch hub clamp (2) that secures the external clutch hub (3) to the engine drive shaft. Slide the external clutch hub (3) towards the engine.
8. Remove the transmission gear box assembly (20); refer to [Removing the Transmission Gear Box Assembly \(page 5–24\)](#).
9. Remove the retaining ring (4) that secures the clutch disc (5) to the transmission gear box shaft. Slide and remove the clutch disc (5), friction plate (6), compression spring (7) and slider clutch disc assembly (8).
10. Use a press to remove the bearing (9) from slider clutch disk (8). Discard the removed bearing (9).
11. Inspect the clutch component for wear or damage. Replace the components as necessary.
12. If necessary, remove the flange bushing (10) and bushing (16) from the bell housing (18).

Installing the Clutch Bearing

1. Ensure that the clutch components are cleaned before assembly.
2. If removed, install the bushing (16) and flange bushing (10) to the bell housing (18).
3. Use a press to install the bearing (9) to the slider clutch disk (8).
4. Slide and install the slider clutch disk assembly (8), compression spring (7), friction plate (6) and clutch disk (5) onto the transmission gearbox shaft (20) and secure with a retaining ring (4).
5. Install the transmission gear box assembly (20) onto the engine base; refer to [Installing the Transmission Gear Box Assembly \(page 5–35\)](#).
6. Slide the external clutch hub (3) onto the slider clutch disk and secure with the clutch hub clamp (2), 2 bolts (1) and 2 locknuts (22).

Note: The inner mating surfaces of the clutch disk (5) and the external clutch hub must be flush and within **0.75 mm (0.03 inch)**.



7. Torque tighten the bolts (1) to **10 to 12.4 N·m (90 to 110 in-lb)**.
8. If removed, install the flange bushing (10) into the clutch fork (14).
9. Apply anti-seize lubricant on splines of the fork shaft (17).
10. Position the clutch fork (14) in the bell housing (18) and slide the fork shaft (17) into the clutch fork (14) and bell housing. Secure the clutch fork with the retaining ring (13).
11. Install the clutch cable onto the fork shaft (17); refer to [Installing the Clutch Cable \(page 7–10\)](#).

Installing the Clutch Bearing (continued)

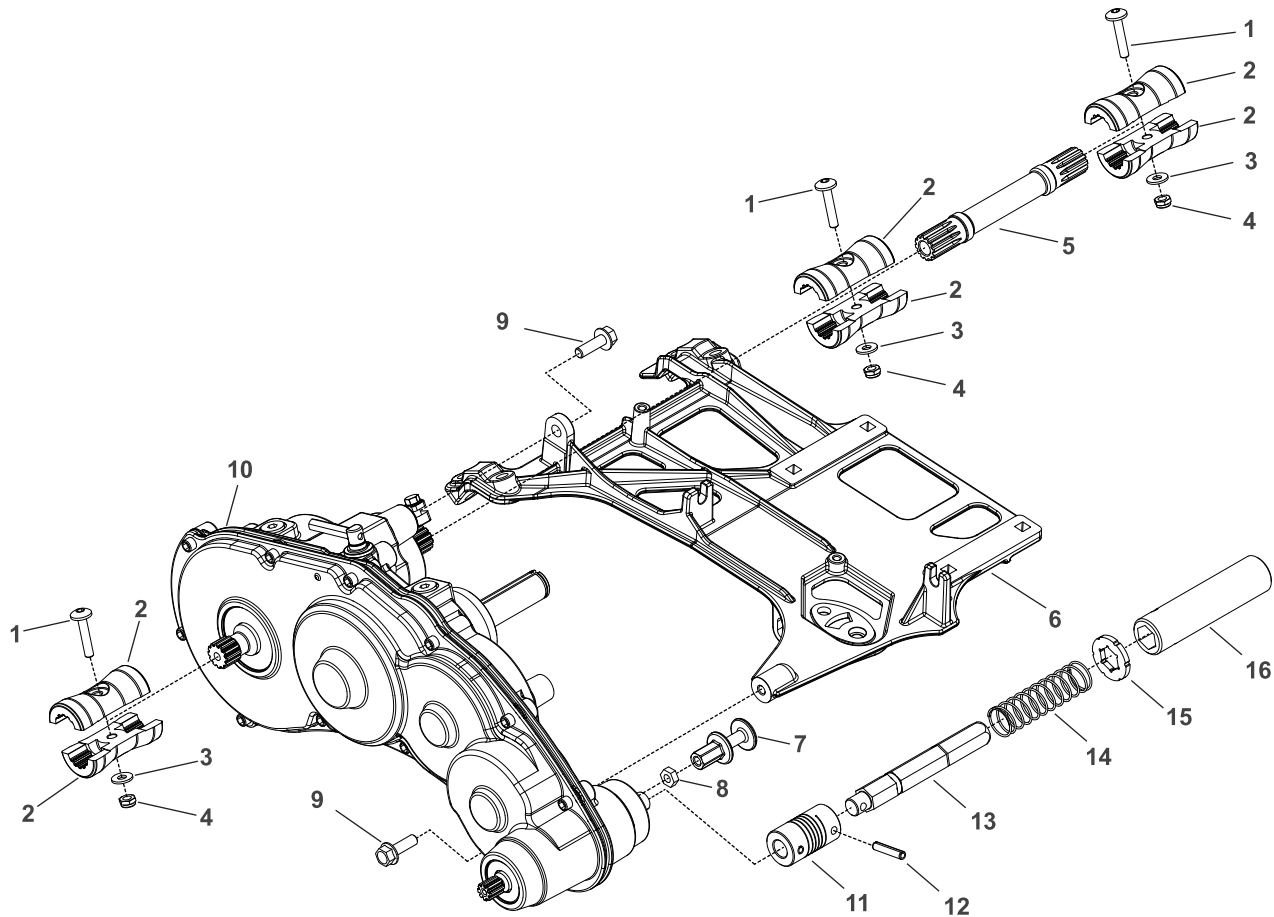
12. Install the clutch cover (11) onto the bell housing (18) and secure with the 2 bolts (12).



13. Torque tighten the bolts (12) to **6.7 to 9 N·m (60 to 80 in-lb)**.

14. Attach the spark plug wire to the spark plug.

Transmission Gear Box Assembly



g312756

Figure 33

- | | | |
|-----------------------------|------------------------------------|------------------------|
| 1. Truss screw (3 each) | 7. Slide adaptor | 13. Coupler shaft |
| 2. Splined coupler (6 each) | 8. Jam nut | 14. Compression Spring |
| 3. Washer (3 each) | 9. Bolt (2 each) | 15. Collar lock |
| 4. Locknut (3 each) | 10. Transmission gear box assembly | 16. Hex tube |
| 5. Drive shaft | 11. Helical coupling | |
| 6. Engine base | 12. Spring pin (2 each) | |

Removal of transmission gear box assembly is necessary to service the internal components.

Removing the Transmission Gear Box Assembly

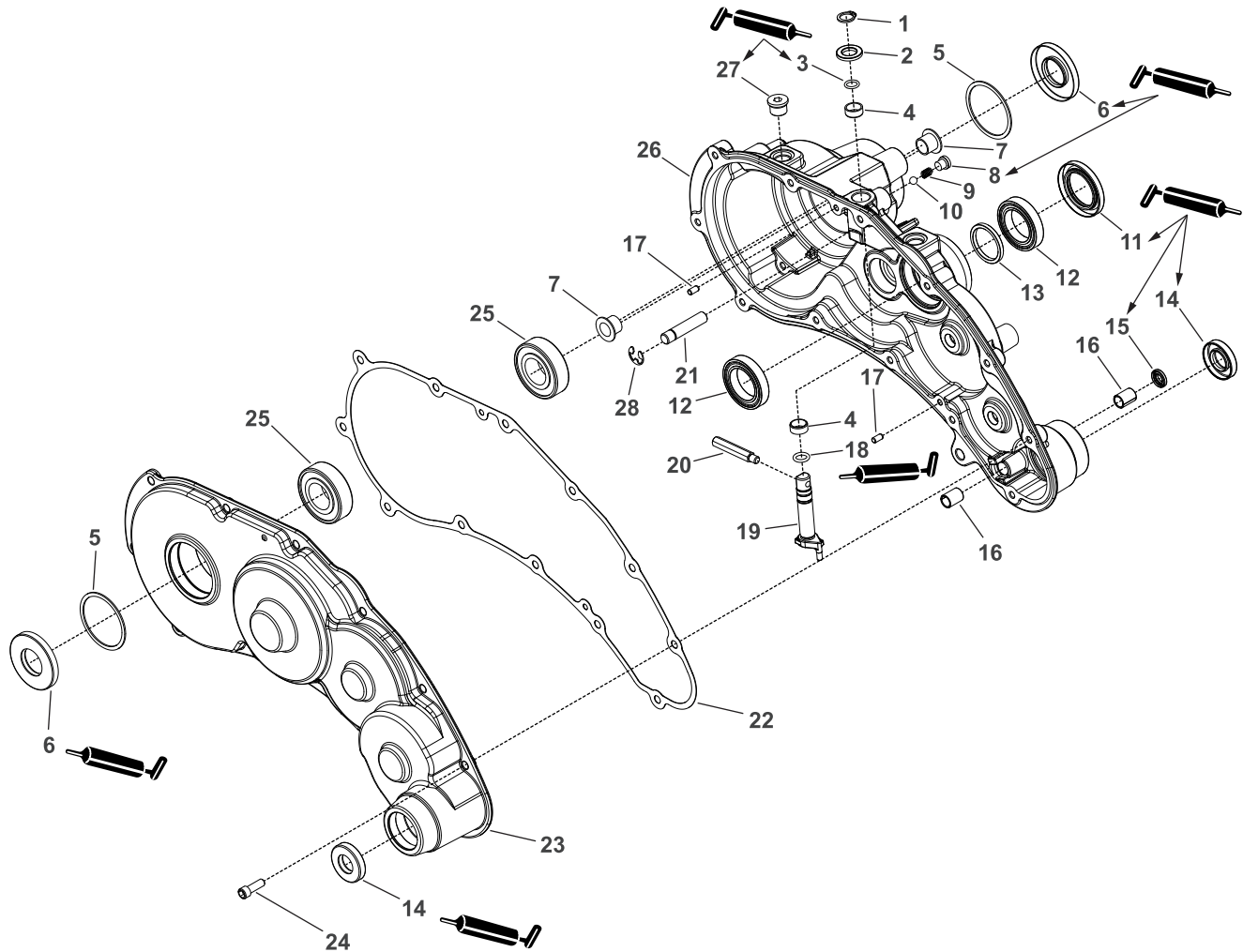
Note: Refer to [Figure 33](#) during this procedure.

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.
2. Disconnect the clutch cable; refer to [Removing the Clutch Cable \(page 7–9\)](#).
3. Disconnect the brake cable; refer to [Removing the Brake Cable \(page 7–6\)](#).
4. Disconnect the reel cable; refer to [Removing the Reel Cable \(page 7–11\)](#).
5. Slide the collar lock (15) into the coupler shaft groove (13).
6. Slide the hex tube (16) to the coupler shaft (13) and disconnect the cutting unit from the transmission gear box assembly.

Removing the Transmission Gear Box Assembly (continued)

7. Remove the nuts (4), washers (3) and truss screws (1) that secures the splined couplers (2) to the drive shaft (5). Remove the splined couplers from the drive shafts.
8. Remove the 2 bolts that secures the clutch cover. Remove the clutch cover.
9. Remove the retaining ring that secures the fork shaft. Slide and remove the fork shaft from the bell housing.
10. Loosen the bolts on the external clutch hub and slide the external clutch hub towards the engine.
11. Loosen the jam nut (8) and remove the slider adapter (7) from the transmission gear box assembly (10).
12. Remove the 3 bolts that secures the bell housing onto the transmission gear box assembly.
13. Remove the two flange head bolts (9) that secures the transmission gear box assembly (10) to the engine base (6). Remove the transmission gear box assembly from the engine base.
14. Remove the clutch bearing from the transmission gear box assembly; refer to [Removing the Clutch Bearing \(page 5–21\)](#).

Disassembling the Transmission Gear Box Assembly



g259588

Figure 34

- | | | |
|------------------------------|-----------------------------|---------------------------------|
| 1. Retaining ring | 11. Grease seal | 21. Brake mount pin |
| 2. Spacer bushing | 12. Ball bearing (2 each) | 22. Transmission gasket |
| 3. O-ring | 13. Spacer | 23. Transmission cover |
| 4. Straight bushing (2 each) | 14. Oil seal (2 each) | 24. Socket head screw (12 each) |
| 5. Retaining ring (2 each) | 15. Oil seal | 25. Ball bearing (2 each) |
| 6. Oil seal (2 each) | 16. Sleeve bushing (2 each) | 26. Transmission housing |
| 7. Flange bushing (2 each) | 17. Dowel pin | 27. Hollow hex plug (2 each) |
| 8. ORB plug | 18. O-ring seal | 28. E-ring |
| 9. Detent spring | 19. Traction selector shaft | |
| 10. Detent ball | 20. Groomer pin | |

Note: Refer to [Figure 34](#) during this procedure.

1. Remove the 2 hollow hex plugs (item 27 in [Figure 34](#)) from the transmission gear box assembly (26).
2. Remove the 12 socket head screws (24) that secures the transmission cover assembly (23) to the transmission housing assembly (26). Remove the transmission cover assembly and transmission gasket (22) from the transmission housing assembly. Discard the transmission gasket (22).

Disassembling the Transmission Gear Box Assembly (continued)

3. Remove the oil seal (6), retaining ring (5) from the transmission cover (23). Use a press to remove the ball bearing (25) from the transmission cover (23). Discard the oil seals and ball bearing.

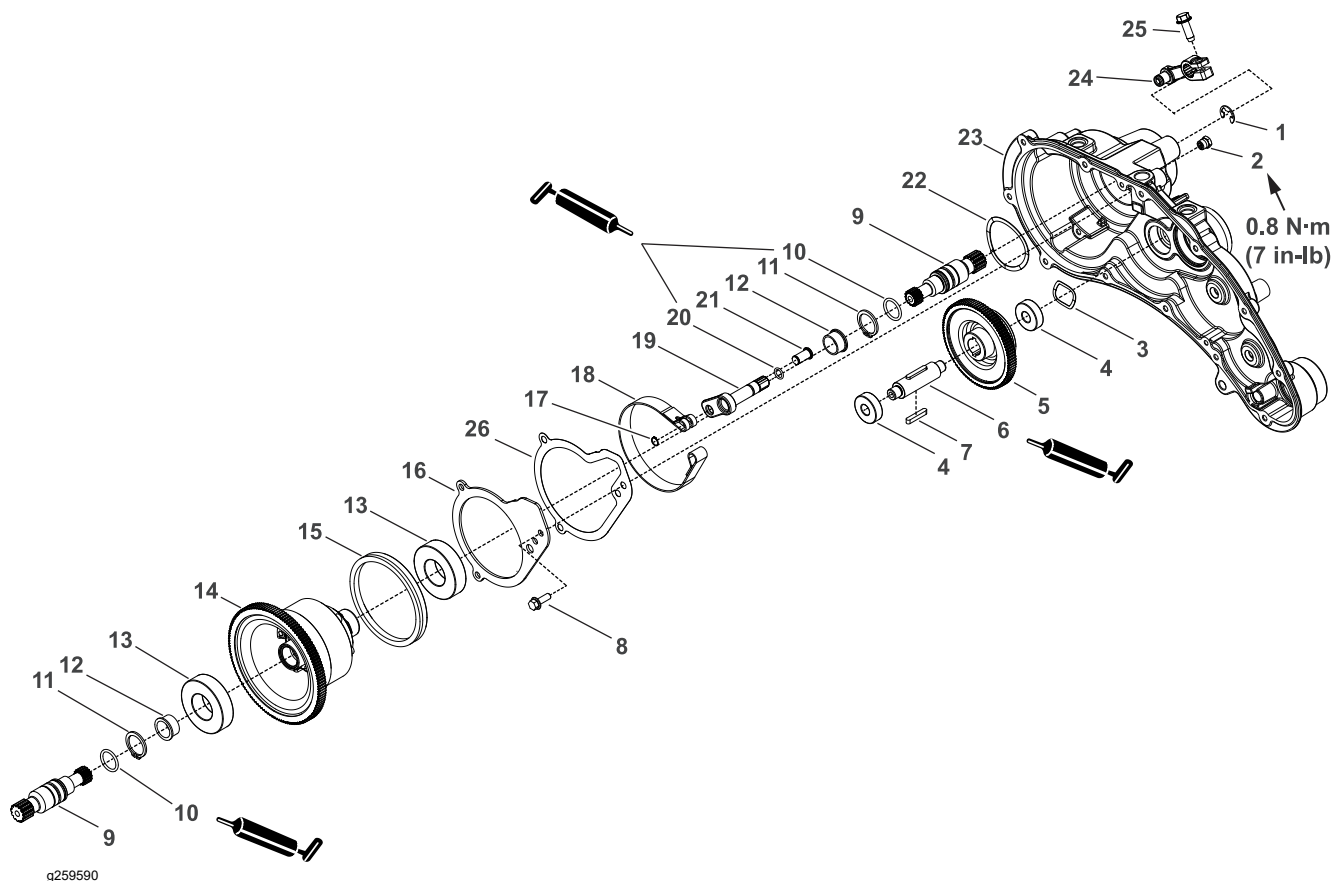


Figure 35

- | | | |
|--------------------------------|-----------------------------|-----------------------------------|
| 1. External retaining ring | 10. O-ring (2 each) | 19. Brake lever |
| 2. Fitting plug | 11. Retaining ring (2 each) | 20. O-ring |
| 3. Wave washer | 12. Flange bearing (2 each) | 21. Brake clevis pin |
| 4. Ball bearing (2 each) | 13. Ball bearing (2 each) | 22. Flat wire spring |
| 5. Neutral spur gear | 14. Differential assembly | 23. Transmission housing assembly |
| 6. Neutral slider shaft | 15. V-ring seal | 24. Cable brake lever |
| 7. Square key (2 each) | 16. Retainer plate | 25. Bolt |
| 8. Bolt (4 each) | 17. Retaining ring | 26. Brake gasket plate |
| 9. Differential shaft (2 each) | 18. Brake band | |

4. Remove the neutral spur gear assembly (item 5 in [Figure 35](#)) and wave washer (3) from the transmission housing assembly (23).
5. Use a press to remove the ball bearings (4) from the neutral slider shaft (6). Remove the square keys (7) from the neutral slider shaft (6). Discard the ball bearings.
6. Remove the differential assembly (14) from the transmission housing assembly (23).
7. Remove the 2 differential shafts (9) from the differential housing (14). Remove the retaining rings (11) and O-rings (10) from the differential shafts (9). Discard the O-rings.

Disassembling the Transmission Gear Box Assembly (continued)

8. Use a press to remove the 2 ball bearings (13) and 2 flange bearings (12) from the differential assembly (14). Remove the V-ring seal (15) from the differential assembly (14). Discard the ball bearings (13).
9. If necessary, disassemble the differential assembly (14); refer to [Disassembly of Differential Assembly \(page 5–37\)](#).
10. Remove the bolt (25) that secures the cable brake lever (24) onto the brake lever (19). Slide and remove the cable brake lever (24) and external retaining ring (1) from the brake lever (19).
11. Remove the 4 bolts (8) that secures the retainer plate (16) to the transmission housing assembly (23). Remove the retainer plate (16) from the transmission housing assembly (23).
12. Slide and remove the brake lever assembly (19) from the transmission housing assembly (23). Remove the flat wire spring (22) from the transmission housing assembly (23).
13. Disassemble the brake lever assembly (19) as follows:
 - A. Remove the retaining ring (17) from the brake clevis pin (21).
 - B. Slide and remove the brake clevis pin (21) from the brake band (18) and brake lever (19).
 - C. Remove the brake lever (19) from the brake band (18).
 - D. Remove and discard the O-ring (20) from the brake lever (19).

Disassembling the Transmission Gear Box Assembly (continued)

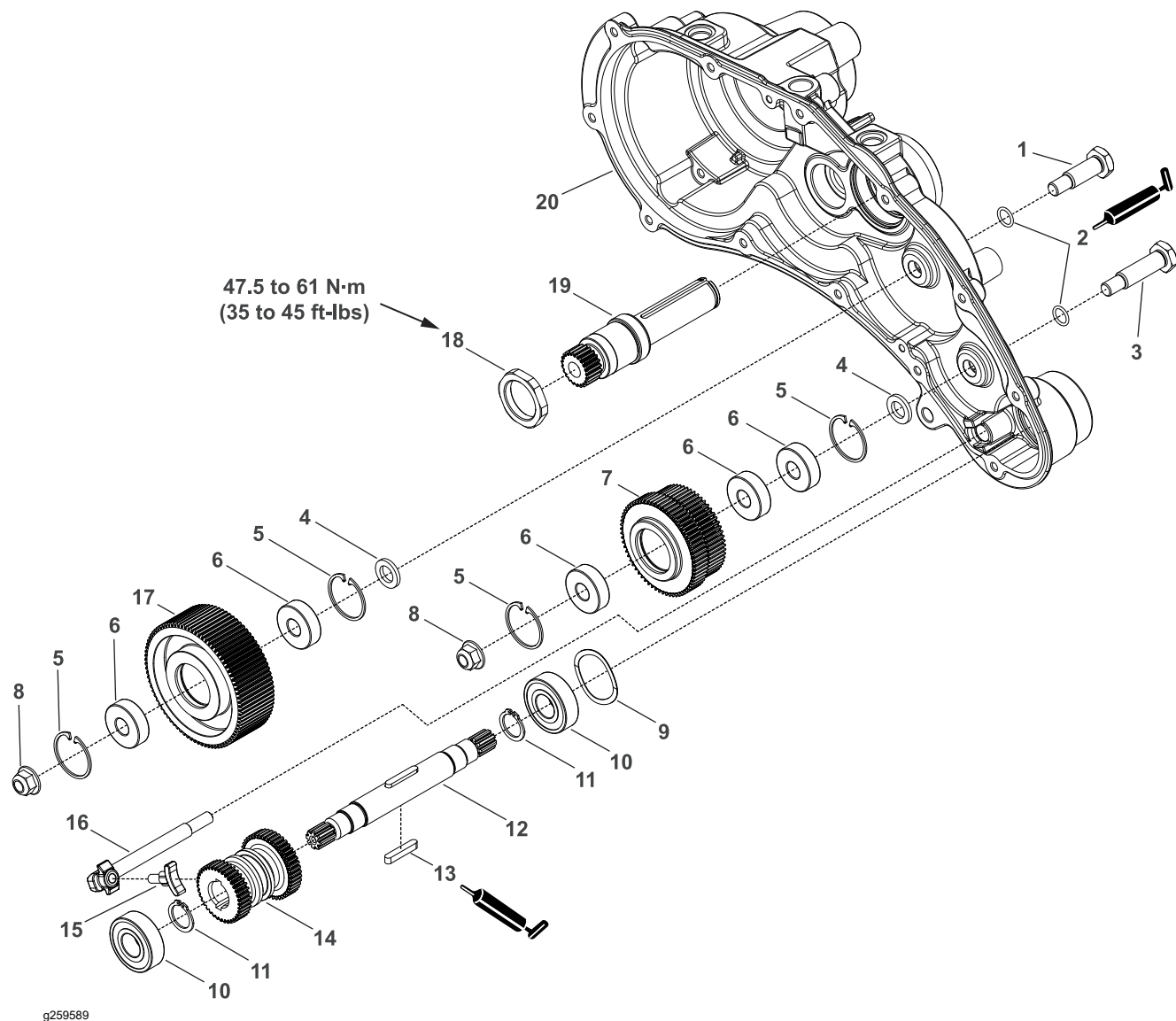


Figure 36

- | | | |
|----------------------------|-----------------------------|-----------------------------------|
| 1. Short bearing pin | 8. Flange nut (2 each) | 15. Reel clutch shoe |
| 2. O-ring | 9. Wave spring | 16. Reel clutch actuator |
| 3. Long bearing pin | 10. Ball bearing (2 each) | 17. Spur gear |
| 4. Bearing spacer (2 each) | 11. Retaining ring (2 each) | 18. Thin locknut |
| 5. Retaining ring (4 each) | 12. Reel drive shaft | 19. Input shaft |
| 6. Ball bearing (5 each) | 13. Square key (2 each) | 20. Transmission housing assembly |
| 7. Spur gear | 14. Slider spur gear | |

14. Slide and remove the reel clutch actuator (item 16 in [Figure 36](#)) from the transmission housing assembly (20). If necessary, remove the reel clutch shoe (15) from the reel clutch actuator (16).

15. Remove the reel drive shaft assembly (14), ball bearing (10) and wave spring (9) from the transmission housing assembly (20). If necessary, disassemble the drive shaft assembly (12) as follows:

- A. Use a press to remove the ball bearings (10) from the reel drive shaft (12). Discard the bearings (10).
- B. Remove the retaining ring (11) from the reel drive shaft (12).

Disassembling the Transmission Gear Box Assembly (continued)

- C. Slide and remove the slider spur gear (14) from the reel drive shaft (12).
- D. Remove the two key squares (13) from the reel drive shaft (12).
- 16. Remove the nut (8) and long bearing pin (3) that secures the spur gear assembly (7) to the transmission housing assembly (20). Remove the spur gear (7) and bearing spacer (4) from the transmission housing assembly (20).
- 17. Remove and discard the O-ring (2) from the long bearing pin (3).
- 18. If necessary, disassemble the spur gear (7) as follows:
 - A. Remove the 2 retaining rings (5) from the spur gear (7).
 - B. Use a press and remove the 3 ball bearings (6) from the spur gear (7). Discard the ball bearings.
- 19. Remove the nut (8) and short bearing pin (1) that secures the spur gear assembly (17) to the transmission housing assembly (20). Remove the spur gear (17) and bearing spacer (4) from the transmission housing assembly (20).
- 20. Remove and discard the O-ring (2) from the short bearing pin (1).
- 21. If necessary, disassemble the spur gear (17) as follows:
 - A. Remove the 2 retaining rings (5) from the spur gear (17).
 - B. Use a press and remove the 2 ball bearings (6) from the spur gear (17). Discard the ball bearings (6).
- 22. Remove the thin locknut (18) that secures the input shaft (19) to the transmission housing assembly (20). Slide and remove the input shaft.
- 23. Remove the ORB plug (item 8 in [Figure 34](#)), detent spring (9) and detent ball (10) from the transmission housing assembly (26).
- 24. Loosen and remove the groomer pin (item 20 in [Figure 34](#)) from the traction selector shaft (19).
- 25. Remove the retaining ring (item 1 in [Figure 34](#)), spacer bushing (2) and O-ring (3) from the traction selector shaft (19).
- 26. Slide and remove the traction selector shaft (item 19 in [Figure 34](#)) and O-ring (18) from the transmission housing assembly (26).
- 27. Remove oil seal (item 15 in [Figure 34](#)) and sleeve bushings (16) from the transmission housing (26). Discard the oil seal (15).
- 28. Remove the flange bushings (item 7 in [Figure 34](#)) from the transmission housing (26).
- 29. Remove the oil seals (item 6 in [Figure 34](#)), grease seals (11) and retaining ring (5) from the transmission housing (26). Discard the oil seals and grease seals.
- 30. Use a press and remove the ball bearings (items 12 and 25 in [Figure 34](#)) and spacer (13) from the transmission housing (26). Discard the ball bearings (12 and 25).

Assembling the Transmission Gear Box Assembly

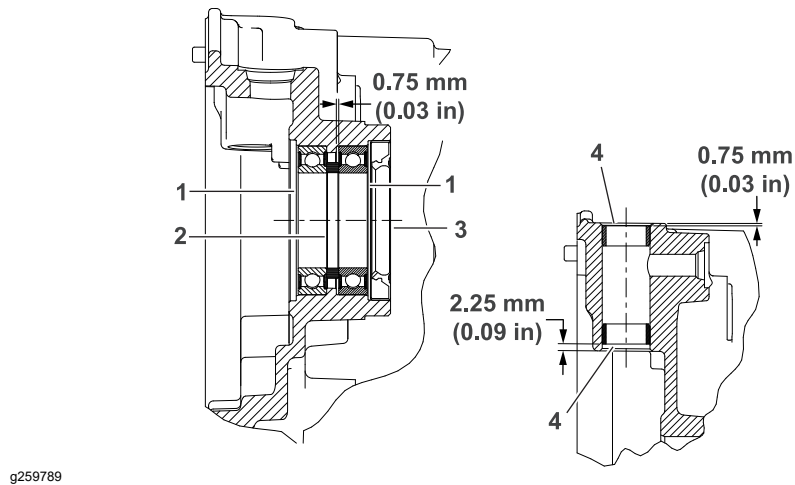


Figure 37

- | | |
|--------------------------|------------------------------|
| 1. Ball bearing (2 each) | 3. Grease seal |
| 2. Spacer | 4. Straight bushing (2 each) |

1. Use a press to install the spacer (item 13 in [Figure 34](#)) and new ball bearings (12 and 25) into the transmission housing (26).
2. Install the retaining ring (item 5 in [Figure 34](#)) into the transmission housing (26).
3. Install the new grease seal (item 11 in [Figure 34](#)) into the transmission housing (26). Ensure that the seal lip is orientated toward the center of the transmission housing. Press the seal into the transmission housing bore so that the seal is flush to the edge of the transmission housing.
4. Install the new oil seal (item 6 in [Figure 34](#)) into the transmission housing. Ensure that the seal lip is orientated toward the center of the transmission housing. Press the seal into the transmission housing bore so that the seal is flush to the edge of the transmission housing.
5. Install the new oil seal (item 14 in [Figure 34](#)) into the transmission housing. Ensure that the seal lip is orientated toward the center of the transmission housing. Press the seal into the transmission housing bore so that the seal is flush to the edge of the transmission housing.
6. Press the flange bushings (item 7 in [Figure 34](#)) into the transmission housing (26).

Assembling the Transmission Gear Box Assembly (continued)

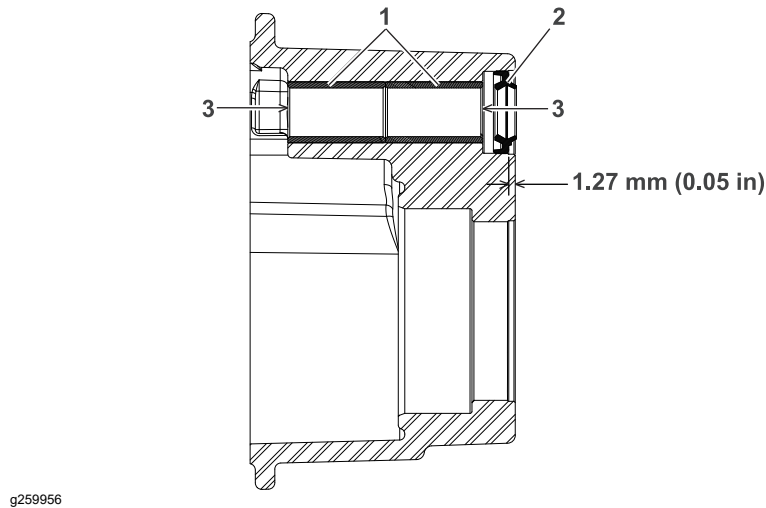



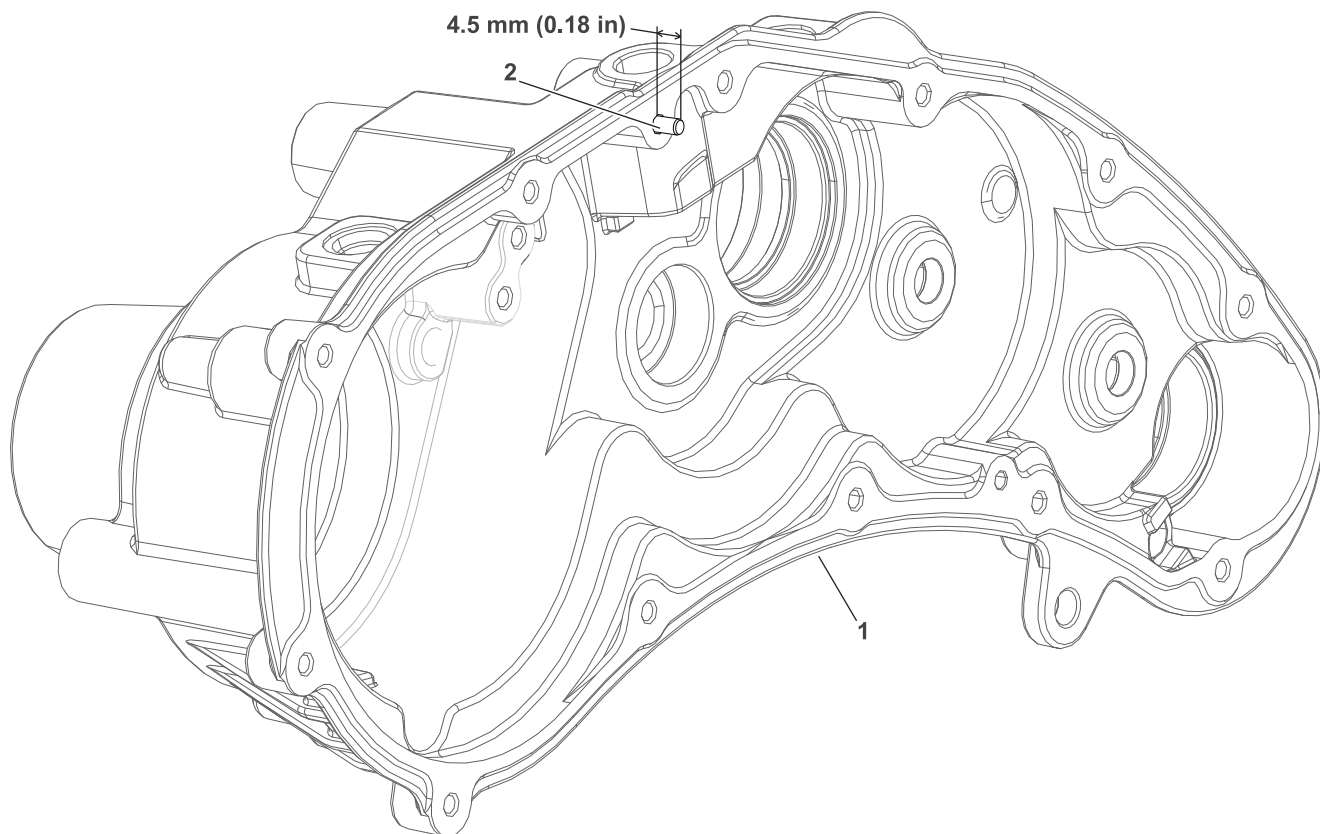
Figure 38

- | | |
|-------------------|----------------|
| 1. Sleeve bushing | 3. Press flush |
| 2. Oil seal | |

7. Insert the sleeve bushing (Item 16 in [Figure 34](#)) into the transmission housing (26) until the sleeve bushing is flush with the transmission housing; refer to [Figure 38](#).
8. Press the oil seal (item 15 in [Figure 34](#)) into the transmission housing (26) so that the seal is recessed from **1.27 mm (0.05 in)** from the edge of the transmission housing; refer to [Figure 38](#). Ensure that the oil seal lip is orientated toward the center of the transmission housing.
9. Apply a coat of grease to the O-ring seal (item 18 in [Figure 34](#)) and slide onto the groove of the traction selector shaft (19).
10. Insert the straight bushings (item 4 in [Figure 34](#)) into the transmission housing (26). Press the straight bushings into the transmission housing bore so that the bushings are recessed from the edge of the transmission housing; refer to [Figure 37](#).
11. Apply a coat of grease to the O-ring (item 18 in [Figure 34](#)) and slide onto the traction selector shaft (item 19 in [Figure 34](#)). Insert the traction selector shaft (item 19 in [Figure 34](#)) into the transmission housing (26).
12. Apply a coat of a grease to the O-ring (item 3 in [Figure 34](#)) and slide onto the groove of the traction selector shaft (19). Slide the spacer bushing (2) onto the traction selector shaft (19) and secure with a retaining ring (1).
13. Install the groomer pin (item 20 in [Figure 34](#)) onto the traction selector shaft (19).
14. Install the detent ball (item 10 in [Figure 34](#)), detent spring (9) and plug (8) into the transmission housing assembly (26).
-  15. Insert the input shaft (item 19 in [Figure 36](#)) into the transmission housing assembly (20) and secure with the thin locknut (18). Torque tighten the thin locknut to **47.5 to 61 N·m (35 to 45 ft-lbs)**.
16. Use a press to install the 2 new ball bearings (item 6 in [Figure 36](#)) into the spur gear (17) and secure with the 2 retaining rings (5).
17. Apply a coat of grease to the O-ring (item 2 in [Figure 36](#)) and slide the O-ring onto the short bearing pin (1). Install the spur gear assembly (17) and

Assembling the Transmission Gear Box Assembly (continued)

- bearing spacer (4) onto the transmission housing assembly (20) and secure with the short bearing pin and nut (8).
18. Use a press to install the 3 new ball bearings (item 6 in [Figure 36](#)) into the spur gear (7) and secure with the 2 retaining rings (5).
 19. Apply a coat of grease to the O-ring (item 2 in [Figure 36](#)) and slide the O-ring onto the long bearing pin (3). Install the spur gear assembly (7) and bearing spacer (4) onto the transmission housing assembly (20) and secure with the long bearing pin (3) and nut (8).
 20. Insert the square keys (item 13 in [Figure 36](#)) into the reel drive shaft (12) and apply a coat of grease to outside of the keys.
 21. Slide the slider spur gear (item 14 in [Figure 36](#)) onto the reel drive shaft (12) and secure with the retaining rings (11). Press the new ball bearings (10) onto the reel drive shaft (12).
 22. Install the wave spring (item 9 in [Figure 36](#)) and reel drive assembly (14) into the transmission housing assembly (20).
 23. Insert the reel clutch shoe (item 15 in [Figure 36](#)) into the reel clutch actuator (16). Slide the reel clutch actuator (16) into the transmission housing assembly (20).
 24. Assemble the brake lever assembly (item 19 in [Figure 35](#)) as follows:
 - A. Apply a coat of grease to the O-ring (item 20 in [Figure 35](#)) and slide the O-ring onto the brake lever.
 - B. Place the brake lever (item 19 in [Figure 35](#)) onto the brake band (18) and secure with the brake clevis pin (21) and retaining ring (17).



g259843

Figure 39

1. Transmission housing

2. Dowel pin

Assembling the Transmission Gear Box Assembly (continued)

25. Slide and install the brake lever assembly (item 19 in [Figure 35](#)) into the transmission housing assembly (23).
26. If removed, insert the brake mount pin through brake band into the transmission housing assembly (item 23 in [Figure 35](#)) and place the flat wire spring (22) onto the transmission housing assembly.
27. Place the retainer plate (item 16 in [Figure 35](#)) onto the transmission housing assembly (23) and secure it with the 4 bolts (8).
28. Slide and install the external retaining ring (item 1 in [Figure 35](#)), cable brake lever (24) onto the brake lever (19) and secure it with the bolt (25).
29. If disassembled, assemble the differential assembly (item 14 in [Figure 35](#)); refer to [Assembly of Differential Assembly \(page 5–38\)](#).
30. Pack the differential assembly (item 14 in [Figure 35](#)) with grease and use a press to install the 2 ball bearing (13) and 2 flange bearings (12) into the differential assembly.
31. Slide the V-ring seal (item 15 in [Figure 35](#)) onto the differential assembly (14).
32. Apply a coat of grease to the 2 O-rings (item 10 in [Figure 35](#)) and slide the O-rings to the differential shafts (9). Install the retaining rings (11) onto the differential shaft (9).
33. Insert the 2 differential shafts (item 9 in [Figure 35](#)) into the differential housing (14).
34. Insert the differential housing assembly (item 14 in [Figure 35](#)) into the transmission housing assembly (23).
35. Insert the square keys (item 7 in [Figure 35](#)) into the neutral slider shaft (6). Apply a coat of grease to outer surface of the square keys (7).
36. Insert the neutral slider shaft (item 6 in [Figure 35](#)) into the neutral spur gear (5).
37. Use a press and insert the bearings (item 4 in [Figure 35](#)) onto the neutral slider shaft (6).
38. Insert the wave washer (item 3 in [Figure 35](#)) and neutral spur gear assembly (5) into the transmission housing assembly (23). Make sure that the traction selector shaft (item 19 in [Figure 34](#)) is engaged in shift selection neutral spur gear (item 5 in [Figure 35](#)).
39. Apply a coat of grease to ORB plug (item 8 in [Figure 34](#)) and install the detent ball (10), detent spring (9) and ORB plug (8) into the transmission housing (26).



40. Torque tighten the ORB plug (8) from **3.6 to 4.7 N·m (32 to 42 in-lb)**.
41. Use a press and insert the ball bearing (item 25 in [Figure 34](#)) into the transmission cover (23). Install the retaining ring (5) and oil seal (6) into the transmission cover (23).
42. Ensure that the oil seal lip is orientated toward the center of the transmission housing. Press the seal into the transmission housing bore so that the seal is flush to the edge of the transmission housing.
43. Install the oil seal (item 14 in [Figure 34](#)) into the transmission cover (23).
44. Ensure that the oil seal lip is orientated toward the center of the transmission housing. Press the seal into the transmission housing bore so that the seal is flush to the edge of the transmission housing.
45. If removed, insert the 2 dowel pins (item 17 in [Figure 34](#)) into the transmission housing assembly (26).

Assembling the Transmission Gear Box Assembly (continued)

Note: Ensure that the dowel pins is recessed outboard to **4.5 mm (0.18 in)** from the edge of the transmission housing; refer to [Figure 39](#).



46. Install the new transmission gasket (item 22 in [Figure 34](#)) and transmission cover assembly (23) onto the transmission housing (26) by aligning the holes. Secure the transmission cover assembly with 12 bolts (24) and torque tighten to **1.7 to 4.5 N·m (15 to 40 in-lb)**. Use an alternation pattern and torque tighten the bolts to **9.6 to 10.7 N·m (85 to 95 in-lb)**.

Note: Transmission gear box assembly (26) must be leak free. Apply a pressure of 2.5 PSI for 30 seconds without dropping more than 1 PSI.



47. Fill the transmission gear box assembly (26) with **1.35 lbs (24 oz)** of Mobil SHC 007 grease.
48. Apply a coat of grease to the O-rings and insert onto the hollow hex plugs. Install the 2 hollow hex plugs (item 27 in [Figure 34](#)) into the transmission gear box assembly (26).



49. Torque tighten the hollow hex plugs from **12.4 to 14.7 N·m (110 to 130 in-lb)**.

Installing the Transmission Gear Box Assembly

1. Install the clutch bearing onto the transmission gear box assembly; refer to [Installing the Clutch Bearing \(page 5–22\)](#).
2. Position the transmission gear box assembly (10) onto the bell housing and secure with 3 bolts. Keep the engine bolts loose, slide the engine transmission assembly laterally until the transmission contacts the mounting surface on the engine base. Tighten the engine bolts and secure the transmission with 2 flange bolts.
3. Install and adjust the slider adapter (7) until the neutral position is achieved and lock the position with jam nut (8) onto the transmission gear box assembly (10).
4. Slide the external clutch hub onto the slider clutch disc and secure with the clutch hub clamp, 2 bolts and 2 locknuts; refer to [Installing the Clutch Bearing \(page 5–22\)](#).
5. Slide and install the fork shaft into the bell housing; refer to [Installing the Clutch Bearing \(page 5–22\)](#). Secure the fork shaft with a retaining ring.
6. Install the clutch cover onto the bell housing and secure with 2 bolts.



7. Install the splined couplers (item 2 in [Figure 33](#)) to the drive shaft (5) and secure with truss screws (1), washers (3) and nuts (4). Torque tighten the truss screws to **10 to 12.4 N·m (90 to 110 in-lb)**.
8. Slide the hex tube (16) onto the reel drive box assembly and lock with collar lock (15).
9. Check and adjust the alignment of transmission drive shaft and reel drive shaft; refer to [Installing the Engine Base \(page 4–15\)](#).
10. If removed, install the reel cable; refer to [Installing the Reel Cable \(page 7–13\)](#).
11. Install the brake cable; refer to [Installing the Brake Cable \(page 7–8\)](#).
12. Install the clutch cable; refer to [Installing the Clutch Cable \(page 7–10\)](#).
13. Attach the spark plug wire to the spark plug.

Differential Assembly

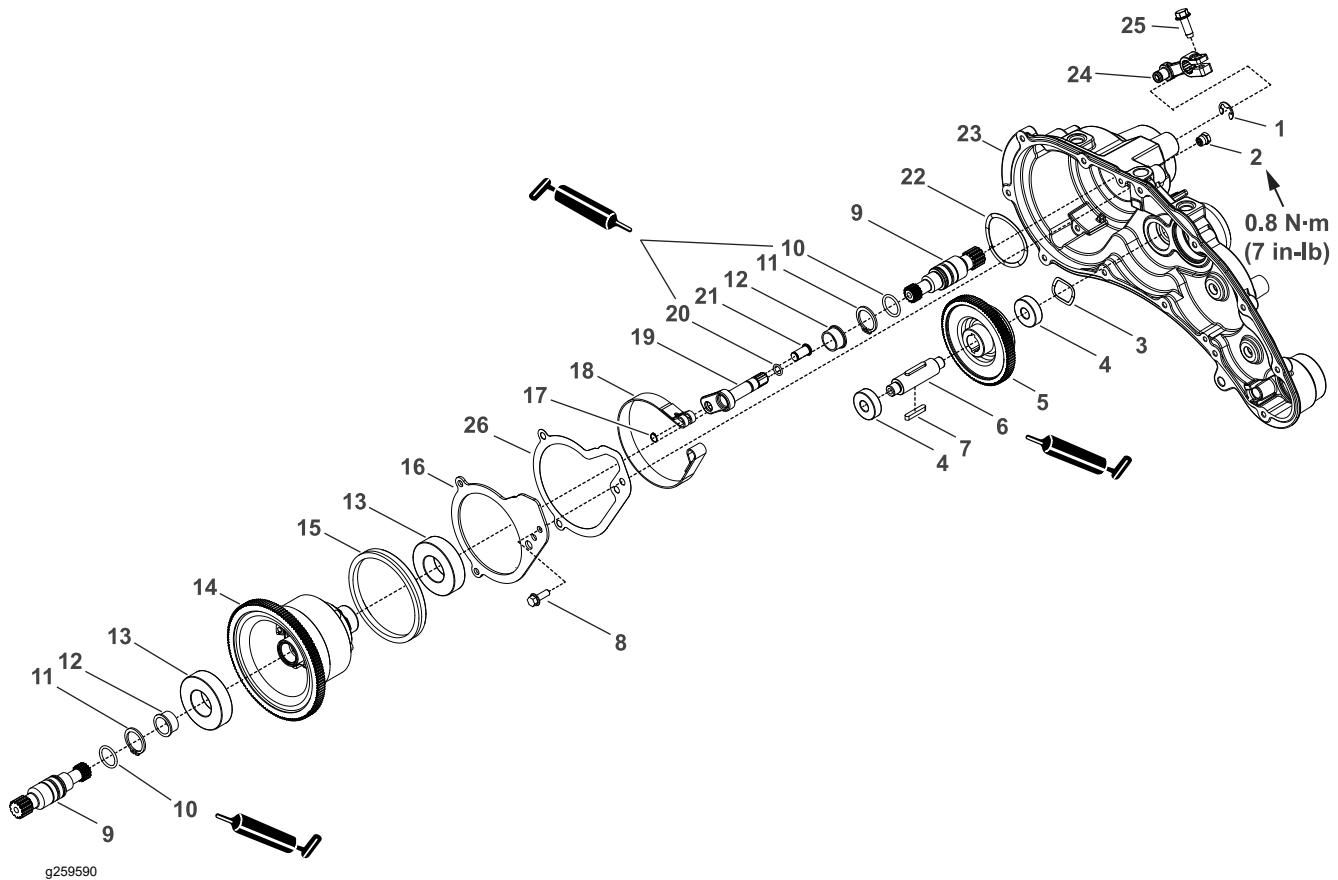


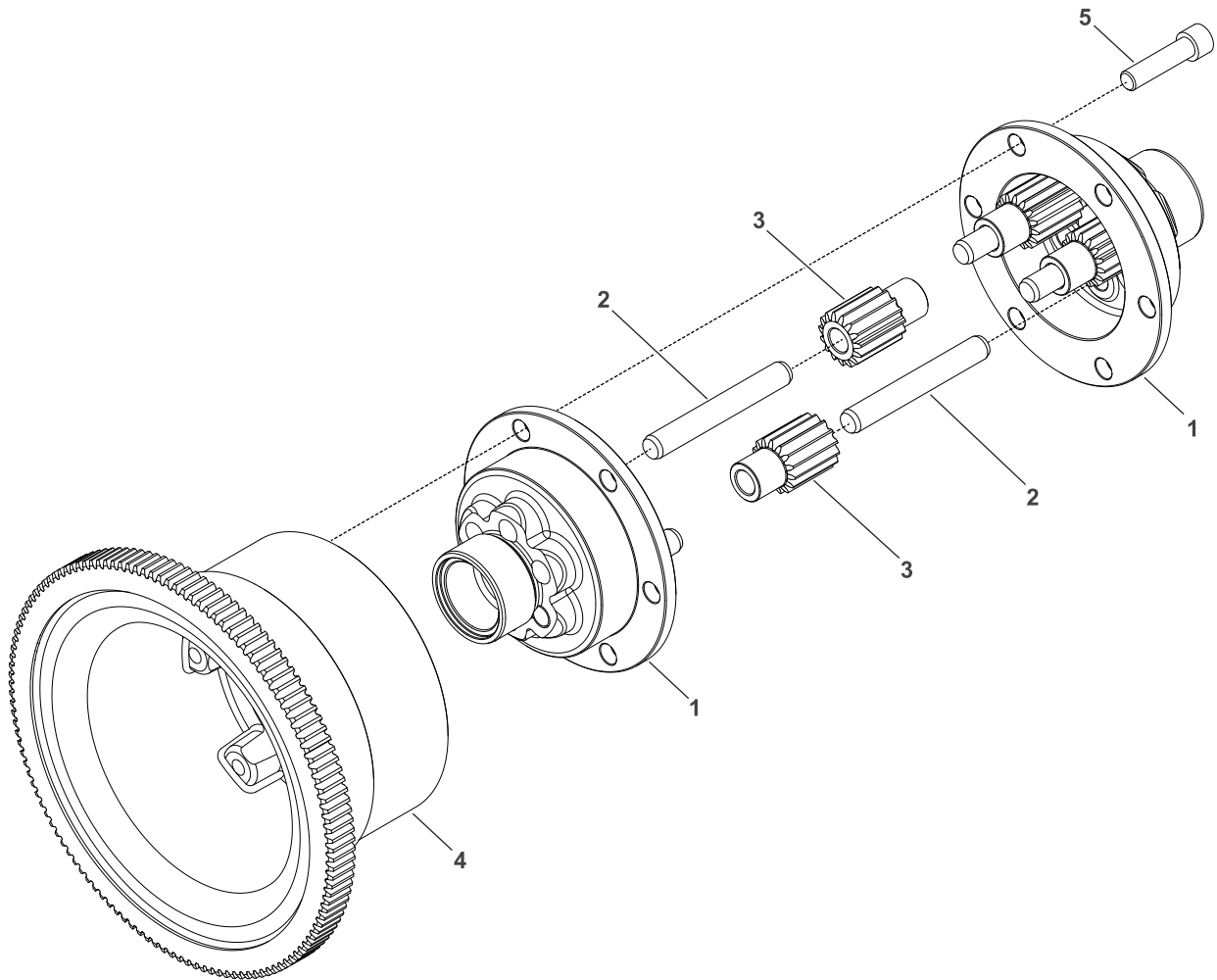
Figure 40

- | | | |
|--------------------------------|-----------------------------|-----------------------------------|
| 1. External retaining ring | 10. O-ring (2 each) | 19. Brake lever |
| 2. Fitting plug | 11. Retaining ring (2 each) | 20. O-ring |
| 3. Wave washer | 12. Flange bearing (2 each) | 21. Brake clevis pin |
| 4. Ball bearing (2 each) | 13. Ball bearing (2 each) | 22. Flat wire spring |
| 5. Neutral spur gear | 14. Differential assembly | 23. Transmission housing assembly |
| 6. Neutral slider shaft | 15. V-ring seal | 24. Cable brake lever |
| 7. Square key (2 each) | 16. Retainer plate | 25. Bolt |
| 8. Bolt (4 each) | 17. Retaining ring | 26. Brake gasket plate |
| 9. Differential shaft (2 each) | 18. Brake band | |

Removing the Differential Assembly

To remove the differential assembly from the transmission gear box assembly; refer to [Disassembling the Transmission Gear Box Assembly \(page 5–26\)](#).

Disassembly of Differential Assembly



g259978

Figure 41

- | | | |
|----------------------------------|------------------------------------|-------------------------------|
| 1. Differential housing (2 each) | 3. Differential spur gear (6 each) | 5. Socket head screw (6 each) |
| 2. Differential pin (6 each) | 4. Differential gear | |

1. Remove the 6 socket head screws (item 5 in [Figure 41](#)) that secures the differential housing assembly (1) to the differential gear (4). Remove the differential gear from the differential housing assembly.
2. Place the differential housing assembly on workbench. Pull each differential housings (1) apart.
3. Use a press to remove the 6 differential pins (2) and 6 differential spur gears (3) from the differential housings (1).

Inspecting the Differential Assembly

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

Assembly of Differential Assembly

1. Place the differential housings (1) on the work bench.
2. Insert the 3 differential pins (2) in each differential housing.

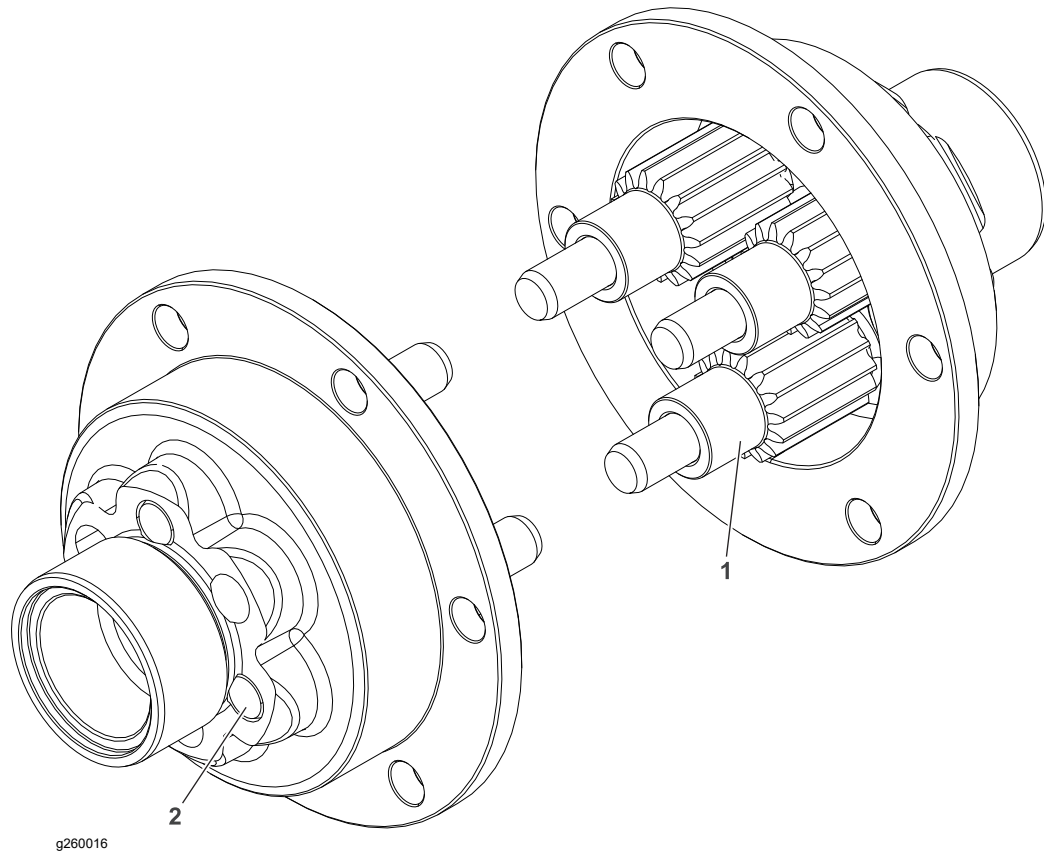


Figure 42

1. Differential spur gears with shoulder up
2. Press flush

3. The differential pins (2) must be inserted in alternate holes of the differential housing (1) and ensure that the differential pins (2) are flush to the surface of the differential housing; refer to [Figure 42](#).
4. Apply a coat of grease to the differential spur gears (3) and the differential pins (2).
5. Insert the differential spur gears (3) to the differential pins (2) by pointing the gears shoulder up.



6. Fill the differential housing assembly (1) with **0.08 lb (1.25 oz)** of grease.
7. Attach the 2 differential housings (1) to each other.

8. Slide and install the differential housing assembly (1) into the differential gear (4) and secure with the 6 socket head screws (5).



9. In alternate pattern torque tighten the socket head screws (5) to **10 to 12.4 N·m (90 to 110 in-lb)**.

Installing the Differential Assembly

Install the differential assembly into the transmission gear box; refer to [Assembling the Transmission Gear Box Assembly \(page 5–31\)](#).



Electrical System

Table of Contents

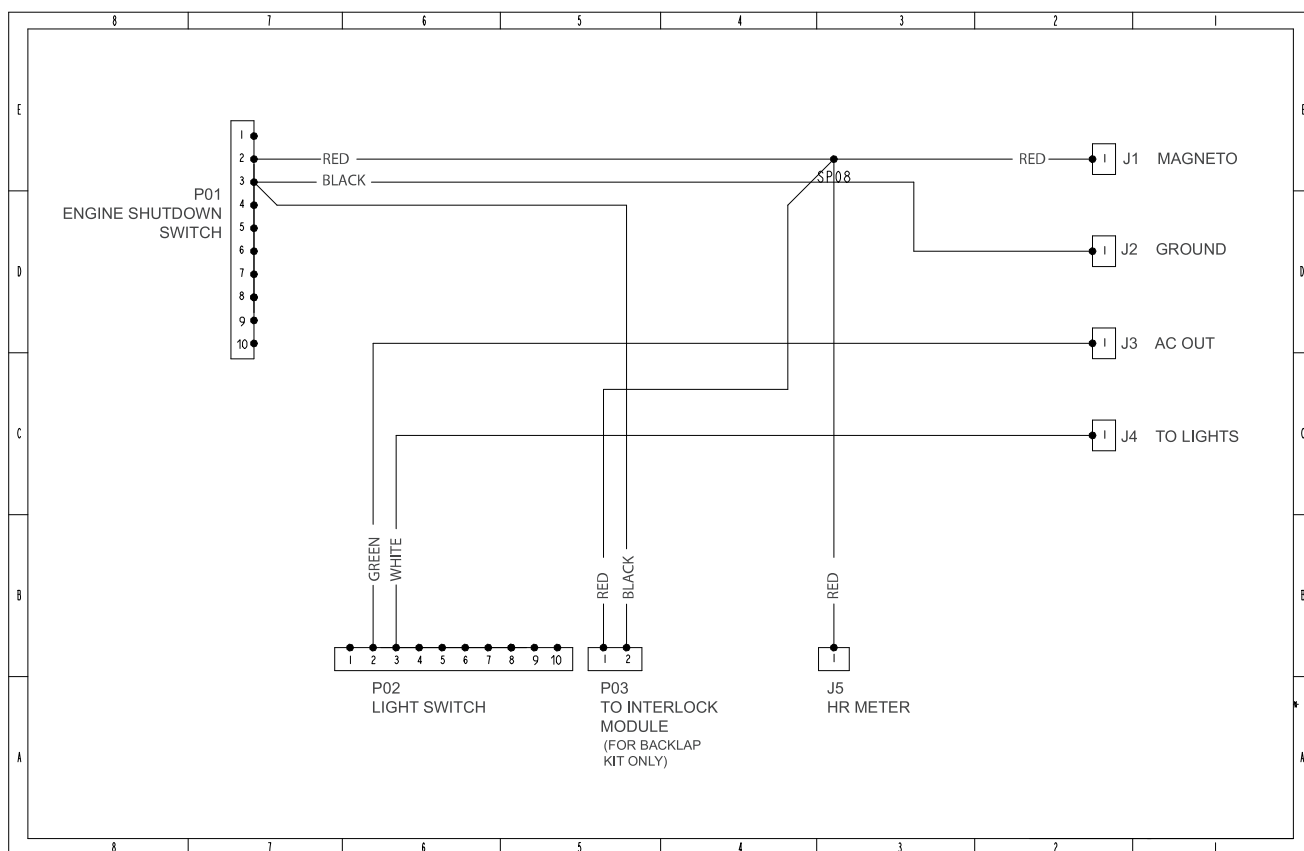
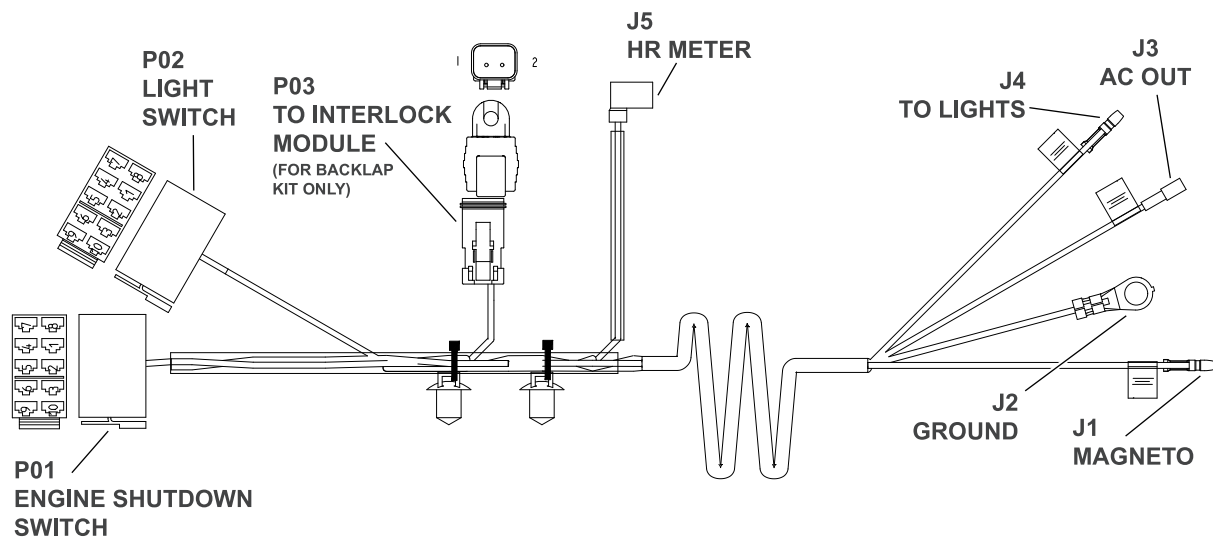
General Information	6-2
Operator's Manual.....	6-2
Wiring Schematic.....	6-3
Component Testing.....	6-4
Ignition System Operation.....	6-5
On/Off Switch	6-6
Hour Meter	6-8
Interlock Module (For backlap kit only).....	6-10
Lighting Coil	6-11

General Information

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.

Wiring Schematic



Drawing 122-1416 Rev C
g268165

Figure 43

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). Individual components should be electronically isolated (e.g., disconnect all leads or remove the circuit) from the circuit when tested.

Note: See the *Honda Service Manual* for the engine components testing information.



CAUTION



When testing the electrical components for the continuity with a multimeter (ohm setting), ensure that the power to the circuit has been disconnected.



WARNING



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

Ignition System Operation

The engine on the Greensmaster has a magneto ignition system consists 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 the spark plug from the engine when testing the ignition system. The spark plug is necessary to maintain normal starting speeds.

1. With the engine not running, remove the spark plug wire from the spark plug and connect it to the spark tester.
2. Connect the spring clip of the tester to a good, unpainted ground on the engine block.
3. Ensure that the ON/OFF switch is in the ON position. Also, ensure that the traction control 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 *Honda 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, interlock module, machine wire harness) are damaged or faulty. Refer to machine component testing information in this section.

On/Off Switch

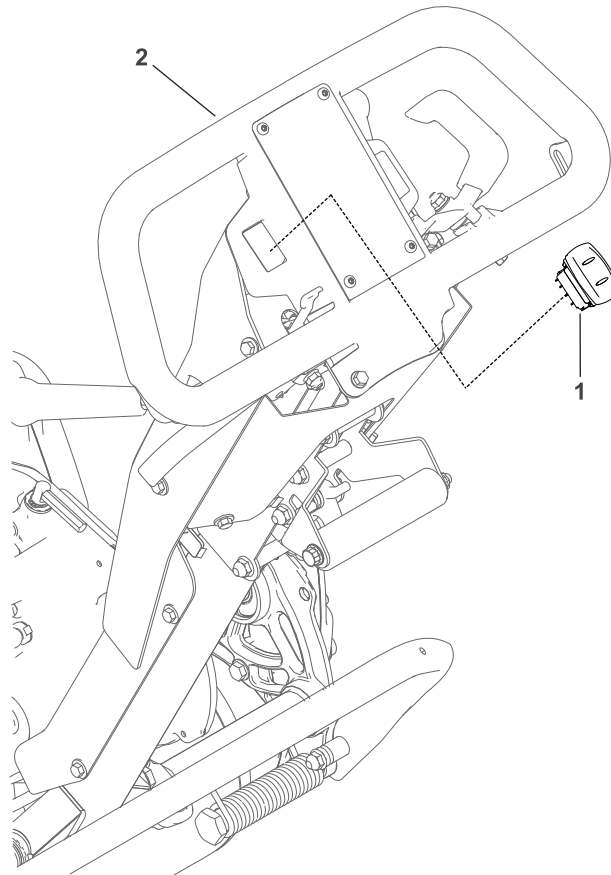


Figure 44

1. On/Off switch
2. Handle assembly

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 the On/Off switch

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.
2. Remove the controls cover from the handle assembly to allow access to the On/Off switch.
3. Disconnect the wire harness electrical connector from the On/Off switch.

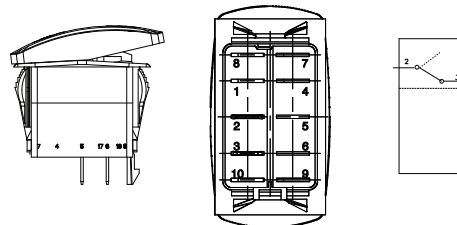


Figure 45

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](#)

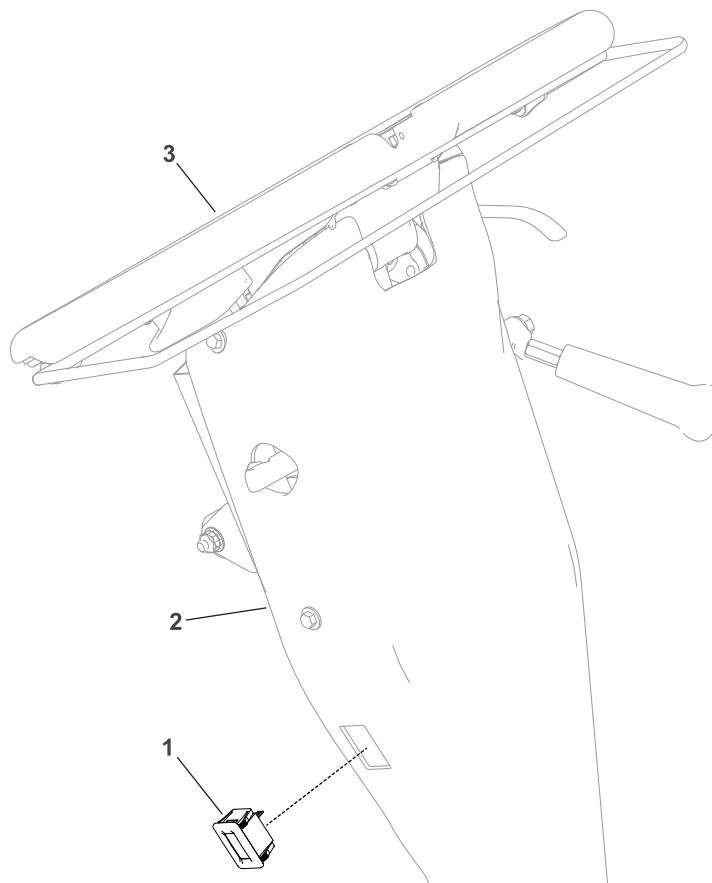
Testing the On/Off switch (continued)

45. The circuitry of the On/Off switch is shown in below table. Verify the continuity between switch terminals.

SWITCH POSITION	NORMAL CIRCUITS	OTHER CIRCUITS
Off	-	-
On	2 + 3	-

5. Replace the switch, if necessary.
6. When the switch testing is complete, connect the wire harness electrical connector to the On/Off switch.
7. Install the control cover to the handle assembly.

Hour Meter



g262085

Figure 46

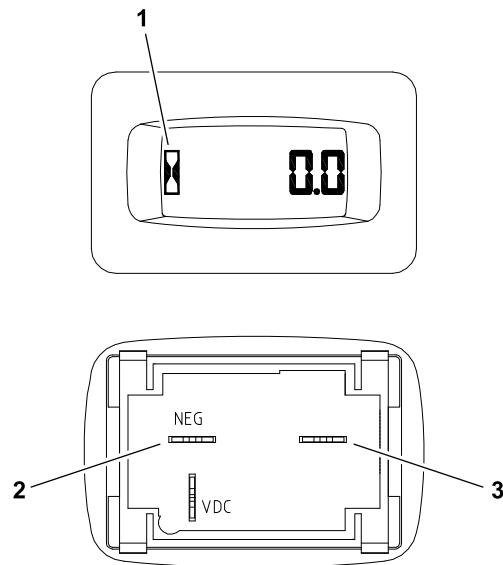
- | | |
|-------------------|--------------------|
| 1. Hour meter | 3. Handle assembly |
| 2. Controls cover | |

The hour meter used on the machine records the amount of time that the engine is running.

Testing the Hour Meter

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.
2. Locate the wire harness connector at the rear of the hour meter. Unplug the harness connector from the hour meter.

Testing the Hour Meter (continued)

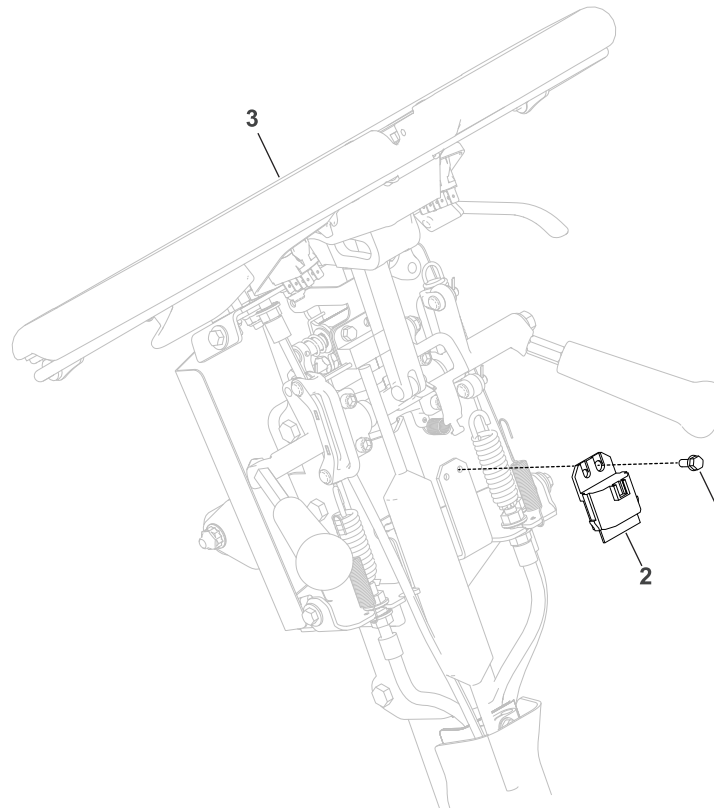


g238110

Figure 47

1. Hourglass icon
 2. Negative terminal (BK)
 3. Positive terminal (Y)
-
3. Connect the positive (+) terminal of a 12 VDC source to the positive (+) terminal of the hour meter.
 4. Connect the negative (-) terminal of the voltage source to the other terminal of the hour meter.
 5. The hour meter should move 1/10 of an hour in 6 minutes.
 6. Disconnect the voltage source from the hour meter.
 7. Replace the hour meter if necessary.
 8. Connect the wire harness connector to the hour meter.
 9. Connect the spark plug wire to the engine spark plug.

Interlock Module (For backlap kit only)



g262116

Figure 48

- | | |
|---------------------|--------------------|
| 1. Bolt (2 each) | 3. Handle assembly |
| 2. Interlock module | |

The interlock module prevents the engine from starting unless the traction control is disengaged.

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 switch to determine the state of the switch. 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.

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; refer to [Ignition System Operation \(page 6–5\)](#).
2. Check the operation of traction switch. 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, traction switch and wire harness all prove to be operating correctly and engine does not start, replace interlock module.

Lighting Coil

The engine on Greensmaster 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 12 VAC output that is rated at 50 watts. See the *Honda Service Manual* for additional lighting coil information.

Note: If lights are desired on the Greensmaster 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.



Controls, Wheels, and Accessories

Table of Contents

General Information	7-2
Operator's Manual	7-2
Service and Repairs	7-3
Replacing the Throttle Cable	7-3
Replacing the Brake Cable	7-6
Replacing the Clutch Cable	7-9
Replacing the Reel Cable	7-11
Clutch and Reel Drive Engagement Lever Assembly	7-14
Brake Latch Shaft	7-16
Handle Assembly	7-18
Kickstand	7-24
Transport Wheels (Optional)	7-26
Rail Kit Wheels (Optional)	7-29
Flex Frame Assembly	7-30

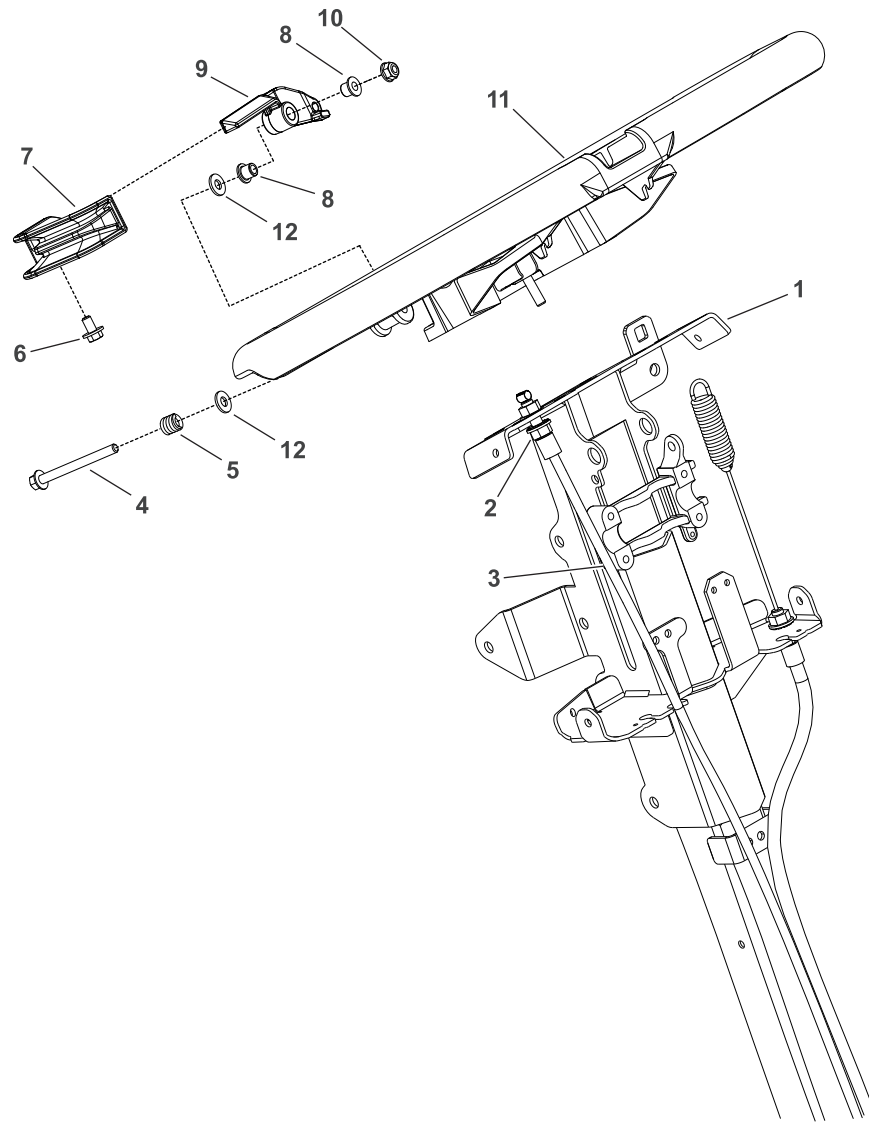
General Information

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

Replacing the Throttle Cable



g261770

Figure 49

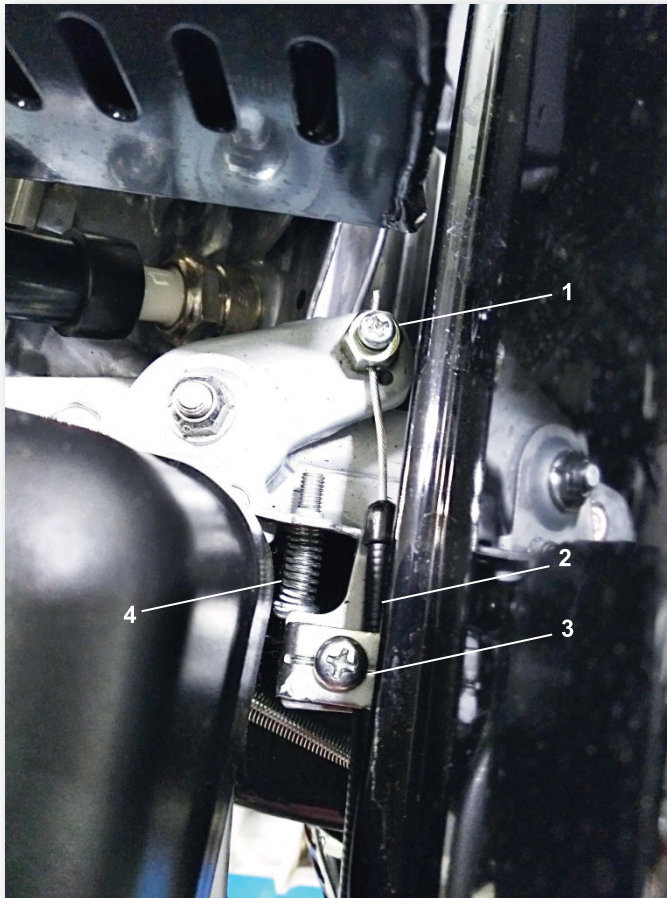
- | | | |
|----------------------------|----------------------------|---------------------|
| 1. Upper receiver weldment | 5. Compression spring | 9. Throttle arm |
| 2. Locknut (2 each) | 6. Bolt | 10. Flange nut |
| 3. Throttle cable | 7. Throttle lever | 11. Handle assembly |
| 4. Bolt | 8. Flange bushing (2 each) | 12. Washer |

Removing the Throttle Cable

Note: Refer to [Figure 49](#) during this procedure.

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.

Removing the Throttle Cable (continued)



g261801

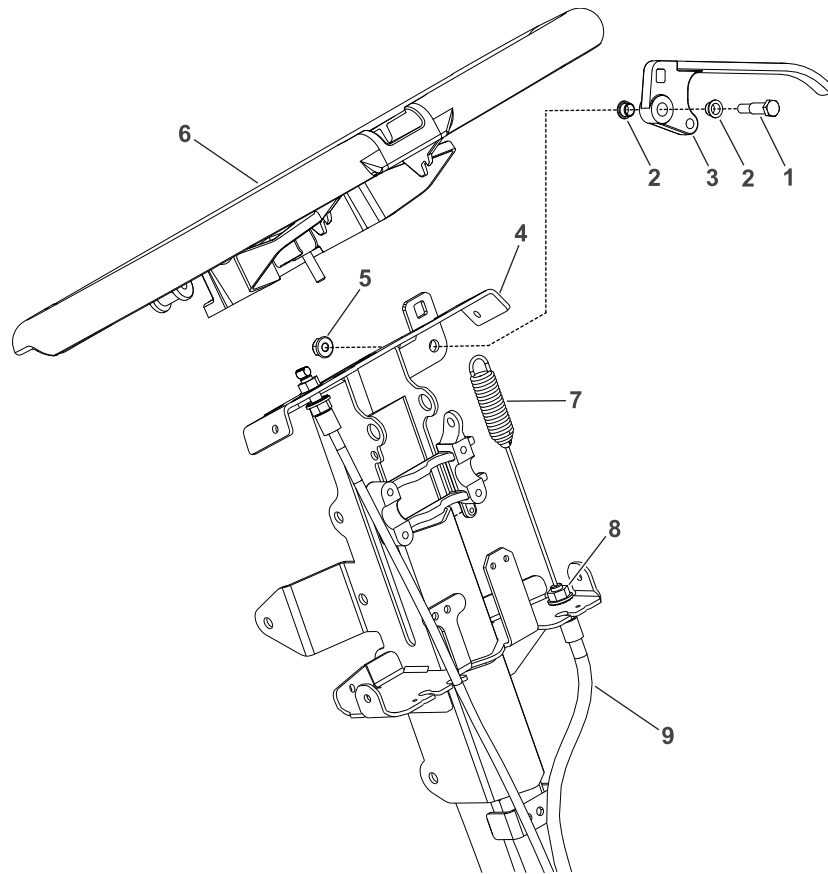
Figure 50

- | | |
|-------------------|---------------------|
| 1. Governor lever | 3. Cable clamp |
| 2. Throttle cable | 4. High speed screw |
-
2. Remove the throttle cable (item 2 in [Figure 50](#)) from the engine governor linkage (1) as follows:
 - A. Loosen the screw that secures the cable clamp (3) to engine bracket. Remove the throttle cable (2) from the cable clamp (3).
 - B. Loosen the screws that secure the throttle cable (2) to the governor lever (1). Slide the throttle cable from the governor lever.
 - C. Separate the throttle cable (2) from the engine.
 3. Remove the control cover and lower cover from the handle assembly to allow access to upper end of the throttle cable (item 3 in [Figure 49](#)).
 4. Remove the throttle arm from the handle assembly. Loosen the locknut (2) on the throttle cable and slide the throttle cable and throttle arm from the upper receiver weldment (1).
 5. Remove the throttle cable from the throttle arm.
 6. Remove the throttle cable from the machine.

Installing the Throttle Cable

1. Connect the throttle cable end to the throttle arm (9).
2. Slide the throttle cable (3) into the upper receiver weldment (1) and tighten the locknut (2).
3. Install the throttle arm to the handle assembly.
4. Route the throttle cable (3) to the engine. Ensure that the throttle cable is routed on the left side of the engine.
5. Install the throttle cable (item 2 in [Figure 50](#)) to the engine governor linkages (1) as follows:
 - A. Slide and secure the throttle cable end into the governor lever (1).
 - B. Place the throttle cable under the cable clamp (3).
 - C. Ensure that the throttle cable is in the SLOW position and with engine running slide the cable through the cable clamp to achieve 1850 to 1950 rpm.
 - D. Tighten the screw on the cable clamp to secure the throttle cable.
6. Check the throttle cable adjustment; refer to *Operator's Manual*.
7. Install the lower cover and control cover to the handle assembly.

Replacing the Brake Cable



g261822

Figure 51

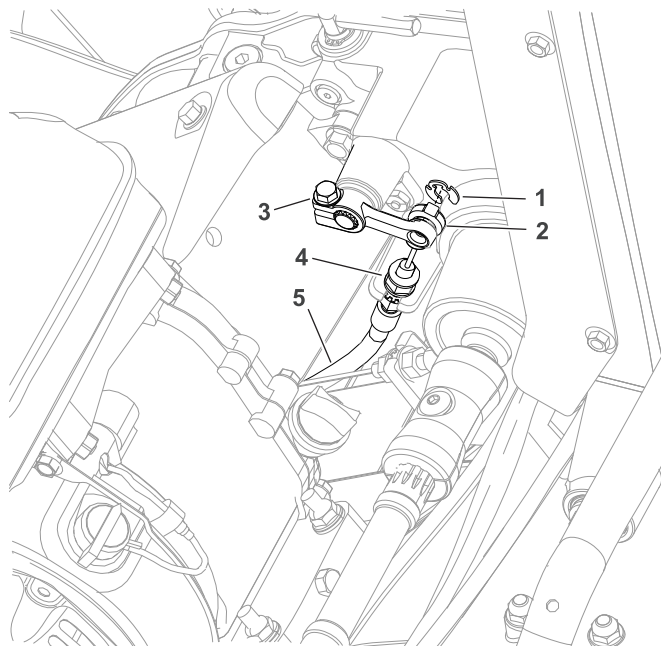
- | | | |
|----------------------------|----------------------------|-----------------------|
| 1. Shoulder screw | 4. Upper receiver weldment | 7. Brake cable spring |
| 2. Flange bushing (2 each) | 5. Flange nut | 8. Jam nut |
| 3. Lever | 6. Handle assembly | 9. Brake cable |

Removing the Brake Cable

Note: Refer to [Figure 51](#) during this procedure.

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.

Removing the Brake Cable (continued)



g261858

Figure 52

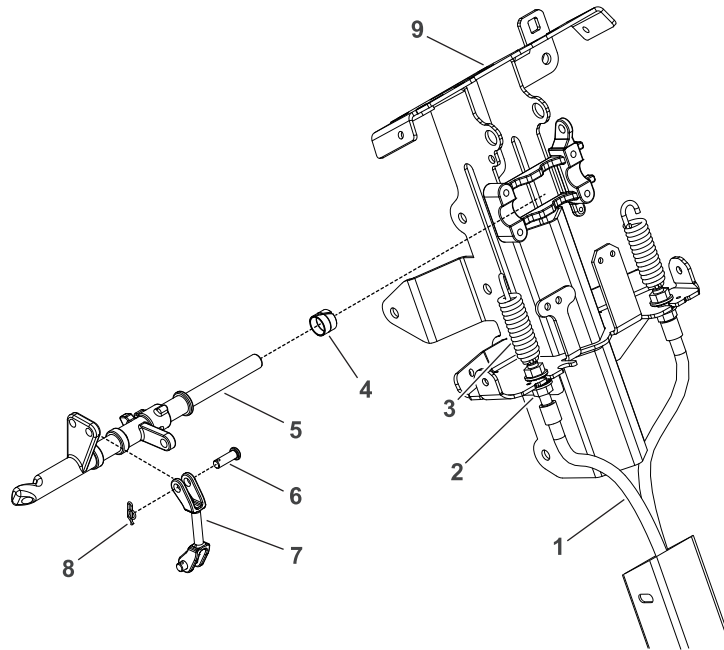
- | | | |
|-------------------|----------------|----------------|
| 1. Retaining ring | 3. Brake lever | 5. Brake cable |
| 2. Cable eyelet | 4. Jam nut | |

2. Remove the brake cable (item 5 in [Figure 52](#)) from the brake lever shaft on the transmission gear box assembly as follows:
 - A. Loosen the front cable jam nut (4) that secures the brake cable to the casting slot on the transmission gear box assembly. Remove the brake cable from the slot.
 - B. Remove the retaining ring (1) that secures the cable eyelet (2) to the brake lever (3) on the transmission gear box assembly.
 - C. Remove the brake cable eyelet (2) from the brake lever (3).
3. Remove the control cover and lower cover from the handle assembly to allow access to upper end of the brake cable.
4. Remove the brake cable (item 9 in [Figure 51](#)) from the brake lever assembly as follows:
 - A. Loosen the lower brake cable jam nut (8) that secures the brake cable (9) to the upper receiver weldment (4). Slide the brake cable from the upper receiver weldment.
 - B. Remove the brake cable spring (7) from the spring anchor on the brake lever assembly (3). Note the orientation of the brake cable spring hook on the brake lever assembly for assembly purpose.
5. Remove the brake cable (9) from the machine.

Installing the Brake Cable

1. Secure the brake cable (9) to the brake lever assembly as follows:
 - A. Install the cable spring (7) to the spring anchor on the brake lever assembly (3).
 - B. Slide the brake cable into the shift mount bracket slot. Ensure that the jam nut (8), flat washer and lock washer are both sides of the bracket. Adjust the 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 the brake cable (9) to the transmission gear box assembly and install the brake cable to the transmission gear box assembly as follows:
 - A. Install the brake cable eyelet (2) onto the brake lever (3) on transmission gear box assembly and secure with a snap ring (1).
 - B. Position the brake cable (5) to the casting slot of the transmission gear box assembly with a jam nut (4), flat washer and lock washer on each side of the slot. Adjust and tighten the jam nuts so that equal amount of cable threads are visible above and below jam nuts.
3. Make final adjustment of the brake cable at the brake cable lever assembly. Adjust the cable jam nuts to remove the slack in the brake cable.
4. Check the brake cable adjustment; refer to *Operator's Manual*.
5. Install the lower cover and control cover to the handle assembly.
6. Attach the spark plug wire to the engine spark plug.

Replacing the Clutch Cable



g261995

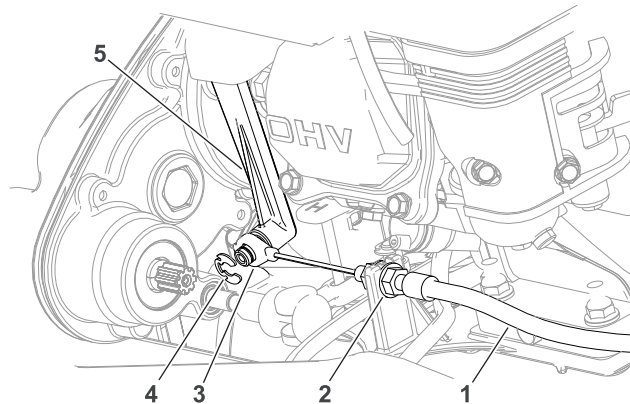
Figure 53

- | | | |
|-----------------|-----------------------|----------------------------|
| 1. Clutch cable | 4. Split bushing | 7. Link assembly |
| 2. Jam nut | 5. Main control shaft | 8. Clip pin |
| 3. Cable spring | 6. Clevis pin | 9. Upper receiver weldment |

Removing the Clutch Cable

Note: Refer to [Figure 53](#) during this procedure.

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.



g262017

Figure 54

- | | | |
|-----------------|-------------------|-----------------|
| 1. Clutch cable | 3. Cable eyelet | 5. Clutch lever |
| 2. Jam nut | 4. Retaining ring | |

2. Remove the clutch cable (item 1 in [Figure 54](#)) from the transmission assembly as follows:

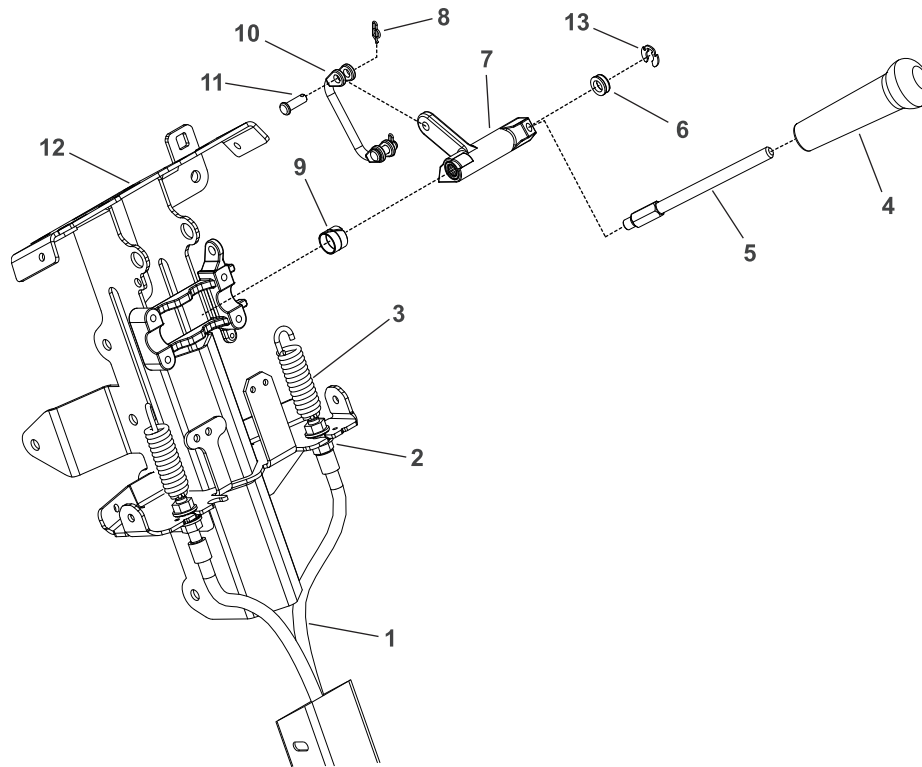
Removing the Clutch Cable (continued)

- A. Loosen the front cable jam nut (2) and lift the clutch cable (1) from the casting slot of the engine base.
- B. Remove the retaining ring (4) that secures the clutch cable eyelet (3) to the clutch lever (5) and slide and remove the clutch cable eyelet from the clutch lever.
3. Remove the control cover and lower cover from the handle assembly to allow access to upper end of the clutch cable (item 1 in [Figure 53](#)).
4. Remove the clutch cable (1) from the link assembly (7) as follows:
 - A. Loosen the lower cable jam nut (2) that secures the clutch cable to the upper receiver weldment (9). Slide the clutch cable from the upper receiver weldment.
 - B. Remove the cable spring (3) from the link assembly (7). Note the orientation of cable spring hook on the shaft assembly for assembly purposes.
5. Remove the clutch cable (1) from the machine.

Installing the Clutch Cable

1. Secure the clutch cable (item 1 in [Figure 53](#)) to the clutch lever assembly as follows:
 - A. Install the cable spring (3) to the link assembly. Orientate the cable spring hook end toward front of the machine.
 - B. Slide the cable housing into the upper receiver weldment (9). Ensure that the jam nut (2), flat washer and lock washer are on both sides of the bracket. Adjust jam nuts so that equal amount of cable threads are visible above the jam nuts. Leave the jam nuts snug until final cable adjustment.
2. Route the clutch cable (item 1 in [Figure 54](#)) to the transmission and install the cable as follows:
 - A. Slide the cable eyelet (3) to the clutch lever (5) and secure with a retaining ring (4).
 - B. Position the clutch cable (1) to the casting slot of the engine base with a jam nut (2), flat washer and a lock washer on each side of the slot.
3. Make final adjustment of the clutch cable at the clutch cable lever assembly. Adjust the cable jam nuts to remove the slack in the clutch cable.
4. Check the clutch cable adjustment; refer to *Operator's Manual*.
5. Install the lower cover and control cover to the handle assembly.
6. Attach the spark plug wire to the engine spark plug.

Replacing the Reel Cable



g262019

Figure 55

- | | | |
|--------------------------|------------------------|-----------------------------|
| 1. Reel cable | 6. V-ring seal | 11. Clevis pin |
| 2. Jam nut | 7. Reel lever assembly | 12. Upper receiver weldment |
| 3. Cable spring | 8. Cotter pin clip | 13. Retaining ring |
| 4. Knob | 9. Split bushing | |
| 5. Reel lever handle rod | 10. Clevis connector | |

Removing the Reel Cable

Note: Refer to [Figure 55](#) during this procedure.

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.

Removing the Reel Cable (continued)

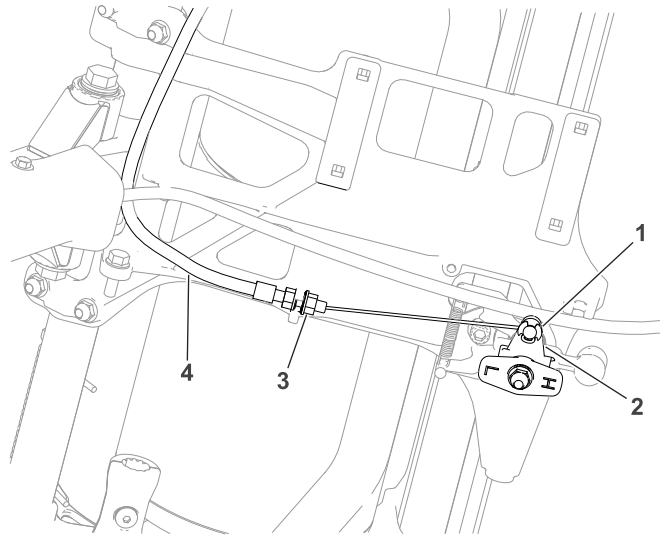


Figure 56

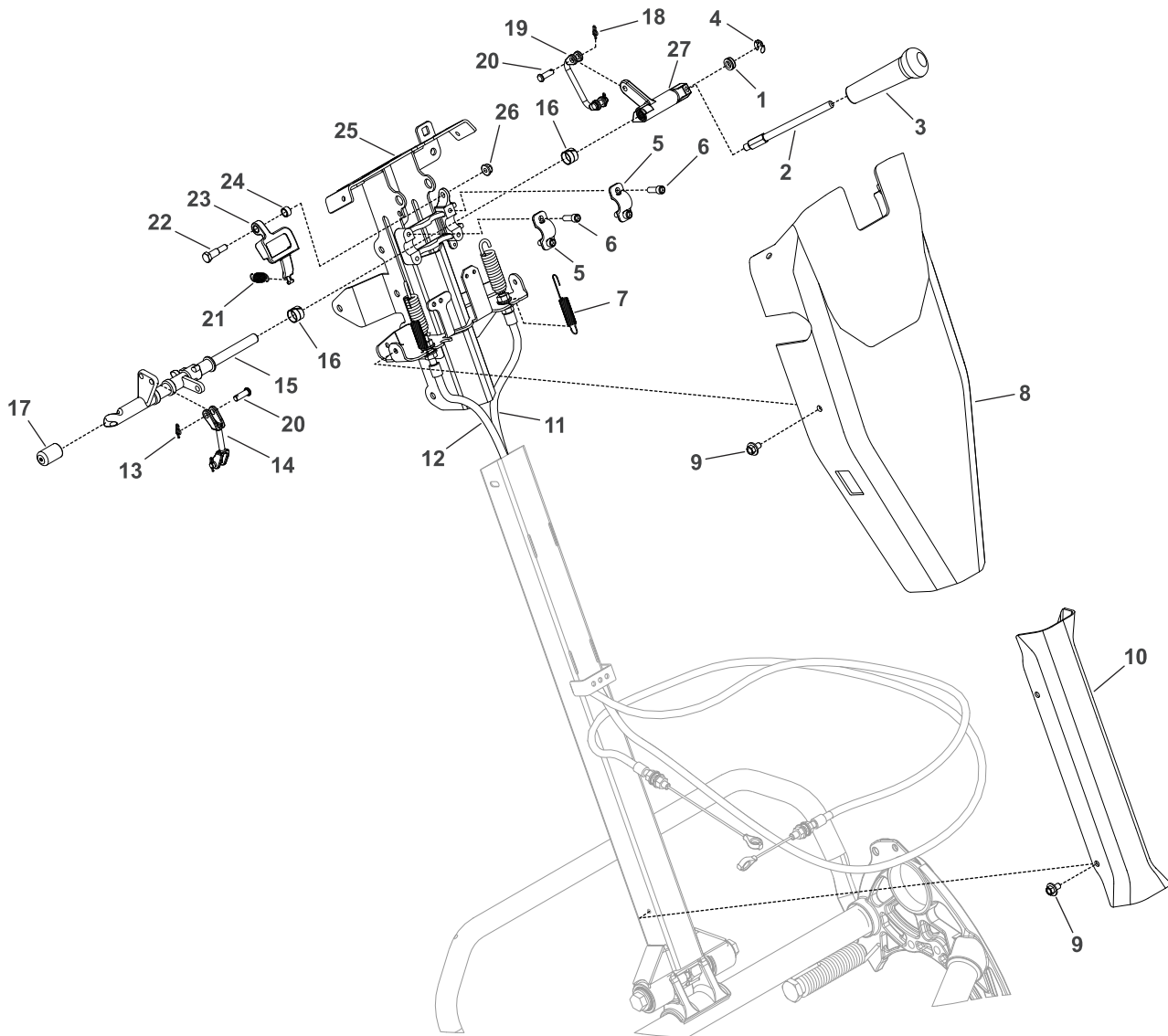
- | | |
|---------------------------|---------------|
| 1. Retaining ring | 3. Jam nut |
| 2. Reel selector assembly | 4. Reel cable |

2. Remove the reel cable (item 4 in [Figure 56](#)) from the reel selector assembly (2) as follows:
 - A. Loosen the front cable jam nut (3) and lift the reel cable (4) from the casting slot of the engine base.
 - B. Remove the retaining ring (1) that secures the reel cable eyelet to the reel selector assembly (2) and slide the reel cable eyelet from the selector assembly.
3. Remove the control cover and lower cover from the handle assembly to allow access to upper end of the reel cable.
4. Remove the reel cable (item 1 in [Figure 55](#)) from the traction lever assembly as follows:
 - A. Loosen the lower cable jam nut (2) that secures the reel cable (1) to the upper receiver weldment (12). Slide the cable from the upper receiver weldment.
 - B. Remove the cable spring (3) from the clevis connector (10) on the reel lever assembly (5). Note the orientation of cable spring hook on the shaft assembly for assembly purposes.
5. Remove the reel cable (1) from the machine.

Installing the Reel Cable

1. Secure the reel cable (item 1 in [Figure 55](#)) to the traction lever assembly as follows:
 - A. Install the cable spring (3) to the clevis connector (10) on the reel lever assembly (7). Orientate the cable spring hook end toward front of the machine.
 - B. Slide the cable (1) into the upper receiver weldment (12). Ensure that the jam nut (2), flat washer and lock washer are on both sides of the bracket. Adjust jam nuts so that equal amount of cable threads are visible above the jam nuts. Leave the jam nuts snug until final cable adjustment.
2. Route the reel cable to the reel selector assembly (item 2 in [Figure 56](#)) and install the reel cable (4) as follows:
 - A. Slide the cable eyelet to the reel selector assembly (2) and secure with a retaining ring (1).
 - B. Position the reel cable (4) to the casting slot of the engine base with a jam nut (3), flat washer and a lock washer on each side of the slot.
3. Make final adjustment of the reel cable at the reel cable lever assembly. Adjust the cable jam nuts to remove the slack in the clutch cable.
4. Check the reel cable adjustment; refer to *Operator's Manual*.
5. Install the lower cover and control cover to the handle assembly.
6. Attach the spark plug wire to the engine spark plug.

Clutch and Reel Drive Engagement Lever Assembly



g260277

Figure 57

- | | | |
|--------------------------------------|----------------------------|------------------------------|
| 1. V-ring seal | 10. Lower handle cover | 19. Clevis connector |
| 2. Reel lever handle rod | 11. Reel cable | 20. Clevis pin (4 each) |
| 3. Knob | 12. Clutch cable | 21. Extension spring |
| 4. Retaining ring | 13. Cotter pin clip | 22. Shoulder screw |
| 5. Control shaft clamp (2 each) | 14. Link assembly | 23. Reel lock lever assembly |
| 6. Socket head screw (4 each) | 15. Main control shaft | 24. Bail latch spacer |
| 7. Extension spring (2 each) | 16. Split bushing (2 each) | 25. Upper receiver weldment |
| 8. Controls cover | 17. Socket cap | 26. Flange nut |
| 9. Bolt and washer assembly (8 each) | 18. Cotter pin clip | 27. Reel lever assembly |

Disassembling the Clutch and Reel Drive Engagement Lever Assembly

Note: Refer to [Figure 57](#) during this procedure.

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.

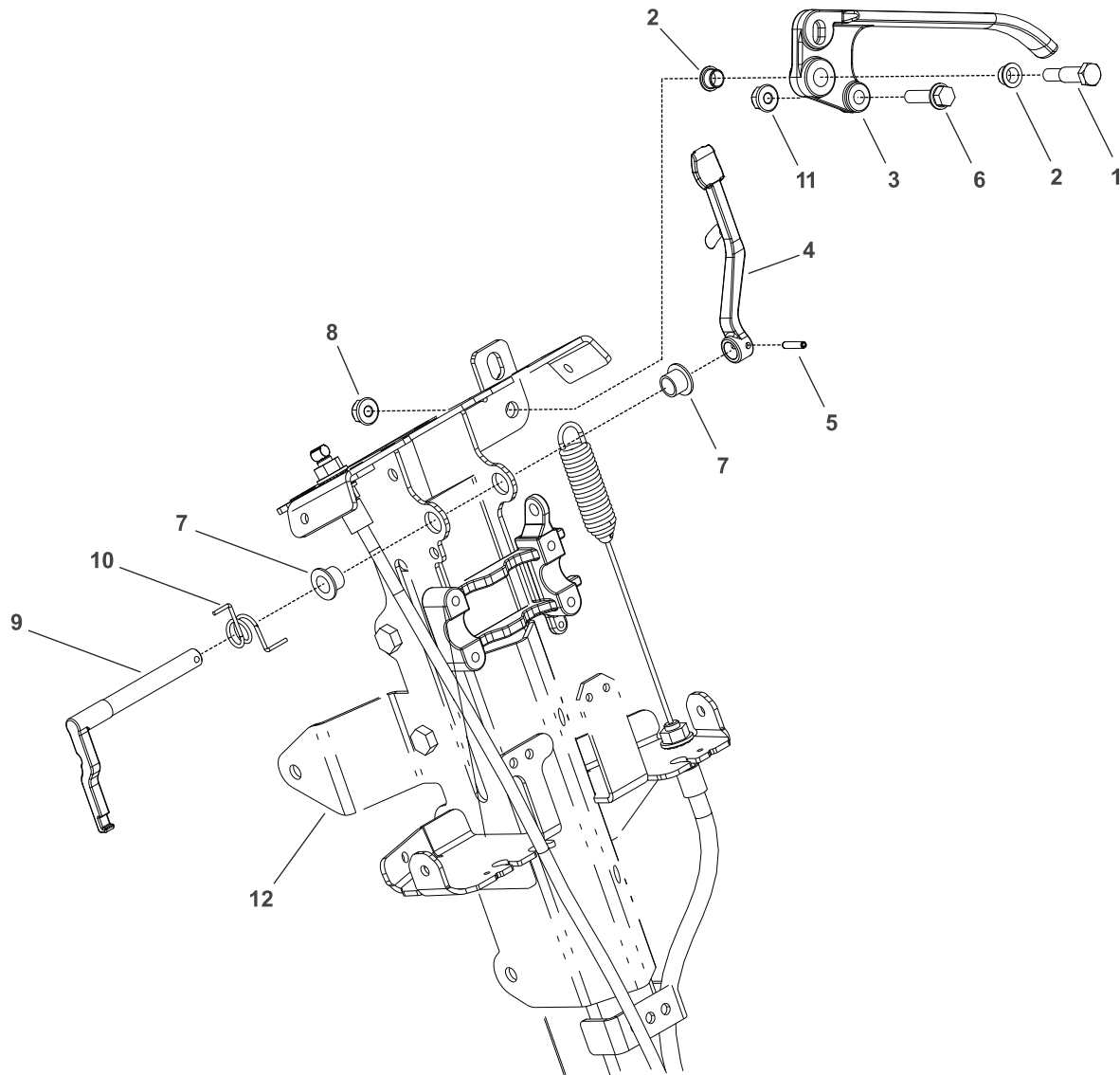
Disassembling the Clutch and Reel Drive Engagement Lever Assembly (continued)

2. Remove the bolts and washers (item 9 in [Figure 57](#)) that secures the controls covers (item 8 and 10) to the upper receiver weldment (25) and handle assembly.
3. Remove the reel lever handle rod (2) from the reel lever assembly (27).
4. If necessary, remove the reel lever knob (3) from the reel lever handle (2).
5. Remove the cotter pin (18) and clevis pin (20) that secures the link assembly (14) to the main control shaft (15).
6. Remove the cotter pin (18) and clevis pin (20) that secures the clevis connector (19) to the reel lever assembly (27).
7. Remove the extension spring (21) from the reel lock lever (23).
8. Remove the flange nut (26) and shoulder screw (22) that secures the reel lock lever (23) to the upper receiver weldment (25). Remove the reel lock lever (23) and bail latch spacer (24).
9. Remove the retaining ring (4) and V-ring seal (1) that secures the reel lever assembly (27) to the main control shaft (15). Slide and remove the reel lever assembly.
10. Remove the socket head screws (6) and control shaft clamps (5) that secures the main control shaft (15) to the upper receiver weldment (23).
11. Remove the main control shaft (15). If necessary, remove the split bushing (16) from the main control shaft.

Assembling the Clutch and Reel Drive Engagement Lever Assembly

1. If removed, install the split bushing (item 16 in [Figure 57](#)) onto the main control shaft (15).
2. Position the main control shaft (15) on the upper receiver weldment (25) and secure the main control shaft (15) with control shaft clamps (5) and the bolts (6).
3. Slide the reel lever assembly (27) and V-ring seal (1) onto the main control shaft (15) and secure reel lever assembly with the retaining ring (4).
4. Install the reel lock lever (23) and bail latch spacer (24) to the upper receiver weldment (25) and secure with the shoulder screw (22) and flange nut (26).
5. Install the link assembly (14) to the main control shaft (15) with clevis pin (20). Secure the clevis pin with the cotter pin clip (13).
6. Install the clevis connector (19) to the reel lever assembly (27) with clevis pin (20) and secure the clevis pin with the cotter pin clip (18).
7. Install the reel lever handle rod (2) to the reel lever assembly (27).
8. If removed, install the reel lever knob (3) to reel lever handle rod (2).
9. Install the control covers (8 and 10) to the handle assembly with bolts and washers (9).
10. Attach the spark plug wire to the engine spark plug.

Brake Latch Shaft



g260416

Figure 58

- | | | |
|----------------------------|----------------------------|-----------------------------|
| 1. Shoulder bolt | 5. Roll pin | 9. Brake latch shaft |
| 2. Flange bushing (2 each) | 6. Bolt | 10. Torsion spring |
| 3. Lever | 7. Flange bushing (2 each) | 11. Flange nut |
| 4. Brake lock lever | 8. Flange nut | 12. Upper receiver weldment |

Disassembling the Brake Latch Shaft

Note: Refer to [Figure 58](#) during this procedure.

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.
2. Remove the bolts and washers that secures the controls covers to the upper receiver weldment.
3. Using the drift pin, remove the roll pin (5) from the brake lock lever (4).
4. Slide and remove the brake lock lever (4) from the brake latch shaft (9).

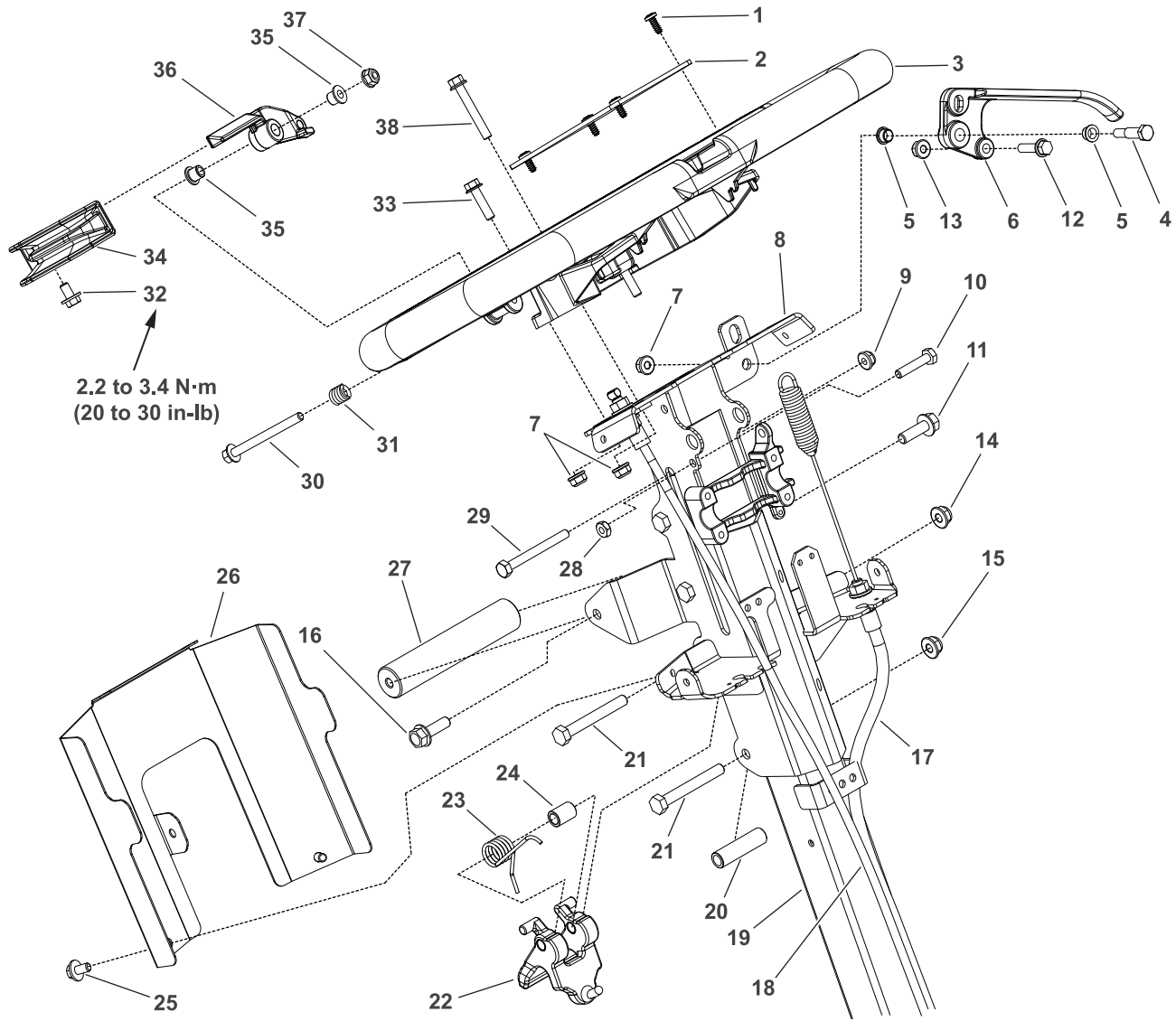
Disassembling the Brake Latch Shaft (continued)

5. Slide and remove the brake latch shaft (9) from the upper receiver weldment (12).
6. Slide and remove the torsion spring (10) from the brake latch shaft (9).

Assembling the Brake Latch Shaft

1. Slide and position the torsion spring (10) onto the brake latch shaft (9).
2. Slide and position the brake latch shaft (9) into the upper receiver weldment (12).
3. Slide and position the brake lock lever (4) onto the brake latch shaft (9). Secure the brake lock lever with the roll pin (5).
4. Install the control covers to the handle assembly with bolts and washers.
5. Attach the spark plug wire to the engine spark plug.

Handle Assembly



g260770

Figure 59

- | | | |
|----------------------------|--|-----------------------------|
| 1. Plastite screw (4 each) | 14. Nut | 27. Lift assist handle |
| 2. Notepad plate | 15. Nut (4 each) | 28. Jam nut |
| 3. Handle | 16. Bolt | 29. Bolt |
| 4. Shoulder screw | 17. Brake cable | 30. Bolt |
| 5. Flange bushing (2 each) | 18. Throttle cable | 31. Compression spring |
| 6. Brake lever | 19. Lower handle assembly | 32. Screw and washer |
| 7. Flange nut (4 each) | 20. Spacer (3 each) | 33. Bolt (2 each) |
| 8. Upper receiver weldment | 21. Bolt (4 each) | 34. Throttle lever |
| 9. Nut | 22. Handle adjuster assembly | 35. Flange bushing (2 each) |
| 10. Bolt | 23. Handle torsion spring | 36. Throttle arm |
| 11. Bolt | 24. Spring spacer | 37. Flange nut |
| 12. Bolt | 25. Screw and washer assembly (2 each) | 38. Bolt |
| 13. Flange nut | 26. Bottom control cover | |

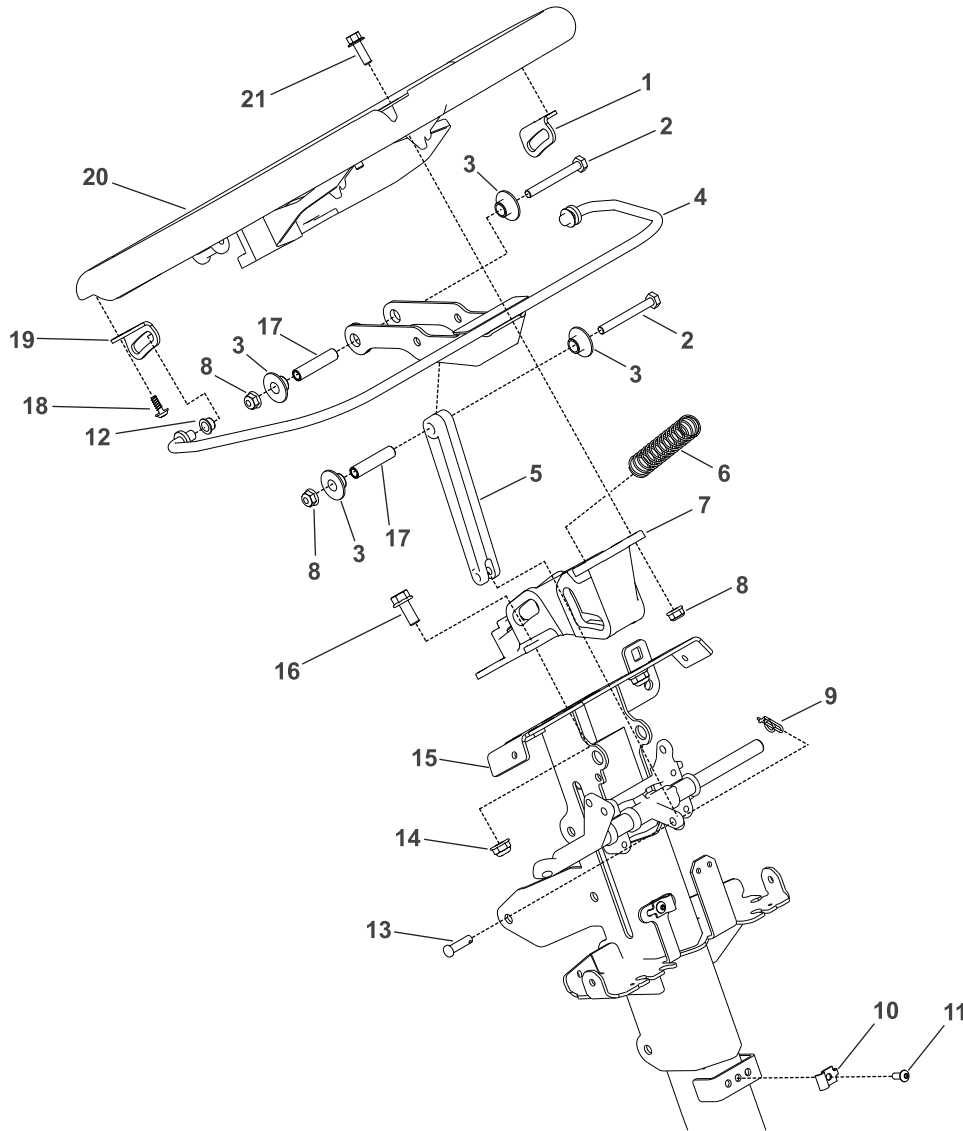
Disassembling the Handle Assembly

Note: Refer to [Figure 57](#), [Figure 59](#), [Figure 60](#), and [Figure 61](#) during this procedure.

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.
2. Remove the 4 bolts that secures the controls cover to the handle assembly, and remove the cover from the handle; refer to [Figure 57](#).
3. Remove the 4 bolts that secures the lower handle cover to the handle assembly, and remove the cover from the handle; refer to [Figure 57](#).
4. Remove the wire harness from bottom controls cover ([Figure 59](#)).
5. Remove the 2 nuts (7) and 4 bolts (25 and 33) that secure the bottom controls cover (26) to the upper receiver weldment (8). Remove the bottom controls cover from the upper receiver weldment.
6. Remove the throttle cable; refer to [Removing the Throttle Cable \(page 7–3\)](#).
7. Remove the clutch cable; refer to [Removing the Clutch Cable \(page 7–9\)](#).
8. Remove the brake cable; refer to [Removing the Brake Cable \(page 7–6\)](#).
9. Remove the reel cable; refer to [Removing the Reel Cable \(page 7–11\)](#).
10. Remove the clutch and reel drive lever assembly; refer to [Disassembling the Clutch and Reel Drive Engagement Lever Assembly \(page 7–14\)](#).
11. Remove the brake latch shaft; refer to [Disassembling the Brake Latch Shaft \(page 7–16\)](#).
12. Remove the flange nut (7) and bolt (38)—which function as a throttle arm stop bolt—from the upper receiver weldment (8); refer to [Figure 59](#).
13. Remove the nut (37), bolt (30) and compression spring (31) that secure the throttle arm (36) to the handle assembly (3), and remove the arm from the handle.
14. If necessary, remove the screw (32) that secures the throttle lever (34) to the throttle arm (36), and remove the lever from the arm.
15. If necessary, remove the flange bushings (35) from the throttle arm (36).
16. Disconnect the wire harness.
17. Remove the engine ON/OFF switch from the handle assembly.
18. Remove 4 plastite screws (1) that secure the handle notepad plate (2) to the handle assembly (3), and remove the handle plate from the handle.
19. Remove the flange nut (7) and shoulder screw (4) that secures the brake lever (6) to the upper receiver weldment (8), and remove the brake lever from the receiver.
20. If necessary, remove the flange bushings (5), flange nut (13) and bolt (12) from the brake lever (6).
21. Remove the 2 bolts (11 and 16) that secure the lift assist handle (27) to the upper receiver weldment (8).
22. Remove the conduit clamp from upper receiver, and separate the wire harness conduit from the receiver.
23. Remove the nut (9) and bolt (29) that secures the upper receiver weldment (8) to the lower handle (19).
24. Remove the upper receiver weldment from the lower handle assembly
25. Remove the nut (15) and bolt (21) that secure the handle adjuster assembly (22) to the upper receiver weldment (8).

Disassembling the Handle Assembly (continued)

26. Remove the handle adjuster assembly from the upper receiver weldment, and separate handle torsion spring (23) and spring spacer (24) from the handle adjuster assembly (22).
27. If necessary, remove the 3 nuts (item 15 in [Figure 59](#)), 3 bolts (21), and 3 spacers (20) from the upper receiver weldment (8).



g260771

Figure 60

- | | | |
|----------------------------|--------------------------------|---------------------------------|
| 1. Left bail bracket | 8. Flange nut (4 each) | 15. Upper receiver weldment |
| 2. Bolt (2 each) | 9. Cotter pin | 16. Bolt (2 each) |
| 3. Flange bushing (4 each) | 10. Conduit clamp (2 each) | 17. Spacer (2 each) |
| 4. Clutch bail assembly | 11. Socket head screw (2 each) | 18. Torques-head screw (2 each) |
| 5. Clutch bail link | 12. Flange bushing(2 each) | 19. Right bail bracket |
| 6. Compression spring | 13. Clevis pin | 20. Handle |
| 7. Handle mount | 14. Nut (2 each) | 21. Bolt (2 each) |

28. Remove the 2 nuts (item 8 in [Figure 60](#)) and 2 bolts (21) that secure handle (20) to handle mount (7), and remove the handle from the clutch bail assembly and the handle mount.

Disassembling the Handle Assembly (continued)

29. If necessary, remove the 2 screws (18) that secure the left and right bail brackets (1 and 19) to the handle (20).
30. Remove the flange nut (8), and bolt (2) that secure the clutch bail link (5) to the handle mount (7). Remove the 2 flange bushings (3) and spacer tube (17) from the handle mount.
31. Remove the flange nut (8) and bolt (2) that secure the clutch bail assembly (4) to the handle mount (7). Remove the clutch bail assembly from the handle mount. Remove the compression spring (6), 2 flange bushings (3) and spacer tube (17) from the handle mount.
32. Remove the 2 nuts (item 14 in [Figure 60](#)) and 2 bolts (16) that secure the handle mount (7) to the upper receiver weldment (15). Remove the handle mount from the upper receiver weldment.

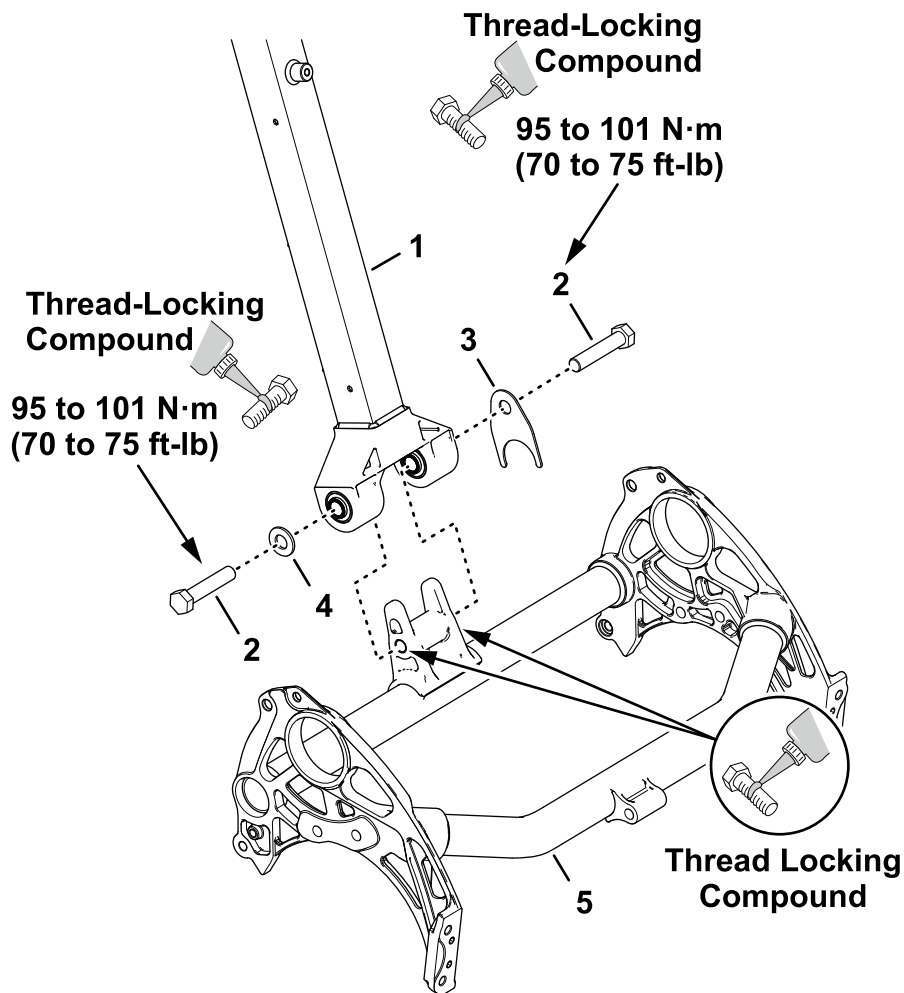


Figure 61

- | | | |
|--------------------------|-------------------------|-------------------|
| 1. Lower handle assembly | 3. Anti-rotation washer | 5. Frame assembly |
| 2. Bolt (2 each) | 4. Washer | |

33. If necessary, remove the 2 bolts (item 2 in [Figure 61](#)), anti-rotation washer (3), and washer (4) that secure the lower handle assembly (1) to the frame assembly (5).

Assembling the Handle Assembly

1. If removed, clean the threads of the frame assembly and the 2 bolts (2), and apply a coat to medium strength thread-locking compound as shown in [Figure 61](#).
2. If removed, install the lower handle assembly (1) onto the frame assembly (5) and secure with the 2 bolts (2), anti-rotation washer (3), and washer (4).



3. Lift the lower handle assembly until it contacts the stop, and torque the 2 bolts (item 2 in [Figure 61](#)) to **95 to 101 N·m (70 to 75 ft-lb)**.
4. Install the handle mount (item 7 in [Figure 60](#)) to the upper receiver weldment (15) and secure with 2 bolts (16) and 2 nuts (14).
5. Position the clutch bail link (5) in the handle mount (7). Install the spacer tube (17) and 2 flange bushings (3) to the handle mount. Secure the clutch bail link to the handle mount with the bolt (2) and flange nut (8).
6. Position the compression spring (6), spacer tube (17) and 2 bushings (3) into the handle mount (7). Install the clutch bail assembly (4) to the handle mount (7) and secure with the bolt (2) and flange nut (8).
7. If removed, install the left and right bail brackets (1 and 19) to the handle (20) with the 2 torques-head screws (18).
8. Install the clutch bail assembly (item 4 in [Figure 60](#)) to the handle (20). Secure the handle to the handle mount (7) with the 2 bolts (21) and 2 nuts (8).
9. If removed, install the 3 spacers (item 20 in [Figure 59](#)), 3 bolts (21) and 3 nuts (15) to the upper receiver weldment (8).
10. Position the spring spacer (24) and handle torsion spring (23) into the handle adjuster assembly (22). Install the handle adjuster assembly to the upper receiver weldment (8) with the bolt (21) and nut (15).
11. If removed, install the lift assist handle (27) to the upper receiver weldment (8) and secure with the bolts (11 and 16).
12. Slide the upper receiver weldment (item 8 in [Figure 59](#)) into the lower handle assembly (19) and secure with the bolt (29) and flange nut (9).

Note: Do not tighten bolt and nut. Install the nut to engage locking feature. The upper receiver weldment (8) must be free to slide.

13. Reposition the wire harness.
14. Install the conduit clamps (item 10 in [Figure 60](#)) to the upper receiver weldment (8) and lower handle assembly (19) and secure with screws (11).
15. If removed, install the flange bushings (item 5 in [Figure 59](#)), bolt (12) and flange nut (13) into the brake lever (6).
16. Position the brake lever (6) to the upper receiver weldment (8) and secure with the shoulder screw (4) and flange nut (7).
17. Install the handle notepad plate (item 2 in [Figure 59](#)) to the handle assembly (3) and secure with the 4 plastite screws (1).
18. Install the engine ON/OFF switch into the handle assembly.
19. Install the wire harness.
20. If removed, install the flange bushings (35) inside the throttle arm (36).
21. If removed, slide the throttle lever (34) onto the throttle arm (36) and secure with bolt (32).

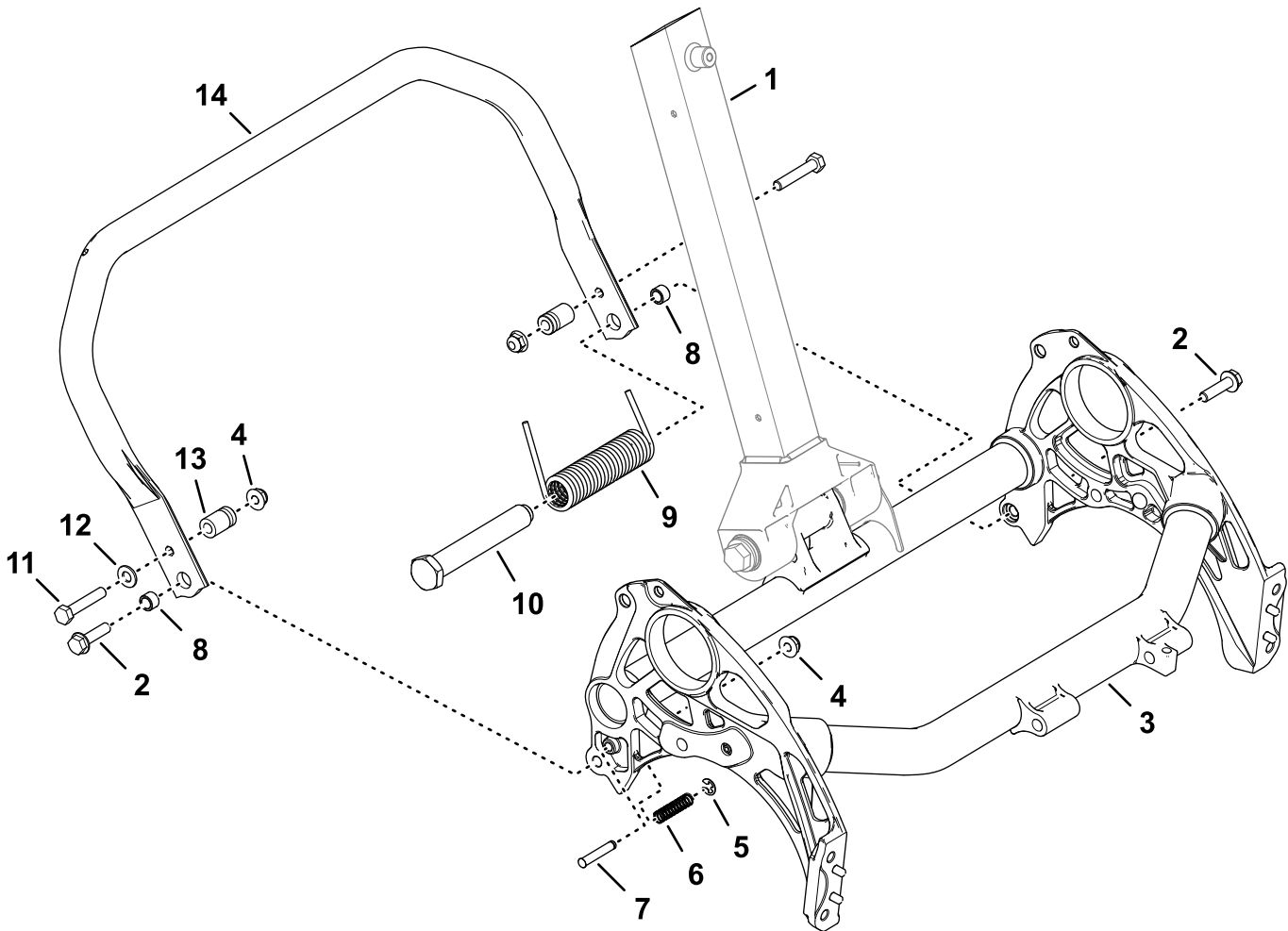


22. Torque tighten the bolt from **2.2 to 3.4 N·m (20 to 30 in-lb)**.
23. Install the throttle arm (36) to the handle assembly (3) and secure with bolt (30), compression spring (31) and flange nut (37).

Assembling the Handle Assembly (continued)

24. Install the bolt (item 38 in [Figure 59](#)) and 2 flange nuts (7) to the upper receiver weldment (8). Ensure that the head of the bolt is resting on the throttle arm (36).
25. Install the brake latch shaft; refer to [Assembling the Brake Latch Shaft \(page 7-17\)](#).
26. Install the clutch and reel drive lever assembly; refer to [Assembling the Clutch and Reel Drive Engagement Lever Assembly \(page 7-15\)](#).
27. Install the reel cable; refer to [Installing the Reel Cable \(page 7-13\)](#).
28. Install the brake cable; refer to [Installing the Brake Cable \(page 7-8\)](#).
29. Install the clutch cable; refer to [Installing the Clutch Cable \(page 7-10\)](#).
30. Install the throttle cable; refer to [Installing the Throttle Cable \(page 7-5\)](#).
31. Reposition the wire harness to the bottom control cover (26 in [Figure 59](#)). Install the cover to the upper receiver weldment (8) with the 2 screw and washer assemblies (25), 2 bolts (33) and 2 flange nuts (7).
32. Install the lower handle cover to the handle assembly and secure with the 4 bolts; refer to [Figure 57](#).
33. Install the controls cover to the handle assembly and secure with the 4 bolts; refer to [Figure 57](#).
34. Attach the spark plug wire to the engine spark plug.

Kickstand



g394086

Figure 62

- | | | |
|--------------------------|-----------------------|------------------------------|
| 1. Lower handle assembly | 6. Compression spring | 11. Bolt (2 each) |
| 2. Bolt (2 each) | 7. Kickstand lock pin | 12. Plain washer (2 each) |
| 3. Frame assembly | 8. Spacer (2 each) | 13. Spring retainer (2 each) |
| 4. Nut (3 each) | 9. LH torsion spring | 14. Kickstand |
| 5. E-ring | 10. Spring mount pin | |

Removing the Kickstand



CAUTION



Be careful when removing or applying tension from or to the torsion spring of the kickstand.

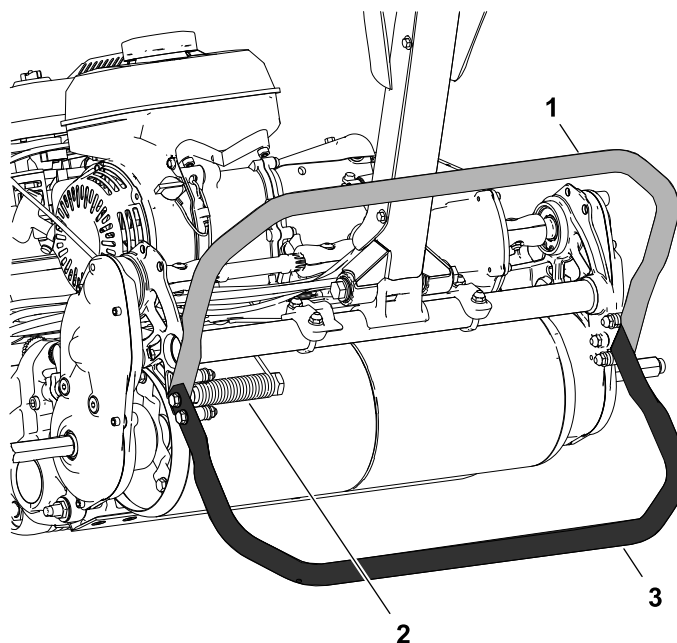
The spring is under heavy load and may cause personal injury.

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.
2. Pivot the kickstand up and hold against the frame stops.

Removing the Kickstand (continued)

3. Remove the bolt (item 11 in [Figure 62](#)) that secures the spring mount pin (3) and torsion spring (2) to the kickstand (16).
4. Remove the spring mount pin (3) and torsion spring (2) from the kickstand (16).
5. Remove the bolt (11), spacer (10) and nut (5) that secures the kickstand (16) to the frame (9).
6. Remove the kickstand (16) from the frame (1).
7. If necessary, remove the spring retainer (14) by removing the nut (15), washer (13) and bolt (12).
8. If necessary, remove the spacers (10) from the kickstand (16).

Installing the Kickstand



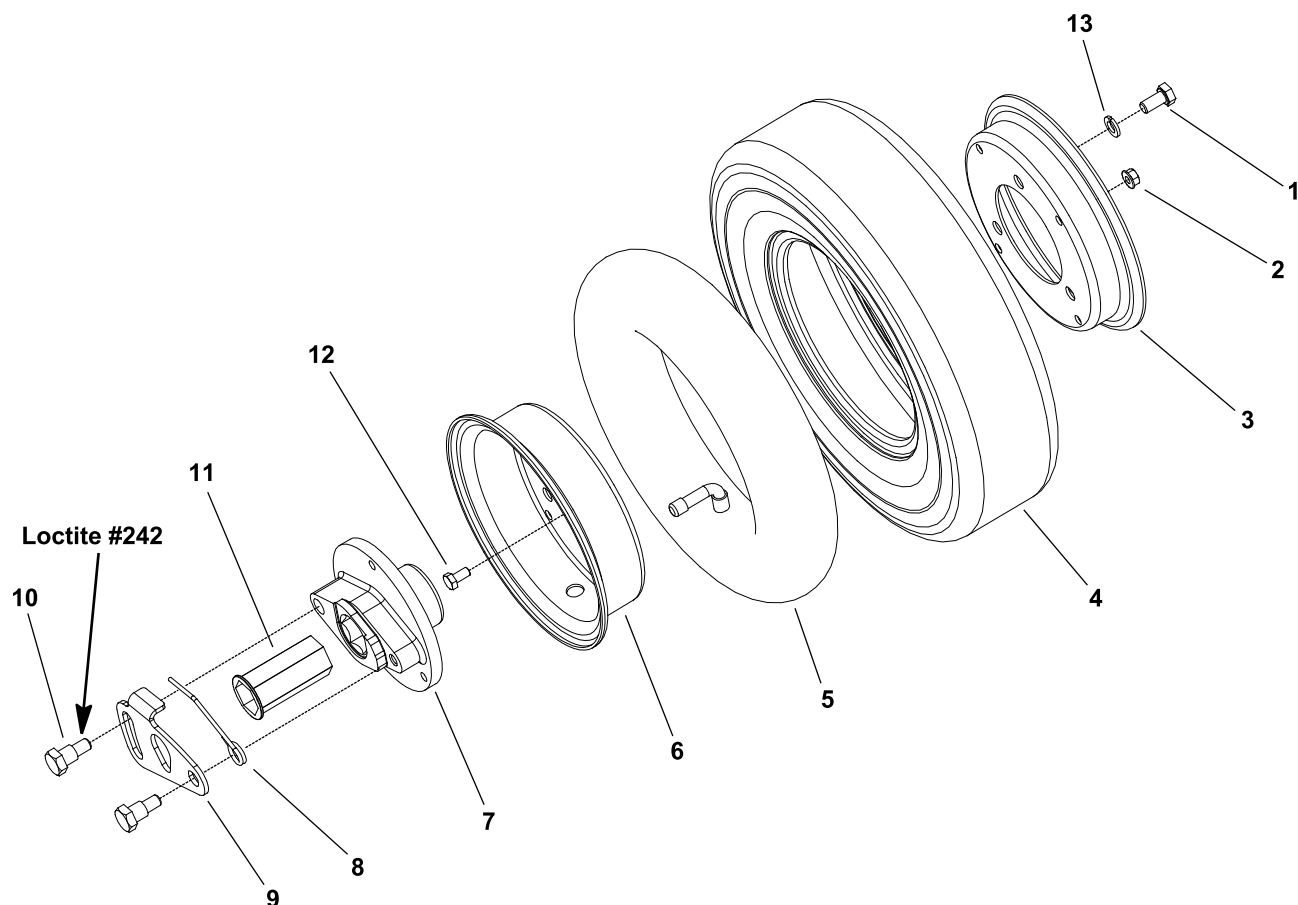
g260998

Figure 63

- | | |
|-----------------------|------------------------|
| 1. Kickstand (raised) | 3. Kickstand (lowered) |
| 2. Torsion spring | |

-
1. If removed, install the spacers (10) to the kickstand (16).
 2. If removed, secure the spring retainer (14) to kickstand with the bolt (12), washer (13) and nut (15).
 3. Secure the kickstand (16) to the frame (9) with the torsion spring (2), spring mount pin (3) and bolt (11).
 4. Secure the kickstand (16) to the frame (9) with spacer (10), bolt (11) and nut (5).
 5. Attach the spark plug wire to the engine spark plug.

Transport Wheels (Optional)



g200275

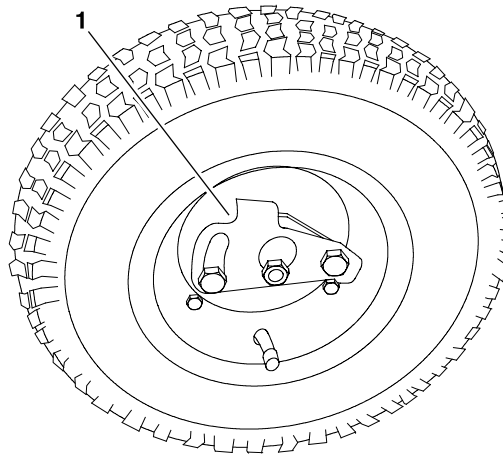
Figure 64

- | | | |
|------------------------|-----------------------------|--------------------------|
| 1. Bolt (3 each) | 6. Deep rim | 11. Hub bushing |
| 2. Flange nut (4 each) | 7. Hub | 12. Bolt (4 each) |
| 3. Shallow rim | 8. Torsion spring | 13. Lock washer (3 each) |
| 4. Tire | 9. Wheel retaining lever | |
| 5. Inner tube | 10. Shoulder screw (2 each) | |

Removing the Transport Wheel

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.
2. Support the machine onto the machine onto the kickstand.

Removing the Transport Wheel (continued)

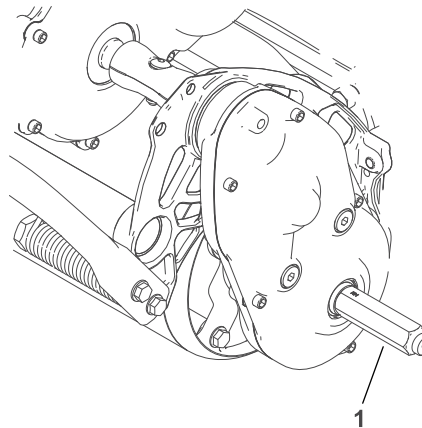


g200276

Figure 65

1. Wheel retaining lever
-
3. Pivot the wheel retaining lever away from the center of the wheel. Slide the transport wheel off the wheel hex shaft.

Disassembling the Transport Wheel



g261682

Figure 66

1. Wheel hex shaft
-
1. Ensure that the tire is fully deflated before disassembly of the wheel.
 2. Remove the 3 bolts and 3 lock washers from the shallow rim and hub. Remove the hub from the deep rim.
 3. Inspect the hub bushing. Replace the bushing, if worn or damaged.
 4. Remove the 4 bolts and 4 flange nuts from the deep rim and shallow rim. Remove the shallow rim from the deep rim.
 5. Separate the tire, tube, and deep rim.
 6. If necessary, remove the shoulder screws, torsion spring, and retaining lever from the hub.

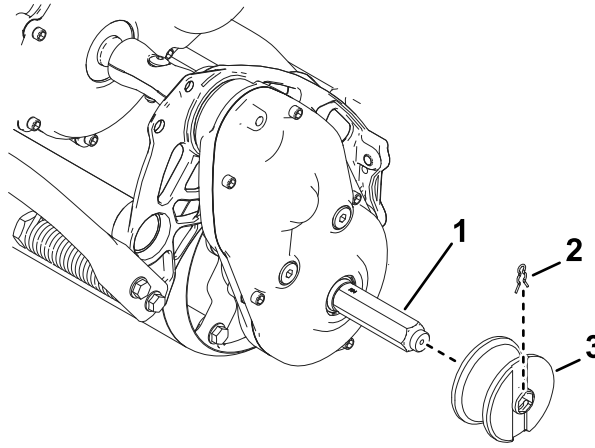
Assembling the Transport Wheel

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

Installing the Transport Wheel

1. Ensure that the machine is parked on a level surface.
2. Support the machine onto the kickstand.
3. Slide the transport wheel completely onto the wheel hex shaft until the wheel retaining lever is secured into the groove onto the wheel hex shaft.

Rail Kit Wheels (Optional)



g261683

Figure 67

- | | |
|--------------------|-------------------|
| 1. Wheel hex shaft | 3. Rail kit wheel |
| 2. Wheel clip | |

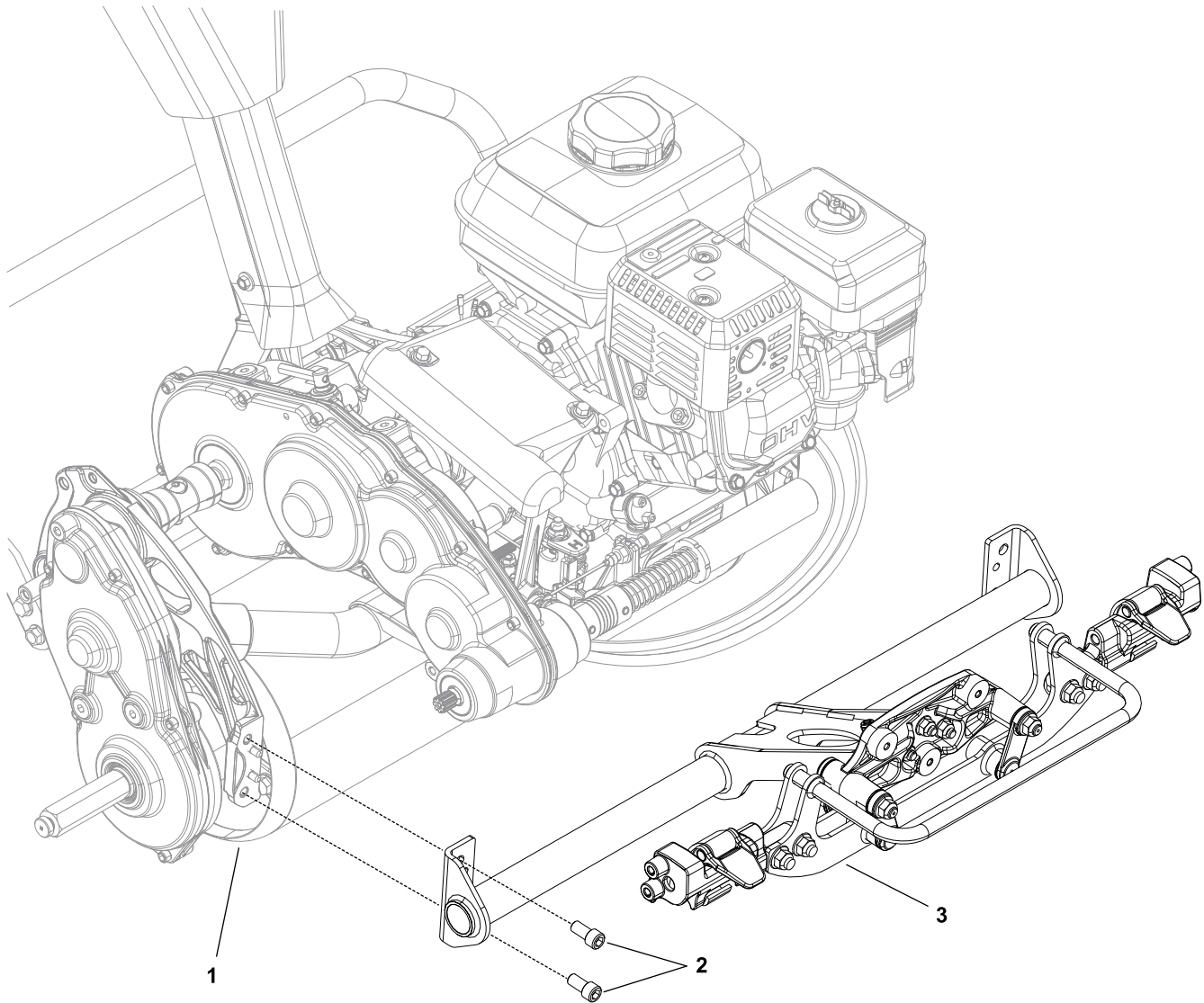
Removing the Rail Kit Wheel

1. Ensure that the cutting-unit-drive lever is in the **DISENGAGE** position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.
2. Support the machine onto the kickstand.
3. Remove the wheel clip, and remove the rail kit wheel from the wheel hex shaft on each side.
4. If necessary, install the transport wheels; refer to [Transport Wheels \(Optional\) \(page 7-26\)](#).

Installing the Rail Kit Wheel

1. Ensure that the machine is parked on a level surface.
2. Support the machine onto the kickstand.
3. If installed, remove the transport wheels; refer to [Transport Wheels \(Optional\) \(page 7-26\)](#).
4. Slide the rail kit wheel onto the wheel hex shaft and secure the wheel with a wheel clip.

Flex Frame Assembly



g313494

Figure 68

1. Machine assembly 2. Socket head screws (4 each) 3. Flex frame assembly

Removing the Flex Frame Assembly

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.
2. Remove the cutting unit from the machine; refer to *Operator's Manual*.
3. Remove the four socket head screws (2) that secures the flex frame assembly (2) to the machine assembly (1).
4. Slide and remove the flex frame assembly (2) from the machine assembly (1).

Disassembly of the Flex Frame Assembly

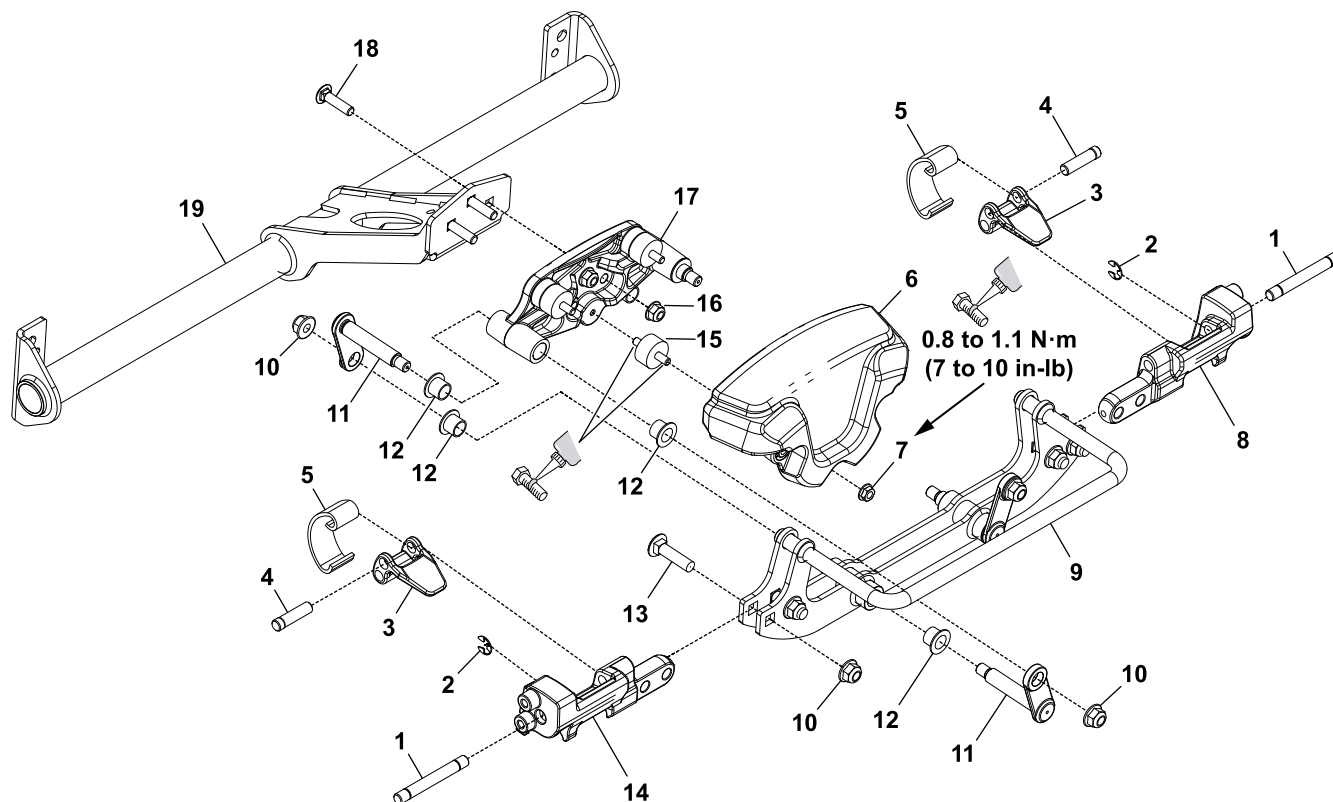


Figure 69

- | | | |
|-----------------------------|-----------------------------|----------------------------|
| 1. Pivot pin latch (2 each) | 8. LH hub end | 15. Isolator |
| 2. E-ring (2 each) | 9. Roll frame assembly | 16. Flange nut (3 each) |
| 3. Lever (2 each) | 10. Flange nut (8 each) | 17. Frame link |
| 4. Pivot pin (2 each) | 11. Flex link (4 each) | 18. Carriage bolt (3 each) |
| 5. Spring (2 each) | 12. Flange bushing (8 each) | 19. Flex frame |
| 6. Weight | 13. Carriage bolt (4 each) | |
| 7. Flange nut (3 each) | 14. RH hub end | |

Disassemble the flex frame assembly using the [Figure 69](#) as a guide.

Assembly of the Flex Frame Assembly

Assemble the flex frame assembly using the [Figure 69](#) as a guide.

Installing the Flex Frame Assembly

1. Position the flex frame assembly onto the machine assembly.
2. Secure the flex frame assembly to the machine assembly with the four socket head screws.
3. Install the cutting unit onto the machine; refer to *Operator's Manual*.
4. Attach the spark plug wire to the spark plug.



DPA Cutting Units

Table of Contents

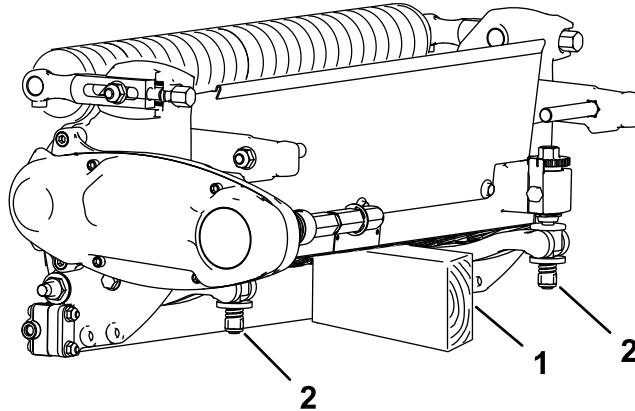
General Information	8-2
Cutting Unit Operator's Manual	8-2
Supporting the Cutting Unit when Servicing	8-2
Adjustments	8-3
DPA Cutting Unit Characteristics	8-3
Leveling the Rear Roller	8-4
Service and Repairs	8-6
Bedbar Assembly	8-6
Servicing the Bedbar Adjuster	8-10
Bedknife	8-12
Reel Assembly	8-18
Roller Assemblies	8-27

General Information

Cutting Unit Operator's Manual

The *Cutting Unit Operator's Manual* provides information regarding the operation, general maintenance, and maintenance intervals for the cutting units on your machine. Additionally, if optional kits have been installed on the cutting units (e.g., groomer), the *Installation Instructions* for the kit includes set-up, operation, and maintenance information. Refer to the *Cutting Unit Operator's Manual* and the kit *Installation Instructions* for additional information when servicing the cutting units.

Supporting the Cutting Unit when Servicing



g311262

Figure 70

1. Support
2. Bedbar adjuster screw nuts

Whenever the cutting unit is tipped to expose the bedknife or cutting reel, support the rear of the cutting unit making sure the back of the bedbar adjuster screws are not resting on the work surface.

Adjustments

DPA Cutting Unit Characteristics



CAUTION



Never install or work on or near a cutting unit or cutting unit suspension with the engine running. Always stop the engine and remove the key before working on or near a cutting unit.

Note: When adjusting reel to bedknife or grinding/backlapping, cutting unit assembly must be attached to traction unit or frame fixture.

The dual point adjust (DPA) bedknife-to-reel adjustment system incorporated in this cutting unit simplifies the adjustment procedure needed to deliver optimum mowing performance. The precise adjustment possible with this design gives the necessary control to provide a continual self-sharpening action. This feature maintains sharp cutting edges, assures good quality of cut and greatly reduces the need for routine backlapping.

If a cutting unit is determined to be out of adjustment, complete the following procedures in the specified order to adjust the cutting unit properly.

1. Adjust the bedknife to reel contact; refer to the *Cutting Unit Operator's Manual*.

Note: If one of the cutting unit side plates is removed during cutting unit service or maintenance, check to make sure the rear roller is level (parallel to the reel) before adjusting the rear roller; refer to [Leveling the Rear Roller \(page 8–4\)](#).

2. Determine desired height-of-cut range and adjust the rear roller accordingly; refer to the cutting unit *Operator's Manual*.
3. Adjust the height-of-cut; refer to the cutting unit *Operator's Manual*.
4. Adjust the cut-off bar; refer to the cutting unit *Operator's Manual*.
5. Adjust the optional groomer reel if equipped; refer to the universal groomer *Installation Instructions*.

Leveling the 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 a limited amount of side plate adjustment is possible to make sure that the rear roller and cutting reel remain parallel.

Note: Use a pie tape to measure the reel diameter taper; service limit 0.25 mm (0.01 inch). Leveling the rear roller of a cutting unit with a reel that exceeds the reel diameter taper limit is not recommended.

1. Ensure that the cutting unit bedknife is properly adjusted to the reel; refer to the cutting unit *Operator's Manual*.
2. Place the assembled cutting unit on a cutting unit bench plate so at least three of the reel blades contact the bench plate rib.

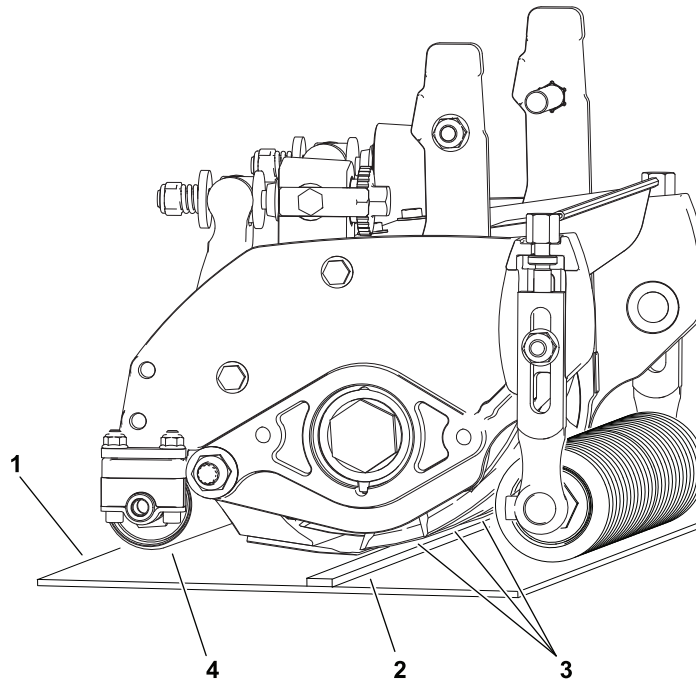


Figure 71

- | | |
|--------------------|------------------------------|
| 1. Bench plate | 3. Reel blade contacting rib |
| 2. Bench plate rib | 4. Rear roller |

3. Check if the rear roller is parallel to the cutting reel by trying to fit a 0.13 mm (0.005 in) shim between the rear roller and the bench plate at each end of rear roller. Rotate the roller and recheck the clearance at each end a few times to account for any roller run-out. If the shim passes under the roller through the entire roller rotation, the rear roller is not parallel to the reel or is high on one side and an adjustment should be made.

Note: If the cutting unit has an optional rear roller adjustment kit (eccentric roller shaft bushing), loosening the cutting unit side plate should not be necessary. Adjust the rear roller by loosening the rear roller clamp fasteners and rotating the eccentric bushing as necessary; refer to the rear roller adjustment kit *Installation Instructions* for additional information.

4. Loosen, but do not remove, the two shoulder bolts that secure the side plate to the frame on the side of the cutting unit where the rear roller is high (not contacting the bench plate).

Leveling the Rear Roller (continued)

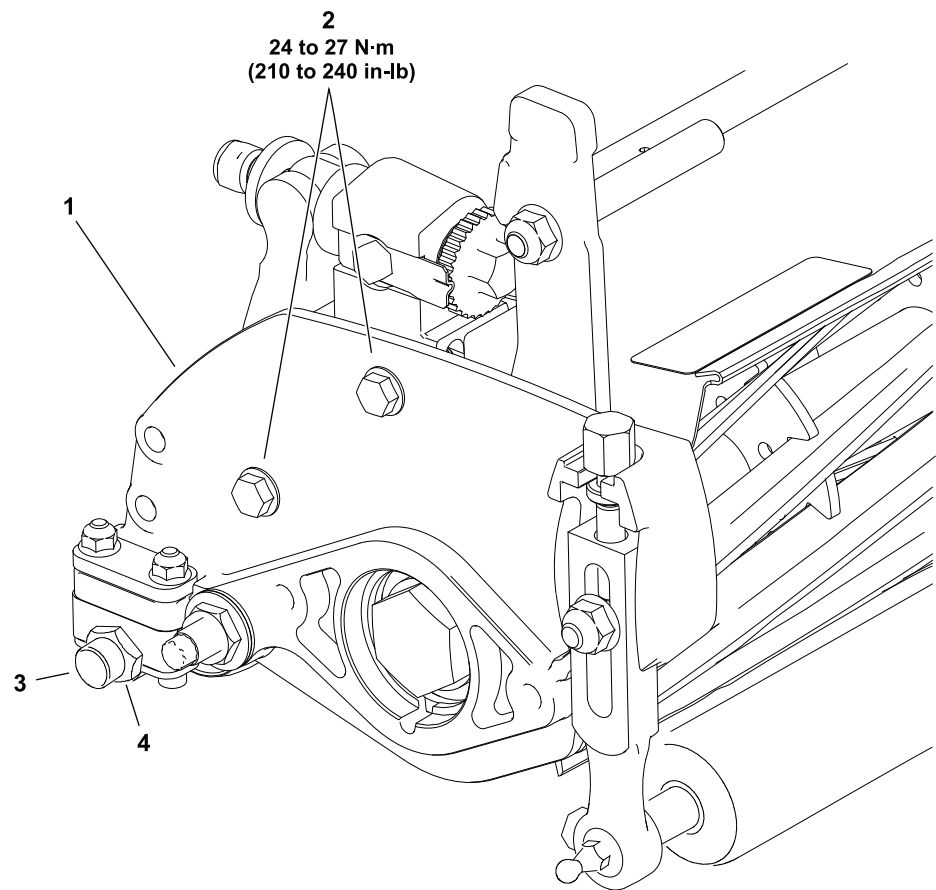


Figure 72

- | | |
|---------------------------|--|
| 1. Side plate | 3. Rear roller |
| 2. Shoulder bolt (2 each) | 4. Rear roller adjustment kit (optional) |



5. Adjust the position of the side plate so the rear roller contacts the bench plate at both ends, making the rear roller parallel to the reel. Tighten the shoulder bolts from **24 to 27 N·m (210 to 240 in-lb)**.
6. Recheck the clearance between the rear roller and the bench plate. If necessary, loosen and adjust second side plate on the side of the cutting unit where the rear roller is low (contacting the bench plate).
7. Complete the cutting unit set-up and adjustment procedure.

Service and Repairs

Bedbar Assembly

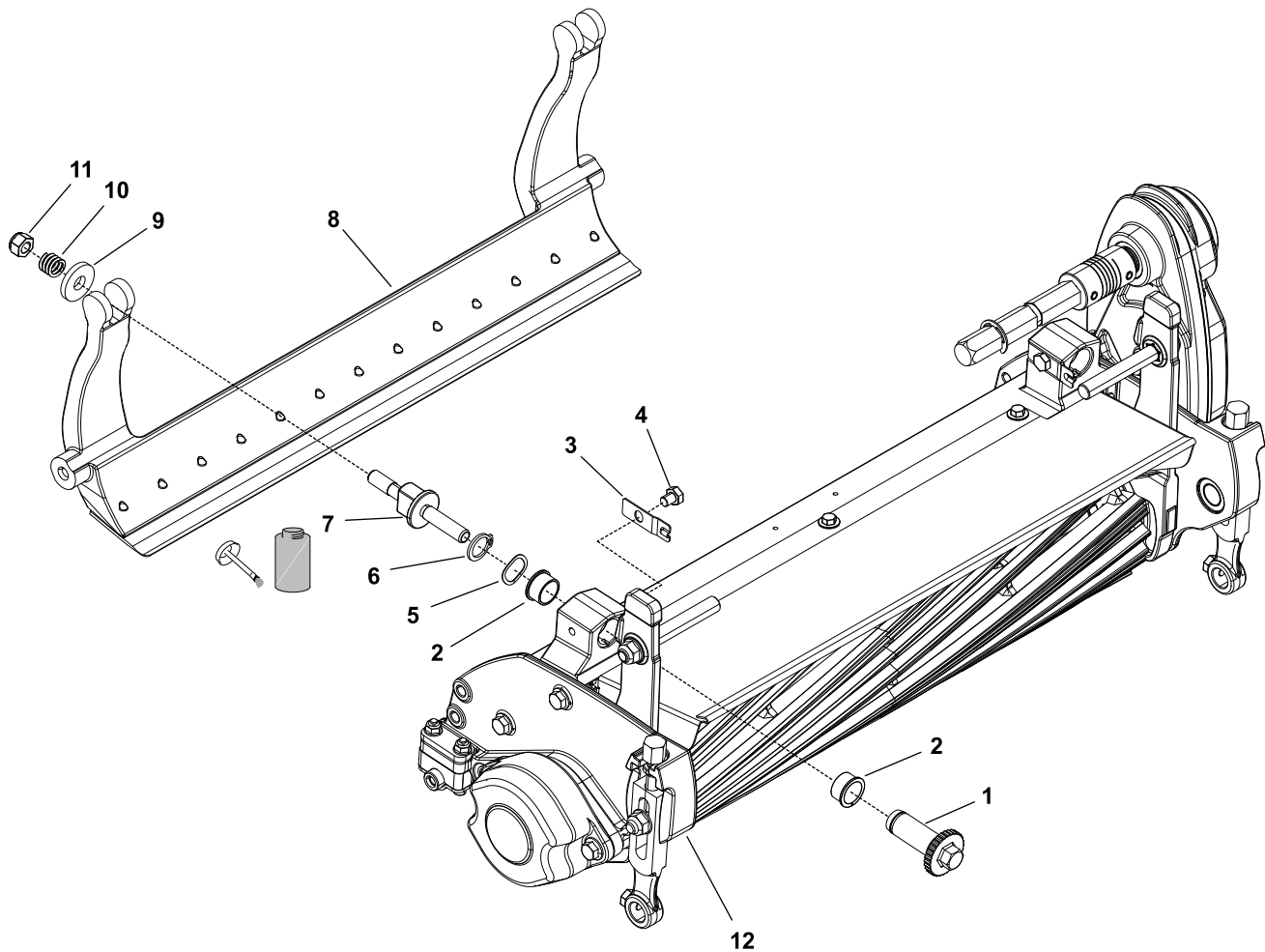


Figure 73

- | | | |
|-----------------------------------|-----------------------------------|------------------------|
| 1. Bedbar adjuster shaft (2 each) | 5. Wave washer (2 each) | 9. Washer (2 each) |
| 2. Keyed flanged bushing (4 each) | 6. Retaining ring (2 each) | 10. Compression spring |
| 3. Detent (2 each) | 7. Bedbar adjuster screw (2 each) | 11. Nut (2 each) |
| 4. Bolt (2 each) | 8. Bedbar assembly | 12. Side plate |

Removing the Bedbar

Note: Refer to [Figure 73](#) during this procedure.

1. Remove the cutting unit from the machine and place the cutting unit on a flat work surface; refer to *Operator's Manual*.
2. Loosen the nuts (11) on the end of each bedbar adjuster assembly (1) until the washers (9) are loose.
3. Tip the cutting unit to expose the bedknife and support the rear of the cutting unit; refer to [Supporting the Cutting Unit when Servicing \(page 8-2\)](#).

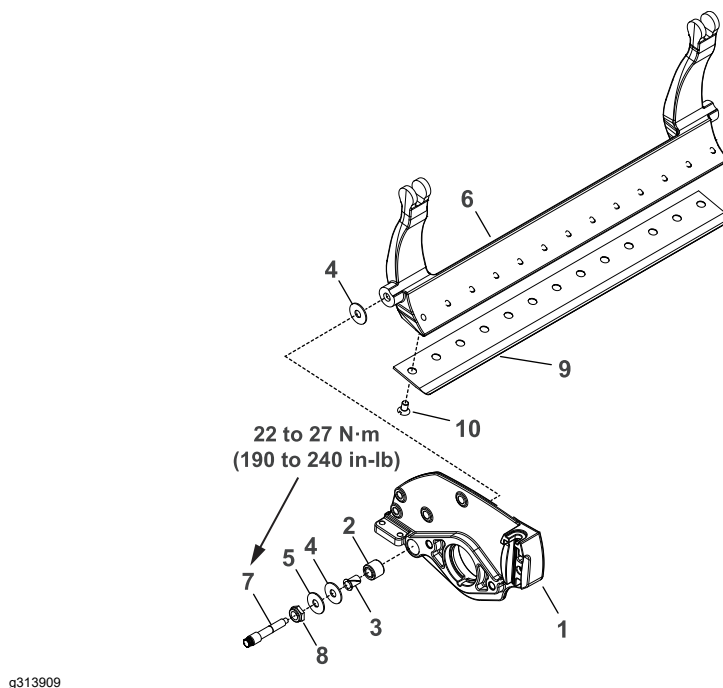


Figure 74

- | | |
|----------------------------|----------------------|
| 1. Side plate | 6. Bedbar |
| 2. Rubber bushing | 7. Bedbar pivot bolt |
| 3. Nylon bushing | 8. Locknut |
| 4. Plastic washer (2 each) | 9. Bed knife |
| 5. Metal washer | 10. Screw (13 each) |

4. Loosen the locknuts (item 8 in [Figure 74](#)) on each bedbar bolt (7).
5. Remove the two bedbar bolts (item 7 in [Figure 74](#)), two flat washers (5) and four plastic washers (4) from the cutting unit side plates (1).



CAUTION



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

6. Remove the bedbar assembly (8) from the cutting unit.
7. Inspect the nylon bushings (item 3 in [Figure 74](#)) and rubber bushings (4) in the side plates for wear or damage. Replace the bushings if necessary.

Installing the Bedbar

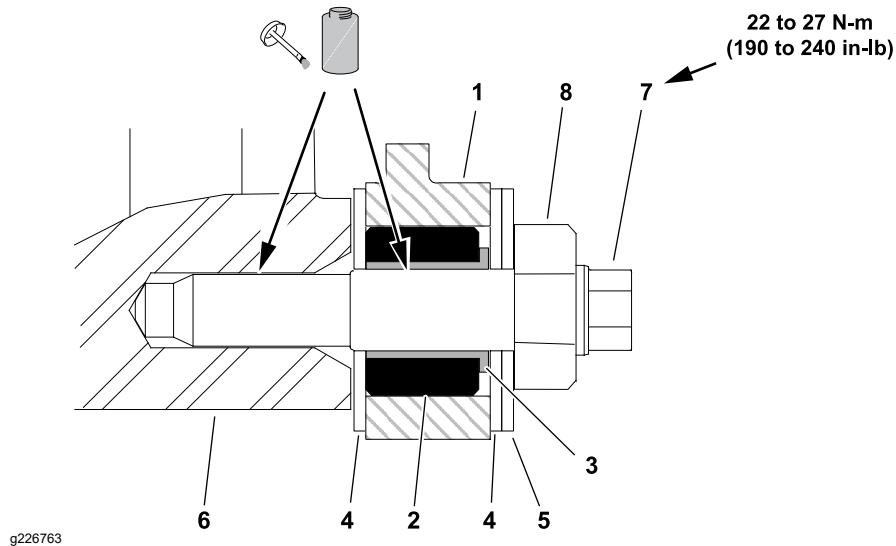


Figure 75

- | | |
|----------------------------|----------------------|
| 1. Side plate | 5. Metal washer |
| 2. Rubber bushing | 6. Bedbar |
| 3. Nylon bushing | 7. Bedbar pivot bolt |
| 4. Plastic washer (2 each) | 8. Locknut |

1. If rubber bushing (item 2 in [Figure 75](#)) was removed from either side plate, apply grease to outside surface of new bushing and install into side plate (1). The bushing (4) should be installed flush with the inside surface of the side plate; refer to [Figure 75](#).
2. If removed, install the nylon bushings (4) with flange facing outward; refer to [Figure 75](#).
3. Apply anti-seize lubricant to the threads and shank of each bedbar bolt (7); refer to [Figure 75](#).



CAUTION



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

Note: If a new bedknife is attached to the bedbar, there may be interference between the bedknife and the reel when installing the bedbar. Turn the bedbar adjusting screws counterclockwise to increase bedknife clearance if necessary.

4. Position the bedbar assembly (8) into the cutting unit. Make sure that the top of each bedbar arm is between the washer (9) and adjuster screw flange (7).

IMPORTANT

When installing the washers, make sure that the plastic washers (6 and 15) are positioned against the side plate.

5. Position one plastic washer (item 4 in [Figure 75](#)) between the bedbar (16) and each side plate (1).
6. Slide a metal washer (item 5 in [Figure 75](#)) onto the bedbar bolt (7).

Installing the Bedbar (continued)



7. Install the bedbar bolt assemblies (item 7 in [Figure 75](#)). Make sure that the washers are not caught on the threads of the pivot bolts. Torque tighten each bedbar bolt (7) from **22 to 27 N·m (190 to 240 in-lb)**.

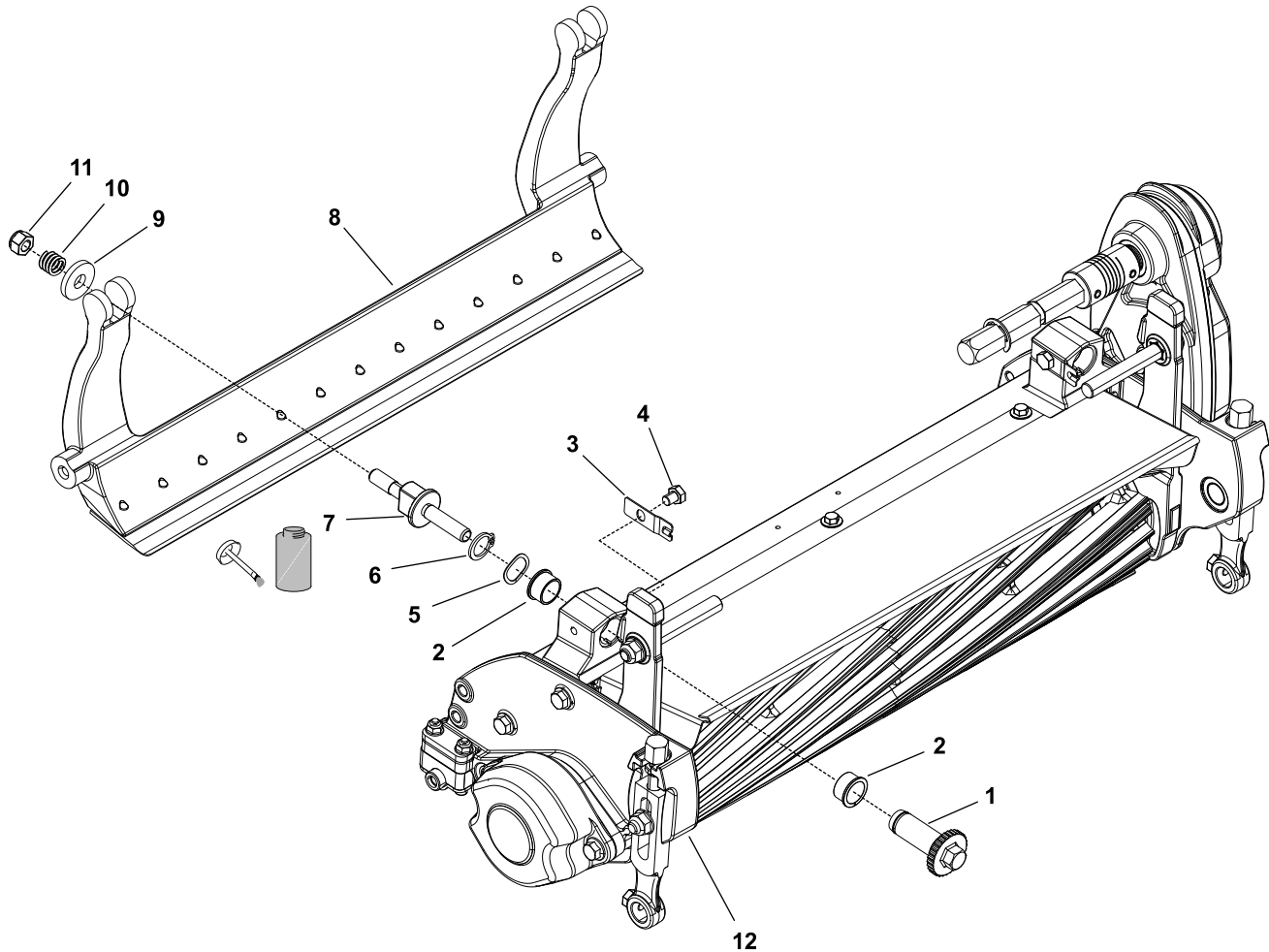
IMPORTANT

Do not over tighten the locknuts as this can distort the side plates and affect reel bearing alignment. When the locknut is correctly tightened, the inside washers may be loose.

8. Tighten both locknuts (item 8 in [Figure 75](#)) until outside metal washers do not have any end play, but can rotate.
9. Tighten the nut (item 11 in [Figure 73](#)) on each bedbar adjuster screw (7) until the adjuster spring (10) is fully compressed, then loosen the nut (11) to 1/2 turn.
10. Adjust the bedknife to reel contact; refer to the *Cutting Unit Operator's Manual*.

Servicing the Bedbar Adjuster

Removing the Bedbar Adjuster



g312976

Figure 76

- | | | |
|-----------------------------------|-----------------------------------|------------------------|
| 1. Bedbar adjuster shaft (2 each) | 5. Wave washer (2 each) | 9. Washer (2 each) |
| 2. Keyed flanged bushing (4 each) | 6. Retaining ring (2 each) | 10. Compression spring |
| 3. Detent (2 each) | 7. Bedbar adjuster screw (2 each) | 11. Nut (2 each) |
| 4. Bolt (2 each) | 8. Bedbar assembly | 12. Side plate |

Note: Refer to [Figure 76](#) during this procedure.

1. Remove bedbar; refer to [Removing the Bedbar \(page 8–7\)](#).
2. Remove the locknut (11), compression spring (10) and washer (9) from the bedbar adjuster screw (7).

Note: The bedbar adjuster shaft (1) has left-hand threads.

3. Unscrew the bedbar adjuster shaft (1) from the bedbar adjuster screw (7).
4. Remove the retaining ring (6) and wave washer (5) from the adjuster shaft (7) and remove the adjuster shaft.
5. Inspect the flange bushings (2) in the cutting unit side plate (12) and replace them if necessary.
6. Inspect the detent (3) and replace it if necessary.

Installing the Bedbar Adjuster

1. If previously removed, secure the detent (3) to the side plate (12) with the bolt (4).
2. If previously removed, align the key on the flange bushings (2) to the slots in the cutting unit side plate (12) and install.
3. Slide adjuster shaft (1) into flange bushings (2) and secure with a wave washer (5) and a retaining ring (6).

Note: The bedbar adjuster shaft (1) has left-hand threads.

4. Apply anti-seize lubricant to the threads of the bedbar adjuster screw (7) that fit into adjuster shaft (1) (the left hand threads) and thread the bedbar adjuster screw into the adjuster shaft.
5. Install the washer (9), compression spring (10) and locknut (11) onto the adjuster screw (7).
6. Install the bedbar (8); refer to [Installing the Bedbar \(page 8–8\)](#).

Bedknife

Removing the Bedknife

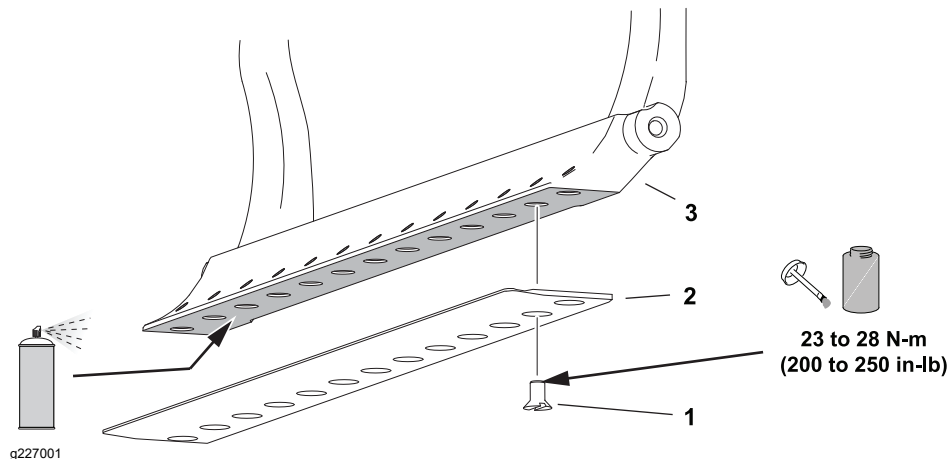


Figure 77

1. Bedknife screw (13 used)
2. Bedknife
3. Bedbar

1. Remove the bedbar from the cutting unit; refer to [Removing the Bedbar \(page 8–7\)](#).
2. Using a socket wrench and the bedknife screw tool, remove screws that secure the bedknife to the bedbar, and remove the bedknife; refer to [Special Tools \(page 2–14\)](#).

IMPORTANT

Discard the old bedknife screws.

3. Refer to [Troubleshooting Bedknife Grinding \(page 8–16\)](#) for additional information.

Installing the Bedknife

1. Use a scraper to remove all rust, scale, and corrosion from the bedbar surface under the bedknife. Lightly oil the bedbar surface before installing the bedknife.
2. Make sure that screw threads in bedbar (5/16-18UNC-2A) are clean.

IMPORTANT

Use new bedknife screws when installing the bedknife.

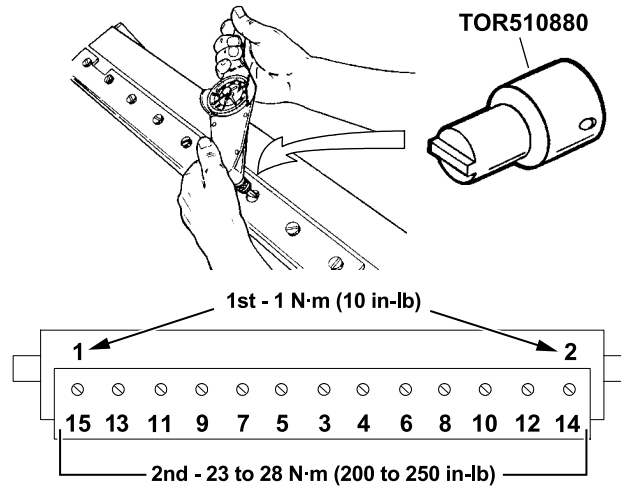
3. Assemble the bedknife to bedbar using new bedknife screws. Apply anti-seize lubricant to the threads of new screws. Do not apply anti-seize lubricant to the taper of the screw heads.
4. Install all screws but do not tighten.

IMPORTANT

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

Installing the Bedknife (continued)

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



g226894

Figure 78

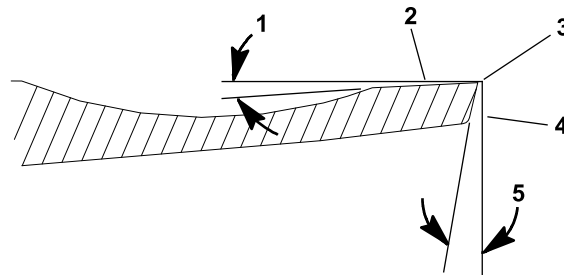
- Working from the center of the bedknife toward each end, tighten screws from **23 to 28 N·m (200 to 250 in-lb)**.
- After installing the bedknife to bedbar, grind the bedknife.

Grinding the Bedknife

Bedknife Grinding Specifications

Standard Bedknife Relief Angle	3° minimum
Fairway Bedknife Relief Angle	3° minimum
Extended Bedknife Relief Angle	7° minimum
Front Angle Range	13° to 17°

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; refer to [Bedknife Grinding Specifications \(page 8–14\)](#). Grind only enough material so that the top surface of the bedknife is true; refer to [Figure 79](#).



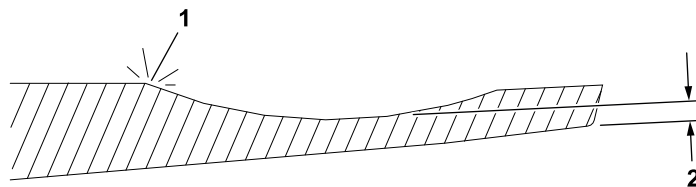
g207289

Figure 79

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

IMPORTANT

Do not grind the bedknife below the service limit; refer to [Figure 80](#). 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.



g227152

Figure 80

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

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.**

IMPORTANT

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 developed special service tools for accurately measuring the top grind angle on all bedknives; refer to [Angle Indicator and Magnetic Mount \(page 2–16\)](#).

1. Use the Toro General Service Training Book, Reel Mower Basics (part no. 09168SL) and grinder manufacturer's instructions for bedknife grinding information.
2. After grinding the bedknife, install the bedbar assembly in the cutting unit; refer to [Installing the Bedbar \(page 8–8\)](#).

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.

Troubleshooting Bedknife Grinding

Perform this troubleshooting procedure if a newly ground bedknife does not cut test paper at the center of the knife.

1. Place a .002 inch shim (Part No. 140-5531) between the outer most left and right magnets and the bedbar-bedknife assembly when placing it in the grinder ([Figure 81](#)).

Note: If a bedknife does not cut paper more than 2 inches from each end, place the shims on the inner magnets instead of the outer magnets.

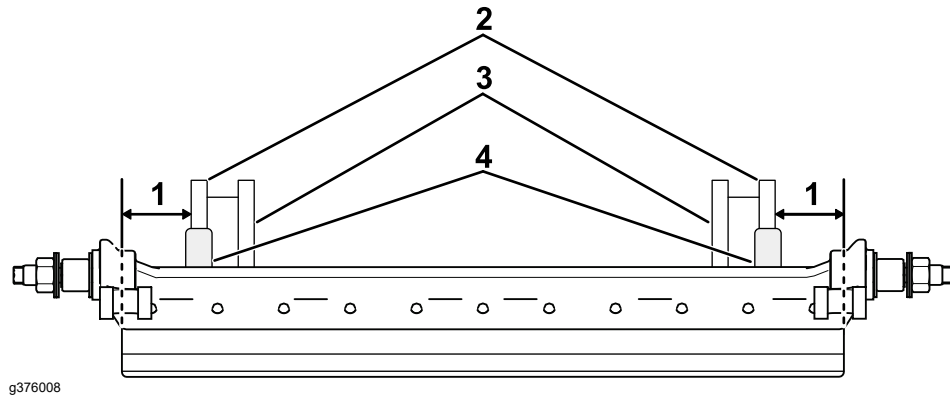


Figure 81

- | | |
|---|---------------------------------------|
| 1. 1 inch between the outer edge of the bedknife and the outer magnet | 3. Inner magnets |
| 2. Outer magnets | 4. .002 inch shim (Part No. 140-5531) |
-
2. Ensure that you are following the grinder manufacturer instructions and grind the bedknife.
 3. In most cases the outside of each outer magnet should be 1 inch (25 mm) from the outside edge of the bedknife.
 4. Remove the bedbar-bedknife assembly from the grinder.
 5. If you have a precision flat granite surface plate, check the bedbar-bedknife; refer to [Checking the Bedknife on a Granite Surface Plate \(page 8–16\)](#).
 6. Install the bedbar-bedknife assembly to the cutting unit and adjust the cutting unit; refer to your Cutting Unit Operator's Manual.
 7. Test the cut across the entire length of the bedknife, if the paper does not cut across the entire length, complete this procedure again with an additional shim installed on each magnet (maximum of 4 shims total).

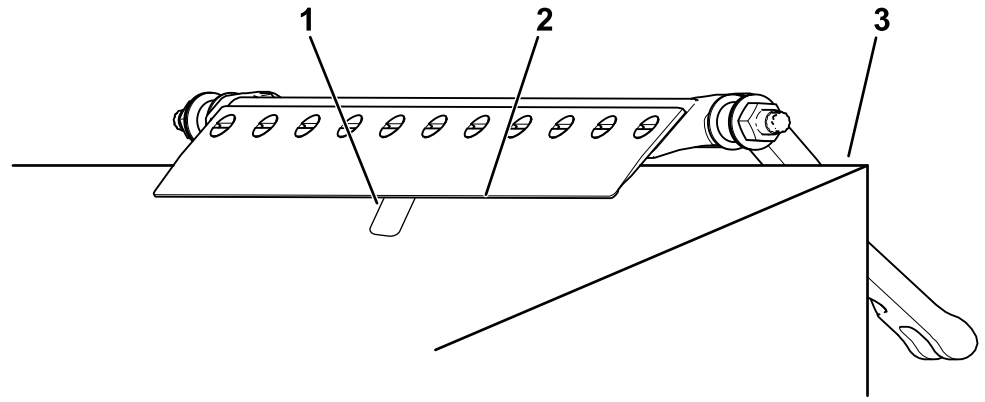
Note: If a properly adjusted cutting unit does not cut the test paper cleanly across the entire length of the bedbar-bedknife after grinding, check the grind angle to be sure it is ground to the bedknife grinding specification; refer to [Bedknife Grinding Specifications \(page 8–14\)](#).

Note: If there are still gaps after grinding with 2 shims at either the outer or inner magnets (maximum of 4 shims total), there may be a separate issue; contact the Technical Assistance Center.

Checking the Bedknife on a Granite Surface Plate

1. Place bedbar-bedknife assembly on a precision flat granite surface plate with the cutting-edge down. Look for visible light between the granite and the bedknife, or use a shim to test for .002 inch or greater gaps ([Figure 82](#)).

Checking the Bedknife on a Granite Surface Plate (continued)



g376005

Figure 82

1. Shim (.002 inch) to test for gaps
2. Inspect the surface between the bedknife and granite for light
3. Granite surface plate

-
2. If there is a gap that the shim fits through, or light shows between the granite and the cutting edge after grinding with 1 shim, regrind the bedknife with an additional shim installed (maximum of 4 shims total, 2 per magnet); refer to [Troubleshooting Bedknife Grinding \(page 8–16\)](#).

Reel Assembly

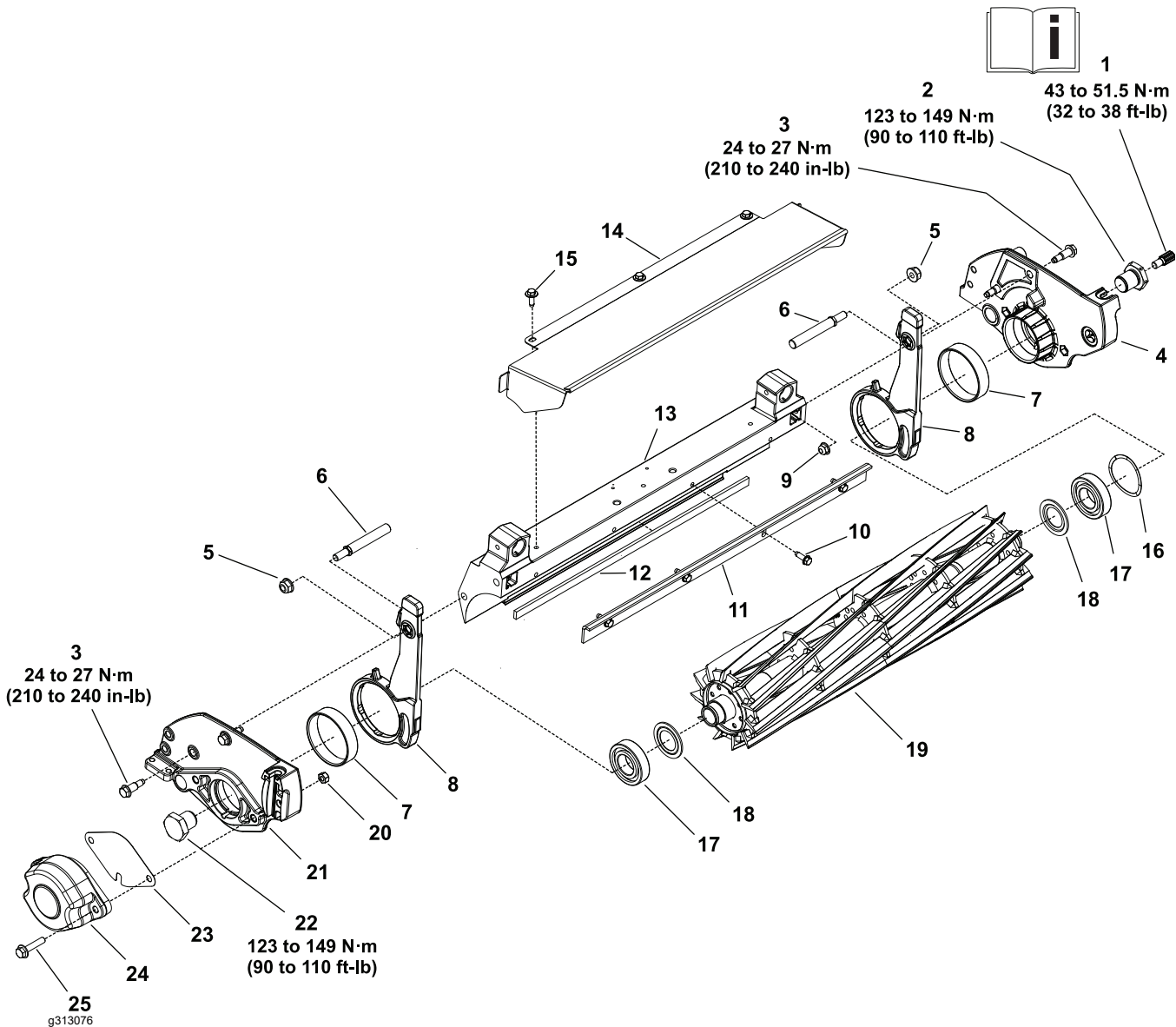


Figure 83

- | | | |
|-------------------------|----------------------|-------------------|
| 1. Drive spline | 10. Bolt | 19. Reel assembly |
| 2. Reel nut - LH | 11. Cutoff bar | 20. Nut |
| 3. Flange shoulder bolt | 12. Strip seal | 21. RH side plate |
| 4. LH side plate | 13. Crossmember | 22. Reel nut - RH |
| 5. Nut | 14. Grass shield | 23. Gasket |
| 6. Mount pin | 15. Bolt | 24. Counterweight |
| 7. Bushing | 16. Flat wire spring | 25. Bolt |
| 8. Pitch arm | 17. Sealed bearing | |
| 9. Flange nut | 18. Seal | |

This section provides the procedure for removing and installing the reel assembly (reel, reel bearing, bearing lock screw, reel nut and seals) from the cutting unit.

Removing the Reel Assembly

Note: Refer to [Figure 83](#) during this procedure.

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.
2. Remove the cutting unit assembly from the machine; refer to the traction unit *Operator's Manual*.
3. If the cutting unit is equipped with an optional universal groomer, remove the groomer gear box; refer to [Removing the Gearbox Assembly \(page 9–5\)](#).
4. Remove the reel drive assembly; refer to [Removing the Reel Drive Assembly \(page 5–7\)](#).
5. Remove the fasteners securing the counterweight (24) and gasket (23) to the RH side plate. Remove the counterweight and discard the gasket.



CAUTION

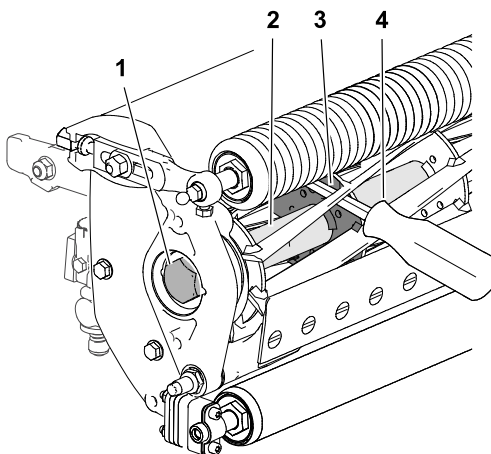


Contact with the reel, bedknife or other cutting unit parts can result in personal injury. Use heavy gloves when removing the cutting reel.

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 roller.

6. Loosen the RH reel nut and LH reel nut.
 - A. Tip up the cutting unit to access the bottom of the reel.



g381385

Figure 84

- | | |
|------------------|-----------------------------|
| 1. Reel nut – RH | 3. Support plate, weld side |
| 2. Reel shaft | 4. Pry bar |

- 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

Removing the Reel Assembly (continued)

pass between the top of the reel shaft and the backs of the reel blades so that the reel will not move; refer to [Figure 84](#).

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 reel nut being removed.

IMPORTANT

The LH reel nut (with drive shaft) on the left end of the cutting reel has left- hand threads. The reel nut on the right end of the cutting reel has right- hand threads.

- D. Rest the handle of the pry bar against the front roller and loosen the reel nut.
- E. Position the pry bar in the same manner on the opposite end of the reel and loosen the remaining reel nut.
- F. Tip the cutting unit back onto its roller.
7. Remove the bedbar; refer to [Removing the Bedbar \(page 8–7\)](#).
8. Remove the front roller; refer to [Removing the Front Roller \(page 8–27\)](#).
9. Remove the rear roller; refer to [Removing the Rear Roller \(page 8–28\)](#).

IMPORTANT

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

10. Support the cutting reel to prevent it from shifting or falling and remove the 2 socket head screws (3) that secure the LH side plate (4) to the crossmember (13).
11. Remove the 2 socket head screws (3) that secure the RH side plate (21) to the crossmember (13).
12. Remove the crossmember (13) from the reel assembly (19).
13. If necessary, remove the three bolts (15) that secures the grass shield (14) to the crossmember (13). Remove the grass shield (14) from the crossmember (13).
14. Carefully slide the cutting reel assembly (with seals, bearings, and reel nuts) from the side plates. Retrieve the flat wire spring from the reel bearing bore of the left side plate.
15. Thoroughly clean any grease and corrosion from the reel bearing bores in the side plates. Inspect the side plates and pitch arms (8) for wear or damage and replace components if needed.
16. Inspect the remaining cutting unit components for corrosion, wear, or damage and replace the components as necessary.

Inspecting the Reel Assembly

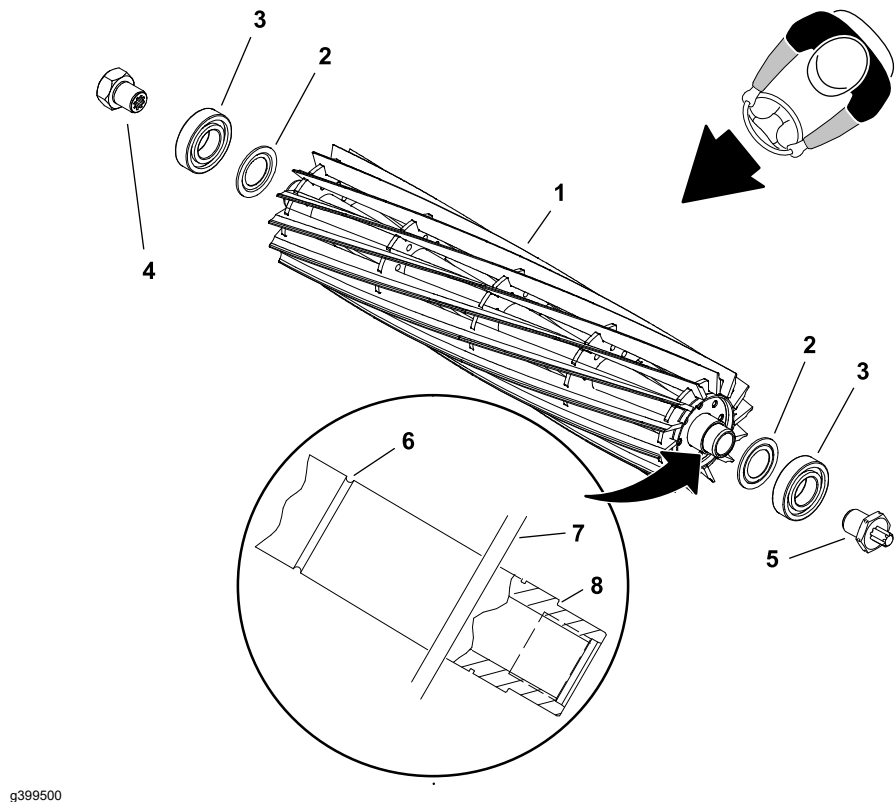


Figure 85

- | | |
|--------------------------|--|
| 1. Cutting reel | 5. LH reel nut (with spline adapter) |
| 2. Flocked seal (2 each) | 6. Groove indication left hand threads |
| 3. Bearing (2 each) | 7. Left-most reel spider |
| 4. RH reel nut | 8. Bearing shoulder |

1. Remove the reel nuts from the cutting reel.
2. Slide the bearings and seals from the reel shaft. Discard the seals and inspect the reel bearings to ensure that they spin freely and have a minimal amount of axial play.
3. Inspect the reel as follows:
 - A. Place the reel shaft ends in V-blocks and check the reel shaft for distortion.
 - B. Check the threads in the ends of the reel shaft.
 - C. Check the reel blades for bending or cracking.
 - D. Check the service limit of the reel diameter; refer to [Preparing the Reel for Grinding \(page 8–25\)](#).
4. Replace the reel if damage is evident.

IMPORTANT

The seal must be installed with the flocked side (red) of the seal toward the bearing.

5. Slide the new flocked seals and the bearings onto the reel shaft until they contact the shoulder of the reel shaft.

Inspecting the Reel Assembly (continued)

Note: The reel nut on the left end of the cutting reel has left-hand threads. The left end of the cutting reel shaft is identified with a groove cut between the left-most reel spiders. Tighten the reel nuts to the specified torque once the cutting reel is installed in the cutting unit.

6. Inspect the LH reel nut and spline adapter:

- A. Ensure that the spline adapter is not loose or damaged.

Note: The spline adapter was installed at the factory with high strength thread locking compound. Heat the LH reel nut prior to removing the spline adapter.

- B. If removing the spline adapter is necessary, use a reel nut from a current riding Greensmaster cutting unit as a tool; refer to [Spline Adapter Tool \(page 2–15\)](#).

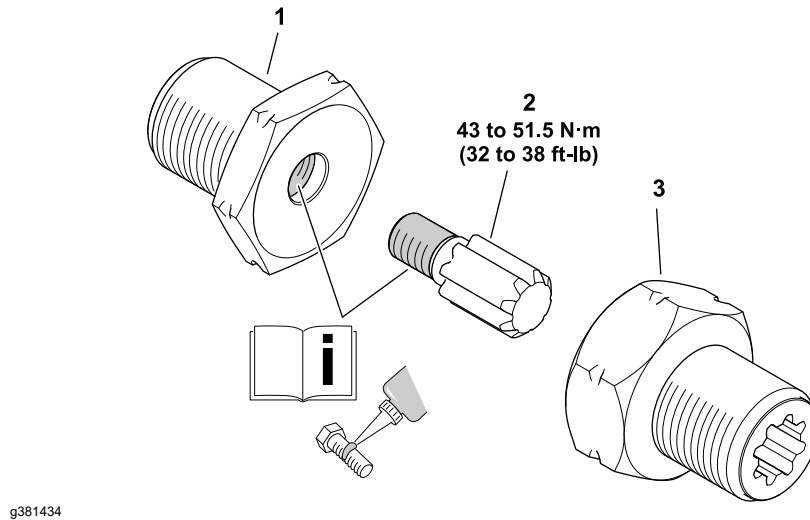


Figure 86

- | | |
|-------------------|--|
| 1. LH reel nut | 3. Tool (riding Greensmaster reel nut) |
| 2. Spline adapter | |

-
- C. Clean and inspect the spline adapter threads and the internal threads of the LH reel nut. Replace the spline adapter or LH reel nut if necessary.

IMPORTANT

Use high strength thread locking compound (Loctite 271 or equivalent) OR factory applied thread locking compound (patch lock) to lock the spline adapter in place. Combining the two compounds will not hold the spline adapter in position sufficiently.

- D. **If installing a used spline adapter:** Remove any residual thread locking compound from the spline adapter threads and the internal threads of the LH reel nut. Apply a liberal amount of high strength thread locking compound (Loctite 271 or equivalent) to the threads of the spline adapter and the internal threads of the LH reel nut prior to installation.

If installing a new spline adapter without factory applied thread locking compound (patch lock): Remove any residual thread locking compound from the internal threads of the LH reel nut. Apply a liberal amount of high strength thread locking compound (Loctite 271 or

Inspecting the Reel Assembly (continued)

equivalent) to the threads of the spline adapter and the internal threads of the LH reel nut prior to installation.

If installing a new spline adapter with factory applied thread locking compound (patch lock): Remove any residual thread locking compound from the internal threads of the LH reel nut.



- E. Use a reel nut from a current riding Greensmaster cutting unit to install the spline adapter. Tighten the spline adapter from **43 to 51.5 N·m (32 to 38 ft-lb)**.

- 7. Install the reel nuts finger tight.

Installing the Reel Assembly

- 1. Position the cutting unit on a flat work area.



CAUTION



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

- 2. Apply a thin coat of grease to the outside of the cutting reel bearings and carefully slide the cutting reel assembly into the right side plate. Make sure that the reel bearing is fully seated in the RH side plate, and that the spline adapter is on the left (exposed) end of the cutting reel.
- 3. If removed, install the grass shield (14) to the crossmember (13) and secure with the three bolts (15).
- 4. Place the flat wire spring into bearing bore of LH side plate and carefully slide the left side plate onto the cutting reel assembly as far as possible.



- 5. Install the four shoulder bolts (3) that secure the RH and LH side plates (4 and 21) to the crossmember (13). Tighten the shoulder bolts (3) from **24 to 27 N·m (210 to 240 in-lb)**.
- 6. Install the rear roller; refer to [Installing the Rear Roller \(page 8–28\)](#).
- 7. Install the front roller; refer to [Installing the Front Roller \(page 8–27\)](#).
- 8. Install the bedbar assembly; refer to [Installing the Bedbar \(page 8–8\)](#).
- 9. If loosened during cutting reel service, tighten the RH reel nut and the LH reel nut.

Installing the Reel Assembly (continued)

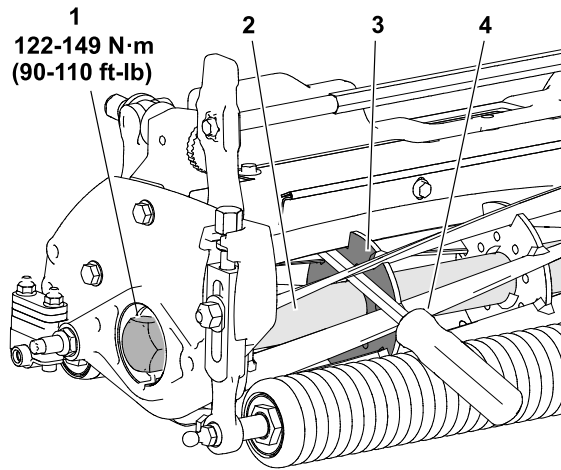


Figure 87

- | | |
|----------------|-----------------------------|
| 1. RH reel nut | 3. Support plate, weld side |
| 2. Reel shaft | 4. Pry bar |

-
- 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; refer to [Figure 87](#).

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 reel nut being tightened.

IMPORTANT

The reel nut on the left end of the cutting reel has left- hand threads. The reel nut 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 reel nut from **123 to 149 N·m (90 to 110 ft-lb)**.
- D. Position the pry bar in the same manner on the opposite end of the reel and tighten the remaining reel nut from **123 to 149 N·m (90 to 110 ft-lb)**.
10. Check to make sure the rear roller and cutting reel are parallel; refer to [Leveling the Rear Roller \(page 8–4\)](#).
11. Install the reel drive assembly; refer to [Installing the Reel Drive Assembly \(page 5–9\)](#). Grease the splines with high temp Mobil XHP–222 grease or equivalent.
12. Install the cutting unit assembly to the machine; refer to the traction unit *Operator's Manual*.

Installing the Reel Assembly (continued)

13. Use a new gasket and install the counterweight to the right side plate with the fasteners previously removed.
14. If the cutting unit is equipped with an optional universal groomer, install the universal groomer gear box; refer to [Groomer Drive Gearbox \(page 9–4\)](#).
15. Adjust the cutting unit; refer to the cutting unit *Operator's Manual*.
 - A. Adjust the bedknife-to-reel contact.
 - B. Adjust the height-of-cut (rear roller height then front roller height).
 - C. Adjust the cut-off bar.
 - D. Adjust the optional groomer reel if equipped; refer to the universal groomer *Installation Instructions*.

Preparing the Reel for Grinding

Reel Grinding Specifications

Reel Diameter New (D)	128.5 mm (5.06 inch)
Reel Diameter Service Limit	114.3 mm (4.50 inch)
Reel Diameter Taper Limit (D1 – D2)	0.25 mm (0.01 inch)
Blade Land Width	0.8 to 1.2 mm (0.03 to 0.05 inch)
Blade Relief Angle	$30^{\circ} \pm 2^{\circ}$
Reel Shaft Diameter	34.9 mm (1.375 inch)

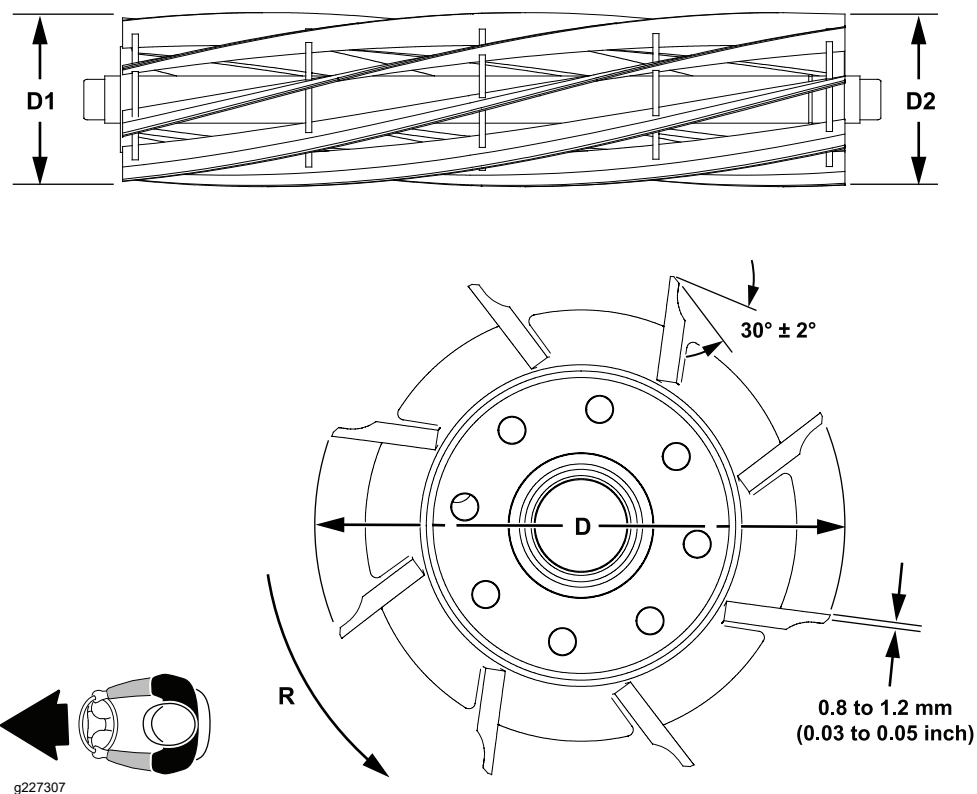


Figure 88

(R = Direction of Rotation)

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

Preparing the Reel for Grinding (continued)

unit components can affect the grinding results. When grinding, be careful to not overheat the cutting reel blades. Remove small amounts of material with each pass of the grinder.

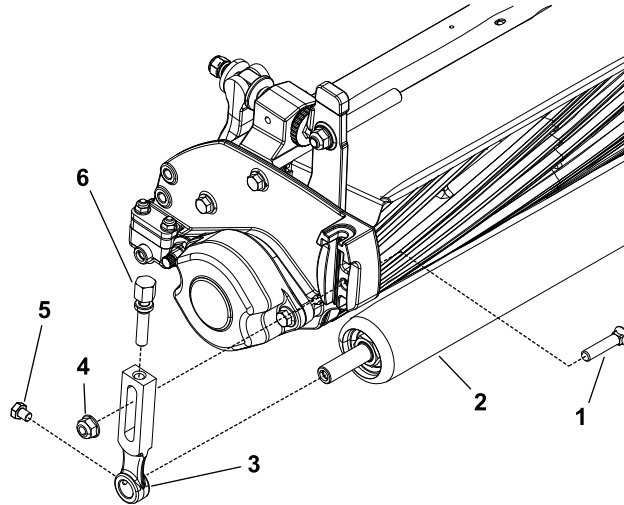
Follow reel grinder manufacturer's instructions to grind cutting reel to Toro specifications; refer to [Reel Grinding Specifications \(page 8–25\)](#). Additional reel grinding information can be found in the *Cutting Unit Operator's Manual*. An additional resource is the Toro Basics Series Training Book, Reel Mower Basics (part no. 09168SL) found on the Service Reference Set available from your Authorized Toro Distributor.

Relief grind the reel blades to the minimum blade land width if the reel blade land width exceeds the service limit. Spin grind the reel to establish the specified blade land width or to restore the reel's cylindrical shape.

Note: Always adjust the cutting unit after grinding the reel and/or bedknife; refer to the *Cutting Unit Operator's Manual*. 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.

Roller Assemblies

Removing the Front Roller



g313144

Figure 89

- | | |
|-------------------------------|---------------------------------|
| 1. Plow bolt (2 each) | 4. Locknut (2 each) |
| 2. Front roller assembly | 5. Pinch bolt (2 each) |
| 3. Height-of-cut arm (2 each) | 6. Height-of-cut screw (2 each) |

Note: Refer to [Figure 89](#) during this procedure.

1. Remove the cutting unit from the machine and place it on a level work surface. Use an appropriate support to raise the front roller off the work surface.
2. Loosen the pinch bolts that secure the front roller shaft to the front height-of-cut arms.
3. Remove the locknut and plow bolt that secures one of the height-of-cut arms to the cutting unit side plate and remove the height-of-cut arm.
4. Slide the front roller assembly from the remaining height-of-cut arm.
5. Remove the remaining height-of-cut arm from the cutting unit if necessary.

Installing the Front Roller

Note: Refer to [Figure 89](#) during this procedure.

1. Place the cutting unit on a level work surface. Use an appropriate support to raise the front the cutting unit off the work surface.
2. Inspect the condition of both height-of-cut screws and replace them if necessary. Apply anti-seize lubricant to the threads of a new height-of-cut screw.

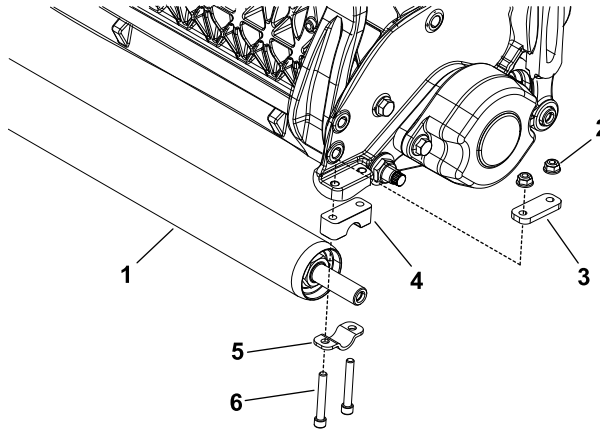
Note: When installing the height-of-cut arms, make sure tab of the side plate fits between the head and the washer of the height-of-cut screw.

3. Secure one of the height-of-cut arms to the side plate with a plow bolt and locknut.
4. Slide the front roller shaft into the height-of-cut arm attached to the cutting unit.
5. Slide the remaining height-of-cut arm onto the other end of roller shaft. Secure the remaining height-of-cut arm to the side plate with a plow bolt and locknut.

Installing the Front Roller (continued)

- Center the front roller in the cutting unit and tighten the pinch bolts that secure the front roller shaft to the height-of-cut arms.
- Adjust the cutting unit height-of-cut; refer to the *Cutting Unit Operator's Manual*.

Removing the Rear Roller



g313146

Figure 90

- | | |
|-------------------------|-------------------------------|
| 1. Rear roller assembly | 4. Spacer |
| 2. Flange nut (2 each) | 5. Shaft retainer |
| 3. Shim | 6. Socket head screw (2 each) |

Refer to [Figure 90](#) for this procedure.

- Remove the cutting unit from the machine and place it on a level work surface. Place blocks under the bedbar to raise the rear roller off the work surface.
- Loosen the flange nuts that secure the rear roller retainer assemblies (flange nuts, socket head screws, shaft retainer, spacer, and shims) to the cutting unit.

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

- Remove one of the rear roller retainer assemblies.
- Slide the rear roller assembly from the remaining retainer assembly.
- Remove the remaining retainer assembly from the cutting unit if necessary.

Installing the Rear Roller

Refer to [Figure 90](#) for this procedure.

- Place the cutting unit on a level work surface. Place blocks under the bedbar to raise the rear of the cutting unit off the work surface.

Note: Refer to the Cutting Unit Operator's Manual to determine the number of shims required for the desired height-of-cut range.

- If previously removed, install one of the rear roller retainer assemblies (flange nuts, socket head screws, shaft retainer, spacer, and shims) to the cutting unit.
- Slide the rear roller shaft into the retainer assembly attached to the cutting unit.
- Install the remaining rear roller retainer assembly.

Installing the Rear Roller (continued)

5. Center the rear roller in the cutting unit and tighten the flange nuts at each of the retainer assemblies.
6. Adjust the rear roller height; refer to the *Cutting Unit Operator's Manual*.

Disassembling the Roller

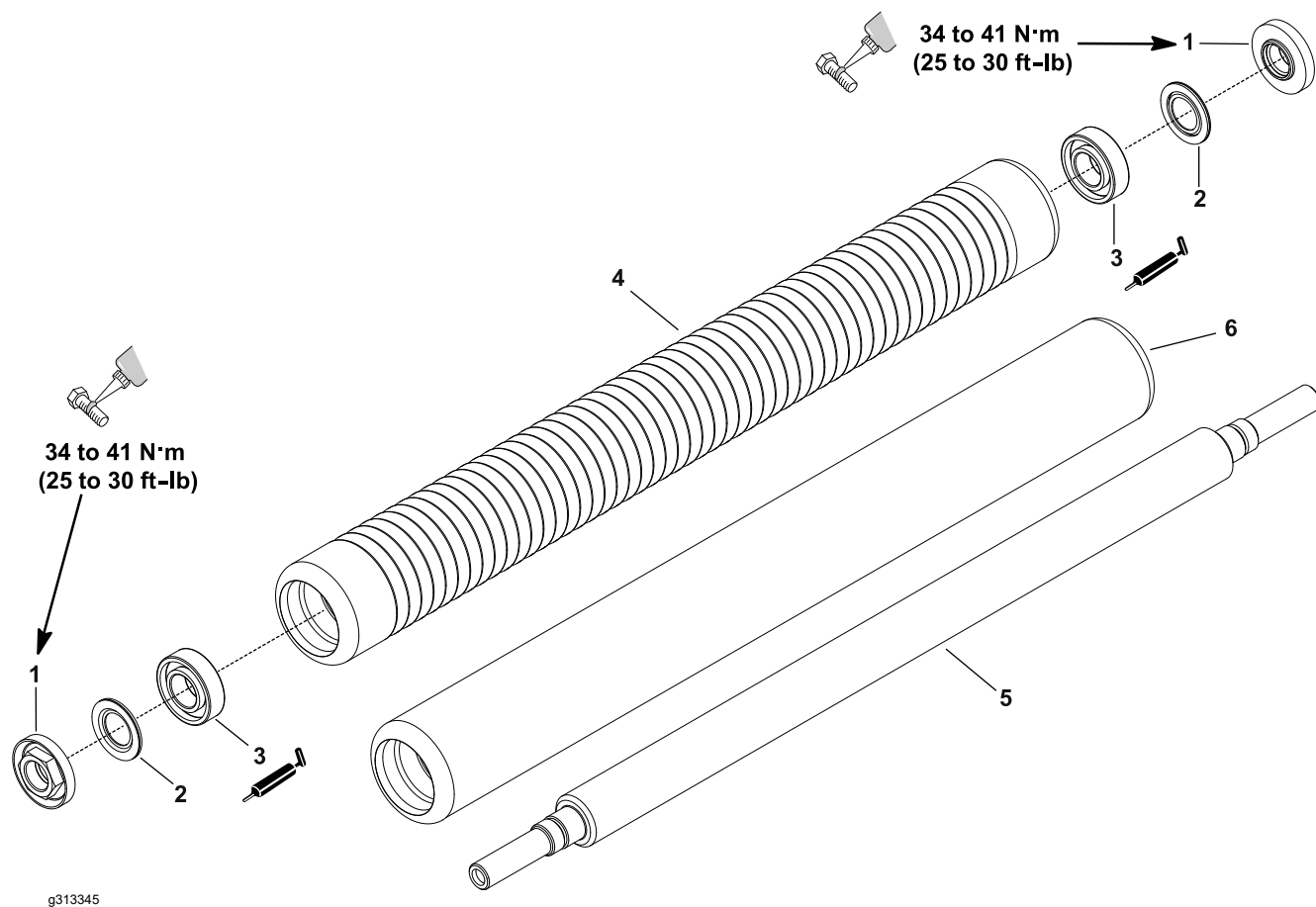


Figure 91

- | | | |
|-----------------------------|--------------------------|------------------|
| 1. Bearing locknut (2 each) | 3. Ball bearing (2 each) | 5. Roller shaft |
| 2. Sealing washer (2 each) | 4. Wiehle roller | 6. Smooth roller |

Note: The rear roller is a low drag roller.

1. To hold the roller shaft (5) stationary while removing the bearing locknut (1), install a 3/8-24 UNF 2B screw with a jam nut into the threaded end of the roller shaft (5) and tighten the jam nut against the roller shaft. Remove the bearing locknuts (1).
2. Carefully inspect the seating surface and threads of the bearing locknuts (1) and replace them if damaged.
3. Loosely secure the roller assembly (4) in a bench vise and lightly tap on the roller shaft (5) to remove the sealing washers (2) and bearings (3). Discard the sealing washers (2).
4. Clean and carefully remove any corrosion from the bearing cavities of the roller.

Assembling the Roller

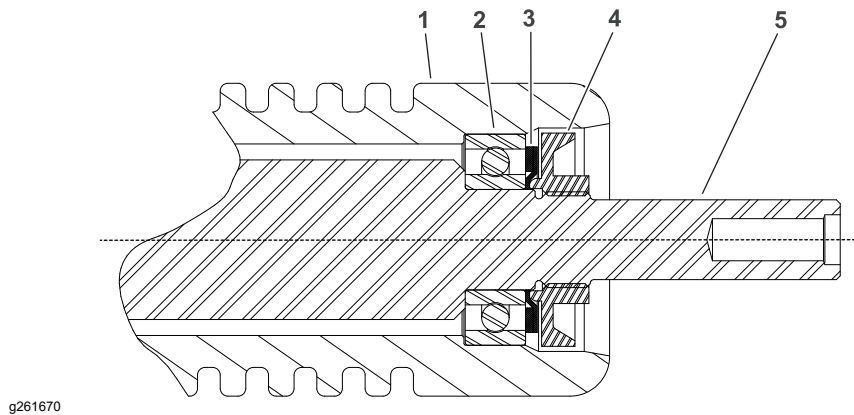


Figure 92

- | | |
|-----------------|--------------------|
| 1. Roller | 4. Bearing locknut |
| 2. Ball bearing | 5. Roller shaft |
| 3. Seal | |

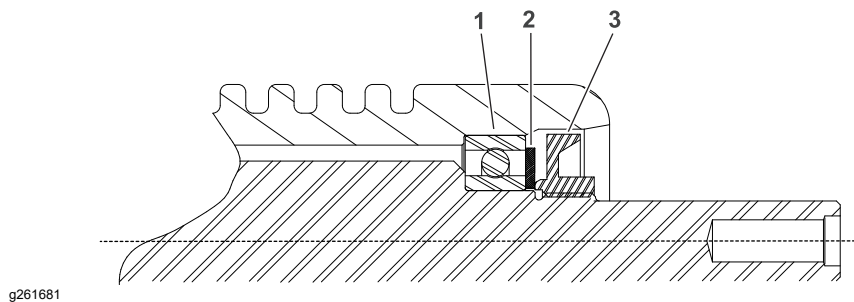


Figure 93

- | | |
|------------|--------------------|
| 1. Bearing | 3. Bearing locknut |
| 2. Seal | |

Note: The rear roller is a low drag roller.

1. Press the bearing into the roller (support both inner and outer raceways).
2. Place the roller shaft into the roller.
3. Press the 2nd bearing into the roller (support both).



4. Install the sealing washer and bearing locknut onto each end of the roller shaft. Tighten the locknuts to **34 to 41 N·m (25 to 30 ft-lb)**.

Installing the Front Roller

1. Place the cutting unit on a level work surface. Use an appropriate support to raise the front of the cutting unit off the work surface.
2. Inspect the condition of both height-of-cut screws (9) and replace them if necessary. Apply anti-seize lubricant to the threads of a new height-of-cut screw (9).

Note: When installing the height-of-cut arms (5), make sure that the tab of the side plate fits between the head and the washer of the height-of-cut screw (9).

3. Secure one of the height-of-cut arms (5) to the side plate with a plow bolt (1) and locknut (6).
4. Slide the front roller shaft (3) into the height-of-cut arm (5) attached to the cutting unit (10).

Installing the Front Roller (continued)

5. Slide the remaining height-of-cut arm (5) onto the other end of roller shaft. Secure the remaining height-of-cut arm to the side plate with a plow bolt and locknut.
6. Center the front roller (3) in the cutting unit and tighten the pinch bolts (8) that secure the front roller shaft to the height-of-cut arms.
7. Install the cutting unit assembly to the frame assembly; refer to *Operator's Manual*, (If necessary).
8. Adjust the cutting unit height-of-cut; refer to the *Cutting Unit Operator's Manual*.



Universal Groomer (Optional)

Table of Contents

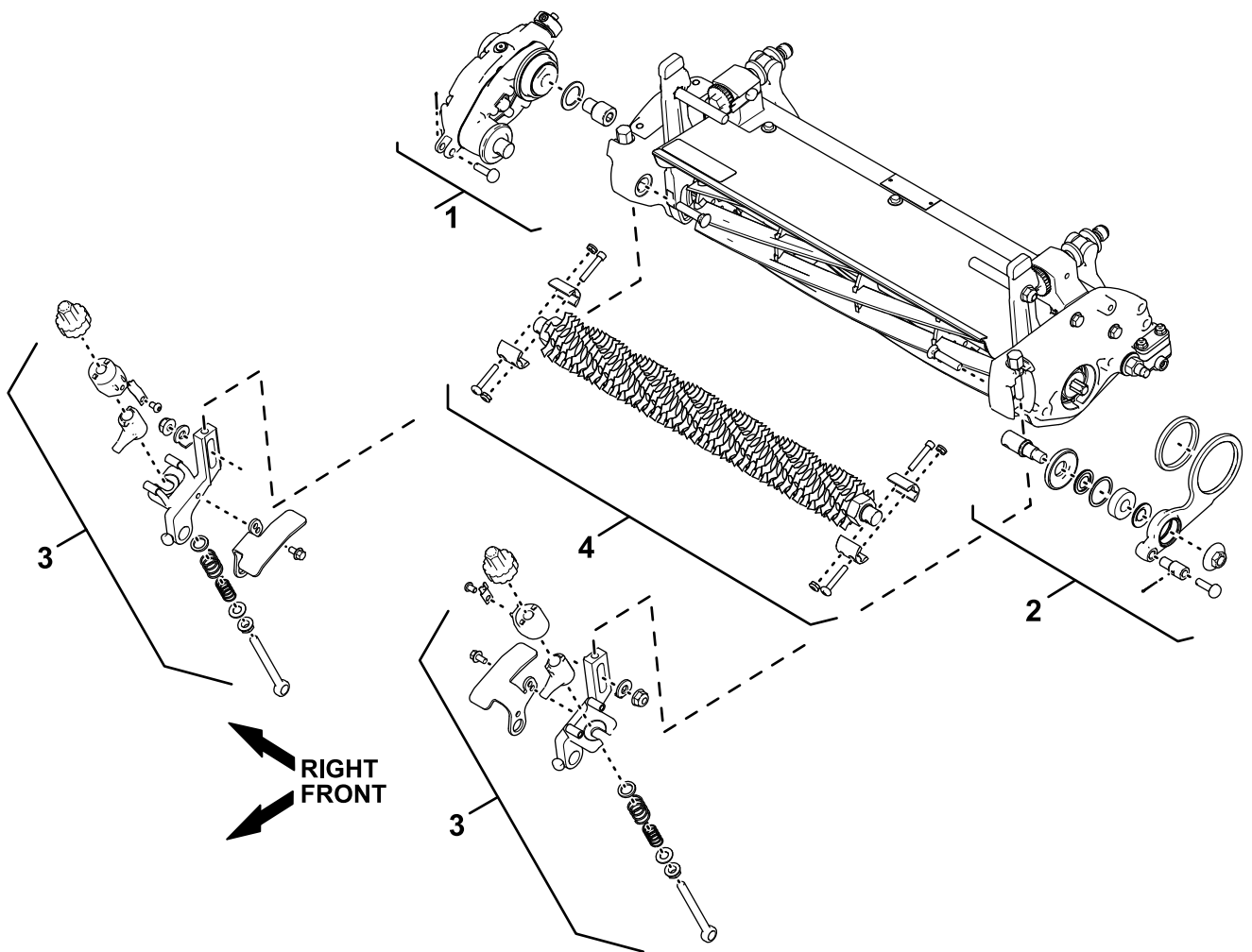
General Information	9-2
Installation Instructions	9-2
Service and Repairs	9-3
Groomer Drive Gearbox.....	9-4
Idler Plate.....	9-16
Groomer Reel	9-19
The Height Adjuster Assembly	9-22
The Height Adjuster Assembly	9-26
The Grooming Brush (Optional)	9-29

General Information

Installation Instructions

The *Installation Instructions* for the groomer provides information regarding the set-up, operation, general maintenance procedures, and maintenance intervals for the groomer assembly on your Greensmaster machine. Refer to the *Installation Instructions* for additional information when servicing the groomer assembly.

Service and Repairs



g395660

Figure 94

- | | |
|---------------------|--------------------------------------|
| 1. Gearbox assembly | 3. Height adjuster assembly (2 each) |
| 2. Idler assembly | 4. Groomer reel |

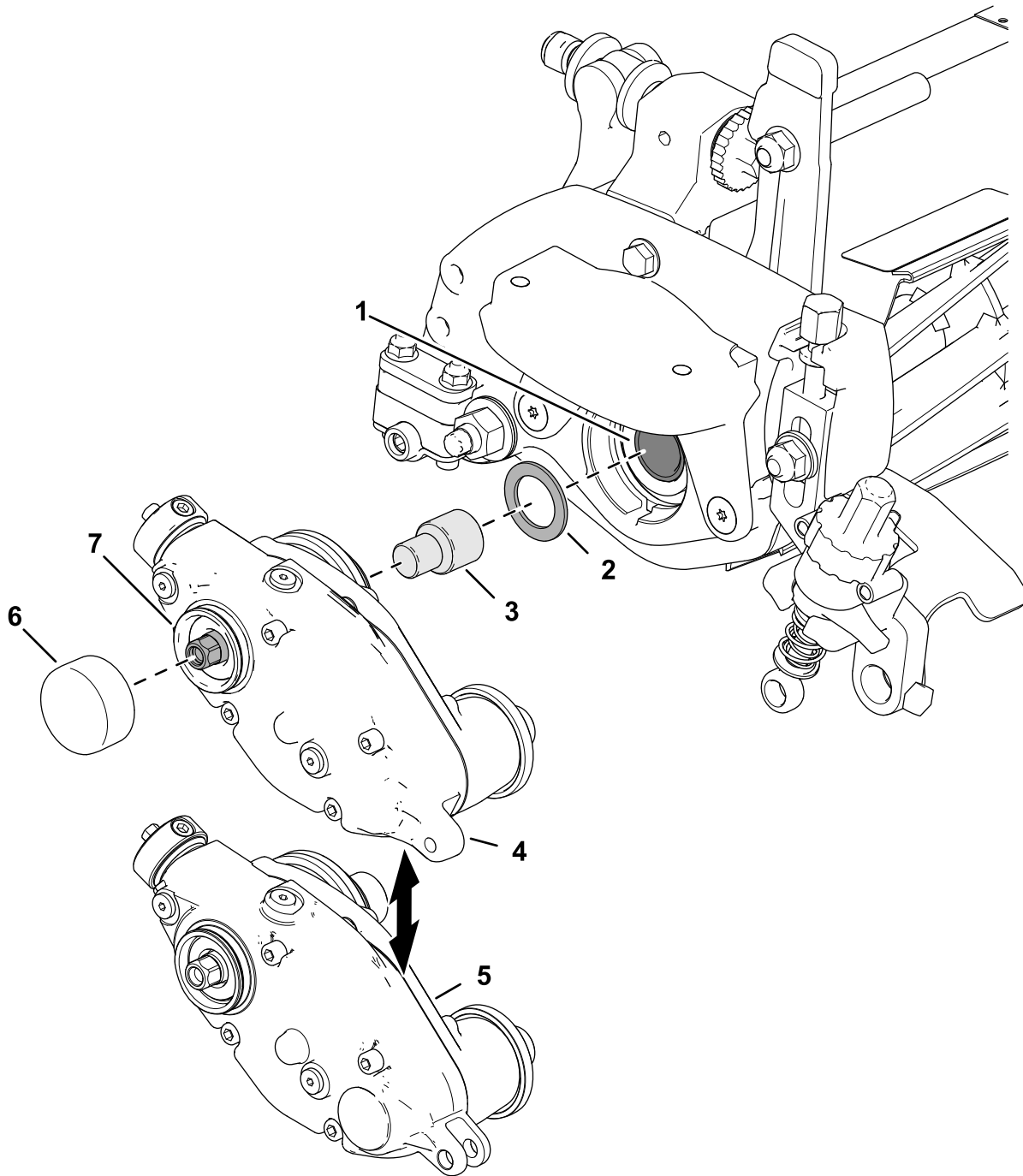


CAUTION



Never work on the groomer with the engine running. Always stop the engine and wait for all machine movement to stop before working on the groomer.

Groomer Drive Gearbox



g395659

Figure 95

- | | | |
|----------------|-------------------------------|----------------------|
| 1. Reel shaft | 4. Single-lug groomer gearbox | 7. Gearbox cover lip |
| 2. Shim washer | 5. 2-lug groomer gearbox | |
| 3. Adapter | 6. Cap | |

The groomer gearbox assembly is located on the opposite side of the cutting unit from the reel drive.

Removing the Gearbox Assembly

Refer to [Figure 95](#) and [Figure 96](#) for this procedure.

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.
2. Remove the cutting unit from the machine and place it on a level work surface; refer to *Operator's Manual*.
3. Remove the groomer reel assembly; refer to [Removing the Groomer Reel \(page 9–19\)](#).
4. Remove the cap from the lip of the groomer drive gearbox cover ([Figure 95](#)).
5. Tip up the cutting unit to access the bottom of the reel to remove the drive shaft assembly.
6. 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 bottom 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.

7. Move the pry bar against the weld side of the reel support plate closest to the groomer gearbox, and lift the pry bar until it contacts the front roller.

Removing the Gearbox Assembly (continued)

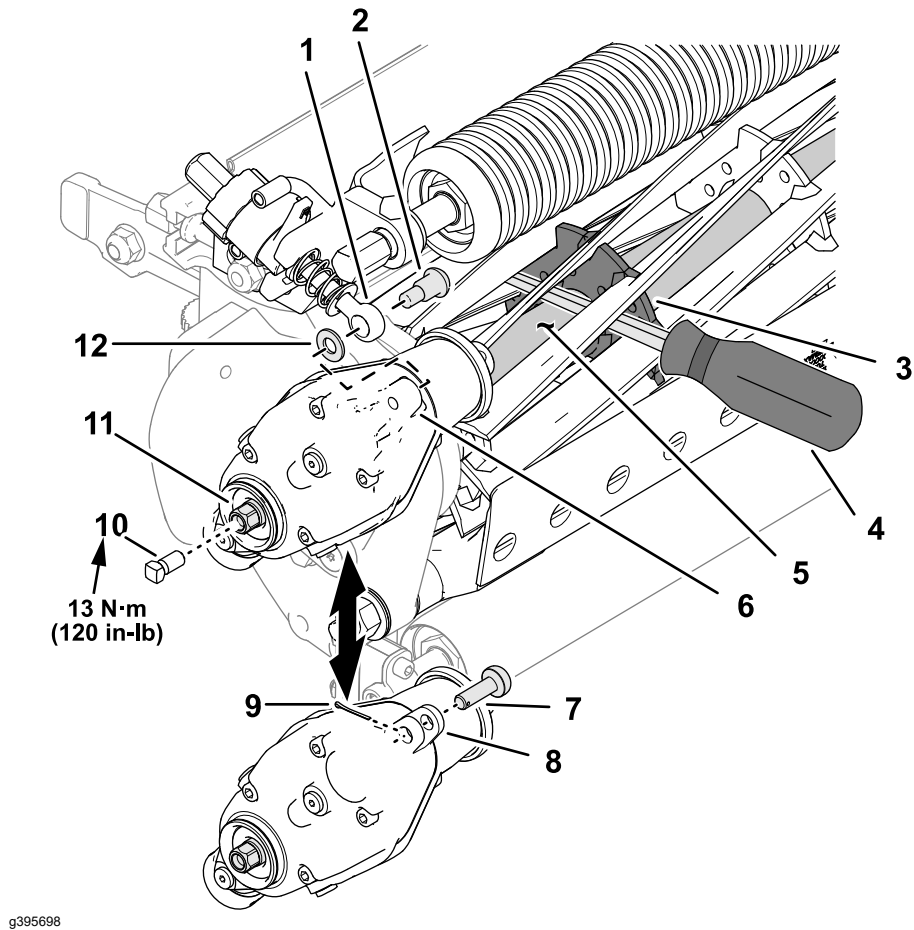


Figure 96

- | | |
|---|---|
| 1. Eye bolt | 7. Adjuster pin (with a 2-lug groomer gearbox) |
| 2. Shoulder screw (with a single-lug groomer gearbox) | 8. 2-lug groomer gearbox |
| 3. Weld side of reel support plate | 9. Cotter pin (with a 2-lug groomer gearbox) |
| 4. Pry bar | 10. Square head set screw (Toro Part No.1-803022) |
| 5. Reel shaft | 11. Drive shaft (groomer-drive gearbox) |
| 6. Single-lug groomer gearbox | 12. Hardened washer |

8. Install a 5/16-18 X 5/8 inch square head set screw (Toro Part No.1-803022) into the end of the drive shaft for the groomer drive gearbox, and tighten the set screw to **13 N·m (120 in-lb)**; refer to [Figure 96](#).

IMPORTANT

The square head set screw is needed to reinforce the hex end of the drive shaft when you remove or install the gearbox. Do not apply thread-locking compound to the square head set screw.

9. Disassemble the eye bolt of the groomer adjuster from the gearbox cover:

- **Machines with a Single-Lug Groomer Gearbox:** remove the shoulder screw and hardened washer from the eye bolt and gearbox-cover lug.

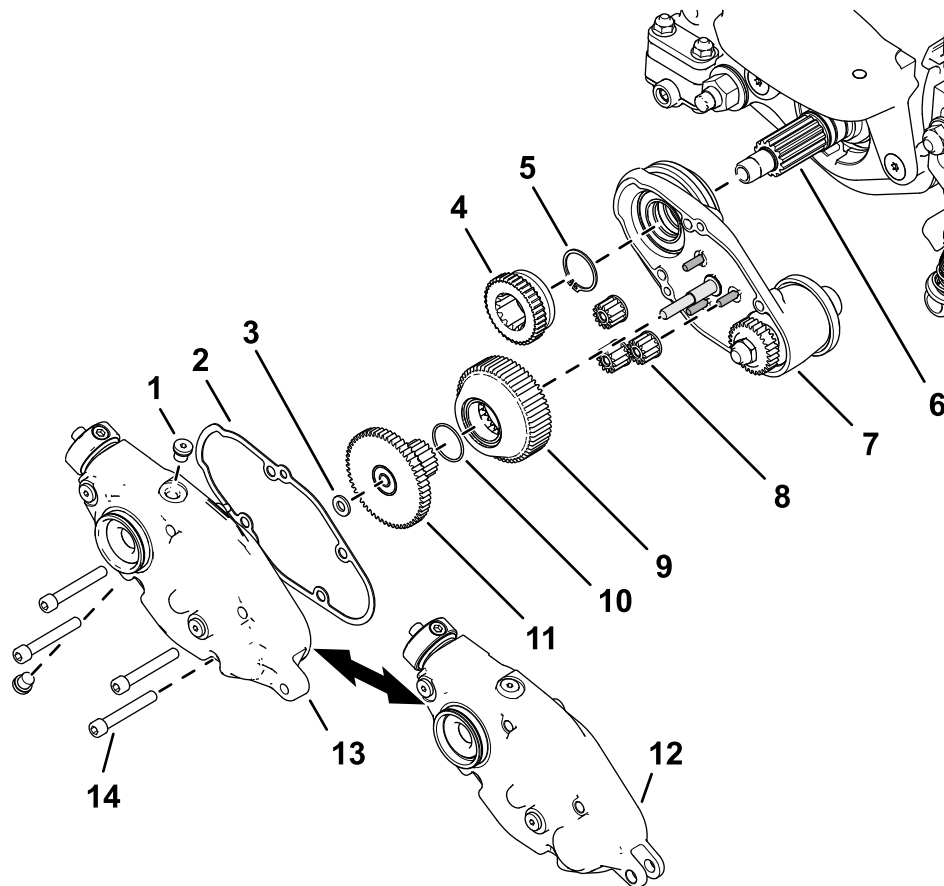
Removing the Gearbox Assembly (continued)

- **Machines with a 2-lug groomer gearbox:** remove the cotter pin and adjuster pin from the eye bolt and gearbox-cover lugs. Discard the cotter pin.

IMPORTANT

You must use a 6-point socket with a heavy wall to remove the gearbox from the reel. Do not use an impact wrench. A groomer gearbox installed at the right side of the cutting unit use a right hand thread; turn the drive shaft counterclockwise to remove the gearbox.

10. Use a heavy wall, 6 point socket and breaker bar at the outboard end of the groomer gearbox drive shaft, and rotate the socket counterclockwise to loosen and remove the gearbox driveshaft from the reel shaft.
11. If the hex head on the end of the drive shaft is damaged during removal, perform the following steps:
 - A. Rotate the cutting unit as shown in [Figure 97](#).



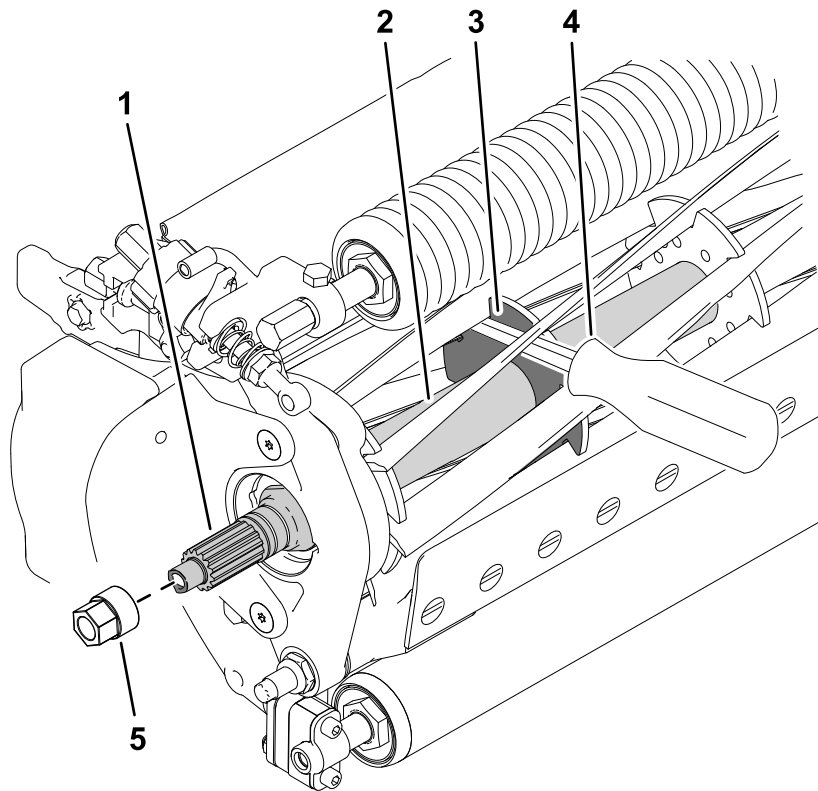
g395722

Figure 97

- | | | |
|--------------------|--|--------------------------------|
| 1. Fill/drain plug | 6. Damaged drive shaft | 11. Sun gear |
| 2. Gasket | 7. Gearbox housing | 12. 2 lug gearbox cover |
| 3. Thrust washer | 8. Planetary gear and bushing (3 each) | 13. Single-lug groomer gearbox |
| 4. Driver gear | 9. Ring gear | 14. Socket head screw (4 each) |
| 5. Retaining ring | 10. O-ring | 15. |

Removing the Gearbox Assembly (continued)

- B. Remove the drain/fill plug from the bottom of the gearbox, and drain the oil.
- C. Remove the 4 socket-head screws that secure the gearbox cover to the gearbox housing, and cover. Remove and discard the cover gasket.
- D. Remove the thrust washer, sun gear, and ring gear from the gearbox housing.
- E. Remove the driven gear from the drive shaft and planet gears from the pins on the gearbox housing.
- F. Remove the retaining ring from the drive shaft.
- G. Remove the groomer housing assembly from the drive shaft.
- H. Tip up the cutting unit to access the bottom of the reel.



g285909

Figure 98

- | | | |
|---------------------------------|------------------------------|-----------------------------------|
| 1. Damaged input shaft assembly | 3. Weld side of reel support | 5. Drive shaft removal tool plate |
| 2. Reel shaft | 4. Pry bar | |

- I. 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 bottom 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.

Removing the Gearbox Assembly (continued)

- J. Move the pry bar against the weld side of the reel support plate closest to the groomer gearbox, and lift the pry bar so that it contacts the front roller.
 - K. Use the drive shaft removal tool on the large flats of the drive shaft assembly, and rotate the tool counterclockwise to loosen and remove the gearbox driveshaft from the reel shaft; refer to [Drive Shaft Removal Tool \(page 2–18\)](#).
12. Remove the pry bar, and tip the cutting unit back onto its rollers.
13. 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 \(page 2–16\)](#).

Servicing the Gearbox Assembly

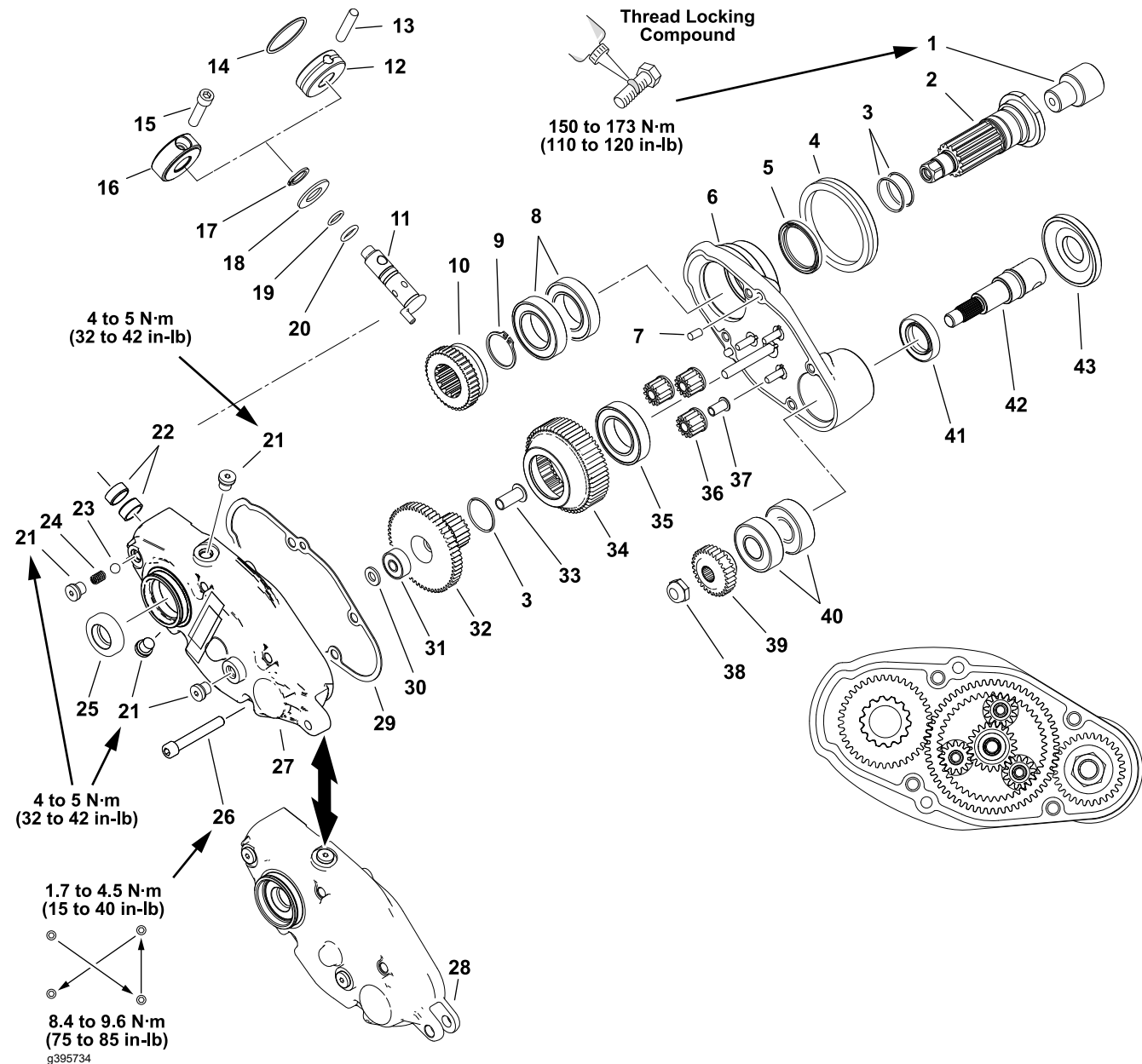


Figure 99

1. Drive adapter	12. Pin (2-lug gearbox)	23. Detent ball	34. Ring gear
2. Input shaft	13. O-ring (2-lug gearbox)	24. Detent spring	35. Bearing
3. O-ring (3 each)	14. Knob (2-lug gearbox)	25. Oil seal	36. Planet gear (3 each)
4. V-ring	15. Socket-head screw (single-lug gearbox)	26. Socket-head screw(4 each)	37. Flange bushing (3 each)
5. Oil seal	16. Knob (single-lug gearbox)	27. Single-lug groomer gearbox cover	38. Locknut
6. Groomer housing	17. Retaining ring	28. 2-lug groomer gearbox cover	39. Driver gear
7. Dowel pin (2 each)	18. Thrust washer	29. Gasket	40. Bearing (2 each)
8. Ball bearing (2 each)	19. O-ring	30. Thrust washer	41. Oil seal
9. Retaining ring	20. O-ring	31. Ball bearing	42. Driven shaft
10. Driver gear	21. Drain/fill plug (4 each)	32. Sun gear	43. Shield
11. Actuator shaft	22. Straight bushing (2 each)	33. Flange bushing	

Servicing the Gearbox Assembly (continued)

Note: Refer to [Figure 99](#) during this procedure.

1. Remove the drain/fill plug and drain the oil from the gearbox, and drain the oil.
2. Remove the 4 socket-head screws and separate the gearbox cover and housing. Remove and discard the cover gasket.
3. Remove the thrust washer, sun gear, ring gear, and planet gears from the pins on the gearbox housing.
4. Continue to disassemble the gearbox as necessary.



CAUTION



Use the large 34.9 mm (1-3/8 inch) flats on the drive shaft to prevent it from rotating when removing or installing the drive adapter.

Do Not use the 12.7 mm (1/2 inch) hex head of the drive shaft when removing or installing the drive adapter—drive shaft damage may occur.

5. If the drive adapter requires replacement, apply medium strength thread locking compound (Loctite 243 or equivalent) to the internal threads of the groomer gearbox drive shaft.

Note: A special tool is available to hold the drive shaft if necessary; refer to [Special Tools \(page 2–14\)](#).



6. Torque the drive adapter to **150 to 163 N·m (110 to 120 ft-lb)**. Allow the thread locking compound to cure for 15 minutes before continuing this procedure.
7. Carefully clean all the gasket material from the gearbox housing and cover.
8. Inspect the V-ring, seals, bearings, gears, and bushings in the gearbox assembly. Replace the damaged or worn components as necessary.
9. If the bearings for the sun gear, ring gear, or the gearbox housing are replaced, press the bearing all the way to shoulder of the bore.
10. If the flange bushings are replaced, ensure that the flange bushing is fully seated against the part.
11. Assemble the gearbox.
 - 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 gearbox housing with the gear oil prior to installing the gears.
12. Clean the gasket surface on the gearbox housing and cover with the solvent and install new gasket.
13. Ensure that the trust washer is assembled to the pin that supports the ring gear and sun gear, and the washer is located between the sun-gear bearing and the gearbox cover.
14. Fit the gearbox 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, torque the screws from 8.4 to 9.6 N·m (75 to 85 in-lb).



Servicing the Gearbox Assembly (continued)

15. If removed, lubricate the O-rings for the drain/fill plug with Mobile XHP-222 or an equivalent grease.

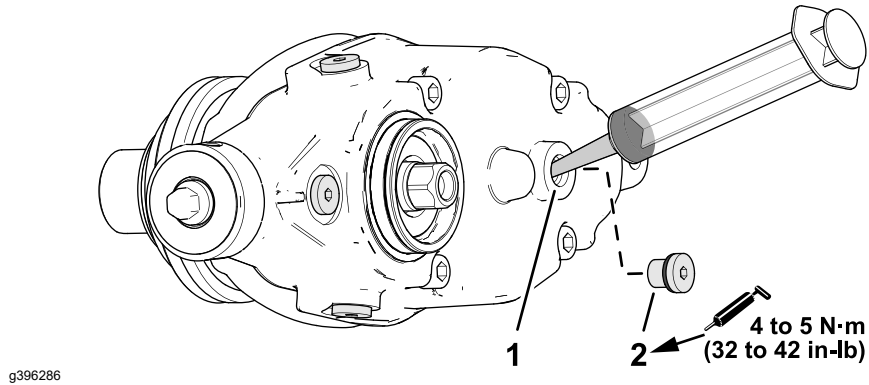


Figure 100

1. Gearbox cover

2. Drain/fill plug



16. Install all the plugs into the gearbox cover, except for the plug for the face of the cover (located between the 4 socket-head screws). Torque the plugs to **4 to 5 N·m (32 to 42 in-lb)**.



17. Add **50 ml (1.7 fluid ounces)** 80W-90 gear oil into the gearbox through the hole in the face of the cover.



18. Install drain/fill plug into the hole in the face of gearbox cover, and tighten the plug to **4 to 5 N·m (32 to 42 in-lb)**.
19. Operate the groomer gearbox by hand to check for proper operation prior to installation.

Installing the Gearbox Assembly

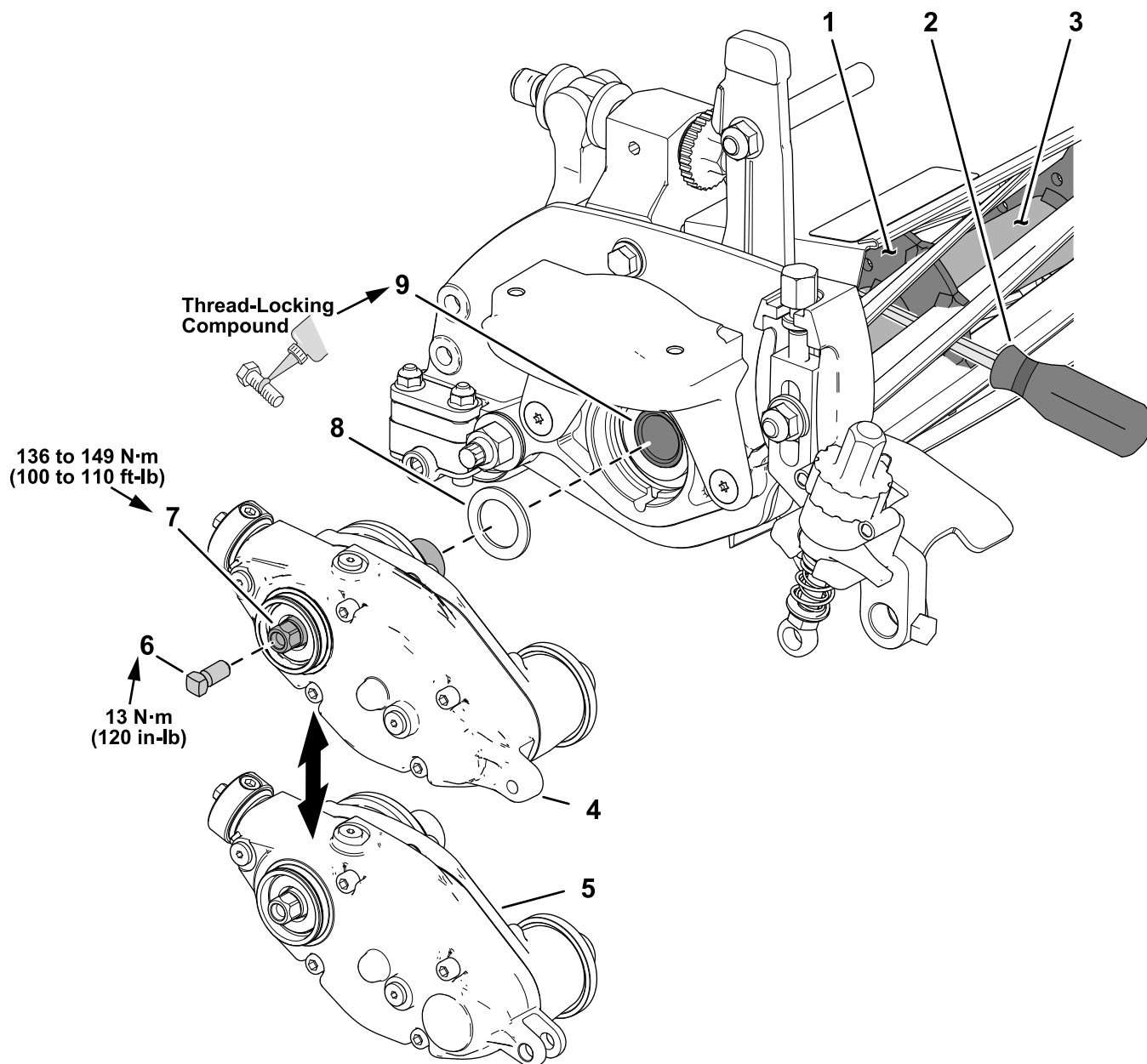


Figure 101

- | | | |
|------------------------------------|--|-------------------------|
| 1. Weld side of reel support plate | 4. Single-lug groomer gearbox | 7. Input shaft assembly |
| 2. Pry bar | 5. 2-lug groomer gearbox | 8. Shim washer |
| 3. Reel shaft | 6. Square head set screw (Toro Part No.1-803022) | 9. Threads (reel shaft) |

Refer to [Figure 101](#) for this procedure.

1. Install a 5/16-18 X 5/8 inch square head set screw (Toro Part No.1-803022) into the end of the drive shaft for the groomer drive gearbox, and tighten the set screw to **13 N·m (120 in-lb)**; refer to [Figure 101](#).

IMPORTANT

The square head set screw is needed to reinforce the hex end of the drive shaft when you remove or install the gearbox. Do not apply thread-locking compound to the square head set screw.

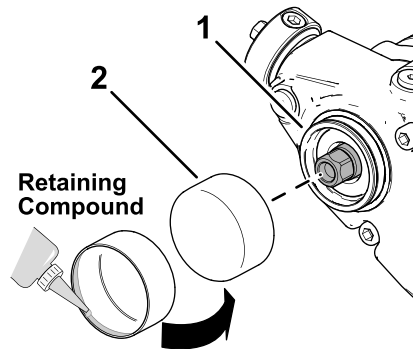
2. Clean the threads in the end of the reel shaft of any debris or grease.
3. Apply medium strength thread locking compound (Loctite 243 or equivalent) to the threads in the reel shaft.
4. Insert a long-handled pry bar through the front of the cutting unit. The pry bar should pass between the top of the reel shaft and the backs of the reel blades so that the reel will not move.
5. Move the pry bar against the weld side of the reel support plate closest to the gearbox assembly and rest the handle of the pry bar against the front roller.
6. Position the groomer drive gearbox assembly against the cutting unit, and rotate the drive shaft assembly clockwise until it is seated against the reel shaft.

IMPORTANT

You must use a 6-point socket with a heavy wall to install the gearbox to the reel. Do not use an impact wrench. A Groomer gearbox installed at the right side of the cutting unit use a right hand thread; turn the drive shaft clockwise to install the gearbox.



7. Torque the drive shaft assembly from **135 to 150 N·m (100 to 110 ft-lb)**. Allow the thread locking compound to cure for 15 minutes.
8. Remove the square head set screw from the end of the drive shaft.
9. Apply a retaining compound (Loctite 609 or equivalent) to the cap for the gearbox cover and install the cap to the lip of the cover.

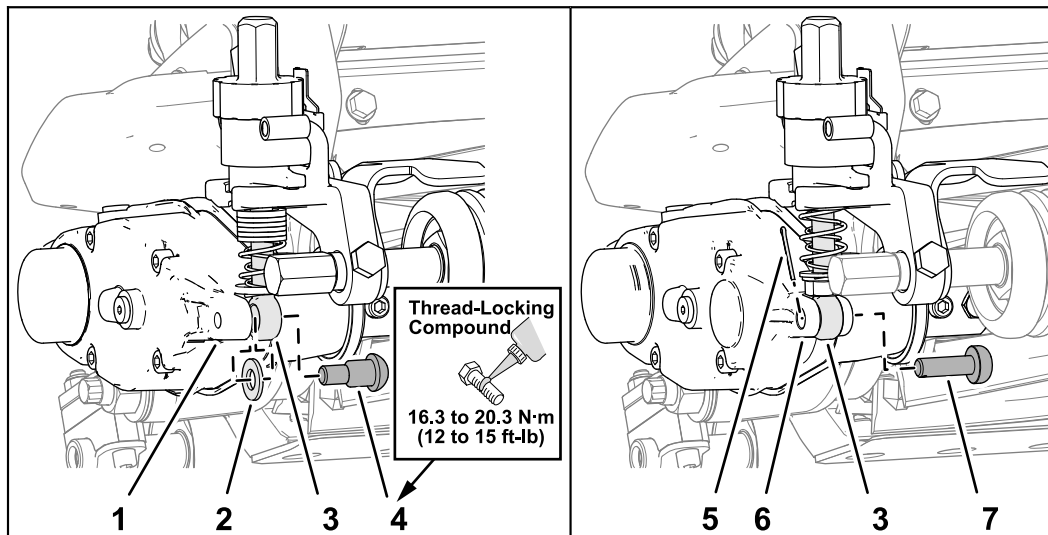


g395978

Figure 102

1. Cap
2. Lip (gearbox cover)

Installing the Gearbox Assembly (continued)



g396135

Figure 103

- | | | |
|-------------------------------|--------------------------|-----------------|
| 1. Single-lug groomer gearbox | 4. Shoulder screw | 7. Adjuster pin |
| 2. Hardened washer | 5. Cotter pin | |
| 3. Eye bolt | 6. 2-lug groomer gearbox | |

10. Assemble the eye bolt of the groomer adjuster to the gearbox cover ([Figure 103](#)).

• Cutting Units with a Single-Lug Groomer Gearbox

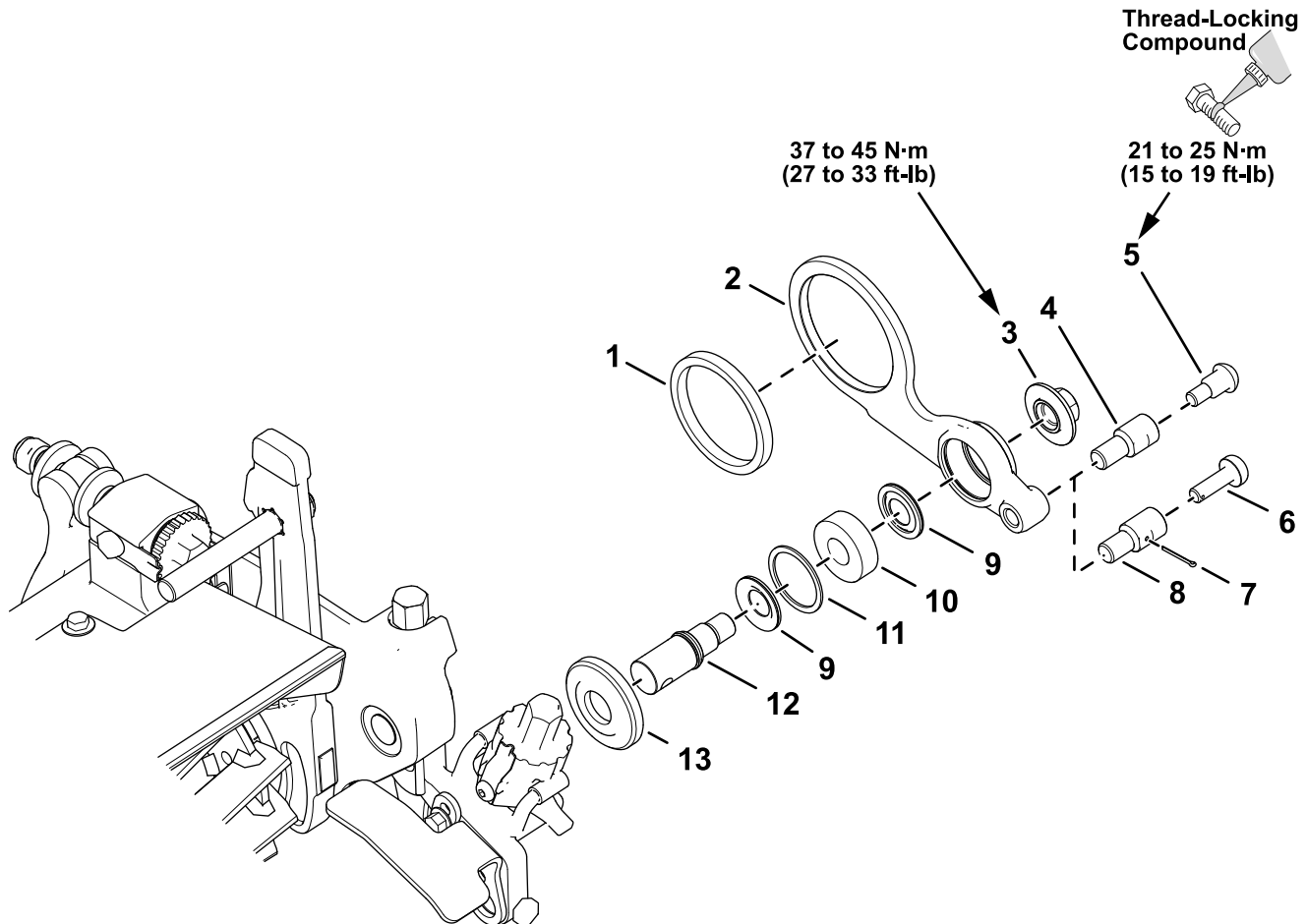
- A. Apply a coat of medium-duty thread-locking compound to the shoulder screw.
- B. Align the hardened washer between the eye bolt and the gearbox-cover lug.
- C. Assemble the eye bolt and hardened washer to the gearbox lug with the shoulder screw. Torque the shoulder screw to **16.3 to 20.3 N·m (12 to 15 ft-lb)**.

• Cutting Units with a 2-lug Groomer Gearbox

- D. Align the eyebolt between the gearbox-cover lugs.
- E. Assemble the eye bolt to the lugs with the adjuster pin and cotter pin.

11. Install the groomer reel assembly; refer to [Installing the Groomer Reel \(page 9-21\)](#).

Idler Plate



g395810

Figure 104

1. Bushing	5. Shoulder screw—threaded (with a single-lug groomer gearbox)	9. Bearing shield	13. Shield
2. Idler plate	6. Adjuster pin (2 lug groomer-drive gearbox)	10. Bearing	
3. Flange nut	7. Cotter pin (with a 2-lug groomer gearbox)	11. Retainer	
4. Spring pin—threaded (with a 2-lug groomer gearbox)	8. Spring pin—cross drilled (with a single-lug groomer gearbox)	12. Shaft	

Note: Early universal groomers used 2 non-adjustable compression springs on eye bolts for the 2-lug gearbox and idler plate. The single-lug gearbox and idler plate assemblies are the current groomer drive configuration, and use shim washers to preload the springs; refer to [Figure 104](#).

Removing the Idler Assembly

1. Remove the reel drive from the cutting unit; refer to [Removing the Reel Drive Assembly \(page 5–7\)](#).
2. Remove the groomer reel assembly; refer to [Removing the Groomer Reel \(page 9–19\)](#).
3. Remove the eye bolt of the groomer adjuster from the idler plate as follows:

Removing the Idler Assembly (continued)

- **Cutting units with a Single-Lug Groomer- Gearbox:** remove the shoulder screw and hardened washer that secure the eye bolt to the spring pin of the idler plate.
- **Cutting units with a 2-Lug Groomer Gearbox:** remove the cotter pin and adjuster pin that secure the eye bolt to the spring pin of the idler plate.

Note: Discard the cotter pin.

4. Remove the idler assembly.
5. If needed, remove the spring pin from the idler plate.
6. Inspect the shields, bearing, and bushing of the idler assembly. Replace worn or damaged components.

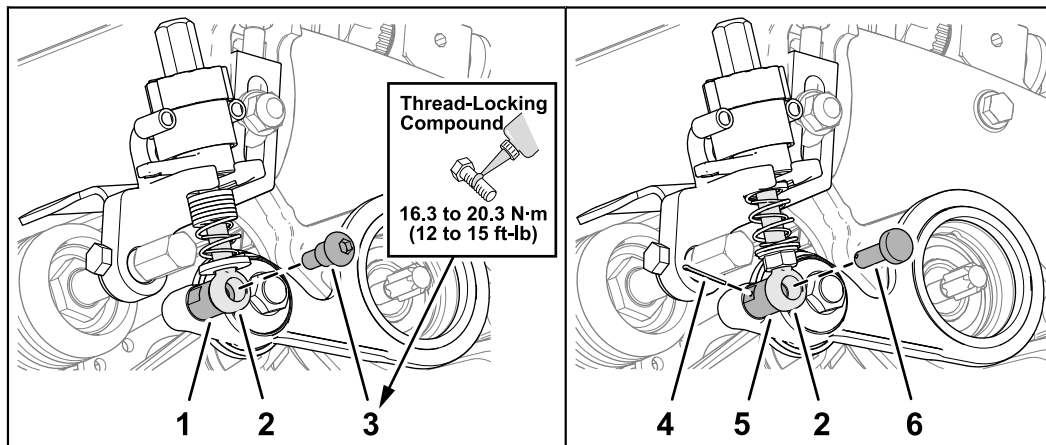
Installing the Idler Assembly

1. If the shields, bearing, or bushing were removed from the idler plate, install new components as follows:
 - A. Press the bushing into the idler plate until the bushing is centered in the bore.
 - B. Press the bearing into the idler plate so that the bearing contacts the shoulder in bore, and secure the bearing with the retaining ring.
 - C. Assemble the 2 bearing shields to the idler plate with flocked side of shield toward the bearing.



- D. Check the idler plate orientation (left side of the cutting unit), and insert the stub shaft (item 12 in [Figure 104](#)) through shields and bearing. Use the through hole in the shaft to prevent it from rotating, and torque the flange nut to **37 to 45 N·m (27 to 33 ft-lb)**.
 - E. If the spring pin was removed from the idler arm, install the spring pin, and torque it to **37 to 45 N·m (27 to 33 ft-lb)**.
2. Assemble the eye bolt of the groomer adjuster to the idler plate ([Figure 105](#)) as follows:
 - **Cutting Units with a Single-Lug Groomer Gearbox**
 - A. Apply a coat of medium-duty thread-locking compound to the shoulder screw.
 - B. Assemble the eye bolt to the spring pin of the idler plate with the shoulder screw. Torque the shoulder screw to **16.3 to 20.3 N·m (12 to 15 ft-lb)**.
 - **Cutting units with a 2-Lug Groomer Gearbox:** assemble the eye bolt to spring pin of the idler plate with the adjuster pin and cotter pin.

Installing the Idler Assembly (continued)



g396158

Figure 105

- | | |
|--|--|
| 1. Spring pin (idler plate)—threaded (with a single-lug groomer gearbox) | 4. Cotter pin |
| 2. Eye bolt | 5. Spring pin (idler plate)—cross drilled (with a 2-lug groomer gearbox) |
| 3. Shoulder screw | 6. Adjuster pin |

3. Install the reel drive; refer to [Installing the Reel Drive Assembly \(page 5–9\)](#).

Groomer Reel

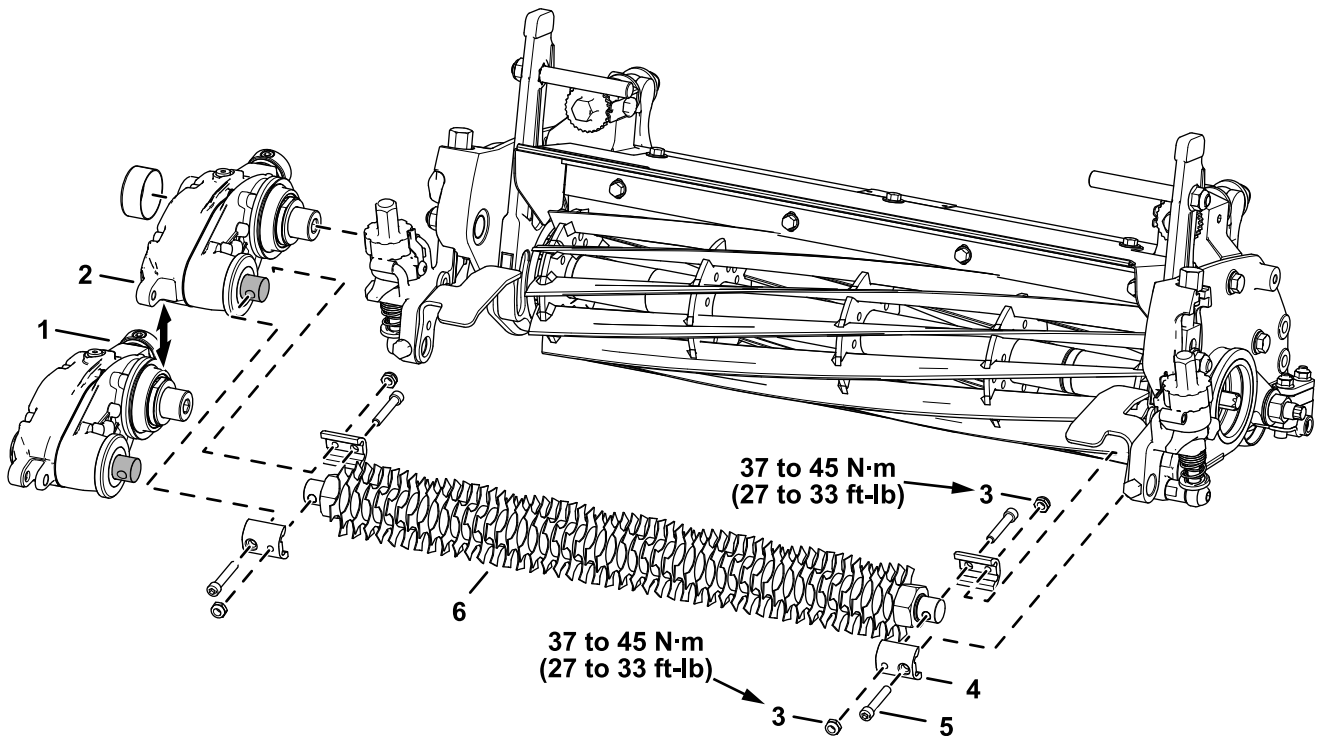


Figure 106

- | | |
|-------------------------------|-------------------------|
| 1. 2lug groomer gearbox | 4. Shaft clamp (4 each) |
| 2. Single-lug groomer gearbox | 5. Bolt (4 each) |
| 3. Jam nut (4 each) | 6. 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



CAUTION

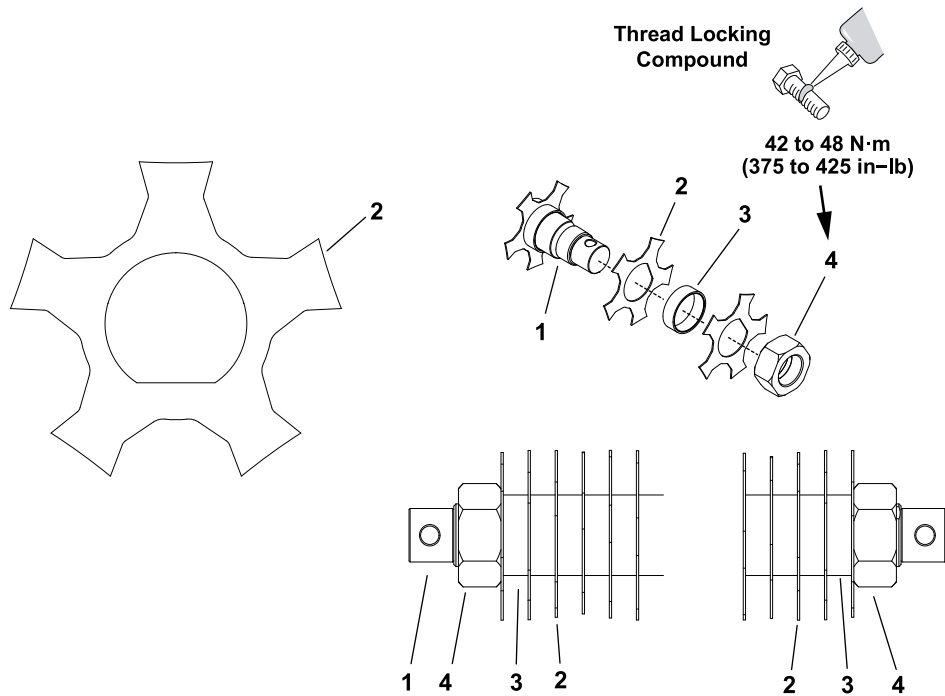


Contact with the reel or other cutting unit parts can result in personal injury.

Use heavy gloves when handling the groomer reel.

1. Carefully remove the 4 jam nuts, 4 bolts, and 4 shaft clamps that secure the groomer reel to the output and stub shafts.
2. Lift the groomer reel from the cutting unit.
3. Inspect the shields, stub shaft, driven shaft and shaft bearings for wear or damage and replace components as necessary; refer to [Groomer Drive Gearbox \(page 9–4\)](#) and [Idler Plate \(page 9–16\)](#).

Servicing the Groomer Reel



g282211

Figure 107

- | | |
|----------------------------|---------------------|
| 1. Groomer reel shaft | 3. Spacer (50 each) |
| 2. Groomer blade (51 each) | 4. Locknut (2 each) |

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: refer to [Figure 107](#).

1. Remove the groomer reel from the cutting unit; refer to [Removing the Groomer Reel \(page 9–19\)](#).
2. Remove the locknut from either end of the groomer reel shaft.
3. Remove the blades from the groomer shaft. If necessary, remove second locknut from the shaft.
4. Inspect and replace worn or damaged components.
5. Assemble the groomer reel as follows:

Note: New locknuts have an adhesive patch to prevent the locknut from loosening. If a used locknut is being installed, apply a medium strength thread locker (Loctite #242 or equivalent) to the threads of the locknut.

- A. Install a locknut on one end of the groomer reel shaft.
- B. Install a groomer blade against the locknut.
- C. Install the remaining spacers and blades in an alternating manner making sure that all blades are separated by a spacer.

Servicing the Groomer Reel (continued)

- D. When all the blades have been installed, install the second locknut onto the shaft. Center the blades and spacers on the shaft by adjusting the locknuts.



- E. Use the through holes in shaft to prevent the shaft from rotating and tighten the second locknut to **42 to 48 N·m (375 to 425 in-lb)**. After tightening the locknut, the spacers should not be free to rotate, and the groomer blades should be centered on the shaft.

- 6. Install the groomer reel back onto the cutting unit; refer to [Installing the Groomer Reel \(page 9–21\)](#).

Installing the Groomer Reel

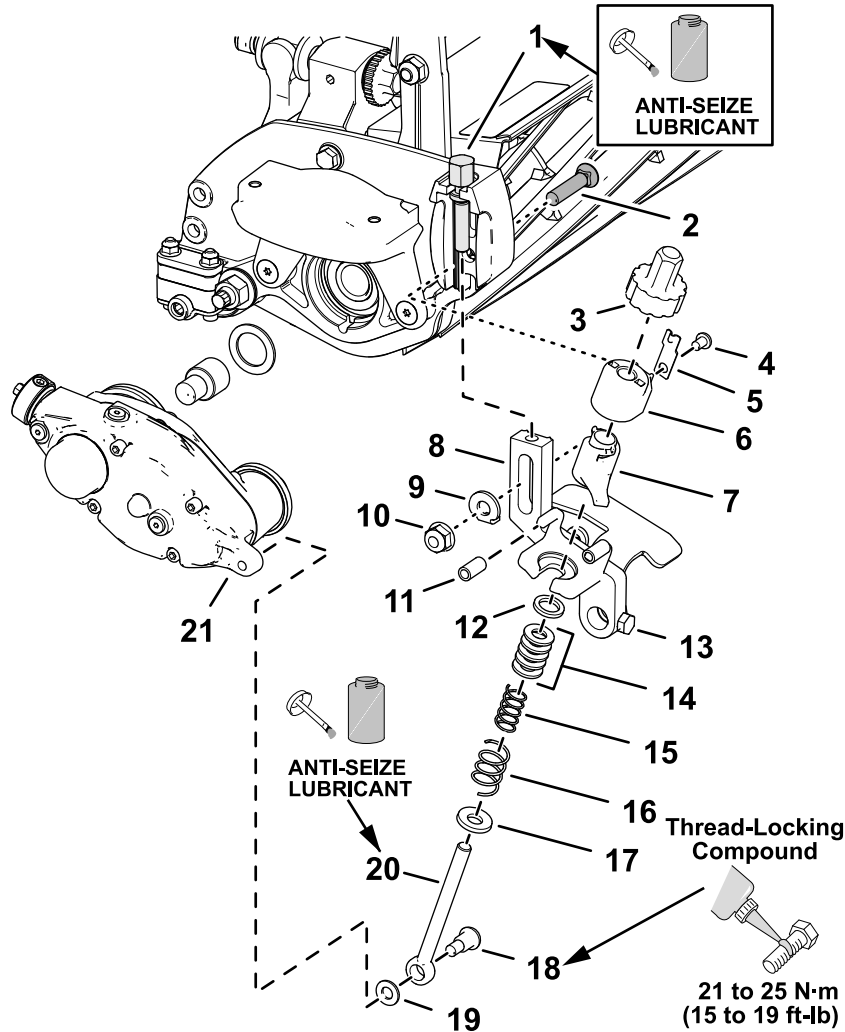
- 1. Position the groomer reel between the gearbox driven shaft and stub shafts of the idler plate.



- 2. Secure the groomer reel to the cutting unit with the 4 jam nuts, 4 bolts, and 4 shaft clamps. Tighten the bolts from **5 to 7 N·m (45 to 60 in-lb)**.
- 3. Check the groomer reel height and mower height-of-cut settings and adjust as necessary.

The Height Adjuster Assembly

Single-Lug Groomer Gearbox and Idler Plate



g396678

Figure 108

- | | | |
|-------------------------|--|--------------------------------|
| 1. Height-of cut screw | 8. Groomer height-of -cut arm | 15. Compression spring (inner) |
| 2. Plow bolt | 9. Height-of -cut washer | 16. Compression spring (outer) |
| 3. Height adjuster knob | 10. Locknut | 17. Belleville washer |
| 4. Screw | 11. Bumper | 18. Eye bolt |
| 5. Detent spring | 12. Washer 20.6 x 14.3 mm (0.813 x 0.563 inch) | 19. Shoulder screw |
| 6. Quick up cover | 13. Lock screw | 20. Hardened washer |
| 7. Quick up handle | 14. Shim washers | 21. Single-lug groomer gearbox |

Note: Early universal groomers used 2 non-adjustable compression springs on eye bolts for the 2-lug gearbox and idler plate. The single-lug gearbox and idler plate assemblies are the current groomer drive configuration, and use shim washers to preload the springs; refer to [Figure 108](#).

Disassembling the Height Adjuster

Note: Refer to [Figure 108](#) during this procedure.

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and

Disassembling the Height Adjuster (continued)

parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.

2. Remove the cutting unit from the machine; refer to the *Operator's Manual*.
3. Remove the shoulder screws and hardened washers that secure the eye bolts to the lugs of the groomer gearbox and the idler plate.
4. Loosen the lock screws that secure the front roller to the height-of-cut arms.
5. Remove the locknuts, height-of-cut washers, and plow bolts that secure the height-of-cut arms to the cutting unit side plates, and remove the height adjusters and front roller from the cutting unit.
6. Remove the height-of-cut bolts from the groomer height-of-cut arms.
7. Disassemble the height adjuster assembly as necessary.
8. Clean all the components and inspect for wear or damage. Replace all the worn or damaged components.

Assembling the Height Adjuster

1. Apply anti-seize lubricant to the upper threads of the adjustment rod and lower threads of the height adjusters.
2. Assemble the height-of-cut bolts to the height-of-cut arms.
3. If both the height-of-cut arms are removed, align 1 height-of-cut arm and height-of-cut bolt to the cutting unit side plate.
4. Loosely assemble the height-of-cut arm to the side plate with the plow bolt, plow bolt, height-of-cut washer, and locknut. Do not tighten the flange locknut.
5. Loosely assemble the front roller shaft to the height-of-cut arm.
6. Assemble the other height-of-cut bracket to the front roller shaft. Assemble height-of-cut arm and height-of-cut bolt to the cutting unit side plate.
7. Assemble the height-of-cut arm to the side plate with the plow bolt, plow bolt, height-of-cut washer, and locknut. Tighten the 2 locknuts and 2 plow bolts finger tight.
8. Adjust the height-of-cut bolts so that the height-of-cut arm are the same.
9. Center the front roller between the height-of-cut arms, and tighten the lock screws in the height-of-cut arms.
10. Align the hardened washers between the eye bolts to the groomer gearbox and idler arm lugs, and loosely assemble the eye bolts and washers to the gearbox and idler plate lugs with the shoulder screws.
11. Adjust the cutting unit height-of-cut; refer to *Cutting Unit Operators Manual*.
12. Adjust the groomer reel height; refer to *Universal Groomer Drive Kit Installation Instructions*.
13. Ensure that both groomer quick up handles are in the OPERATING position.

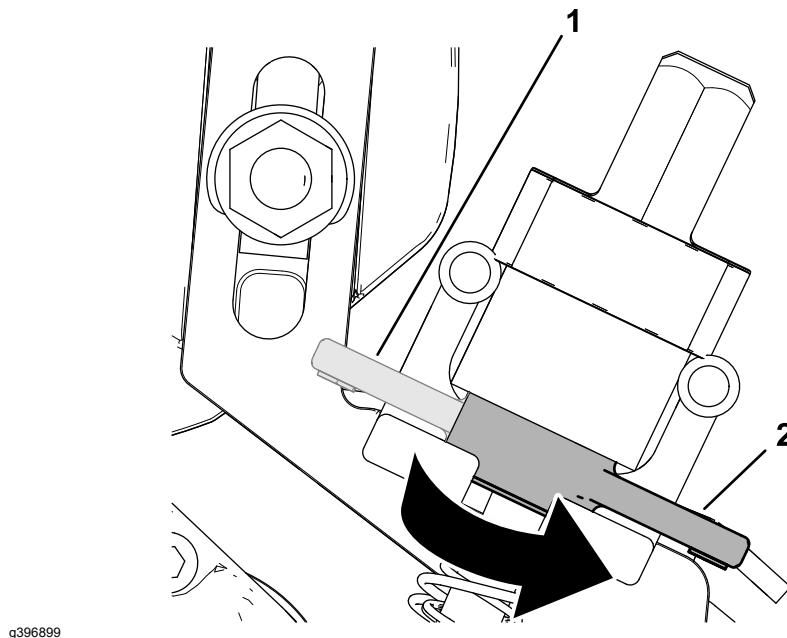
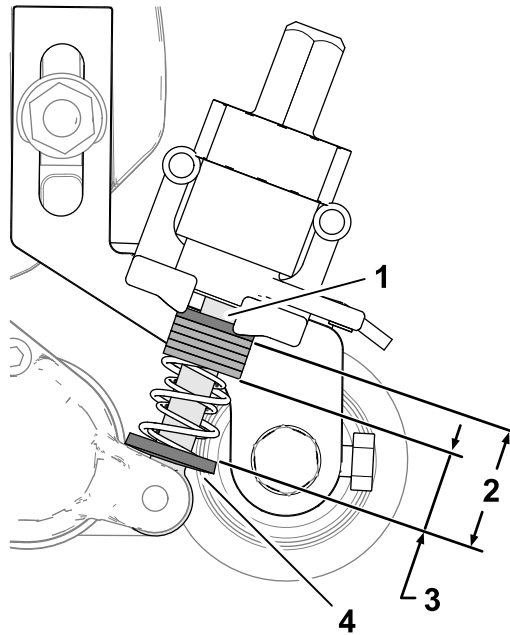


Figure 109

1. Transport position
2. Operating position

14. Measure the distance between the washers (the current spring length) as shown in

Assembling the Height Adjuster (continued)



g396935

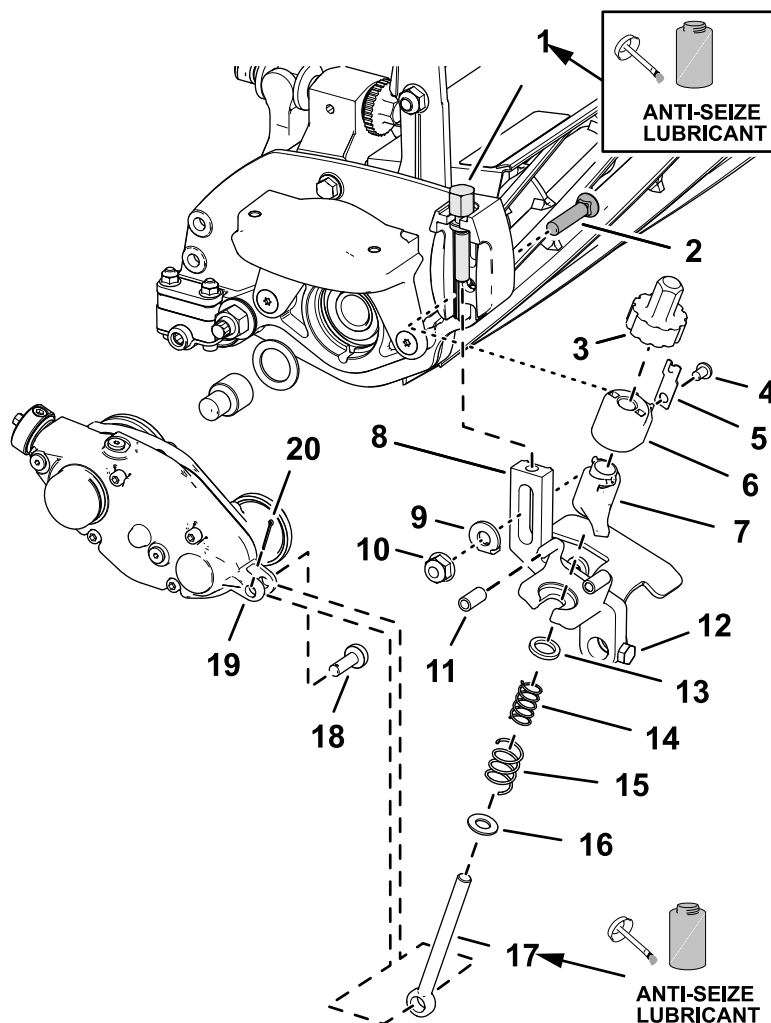
Figure 110

- | | |
|---|--|
| 1. Top washer | 3. Desired spring length with optional washers—19 mm (0.75 inch) |
| 2. Original spring length (distance between top and bottom washers) | 4. Belleville washer |

-
15. Subtract the desired (.75 inch or 19 mm) spring length from the current spring length, and divide this difference by 0.06 inches to determine how many shim washers you need to add to achieve the desired spring length.
 16. Repeat steps 14 and 15.
 17. Remove the eye bolts and hardened washers from the groomer gearbox and idler arm lugs, and adjust the shim washers as you calculated in step 15.
 18. Apply medium strength thread locking compound to the threads of the shoulder screws.
 19. Align the hardened washers between the eye bolts to the groomer gearbox and idler arm lugs, and loosely assemble the eye bolts and washers to the gearbox and idler plate lugs with the shoulder screws.

The Height Adjuster Assembly

2-Lug Groomer Gearbox and Idler Plate



g396679

Figure 111

1. Height-of-cut screw	6. Quick up cover	11. Bumper	16. Washer 20.6 x 10.3 mm (0.813 x 0.406 inch)
2. Plow bolt	7. Quick up handle	12. Lock screw	17. Eye bolt
3. Height adjuster knob	8. Groomer height-of-cut arm	13. Washer 20.6 x 14.3 mm (0.813 x 0.563 inch)	18. Adjuster pin
4. Screw	9. Height-of-cut washer	14. Compression spring (inner)	19. 2-lug groomer gearbox
5. Detent spring	10. Locknut	15. Compression spring (outer)	20. Cotter pin

Disassembling the Height Adjuster

1. Ensure that the cutting-unit-drive lever is in the DISENGAGE position, park the machine on a level surface, release the clutch bail, engage the service and parking brake, shut off the engine, and remove the spark plug wire from the spark plug; refer to the *Operator's Manual*.
2. Remove the cutting unit from the machine; refer to the *Operator's Manual*.

Disassembling the Height Adjuster (continued)

3. Remove the cotter pin and adjuster pin that secure the eye bolts to the lugs of the groomer gearbox and the idler plate.
4. Loosen the lock screws that secure the front roller to the height-of-cut arms.
5. Remove the locknuts, height-of-cut washers, and plow bolts that secure the height-of-cut arms to the cutting unit side plates, and remove the arms from the cutting unit.
6. If needed, remove the height-of-cut bolts from the groomer height-of-cut arms.
7. Disassemble the height adjuster assembly as necessary.
8. Clean all the components and inspect for wear or damage. Replace all the worn or damaged components.

IMPORTANT

If the cutting units is equipped with an eyebolt and flange nut used to adjust the spring pretension for the height of groom adjuster, replace the flange nut with washers to eliminate premature hardware wear.

Assembling the Height Adjuster

1. Apply anti-seize lubricant to the upper threads of the eye bolts and lower threads of the height-of-cut bolts.
2. Assemble an eye bolt to each of the height-of-cut arms with a serrated-flange nut, washer 20.6 x 10.3 mm (0.813 x 0.406 inch), inner and outer springs, and washer 20.6 x 14.3 mm (0.813 x 0.563 inch) washer below the slot in the arms, and the quick up handle, quick up cover, and height adjuster knob above the slots.
3. Apply anti-seize lubricant to the upper threads of the adjustment rod and lower threads of the height adjusters. Assemble the height adjuster assembly.
4. Assemble the height-of-cut bolts to the height-of-cut arms.
5. If both the height-of-cut arms are removed, align 1 height-of-cut arm and height-of-cut bolt to the cutting unit side plate.
6. Loosely assemble the height-of-cut arm to the side plate with the plow bolt, plow bolt, height-of-cut washer, and locknut. Do not tighten the flange locknut.
7. Loosely assemble the front roller shaft to the height-of-cut arm.
8. Assemble the other height-of-cut bracket to the front roller shaft. Assemble height-of-cut arm and height-of-cut bolt to the cutting unit side plate.
9. Assemble the height-of-cut arm to the side plate with the plow bolt, plow bolt, height-of-cut washer, and locknut. Tighten the 2 locknuts and 2 plow bolts finger tight.
10. Adjust the height-of-cut bolts so that the height-of-cut arm are the same.
11. Center the front roller between the height-of-cut arms, and tighten the lock screws in the height-of-cut arms.
12. Secure the eye bolts to the groomer gearbox and idler arm lugs with the adjuster pin and cotter pin.
13. Adjust the cutting unit height-of-cut; refer to *Cutting Unit Operators Manual*.
14. Adjust the groomer reel height; refer to *Universal Groomer Drive Kit Installation Instructions*.
15. Ensure that both groomer quick up handles are in the OPERATING position.

Assembling the Height Adjuster (continued)

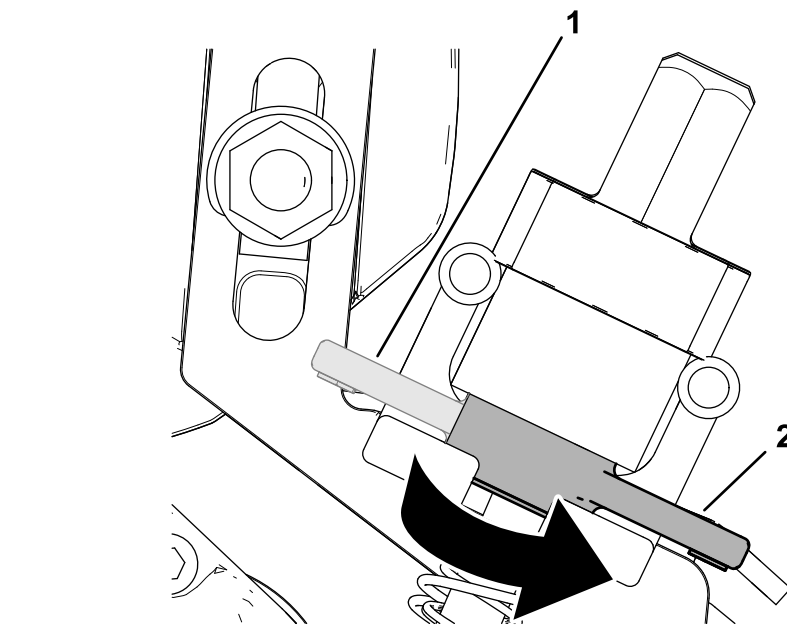


Figure 112

1. Transport position
2. Operating position

16. Measure the distance between the washers (the current spring length) as shown in [Figure 113](#).

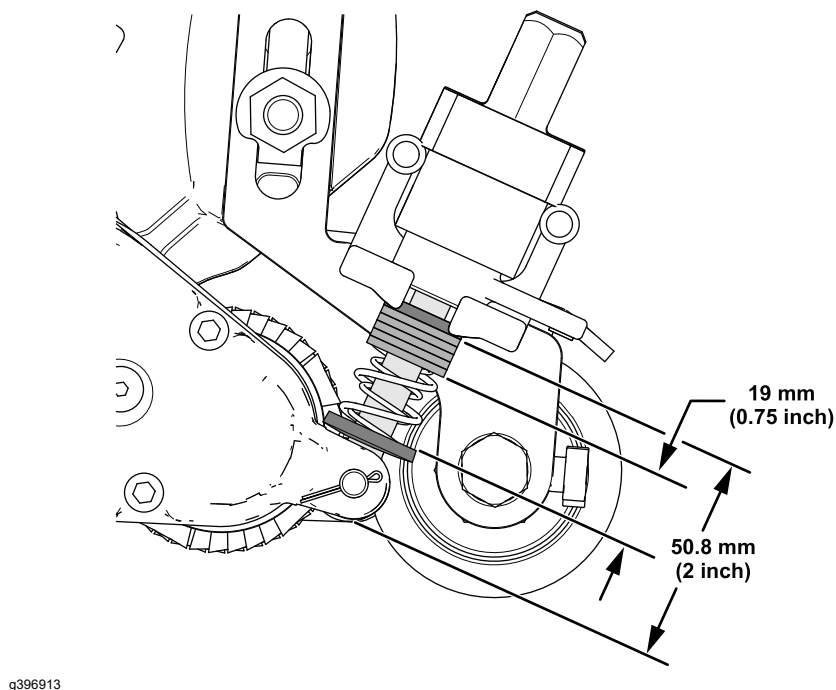


Figure 113

17. Add or remove washers on the groomer eyebolts until the springs compress to **19 mm (0.75 inch)**.
18. Secure the eyebolt to the lugs of the gearbox with the adjuster pin and cotter pin.
19. Secure the eyebolt to the spring pin of the idler pin with the adjuster pin and cotter pin.

The Grooming Brush (Optional)

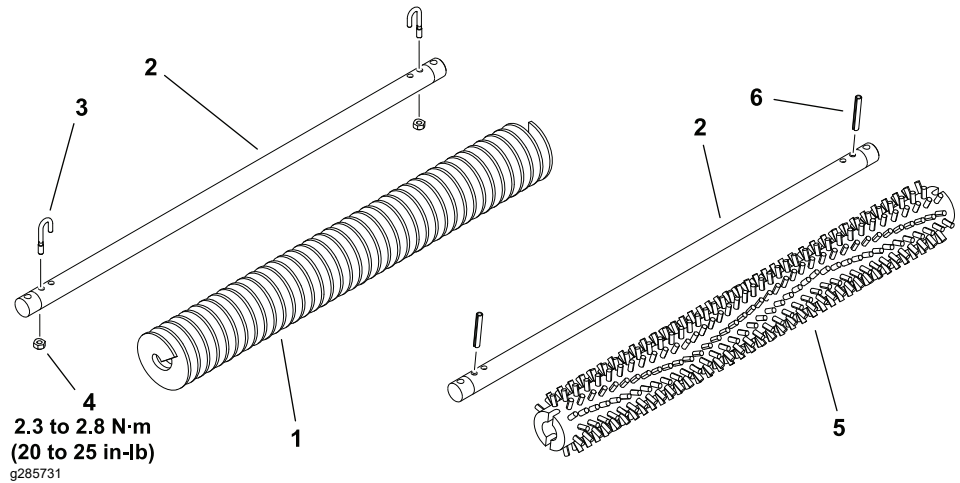


Figure 114

- | | |
|--------------------|----------------------|
| 1. Spiral brush | 4. Locknut (2 each) |
| 2. Brush shaft | 5. Grooming brush |
| 3. J-bolt (2 each) | 6. Roll pin (2 each) |

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 \(page 9–19\)](#).

The grooming brush element or shaft can be serviced separately.

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, make sure that the J-bolts are installed with the threaded portion on the outside of the brush and tighten the locknuts from **2.3 to 2.8 N·m (20 to 25 in-lb)**.



Count on it.