



# Service Manual

## Reelmaster<sup>®</sup> 7000

### Preface

The purpose of this publication is to provide the service technician with information for troubleshooting, testing and repair of major systems and components on the Reelmaster 7000.

REFER TO THE TRACTION UNIT AND CUTTING UNIT OPERATOR'S MANUALS FOR OPERATING, MAINTENANCE AND ADJUSTMENT INSTRUCTIONS. For reference, insert a copy of the Operator's Manuals and Parts Catalog for your machine into Chapter 2 of this service manual. Additional copies of the Operator's Manuals and Parts Catalog are available on the internet at [www.Toro.com](http://www.Toro.com).

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



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

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

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



Product: 2011 TORO Reelmaster 7000 Service Repair Workshop Manual  
Full Download: <https://www.arepairmanual.com/downloads/2011-toro-reelmaster-7000-service-repair-workshop-manual/>

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Safety

Product Records  
and Maintenance

Kubota  
Diesel Engine

Hydraulic  
System

Electrical  
System

Axles, Planetaries  
and Brakes

Chassis

DPA Cutting  
Units

Foldout  
Drawings

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# General Safety Instructions

The Reelmaster 7000 have been tested and certified by TORO for compliance with existing safety standards and specifications. Although hazard control and accident prevention partially are dependent upon the design and configuration of the machine, these factors are also dependent upon the awareness, concern and proper training of the personnel involved in the operation, transport, maintenance and storage of the machine. Improper use or maintenance of the machine can result in injury or death. To reduce the potential for injury or death, comply with the following safety instructions.



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## Before Operating

1. Review and understand the contents of the Operator's Manuals and Operator's DVD before starting and operating the vehicle. Become familiar with the controls and know how to stop the vehicle and engine quickly. Additional copies of the Operator's Manual are available on the internet at [www.Toro.com](http://www.Toro.com).
2. Keep all shields, safety devices and decals in place. If a shield, safety device or decal is defective, illegible or damaged, repair or replace it before operating the machine. Also tighten any loose nuts, bolts or screws to ensure machine is in safe operating condition.
3. Assure interlock switches are adjusted correctly so engine cannot be started unless traction pedal is in NEUTRAL and cutting units are DISENGAGED.
4. Since diesel fuel is flammable, handle it carefully:
  - A. Use an approved fuel container.
  - B. Do not remove fuel tank cap while engine is hot or running.
  - C. Do not smoke while handling fuel.
  - D. Fill fuel tank outdoors and only to within an inch of the top of the tank, not the filler neck. Do not overfill.
  - E. Wipe up any spilled fuel.

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## While Operating

1. Sit on the seat when starting and operating the machine.
2. Before starting the engine:
  - A. Engage the parking brake.
  - B. Make sure traction pedal is in neutral and the PTO switch is OFF (disengaged).
  - C. After engine is started, release parking brake and keep foot off traction pedal. Machine must not move. If movement is evident, the traction pedal linkage is adjusted incorrectly; therefore, shut engine off and adjust traction pedal linkage until machine does not move when traction pedal is released.
3. Do not run engine in a confined area without adequate ventilation. Exhaust fumes are hazardous and could possibly be deadly.
4. Do not touch engine, exhaust system components or radiator while engine is running or soon after it is stopped. These areas could be hot enough to cause burns.
5. Before getting off the seat:
  - A. Ensure that traction pedal is in neutral.
  - B. Engage parking brake.
  - C. Disengage PTO and wait for cutting unit reel to stop rotating.
  - D. Stop engine and remove key from switch.
  - E. Toro recommends that anytime the machine is parked (short or long term), the cutting units should be lowered to the ground. This relieves pressure from the lift circuit and eliminates the risk of cutting units accidentally lowering to the ground.
  - F. Do not park on slopes unless wheels are chocked or blocked.

## Maintenance and Service

1. The Traction Unit and Cutting Unit Operator's Manuals provide information regarding the operation, general maintenance and maintenance intervals for your Reelmaster machine. Refer to these publications for additional information when servicing the machine.
2. Before servicing or making adjustments, lower cutting units, stop engine, set parking brake and remove key from the ignition switch.
3. Make sure machine is in safe operating condition by keeping all nuts, bolts and screws tight.
4. Never store the machine or fuel container inside where there is an open flame, such as near a water heater or furnace.
5. Make sure all hydraulic line connectors are tight and all hydraulic hoses and lines are in good condition before applying pressure to the hydraulic system.
6. Keep body and hands away from pin hole leaks in hydraulic lines that eject high pressure hydraulic fluid. Use cardboard or paper to find hydraulic leaks. Hydraulic fluid escaping under pressure can penetrate skin and cause injury. Fluid accidentally injected into the skin must be surgically removed within a few hours by a doctor familiar with this form of injury or gangrene may result.
7. Before disconnecting or performing any work on the hydraulic system, all pressure in system must be relieved by stopping engine and lowering cutting units to the ground.
8. If major repairs are ever needed or assistance is desired, contact an Authorized Toro Distributor.
9. To reduce potential fire hazard, keep engine area free of excessive grease, grass, leaves and dirt. Clean protective screen on machine frequently.
10. If engine must be running to perform maintenance or an adjustment, keep hands, feet, clothing and other parts of the body away from cutting units and other moving parts. Keep bystanders away.
11. Do not overspeed the engine by changing governor setting. To assure safety and accuracy, check maximum engine speed.
12. Shut engine off before checking or adding oil to the engine crankcase.
13. Disconnect battery before servicing the machine. Disconnect negative battery cable first and positive cable last. If battery voltage is required for troubleshooting or test procedures, temporarily connect the battery. Reconnect positive battery cable first and negative cable last.
14. Battery acid is poisonous and can cause burns. Avoid contact with skin, eyes and clothing. Protect your face, eyes and clothing when working with a battery.
15. Battery gases can explode. Keep cigarettes, sparks and flames away from the battery.
16. When welding on machine, disconnect both battery cables to prevent damage to machine electronic equipment. Disconnect negative battery cable first and positive cable last. Also, disconnect the wire harness connector from the machine TEC controller and disconnect the terminal connector from the alternator.
17. At the time of manufacture, the machine conformed to the safety standards for riding mowers. To assure optimum performance and continued safety certification of the machine, use genuine Toro replacement parts and accessories. Replacement parts and accessories made by other manufacturers may result in non-conformance with the safety standards and the warranty may be voided.
18. When changing attachments, tires or performing other service, use correct blocks, hoists and jacks. Make sure machine is parked on a solid level surface such as a concrete floor. Prior to raising the machine, remove any attachments that may interfere with the safe and proper raising of the machine. Always chock or block wheels. Use appropriate jack stands to support the raised machine. If the machine is not properly supported by jack stands, the machine may move or fall, which may result in personal injury (see Jacking Instructions in this chapter).

# Jacking Instructions



## CAUTION

When changing attachments, tires or performing other service, use correct jacks and supports. Make sure machine is parked on a solid, level surface such as a concrete floor. Prior to raising machine, remove any attachments that may interfere with the safe and proper raising of the machine. Always chock or block wheels. Use jack stands to support the raised machine. If the machine is not properly supported by jack stands, the machine may move or fall, which may result in personal injury.

### Jacking the Front End (Fig. 1)

1. Apply parking brake and chock both rear tires to prevent the machine from moving.

**IMPORTANT: Do not place jack, jack stands or blocks under the wheel motors. Wheel motors can be damaged if used for jacking or support points.**

2. Position jack securely under the frame, just to the inside of the front tire.

3. Jack front of machine off the ground.

4. Position appropriate jack stands under the frame as close to the wheels as possible to support the machine.

### Jacking the Rear End (Fig. 2)

1. Apply parking brake and chock both front tires to prevent the machine from moving.

2. Place jack securely under the center of rear axle.

3. Jack rear of machine off the ground.

4. Position appropriate jack stands under the rear axle to support the machine.

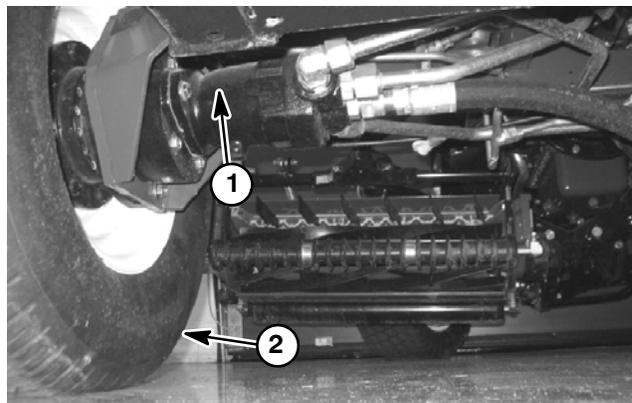


Figure 1

1. Frame

2. Front tire (RH shown)

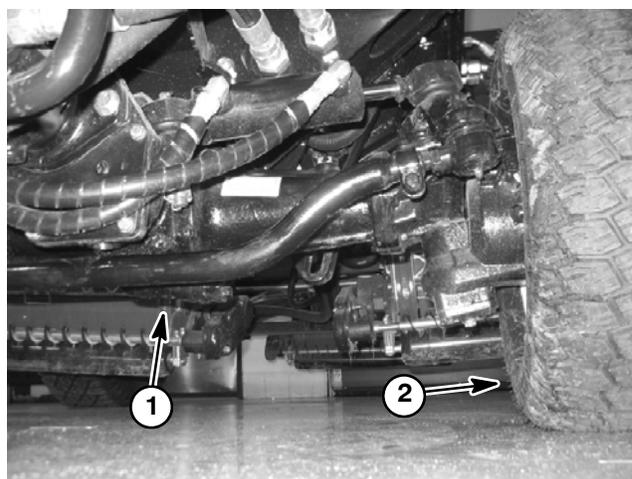


Figure 2

1. Rear axle

2. Rear tire (RH shown)

# Safety and Instruction Decals

Numerous safety and instruction decals are affixed to the Reelmaster 7000. If any decal becomes illegible or damaged, install a new decal. Decal part numbers are listed in your Parts Catalog.

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# Product Records and Maintenance

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## Product Records

Insert Operator’s Manuals and Parts Catalog for your Reelmaster at the end of this chapter. Additionally, insert Installation Instructions, Operator’s Manuals and Parts Catalogs for any accessories that have been installed on your Reelmaster at the end of this section.

## Maintenance

Maintenance procedures and recommended service intervals for your Reelmaster are covered in the Traction Unit and Cutting Unit Operator’s Manuals. Refer to those publications when performing regular equipment maintenance. Several maintenance procedures have break-in intervals identified in the Operator’s Manuals. Refer to the Engine Operator’s Manual for additional engine specific maintenance procedures.

# Equivalents and Conversions

## Decimal and Millimeter Equivalents

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

## U.S. to Metric Conversions

	To Convert	Into	Multiply By
<b>Linear Measurement</b>	Miles	Kilometers	1.609
	Yards	Meters	0.9144
	Feet	Meters	0.3048
	Feet	Centimeters	30.48
	Inches	Meters	0.0254
	Inches	Centimeters	2.54
	Inches	Millimeters	25.4
<b>Area</b>	Square Miles	Square Kilometers	2.59
	Square Feet	Square Meters	0.0929
	Square Inches	Square Centimeters	6.452
	Acre	Hectare	0.4047
<b>Volume</b>	Cubic Yards	Cubic Meters	0.7646
	Cubic Feet	Cubic Meters	0.02832
	Cubic Inches	Cubic Centimeters	16.39
<b>Weight</b>	Tons (Short)	Metric Tons	0.9078
	Pounds	Kilograms	0.4536
	Ounces (Avdp.)	Grams	28.3495
<b>Pressure</b>	Pounds/Sq. In.	Kilopascal	6.895
	Pounds/Sq. In.	Bar	0.069
<b>Work</b>	Foot-pounds	Newton-Meters	1.356
	Foot-pounds	Kilogram-Meters	0.1383
	Inch-pounds	Kilogram-Centimeters	1.152144
<b>Liquid Volume</b>	Quarts	Liters	0.9463
	Gallons	Liters	3.785
<b>Liquid Flow</b>	Gallons/Minute	Liters/Minute	3.785
<b>Temperature</b>	Fahrenheit	Celsius	1. Subtract 32°
			2. Multiply by 5/9

# Torque Specifications

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

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

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

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

## Fastener Identification

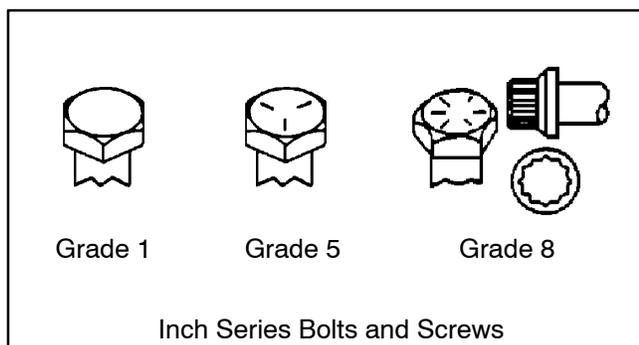


Figure 1

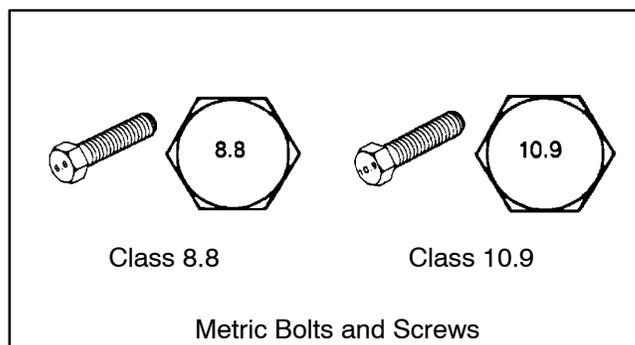


Figure 2

## Using a Torque Wrench with an Offset Wrench

Use of an offset wrench (e.g. crowfoot wrench) will affect torque wrench calibration due to the effective change of torque wrench length. When using a torque wrench with an offset wrench, multiply the listed torque recommendation by the calculated torque conversion factor (Fig. 3) to determine proper tightening torque. Tightening torque when using a torque wrench with an offset wrench 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 18".

The measured effective length of the torque wrench with the offset wrench installed (distance from the center of the handle to the center of the offset wrench) is 19".

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

If the listed torque recommendation for a fastener is from 76 to 94 ft-lb, the proper torque when using this torque wrench with an offset wrench would be from 72 to 89 ft-lb.

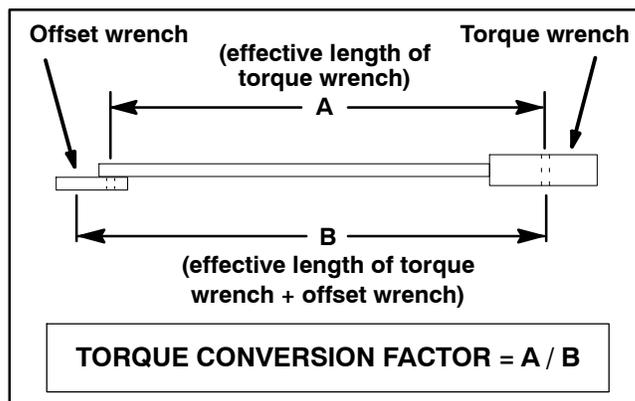


Figure 3

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

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

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

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

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

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

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

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

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

## Other Torque Specifications

### SAE Grade 8 Steel Set Screws

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

### Wheel Bolts and Lug Nuts

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

\*\* For steel wheels and non-lubricated fasteners.

### Thread Cutting Screws (Zinc Plated Steel)

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

### Thread Cutting Screws (Zinc Plated Steel)

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

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

## Conversion Factors

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

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

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

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



# Kubota Diesel Engine

Kubota  
Diesel Engine

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KUBOTA WORKSHOP MANUAL, DIESEL ENGINE,  
03-M-DI-E3B SERIES

# Specifications

Item	Description
Make / Designation	Kubota Model V2403-M-DI-E3B 4-Cycle, 4 Cylinder, Liquid Cooled, Diesel Engine
Bore	3.425" (87.0 mm)
Stroke	4.031" (102.4 mm)
Total Displacement	148.5 in <sup>3</sup> (2434 cc)
Firing Order	1 (closest to gear case end) - 3 - 4 (closest to flywheel end) - 2
Combustion Chamber	Spherical Type (E-TVCS)
Compression Ratio	23.2:1
Direction of Rotation	Counterclockwise (viewed from flywheel)
Fuel	Diesel or Biodiesel (up to B20) Fuel with Low or Ultra Low Sulfur Content
Fuel Capacity	22 U.S. gallons (83 liters)
Fuel Injection Pump	Denso PFR 4M Type Mini Pump
Injection Nozzle	Denso OPD Mini Nozzle
Governor	Centrifugal Mechanical
Low Idle (no load)	1550 ± 50 RPM
High Idle (no load)	2850 +50/-120 RPM
Engine Oil	API CH-4, CI-4 or higher
Engine Oil Viscosity	See Operator's Manual
Crankcase Oil Capacity	10.0 U.S. Quarts (9.5 Liters) with Filter
Oil Pump	Trochoid Type
Coolant Capacity	13 U.S. Quarts (12.3 Liters)
Starter	12 VDC, 2.0 kW
Alternator/Regulator Alternator Output	12 VDC 60 amp
Engine Dry Weight	406 U.S. pounds (184 kg)

# General Information

This Chapter gives information about specifications and repair of the diesel engine used in the Reelmaster 7000.

General maintenance procedures are described in your Traction Unit Operator's Manual. Information on engine troubleshooting, testing, disassembly and assembly is identified in the Kubota Workshop Manual, Diesel Engine, 03-M-DI-E3B.

Most repairs and adjustments require tools which are commonly available in many service shops. Special

tools are described in the Kubota Workshop Manual, Diesel Engine, 03-M-DI-E3B. The use of some specialized test equipment is explained. However, the cost of the test equipment and the specialized nature of some repairs may dictate that the work be done at an engine repair facility.

Service and repair parts for Kubota engines are supplied through your Authorized Toro Distributor. If no parts list is available, be prepared to provide your distributor with the Toro model and serial number.

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## Operator's Manual

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

# Service and Repairs

## Air Filter System

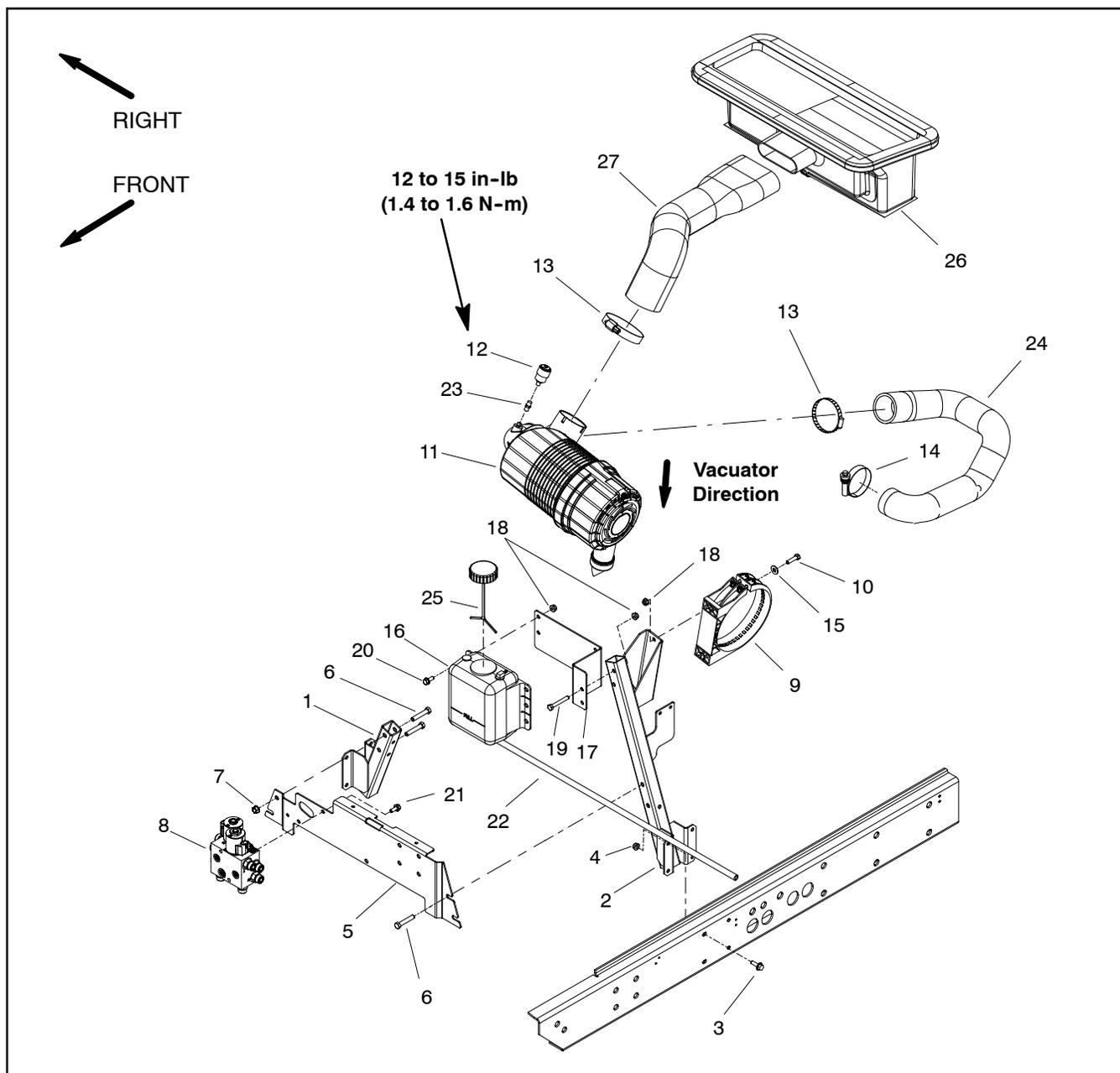


Figure 1

- |                               |                          |                                |
|-------------------------------|--------------------------|--------------------------------|
| 1. Battery support            | 10. Cap screw (2 used)   | 19. Cap screw (2 used)         |
| 2. Bracket                    | 11. Air cleaner assembly | 20. Flange head screw (4 used) |
| 3. Flange head screw (8 used) | 12. Service indicator    | 21. Flange head screw (2 used) |
| 4. Flange nut (8 used)        | 13. Hose clamp           | 22. Hose                       |
| 5. Support bracket            | 14. Hose clamp           | 23. Adapter                    |
| 6. Cap screw (4 used)         | 15. Flat washer (2 used) | 24. Air cleaner hose           |
| 7. Flange nut (4 used)        | 16. Coolant reservoir    | 25. Reservoir cap              |
| 8. Fan drive manifold         | 17. Reservoir bracket    | 26. Plenum                     |
| 9. Air cleaner strap          | 18. Flange nut (8 used)  | 27. Air intake hose            |

### Removal (Fig. 1)

1. Park machine on a level surface, lower cutting units, stop engine, apply parking brake and remove key from the ignition switch.
2. Raise and support hood.
3. Remove air cleaner components as needed using Figure 1 as a guide.

### Installation (Fig. 1)

**IMPORTANT: Any leaks in the air filter system will cause serious engine damage. Make sure that all air cleaner components are in good condition and are properly secured during assembly.**

1. Assemble air filter system using Figure 1 as a guide.
  - A. If service indicator (item 12) was removed from air cleaner housing, apply thread sealant to adapter threads before installing adapter and indicator to housing. Install adapter so that grooves in adapter hex and adapter filter element are installed toward service indicator (Fig. 3). Torque indicator from **12 to 15 in-lb (1.4 to 1.6 N-m)**.
  - B. Orientate vacuator valve on air cleaner cover toward ground.
  - C. Install air cleaner so air cleaner strap (item 9) is as close as possible to air cleaner cover.
  - D. Make sure that air cleaner hose (item 24) does not contact engine valve cover or other engine components. To modify clearance, move and/or rotate air cleaner body in air cleaner strap. Verify that tabs in strap mesh fully with slots in air cleaner body.
2. After air cleaner installation is completed, lower and secure hood.

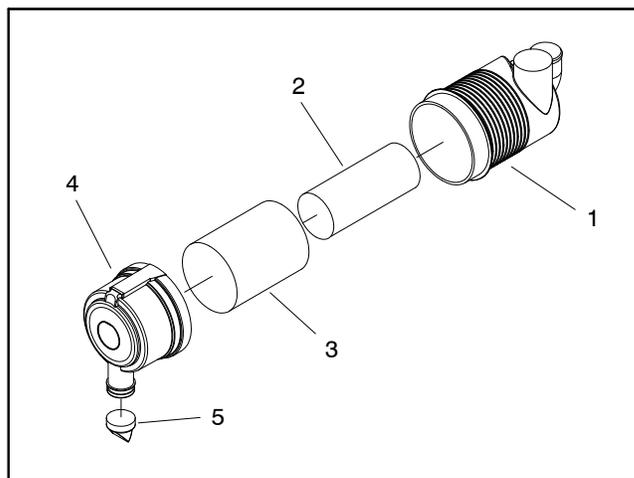


Figure 2

- |                          |                      |
|--------------------------|----------------------|
| 1. Air cleaner housing   | 4. Air cleaner cover |
| 2. Safety filter element | 5. Vacuator valve    |
| 3. Air filter element    |                      |

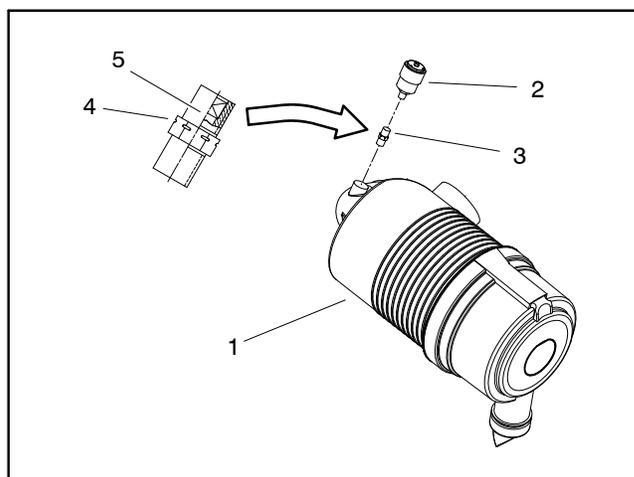


Figure 3

- |                         |                   |
|-------------------------|-------------------|
| 1. Air cleaner assembly | 4. Groove         |
| 2. Service indicator    | 5. Filter element |
| 3. Adapter              |                   |

# Exhaust System

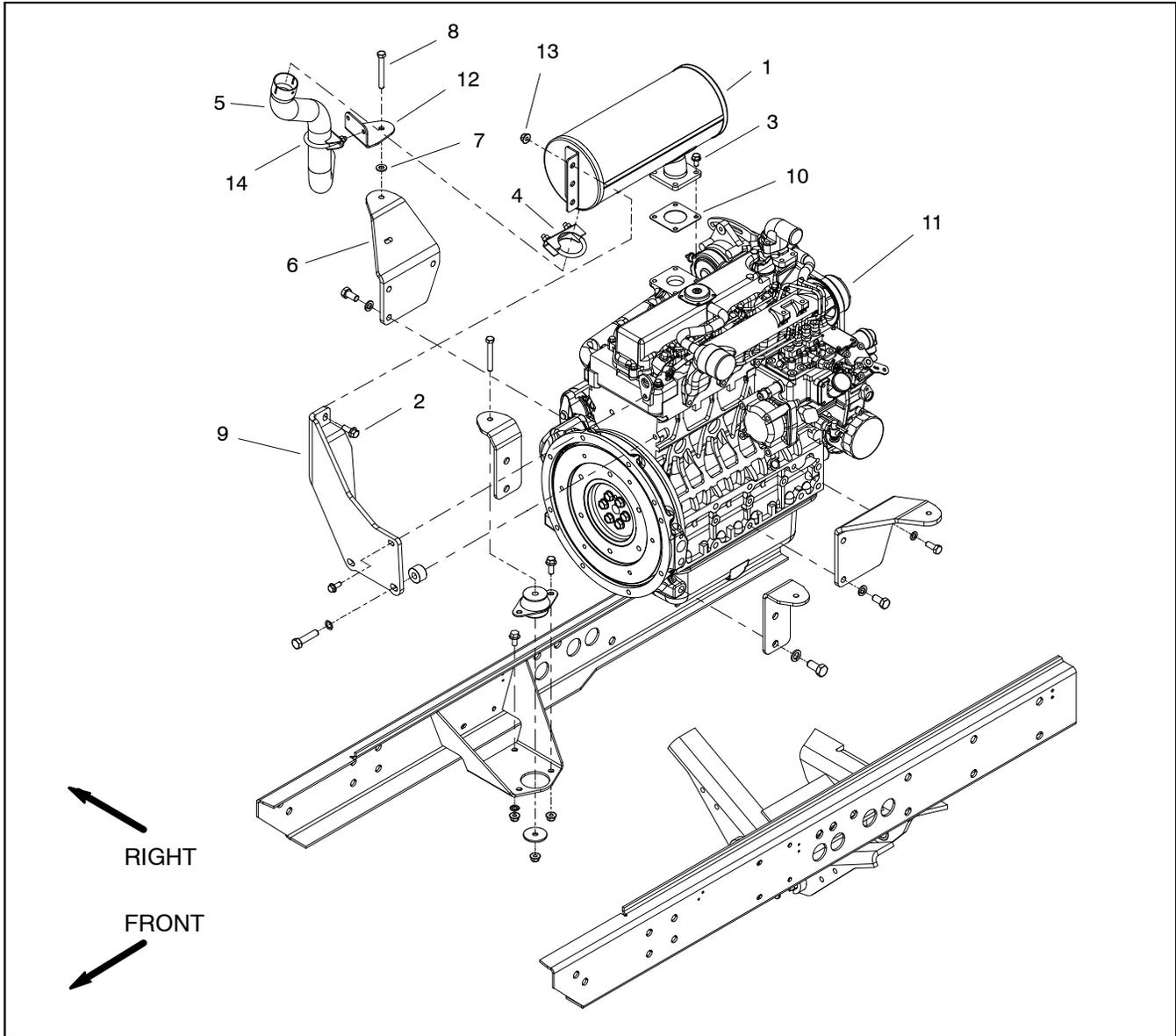
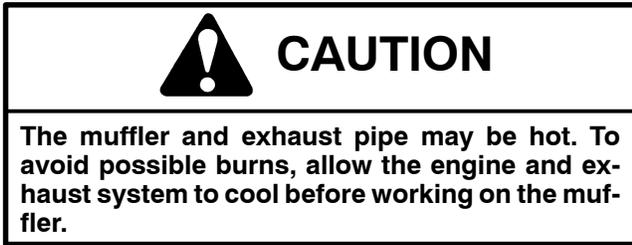


Figure 4

- |                               |                    |                         |
|-------------------------------|--------------------|-------------------------|
| 1. Muffler                    | 6. RH engine mount | 11. Engine              |
| 2. Flange head screw (2 used) | 7. Flat washer     | 12. Muffler bracket     |
| 3. Flange head screw (4 used) | 8. Cap screw       | 13. Flange nut (2 used) |
| 4. Muffler clamp              | 9. Muffler bracket | 14. Muffler clamp       |
| 5. Tailpipe                   | 10. Muffler gasket |                         |

## Removal (Fig. 4)



1. Park machine on a level surface, lower cutting units, stop engine, engage parking brake and remove key from the ignition switch.
2. Raise and support hood.
3. Remove muffler and/or muffler bracket from the engine as necessary using Figure 4 as a guide.

## Installation (Fig. 4)

**IMPORTANT:** If exhaust studs were removed from engine cylinder head, thoroughly clean threads in head and apply Loctite #277 (or equivalent) to stud threads before installing studs into head.

**NOTE:** Make sure muffler flange and exhaust manifold sealing surfaces are free of debris or damage that may prevent a tight seal.

1. Install **new** exhaust gasket if original gasket is damaged or torn.

**IMPORTANT:** Failure to follow the suggested muffler fastener sequence may result in premature muffler failure.

2. Install exhaust system components to the engine using Figure 4 as a guide. Hand tighten all exhaust system fasteners before fully tightening any fastener.
3. Tailpipe should have equal clearance between frame and engine after installation.
4. After exhaust system installation is completed, lower and secure hood.





## DANGER

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

### Check Fuel Lines and Connections

Check fuel lines and connections as recommended in the Traction Unit Operator's Manual. Check lines for deterioration, damage, leaking or loose connections. Replace hoses, clamps and connections as necessary.

### Drain and Clean Fuel Tank

Drain and clean the fuel tank periodically as recommended in the Traction Unit Operator's Manual. Also, drain and clean the fuel tank if the fuel system becomes contaminated or if the machine is to be stored for an extended period. To clean fuel tank, flush tank out with clean diesel fuel. Make sure tank is free of contaminants and debris.

### Fuel Tank Removal (Fig. 5)

1. Park machine on a level surface, lower cutting units, stop engine, engage parking brake and remove key from the ignition switch.
2. Disconnect fuel hoses from the suction and return fittings in top of tank.
3. Use draincock on bottom of tank to empty fuel tank into a suitable container.
4. Remove fuel tank from machine using Figure 5 as a guide.

### Fuel Tank Installation (Fig. 5)

1. Install fuel tank to frame using Figure 5 as a guide.
2. Connect fuel hoses to the suction and return fittings in top of tank.
3. Make sure that draincock on bottom of tank is closed.
4. Fill fuel tank with clean fuel.

# Radiator

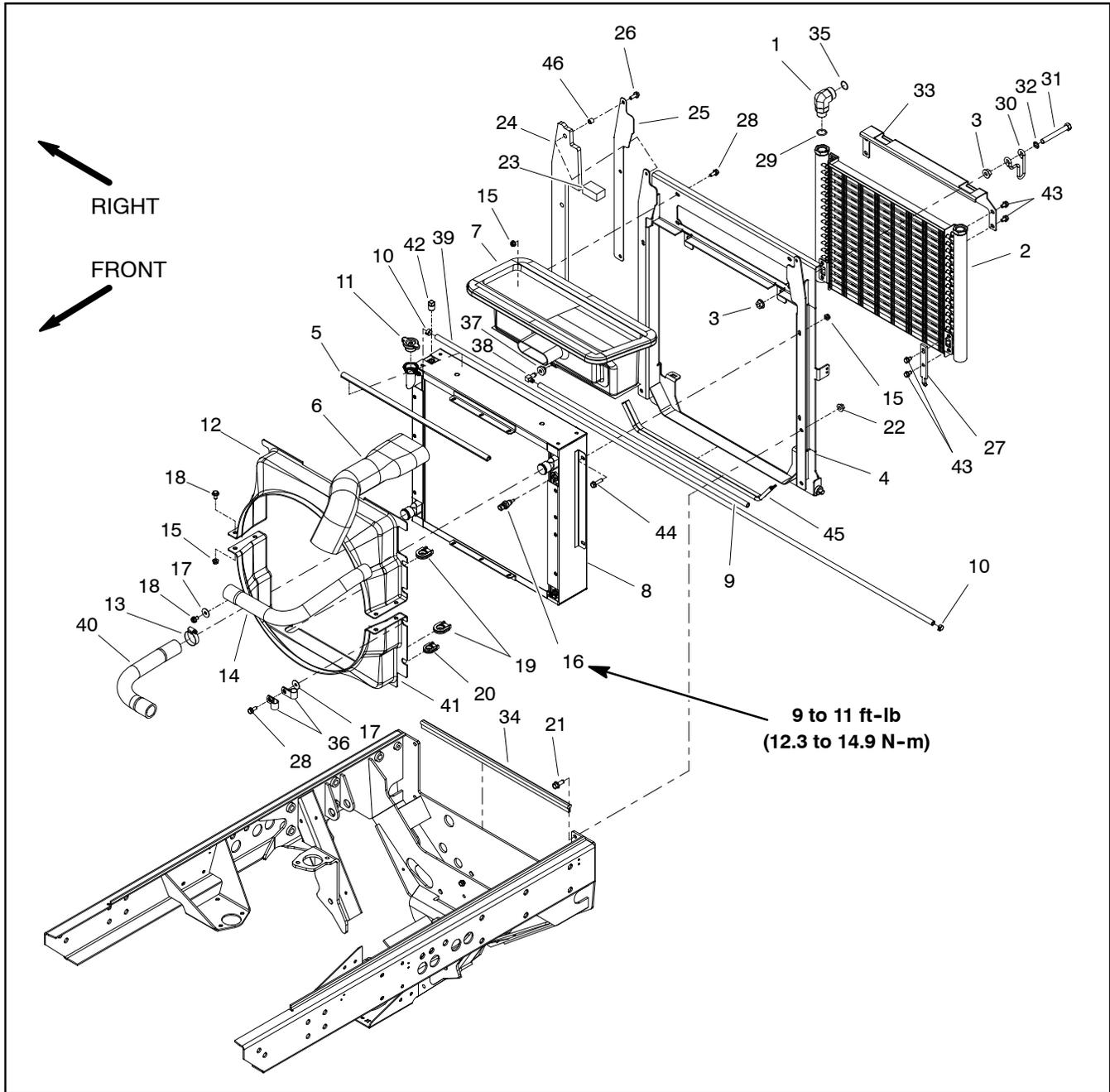


Figure 6

- |                                   |  |                                |
|-----------------------------------|--|--------------------------------|
| 1. 90° hydraulic fitting (2 used) | 17. Flat washer (8 used)                   | 32. Washer (2 used)            |
| 2. Oil cooler                     | 18. Flange head screw (11 used)            | 33. Oil cooler top bracket     |
| 3. Flange nut (4 used)            | 19. Rubber grommet (2 used)                | 34. Bulb seal                  |
| 4. Radiator mount                 | 20. Rubber grommet                         | 35. O-ring                     |
| 5. Bulb seal                      | 21. Flange head screw (4 used)             | 36. R-clamp (2 used)           |
| 6. Air cleaner hose               | 22. Flange nut (4 used)                    | 37. Bushing                    |
| 7. Plenum                         | 23. Foam seal (2 used)                     | 38. Elbow fitting              |
| 8. Radiator                       | 24. Recirculation barrier (2 used)         | 39. Reservoir hose             |
| 9. Hose                           | 25. Recirculation barrier bracket (2 used) | 40. Lower radiator hose        |
| 10. Hose clamp (3 used)           | 26. Screw (2 used)                         | 41. Lower radiator shroud      |
| 11. Radiator cap                  | 27. Oil cooler mount plate (2 used)        | 42. Pipe plug                  |
| 12. Upper radiator shroud         | 28. Flange head screw (9 used)             | 43. Flange head screw (8 used) |
| 13. Clamp (4 used)                | 29. O-ring                                 | 44. Flange head screw (4 used) |
| 14. Upper radiator hose           | 30. Clamp (2 used)                         | 45. Bulb seal                  |
| 15. Flange nut (12 used)          | 31. Cap screw (2 used)                     | 46. Spacer                     |
| 16. Temperature sender            |  |                                |

## Removal (Fig. 6)

1. Park machine on a level surface, lower cutting units, stop engine, engage parking brake and remove key from the ignition switch.

2. Remove hood from the machine (see Hood Removal in the Service and Repairs section of Chapter 7 – Chassis).



## CAUTION

**Do not open radiator cap or drain coolant if the radiator or engine is hot. Pressurized, hot coolant can escape and cause burns.**

**Ethylene-glycol antifreeze is poisonous. Dispose of coolant properly or store it in a properly labeled container away from children and pets.**

3. Remove radiator cap. Drain radiator into a suitable container using the radiator draincock.

4. Disconnect upper and lower hoses from the radiator.

5. Remove air cleaner hose (item 6).

6. Remove four (4) flange head screws and flange nuts that secure plenum (item 7) to radiator mount. Remove plenum.

7. Disconnect reservoir hose (item 39) from the radiator vent tube.

8. Detach upper radiator shroud from the radiator and lower radiator shroud. Remove upper shroud from machine.

9. Remove fasteners that secure lower radiator shroud to radiator.

10. Remove six (6) cap screws and flange nuts that secure fan motor bracket to radiator (Fig. 7).

11. Position lower radiator shroud and fan motor bracket assembly away from radiator.

12. Remove four (4) flange head screws and flange nuts securing the radiator and recirculation barriers (items 24 and 25) to the radiator mount. Carefully remove barriers and radiator from the machine.

13. Plug all radiator and hose openings to prevent contamination.

## Installation (Fig. 6)

1. Remove plugs placed in radiator and hose openings during the removal procedure. Make sure that radiator draincock is closed.

Reelmaster 7000

2. Carefully position radiator and recirculation barriers (items 24 and 25) to the radiator mount. Secure radiator and barriers in place with four (4) flange head screws and flange nuts.

3. Position lower radiator shroud and fan motor bracket assembly to the radiator. Make sure that hydraulic hoses are correctly positioned in grommets in lower radiator shroud.

4. Secure fan motor bracket to radiator with six (6) cap screws and flange nuts (Fig. 7).

5. Secure lower radiator shroud to radiator with removed fasteners.

6. Position upper radiator shroud to lower radiator shroud and radiator. Secure shrouds with removed fasteners. Make sure that clearance between shrouds and fan is at least 0.180" (4.6 mm) at all points.

7. Connect reservoir hose (item 39) to the radiator vent tube.

8. Connect upper and lower hoses to the radiator.

9. Install plenum (item 7) to radiator mount and secure with flange head screws and flange nuts.

10. Install air cleaner hose (item 6) to the air cleaner and plenum.

11. Fill radiator with coolant.

12. Install hood on the machine (see Hood Installation in the Service and Repairs section of Chapter 7 – Chassis).

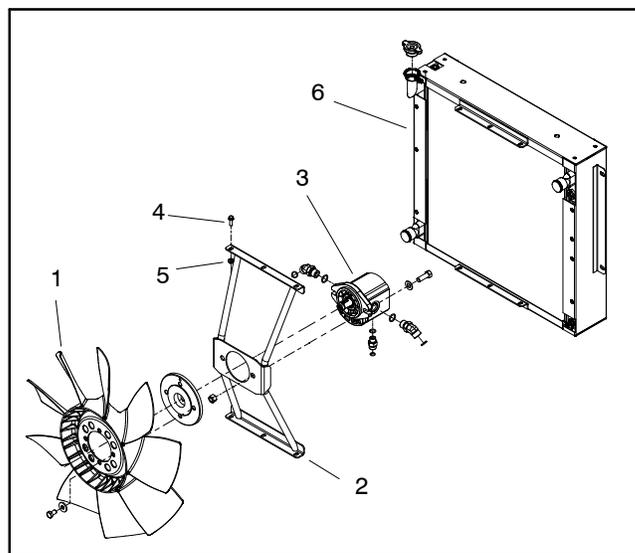


Figure 7

- |                      |                        |
|----------------------|------------------------|
| 1. Fan               | 4. Cap screw (6 used)  |
| 2. Fan motor bracket | 5. Flange nut (6 used) |
| 3. Fan motor         | 6. Radiator            |

# Engine

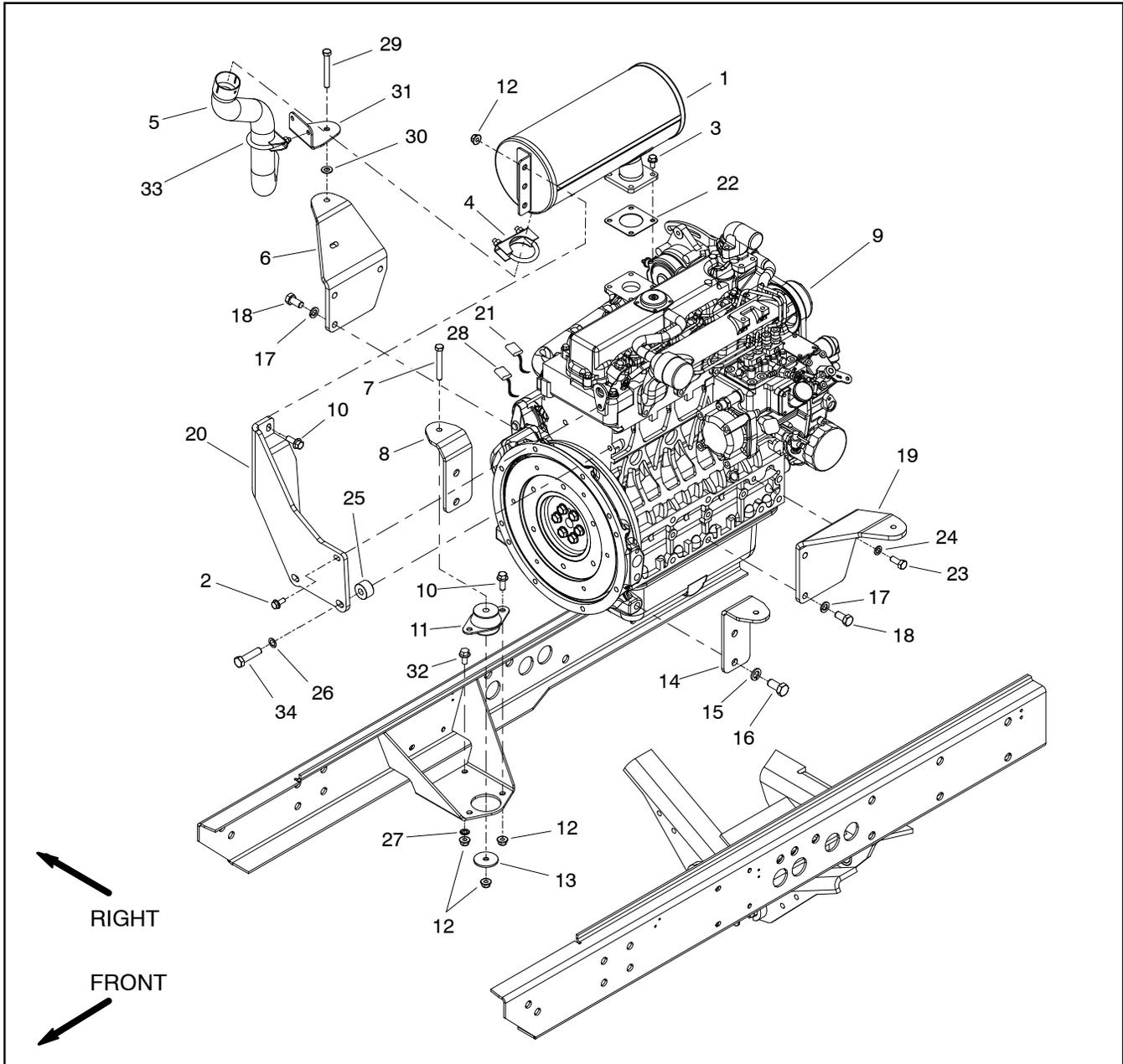


Figure 8

- |                                 |                             |                              |
|---------------------------------|-----------------------------|------------------------------|
| 1. Muffler                      | 13. Rebound washer (4 used) | 24. Lock washer              |
| 2. Flange head screw            | 14. LH front engine mount   | 25. Spacer (2 used)          |
| 3. Flange head screw (4 used)   | 15. Lock washer (4 used)    | 26. Hardened washer (2 used) |
| 4. Muffler clamp                | 16. Cap screw (4 used)      | 27. Lock washer              |
| 5. Tailpipe                     | 17. Lock washer (5 used)    | 28. Alternator wire harness  |
| 6. RH rear engine mount         | 18. Cap screw (5 used)      | 29. Cap screw                |
| 7. Cap screw (3 used)           | 19. LH rear engine mount    | 30. Flat washer              |
| 8. RH front engine mount        | 20. Muffler bracket         | 31. Muffler bracket          |
| 9. Engine                       | 21. Ground wire harness     | 32. Flange head screw        |
| 10. Flange head screw (10 used) | 22. Muffler gasket          | 33. Muffler clamp            |
| 11. Engine mount (4 used)       | 23. Cap screw               | 34. Cap screw (2 used)       |
| 12. Flange nut (15 used)        |                             |                              |

## Engine Removal (Fig. 8)

1. Park machine on a level surface, lower cutting units, stop engine, engage parking brake and remove key from the ignition switch.
2. Remove hood from the machine (see Hood Removal in the Service and Repairs section of Chapter 7 - Chassis).
3. Remove battery cover. Disconnect negative battery cable first and then positive battery cable.



### CAUTION

**Do not open radiator cap or drain coolant if the radiator or engine is hot. Pressurized, hot coolant can escape and cause burns.**

**Ethylene-glycol antifreeze is poisonous. Dispose of coolant properly, or store it in a properly labeled container away from children and pets.**

4. Drain coolant from radiator into a suitable container (see Radiator Removal in this section). Disconnect coolant hoses from the radiator.



### CAUTION

**The exhaust system may be hot. To avoid possible burns, allow the exhaust system to cool before working on or near the muffler.**

5. Remove exhaust system from engine (see Exhaust System Removal in this section).
6. Remove air cleaner system from engine (see Air Cleaner Removal in this section).
7. Note location of cable ties used to secure wire harness. Disconnect wire harness connectors from the following engine components:
  - A. The engine run solenoid (Fig. 9).
  - B. The temperature sender (Fig. 10).
  - C. The alternator (Fig. 10).
  - D. The glow plug connection.
  - E. Wire harness connector from engine ground harness.
  - F. The electric starter motor.
  - G. Low oil pressure switch located on alternator side of engine (above electric starter).

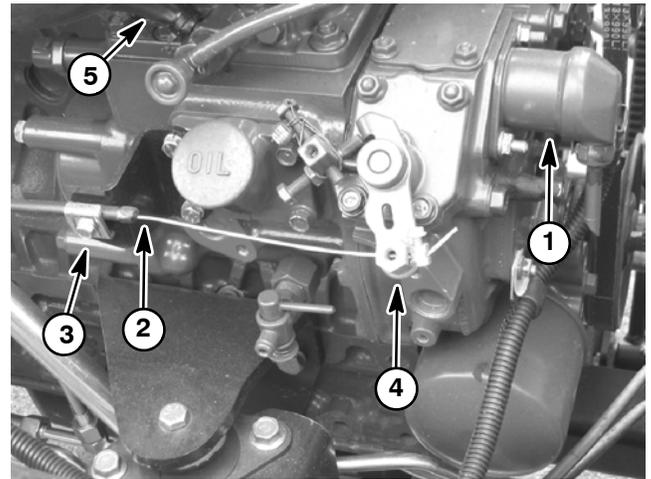


Figure 9

- |                        |                     |
|------------------------|---------------------|
| 1. Engine run solenoid | 4. Cable swivel     |
| 2. Throttle cable      | 5. Fuel supply hose |
| 3. Cable clamp         |                     |

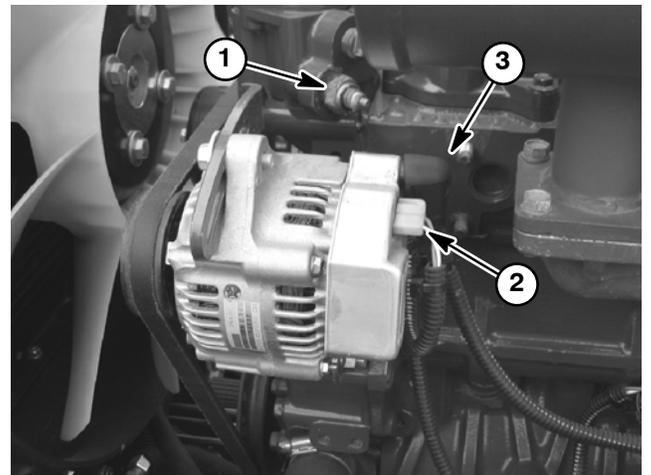


Figure 10

- |                       |                  |
|-----------------------|------------------|
| 1. Temperature sender | 3. Battery cable |
| 2. Harness connector  |                  |

8. Disconnect fuel supply hose from injection pump (Fig. 9). Cap fuel hose and injector pump fuel inlet to prevent contamination.
9. Remove throttle cable from engine (Fig. 9):
  - A. Remove lock nut that secures throttle cable swivel to speed control lever.
  - B. Loosen cable clamp and remove throttle cable from under clamp.
  - C. Position throttle cable away from the engine.
10. Remove fasteners that secure the upper radiator shroud to the lower shroud and radiator (see Radiator Removal in this section). Remove upper radiator shroud from machine.

A. To prevent contamination of hydraulic system, thoroughly clean exterior of fan motor and fittings.

B. Disconnect hydraulic hoses from cooling fan motor. Put caps or plugs on fittings and hoses to prevent contamination. Label hydraulic lines for proper assembly.

C. Remove six (6) cap screws and flange nuts that secure fan motor bracket to radiator.

D. Carefully remove fan motor, fan and motor bracket assembly from machine.

**IMPORTANT: The hydraulic pump assembly can remain in machine during engine removal. To prevent pump assembly from shifting or falling, make sure to support pump assembly before pump mounting fasteners are removed.**

12. Support hydraulic pump assembly. Remove fasteners that secure piston (traction) pump assembly to engine (see Piston (Traction) Pump Assembly Removal in the Service and Repairs section of Chapter 4 - Hydraulic System).

13. Make sure all cable ties securing the wiring harness, fuel lines or hydraulic hoses to the engine are removed.

14. Connect lift or hoist to the lift tabs on engine.

15. Remove flange nuts, rebound washers and cap screws that secure the engine mount brackets to the rubber engine mounts.



## CAUTION

One person should operate lift or hoist while a second person guides the engine out of the machine.

**IMPORTANT: Make sure to not damage the engine, fuel lines, hydraulic lines, electrical harness or other parts while removing the engine.**

16. Carefully raise engine from the machine.

17. If necessary, remove engine mounts from the engine using Figure 8 as a guide.

### Engine Installation (Fig. 8)

1. Locate machine on a level surface with key removed from the ignition switch. Chock wheels to keep the machine from moving.

Sample of manual. Download All 315 pages at:

<https://www.arepairmanual.com/downloads/2011-toro-reelmaster-7000-service-repair-workshop-manual/>

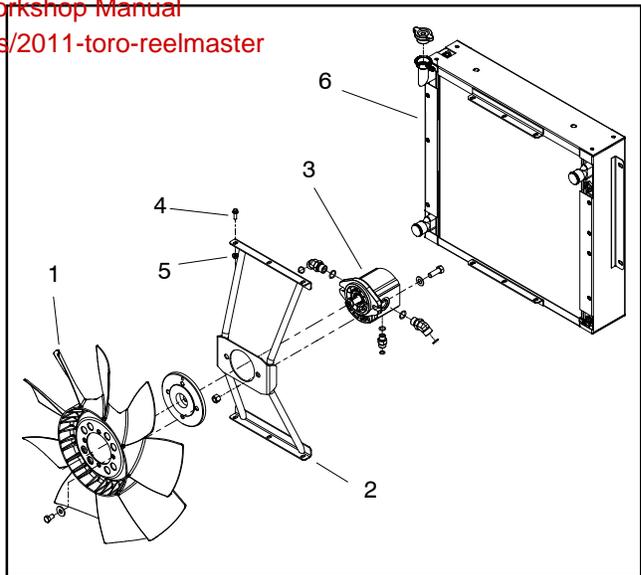


Figure 11

- |                      |                        |
|----------------------|------------------------|
| 1. Fan               | 4. Cap screw (6 used)  |
| 2. Fan motor bracket | 5. Flange nut (6 used) |
| 3. Fan motor         | 6. Radiator            |

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

3. If removed, install engine mounts to the engine using Figure 8 as a guide.

4. Connect lift or hoist to the lift tabs on engine.



## CAUTION

One person should operate lift or hoist while a second person guides the engine into the machine.

**IMPORTANT: Make sure to not damage the engine, fuel lines, hydraulic lines, electrical harness or other parts while installing the engine.**

5. Carefully lower engine into the machine.

6. Align engine to the rubber engine mounts and hydraulic pump input shaft. Secure engine to engine mounts with cap screws, rebound washers and flange nuts.

7. Secure hydraulic pump assembly to engine (see Piston (Traction) Pump Assembly Installation in the Service and Repairs section of Chapter 4 - Hydraulic System).