Service Manual

Line Painter 1200

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 Line Painter 1200.

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

The Toro Company
Attn. Technical Publications
8111 Lyndale Avenue South
Minneapolis, MN 55420

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

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

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

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

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Chapter 1

Safety

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Safety Instructions

The Line Painter 1200 is designed and tested to offer safe service when operated and maintained properly. 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.

WARNING

To reduce the potential for injury or death, comply with the following safety instructions.

Before Operating

1. Read and understand the contents of the Operator's Manual before starting and operating the machine. Become familiar with the controls and know how to stop the machine quickly. A replacement Operator's Manual is available on the Internet at www.Toro.com or by sending the complete model and serial number to:

   The Toro Company
   Attn. Technical Publications
   8111 Lyndale Avenue South
   Bloomington, Minnesota 55420–1196

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. Since gasoline is highly flammable, handle it carefully:

   A. Store fuel in containers specifically designed for this purpose.

   B. Do not remove machine 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 the fuel tank.

   E. If fuel is spilled, do not start engine. Move the machine away from the area of spillage and allow the gasoline vapors to dissipate. Properly dispose of any spilled fuel.

While Operating

1. Operator should be in the operator's position when operating the Line Painter 1200.

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

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

4. If abnormal vibration is detected, stop machine immediately and determine source of vibration. Correct problems before resuming the use of the machine.

5. Use extreme caution when operating the machine in reverse or when pulling the machine rearward.

6. Always wear safety goggles or safety glasses with side shields when operating the machine.

7. While operating, the Line Painter 1200 may exceed noise levels of 85dB(A) at the operator position. Hearing protection is recommended for prolonged exposure to reduce the potential of permanent hearing damage.

8. Before leaving the operator's position of the Line Painter 1200:

   A. Release paint control lever to stop the paint operation.

   B. Ensure that vehicle traction lever is in neutral, apply parking brake, stop engine and remove key from ignition switch.

9. Use only latex base paint in the Line Painter 1200. Do not use oil based paint!

Maintenance and Service

1. Before servicing or making adjustments, position machine on a level surface and apply parking brake to prevent machine from moving.

2. Disconnect the spark plug wire from the spark plug and position the wire away from the spark plug to ensure that the engine will not start accidentally.

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 paint system line connectors are tight and all paint system hoses and lines are in good condition before applying pressure to the paint system.

6. Before disconnecting any paint system component or performing any work on the paint system, all pressure in system must be relieved.

7. Do not use lacquers, lacquer thinners, acetones or other solvents when servicing the paint system of the Line Painter 1200.

8. Do not overspeed the engine by changing governor setting. To assure safety and accuracy, check maximum engine speed with a tachometer.

9. Shut engine off before checking or adding oil to the engine crankcase.

10. To reduce potential fire hazard, keep engine area free of excessive grease, grass, leaves and dirt.

11. If major repairs are ever needed or assistance is desired, contact an Authorized Toro Distributor.

12. When changing tires or performing other service, make sure machine is properly supported. If the machine is not properly supported, the machine may move or fall, which may result in personal injury.

13. At the time of manufacture, the machine conformed to all applicable safety standards. To assure optimum performance and continued safety certification of the machine, use genuine Toro replacement parts and accessories. Replacement parts and accessories made by other manufacturers may result in non-conformance with the safety standards, and the warranty may be voided.

Safety and Instruction Decals

Numerous safety and instruction decals are affixed to the Line Painter 1200. If any decal becomes illegible or damaged, install a new decal. Part numbers for replacement decals are listed in your Parts Catalog. Order replacement decals from your Authorized Toro Distributor.

Chapter 2

Product Records and Maintenance

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Product Records

Insert a copy of the Operator's Manual and Parts Catalog for your Line Painter 1200 at the end of this chapter. Additionally, if any optional equipment or accessories have been installed to your machine, insert the Installation Instructions, Operator's Manuals and Parts Catalogs for those options at the end of this chapter.

Maintenance

Maintenance procedures and recommended service intervals for the Line Painter 1200 are covered in the Operator's Manual. Refer to that publication when performing regular equipment maintenance.

Equivalents and Conversions

Decimal and Millimeter Equivalents

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

1 mm = 0.03937 in. **0.001 in. = 0.0254 mm**

U.S.to Metric Conversions

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

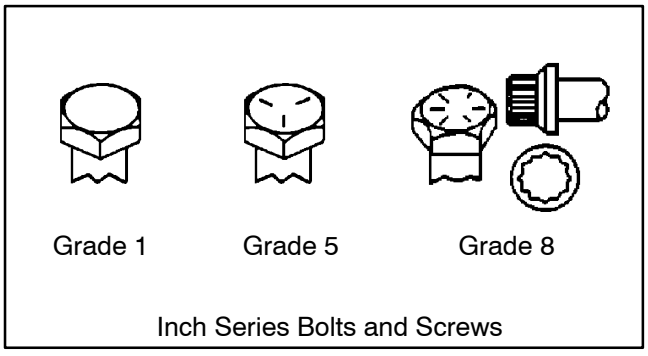

Figure 1

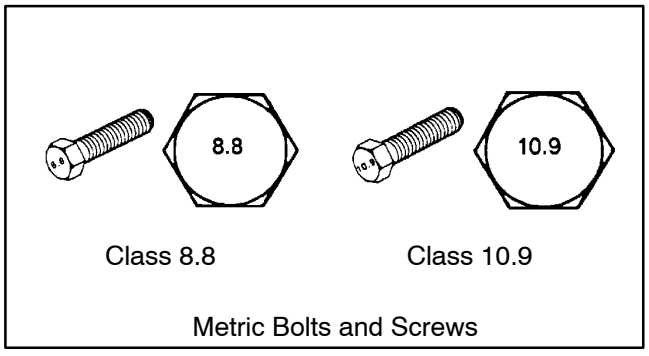

Figure 2

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 ± 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	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

** A Sems screw is a self–tapping screw equipped with a captive washer.

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

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

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

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

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

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

NOTE: 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.

Other Torque Specifications

SAE Grade 8 Steel Set Screws

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

Wheel Bolts and Lug Nuts

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

** For steel wheels and non–lubricated fasteners.

Thread Cutting Screws (Zinc Plated Steel)

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

Thread Cutting Screws (Zinc Plated Steel)

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

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

Conversion Factors

in–lb X 11.2985 = N–cm
ft–lb X 1.3558 = N–m

N–cm X 0.08851 = in–lb
N–m X 0.7376 = ft–lb

TORO

Chapter 3

Gasoline Engine

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Introduction

This Chapter gives information about specifications, maintenance, troubleshooting, testing and repair of the Kawasaki FJ180V gasoline engine used in the Line Painter 1200.

Most repairs and adjustments require tools which are commonly available in many service shops. Special tools are described in the Kawasaki FJ180V Service Manual that is included at the end of this Chapter. 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 the Kawasaki engine used to power the Line Painter 1200 are supplied through your local Toro distributor. Be prepared to provide your distributor with the Toro model and serial number.

Specifications

Item	Description
Make / Designation	Kawasaki, FJ180V, 4–stroke, air–cooled, OHV, single cylinder
Bore x Stroke	2.6” x 2.1” (65 mm x 54 mm)
Total Displacement	10.9 cu. in. (179 cc)
Compression Ratio	8.5:1
Carburetor	Float Feed, Fixed Main Jet
Governor	Mechanical
High Idle (No Load)	2800 $\pm$ 100 RPM
Direction of Rotation	Counter Clockwise (Facing PTO Shaft)
Fuel	Unleaded, Automotive Grade Gasoline
Fuel Tank Capacity	4 Quart (3.8 Liter)
Engine Oil	See Operator’s Manual
Lubrication System	Pressure Lubrication
Oil Capacity (Including Oil Filter)	0.9 Quart (0.85 Liter)
Air Cleaner	Dual Element
Ignition System	Flywheel Magneto CDI
Spark Plug	NGK BPR5ES
Spark Plug Gap	.028” to .032” (.7 to .8 mm)
Dry Weight	35.3 Pounds (16 Kilograms)

Fuel Shut–off Valve

The fuel shut off valve is positioned in the fuel hose between the fuel tank and the carburetor inlet. It has two positions: CLOSED and OPEN. Turn valve to the closed position when storing or transporting the machine. Rotate valve to the open position before starting the engine.

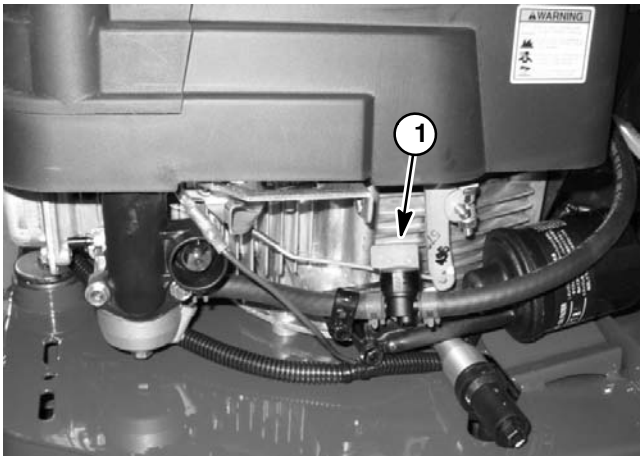

Figure 1

1. Fuel shut–off valve

Cooling System

IMPORTANT: The engine that powers the Line Painter 1200 is air–cooled. Operating the engine with dirty or plugged cooling fins or a plugged or dirty blower housing will result in engine overheating and damage.

1. Park machine on a level surface, stop engine, engage parking brake and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

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

2. Remove rewind starter and clean rotating screen (Fig.2).

3. If necessary, remove engine cover, rotating screen and blower housing from engine (Fig. 3). Clean blower housing and engine cooling fins of dirt and debris.

IMPORTANT: Never operate engine without the blower housing installed. Overheating and engine damage will result.

4. Make sure blower housing, rotating screen and engine cover are reinstalled to the engine if removed.

5. Attach high tension lead to the spark plug.

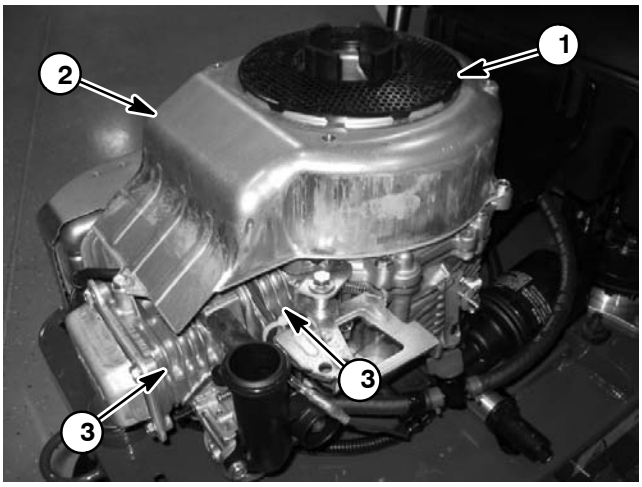

Figure 2

1. **Rotating screen**
2. **Blower housing**
3. **Cooling fins**

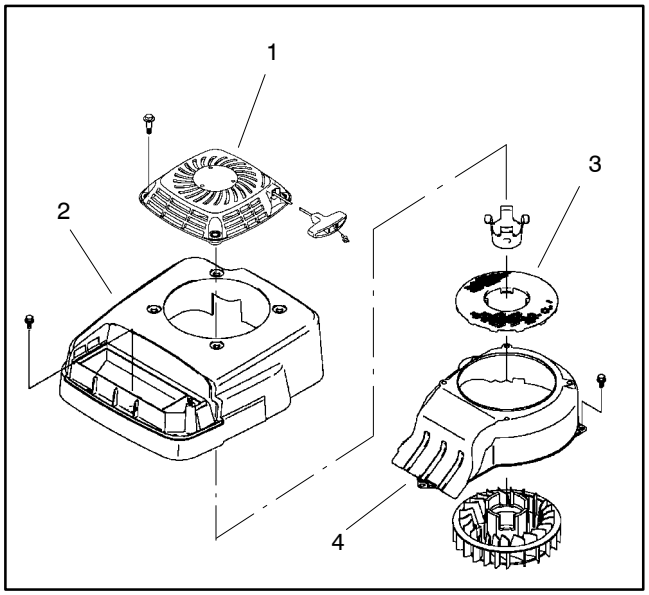

Figure 3

1. **Rewind starter**
2. **Engine cover**
3. **Rotating screen**
4. **Blower housing**

Fuel Tank

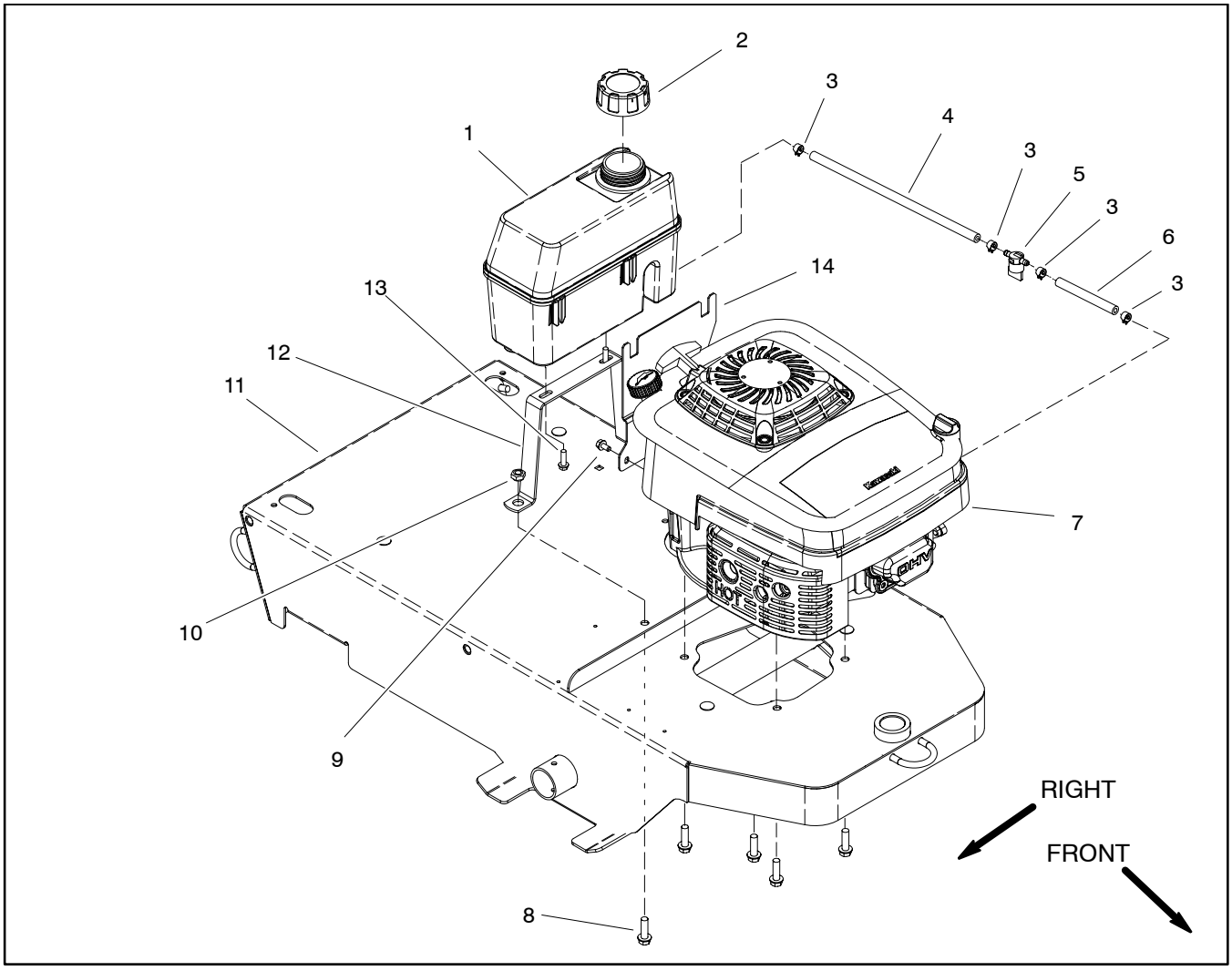

Figure 4

1. **Fuel tank**
2. **Fuel tank cap**
3. **Hose clamp (4 used)**
4. **Fuel hose**
5. **Fuel shut off valve**
6. **Fuel hose**
7. **Engine**
8. **Screw (2 used)**
9. **Washer head screw (2 used)**
10. **Nut (2 used)**
11. **Frame**
12. **Fuel tank support**
13. **Washer head screw (2 used)**
14. **Fuel tank bracket**

DANGER

Because gasoline is highly 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 fuel before starting the engine. Store fuel in a clean, safety–approved container and keep cap in place. Use gasoline for the engine only; not for any other purpose.

Check Fuel Lines and Connections

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

Drain and Clean Fuel Tank

IMPORTANT: If fuel tank is to be drained, drain fuel outdoors.

Drain and clean the fuel tank periodically as recommended in the 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.

NOTE: The fuel tank is equipped with an integral filter screen at the tank outlet.

To clean fuel tank, flush tank and fuel hoses out with clean solvent. Make sure tank is free of contaminates and debris.

Fuel Tank Removal (Fig. 4)

1. Park machine on a level surface, stop engine, engage parking brake and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

2. Allow engine to cool before removing fuel tank.

3. Remove high tension lead from the spark plug and position the lead away from the spark plug.

4. Close fuel shut off valve. Disconnect fuel hose from carburetor inlet.

5. Place disconnected hose in appropriate container and open fuel shut off valve to allow fuel tank to drain completely.

6. Remove fuel tank using Figure 4 as a guide. If fuel tank bracket (item 14) removal is necessary, remove ground wire from bracket.

7. If fuel in tank was contaminated, remove and clean carburetor (see Kawasaki FJ180V Service Manual at the end of this chapter).

Fuel Tank Installation (Fig. 4)

1. If carburetor was removed from engine for cleaning, install carburetor (see Kawasaki FJ180V Service Manual at the end of this chapter).

2. Install fuel tank to frame using Figure 4 as a guide. If ground wire was removed from fuel tank bracket (item 14) secure ground wire to bracket with screw.

3. Connect fuel hose to carburetor inlet. Make sure that fuel hoses are secured with hose clamps.

4. Attach high tension lead to the spark plug.

5. Fill fuel tank (see Operator's Manual).

Engine

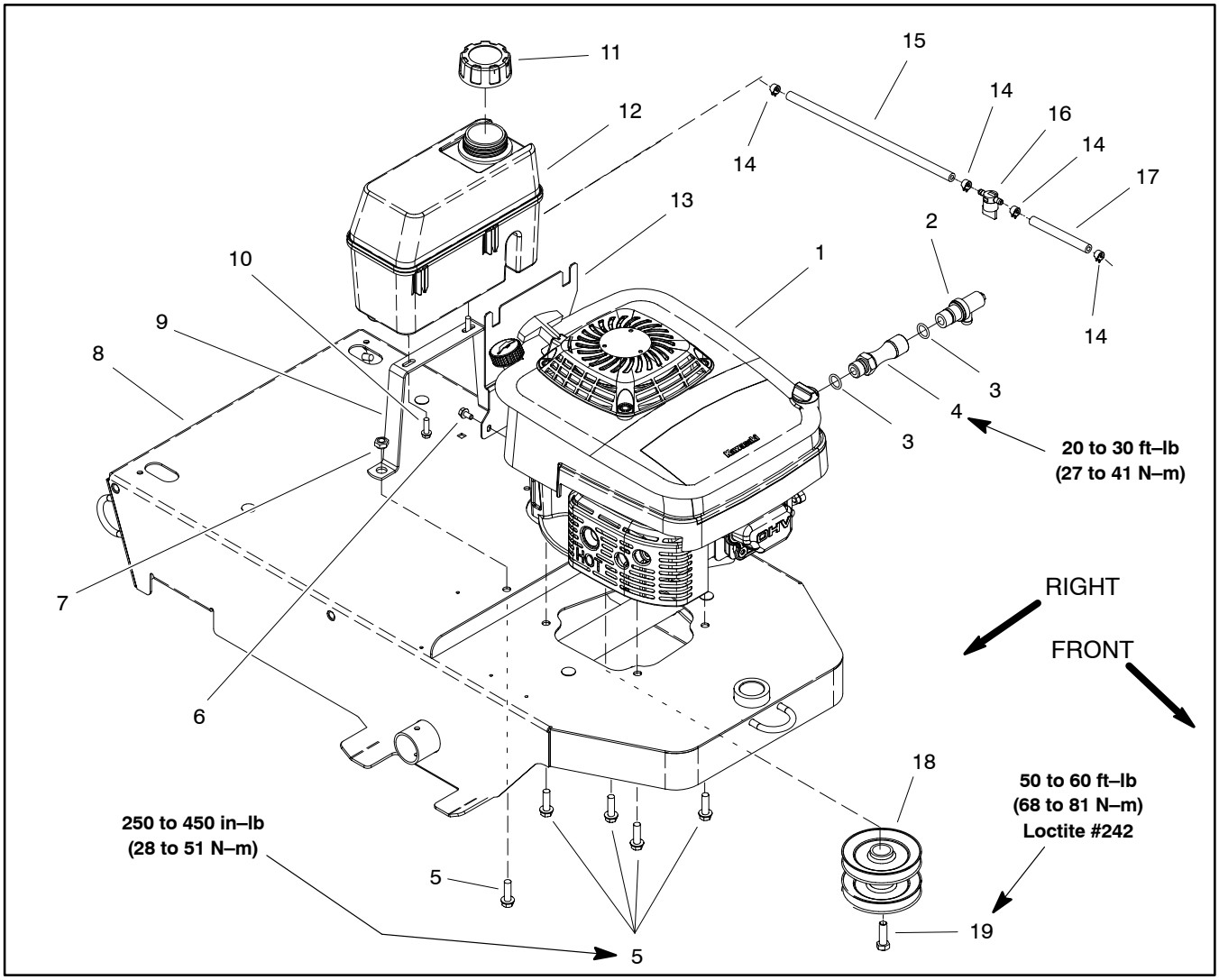

Figure 5

1. **Engine**
2. **Oil drain valve**
3. **O–ring**
4. **Drain extension**
5. **Screw (6 used)**
6. **Washer head screw (2 used)**
7. **Nut (2 used)**
8. **Frame**
9. **Fuel tank support**
10. **Washer head screw (2 used)**
11. **Fuel tank cap**
12. **Fuel tank**
13. **Fuel tank bracket**
14. **Hose clamp (4 used)**
15. **Fuel hose**
16. **Fuel shut off valve**
17. **Fuel hose**
18. **Engine pulley**
19. **Cap screw**

Removal (Fig. 5)

1. Park machine on a level surface, stop engine, engage parking brake and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

2. If engine is to be disassembled, it may be easier to drain oil from engine before removing engine from machine (see Operator's Manual).

3. Close fuel shut off valve. Disconnect fuel hose from carburetor inlet.

4. Remove fuel tank from machine (see Fuel Tank Removal in this section).

5. If machine is equipped with a hour meter, remove hour meter pickup wire from spark plug lead on engine. Position pickup wire away from engine.

6. Disconnect stop switch wire from engine (Fig. 6). Make sure that ground wire is removed from fuel tank bracket (item 14).

7. On the underside of the machine frame (Fig. 7):

   A. Loosen flange nuts that retain two (2) belt guides to frame. Position belt guides away from engine pulley.

   B. Loosen idler tension on pump drive belt (lower) and transmission drive bolt (upper) and remove belts from engine pulley.

   C. Remove four (4) screws that secure engine to machine.

8. Lift the engine from the frame.

9. If necessary, remove cap screw that secures pulley to engine crankshaft. Slide pulley from crankshaft.

Installation (Fig. 5)

1. Position machine on a level surface.

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

3. If pulley was removed from engine, apply antisieze lubricant to engine crankshaft. Slide pulley onto crankshaft making sure to align pulley key with crankshaft slot.

4. Apply Loctite #242 (or equivalent) to threads of cap screw (item 19). Secure pulley to crankshaft with cap screw. Torque cap screw from 50 to 60 ft–lb (68 to 81 N–m).

5. Position engine on the frame.

6. Align holes in frame with engine mounting holes. Secure engine to frame with four (4) screws. Torque screws from 250 to 450 in–lb (28 to 51 N–m).

7. On the underside of the machine frame (Fig. 7):

   A. Install transmission drive belt (upper) and pump drive belt (lower) onto engine pulley. Make sure that belts are correctly routed at idler pulleys.

   B. Position two (2) belt guides to allow from .060" to .130" (1.5 to 3.3 mm) clearance when the traction (upper) belt is tensioned by the idler pulley. When properly positioned, tighten flange nuts to secure belt guides to frame.

8. Install fuel tank to machine (see Fuel Tank Installation in this section).

9. If machine is equipped with a hour meter, install hour meter pickup wire to spark plug lead on engine.

10. Connect stop switch wire to engine. Secure ground wire to fuel tank bracket (item 14) with screw.

11. Check and adjust engine oil level as needed (See Checking Engine Oil Level).

12. Attach high tension lead to the spark plug.

13. Make sure that fuel hose is secured to carburetor inlet. Open fuel shut–off valve.

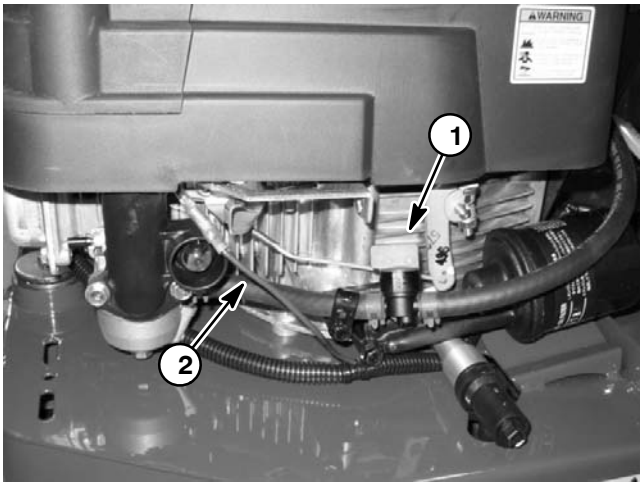

Figure 6

1. **Fuel shut off valve**
2. **Stop switch wire**

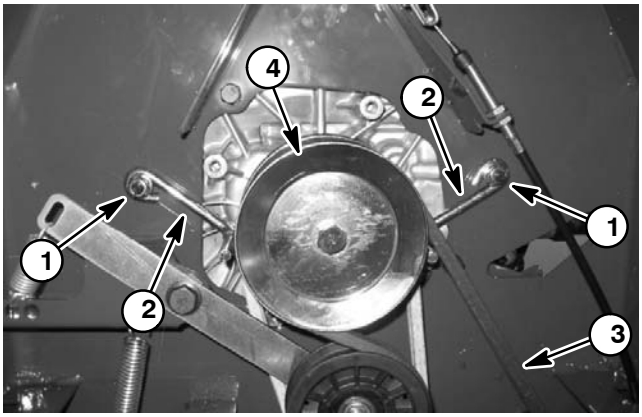

Figure 7

1. **Flange nut**
2. **Belt guide**
3. **Pump drive belt**
4. **Engine pulley**

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Chapter 4

Electrical System

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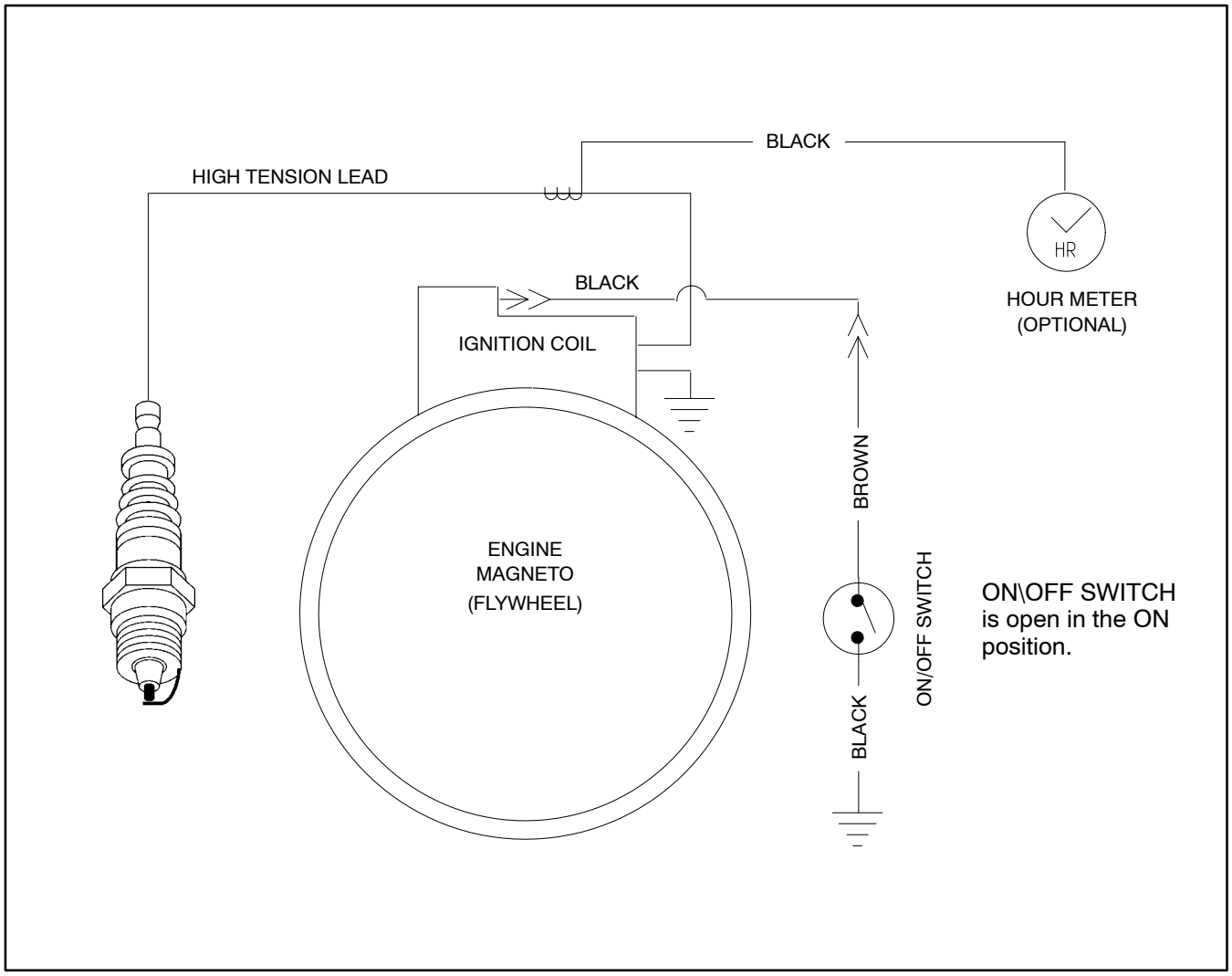
Electrical Schematic



Special Tools

Multimeter

The multimeter can test electrical components and circuits for current (amps), resistance (ohms) or voltage.

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

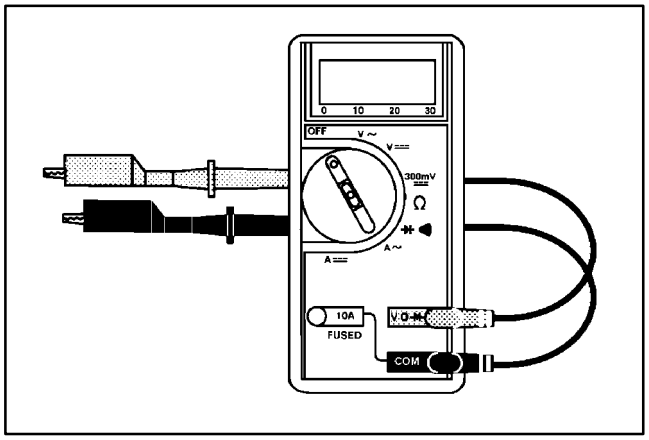


Figure 1

Spark Tester – TOR4036

The spark tester can test magneto ignitions. The spark tester determines if ignition is present.

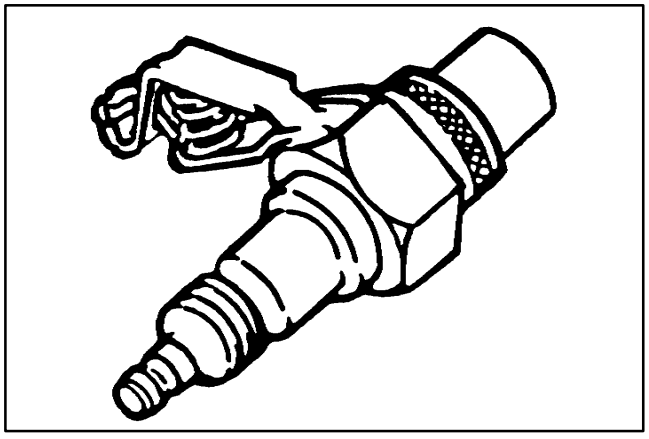


Figure 2

Troubleshooting

CAUTION

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

For effective troubleshooting and repairs, there must be a good understanding of the electrical circuits and components used on this machine (see Electrical Schematic in this chapter).

NOTE: See the **Kawasaki FJ180V Service Manual** at the end of Chapter 3 – Engine for troubleshooting of engine electrical problems.

Starting Problems

Problem	Possible Causes	Correction
Engine will not start.	ON/OFF switch is in the OFF position.	Turn switch to ON.
	ON/OFF switch is faulty.	Replace ON/OFF switch.
	Ignition spark plug lead is not connected to spark plug.	Connect high tension lead to spark plug.
	Electrical wires are loose or damaged.	Check electrical connections. Repair wiring.
	Engine is malfunctioning.	See Kawasaki FJ180V Service Manual at the end of Chapter 3 – Engine.
Engine will start, but will not continue to run.	Electrical wires are loose or damaged.	Check electrical connections. Repair wiring.
	ON/OFF switch is faulty.	Replace ON/OFF switch.
	Engine is malfunctioning.	See Kawasaki FJ180V Service Manual at the end of Chapter 3 – Engine.

Component Testing

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

On/Off Switch

The on/off switch is used to shut the engine off. When the on/off switch is in the off position, the engine armature is grounded to prevent the engine from running. This switch is located handle panel (Fig. 3).

Testing

In the OFF position, there should be continuity between the two switch terminals. In the RUN position, there should not be continuity between the two switch terminals.

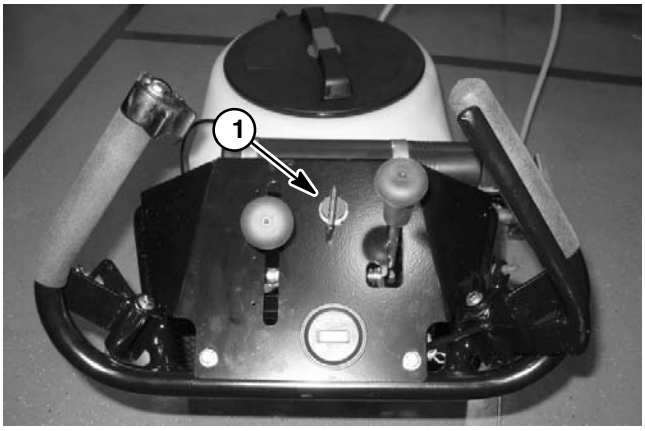


Figure 3

1. On/Off switch

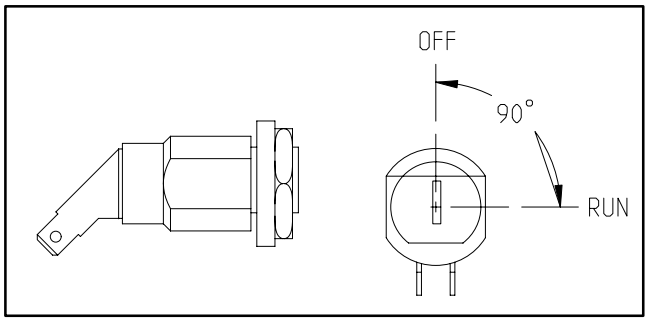


Figure 4

Hourmeter (Optional)

The optional hourmeter available for the Line Painter 1200 uses an inductive pickup wire connected to the spark plug wire to sense when the engine is running. The hourmeter should increase 1/10 of an hour every six (6) minutes of engine running time.

The hourmeter uses its own internal battery for operation. The hourmeter battery is not replaceable.

NOTE: The hourmeter display is programmed to flash service reminders initially at 50 hours and then every 100 hours thereafter. The display will flash for three hours before and three hours after these running times. Regardless of these service reminders, follow the maintenance intervals identified in the Line Painter 1200 Operator's Manual.

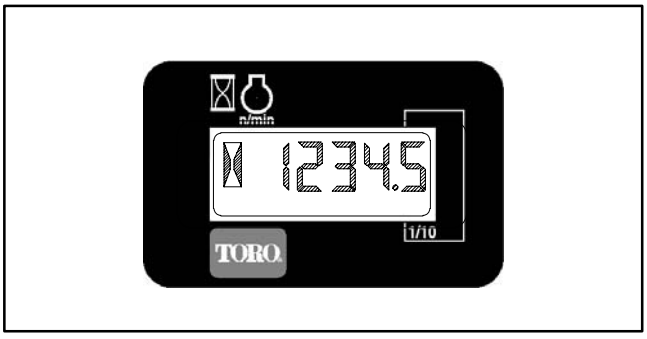


Figure 5

Chapter 5

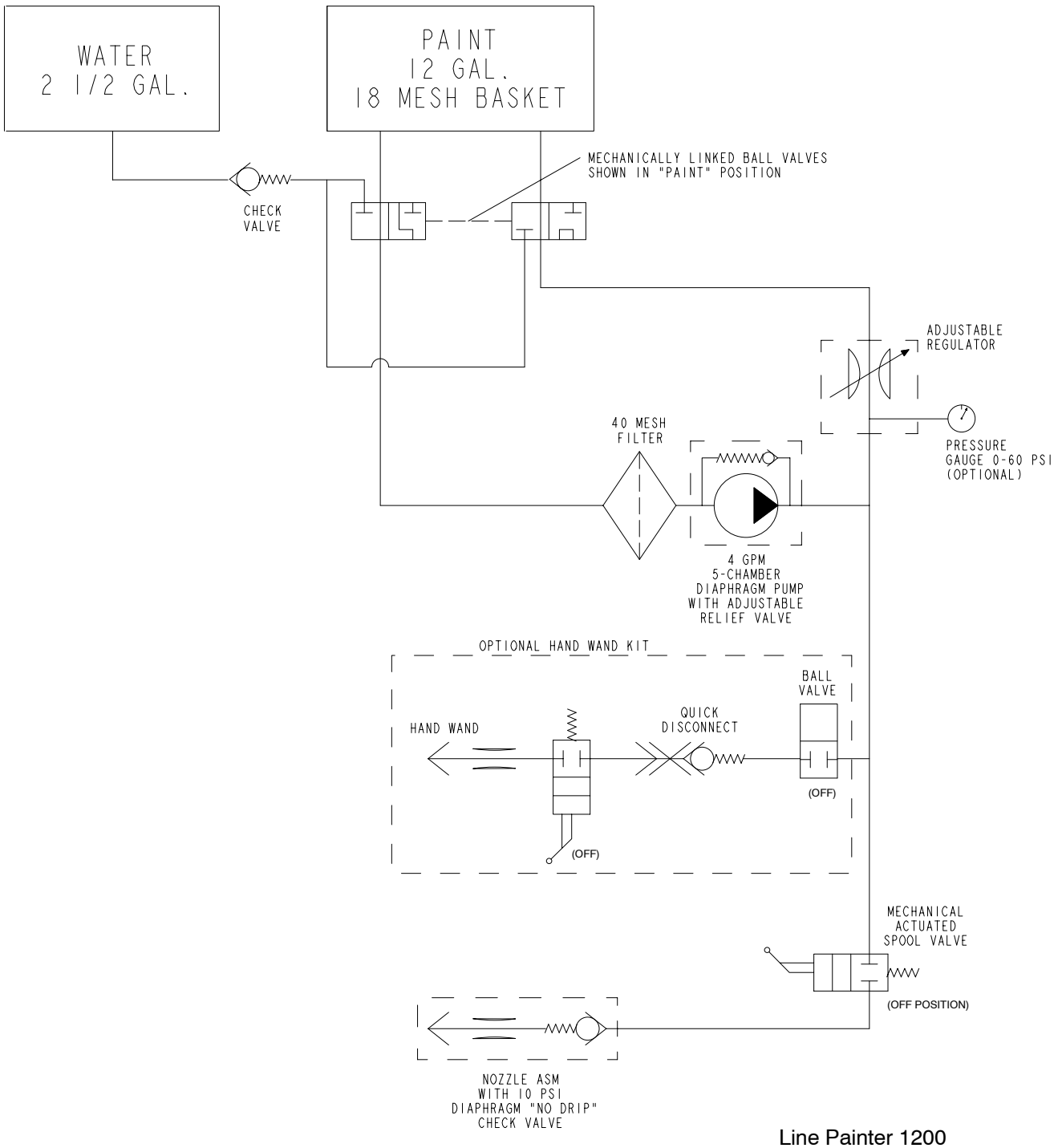
Paint System

Table of Contents

Specifications

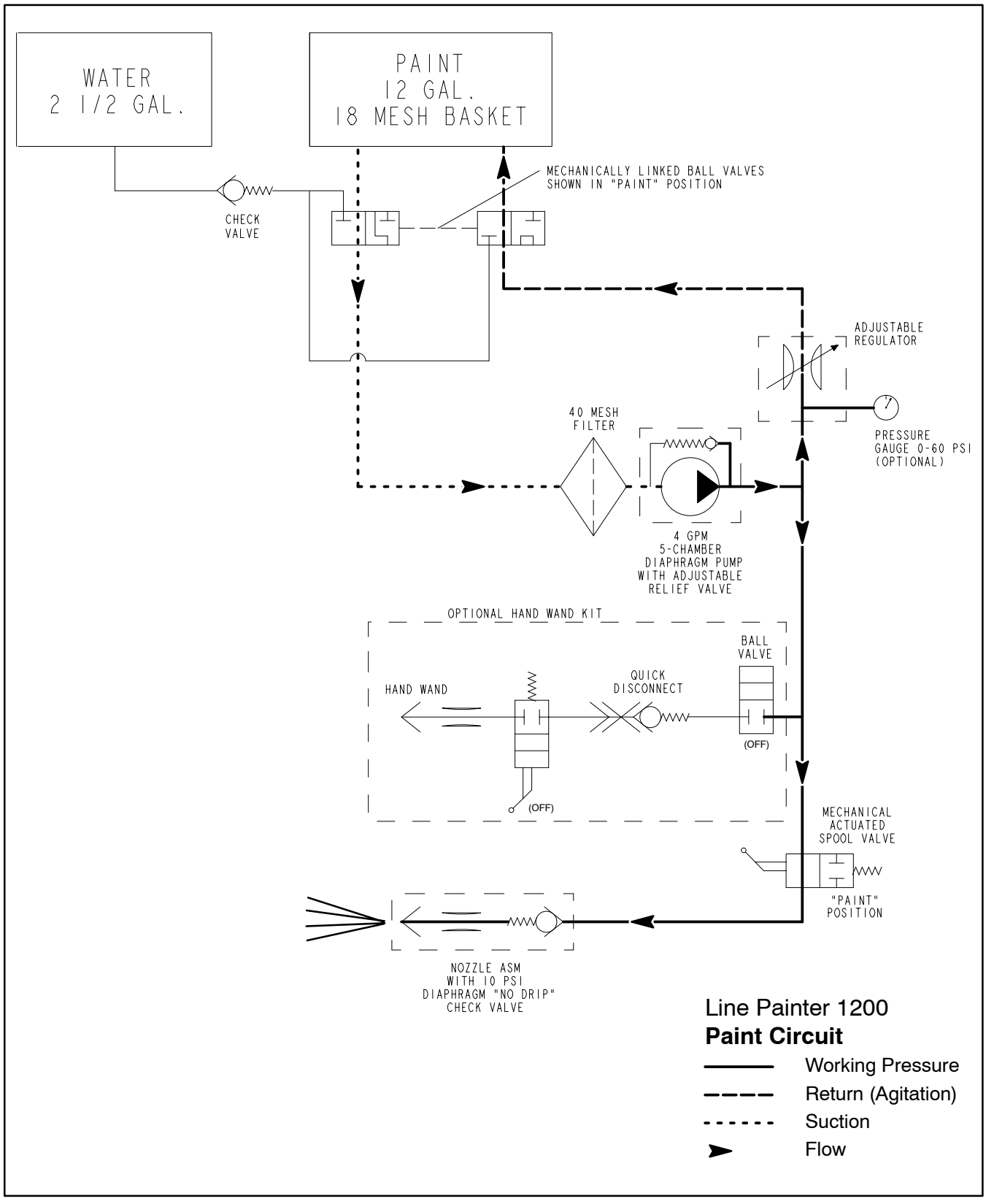
Item	Description
Pump Pump Capacity Relief Pressure	Diaphragm Pump with 5 Chambers 4 GPM (15.1 LPM) 65 PSI (4.5 Bar)
Paint Tank Capacity	12 Gallons (45.4 Liters)
Water (Flush) Tank Capacity	2.5 Gallons (9.5 Liters)

Paint Schematic



Line Painter 1200
Hydraulic Schematic

Circuit Operation



Paint Circuit

The Line Painter 1200 paint circuit uses a positive displacement diaphragm pump to move paint from the paint tank to the spray nozzle. The spray pump is a self–priming diaphragm pump that has a dry crankcase.

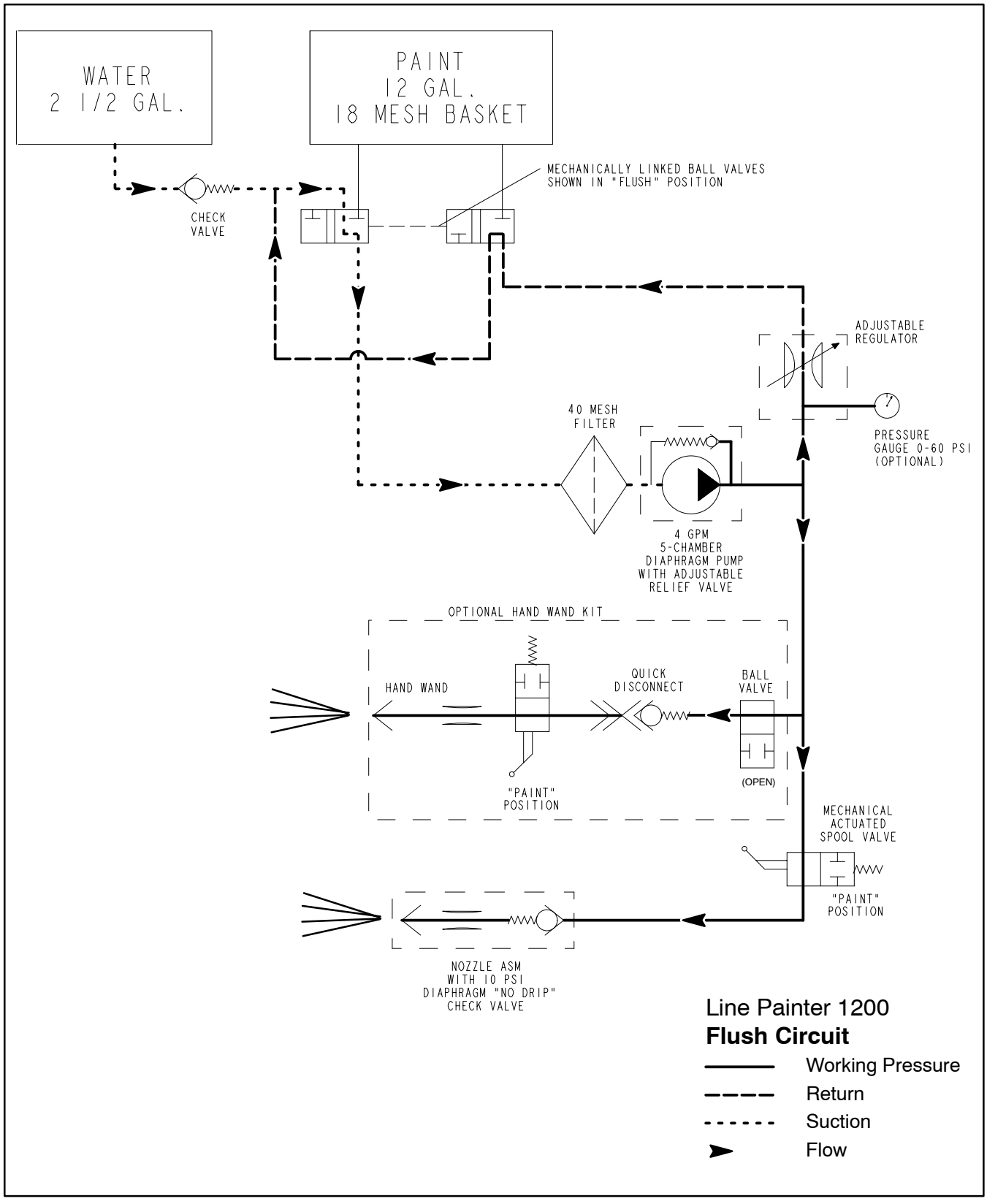
The engine drives the spray pump indirectly through pulleys and a V–belt. The spray pump belt is always tensioned by a backside idler pulley so the pump is being rotated whenever the engine is running.

When the pump is rotated, the downward stroke of the pump's diaphragm creates suction to allow fluid (paint) to be drawn from the paint tank to the pump via hoses, a ball valve (in the paint position) and a 40 mesh screen filter. Pump design prevents fluid from being pumped back into the suction line.

Once to the pump, the fluid (paint) is pushed by the upward stroke of the pump's diaphragm to the pressure side of the spray system through hoses, control valves and the spray nozzle. Pump design prevents fluid from being drawn back into the pump. Maximum pressure in the system is limited by an adjustable relief valve located in the pump.

An adjustable pressure regulator is used by the operator to set paint circuit pressure on the Line Painter 1200. Flow in excess of the regulator setting is directed back to the paint tank via a ball valve (in the paint position). This return flow is used for paint tank agitation. An optional pressure gauge (if equipped) indicates system pressure.

A mechanically actuated spool valve is used to turn the spray nozzle on/off. Spool valve shift occurs when the operator depresses or releases the paint control lever.


WATER
2 1/2 GAL.
PAINT
12 GAL.
18 MESH BASKET
MECHANICALLY LINKED BALL VALVES
SHOWN IN "FLUSH" POSITION
CHECK
VALVE
ADJUSTABLE
REGULATOR
40 MESH
FILTER
PRESSURE
GAUGE 0-60 PSI
(OPTIONAL)
4 GPM
5-CHAMBER
DIAPHRAGM PUMP
WITH ADJUSTABLE
RELIEF VALVE
OPTIONAL HAND WAND KIT
HAND WAND
QUICK
DISCONNECT
BALL
VALVE
(OPEN)
"PAINT"
POSITION
MECHANICAL
ACTUATED
SPOOL VALVE
"PAINT"
POSITION
NOZZLE ASM
WITH 10 PSI
DIAPHRAGM "NO DRIP"
CHECK VALVE
Line Painter 1200
Flush Circuit
Working Pressure
Return
Suction
Flow

Flush Circuit

The Line Painter 1200 paint circuit uses a positive displacement diaphragm pump to move fluid (water) from the flush (water) tank through the spray system. The spray pump is a self–priming diaphragm pump that has a dry crankcase.

When the pump is rotated, the downward stroke of the pump's diaphragm creates suction to allow fluid (water) to be drawn from the flush tank to the pump via hoses, a one–way check valve, a ball valve (in the flush position) and a 40 mesh screen filter.

Once to the pump, the fluid (water) is pushed by the upward stroke of the pump's diaphragm to the pressure side of the spray system through hoses, control valves and the spray nozzle. Maximum pressure in the system is limited by an adjustable relief valve located in the diaphragm pump.

Flow in excess of the adjustable pressure regulator setting is directed back to the flush (water) suction line via a ball valve (in the flush position).

Flow through the flush circuit is used to dilute and remove paint from the ball valves, screen filter, spray pump, regulator, spool valve, spray nozzle and all hoses.

A one–way check valve is positioned between the flush (water) tank and the ball valve (see schematic). This check valve prevents paint from entering the flush (water) tank when the paint/flush lever is moved from the paint position to the flush position and while the machine is operated in the flush mode.

NOTE: If the flush system is not cleaned after use, diluted paint may cause check valve and associated hoses to become blocked. If the check valve is stuck open, paint may enter the flush (water) tank when the paint/flush lever is moved from the paint position to the flush position. If the check valve is stuck closed, the flush system may not operate.

Troubleshooting

Problem	Possible Cause
Spray system leaks fluid.	Fitting(s) or hose(s) are loose or damaged. O–ring(s) or seal(s) are missing or damaged.
Spray pressure is low.	Suction line is restricted. Filter screen is plugged. Pressure regulator is damaged or incorrectly adjusted. Spray nozzle is worn or damaged. Check valve in diaphragm nozzle is stuck or plugged. Engine speed is low. Pressure relief valve in spray pump is stuck. Pump drive belt is slipping. Spray pump is faulty.
No spray output from nozzle.	Paint tank is empty. Paint/Flush lever is in the off position. Hose(s) are pinched or kinked. Dried paint in system. Filter screen is plugged. Spray nozzle is clogged or damaged. Check valve in diaphragm nozzle is stuck or plugged. Paint shutoff valve is faulty. Pump drive belt is slipping, damaged or broken. Spray pump is faulty.
No spray output from nozzle in the flush mode.	Flush tank is empty. Check valve in flush tank outlet tube is stuck closed.
Nozzle leaks when paint valve is closed.	Check valve diaphragm in diaphragm nozzle body is leaking or damaged. Paint shutoff valve is not seating. Paint control cable is not adjusted correctly (see Paint Control Cable in the Service and Repairs section of Chapter 6 – Chassis and Controls).
Paint is being pumped into the flush tank.	Check valve in flush tank outlet tube is stuck open.

Paint/Flush Lever

To prevent paint system pressure spikes, the paint/flush lever should normally be in either the paint mode or the flush mode. It is recommended to use the OFF position only when the engine is not running.

If the paint filter is to be cleaned and paint is in the paint tank, turn the paint/flush lever to OFF (engine not running) to prevent paint leakage.

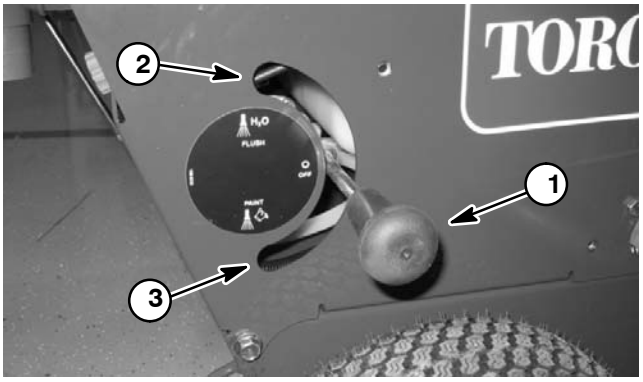


Figure 1

1. **Paint lever (in OFF)**
2. **Flush mode**
3. **Paint mode**

Quick Disconnect Fittings

The Line Painter 1200 uses several quick disconnect fittings that provide excellent sealing and allow easy disassembly. To remove a hose from a quick disconnect fitting, push the release collar in toward the fitting and then pull the hose from the fitting. To install a hose into a quick disconnect fitting, fully push the hose into the collar. Pull lightly on the hose to make sure it is secured in the fitting.

If the end of the tubing is scratched, deformed or not cut squarely, the fitting seal will not be effective and leakage will occur.

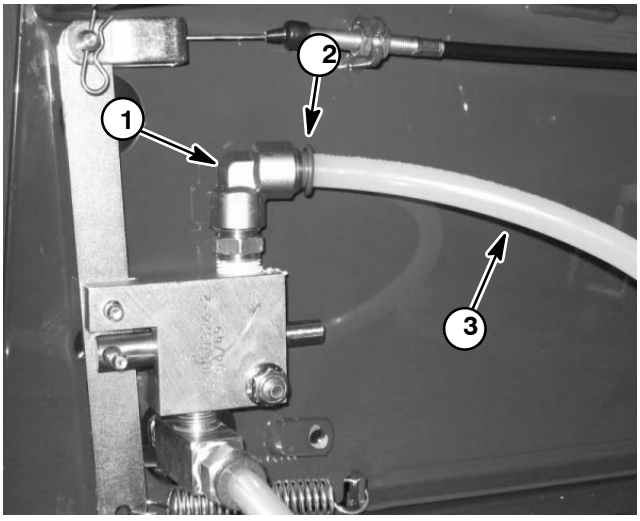


Figure 2

1. **Fitting**
2. **Release collar**
3. **Hose**

Thread Sealant for Paint System Fittings

Many fittings used in the Line Painter 1200 paint system have a sealant patch applied to the fitting threads. If a fitting is being replaced and a sealant patch is evident on the threads of the new fitting, there is no need to apply additional thread sealant before installation.

If a fitting has been removed, however, the sealant patch may not allow a leak–free seal if the fitting is re–installed. If a fitting is to be re–installed, apply Saf–T–Lok brand TPS (PTFE Sealant) to the fitting threads before installation. If an alternate sealant is used, make sure that it is compatible with nylon and polypropylene materials.

Adjustments

Spray Pump Relief Valve Adjustment

The spray pump used on the Line Painter 1200 is equipped with an adjustable relief valve (Fig. 3). Adjustment of the relief valve is made with a socket head screw on the top of the pump. The end of the socket head screw should be flush with the relief valve housing for correct relief valve adjustment.

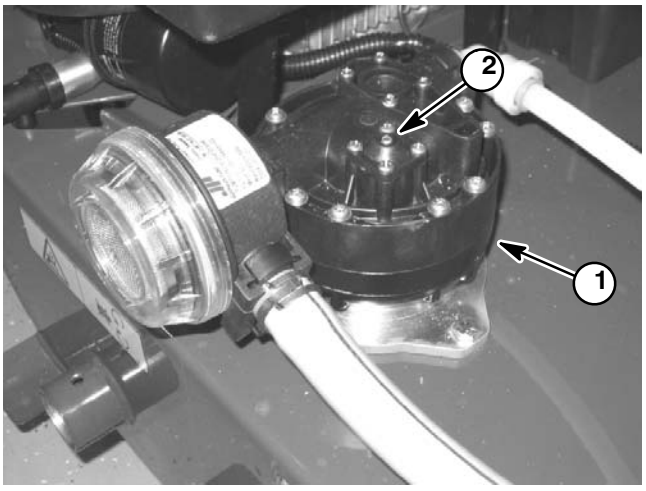


Figure 3

1. **Spray pump**
2. **Socket head screw**

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Paint Tank

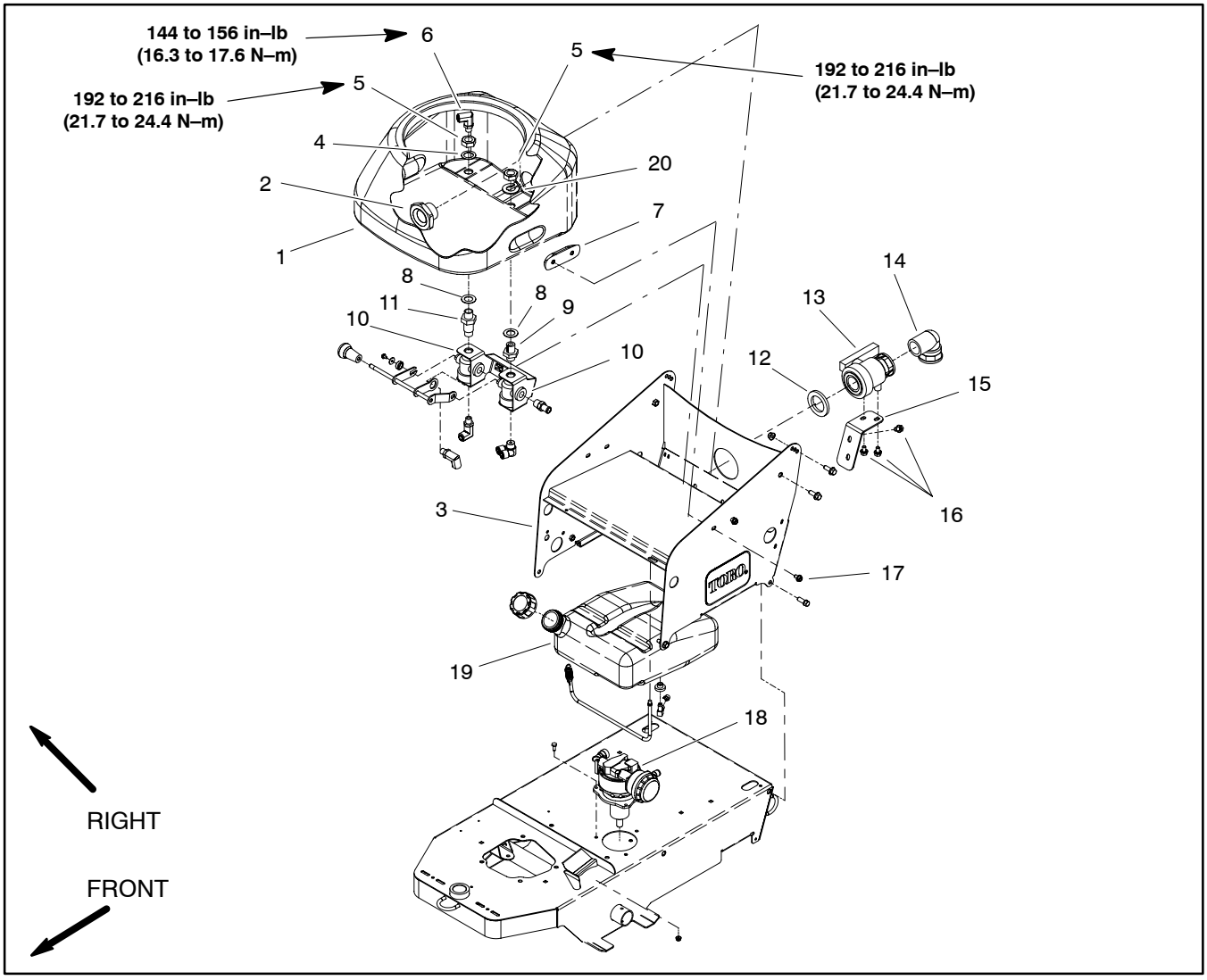

Figure 4

1. Paint tank
2. Nut
3. Tank support
4. Flat washer
5. Jam nut
6. Elbow fitting
7. Tank clamp (2 used)
8. Rubber washer
9. Outlet port
10. Ball valve
11. Recirculation port
12. O–ring
13. Drain valve
14. Elbow fitting
15. Valve bracket
16. Flange head screw
17. Flange head screw (4 used)
18. Pump assembly
19. Flush tank
20. Slotted washer

Removal (Fig. 4)

1. Park machine on a level surface, stop engine, engage parking brake and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

2. Drain paint tank (see Operator's Manual). Remove tank lid and strainer.

3. Loosen nut that secures drain valve to tank (Fig. 5).

4. Remove two (2) flange head screws (item 16) that secure drain valve to valve bracket. Remove nut from drain valve and remove valve from machine. Retrieve o–ring (item 12) from outside tank.

5. Remove agitation tube from elbow fitting (Fig. 5) (see Quick Disconnect Fitting in the General Information section). Loosen and remove elbow fitting.

6. Remove two (2) jam nuts that secure tank to ball valve ports (Fig. 5). Locate and retrieve washers (items 4 and 20).

7. Remove four (4) flange head screws (item 17) that secure tank to tank support.

8. Lift tank from machine. Locate and retrieve rubber washers (item 8) that seal tank to ball valve ports. Discard washers.

9. If necessary, remove tank lid flange using Figure 6 as a guide.

Installation (Fig. 4)

1. Place new rubber washers (item 8) on ball valve ports.

2. Position tank on ball valve ports.

3. Loosely install the following components:

   A. Valve fitting washers (items 4 and 20) and jam nuts (item 5).

   B. Drain valve, o–ring (item 12) and nut (item 2).

   C. Four (4) flange head screws (item 17).

4. Torque jam nuts (item 5) from 192 to 216 in–lb (21.7 to 24.4 N–m).

5. Tighten drain valve nut (item 2) to secure drain valve to tank. Then tighten two (2) flange head screws (item 16) that secure drain valve to valve bracket. Finally tighten the four screws (item 17) to secure tank to machine.

6. Install elbow fitting (item 6) and torque from 144 to 156 in–lb (16.3 to 17.6 N–m). Install agitation tube to elbow fitting (Fig. 5) (see Quick Disconnect Fitting in the General Information section).

7. If removed, install tank lid flange using Figure 6 as a guide. Torque screws from 10 to 12 in–lb (1.1 to 1.4 N–m).

8. Install high tension lead to spark plug when service is complete.

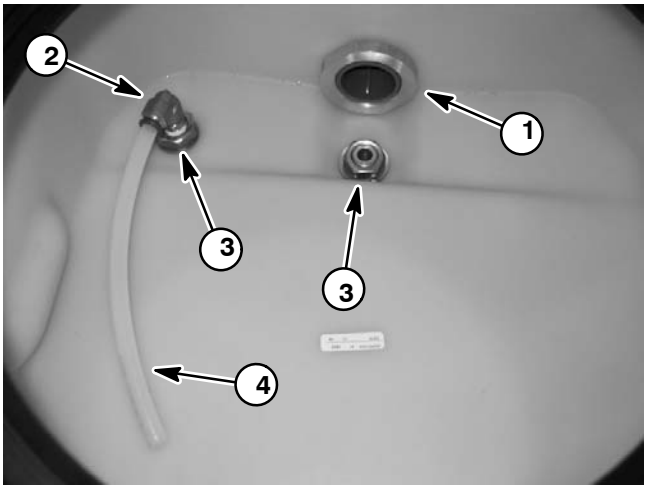

Figure 5

1. **Drain valve**
2. **Elbow fitting**
3. **Jam nut**
4. **Agitation tube**

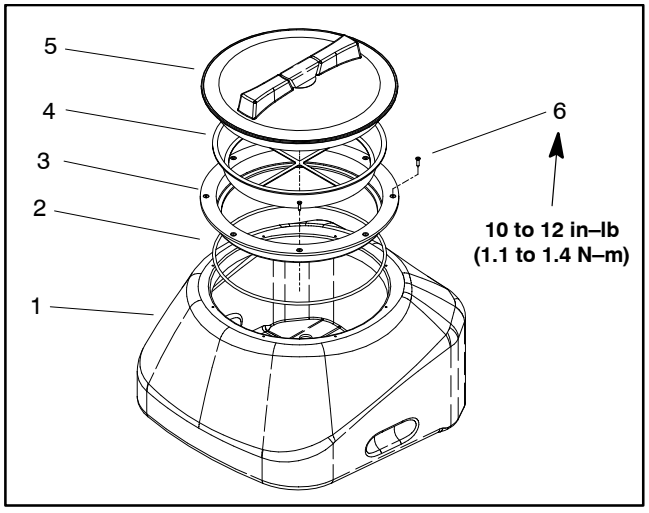

Figure 6

1. **Paint tank**
2. **O–ring**
3. **Lid flange**
4. **Strainer**
5. **Lid**
6. **Screw (8 used)**

Tank Support

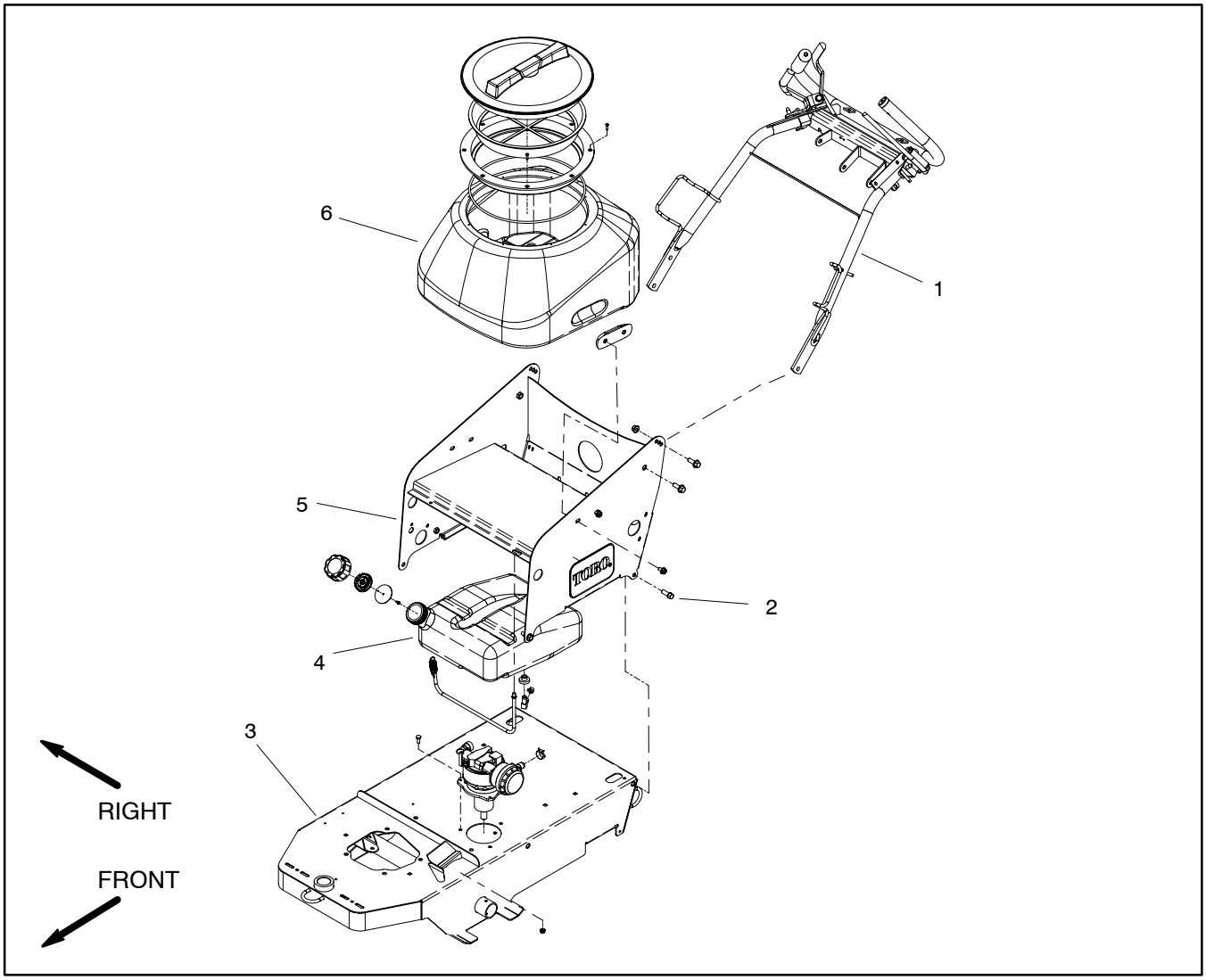

Figure 7

1. **Handle assembly**
2. **Flange head screw (4 used)**
3. **Chassis**
4. **Flush tank**
5. **Tank support**
6. **Paint tank**

To ease service of paint components attached to the tank support, the tank support and handle can be tipped back using the following procedure:

1. Drain paint tank (see Operator's Manual).

NOTE: The nozzle can be removed from the spray head to allow the flush tank to be emptied faster.

2. Clean paint system hoses by operating line painter in the flush mode until the flush tank is empty.

3. Park machine on a level surface, stop engine, engage parking brake and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

4. Remove the hairpin and flat washer that secure the shift rod to the shift bellcrank at the rear of the machine (Fig. 8).

5. Disconnect shift rod from shift bellcrank. Take care to not change location of fitting on shift rod.

6. Loosen the rear two flange head screws that fasten tank support to chassis (Fig. 9).

7. While supporting handle and tank support in the upright position, remove the front two (2) flange head screws that fasten tank support to chassis (Fig. 9).

8. Carefully, tilt handle and tank support back to allow access to tank support components (Fig. 10).

9. After repairs are completed, raise handle and tank support. Install front two (2) flange head screws to fasten tank support to chassis. Tighten all four (4) flange head screws to secure tank support to machine.

10. Slide shift rod fitting onto shift bellcrank and secure with flat washer and hairpin.

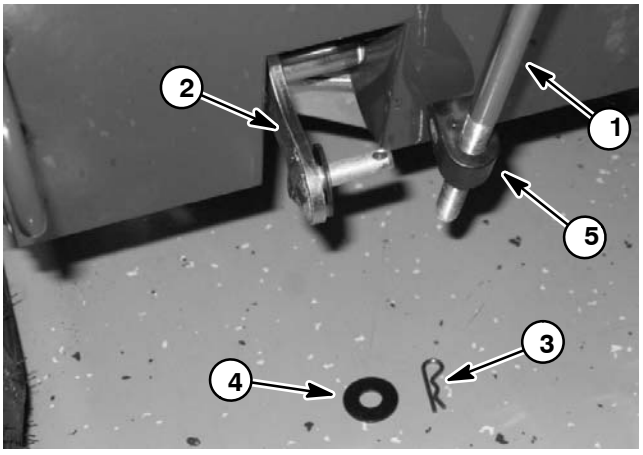

Figure 8

1. **Shift rod**
2. **Shift bellcrank**
3. **Hairpin**
4. **Flat washer**
5. **Fitting**

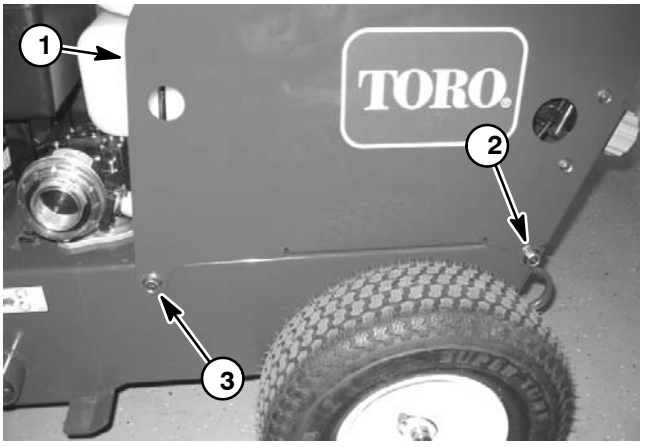

Figure 9

1. **Tank support**
2. **Rear flange screw**
3. **Front flange screw**

Figure 10

Flush (Water) Tank

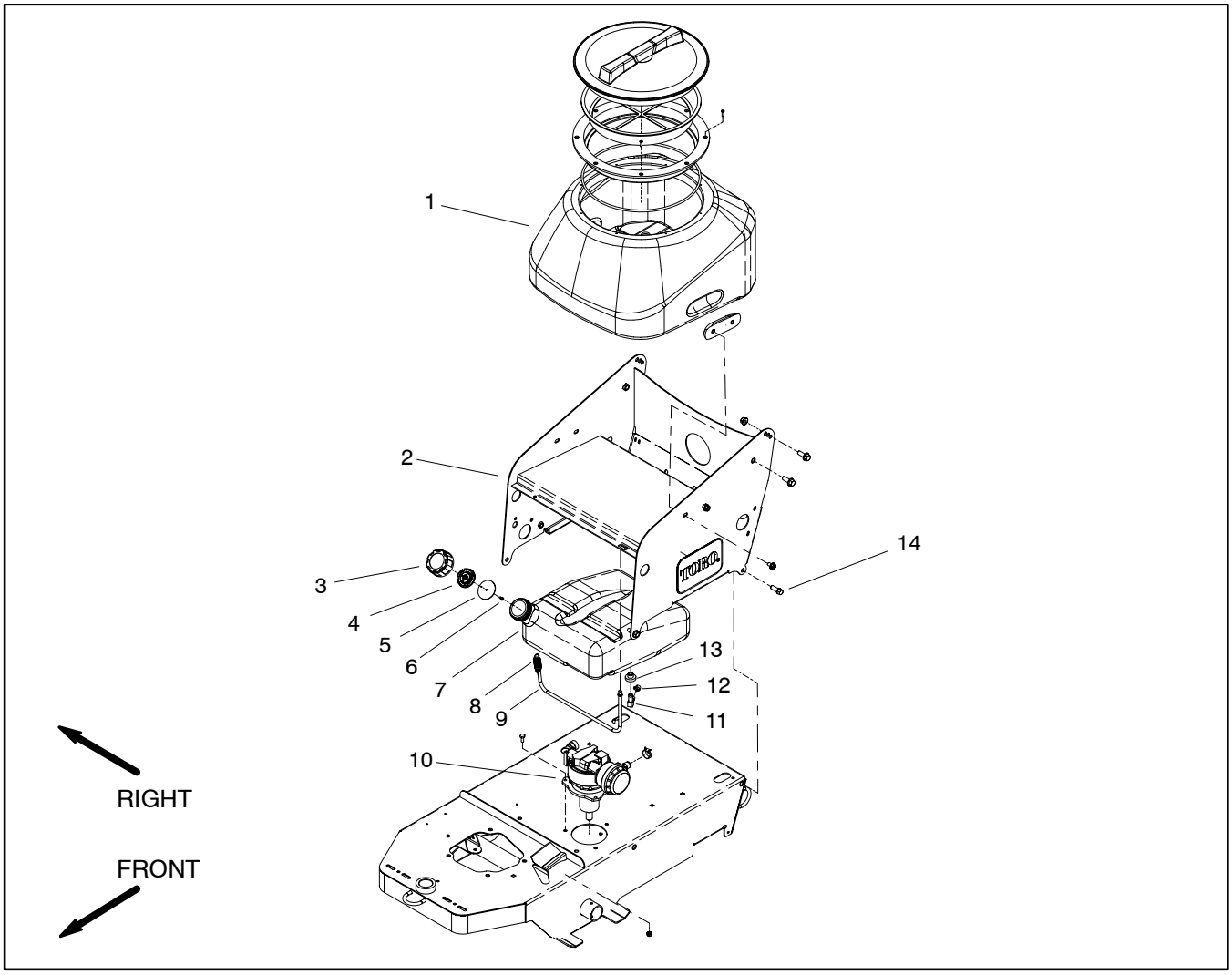

Figure 11

1. **Paint tank**
2. **Tank support**
3. **Cap**
4. **Cap insert**
5. **Gasket**
6. **Stud**
7. **Flush tank**
8. **Extension spring**
9. **Tank support rod**
10. **Spray pump assembly**
11. **Elbow fitting**
12. **Clamp**
13. **Bushing**
14. **Flange head screw (4 used)**

Removal (Fig. 11)

1. Drain paint tank (see Operator's Manual).

NOTE: The nozzle can be removed from the spray head to allow the flush tank to be emptied faster.

2. Operate line painter in the flush mode until the flush tank is empty.

3. Park machine on a level surface, stop engine, engage parking brake and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

4. Tip tank support to gain access to flush tank (see Tank Support in this section).

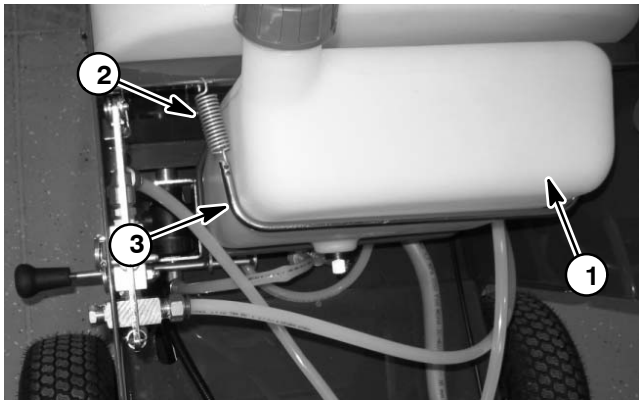

Figure 12

1. **Flush tank**
2. **Extension spring**
3. **Tank support rod**

5. Unhook extension spring from hole in tank support (Fig. 12). Remove spring and tank support rod from machine.

6. Remove flush tank outlet tube from elbow fitting on bottom of ball valve (Fig. 13 and 14) (see Quick Disconnect Fitting in the General Information section).

7. Remove flush tank with outlet tube attached from machine.

8. If necessary, remove outlet tube and check valve from flush tank (Fig. 14).

Installation (Fig. 11)

1. If removed, attach outlet tube and check valve to flush tank (Fig. 14). Make sure that check valve is installed to allow free flow from flush (water) tank (Fig. 15).

2. Position flush tank to machine. Connect flush valve outlet tube to elbow fitting on bottom of ball valve (Fig. 13 and 14) (see Quick Disconnect Fitting in the General Information section).

3. Secure flush tank to machine with tank support rod and extension spring.

4. Return tank support to upright position and secure with flange head screws (see Tank Support in this section).

5. Secure high tension lead to spark plug.

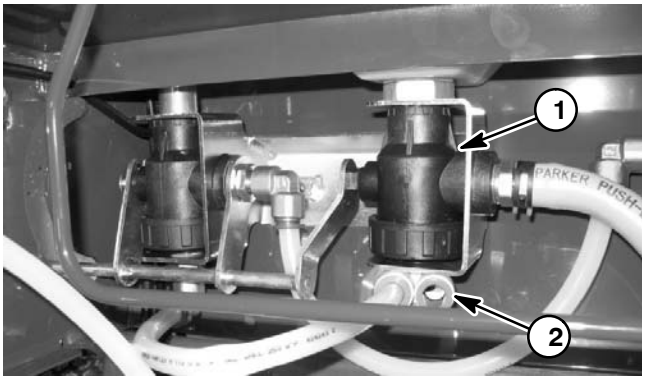

Figure 13

1. **Ball valve**
2. **Outlet tube location**

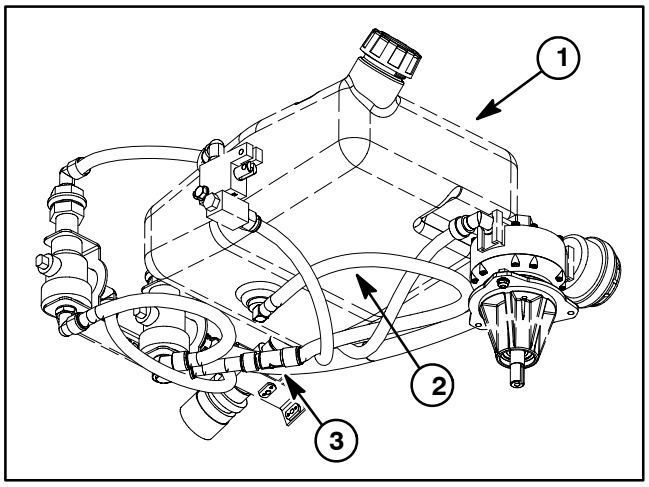

Figure 14

1. **Flush tank**
2. **Outlet tube**
3. **Check valve**

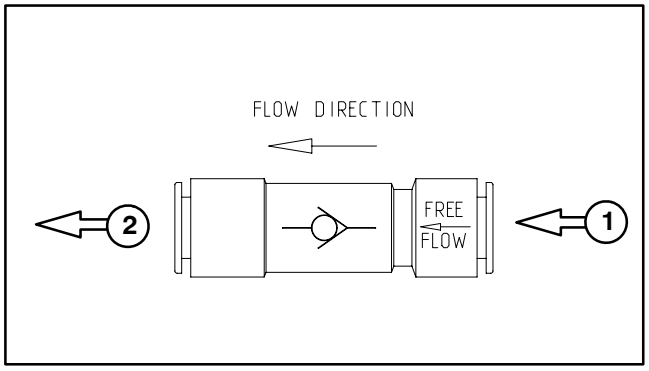

Figure 15

1. **Outlet tube from tank**
2. **Tube to ball valve**

Check Valve Service

The one–way check valve that is positioned between the flush (water) tank and the ball valve (see schematic) prevents paint from entering the flush (water) tank when the paint/flush lever is moved from the paint position to the flush position and while the machine is operated in the flush mode.

NOTE: If the flush system is not cleaned after use, diluted paint may cause check valve and associated hoses to become blocked. If the check valve is stuck open, paint may enter the flush (water) tank when the paint/flush lever is moved from the paint position to the flush position. If the check valve is stuck closed, the flush system may not operate.

1. Remove flush tank (see Flush Tank Removal in this section).

2. Remove check valve from tubes (see Quick Disconnect Fitting in the General Information section) (Fig. 16).

3. Inspect check valve:

   A. The spring loaded plunger in the check valve should unseat with very light pressure when pressed on with a suitable probe. Take care when pressing on the plunger not to damage the check valve or to allow contaminates into the valve.

   B. If the check valve is stuck due to dried paint, soak check valve in water to clean. If soaking in water will not free valve, check valve replacement is necessary.

4. Install check valve to tubes (see Quick Disconnect Fitting in the General Information section) (Fig. 16). Make sure that check valve is installed to allow free flow from flush (water) tank (Fig. 17).

5. Install flush tank (see Flush Tank Installation in this section).

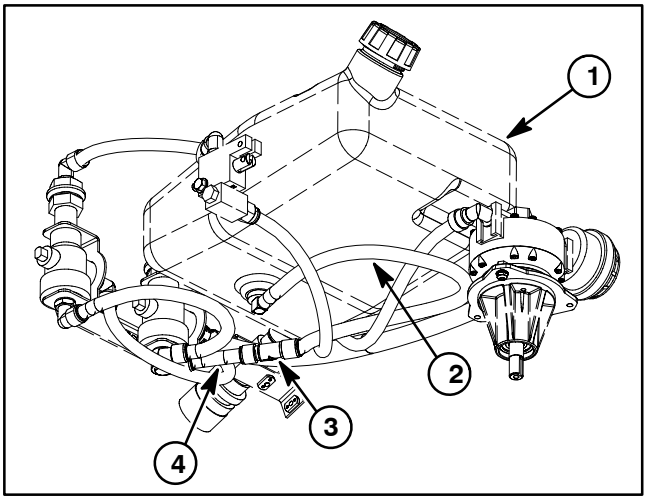

Figure 16

1. Flush tank
2. Outlet tube (from tank)
3. Check valve
4. Outlet tube (to valve)

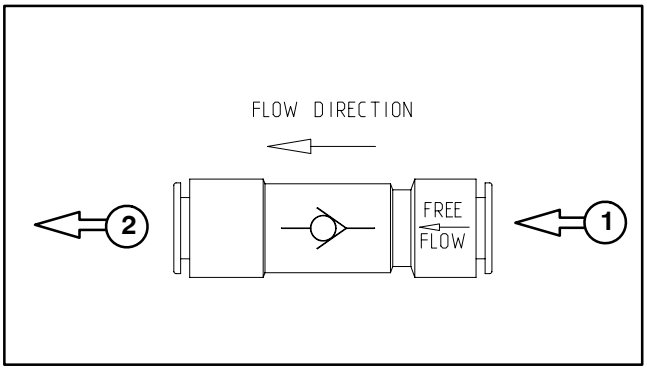

Figure 17

1. Outlet tube from tank
2. Tube to ball valve

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Paint Shutoff Valve

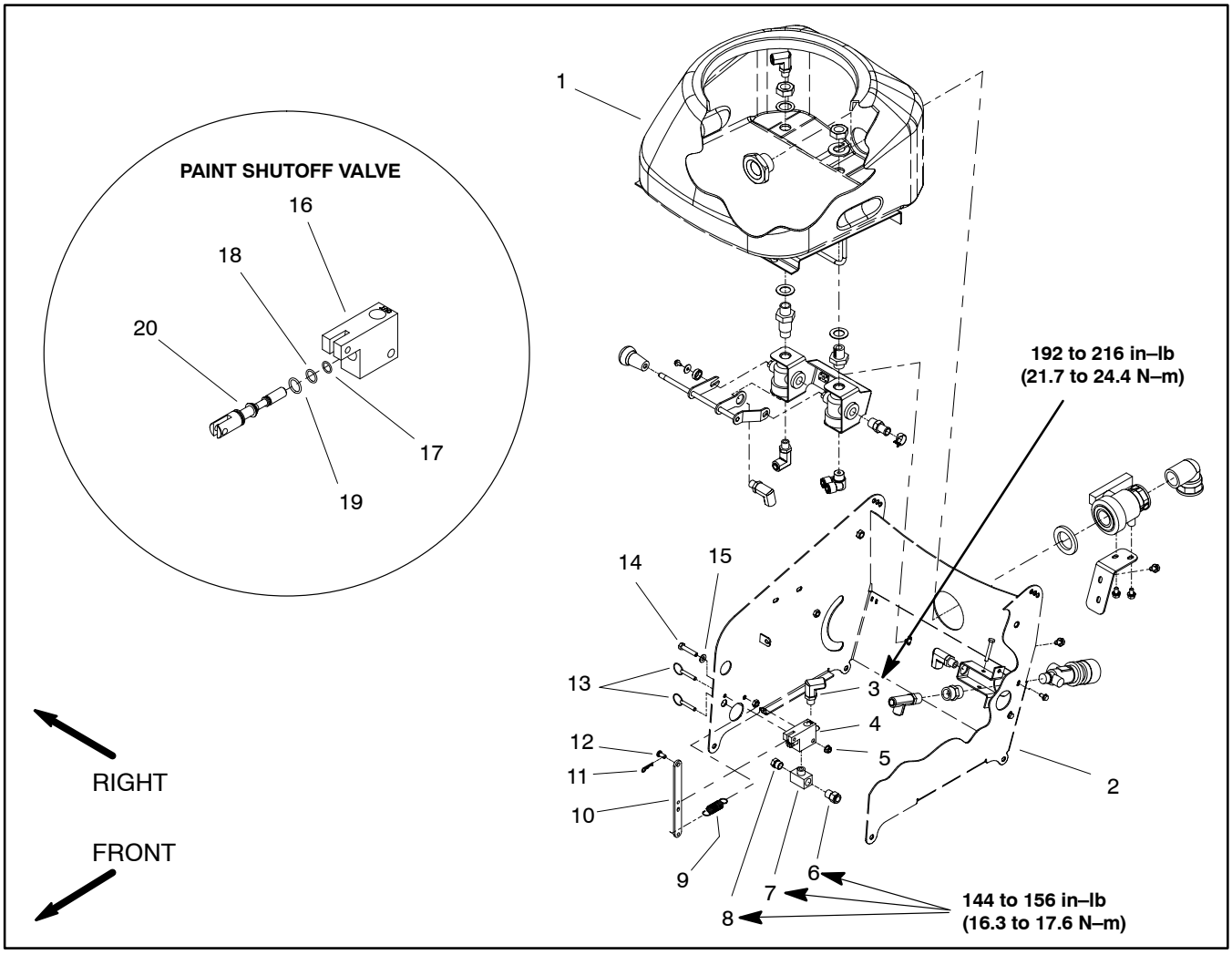

Figure 18

1. **Paint tank**
2. **Tank support**
3. **Elbow fitting**
4. **Paint shutoff valve**
5. **Flange nut**
6. **Straight fitting**
7. **Tee fitting**
8. **Plug**
9. **Extension spring**
10. **Lever**
11. **Hair pin**
12. **Pin**
13. **Cotterless pin**
14. **Cap screw**
15. **Flat washer**
16. **Manifold block**
17. **O–ring**
18. **O–ring**
19. **O–ring**
20. **Spool**

Paint Shutoff Valve Spool (Fig. 18)

The spool can be removed from the paint shutoff valve without removing the complete valve from the machine using the following procedure:

1. Drain paint tank (see Operator's Manual). Operate line painter in the flush mode to clean paint tubes.

2. Park machine on a level surface, stop engine, engage parking brake and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

3. Remove two (2) cotterless pins (item 13) that retain lever to shutoff valve (Fig. 20).

4. Slide lever out of manifold block and place to side.

5. Pull spool from manifold block. Remove and discard o–rings from spool. Thoroughly clean spool and manifold block.

6. Install new o–rings on spool. Lightly grease o–rings and spool. Push spool into manifold block.

7. Install lever and secure with two (2) cotterless pins (item 13).

Paint Shutoff Valve Removal (Fig. 18)

1. Drain paint tank (see Operator's Manual). Operate line painter in the flush mode to clean paint tubes.

2. Park machine on a level surface, stop engine, engage parking brake and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

3. Remove flush tank (see Flush Tank Removal in this section).

4. Remove inlet and outlet hoses from paint shutoff valve (Fig. 19) (see Quick Disconnect Fitting in the General Information section).

5. Disconnect extension spring (item 9) from lever (item 10).

6. Remove hair pin (item 11) and pin (item 12) that secure cable to lever.

7. Remove two (2) cotterless pins (item 13) that retain lever to shutoff valve (Fig. 20). Remove lever from valve.

8. Remove flange nut (item 5), cap screw (item 14) and flat washer (item 15) that secure shutoff valve to tank support. Remove valve from machine.

9. If needed, remove fittings from shutoff valve.

10. If required, push spool from manifold block. Remove and discard o–rings. Thoroughly clean spool and manifold block.

Paint Shutoff Valve Installation (Fig. 18)

1. If spool was removed from manifold block, install new o–rings on spool. Lightly grease o–rings and spool. Push spool into manifold block.

2. If fittings were removed from shutoff valve, apply Saf–T–Lok PTFE Pipe Sealant (or equivalent) to threads of fittings (see Thread Sealant for Paint System Fittings in the General Information section). Install fittings to valve. Torque fittings to values identified in Fig. 18.

3. Position valve to tank support and install cap screw (item 14), flat washer (item 15) and flange nut (item 5). Do not fully tighten nut.

4. Position lever to valve and install two (2) cotterless pins (item 13) to secure lever to shutoff valve.

5. Secure cable to lever with pin (item 12) and hair pin (item 11).

6. Tighten flange nut (item 5) to secure shutoff valve to machine.

7. Connect extension spring (item 9) to lever.

8. Connect inlet and outlet hoses to paint shutoff valve (Fig. 19) (see Quick Disconnect Fitting in the General Information section).

9. Install flush tank (see Flush Tank Installation in this section).

10. Secure high tension lead to spark plug.

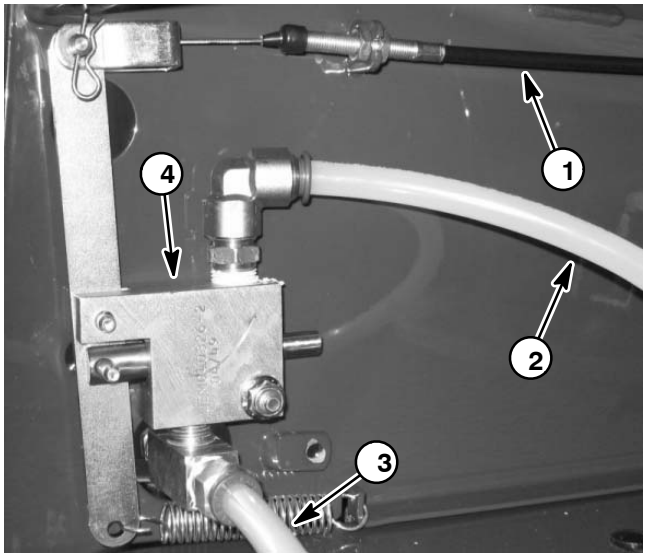

Figure 19

1. **Cable**
2. **Outlet hose**
3. **Inlet hose**
4. **Paint shutoff valve**

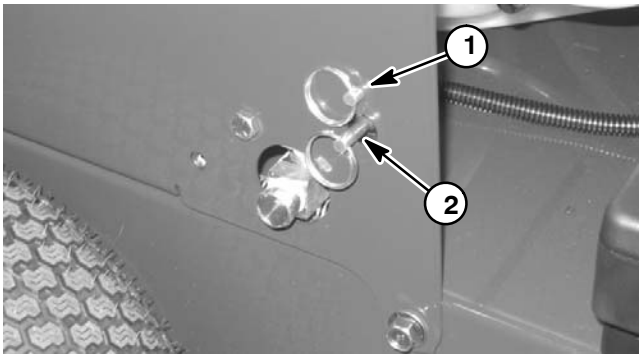

Figure 20

1. **Pivot cotterless pin**
2. **Spool cotterless pin**

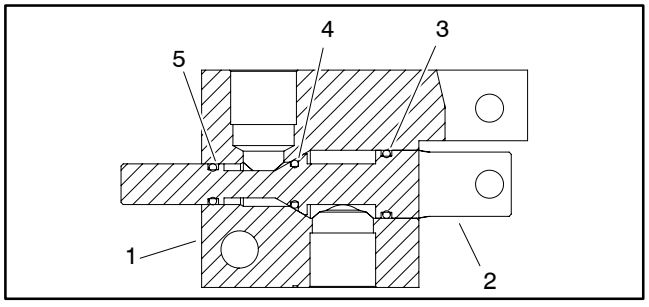

Figure 21

1. **Manifold block**
2. **Spool**
3. **O–ring**
4. **O–ring**
5. **O–ring**

Pressure Regulator

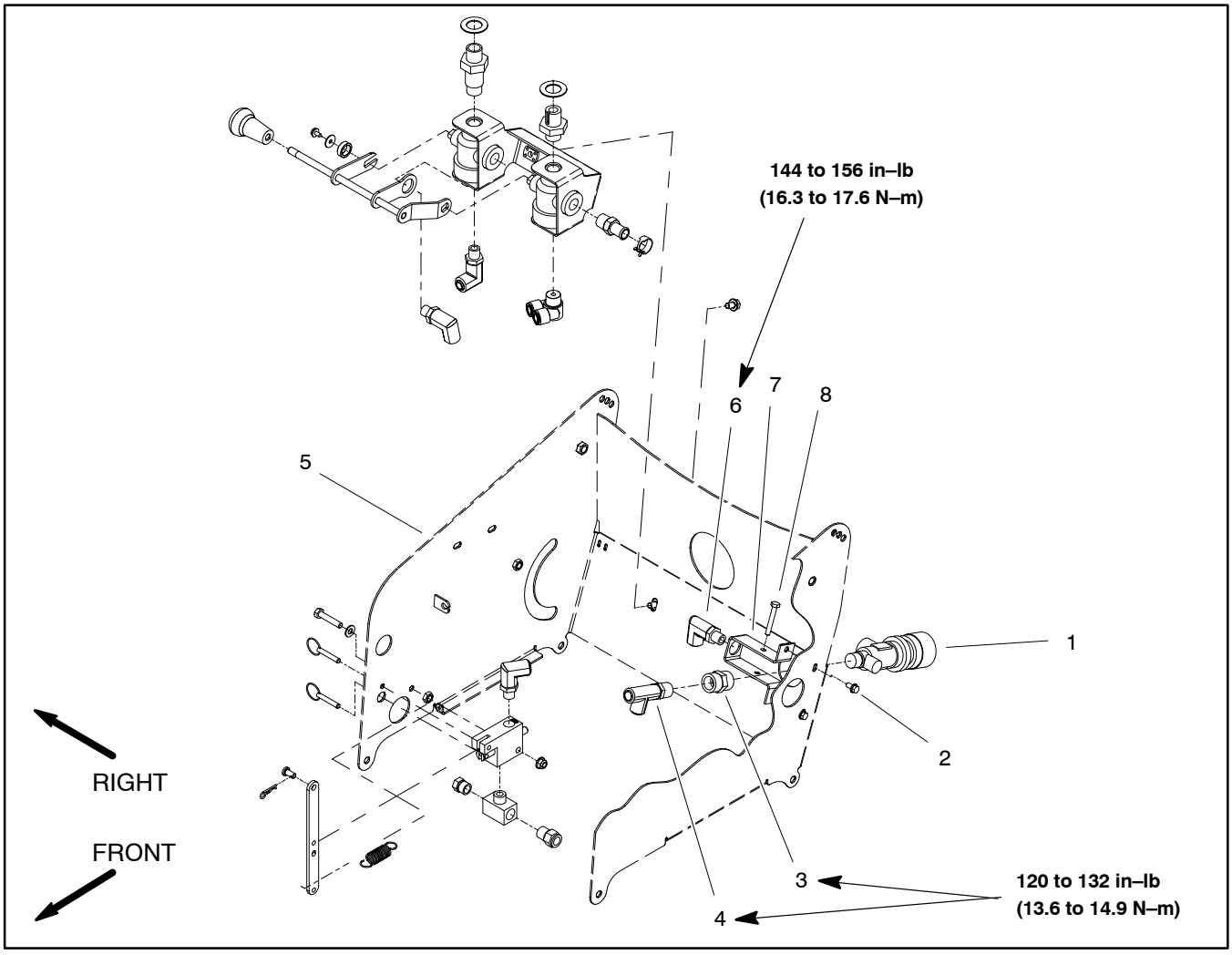

Figure 22

1. **Pressure regulator**
2. **Flange head screw (2 used)**
3. **Straight fitting**
4. **Tee fitting**
5. **Tank support**
6. **Elbow fitting**
7. **Bracket**
8. **Cap screw**

Removal (Fig. 22)

1. Drain paint tank (see Operator's Manual). Operate line painter in the flush mode to clean paint tubes.

2. Park machine on a level surface, stop engine, engage parking brake and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

3. Remove flush tank (see Flush Tank Removal in this section).

4. If equipped, remove pressure gauge from machine.

5. Label hoses connected to pressure regulator to assist in assembly. Remove hoses from fittings on pressure regulator (Fig. 23) (see Quick Disconnect Fitting in the General Information section).

6. Remove pressure regulator from machine using Figure 22 as a guide.

7. If necessary, remove fittings from pressure regulator.

Disassembly (Fig. 24)

NOTE: Individual components for the pressure regulator are not available. If pressure regulator is disassembled for cleaning, take care not to damage regulator components.

1. Remove knob from pressure regulator.

2. Carefully press spring pin from regulator housing.

3. Remove collar, spring and poppet from regulator housing.

Assembly (Fig. 24)

1. Assemble regulator in the reverse order of disassembly. Make sure that spring pin is centered in housing before installing jam nut and knob to housing.

Installation (Fig. 22)

1. If fittings were removed from pressure regulator, apply Saf–T–Lok PTFE Pipe Sealant (or equivalent) to threads of fittings (see Thread Sealant for Paint System Fittings in the General Information section). Install fittings to regulator. Torque fittings to values identified in Fig. 22.

2. Install regulator to machine using Figure 22 as a guide.

3. Install hoses to fittings on pressure regulator (Fig. 19) (see Quick Disconnect Fitting in the General Information section).

4. If equipped, install pressure gauge to machine.

5. Install flush tank (see Flush Tank Installation in this section).

6. Secure high tension lead to spark plug.

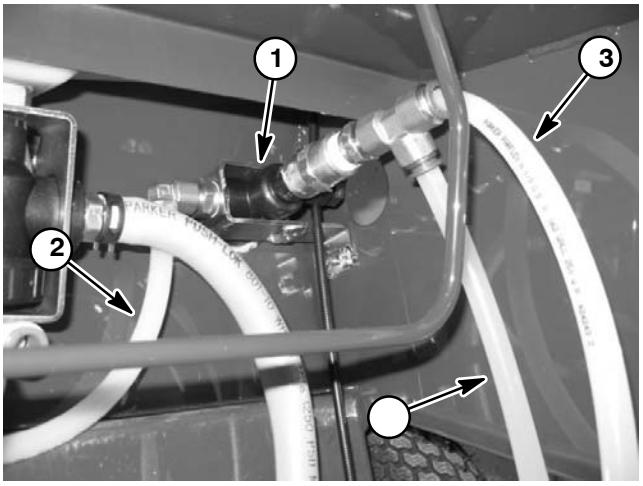

Figure 23

1. **Pressure regulator**
2. **To RH ball valve**
3. **To paint shutoff valve**
4. **To spray pump**

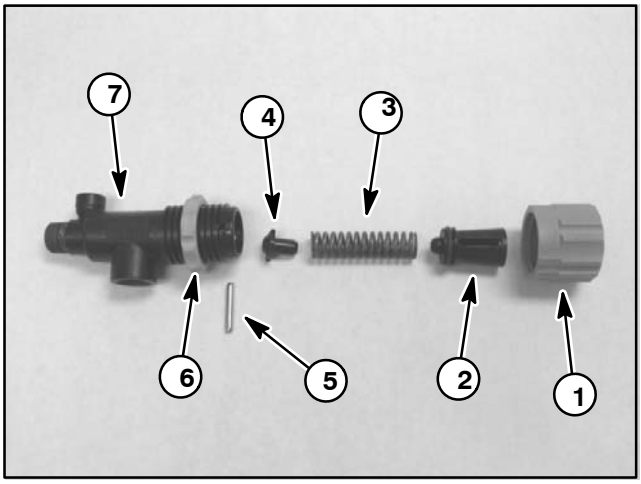

Figure 24

1. **Knob**
2. **Collar**
3. **Spring**
4. **Poppet**
5. **Spring pin**
6. **Jam nut**
7. **Housing**

Ball Valve

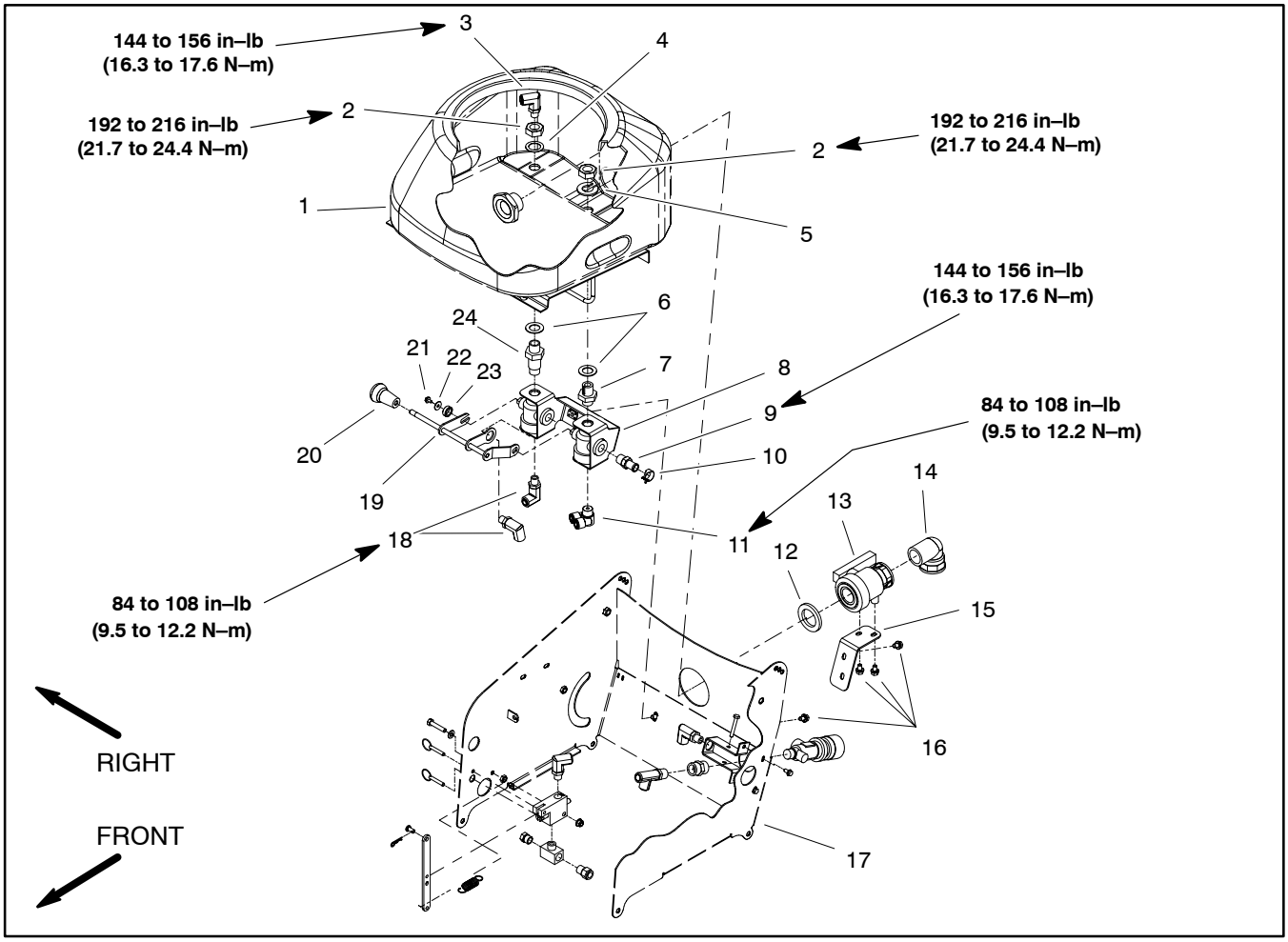

Figure 25

1. **Paint tank**
2. **Jam nut**
3. **Elbow fitting**
4. **Flat washer**
5. **Slotted washer**
6. **Rubber washer**
7. **Outlet port**
8. **Ball valve bracket**
9. **Straight fitting**
10. **Hose clamp**
11. **Tee fitting**
12. **O–ring**
13. **Ball valve**
14. **Elbow fitting**
15. **Drain valve bracket**
16. **Flange screw (5 used)**
17. **Tank support**
18. **Elbow fitting**
19. **Lever**
20. **Knob**
21. **Screw**
22. **Flat washer**
23. **Spacer**
24. **Recirculation port**

Removal (Fig. 25)

1. Drain paint tank and clean the paint system with clean water (see Operator's Manual).

2. Park machine on a level surface, stop engine, engage parking brake and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

3. Remove flush tank (see Flush (Water) Tank Removal in this section).

4. Remove elbow fitting (item 3), jam nuts (item 2) and washers (items 4 and 5) that secure ball valve ports to paint tank.

5. Label hoses connected to ball valves to assist in assembly. Remove hoses from fittings on ball valves (Fig. 26) (see Quick Disconnect Fitting in the General Information section).

6. Remove knob (item 20) from lever (item 19).

7. Remove two (2) flange screws (item 16) that secure ball valve assembly to tank support.

8. Remove ball valve assembly from machine. Locate and retrieve rubber washers (item 6) that seal ports on ball valves to paint tank. Discard rubber washers.

9. As necessary, remove fittings and lever from ball valves to allow removal of ball valve(s) from ball valve bracket.

NOTE: Individual components for the ball valves are not available.

NOTE: Ball valve nut threads have thread sealant applied during initial assembly. Nut removal may be difficult.

10. If needed, disassemble ball valve using Fig. 27 as a guide.

Installation (Fig. 25)

1. If ball valves were disassembled, assemble ball valves using Fig. 27 as a guide. Torque nut 45 to 55 in–lb (5.1 to 6.2 N–m).

NOTE: When assembling ball valves and lever to ball valve bracket, make sure that valve ball is orientated to upper fitting opening of ball valve assembly and lever is in the paint (lowered) position.

2. Position ball valves and lever to ball valve bracket.

IMPORTANT: Install fittings into ball valves by hand to prevent cross–threading the ball valve threads.

3. Apply Saf–T–Lok PTFE Pipe Sealant (or equivalent) to threads of all removed fittings (see Thread Sealant for Paint System Fittings in the General Information section). Install fittings to ball valves as follows:

A. Tighten recirculation port (item 24) so that clearance between port neck and top of bracket is from 0.000" (flush) to .030" (.0 to .8 mm) (Fig. 28).

B. Tighten outlet port (item 7) so that clearance between bottom of hex and top of bracket is from 0.000" (flush) to .030" (.0 to .8 mm) (Fig. 28).

C. Torque remaining fittings to value identified in Fig. 25.

4. Place new rubber washers (item 6) on ball valve ports. Position ball valve assembly to machine.

5. Install two (2) flange screws (item 16) that secure ball valve assembly to tank support but do not fully tighten.

6. Install washers (items 4 and 5), jam nuts (item 2) and elbow fitting (item 3) that secure ball valve fittings to paint tank. Tighten jam nuts. Torque elbow fitting from 144 to 156 in–lb (16.3 to 17.6 N–m).

7. Tighten two (2) flange screws (item 16).

8. Install hoses to fittings on ball valves (Fig. 26) (see Quick Disconnect Fitting in the General Information section).

9. Install knob (item 19) to lever.

10. Install flush tank (see Flush (Water) Tank Installation in this section).

11. Secure high tension lead to spark plug.

Figure 26

1. To spray pump
2. To pressure regulator
3. Lever (paint position)

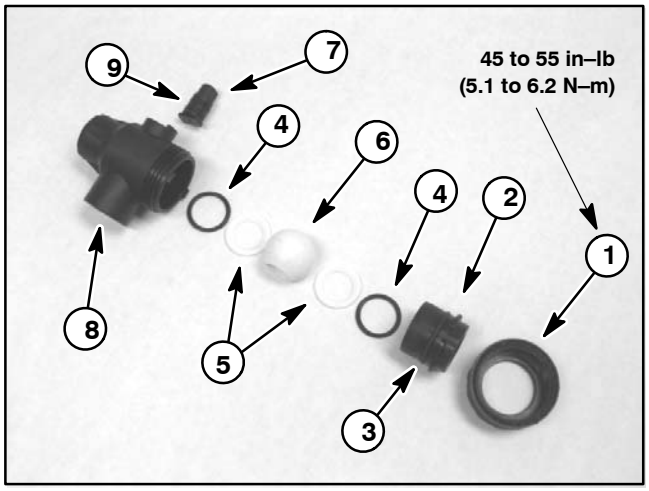

Figure 27

1. Nut
2. Cover
3. O–ring
4. O–ring
5. Seat
6. Valve ball
7. Spindle
8. Housing
9. O–ring (2 used)

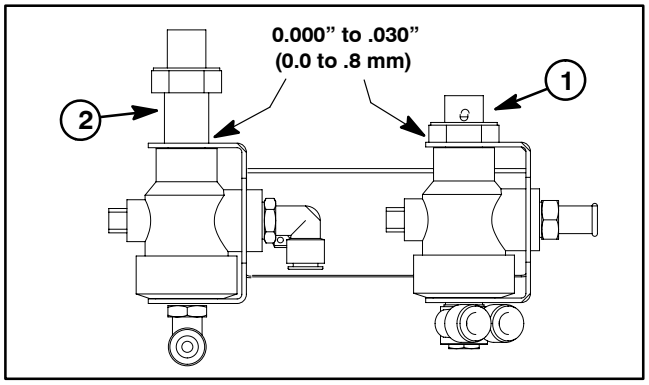

Figure 28

1. Recirculation port
2. Outlet port

Spray Pump Drive Belt

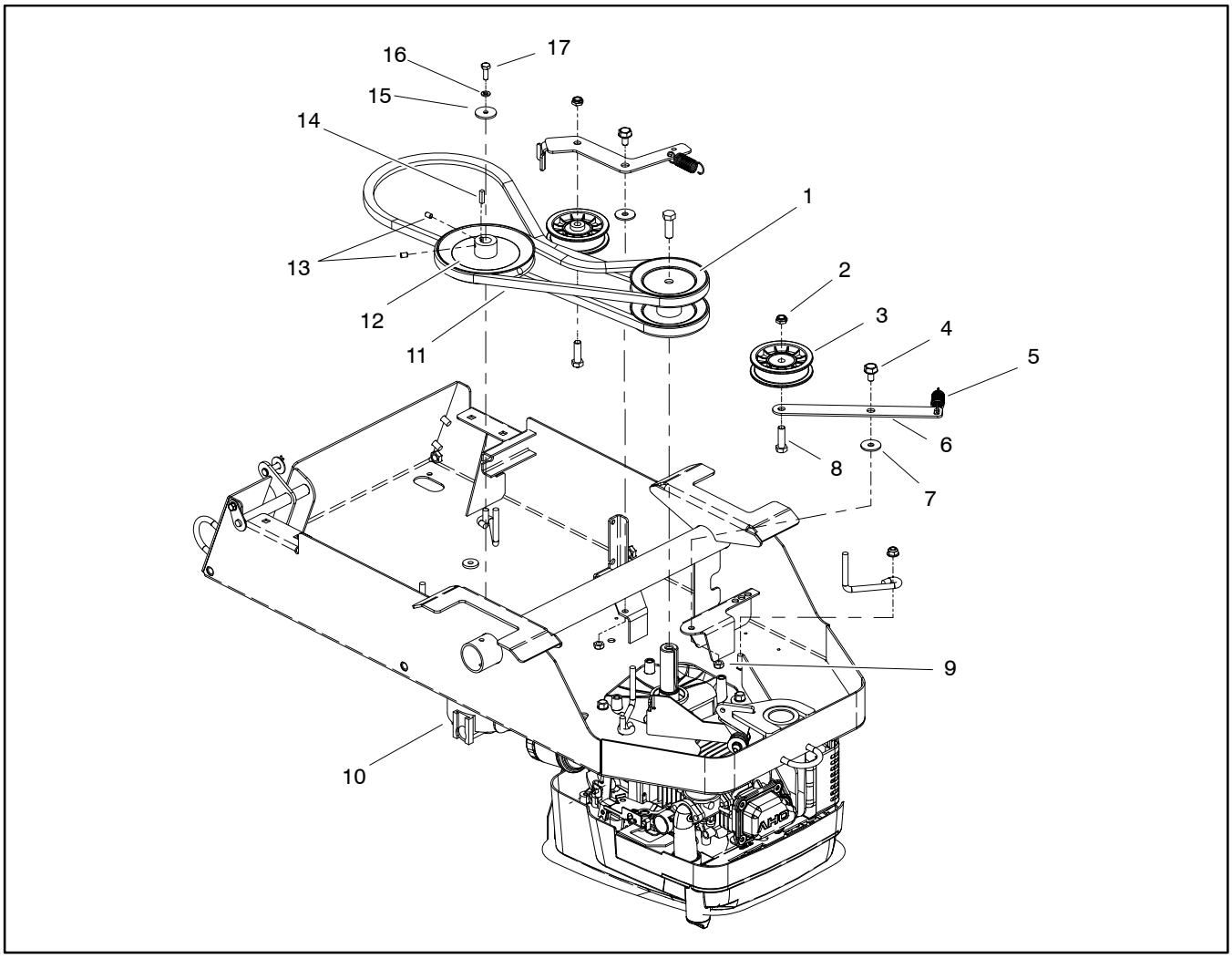

Figure 29

1. **Engine pulley**
2. **Lock nut**
3. **Idler pulley**
4. **Shoulder screw**
5. **Extension spring**
6. **Idler bracket**
7. **Pivot washer**
8. **Cap screw**
9. **Lock nut**
10. **Spray pump**
11. **Pump drive belt**
12. **Pump pulley**
13. **Set screw**
14. **Square key**
15. **Flat washer**
16. **Lock washer**
17. **Cap screw**

Removal (Fig. 29)

1. Drain paint tank (see Operator's Manual).

2. Park machine on a level surface, stop engine, engage parking brake and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

3. Under chassis, rotate idler bracket and pulley to release tension on pump drive belt. While holding idler pulley away from pump drive belt, remove belt from pump pulley. Carefully release idler bracket and pulley.

4. Remove pump drive belt from engine pulley and machine.

Installation (Fig. 29)

1. Position pump drive belt to engine pulley.

2. Rotate idler bracket and pulley to allow belt to be installed on pump pulley. Carefully release idler bracket and pulley to tension belt.

3. Secure high tension lead to spark plug.

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Spray Pump

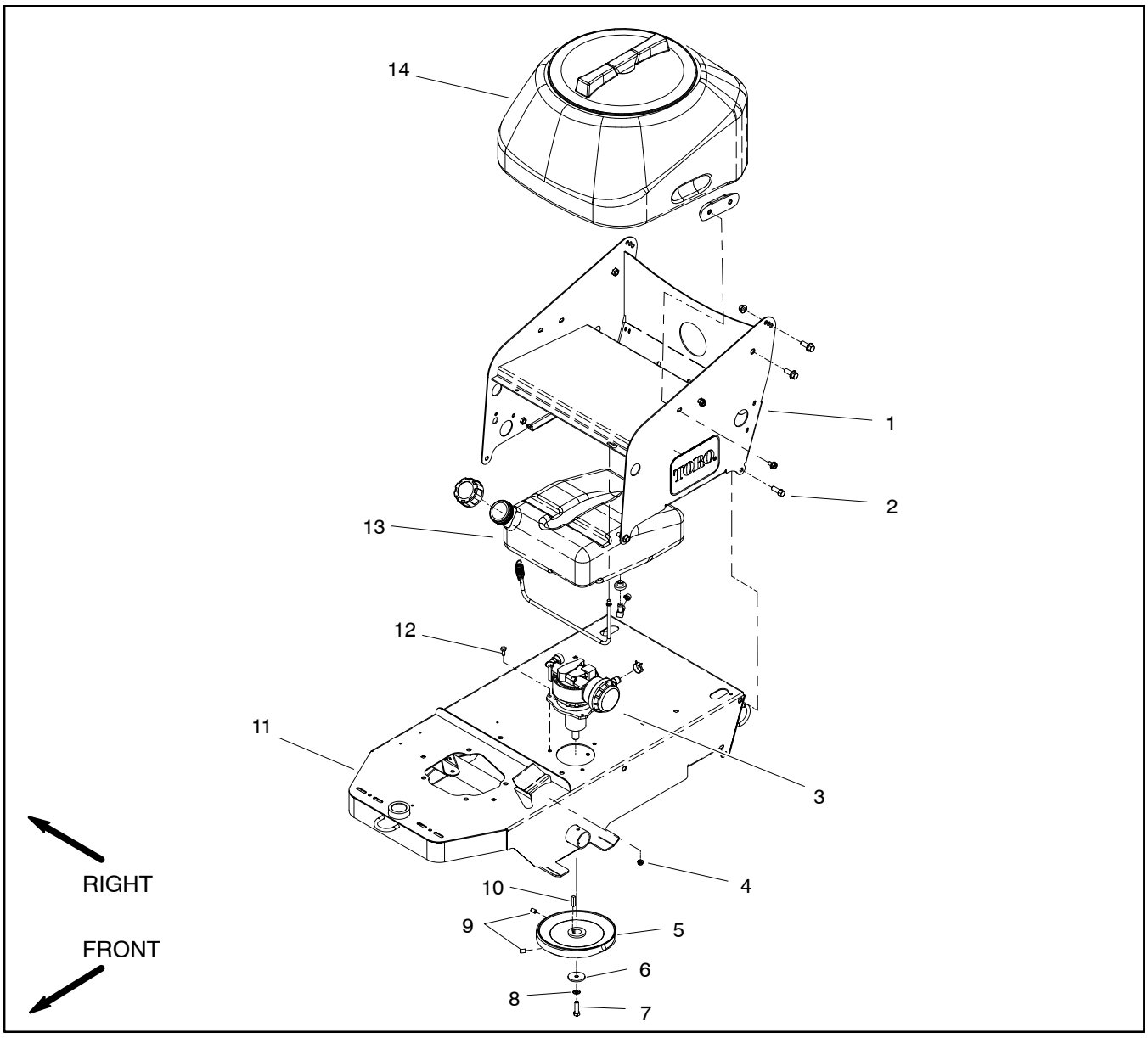

Figure 30

1. **Tank support**
2. **Flange head screw (4 used)**
3. **Spray pump assembly**
4. **Flange nut (3 used)**
5. **Pulley**
6. **Flat washer**
7. **Cap screw**
8. **Lock washer**
9. **Set screw**
10. **Square key**
11. **Chassis**
12. **Cap screw (3 used)**
13. **Flush tank**
14. **Paint tank**

Removal (Fig. 30)

1. Drain paint tank (see Operator's Manual).

2. Park machine on a level surface, stop engine, engage parking brake and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

3. Remove spray pump drive belt (see Spray Pump Drive Belt Removal in this section).

4. Loosen two (2) set screws and then remove cap screw (item 7), lock washer (item 8) and flat washer (item 6) that secure pulley to pump shaft. Slide pulley from pump shaft. Locate and retrieve square key (item 10).

5. Tip tank support to gain access to spray pump (see Tank Support in this section).

6. Disconnect suction and pressure hoses from spray pump fittings (Fig. 31).

7. Remove three (3) flange nuts (item 4) and cap screws (item 12) that secure spray pump to chassis.

8. Lift spray pump assembly from machine.

Installation (Fig. 30)

1. Position spray pump to machine chassis. Secure pump to chassis with three (3) flange nuts (item 4) and cap screws (item 12).

2. Connect suction and pressure hoses to spray pump fittings.

3. Return tank support to upright position and secure with flange head screws (see Tank Support in this section).

4. Apply antiseize lubricant to drive shaft. Place square key (item 10) in pump shaft. Slide pulley onto pump shaft with the pulley hub away from pump. Secure pulley to pump with cap screw (item 7), lock washer (item 8) and flat washer (item 6). Tighten pulley set screws.

5. Install spray pump drive belt (see Spray Pump Drive Belt Installation in this section).

6. Secure high tension lead to spark plug.

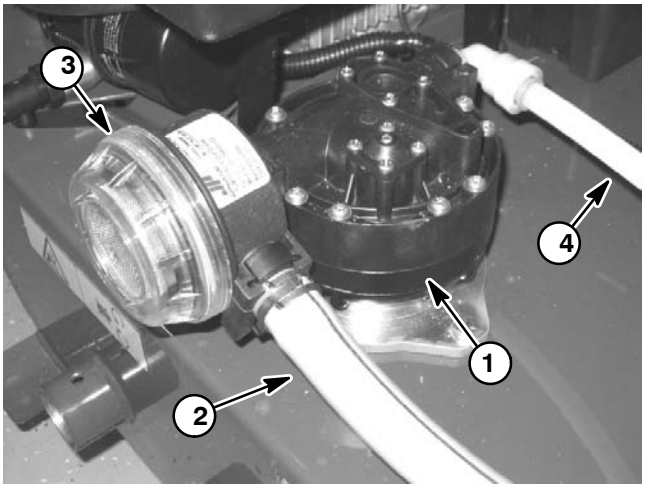

Figure 31

1. **Spray pump**
2. **Suction line (in)**
3. **Filter**
4. **Pressure line (out)**

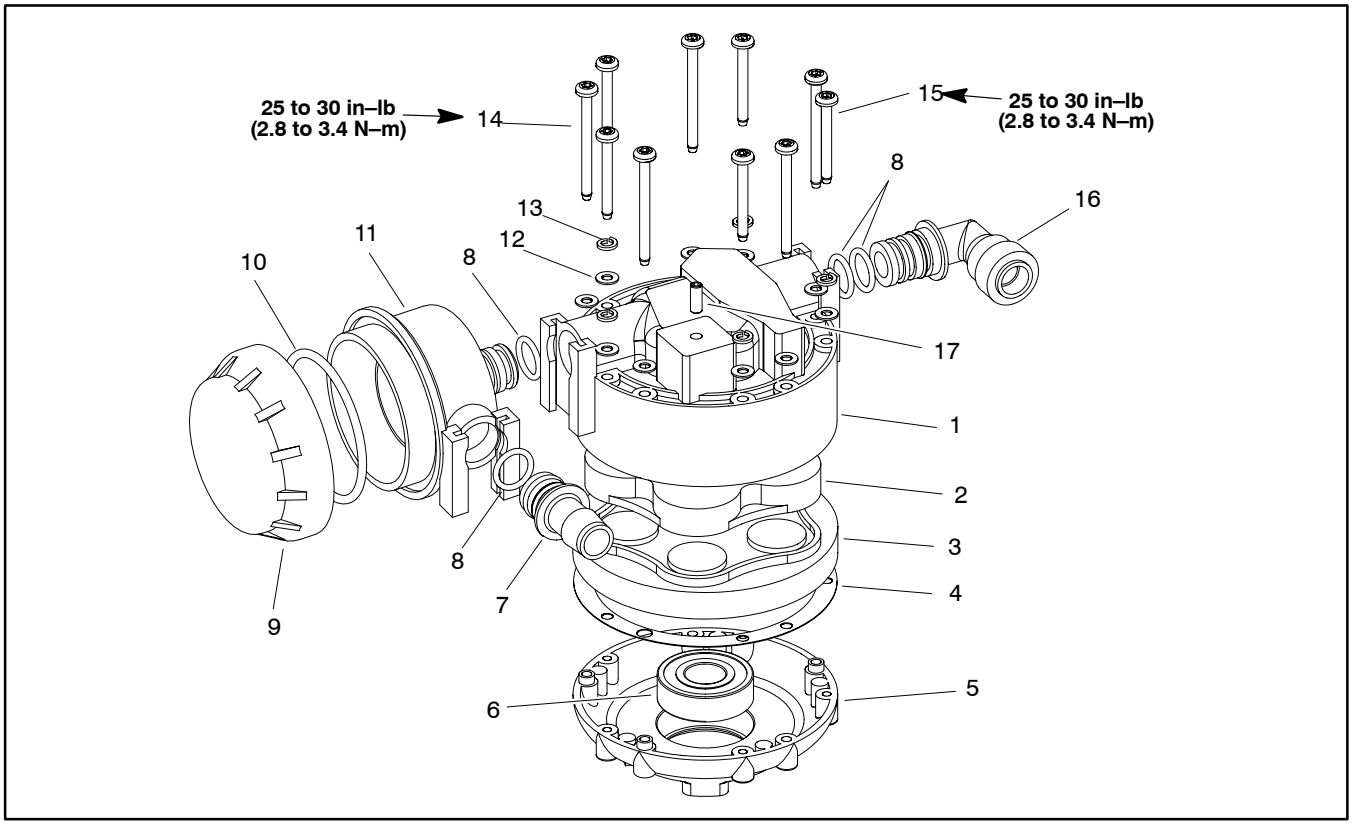

Figure 32

1. **Pump head**
2. **Check valve kit**
3. **Wobbler plate/diaphragm assembly**
4. **Gasket**
5. **Pump endbell**
6. **Bearing**
7. **Straight fitting**
8. **O–ring**
9. **Filter cover**
10. **O–ring**
11. **Filter (40 mesh)**
12. **Flat washer (10 used)**
13. **Lock washer (5 used)**
14. **Screw (2” long) (5 used)**
15. **Screw (1.5” long) (5 used)**
16. **Elbow fitting**
17. **Socket head screw (relief valve)**

Disassembly (Fig. 32)

1. Remove two (2) socket head screws and lock washers that secure spray pump to pump drive housing (Fig. 34). Separate spray pump from drive housing.

2. If necessary, disassemble pump drive housing assembly (Fig. 34):

   A. Remove retaining rings from grooves in pump drive housing.

   B. Slide drive shaft and bearings from housing.

   C. Press bearings from drive shaft.

3. Use a marker to make a **diagonal** line across the pump head, wobbler plate/diaphragm assembly and pump endbell for assembly purposes (Fig. 33).

4. Loosen and remove ten (10) screws that retain pump head to endbell. Locate and retrieve lock washers and flat washers.

5. Carefully separate pump head from pump endbell. Remove and discard gasket. Separate wobbler plate/diaphragm assembly, check valve kit and pump head.

6. If necessary, remove bearing from pump endbell.

7. If necessary, remove filter (item 11) from pump head by sliding retainer and pulling filter from pump head. Remove and discard o–ring (item 8).

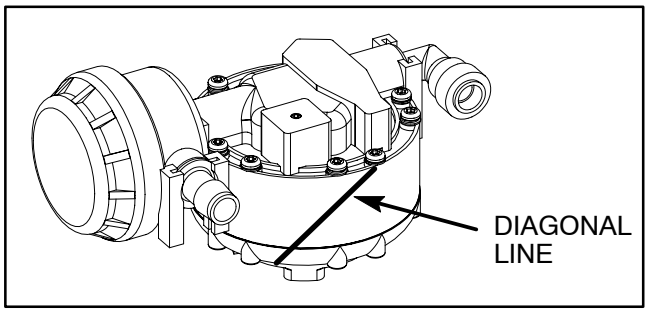

Figure 33

8. If necessary, remove fittings in filter (item 7) and/or pump head (item 16) by sliding retainer and pulling fitting from housing. Remove and discard o–rings (item 8).

Inspection

1. If paint has dried on internal pump parts, components or complete pump replacement will most likely be required.

IMPORTANT: Do not attempt to clean internal pump components with solvents as component damage will occur.

2. Inspect check valve kit and diaphragm assembly for deformation, erosion of sealing areas or debris. If individual valves are damaged, replace check valve kit. If wobbler plate/diaphragm is damaged, replace pump.

3. Inspect pump endbell and drive housing bearings. Bearings should rotate freely with no evidence of wear or roughness. Bearing seals should be intact and show no signs of lubricant leakage.

Assembly (Fig. 32)

1. If bearing was removed from pump endbell, install new bearing into endbell.

IMPORTANT: When assembling pump, make sure to lower pump head onto check valve kit to keep outlet check valves in position.

2. Place check valve kit onto wobbler plate/diaphragm assembly (Fig. 35). Position outlet check valves to top of check valve kit.

3. Lower pump head onto valve kit aligning diagonal line made during disassembly (Fig. 33).

4. Install five (5) shorter (1.5” (38.1 mm) length) screws with lock washers and flat washers to secure pump head to wobbler plate/diaphragm assembly. Tighten screws in a crossing pattern and in three equal steps to a final torque from 25 to 30 in–lb (2.8 to 3.4 N–m). **DO NOT** over tighten screws.

5. Position gasket and end bell to pump assembly aligning diagonal line made during disassembly (Fig. 33).

6. Install five (5) longer (2” (50.8 mm) length) screws with flat washers to secure pump assembly to endbell. Tighten screws in a crossing pattern and in three equal steps to a final torque from 25 to 30 in–lb (2.8 to 3.4 N–m). **DO NOT** over tighten screws.

7. If pump drive housing was disassembled:

   A. Press bearings onto drive shaft. Make sure bearings contact drive shaft shoulder.

   B. Slide drive shaft and bearings into housing.

   C. Install retaining rings into pump drive housing grooves.

8. Apply antiseize lubricant to drive shaft. Position pump gasket to pump housing. Slide spray pump onto drive shaft. Align tab on pump with slot on pump drive housing.

9. Secure spray pump to pump drive housing with two (2) socket head screws and lock washers. Torque socket head screws from 22 to 28 in–lb (2.5 to 3.2 N–m). **DO NOT** over tighten screws.

10. If fittings and/or filter were removed from pump assembly, install new o–ring, slide fitting or filter into housing and secure with retainer.

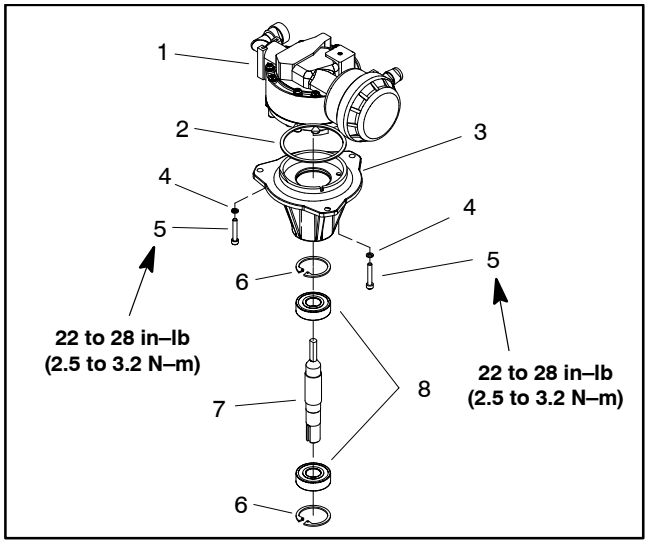

Figure 34

1. **Spray pump**
2. **Pump gasket**
3. **Pump drive housing**
4. **Lock washer**
5. **Socket head screw**
6. **Retaining ring**
7. **Drive shaft**
8. **Ball bearing**

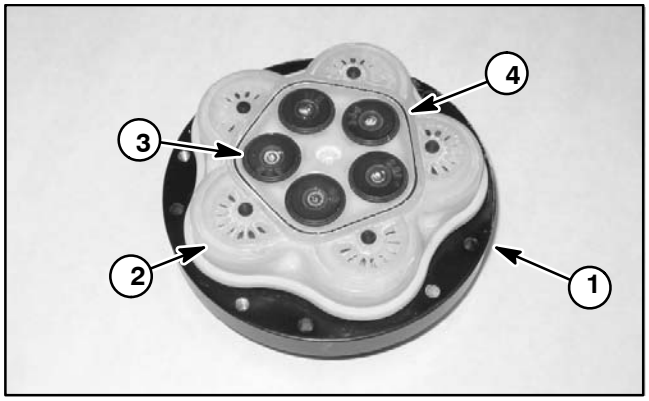

Figure 35

1. **Wobbler plate/diaphragm assembly**
2. **Check valve kit**
3. **Outlet check valve (5 used)**
4. **O–ring**

Spray Head

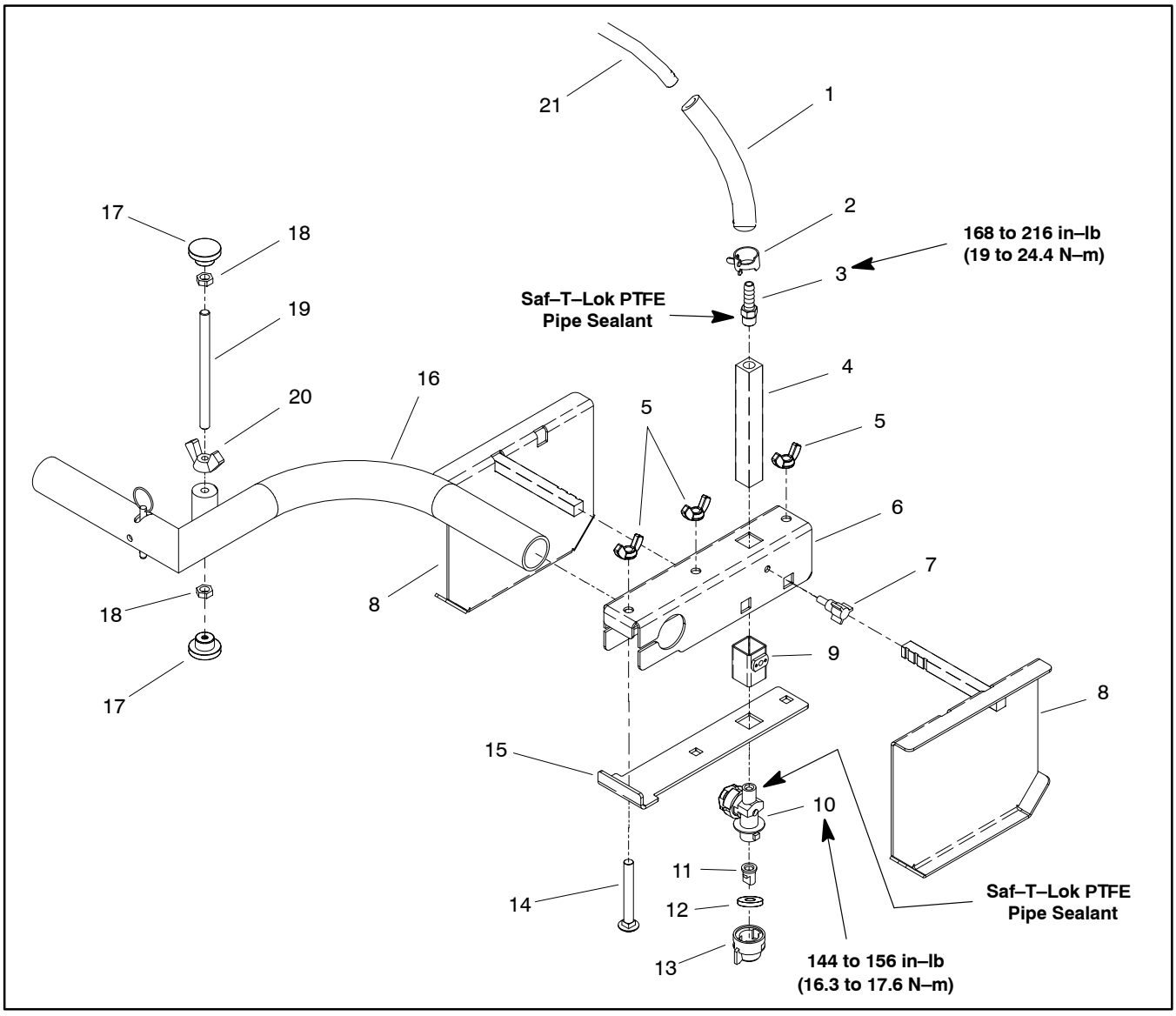

Figure 36

1. Hose
2. Hose clamp
3. Barb fitting
4. Nozzle tube
5. Wing nut
6. Nozzle bracket
7. Knob
8. Shield
9. Nozzle bracket
10. Diaphragm nozzle
11. Spray nozzle
12. Seat gasket
13. Adapter cap
14. Cap screw (3 used)
15. Clamp bracket
16. Spray arm
17. Stop
18. Jam nut
19. Threaded rod
20. Wing nut
21. Supply hose

Disassembly (Fig. 36)

1. Operate line painter in the flush mode to clean paint tubes.

2. Park machine on a level surface, stop engine, engage parking brake and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

3. Remove spray head components as needed using Figures 36 and 37 as guides.

Assembly (Fig. 36)

1. Assemble spray head using Figures 36 and 37 as guides. If barb fitting (item 3) or diaphragm nozzle (item 10) were removed from nozzle tube, apply Saf–T–Lok PTFE Pipe Sealant (or equivalent) to threads of components before assembly (see Thread Sealant for Paint System Fittings in the General Information section).

2. Adjust spray head components (see Operator's Manual).

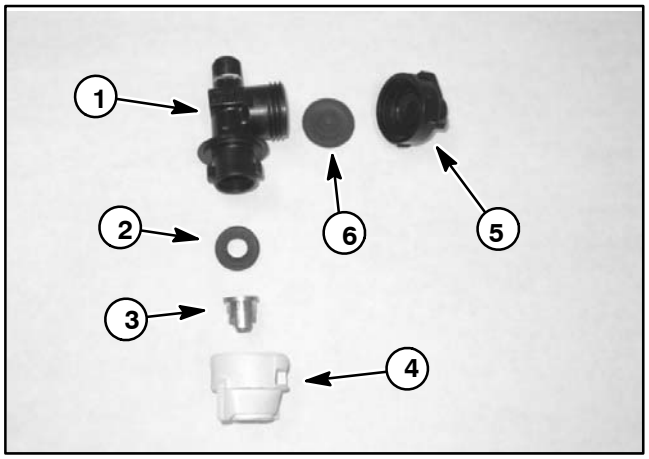

Figure 37

1. **Body**
2. **Seat gasket**
3. **Spray nozzle**
4. **Adapter cap**
5. **Check valve end cap**
6. **Check valve diaphragm**

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Chapter 6

Chassis and Controls

Table of Contents

Specifications

Item	Description
Tire Pressure	
Front Castor Tire	18 to 20 PSI (1.2 to 1.4 Bar)
Rear Tire	12 to 15 PSI (0.8 to 1.0 Bar)

Adjustments

Traction Drive Cable

1. Park machine on a level surface, stop engine, engage parking brake and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

2. Make sure that traction lever on handle is released.

3. Adjust location of traction cable jam nuts so that traction cable spring is stretched .120” to .250” (3.0 to 6.4 mm) from it’s relaxed state.

4. Make sure that jam nuts are fully tightened and that boot is positioned on end of traction cable.

5. Secure high tension lead to spark plug.

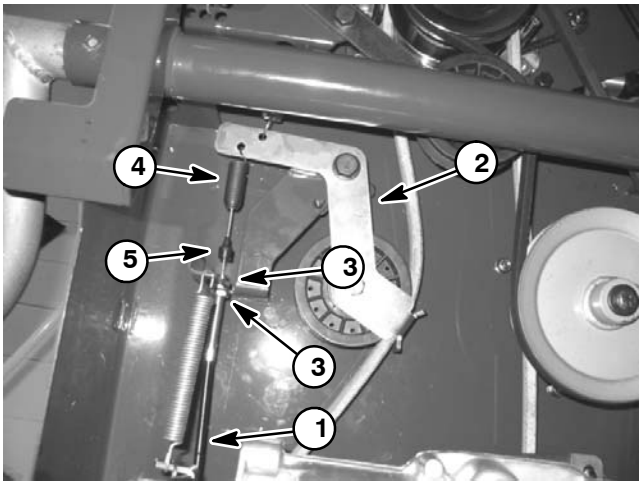

Figure 1

1. **Traction drive cable**
2. **Idler bracket**
3. **Jam nut**
4. **Cable spring**
5. **Cable boot**

Front Castor Fork

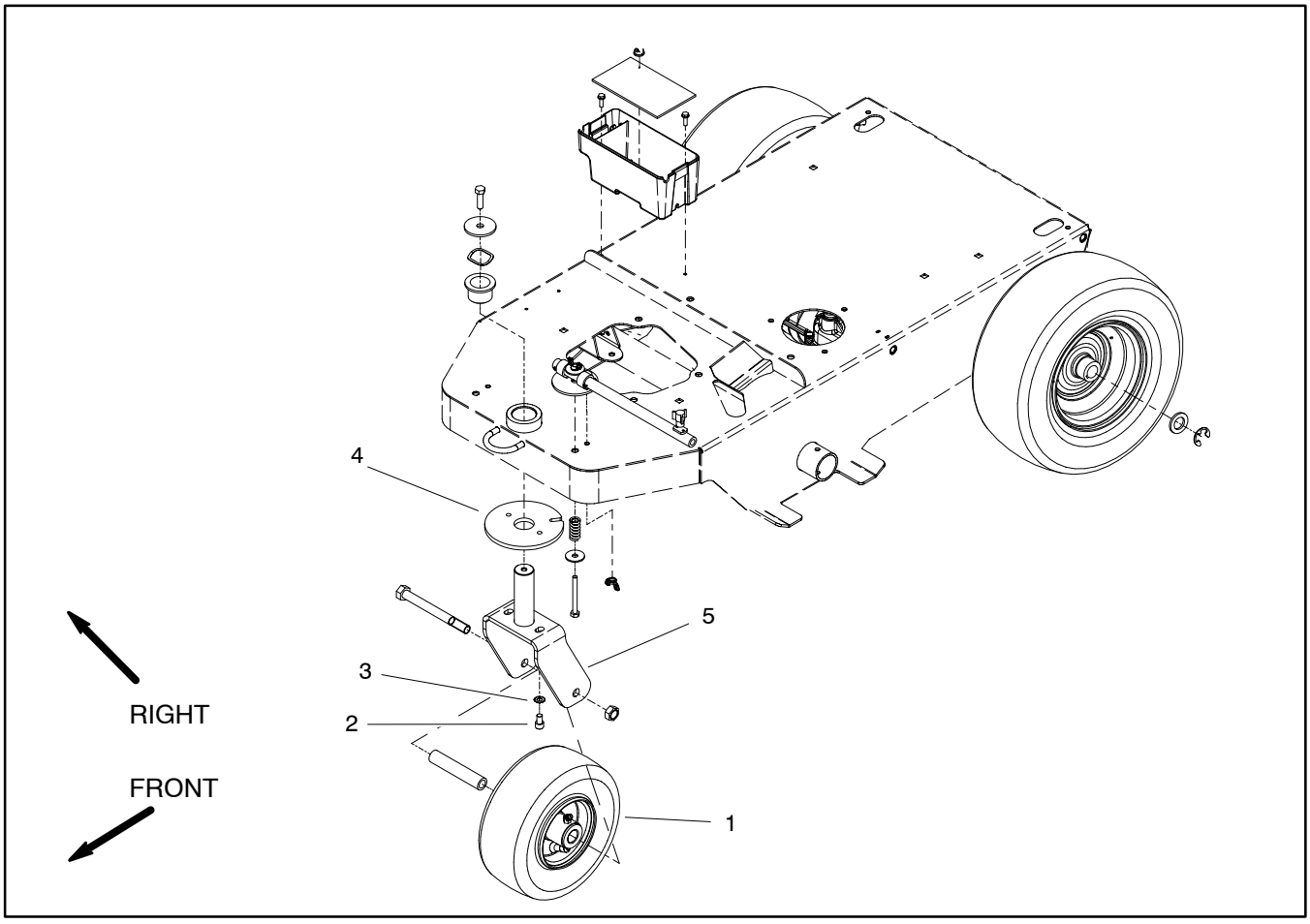

Figure 2

1. **Front castor wheel**
2. **Socket head screw (2 used)**
3. **Lock washer (2 used)**
4. **Castor plate**
5. **Castor fork**

If the Line Painter 1200 does not follow a straight line when the castor detent is engaged, front castor fork adjustment is necessary.

Adjustment

1. Park machine on a level surface, stop engine, engage parking brake and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

2. Make sure that castor lever on handle is released to lock the castor fork in position.

NOTE: Shorten a 1/4" allen wrench (Fig. 3) to allow access to socket head screws (item 2) that secure castor plate. If modified allen wrench is not available, remove front wheel to access socket head screws.

3. Loosen two (2) socket head screws (item 2) that secure castor plate to castor fork.

4. Rotate castor fork until wheel is in proper position for straight line tracking.

5. Tighten two (2) socket head screws to secure castor fork assembly.

6. Secure high tension lead to spark plug.

7. Operate machine to make sure it follows a straight line. Readjust castor fork if necessary.

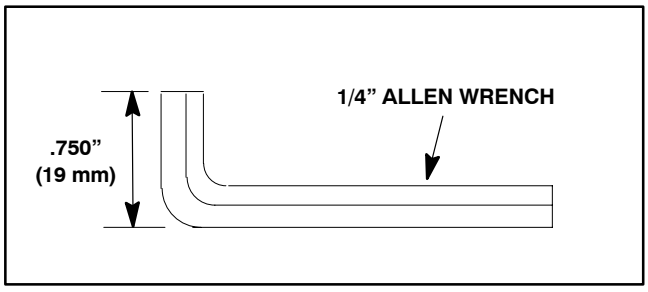

Figure 3

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Wheels

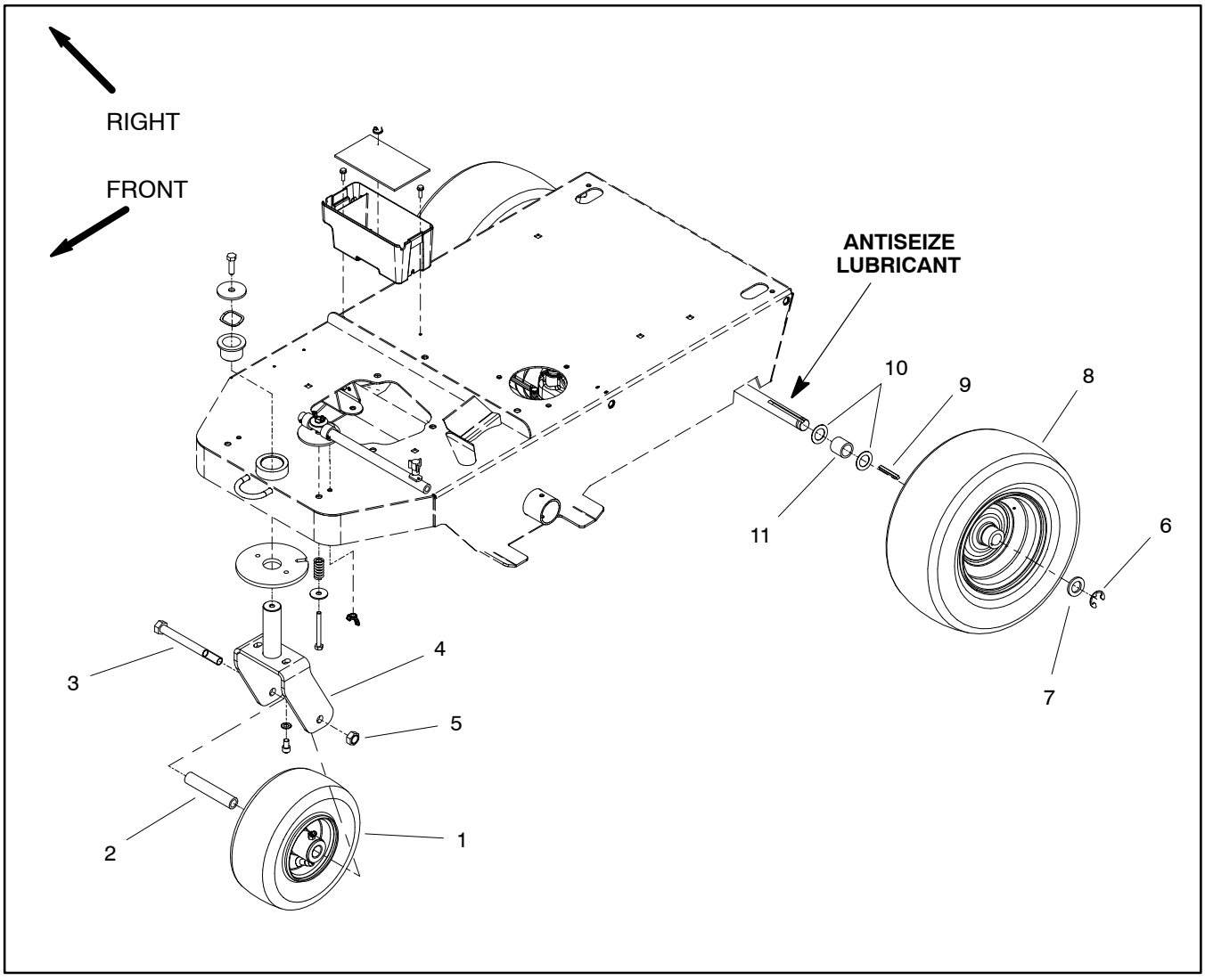

Figure 4

1. **Front castor wheel**
2. **Bushing**
3. **Cap screw**
4. **Castor fork**
5. **Lock nut**
6. **E–ring**
7. **Washer**
8. **Rear wheel**
9. **Square key**
10. **Thrust washer**
11. **Spacer**

Removal (Fig. 4)

1. Park machine on a level surface, stop engine, engage parking brake and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

2. Raise machine so that wheel to be removed is off the ground. Support machine to prevent it from shifting during wheel removal.

3. To remove front wheel:

   A. Remove lock nut (item 5) and cap screw (item 3) that secure wheel to castor fork.

   B. Slide wheel from castor fork.

   C. Remove front wheel bushing and bearings as needed (Fig. 5).

4. To remove rear wheel:

   A. Remove e–ring (item 6) and washer (item 7) that secure wheel to transaxle shaft.

   B. Slide wheel from transaxle shaft.

   C. Locate and retrieve square key (item 9).

Installation (Fig. 4)

1. To install front wheel:

   A. If front wheel bushing and bearings were removed, install bushing and bearings to wheel assembly (Fig. 5).

   B. Position front wheel to castor fork.

   C. Install cap screw (item 3) and lock nut (item 5) to secure wheel to castor fork.

   D. Lubricate grease fitting on front wheel (see Operator's Manual).

2. To install rear wheel:

   A. Apply antiseize lubricant to transaxle shaft. Position square key (item 9) in transaxle slot.

   B. Slide wheel onto transaxle shaft.

   C. Secure wheel to transaxle shaft with washer (item 7) and e–ring (item 6).

3. Carefully, lower machine to ground.

4. Secure high tension lead to spark plug.

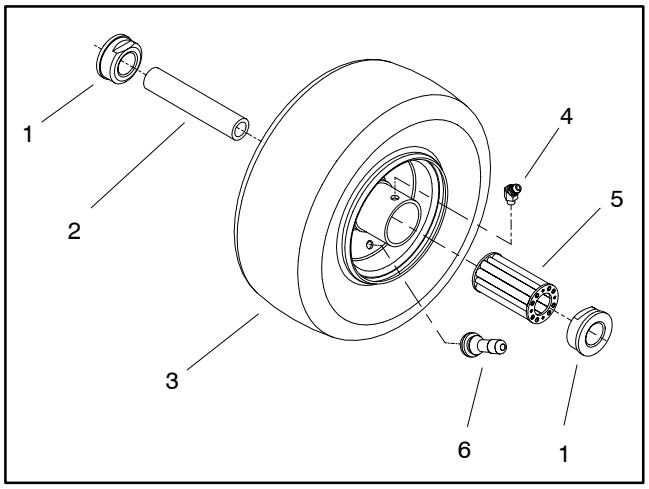

Figure 5

1. Outside bearing	**4. Grease fitting**
2. Bushing	**5. Bearing**
3. Rim and tire assembly	**6. Valve stem**

Brake Cable

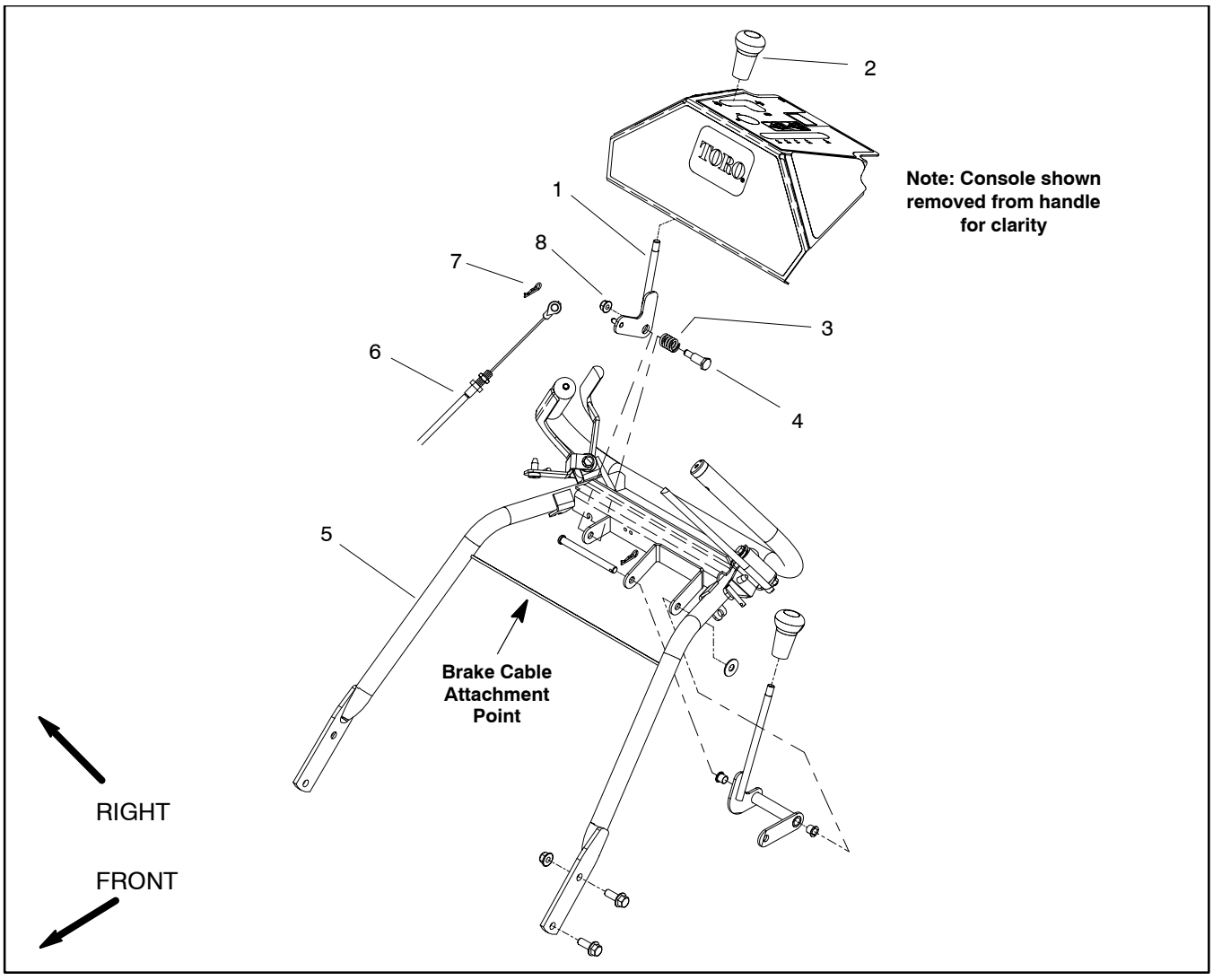

Figure 6

1. **Brake lever**
2. **Knob**
3. **Compression spring**
4. **Shoulder screw**
5. **Handle assembly**
6. **Brake cable**
7. **Hairpin**
8. **Flange nut**

Removal (Fig. 6)

1. Park machine on a level surface, stop engine and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug. Chock wheels to prevent machine from moving during brake cable repair.

2. Disconnect brake cable from brake lever (Fig. 6):

   A. Loosen jam nut that secures cable to handle assembly.

   B. Remove hair pin that retains cable end to brake lever.

   C. Slide cable end from brake lever.

3. Disconnect brake cable from brake lever on transaxle (Fig. 7):

   A. Loosen jam nuts that secure cable to chassis bracket.

   B. Disconnect cable spring from brake lever.

4. Note routing of brake cable. Remove cable from machine.

Installation (Fig. 6)

1. Position brake cable to machine.

2. Connect brake cable to brake lever on handle (Fig. 6):

   A. Slide cable end onto brake lever and secure with hair pin.

   B. Secure cable to handle assembly with jam nut.

3. Connect brake cable to brake lever on transaxle (Fig. 7):

   A. Connect cable spring to brake lever.

   B. Position cable to chassis bracket.

   C. Tighten cable jam nuts enough to prevent cable spring hook from coming off transaxle brake lever. When properly adjusted, the cable spring should not be stretched.

   D. Make sure that cable boot is positioned over end of cable.

4. Secure high tension lead to spark plug.

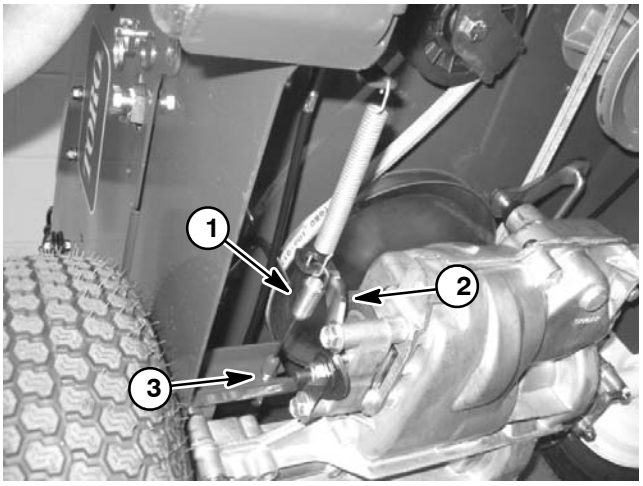

Figure 7

1. **Brake cable spring**
2. **Brake lever**
3. **Cable jam nut**

Castor Release Cable

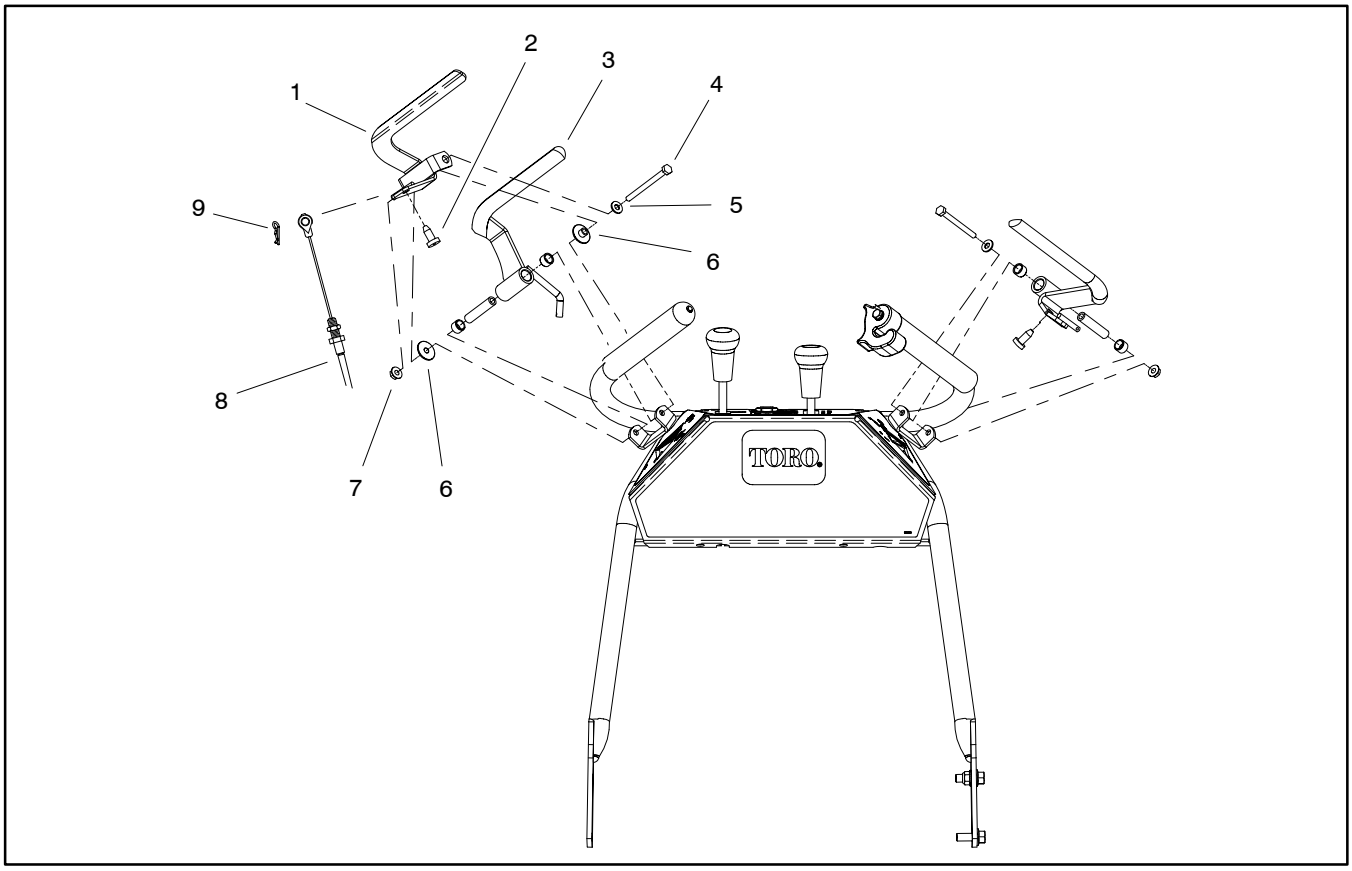

Figure 8

1. **Castor release lever**
2. **Rubber bumper**
3. **Traction lever**
4. **Cap screw**
5. **Flat washer**
6. **Flange bushing**
7. **Flange nut**
8. **Castor release cable**
9. **Hair pin**

Removal (Fig. 8)

1. Park machine on a level surface, stop engine, engage parking brake and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

2. Disconnect castor release cable from castor release lever on machine handle:

   A. Loosen jam nut that secures cable to handle assembly.

   B. Remove hair pin that retains cable end to castor release lever.

   C. Slide cable end from castor release lever.

3. Disconnect castor release cable from castor release detent under front of machine (Figs. 9 and 10):

   A. Loosen jam nuts that secure cable to chassis bracket.

   B. Remove hair pin and clevis pin that secure cable clevis to castor release lever.

   C. Slide cable clevis from release lever.

4. Note routing of castor release cable. Remove cable from machine.

Installation (Fig. 8)

1. Position castor release cable to machine.

2. Connect castor release cable to castor release lever on machine handle:

   A. Slide cable end onto castor release lever and secure with hair pin.

   B. Secure cable to handle assembly with jam nut.

   C. Make sure that cable boot is positioned over end of cable.

3. Connect castor release cable to castor release detent under front of machine (Figs. 9 and 10):

   A. Secure cable clevis to castor release detent with clevis pin and hair pin.

   B. Position cable to chassis bracket.

   C. Tighten cable jam nuts to allow castor detent to completely disengage from front castor when castor release lever on handle is pulled against handle.

   D. Make sure that cable boot is positioned over end of cable.

4. Secure high tension lead to spark plug.

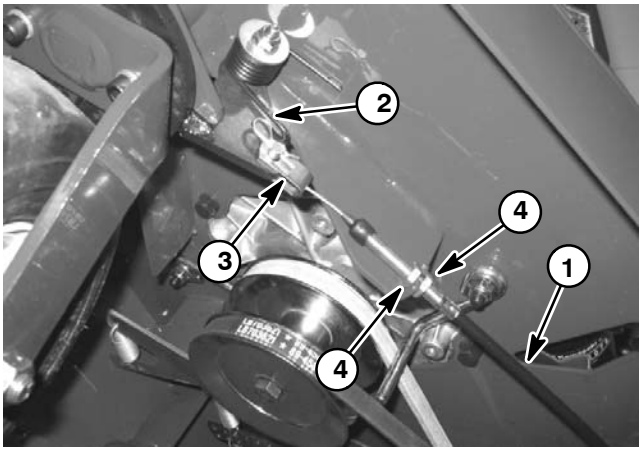

Figure 9

1. **Castor release cable**
2. **Castor release lever**
3. **Cable clevis**
4. **Jam nut**

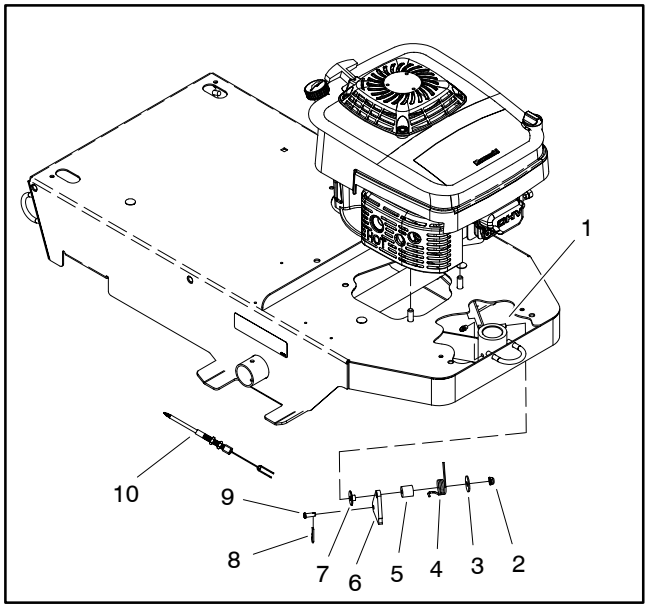

Figure 10

1. **Cap screw**
2. **Flange nut**
3. **Flat washer**
4. **Torsion spring**
5. **Spacer**
6. **Detent**
7. **Flange bushing**
8. **Hair pin**
9. **Clevis pin**
10. **Castor release cable**

Traction Drive Cable

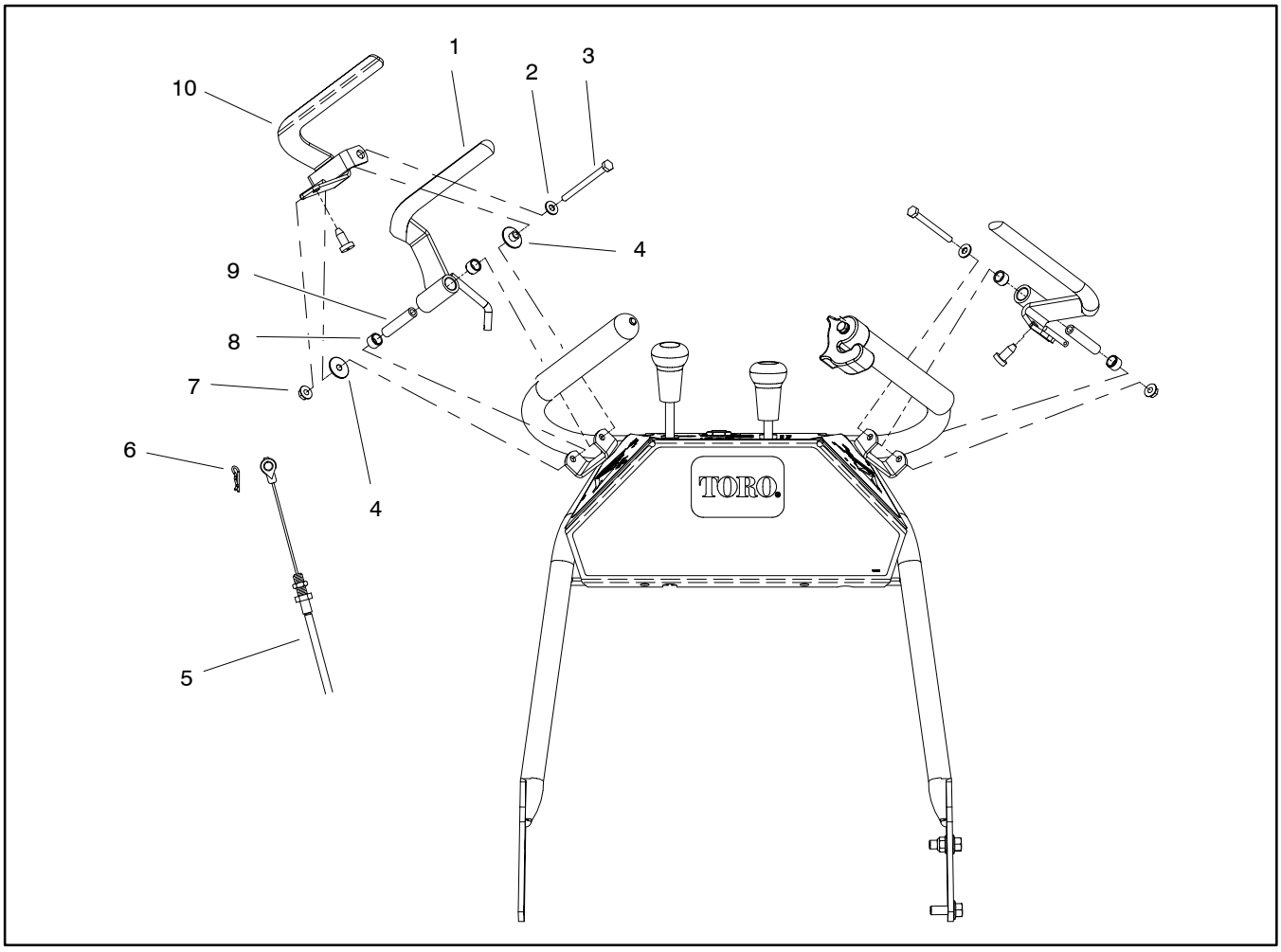

Figure 11

1. **Traction lever**
2. **Flat washer**
3. **Cap screw**
4. **Flange bushing**
5. **Traction drive cable**
6. **Hair pin**
7. **Flange nut**
8. **Bushing (2 used)**
9. **Bushing**
10. **Castor release lever**

Removal (Fig. 11)

1. Park machine on a level surface, stop engine, engage parking brake and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

2. Disconnect traction drive cable from traction lever on machine handle:

   A. Loosen jam nut that secures cable to handle assembly.

   B. Remove hair pin that retains cable end to traction lever.

   C. Slide cable end from traction lever.

3. Disconnect traction drive cable from traction idler bracket under machine (Fig. 12):

   A. Loosen jam nuts that secure cable to chassis bracket.

   B. Disconnect cable spring from idler bracket.

4. Note routing of traction drive cable. Remove cable from machine.

Installation (Fig. 11)

1. Position traction drive cable to machine.

2. Connect traction drive cable to traction lever on machine handle:

A. Slide cable end onto traction lever and secure with hair pin.

B. Secure cable to handle assembly with jam nut.

C. Make sure that cable boot is positioned over end of cable.

3. Connect traction drive cable to traction idler bracket under machine (Fig. 12):

A. Connect cable spring to idler bracket.

B. Position cable to chassis bracket.

C. Adjust traction drive cable (see Traction Drive Cable in the Adjustments section of this chapter).

D. Make sure that cable boot is positioned over end of cable.

4. Secure high tension lead to spark plug.

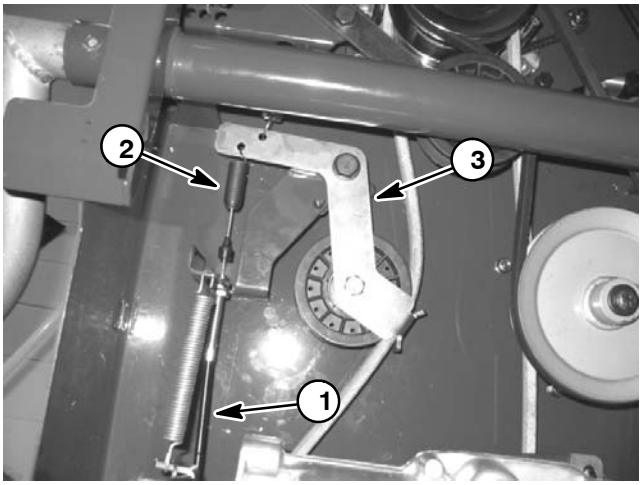

Figure 12

1. **Traction drive cable**
2. **Cable spring**
3. **Idler bracket**

Paint Control Cable

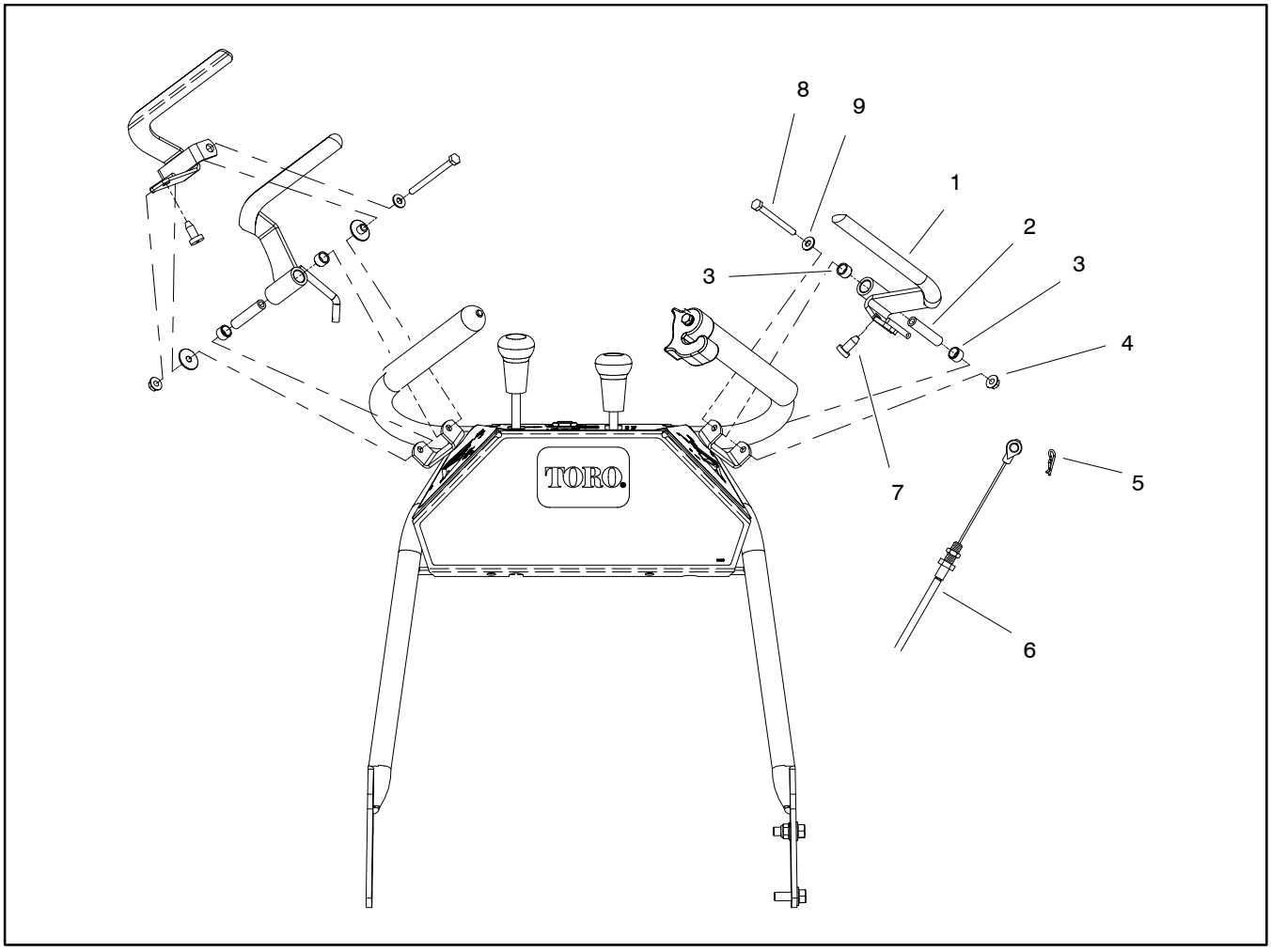

Figure 13

1. **Paint control lever**
2. **Bushing**
3. **Bushing**
4. **Flange nut**
5. **Hair pin**
6. **Paint control cable**
7. **Rubber bumper**
8. **Cap screw**
9. **Flat washer**

Removal (Fig. 13)

1. Park machine on a level surface, stop engine, engage parking brake and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

2. Disconnect paint control cable from paint control lever on machine handle:

   A. Loosen jam nut that secures cable to handle assembly.

   B. Remove hair pin that retains cable end to paint control lever.

   C. Slide cable end from paint control lever.

3. Disconnect paint control cable from paint shutoff valve (Fig. 14):

   A. Loosen jam nuts that secure cable to chassis bracket.

   B. Remove two (2) pins that secure paint shutoff valve lever to shutoff valve. Shift position of lever to allow cable clevis removal.

   C. Remove hair pin and clevis pin that secure cable clevis to paint shutoff valve lever.

4. Note routing of paint control cable. Remove cable from machine.

Installation (Fig. 13)

1. Position paint control cable to machine.

2. Connect paint control cable to paint control lever on machine handle:

   A. Slide cable end onto paint control lever and secure with hair pin.

   B. Secure cable to handle assembly with jam nut.

   C. Make sure that cable boot is positioned over end of cable.

3. Connect paint control cable to paint shutoff valve (Figs. 14):

   A. Secure cable clevis to shutoff valve lever with clevis pin and hair pin.

   B. Position shutoff valve lever to shutoff valve and secure with two (2) cotterless pins.

   C. Position cable to chassis bracket.

   D. Tighten cable jam nuts to allow slight cable freeplay. Verify that operator control lever has

   E. Make sure that cable boot is positioned over end of cable.

4. After cable installation, verify that operator paint control lever has from .050" to .100" (1.3 to 2.5 mm) freeplay. Readjust cable if necessary.

5. Secure high tension lead to spark plug.

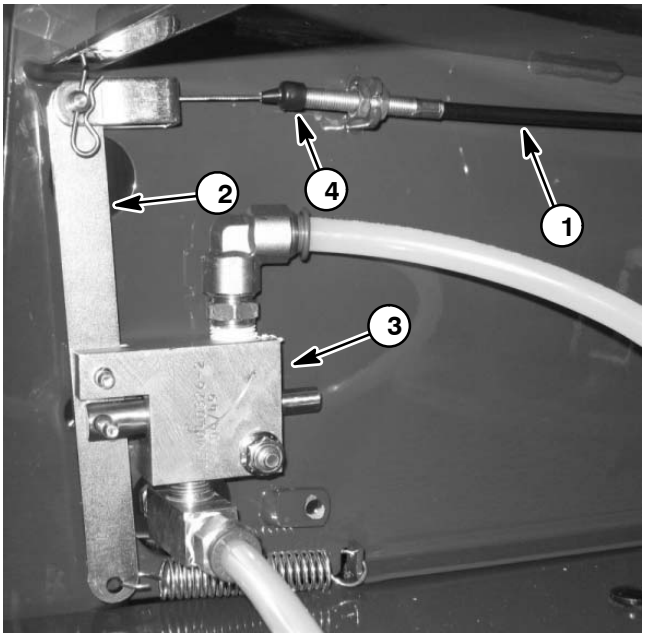

Figure 14

1. **Paint control cable**
2. **Paint shutoff valve lever**
3. **Paint shutoff valve**
4. **Cable boot**

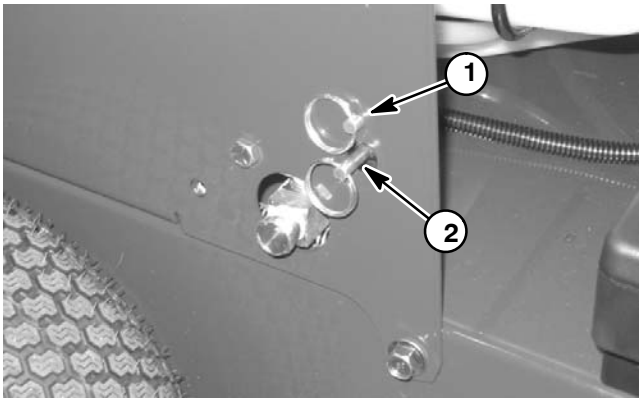

Figure 15

1. **Pivot cotterless pin**
2. **Spool cotterless pin**

Front Castor Fork

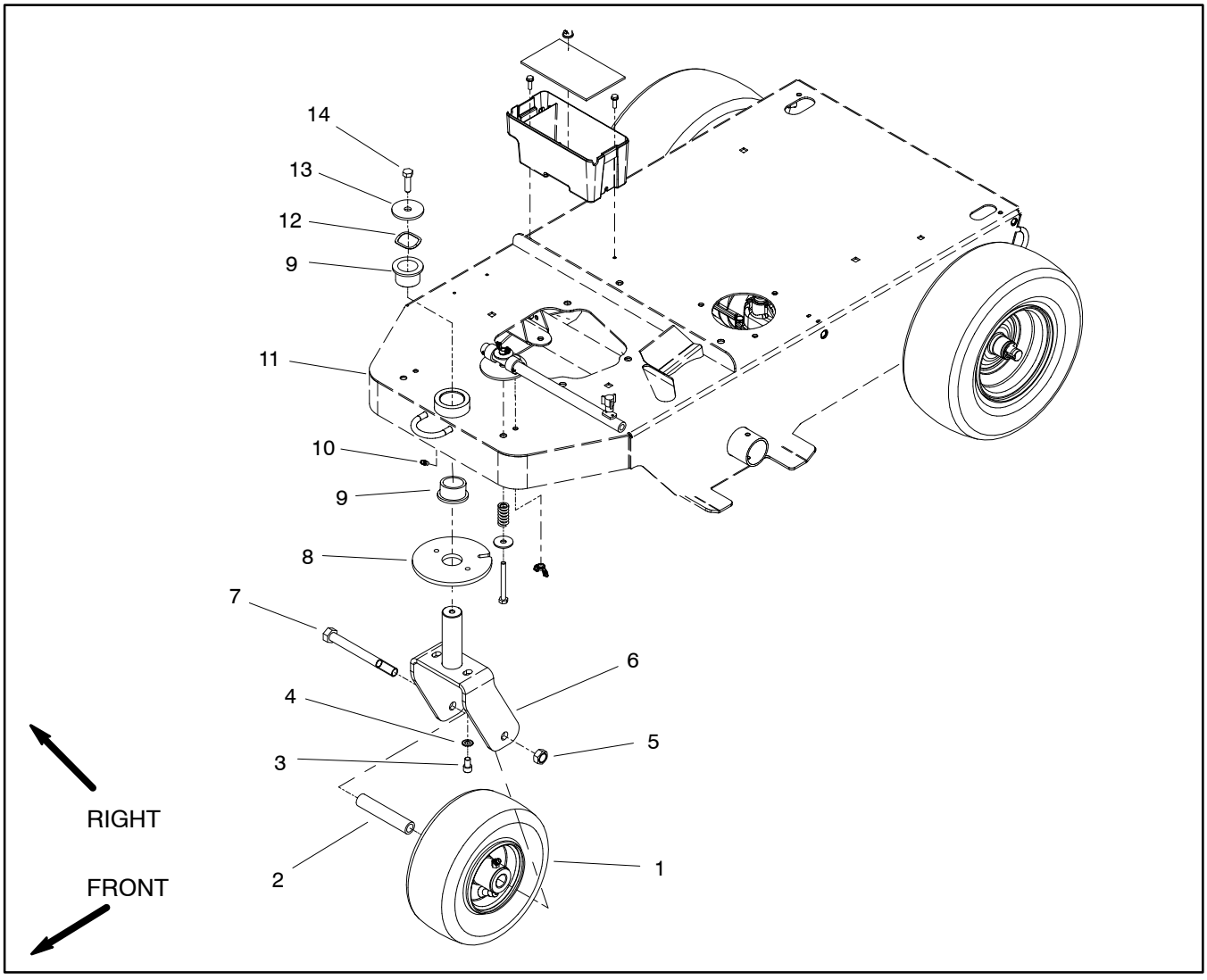

Figure 16

1. **Castor wheel**
2. **Bushing**
3. **Socket head screw (2 used)**
4. **Lock washer (2 used)**
5. **Lock nut**
6. **Castor fork**
7. **Cap screw**
8. **Castor plate**
9. **Bushing**
10. **Grease fitting**
11. **Chassis**
12. **Wave washer**
13. **Rebound washer**
14. **Flange head screw**

Removal (Fig. 16)

1. Park machine on a level surface, stop engine, engage parking brake and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

2. Raise front of machine to allow front castor fork removal. Support machine to prevent it from shifting during repair.

3. Depress castor release lever to disengage caster detent from castor fork.

4. Remove castor wheel from castor fork (see Wheel Removal in this section).

5. Remove flange head screw (item 13), rebound washer (item 12) and wave washer (item 11).

6. Lower castor fork from chassis.

7. If necessary, remove two (2) socket head screws (item 3) and lock washers (item 4) that secure castor plate to castor fork.

8. If necessary, remove bushing(s) (item 9) from chassis.

Installation (Fig. 16)

1. If removed, install bushing(s) (item 9) into chassis.

2. If removed, install castor plate to castor fork with two (2) socket head screws (item 3) and lock washers (item 4).

3. Coat stem of castor fork with grease. Slide fork into chassis.

4. Position wave washer (item 11) and rebound washer (item 12) to top of castor fork. Secure castor fork to machine with flange head screw (item 13).

5. Install castor wheel to castor fork (see Wheel Installation in this section).

6. Carefully lower machine to ground.

7. Lubricate grease fitting for castor fork.

8. Secure high tension lead to spark plug.

9. Release castor release lever on handle to engage castor detent.

10. Operate machine to make sure it follows a straight line. If machine does not track correctly, adjust front castor fork (see Front Castor Fork in the Adjustments section).

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Chapter 7

Traction Drive System

Table of Contents

Traction Drive Belt

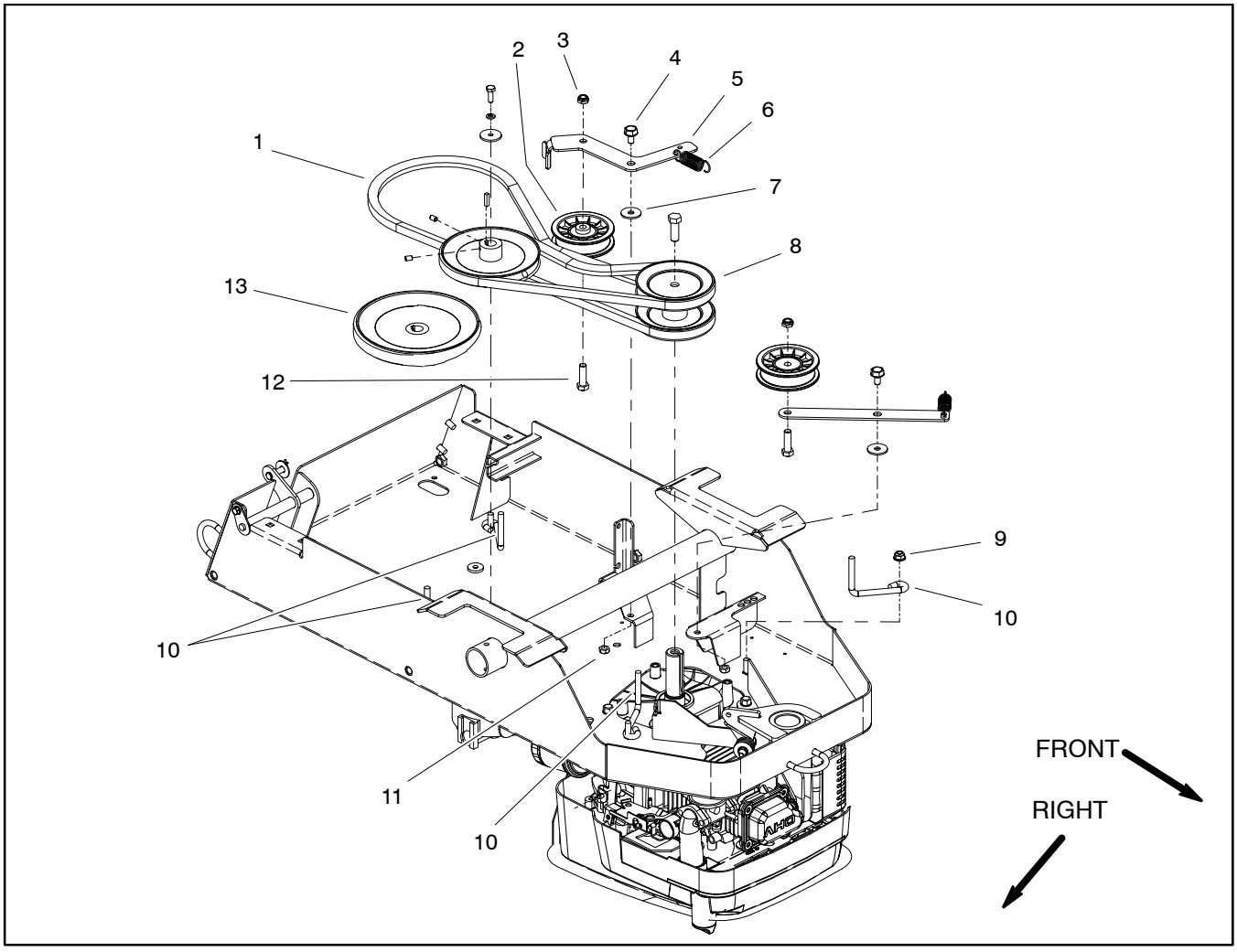

Figure 1

1. **Traction drive belt**
2. **Idler pulley**
3. **Lock nut**
4. **Shoulder bolt**
5. **Idler bracket**
6. **Extension spring**
7. **Pivot washer**
8. **Engine pulley**
9. **Flange nut (4 used)**
10. **Belt guide (4 used)**
11. **Lock nut**
12. **Cap screw**
13. **Transaxle pulley**

Removal (Fig. 1)

1. Park machine on a level surface, stop engine and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

2. Remove pump drive belt from machine (see Spray Pump Drive Belt Removal in the Service and Repairs section of Chapter 5 – Paint System).

3. Loosen flange nuts (item 9) that secure belt guides to machine. Rotate belt guides away from traction drive belt.

4. To allow removal of traction drive belt from idler pulley (Fig. 2), loosen cap screw (item 12) and lock nut (item 3) that secure idler pulley to idler bracket. Remove belt from idler pulley.

5. Carefully remove traction belt from engine and transaxle pulleys. Remove traction belt from machine.

Installation (Fig. 1)

1. Position traction drive belt to engine and transaxle pulleys.

2. Position traction drive belt to idler pulley and bracket making sure that belt is placed between pulley and guide on bracket (Fig. 2). Tighten cap screw (item 12) and lock nut (item 3) to secure idler pulley to idler bracket.

3. Tension the traction drive belt by depressing the traction drive lever operator control. Rotate belt guides to allow from .060" to .130" (1.5 to 3.3 mm) clearance between guide and tensioned traction drive belt. Tighten lock nuts to secure guides in place.

4. Install pump drive belt to machine (see Spray Pump Drive Belt Installation in the Service and Repairs section of Chapter 5 – Paint System).

5. Check traction drive belt cable adjustment (see Traction Drive Cable in the Adjustments section of Chapter 6 – Chassis).

6. Secure high tension lead to spark plug.

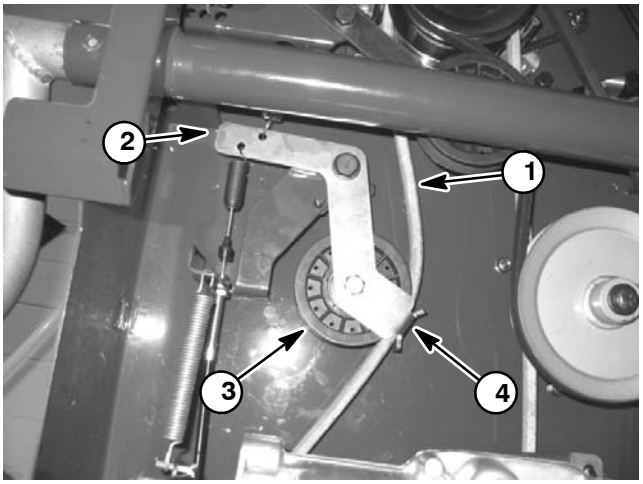

Figure 2

1. **Traction drive belt**
2. **Idler bracket**
3. **Idler pulley**
4. **Bracket belt guide**

Shift Lever and Linkage

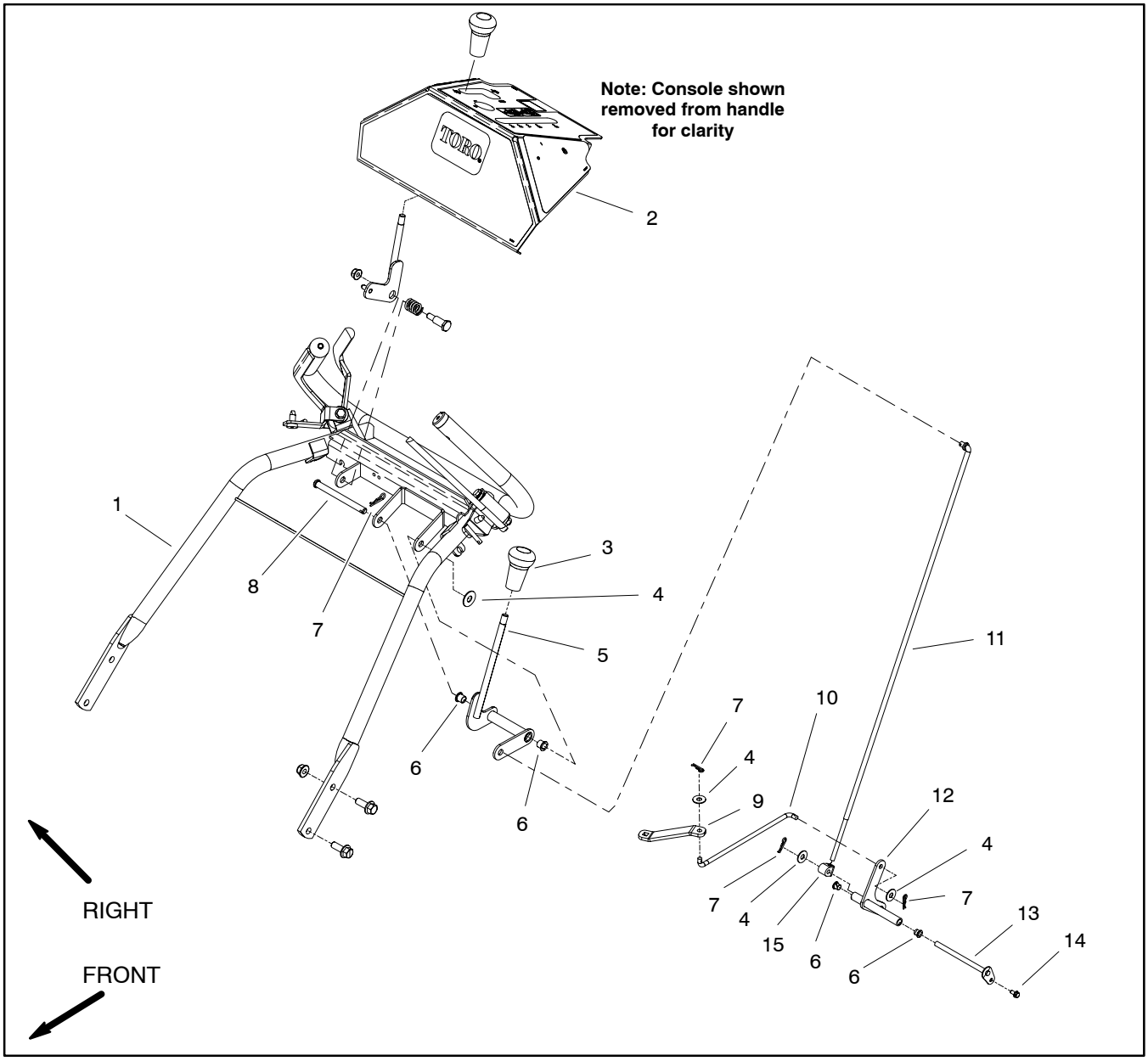

Figure 3

1. **Handle**
2. **Console**
3. **Knob**
4. **Nylon washer**
5. **Console shift lever**
6. **Bushing**
7. **Hair pin**
8. **Clevis pin**
9. **Shift lever (on transaxle)**
10. **Shift link**
11. **Control rod**
12. **Bell crank**
13. **Pivot shaft**
14. **Washer head screw**
15. **Rod fitting**

Disassembly (Fig. 3)

1. Park machine on a level surface, stop engine, apply parking brake and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

2. Disassemble shift linkage components as needed using Figure 3 as a guide.

Assembly (Fig. 3)

1. Assemble shift linkage components using Figure 3 as a guide.

2. After assembly of shift linkage components, make sure that console shift lever movement allows correct transaxle shifting. If necessary, adjust rod fitting (item 15) location on control rod for proper shifting.

3. Secure high tension lead to spark plug.

Transaxle

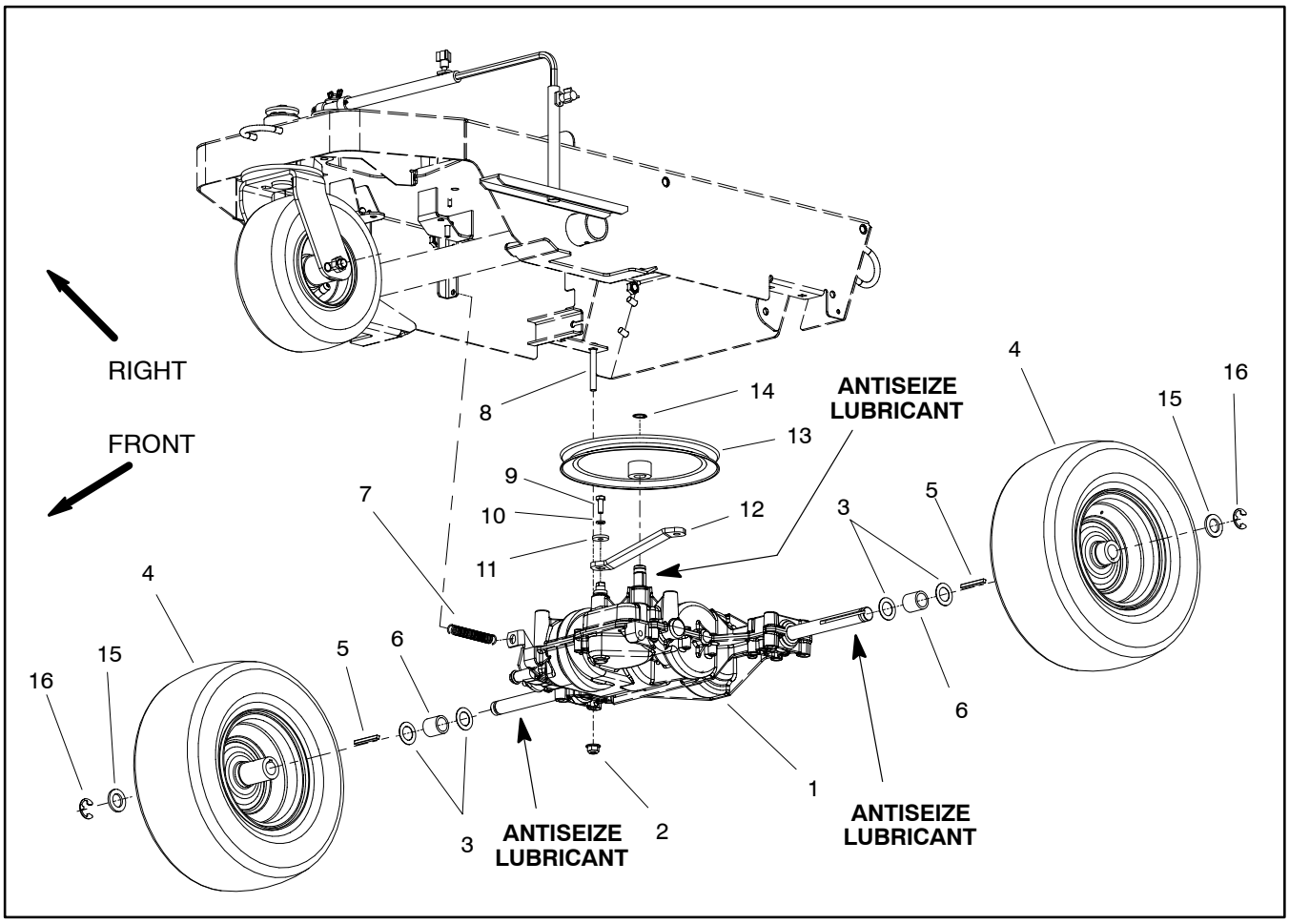

Figure 4

1. **Transaxle assembly**
2. **Flange nut (4 used)**
3. **Thrust washer**
4. **Wheel and tire**
5. **Square key**
6. **Spacer**
7. **Brake return spring**
8. **Carriage screw (4 used)**
9. **Cap screw**
10. **Lock washer**
11. **Spacer**
12. **Shift lever**
13. **Drive pulley**
14. **External snap ring**
15. **Washer**
16. **E–ring**

Removal (Fig. 4)

1. Park machine on a level surface, stop engine and remove key from the ignition switch. Remove high tension lead from the spark plug and position the lead away from the spark plug.

2. Disconnect shift linkage from shift lever on transaxle (see Shift Lever and Linkage in this section).

3. Disconnect brake cable from transaxle (see Brake Cable Removal in the Service and Repairs section of Chapter 6 – Chassis).

4. Disconnect brake return spring (item 7) from brake lever on transaxle.

5. Remove traction drive belt from transaxle pulley (see Traction Drive Belt Removal in this section).

6. Chock front castor wheel. Raise machine so that rear of machine is off the ground. Support machine to prevent it from shifting during transaxle removal.

7. Remove rear wheels (see Wheel Removal in the Service and Repairs section of Chapter 6 – Chassis).

8. Support transaxle to prevent it from falling.

9. Remove four (4) flange nuts (item 2) and carriage screws (item 8) that secure transaxle to machine.

10. Lower transaxle from machine.

11. If necessary, remove external snap ring (item 14) and drive pulley (item 13) from transaxle input shaft. Locate and retrieve woodruff key (not shown).

Installation (Fig. 4)

1. Chock front castor wheel. Raise machine so that rear of machine is off the ground. Support machine to prevent it from shifting during transaxle installation.

2. If drive pulley was removed from transaxle input shaft, apply antiseize lubricant to input shaft. Position woodruff key (not shown) in input shaft keyslot. Slide drive pulley onto shaft and secure with snap ring (item 14).

3. Raise transaxle to machine frame.

4. Secure transaxle to machine frame with four (4) carriage screws and flange nuts.

5. Install rear wheels (see Wheel Installation in the Service and Repairs section of Chapter 6 – Chassis).

6. Install traction drive belt to transaxle pulley (see Traction Drive Belt Installation in this section). Make sure that traction belt guides are positioned from .060" to .130" (1.5 to 3.3 mm) from installed belt.

7. Connect brake return spring (item 7) to brake lever on transaxle.

8. Connect brake cable to transaxle (see Brake Cable Installation in the Service and Repairs section of Chapter 6 – Chassis).

9. Connect shift linkage to shift lever on transaxle (see Shift Lever and Linkage in this section).

10. Lower machine to ground.

11. Secure high tension lead to spark plug.

12. Verify that machine will track in a straight line. If necessary, adjust front castor fork (see Front Castor Fork Adjustment in Chapter 6 – Chassis and Controls).

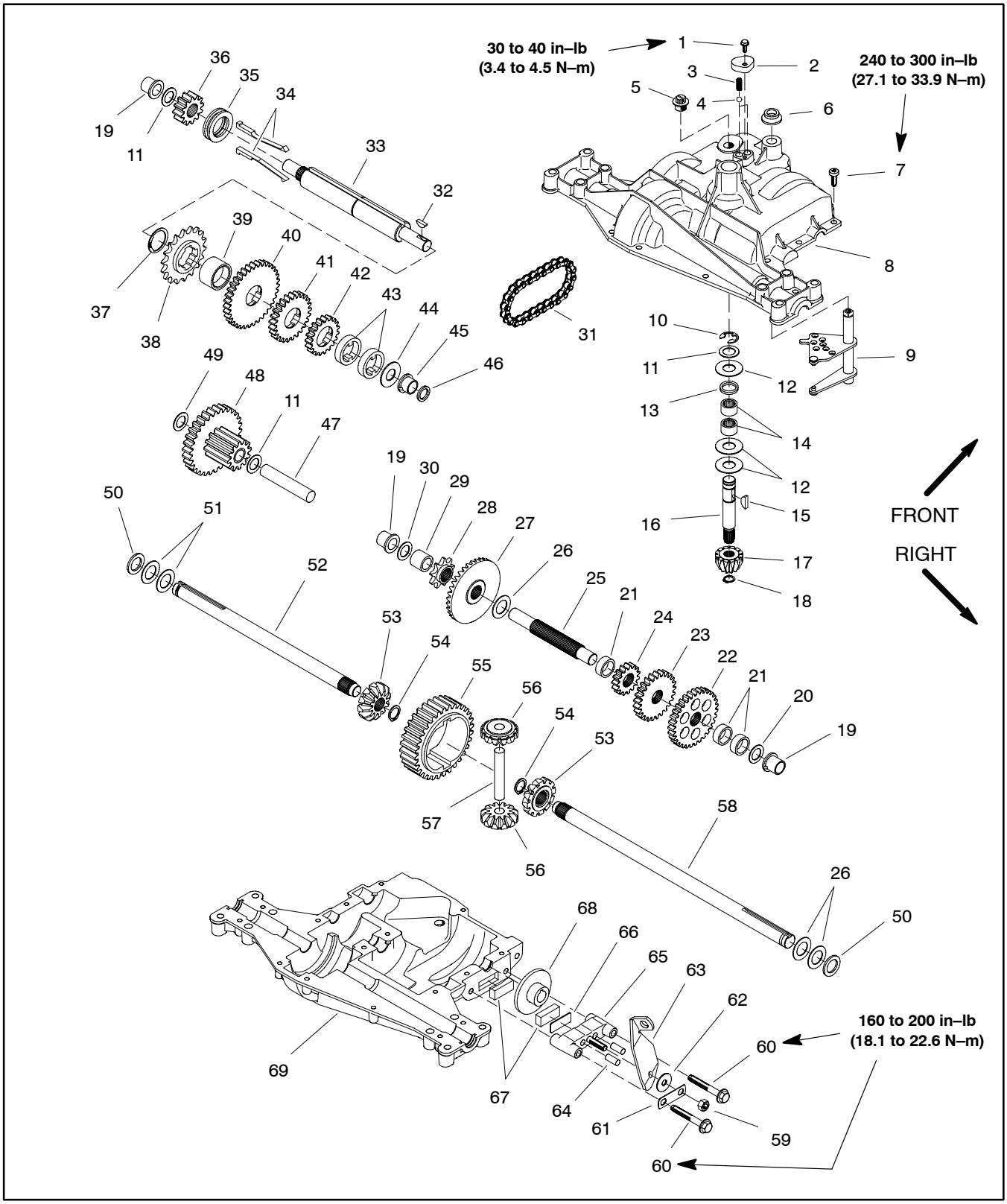
30 to 40 in–lb
(3.4 to 4.5 N–m)
240 to 300 in–lb
(27.1 to 33.9 N–m)
160 to 200 in–lb
(18.1 to 22.6 N–m)
FRONT
RIGHT

Figure 5

Figure 5 (Continued)

1. Screw
2. Detent cover
3. Detent spring (2 used)
4. Detent ball (2 used)
5. Cap plug
6. Shifter boot
7. Screw (16 used)
8. Upper housing
9. Shifter
10. Retaining ring
11. Shim washer
12. Plain washer
13. Washer
14. Bearing
15. Woodruff key
16. Input shaft
17. Bevel pinion gear (12T)
18. Retaining ring
19. Flange bearing
20. Washer
21. Spacer
22. Spur gear (31T)
23. Spur gear (23T)
24. Spur gear (15T)
25. Drive shaft
26. Shim washer
27. Bevel gear (36T)
28. Sprocket (9T)
29. Spacer
30. Washer
31. Chain
32. Woodruff key
33. Intermediate shaft
34. Clutch key
35. Clutch collar
36. Spur gear (12T)
37. Retaining ring
38. Sprocket (18T)
39. Spacer
40. Spur gear (35T)
41. Spur gear (27T)
42. Spur gear (19T)
43. Spacer
44. Washer
45. Flange bearing
46. Oil seal
47. Idler shaft
48. Combination gear
49. Washer
50. Neoprene washer
51. Plain washer
52. LH axle
53. Miter gear (12T)
54. Retaining ring
55. Spur gear (32T)
56. Miter gear (12T)
57. Cross shaft
58. RH axle
59. Lock nut
60. Screw
61. Bracket
62. Washer
63. Brake actuating lever
64. Dowel pin (2 used)
65. Brake jaw
66. Brake puck spacer
67. Brake puck
68. Brake disc
69. Lower housing

NOTE: For service of the transaxle, see the Dana Model 4360 Teardown and Reassembly Instructions at the end of this chapter.

NOTE: After transaxle has been disassembled and cleaned, pack transaxle with 12 to 16 ounces of #4300 Shell Darina “D” grease before assembly.

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