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TORO

Count on it.

Service Manual

4000 Series Z MASTER® Service Manual



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Original Instructions (EN)
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Revision History

Preface

This service manual was written expressly for Toro service technicians. The Toro Company has made every effort to make the information in this manual complete and correct.

Basic shop safety knowledge and mechanical/electrical skills are assumed. The Table of Contents lists the systems and the related topics covered in this manual.

We are hopeful that you will find this manual a valuable addition to your service shop. If you have any questions or comments regarding this manual, please contact us at the following address:

The Toro Company

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The Toro Company reserves the right to change product specifications or make changes to this manual without notice.

Service Procedure Icons

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



Critical Process

This icon is used to highlight:

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



Critical Torque

This icon is used to highlight an assembly torque requirement that is different than what is recommended in the Standard Torque Tables.



Fluid Specifications

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

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

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Chapter 1

Safety

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Safety Instructions

DANGER

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

WARNING

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

CAUTION

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

Think Safety First

Avoid unexpected starting of engine…

Always turn off the engine, remove the ignition key and disconnect the spark plug wire(s) before cleaning, adjusting, or repair.

Avoid lacerations and amputations…

Stay clear of all moving parts whenever the engine is running. Treat all normally moving parts as if they were moving whenever the engine is running or has the potential to start.

Avoid burns…

Do not touch the engine, muffler, or other components, which may be hot during operation, while the unit is running or shortly after it has been running.

Avoid fires and explosions…

Use extreme care in handling fuel. It is flammable and its vapors are explosive. Extinguish all cigarettes, cigars, pipes, and other sources of ignition. Avoid spilling fuel and never smoke while working with any type of fuel or lubricant. Wipe up any spilled fuel or oil immediately. Never remove the fuel cap or add fuel when the engine is running. Always use approved, labeled containers for storing or transporting fuel and lubricants. Do not add or drain fuel in an enclosed space. Do not store the machine or fuel container where there is an open flame, spark, or pilot light, such as on a water heater or other appliance.

Avoid asphyxiation…

Do not operate an engine in a confined area without proper ventilation.

Avoid injury from batteries…

Battery acid is poisonous and can cause burns. Avoid contact with skin, eyes and clothing. Battery gases can explode. Keep cigarettes, sparks and flames away from the battery.

Avoid injury due to inferior parts…

Use only original equipment parts to ensure that important safety criteria are met.

Avoid injury to bystanders…

Always clear the area of bystanders before starting or testing powered equipment.

Avoid injury due to projectiles…

Always clear the area of sticks, rocks or any other debris that could be picked up and thrown by the powered equipment.

Avoid modifications…

Never alter or modify any part unless it is a factory approved procedure.

Avoid unsafe operation…

Always test the safety interlock system after making adjustments or repairs on the machine. Refer to the Electrical section in this manual for more information.

Avoid electrical shock…

Never touch electrical wires or components while the engine is running. They can be sources of shock. De-energize the system if you are having to do repairs. If testing electrical components ensure you are working in a dry environment.

Hydraulic System...

Release all pressure in the hydraulic system before performing any work on the system. Keep your body and hands away from pin-hole leaks or nozzles that eject hydraulic fluid under high pressure. Do not use your hands to search for leaks. Hydraulic fluid escaping under pressure can have sufficient force to penetrate under the skin and cause serious injury. Seek medical attention right away if hydraulic fluid gets in the skin.

Personal Protective Equipment…

Tie back long hair, and do not wear loose clothing or jewelry. Use appropriate personal protective equipment (PPE) for protecting yourself from potential hazards in the environment in which you will work. Each process outlined in this manual may need different PPE to protect the service person. Use the proper PPE for the task at hand.

Tools…

All tools should be in proper working order. Do not use tools that are broken or in disrepair. Use the proper tool for the proper application.

Lifts, Hoists, and Jacks…

All lifts, hoists, and jacks should be used in accordance with the manufacturer information. Inspect lifts, hoists, and jacks prior to use. Do not overload lifts, hoists, and jacks. Do not work under a suspended load. Ensure chock blocks are used on equipment that can move. Use lifts or jacks and jack stands that are rated to support the total weight of the machine and any attachments. Do not rely on jacks to support the machine. If you are unsure of the operation of any lifts, hoists, and jacks do not use.

Fire Extinguishers…

Think Safety First (continued)

The proper class of fire extinguisher should be used in case of fire.

Class A extinguishers are for ordinary combustible materials such as paper, wood, cardboard, and most plastics. The numerical rating on these types of extinguishers indicates the amount of water it holds and the amount of fire it can extinguish. Geometric symbol (green triangle).

Class B fires involve flammable or combustible liquids such as gasoline, kerosene, grease and oil. The numerical rating for class B extinguishers indicates the approximate number of square feet of fire it can extinguish. Geometric symbol (red square).

Class C fires involve electrical equipment, such as appliances, wiring, circuit breakers and outlets. Never use water to extinguish class C fires - the risk of electrical shock is far too great! Class C extinguishers do not have a numerical rating. The C classification means the extinguishing agent is non-conductive. Geometric symbol (blue circle).

ABC fire extinguishers are a dry chemical type used for multiple purposes. See above information for description. Ensure fire extinguishers are serviceable and replace any that are discharged or out of inspection dates

Chapter 2

Specifications and Maintenance

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Specifications

Model	74000	74002	74004	74050
Engine	24.5 HP Kawasaki	25.5 hp Kawasaki		
Engine Type	Carbureted 4 Cycle			
Engine Model	FX751V	FX801V		
High Idle	3750 ± 50 RPM			
Low Idle	1550 ± 100 RPM			
Spark Plug	NGK BPR4ES			
Oil Capacity	2.3 L (2.4 US qt.) w/filter			
Fuel Capacity	37.8 L (10 gallons)			
Battery	300 CCA			
Hydraulic Drive System				
Transmission	ZT-4400			
Transmission Lubricant	HYPR-OIL 500 7.57 L (8 US qt.)			
Max Ground Speed (FWD)	10 MPH			12 MPH
Rear Tires	60.9 x 24.1–30.1 cm (24 x 9.5-12 inches)	60.9 x 26.7–30.5 cm (24 x 10.5-12 inches)	60.9 x 30.5–30.5 cm (24 x 12-12 inches)	60.9 x 26.7–30.5 cm (26 x 10.5-12 inches)
Rear Tire Pressure	13 psi			
Front Caster Tires	33 x 16.5–15.2 cm (13 x 6.5-6 inches)			
Front Tire Pressure	Semi-Pneumatic			
Mower Deck				
Deck Width	121.92 cm (48 inch)	132.1 cm (52 inch)	152.4 cm (60 inch)	132.1 cm (52 inch)
Deck Configuration	Side Discharge			
Deck Spindles	22.9 cm (9 inch) AL /W Blade Driver			
Blade Tip Speed	18,500 FPM			
Cutting Height	3.8–13.9 cm (1.5-5.5 inch)			

Model	74054	74035	74052	74055
Engine	25.5 hp Kawasaki	26.5 hp Kohler Command Pro	31 hp Kawasaki	
Engine Type	Carbureted 4 Cycle	EFI 4 Cycle	Carbureted 4 Cycle	
Engine Model	FX801V	ECV749	FX921V	
High Idle	3750 ± 50 RPM			
Low Idle	1550 ± 100 RPM	1800 ± 100 RPM	1550 ± 100 RPM	
Spark Plug	NGK BPR4ES	XC12YC	NGK BPR5ES	
Oil Capacity	2.3 L (2.4 US qt) w/filter	1.9 L (64 oz) w/filter	2.2 L (2.3 US qt) w/filter	
Fuel Capacity	37.8 L (10 gallons)			
Battery	300 CCA			
Hydraulic Drive System				
Transmission	ZT-4400			
Transmission Lubricant	HYPR-OIL 500 7.57 L (8 US qt)			
Max Ground Speed (FWD)	12 MPH	10 MPH	12 MPH	
Rear Tires	66 x 30.5–30.5 cm (26 x 12-12 inches)	61 x 30.5–30.5 cm (24 x 12-12 inches)	66 x 26.7–30.5 cm (26 x 10.5-12 inches)	66 x 30.5–30.5 cm (26 x 12-12 inches)
Rear Tire Pressure	13 psi			
Front Caster Tires	38.1 x 16.5–15.2 cm (15 x 6.5-6 inches)	33 x 16.5–15.2 cm (13 x 6.5-6 inches)	38.1 x 16.5–15.2 cm (15 x 6.5–6 inches)	
Front Tire Pressure	13 psi	Semi-Pneumatic	13 psi	
Mower Deck				
Deck Width	152.4 cm (60 inch)		132.1 cm (52 Inch)	152.4 cm (60 inch)
Deck Configuration	Side Discharge			
Deck Spindles	22.9 cm (9 inch) AL /W Blade Driver			
Blade Tip Speed	18,500 FPM			
Cutting Height	3.8–13.9 cm (1.5-5.5 inch)			

Model	74010	74015	74000TE	74000TA
Engine	31 hp Kawasaki		24.5 hp Kawasaki	
Engine Type	Carbureted 4 Cycle			
Engine Model	FX921V		FX751	
High Idle	3600 ± 100 RPM			
Low Idle	1550 ± 100 RPM			
Spark Plug	NGK BPR5ES		NGK BPR4ES	
Oil Capacity	2.2 L (2.3 US qt) w/filter		2.3 L (2.4 US qt) w/filter	
Fuel Capacity	37.8 L (10 gallons)			
Battery	300 CCA			
Hydraulic Drive System				
Transmission	ZT-5400		ZT-4400	
Transmission Lubricant	HYPR-OIL 500 9.46 L (10 US qt)		HYPR-OIL 500 7.57 L (8 US qt)	
Max Ground Speed (FWD)	12 MPH		10 MPH	
Rear Tires	61 x 26.7–30.5 cm (24 x 10.5-12 inches)	61 x 30.5–30.5 cm (24 x 12-12 inches)	61 x 24.1–30.5 cm (24 x 9.5-12 inches)	
Rear Tire Pressure	13 psi			
Front Caster Tires	33 x 16.5–15.2 cm (13 x 6.5-6 inches)			
Front Tire Pressure	Semi-Pneumatic		13 psi	
Mower Deck				
Deck Width	132.1 cm (52 Inch)	152.4 cm (60 inch)	114.3 cm (45 inch)	132.1 cm (52 Inch)
Deck Configuration	Side Discharge			
Deck Spindles	22.9 cm (9 inch) AL /W Blade Driver			
Blade Tip Speed	18,500 FPM			
Cutting Height	3.8–13.9 cm (1.5-5.5 inch)			

Model	74050TA	74054TA	74052TE	74055TE
Engine	25.5 hp Kawasaki		31 hp Kawasaki	
Engine Type	Carbureted 4 Cycle			
Engine Model	FX801V		FX921V	
High Idle	3600 ± 100 RPM			
Low Idle	1550 ± 100 RPM			
Spark Plug	NGK BPR4ES		NGK BPR5ES	
Oil Capacity	2.3 L (2.4 US qt) w/filter		2.2 L (2.3 US qt) w/filter	
Fuel Capacity	37.8 L (10 gallons)			
Battery	300 CCA			
Hydraulic Drive System				
Transmission	ZT-4400			
Transmission Lubricant	HYPR-OIL 500 7.57 L (8 US qt)			
Max Ground Speed (FWD)	12 MPH			
Rear Tires	66 x 25.7–30.5 cm (26 x 10.5-12 inches)	66 x 30.5–30.5 cm (26 x 12-12 inches)	66 x 25.7–30.5 cm (26 x 10.5-12 inches)	66 x 30.5–30.5 cm (26 x 12-12 inches)
Rear Tire Pressure	13 psi			
Front Caster Tires	38.1 x 16.5–15.2 cm (15 x 6.5-6 inches)			
Front Tire Pressure	13 psi			
Mower Deck				
Deck Width	132.1 cm (52 Inch)	152.4 cm (60 inch)	132.1 cm (52 Inch)	152.4 cm (60 inch)
Deck Configuration	Side Discharge			
Deck Spindles	22.9 cm (9 inch) AL /W Blade Driver			
Blade Tip Speed	18,500 FPM			
Cutting Height	3.8–13.9 cm (1.5-5.5 inch)			

Model	74055TA
Engine	31 hp Kawasaki
Engine Type	Carbureted 4 Cycle
Engine Model	FX921V
High Idle	3600 ± 100 RPM
Low Idle	1550 ± 100 RPM
Spark Plug	NGK BPR5ES
Oil Capacity	2.2 L (2.3 US qt) w/filter
Fuel Capacity	37.8 L (10 gallons)
Battery	300 CCA
Hydraulic Drive System	
Transmission	ZT-4400
Transmission Lubricant	HYPR-OIL 500 7.57 L (8 US qt)
Max Ground Speed (FWD)	12 MPH
Rear Tires	66 x 30.5–30.5 cm (26 x 12-12 inches)
Rear Tire Pressure	13 psi
Front Caster Tires	38.1 x 16.5–15.2 cm (15 x 6.5-6 inches)
Front Tire Pressure	13 psi
Mower Deck	
Deck Width	152.4 cm (60 inch)
Deck Configuration	Side Discharge
Deck Spindles	22.9 cm (9 inch) AL /W Blade Driver
Blade Tip Speed	18,500 FPM
Cutting Height	3.8–13.9 cm (1.5-5.5 inch)

Torque Specifications

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

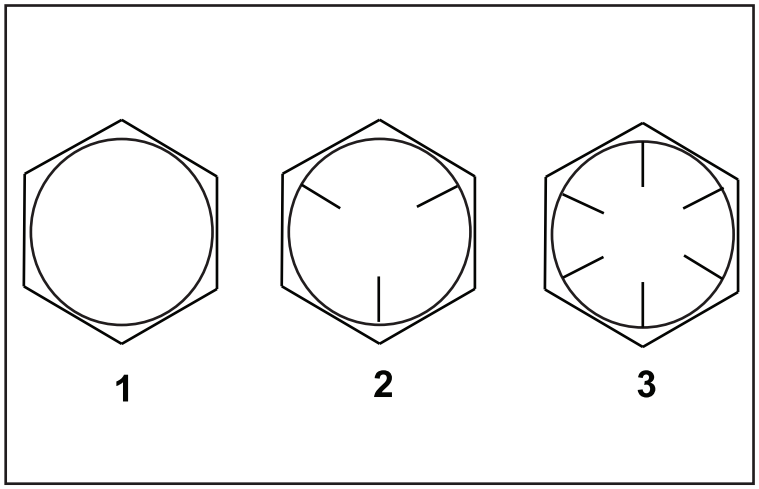
These torque specifications for the installation and tightening of fasteners shall apply for all fasteners which do not have a specific requirement identified in the service manual. The following factors shall be considered when applying torque: cleanliness of the fastener, use of a thread sealant (Loctite),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

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

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

Fastener Identification

Inch Series Bolts and Screws

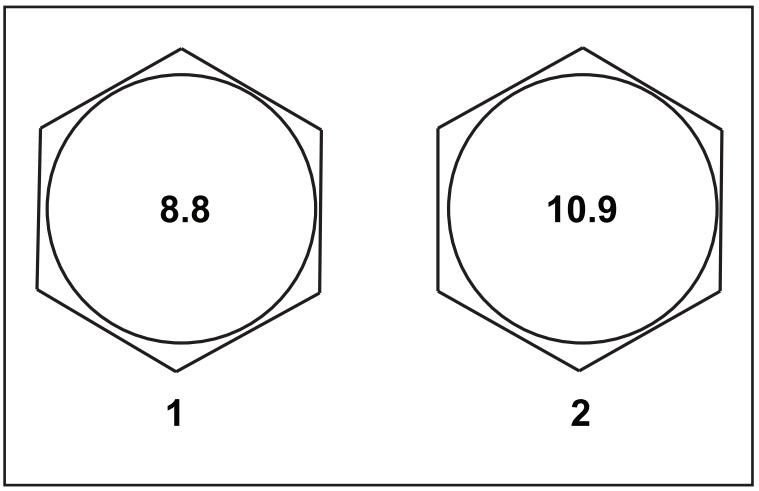


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Figure 1

1. Grade 1
2. Grade 5
3. Grade 8

Metric Bolts and Screws



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Figure 2

1. Class 8.8
2. Class 10.9

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

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

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

Torque values my 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.

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 nuts include jam nuts.

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

Thread Size	Class 8.8 Bolts, Screws, Studs with Regular Height Nuts (Class 8 or Stronger Nuts)		Class 10.9 Bolts, Screws, Studs with Regular Height Nuts (Class 10 or stronger Nuts)	
	in-lb	N • cm	in-lb	N • cm
M5 X 0.8	57 ± 6	644 ± 68	78 ± 8	881 ± 90
M6 X 1.0	96 ± 10	1085 ± 113	133 ± 14	1503 ± 158
	ft-lb	**N • m**	**ft-lb**	**N • m**
M8 X 1.25	19 ± 2	26 ± 3	28 ± 3	38 ± 4
M10 X 1.5	38 ± 4	52 ± 5	54 ± 6	73 ± 8
M12 X 1.75	66 ± 7	90 ± 10	93 ± 10	126 ± 14
M16 X 2.0	166 ± 17	255 ± 23	229 ± 23	310 ± 31
M20 X 2.5	325 ± 33	440 ± 45	450 ± 46	610 ± 62

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 oil, graphite, or thread sealant such as Loctite.

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.

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. Thin height nuts include jam nuts.

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
1/2 - 13 UNC	75 ± 15 ft-lb	50 ± 10 ft-lb
3/8 - 16 UNC	35 ± 10 ft-lb	18 ± 3 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

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

Conversion Factors

in-lb X 11.2985 = N • cm

ft-lb X 1.3558 = N • m

N • cm X 0.08851 = in-lb

N • cm X 0.73776 = ft-lb

Thread Cutting Screws (Zinc Plated Steel)

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

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

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	**16/32**	0.53125	13.484
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
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	**11/64**	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	7.541	**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	Grams	28.3495
Pressure	Pounds/Square Inch	Kilopascal	6.895
Work	Foot-Pounds	Newton-Meters	1.356
	Foot-Pounds	Kilogram-Meters	0.1383
	Inch-Pounds	Kilogram-Centimeters	1.152144
Liquid Volume	Quarts	Liters	0.9463
	Gallons	Liters	3.785
Liquid Flows	Gallons/Minute	Liters/Minute	3.785
Temperature	Fahrenheit	Celsius	1. Subtract by 32°
			2. Multiply by 5/9

Chapter 3

Troubleshooting

Table of Contents

General Troubleshooting 3–3

GEARS

The Systematic approach to defining, diagnosing and solving problems.



G

Gather Information

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



E

Evaluate Potential Causes

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



A

Assess Performance

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



R

Repair

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



S

Solution Confirmation

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

General Troubleshooting

Problem	Possible Cause	Corrective Action
The starter does not crank	The blade control switch (PTO) is engaged.	Move the blade-control switch (PTO) to the disengaged position.
	The parking brake is not engaged.	Move the motion control levers to the neutral lock (Park) position.
	The battery is dead.	Charge the battery.
	The electrical connections are corroded or loose.	Check the electrical connects for good contact.
	A switch is worn or damaged.	Test and replace faulty switch.
	The fuse is blown.	Replace the fuse.
The engine does not start, starts hard, or fails to keep running	The fuel tank is empty.	Fill the fuel tank.
	The throttle is not in the correct position.	Be sure that the throttle control is always in the fast positions.
	There is dirt in the fuel filter.	Replace the fuel filter.
	There is dirt, water, or stale fuel in the fuel system.	Clean and flush the fuel system.
	The air cleaner is dirty.	Clean or replace the air cleaner element.
	The seat switch is not functioning properly.	Check the seat-switch and replace if faulty.
	The electrical connections are corroded, loose, or damaged.	Check the electrical connections for good contact. Clean the connector terminals thoroughly with electrical contact cleaner and apply dielectric grease.
	The spark plug is fouled or improperly gapped.	Adjust or replace the spark plug.
	The ignition coil(s) have failed.	Test and replace faulty coil(s).
	The spark plug wire is not connected.	Check the spark plug wire connection.
	A switch is worn or damaged.	Test and replace faulty switch.
Engine loses power	The engine load is excessive.	Reduce the ground speed or raise height-of-cut.
	The air cleaner is dirty.	Clean or replace the air cleaner element.
	The oil level in the crankcase is low.	Add oil to the crankcase.
	The cooling fins and air passages above the engine are plugged.	Remove the obstruction and thoroughly clean cooling fins and the air passages.
	One of the ignition coils has failed.	Test and replace the faulty coil.
	The fuel tank vent system is plugged.	Inspect fuel tank vent system for obstruction and repair system.
	There is dirt in the fuel filter.	Replace the fuel filter.
	There is dirt, water, or stale fuel in the fuel system.	Clean and flush the fuel system.

General Troubleshooting (continued)

Problem	Possible Cause	Corrective Action
The engine overheats	The engine load is excessive.	Reduce the ground speed or raise height-of-cut.
	The oil level in the crankcase is low.	Add oil to the crankcase.
	A fuel related issue has resulted in a lean condition.	Diagnose the origin of the lean condition.
	The oil cooler (if equipped) fins are plugged.	Clean the oil cooler fins.
	The cooling fins and the air passages above the engine are plugged.	Remove the obstruction and thoroughly clean cooling fins and the air passages.
The mower pulls to the left or right (with levers fully forward)	The tracking needs adjustment.	Adjust the tracking.
	One of the transaxles is weak.	Diagnose the failed side and repair as needed.
	The tire pressure in the drive tires is not correct.	Adjust the tire pressure in the drive tires.
The machine does not drive	The bypass rods are in the manual move position.	Place the bypass rods into the drive position.
	The drive belt is worn, loose, off a pulley, or broken.	Replace the drive belt.
	The tensioner spring is broken or missing.	Replace the spring.
	The hydraulic oil level is low in the transaxle.	Add hydraulic oil to the transaxle.
The machine vibrates abnormally	The cutting blade(s) is/are bent or unbalanced.	Install new cutting blade(s).
	The blade mounting bolt is loose.	Tighten the blade mounting bolt.
	The engine mounting bolts are loose.	Tighten the engine mounting bolts.
	The engine pulley, idler pulley, or blade pulley is loose.	Tighten the appropriate pulley, check to make sure idler springs are not over stretched.
	The engine pulley is damaged.	Replace the engine pulley.
	The blade spindle is bent.	Replace the spindle.
	The motor mount is loose or worn.	Check the mounting bolts.
The machine produces an uneven cutting height	The blade(s) are not sharp.	Sharpen the blade(s).
	The cutting blade(s) are bent.	Install new cutting blade(s).
	The mower deck is not level/rake is incorrect.	Level the mower deck from side-to-side and front-to-rear.
	The underside of mower is dirty.	Clean the underside of the mower.
	The tire pressure is not correct.	Adjust the tire pressure.
	The blade spindle is bent.	Replace the spindle.

General Troubleshooting (continued)

Problem	Possible Cause	Corrective Action
The blades do not rotate	The mower deck belt is damaged, worn, loose, or broken.	Install a new deck belt.
	The mower deck belt is off the pulley.	Install the mower belt on the deck pulley and check the idler pulley, idler arm, and spring for correct position and function.
	The idler spring is broken or missing.	Replace the spring.
The clutch does not engage	There is a low voltage supply at the clutch.	Check the coil resistance, battery charge, charging system, and wiring connections and replace parts if necessary.
	The coil is damaged.	Replace the clutch.
	There is inadequate current supply.	Repair or replace the clutch lead wire or electrical system. Clean the connector contacts.
	The rotor/armature air gap is too large.	Replace the clutch.
	The blade control switch (PTO) is faulty.	Replace the blade control switch (PTO).

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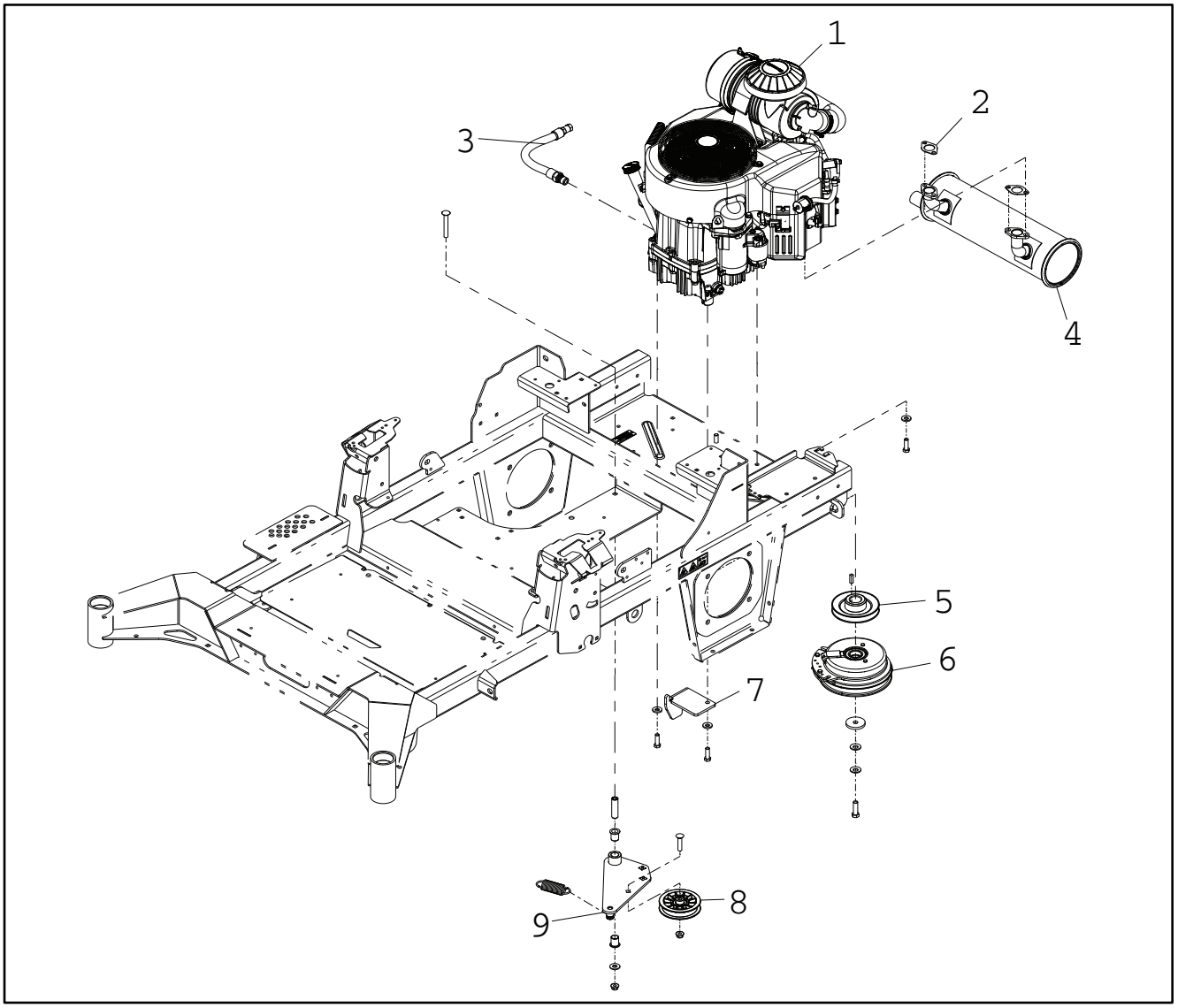
General Information 4–2
Service and Repairs 4–3
Kawasaki Engine Replacement 4–5

General Information

The 4000 series Z MASTER® mowers use a variety of engines. All options are V-Twin 4 cycle engines 726cc, 852cc and 999cc Kawasaki carbureted engines and 747cc Kohler EFI engines.

Service and Repairs

Engine Assembly 1

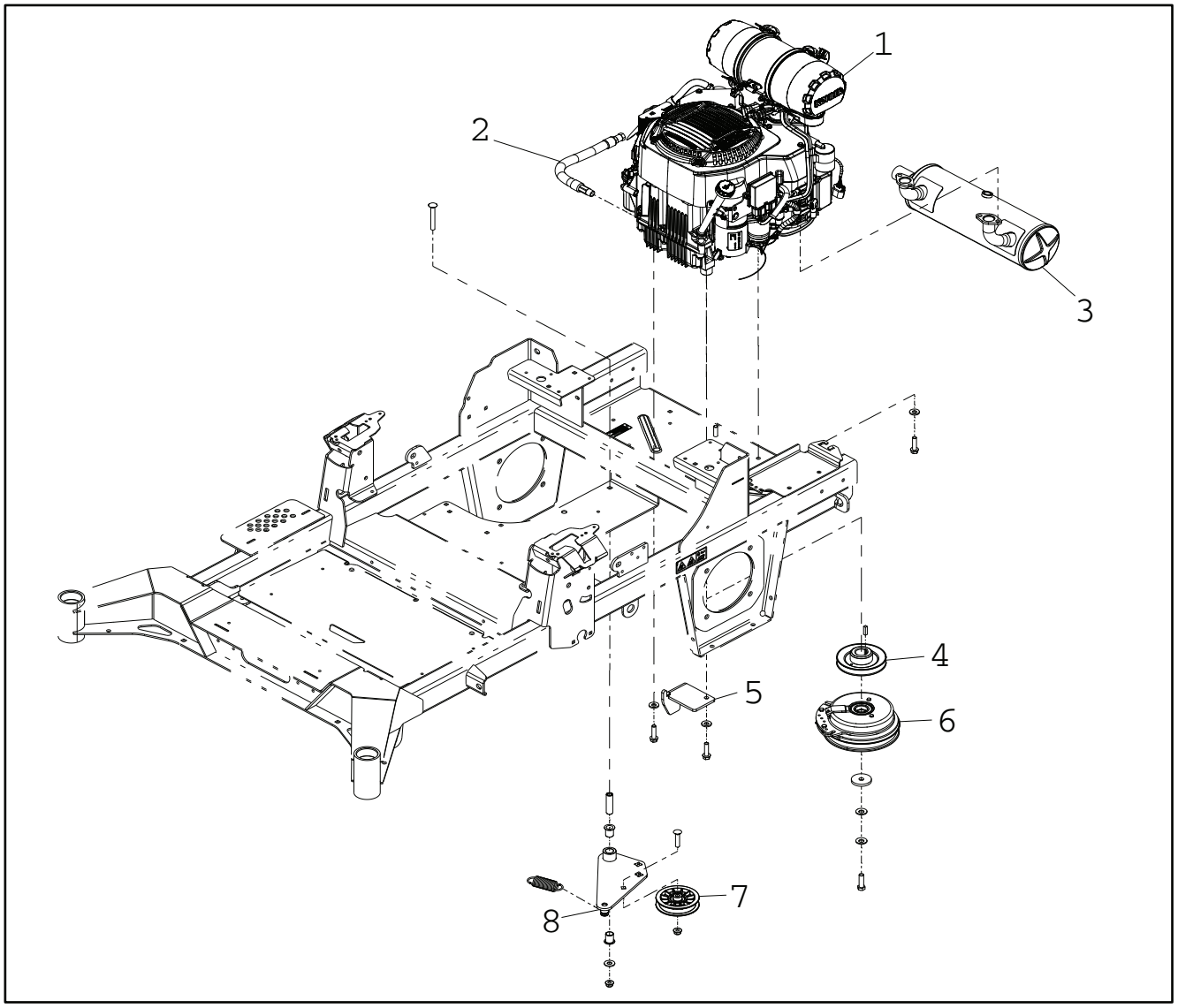


g338383

Figure 3

1. Kawasaki Engine
2. Exhaust Gasket
3. Engine Oil Drain Hose Asm
4. Muffler
5. Transmission Pulley
6. Clutch
7. Clutch Anchor
8. Flat Idler Pulley
9. Idler Arm Asm

Engine Assembly 2



g338446

Figure 4

1. Kohler Engine
2. Oil Drain Hose Asm
3. Kohler EFI Muffler
4. Transmission Pulley
5. Clutch Anchor
6. Clutch
7. Flat Idler Pulley
8. Idler Arm Asm

Kawasaki Engine Replacement

Kawasaki Engine Removal

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.
3. Unhook the rubber strap securing the battery to the battery tray. Lift the battery away from the machine.
4. Close the fuel supply valve.
5. Remove the 2 (5/16 inch) torx screws securing the top rear guard to the rear guard asm. Remove the top rear guard.



g346044

Figure 5

6. Remove the 6 (5/16 inch) torx screws and lock nuts securing the rear guard to the chassis. Remove the rear guard asm.

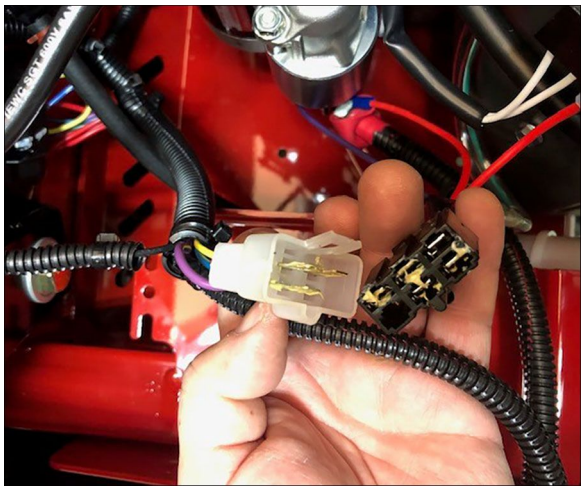


g346045

Figure 6

7. Disconnect the throttle cable. Throttle Cable Assembly Replacement (page 5–15)

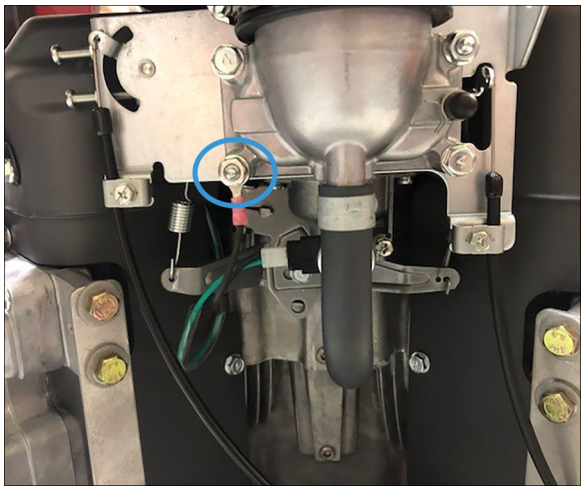
8. Disconnect the choke cable. Choke Cable Assembly Replacement (page 5–16)
9. Remove the deck belt. Deck Belt Replacement (page 6–4)
10. Remove the hydrostatic drive belt from the engine pulley. Hydrostatic Drive Belt Replacement (page 7–5)
11. Disconnect the chassis wire harness from the main engine harness.



g346046

Figure 7

12. Disconnect the red (B+) wire from the starter.
13. Disconnect the black engine ground wire.

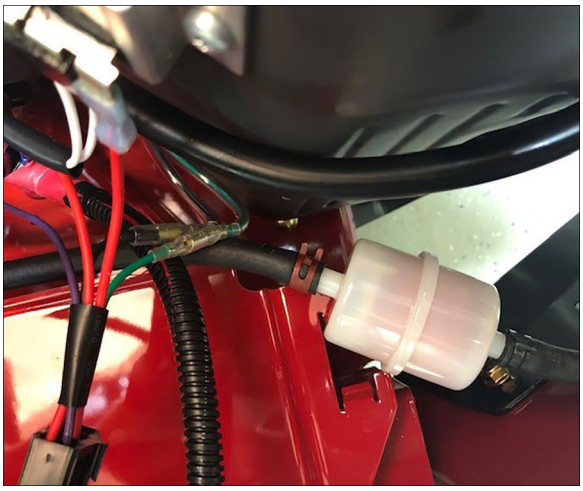


g346104

Figure 8

14. Disconnect the fuel supply line at the fuel filter.

Kawasaki Engine Removal (continued)



g346048

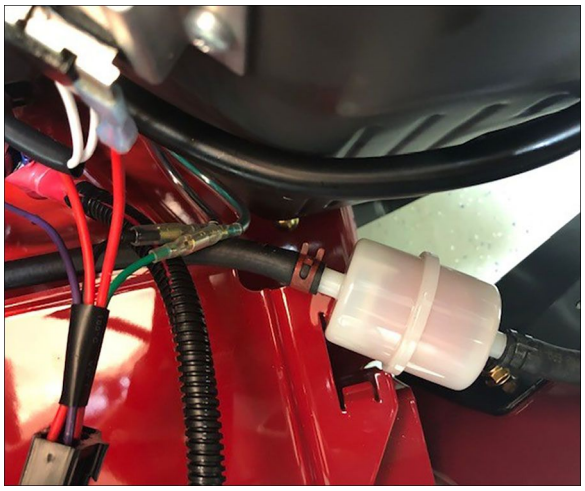
Figure 9

15. Remove the vent line from the air cleaner, if applicable.
16. Disconnect the clutch wire from the clutch.
17. Remove the clutch mounting 7/16 inch bolt, 2 belleville washers, and flat washer. Slip the clutch off of the crankshaft.

    Note: Before removing the clutch, note the orientation of the clutch wire and the clutch.
18. Remove the engine pulley and retain the square key for use in reassembly.
19. Remove the clutch harness from the harness retainer on the clutch anchor.
20. Remove the 3/8 inch engine mounting bolt securing the clutch anchor to the chassis.
21. Remove the 3 (3/8 inch) engine mounting bolts.
22. Using an appropriate lifting device, lift the engine away from the frame.

Kawasaki Engine Installation

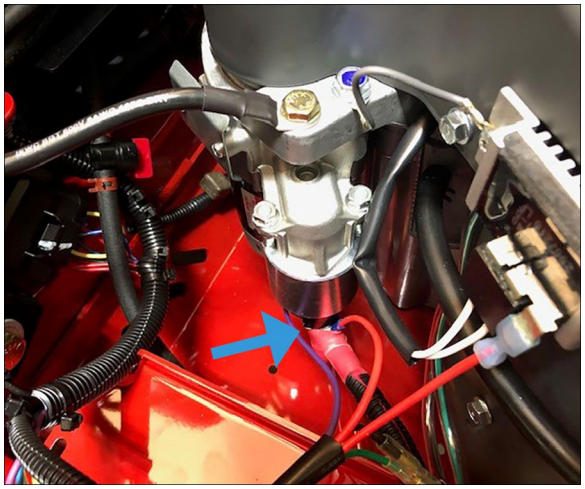
1. Using an appropriate lifting device, install the engine into position on the frame.
2. Install the 3 (3/8 inch) engine mounting bolts. Torque to 37–44 N•m (30 ± 3 ft-lb)
3. Install the 3/8 inch engine mounting bolt securing the clutch anchor to the chassis.
4. Install the clutch harness to the harness retainer on the clutch anchor.
5. Install the engine pulley and square key.
6. Install the clutch to the crankshaft. Install the clutch mounting 7/16 inch bolt, 2 belleville washers, and flat washer. Torque to 37–82 N•m (49-61 ft-lb).
7. Connect the clutch wire to the clutch.
8. Install the vent line to the air cleaner, if applicable.
9. Connect the fuel supply line at the fuel filter.



g346048

Figure 10

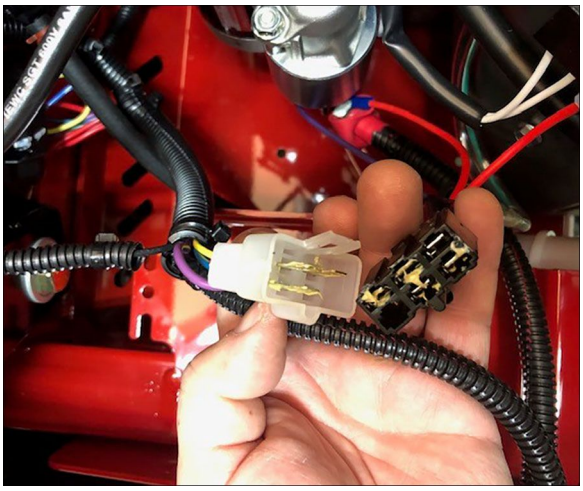
10. Connect the black engine ground wire.
11. Connect the red (B+) wire to the starter



g346047

Figure 11

12. Connect the chassis wire harness to the main engine harness.



g346046

Figure 12

13. Install the hydrostatic drive belt to the engine pulley. Hydrostatic Drive Belt Replacement (page 7–5)
14. Install the deck belt. Deck Belt Replacement (page 6–4)
15. Connect the choke cable. Choke Cable Assembly Replacement (page 5–16)
16. Connect the throttle cable. Throttle Cable Assembly Replacement (page 5–15)
17. Install the rear guard asm. Install and tighten the 6 (5/16 inch) torx screws and lock nuts securing the rear guard to the chassis.



g346045

Figure 13

18. Install the top rear guard. Install and tighten the 2 (5/16 inch) torx screws securing the top rear guard to the rear guard asm.



g346044

Figure 14

19. Open the fuel supply valve.
20. Install the battery onto the machine. Hook the rubber strap securing the battery to the battery tray.
21. Connect the battery by installing the positive cable first, then the negative cable to the battery.

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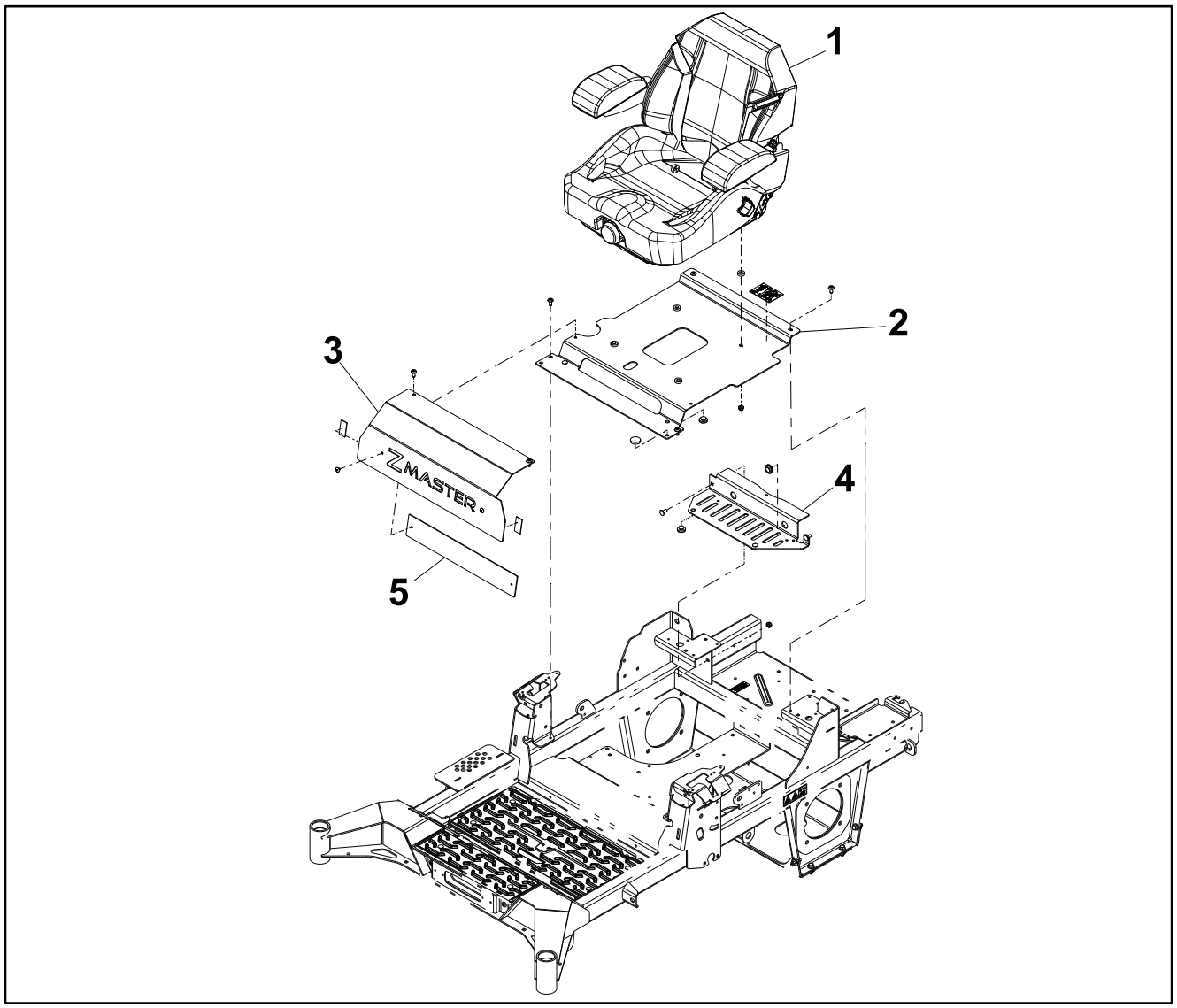
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ROPS (Roll Over Protection System) Replacement 5–26
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Caster Wheel Rebuild 5–29
Motion Control Assembly Replacement 5–30

General Information

The 4000 series Z MASTER® mowers use a one-piece, fully welded frame. All models use a foldable ROPS system.

Service and Repairs

Chassis Assembly 1

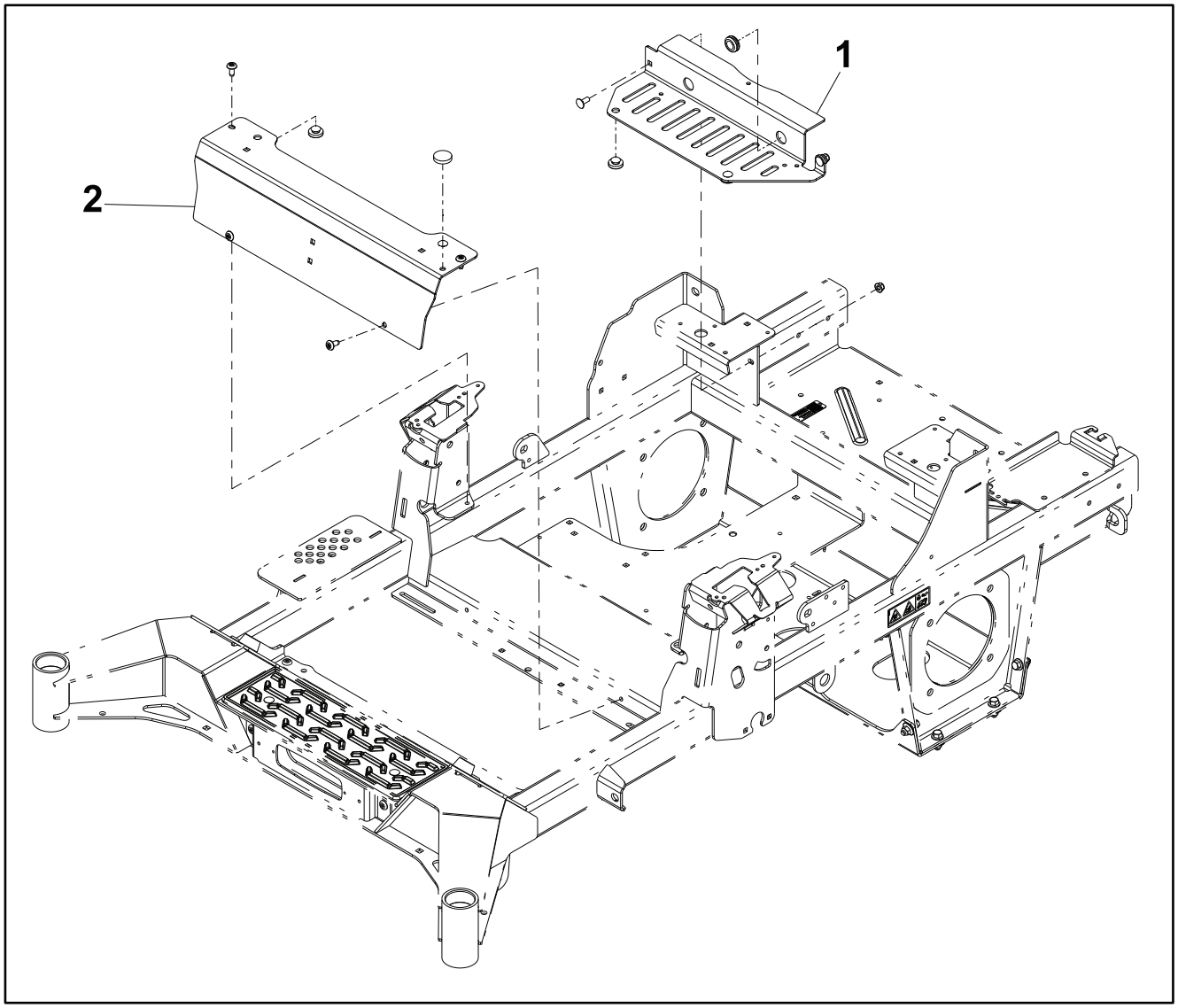


g338832

Figure 15

1. Suspension Seat Asm
2. Seat Pan
3. Front Retainer Tank Plate
4. Rear Retainer Tank Plate
5. Backer Plate

Chassis Assembly 2

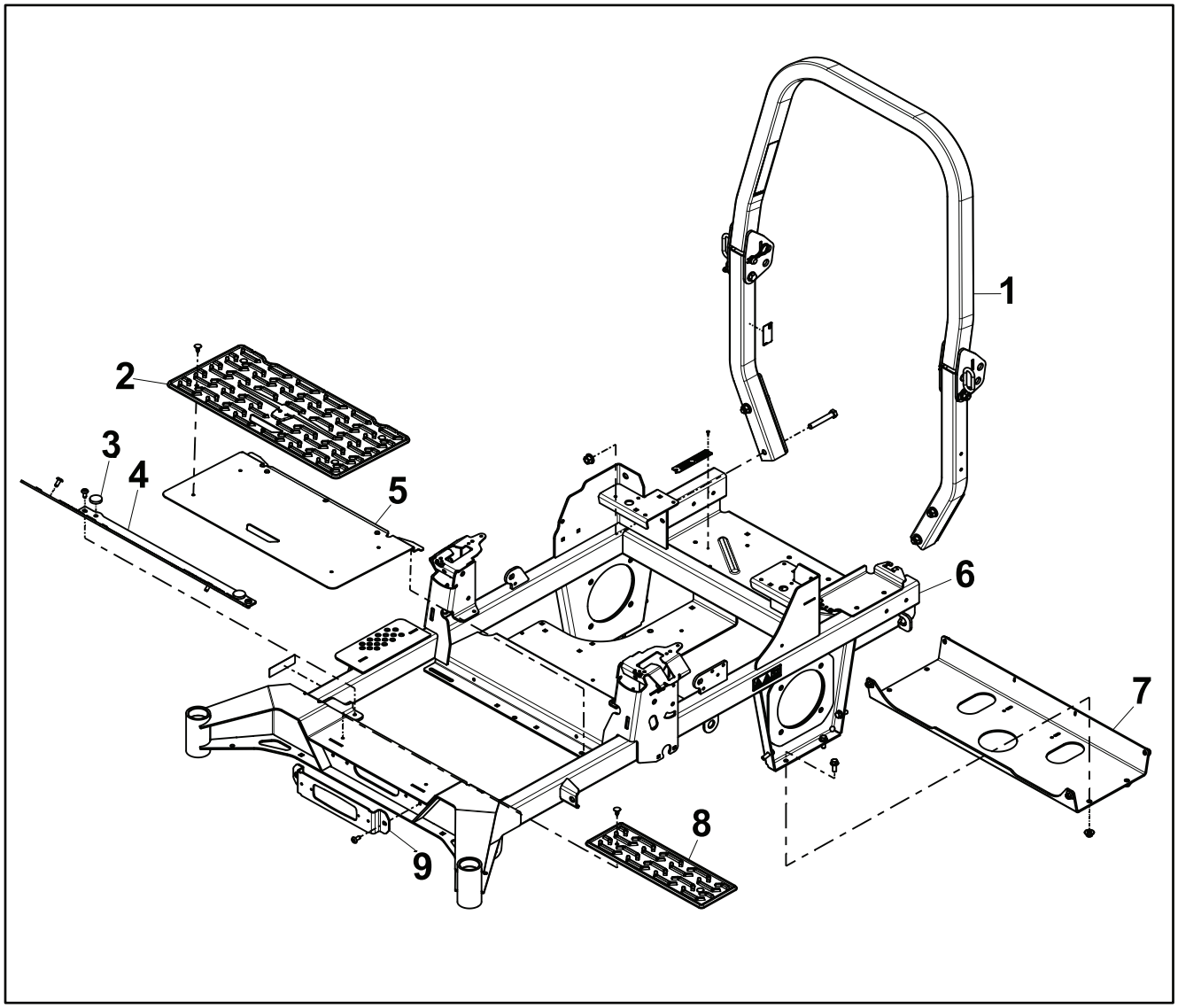


g338834

Figure 16

1. Rear Retainer Tank Plate
2. Front Retainer Tank Plate

Chassis Assembly 3

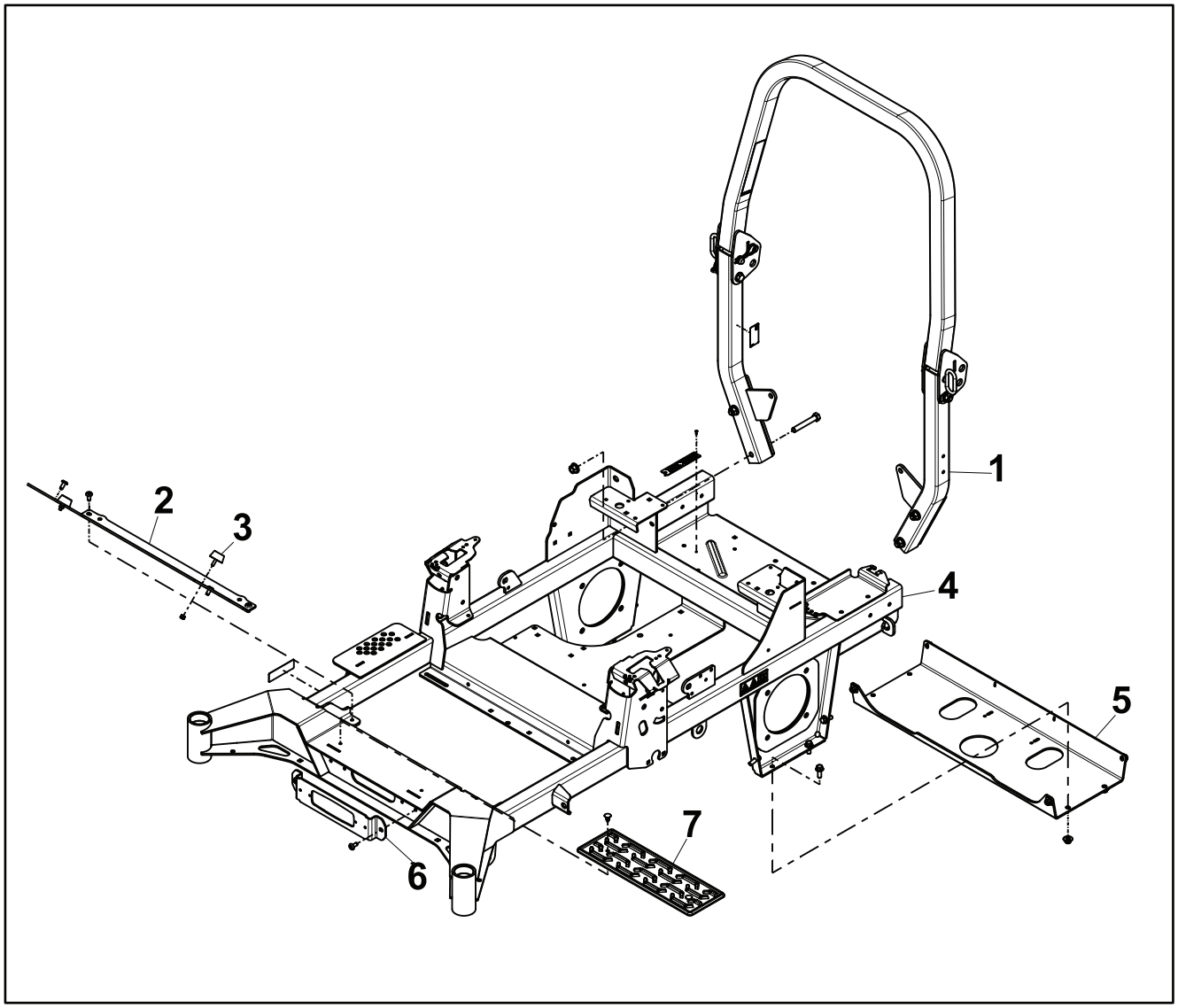


g338879

Figure 17

1. ROPS Asm
2. Fixed Seat Floormat
3. Rubber Push-In Bumper
4. Toeboard
5. Floor Pan Asm
6. 60 Inch Frame
7. Hydro Plate
8. Step

Chassis Assembly 4

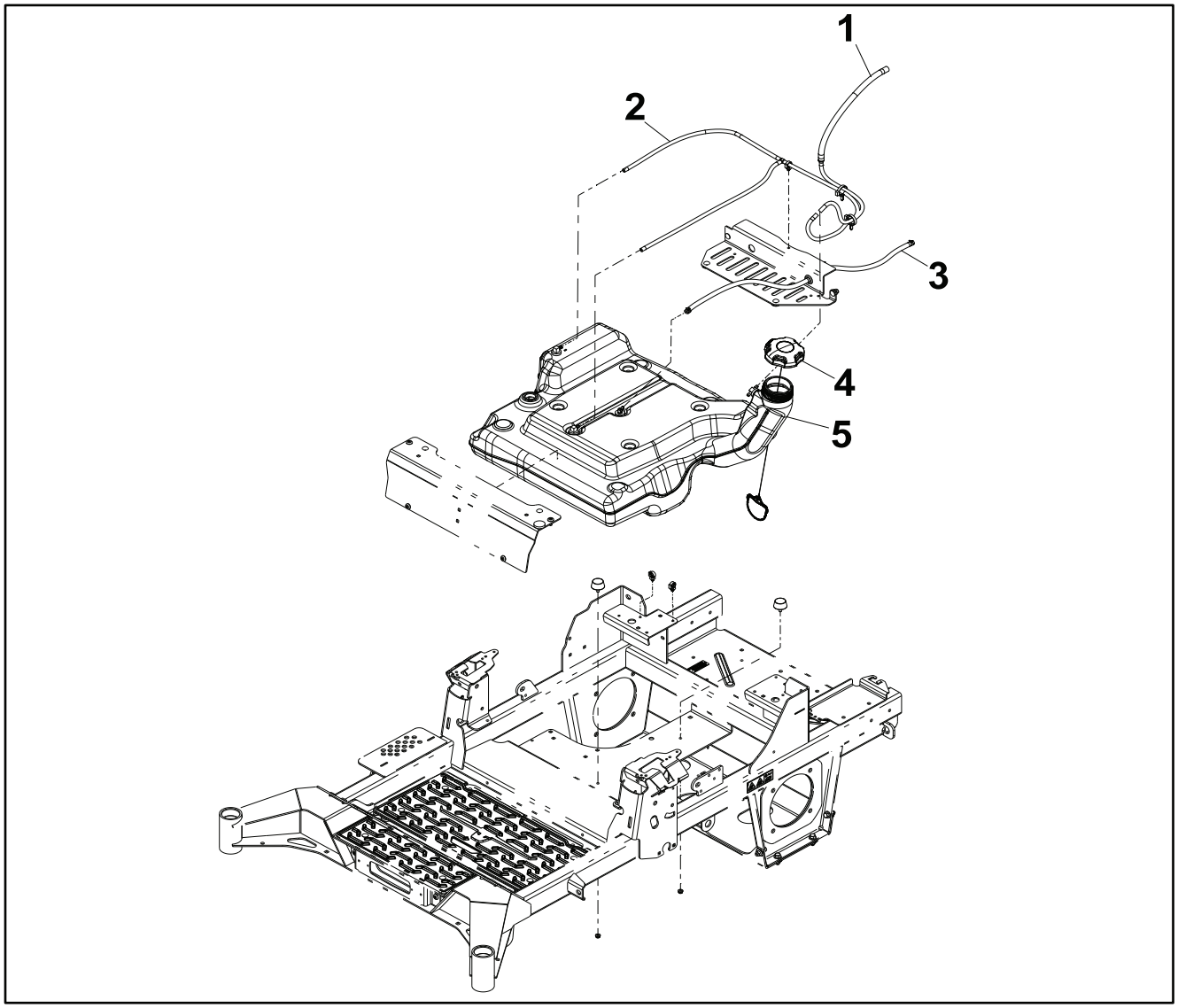


g338890

Figure 18

1. ROPS Asm
2. Toeboard
3. Bumper
4. 60 Inch Frame
5. Hydro Plate
6. Light Bracket
7. Step

Chassis Assembly 5

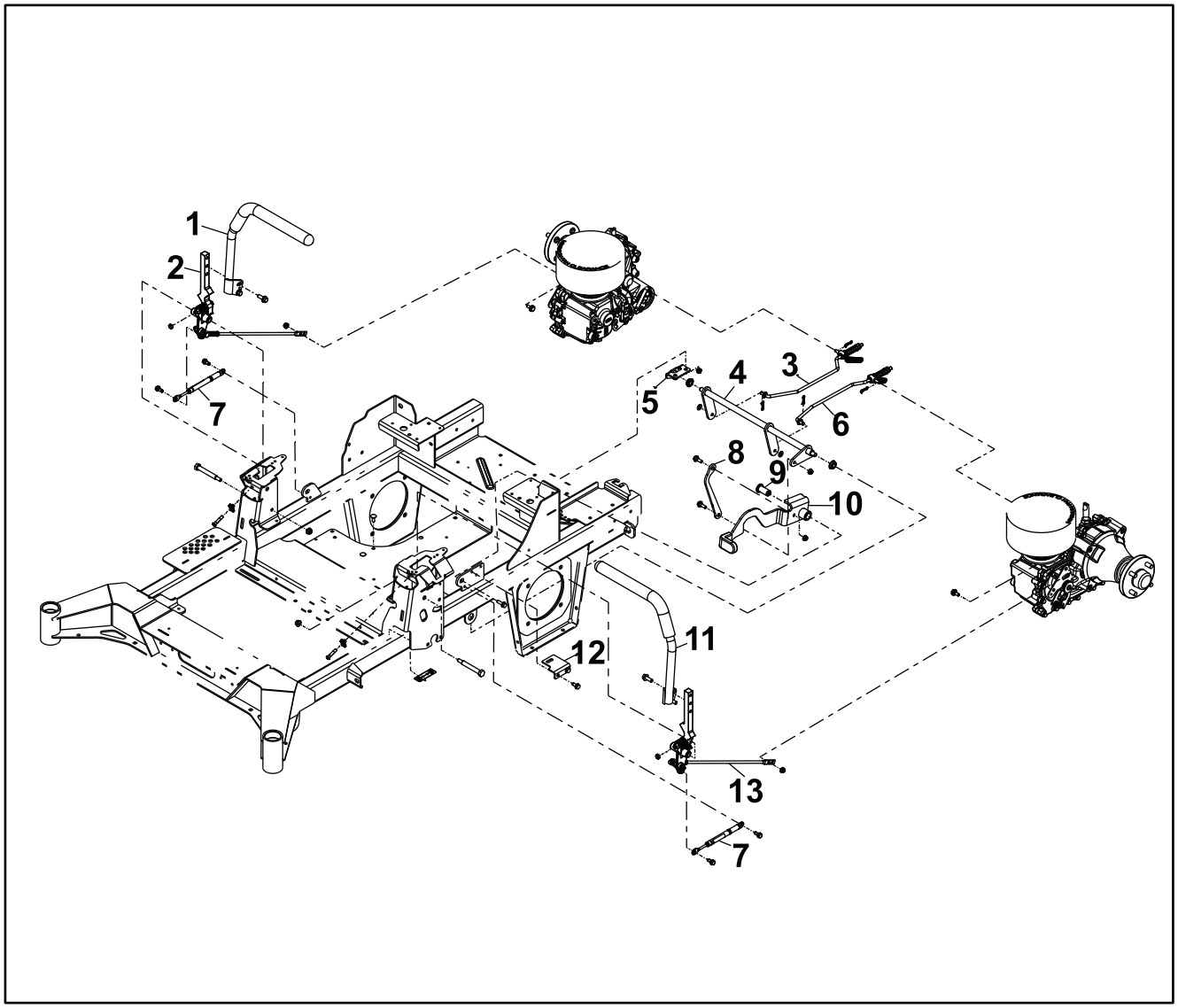


g341393

Figure 19

1. Fuel Vent Asm
2. Vent Hose Asm
3. Fuel Hose Asm
4. Fuel Cap
5. Fuel Tank Assembly

Chassis Assembly 6

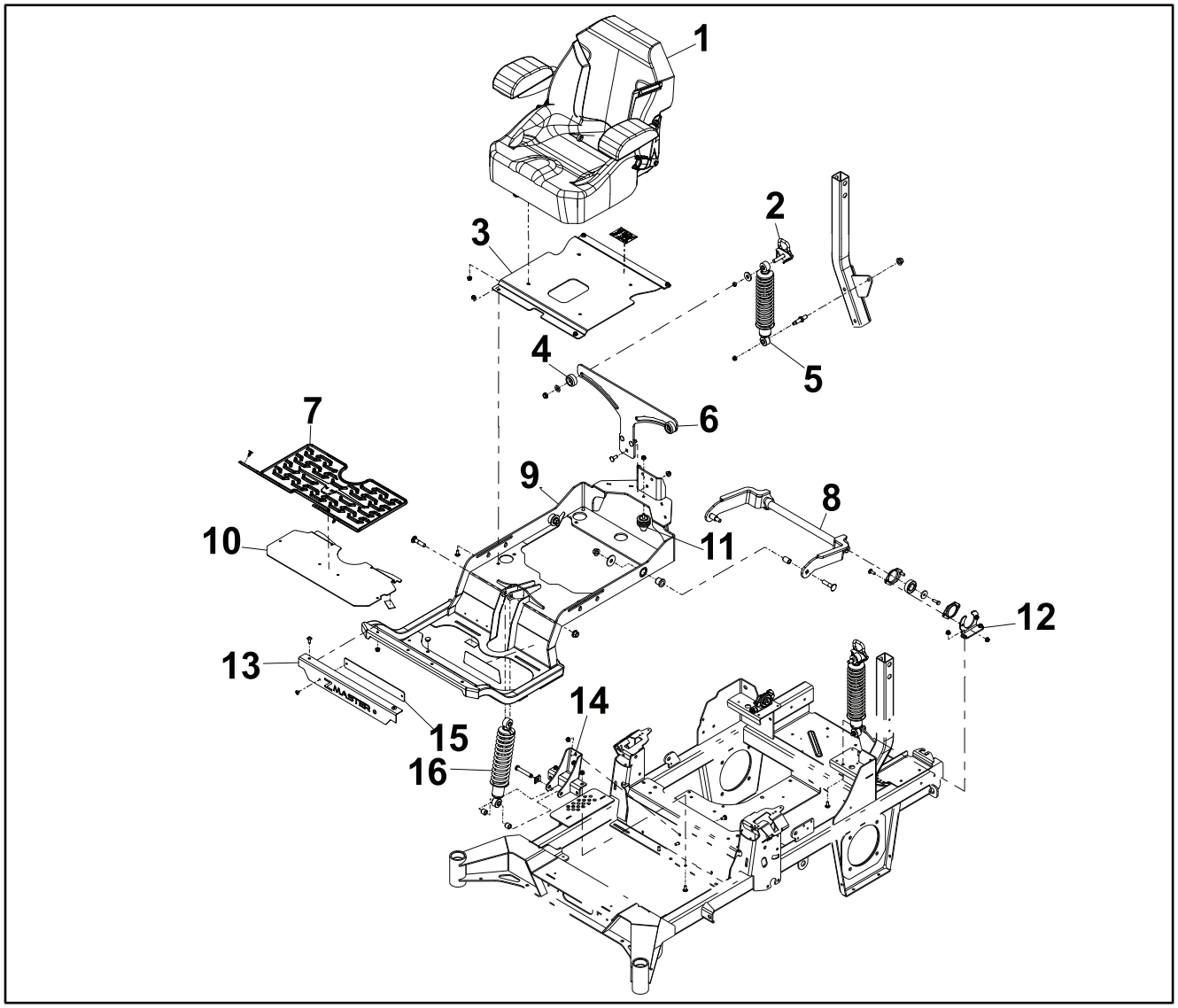


g341394

Figure 20

1. RH Handle Asm
2. RH Motion Control Asm
3. RH Brake Rod Asm
4. Brake Asm
5. Brake Bracket
6. LH Brake Rod Asm
7. Damper
8. Brake Link Asm
9. Handle Pivot
10. Brake Lever Asm with Grip
11. LH Handle Asm
12. Switch Plate
13. LH Motion Control Asm

Chassis Assembly 7

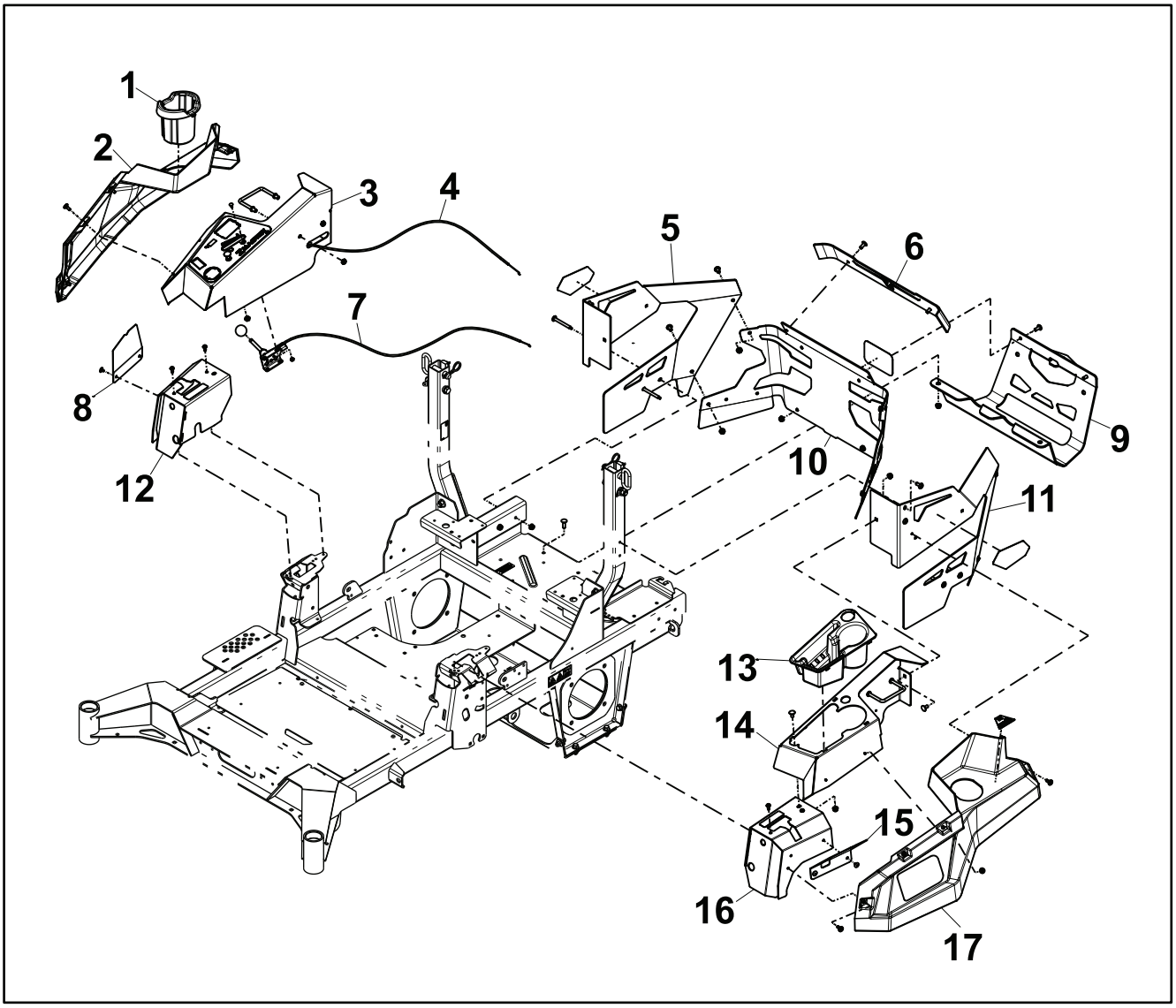


g341395

Figure 21

1. Seat Asm
2. Cam Lock Asm
3. Seat Pan
4. Cam Lock Knob
5. Shock/Spring Asm
6. Mounting Bracket
7. Floor Mat
8. Trailing Arm
9. Subframe Asm
10. Floor Pan
11. Isolator
12. Bearing Bracket
13. Badge Plate
14. Lower Shock Mount
15. Backer Plate
16. Front Shock Asm

Chassis Assembly 8



g342075

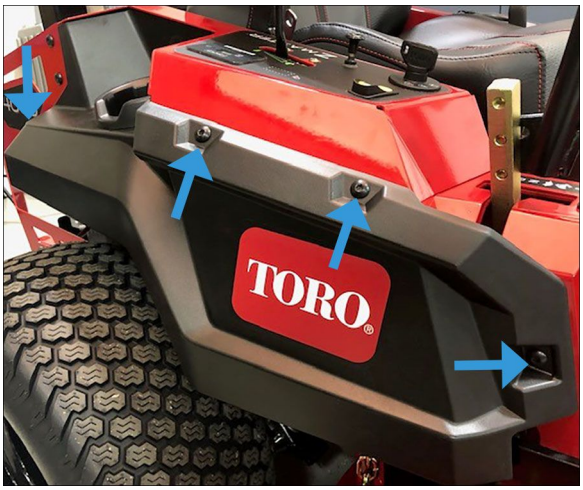
Figure 22

1. RH Cup Holder
2. RH Side Pod
3. RH Console
4. Choke Control Cable
5. RH Rear Guard Asm
6. Top Rear Guard
7. Throttle Control Cable
8. RH Front Plate Cover
9. Muffler Guard
10. Rear Guard Asm
11. LH Rear Guard
12. RH Cover Asm
13. Cup Holder
14. LH Console
15. LH Front Plate Cover
16. LH Cover Asm
17. LH Side Pod

Right Console Replacement

Right Console Removal

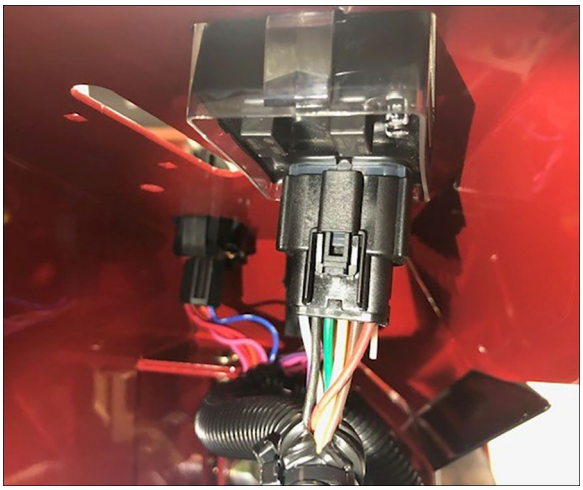
1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.
3. Remove the 4 (1/4-20 inch) torx screws securing the RH side pod to the RH console. Remove the RH side pod from the RH console.



g346220

Figure 23

4. Remove the throttle cable from the machine. Throttle Cable Assembly Replacement (page 5–15)
5. Remove the choke cable from the machine. Choke Cable Assembly Replacement (page 5–16)
6. Remove the light switch, if applicable.
7. Disconnect the wiring harness from the hourmeter.



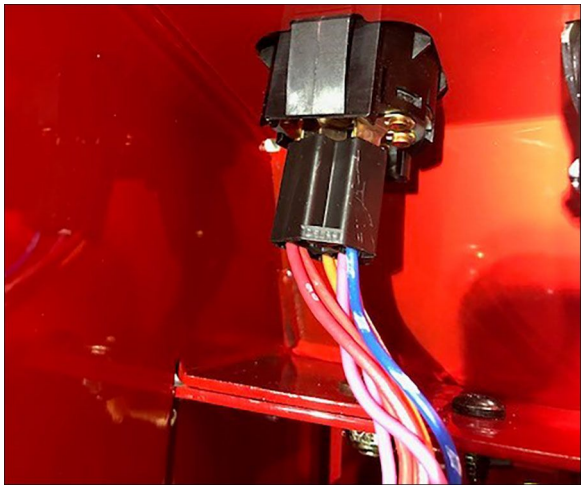
g346221

Figure 24

8. Pinch together the 2 tabs on the hourmeter. Pushing from the bottom side up, remove the hourmeter from the RH side pod.

Right Console Removal (continued)

9. Disconnect the wiring harness from the PTO switch.



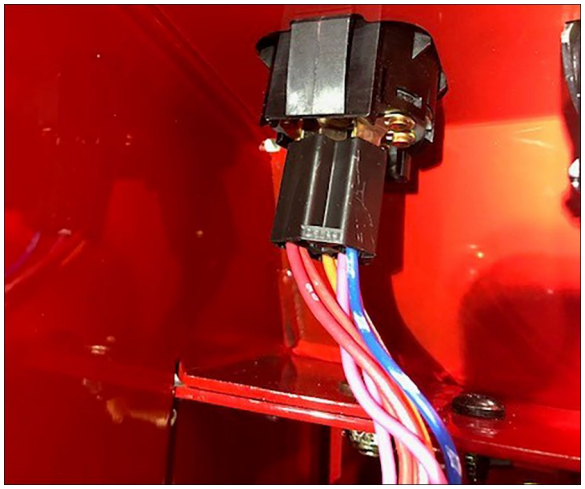
g346222

Figure 25

10. Pinch together the 2 tabs on the PTO switch. Pushing from the bottom side up, remove the PTO switch from the RH side pod.
11. Pinch together the 2 tabs on the ignition switch. Pushing from the bottom side up, remove the ignition switch from the RH side pod.
12. Remove the 2 (5/16 inch) lock nuts and carriage bolts securing the RH console to the chassis.
13. Lift the RH console away from the machine.

Right Console Installation

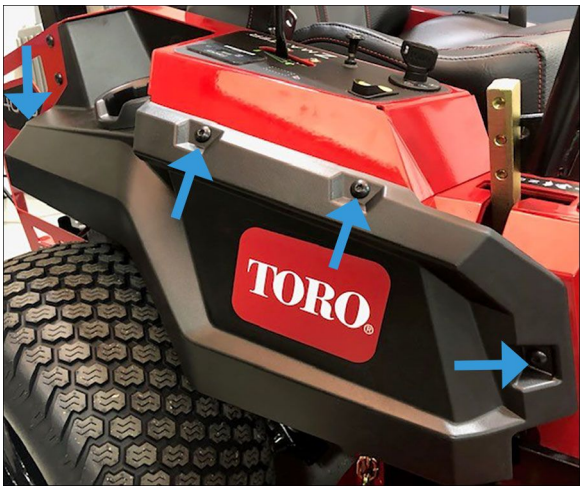
1. Install the RH console onto the machine.
2. Install the 2 (5/16 inch) lock nuts and carriage bolts securing the RH console to the chassis.
3. Install the ignition switch to the RH side pod.
4. Install the PTO switch to the RH side pod.
5. Connect the wiring harness to the PTO switch.



g346222

Figure 26

6. Install the hourmeter onto the RH side pod.
7. Connect the wiring harness from the hourmeter.
8. Install the light switch, if applicable.
9. Install the choke cable onto the machine. Choke Cable Assembly Replacement (page 5–16)
10. Install the throttle cable onto the machine. Throttle Cable Assembly Replacement (page 5–15)
11. Install the RH side pod onto the RH console. Install the 4 (1/4-20 inch) torx screws securing the RH side pod to the RH console.



g346220

Figure 27

12. Connect the battery by installing the positive cable first, then the negative cable to the battery.

Left Console Replacement

Left Console Removal

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.
3. Remove the 4 (1/4-20 inch) torx screws securing the LH side pod to the LH console. Remove the LH side pod from the LH console.

   Note: 3 screws are shown in the image below.

Left Console Removal (continued)



g346223

Figure 28

4. Disconnect the wiring harness from the USB charger.
5. Remove the 2 (5/16 inch) lock nuts and carriage bolts securing the LH console to the chassis.
6. Lift the LH console away from the machine.

Left Console Installation

1. Install the LH console onto the machine.
2. Install and tighten the 2 (5/16 inch) lock nuts and carriage bolts securing the LH console to the chassis.
3. Connect the wiring harness to the USB charger.
4. Install the LH side pod to the LH console. Install the 4 (1/4-20 inch) torx screws securing the LH side pod to the LH console.

   Note: 3 screws are shown in the image below.



g346223

Figure 29

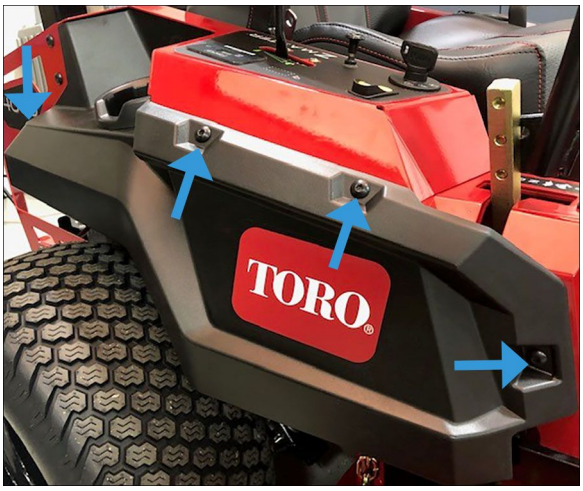
5. Connect the battery by installing the positive cable first, then the negative cable to the battery.

Throttle Cable Assembly Replacement

Throttle Cable Assembly Unit Removal

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.
3. Remove the 4 (1/4-20 inch) torx screws securing the RH side pod to the RH console. Remove the RH side pod from the RH console.

   Note: In image below, 3 screws are shown.



g346220

Figure 30

4. Unscrew the throttle control knob from the throttle control.
5. From the bottom side of the throttle control, remove the 2 (10-24 inch) lock nuts securing the throttle control to the RH console.
6. Disconnect the throttle cable.

Throttle Cable Assembly Engine Removal

Note the position of the throttle clamp on the engine plate.

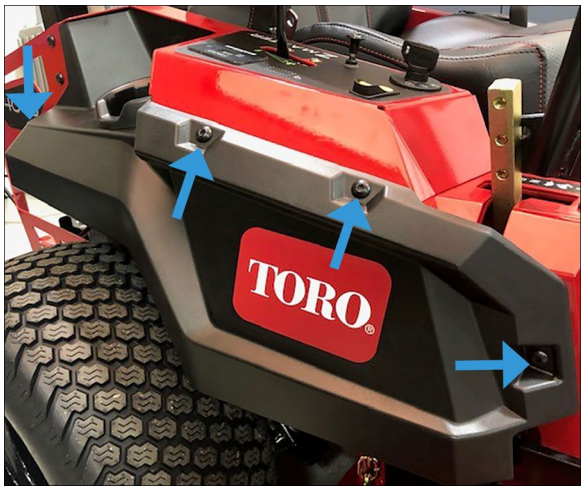
1. Remove the cable clamp screw securing the cable to the engine plate. Remove the clamp from the engine plate.
2. Disconnect the throttle cable.

Throttle Cable Assembly Engine Installation

1. Connect the throttle cable.
2. Install the clamp to the engine plate. Install the cable clamp screw securing the cable to the engine plate.

Throttle Cable Assembly Unit Installation

1. Connect the throttle cable.
2. From the bottom side of the throttle control, install the 2 (10-24 inch) lock nuts securing the throttle control to the RH console.
3. Screw the throttle control knob to the throttle control.
4. Install the RH side pod to the RH console. Install the 4 (1/4-20 inch) torx screws securing the RH side pod to the RH console.



g346220

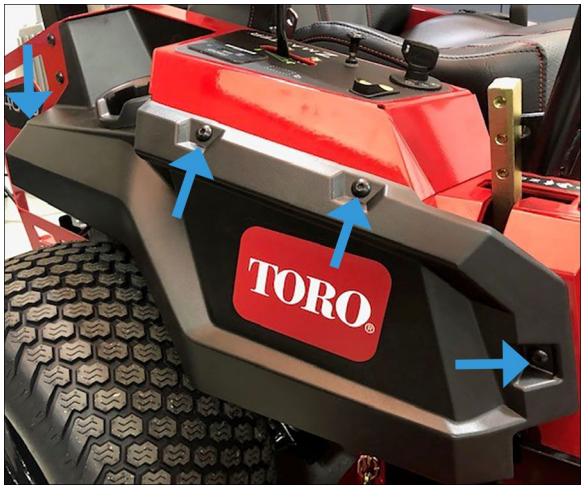
Figure 31

5. Connect the battery by installing the positive cable first, then the negative cable to the battery.

Choke Cable Assembly Replacement

Choke Cable Assembly Unit Removal

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.
3. Remove the 4 (1/4-20 inch) torx screws securing the RH side pod to the RH console. Remove the RH side pod from the RH console.



g346220

Figure 32

4. Remove the nut from the bottom side of the choke cable securing the cable to the pod.
5. Disconnect the choke cable.

Choke Cable Assembly Engine Removal

Note the position of the throttle clamp on the engine plate.

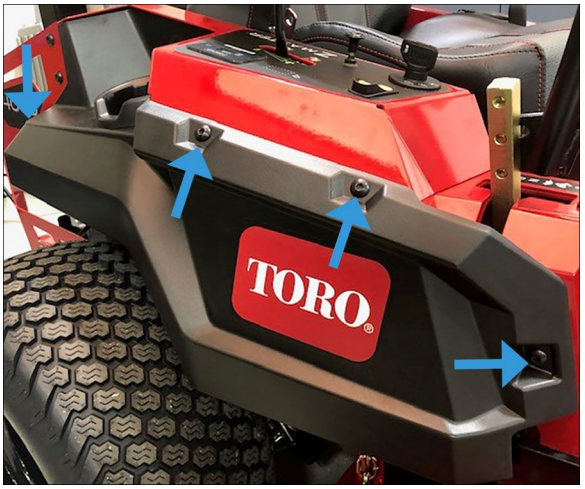
1. Remove the cable clamp screw securing the cable to the engine plate. Remove the clamp from the engine plate.
2. Disconnect the choke cable.
3. Feed the cable through the retainers and out of the pod.

Choke Cable Assembly Engine Installation

1. Feed the cable through the retainers.
2. Connect the choke cable.
3. Install the clamp to the engine plate. Install the cable clamp screw securing the cable to the engine plate.

Choke Cable Assembly Unit Installation

1. Connect the choke cable.
2. Install the nut to the bottom side of the choke cable securing the cable to the pod.
3. Install the RH side pod to the RH console. Install the 4 (1/4-20 inch) torx screws securing the RH side pod to the RH console.



g346220

Figure 33

4. Connect the battery by installing the positive cable first, then the negative cable to the battery.

Seat Replacement

Seat Removal

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.
3. Remove the 2 (5/16 inch) torx screws securing the rear of the seat pan to the chassis.



g348057

Figure 34

4. Remove the 2 (5/16 inch) torx screws securing the front tank retainer plate to the seat pan.

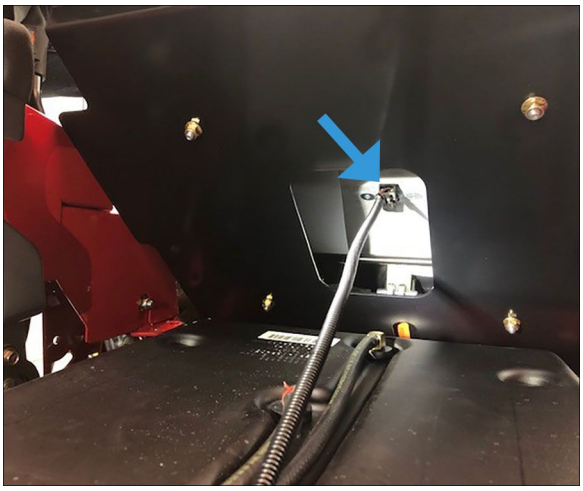


g346224

Figure 35

5. Remove the 2 (5/16 inch) torx screws securing the front of the seat pan to the chassis.
6. With assistance, slide the seat pan/seat assembly forward and tip upwards to gain access to the seat switch. Disconnect the seat switch from the seat.

Seat Removal (continued)



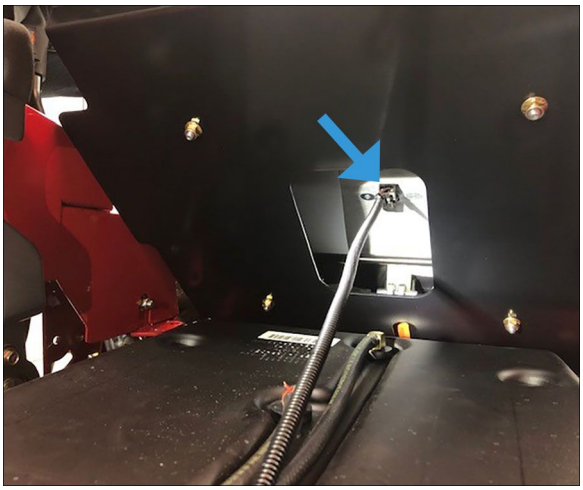
g346225

Figure 36

7. With assistance, lift the seat pan/seat assembly away from the machine.
8. Remove the 4 (5/16 inch) locks securing the seat pan to the seat assembly.

Seat Installation

1. Install and tighten the 4 (5/16 inch) lock nuts securing the seat pan to the seat assembly.
2. With assistance, install the seat pan/seat assembly into the machine.
3. Connect the seat switch to the seat. With assistance, slide the seat pan/seat assembly forward and tip upwards to gain access to the seat switch connector.



g346225

Figure 37

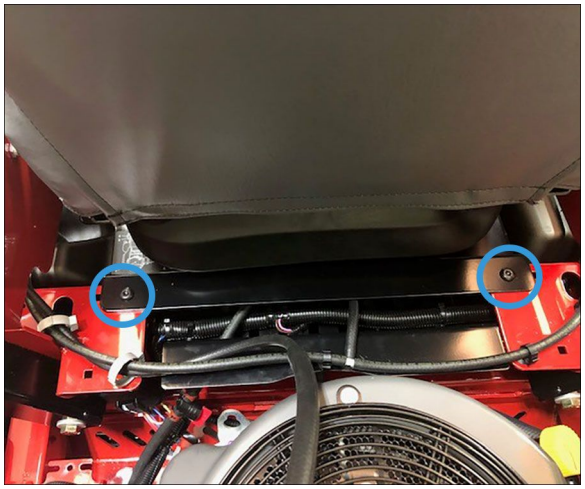
4. Install the 2 (5/16 inch) torx screws securing the seat pan to the chassis.
5. Install the 2 (5/16 inch) torx screws securing the front tank retainer plate to the seat pan.



g346224

Figure 38

6. Install the 2 (5/16 inch) torx screws securing the rear seat pan to the chassis.



g348057

Figure 39

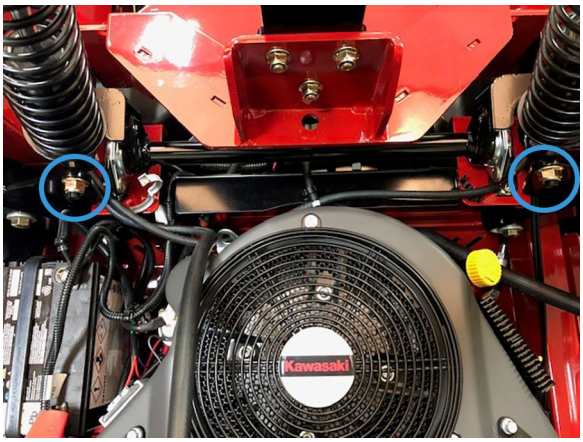
7. Connect the battery by installing the positive cable first, then the negative cable to the battery.

MYRIDE® Replacement

MYRIDE® Removal

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.
3. Move the MYRIDE springs to the #5 position.
4. Remove the 4 (5/16 inch) lock nuts and carriage bolts securing the rear seat pan to the MYRIDE platform.
5. With assistance, tip the seat forward and disconnect the seat switch.

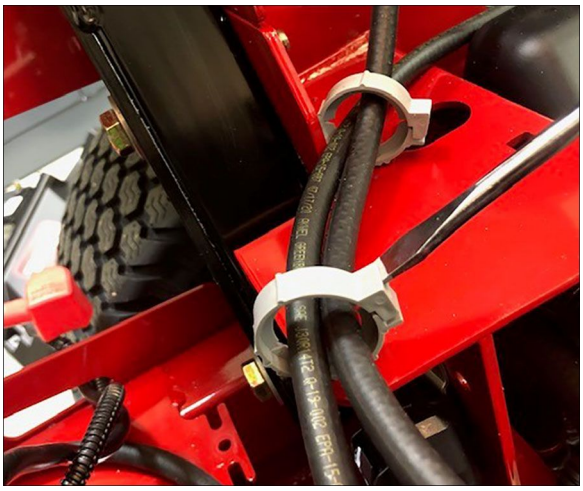
6. Loosen (do not remove) the 2 (3/8 inch) lock nuts securing the lower mount of the rear shock to the ROPS.



g348060

Figure 40

7. Loosen (do not remove) the 1/2 inch lock nut securing the front shock upper mount to the MYRIDE platform.
8. Remove the floor pan.
9. Open the 2 plastic clamps securing the fuel and vent lines.



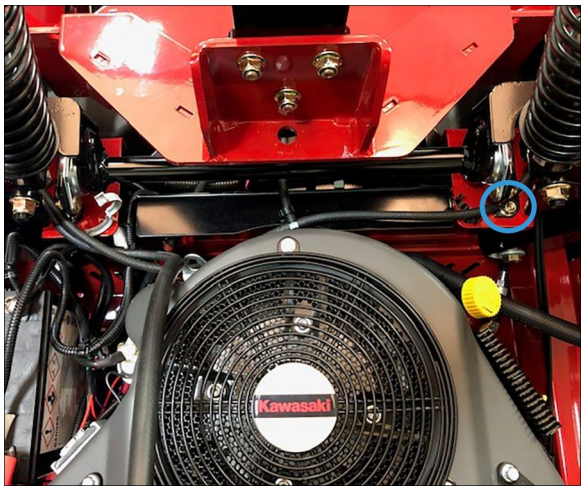
g348062

Figure 41

10. Remove the 4 (5/16 inch) lock nuts securing the 2 (1 shown below) bearing brackets to the chassis.

    Note: Only 1 of the 4 lock nuts are shown in the image below.

MYRIDE® Removal (continued)



g348084

Figure 42

11. Remove the ½ inch carriage bolt from the shock mount while supporting the front MYRIDE subframe. Reinstall the ½ inch carriage bolt with the MYRIDE subframe resting against the shock and tighten.



g346226

Figure 43

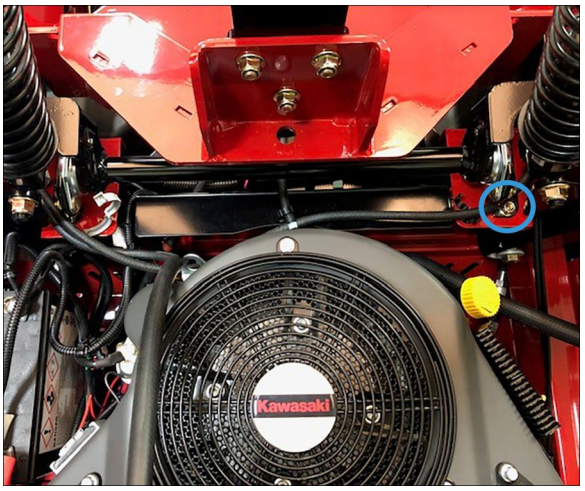
12. Lower the ROPS to the full-down position.
13. Fully remove the 2 (3/8 inch) locks nuts securing the lower front rear shocks to the ROPS (previously loosened).
14. Using an appropriate lifting device, slightly raise the MYRIDE assembly and slide the rear shocks off the mount studs, move to the side.
15. Fully raise the MYRIDE assembly out of the machine.

MYRIDE® Installation

1. Using an appropriate lifting device, Install the MYRIDE assembly into the machine.
2. Raise the ROPS.
3. Install and tighten the ½ inch carriage bolt to the shock mount while supporting the front MYRIDE subframe.

   Note: Do not over-tighten the carriage bolt. The shock must pivot freely.

4. Install the 4 (5/16 inch) lock nuts securing the 2 (1 shown below) bearing brackets to the chassis.



g348084

Figure 44

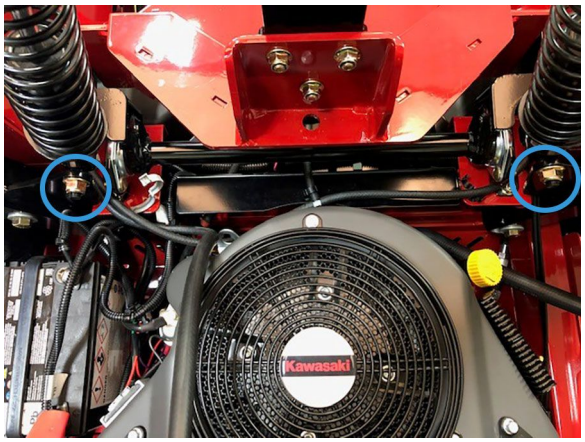
5. Close the 2 plastic clamps securing the fuel and vent lines.



g348062

Figure 45

6. Install the floor pan.
7. Tighten the 2 (3/8 inch) lock nuts securing the lower front rear shocks to the ROPS.



g348060

Figure 46

8. With assistance, tip the seat forward and connect the seat switch.
9. Install the 4 (5/16 inch) lock nuts and carriage bolts securing the rear seat pan to the MYRIDE platform.
10. Connect the battery by installing the positive cable first, then the negative cable to the battery.

Fuel Tank Replacement

Fuel Tank Removal

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.
3. Shut off the fuel valve.
4. Remove the RH console. Right Console Replacement (page 5–11)
5. Remove the LH console. Left Console Replacement (page 5–13)
6. Remove the seat assembly. Seat Replacement (page 5–17) MYRIDE® Replacement (page 5–20)
7. Remove the 2 (5/16 inch) nylock nuts and carriage bolts securing the rear tank retainer plate to the chassis. Remove the rear tank retainer plate from the chassis.
8. Remove the retainers securing the wiring harness and the vent line to the rear tank retainer plate.
9. Remove the spring clamp and remove the fuel line from the fuel tank fitting.
10. Remove the fuel tank vent line from the fuel tank. Plug the fuel line, fuel outlet, and vent fitting.
11. Remove the rear tank retainer plate from the chassis.
12. Open the 4 plastic clamps securing the vent line.
13. Remove the vent line from the air filter.
14. Remove the fuel tank away from the machine.

Fuel Tank Installation

1. Install the fuel tank onto the machine.

Fuel Tank Installation (continued)

2. Install the vent line to the air filter.
3. Close the 4 plastic clamps securing the vent line.
4. Install the rear tank retainer plate to the chassis.
5. Install the fuel tank vent line to the fuel tank. Plug the fuel line, fuel outlet, and vent fitting.
6. Install the fuel line to the fuel tank fitting, secure with the spring clamp.
7. Install the retainers the wiring harness and the vent line to the rear tank retainer plate.
8. Remove the rear tank retainer plate from the chassis.
9. Install the 2 (5/16 inch) nylock nuts and carriage bolts securing the rear tank retainer plate to the chassis.
10. Install the seat assembly. Seat Replacement (page 5–17) MYRIDE® Replacement (page 5–20)
11. Install the LH console. Left Console Replacement (page 5–13)
12. Install the RH console. Right Console Replacement (page 5–11)
13. Turn on the fuel valve.
14. Connect the battery by installing the positive cable first, then the negative cable to the battery.

Park Brake Handle Assembly Replacement

Park Brake Handle Assembly Removal

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.
3. Remove the fuel tank. Fuel Tank Replacement (page 5–24)
4. Remove the 5/16 inch bolt and lock nut securing the park brake link to the park brake lever.
5. Remove the 5/16 inch bolt securing the park brake lever to the park brake handle pivot.
6. Remove the park brake lever from the machine.

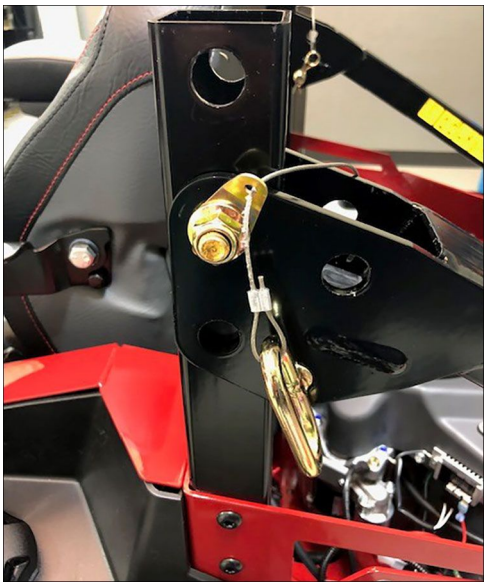
Park Brake Handle Assembly Installation

1. Install the park brake lever to the machine.
2. Install the 5/16 inch bolt securing the park brake lever to the park brake handle pivot.
3. Install the 5/16 inch bolt and lock nut securing the park brake link to the park brake lever.
4. Install the fuel tank. Fuel Tank Replacement (page 5–24)
5. Connect the battery by installing the positive cable first, then the negative cable to the battery.

ROPS (Roll Over Protection System) Replacement

ROPS (Roll Over Protection System) Removal

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.
3. Remove the fuel tank. Fuel Tank Replacement (page 5–24)
4. Remove the hair pins and ROPS fold pins.
5. Lower the upper ROPS assembly to the full-down position.



g346262

Figure 47

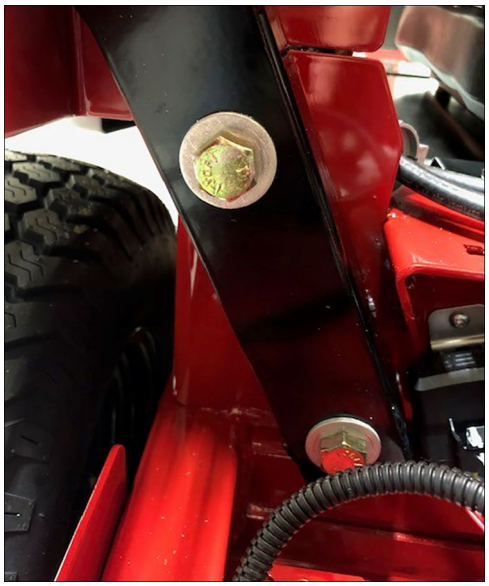
6. Remove the LH shoulder bolt securing the upper ROPS assembly to the lower ROPS assembly.
7. While supporting the upper ROPS assembly, remove the RH shoulder bolt securing the upper ROPS assembly to the lower ROPS assembly.

   Note: May need assistance to support the upper ROPS assembly.

⚠ CAUTION ⚠

Upper ROPS assembly is heavy, assistance or support is needed for removal. Personal injury or damage may occur.

8. Lift the upper ROPS assembly away from the machine.
9. Remove the 4 (½ inch, 2 per side) bolts and lock nuts securing the lower tubes to the chassis.



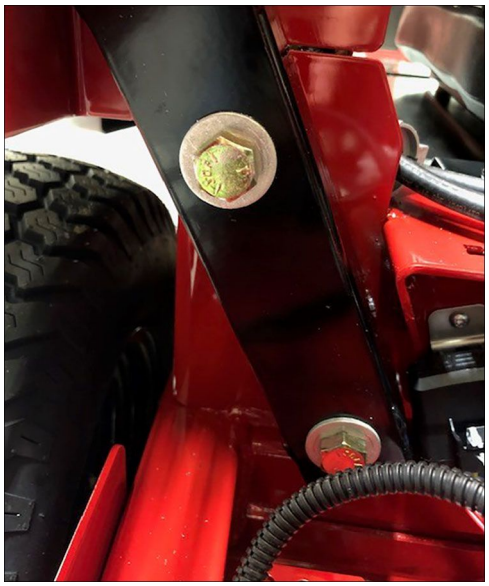
g346263

Figure 48

10. Lift the lower tubes away from the chassis.

ROPS (Roll Over Protection System) Installation

1. Install the lower tubes onto the chassis.
2. Install the 4 (½ inch, 2 per side) bolts and lock nuts securing the lower tubes to the chassis.



g346263

Figure 49

⚠ CAUTION ⚠

Upper ROPS assembly is heavy, assistance or support is needed for removal. Personal injury or damage may occur.

ROPS (Roll Over Protection System) Installation (continued)

3. Install the upper ROPS assembly onto the machine.
4. While supporting the upper ROPS assembly, install the RH shoulder bolt securing the upper ROPS assembly to the lower ROPS assembly.

   Note: May need assistance to support the upper ROPS assembly.
5. Install the LH shoulder bolt securing the upper ROPS assembly to the lower ROPS assembly.
6. Raise the upper ROPS assembly, secure with the ROPS fold pins and hair pins.
7. Install the fuel tank. Fuel Tank Replacement (page 5–24)
8. Connect the battery by installing the positive cable first, then the negative cable to the battery.

Caster Fork and Bearing Replacement

Caster Fork and Bearing Removal

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.
3. Raise and support the machine so that the front wheels are off the ground.
4. Remove the caster cap.
5. Support the underside of the caster wheel and remove the fastener screw securing the caster bearing assembly.
6. Remove the caster fork from the front axle. Inspect the caster fork shaft for wear or damage.
7. Remove the upper and lower bearings from the axle and inspect the inside of the axle bearing area for damage and excessive wear.

Caster Fork and Bearing Installation

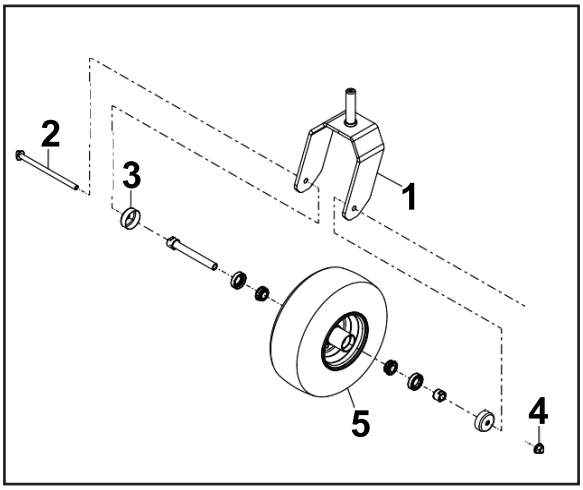
1. Clean the surface inside the axle bearing area.
2. Install a new lower bearing from the bottom side into the axle, making sure it is fully seated. Press evenly on the inner and outer race to seat the bearing.
3. Install spring washer on the top side of the axle, followed by a new upper bearing, ensuring that the bearing is properly seated (the upper bearing should be floating in the housing and does not need to be pressed in place).

   Note: The bearings are sealed and do not require grease/lubrication.
4. Install the flat washer on top of the bearing.
5. Install the fastener screw and tighten to the caster shaft. The spring washers will provide the appropriate preload to the bearings.
6. Lower the unit and verify proper function.

   Note: The caster wheel is not serviceable and should be replaced as a complete assembly.
7. Connect the battery by installing the positive cable first, then the negative cable to the battery.

Caster Wheel Rebuild

Caster Wheel Disassembly



g336095

Figure 50

1. Caster Fork
2. Screw
3. Seal Guard
4. Lock Nut
5. Wheel Assembly

---

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.
3. Raise and support the machine so that the front wheels are off the ground.
4. Remove the caster wheel from the caster fork.
5. Remove the seal guards from the wheel hub.
6. Remove a spacer nut from the axle assembly.

   Note: Thread locking adhesive has been applied to lock the spacer nuts to the axle.
7. Remove the axle from the wheel assembly with the second spacer nut still attached.
8. Pry out the seals and remove the bearings.
9. Inspect the bearings for wear or damage and replace if necessary.

   Note: Bearing seals must be replaced after removal. Do not reuse bearing seals.

Caster Wheel Assembly

1. Ensure that the wheel is clean and free of debris or excessive wear.
2. Pack the 2 tapered bearings with grease.
3. Insert 1 bearing and seal into the wheel.
4. Insert the assembled spacer nut and axle into the wheel.
5. With the open end of the wheel facing up, fill the area inside the wheel, around the axle, full of grease.
6. Insert the second bearing and seal into the wheel.
7. Apply thread locker to the second spacer nut and thread onto the axle.



8. Torque the nut to 101–110 N•m (78 ± 3 in-lb) to seat the bearings, loosen, then torque to 27–35 N•m (23 ± 3 in-lb).

   Note: Make sure that the axle does not extend beyond the nut on either side of the wheel assembly.

9. Install the seal guards onto the wheel hub and assemble the wheel onto the caster fork.
10. Lower the unit and verify proper function.

    Note: To prevent seal and bearing damage, check the bearing adjustment often. The tire should not spin freely (more than one or two revolutions) or have any side play. If the wheel spins freely, adjust the torque on the spacer nut until there is a slight amount of drag. Reapply thread locking adhesive to the spacer nut.

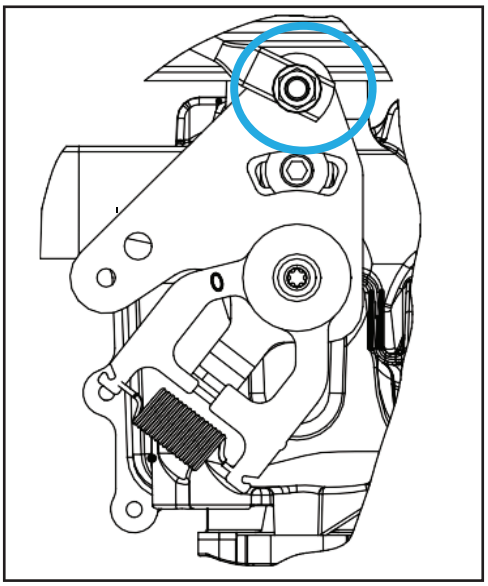
11. Connect the battery by installing the positive cable first, then the negative cable to the battery.

Motion Control Assembly Replacement

Motion Control Assembly Removal

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.
3. Remove the side console. Right Console Replacement (page 5–11) Left Console Replacement (page 5–13)
4. Raise and support the unit so that the drive wheels are off the ground.
5. Remove the 2 bolts securing the motion control handle to the motion control assembly.
6. Remove the 2 screws securing the motion control cover to the frame.
7. Disconnect the motion control damper from the motion control assembly.
8. Disconnect the motion control linkage from the transmission.

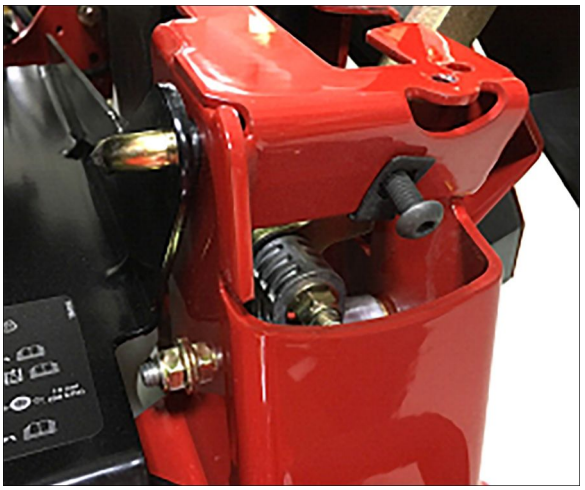
Motion Control Assembly Removal (continued)



g337843

Figure 51

9. Disconnect the motion control assembly from the frame.



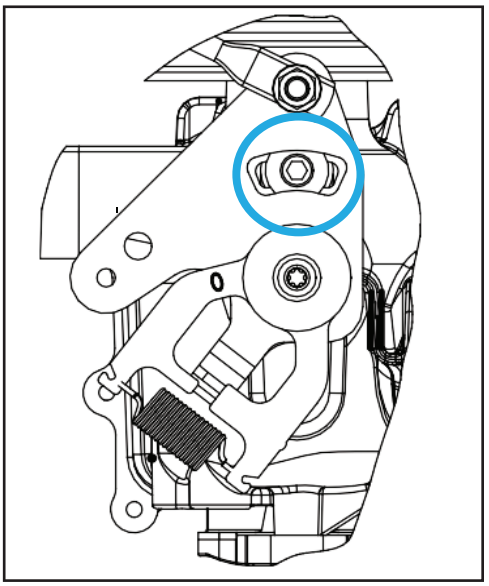
g336044

Figure 52

10. Lower the motion control assembly through the frame toward the center of the machine, remove the assembly.

Motion Control Assembly Installation

1. Position the motion control assembly in place with the linkage extending toward the transmission.
2. Secure the motion control assembly to the frame.
3. Connect the motion control linkage to the transmission.
4. Adjust the nut on the motion control assembly until the motion control nut is centered in the control plate slots.



g337846

Figure 53

5. Connect the motion control damper to the motion control assembly and torque the bolt to 108-135 N•m (90 ± 10 in-lb).
6. Install the motion control cover to the frame, secure with the 2 screws.
7. Connect the motion control handle to the motion control assembly.
8. Install the side console. Right Console Replacement (page 5–11) Left Console Replacement (page 5–13)
9. Connect the battery by installing the positive cable first, then the negative cable to the battery.
10. Adjust the neutral setting.
11. Adjust the tracking if necessary.

Chapter 6

Deck

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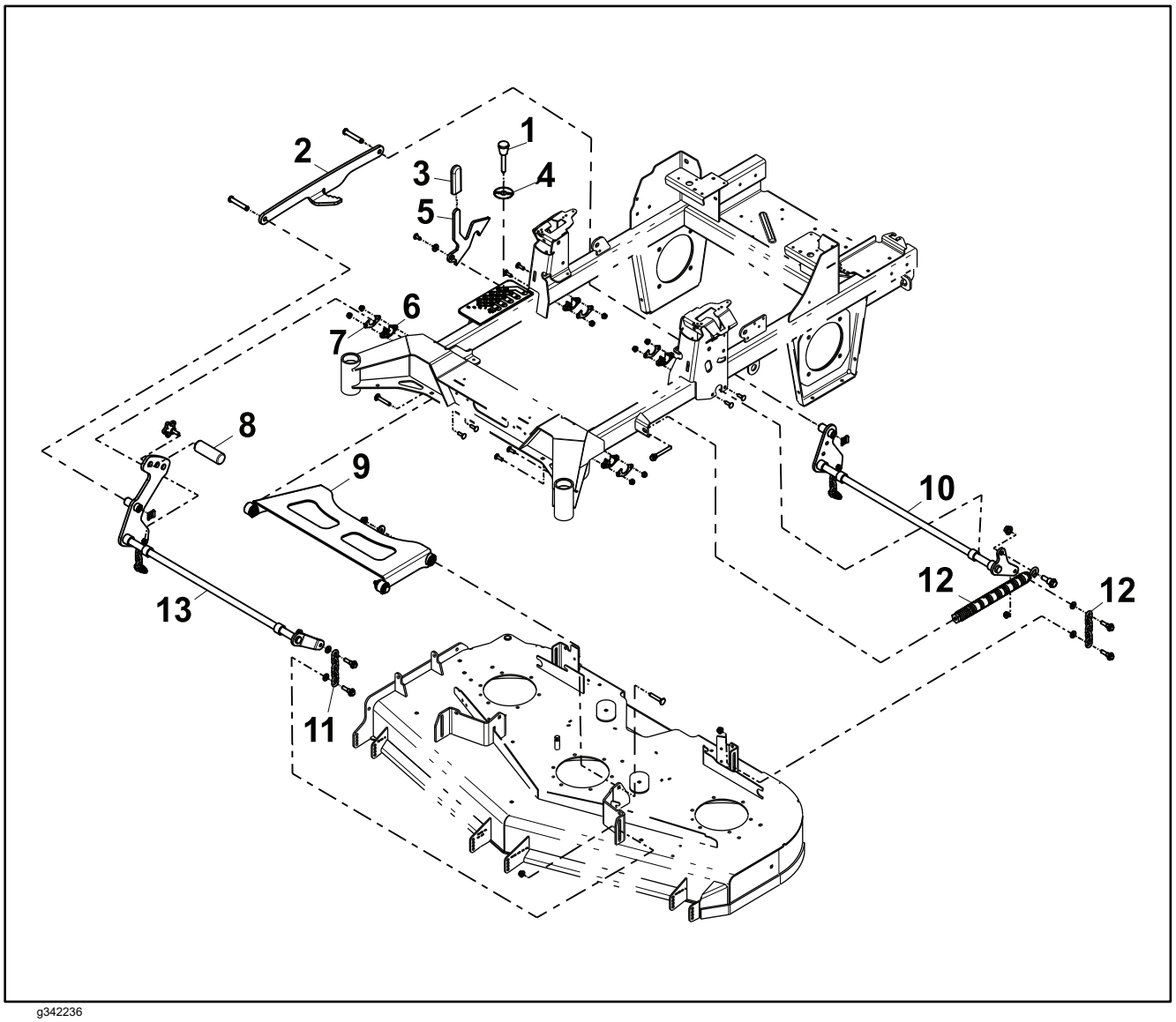
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General Information

The 4000 series Z MASTER® mowers use a TURBO FORCE® deck platform. All decks are 5.5 inch deep and constructed of 7ga steel. The spindles are of aluminum construction and utilize a blade driver.

Service and Repairs

Deck Assembly



g342236

Figure 54

1. HOC Pin
2. Lift Link
3. Lever Grip
4. Magnetic Retention Tag
5. Transport Lock Plate
6. Flange Bushing
7. Deck Lift Gusset
8. Foot Lift Pedal
9. Deck Strut with Bushings Asm
10. Deck Lift Shaft Asm
11. Deck Chain Asm
12. Extension Spring
13. Front Deck Lift Shaft Asm

Deck Belt Replacement

Deck Belt Removal

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.
3. Remove the LH and RH belt guards from the deck.
4. Remove the floor pan from the chassis.
5. Remove the 3/8 inch lock nut securing the belt guides to the idler arm asm.

⚠ CAUTION ⚠

Use caution when preforming this service procedure, spring is under high tension. Personal injury or property damage may occur.

---

6. Using a 3/8 inch rachet or breaker bar, pull the idler arm clockwise to release spring tension.
7. Remove the deck belt from the deck and clutch pulleys.

Deck Belt Installation

1. Install the deck belt to the deck and clutch pulleys.
2. Using a 3/8 inch rachet or breaker bar, pull the idler arm counterclockwise to add spring tension.
3. Install the 3/8 inch lock nut securing the belt guides to the idler arm asm.
4. Install the floor pan to the chassis.
5. Install the LH and RH belt guards to the deck.
6. Connect the battery by installing the positive cable first, then the negative cable to the battery.

Mower Deck Replacement

Mower Deck Removal

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.
3. Set the height-of-cut to 4 inches.
4. Remove the deck belt. Deck Belt Replacement (page 6–4)
5. Place blocks under the deck. Remove the height-of-cut pin to allow the deck to rest on the blocks.



g348085

Figure 55

6. Slowly loosen and remove the lift assist spring screw.

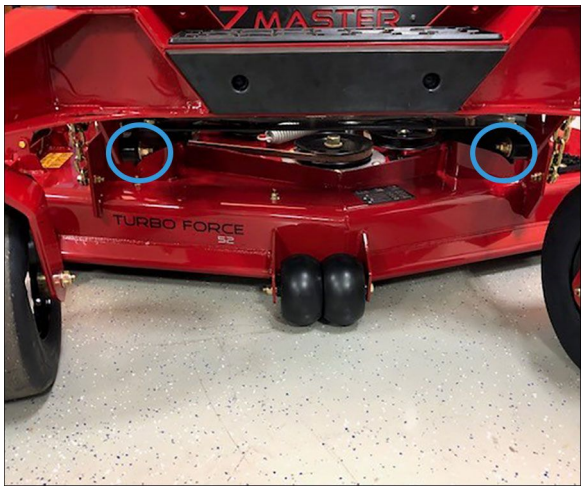


g348207

Figure 56

7. Remove the 2 (3/8 inch) lock nuts and carriage bolts securing the deck strut to the frame.

Mower Deck Removal (continued)



g348210

Figure 57

8. Remove the 4 (3/8 inch) shoulder bolts (1 per deck corner) securing the deck lift chains to the deck lift assembly.
9. Place the deck lift into the transport position.
10. Slide the deck out the RH side of the machine.

Mower Deck Installation

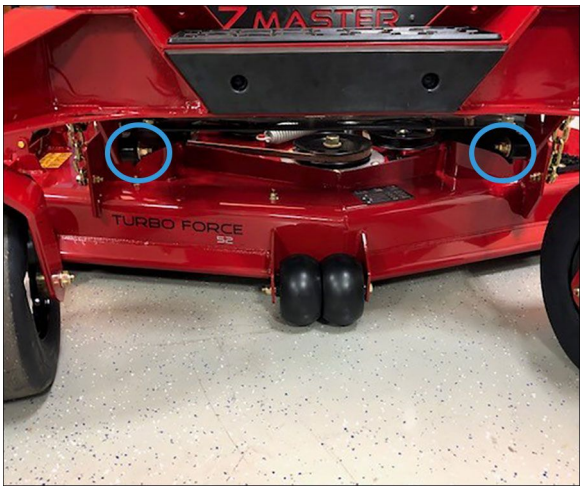
1. Place the deck lift into the transport position.
2. Slide the deck under the machine through the RH side.
3. Place the deck on the same blocks that were used in the removal section.



g348085

Figure 58

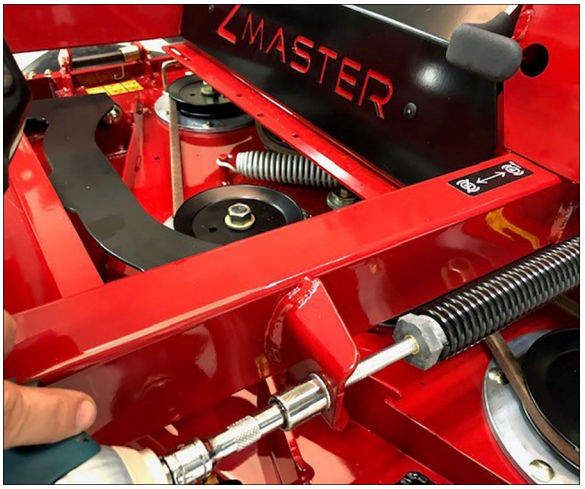
4. Place the deck lift at the lowest height-of-cut position.
5. Install the 4 (3/8 inch) shoulder bolts (1 per deck corner) securing the deck lift chains to the deck lift assembly.
6. Install the 2 (3/8 inch) lock nuts and carriage bolts securing the deck strut to the frame.



g348210

Figure 59

7. Install the lift assist spring screw.



g348207

Figure 60

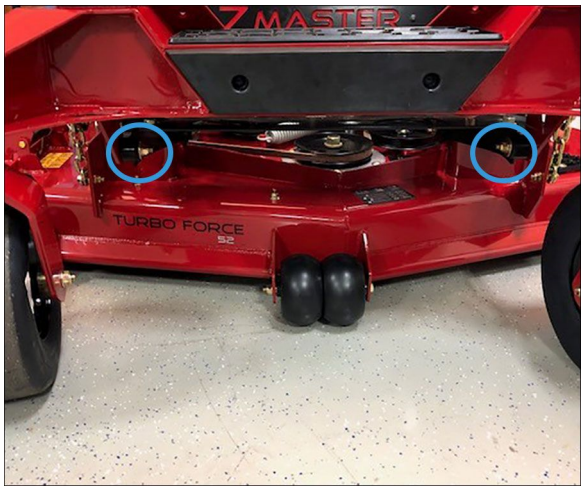
8. Install the deck belt. Deck Belt Replacement (page 6–4)
9. Connect the battery by installing the positive cable first, then the negative cable to the battery.

Mower Deck Replacement (with Deck Lift)

Mower Deck Removal (with Deck Lift)

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Remove the deck belt. Deck Belt Replacement (page 6–4)
3. Remove the height-of-cut pin. Lower the deck until it's on the floor and there is slack in the chains.
4. Remove the 2 (3/8 inch) lock nuts and carriage bolts securing the deck strut to the frame.

Mower Deck Removal (with Deck Lift) (continued)



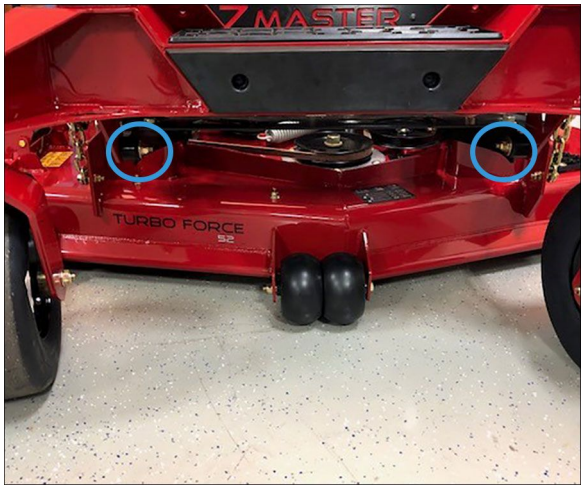
g348210

Figure 61

5. Remove the 4 (3/8 inch) shoulder bolts (1 per deck corner) securing the deck lift chains to the deck lift assembly.
6. Raise the deck lift into the transport position.
7. Slide the deck out the RH side of the machine.

Mower Deck Installation (with Deck Lift)

1. Slide the deck under the machine through the RH side.
2. Lower the deck lift until the lift chains can be attached to the deck.
3. Install the 4 (3/8 inch) shoulder bolts (1 per deck corner) securing the deck lift chains to the deck lift assembly.
4. Install the 2 (3/8 inch) lock nuts and carriage bolts securing the deck strut to the frame.



g348210

Figure 62

5. Install the deck belt. Deck Belt Replacement (page 6–4)

Electric Mower Deck Lift Replacement

Electric Mower Deck Lift Removal

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Remove the height-of-cut pin. Lower the deck until it's on the floor and there is slack in the chains.
3. Remove the ½ lock nut and bolt securing the deck lift to the deck lift actuator.

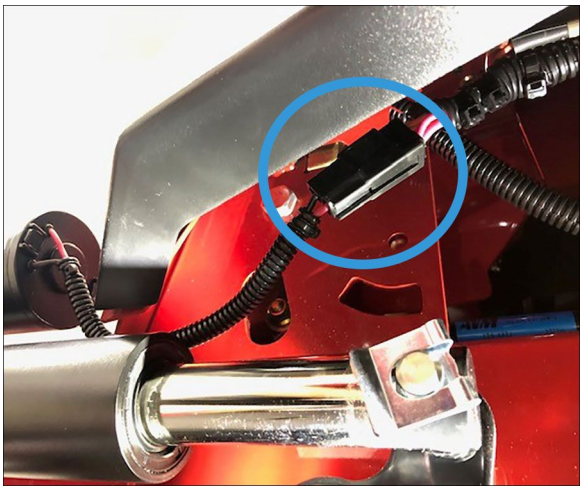
   Note: May need to raise deck lift actuator slightly for removal. Deck lift actuator will swing downwards after fastener removal.



g348232

Figure 63

4. Disconnect the harness plug from the deck lift to the wiring harness.



g348235

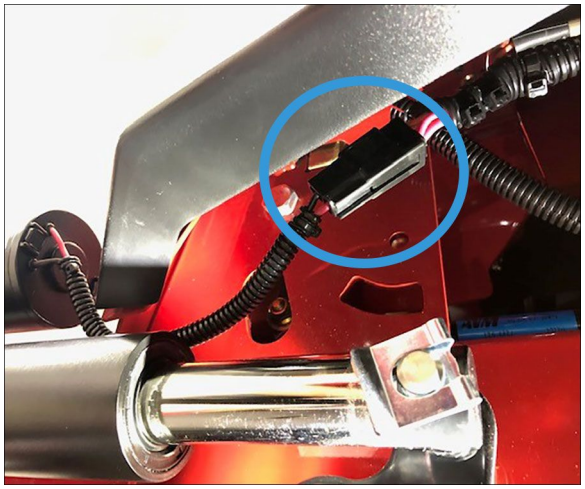
Figure 64

5. Remove the pin clip securing the rear of the deck lift actuator to the deck lift asm. Remove the deck lift asm.

Electric Mower Deck Lift Installation

1. Install the deck lift asm. Install the pin clip securing the rear of the deck lift actuator to the deck lift asm.

2. Connect the harness plug to the deck lift to the wiring harness.



g348235

Figure 65

3. Swing the actuator up and install the ½ inch lock nut and bolt securing the deck lift to the deck lift actuator.



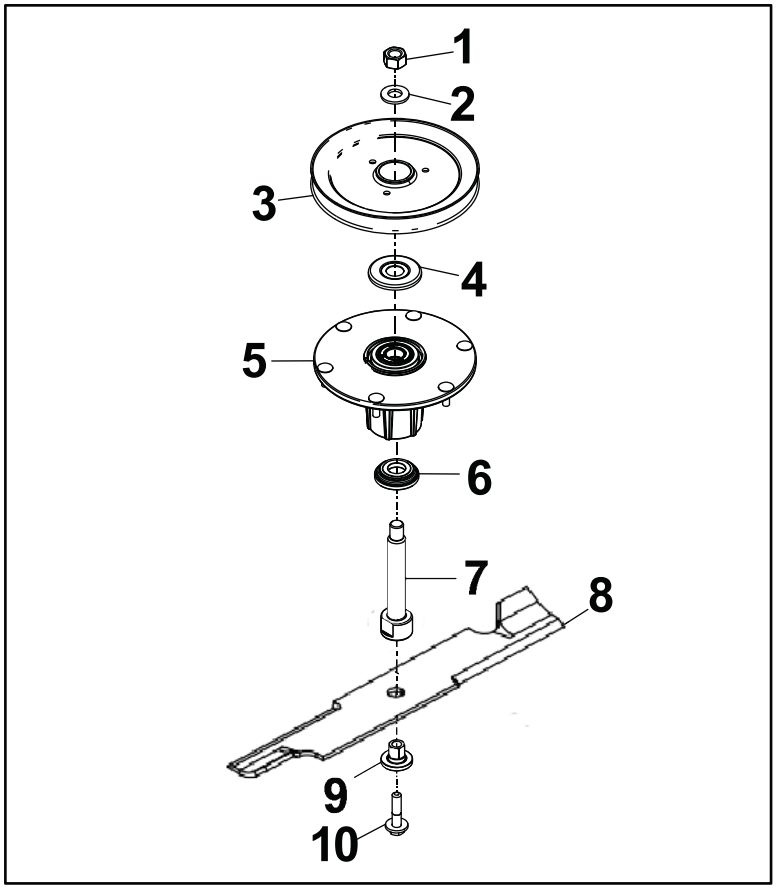
g346264

Figure 66

4. Raise the deck until there is tension in the chains. Install the height-of-cut pin.

Aluminum Spindle Rebuild

Aluminum Spindle Disassembly



g352924

Figure 67

1. Hex Nut
2. Washer
3. Blade Drive Sheave
4. Top Bearing Guard
5. Spindle Asm
6. Bottom Guard
7. Spindle Shaft
8. Blade
9. Hex Bushing
10. Screw

---

1. Park the machine on a level surface, disengage the PTO and set the parking brake. Stop the engine, wait for all moving parts to stop and remove the key.
2. Remove the deck belt. Deck Belt Replacement (page 6–4)
3. Remove the ½ inch bolt securing the blade and blade driver to the spindle shaft.
4. Remove the ¾ inch lock nut securing the pulley to the spindle shaft. Once the pulley is removed, the spindle shaft can be lowered from the spindle housing.

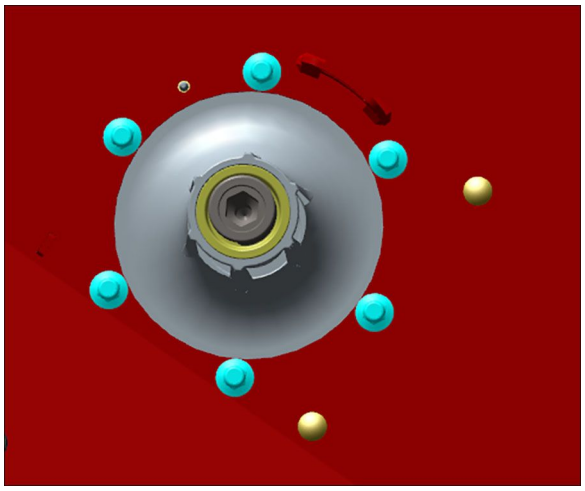
   Note: View the orientation of the top and bottom bearing guards when removing the spindle shaft.



g339541

Figure 68

5. Remove the 6 (3/8 inch) flange lock nuts securing the spindle to the deck (from bottom).



g339542

Figure 69

6. Lift spindle assembly from the deck.
7. Remove the housing ring (if applicable).
8. Slide spindle shaft out of spindle housing.
9. Move bearing spacer to the side in order to gain access to the inner race of the bottom bearing.



g339543

Figure 70

10. Gently tap the inner race of the lower bearing to remove from the housing. Alternate in a star pattern to avoid binding when removing.

    Note: Bearings may be damaged during removal. Replace as needed.



g339544

Figure 71

11. Remove the bearing spacer.
12. Rotate the spindle housing. Repeat bearing removal for the opposite side.
13. Inspect spindle housing for internal or external damage.

Aluminum Spindle Disassembly (continued)



g347983

Figure 72

Aluminum Spindle Assembly

1. Clean and inspect all surfaces.
2. Using the appropriate sized bearing driver, install the upper bearing until seated.

   Note: Gently tap driver to avoid damaging the bearing during install.
3. Rotate spindle assembly and install the bearing spacer.
4. Using an appropriate bearing driver, install the remaining bearing until seated.
5. Place the bottom bearing guard onto the spindle shaft.
6. Install the spindle shaft into the housing.

   Note: Verify proper orientation of the spindle.
7. Place the upper bearing guard onto the spindle shaft.
8. Place the pulley onto the spindle shaft.
9. Install the nut. Torque nut to 130-176 N•m (130-160 ft-lb).
10. Rotate the spindle shaft in housing to verify operation.
11. Place the housing ring onto the spindle studs (if applicable).
12. Place the spindle housing into the deck.
13. Install the 6 (3/8 inch) flange lock nuts to the studs. Torque lock nuts 38-44 N•m (27–33 ft-lb).
14. Install the belt guide bracket (if applicable).
15. Install the hex blade driver into the blade.
16. Install the blade and driver to the spindle. Torque to 68-81 N•m (50-60 ft-lb).
17. Install the deck belt. Deck Belt Replacement (page 6–4)
18. Start the mower and engage the deck several time to ensure proper operation.

Chapter 7

Drive System

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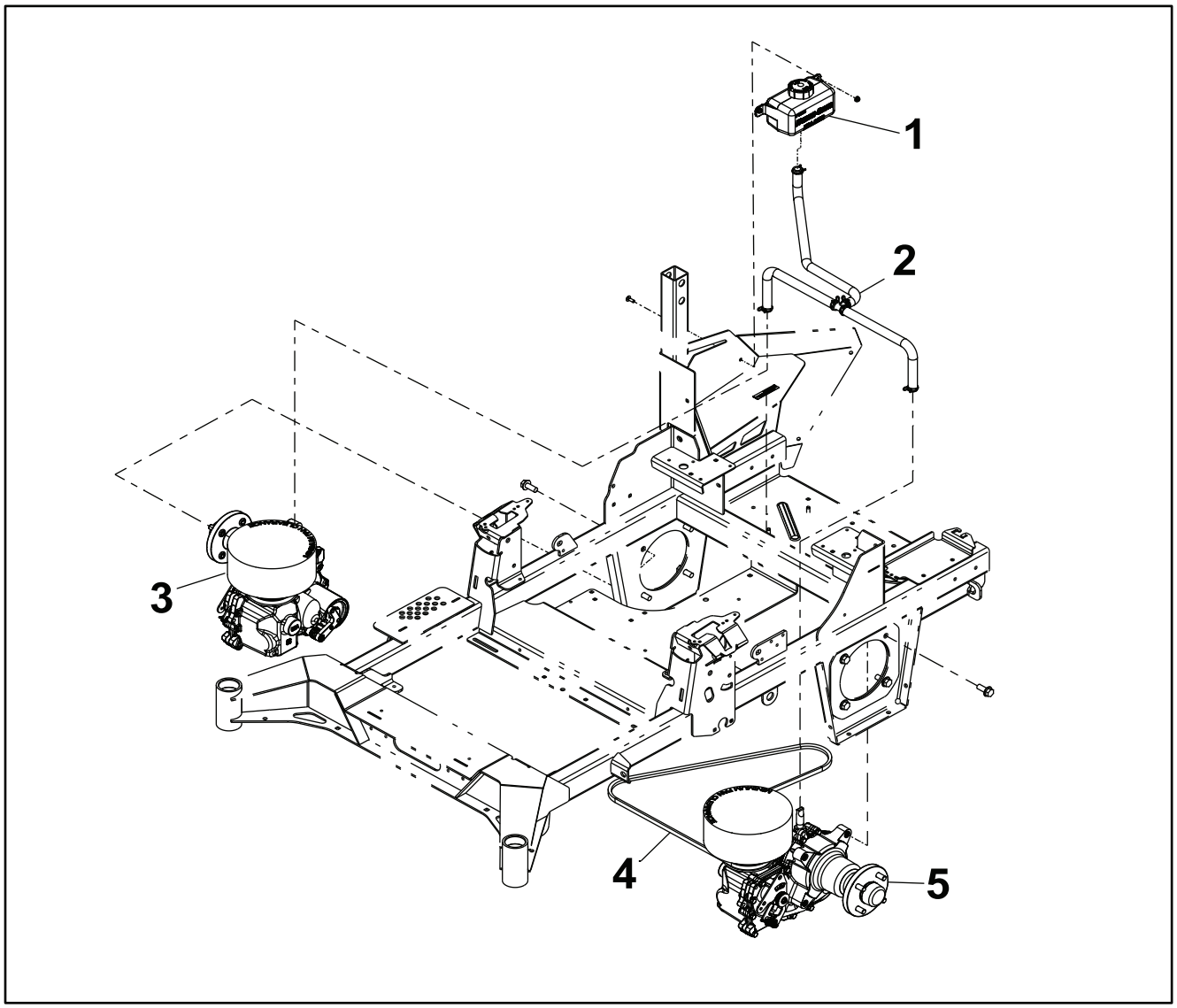
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Service and Repairs 7–3
Hydrostatic Drive Belt Replacement 7–5
Hydrostatic Drive Transmission Replacement 7–6

General Information

The 4000 series Z MASTER® mowers have ZT4400 and ZT5400 hydrostatic transaxles. Either transaxle is serviceable via internal cartridge filter and remote reservoir.

Service and Repairs

Drive Assembly 1

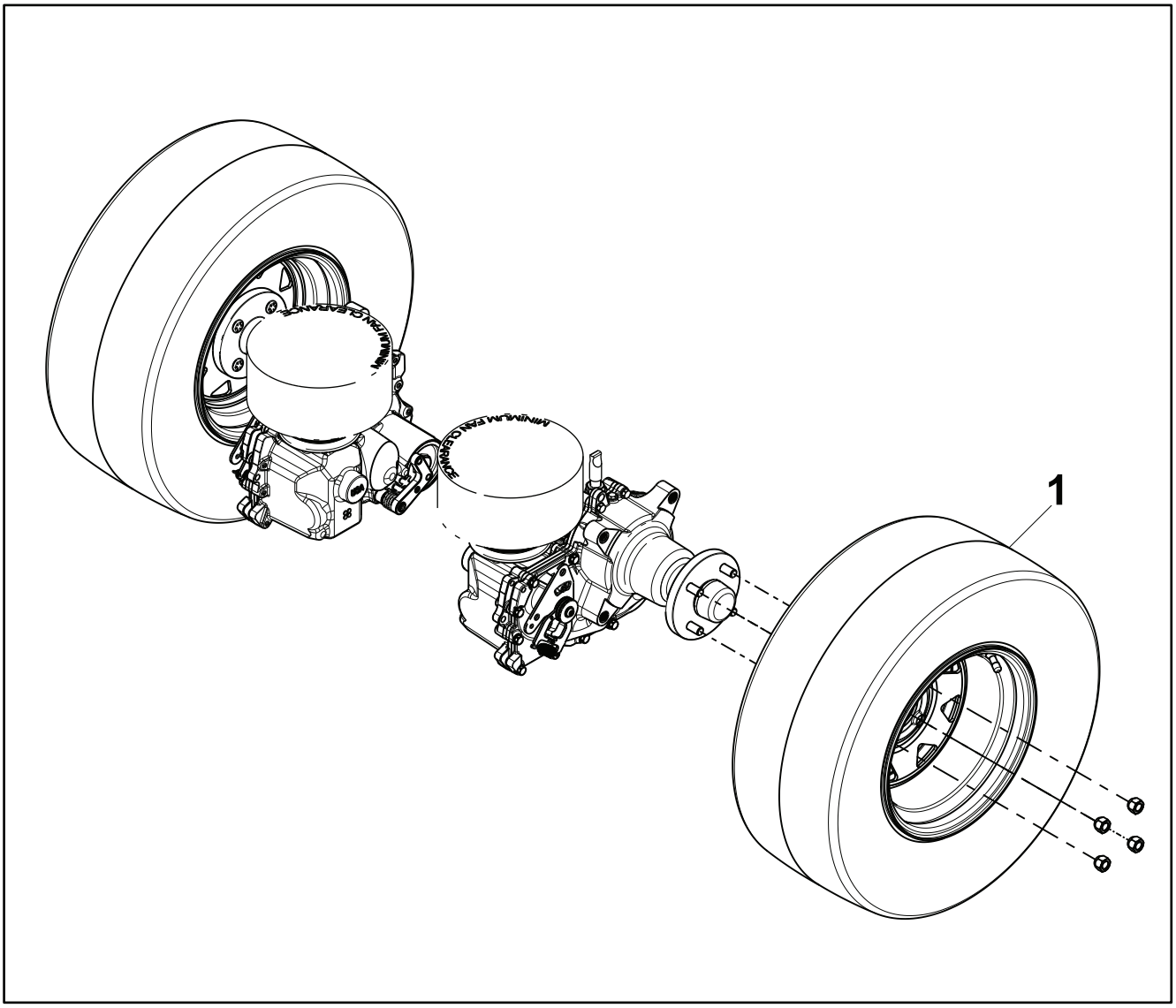


g341074

Figure 73

1. Hydraulic Reservoir Asm
2. Hydraulic Hose Asm
3. RH Transaxle Asm
4. V-Belt
5. LH Transaxle Asm

Drive Assembly 2



g341076

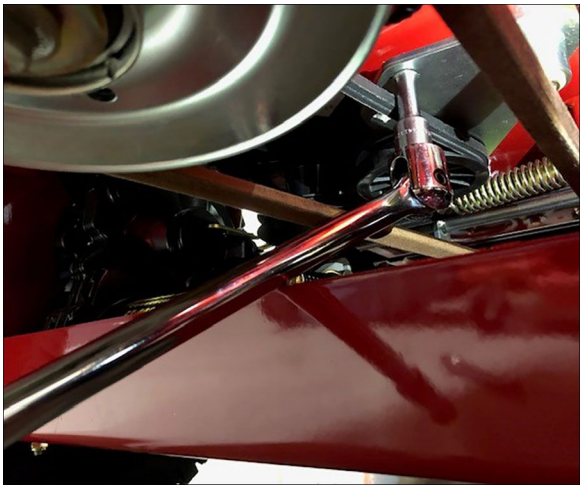
Figure 74

1. Wheel and Tire Asm

Hydrostatic Drive Belt Replacement

Hydrostatic Drive Belt Removal

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.
3. Remove the deck belt. Deck Belt Replacement (page 6–4)
4. Using a ½ inch breaker bar, insert into the most accessible square hole of the idler arm.



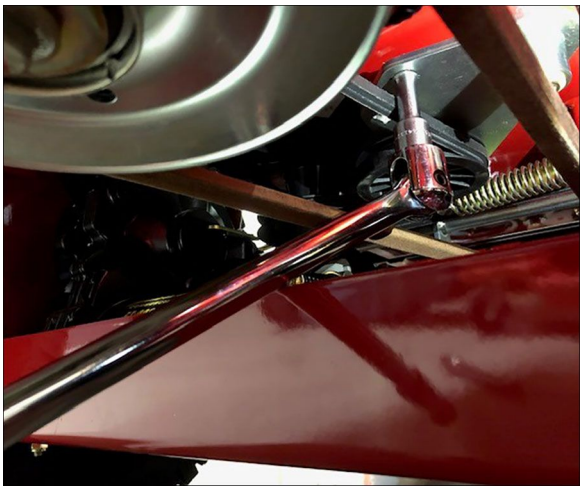
g346265

Figure 75

5. Turn the breaker bar to release belt tension. Remove the belt from the idler pulley.

Hydrostatic Drive Belt Installation

1. Install the belt to the idler pulley. Turn the breaker bar to add belt tension.
2. Using a ½ inch breaker bar, insert into the most accessible square hole of the idler arm.



g346265

Figure 76

3. Install the deck belt. Mower Deck Replacement (page 6–4)

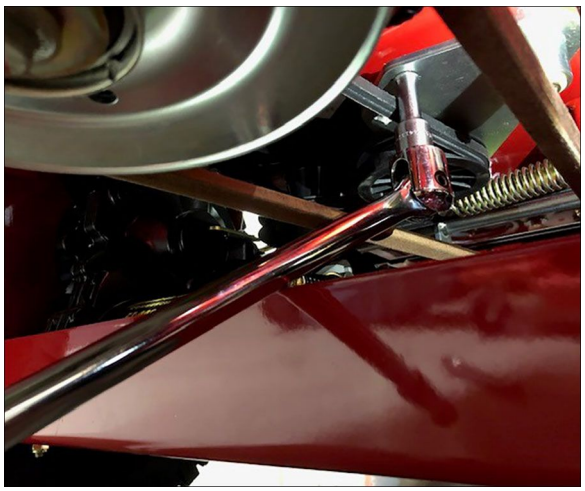
4. Connect the battery by installing the positive cable first, then the negative cable to the battery.

Hydrostatic Drive Transmission Replacement

Hydrostatic Drive Transmission Removal

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.
3. Using an appropriate lifting device, raise the rear of the machine and support.

   Note: Do not raise and support on the hydro plate.
4. Remove the deck belt. Deck Belt Replacement (page 6–4)
5. Using a ½ inch breaker bar, insert into the most accessible square hole of the idler arm.



g346265

Figure 77

6. Turn the breaker bar to release belt tension. Remove the drive belt from the idler pulley.
7. Remove the wheel from the side being serviced.
8. Release the parking brake.
9. ZT 5400 only, remove the 2 brake return springs connecting the brake rod to the hydro plate.
10. Remove the 8 (3/8 inch) (4 per side) locks nuts and bolts securing the hydro plate to the chassis. Remove the hydro plate.
11. Remove the locking cotter pin securing the brake rod to the hydrostatic transaxle. Remove the break rod from the hydrostatic transaxle.
12. Remove the 5/16 inch nut and shoulder bolt securing motion control link to the hydrostatic transaxle.
13. Remove the cartridge filter and drain the hydrostatic transaxle being removed.
14. Remove and plug the spring clamps securing the reservoir hose to the hydrostatic transaxle.

Hydrostatic Drive Transmission Removal (continued)

15. Loosen (do not remove) the 4 (1/2 inch) hydrostatic transaxle mount bolts securing the hydrostatic transaxle to the chassis.
16. While supporting the hydrostatic transaxle being removed, remove the 4 loosened mount bolts from the chassis. Remove the hydrostatic transaxle from the machine.

Hydrostatic Drive Transmission Installation

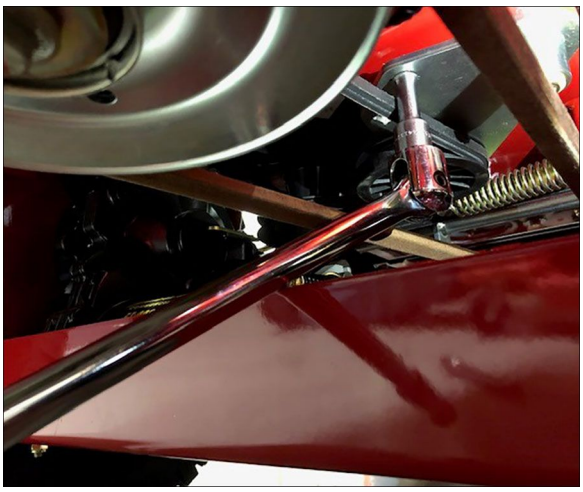
1. Place the hydrostatic transaxle into the machine. While supporting the hydrostatic transaxle being installed, install and finger tighten the 4 chassis mount bolts.



2. Tighten the 4 (1/2 inch) hydrostatic transaxle mount bolts securing the hydrostatic transaxle to the chassis. Torque bolts to 129–155 N •m (95–115 ft-lb).
3. Install the spring clamps securing the reservoir hose to the hydrostatic transaxle.
4. Install the cartridge filter.



5. Install the 5/16 inch nut and shoulder bolt securing motion control link to the hydrostatic transaxle. Torque to 2.3–2.8 N•m (20–25 in-lb).
6. Install the break rod to the hydrostatic transaxle. Install the locking cotter pin securing the brake rod to the hydrostatic transaxle.
7. Install the hydro plate. Install the 8 (3/8 inch) (4 per side) locks nuts and bolts securing the hydro plate to the chassis.
8. ZT 5400 only, install the 2 brake return springs connecting the brake rod to the hydro plate.
9. Set the parking brake.
10. Install the wheel to the side being serviced.
11. Install the drive belt to the idler pulley. Using a ½ inch breaker bar, insert into the most accessible square hole of the idler arm. Turn the breaker bar to add belt tension.



g346265

Figure 78

12. Install the deck belt. Deck Belt Replacement (page 6–4)
13. Using an appropriate lifting device, lower the rear of the machine and support.

Note: Do not lower and support on the hydro plate.

14. Connect the battery by installing the positive cable first, then the negative cable to the battery.

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General Information

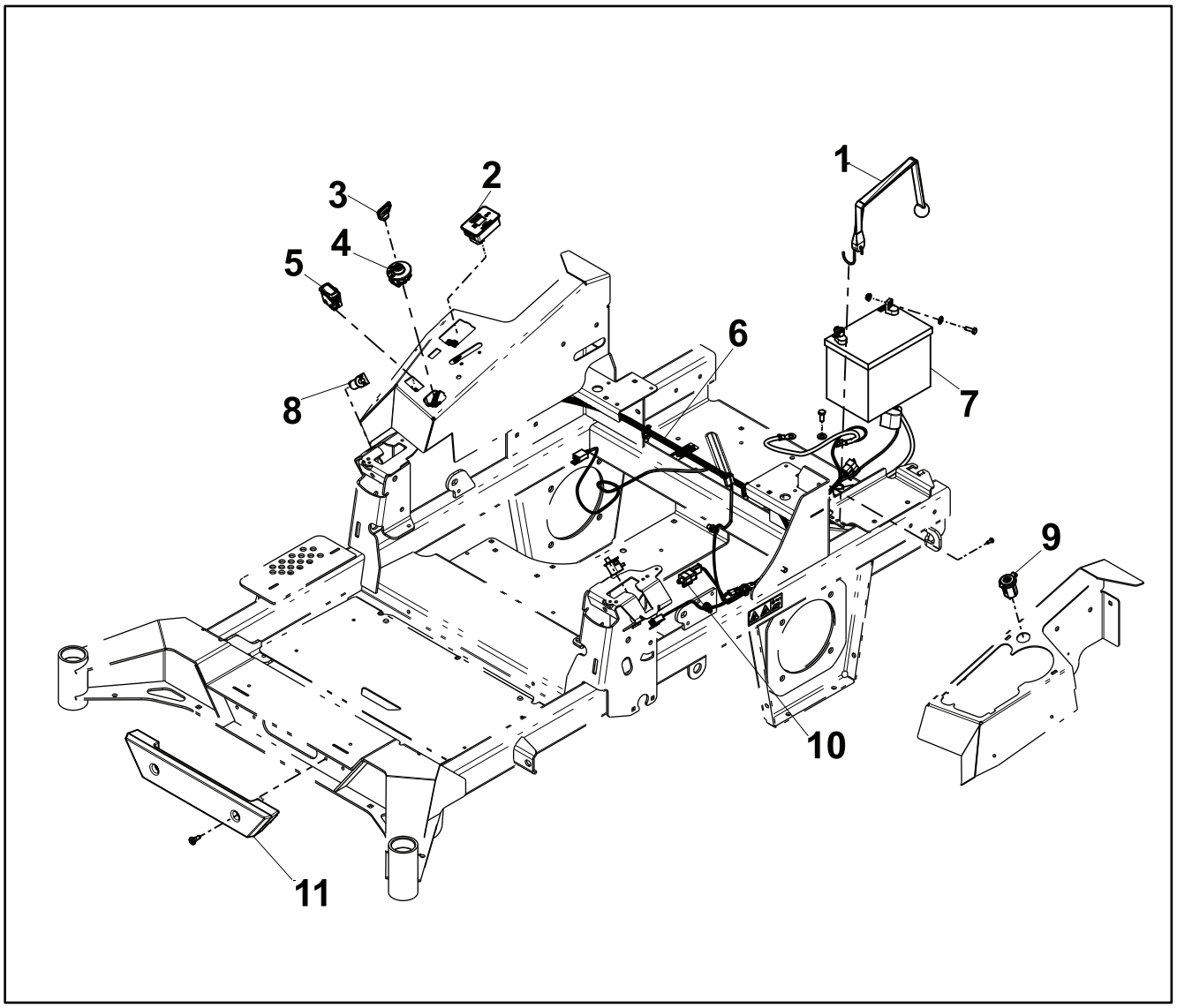
The electrical system operates on 12 VDC. The proper battery size is 300CCA. Before performing any electrical troubleshooting, always:

- Verify proper battery voltage (above 12.4V), batteries reading 12.4v or less are considered discharged.
- Check that all engine and chassis ground wires are securely connected and not damaged.

Use of test lights and continuity testers may result in false readings and lead to an incorrect diagnosis. Use of digital volt ohm meter is necessary for accurate testing.

Service and Repairs

Electrical Assembly



g342240

Figure 79

1. Bungee Strap
2. Module Asm
3. Ignition Key
4. Ignition Switch
5. Rocker Switch
6. Wire Harness
7. Battery
8. Bail Switch
9. USB Power Port
10. Park Brake Switch
11. Front Bumper

Ignition Switch Replacement

Ignition Switch Removal

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.
3. Remove the 4 (1/4-20 inch) torx screws securing the RH side pod to the RH console. Remove the RH side pod from the RH console.
4. Disconnect the wiring harness from the ignition switch.
5. Pinch together the 2 tabs on the ignition switch. Pushing from the bottom side up, remove the ignition switch from the RH side pod.

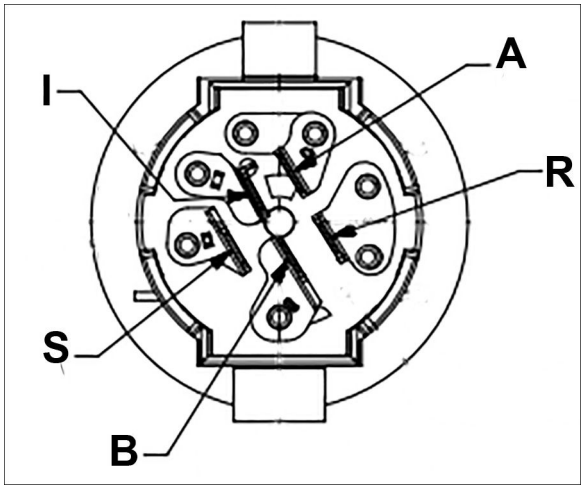
Ignition Switch Installation

1. Install the ignition switch from the RH side pod.
2. Connect the wiring harness from the ignition switch.
3. Install the RH side pod to the RH console. Install the 4 (1/4-20 inch) torx screws securing the RH side pod to the RH console.
4. Connect the battery by installing the positive cable first, then the negative cable to the battery.

Ignition Switch Test

Ignition Switch Wiring Connections:

- B - Battery
- A - Accessory
- S - Starting Circuit
- I - Operator Presence Switch, Safety Interlock Switches
- R - Battery Voltage (constant power)



g353109

Figure 80

---

1. Remove the control panel from the right console.
2. Disconnect the ignition switch from the wire harness.
3. Using a digital multi-meter set to the OHM or Continuity setting, verify that continuity exists between the terminals listed for each switch position.

Ignition Switch Test (continued)

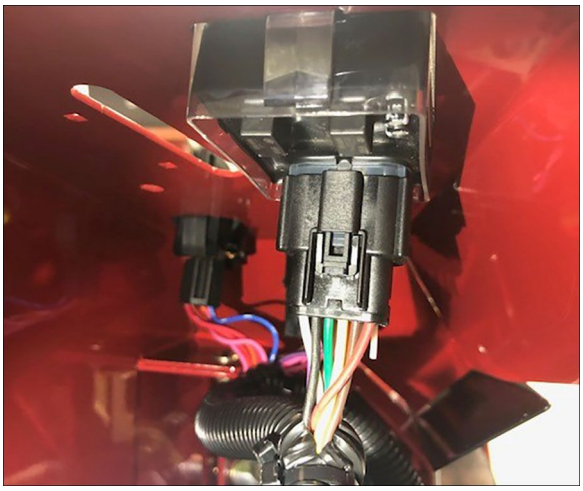
4. Using a digital multi-meter set to the OHM or Continuity setting, verify that NO continuity exists between the terminals not listed for each switch position.

Position	Circuit "Make"
OFF	None
RUN	B+R+I+A
START	B+R+I+S

Hourmeter Replacement

Hourmeter Removal

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.
3. Remove the 4 (1/4-20 inch) torx screws securing the RH side pod to the RH console. Remove the RH side pod from the RH console.
4. Disconnect the wiring harness from the hourmeter.



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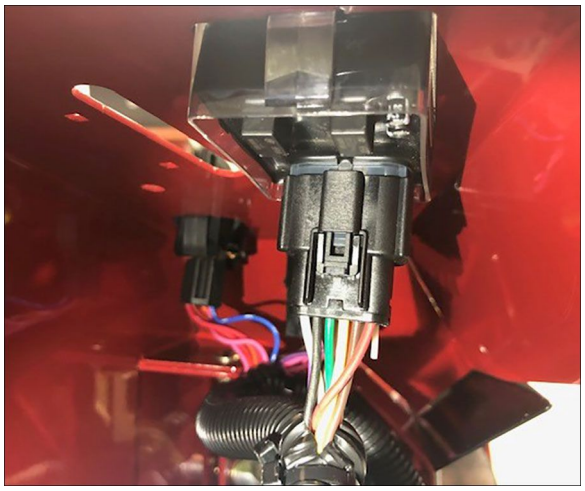
Figure 81

5. Pinch together the 2 tabs on the hourmeter. Pushing from the bottom side up, remove the hourmeter from the RH side pod.

Hourmeter Installation

1. Install the hourmeter into the RH side pod.
2. Connect the wiring harness from the hourmeter.

Hourmeter Installation (continued)



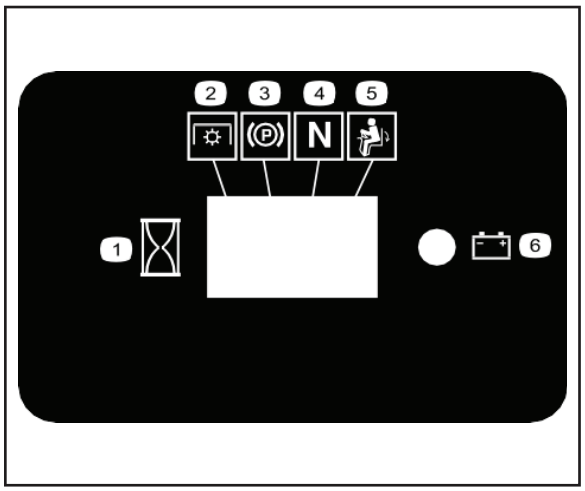
g346221

Figure 82

3. Install the RH side pod to the RH console. Install the 4 (1/4-20 inch) torx screws securing the RH side pod to the RH console.
4. Connect the battery by installing the positive cable first, then the negative cable to the battery.

Hourmeter Test

With the ignition switch in the RUN position and the PTO switch closed (ON), verify battery voltage and ground to the hourmeter.



g336418

Figure 83

Left and Right Neutral Switch Replacement

Left and Right Neutral Switch Removal

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.

Left and Right Neutral Switch Removal (continued)

3. Remove the 4 (1/4-20 inch) torx screws securing the side pod to the console. Remove the side pod from the console.
4. Push on the 2 tabs on either side of the neutral switch and push the switch through the mount hole to remove.

Left and Right Neutral Switch Installation

1. Install the neutral switch to the mount hole on the machine.
2. Install the side pod onto the console. Install the 4 (1/4-20 inch) torx screws securing the side pod to the console.
3. Connect the battery by installing the positive cable first, then the negative cable to the battery.

Left and Right Neutral Switch Test

The neutral switch is a single pole plunger type switch (normally open) with two terminals. When the plunger is depressed, the circuit closes and there is continuity between the terminals.

Motion control levers in neutral position (OUT), the switch will have continuity (closed).

Motion control levers in the operating position (IN), the switch will NOT have continuity (open).



g336403

Figure 84

Park Brake Switch Replacement

Park Brake Switch Removal

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.
3. Remove the 2 (5/16 inch) screws securing the park brake switch bracket to the chassis.
4. Pull the park brake switch bracket away from the chassis and unplug.
5. Remove the park brake switch from the park brake switch bracket.

Park Brake Switch Installation

1. Install the park brake switch to the park brake switch bracket.
2. Install the park brake switch bracket into the chassis and connect.
3. Install the 2 (5/16 inch) screws securing the park brake switch bracket to the chassis.
4. Install the 2 (5/16 inch) screws securing the park brake switch bracket to the chassis.

Park Brake Switch Test

The parking brake switch is a single pole plunger type switch (normally open) with two terminals. When the plunger is depressed (parking brake ON), the circuit closes and there is continuity between the terminals. This allows battery voltage to flow to the rest of the safety interlock system.

Parking brake ON, the switch should have continuity (closed).

Parking brake OFF, the switch should NOT have continuity (open).

PTO Switch Replacement

PTO Switch Removal

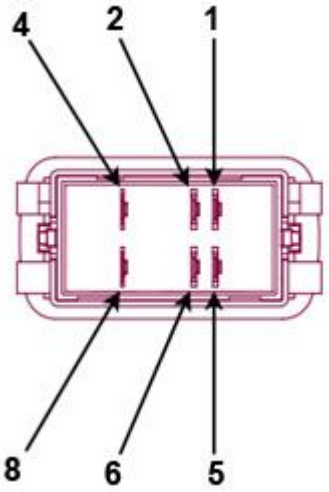
1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.
3. Remove the 4 (1/4-20 inch) torx screws securing the RH side pod to the RH console. Remove the RH side pod from the RH console.
4. Disconnect the wiring harness from the PTO switch.
5. Pinch together the 2 tabs on the PTO switch. Pushing from the bottom side up, remove the PTO switch from the RH side pod.

PTO Switch Installation

1. Install the PTO switch to the RH side pod.
2. Connect the wiring harness to the PTO switch.
3. Install the RH side pod to the RH console. Install the 4 (1/4-20 inch) torx screws securing the RH side pod to the RH console.
4. Connect the battery by installing the positive cable first, then the negative cable to the battery.

PTO Switch Test

1. Remove and disconnect the PTO switch.
2. With the switch in the “ON” position



g349741

Figure 85

3. Using a digital multi-meter set to the OHM or Continuity setting, verify the following:
   - Pin 2 and 4 should have continuity (closed)
   - Pin 6 and 8 should have continuity (closed)
   - Pin 2 and 1 should NOT have continuity (open)
   - Pin 6 and 5 should NOT have continuity (open)
4. With the switch in the OFF position (button pushed IN):
   - Pin 2 and 1 should have continuity (closed)
   - Pin 6 and 5 should have continuity (closed)

Electric PTO Clutch Replacement

The PTO clutch electronically controls the engagement and disengagement of the PTO pulley (deck belt).

The PTO clutch is composed of three major components:

- Field
- Clutch Plate
- Friction Plate

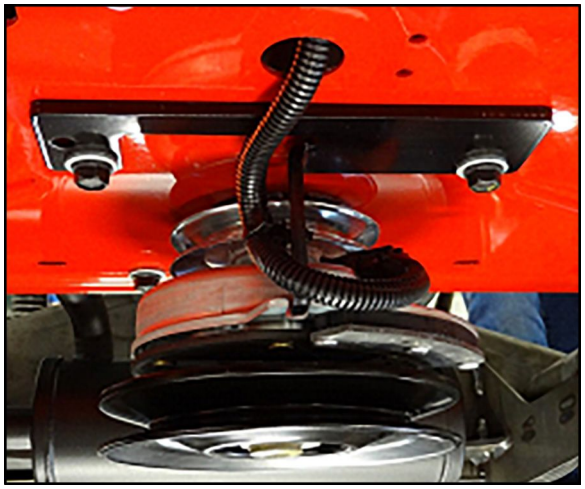
The clutch plate always turns with the engine (crankshaft). The field is a coil of wire on an iron core which becomes an electromagnet when power is applied. The friction plate is the only piece that moves vertically on the crankshaft. It is normally spring loaded so that it is not in contact with the clutch plate and is pressed against the brake material opposite the clutch plate. When power is applied, the friction plate is pulled toward the clutch plate and the two rotate as one. When the clutch plate and the friction plate rotate as different speeds it is known as clutch slipping.

Electric PTO Clutch Removal

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.

Electric PTO Clutch Removal (continued)

3. Raise and support the unit so that the drive wheels are off the ground.
4. Remove the deck belt. Deck Belt Replacement (page 6–4)
5. Disconnect the clutch wire connector from the clutch.



g336161

Figure 86

6. Remove the clutch mounting bolt and washers. Slip the clutch off of the crankshaft.

Electric PTO Clutch Installation

1. Install the clutch onto the crankshaft verifying that the slot in the clutch aligns with the tab on the clutch anchor



2. Install the 2 spring washers, flat washer and clutch bolt. Torque the clutch bolt to 67–82 N•m (49 ± 61 ft-lb).
3. Connect the clutch power wire to the clutch.

   Note: Verify the wire harness is properly routed to avoid contact with the mower belt or drive belt.



g336162

Figure 87

4. Connect the battery by installing the positive cable first, then the negative cable to the battery.

Electric PTO Clutch Installation (continued)

5. Lower the unit and verify proper function.

Coil Resistance Measurement Test

If the PTO clutch is not engaging or is suspect as a cause of electrical problems, use the following electrical troubleshooting steps. These procedures will help determine if the clutch has failed as a result of or is the cause of an electrical problem.

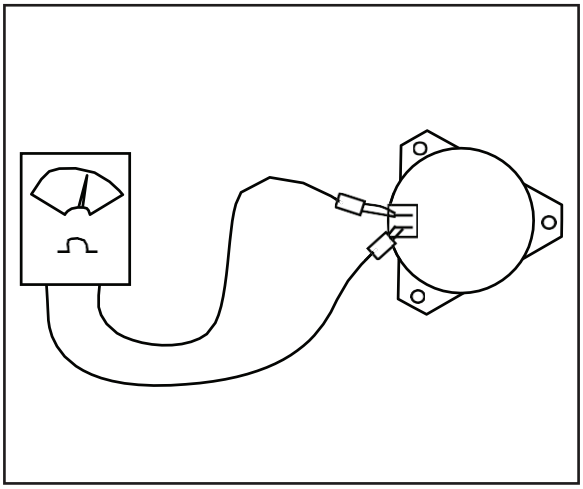
1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the clutch wire connector.
3. Set the multi-meter to measure resistance (OHMs setting).
4. Connect the meter lead wires to the terminals in the clutch connector.
5. See the PTO Clutch Electrical Specifications chart.

PTO Clutch Electrical Specification Chart

Resistance (OHMs)	AMP Draw	Continuity to Ground	Clutch
2.29 ± 5%	5.24	OPEN	116–1947
1.84 ± 5%	6.53	OPEN	116–1620

PTO Clutch Continuity to Ground Check Test

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the clutch wire connector.
3. Set the multi-meter to measure resistance (OHM setting).
4. Connect one multi-meter lead to the engine, chassis or battery ground. Connect the other multi-meter lead to each of the clutch connector terminals.
5. The clutch connector terminals should never have continuity to ground and should be OPEN at all times.
6. If continuity is found between the PTO connector and ground, the PTO clutch and the PTO switch must be replaced.

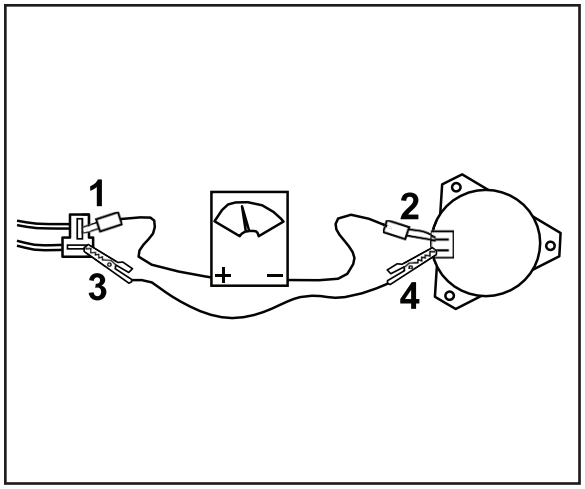


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Figure 88

Measuring Clutch Current Draw Test

Note: Do not measure current draw if the clutch has shorted to ground or if the resistance measurement is out of specification.



g336411

Figure 89

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the clutch wire connector.
3. Set the multi-meter to measure amps (10 amp scale).
4. Connect the positive meter lead to the chassis harness terminal 1.
5. Connect the negative meter lead to the corresponding wire terminal 2.
6. Connect a short jumper lead from terminal 3 to terminal 4.
7. Turn the ignition switch to RUN and the PTO switch to the ON position.
8. Record the amp reading and refer to the PTO Clutch Electrical Specification Chart below.

PTO Clutch Electrical Specification Chart

Resistance (OHMs)	AMP Draw	Continuity to Ground	Clutch
2.29 ± 5%	5.24	OPEN	116–1947
1.84 ± 5%	6.53	OPEN	116–1620

Electric Deck Lift Switch Replacement

Electric Deck Lift Switch Removal

1. Park the machine on a level surface and disengage the PTO. Stop the engine, wait for all moving parts to stop and remove the key. Engage the parking brake.
2. Disconnect the battery by removing the negative cable first, then the positive cable from the battery.
3. Remove the 2 Philips head screws securing the deck lift switch to the motion control lever.
4. Take note of the wire orientation, unplug the 3 terminals from the deck lift switch. Remove the deck lift switch.

Electric Deck Lift Switch Installation

1. Install the deck lift switch. Plug the 3 terminals into the deck lift switch.
2. Install the 2 Philips head screws securing the deck lift switch to the motion control lever.
3. Connect the battery by installing the positive cable first, then the negative cable to the battery.

Appendix A

Foldout Drawings

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Electrical Drawing Abbreviations

The following abbreviations are used for wire harness colors on the electrical schematics and wire harness drawings in this chapter.

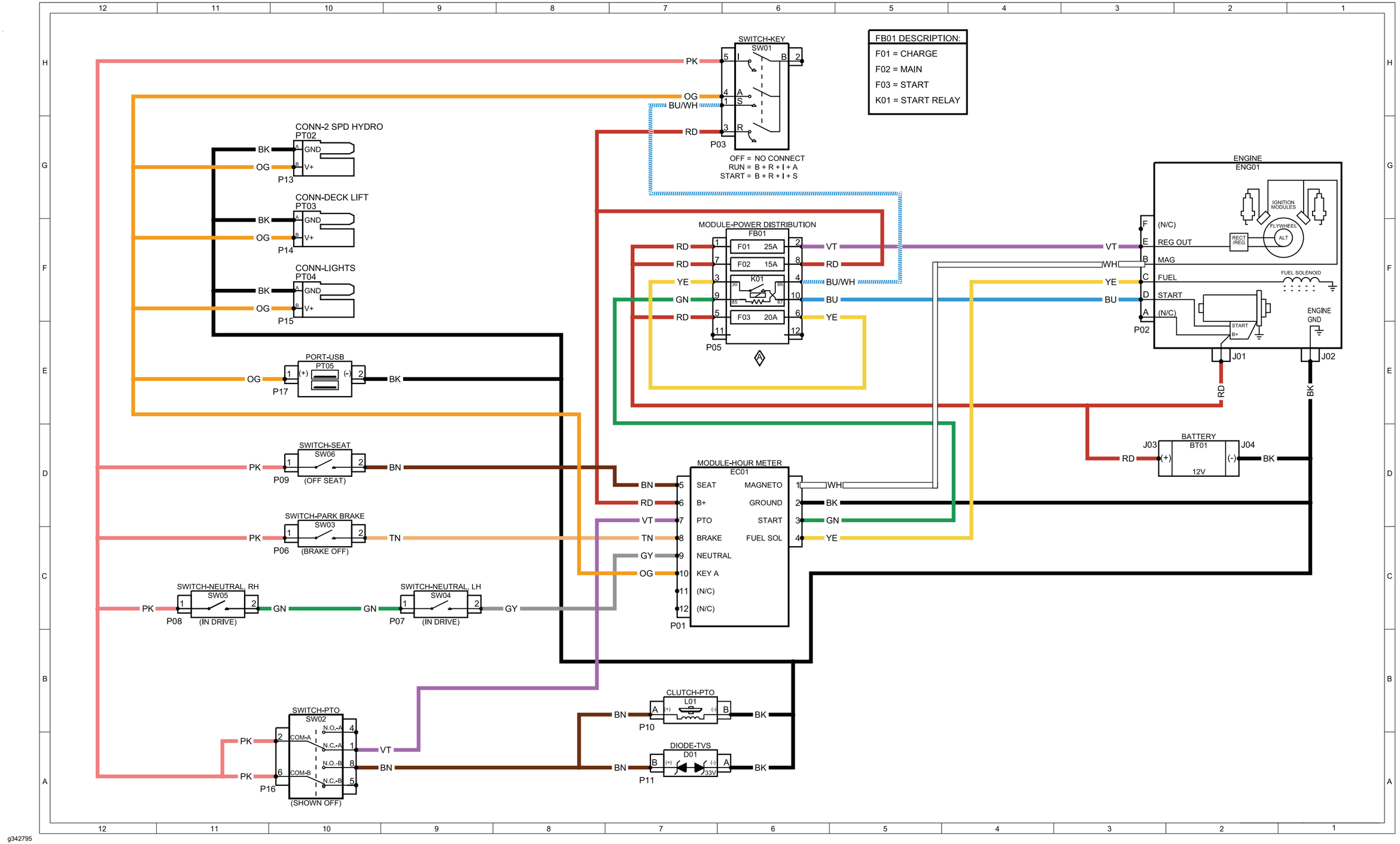
Abbreviation	Color
BK	Black
BR or BN	Brown
BU	Blue
GN	Green
GY	Gray
OR or OG	Orange
PK	Pink
R or RD	Red
T or TN	Tan
VIO or VT	Violet
W or WH	White
Y or YE	Yellow

Numerous harness wires include a line with an alternate color. These wires are identified with the wire color followed by a / or _ and then the line color (e.g, R/BK is a red wire with a black line; OR_BK is an orange wire with a black line).

Note: The electrical harness drawings in this chapter identify both the wire color and the wire gauge. For example, 16 BK on a harness diagram identifies a 16 gauge wire with black insulation.

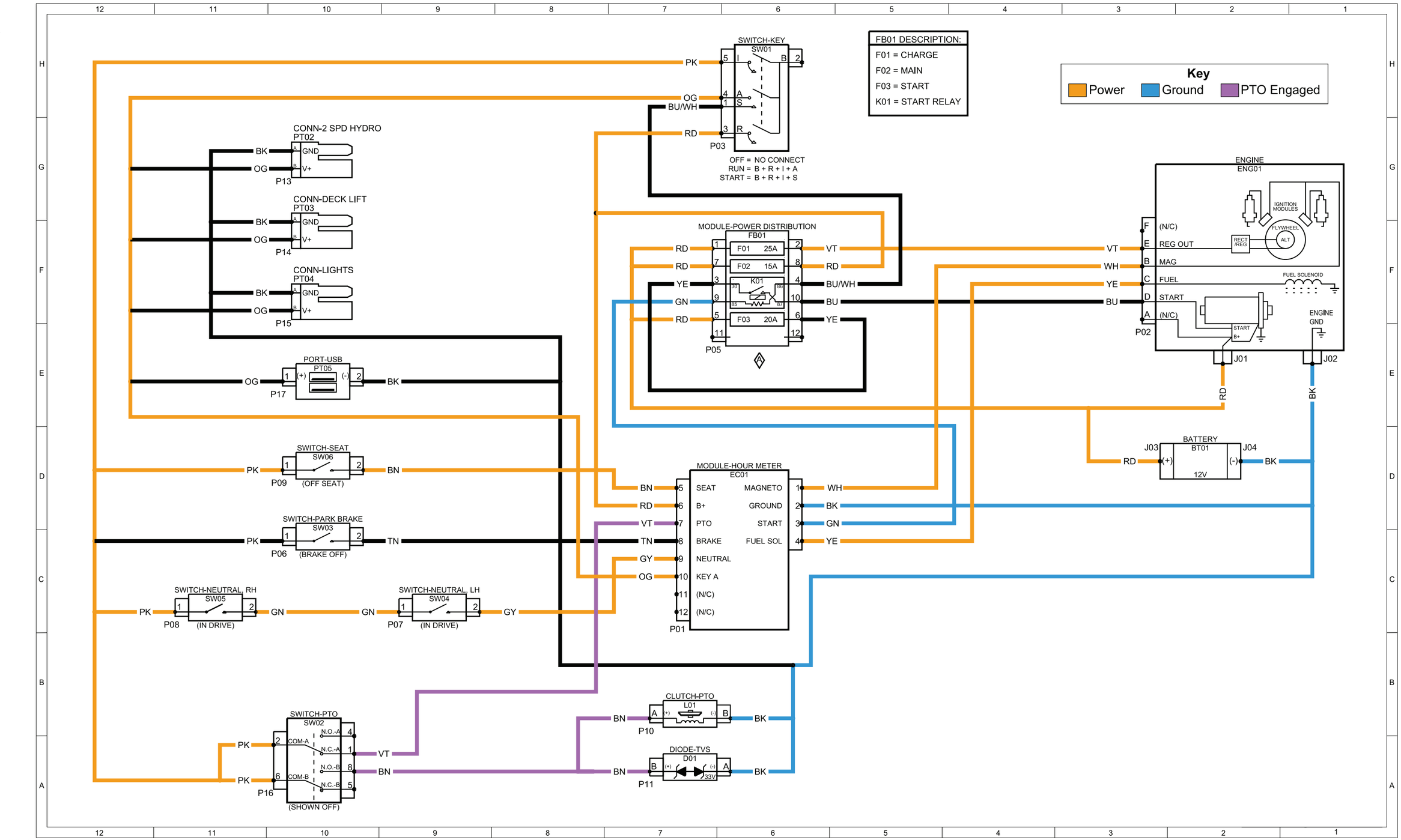
Note: A splice used in a wire harness will be identified on the wire harness diagram by SP. The manufacturing number of the splice is also identified on the wire harness diagram (e.g., SP01 is splice number 1).

Electrical Schematic



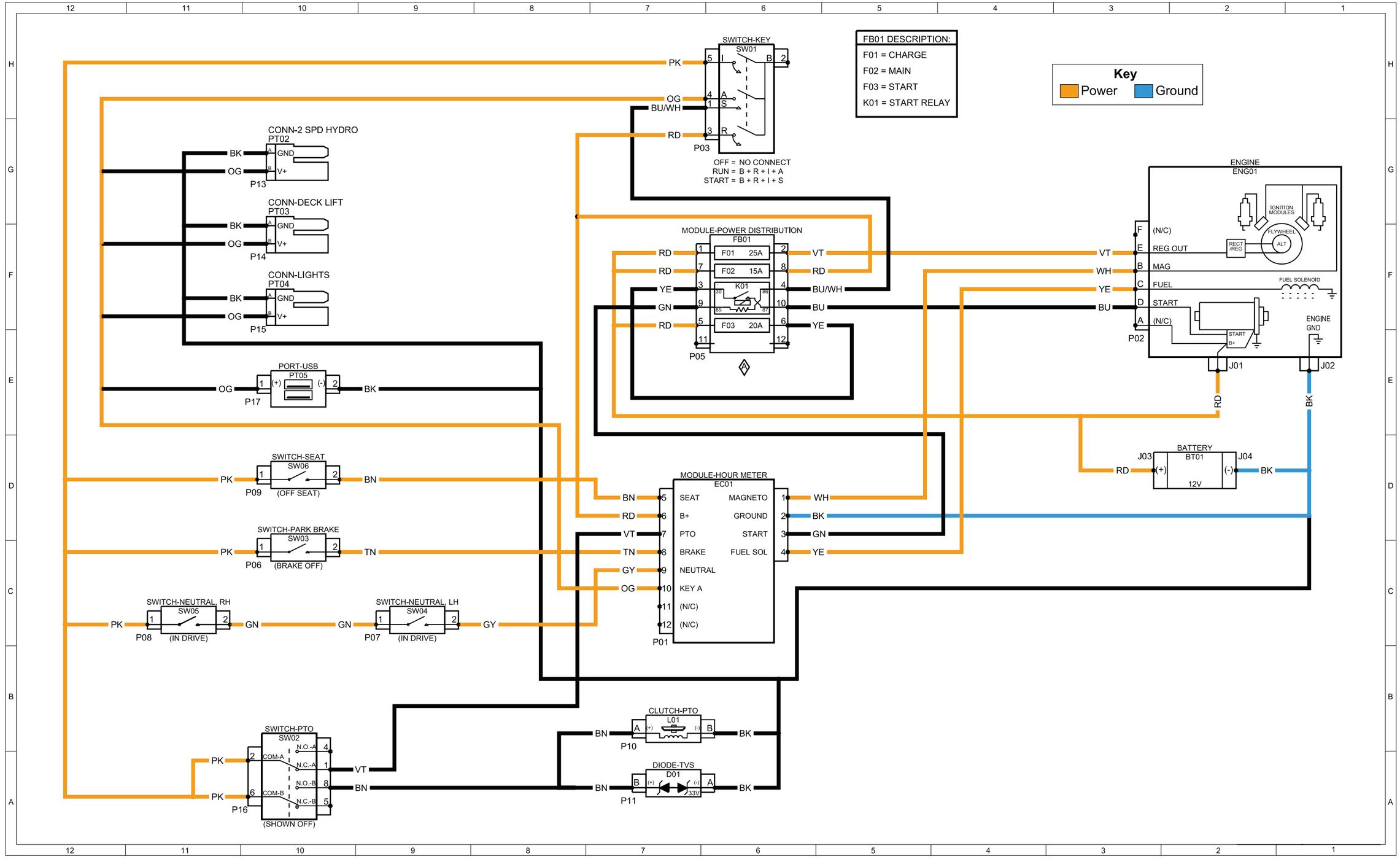
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Electrical PTO Engaged Schematic



g346038

Electrical Run Position



g346039

Electrical Start Position

FB01 DESCRIPTION:
F01 = CHARGE
F02 = MAIN
F03 = START
K01 = START RELAY

Key
Power
Ground
Start

SWITCH-KEY
SW01
PK
OG
BU/WH
RD
P03
OFF = NO CONNECT
RUN = B + R + I + A
START = B + R + I + S

CONN-2 SPD HYDRO
PT02
BK GND
OG V+
P13

CONN-DECK LIFT
PT03
BK GND
OG V+
P14

CONN-LIGHTS
PT04
BK GND
OG V+
P15

PORT-USB
PT05
OG
P17
BK

MODULE-POWER DISTRIBUTION
FB01
F01 25A
F02 15A
K01
F03 20A
P05

ENGINE
ENG01
IGNITION MODULES
FLYWHEEL
RECT /REG
ALT
FUEL SOLENOID
ENGINE GND
F (N/C)
E REG OUT
B MAG
C FUEL
D START
A (N/C)
P02
J01
J02

BATTERY
BT01
J03 (+)
J04 (-)
12V
RD
BK

SWITCH-SEAT
SW06
PK
P09
(OFF SEAT)
BN

SWITCH-PARK BRAKE
SW03
PK
P06
(BRAKE OFF)
TN

SWITCH-NEUTRAL, RH
SW05
PK
P08
(IN DRIVE)
GN

SWITCH-NEUTRAL, LH
SW04
GN
P07
(IN DRIVE)
GY

MODULE-HOUR METER
EC01
SEAT
B+
PTO
BRAKE
NEUTRAL
KEY A
(N/C)
(N/C)
MAGNETO
GROUND
START
FUEL SOL
P01

SWITCH-PTO
SW02
PK
PK
COM-A
COM-B
N.O.-A
N.C.-A
N.O.-B
N.C.-B
P16
(SHOWN OFF)
VT
BN

CLUTCH-PTO
L01
BN
P10
BK

DIODE-TVS
D01
33V
BN
P11
BK

g346040