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TORO

Count on it.

Service Manual

60v WPM Service Manual

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8111 Lyndale Avenue South
Bloomington, MN 55420

Original Instructions (EN)

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

RLC/SWS Customer Care Department

8111 Lyndale Avenue South

Bloomington, MN 55420

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.

Table of Contents

Chapter 1

Safety

Table of Contents

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 the skin and cause serious injury. Seek medical attention right away if hydraulic fluid gets in the skin.

Personal Protective Equipment…

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 over load 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…

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

Table of Contents

Specifications

Product Specifications		
Model	**20363**	**20366**
Motor	60 volt, 2kW motor	
Battery	6.0Ah battery (1/3 acres of cut)	7.5Ah battery (approx. .4 Acres of cut)
Charge Time	2 amp charger, 6.0Ah battery takes about 3 hours to charge	2 amp charger, 7.5 Ah battery takes about 3 hours and 45 minutes to charge

If the battery is over the charging temperature limit (which is lower than operational temperature limit) the battery will take longer to charge because the charger will not charge the battery until the battery is sufficiently cooled and the battery is under the charging temperature limit.

Battery and performance run time are subject to lawn conditions.

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

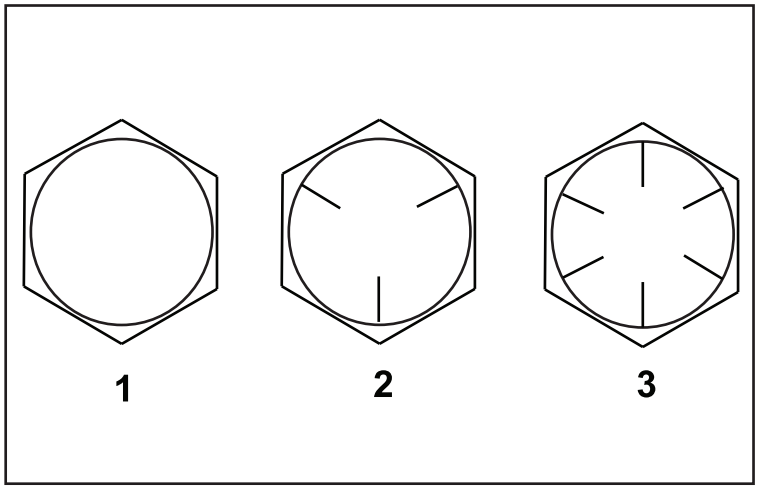

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Figure 1

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

Metric Bolts and Screws

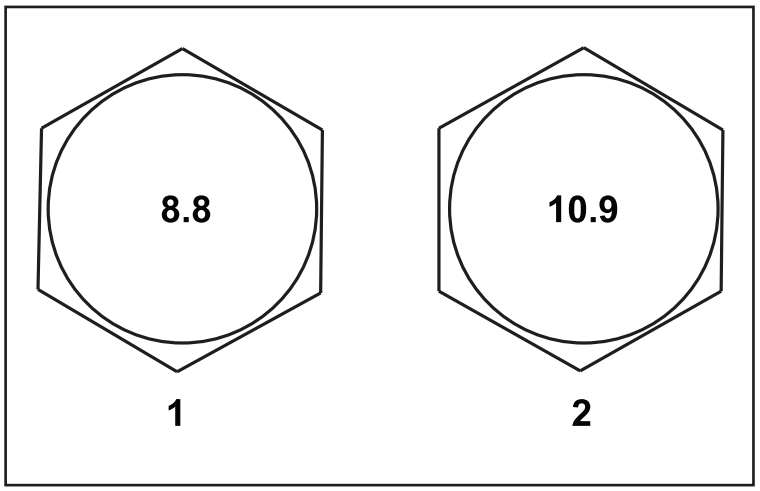

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Figure 2

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, Studes & 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-lbs.	**N-m**	**ft-lbs.**	**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 Nm
M12 X 1.5 Class 8.8	80 ± 10 ft-lb.	108 ± 14 Nm

**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

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 tool will not operate	The charger is not charging the battery.	1. Is the charger physically damaged? If yes, replace the charger. 2. Check if LEDs light up on the battery. If the LEDs do not light up when the battery State of Charge (SOC) button is pressed, replace the battery. 3. When the battery is docked, the battery State of Charge (SOC) LEDs should cycle (if the SOC button is pushed immediately before docking the battery), the LEDs will not cycle when the battery is docked. Wait approximately 30 seconds between pressing the SOC button on the battery and docking the battery to test. If the battery LEDs do not cycle when placed on the charger, but do cycle when the SOC button is pressed, the charger will need to be replaced. 4. If none of the above steps resolved the issue or no lights are visible on the charger, replace the charger.
	The battery is not taking a charge.	1. Is the battery physically damaged? If yes, replace the battery. 2. Install the battery on the charger. If the charger light blinks green, the battery is charging. If no lights blink on the charger, replace the charger. 3. If the LEDs on the battery do not turn on when the State of Charge (SOC) button is pressed on the battery, replace the battery.
	The tool is not functioning.	1. Is the tool physically damaged? If yes, repair/replace the tool. 2. Verify safety switch functionality. 3. Check to make sure the battery is charged. If it's not charged, follow the battery and charger testing procedure. If the battery is charged and tool is not functioning, replace/repair the tool.

Error Beep Table

Error Type	Number of Beeps	Next Step
Communication Error	2	1. Verify motor driver and battery functionality. 2. Replace motor driver and/or battery as necessary.
Time Out Error	3	1. Verify motor driver and battery functionality. 2. Replace motor driver and/or battery as necessary.
Motor Driver Error	4	1. Verify motor driver functionality. 2. Replace motor driver as necessary.
Motor Driver Error	5	1. Verify motor driver functionality. 2. Replace motor driver as necessary.
Hall Sensor Error	6	1. Verify the error occurs. 2. Replace the motor.
Motor Driver Error	7	1. Verify motor driver functionality. 2. Replace motor driver as necessary.
Communication Low Error from Battery, Low Power	8	1. Charge the battery. 2. Replace as necessary.
Motor Driver Block Error	9	1. Verify motor driver functionality. 2. Replace motor driver as necessary.
Internal Error Code	10	1. Verify motor driver functionality. 2. Replace motor driver as necessary.
Communication High Error from Battery Communication	11	1. Verify motor driver functionality. 2. Replace motor driver as necessary.
Motor Error	12	1. Verify motor driver functionality. 2. Replace motor driver as necessary.
Current Error	13	1. Cutting motor overloaded. Reduce load. 2. Verify cutting chamber is free from debris and deck is clean.
Precharge Error	14	1. Verify motor driver functionality. 2. Replace motor driver as necessary.
Gryoscope Error	15	1. Place mower flat on the ground and try again. 2. If same error occurs, replace the motor driver.
Temp Error	16	1. Discontinue use and allow the machine to cool. 2. If same error occurs, replace the motor driver.
Calibration Error	18	1. Verify motor driver and battery functionality. 2. Replace motor driver and/or battery as necessary.

Chapter 4

Power Head Assembly

Table of Contents

General Information

Both models 20363/20361 power head assemblies are secured to the mower chassis by 3 mounting bolts. The 20363 model (Personal Pace unit) has an added belt driver, belt guide, and belt cover. In addition, the model has traction/drive cable for transmission engagement.

Service and Repairs

20363 with Personal Pace 22 inch Recycler Power Head Assembly

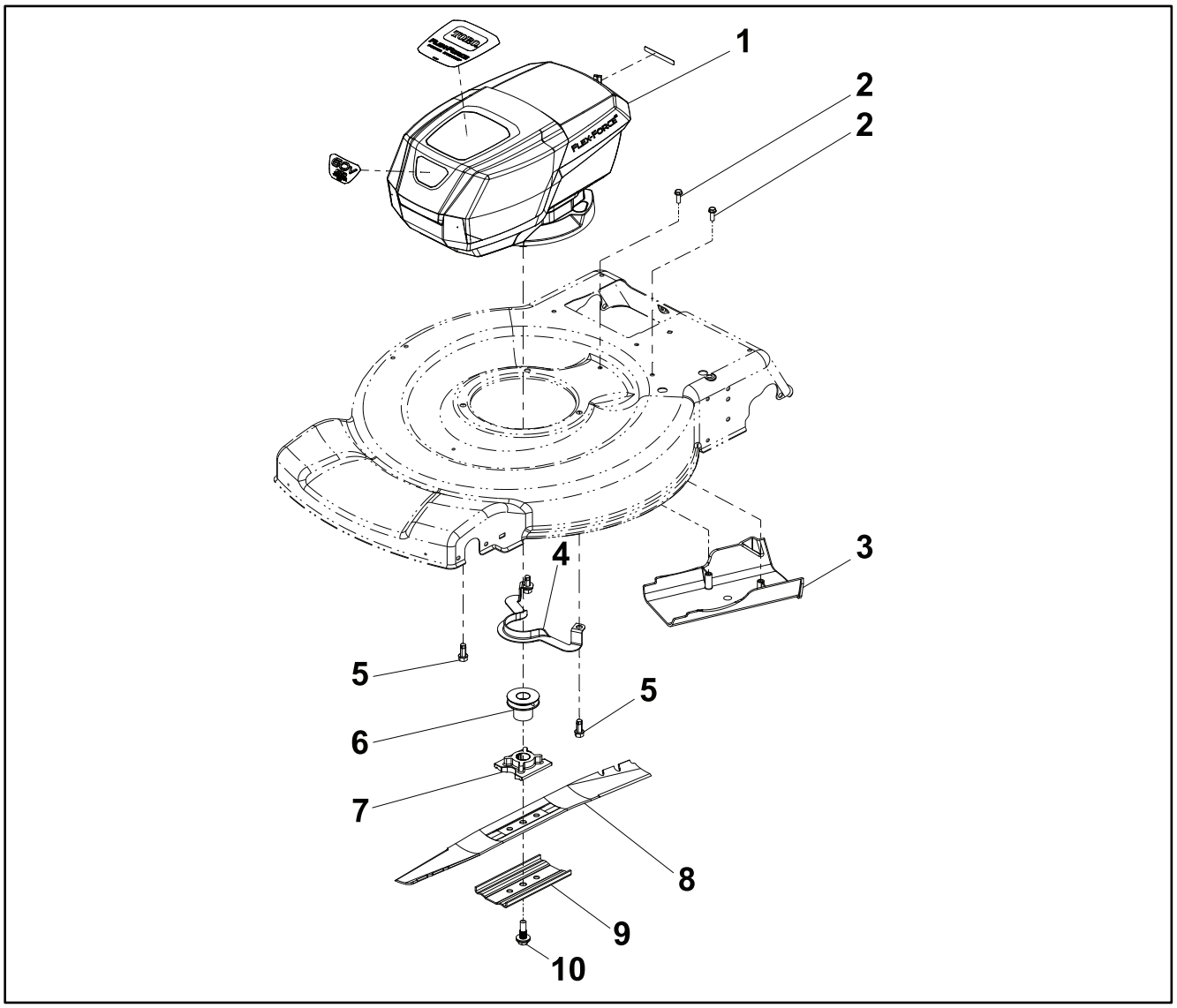

Figure 3

1. Motor Module
2. HWH Screw
3. Belt Cover
4. Belt Guide
5. Taptite Screw
6. Pulley
7. Blade Retainer
8. Blade
9. Blade Support
10. Blade Bolt

20361 22 inch Recycler Power Head Assembly

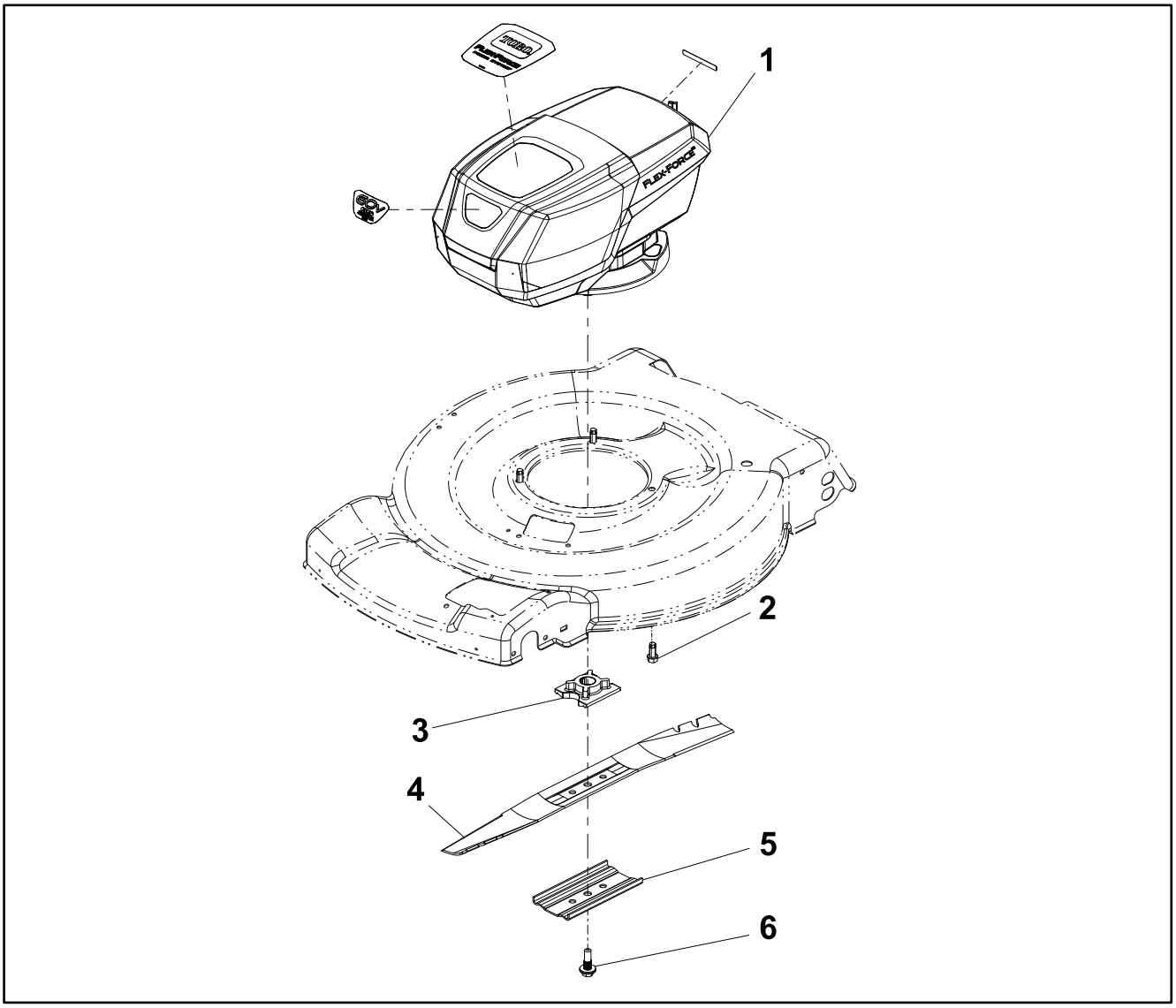

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Figure 4

1. Motor Module
2. HWH Form THD Screw
3. Taptite Screw
4. Blade
5. Blade Support
6. Blade Bolt

20363 with Personal Pace 22 inch Recycler Power Head Assembly Replacement

20363 with Personal Pace 22 inch Recycler Power Head Assembly Removal

1. Park the machine on a level surface and set the parking brake. Stop the motor, wait for all moving parts to stop and remove the key.
2. Remove the brake cable from the bail.
3. Disconnect the brake cable from the power head.

g297088

Figure 5

4. Remove the harness from the power head by squeezing the tabs on the side of the connector and pull downward.

g296400

Figure 6

5. Pull the harness anchor out of the power head. If the harness anchor is damaged, replace.

6. Remove the blade and blade bolt from the machine. See the operator's manual.
7. Remove the keyed blade driver from the power head shaft.

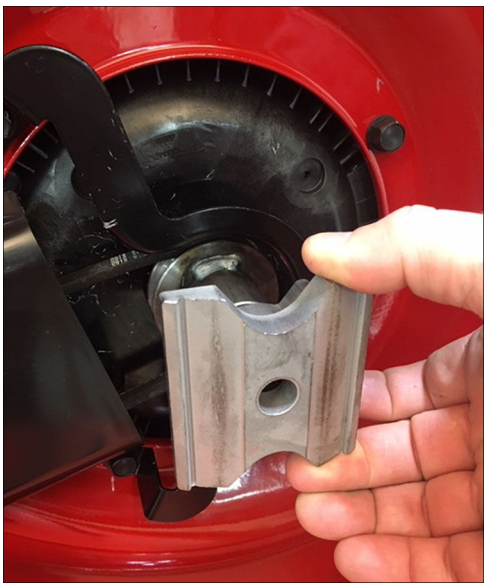

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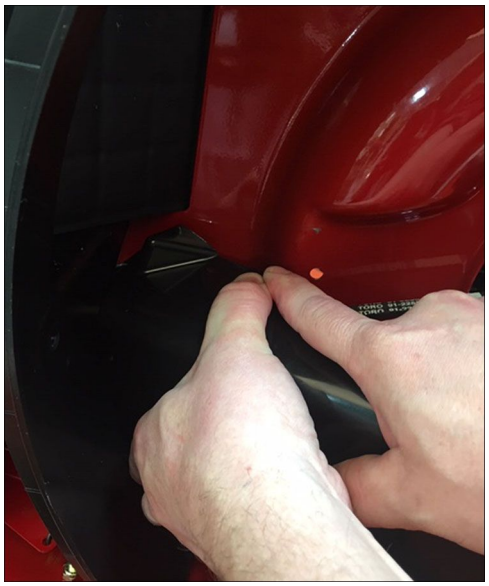
Figure 7

8. Remove the 2 (3/8 inch) screws securing the top side of chassis to the belt cover.

g296514

Figure 8

9. Squeeze and hold down on the belt cover and remove from the chassis.



g296525

Figure 9

10. Remove the 2 (1/2 inch) motor mounting bolts securing the belt guide to the chassis.

g296526

Figure 10

11. Remove the belt from the pulley driver.

20363 with Personal Pace 22 inch Recycler Power Head Assembly Removal (continued)

g296528

Figure 11

12. Remove the pulley driver from the motor shaft.

g295231

Figure 12

13. Using an appropriate lifting device, support the motor and remove the last (1/2 inch) motor mount bolt from the chassis.

20363 with Personal Pace 22 inch Recycler Power Head Assembly Installation

1. Using an appropriate lifting device, support the motor. Install the 1 (1/2 inch) motor mount bolts securing the motor to the chassis. Torque motor mount bolts to 450 in-lbs. (50.8 Nm).

2. Install the pulley driver to the motor shaft.

g295231

Figure 13

3. Install the belt to the pulley driver.

g296528

Figure 14

4. Install the 2 (1/2 inch) motor mounting bolts securing the belt guide to the chassis. Torque motor mount bolts to 450 in-lbs. (50.8 Nm).

g296526

Figure 15

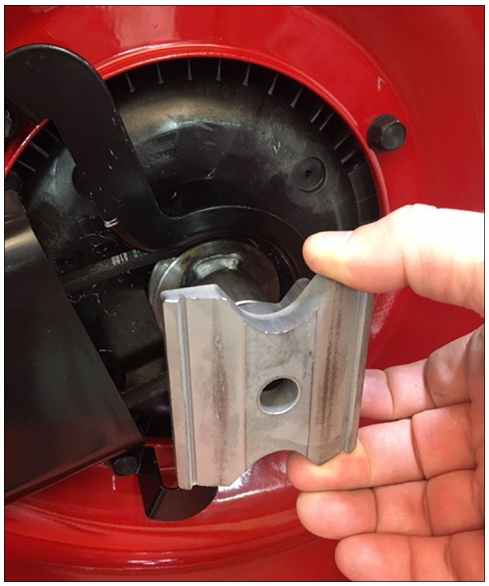
5. Install the belt cover to the chassis.

6. Install the 2 (3/8 inch) screws securing the top side of the chassis to the belt cover. Torque screws to 30 in-lbs. (3.39 Nm).

g296514

Figure 16

7. Install the keyed blade driver to the power head shaft.



g295229

Figure 17

8. Install the blade to the machine. Secure with the blade bolt. Torque blade bolt to 50 ft-lbs. (68 Nm).
9. Install the harness anchor onto the power head.
10. Install the harness to the power head.
11. Connect the brake cable to the power head.
12. Install the brake cable to the bail and power head assembly.

20361 22 inch Recycler Power Head Assembly Replacement

20361 22 inch Recycler Power Head Assembly Removal

1. Park the machine on a level surface and set the parking brake. Stop the motor, wait for all moving parts to stop and remove the key.
2. Remove the brake cable from the bail and power head assembly.
3. Disconnect the brake cable from the power head.
4. Remove the blade from the machine.
5. Remove the 3 (1/2 inch) power head mounting bolts from the machine.
6. Remove the zip tie. Disconnect the power cord from the power head assembly.
7. Remove the power head assembly from the machine.

20361 22 inch Recycler Power Head Assembly Installation

1. Using an appropriate lifting device with the machine on it's side, support the motor. Install the 3 (1/2 inch) motor mount bolts securing the motor to the chassis. Torque motor mount bolts to 450 in-lbs. (50.8 Nm).
2. Connect the power cord to the power head to the power head assembly. Secure power cord to the chassis with a zip tie.

20361 22 inch Recycler Power Head Assembly Installation (continued)

3. Install the blade to the machine. Secure with the blade bolt. Torque blade bolt to 50 ft-lbs. (68 Nm).
4. Connect the brake cable to the power head.
5. Install the brake cable to the bail and power head assembly.

Chapter 5

Controls

Table of Contents

General Information

Unit has 2 controls for operation; starter switch and safety bail. Both controls are normally open circuits and needed for machine operation. When the starter switch has the key present and blue button pushed, depressing both internal switches, the circuits are then closed. When the bail is pulled, closing the circuit, the motor/driver is signaled to turn on. The starter switch returns to an open state after being pushed. The safety bail switch will need to stay in the closed circuit (pulled) position for operation. Once the bail switch is opened (released), the motor drive will be powered down.

Starter Switch

When the key is inserted in the starter switch, the key makes contact with the switch on the left side of the board. When the blue button is depressed, it makes contact with the right hand side switch. The switch housing has 3 Phillip head screws holding the assembly together. The assembly has a spring loaded retainer to hold the key in place when installed in the housing assembly.

Service and Repairs

Starter Switch Assembly

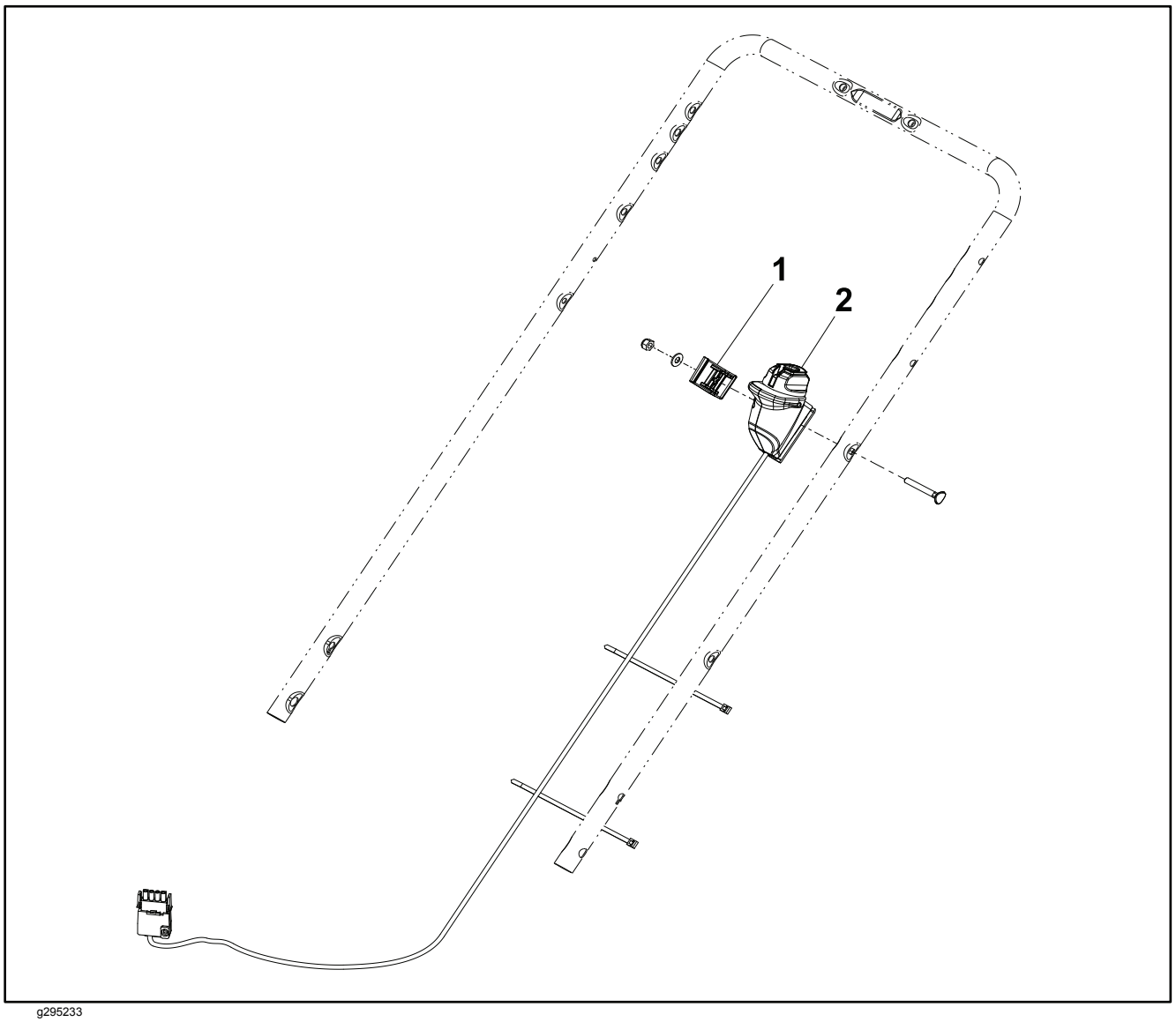


Figure 18

1. Cable Clamp
2. Starter Switch Asm.

Figure 18 (continued)

Safety Bail Switch Assembly

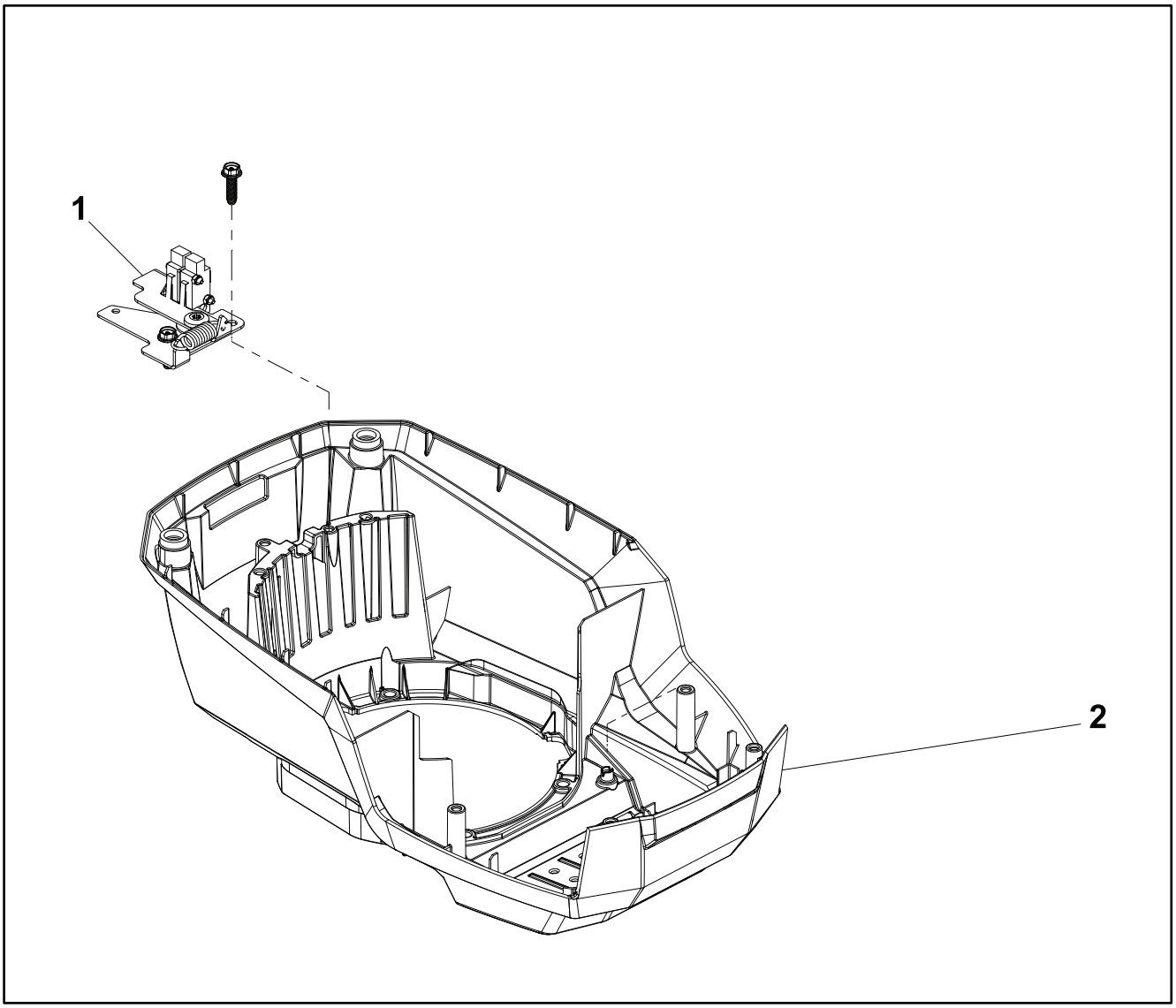


Figure 19

1. Safety Bail Switch
2. Lower Shroud

Starter Switch Replacement

Starter Switch Removal

1. Remove the ½ inch nut securing the start switch handle assembly.

g296539

Figure 20

2. Remove the starter switch from the machine.
3. Remove the harness and connector.

g296540

Figure 21

4. Remove the zip tie from the power head securing the harness. Unplug the harness from the power head by pressing the tabs on the outside of the plug and pulling downward.

Starter Switch Removal (continued)

g296541

Figure 22

Starter Switch Harness Testing

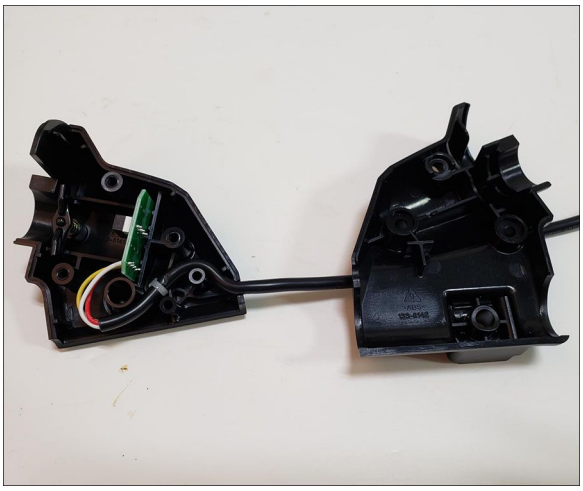
Continuity testing with the battery disconnected from or removed from the mower.

1. Remove the 3 Philip head screws securing the starter switch to the power head.

g296686

Figure 23

2. Split the starter housing apart to expose the circuit board.



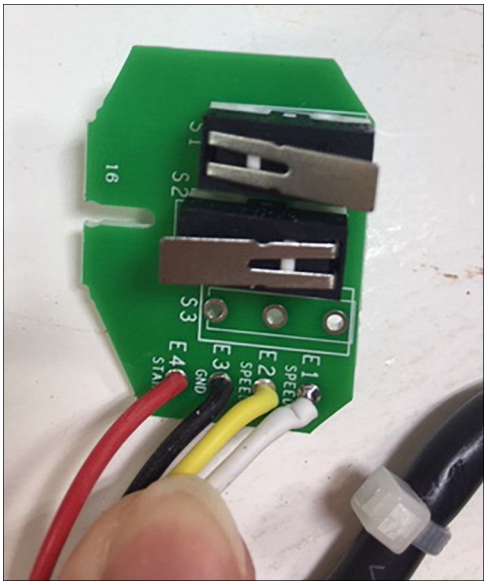
g296663

Figure 24

3. Visually inspect the small switches on the circuit board, looking for any damage or stuck switches. If damaged, replace the switch assembly.
4. Using a digital multi-meter, check the continuity between the board and to the power head plug.

   Note: Remove the outer plug case for easy determination of the pin/wire.

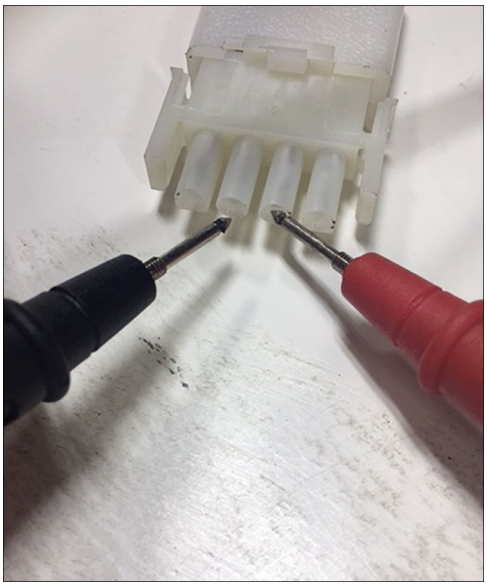
   Note: Left switch is the switch furthest away from the board wiring, right side is closest to the board wiring.



g296542

Figure 25

Starter Switch Harness Testing (continued)



g296543

Figure 26

Wire Color	Continuity with Left Side Switch Depressed	Continuity with Right Side Switch Depressed	Continuity with Both Side Switches Depressed
Red	Red Only	Red/Black	Red/White/Black
Black	Black/White	Black/Red	Red/White/Black
Yellow	Yellow Only	Yellow Only	Yellow Only
White	White/Black	White Only	Red/White/Black

Starter Switch Installation

1. Install the starter switch to the machine.
2. Install the 1/2 inch nut securing the start switch handle assembly. Tighten the nut.

Safety Bail Switch Replacement

Safety Bail Switch Removal

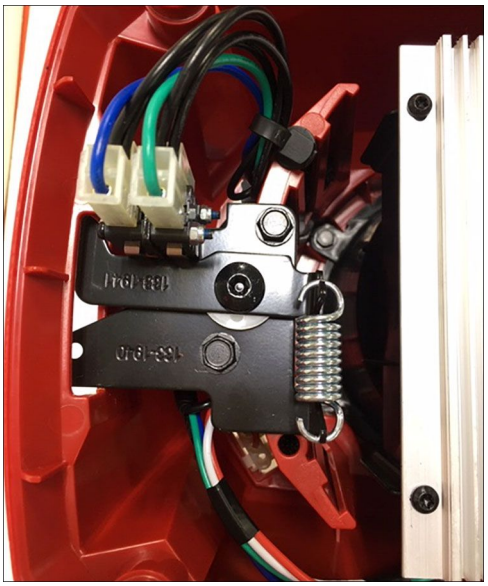
1. Squeeze the bail ends inward from the Personal Pace handle.
2. Pop the rod out of the hole in the Personal Pace handle.

Safety Bail Switch Installation

1. Install the rod into the hole.
2. Install the bail.

Safety Bail Switch Testing

The switch is tested on the power head, a normally open switch. When the bail is pulled inward, the circuit should be closed. When the bail is released and the circuit is open, the motor will be powered down.



g296544

Figure 27

Charger and Battery

Table of Contents

General Information

Battery

The battery has an internal fuse for protection and is not serviceable. Replacement of the battery is required to fix a blown fuse. To verify there is a blown fuse, test the circuit on the battery between the positive and negative circuits.

The LED status bar on the battery will shows the current charge level. When the button is pressed, the lights should first cycle through all lights, then end on the light showing the amount of charge. If no lights come on when the button is pushed, the module in the battery is failed, replace the battery.

The battery will go to sleep after a short period of time. The power head or charger will wake up the battery via the communication line, allowing operation of the mower.

Charger

The charger has an internal fuse for protection and is not serviceable. When there is a blown fuse, lights will not turn on.

The charger will only charge when the battery is in the temperature ranges of 41–104º Fahrenheit (5–55º Celsius). If the battery is installed over the temperature range, the charger will attempt to cool the battery before charging. The charger starts the charge at 0.8 amps until the battery reaches a desired temperature, then the charge goes up to 2.0 amps.

If a battery is above the allowable charging temperature range or stored in temperatures above the allowable charging temperature range, the charger will attempt to cool the battery with an internal fan if it is over the charging temperature range when the battery is placed on the charger. If the temperature is not cooled below the allowable range in two hours, the charger will stop the attempt to charge. To restart the process, un-dock and re-dock the battery. If the battery is below the allowable charging temperature range or stored in temperatures below the allowable charging temperature range, the charger will wait two hours after the battery is placed on the charger. If the battery does not warm in the two hours, the charger will stop attempting to charge. Unlike hot temperatures, the charger has no means to warm the battery. To restart the process, un-dock and re-dock the battery.

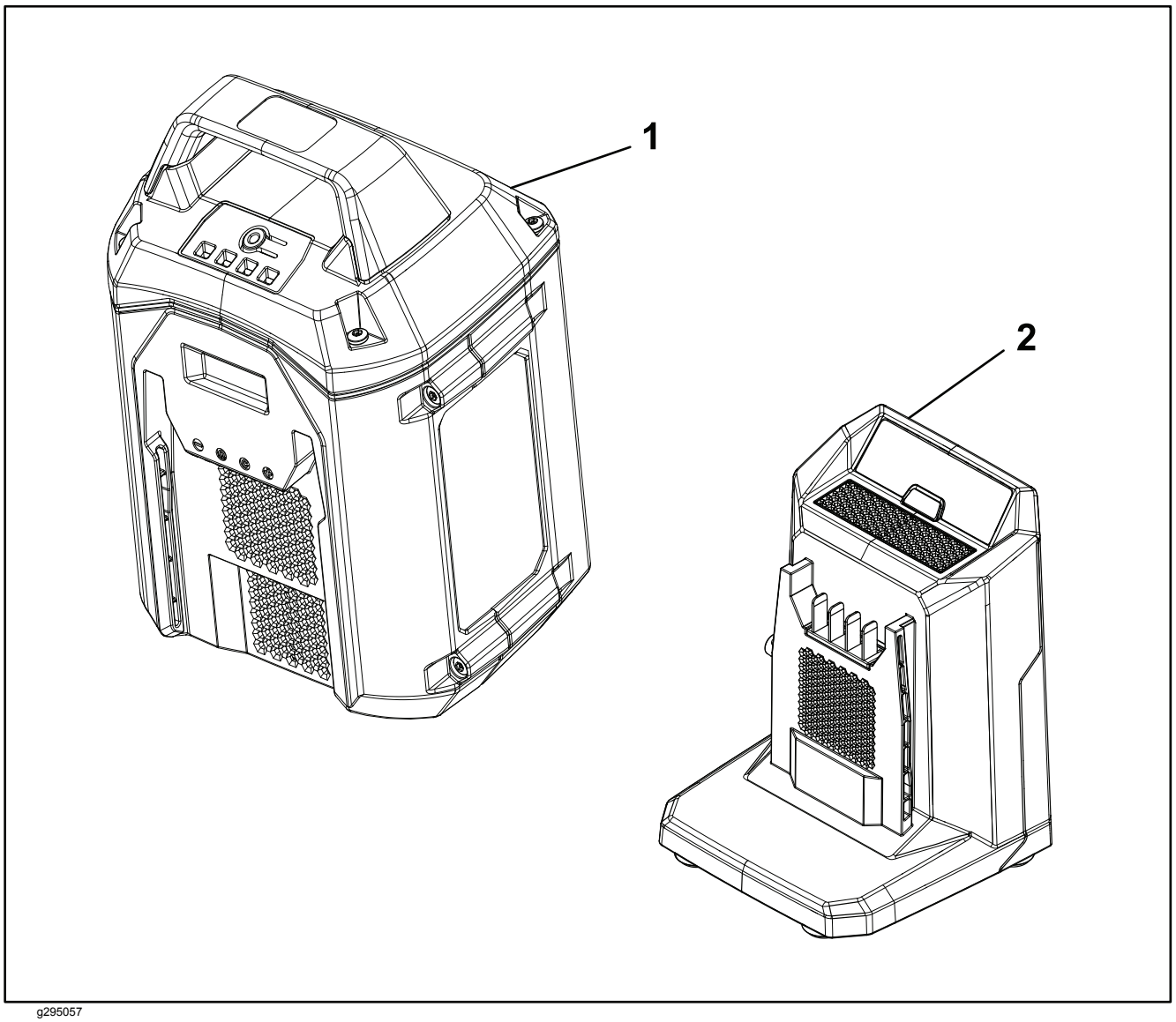
When the battery is installed in the charger, the battery State Of Charge (SOC) lights will cycle. If the SOC button was pressed shortly before the battery is placed on the charger, the lights will not cycle again when the battery is placed on the charger.

The charger light will blink green when it is charging and the battery voltage is below 90%. The charger light will change to solid green when the battery voltage is charged over 90% and the charger will continue charging to 100%. If the battery was placed on the charger when the voltage was already above 90%, the charger will not initiate the charge process to 100%. The charger light will be solid green.

The charger is not a trickle type charger, as found with lead acid batteries. This type of continuous trickle charging at the end of charge will damage a lithium ion battery.

Service and Repairs

Battery and Charger Assembly



g295057

Figure 28

1. Battery
2. Charger

Battery

Battery Test

When probing the battery to check for voltage with a voltmeter probe, do not force the probe into the battery. The battery terminal can be damaged if spread too far.

1. Place a voltmeter probe between the positive and negative terminals on the battery.
2. Battery voltage should be between 43-62 volts. A battery that is reading voltage under 40 volts is over discharged and will most likely not recover. If the measured voltage on the battery is over 50v and the battery is placed in the mower, but the mower will not start, then there is an issue with the mower.

   Note: The motor driver will stop the power head usage when the battery reaches 43.0 volts.

Battery Voltage Range

Number of Lights	Voltage Range
0	Anything under 51.00
1	51.1–53.99
2	54.0–56.99
3	57.0–59.99
4	Anything over 60.0

Charger

Charger Test

When the charger reaches full capacity 62.0 volts, the charger will no longer charge.

1. With the charger plugged in, place the negative lead on the negative terminal and the positive on the Ohm symbol terminal.
2. Voltage should read 4.2 on the communication terminal of the charger.

   Note: When the charger is unplugged, the voltage reading will slowly drop.

Chapter 7

Shrouds

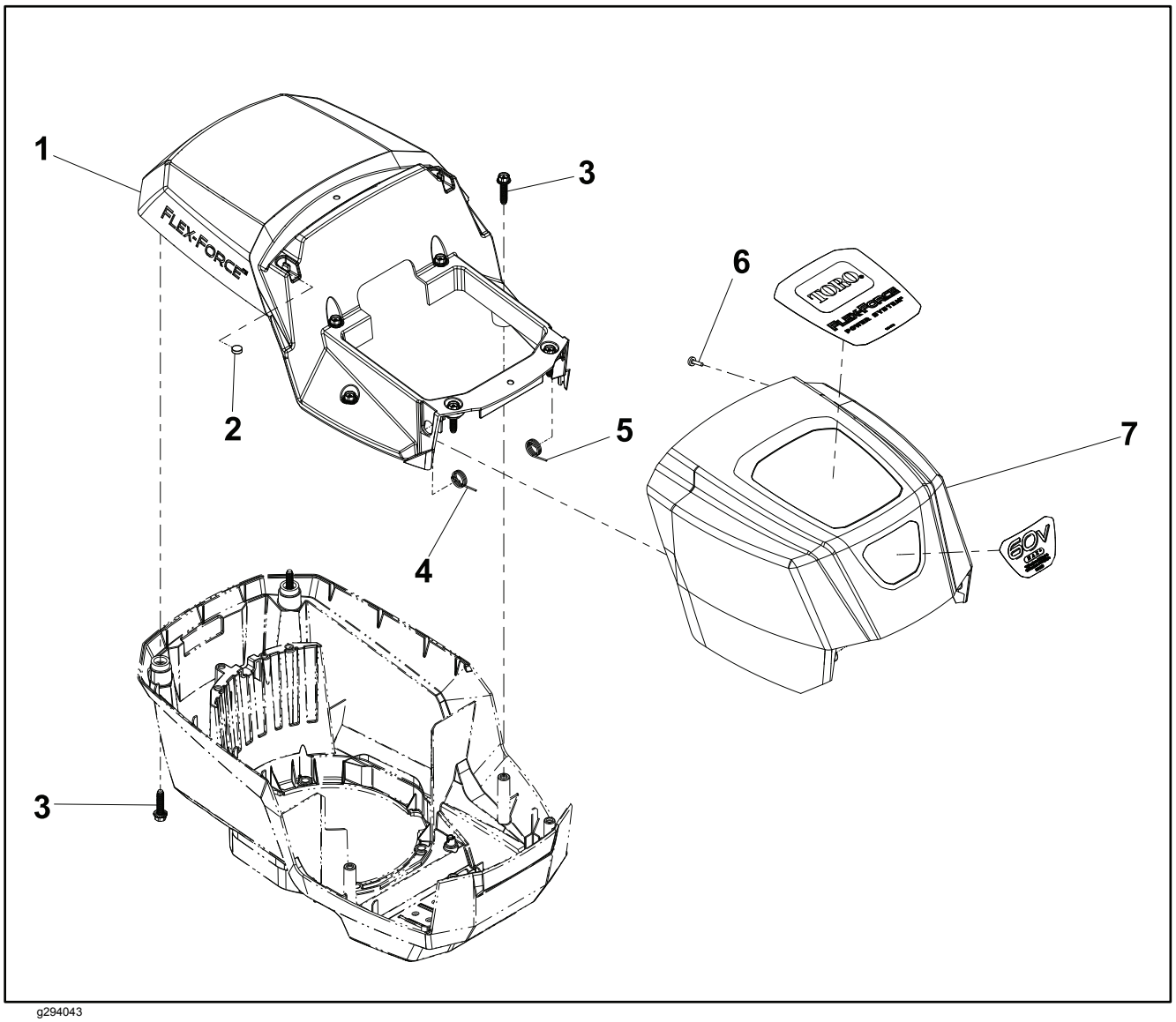
Table of Contents

General Information

The power head assembly consists of 3 pieces; power head shroud, upper shroud, and lower shroud. All the mounting screws for the upper and lower shroud are the same length, 10 in total.

Service and Repairs

Shroud Assembly



g294043

Figure 29

1. Upper Shroud
2. Magnet
3. Flange Screw
4. RH Spring
5. LH Spring
6. PPH Screw
7. Hood

Power Head Shroud Upper Replacement

Power Head Shroud Upper Removal

1. Remove the battery from the power head assembly.
2. Remove the 8 (6 top-around the battery cavity and 2 on the bottom rear) (1/4 x 1.0 inch) flange screws securing the power head upper shroud to the lower shroud. Remove the power head upper shroud.

g293756

Figure 30

Power Head Shroud Upper Installation

Install the power head upper shroud to the lower shroud. Secure with 8 (6 top-around the battery cavity and 2 on the bottom rear). Torque screws to 30 ± 3 in-lbs. (3.39 Nm).

g293756

Figure 31

Power Head Shroud Lower Replacement

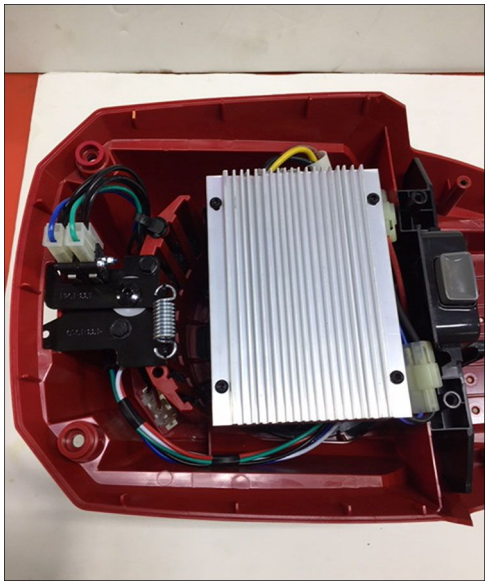
Power Head Shroud Lower Removal

1. Remove the battery from the power head assembly.
2. Remove the 8 (6 top-around the battery cavity and 2 on the bottom rear) (1/4 x 1.0 inch) flange screws securing the power head upper shroud to the lower shroud. Remove the power head upper shroud.

g293756

Figure 32

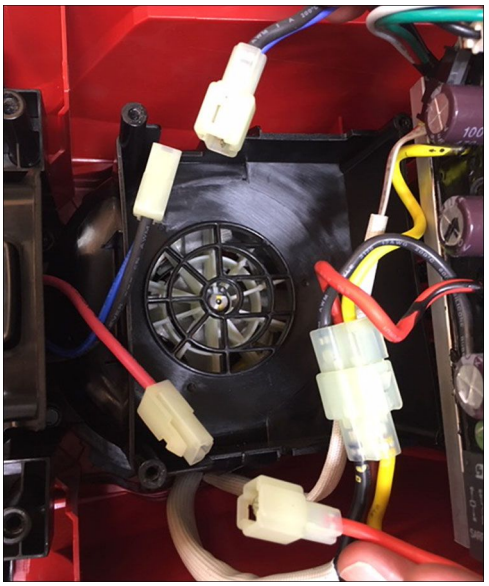
3. Remove the 4 (T-20) torx screws from the motor fan shroud.



g293757

Figure 33

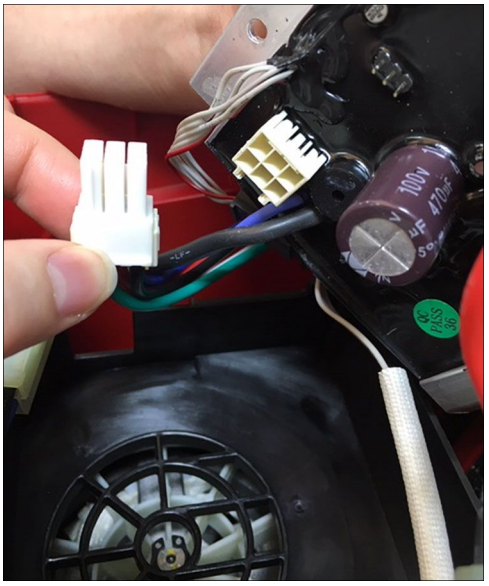
4. Disconnect the 2 connectors from the battery receiver assembly to the motor driver. Disconnect the positive first, then the negative.



g293758

Figure 34

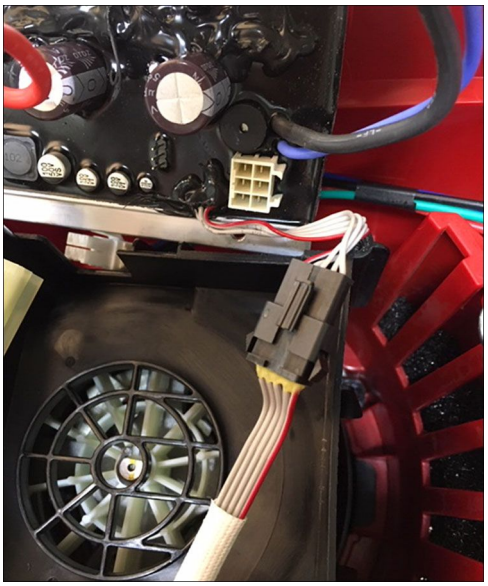
5. Disconnect the harness from the motor driver to the start stop switch and bail switch connectors.



g293759

Figure 35

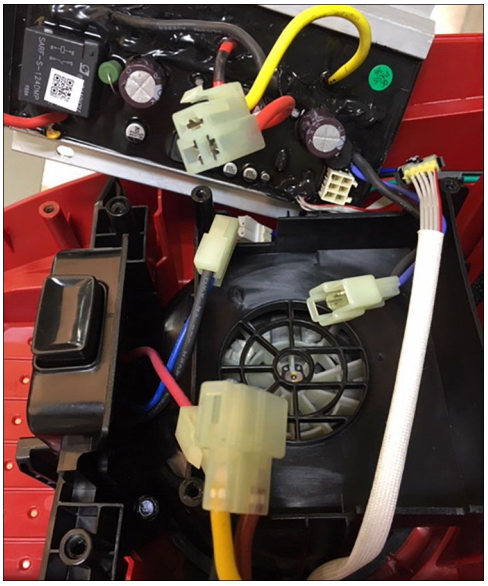
6. Disconnect the motor to the motor driver harness connector.



g293761

Figure 36

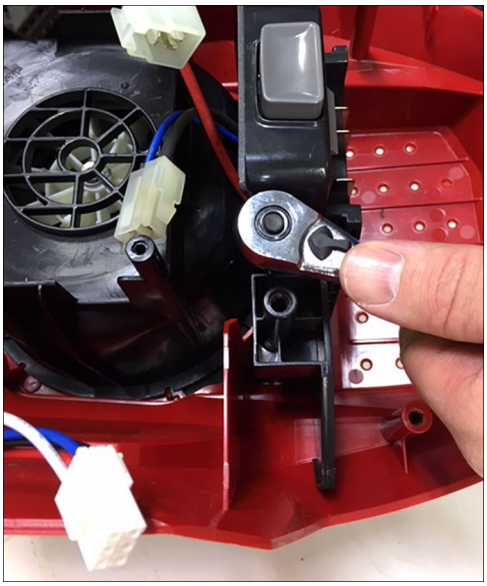
7. Disconnect the motor driver to the motor power connection. Remove the motor driver.



g293760

Figure 37

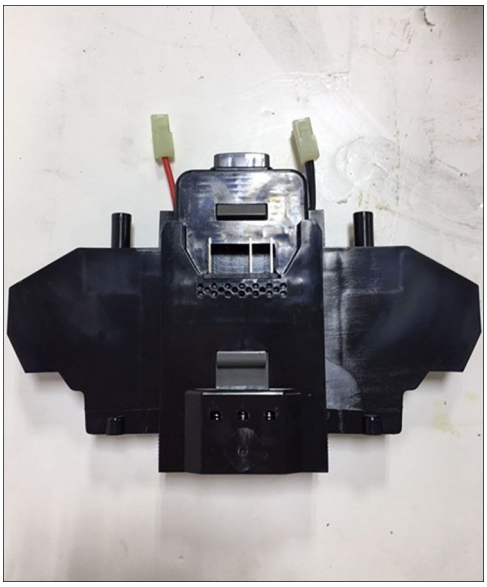
8. Remove the 2 (1/4 x 1.0 inch) flange screws at the base of the battery receiver assembly.



g293765

Figure 38

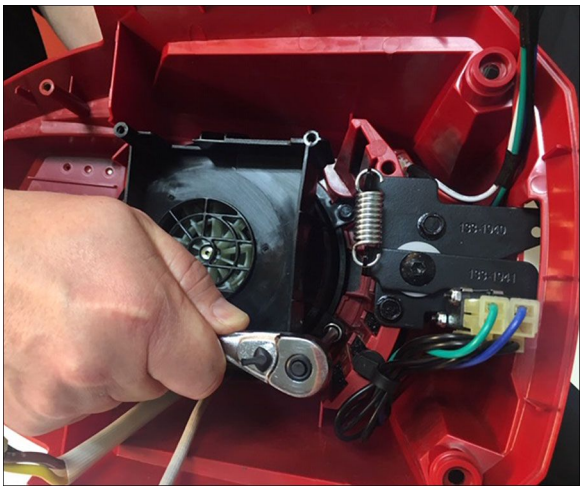
9. Remove the battery receiver assembly from the power head assembly.



g293766

Figure 39

10. Remove the remaining 2 (1/4 x 1.0 inch) flange screws from the motor shroud.



g295055

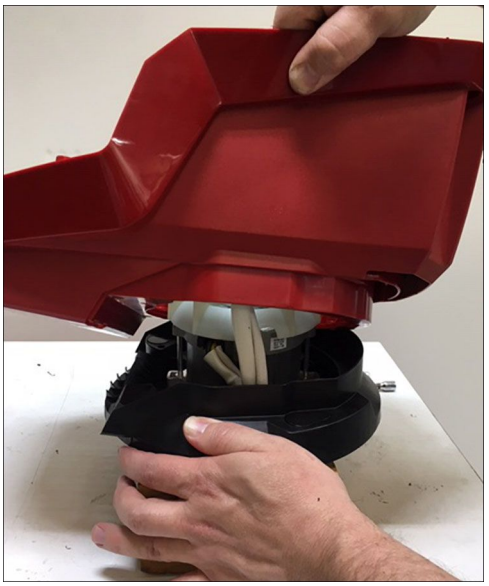
Figure 40

11. Remove the motor shroud from the power head assembly.

g293768

Figure 41

12. Separate the lower shroud from the motor base assembly.

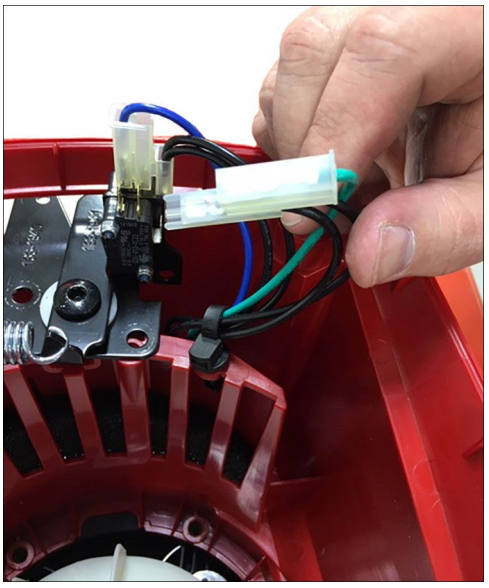


g293795

Figure 42

13. Disconnect the harness from the bail switch. Remove the switch and harness from the lower shroud.

    Note: If harness anchor is damaged, replace.

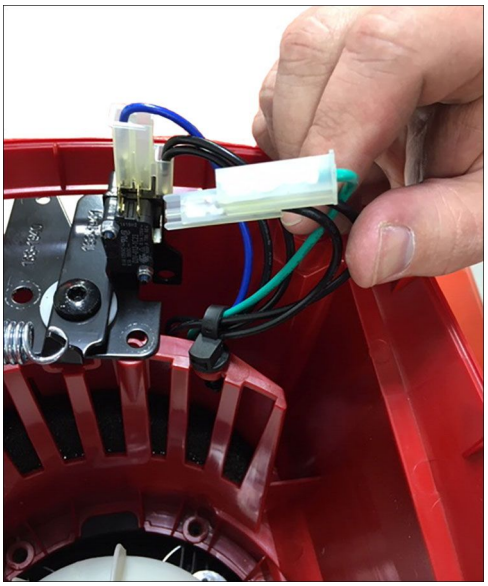


g293791

Figure 43

Power Head Shroud Lower Installation

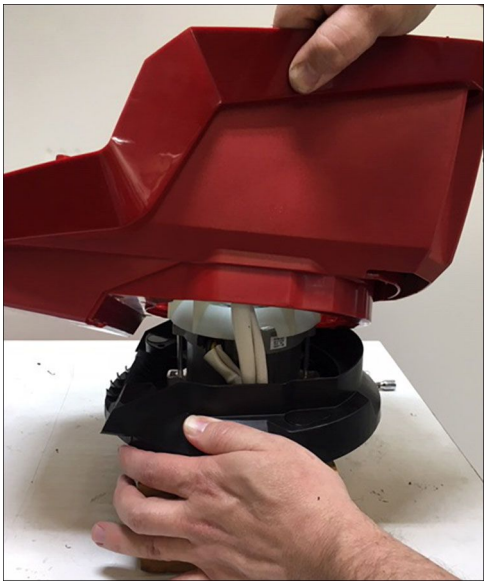
1. Install the switch and harness to the lower shroud. Connect the harness to the bail switch.



g293791

Figure 44

2. Install the lower shroud to the motor base assembly.



g293795

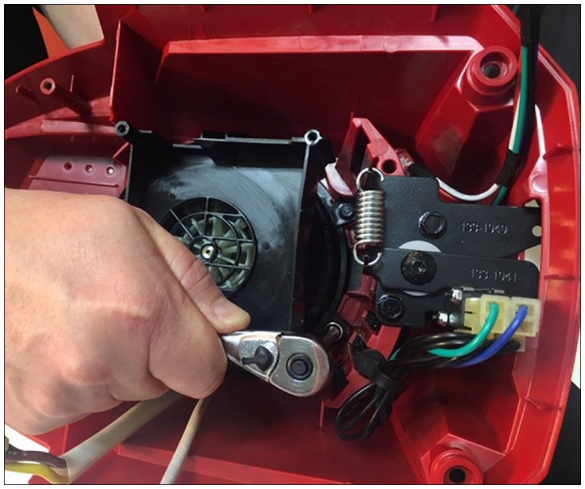
Figure 45

3. Install the motor shroud to the power head assembly.

g293768

Figure 46

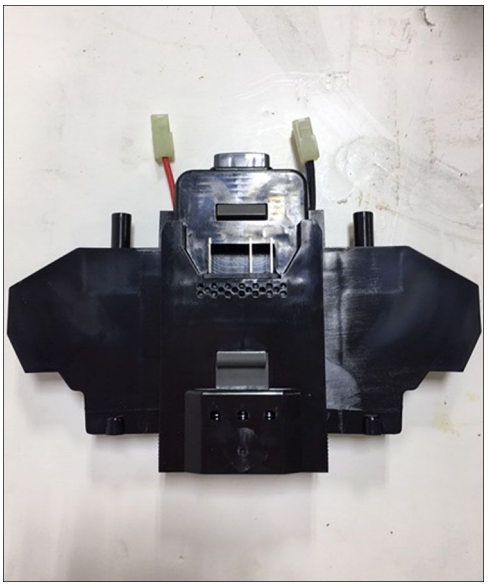
4. Install the 2 (1/4 x 1.0 inch) flange screws to the motor shroud. Torque screws to 30 in-lbs. (3.39 Nm).



g295055

Figure 47

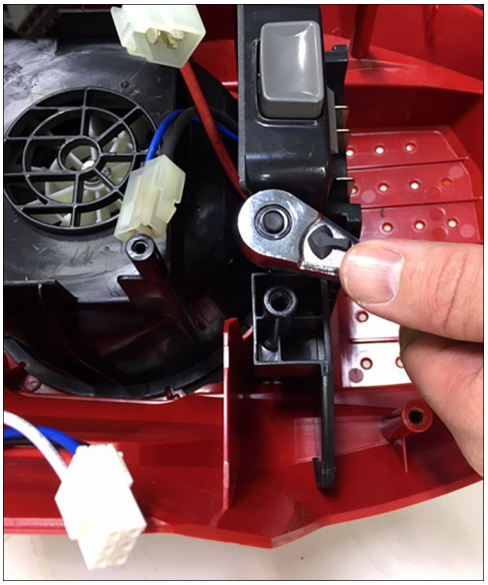
5. Install the battery receiver assembly to the power head assembly.



g293766

Figure 48

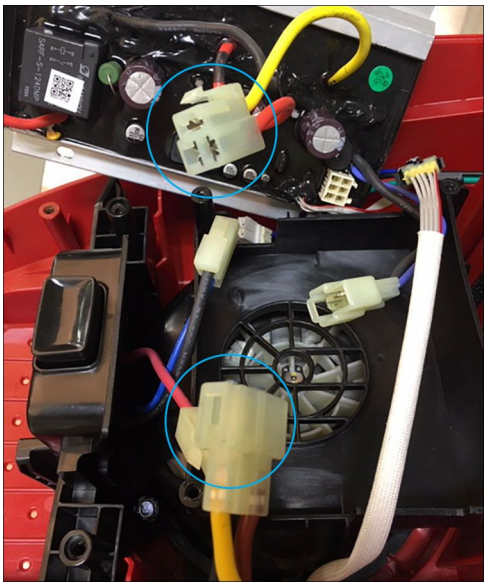
6. Install the 2 (1/4 x 1.0 inch) flange screws at the base of the battery receiver assembly. Torque screws to 30 ± 3 in-lbs. (3.39 Nm).



g293765

Figure 49

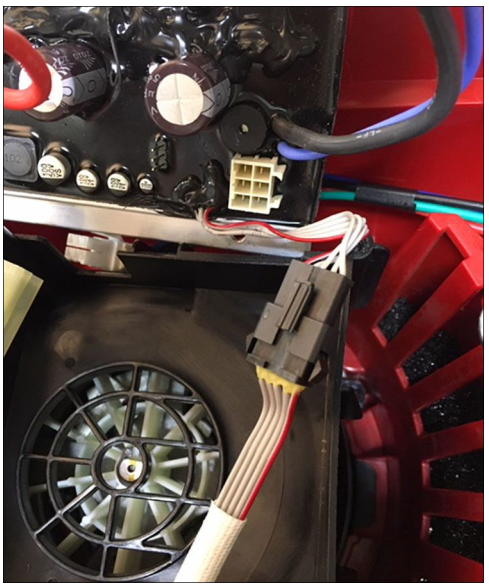
7. Install the motor driver. Connect the motor driver to the motor power connection.



g296707

Figure 50

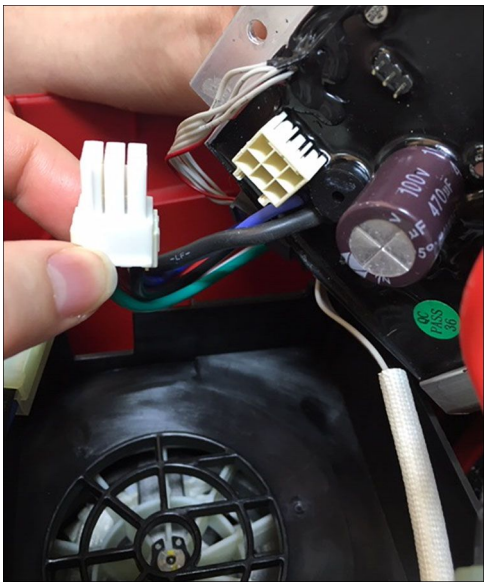
8. Connect the motor to the motor driver harness connector.



g293761

Figure 51

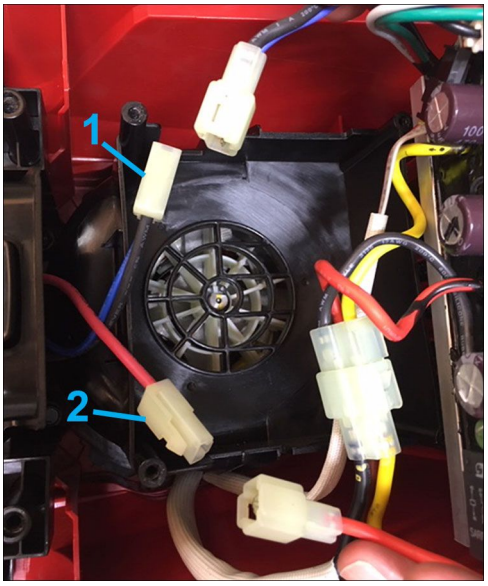
9. Connect the harness from the motor driver to the start stop switch and bail switch connectors.



g293759

Figure 52

10. Connect the 2 connectors from the battery receiver assembly to the motor driver. Connect the negative first, then the positive.

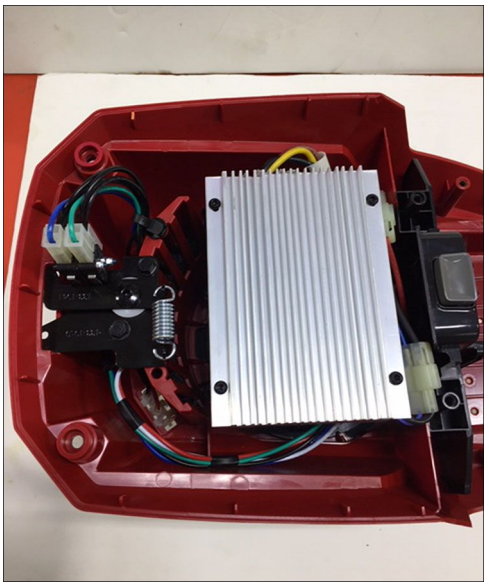


g296708

Figure 53

1. Negative
2. Positive

11. Install the 4 (T-20) torx screws to the motor fan shroud. Torque screws to 15–20 in-lbs. (1.7–2.26 Nm).



g293757

Figure 54

12. Install the power head upper shroud. Secure with 8 (6 top-around the battery cavity and 2 on the bottom rear) (1/4 x 1.0 inch) flange screws securing the power head upper shroud to the lower shroud. Torque screws to 30 ± 3 in-lbs. (3.39 Nm).

g293756

Figure 55

Motor Shroud Replacement

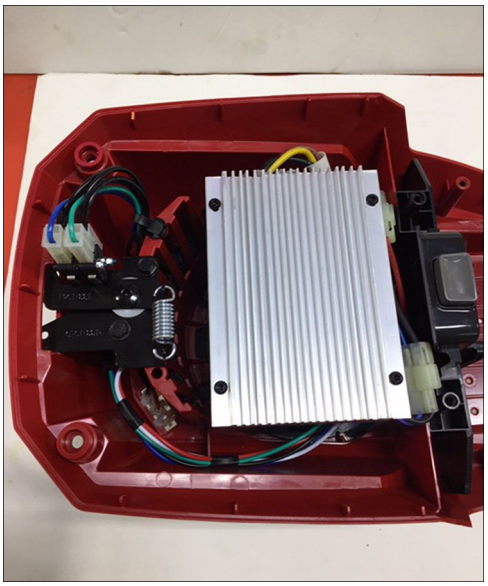
Motor Shroud Removal

1. Remove the 8 (6 top-around the battery cavity and 2 on the bottom rear) (1/4 x 1.0 inch) flange screws securing the power head upper shroud to the lower shroud. Remove the power head upper shroud.

g293756

Figure 56

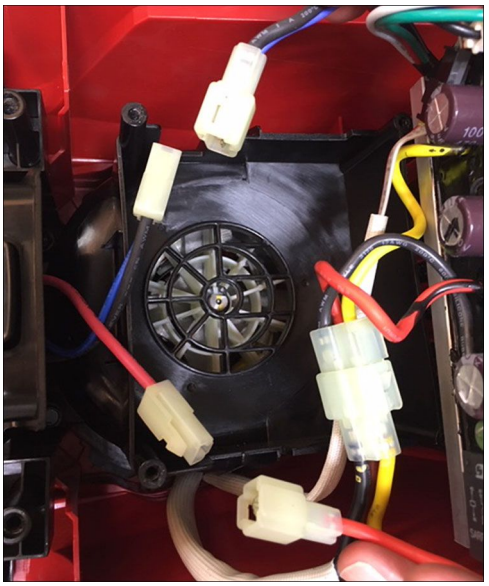
2. Remove the 4 (T-20) torx screws from the motor fan shroud.



g293757

Figure 57

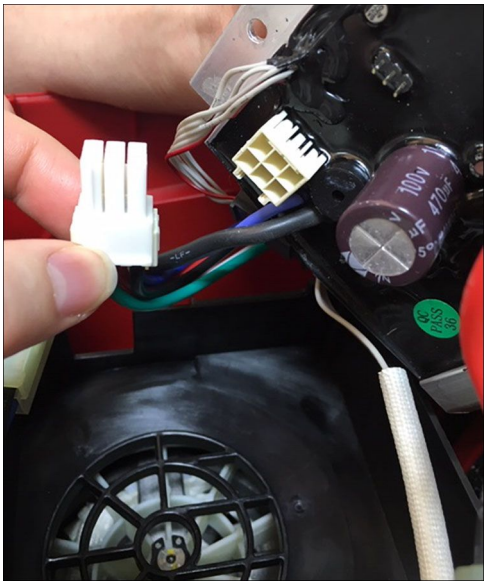
3. Disconnect the 2 connectors from the battery receiver assembly to the motor driver. Disconnect the positive first, then the negative.



g293758

Figure 58

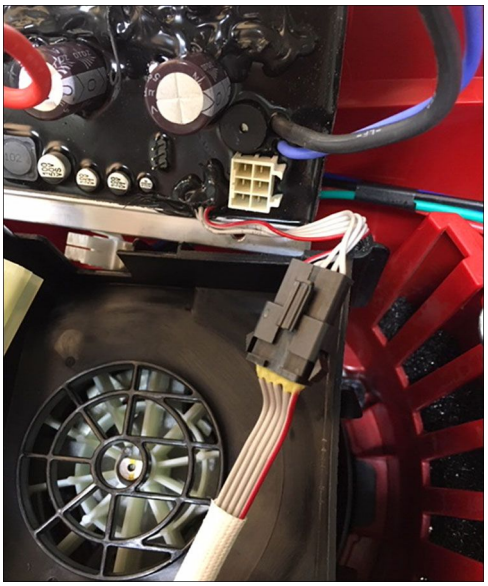
4. Disconnect the harness from the motor driver to the start stop switch and bail switch connectors.



g293759

Figure 59

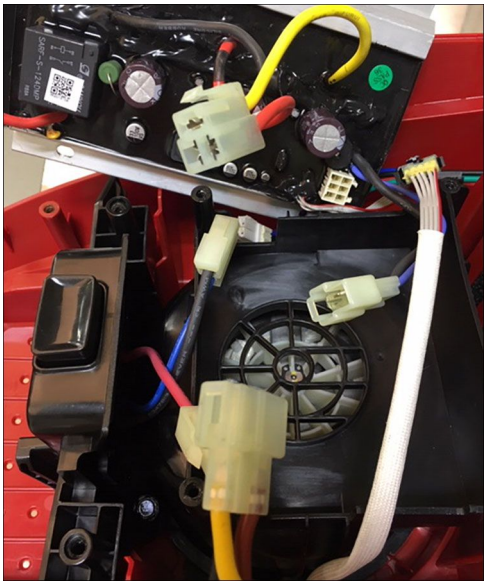
5. Disconnect the motor to the motor driver harness connector.



g293761

Figure 60

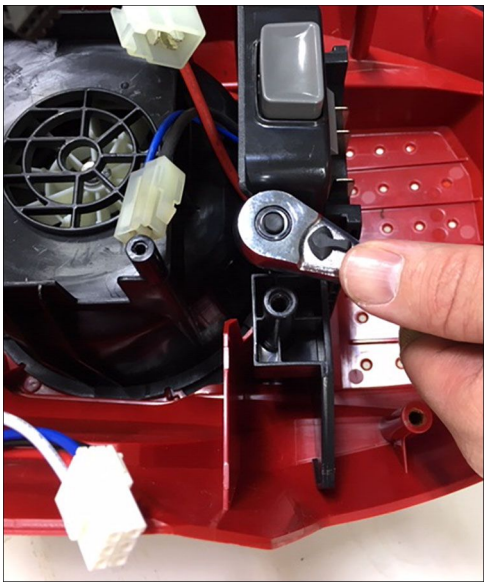
6. Disconnect the motor driver to the motor power connection. Remove the motor driver.



g293760

Figure 61

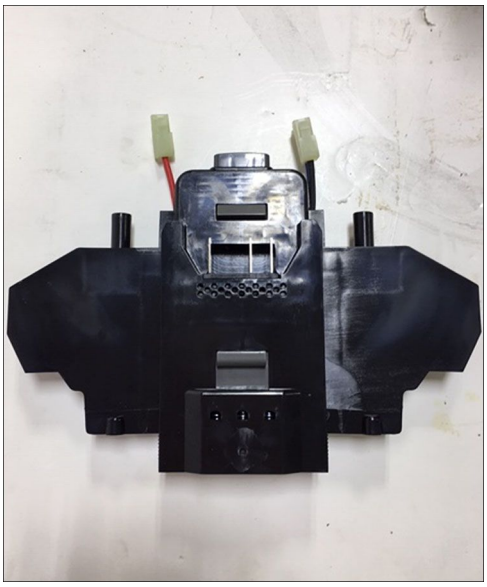
7. Remove the 2 (1/4 x 1.0 inch) flange screws at the base of the battery receiver assembly.



g293765

Figure 62

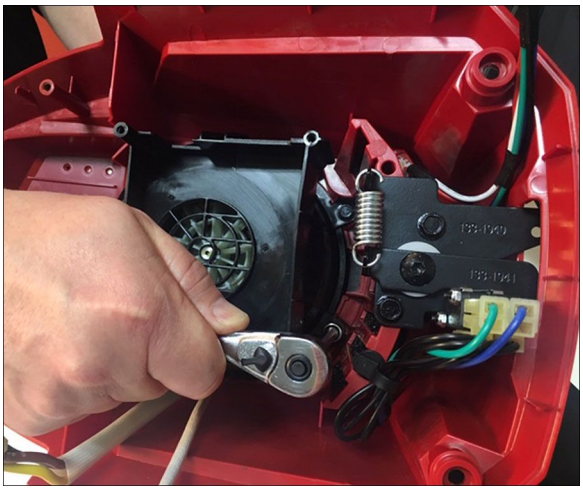
8. Remove the battery receiver assembly from the power head assembly.



g293766

Figure 63

9. Remove the remaining 2 (1/4 x 1.0 inch) flange screws from the motor shroud.



g295055

Figure 64

10. Remove the motor shroud from the power head assembly.

g293768

Figure 65

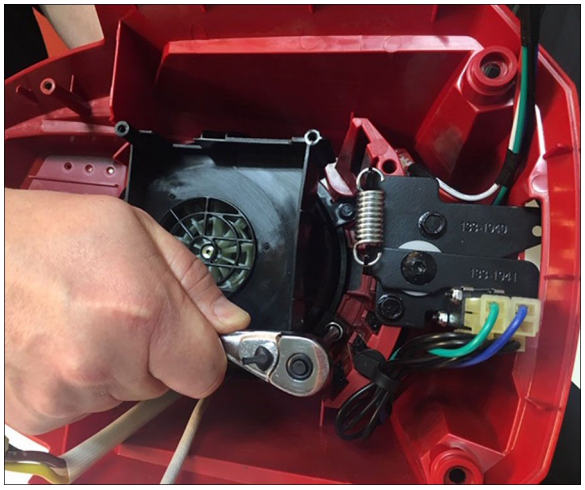
Motor Shroud Installation

1. Install the motor shroud to the power head assembly.

g293768

Figure 66

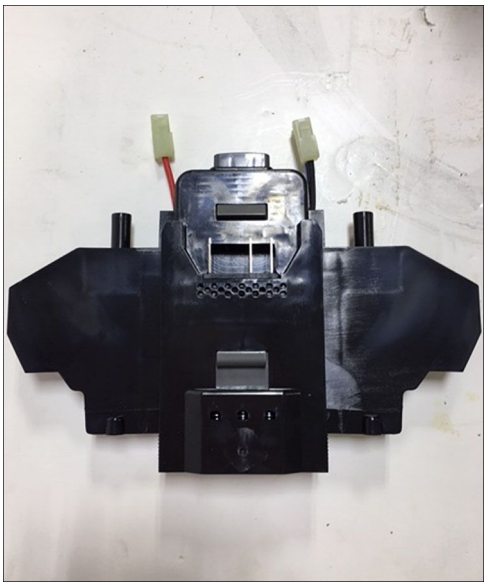
2. Install the 2 of 4 (1/4 x 1.0 inch) flange screws securing motor shroud to lower shroud. Torque screws to 30 ± 3 in-lbs. (3.39 Nm).



g295055

Figure 67

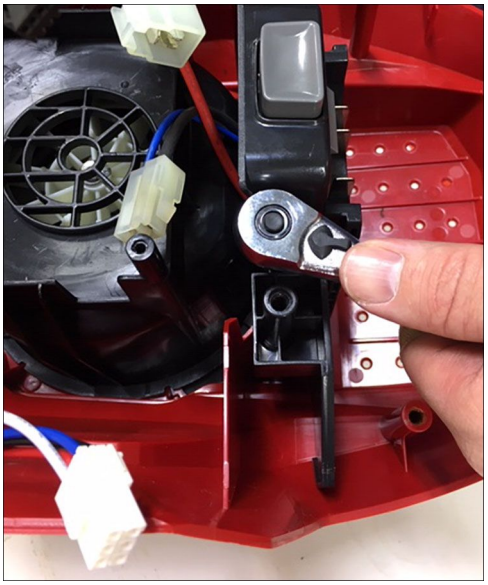
3. Install the battery receiver assembly to the power head assembly.



g293766

Figure 68

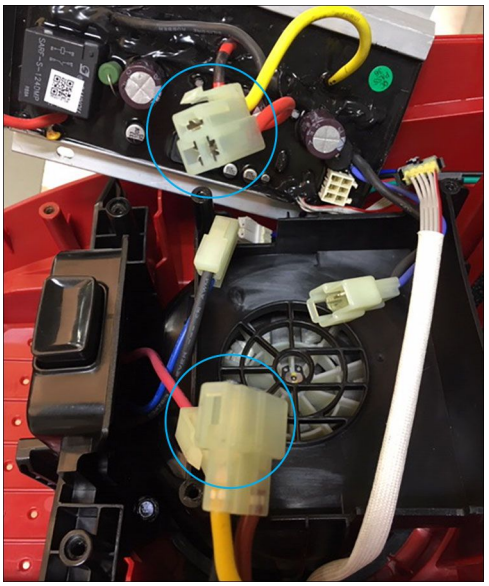
4. Install the 2 (1/4 x 1.0 inch) flange screws at the base of the battery receiver assembly. Torque screws to 30 ± 3 in-lbs. (3.39 Nm).



g293765

Figure 69

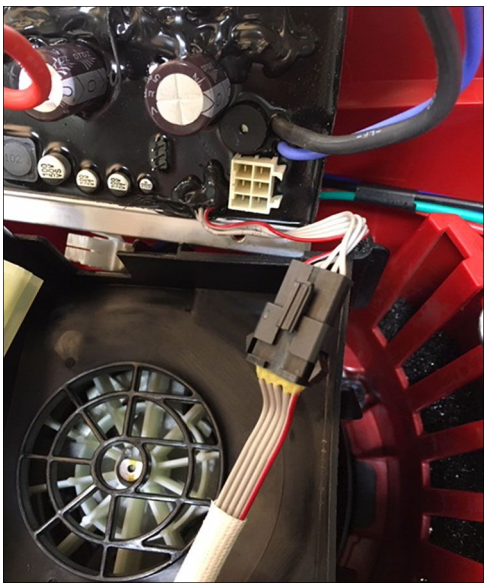
5. Install the motor driver. Connect the motor driver to the motor power connection.



g296707

Figure 70

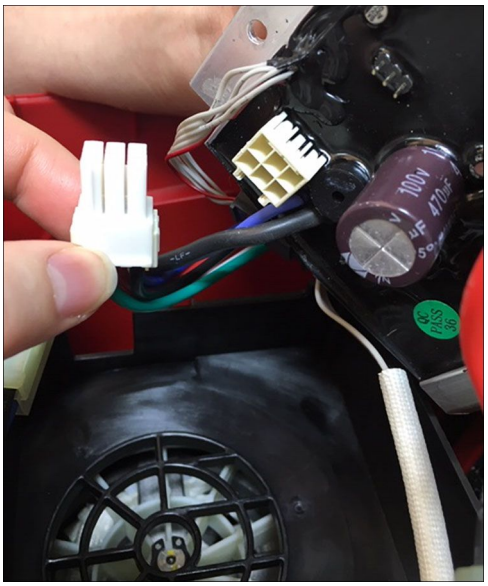
6. Connect the motor to the motor driver harness connector.



g293761

Figure 71

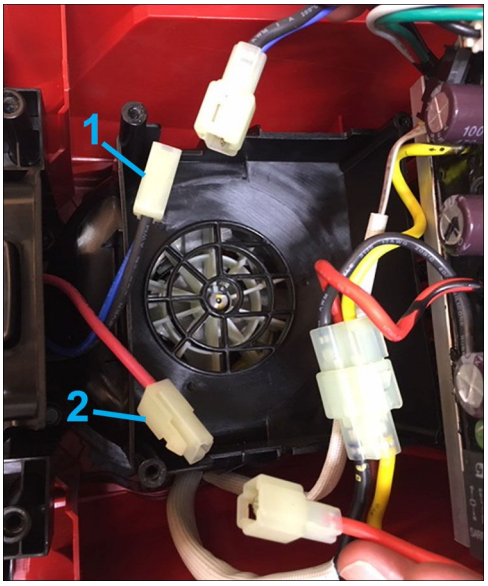
7. Connect the harness from the motor driver to the start stop switch and bail switch connectors.



g293759

Figure 72

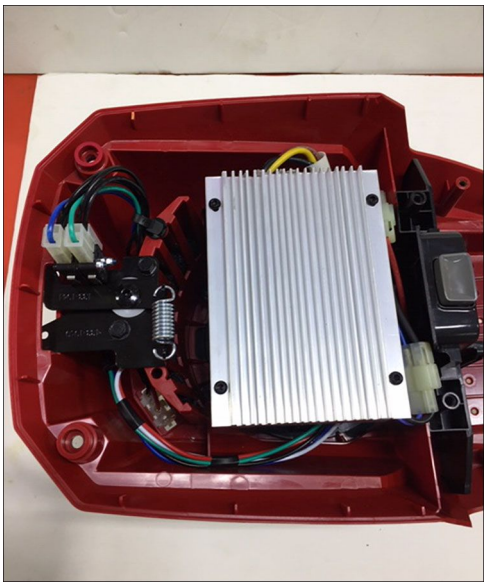
8. Connect the 2 connectors from the battery receiver assembly to the motor driver. Connect the negative first, then the positive.



g296708

Figure 73

9. Install the 4 (T-20) torx screws to the motor fan shroud. Torque screws to 15–20 in-lbs. (1.7–2.26 Nm).



g293757

Figure 74

10. Install the power head upper shroud. Secure with 8 (6 top-around the battery cavity and 2 on the bottom rear) (1/4 x 1.0 inch) flange screws securing the power head upper shroud to the lower shroud. Torque screws to 30 ± 3 in-lbs. (3.39 Nm).

g293756

Figure 75

Battery Door Replacement

Battery Door Removal

1. Remove the upper shroud from the power head assembly.
2. Turn the upper shroud upside down.

Battery Door Removal (continued)

3. Remove the battery door by spreading apart, allowing the springs to fall into upper shroud.
4. Remove the springs from the upper shroud assembly.

g295226

Figure 76

Battery Door Installation

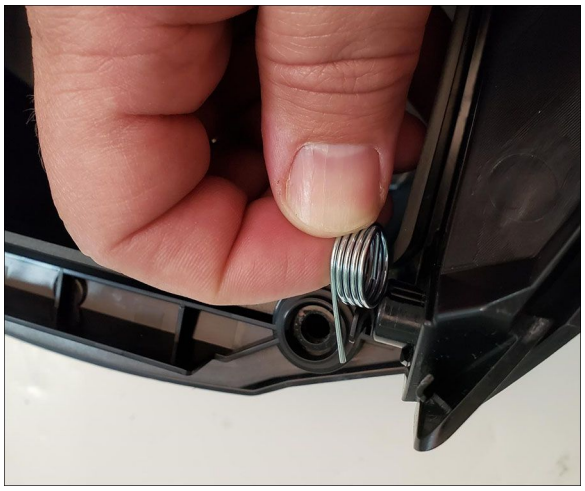
1. Insert the battery door back into the upper shroud assembly.

g295227

Figure 77

2. Insert a spring at a time, ensure the correct spring is for the correct side. Long tail of the spring should be toward the inside of the shroud assembly. Short side of the spring is inserted in the slot of the door pin.

   Note: May need to spread door apart slightly in order to insert the spring in the slot and over the door pin.



g295178

Figure 78

3. Using a small blade type screw driver, push the long tail of the spring into the molded slot on the upper shroud assembly. Repeat for opposite side.

   Note: This will preload the spring and put tension on the spring to return the door when opened.

4. Install the upper shroud assembly to the power head assembly.

Chapter 8

Motor Driver

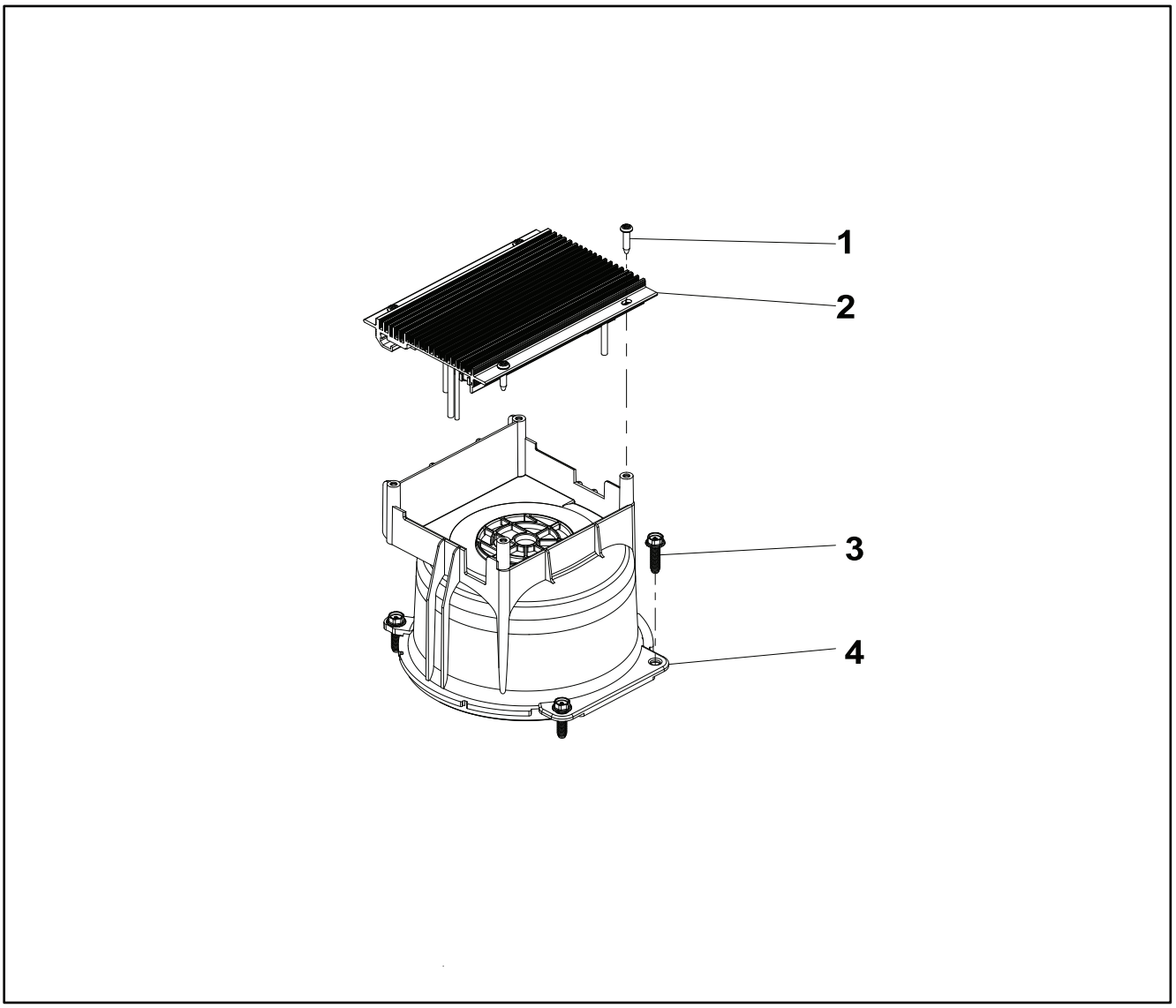
Table of Contents

General Information

The motor driver measures and controls the battery and motor. It limits battery temperature and controls overheating by shutting down the motor for over temperature. The motor driver limits the amp draw to 35 amps.

Service and Repairs

Motor Driver Assembly



g294111

Figure 79

1. Screw
2. Motor Driver
3. Flange Screw
4. Motor Shroud

Motor Driver Replacement

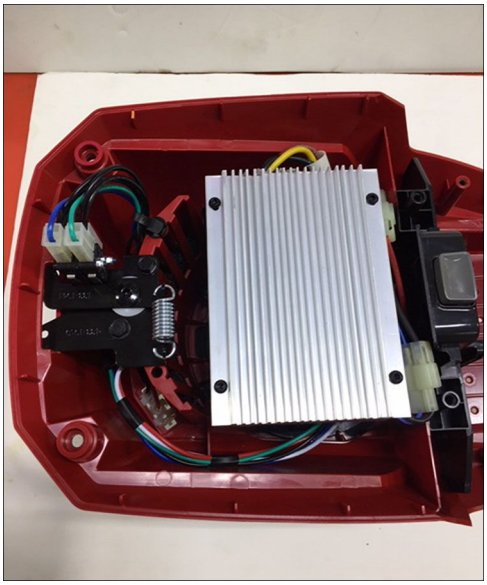
Motor Driver Removal

1. Remove the battery from the power head assembly.
2. Remove the 8 (6 top-around the battery cavity and 2 on the bottom rear) (1/4 x 1.0 inch) flange screws securing the power head upper shroud to the lower shroud. Remove the power head upper shroud.

g293756

Figure 80

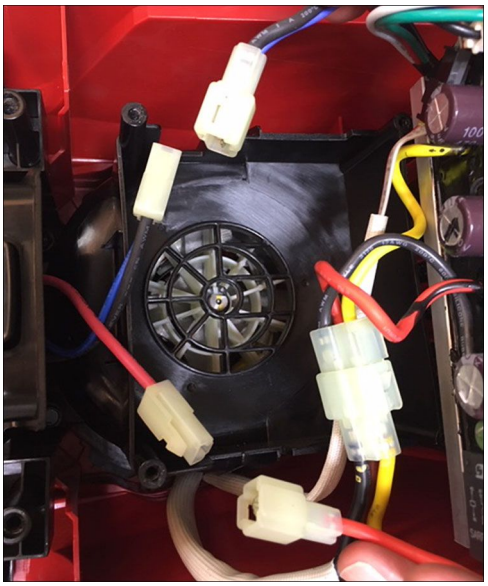
3. Remove the 4 (T-20) torx screws from the motor fan shroud.



g293757

Figure 81

4. Disconnect the 2 connectors from the battery receiver assembly to the motor driver. Disconnect the positive first, then the negative.



g293758

Figure 82

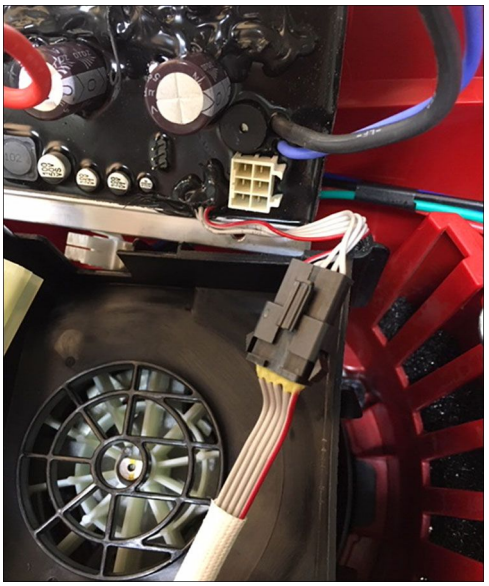
5. Disconnect the harness from the motor driver to the start stop switch and bail switch connectors.

g293759

Figure 83

6. Disconnect the motor to the motor driver harness connector.

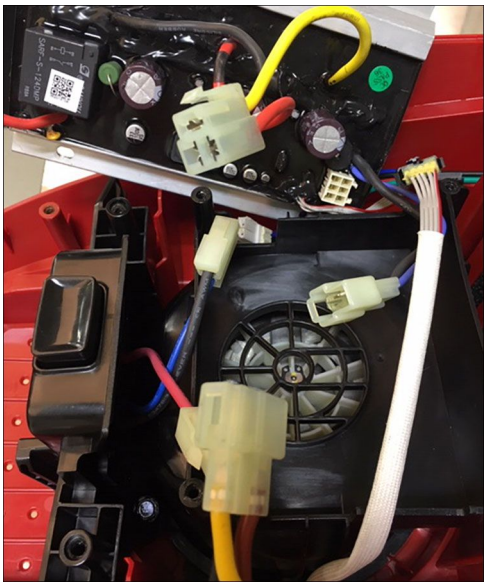
Motor Driver Removal (continued)



g293761

Figure 84

7. Disconnect the motor driver to the motor power connection. Remove the motor driver.



g293760

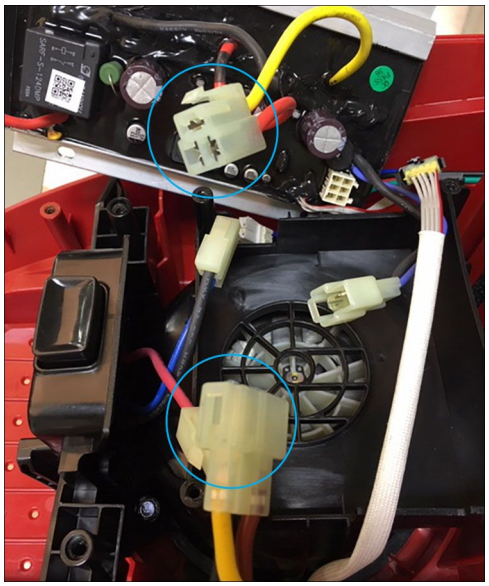
Figure 85

Motor Driver Test

1. Verify battery is operational.
2. Verify motor driver is getting voltage (power to motor driver).
3. Verify motor is operational.
4. If battery and motor are operational, replace the motor driver.

Motor Driver Installation

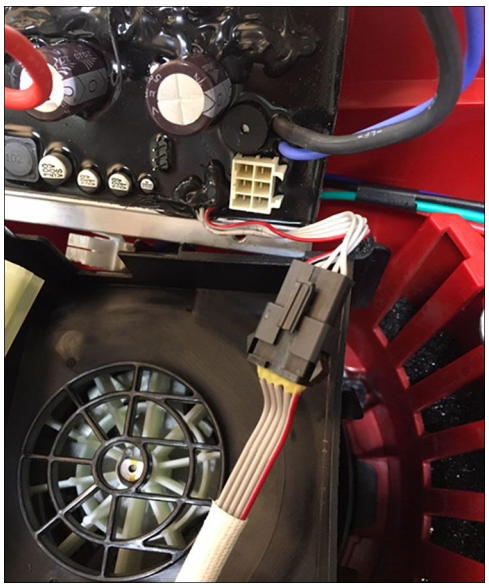
1. Install the motor driver. Connect the motor driver to the motor power connection.



g296707

Figure 86

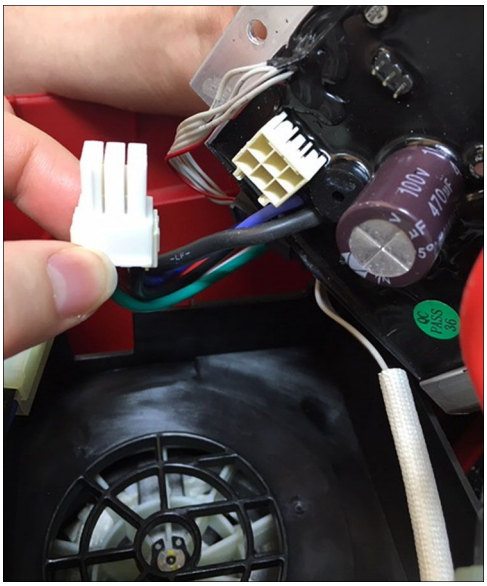
2. Connect the motor to the motor driver harness connector.



g293761

Figure 87

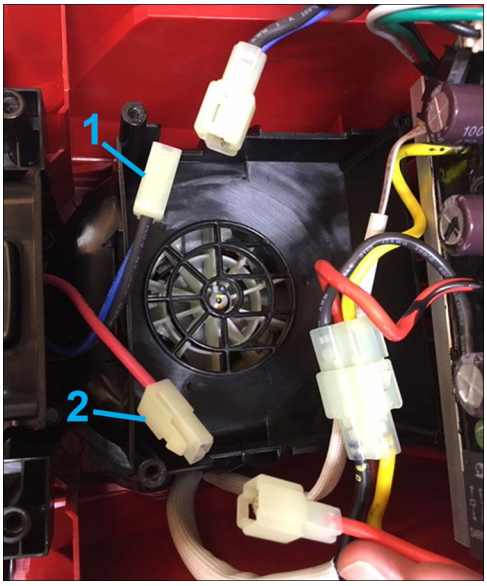
3. Connect the harness from the motor driver to the start stop switch and bail switch connectors.



g293759

Figure 88

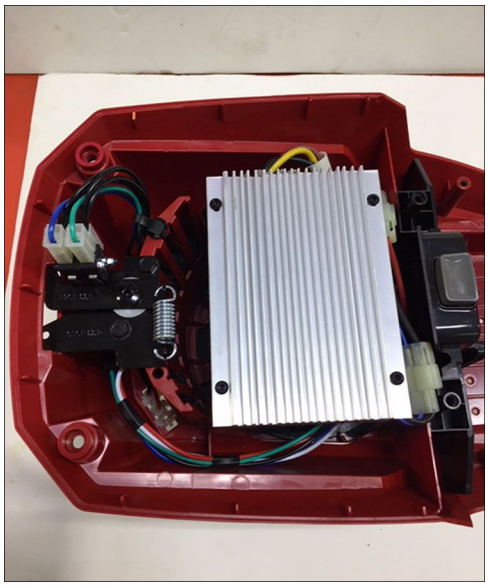
4. Connect the 2 connectors from the battery receiver assembly to the motor driver. Connect the negative first, then the positive.



g296708

Figure 89

5. Install the 4 (T-20) torx screws to the motor fan shroud. Torque screws to 15–20 in-lbs. (1.7–2.26 Nm).



g293757

Figure 90

6. Install the power head upper shroud. Secure with 8 (6 top-around the battery cavity and 2 on the bottom rear) (1/4 x 1.0 inch) flange screws securing the power head upper shroud to the lower shroud. Torque screws to 30 ± 3 in-lbs. (3.39 Nm).

g293756

Figure 91

7. Install the battery to the power head assembly.

Chapter 9

Battery Terminal

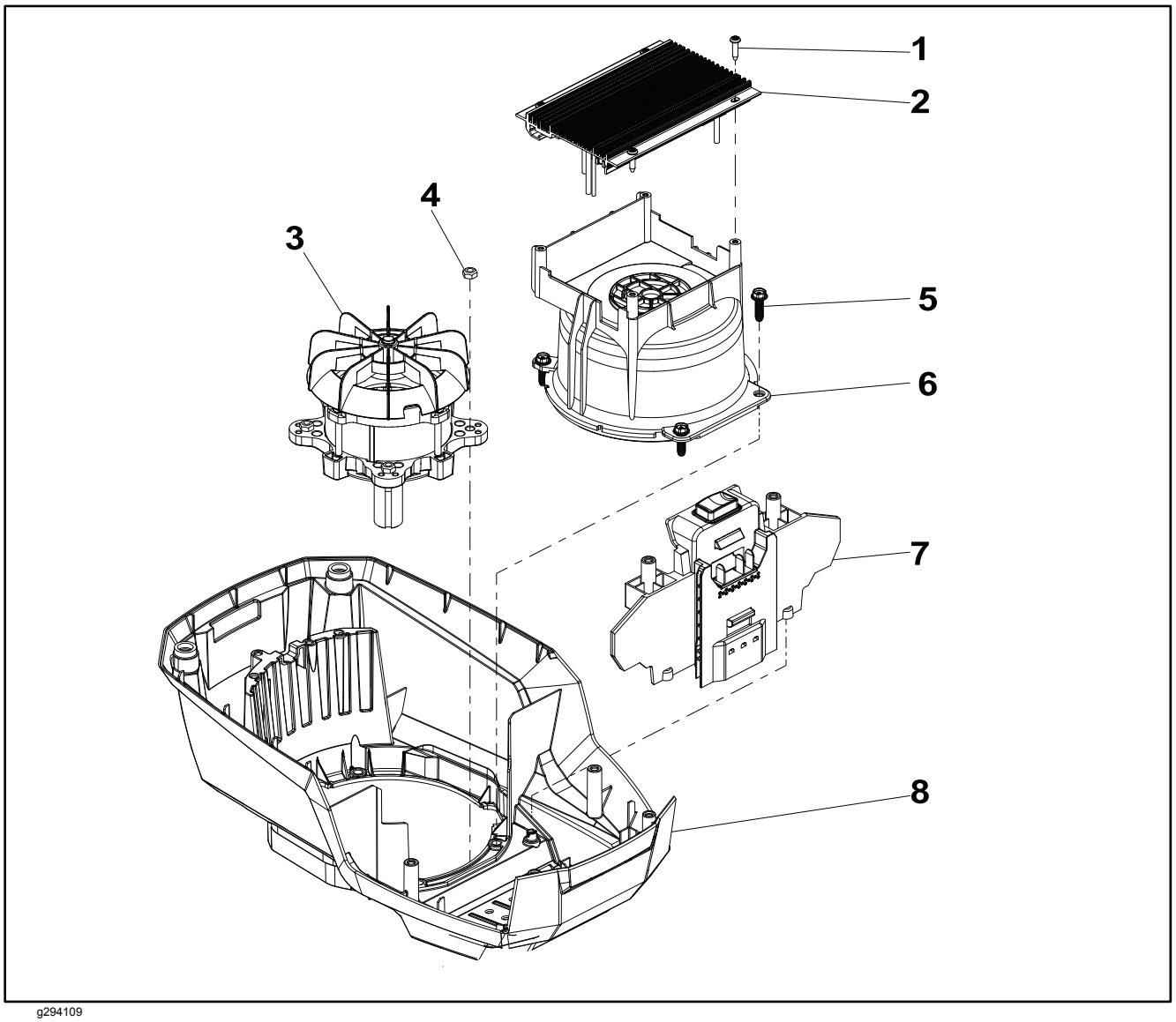
Table of Contents

General Information

The battery terminal is a 3 terminal receiver with a positive, negative, and communication probe.

Service and Repairs

Battery Terminal Assembly



g294109

Figure 92

1. Screw
2. Motor Driver
3. XKW Motor
4. Lock Nut
5. Flange Screw
6. Motor Shroud
7. Battery Receiver Asm.
8. Lower Shroud

Battery Terminal Replacement

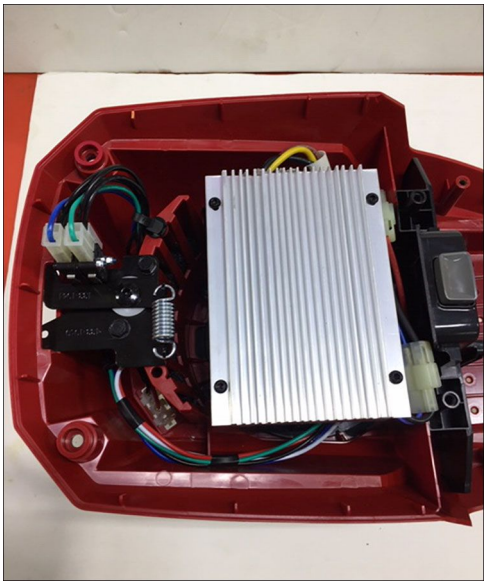
Battery Terminal Removal

1. Remove the battery from the power head assembly.
2. Remove the 8 (6 top-around the battery cavity and 2 on the bottom rear) (1/4 x 1.0 inch) flange screws securing the power head upper shroud to the lower shroud. Remove the power head upper shroud.

g293756

Figure 93

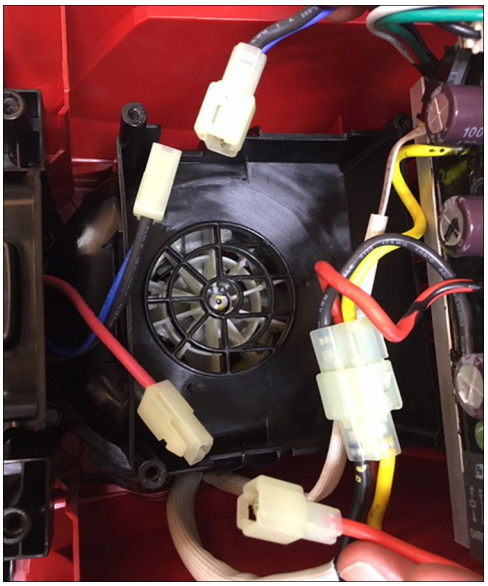
3. Remove the 4 (T-20) torx screws from the motor fan shroud.



g293757

Figure 94

4. Disconnect the 2 connectors from the battery receiver assembly to the motor driver. Disconnect the positive first, then the negative.



g293758

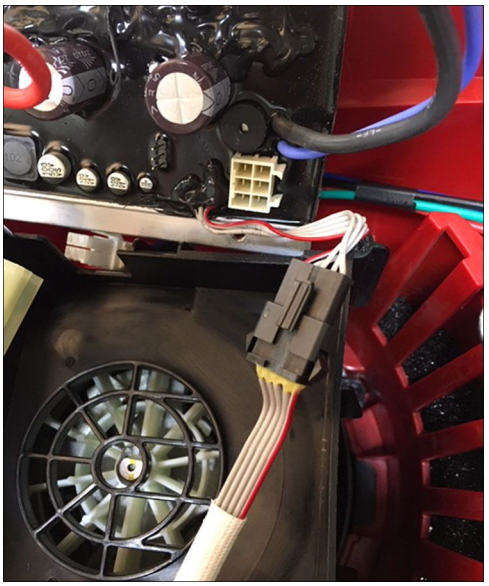
Figure 95

5. Disconnect the harness from the motor driver to the start stop switch and bail switch connectors.

g293759

Figure 96

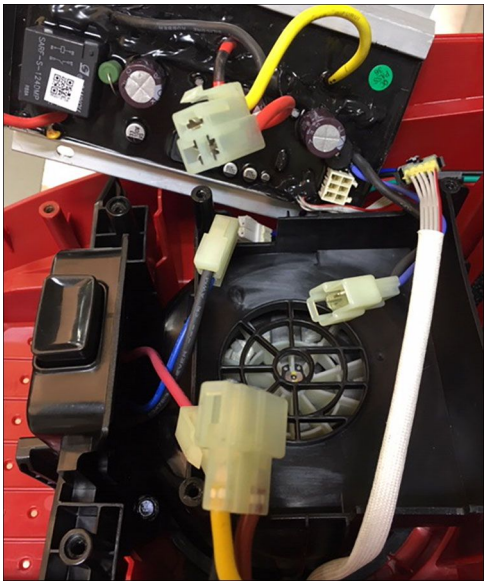
6. Disconnect the motor to the motor driver harness connector.



g293761

Figure 97

7. Disconnect the motor driver to the motor power connection. Remove the motor driver.

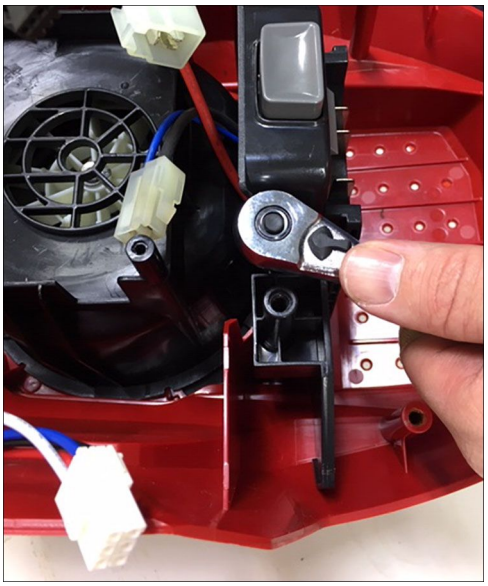


g293760

Figure 98

8. Remove the 2 (1/4 x 1.0 inch) flange screws at the base of the battery receiver assembly.

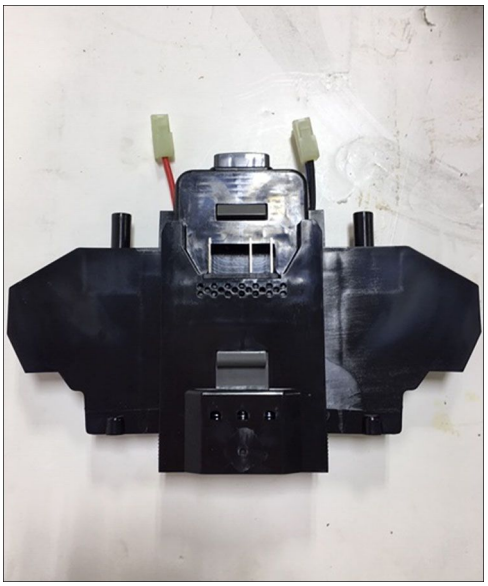
Battery Terminal Removal (continued)



g293765

Figure 99

9. Remove the battery receiver assembly from the power head assembly.

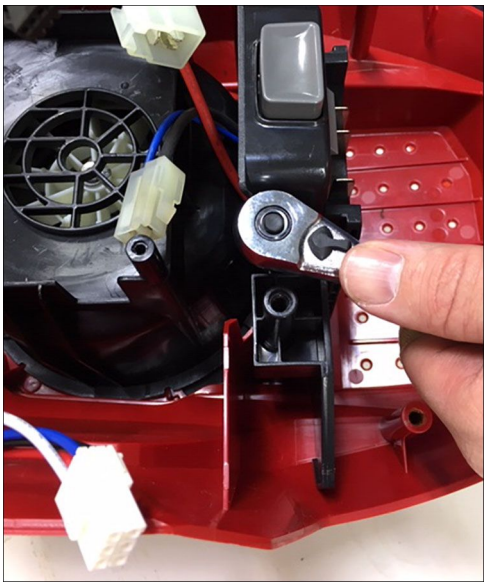


g293766

Figure 100

Battery Terminal Installation

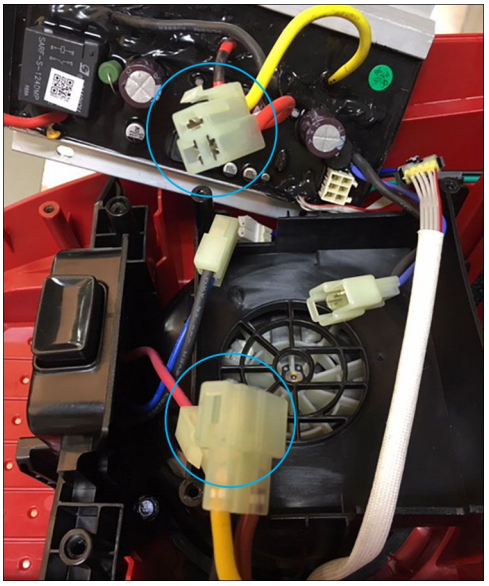
1. Install the 2 (1/4 x 1.0 inch) flange screws at the base of the battery receiver assembly. Torque screws to 30 ± 3 in-lbs. (3.39 Nm).



g293765

Figure 101

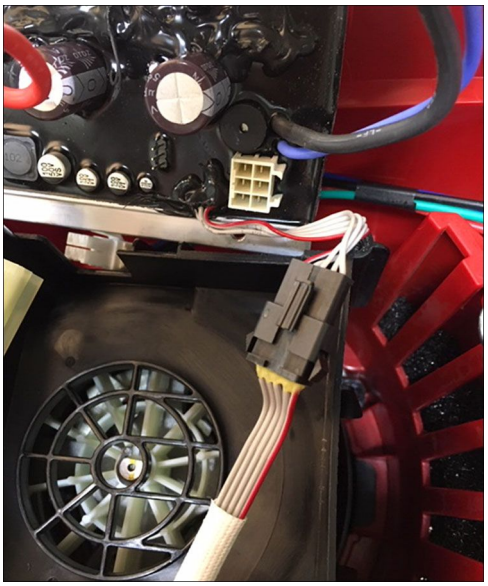
2. Install the motor driver. Connect the motor driver to the motor power connection.



g296707

Figure 102

3. Connect the motor to the motor driver harness connector.



g293761

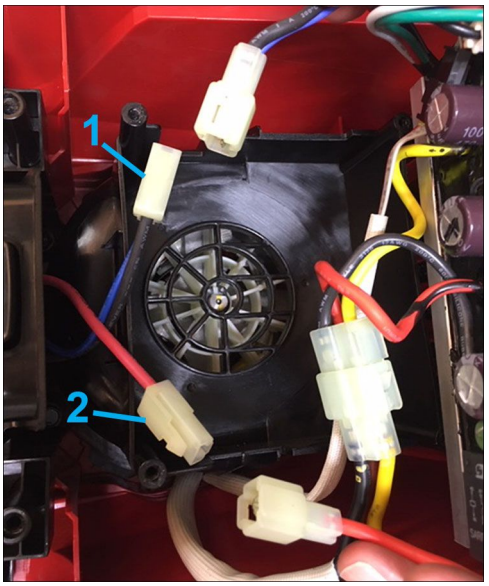
Figure 103

4. Connect the harness from the motor driver to the start stop switch and bail switch connectors.

g293759

Figure 104

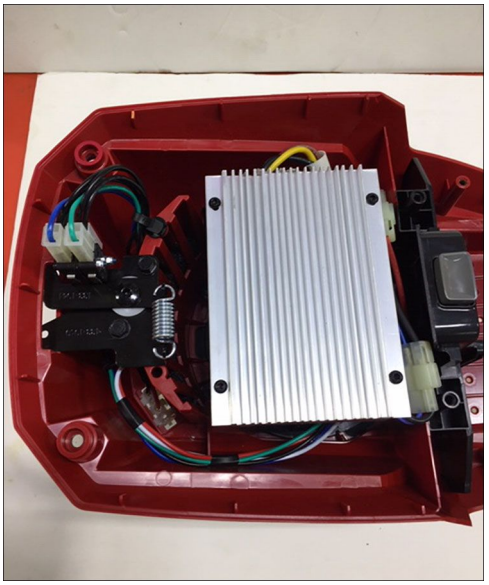
5. Connect the 2 connectors from the battery receiver assembly to the motor driver. Connect the negative first, then the positive.



g296708

Figure 105

6. Install the 4 (T-20) torx screws to the motor fan shroud. Torque screws to 15–20 in-lbs. (1.7–2.26 Nm).



g293757

Figure 106

7. Install the power head upper shroud. Secure with 8 (6 top-around the battery cavity and 2 on the bottom rear) (1/4 x 1.0 inch) flange screws securing the power head upper shroud to the lower shroud. Torque screws to 30 ± 3 in-lbs. (3.39 Nm).

g293756

Figure 107

8. Install the battery to the power head assembly.

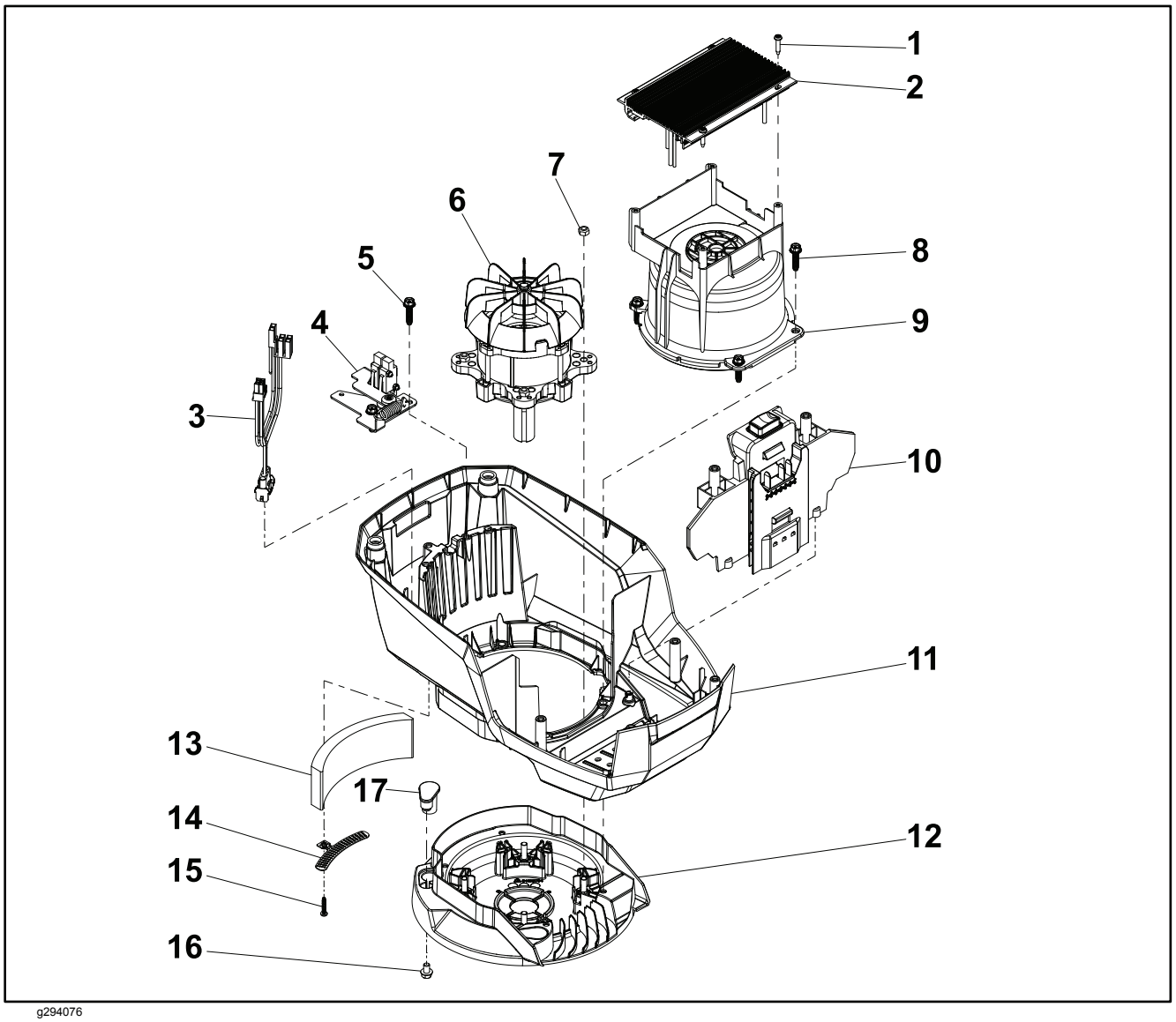
Table of Contents

General Information

The motor is a brushless DC motor with cooling fans mounted on top to keep the motor temps down during operation.

Service and Repairs

Motor Assembly



g294076

Figure 108

1. Screw
2. Motor Driver
3. Wire Harness
4. Bail Switch Asm.
5. Flange Screw
6. XKW Motor
7. Lock Nuts
8. Flange Screw
9. Motor Shroud
10. Battery Receiver Asm.
11. Lower Shroud
12. Motor Base Asm. Mount
13. Foam
14. Foam Bracket
15. Plastic Screw
16. Screw
17. Motor Mount Insert

Motor Replacement

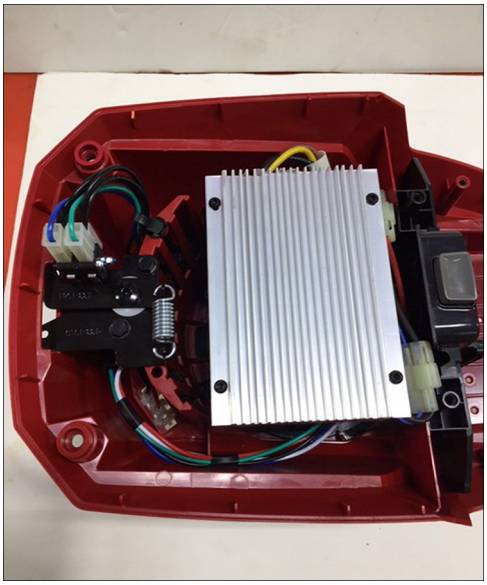
Motor Removal

1. Remove the battery from the power head assembly.
2. Remove the 8 (6 top-around the battery cavity and 2 on the bottom rear) (1/4 x 1.0 inch) flange screws securing the power head upper shroud to the lower shroud. Remove the power head upper shroud.

g293756

Figure 109

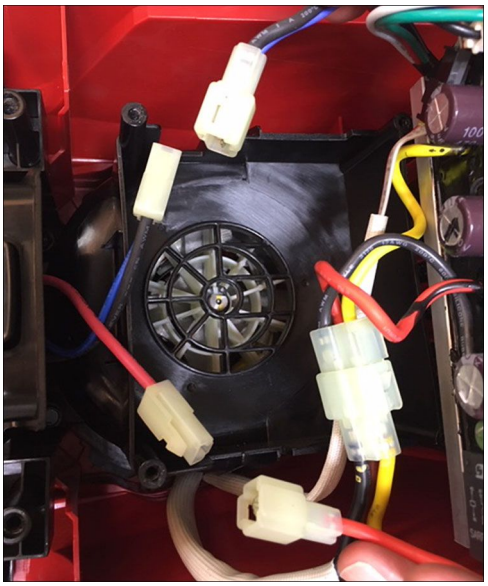
3. Remove the 4 (T-20) torx screws from the motor fan shroud.



g293757

Figure 110

4. Disconnect the 2 connectors from the battery receiver assembly to the motor driver. Disconnect the positive first, then the negative.



g293758

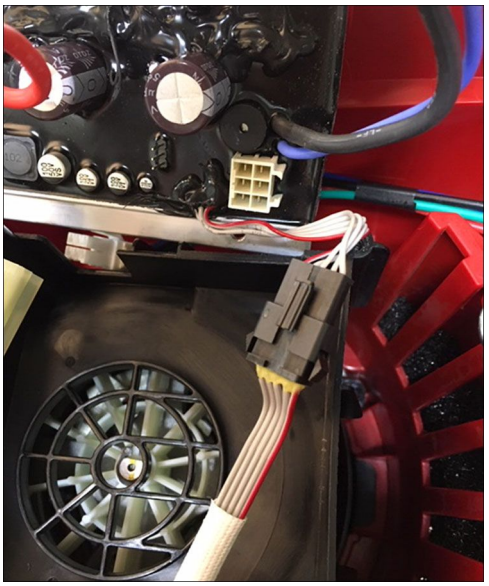
Figure 111

5. Disconnect the harness from the motor driver to the start stop switch and bail switch connectors.

g293759

Figure 112

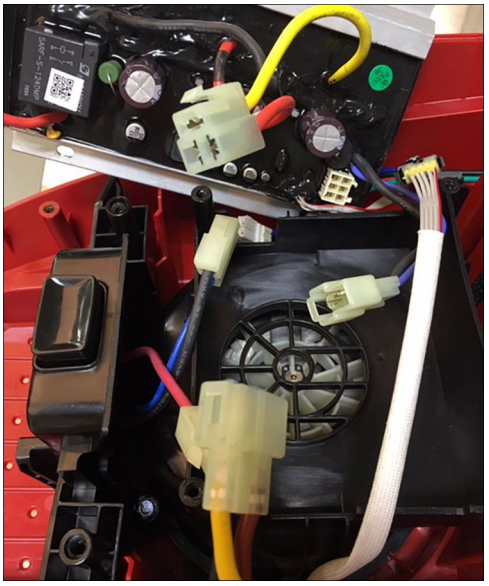
6. Disconnect the motor to the motor driver harness connector.



g293761

Figure 113

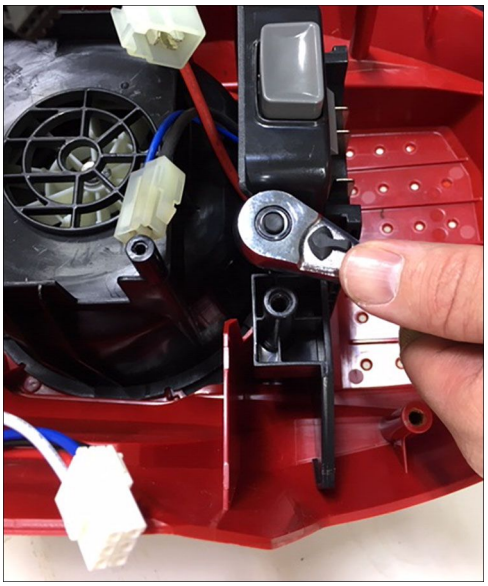
7. Disconnect the motor driver to the motor power connection. Remove the motor driver.



g293760

Figure 114

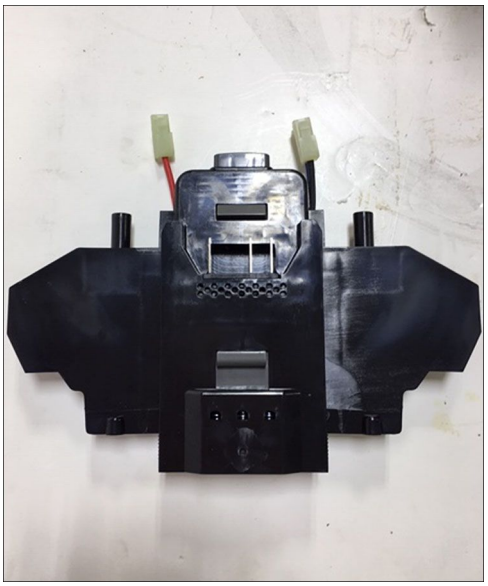
8. Remove the 2 (1/4 x 1.0 inch) flange screws at the base of the battery receiver assembly.



g293765

Figure 115

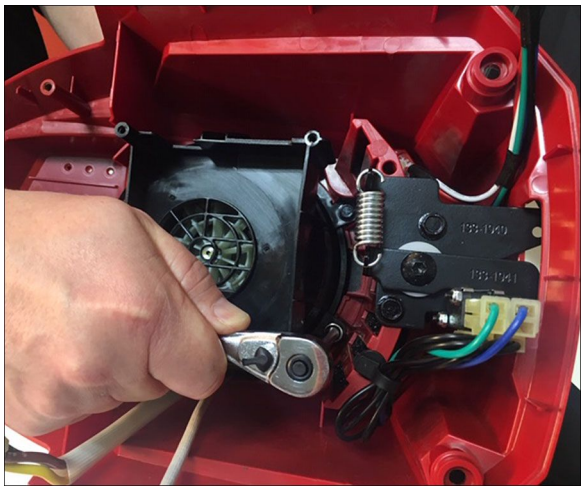
9. Remove the battery receiver assembly from the power head assembly.



g293766

Figure 116

10. Remove the remaining 2 (1/4 x 1.0 inch) flange screws from the motor shroud.



g295055

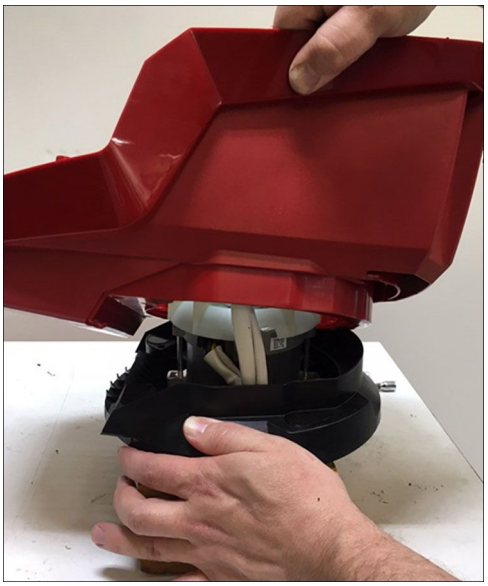
Figure 117

11. Remove the motor shroud from the power head assembly.

g293768

Figure 118

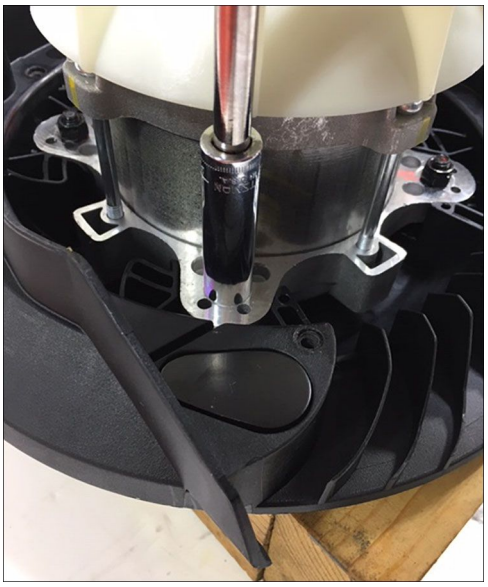
12. Separate the lower shroud from the motor base assembly.



g293795

Figure 119

13. Remove the 4 (10 mm) nuts from the motor to the motor base assembly.

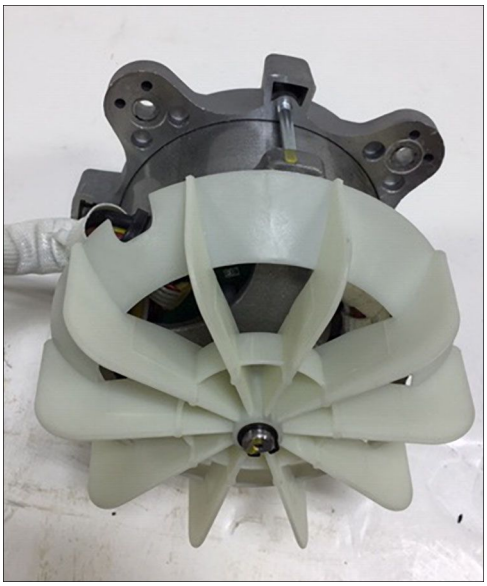


g293792

Figure 120

14. Separate the motor from the motor base assembly.

Motor Removal (continued)



g293794

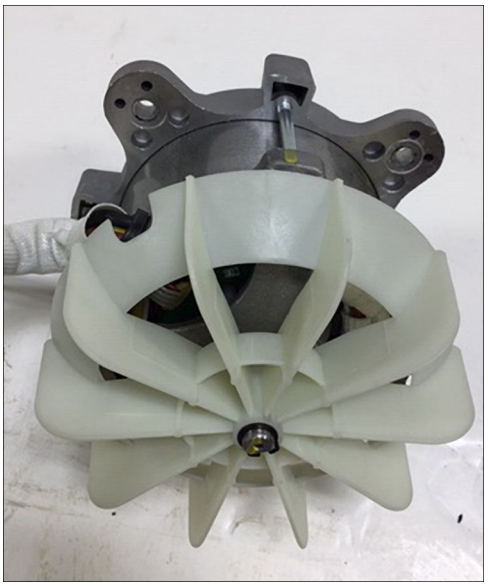
Figure 121

g293793

Figure 122

Motor Installation

1. Install the motor to the motor base assembly.



g293794

Figure 123

g293793

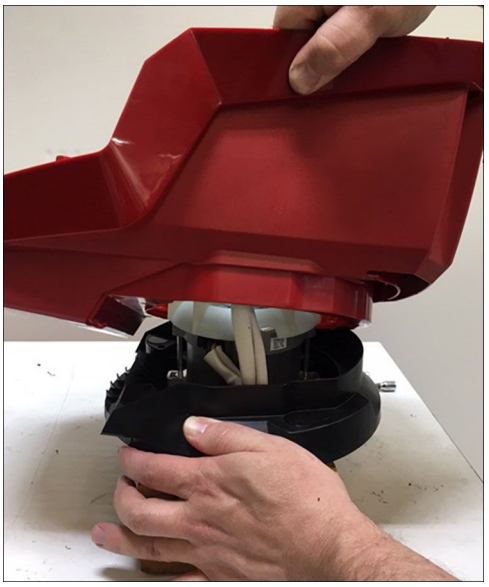
Figure 124

2. Install the 4 (10 mm) nuts to the from the motor to the motor base assembly. Torque nuts to 10 ft-lbs. (14 Nm).

g293792

Figure 125

3. Install the lower shroud to the motor base assembly.



g293795

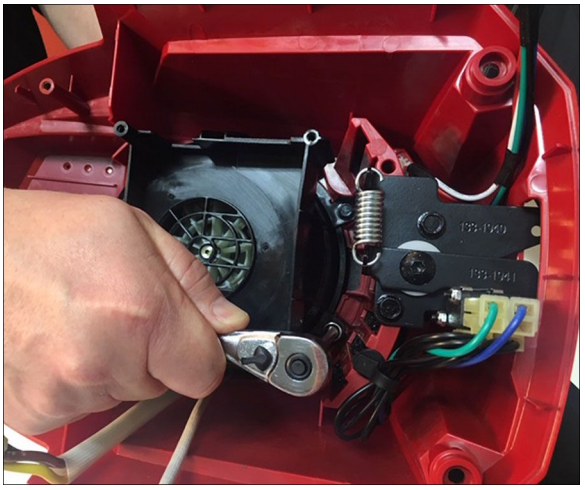
Figure 126

4. Install the motor shroud to the power head assembly.

g293768

Figure 127

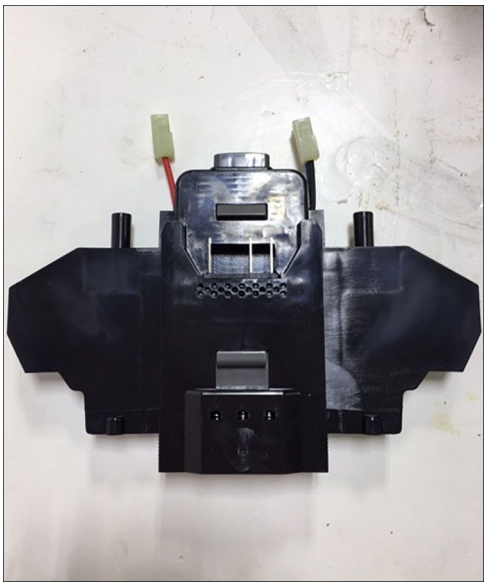
5. Install the 2 (10 mm) screws to the motor shroud. Torque screws to 30 in-lbs. (3.39 Nm).



g295055

Figure 128

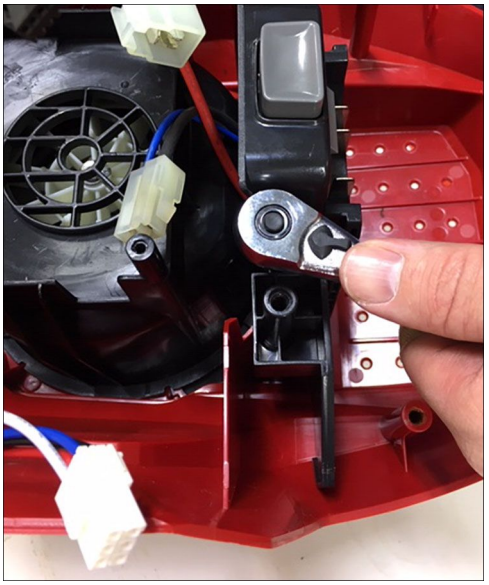
6. Install the battery receiver assembly to the power head assembly.



g293766

Figure 129

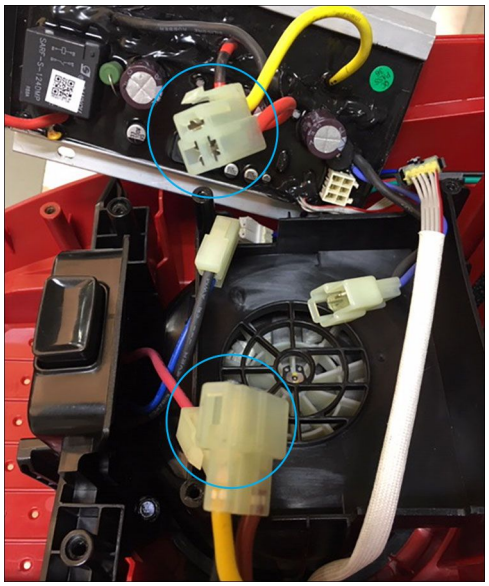
7. Install the 2 (1/4 x 1.0 inch) flange screws at the base of the battery receiver assembly. Torque screws to 30 ± 3 in-lbs. (3.39 Nm).



g293765

Figure 130

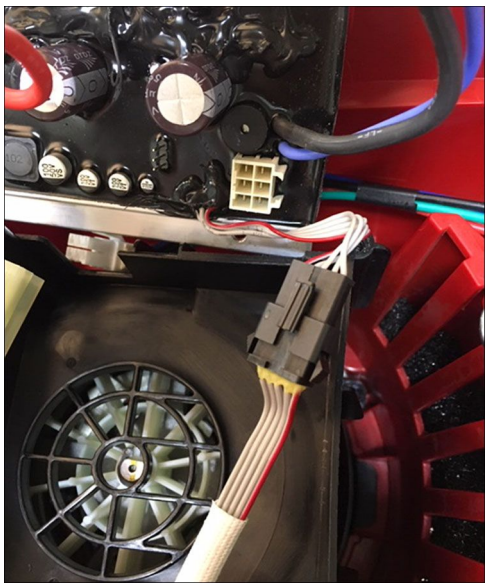
8. Install the motor driver. Connect the motor driver to the motor power connection.



g296707

Figure 131

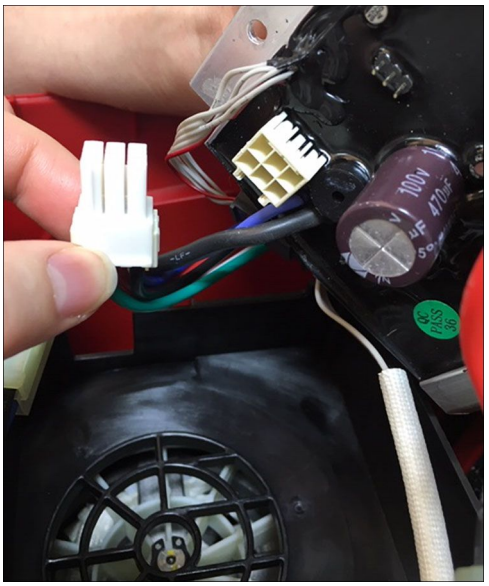
9. Connect the motor to the motor driver harness connector.



g293761

Figure 132

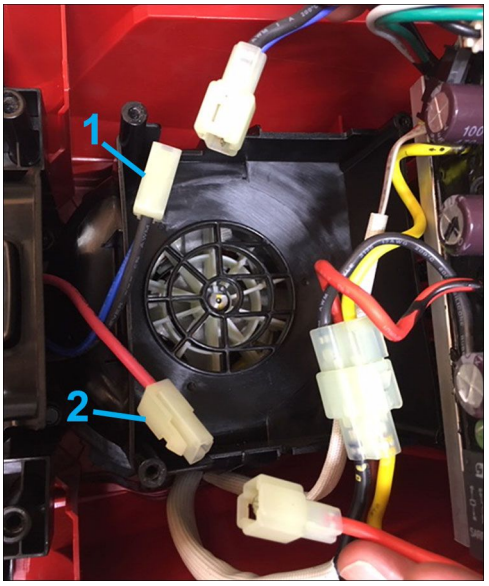
10. Connect the harness from the motor driver to the start stop switch and bail switch connectors.



g293759

Figure 133

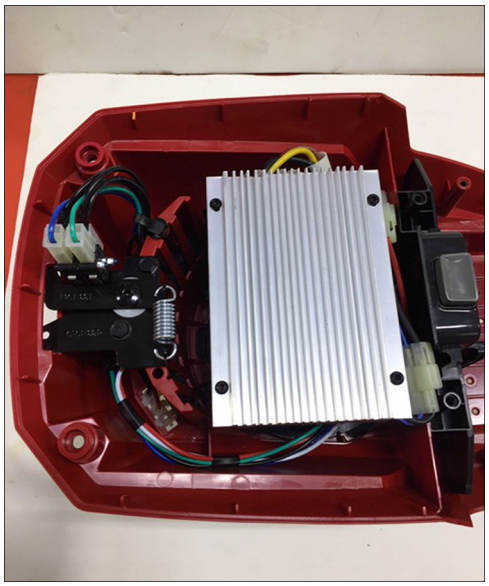
11. Connect the 2 connectors from the battery receiver assembly to the motor driver. Connect the negative first, then the positive.



g296708

Figure 134

12. Install the 4 (T-20) torx screws to the motor fan shroud. Torque screws to 15–20 in-lbs. (1.7–2.26 Nm).



g293757

Figure 135

13. Install the power head upper shroud. Secure with 8 (6 top-around the battery cavity and 2 on the bottom rear) (1/4 x 1.0 inch) flange screws securing the power head upper shroud to the lower shroud. Torque screws to 30 ± 3 in-lbs. (3.39 Nm).

g293756

Figure 136

14. Install the battery to the power head assembly.

Motor Testing

The motor should turn relatively easy with a pulsing motion. When the Ohm testing connection leads, ohm readings should pulse when turning.

Bail Switch Replacement

Bail Switch Removal

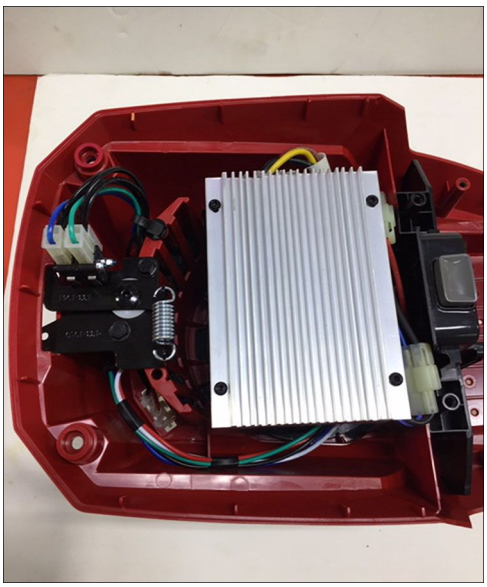
The shoulder bolt is critical if ever removed, replacement part only sold as assembly.

1. Remove the battery from the power head assembly.
2. Remove the 8 (6 top-around the battery cavity and 2 on the bottom rear) (1/4 x 1.0 inch) flange screws securing the power head upper shroud to the lower shroud. Remove the power head upper shroud.

g293756

Figure 137

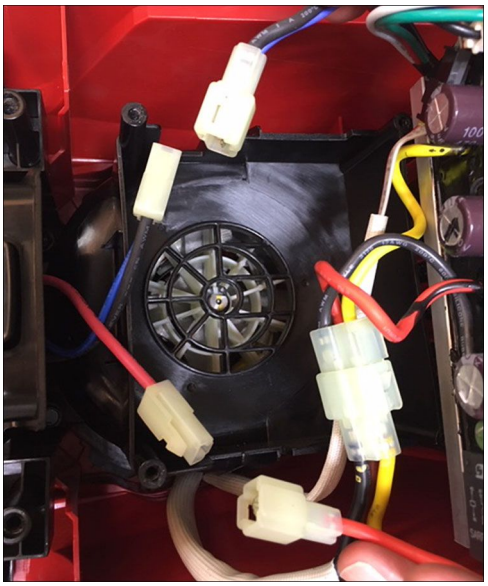
3. Remove the 4 (T-20) torx screws from the motor fan shroud.



g293757

Figure 138

4. Disconnect the 2 connectors from the battery receiver assembly to the motor driver. Disconnect the positive first, then the negative.



g293758

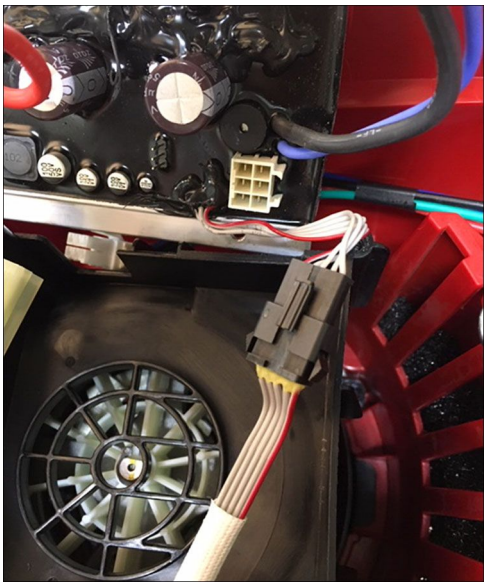
Figure 139

5. Disconnect the harness from the motor driver to the start stop switch and bail switch connectors.

g293759

Figure 140

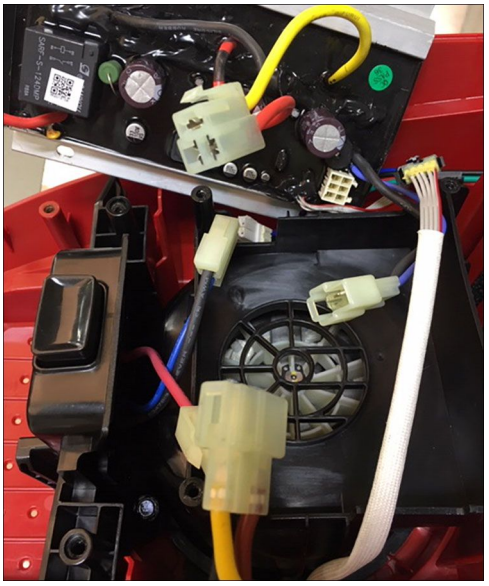
6. Disconnect the motor to the motor driver harness connector.



g293761

Figure 141

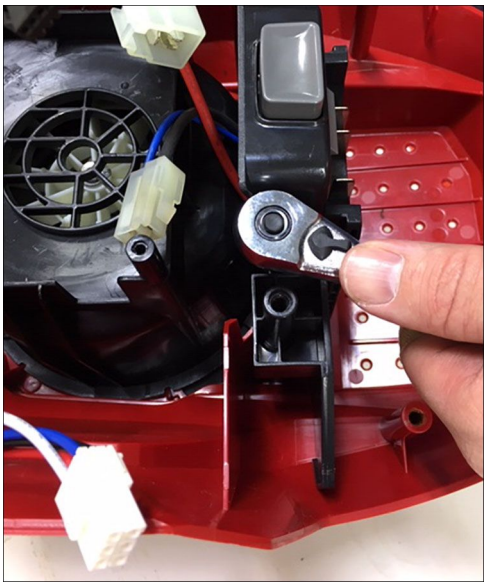
7. Disconnect the motor driver to the motor power connection. Remove the motor driver.



g293760

Figure 142

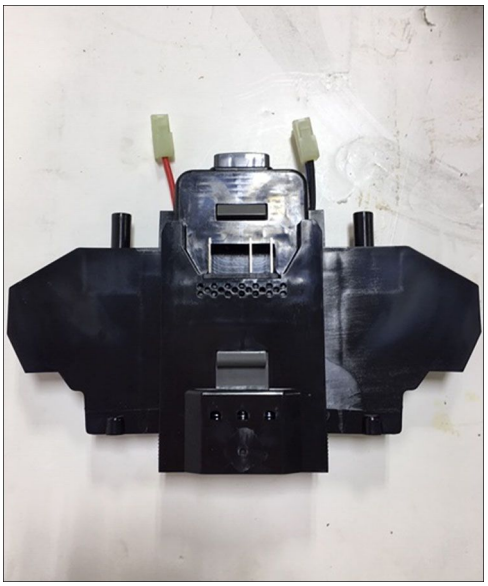
8. Remove the 2 (1/4 x 1.0 inch) flange screws at the base of the battery receiver assembly.



g293765

Figure 143

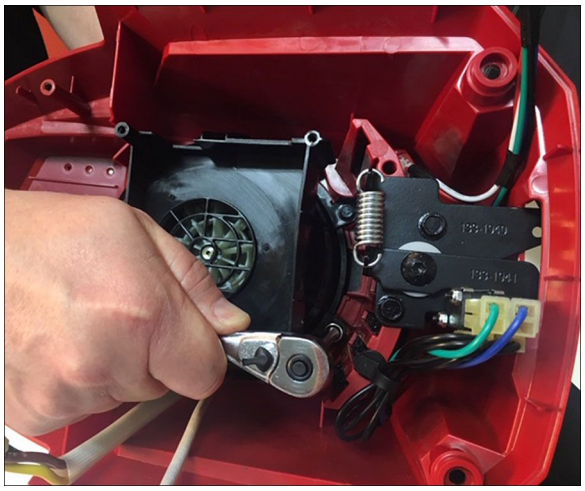
9. Remove the battery receiver assembly from the power head assembly.



g293766

Figure 144

10. Remove the remaining 2 (1/4 x 1.0 inch) flange screws from the motor shroud.



g295055

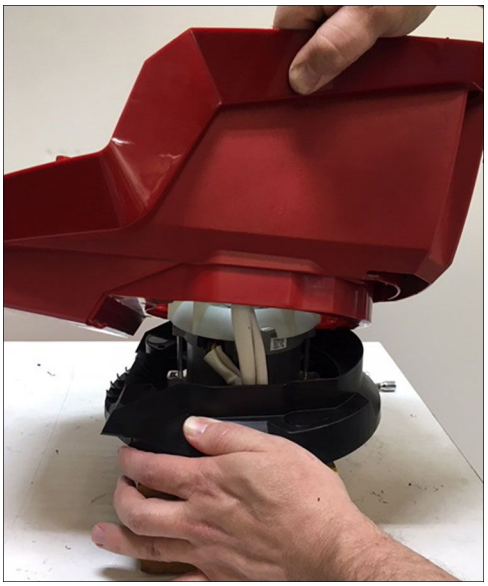
Figure 145

11. Remove the motor shroud from the power head assembly.

g293768

Figure 146

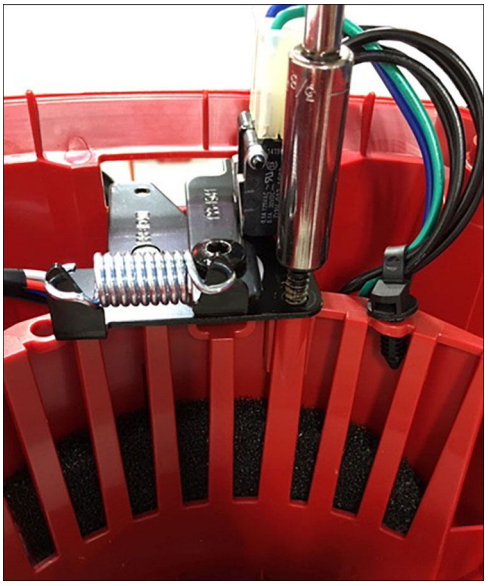
12. Separate the lower shroud from the motor base assembly.



g293795

Figure 147

13. Remove the 2 (1/4 x 1.0 inch) flange screws securing the bail switch to the lower motor shroud.



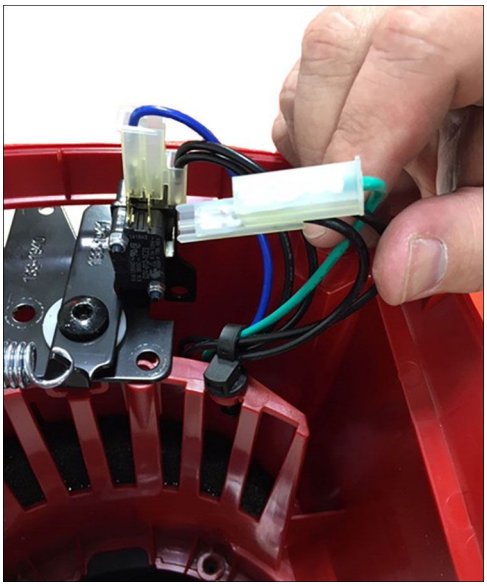
g297102

Figure 148

14. Disconnect the harness from the bail switch. Remove the switch and harness from the lower shroud.

    Note: If harness anchor is damaged, replace.

Bail Switch Removal (continued)

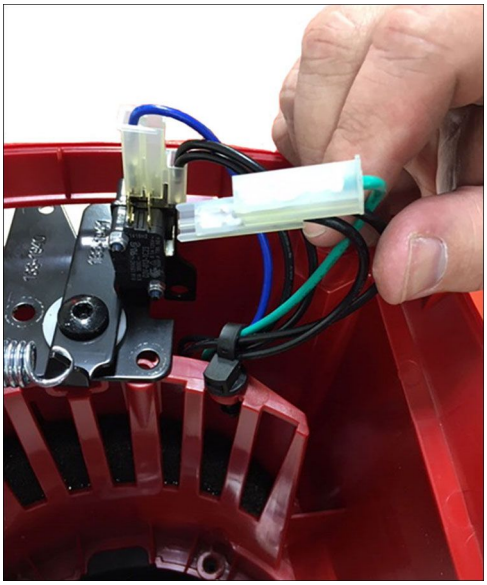


g297103

Figure 149

Bail Switch Installation

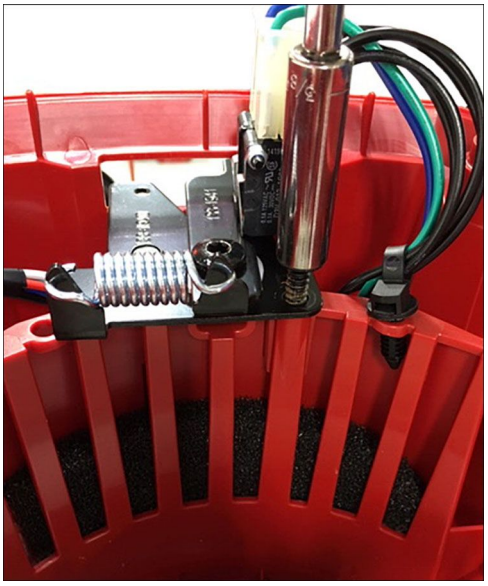
1. Install the switch and harness to the lower shroud. Connect the harness to the bail switch.



g297103

Figure 150

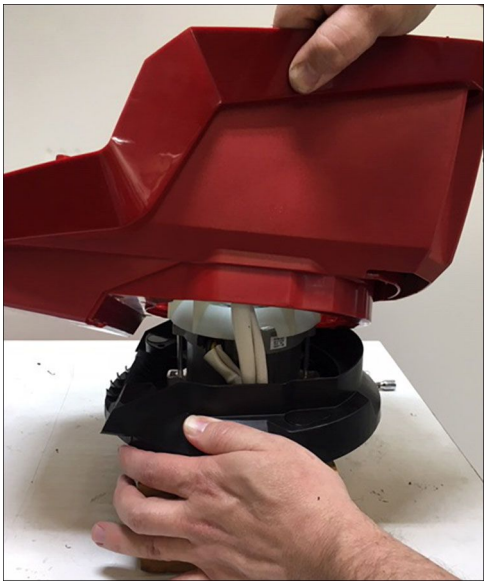
2. Install the 2 (1/4 x 1.0 inch) flange screws securing the bail switch to the lower motor shroud. Torque screws to 30 ± 3 in-lbs. (3.39 Nm).



g297102

Figure 151

3. Install the lower shroud to the motor base assembly.



g293795

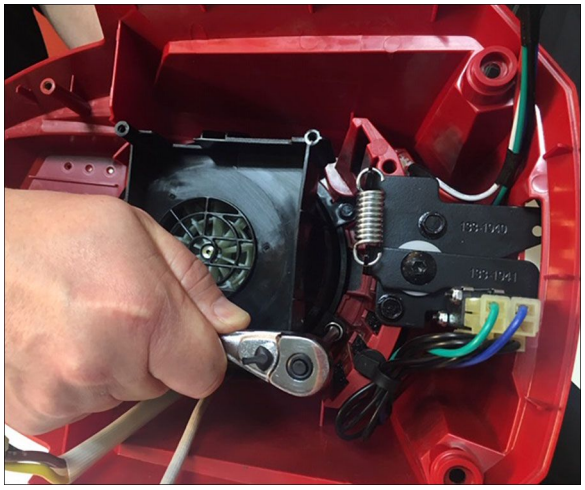
Figure 152

4. Install the motor shroud to the power head assembly.

g293768

Figure 153

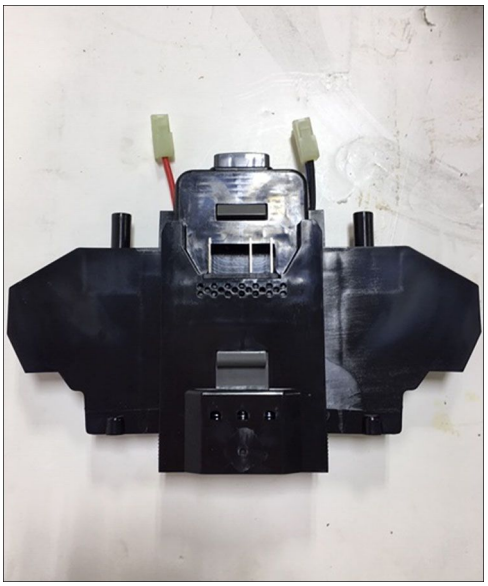
5. Install the 2 (1/4 x 1.0 inch) flange screws to the motor shroud. Torque screws to 30 in-lbs. (3.39 Nm).



g295055

Figure 154

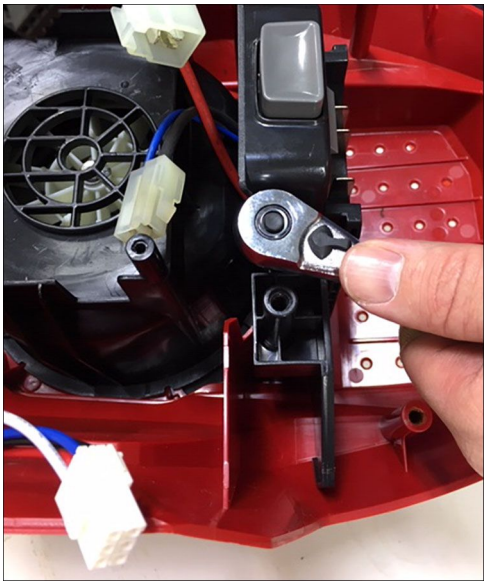
6. Install the battery receiver assembly to the power head assembly.



g293766

Figure 155

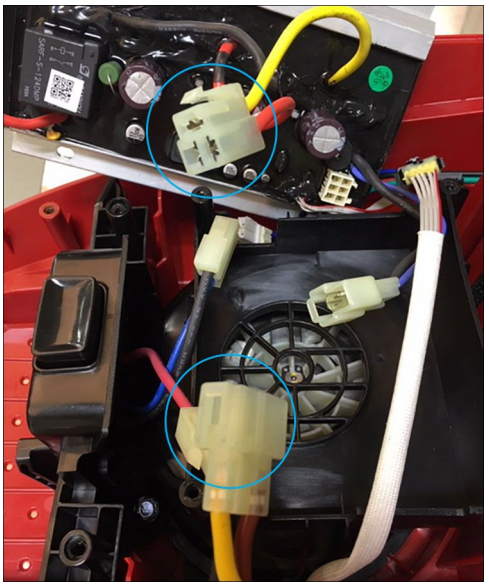
7. Install the 2 (1/4 x 1.0 inch) flange screws at the base of the battery receiver assembly. Torque screws to 30 ± 3 in-lbs. (3.39 Nm).



g293765

Figure 156

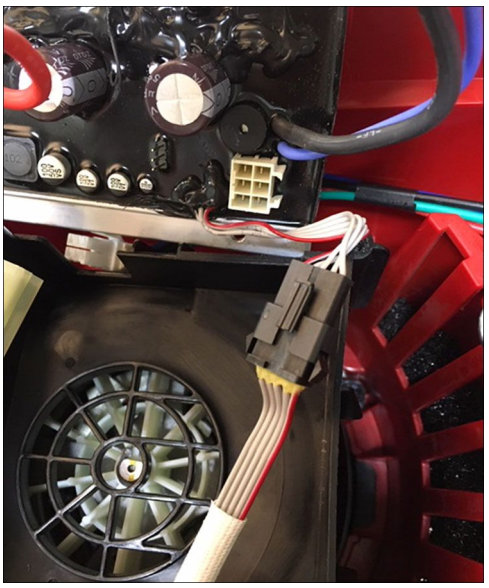
8. Install the motor driver. Connect the motor driver to the motor power connection.



g296707

Figure 157

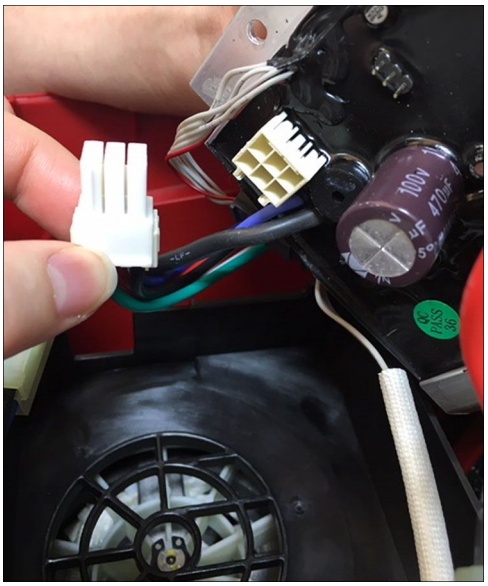
9. Connect the motor to the motor driver harness connector.



g293761

Figure 158

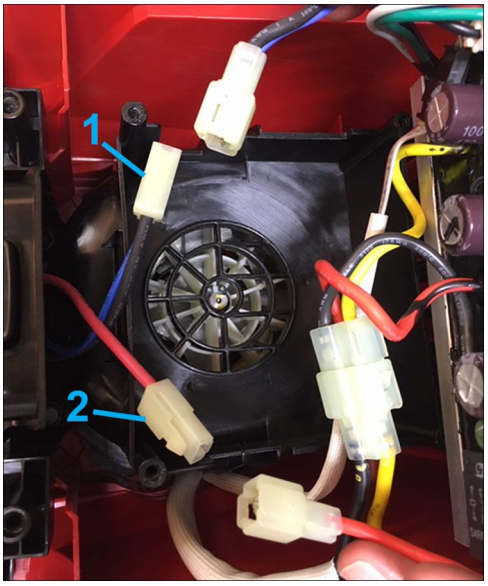
10. Connect the harness from the motor driver to the start stop switch and bail switch connectors.



g293759

Figure 159

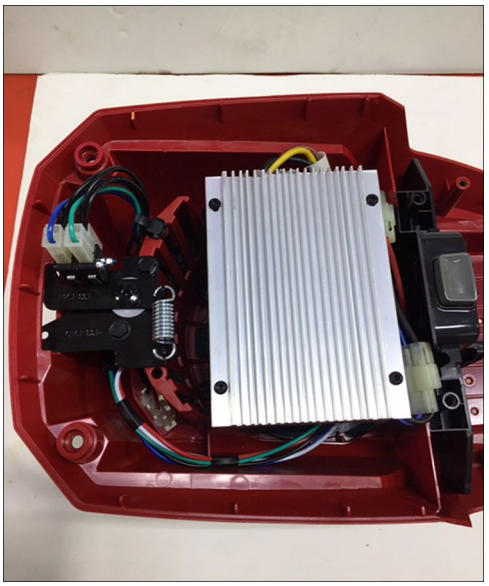
11. Connect the 2 connectors from the battery receiver assembly to the motor driver. Connect the negative first, then the positive.



g296708

Figure 160

12. Install the 4 (T-20) torx screws to the motor fan shroud. Torque screws to 15–20 in-lbs. (1.7–2.26 Nm).



g293757

Figure 161

13. Install the power head upper shroud. Secure with 8 (6 top-around the battery cavity and 2 on the bottom rear) (1/4 x 1.0 inch) flange screws securing the power head upper shroud to the lower shroud. Torque screws to 30 ± 3 in-lbs. (3.39 Nm).

g293756

Figure 162

14. Install the battery to the power head assembly.

Appendix A

Foldout Drawings

Table of Contents

Electrical Drawing Abbreviations

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

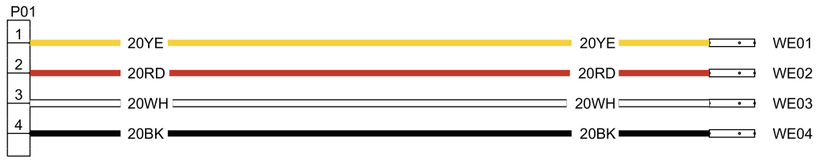
Abbreviation	Color
BK	Black
BR or BM	Brown
BU	Blue
GN	Green
GY	Gray
OR	Orange
PK	Pink
R or RD	Red
T	Tan
VIO	Violet
W or WH	White
Y or YE	Yellow

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).

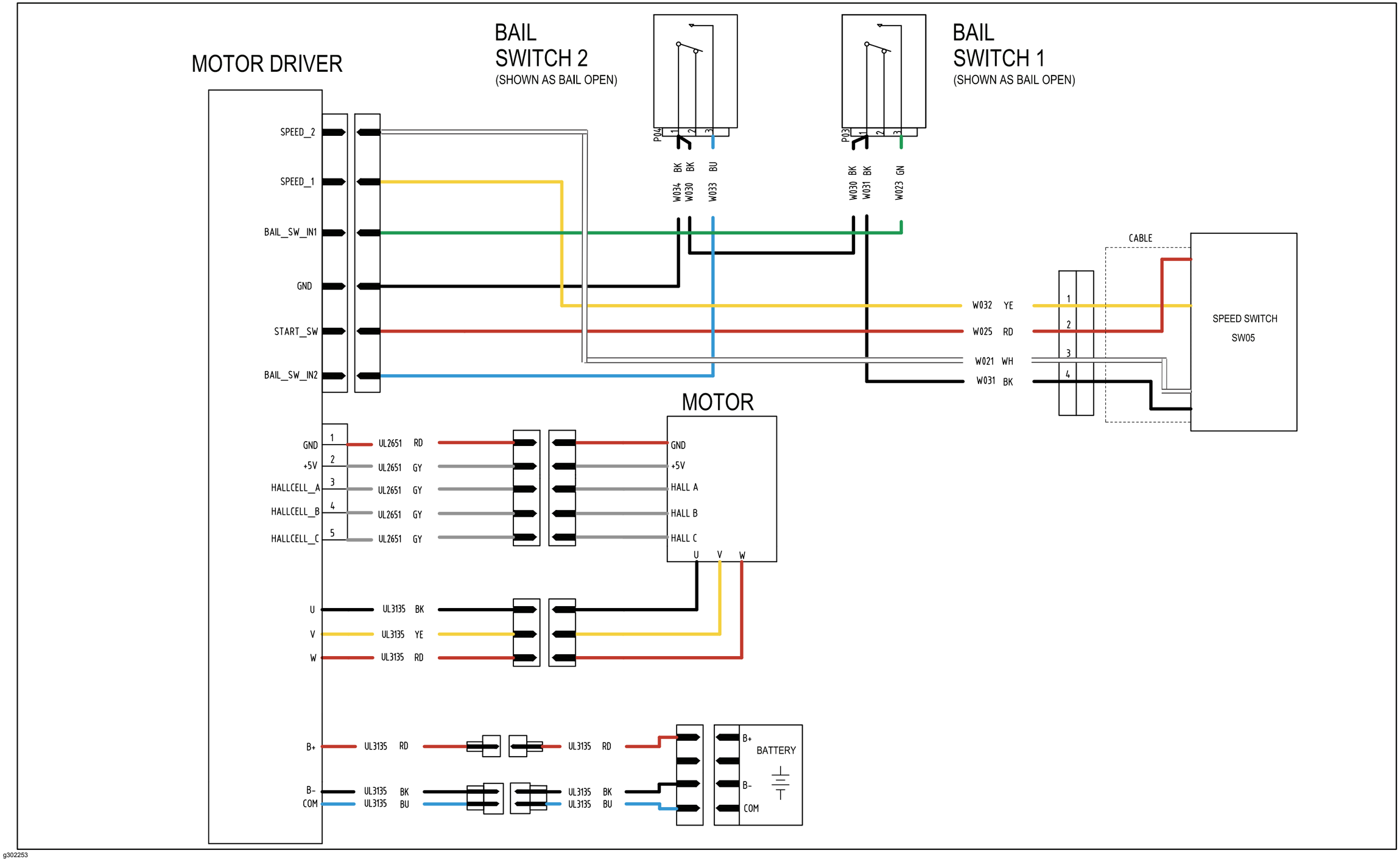
Note: The electrical harness drawings in this chapter identify both the wire color and the wire gauge. For example, 16 BK on a harness diagram identifies a 16 gauge wire with black insulation.

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



g295078


MOTOR DRIVER
BAIL SWITCH 2
(SHOWN AS BAIL OPEN)
BAIL SWITCH 1
(SHOWN AS BAIL OPEN)
P04
P03
SPEED_2
SPEED_1
BAIL_SW_IN1
GND
START_SW
BAIL_SW_IN2
BK BK BU
W034 W030 W033
BK BK GN
W030 W031 W023
W032 YE
W025 RD
W021 WH
W031 BK
CABLE
SPEED SWITCH
SW05
MOTOR
GND UL2651 RD
+5V UL2651 GY
HALLCELL_A UL2651 GY
HALLCELL_B UL2651 GY
HALLCELL_C UL2651 GY
GND
+5V
HALL A
HALL B
HALL C
U V W
U UL3135 BK
V UL3135 YE
W UL3135 RD
B+ UL3135 RD
B- UL3135 BK
COM UL3135 BU
BATTERY
B+
B-
COM

g302253