Form No. 16224SL Rev C

TORO®

Count on it.

Service Manual

Workman® GTX Gasoline

Original Instructions (EN)

Revision History

Revision	Date	Description
--	2016	Initial Issue.
A	03/2018	Incorporated EFI information and procedures. Added revision history.
B	02/2020	Updated torque values.
C	05/2020	Updated Chassis and Electrical Drawings chapters.

Reader Comments

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

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NOTES

Part No. 16224SL (Rev. C)

TORO

Service Manual

Workman® GTX Gasoline

Preface

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

REFER TO THE OPERATOR'S MANUAL FOR OPERATING, MAINTENANCE AND ADJUSTMENT INSTRUCTIONS. For reference, insert a copy of the Operator's Manual and Parts Catalog for your machine into Chapter 2 of this service manual. Additional copies of the Operator's Manual and Parts Catalog are available on the internet at www.Toro.com.

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

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

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

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

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Chapter 1

Safety

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Safety Instructions

The Workman GTX vehicles are designed and tested to offer safe service when operated and maintained properly. Although hazard control and accident prevention partially are dependent upon the design and configuration of the machine, these factors are also dependent upon the awareness, concern and proper training of the personnel involved in the operation, transport, maintenance and storage of the machine. Improper use or maintenance of the machine can result in injury or death.

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

WARNING

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

WARNING

The Workman GTX is an off–highway vehicle only. It is not designed, equipped or manufactured for use on public streets, roads or highways.

Supervisor's Responsibilities

1. Make sure operators are thoroughly trained and familiar with the Operator's Manual and all labels on the vehicle.

2. Be sure to establish your own special procedures and work rules for unusual operating conditions (e.g. slopes too steep for vehicle operation).

Before Operating

1. Read and understand the contents of the Operator's Manual and Operator's DVD before starting and operating the vehicle. Become familiar with the controls and know how to stop the vehicle and engine quickly. Additional copies of the Operator's Manual are available on the internet at www.Toro.com.

2. Keep all shields, safety devices and decals in place. If a shield, safety device or decal is defective, illegible or damaged, repair or replace it before operating the vehicle. Also, tighten any loose nuts, bolts or screws to ensure vehicle is in safe operating condition.

3. Since fuel used in Workman vehicles is highly flammable, handle it carefully:

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

   B. Do not remove vehicle fuel tank cap while engine is hot or running.

   C. Do not smoke while handling fuel.

   D. Fill fuel tank outdoors and only to within an inch of the top of the tank, not the filler neck. Do not overfill the fuel tank.

   E. Clean up any spilled fuel.

While Operating

1. Sit on the operator seat when starting and operating the vehicle.

2. When the vehicle is stationary, apply the parking brake to prevent the vehicle from unexpected movement. Make sure to release parking brake before driving the vehicle.

3. The engine can be started by rotating the key switch to the START position or by turning the key switch to the ON position and depressing the accelerator pedal.

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

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

6. Before getting off the seat:

   A. Stop movement of the vehicle.

   B. Turn key switch to OFF and wait for all machine movement to stop.

   C. Remove key from key switch.

   D. Apply parking brake.

7. If vehicle is parked on incline, chock or block the wheels after getting off the vehicle.

Maintenance and Service

1. Before servicing or making adjustments, turn engine and all accessories OFF, release pressure from accelerator pedal, allow engine to stop, set parking brake and remove key from the key switch.

2. Make sure vehicle is in safe operating condition by keeping all nuts, bolts and screws tight.

3. Never store the vehicle or fuel container inside where there is an open flame, such as near a water heater or furnace.

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

5. If engine must be running to perform maintenance or an adjustment, keep clothing, hands, feet and other parts of the body away from moving parts. Keep bystanders away.

6. Do not overspeed the engine by changing governor setting. To assure safety and accuracy, check maximum engine speed. The maximum engine speed for the Workman GTX is 3750 RPM.

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

8. Disconnect battery before servicing the vehicle. Disconnect negative (–) battery cable first and positive (+) cable last. If battery voltage is required for troubleshooting or test procedures, temporarily connect the battery. Reconnect positive (+) cable first and negative (–) cable last.

9. Battery acid is poisonous and can cause burns. Avoid contact with skin, eyes and clothing. Protect your face, eyes and clothing when working with a battery.

10. Battery gases can explode. Keep cigarettes, sparks and flames away from the battery.

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

12. To assure optimum performance and continued safety of the vehicle, use genuine Toro replacement parts and accessories. Replacement parts and accessories made by other manufacturers may result in nonconformance with safety standards, and the warranty may be voided.

13. When raising the vehicle to change tires or to perform other service, use correct blocks, hoists and jacks. Make sure vehicle is parked on a solid level surface such as a concrete floor. Prior to raising the vehicle, remove any attachments that may interfere with the safe and proper raising of the vehicle. Always chock or block wheels. Use appropriate jack stands to support the raised vehicle. If the vehicle is not properly supported by jack stands, the vehicle may move or fall, which may result in personal injury (see Jacking Instructions in this section).

14. Make sure to dispose of potentially harmful waste (e.g. fuel, oil, engine coolant, filters, battery) in an environmentally safe manner. Follow all local codes and regulations when recycling or disposing of waste.

Jacking and Other Instructions

Jacking Vehicle

DANGER

POTENTIAL HAZARD
- **A vehicle that is not properly supported may become unstable.**

WHAT CAN HAPPEN
- **The vehicle may move or fall. Personal injury or damage to the machine may result.**

HOW TO AVOID THE HAZARD
- **Make sure vehicle is parked on a solid level surface, such as a concrete floor.**
- **Make sure engine is off and key is removed from the key switch before getting off the vehicle.**
- **Before raising the vehicle, remove any attachments that may interfere with the safe and proper raising of the vehicle.**
- **Always chock or block wheels to prevent the vehicle from rolling.**
- **Do not start vehicle while it is on jack stands without placing transaxle in neutral.**
- **Make sure proper hoists, jacks and jack stands are used to raise and support the vehicle.**

Jacking Locations

1. Jack front of the vehicle on the front of the frame behind the towing tongue (Fig. 1).

2. Jack rear of the vehicle under each rear axle tube. Do not jack vehicle below the transaxle case (Fig. 2).

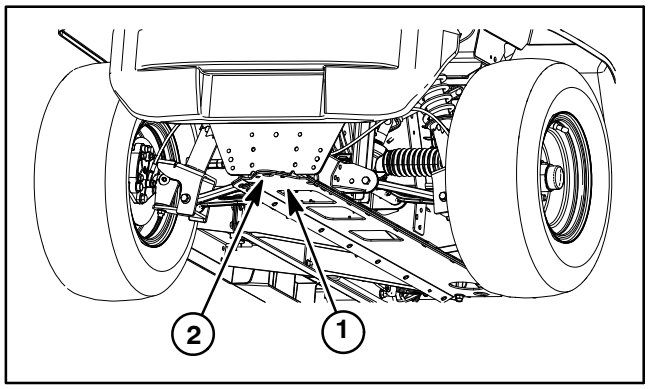

Figure 1

1. **Front of frame** 2. **Towing tongue**

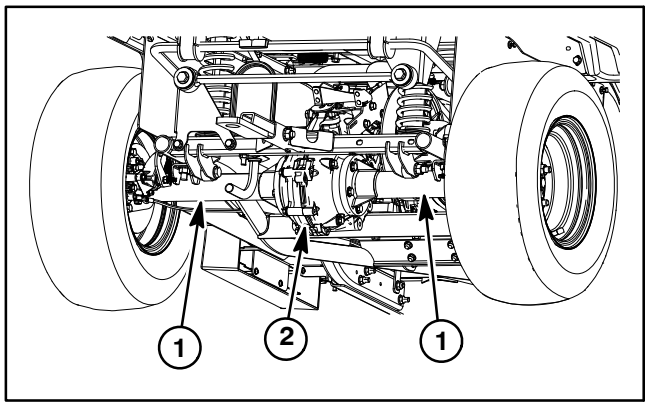

Figure 2

1. **Rear axle tube** 2. **Transaxle case**

Transporting Vehicle

When moving the vehicle long distances, use a trailer or flatbed truck. Make sure vehicle is secured to the trailer properly. Also, make sure to secure seats to vehicle during transport. Refer to Operator's Manual for transport information.

Towing Vehicle

IMPORTANT: Frequent or long distance towing of the Workman GTX is not recommended.

In case of emergency, the vehicle can be towed for a **short** distance. Refer to Operator's Manual for towing information.

IMPORTANT: If vehicle is towed, make sure that transaxle is in the NEUTRAL position, parking brake is released, key switch is in the OFF position, and key is removed from switch. Also, secure seats to vehicle.

Transaxle Neutral Position

When performing routine maintenance and/or engine testing, the transaxle must be shifted into the neutral position.

1. Park machine on a level surface, stop engine, set parking brake and remove key from the key switch.

2. Move shift lever to the neutral position (Fig. 3).

3. Make sure transaxle is in the neutral position by rotating the secondary clutch (Fig. 4). The rear tires should not rotate as the secondary clutch is rotated. If tire rotation does occur, see Adjust Shift Cable in the Adjustment section of Chapter 5 – Drive Train.

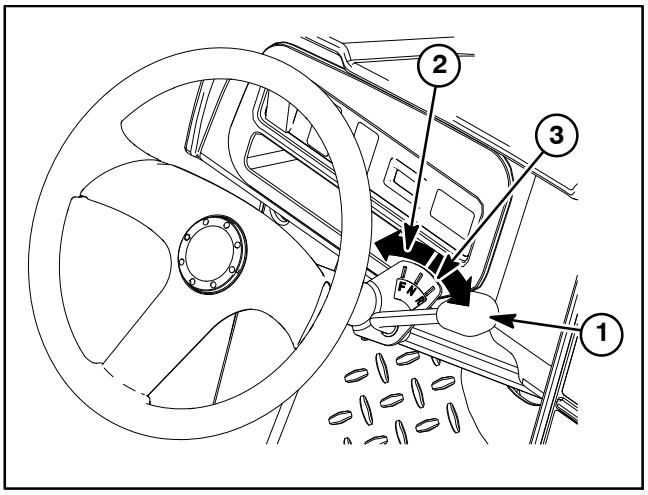

Figure 3

1. **Shift lever (in neutral)**
2. **Forward position**
3. **Reverse position**

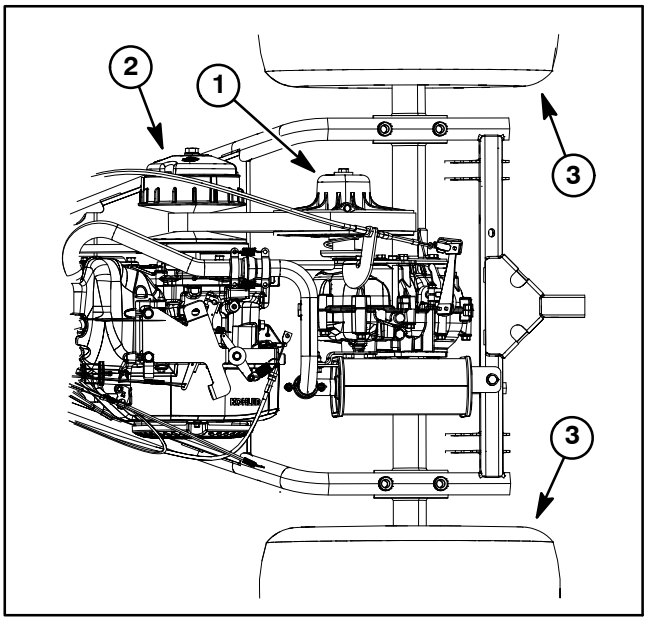

Figure 4

1. **Secondary clutch**
2. **Primary clutch**
3. **Rear wheel**

Safety and Instruction Decals

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

Chapter 2

Product Records and Maintenance

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Product Records

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

Maintenance

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

Equivalents and Conversions

Decimal and Millimeter Equivalents

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

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

U.S.to Metric Conversions

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

Torque Specifications

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

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

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

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

Fastener Identification

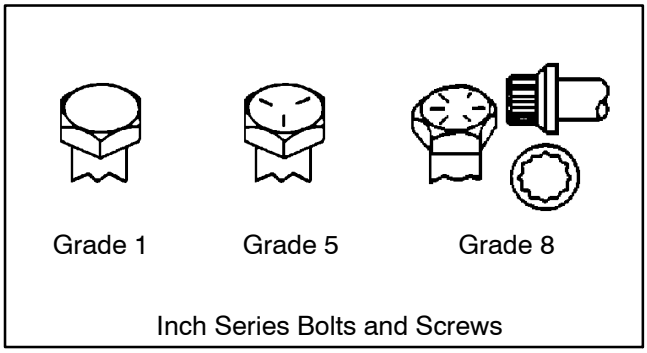


Figure 1

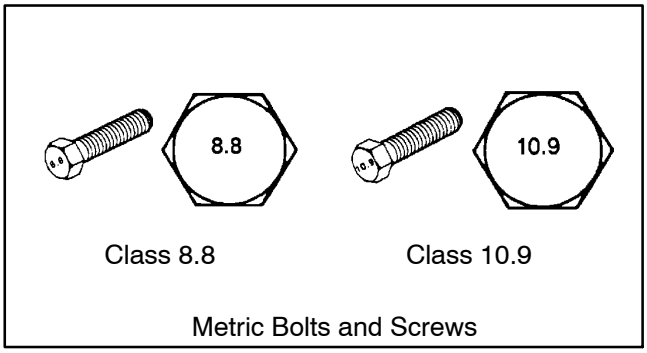


Figure 2

Using a Torque Wrench with an Offset Wrench

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

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

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

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

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

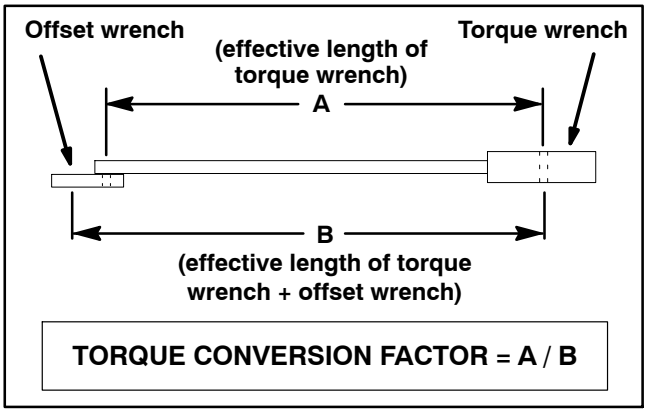


Figure 3

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

Thread Size	Grade 1, 5 & 8 with Thin Height Nuts	SAE Grade 1 Bolts, Screws, Studs & Sems with Regular Height Nuts (SAE J995 Grade 2 or Stronger Nuts)		SAE Grade 5 Bolts, Screws, Studs & Sems with Regular Height Nuts (SAE J995 Grade 2 or Stronger Nuts)		SAE Grade 8 Bolts, Screws, Studs & Sems with Regular Height Nuts (SAE J995 Grade 5 or Stronger Nuts)	
	in–lb	**in–lb**	**N–cm**	**in–lb**	**N–cm**	**in–lb**	**N–cm**
# 6 – 32 UNC	10 ± 2	13 ± 2	147 ± 23	15 ± 2	170 ± 20	23 ± 2	260 ± 20
# 6 – 40 UNF				17 ± 2	190 ± 20	25 ± 2	280 ± 20
# 8 – 32 UNC	13 ± 2	25 ± 5	282 ± 30	29 ± 3	330 ± 30	41 ± 4	460 ± 45
# 8 – 36 UNF				31 ± 3	350 ± 30	43 ± 4	485 ± 45
# 10 – 24 UNC	18 ± 2	30 ± 5	339 ± 56	42 ± 4	475 ± 45	60 ± 6	675 ± 70
# 10 – 32 UNF				48 ± 4	540 ± 45	68 ± 6	765 ± 70
1/4 – 20 UNC	48 ± 7	53 ± 7	599 ± 79	100 ± 10	1125 ± 100	140 ± 15	1580 ± 170
1/4 – 28 UNF	53 ± 7	65 ± 10	734 ± 113	115 ± 10	1300 ± 100	160 ± 15	1800 ± 170
5/16 – 18 UNC	115 ± 15	105 ± 17	1186 ± 169	200 ± 25	2250 ± 280	300 ± 30	3390 ± 340
5/16 – 24 UNF	138 ± 17	128 ± 17	1446 ± 192	225 ± 25	2540 ± 280	325 ± 30	3670 ± 340
	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 ± 4	58 ± 5
3/8 – 24 UNF	17 ± 2	18 ± 2	24 ± 3	35 ± 3	47 ± 4	50 ± 4	68 ± 5
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 ± 5	75 ± 7	77 ± 7	104 ± 9
1/2 – 13 UNC	30 ± 3	48 ± 7	65 ± 9	75 ± 8	102 ± 11	105 ± 10	142 ± 14
1/2 – 20 UNF	32 ± 3	53 ± 7	72 ± 9	85 ± 8	115 ± 11	120 ± 10	163 ± 14
5/8 – 11 UNC	65 ± 10	88 ± 12	119 ± 16	150 ± 15	203 ± 20	210 ± 20	285 ± 27
5/8 – 18 UNF	75 ± 10	95 ± 15	129 ± 20	170 ± 15	230 ± 20	240 ± 20	325 ± 27
3/4 – 10 UNC	93 ± 12	140 ± 20	190 ± 27	265 ± 25	359 ± 34	375 ± 35	508 ± 47
3/4 – 16 UNF	115 ± 15	165 ± 25	224 ± 34	300 ± 25	407 ± 34	420 ± 35	569 ± 47
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 ± 45	644 ± 61	660 ± 60	895 ± 81

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.

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

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

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

Thread Size	Class 8.8 Bolts, Screws and Studs with Regular Height Nuts (Class 8 or Stronger Nuts)		Class 10.9 Bolts, Screws and Studs with Regular Height Nuts (Class 10 or Stronger Nuts)	
M5 X 0.8	57 ± 5 in–lb	640 ± 60 N–cm	78 ± 7 in–lb	885 ± 80 N–cm
M6 X 1.0	96 ± 9 in–lb	1018 ± 100 N–cm	133 ± 13 in–lb	1500 ± 150 N–cm
M8 X 1.25	19 ± 2 ft–lb	26 ± 3 N–m	27 ± 2 ft–lb	36 ± 3 N–m
M10 X 1.5	38 ± 4 ft–lb	52 ± 5 N–m	53 ± 5 ft–lb	72 ± 7 N–m
M12 X 1.75	66 ± 7 ft–lb	90 ± 10 N–m	92 ± 9 ft–lb	125 ± 12 N–m
M16 X 2.0	166 ± 15 ft–lb	225 ± 20 N–m	229 ± 22 ft–lb	310 ± 30 N–m
M20 X 2.5	325 ± 33 ft–lb	440 ± 45 N–m	450 ± 37 ft–lb	610 ± 50 N–m

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

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

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

Other Torque Specifications

SAE Grade 8 Steel Set Screws

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

Wheel Bolts and Lug Nuts

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

** For steel wheels and non–lubricated fasteners.

Thread Cutting Screws (Zinc Plated Steel)

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

Thread Cutting Screws (Zinc Plated Steel)

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

* Hole size, material strength, material thickness 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–m X 0.7376 = ft–lb

Chapter 3

Gasoline Engine

Table of Contents

General Information

This Chapter gives information about specifications, maintenance, troubleshooting, testing and repair of the single cylinder Kohler gasoline engines used in the Workman GTX.

Operator's Manual

The Operator's Manual provides information regarding the operation, general maintenance and maintenance intervals for your Workman GTX vehicle. The Kohler Owner's Manual includes information specific to the engine used in your Workman. Refer to these publications for additional information when servicing the machine.

Kohler Command Pro Service Manual

General engine maintenance procedures are described in your Operator's Manual. Information on engine troubleshooting, testing, disassembly and assembly is identified in either the KOHLER Command PRO CH260- CH440 Service Manual for carbureted engines, or the KOHLER Command PRO EFI ECH440 & ECH440LE Service Manual for electronic fuel injected (EFI) engines.

Most repairs and adjustments require tools which are commonly available in many service shops. Special tools are described in the KOHLER Service Manuals and the use of some specialized test equipment is explained. The cost of the test equipment and the specialized nature of some repairs may dictate that engine work be done at an engine repair facility.

Kohler Gasoline Engine

The engine that powers your Workman GTX vehicle is either a Kohler model Command Pro CH440 carbureted engine, or a ECH440 electronic fuel injected (EFI) engine. Verify the engine used in your vehicle before servicing the vehicle.

Fuel injected engines feature an electronic control unit (ECU) and an oxygen sensor incorporated into the exhaust system. The ECM receives information from numerous engine sensors. The information provided allows the engine ECM to monitor and control engine operation for optimum engine performance.

Service and repair parts for Kohler engines are supplied through your local Toro distributor. Be prepared to provide your distributor with both the Toro and Kohler model and serial numbers.

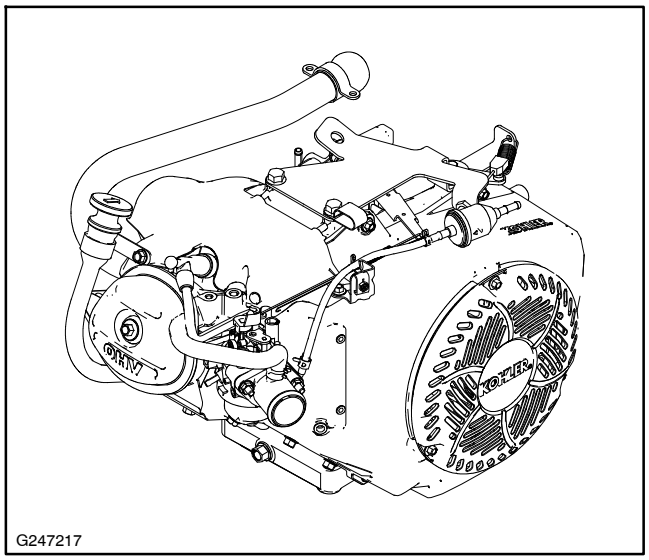


Figure 4
(carbureted engine shown)

Engine Electronic Control Unit (ECU) (Fuel Injected Engines only)

Vehicles with a fuel injected engine (Kohler ECH440) use an electronic control unit (ECU) for engine management. The ECU is located at the front of the engine below the valve cover. All wire harness electrical connectors should be plugged into the ECU before the machine ignition switch is moved from the OFF position to either the RUN or START position.

If the engine ECU identifies that an engine problem exists, the engine speed may be reduced or the engine might stop. The Kohler EFI Diagnostic Software Kit (Kohler P/N 25 761 23- S) and the adapter harness (Kohler P/N 25 176 23) is required to see fault codes. view engine data, access service information, and aid in troubleshooting engine issues. This kit includes the software and a communication cable. The adapter harness must be purchased separately. The diagnostic connecter is secured to the left side of the swing arm under the air cleaner assembly.

Kohler also offers an EFI Service Tool Kit (Kohler P/N 24 761 01- S) which includes a pressure gauge, a test light, fittings, wiring, and adapters required to maintain the fuel system. Kohler diagnostic software and service tool kits can be obtained through Kohler Distributors and Dealers or purchased online.

IMPORTANT: Do not plug or unplug the engine ECU for a period of forty (40) seconds after the machine key switch is turned OFF. The ECU may remain energized even though the ignition switch is OFF.

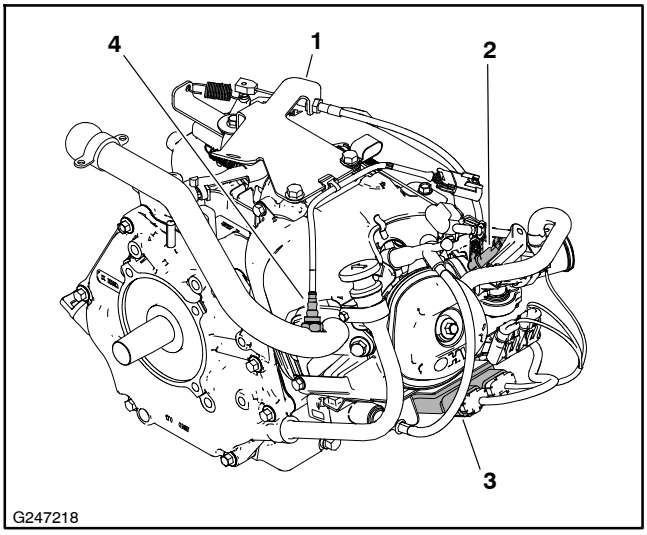


Figure 5

1. **EFI Engine**
2. **Fuel Injector**
3. **Engine ECU**
4. **Oxygen Sensor**

If the engine ECU is to be disconnected for any reason, make sure that the ignition switch is in the OFF position with the key removed before disconnecting the engine ECU. Also, to prevent possible ECU damage when welding on the machine, disconnect and remove the engine ECU from the machine before welding.

Rear Frame Panel Cover

A panel cover is secured to the top of the rear frame behind the seats to prevent debris entry to the front of the swing arm area. The cover can easily be removed by releasing the latches and lifting the cover from the rear frame to improve engine access.

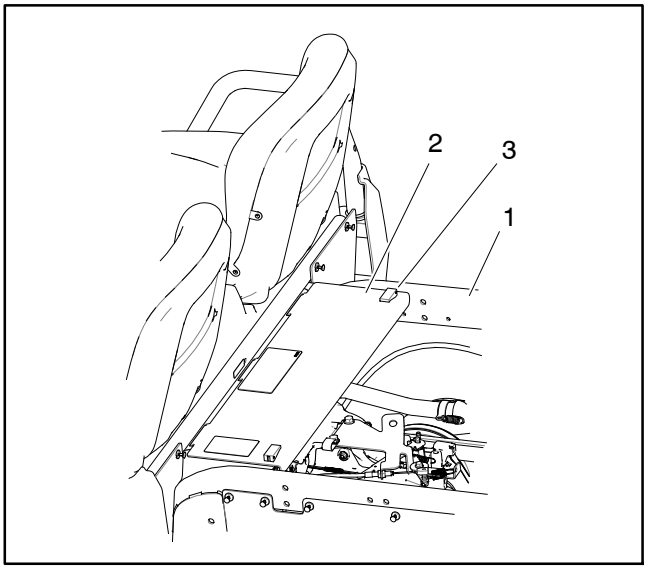


Figure 1

1. **Rear frame**
2. **Panel cover**
3. **Latch (2 used)**

Specifications

Item	Description
Make / Designation	4- cycle, Single Cylinder, OHV, Air Cooled, Gasoline Engine
Bore x Stroke	3.5 in x 2.7 in (89 mm x 69 mm)
Total Displacement	24.7 in^3 (429 cc)
Governor	Mechanical
Idle Speed (no load)	1300 + 50 RPM
High Idle (no load)	3700 + 50 RPM
Carburetor	Float Feed, Single Barrel
Fuel Pump	Pulsating Crankcase Vacuum
Fuel	Unleaded regular grade gasoline
Fuel Tank Capacity	5.0 U.S. gal (18.9 l)
Lubrication System	Splash Lubrication
Crankcase Oil Capacity	1.1 U.S. qt (1.0 l)
Engine Oil	See Operator's Manual
Spark Plugs	Champion RC 12LC4 (or equivalent)
Spark Plug Gap	0.030 in (0.76 mm)
Starter/Generator	220 Amps (starting) @12VDC 41 Amps (maximum charging) @ 14.8 VDC
Engine Dry Weight (approximate)	76 lb (34.5 kg)

Adjustments

Adjust Accelerator Cable

NOTE: Workman GTX vehicles use the engine governor to control engine speed. Refer to the Kohler Service Manual for additional governor information.

Depressing the accelerator pedal rotates the engine mounted throttle lever which tensions the engine governor spring to increase engine speed. Releasing the accelerator pedal decreases governor spring tension which reduces engine speed.

NOTE: Two (2) people are needed to complete this procedure. Also, a tachometer is necessary to measure engine speed.

1. Park machine on a level surface, stop engine, engage parking brake.

2. Raise cargo bed and prop with rod to gain access to the engine.

3. Make sure that shift lever on steering column is in the neutral position to prevent the vehicle from moving.

NOTE: If phototac is to be used to measure engine speed, DO NOT use secondary clutch on transaxle for speed measurement.

4. Start engine and fully depress accelerator pedal. Have a second person measure engine speed with a tachometer. With pedal fully depressed, engine speed should be from **3650 to 3750 RPM**. If necessary, adjust jam nuts on accelerator cable so that engine speed is correct when the accelerator pedal is fully depressed.

5. After accelerator cable adjustment is correct, lower and secure cargo bed.

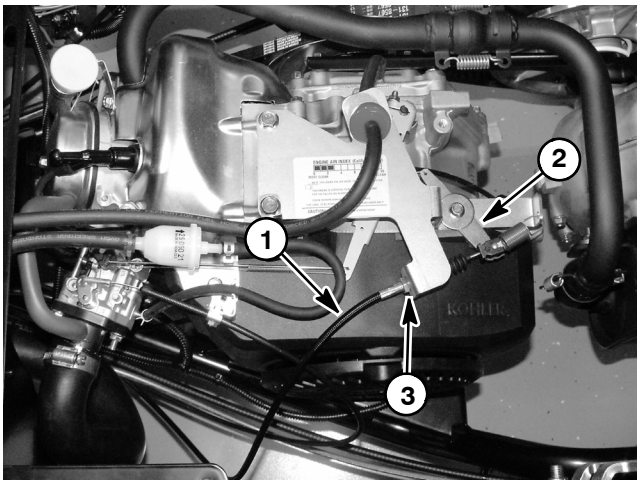


Figure 2

1. **Accelerator cable**
2. **Throttle lever**
3. **Cable jam nut**

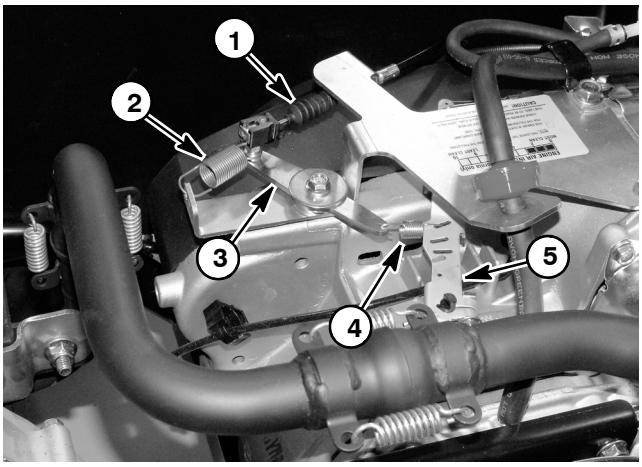


Figure 3

1. **Accelerator cable**
2. **Return spring**
3. **Throttle lever**
4. **Engine governor spring**
5. **Engine governor lever**

Cooling System

To ensure proper engine cooling, make sure the grass screen, cooling fins and other external surfaces of the engine are kept clean at all times.

NOTE: Perform this maintenance procedure at the interval specified in the Operator's Manual.

IMPORTANT: The engine that powers the Workman GTX is air-cooled. Operating the engine with dirty or plugged cooling fins or a plugged or dirty blower housing will result in engine overheating and damage.

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

2. Raise bed and support with prop rod.

3. Remove rear frame panel cover to allow easier access to engine (see Rear Frame Panel Cover in the General Information section of this chapter).

4. Carefully remove spark plug wire from the spark plug to prevent the engine from starting unexpectedly.

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

5. Clean cooling fins on cylinder head.

6. Clean static debris screen and blower housing of dirt and debris. Remove screen and housing if necessary (Fig. 4).

7. If necessary, remove engine cylinder and head shields to allow thorough cleaning of cylinder fins (Fig. 5).

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

8. Make sure static screen, blower housing, cylinder shield and head shield are reinstalled to the engine if removed.

9. Attach spark plug wire to spark plug.

10. Secure rear frame panel cover to vehicle. Lower and secure bed.

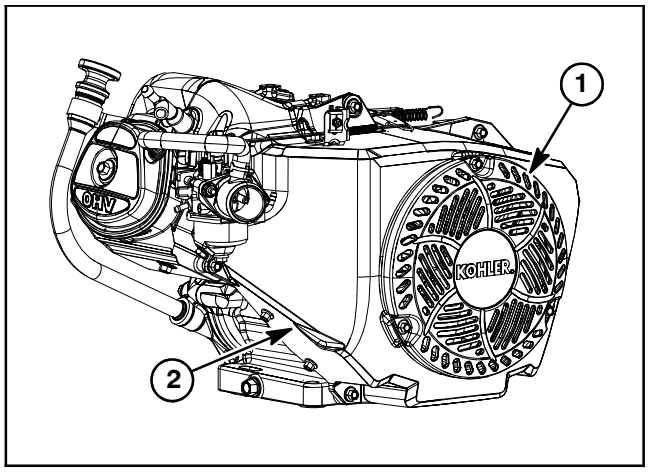


Figure 4

1. Static debris screen **2. Blower housing**

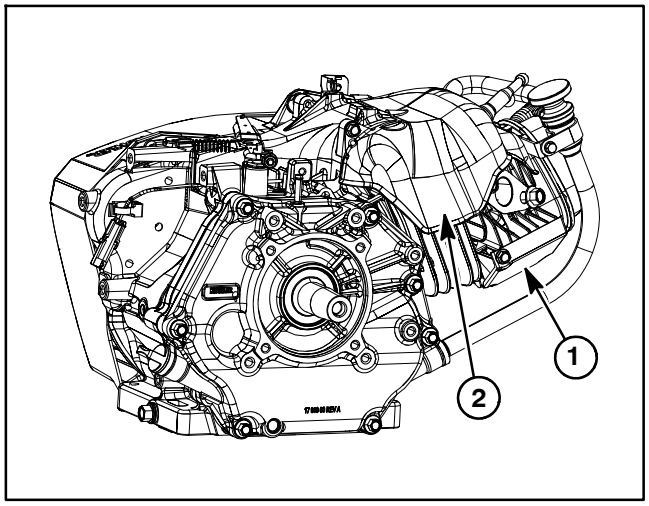


Figure 5

1. Cylinder head shield **2. Cylinder shield**

Accelerator Control

The Workman GTX accelerator control includes an engine mounted throttle lever that is rotated by the accelerator cable to change engine speed.

Disassembly (Fig. 6)

1. Park vehicle on a level surface and engage parking brake.

2. Raise and support the cargo bed.

3. Make sure that the engine is stopped and the key is removed from key switch. Allow engine to cool.

4. Remove accelerator control components as needed using Figures 6 and 7 as guides. If engine governor spring needs to be disconnected from throttle lever, note spring attachment points for assembly purposes.

Assembly (Fig. 6)

1. Install removed accelerator control components to engine using Figures 6 and 7 as guides.

   A. If throttle lever was removed, make sure that bushing flange is inserted into lever hole before installing flat washer and flange head screw. Make sure that throttle lever rotates freely after assembly.

2. After assembly is completed, make sure that throttle lever moves freely as accelerator pedal is depressed fully and released.

3. Check adjustment of accelerator control (see Adjust Accelerator Control in the Adjustments section of this chapter).

4. Lower and secure cargo bed.

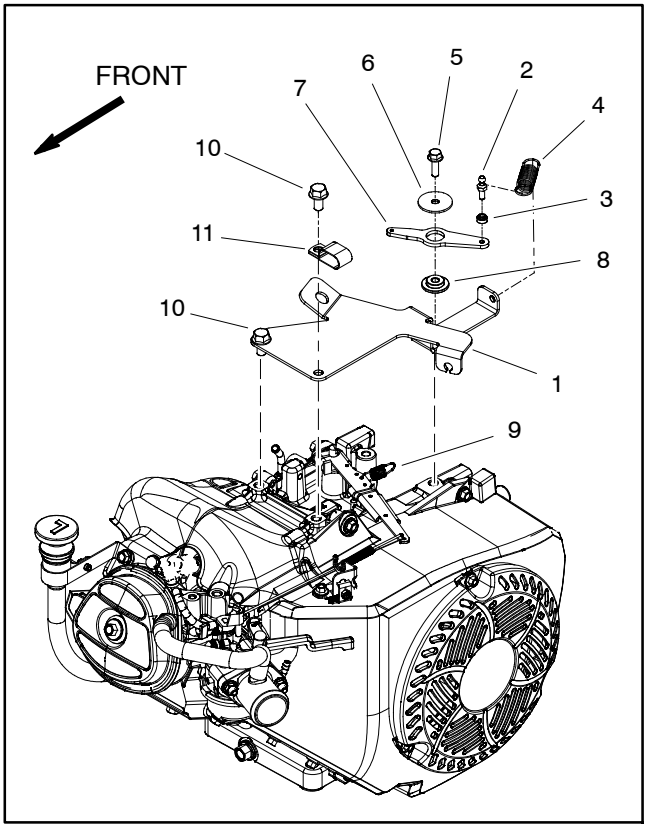


Figure 6

1. **Throttle bracket**
2. **Stud ball**
3. **Spring keeper**
4. **Return spring**
5. **Flange screw**
6. **Flat washer**
7. **Throttle lever**
8. **Flange bushing**
9. **Engine governor spring**
10. **Flange screw (2 used)**
11. **Tube clamp**

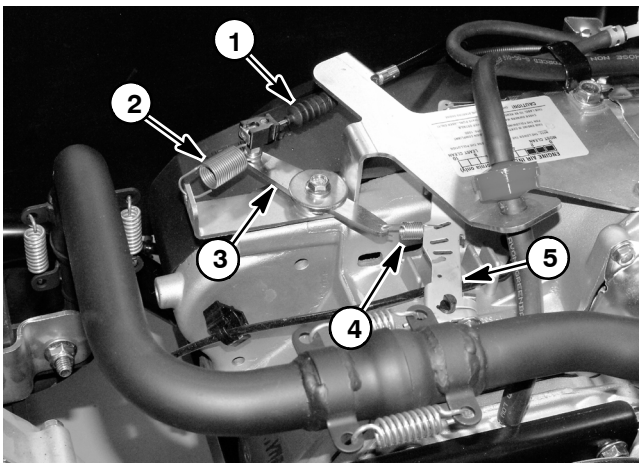


Figure 7

1. **Accelerator cable**
2. **Return spring**
3. **Throttle lever**
4. **Engine governor spring**
5. **Engine governor lever**

Air Cleaner System

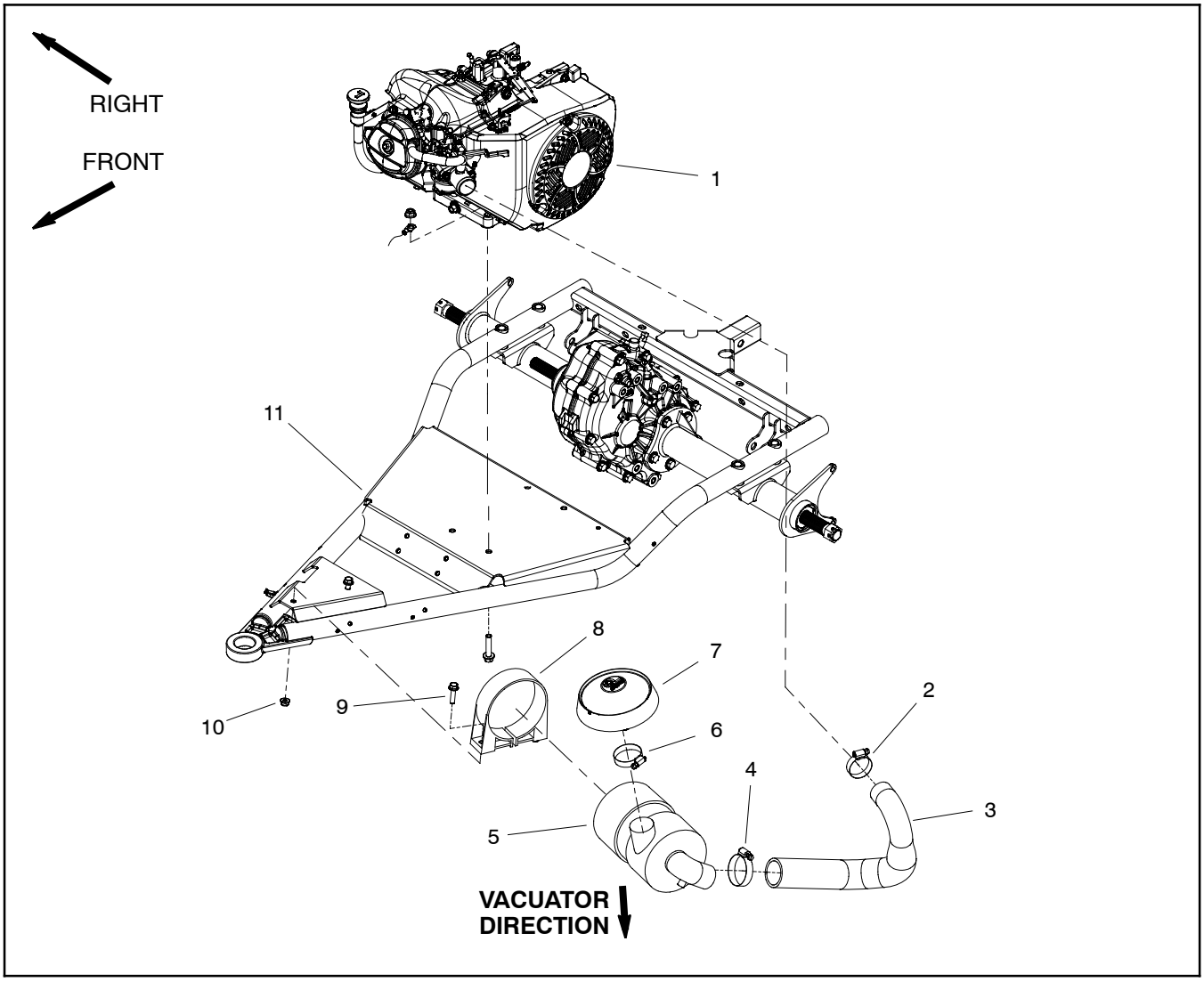


Figure 8

1. **Engine**
2. **Hose clamp**
3. **Intake hose**
4. **Hose clamp**
5. **Air cleaner assembly**
6. **Hose clamp**
7. **Air inlet hood**
8. **Mounting bracket**
9. **Flange head screw (2 used)**
10. **Flange nut (2 used)**
11. **Swing arm**

Removal (Fig. 8)

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

2. Raise cargo bed and support with prop rod.

3. Remove rear frame panel cover to allow easier access to air cleaner (see Rear Frame Panel Cover in the General Information section of this chapter).

CAUTION

The engine and exhaust exhaust may be hot. To avoid possible burns, allow engine and exhaust system to cool before working in the engine area.

4. Remove air cleaner components as needed using Figures 8 and 9 as guides.

Installation (Fig. 8)

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

1. Assemble air cleaner system using Figures 8 and 9 as guides. The air inlet hood (item 5 in Fig. 8) should be positioned straight upward. The vacuator valve on the air cleaner cover should be positioned downward.

2. After all air cleaner components have been installed, install rear frame panel cover to vehicle. Lower and secure the cargo bed.

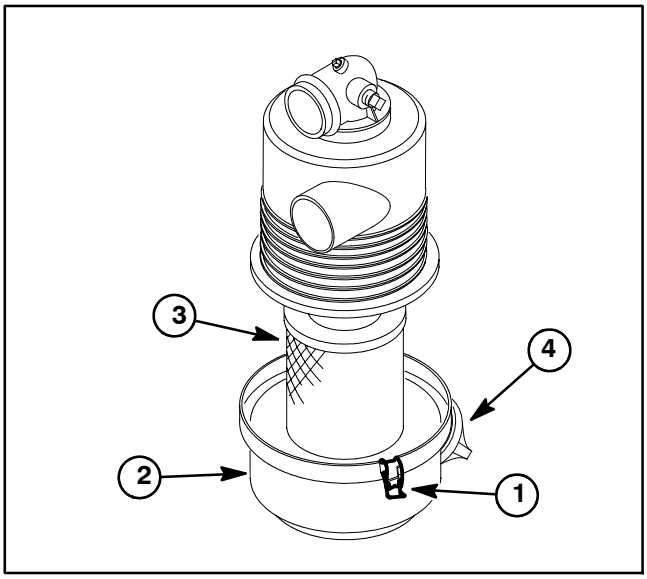


Figure 9

1. **Air cleaner latches**
2. **Cover**
3. **Filter element**
4. **Vacuator valve**

Exhaust System

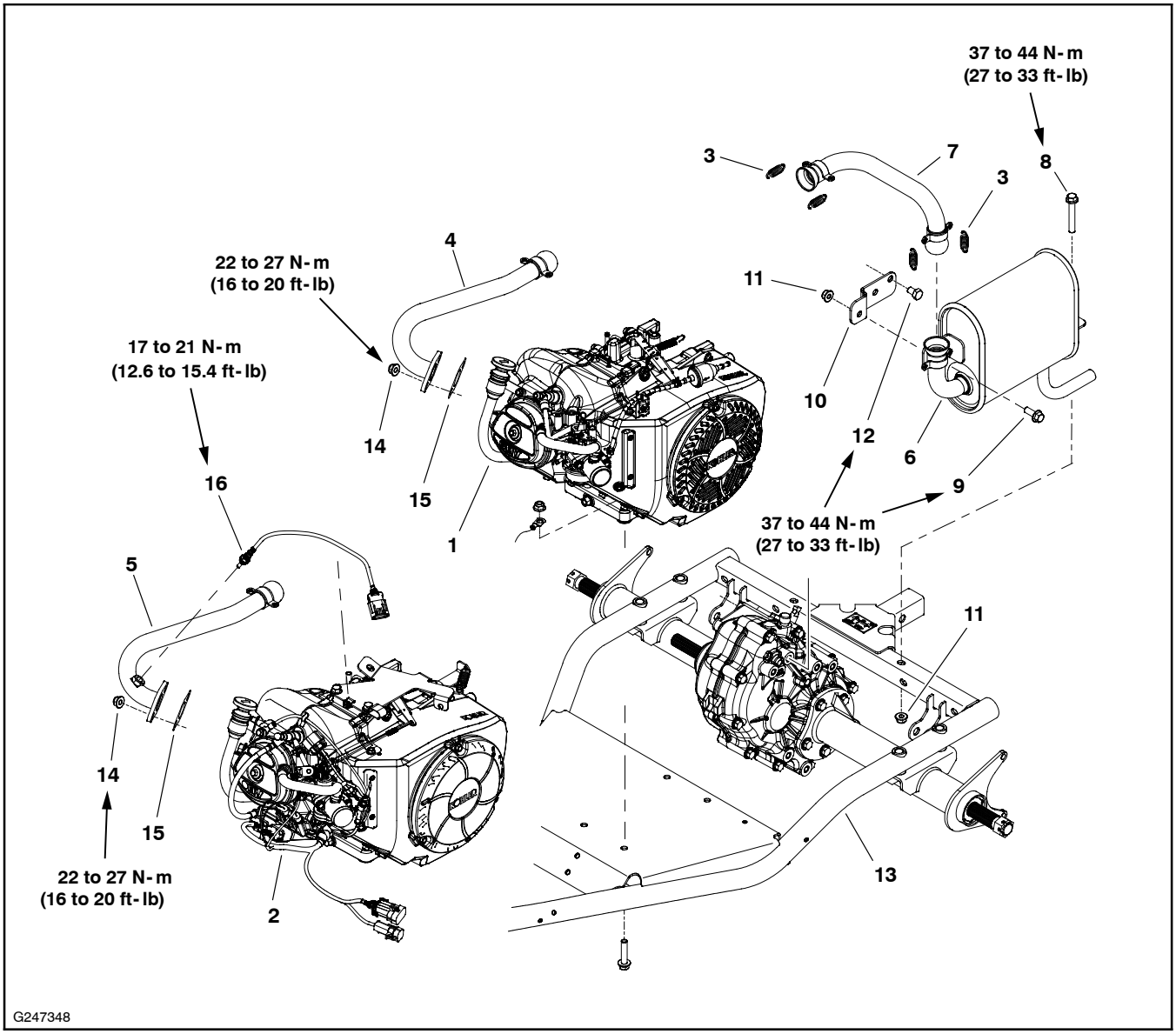


Figure 10

1. Engine (carbureted)
2. Engine (EFI)
3. Coupler spring (4 used)
4. Exhaust manifold (carbureted)
5. Exhaust manifold (EFI)
6. Muffler
7. Intermediate pipe
8. Flange head screw
9. Flange head screw
10. Muffler bracket
11. Flange nut (2 used)
12. Cap screw (2 used)
13. Swing arm
14. Flange nut (2 used)
15. Exhaust gasket
16. Oxygen Sensor (EFI)

Removal (Fig. 10)

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

2. Raise cargo bed and support with prop rod.

CAUTION

The engine and exhaust exhaust may be hot. To avoid possible burns, allow engine and exhaust system to cool before working on the exhaust system.

3. Remove exhaust system components as needed using Figure 10 as a guide. On machines with electronic fuel injection (EFI) disconnect the oxygen sensor from the engine wire harness before removing the exhaust manifold.

4. If removed, discard exhaust gasket and thoroughly clean flange surface of cylinder head and exhaust manifold.

Installation (Fig. 10)

NOTE: New oxygen sensor threads come pre- coated with an anti seize compound. If a previously installed oxygen sensor is used, apply a small amount of anti-seize to the threads.

1. If installing an oxygen sensor, do not allow the tip of the sensor to touch anything as it may become contaminated. Tighten from **12.6 to 15.4 ft- lb (17 to 21 N·m)**.

2. If the exhaust manifold was removed from engine, install manifold to engine with new gasket. Attach exhaust manifold loosely to the engine with removed flange nuts.

3. Using Figure 10 as a guide, loosely fit all exhaust system components to vehicle.

4. Tighten all exhaust system fasteners starting at the engine and working out toward the muffler. During assembly, use fastener torque specifications that are identified in Figure 10.

5. On machines with electronic fuel injection (EFI) connect the oxygen sensor to the engine wire harness.

6. Lower and secure cargo bed.

Fuel Lines and Connections

CAUTION

Read safety precautions for handling gasoline before working on the fuel system (see Safety Instructions in Chapter 1 - Safety).

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

NOTE: If fuel evaporative control system components require service, see Fuel Evaporative Control System Service in this chapter.

Carbureted Engines

1. Record routing of fuel hoses and hose clamp applications prior to disassembly for installation purposes.

2. Connect fuel hoses to barb connectors and secure with hose clamps.

Electronic Fuel Injected (EFI) Engines

1. Record routing of fuel hoses and hose clamp applications prior to disassembly for installation purposes.

CAUTION

Fuel in the supply line may be under pressure. Cover the supply hose end with a rag while disconnecting the hose to absorb any fuel leakage.

2. Disconnect the fuel supply hose from either the electric fuel pump or the fuel injector.

   A. Lift supply hose fitting lock up to unlock the fitting (Fig. 13).

   B. Press supply hose fitting tab and pull fitting from barb.

3. Connect the fuel supply hose to either the electric fuel pump or the fuel injector.

   A. Push supply hose fitting onto barb until an audible "*Click*" is heard.

   B. Press supply hose fitting lock down to lock fitting in place (Fig. 13).

4. Connect low pressure fuel hoses to barb connectors and secure with hose clamps.

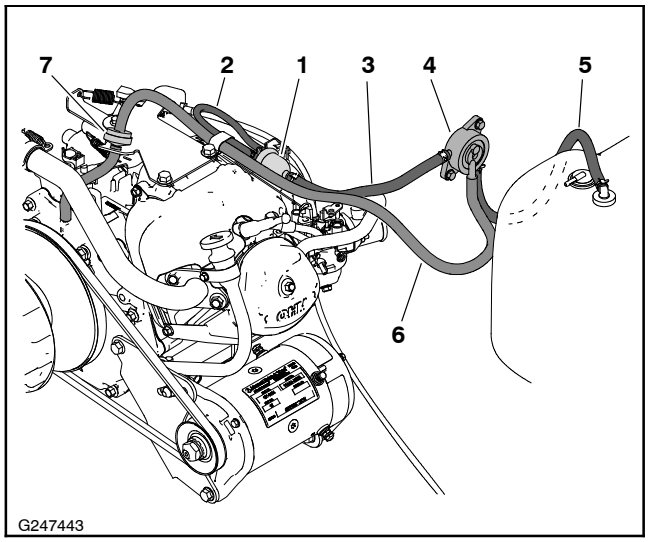


Figure 11
(carbureted engine)

1. **Fuel filter**
2. **Supply hose (filter to carburetor)**
3. **Supply hose (pulse pump to filter)**
4. **Pulse pump**
5. **Supply hose (tank to pulse pump)**
6. **Pulse hose**
7. **Pulse line filter**

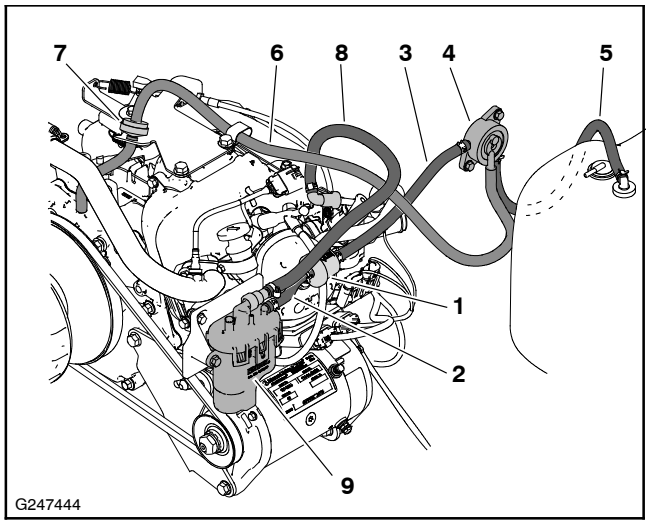


Figure 12
(fuel injected engine)

1. **Fuel filter**
2. **Supply hose (filter to electric fuel pump)**
3. **Supply hose (pulse pump to filter)**
4. **Pulse pump**
5. **Supply hose (tank to pulse pump)**
6. **Pulse hose**
7. **Pulse line filter**
8. **High pressure supply hose (electric fuel pump to injector)**
9. **Electric fuel pump**

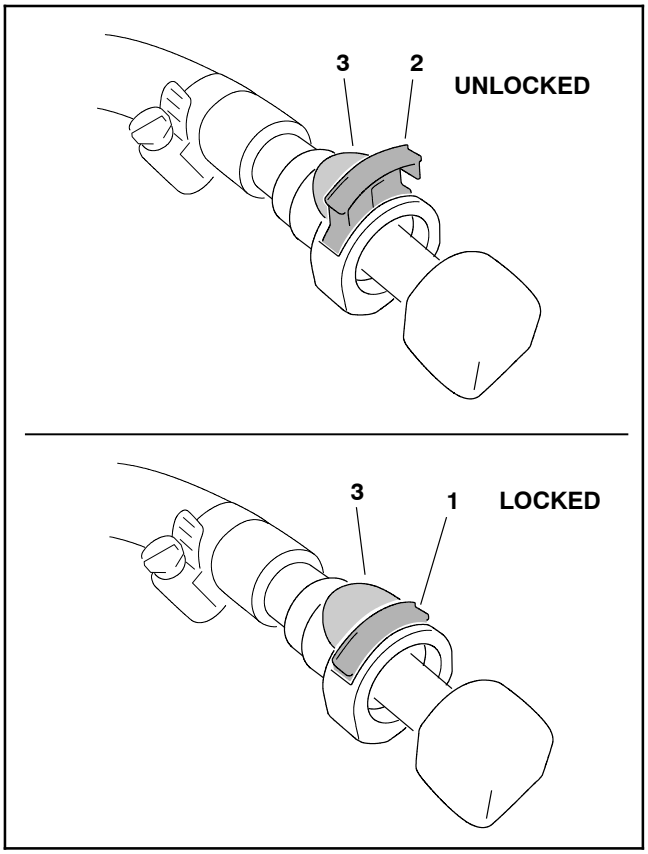


Figure 13

1. **Supply hose fitting lock (locked - down)**
2. **Supply hose fitting lock (unlocked - up)**
3. **Supply hose fitting tab**

Fuel Tank and Fuel Pumps

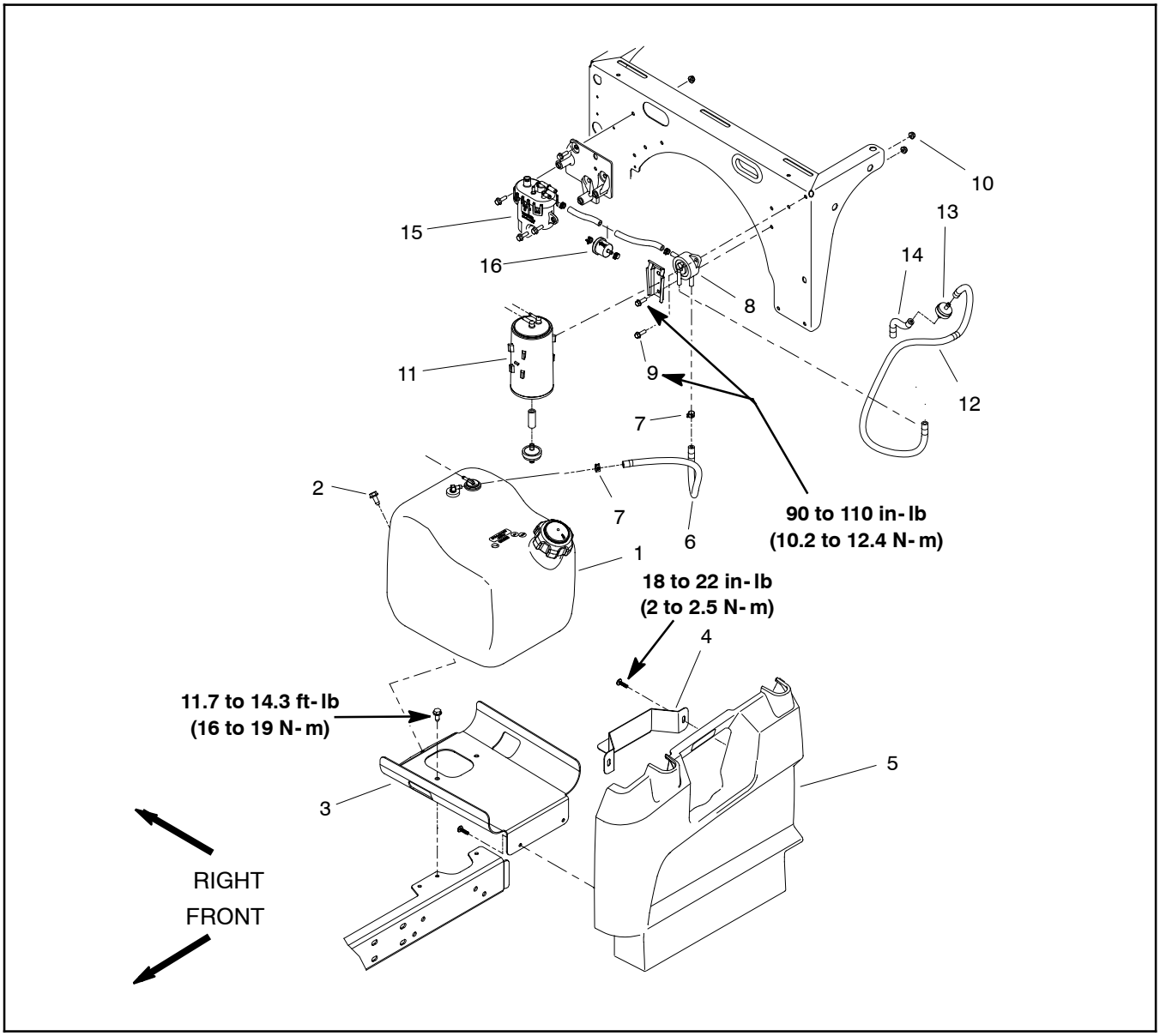


Figure 14

1. Fuel tank
2. Washer head screw
3. Fuel tank mount
4. Fuel tank bracket
5. LH seat base side
6. Fuel supply hose
7. Hose clamp (2 used)
8. Pulse pump
9. Washer head screw (2 used)
10. Flange nut (2 used)
11. Carbon canister (EVAP system)
12. Pulse hose
13. Pulse line filter
14. Pulse hose (to engine cover)
15. Electric fuel pump (fuel injected engines)
16. Fuel filter (fuel injected engines)

CAUTION

Read safety precautions for handling gasoline before working on the fuel system (see Safety Instructions in Chapter 1 - Safety).

Fuel Pumps (Fig. 14)

A pulse style fuel pump is used with both the carbureted and the fuel injected engines to lift fuel from the fuel tank. Pumping action within the pulse pump is created by alternating positive and negative pressures within the crankcase through a pulse line. Check valves inside the pulse pump prevent fuel from going backward through the pump.

The pulse pump is not serviceable and difficult to test accurately. If the pulse pump performance is suspect, ensure the entire pulse line between the pump and the engine crankcase is not damaged or obstructed. Replace the pump as necessary.

Machines with fuel injected engines incorporate an electric fuel pump in addition to the pulse pump. The electric fuel pump module receives fuel from the pulse pump, then increases and regulates the fuel pressure for the fuel injector. The engine ECU activates the fuel pump for about 6 seconds to prime the system when the key switch is turned to the run position. Once the engine is running, the fuel pump remains energized.

The electric fuel pump performance can be tested, but the pump assembly is not serviceable; refer to Chapter 5 - Electrical System in this manual. Because the electric fuel pump is not serviceable, fuel injected engines are equipped with a special 10- micron fuel filter upstream of the electric fuel pump to prevent harmful contamination from entering the electric fuel pump assembly.

Fuel Tank Removal (Fig. 14)

NOTE: If fuel evaporative control system components require service, see Fuel Evaporative Control System Service in this section of this chapter.

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

2. Remove seat base assembly with attached seats from vehicle.

3. Use fuel transfer pump to remove gas from fuel tank.

IMPORTANT: Follow all local codes and regulations when recycling or disposing waste fuel.

4. Record routing of fuel hoses for installation purposes.

5. Loosen hose clamp and carefully disconnect fuel supply hose from the fuel tank stand pipe.

6. Carefully disconnect vent hose from rollover valve.

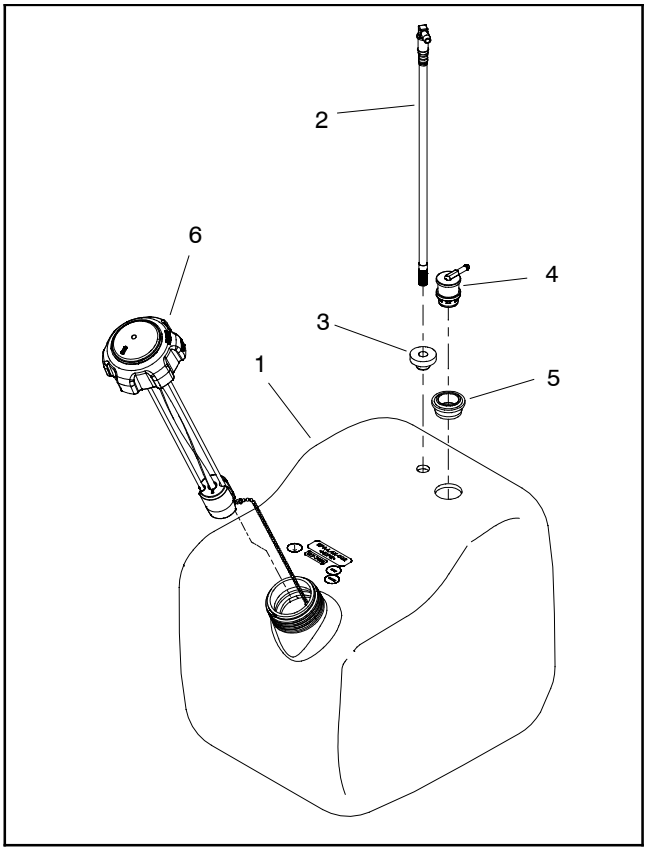


Figure 15

1. **Fuel tank**
2. **Stand pipe**
3. **Bushing**
4. **Rollover valve**
5. **Grommet**
6. **Cap with gauge**

7. Remove washer head screw that secures fuel tank to tank mount. Slide tank from under fuel tank bracket and then lift tank from frame.

8. If necessary, remove stand pipe, rollover valve, bushing and grommet from tank (Fig. 15).

Fuel Tank Installation (Fig. 14)

1. If removed, install bushing, grommet, stand pipe and rollover valve to tank (Fig. 15).

2. Position fuel tank to vehicle. Slide tank under fuel tank bracket and then secure tank to tank mount with washer head screw.

3. Connect fuel supply hose to the fuel tank stand pipe and secure with hose clamp.

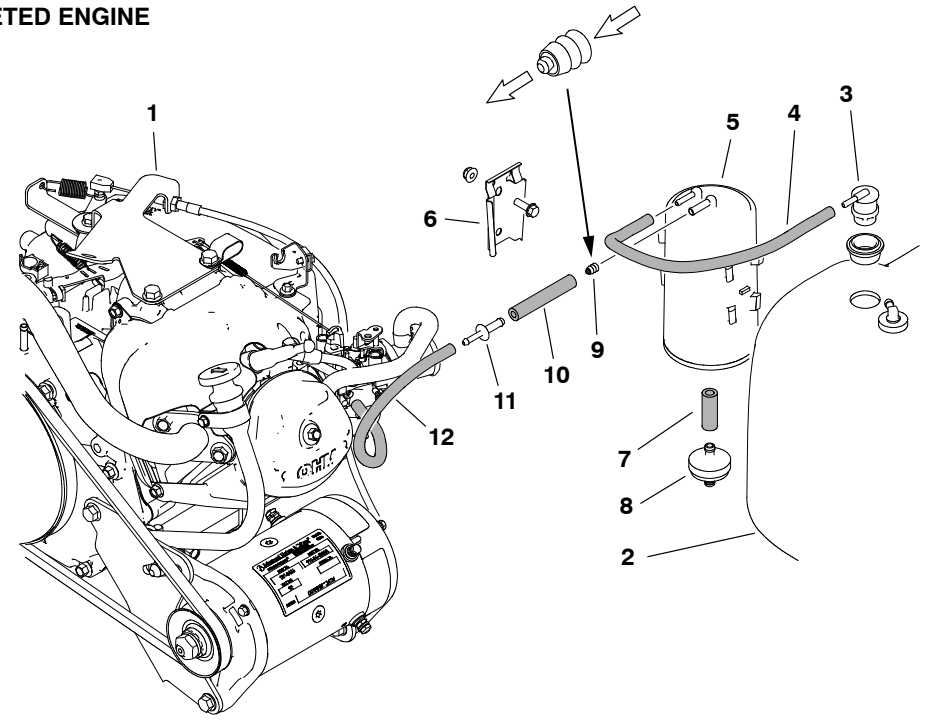
4. Connect vent hose to rollover valve.

5. Install seat base assembly with attached seats to vehicle.

6. Add fresh fuel to tank and check for any fuel leaks.

Fuel Evaporative Control System

CARBURETED ENGINE



FUEL INJECTED ENGINE (EFI)

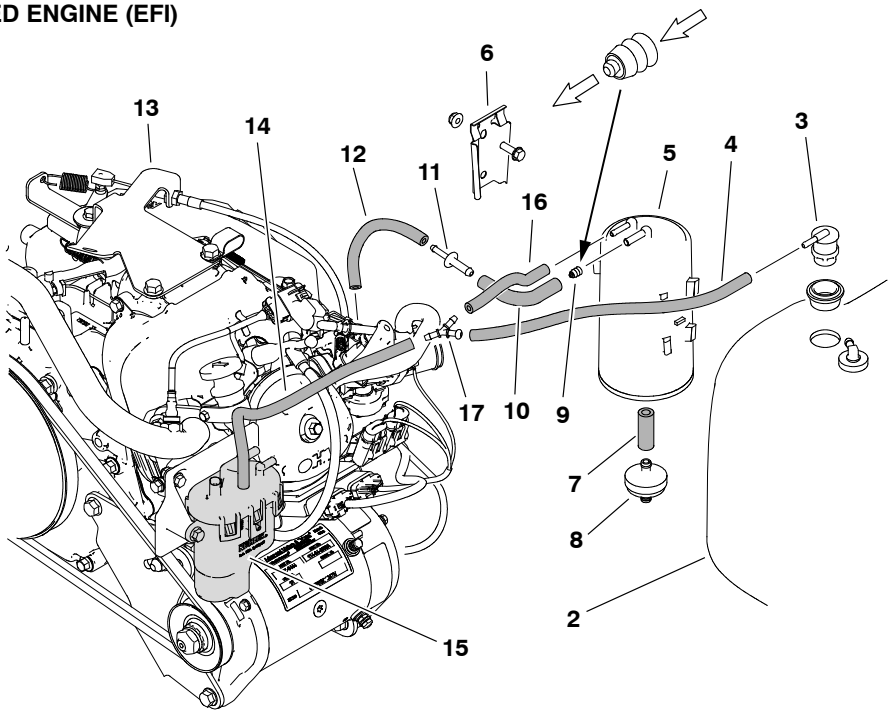


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Figure 16

1. Engine (carbureted)
2. Fuel tank
3. Rollover valve
4. EVAP hose
5. Carbon canister
6. Carbon canister bracket
7. EVAP hose
8. Fresh air filter
9. CV cartridge
10. EVAP hose
11. Orifice adapter
12. EVAP hose (to engine)
13. Engine (EFI)
14. EVAP hose
15. Electric fuel pump
16. EVAP hose
17. Wye fitting

Workman GTX vehicles are equipped with a fuel evaporative control system (EVAP) designed to collect and store evaporative emissions from the fuel tank. The EVAP system on machines with electronic fuel injection (EFI) collect and store evaporative emissions from the electric fuel pump as well. This system uses a carbon canister to collect these evaporative emissions. Fuel vapors from the fuel tank are vented to the canister where they are stored. Vapors from the canister are consumed when the engine is running which purges the canister.

The fuel tank on the Workman GTX vehicle uses a non-vented fuel cap. To connect the tank to the evaporative control system, a rollover valve is positioned in the top of the tank that allows tank venting through the carbon canister. The EVAP system also includes an in- line check valve (CV cartridge) that is inserted in the hose between the carbon canister and the carburetor EVAP fitting. Evaporative control system components for Workman GTX vehicles are shown in Figure 16.

NOTE: If there is restriction in the carbon canister, the rollover valve or the fresh air filter mounted below the carbon canister, the fuel tank may distort due to venting issues. If the fuel tank returns to it's normal shape when the fuel cap is removed, restriction in the evaporative control system is likely.

Disassembly

CAUTION

Read safety precautions for handling gasoline before working on the fuel system (see Safety Instructions in Chapter 1 - Safety).

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

2. Remove seat base assembly from vehicle.

3. Inspect carbon cannister and attached hoses for damage or obvious leaks. A damaged or leaking cannister should be replaced.

4. Remove EVAP components as needed using Figures 16 and 17 as guides.

   A. If hoses are removed from the carbon canister, note hose location for assembly purposes. Figure 17 identifies hose location.

   B. The orifice adapter (item 11 in Fig. 16) has a larger OD for the hose from the canister and a smaller OD for the hose to the carburetor. Record the orientation of the orifice adapter for assembly purposes.

   C. The CV cartridge (item 9 in Fig. 16) is installed inside the hose between the canister and the orifice adapter. If this hose (item 11 in Fig. 16) is removed, mark the hose so that it can be installed in the correct direction. Air flow through the hose should be allowed toward the carburetor and not toward the canister when the hose with cartridge is orientated correctly.

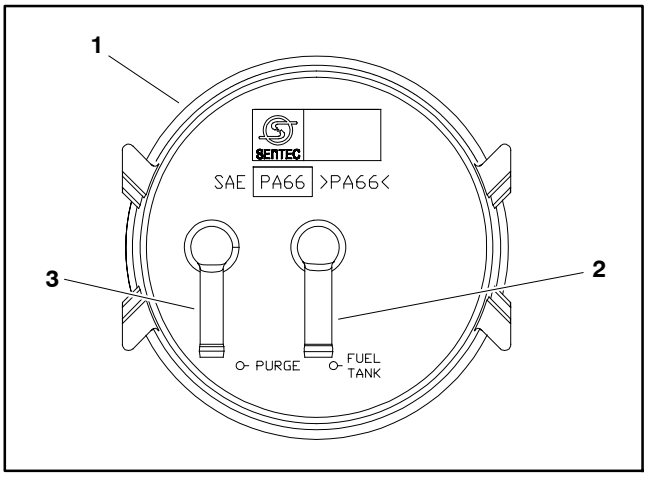

Figure 17

1. **Top of carbon canister**
2. **Fitting to rollover valve**
3. **Fitting to engine**

5. If the CV cartridge is faulty, either air movement will be allowed through the hose in both directions (valve is open) or in neither direction (valve is plugged). If necessary, replace the CV cartridge and the hose. Insert new CV cartridge into the new hose in the direction shown in Figure 16.

IMPORTANT: A plugged carbon canister or fresh air filter can cause fuel pressure problems that result in poor engine performance and also can lead to failure of the fuel pump.

Assembly

1. Install all removed EVAP components using Figures 16 and 17 as guides.

   A. If the hose with CV cartridge was removed, use mark made during disassembly to install the hose in the correct direction.

   B. Make sure that all evaporative system fuel hoses are not kinked after installation.

2. Install seat base assembly to vehicle.

Engine

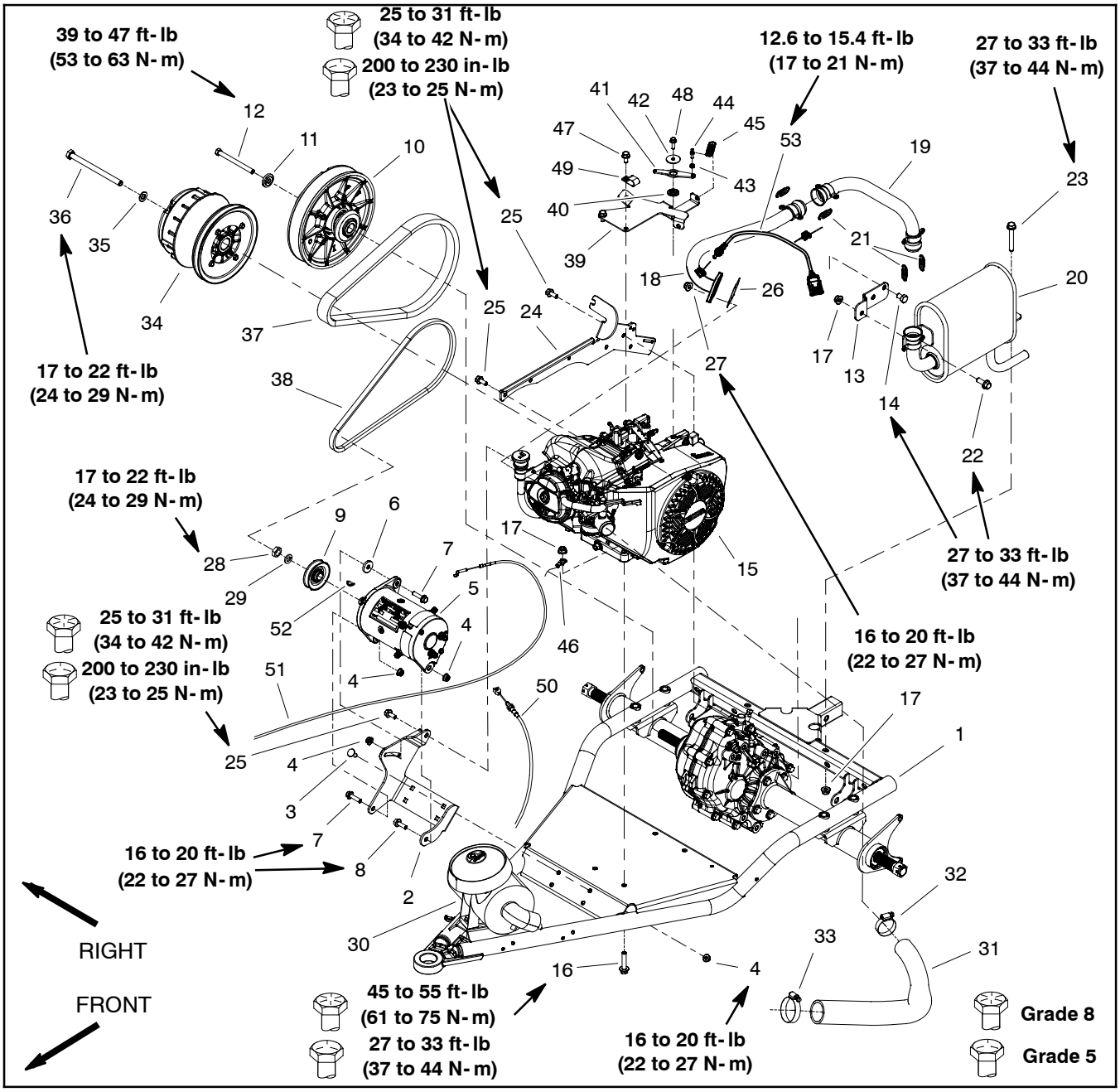

Figure 18

1. Swing arm
2. Starter/generator bracket
3. Carriage screw (4 used)
4. Flange nut (7 used)
5. Starter/generator
6. Washer
7. Flange head screw (2 used)
8. Flange head screw
9. Starter/generator pulley
10. Secondary clutch
11. Stepped washer
12. Cap screw
13. Muffler bracket
14. Cap screw (2 used)
15. Engine (carbureted shown)
16. Flange head screw (4 used)
17. Flange nut (6 used)
18. Exhaust manifold
19. Intermediate pipe
20. Muffler
21. Coupler spring (4 used)
22. Flange head screw
23. Flange head screw
24. Spanner bar
25. Flange head screw (6 used)
26. Exhaust gasket
27. Flange nut (2 used)
28. Hex nut
29. Lock washer
30. Air cleaner assembly
31. Air intake hose
32. Hose clamp
33. Hose clamp
34. Primary clutch
35. Flat washer
36. Cap screw
37. CVT drive belt
38. Starter/generator belt
39. Throttle bracket
40. Flange bushing
41. Throttle lever
42. Flat washer
43. Spring keeper
44. Ball stud
45. Spring
46. Negative cable
47. Flange head screw (2 used)
48. Flange head screw
49. R-clamp
50. Accelerator cable
51. Choke cable (carbureted engine)
52. Woodruff key
53. Oxygen sensor (EFI engine)

IMPORTANT: Torque tighten the fasteners based on the fastener grade. Make sure to use the correct torque; refer to Figure 18.

Engine Removal (Fig. 18)

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

2. Disconnect ground (black) cable from the battery. Then, disconnect positive (red) cable from the battery.

3. Raise cargo bed and support with prop rod.

4. Remove rear frame panel cover to allow easier access to air cleaner (see Rear Frame Panel Cover in the General Information section of this chapter).

IMPORTANT: Make sure all hoses and engine openings are plugged after disconnecting. This will prevent contaminants from entering the engine and fuel system.

5. Disconnect the control cables from the engine (Fig. 19 and 20):

A. For all engines, disconnect the accelerator cable from the ball joint on the throttle lever and remove the cable from the throttle bracket.

B. On machines with carbureted engines, Remove the choke cable from the cable clamp and carburetor choke lever.

6. Loosen hose clamps that secure the air intake hose to the engine and the air cleaner assembly. Remove the intake hose.

7. Remove exhaust manifold and intermediate pipe from engine and muffler (see Exhaust System in this section).

CAUTION

Read safety precautions for handling gasoline before working on the fuel system (see Safety Instructions in Chapter 1 - Safety).

8. Disconnect hoses from carbureted engines (Fig. 19):

A. Disconnect the fuel supply hose at the carburetor.

B. Disconnect the pulse hose at the pulse line filter.

C. Remove the R-clamp from the throttle bracket and secure the clamp and disconnected hoses away from the engine.

D. Disconnect the EVAP hose at the carburetor.

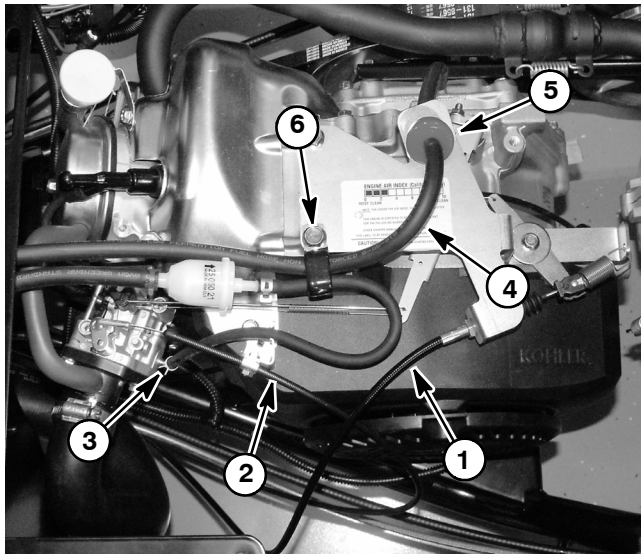

Figure 19
(carbureted engine)

1. **Accelerator cable**
2. **Choke cable**
3. **Fuel supply hose**
4. **Pulse hose**
5. **Pulse line filter**
6. **R-clamp**

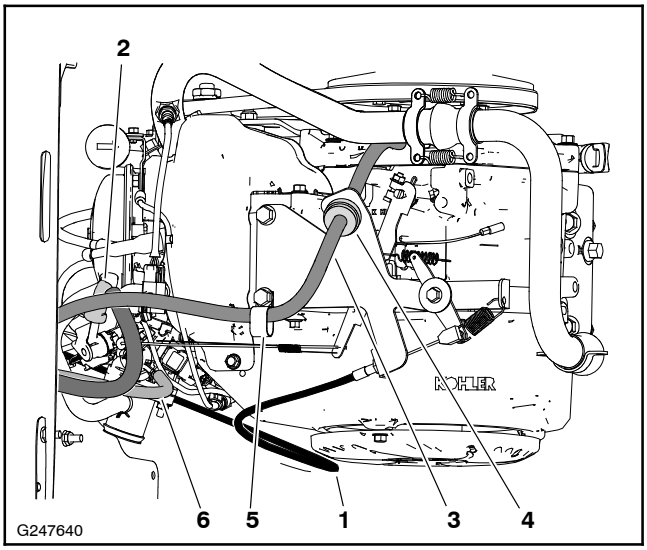

Figure 20
(fuel injected engine)

1. **Accelerator cable**
2. **High pressure fuel supply hose**
3. **Pulse hose**
4. **Pulse line filter**
5. **R-clamp**
6. **EVAP hose**

9. Disconnect hoses from electronic fuel injected (EFI) engines (Fig. 20):

A. Disconnect the high pressure fuel supply hose at the carburetor (see Fuel Lines and Connections in this Chapter).

B. Disconnect the pulse hose at the pulse line filter and remove the hose from the R-clamp.

C. Disconnect the EVAP hose at the throttle body.

10. Disconnect the engine from the machine wire harness:

A. For machines with carbureted engines, disconnect the engine magneto electrical connector at the rear of the engine.

B. For machines with electronic fuel injected (EFI) engines, disconnect the engine wire harness connector secured to the left side of the swing arm under the air cleaner assembly.

11. Remove CVT drive belt, starter/generator belt and primary clutch from engine (see Primary and Secondary Clutches in the Service and Repairs section of Chapter 4 - Drive Train).

12. Remove two (2) flange head screws that secure spanner bar (item 24) to engine.

13. Remove flange head screw that secures starter/generator bracket (item 2) to engine.

14. Remove four (4) flange nuts and flange head screws that secure the engine to the swing arm platform. For assembly purposes, note that the negative battery cable is secured to engine with the left, front engine fastener.

CAUTION

To prevent personal injury, make sure that engine is properly supported as it is removed from the vehicle. Engine weighs approximately 76 pounds (34.5 kg).

IMPORTANT: Make sure to not damage the engine, fuel hoses, control cables, electrical harness or other parts while removing the engine.

15. Carefully remove engine from the swing arm and vehicle.

16. Remove engine parts and attachments as necessary to repair the engine.

Engine Installation (Fig. 18)

NOTE: When installing engine, use fastener torque specifications that are listed in Figure 18.

1. Install all removed engine parts and attachments to the engine before installing engine to vehicle.

CAUTION

To prevent personal injury, make sure that engine is properly supported as it is installed to the vehicle. Engine weighs approximately 76 pounds (34.5 kg).

IMPORTANT: Make sure to not damage the engine, fuel hoses, control cables, electrical harness or other parts while installing the engine.

2. Carefully install engine to the vehicle and position it to the swing arm platform.

3. Install four (4) flange head screws and flange nuts to engine and swing arm. Make sure that negative battery cable is installed with the left, front engine fastener. Leave engine fasteners loose.

IMPORTANT: The flange head screws that secure the spanner bar and starter/generator bracket have a patch-lock feature. If screws are being re-installed on vehicle, apply medium strength thread locker to screw threads before installation.

4. To prevent distorting the spanner bar (item 24), move the engine toward the spanner bar and secure the spanner bar to engine with two (2) flange head screws.

5. Secure starter/generator bracket (item 2) to engine with flange head screw.

6. Secure the engine to the swing arm by fully tightening four (4) flange nuts and flange head screws.

7. Connect the engine to the machine wire harness:

A. For machines with carbureted engines, connect the engine magneto electrical connector at the rear of the engine.

B. For machines with electronic fuel injected (EFI) engines, connect the engine wire harness connector. Secure the connector to the left side of the swing arm under the air cleaner assembly.

8. Secure primary clutch, starter/generator belt and CVT drive belt to engine (see Primary and Secondary Clutches in the Service and Repairs section of Chapter 4 - Drive Train).

IMPORTANT: Make sure to remove all plugs and covers that were placed on hose and engine openings during engine removal.

9. Install exhaust manifold and intermediate pipe to engine and muffler (see Exhaust System in this section).

10. Connect hoses to carbureted engines (Fig. 19):

    A. Connect the EVAP hose at the carburetor.

    B. Install the R- clamp with the disconnected hoses to the throttle bracket.

    C. Connect the pulse hose at the pulse line filter.

    D. Connect the fuel supply hose at the carburetor.

11. Connect hoses to electronic fuel injected (EFI) engines (Fig. 20):

    A. Connect the EVAP hose at the throttle body.

    B. Route the pulse hose through the R- clamp and connect the pulse hose at the pulse line filter.

    C. Connect the high pressure fuel supply hose at the carburetor (see Fuel Lines and Connections in this Chapter).

12. Position and connect the cables to the engine (Fig. 19):

    A. On machines with carbureted engines, attach the choke cable to the carburetor choke lever and secure with cable clamp. Make sure that choke fully closes when choke is applied with dash mounted choke control.

    B. For all engines, secure accelerator cable to ball joint on throttle lever and cable jam nuts to throttle bracket.

13. Install air intake hose (item 31) to the carburetor and air cleaner assembly. Secure hose with hose clamps.

14. Connect positive (red) cable to the battery. Then, connect ground (black) cable to the battery.

15. Make sure engine oil level is correct.

16. Check operation of accelerator cable and adjust if necessary (see Adjust Accelerator Cable in the Adjustments section of this chapter).

17. Install rear frame panel cover to vehicle. Lower and secure the cargo bed.

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Chapter 4

Drive Train

Table of Contents

General Information

Operator's Manual

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

Specifications

Item	Description
Transaxle Transaxle Fluid Transaxle Fluid Capacity	 SAE 80W−90 gear oil (API GL−1/MT−1) 1.7 U.S. quarts (1.6 liters)
Clutch System Primary Clutch Secondary Clutch	Continuously variable speed transmission type Speed sensing with mechanical roller weights Torque sensing with spring loaded cam
Cap Screw Torque for Primary Clutch	17 to 22 ft−lb (24 to 29 N−m)
Cap Screw Torque for Secondary Clutch	39 to 47 ft−lb (53 to 63 N−m)

Drive Train Operation

Clutch System Operation

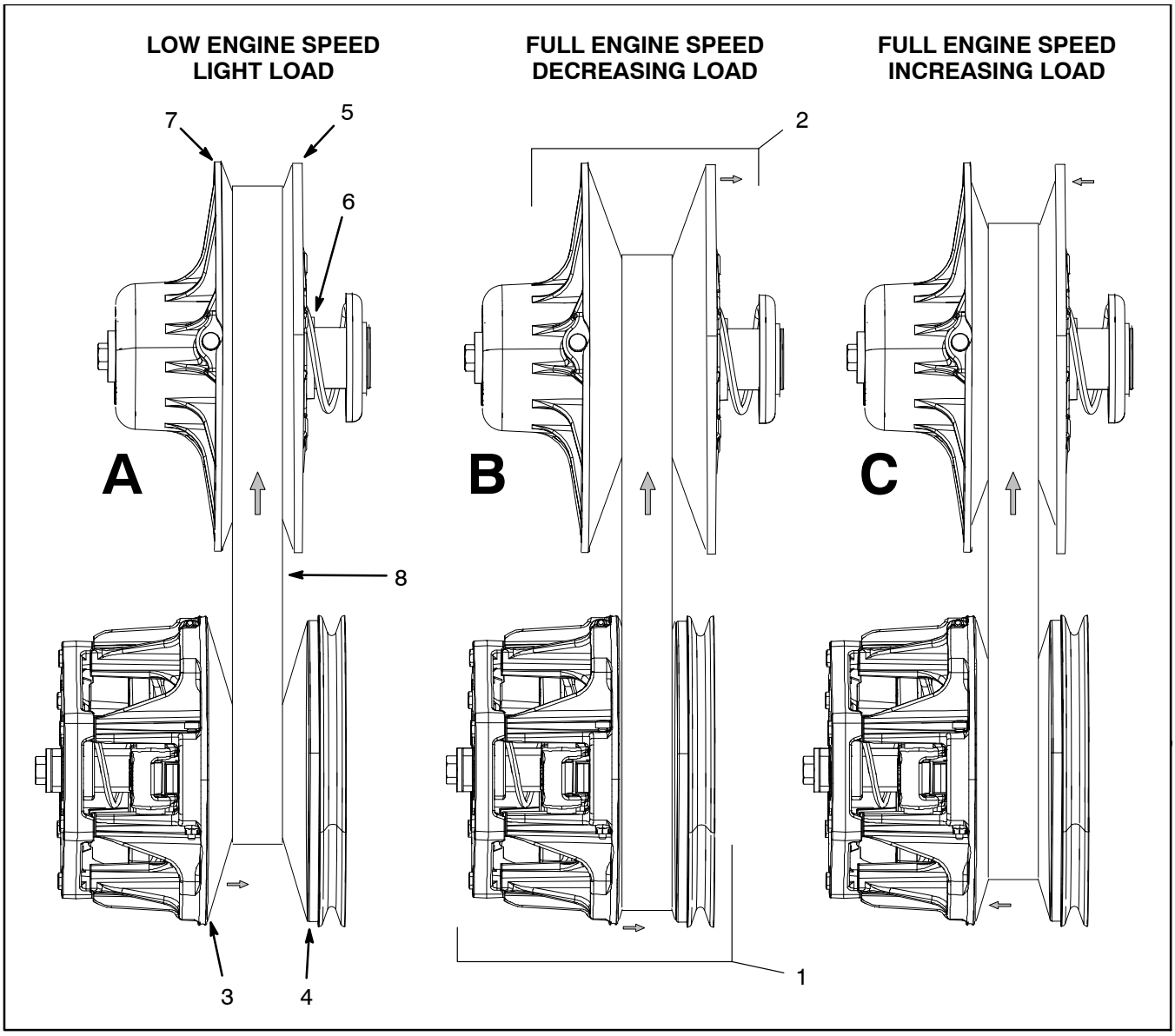

Figure 1

1. **Primary clutch**
2. **Secondary clutch**
3. **Moveable sheave (primary clutch)**
4. **Stationary sheave (primary clutch)**
5. **Moveable sheave (driven clutch)**
6. **Spring**
7. **Stationary sheave (secondary clutch)**
8. **CVT drive belt**

Power is transferred from the engine to the transaxle by a variable clutch system that consists of two (2) clutches connected by a drive belt. The primary clutch responds to engine speed, and is mounted to the engine crankshaft. The secondary clutch responds to changes in load to the rear axle, and is mounted to the transaxle input shaft.

The two clutches work together to automatically up−shift and back−shift as changes in load and speed occur. This shifting changes the turning ratio between the primary and secondary clutches and allows the engine to operate at optimum efficiency.

Primary Clutch Operation

The operation of the primary clutch is affected by engine shaft speed. When the engine is off and not turning, the drive belt rests low within the primary clutch sheaves as the clutch sheaves are spaced apart. As the engine is started and increases in speed, the clutch rollers move outward as they spin about the engine drive shaft. The outward movement of the rollers against the spider assembly forces the moveable sheave closer to the stationary sheave. This inward movement of the moveable sheave engages the drive belt which begins to rotate.

With increasing engine speed, the moveable sheave continues to move inward. This sheave movement forces the drive belt to ride towards the outer diameter of the primary clutch sheaves which increases the drive belt speed.

When engine speed is decreased, the rollers exert less force on the moveable sheave. The reduced force causes the moveable sheave to shift away from the stationary sheave and slows the drive belt speed. As engine speed continues to decrease, the drive belt disengages from the clutch sheaves.

The primary clutch controls moveable sheave operation with six (6) weighted rollers and ramp surfaces in the moveable sheave.

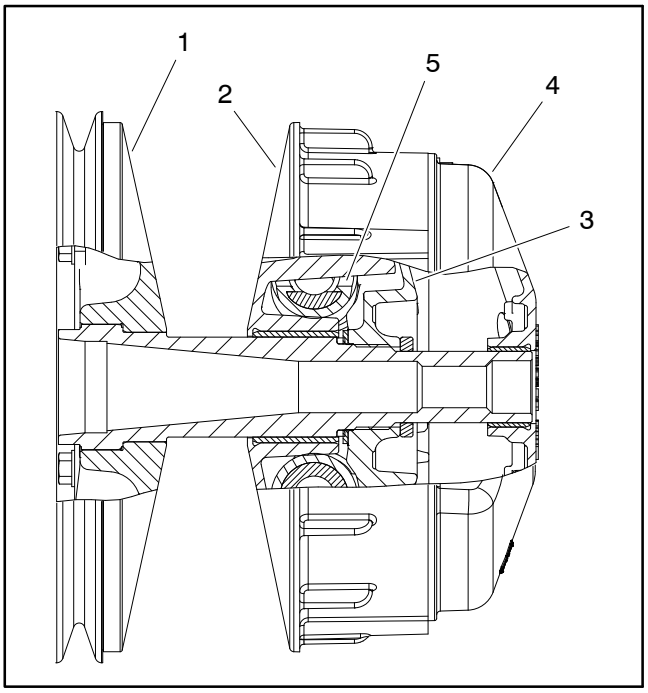

Figure 2

1. **Stationary sheave**
2. **Moveable sheave**
3. **Spider assembly**
4. **Cover**
5. **Roller (6 used)**

Secondary Clutch Operation

The operation of the secondary clutch is affected by transaxle load. When the vehicle is stopped, the drive belt is held at the outer diameter of the secondary clutch sheaves from the pressure of the spring pushing the moveable sheave against the stationary sheave and away from the fixed cam.

Once the drive belt starts rotating, the secondary clutch also starts to rotate. With increasing speed of the primary clutch, the drive belt begins to climb to the outer diameter of the primary clutch sheaves. This increases the tension on the drive belt, and forces the moveable sheave of the secondary clutch to move away from the stationary sheave against the pressure of the spring. As the belt tightens and the sheaves open up, the drive belt rides lower in the secondary clutch sheaves.

With increased load to the transaxle, the fixed cam resists forward movement relative to the moveable sheave and drive belt. Torque from the drive belt and spring pressure moves the moveable sheave up the ramp of the fixed cam. The drive belt becomes positioned closer to the outer diameter of the secondary clutch sheaves.

A fixed cam on the secondary clutch moveable sheave rotates on a pair of rollers in the stationary sheave base to allow low friction movement of the moveable sheave.

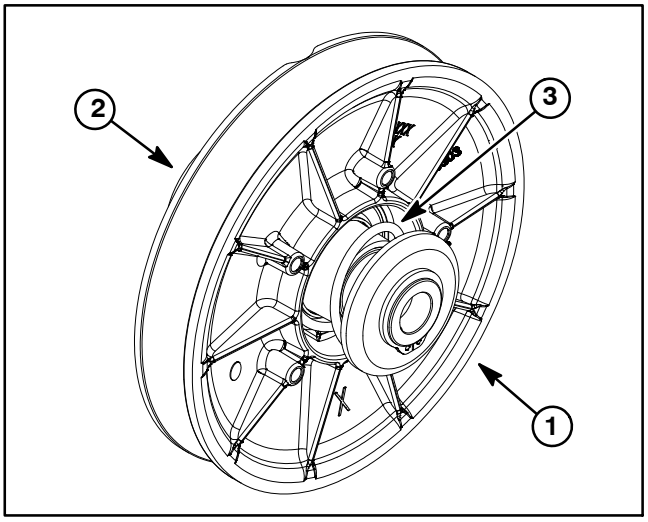

Figure 3

1. **Moveable sheave**
2. **Stationary sheave**
3. **Spring**

Special Tools

Order special tools from your Toro Distributor.

Primary Clutch Removal Tool

This tool is required to remove the primary clutch from the tapered drive shaft of the engine. It is placed in the threaded hole of the stationary clutch sheave after the clutch holding cap screw is removed.

Toro Part Number: **TOR6039**

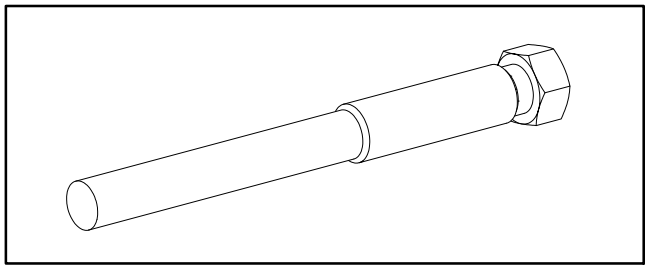

Figure 4

Primary Clutch Spider Removal Tool Kit

This kit is required to remove the primary clutch spider from the post of the stationary sheave. Kit includes clutch holding bar and spanner.

Toro Part Number: **TOR6016**

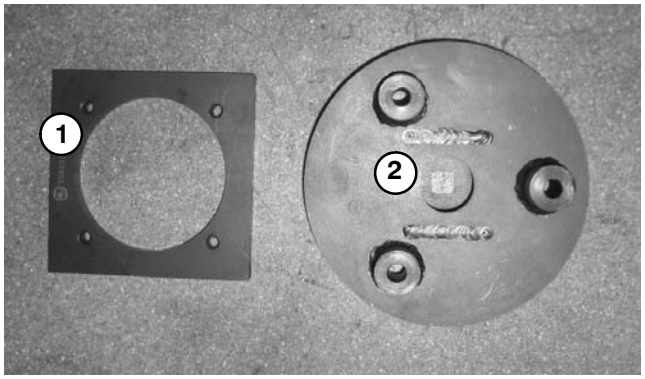

Figure 5

1. **Holding bar**
2. **Spanner**

Secondary Clutch Press Tool

The secondary clutch press tool is used to compress the compression spring in the secondary clutch to allow removal of the retaining ring and separation of the clutch sheaves.

Toro Part Number: **TOR6027**

Figure 6

Troubleshooting

Clutch

Problem	Possible Cause
Poor up−shifting.	Governed engine speed is adjusted too low. Primary and/or secondary clutch assemblies have accumulation of dirt or debris. CVT drive belt is worn. Clutch sheaves are worn or damaged.
Poor downshifting.	Primary and/or secondary clutch assembly has accumulation of dirt or debris. CVT drive belt is worn. Clutch sheaves are worn or damaged.
Vehicle creeps at idle.	Engine idle speed is too high. Primary clutch has accumulation of dirt or debris preventing full down−shifting. Primary and secondary clutches are not aligned.
Rough clutch engagement.	Engine idle speed is too low. Primary clutch assembly has accumulation of dirt or debris. CVT drive belt is worn. Primary clutch sheaves are worn or damaged.
Noisy clutch operation.	Engine idle speed is too low causing excess shaking. Worn primary clutch roller or weight bushings. Worn primary clutch spider slides (primary clutch replacement necessary if found).

CVT Drive Belt

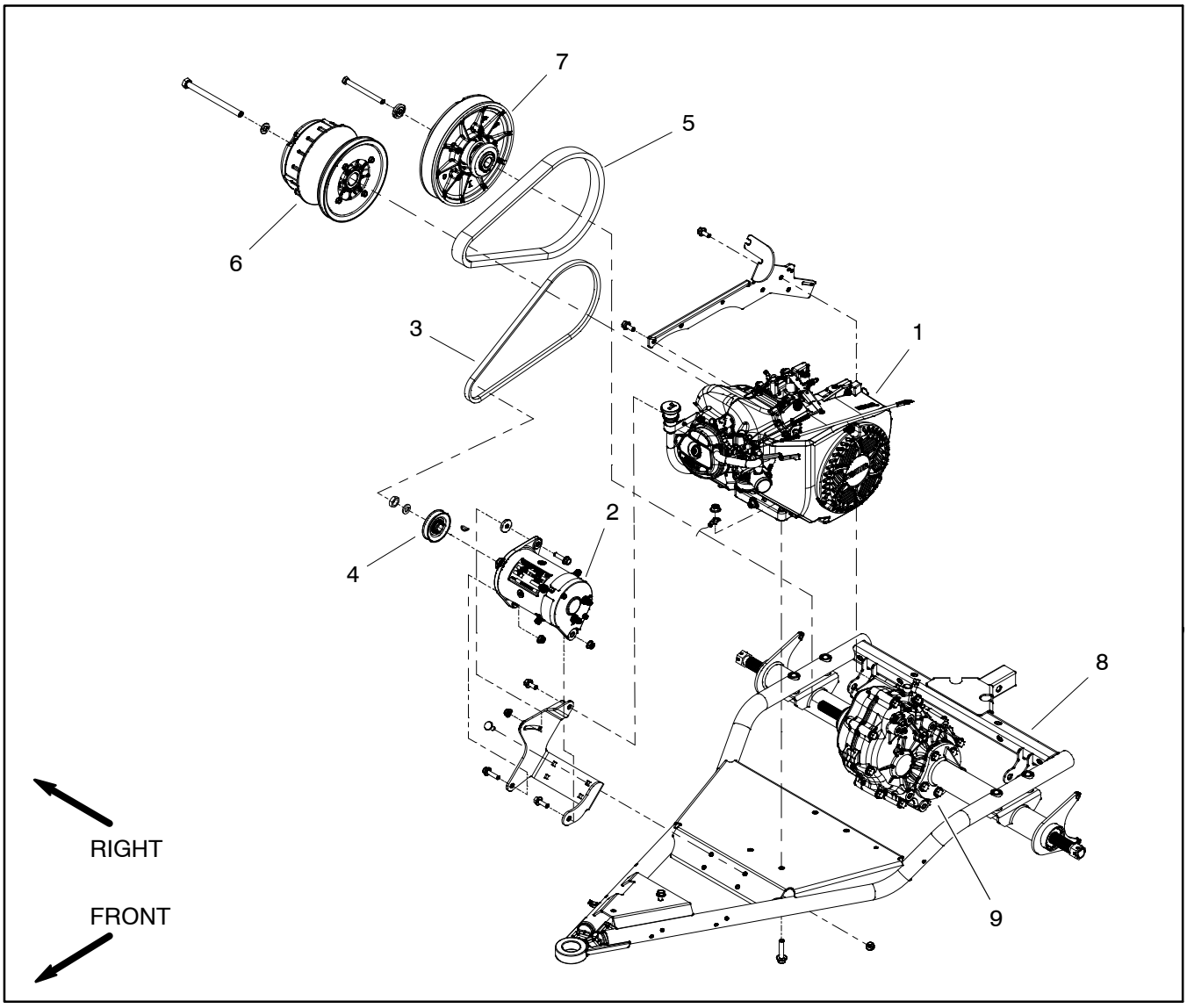

Figure 7

1. **Engine**
2. **Starter/generator**
3. **Starter/generator drive belt**
4. **Starter/generator pulley**
5. **CVT drive belt**
6. **Primary clutch**
7. **Secondary clutch**
8. **Vehicle swing arm**
9. **Transaxle assembly**

CAUTION

The engine, exhaust system and drive system components may be hot. To avoid possible burns, allow all components to cool before working on drive system components.

Drive Belt Removal (Fig. 7)

1. Park vehicle on a level surface, shut engine off and engage the parking brake. Remove key from the key switch. Place gear shift lever in the neutral position.

2. Allow engine, exhaust system and drive system to cool before working on drive system.

3. Raise and support vehicle cargo bed to allow access to drive system.

4. While rotating the secondary clutch, route CVT drive belt from the secondary clutch sheaves.

5. Remove drive belt from from the primary clutch and vehicle.

Drive Belt Installation (Fig. 7)

1. Place CVT drive belt around primary clutch.

2. Position drive belt to secondary clutch. While rotating the secondary clutch, route belt into position between secondary clutch sheaves.

3. Lower and secure vehicle cargo bed (if installed).

Primary and Secondary Clutches

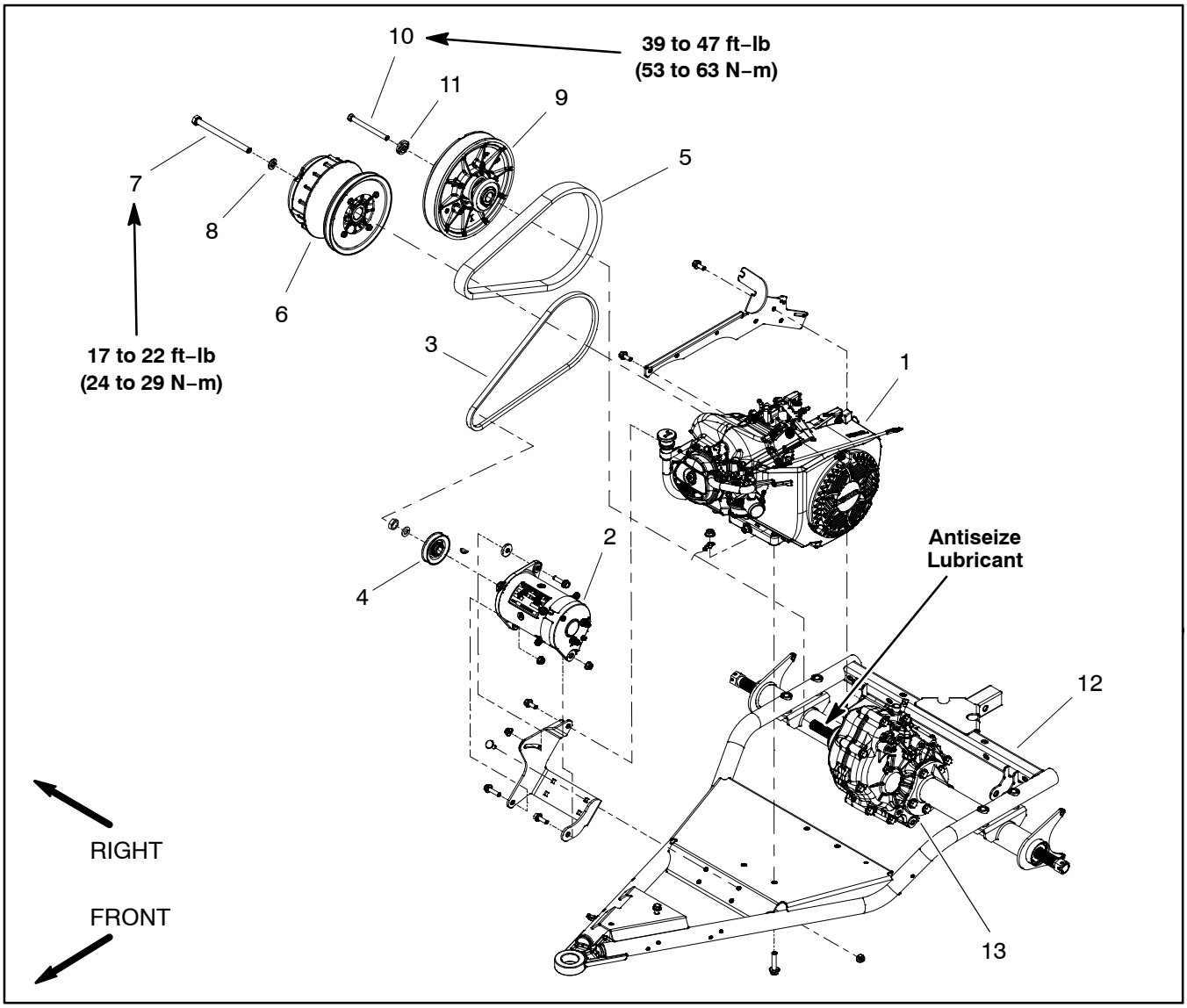

Figure 8

1. Engine
2. Starter/generator
3. Starter/generator drive belt
4. Starter/generator pulley
5. CVT drive belt
6. Primary clutch
7. Cap screw
8. Flat washer
9. Secondary clutch
10. Cap screw
11. Stepped washer
12. Vehicle swing arm
13. Transaxle assembly

CAUTION

The engine, exhaust system and drive system components may be hot. To avoid possible burns, allow all components to cool before working on drive system components.

Removal (Fig. 8)

1. Park machine on a level surface, stop engine, set parking brake and remove key from the key switch.

2. Allow engine, exhaust system and drive system to cool before working on drive system.

3. Raise and support vehicle cargo bed (if installed) to allow access to clutches.

4. Remove CVT drive belt from the primary and secondary clutches (see CVT drive belt in this section).

5. If necessary, remove primary clutch from engine drive shaft:

A. Loosen starter/generator pivot nut, rotate starter/generator toward engine and remove starter/generator drive belt from the pulley attached to the primary clutch (Fig. 9).

B. Remove cap screw and flat washer that secure primary clutch to engine crankshaft.

IMPORTANT: Lightly grease end of clutch removal tool to prevent wear or damage to removal tool and engine crankshaft. Prevent damage to clutch threads; thread tool into primary clutch only enough to remove the clutch.

C. Thread clutch removal tool (see Special Tools in this chapter) into threads in primary clutch and then tighten tool to loosen clutch from the engine tapered crankshaft.

D. If necessary, remove starter/generator pulley from primary clutch (Fig. 10).

6. Remove secondary clutch from transaxle input shaft, if necessary:

A. Remove cap screw and stepped washer that secure secondary clutch to transaxle input shaft.

B. Remove secondary clutch from transaxle shaft. Use of clutch removal tool and secondary clutch adapter (see Special Tools in this chapter) may be needed to loosen clutch from shoulder on input shaft.

Primary Clutch Installation (Fig. 8)

1. If removed, install primary clutch to engine crankshaft:

A. If removed, secure starter/generator pulley to primary clutch with removed washer head screws (Fig. 10). Torque screws from **132 to 168 in−lb (15.0 to 18.9 N−m)**.

B. Thoroughly clean the tapered surfaces of the engine crankshaft and primary clutch.

C. Slide primary clutch assembly onto the engine shaft.

D. Secure primary clutch to engine shaft with cap screw and flat washer. Torque screw from **17 to 22 ft−lb (24 to 29 N−m)**.

E. Install starter/generator belt to the primary clutch and starter/generator pulleys. Tension the belt by rotating the starter/generator away from the engine. Torque fasteners that secure starter/generator from **200 to 230 in−lb (23 to 25 N−m)** to secure starter/generator. When properly adjusted, the belt should deflect 1/4 inch (6 mm) with 10 lb (4.5 kg) of force on the center of the belt.

2. If removed, install secondary clutch to transaxle input shaft:

A. Apply antiseize lubricant to transaxle input shaft.

B. Slide secondary clutch onto the transaxle shaft.

C. Secure secondary clutch to transmission shaft with cap screw and stepped washer. Torque cap screw from **39 to 47 ft−lb (53 to 63 N−m)**.

3. Install CVT drive belt to primary and secondary clutches (see CVT Drive Belt in this section).

4. Lower and secure vehicle cargo bed (if installed).

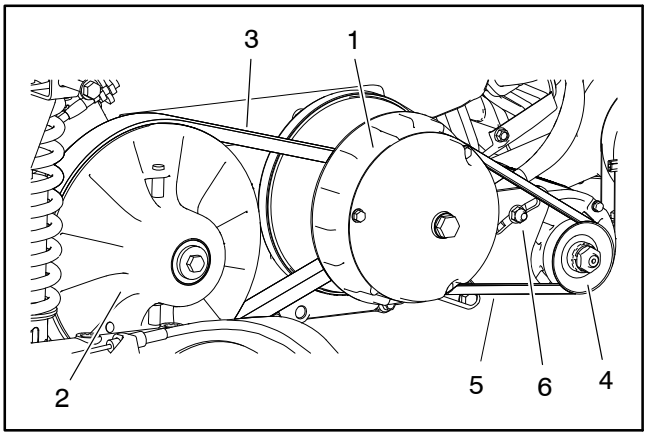

Figure 9

1. **Primary clutch**
2. **Secondary clutch**
3. **CVT drive belt**
4. **Starter/generator pulley**
5. **Starter/generator belt**
6. **Pivot nut**

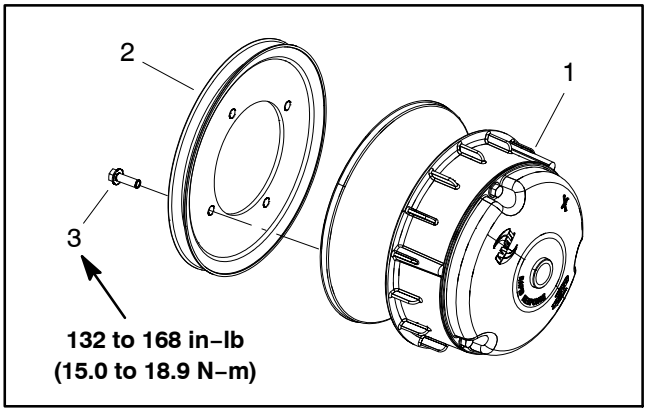

Figure 10

1. **Primary clutch**
2. **Starter/generator pulley**
3. **Screw (4 used)**

Primary Clutch Service

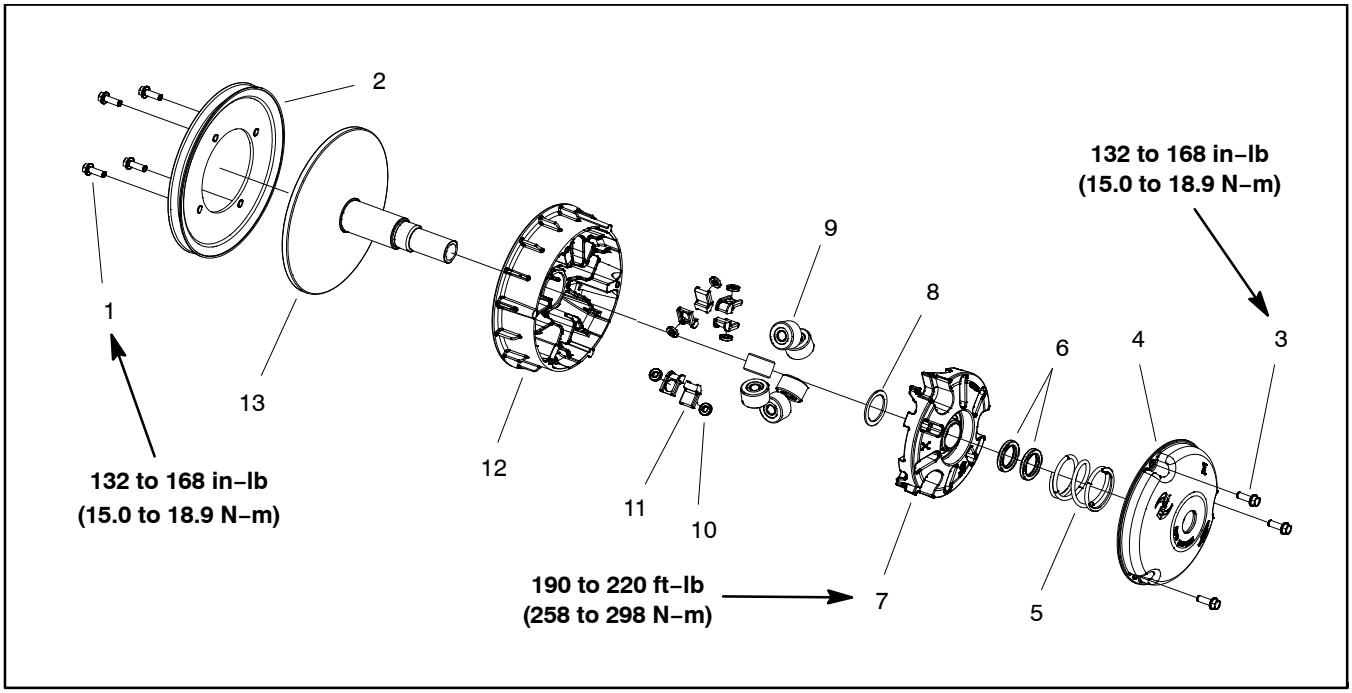

Figure 11

1. Washer head screw (4 used)
2. Starter/generator pulley
3. Washer head screw (3 used)
4. Dust cover
5. Compression spring
6. Shim (2 used)
7. Spider
8. Shim
9. Roller (6 used)
10. Button plug (6 used)
11. Primary button (6 used)
12. Moveable sheave
13. Stationary sheave

Primary Clutch Disassembly (Fig. 11)

IMPORTANT: During clutch disassembly, note location of shims (items 6 and 8) for assembly purposes. Correct shim location is necessary for proper clutch operation.

IMPORTANT: Make note of the "X" mark cast into the dust cover, spider and moveable sheave before clutch disassembly. These marks must be aligned during assembly for proper clutch operation.

1. Remove three (3) washer head screws securing the dust cover to the moveable sheave. Note location of "X" marks cast on the cover and spider for assembly purposes. Remove cover from clutch assembly.

2. Remove compression spring and shims (item 6) from clutch. Label shims and their location for assembly purposes.

3. Make sure that starter/generator pulley (item 2) has been removed from the primary clutch (see Primary and Secondary Clutches in this section).

4. Use starter/generator pulley washer head screws to secure the spider removal holding bar to primary clutch (see Special Tools in this chapter).

5. Secure clutch with attached spider removal holding bar in a vise. Note location of "X" marks cast on the spider and moveable sheave for assembly purposes.

IMPORTANT: Use spider removal spanner to remove spider. Unequal pressure on the spider during removal may damage the spider.

6. Using spider removal spanner (see Special Tools in this chapter), remove spider (item 7) from the stationary sheave post (Fig. 12).

7. Remove shim (item 8) from stationary sheave post. Label shim and its location for assembly purposes.

8. As needed, remove rollers, button plugs and primary buttons from moveable sheave.

9. If necessary, remove moveable sheave from stationary sheave.

Primary Clutch Inspection

NOTE: If primary clutch wear or damage occurs, clutch replacement may be necessary. Refer to your parts catalog to identify individual primary clutch components that are available.

1. Inspect the tapered ends of the engine crankshaft and stationary sheave of primary clutch. If either is severely damaged, replace component as damage to the taper will allow loosening of the clutch during vehicle operation.

2. Check all of the rollers, button plugs and primary buttons. If binding or uneven wear is found, replace all rollers, plugs and buttons as a set.

3. Check the contact surface of the moveable sheave for wear and/or fraying. If surface is worn/frayed, replace component.

Primary Clutch Assembly (Fig. 11)

IMPORTANT: For proper clutch operation, make sure to use the correct clutch components for your Workman model and serial number. Do not mix clutch components from different vehicles.

IMPORTANT: For proper primary clutch operation, DO NOT lubricate primary clutch components.

1. If removed, install moveable sheave onto post of stationary sheave.

2. If removed, install primary buttons, button plugs and rollers to pockets in moveable sheave. Rollers **should not** be lubricated.

3. Place shim (item 8) onto stationary sheave post.

4. Install spider to the stationary sheave post using spider tool kit (see Special Tools in this chapter). Make sure that the “X” mark cast into the spider and moveable sheave are aligned. Torque spider from **190 to 220 ft−lb (258 to 298 N−m)**.

5. Install shims (item 6) and compression spring onto the stationary sheave post.

6. Position dust cover to clutch. Make sure that the “X” mark cast into the cover, spider and moveable sheave are aligned.

7. Secure cover to the moveable sheave with three (3) cap screws. Torque cap screws from **132 to 168 in−lb (15.0 to 18.9 N−m)**.

8. Remove spider tool from stationary sheave.

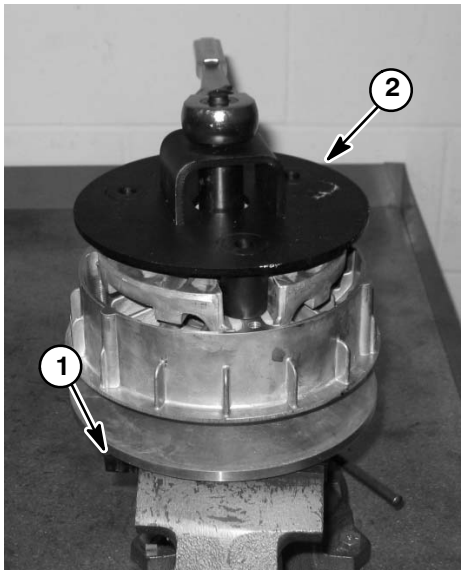

Figure 12

1. Holding bar **2. Spanner**

Secondary Clutch Service

1. Use secondary clutch press tool (see Special Tools in this chapter) to compress the compression spring enough to allow removal of the retaining ring (item 7) that secures internal clutch components.

2. Remove retaining ring.

3. Carefully, release clutch press tool to allow the spring to extend fully.

4. Remove outer spring retainer, spring and inner spring retainer from clutch.

5. Make note of the “X” mark cast into the stationary sheave and moveable sheave before removing the moveable sheave. These marks must be aligned during assembly for proper clutch operation.

6. Separate the clutch sheaves. Locate and retrieve thrust washer.

7. Clean and inspect secondary clutch components:

   A. Clean all dust and debris from clutch components. If necessary, use contact or brake cleaner to remove any oil or other lubricants from clutch components.

   B. Inspect the spring and replace if damaged or fatigued.

   C. Check the rollers in the stationary sheave for binding or wear. If binding or uneven wear is found, replace secondary clutch assembly.

   D. Check the contact surface of the sheaves for wear and/or fraying. If wear or damage is found, replace secondary clutch assembly.

IMPORTANT: For proper secondary clutch operation, DO NOT lubricate secondary clutch components.

8. Assemble the secondary clutch in the reverse order of disassembly. Make sure that the “X” mark cast into the stationary and moveable sheaves are aligned. Also, make sure that the retaining ring is fully seated in groove after installation.

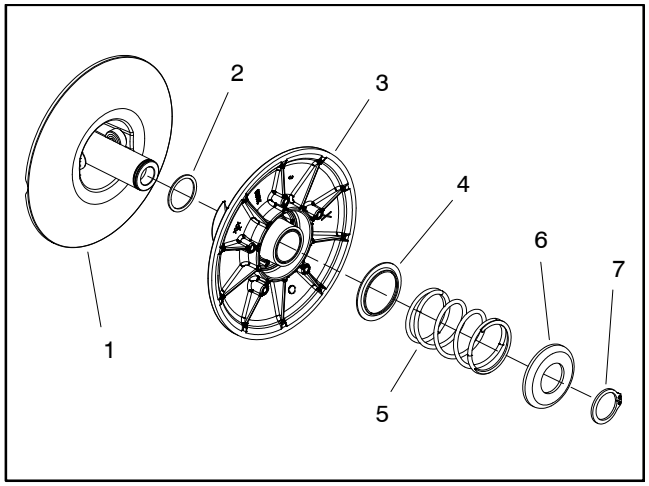

Figure 13

1. **Stationary sheave**
2. **Thrust washer**
3. **Moveable sheave**
4. **Inner spring retainer**
5. **Spring**
6. **Outer spring retainer**
7. **Retaining ring**

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Transaxle Shift Cable

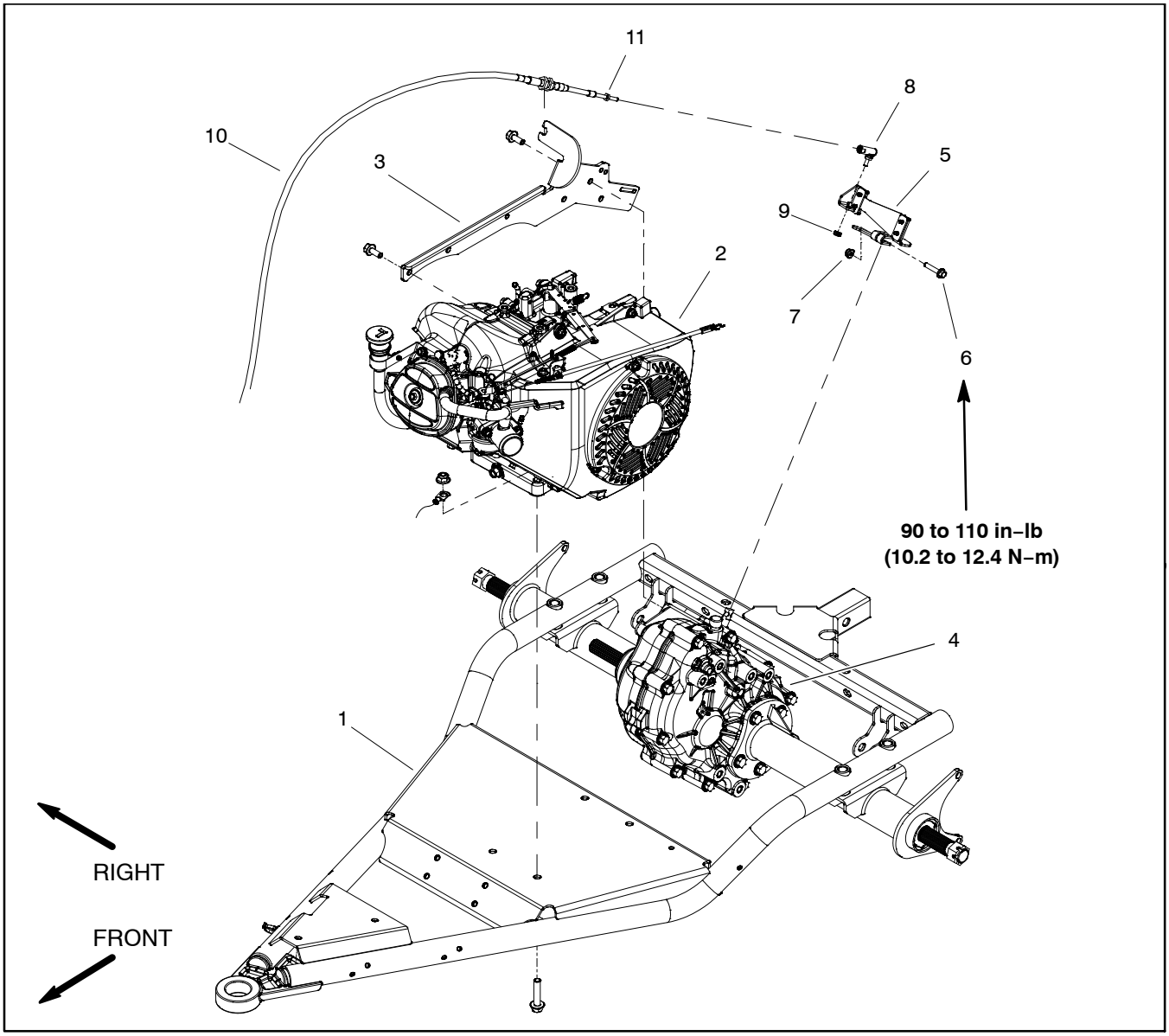

Figure 14

1. **Swing arm**
2. **Engine**
3. **Spanner bar**
4. **Transaxle assembly**
5. **Shift arm**
6. **Flange head screw**
7. **Flange nut**
8. **Ball joint**
9. **Lock nut**
10. **Shift cable**
11. **Shift cable jam nut**

Removal

1. Park machine on a level surface, stop engine, set parking brake and remove key from the key switch.

2. Raise and support cargo bed to access the end of shift cable at the transaxle.

3. Remove dash and position it toward the front of the vehicle to access the end of the shift cable at the shift lever (see Dash in the Service and Repairs section of Chapter 6 − Chassis). It is not necessary to remove choke cable from dash.

4. Disconnect shift cable from transaxle (Fig. 14):

   A. Loosen jam nuts that secure shift cable to spanner bar (item 3). Separate cable from spanner bar.

   B. Remove ball joint (item 8) from shift arm on transaxle. Then, remove ball joint from end of shift cable.

   C. Carefully separate shift cable from clip on swing arm.

5. Disconnect shift cable from shift lever (Fig. 16):

A. Remove ball joint from shift lever assembly. Then, remove ball joint from end of shift cable.

B. Remove shift cable jam nut on the left side of the parking brake mount and pull cable from brake mount.

6. Note routing of shift cable through front frame for assembly purposes.

7. Carefully remove shift cable by pulling it through the front frame toward front of vehicle.

Installation

1. Carefully route shift cable through the front frame and toward the transaxle using cable routing noted during cable removal.

2. Connect front of shift cable to shift lever (Fig. 16):

A. Insert front end of shift cable through hole in parking brake mount.

B. Secure shift cable to parking brake mount with jam nuts. Locate the jam nuts in the middle of the cable adjustment area.

C. Fully install ball joint onto end of shift cable and secure with jam nut. Then, secure ball joint to shift lever assembly.

3. Make sure that shift lever on steering column is in the NEUTRAL position and that shift lever on transaxle is in the NEUTRAL position.

4. Connect rear of shift cable to transaxle (Fig. 14):

A. Fully install ball joint (item 8) to end of shift cable and secure to cable with jam nut.

B. Position shift cable to spanner bar (item 3) making sure that spanner bar is between washers and jam nuts on cable.

C. Adjust cable position with jam nuts on spanner bar so that ball joint on end of cable can easily be inserted into shift lever on transaxle. Tighten jam nuts.

D. Secure ball joint to transaxle shift lever.

E. Secure shift cable to swing arm with clip.

5. Check that forward, neutral and reverse positions engage as shift lever is moved to each position. If necessary, adjust shift cable at spanner bar so that all positions engage. If necessary, additional cable adjustment can be made with jam nuts at the parking brake mount.

6. After shift cable adjustments have been made, install dash (see Dash in the Service and Repairs section of Chapter 6 – Chassis).

7. Lower and secure cargo bed.

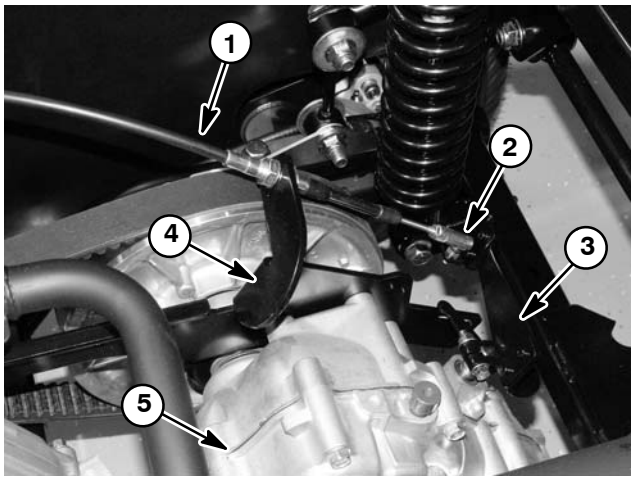

Figure 15

1. **Shift cable**
2. **Ball joint**
3. **Shift lever**
4. **Spanner bar**
5. **Transaxle**

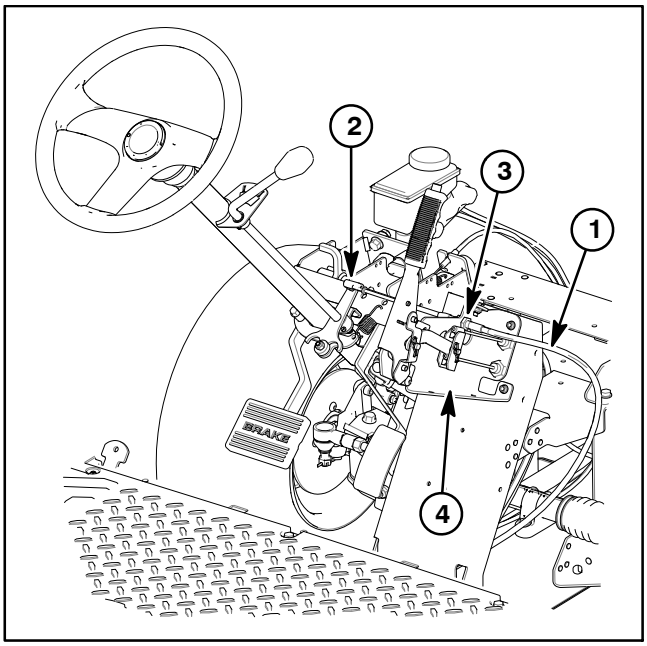

Figure 16

1. **Shift cable**
2. **Cable jam nuts**
3. **Ball joint**
4. **Parking brake mount**

Transaxle

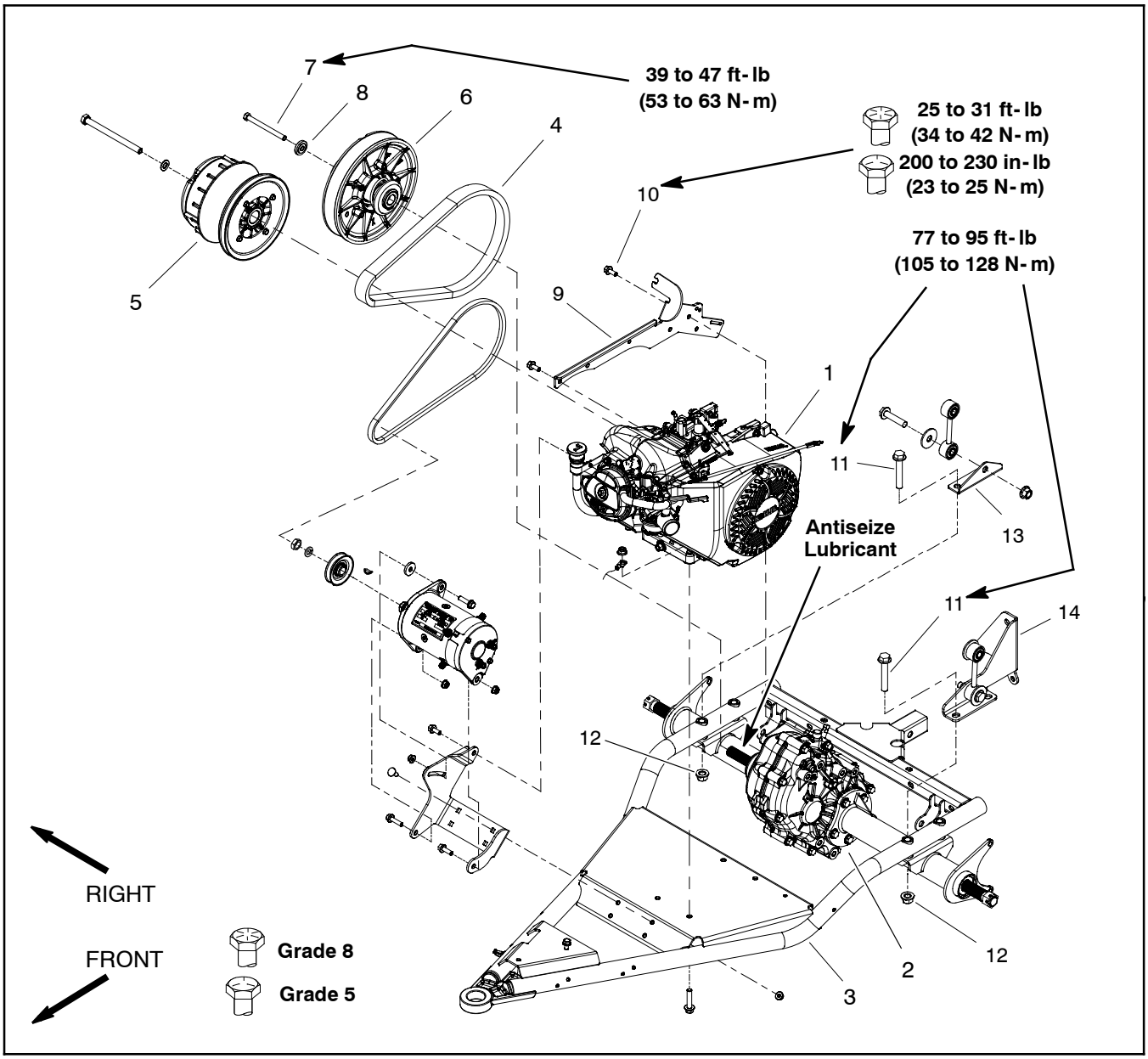

Figure 17

1. Engine
2. Transaxle assembly
3. Swing arm
4. CVT drive belt
5. Primary clutch
6. Secondary clutch
7. Cap screw
8. Stepped washer
9. Spanner bar
10. Flange head screw (3 used)
11. Flange head screw (4 used)
12. Lock nut (4 used)
13. Sway bar link bracket (2 used)
14. Stabilizer bracket

CAUTION

The engine, exhaust system and drive system components may be hot. To avoid possible burns, allow all components to cool before working on drive system components.

IMPORTANT: Torque tighten the fasteners based on the fastener grade. Make sure to use the correct torque; refer to Figure 17.

Transaxle Removal (Fig. 17)

1. Park vehicle on a level surface, stop engine, set parking brake and remove key from the key switch.

2. Remove cargo bed from the frame (see Cargo Bed in the Service and Repairs section of Chapter 7 - Chassis).

3. Remove drive belt from the primary and secondary clutches (see CVT Drive Belt in this section).

4. Remove secondary clutch from transaxle input shaft (see Primary and Secondary Clutches in this section).

5. Remove muffler from vehicle (see Exhaust System in the Service and Repairs section of Chapter 3 – Gasoline Engine).

6. Separate shift lever from transaxle and position it away from transaxle (Fig. 18).

A. Remove flange head screw and flange nut that secure the shift lever to the transaxle selector shaft.

B. Loosen shift cable jam nuts that secure cable to the spanner bar.

C. Separate shift arm with attached shift cable from the transaxle selector shaft and position it away from transaxle.

7. Remove three (3) flange head screws that secure spanner bar (item 9) to transaxle.

WARNING

Before jacking up the vehicle, review and follow Jacking Instructions in Chapter 1 – Safety.

8. Raise and support rear of vehicle to allow rear wheels and transaxle to be removed.

A. Chock the front and rear of both front tires to prevent the vehicle from moving.

B. Jack up both sides of the frame enough to remove both rear wheels.

C. Support both sides of the frame with appropriate jack stands positioned just in front of the transaxle shafts. This will allow the transaxle to be removed toward the rear of the vehicle.

9. Remove both rear wheels and wheel hub assemblies from the transaxle (see Rear Wheels and Hubs in the Service and Repairs section of Chapter 7 – Chassis).

10. Support transaxle from below to prevent it from moving.

CAUTION

To prevent personal injury, make sure that transaxle is properly supported as it is removed from the vehicle. Transaxle weighs approximately 55 pounds (25 kg).

11. Remove four (4) flange head screws (item 11) and lock nuts (item 12) that secure the transaxle to the swing arm.

IMPORTANT: Take care to not damage any vehicle components while lowering the transaxle assembly from the swing arm and vehicle.

12. Carefully lower and remove transaxle assembly toward the rear of the vehicle.

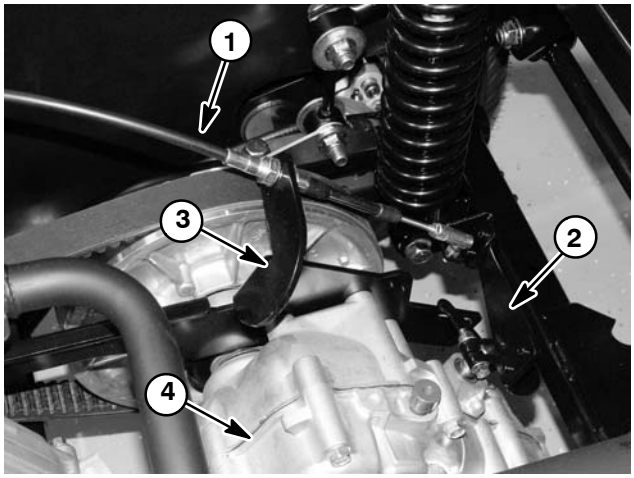

Figure 18

1. **Shift cable**
2. **Shift lever**
3. **Spanner bar**
4. **Transaxle**

Transaxle Installation (Fig. 17)

IMPORTANT: Take care to not damage any vehicle components while installing the transaxle assembly to the vehicle.

1. Carefully raise transaxle assembly and align it with swing arm mounting points.

2. Secure the transaxle to the swing arm with four (4) flange head screws and lock nuts.

3. Secure spanner bar (item 9) to transaxle with three (3) flange head screws.

4. Secure shift lever with attached shift cable to transaxle selector shaft (Fig. 18).

A. Position shift lever with attached shift cable to the transaxle selector shaft and secure with flange head screw and flange nut.

B. Secure shift cable to the spanner bar with cable jam nuts.

5. Install secondary clutch to transaxle input shaft (see Primary and Secondary Clutches in this section).

6. Install CVT drive belt to the primary and secondary clutches (see CVT Drive Belt in this section).

7. Install muffler to vehicle (see Exhaust System in the Service and Repairs section of Chapter 3 – Gasoline Engine).

8. Install both rear wheel hubs and wheels to the vehicle (see Rear Wheel and Hubs in the Service and Repairs section of Chapter 7 – Chassis).

9. Check that forward, neutral and reverse positions engage as shift lever is moved to each position. If necessary, adjust shift cable at spanner bar so that all positions engage.

10. Lower vehicle to ground.

11. Install cargo bed to the frame (see Cargo Bed in the Service and Repairs section of Chapter 7 – Chassis).

12. Make sure that transaxle is filled with 1.7 quarts (1.6 liters) of new SAE 80W–90 gear oil.

13. Check brakes for proper operation.

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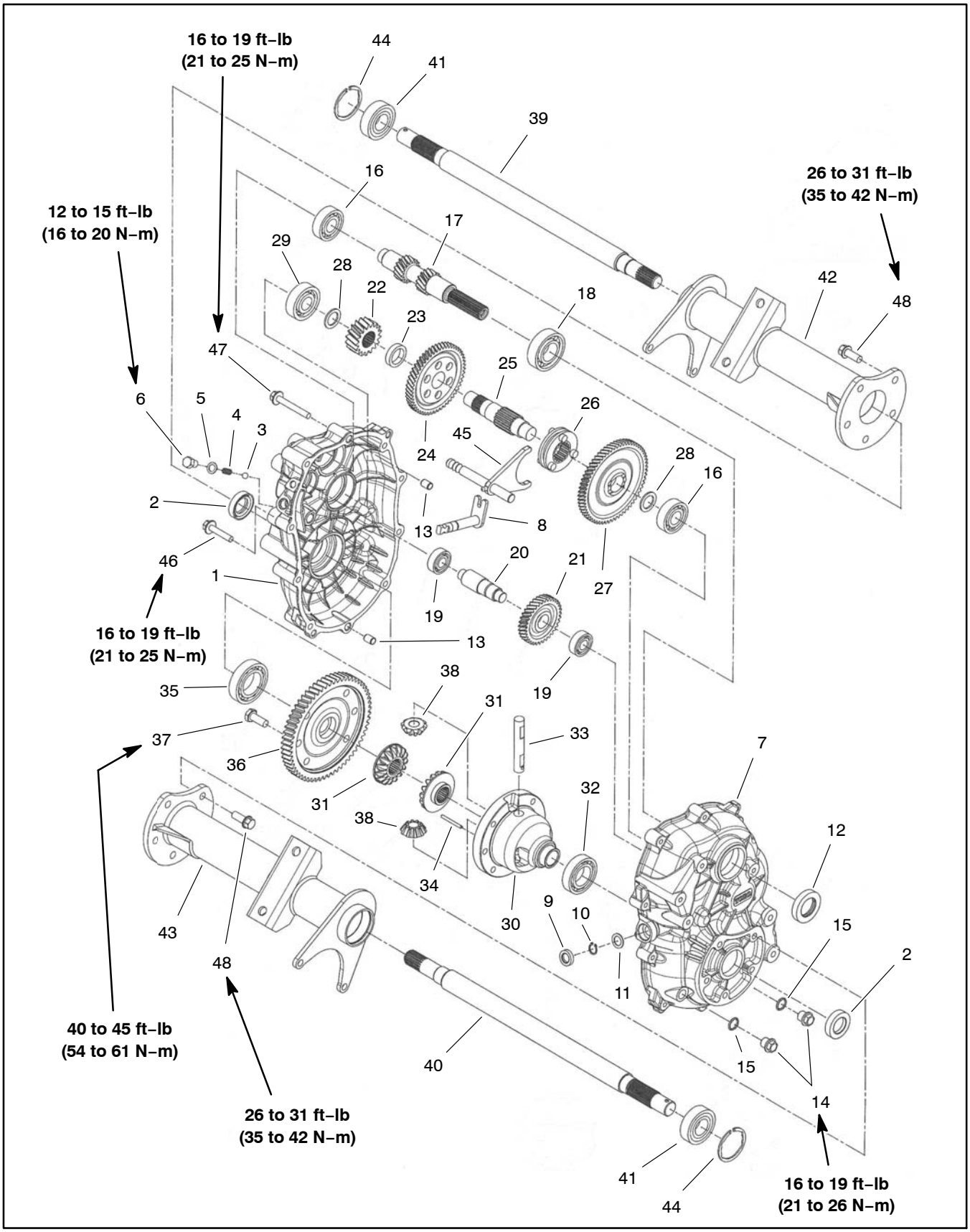
16 to 19 ft–lb
(21 to 25 N–m)
12 to 15 ft–lb
(16 to 20 N–m)
26 to 31 ft–lb
(35 to 42 N–m)
16 to 19 ft–lb
(21 to 25 N–m)
40 to 45 ft–lb
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Figure 19

Figure 19 (Continued)

1. Case (LH)
2. Oil seal (2 used)
3. Steel ball
4. Spring
5. Gasket
6. Bolt
7. Case (RH)
8. Selector shaft
9. Oil seal
10. Snap ring
11. Spacer
12. Oil seal
13. Pipe knock (2 used)
14. Oil drain plug (2 used)
15. Gasket (2 used)
16. Ball bearing (2 used)
17. Input shaft
18. Ball bearing
19. Ball bearing (2 used)
20. Counter shaft
21. Gear 34
22. Gear 17
23. Collar
24. Gear 52
25. Center shaft
26. Pin clutch
27. Gear 51
28. Spacer (2 used)
29. Ball bearing
30. Differential case
31. Side gear (2 used)
32. Ball bearing
33. Pinion shaft
34. Pin
35. Ball bearing
36. Gear 60
37. Bolt (6 used)
38. Pinion gear (2 used)
39. Axle shaft (LH)
40. Axle shaft (RH)
41. Ball bearing (2 used)
42. Axle case (LH)
43. Axle case (RH)
44. Snap ring (2 used)
45. Shift shaft
46. Flange bolt
47. Flange bolt (9 used)
48. Flange bolt (10 used)

Transaxle Disassembly (Fig. 19)

1. Drain oil from transaxle. After draining, install and torque drain plug from **16 to 19 ft−lb (21 to 25 N−m)**.

2. Clean the outside of the transaxle assembly.

3. Remove RH and LH axle case assemblies from transaxle case assembly (Fig. 20):

   A. For assembly purposes, mark axle case and transaxle case before removing the axle case. The right and left axle cases and axle shafts have different lengths so correct assembly is critical.

   B. Remove five (5) flange bolts that secure axle case assembly to transaxle case.

   C. Slide axle case assembly with installed axle shaft from transaxle case.

   D. Repeat process to remove second axle case assembly.

4. Remove bolt (item 6 in Fig. 19) near the selector shaft. Remove gasket, spring and steel ball from bore in LH case. Gasket replacement is recommended during assembly.

5. Separate transaxle cases (Fig. 21):

   A. Support the transaxle case assembly with the input shaft side (RH case side) down. Loosen and remove flange bolts that secure the cases together. Note location of shorter flange bolt for assembly purposes.

   IMPORTANT: Do not use a pry bar or screw driver on the transaxle case mating surfaces when separating the transaxle cases. Damage to the sealing surfaces of the cases may result.

   B. Using bosses on cases as pry−points, separate cases. Raise LH case leaving internal transaxle components in RH case.

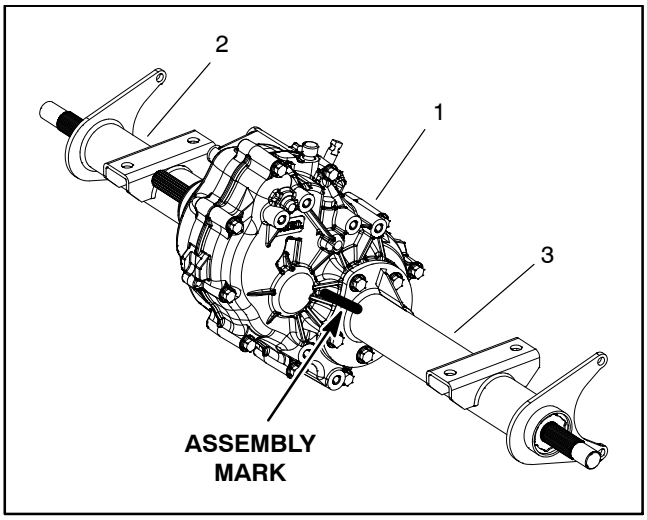

Figure 20

1. Case assembly
2. RH axle case
3. LH axle case

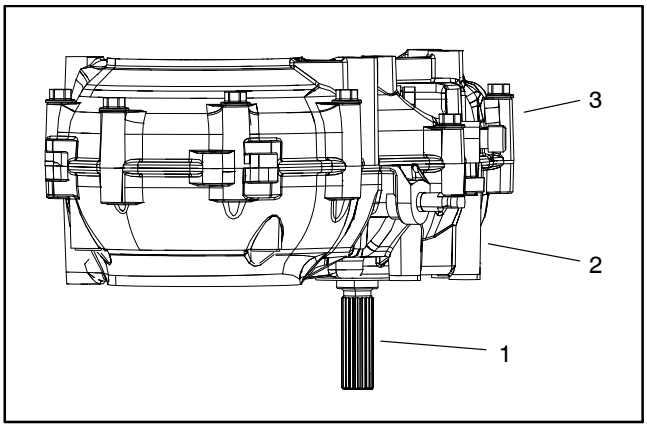

Figure 21

1. Input shaft
2. RH case
3. LH case

6. For assembly purposes, note location of pipe knocks (item 13 in Fig. 19) in the cases. Remove pipe knocks from cases.

7. Individually, remove counter shaft, differential, center shaft (with shift shaft) and input shaft assemblies from RH case (Fig. 22).

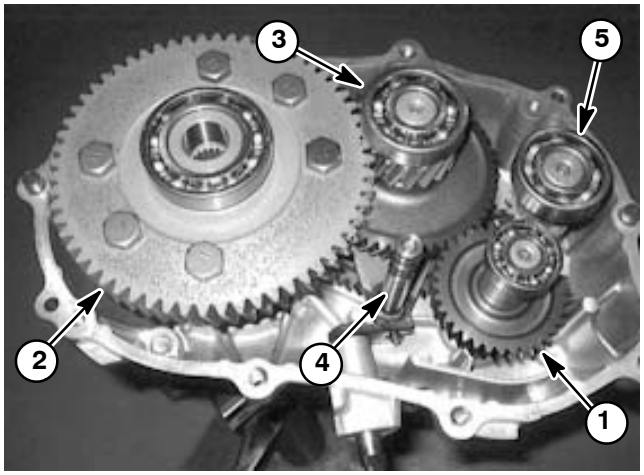

Figure 22

1. **Counter shaft**
2. **Differential**
3. **Center shaft**
4. **Shift shaft**
5. **Input shaft**

IMPORTANT: When disassembling transaxle shaft assemblies, discard all bearings that have been removed and replace with new bearings during assembly. Use appropriate puller or press to remove bearings and gears from transaxle shafts.

8. Disassemble counter shaft assembly (Fig. 23):

   A. Remove bearings from the counter shaft assembly. Discard removed bearings.

   B. Remove gear from the counter shaft.

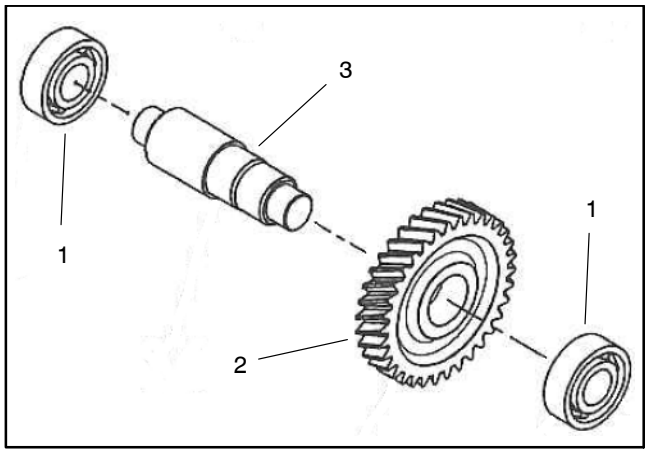

Figure 23

1. **Bearing (2 used)**
2. **Gear 34**
3. **Counter shaft**

9. Disassemble center shaft assembly (Fig. 24):

   A. Remove bearings from the center shaft assembly. Discard removed bearings.

   B. Remove spacers, gear 51, gear 17 and pin clutch from the center shaft.

   C. Remove gear 52 and collar from shaft with puller. Collar is a press fit on shaft.

   D. Replace pin clutch if worn, cracked or bent.

   E. Replace collar or spacers if excessively worn or damaged.

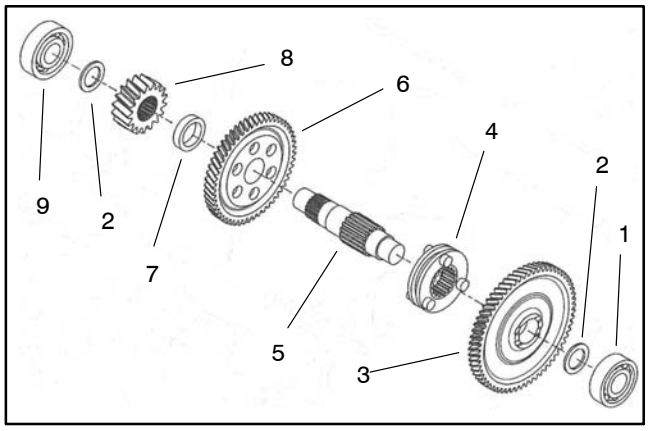

Figure 24

1. **Bearing (RH case)**
2. **Spacer (2 used)**
3. **Gear 51**
4. **Pin clutch**
5. **Center shaft**
6. **Gear 52**
7. **Collar**
8. **Gear 17**
9. **Bearing (LH case)**

10. Disassemble differential case assembly (Fig. 25):

    A. Remove bearings from the differential case assembly. Discard removed bearings.

    B. Remove six (6) bolts securing gear 60 to the differential case and remove gear from case.

    C. Remove pin from the differential case. Discard pin and replace it during assembly.

    D. Remove pinion shaft, side gears and pinion gears from the case.

11. Disassemble input shaft assembly (Fig. 26):

    A. Remove bearings from the input shaft assembly. Discard removed bearings.

12. Remove selector shaft (item 8 in Fig. 19) from RH case:

    A. Carefully remove selector shaft oil seal from RH case taking care to not damage bore in case. Discard seal after removal.

    B. Remove snap ring from selector shaft.

    C. Remove spacer from RH case.

    D. Clean all corrosion and burrs from end of selector shaft to prevent damage to bore in RH case during shaft removal. Slide shaft from RH case.

13. Remove oil seals from transaxle cases taking care to not damage bores in cases during seal removal. Discard removed seals.

14. If necessary, pull breather from LH case with pliers (Fig. 27). Discard and replace breather after removal.

15. Remove axle shafts from axle cases (RH and LH):

    A. Remove axle shaft from case by pulling it out of bearing that is installed in axle case.

    IMPORTANT: Do not reuse snap ring that secures bearing in axle case. Discard and replace snap ring with new one during assembly.

    B. Remove snap ring from the axle case. Discard removed snap ring.

    NOTE: Bearing is press fit in axle case. Use press to remove bearing from axle case.

    C. Remove bearing from axle case and discard bearing.

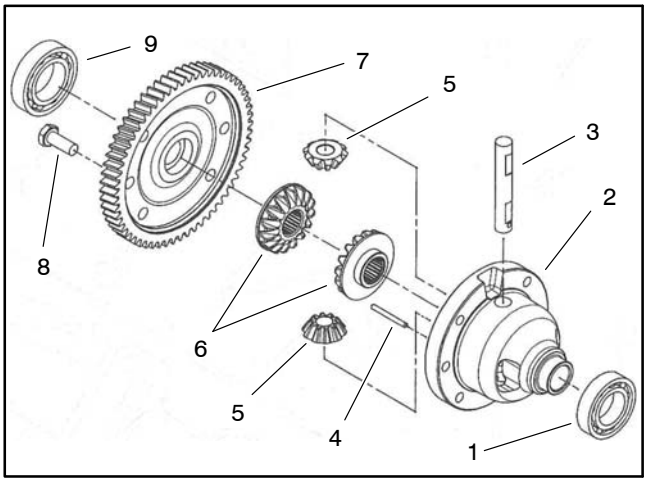

Figure 25

1. **Bearing (RH case)**
2. **Differential case**
3. **Pinion shaft**
4. **Pin**
5. **Pinion gear (2 used)**
6. **Side gear (2 used)**
7. **Gear 60**
8. **Bolt (6 used)**
9. **Bearing (LH case)**

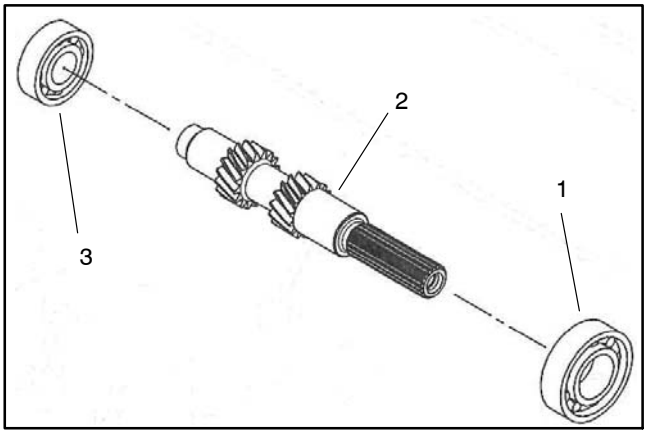

Figure 26

1. **Bearing (RH case)**
2. **Input shaft**
3. **Bearing (LH case)**

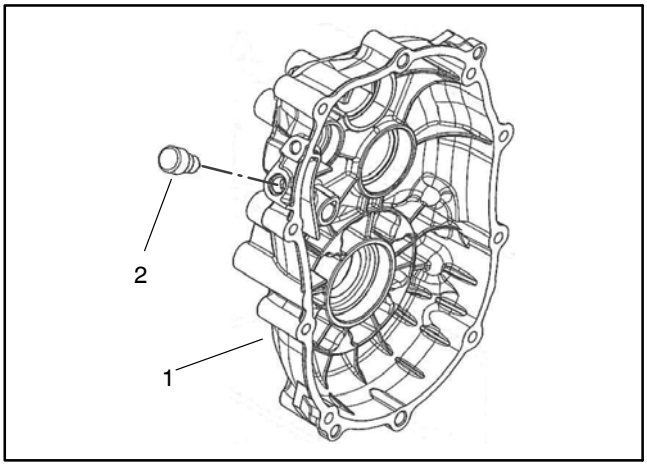

Figure 27

1. **LH transaxle case**
2. **Breather**

Transaxle Inspection

1. Thoroughly clean and dry all internal transaxle parts.

2. Use emery cloth to remove nicks and burrs from all transaxle components.

3. Inspect all gear teeth for roughness, material transfer or other damage. Cracked, broken, missing or chipped gear teeth are not acceptable. Replace gears if worn or damaged.

4. Inspect splines on input and center shafts. If cracked, broken, chipped or missing splines are found on either shaft, replace shaft.

5. Inspect I.D. of all gears for excessive wear or scoring. Gears should fit snugly on shafts.

6. Inspect all shaft bearing surfaces for worn or damaged areas.

7. Inspect oil seal surfaces of shafts for wear or damage and replace shafts if necessary.

8. Inspect shift shaft and pin clutch (Fig. 28):

   A. The shift shaft should move freely in the groove of the pin clutch.

   B. The engagement arm of the shift shaft should not have excessive scoring at surfaces that contact the pin clutch groove.

   C. The shift pins on the pin clutch should not be worn or damaged.

9. Inspect differential assembly components (Fig. 29):

   A. Inspect differential case for wear in side gears and pinion shaft mating area. Replace the case if machined surfaces are scored or if the pinion shaft fits loosely in the bore.

   B. Replace pinion shaft if cracked or bent.

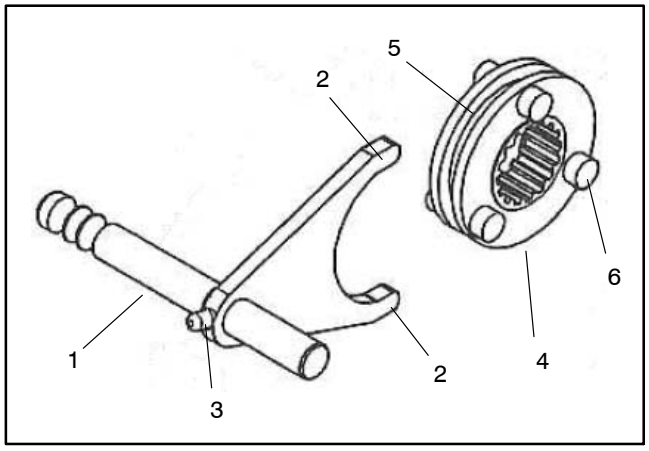

Figure 28

1. **Shift shaft**
2. **Engagement surfaces**
3. **Pin**
4. **Pin clutch**
5. **Groove**
6. **Shift pin**

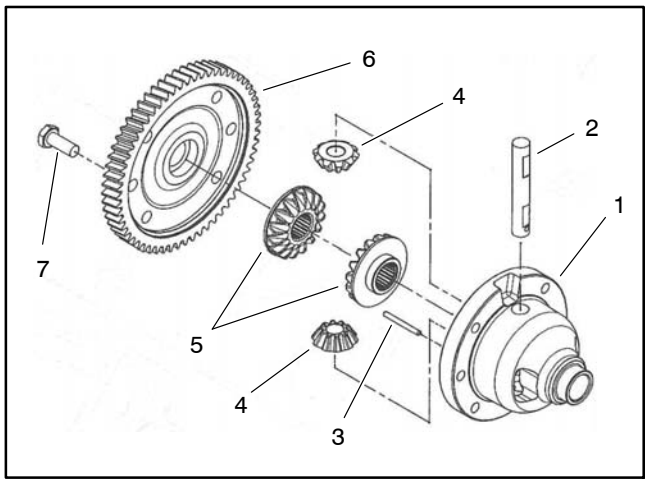

Figure 29

1. **Differential case**
2. **Pinion shaft**
3. **Pin**
4. **Pinion gear (2 used)**
5. **Side gear (2 used)**
6. **Gear 60**
7. **Bolt (6 used)**

Transaxle Assembly (Fig. 19)

1. Clean sealant material from transaxle RH and LH case mating surfaces before transaxle assembly. Make sure all transaxle parts are clean.

2. Replace all removed bearings and seals during transaxle assembly.

IMPORTANT: When pressing bearings onto transaxle shafts, make sure to press bearing only on the inner race to prevent damaging the bearing.

3. Press new bearings onto the input shaft (Fig. 30). Make sure bearings are pressed fully to the shaft shoulder.

4. Assemble the counter shaft (Fig. 31):

   A. Press gear 34 onto shaft fully to the shoulder on the counter shaft.

   B. Press new bearings onto the counter shaft. Make sure bearings are pressed fully to the shaft shoulder.

5. Assemble differential case (Fig. 32):

   A. Apply a coating of oil to all surfaces of pinion and side gears.

   B. Place first side gear into case and then position both pinion gears into case making sure that gear teeth mesh properly with side gear.

   C. Slide pinion shaft through case and installed pinion gears.

   D. Align holes in pinion shaft and differential case to allow installation of pin. Install new pin into the differential case to secure pinion shaft.

   E. Place second side gear into case making sure that gear teeth mesh properly with pinion gears.

   F. Install gear 60 to case with outer side gear fitted to bore in gear 60. Gear 60 should fit flush with case surface and side and pinion gears must rotate freely.

   G. Secure gear 60 to case with six (6) bolts. Torque bolts in a crossing pattern from **40 to 45 ft−lb (54 to 61 N−m)**.

   H. Press new bearings onto the differential case assembly. Make sure bearings are pressed fully to the shoulders on gear 60 and the differential case.

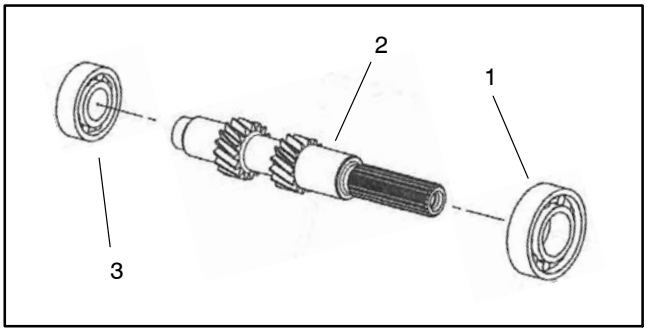

Figure 30

1. **Bearing (RH case)**
2. **Input shaft**
3. **Bearing (LH case)**

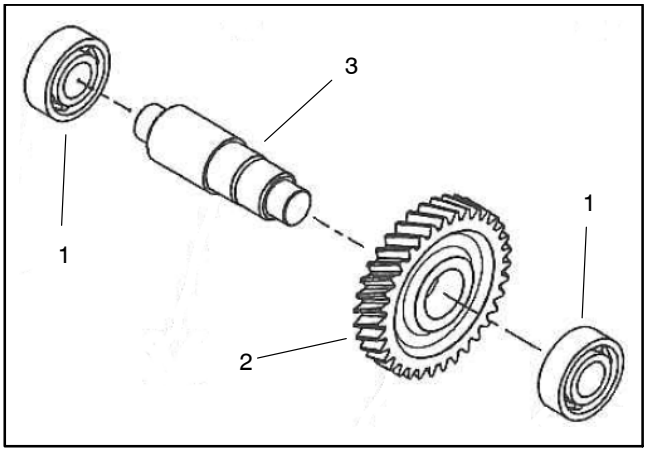

Figure 31

1. **Bearing (2 used)**
2. **Gear 34**
3. **Counter shaft**

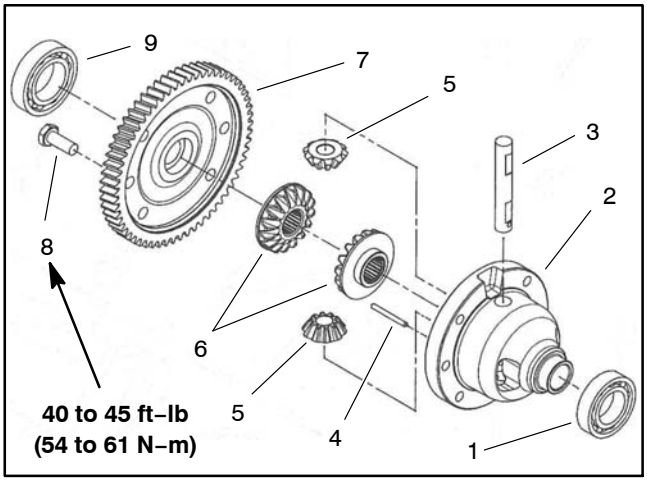

Figure 32

1. **Bearing (RH case)**
2. **Differential case**
3. **Pinion shaft**
4. **Pin**
5. **Pinion gear (2 used)**
6. **Side gear (2 used)**
7. **Gear 60**
8. **Bolt (6 used)**
9. **Bearing (LH case)**

6. Assemble center shaft assembly (Fig. 33):

   A. With mating holes for pin clutch engagement toward pin clutch location, install gear 51 onto center shaft.

   B. Install spacer onto shaft and then press new bearing onto center shaft. Make sure that bearing is pressed fully to the shaft shoulder.

   C. Install pin clutch onto splines of center shaft.

   D. With mating holes for pin clutch engagement facing pin clutch location, install gear 52 onto center shaft.

   E. Press collar onto shaft fully to shoulder on shaft.

   F. Install gear 17 and then spacer onto shaft.

   G. Press new bearing onto center shaft. Make sure that bearing is pressed fully to the shaft shoulder.

   H. After assembly, make sure that distance from one ball bearing outer edge to the other ball bearing outer edge is **4.894" to 4.925" (124.3 to 125.1 mm)** (Fig. 34).

7. Install selector shaft (item 8 in Fig. 19) to RH case:

   A. Slide selector shaft into RH case.

   B. Install spacer onto installed selector shaft and secure with snap ring. Make sure that snap ring is fully installed into groove in shaft.

   C. Apply oil to lip of new oil seal and carefully install oil seal into RH case. Take care to not damage seal during installation.

   D. Make sure that selector shaft rotates freely after assembly.

8. Apply oil to lip of new oil seals and install seals into transaxle cases.

9. Install transaxle shaft assemblies into RH case (Fig. 35):

   A. Support the RH case allowing enough space below the case for the installation of the input shaft.

   B. Carefully install input shaft assembly into RH case taking care to not damage installed seal in case.

   C. Individually, install center shaft (with shift shaft), differential and counter shaft into RH case (Fig. 35). Make sure to engage pin on shift shaft into groove of selector shaft while installing center shaft assembly.

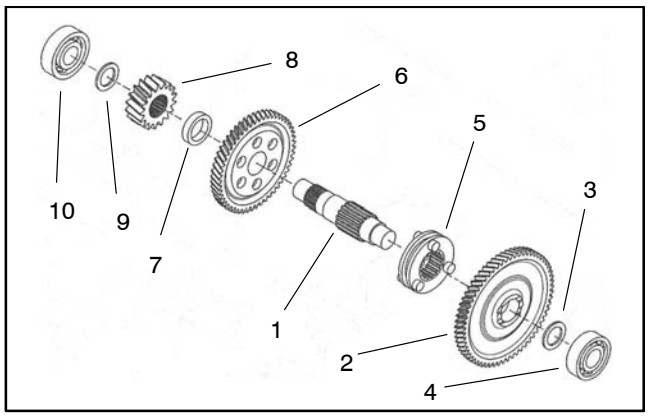

Figure 33

1. **Center shaft**
2. **Gear 51**
3. **Spacer**
4. **Bearing (RH case)**
5. **Pin clutch**
6. **Gear 52**
7. **Collar**
8. **Gear 17**
9. **Spacer**
10. **Bearing (LH case)**

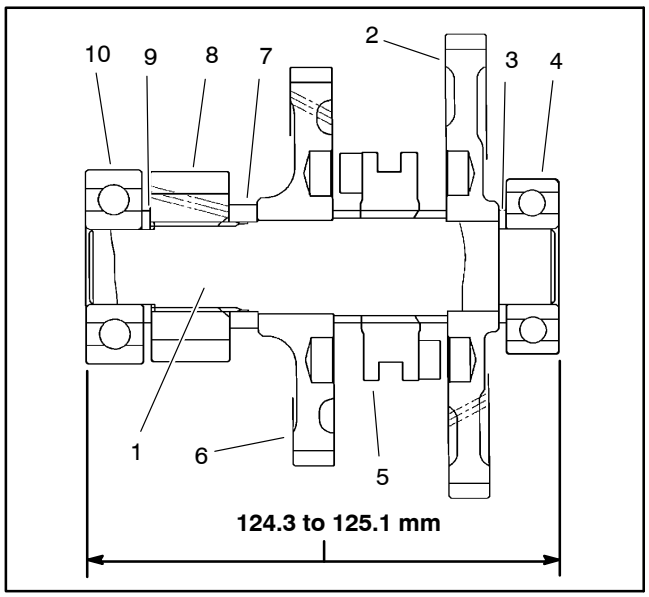

Figure 34

1. **Center shaft**
2. **Gear 51**
3. **Spacer**
4. **Bearing (RH case)**
5. **Pin clutch**
6. **Gear 52**
7. **Collar**
8. **Gear 17**
9. **Spacer**
10. **Bearing (LH case)**

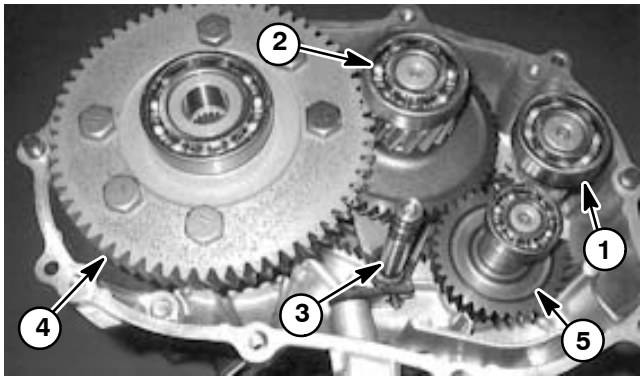

Figure 35

1. **Input shaft**
2. **Center shaft**
3. **Shift shaft**
4. **Differential**
5. **Counter shaft**

10. Install LH case to RH case assembly:

A. Make sure gasket sealing surfaces of both cases are clean.

B. Install both pipe knocks to the supported RH case.

C. Apply Three Bond #1215 (or equivalent) to mating surface of RH case.

D. Install LH case to RH case assembly so each shaft fits properly into the case. Use light pressure to fully engage pipe knocks and internal shafts.

E. Secure transaxle cases with flange head screws making sure that single, shorter screw is installed in location identified during disassembly. Torque screws from **16 to 19 ft−lb (21 to 25 N−m)**.

11. Install steel ball, spring, new gasket and bolt (item 6 in Fig. 19) in the LH case near the selector shaft. Torque bolt from **12 to 15 ft−lb (16 to 20 N−m)**.

12. If breather was removed from LH case (Fig. 36), install new breather into case. Use plastic hammer to carefully install breather.

13. Install axle shafts into axle cases (RH and LH) (Fig. 37):

A. Make sure that interior of axle cases and axle shafts are clean.

NOTE: Bearing is press fit into axle case. Use press to install bearing into axle case.

B. Pressing on the outer surface of the bearing, press new bearing into axle case fully to the shoulder in the axle case.

C. Install new snap ring into the axle case to secure bearing. Make sure that snap ring is fully installed into axle case groove.

IMPORTANT: Make sure that longer axle shaft is installed in longer axle case. The RH axle case is the longer case.

D. Insert axle shaft through axle case and bearing. Make sure that threaded end of axle shaft is inserted through bearing.

14. Install axle cases to transaxle cases (RH and LH):

IMPORTANT: Make sure to install the axle cases to the correct side of the transaxle case assembly. The right side of the transaxle case uses the longer axle case and the left side takes the shorter axle case. Use marks made during disassembly when installing axle cases.

IMPORTANT: Make sure to not damage the oil seal when installing the axle case to the transaxle case assembly.

A. While rotating the axle shaft to align splines, carefully install axle case to the transaxle case.

B. Secure each axle case to the transaxle case with five (5) flange bolts. Torque bolts from **26 to 31 ft−lb (35 to 42 N−m)**.

15. Make sure that 1.7 quarts (1.6 liters) of new SAE 80W−90 gear oil is added to transaxle before vehicle operation.

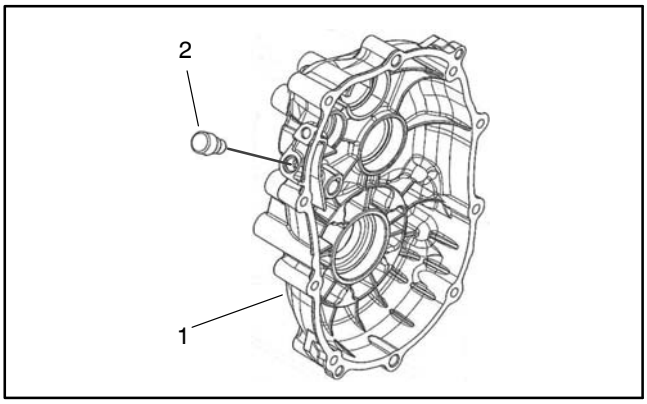

Figure 36

1. LH transaxle case **2. Breather**

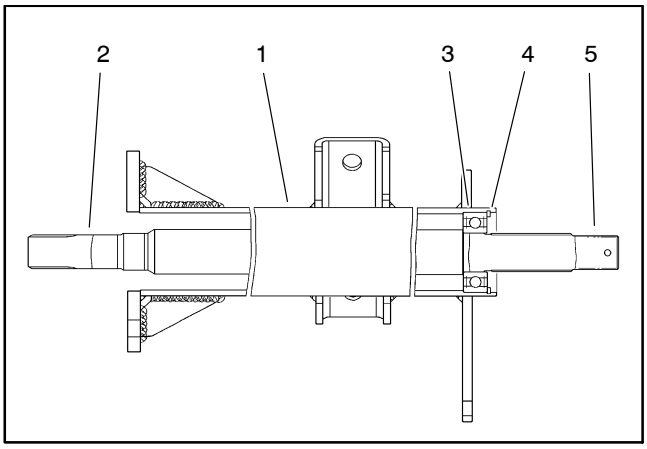

Figure 37

1. Axle case
2. Axle shaft
3. Bearing
4. Snap ring
5. Shaft threaded end

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Chapter 5

Electrical System

Table of Contents

General Information

Operator's Manual

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

Engine Electronic Control Unit (ECU) (Fuel Injected Engines only)

Vehicles with a fuel injected engine (Kohler ECH440) use an electronic control unit (ECU) for engine management. The ECU is located at the front of the engine below the valve cover. All wire harness electrical connectors should be plugged into the ECU before the machine ignition switch is moved from the OFF position to either the RUN or START position.

IMPORTANT: Do not plug or unplug the engine ECU for a period of forty (40) seconds after the machine key switch is turned OFF. The ECU may remain energized even though the ignition switch is OFF.

If the engine ECU is to be disconnected for any reason, make sure that the ignition switch is in the OFF position with the key removed before disconnecting the engine ECU. Also, to prevent possible ECU damage when welding on the machine, disconnect and remove the engine ECU from the machine before welding.

Kohler Engine Electrical Components

When servicing or troubleshooting the engine electrical components, refer to the KOHLER Command PRO EFI ECH440 & ECH440LE Service Manual. The Kohler EFI Diagnostic Software Kit (Kohler P/N 25 761 23–S) and the adapter harness (Kohler P/N 25 176 23) is required to see fault codes. view engine data, access service information, and aid in troubleshooting engine issues. This kit includes the software and a communication cable. The adapter harness must be purchased separately. The diagnostic connecter is secured to the left side of the swing arm under the air cleaner assembly.

Electrical Drawings

The electrical schematics and other electrical drawings for the Workman GTX are located in Chapter 7 – Electrical Drawings.

Rear Frame Panel Cover

A panel cover is secured to the top of the rear frame behind the seats to prevent debris entry to the front of the swing arm area. The cover can easily be removed by releasing the latches and lifting the cover from the rear frame.

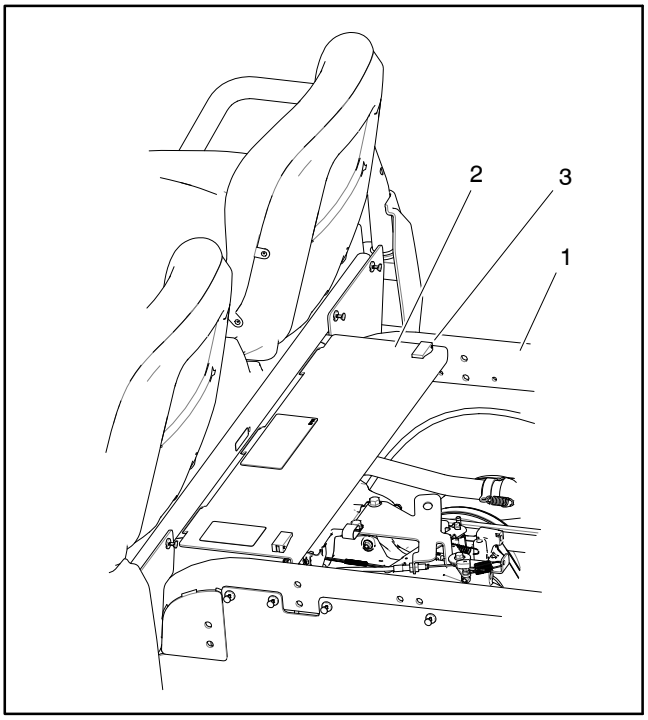

Figure 1

1. **Rear frame**
2. **Panel cover**
3. **Latch (2 used)**

Special Tools

Order special tools from your Toro Distributor. Some tools may also be available from a local supplier.

Multimeter

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

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

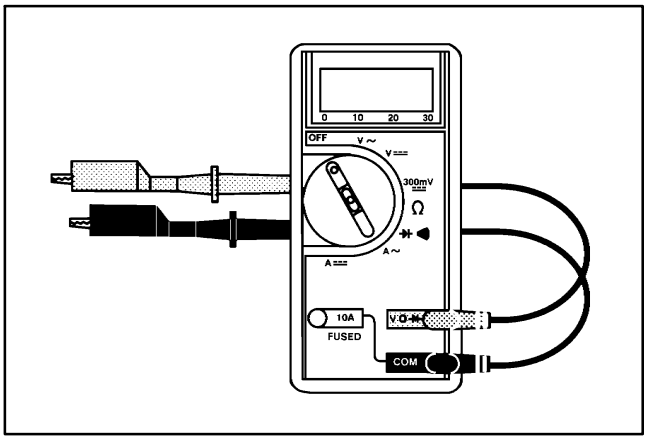

Figure 2

Dielectric Gel

Dielectric gel should be used to prevent corrosion of un–sealed connection terminals. To ensure complete coating of terminals, liberally apply gel to both component and wire harness connector, plug connector to component, unplug connector, reapply gel to both surfaces and reconnect harness connector to component. Connectors should be thoroughly packed with gel for effective results.

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

Toro Part Number: **107–0342**

Figure 3

Battery Hydrometer

Use the battery hydrometer when measuring specific gravity of battery electrolyte if the battery caps can be removed. Obtain this tool locally.

Figure 4

Terminal Protector

Aerosol spray that should be used on battery terminals, ring terminals and fork terminals to reduce corrosion problems. Apply terminal protector to the connection after the battery cable, ring terminal or fork terminal has been secured.

Toro Part Number: **107–0392**

Figure 5

Spark Tester

The spark tester can be used to test magneto ignitions on gasoline engines. The spark tester determines if ignition is present.

Toro Part Number: **TOR4036**

Figure 6

Troubleshooting

CAUTION

Remove all jewelry, especially rings and watches, before doing any electrical troubleshooting or testing. Disconnect the battery cables unless the test requires battery voltage.

For effective troubleshooting and repairs, you must have a good understanding of the electrical circuits and components used on this vehicle (see electrical schematic and wire harness drawings in Chapter 7 – Electrical Drawings).

If the vehicle has any interlock switches by–passed, they must be reconnected for proper troubleshooting and safety.

Starting Problems

Problem	Possible Causes
Start/run solenoid clicks, but starter will not crank.	Battery is discharged. Battery cables are loose or corroded. Battery ground to frame is loose or corroded. Wiring at starter/generator is faulty. Start/run solenoid or circuit wiring is faulty. Starter/generator or circuit wiring is faulty.
Nothing happens when start attempt is made by depressing the accelerator pedal.	Key switch is not in the ON position. Battery is discharged. Wiring to the start circuit components is loose, corroded or damaged (see electrical schematic and wire harness drawings in Chapter 7 – Electrical Diagrams). Battery cables are loose or corroded. Battery ground to frame is loose or corroded. 15 ampere fuse to the key switch is loose or faulty. The key switch or circuit wiring is faulty. Fuse block or circuit wiring is faulty. Accelerator pedal switch is faulty. Start/run solenoid is faulty.

Starting Problems (continued)

Problem	Possible Causes
Engine starts and runs when the accelerator pedal is depressed but will not start when the key switch is moved to the START position.	Key switch or circuit wiring is faulty. Wiring to the start circuit components is loose, corroded or damaged (see electrical schematic and wire harness drawings in Chapter 7 – Electrical Diagrams). One or both of the key start latch relays or circuit wiring is faulty. Diode 2 in wire harness is faulty.
Engine cranks when the accelerator pedal is depressed, but does not start.	Choke needs to be applied. Wiring to start circuits is loose, corroded or damaged (see electrical schematic and wire harness drawings in Chapter 7 – Electrical Diagrams). Magneto relay or circuit wiring is faulty. Engine or fuel system is malfunctioning (see Chapter 3 – Gasoline Engine). Accelerator pedal switch is faulty. Engine and fuel may be too cold.

General Run Problems

Problem	Possible Causes
Battery does not charge.	Wiring to the charging circuit components is loose, corroded or damaged (see electrical schematic and wire harness drawings in Chapter 7 – Electrical Diagrams). Starter/generator belt is slipping or is damaged. Voltage regulator is faulty. Starter/generator is faulty. Battery is faulty.
Engine stops during operation.	Wiring to the run circuit components are loose, disconnected or otherwise faulty (see electrical schematic and wire harness drawings in Chapter 7 – Electrical Diagrams). Accelerator pedal switch or circuit wiring is faulty. Magneto relay or circuit wiring is faulty. An engine fault exists (fuel injected engine – EFI) Engine or fuel system is malfunctioning (see Chapter 3 – Gasoline Engine).

Electrical System Quick Checks

Battery Test

Use a multimeter to measure the voltage between the battery terminals.

Set the multimeter to the DC volts setting. The battery should be at a temperature of 60º to 100º F. The key switch should be OFF and all accessories turned off. Connect the positive (+) meter lead to the positive battery post and the negative (–) meter lead the negative battery post.

NOTE: This test provides a relative condition of the battery. Load testing of the battery will provide additional and more accurate information.

Voltage Measured	Battery Charge Level
12.68 V (or higher)	Fully charged (100%)
12.45 V	75% charged
12.24 V	50% charged
12.06 V	25% charged
11.89 V	0% charged

Charging System Test

This is a simple test used to determine if a charging system is functioning. It will tell you if the charging system has an output, but not its capacity.

Remove seat base to gain access to battery. Use a digital multimeter set to DC volts. Connect the positive (+) multimeter lead to the positive battery post and the negative (–) multimeter lead to the negative battery post. Keep the test leads connected to the battery posts and record the battery voltage.

NOTE: When starting the engine, the battery voltage will drop and then should increase once the engine is running.

NOTE: Depending upon the condition of the battery charge and battery temperature, the battery voltage will increase at different rates as the battery charges.

Make sure the shift lever is in the neutral position and the parking brake is applied. Start the engine and run engine at high idle **(above 3000 RPM)**. Maintain high idle engine speed to allow the battery to charge for at least three (3) minutes. Record the battery voltage.

After running the engine for at least three (3) minutes, battery voltage should be at least 0.50 volt higher than initial battery voltage.

An example of a charging system that is functioning:

At least 0.50 volt over initial battery voltage.	
Initial Battery Voltage	= 12.30 v
Battery Voltage after 3 Minute Charge	= 12.95 v
Difference	= +0.65 v

Component Testing

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

NOTE: For engine electrical component testing information, see the Kohler COMMAND PRO CH260–CH440 Service Manual for machines with carbureted engines and the Kohler COMMAND PRO EFI ECH440 & ECH440LE Service Manual for machines with fuel injected (EFI) engines.

CAUTION

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

Key Switch

The dash mounted key switch used on the Workman has three (3) switch positions (OFF, ON AND START) and six (6) switch terminals. The switch terminals are identified as shown in Figure 8.

Testing

1. Park vehicle on a level surface, shut engine off and engage the parking brake. Remove key from the key switch.

2. Raise hood to allow access to wire harness connections for key switch. Disconnect wire harness connector from the key switch.

3. With the use of a multimeter (ohms setting), the key switch functions may be tested to determine whether continuity exists between the various terminals for each switch position. The switch terminals are marked as shown in Figure 8. The circuitry of the switch is shown in the chart below. Verify continuity between switch terminals.

Machine serial number below 401400000	
POSITION	CIRCUITS
OFF	NONE
ON	B + C + F, D + E
START	A + B + C

Machine serial number above 401400000	
POSITION	CIRCUITS
OFF	E + F
ON	A + B
START	A + B, C + D

4. Replace key switch if testing determines that the switch is faulty.

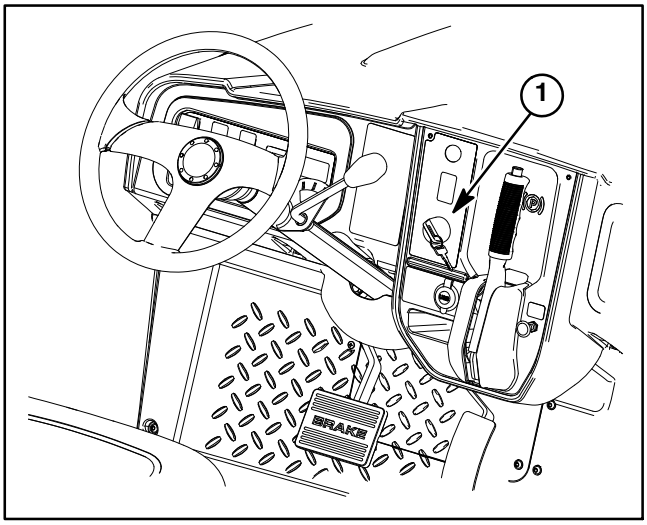

Figure 7

1. **Key switch**

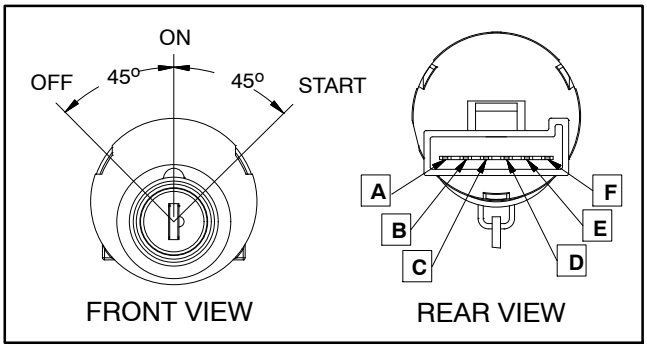

Figure 8

5. If key switch tests correctly and circuit problem still exists, check wire harness (see electrical schematic and wire harness drawing in Chapter 7 – Electrical Drawings).

6. After key switch testing is complete, connect wire harness connector to the switch. Lower and secure front hood.

Headlight Switch

The headlight switch is located on the dash (Fig. 9). This rocker switch allows the headlights to be turned ON and OFF.

Testing

1. Park vehicle on a level surface, shut engine off and engage the parking brake. Remove key from the key switch.

2. Raise hood to allow access to wire harness connections for switches mounted in dash.

3. Disconnect wire harness connector from the headlight switch.

4. With the use of a multimeter (ohms setting), the switch functions may be tested to determine whether continuity exists between the various terminals for each headlight switch position. The headlight switch terminals are marked as shown in Figure 9. The circuitry of this switch is shown in the chart below. Verify continuity between switch terminals.

SWITCH POSITION	NORMAL CIRCUITS	OTHER CIRCUITS
ON	2 + 3	5 + 6
OFF	1 + 2	4 + 5

5. Replace headlight switch if testing determines that the switch is faulty.

6. If headlight switch tests correctly and circuit problem still exists, check wire harness (see electrical schematic and wire harness drawing in Chapter 7 – Electrical Drawings).

7. After headlight switch testing is complete, connect wire harness connector to the headlight switch. Lower and secure front hood.

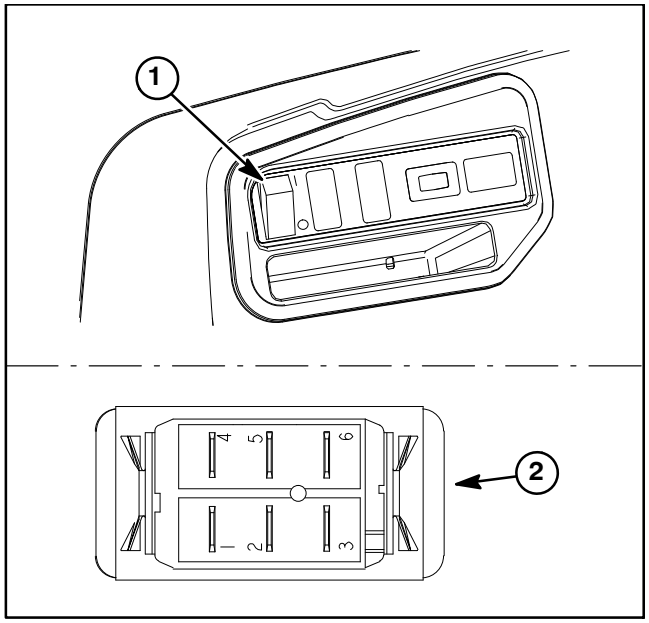

Figure 9

1. **Headlight switch**
2. **Back of switch**

Machine Fuses

The fuse blocks for the machine fuses are located beneath the seat base (Fig. 10). Fuses can be removed to check continuity. The test meter should read less than 1 ohm if a fuse is functional.

Fuses protect circuits as follows:

Bottom fuse in the left fuse block (10 amp) protects the circuit for the USB charge port on the dash. This fuse also provides circuit protection for the optional power point, reverse alarm and parking brake alarm.

Second fuse from the bottom in the left fuse block (10 amp) protects the headlight circuit. The fuse also provides circuit protection for the optional brake light and turn signal kit.

Third fuse from the bottom in the left fuse block (15 amp) protects the main power circuits that are controlled by the key switch.

Top fuse in the left fuse block (30 amp recommended) protects the horn circuit (if equipped).

Top fuse in the right fuse block

Machines with carbureted engine: **(15 amp)** protects the rear lift actuator circuit (if equipped).

Machines with fuel injected engine: **(10 amp)** protects the delay timer and the engine ECU.

Second fuse from the bottom in the right fuse block

Machines with fuel injected engine: **(15 amp)** protects the rear lift actuator circuit (if equipped).

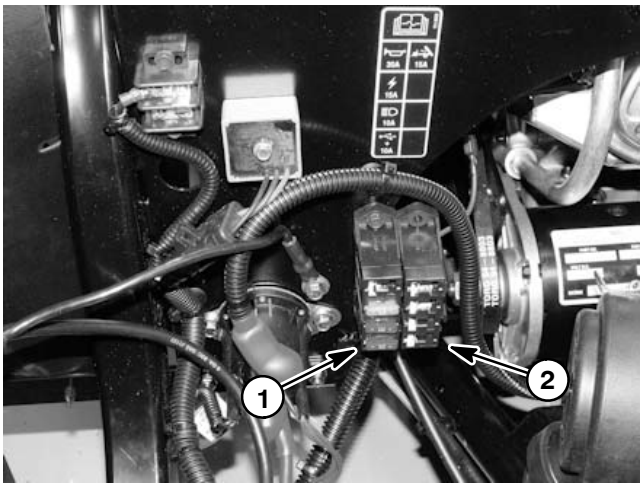

Figure 10

1. **Left fuse block**
2. **Right fuse block**

Engine Fuses (machines with fuel injected engine – EFI)

The fuse holders for the engine fuses are located at the front of the engine next to the engine ECU (Fig. 11). The fuses may be located in either fuse holder and can be identified by wire color. Fuses can be removed to check continuity. The test meter should read less than 1 ohm if a fuse is functional.

Fuses protect circuits as follows:

Fuse with red and red wires (10 amp) protects the unswitched power circuit to the engine ECU.

Fuse with red/white and red/black wires (10 amp) protects the switched power circuit to the engine ECU, oxygen sensor, ignition coil and fuel injector.

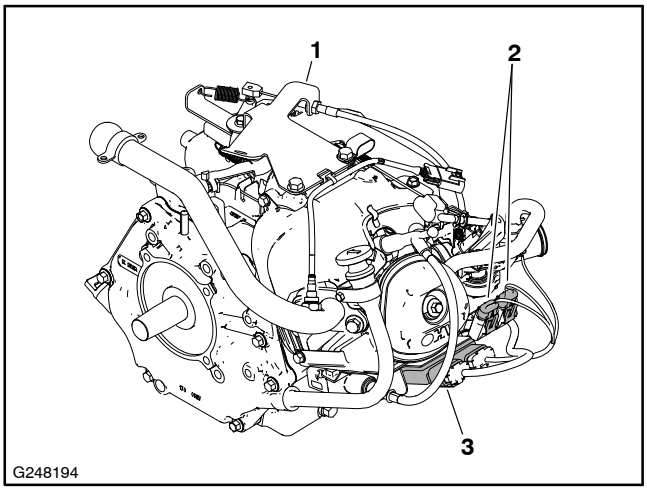

Figure 11

1. **EFI engine**
2. **Engine fuse holders**
3. **Engine ECU**

USB Charge Port

The USB charge port can be used to charge or power electrical devices that use a USB port. The charge port has a 5 VDC output and is mounted to the dash (Fig. 12).

If the vehicle wire harness is to be disconnected from the charge port, note the wire harness connections at the charge port for assembly purposes. The white wire harness lead should be connected to the positive (+) terminal on the charge port and the black wire harness lead should be connected to the negative (–) terminal on the charge port (Fig. 13).

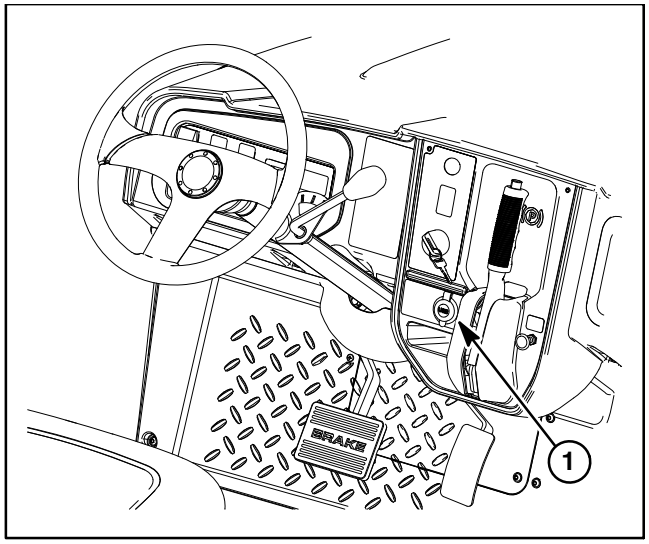

Figure 12

1. USB charge port

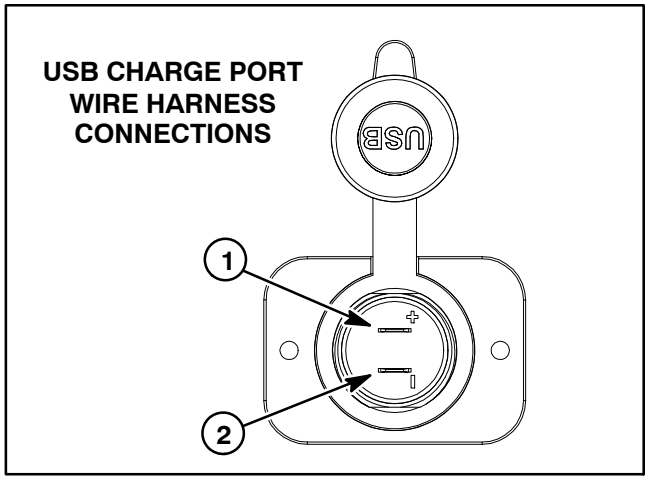

Figure 13

1. Positive (+) terminal **2. Negative (–) terminal**

Start/Run Solenoid

The start/run solenoid provides a current path between the starter/generator and the vehicle electrical circuits. The solenoid is located beneath the seat base near the fuse blocks (Fig. 14).

The start/run solenoid is energized when:

A. The key switch is in the ON position and the accelerator pedal is depressed.

B. The key switch is momentarily held in the START position. The solenoid remains energized when the switch is returned to the ON position.

Testing

NOTE: Prior to taking small resistance readings with a digital multimeter, short the meter test leads together. The meter will display a small resistance value (usually 0.5 ohms or less). This resistance is due to the internal resistance of the meter and test leads. Subtract this value from the measured value of the component you are testing.

1. Park vehicle on a level surface, stop engine, engage parking brake and remove key from the key switch.

2. To access start/run solenoid, remove seat base assembly with attached seats from vehicle.

3. To prevent unexpected circuit activity, disconnect cables from battery. Disconnect negative (black) cable first and then disconnect positive (red) cable (see Battery Service in the Service and Repairs section of this chapter).

4. Note wire connector locations on start/run solenoid for assembly purposes. Disconnect wire harness connectors from solenoid.

5. Apply 12 VDC directly across the solenoid coil posts. The solenoid should click as the solenoid coil is energized. Make sure resistance across the main contact posts is less than **1 ohm** with voltage applied to solenoid coil posts.

6. Remove voltage from solenoid coil posts. The solenoid should click as the solenoid coil is de−energized. Make sure resistance across the main contact posts is **infinite ohms** without voltage applied to solenoid coil posts.

7. Without voltage applied to solenoid coil posts, resistance across the solenoid coil posts should be approximately **13.5 ohms**.

8. Replace start/run solenoid if testing determines that it is faulty.

9. When testing is complete, connect electrical connections to solenoid: positive battery cable and wire to fuse block on lower main contact post and starter/generator cable and wire to regulator on the upper main contact post. Also, connect wire harness connectors (blue wire and black wire) to coil posts.

10. Connect battery cables. Make sure to connect positive (red) cable first and then connect negative (black) cable.

11. Install seat base assembly to vehicle.

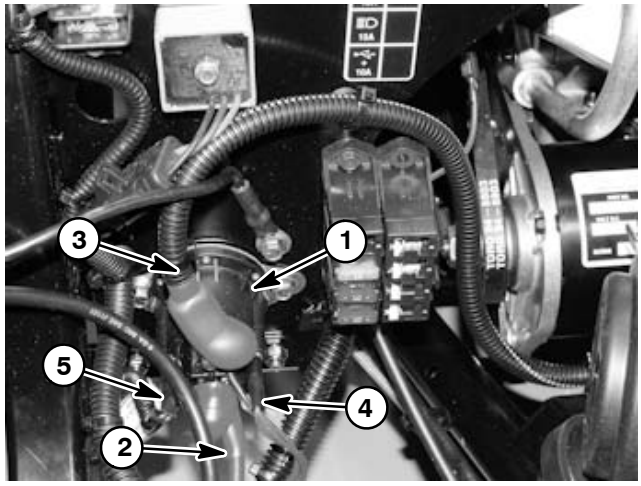

Figure 14

1. **Start/run solenoid**
2. **Positive battery cable**
3. **Cable to starter/gen**
4. **Harness wire (blue)**
5. **Harness wire (black)**

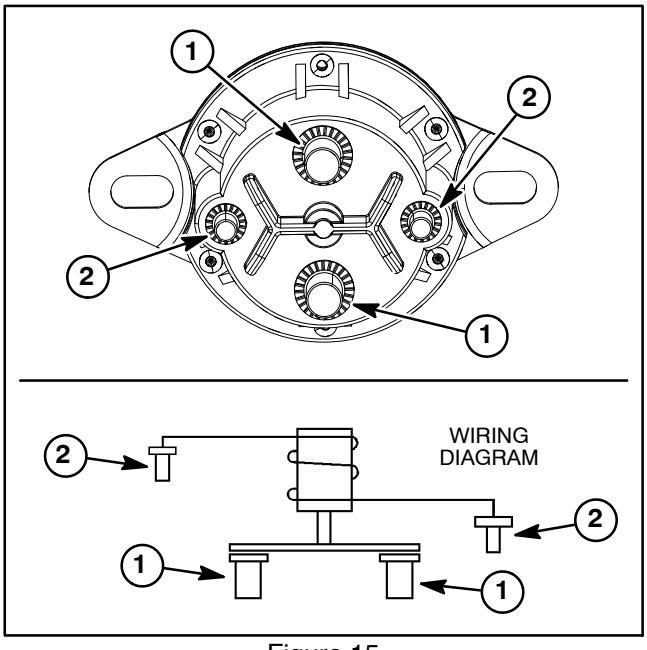

Figure 15

1. **Main contact post**
2. **Solenoid coil post**

Electric Fuel Pump (fuel injected engines – EFI)

An electric fuel pump assembly is used on Workman GTX machines with a fuel injected gasoline engine. The fuel pump assembly provides pressurized fuel to the fuel injector in a return–less system and includes a regulator to maintain fuel pressure of approximately 40 PSI (276 kPa). The fuel pump is rated for a minimum output of 7.6 oz. (224 ml) per minute. To protect the fuel pump, a special 10–micron fuel filter is included upstream of the electric fuel pump. The electric fuel pump assembly and fuel filter are located under the seats (Fig. 16).

The fuel pump assembly is energized by the engine ECU. The fuel pump electrical circuit is protected by the main power fuse (15 Amp). When the ignition switch is turned to RUN, the engine ECU energizes the fuel pump for approximately six (6) seconds which allows the fuel system to be pressurized. Once the engine is running, the fuel pump is always energized.

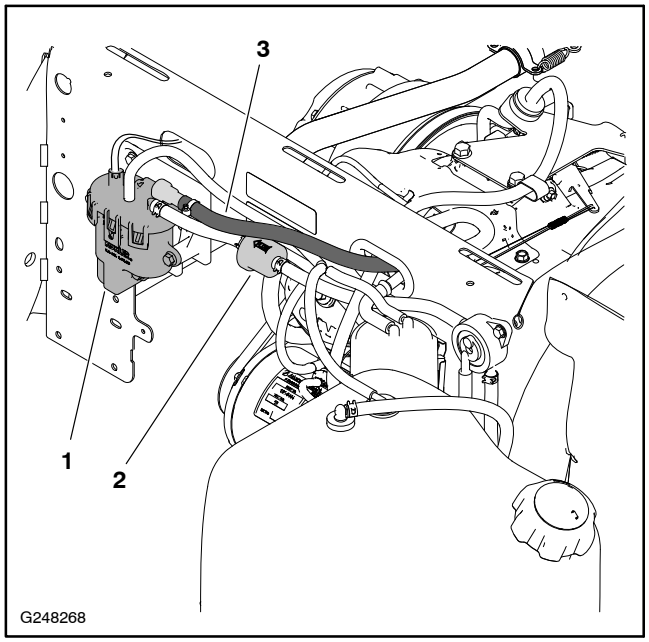

Figure 16

1. Electric fuel pump
2. Fuel filter
3. Fuel supply hose

Testing

1. Park machine on a level surface, stop engine and engage parking brake.

2. Raise cargo bed and support with prop rod. Remove rear frame panel cover.

3. Raise or remove the seat base.

CAUTION

The fuel supply hose may contain pressurized fuel. Cover the connection with a rag to prevent fuel spray when disconnecting the fuel supply hose. Always wipe up any spilled fuel before starting the engine.

4. Disconnect the fuel supply hose from the engine fuel injector.

   A. Lift supply hose fitting lock up to unlock fitting (Fig. 17).

   B. Press barb fitting tab and pull fitting from fuel injector.

5. Install a fuel pressure gauge capable of measuring 50 PSI (350 kPa) to the disconnected hose.

Note: If may be necessary to bypass the pulse pump and provide a temporary fuel supply to the electric pump for testing.

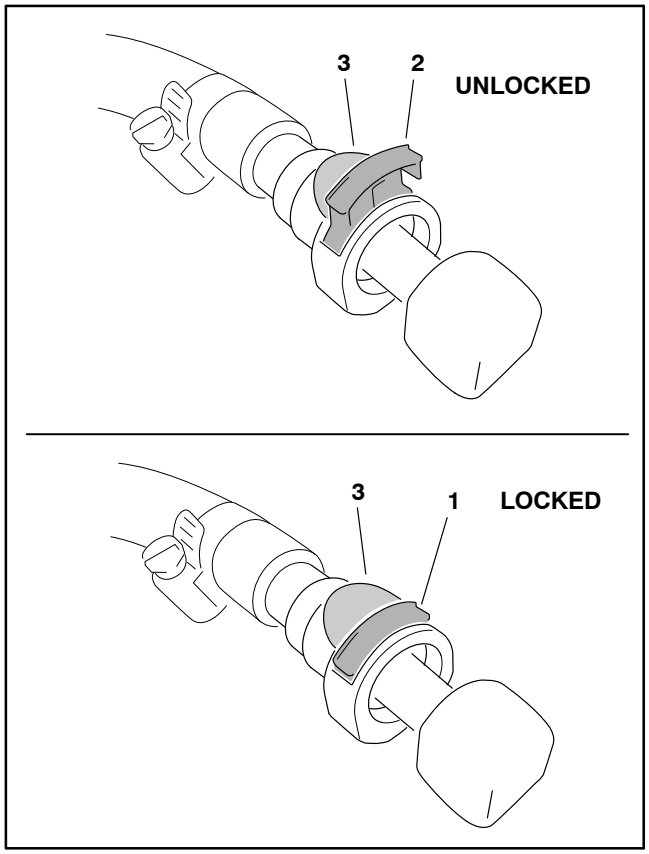

Figure 17

1. Supply hose fitting lock (locked – down)
2. Supply hose fitting lock (unlocked – up)
3. Supply hose fitting tab

6. While monitoring pressure gauge, turn ignition switch to RUN (do not start engine) so that fuel pump is energized. The fuel pressure displayed on the gauge should rise. After pump is de−energized (approximately 6 seconds), turn ignition switch to OFF and then back to RUN (do not start engine) to re−energize the fuel pump. Repeat energizing the fuel pump in this manner until the fuel pressure stabilizes. Fuel pump pressure should be approximately **40 PSI (276 kPa)**.

7. If fuel pump pressure is low, make sure that electrical power is available to fuel pump and fuel filter is not clogged. Replace the fuel pump as necessary.

8. After testing is completed, remove pressure gauge from fuel supply hose and connect fuel hose to the fuel injector.

   A. Push supply hose fitting onto fuel injector until an audible *"Click"* is heard.

   B. Press fitting lock down to lock fitting in place (Fig. 17).

9. Cycle (energize) the fuel pump a few times to prime the fuel supply hose.

10. Make sure that no fuel leaks exist before returning machine to service.

11. Install rear frame panel cover and lower bed.

Key Start Latch and Magneto/ECU Relays

A Workman GTX vehicle uses up to three (3) identical relays that have five (5) terminals. The relays are attached to the dash bracket near the brake master cylinder (Fig. 18).

Two relays work together to operate the start latch circuits so that the engine can be started when the key switch is rotated to the START position. If the engine is started with the key switch, the engine will continue to run due to the latch relays until the key switch is moved to the OFF position.

A third relay is used to manage the magneto on machines with a carbureted engine (machine serial number before 401400000), or the ECU on machines with electronic fuel injection (EFI).

Machines with a carbureted engine (machine serial number before 401400000): when the key switch is in the OFF position, the magneto relay is not energized and the engine magneto is grounded to prevent engine operation. When the key switch is in the RUN or START position, the magneto relay is energized which allows the engine to operate.

Machines with a fuel injected engine: when the key switch is in the OFF position, the ECU relay is not be energized and the engine ECU is switched OFF. When the key switch is in the RUN or START position, the ECU relay is energized and the ECU is switched ON. To prevent the engine ECU from switching ON/OFF rapidly when using the accelerator pedal start feature, a delay timer works with the ECU relay to keep the ECU energized for 30 seconds after the engine stops (magneto grounded).

Testing

1. Park vehicle on a level surface, stop engine, engage parking brake and remove key from the key switch. Place vehicle shift lever in the NEUTRAL position.

2. Raise hood to gain access to relays.

3. Locate relay that is to be tested and disconnect the wire harness connector from the relay. Remove relay from vehicle for easier testing.

NOTE: Prior to taking small resistance readings with a digital multimeter, short the meter test leads together. The meter will display a small resistance value (usually 0.5 ohms or less). This resistance is due to the internal resistance of the meter and test leads. Subtract this value from from the measured value of the component you are testing.

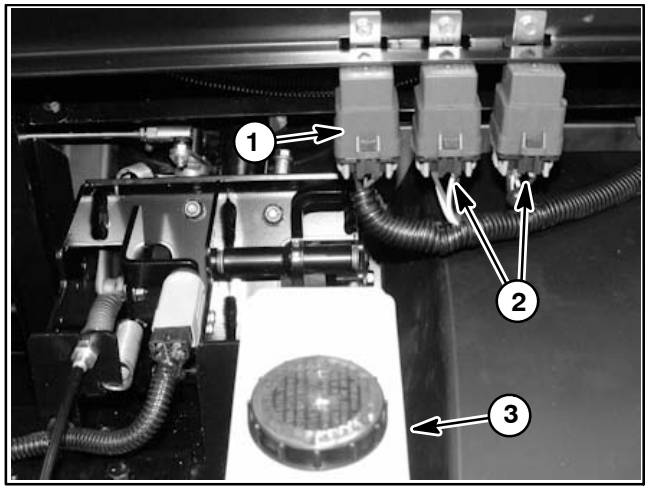

Figure 18

1. **Magneto/ECU relay**
2. **Key start latch relays**
3. **Brake master cylinder**

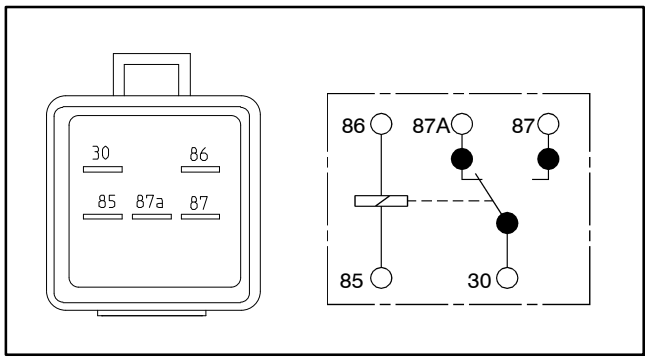

Figure 19

4. Using a multimeter (ohms setting), measure coil resistance between terminals 85 and 86 (Fig. 19). Resistance should be between 70 and 90 ohms.

5. Connect multimeter (ohms setting) leads to relay terminals 30 and 87 (Fig. 19). Ground terminal 86 and apply +12 VDC to terminal 85. The relay should make and break continuity between terminals 30 and 87 as +12 VDC is applied and removed from terminal 85.

6. Disconnect voltage from terminal 85 and multimeter lead from terminal 87.

7. Connect multimeter (ohms setting) leads to relay terminals 30 and 87A. Apply +12 VDC to terminal 85. The relay should make and break continuity between terminals 30 and 87A as +12 VDC is applied and removed from terminal 85.

8. Disconnect the voltage and multimeter leads.

9. Replace relay if testing determines that it is faulty.

10. After relay testing is complete, secure relay to vehicle and connect wire harness connector to relay.

11. Lower and secure hood.

Delay Timer (fuel injected engines – EFI)

To prevent the engine ECU from switching ON/OFF rapidly when using the accelerator pedal start feature, a delay timer works with the ECU relay to keep the ECU energized for 30 seconds after the engine stops (magneto grounded). The delay timer is attached to the dash bracket near the brake master cylinder (Fig. 20).

Testing

1. Park vehicle on a level surface, stop engine, engage parking brake and remove key from the key switch. Place vehicle shift lever in the NEUTRAL position.

2. Raise hood to gain access to relays.

3. Disconnect the wire harness connector from the timer. You may want to remove the timer from the vehicle for easier testing.

4. At the delay connecter, ground timer terminal 2 and apply +12 VDC to terminal 3 (Fig. 21). Connect multimeter leads (DC voltage setting) to terminals 1 and 2. The multimeter should read 0 VDC.

5. Apply +12 VDC to terminal 4, 12 VDC should appear on the multimeter. Remove the power to terminal 4 only, 12 VDC should continue to appear on the multimeter for 30 seconds before the multimeter returns to 0 VDC.

6. Disconnect the voltage and multimeter leads.

7. If the timer tests correctly and a circuit problem still exists, check main wire harness and ECU relay for problems.

8. Replace the timer if testing determines that it is faulty.

9. After timer testing is complete, install the timer and connect the wire harness.

10. Lower and secure the hood.

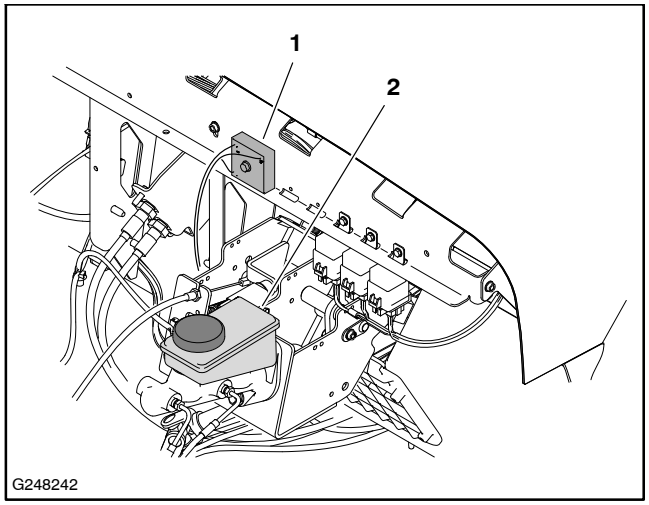

Figure 20

1. **Delay timer**
2. **Brake master cylinder**

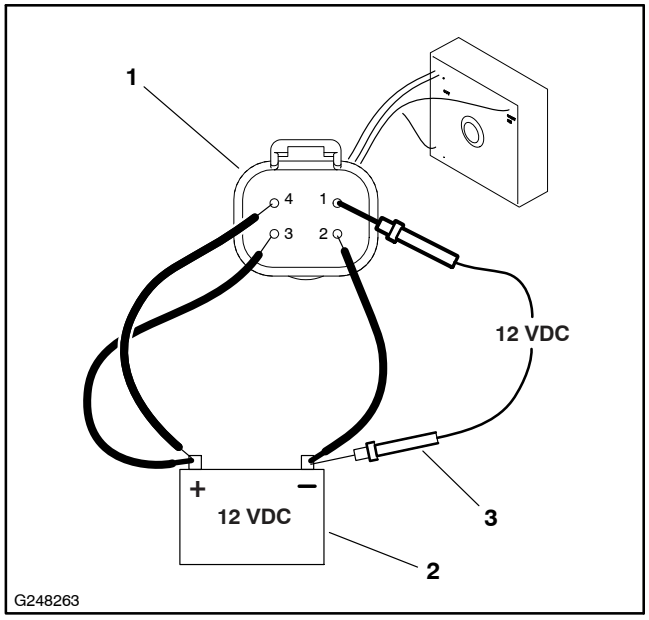

Figure 21

1. **Delay timer connecter**
2. **12 VDC power supply**
3. **Multimeter probe**

Accelerator Pedal Switch

The accelerator pedal switch is a four (4) terminal, two (2) circuit switch. The switch is used to determine if the accelerator pedal is depressed or not when starting the engine via the accelerator pedal. The switch is attached to the pedal mount next to the brake master cylinder (Fig. 22).

When the accelerator pedal is pushed, the switch allows current flow to the start/run solenoid and hour meter and also provides an open circuit to the engine ignition system to allow the magneto ignition to operate. With the accelerator pedal released, the switch provides a grounding circuit for the engine ignition system and also prevents current flow to the start/run solenoid and hour meter.

Testing

1. Park vehicle on a level surface, stop engine, engage parking brake and remove key from the key switch. Place vehicle shift lever in the NEUTRAL position.

2. Raise hood to gain access to accelerator pedal switch (Fig. 23).

3. Unplug wire harness connector from accelerator pedal switch. Note that wire harness connector is keyed to fit correctly onto the pedal switch.

4. With the use of a multimeter (ohms setting), the switch functions may be tested to determine whether continuity exists between the switch terminals for both switch positions. Verify continuity between switch terminals using the following table:

PLUNGER POSITION	CONTINUITY	NO CONTINUITY
IN	NO Terminals	NC Terminals
OUT	NC Terminals	NO Terminals

5. Replace switch if testing determines that it is faulty.

6. After testing is complete, plug wire harness connector to accelerator pedal switch. Use dielectric gel to prevent corrosion of connection terminals. To ensure complete coating of switch terminals, liberally apply gel to switch terminals and wire harness connector, plug connector to switch, unplug connector, reapply gel to both surfaces and reconnect harness connector to switch. Connectors should be thoroughly packed with gel for effective results.

7. Lower and secure hood.

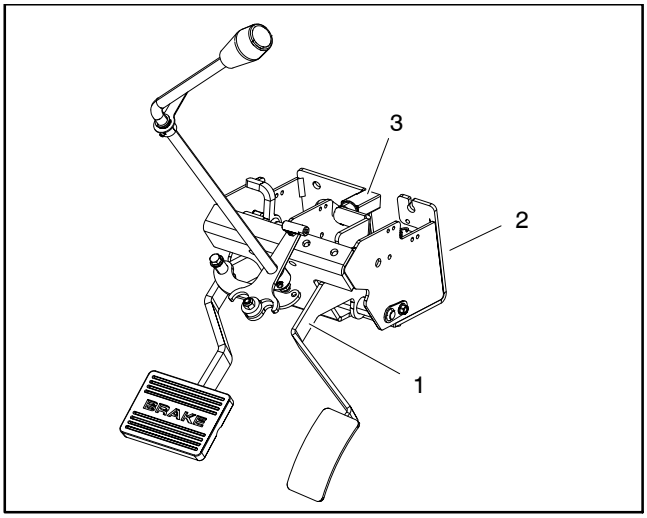

Figure 22

1. Accelerator pedal
2. Pedal mount
3. Accelerator switch

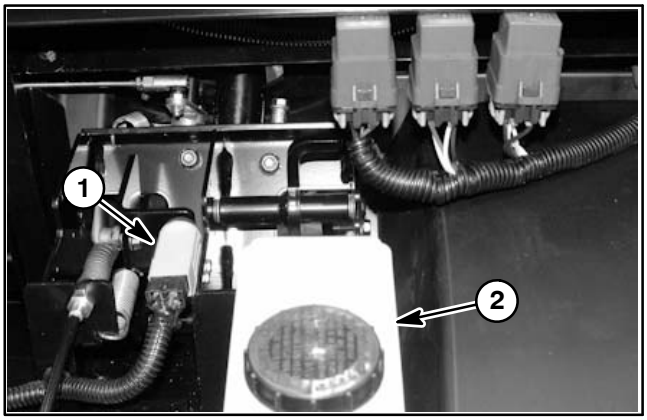

Figure 23

1. Accelerator pedal switch
2. Brake master cylinder

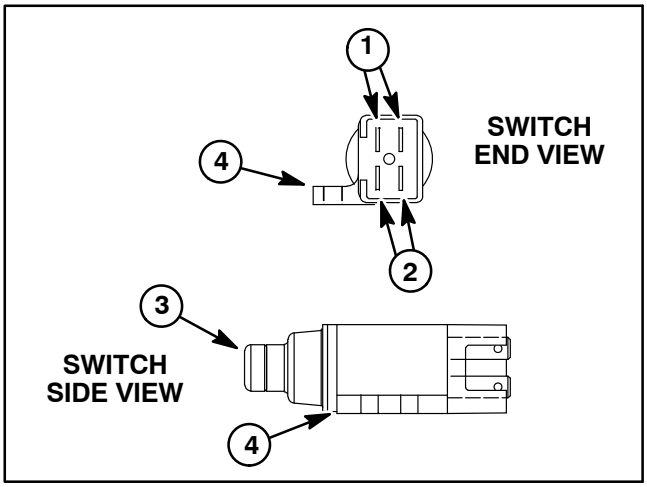

Figure 24

1. NO terminals
2. NC terminals
3. Switch plunger
4. Mounting tab

Diode Assemblies

Two (2) identical diode assemblies are included in the Workman GTX wire harness.

The diode D1 is used for circuit protection from voltage spikes that can occur when the start/run solenoid is de–energized. This diode plugs into the wire harness beneath the seat base near the battery.

The second diode is used for circuit logic to allow the key switch START position to function. This diode plugs into the wire harness near the relays mounted under the hood.

The diode assembly can be identified by a black color and a diode symbol on the end of the diode assembly body (Fig. 25). Refer to the wire harness drawings in Chapter 7 – Electrical Drawings for additional information on diode assembly location.

NOTE: If a vehicle is equipped with the optional brake and turn signal kit that includes flashers, four (4) additional diodes are used for hazard light and turn signal circuit logic. These diodes plug into the brake and turn signal kit wire harness and can be accessed by raising the hood.

Testing

1. Park vehicle on a level surface, stop engine, engage parking brake and remove key from the key switch.

2. Locate diode assembly that is to be tested.

3. Remove cable tie that secures diode to wire harness. Unplug the diode from the wire harness for testing.

4. Test diode assembly using a digital multimeter (diode test or ohms setting) and the table in the right column.

5. If testing determines that a diode assembly is faulty, replace diode assembly.

6. After diode testing is complete, make sure that diode assembly is fully installed into wire harness connector and secured to harness with cable tie.

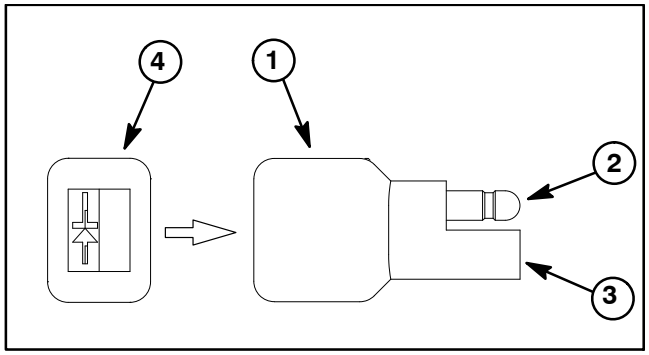

Figure 25

1. **Diode assembly**
2. **Male terminal**
3. **Female terminal**
4. **End of diode body**

Multimeter Red Lead (+) on Terminal	Multimeter Black Lead (–) on Terminal	Continuity
Female	Male	YES
Male	Female	NO

Starter/Generator & Voltage Regulator

Testing

1. Park vehicle on a level surface, stop engine and engage parking brake. Place vehicle shift lever in the NEUTRAL position.

2. To access electrical components:

   A. Remove seat base assembly with attached seats from vehicle.

   B. Raise cargo bed and secure with prop rod.

   C. Remove rear frame panel cover from rear frame (see Rear Frame Panel Cover in the General Information section of this chapter).

3. Make sure all wires at charging circuit components (battery, starter/generator, start/run solenoid and voltage regulator) are connected correctly and tightly.

4. Make sure the battery is fully charged. Operate the vehicle for several minutes so the voltage regulator is warmed up. Stop engine and turn key switch to OFF.

5. Test charging circuit:

   A. Set multimeter to VDC. Connect red (+) multimeter probe to the positive (+) battery post. Connect black (–) multimeter probe to the negative (–) battery post.

   B. Start and run the engine at mid–range RPM.

   C. Battery voltage should increase to approximately 14.5 VDC identifying a correctly operating charging circuit. If the battery has a low charge, this may take a few minutes of running.

   D. Stop engine and turn key switch to OFF.

   E. Disconnect multimeter probes from battery posts.

6. If battery voltage increased to 14.5 VDC during charging circuit test, the charging system is working correctly and no further testing is required.

7. If battery voltage did not increase to 14.5 VDC, test starter/generator:

   A. Disconnect wire harness connector from starter/generator terminal DF (Fig. 26). Cover the harness connector to prevent it from accidentally grounding during testing.

   B. Use a jumper lead to connect starter/generator terminal DF with a known good ground.

   C. Set multimeter to VDC. Connect red (+) multimeter probe to the positive (+) battery post. Connect black (–) multimeter probe to the negative (–) battery post.

   IMPORTANT: Run engine only long enough to get battery voltage reading and not for more than fifteen (15) seconds.

   D. Start and run engine at mid–range RPM.

   E. Battery voltage should rise steadily to approximately 18 VDC identifying a correctly operating starter/generator. A low reading indicates the need for starter/generator repair.

   F. Stop engine and turn key switch to OFF.

   G. Disconnect jumper wire and re–connect wire harness connector onto starter/generator terminal DF. Secure connector onto terminal DF with nut and torque from **15 to 19 in–lb (1.7 to 2.2 N–m)**.

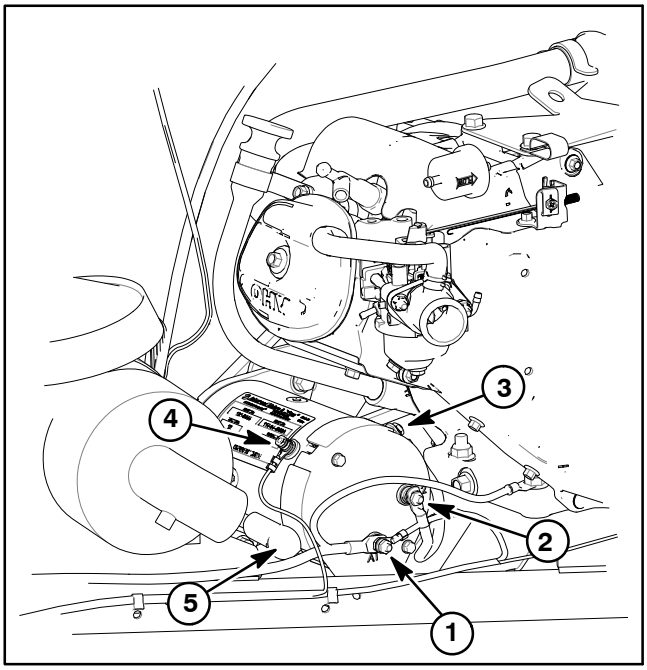

Figure 26

1. **Terminal A1**
2. **Terminal A2**
3. **Terminal F1**
4. **Terminal DF**
5. **Terminal F2**

8. If battery voltage in step 5 above did not increase to 14.5 VDC and starter/generator tested correctly in step 7 above, test voltage regulator:

A. Set multimeter to VDC. Connect red (+) multimeter probe to the starter/generator terminal DF (Fig. 27). Connect black (–) multimeter probe to a known good ground.

B. Start and run the engine at mid–range RPM.

C. The measured voltage should be approximately 2 VDC when the battery is charging and from 6 to 8 VDC when the battery is fully charged. This voltage may rise to 14 VDC when the accelerator pedal is released and the engine is coasting to a stop.

D. If measured voltage is incorrect, stop engine and replace voltage regulator. Retest charging circuit after replacing voltage regulator (Step 5 above).

9. When testing is complete, stop engine and remove multimeter leads.

10. Install seat base assembly to vehicle.

11. Install rear frame panel cover to vehicle. Lower and secure the cargo bed.

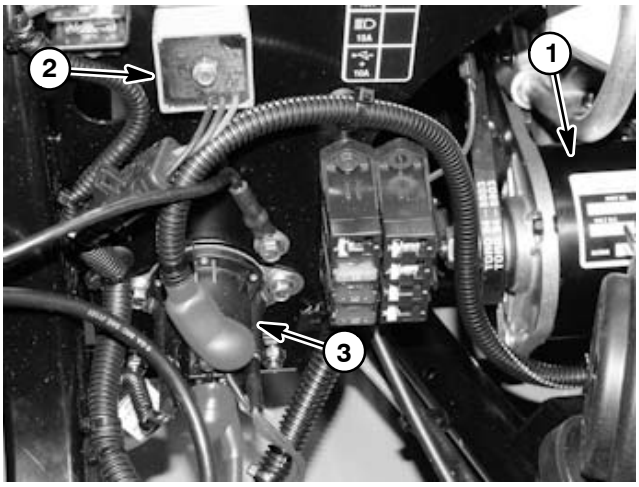

Figure 27

1. **Starter/generator**
2. **Voltage regulator**
3. **Start/run solenoid**

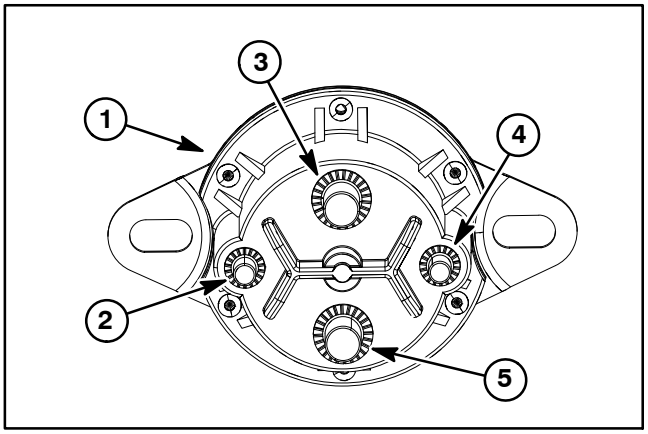

Figure 28

1. **Start/run solenoid**
2. **Harness wire (black)**
3. **Starter/gen cable (to F2) and red wire (to volt regulator)**
4. **Harness wire (blue)**
5. **Positive battery cable and red wire (to fuse blocks)**

Starter/Generator

Resistance Testing

Resistance testing of starter/generator field and armature windings are as follows:

NOTE: Prior to taking small resistance readings with a digital multimeter, short the meter test leads together. The meter will display a small resistance value (usually 0.5 ohms or less). This resistance is due to the internal resistance of the meter and test leads. Subtract this value from the measured value of the component you are testing.

1. Park vehicle on a level surface, stop engine, engage parking brake and remove key from the key switch. Place vehicle shift lever in the NEUTRAL position.

2. To prevent unexpected operation of electrical system components, disconnect cables from battery. Disconnect negative (black) cable first and then disconnect positive (red) cable (see Battery Service in this section). Position cable away from battery terminals.

3. Raise cargo bed and secure with prop rod to gain access to the starter/generator.

4. Remove rear frame panel cover from rear frame to allow access to starter generator (see Rear Frame Panel Cover in the General Information section of this chapter).

NOTE: Place all fasteners back onto starter/generator terminals after disconnecting wires to prevent loss of fasteners.

5. Label all wires on the starter/generator for assembly purposes. Disconnect all wire connections on starter/generator to separate starter/generator circuits.

6. Measure resistance (Ohms) between starter/generator terminals F1 and F2. The meter reading should be **very low (approximately 0.006 Ohms) but not zero**.

7. Measure resistance (Ohms) between starter/generator terminals DF and F1. The meter reading should be **approximately 3 to 6 Ohms**.

8. Measure resistance (Ohms) between each starter/generator terminal and ground. The meter reading should be **infinite (no continuity)**.

9. Starter/generator removal, disassembly and repair will be needed if any of the above resistance readings are incorrect (see Starter/Generator and Starter/Generator Service in the Service and Repairs section of this chapter).

10. After resistance testing of starter/generator is completed, connect all wire connections to starter/generator terminals. Use torque values shown in Figure 29 to torque the lower nut before installing the wire connector. Then, place wire connector on post, install final nut and torque final nut to values shown in Figure 29.

11. Using labels placed during starter/generator removal, correctly connect all wires to the starter/generator.

12. Connect battery cables to battery (see Battery Service in the Service and Repairs section of this chapter). Connect positive cable first and then connect negative cable.

13. Install rear frame panel cover to vehicle. Lower and secure the cargo bed.

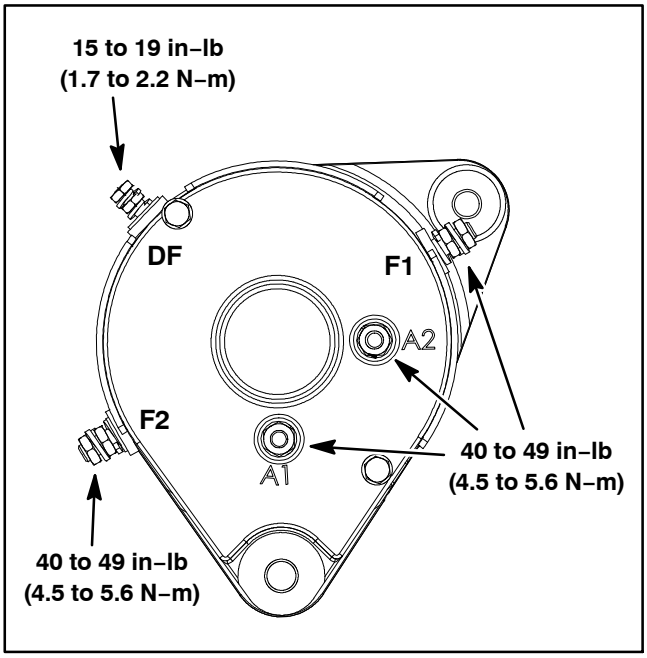

Figure 29

Parking Brake Alarm Switch (If Equipped)

If your Workman is equipped with the optional parking brake alarm, the audio alarm should sound whenever the parking brake is applied. The parking brake alarm switch is attached to the parking brake mount behind the dash (Fig. 30).

A normally closed contact in the switch is opened when the parking brake is released. When the parking brake is applied, the switch is in its normally closed state. Only two (2) of the switch terminals are used in the parking brake alarm switch circuit.

Testing

1. Park vehicle on a level surface, stop engine, engage parking brake and remove key from the key switch. Place vehicle shift lever in the NEUTRAL position.

2. To access the parking brake alarm switch, remove dash and position it toward the front of the vehicle (see Dash in the Service and Repairs section of Chapter 6 – Chassis). It is not necessary to remove choke cable from dash.

3. Disconnect wire harness electrical connector from the alarm switch (Fig. 30).

4. Connect a multimeter (ohms setting) across the common and normally closed (NC) terminals of the alarm switch (Fig. 31).

5. With the parking brake released (not applied), the washer on the parking brake lever should be depressing the lever on the alarm switch. In this switch position, there **should not be continuity** (infinite ohms) between the common and normally closed (NC) switch terminals.

6. With the parking brake applied, the washer on the parking brake lever should not be depressing the lever on the alarm switch. In this switch position, there **should be continuity** (zero ohms) between the common and NC switch terminals.

NOTE: The normally open (NO) switch terminal is not used in the parking brake alarm circuit.

7. If testing determines that alarm switch is faulty, replace switch.

8. If the alarm switch tests correctly and a circuit problem still exists, check wire harness and alarm for problems.

9. After alarm switch testing is completed, connect wire harness electrical connector to the switch.

10. Carefully position and secure dash to vehicle (see Dash in the Service and Repairs section of Chapter 6 – Chassis).

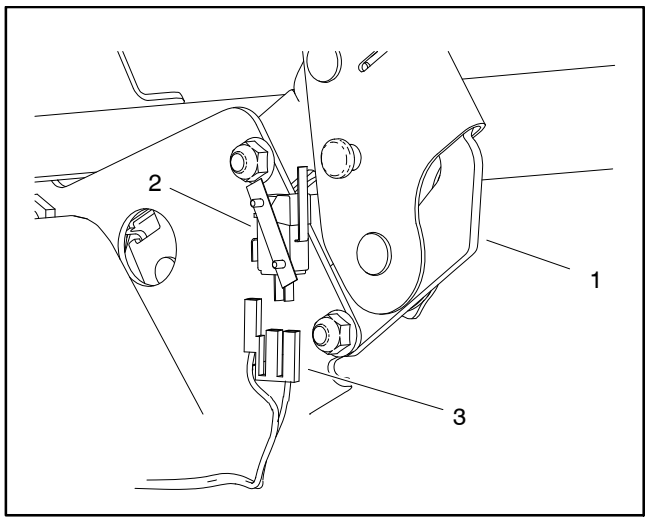

Figure 30

1. **Parking brake lever**
2. **Brake alarm switch**
3. **Wire harness connector**

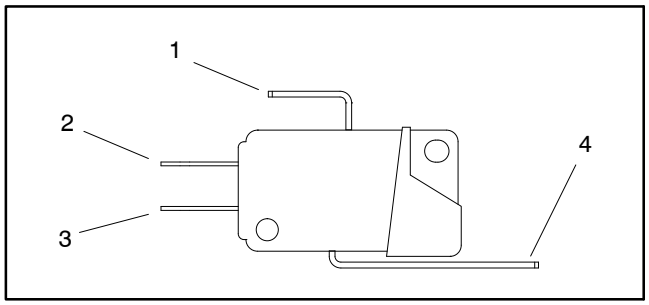

Figure 31

1. **Common terminal**
2. **NO terminal**
3. **NC terminal**
4. **Switch lever**

Reverse Alarm Switch (If Equipped)

The optional reverse alarm switch is a normally open proximity switch that is secured to the spanner bar that is attached to the engine and transaxle (Fig. 32). When vehicle is equipped with the optional reverse alarm, the audio alarm should sound whenever the shift lever is placed in the reverse position.

The alarm switch is in its normal open position when the dash mounted shift lever is either in the neutral or the forward position. When the shift lever is in the reverse position, a tab on the shift arm attached to the transaxle is positioned near the reverse switch causing the alarm switch to close. The closed alarm switch is used to activate the reverse alarm.

Switch Testing

1. Park vehicle on a level surface, stop engine, engage parking brake and remove key from the key switch. Place vehicle shift lever in the NEUTRAL position.

2. Raise and support cargo bed to access the reverse alarm switch near the transaxle.

3. Locate the reverse alarm switch below the transaxle shift arm (Fig. 32).

4. Disconnect the wire harness connector from the reverse alarm switch.

5. With the use of a multimeter (ohms setting), test for continuity across the two (2) switch terminals. There **should not be** continuity (infinite ohms) when the dash mounted shift lever is either in the neutral or the forward position. There **should be** continuity (zero ohms) when the shift lever is in the reverse position.

6. Replace reverse alarm switch if testing determines that it is faulty.

7. After switch testing is completed, connect the wire harness connector to the alarm switch.

8. Lower and secure cargo bed.

Switch Adjustment

The reverse alarm switch can be moved in the spanner bar slot to ensure that the target end of the switch is near the shaft arm tab when the dash mounted shift lever is in reverse. If necessary, the tab on the shift arm can be bent to reduce the clearance between the tab and the alarm switch. Make sure that there is no contact between the switch and the shift arm tab after adjustments are made.

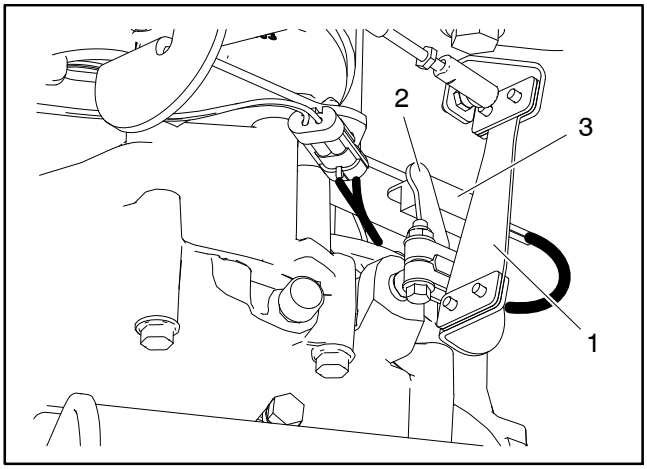

Figure 32

1. **Transaxle shift arm**
2. **Shift arm tab**
3. **Reverse alarm switch**

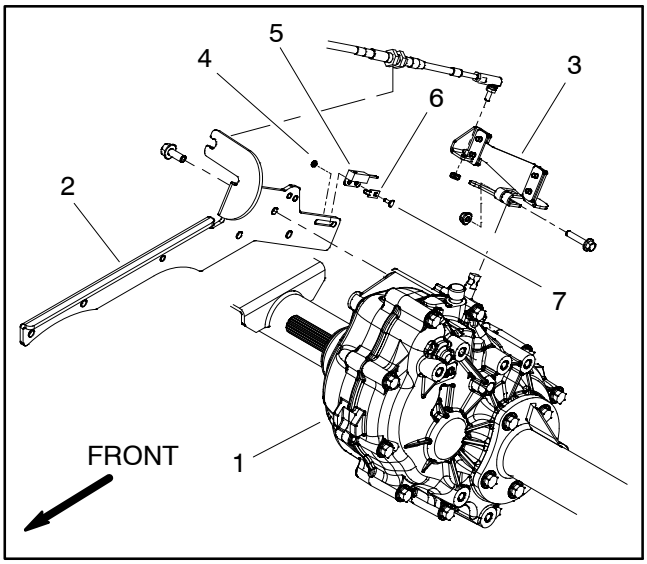

Figure 33

1. **Transaxle**
2. **Spanner bar**
3. **Shift lever**
4. **Lock nut**
5. **Reverse alarm switch**
6. **Switch plate**
7. **Carriage screw**

Service and Repairs

NOTE: See the KOHLER Command PRO CH260- CH440 Service Manual for carbureted engines, or the KOHLER Command PRO EFI ECH440 & ECH440LE Service Manual for electronic fuel injected (EFI) engines for engine electrical component testing information.

Battery Service

The battery is the heart of the electrical system. With regular and proper service, battery life can be extended and electrical component failure can be prevented.

Battery Specifications

BCI Group Size U1
300 Amp Cranking Performance at 0º F (- 17.8C)
28 Minute Reserve Capacity at 25 Amps and 80ºF (26.7C)

WARNING

POTENTIAL HAZARD:
Either the battery terminals or metal tools could short against metal vehicle components.
WHAT CAN HAPPEN:
Sparks can cause the battery gasses to explode.
Damaged cables could short against metal vehicle components and cause sparks.
HOW TO AVOID THE HAZARD:
When removing or installing the battery, do not allow the battery terminals to touch any metal parts of the vehicle.
Always DISCONNECT the negative (black) battery cable before disconnecting the positive (red) cable.
Always CONNECT the positive (red) battery cable before connecting the negative (black) cable.
Do not allow metal tools to short between the battery terminals and metal parts of the vehicle.
Always keep the battery retaining components secure to protect the battery.

Battery Removal (Fig. 34)

IMPORTANT: Be careful to not damage battery terminal posts or cable connectors when removing the battery cables.

1. Park vehicle on a level surface, stop engine, engage parking brake and remove key from the key switch.

2. To access battery, remove seat base assembly with attached seats from vehicle.

3. Disconnect negative (black) cable from battery first to prevent short circuiting the battery, other components or operator's hands. Then disconnect positive (red) cable.

4. Remove battery clamp, cap screw, flat washer and flange nut that secure battery to frame.

5. Carefully lift battery from vehicle and move it to a service area. This will minimize possible battery damage and allow better access for battery inspection and service.

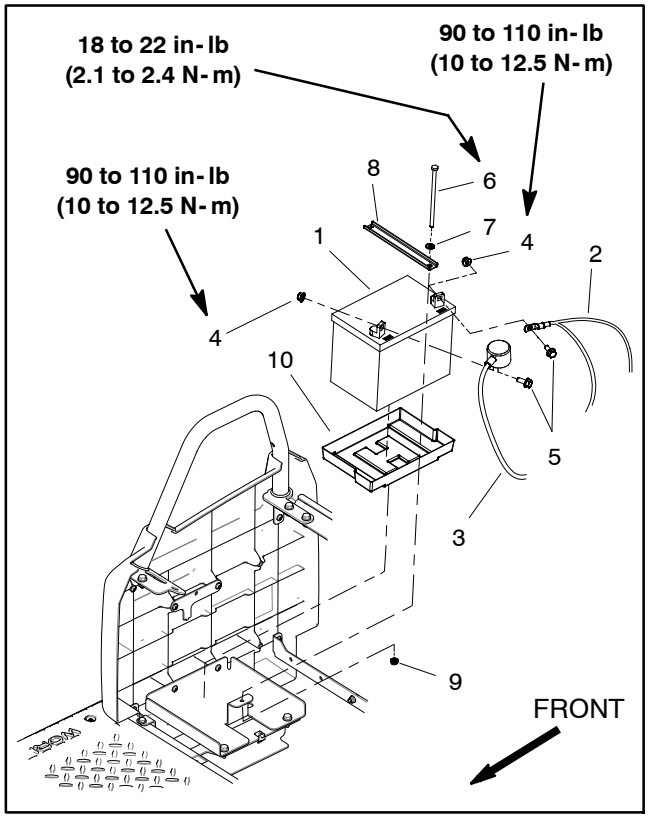

Figure 34

1. **Battery**
2. **Negative cable (black)**
3. **Positive cable (red)**
4. **Flange nut (2 used)**
5. **Flange screw (2 used)**
6. **Cap screw**
7. **Flat washer**
8. **Battery clamp**
9. **Flange nut**
10. **Battery tray**

Battery Inspection and Maintenance

WARNING

POTENTIAL HAZARD:
Battery electrolyte contains sulfuric acid which is a deadly poison and it causes severe burns.
WHAT CAN HAPPEN:
If you carelessly drink electrolyte you could die or if it gets onto your skin you will be burned.
HOW TO AVOID THE HAZARD:
Do not drink electrolyte and avoid contact with skin, eyes or clothing. Wear safety glasses to shield your eyes and rubber gloves to protect your hands.
Fill the battery where clean water is always available for flushing the skin. Always RECONNECT the positive (red) battery cable before reconnecting the negative (black) cable.
Follow all instructions and comply with all safety messages on the electrolyte container.

1. Check for cracks caused by overly tight or loose battery clamp. Replace battery if cracked and leaking.

2. Check battery terminal posts for corrosion. Use a terminal brush or steel wool to clean corrosion from the battery terminal posts.

IMPORTANT: Before cleaning the battery, tape or block the vent holes to the filler caps and make sure the caps are on tightly.

3. Check for signs of wetness or leakage on the top of the battery which might indicate a loose or missing filler cap, overcharging, loose terminal post or overfilling. Clean the battery with a solution of baking soda and water, then rinse it with clean water.

4. Check that the cover seal is not broken away. Replace the battery if the seal is broken or leaking.

5. If battery design allows removal of battery caps, check the electrolyte level in each cell. If the level is below the tops of the plates in any cell, fill all cells with **distilled** water to the bottom of the cap tubes (or fill line). Charge at 15 to 25 amps for 15 minutes to allow sufficient mixing of the electrolyte.

Battery Installation (Fig. 34)

IMPORTANT: To prevent possible electrical problems, install only a fully charged battery.

1. Make sure the key switch and all accessories are off.

2. Make sure the battery base is clean and repainted if necessary.

3. Make sure battery cables and the battery hold down components are in good condition.

4. Set battery tray and then battery on the battery base with the battery posts toward the left side of the vehicle.

5. Secure battery to vehicle with battery clamp, cap screw, flat washer and flange nut. Torque cap screw from **18 to 22 in-lb (2.1 to 2.4 N-m)**.

6. Secure positive cable (red) to positive battery post with flange head screw and flange nut. Torque screw from **90 to 110 in-lb (10 to 12.5 N-m)**.

7. Connect a digital multimeter (set to amps) between the negative battery post and the negative cable (black) connector. The reading should be less than 0.1 amp. If the reading is 0.1 amp or more, the unit's electrical system should be tested and repaired.

8. Secure negative cable (black) to negative battery post with flange head screw and flange nut. Torque screw from **90 to 110 in-lb (10 to 12.5 N-m)**.

9. After battery and cables are secure, apply battery terminal protector (Toro part number 107-0392) on battery posts and cable connectors to reduce corrosion.

10. Install seat base assembly to vehicle.

Battery Testing

1. If the battery design allows removal of battery caps, conduct a hydrometer test of the battery electrolyte:

IMPORTANT: Make sure the area around the cells is clean before opening the battery caps.

A. Measure the specific gravity of each cell with a hydrometer. Draw electrolyte in and out of the hydrometer barrel prior to taking a reading to warm–up the hydrometer. At the same time take the temperature of the cell.

B. Temperature correct each cell reading. For each 10F (5.5C) above 80F (27C) add 0.004 to the specific gravity reading. For each 10°F (5.5C) below 80F (27C) subtract 0.004 from the specific gravity reading.

Example:	Cell Temperature	100F
	Cell Gravity	1.245
	ADD (20 above 80F)	0.008
	Correction to 80F	1.253

C. If the difference between the highest and lowest cell specific gravity is 0.050 or greater or the lowest cell specific gravity is less than 1.225, charge the battery. Charge at the recommended rate and time given in **Charging** or until all cells specific gravity is 1.225 or greater with the difference in specific gravity between the highest and lowest cell less than 0.050. If these charging conditions can not be met, replace the battery.

2. Perform a high–discharge battery test with an adjustable load tester.

This is one of the most reliable means of testing a battery as it simulates the cold–cranking test. A commercial battery load tester is **required** to perform this test.

CAUTION

Follow the battery load tester manufacturer's instructions when using a load tester.

A. Check the voltage across the battery terminals prior to testing the battery. If the voltage is less than 12.0 VDC, recharge the battery before load testing.

B. Make sure the battery terminals are free of corrosion.

C. If the battery has been charged, apply a 150 amp load for 15 seconds to remove the surface charge. Use a battery load tester following the manufacturer's instructions.

D. If battery design allows, measure the temperature of the electrolyte in the center cell. If battery is sealed, estimate electrolyte temperature based on ambient temperature of surroundings.

E. Connect a battery load tester to the battery terminals **following the manufacturer's instructions**. Connect a digital multimeter to the battery terminals.

F. Apply a test load of 150 amps (one half the Cranking Performance) for 15 seconds.

G. Take a battery voltage reading at 15 seconds, then remove the load. Record this test voltage reading.

H. Using the table below, determine the minimum test voltage for the cell temperature reading.

Minimum Test Voltage	Battery Electrolyte Temperature	
9.6	70F (and up)	21.1C (and up)
9.5	60F	15.6C
9.4	50F	10.0C
9.3	40F	4.4C
9.1	30F	–1.1C
8.9	20F	–6.7C
8.7	10F	–12.2C
8.5	0F	–17.8C

I. If the test voltage is below the minimum, replace the battery. If the test voltage is at or above the minimum, return the battery to service.

Battery Charging

To minimize possible damage to the battery and allow the battery to be fully charged, the slow charging method is presented here. This charging method can be accomplished with a constant current battery charger which is readily available.

CAUTION

Follow the battery charger manufacturer's instructions when using a battery charger.

NOTE: If the battery design allows removal of battery caps, using specific gravity of the battery cells is the most accurate method of determining battery condition.

1. Determine the battery charge level from either its specific gravity (if the battery design allows) or open circuit voltage.

Battery Charge Level	Specific Gravity	Open Circuit Voltage
100%	1.265	12.68
75%	1.225	12.45
50%	1.190	12.24
25%	1.155	12.06
0%	1.120	11.89

2. Determine the charging time and rate using the battery charger instructions or the following table.

Battery Reserve Capacity (Minutes)	Battery Charge Level (Percent of Fully Charged)			
	75%	50%	25%	0%
80 or less	**3.8 hrs @ 3 amps**	**7.5 hrs @ 3 amps**	**11.3 hrs @ 3 amps**	**15 hrs @ 3 amps**
81 to 125	5.3 hrs @ 4 amps	10.5 hrs @ 4 amps	15.8 hrs @ 4 amps	21 hrs @ 4 amps
126 to 170	5.5 hrs @ 5 amps	11 hrs @ 5 amps	16.5 hrs @ 5 amps	22 hrs @ 5 amps
171 to 250	5.8 hrs @ 6 amps	11.5 hrs @ 6 amps	17.3 hrs @ 6 amps	23 hrs @ 6 amps
above 250	6 hrs @ 10 amps	12 hrs @ 10 amps	18 hrs @ 10 amps	24 hrs @ 10 amps

CAUTION

Do not charge a frozen battery because it can explode and cause injury. Let the battery warm to 60F (16C) before connecting to a charger.

Charge battery in a well–ventilated place to dissipate gases produced from charging. These gases are explosive.

Keep open flame and electrical spark away from the battery. Do not smoke. Unplug the charger from the electrical outlet before connecting or disconnecting the charger leads from the battery posts.

Nausea may result if battery gases are inhaled.

3. Connect charger cables to the battery. Make sure a good connection is made.

4. Charge the battery following the battery charger instructions and the charging time and rate determined above.

5. Occasionally check the temperature of the battery electrolyte if battery design allows. If the temperature exceeds 125F (52C) or if the electrolyte is violently gassing or spewing, the charging rate must be lowered or temporarily stopped.

6. Three (3) hours prior to the end of the charging, measure the specific gravity of a battery cell once per hour. The battery is fully charged when the cells are gassing freely at a low charging rate and there is less than a 0.003 change in specific gravity for three (3) consecutive readings.

Battery Storage

If the vehicle will be stored for more than thirty (30) days, disconnect the battery and charge it fully. Either store the battery in the vehicle or on a shelf. Leave the battery cables disconnected if the battery is stored in the vehicle. Store the battery in a cool atmosphere to avoid quick deterioration of the charge in the battery. To prevent the battery from freezing, make sure it is fully charged during storage.

Starter/Generator

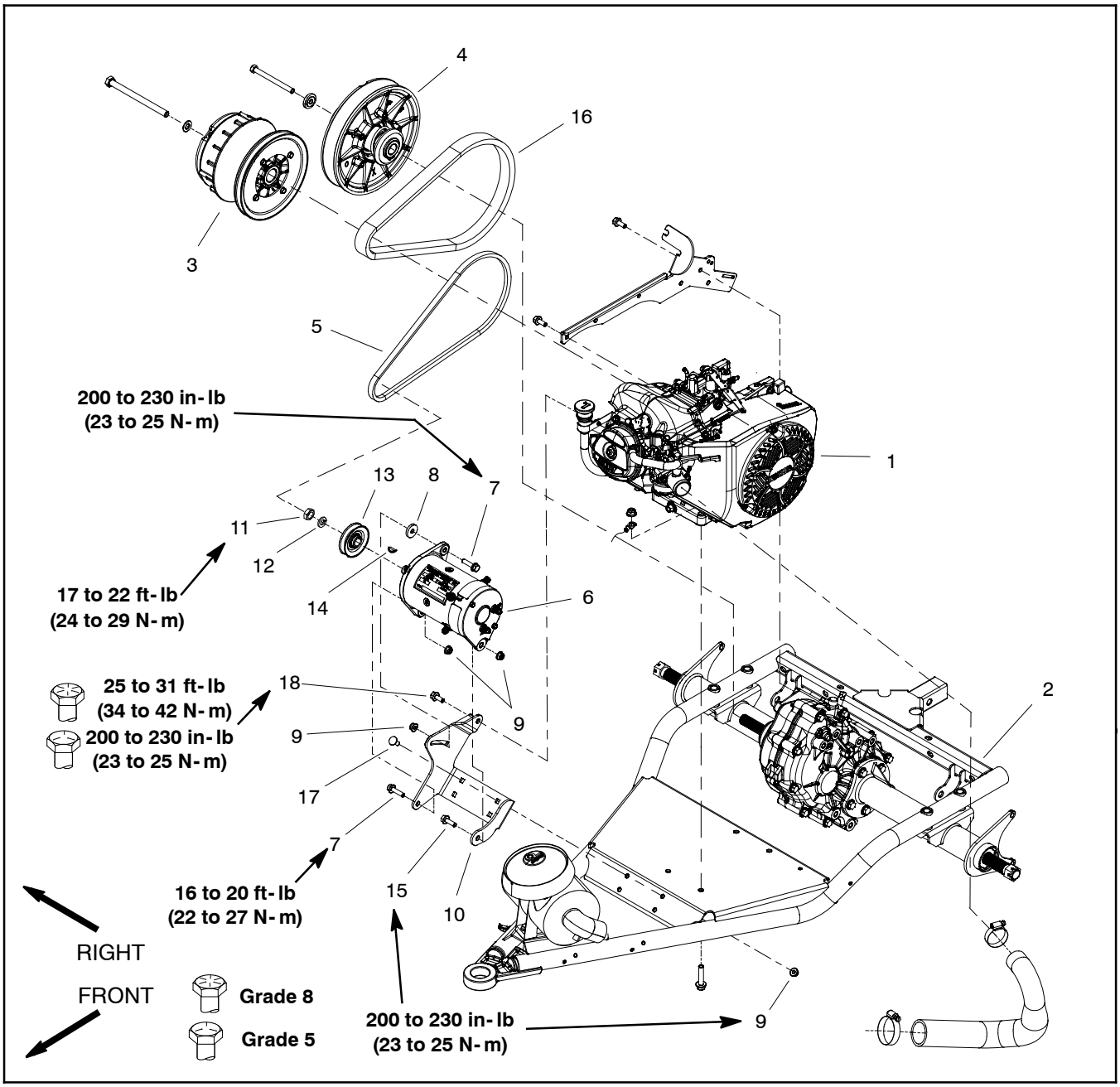

Figure 35

1. Engine
2. Swing arm
3. Primary clutch
4. Secondary clutch
5. Starter/generator belt
6. Starter/generator
7. Flange head screw (2 used)
8. Washer
9. Flange nut (7 used)
10. Starter/generator bracket
11. Nut
12. Lock washer
13. Starter/generator pulley
14. Woodruff key
15. Flange head screw
16. CVT drive belt
17. Carriage screw (4 used)
18. Flange head screw

IMPORTANT: Torque tighten the fasteners based on the fastener grade. Make sure to use the correct torque; refer to Figure 35.

Removal (Fig. 35)

1. Park vehicle on a level surface, stop engine, engage parking brake and remove key from the key switch. Place vehicle shift lever in the NEUTRAL position.

2. Raise cargo bed and secure with prop rod to gain access to the starter/generator.

3. Remove rear frame panel cover from rear frame to allow access to starter generator (see Rear Frame Panel Cover in the General Information section of this chapter).

4. To prevent unexpected operation of electrical system components, disconnect cables from battery. Disconnect negative (black) cable first and then disconnect positive (red) cable (see Battery Service in this section). Position cable away from battery terminals.

NOTE: Place all fasteners back onto starter/generator terminals after disconnecting wires to prevent loss of fasteners.

5. Label all wires on the starter/generator for assembly purposes. Disconnect all wires from the starter/generator.

6. Loosen flange head screws (items 7 and 15) and flange nuts (item 9) that secure starter/generator to bracket.

7. Pivot starter/generator toward engine and remove drive belt from the starter/generator pulley.

8. Support starter/generator to prevent it from shifting or falling.

9. Remove fasteners that secure starter/generator to bracket. Make sure to locate and retrieve washer (item 8) from between starter/generator and bracket. For assembly purposes, note that flange head screw (item 15) toward left side of vehicle is inserted from center of vehicle toward the outside.

10. Carefully separate starter/generator from bracket. Then, rotate starter/generator and lower it from the vehicle.

11. If necessary, remove pulley from the starter/generator shaft:

A. Remove nut and spring washer from the shaft. Use appropriate puller to remove pulley from the shaft.

B. Remove woodruff key from the shaft.

Installation (Fig.35)

1. If removed, install pulley to the starter/generator shaft:

A. Position woodruff key to the shaft. Slide pulley onto the shaft with the larger diameter pulley hub installed toward starter/generator.

B. Secure pulley to the shaft with spring washer and nut. Torque nut from **17 to 22 ft- lb (24 to 29 N- m)**.

2. Install starter/generator to the vehicle:

A. Raise starter/generator from bottom of vehicle and then rotate it into the bracket.

B. Insert flange head screws through starter/generator and bracket mounting holes. Make sure that washer is installed between upper starter/generator mounting ear and bracket.

C. Thread flange nuts onto screws. Leave fasteners loose to allow belt adjustment.

3. Using labels placed during starter/generator removal, correctly connect all wires to the starter/generator. Use torque values shown in Figure 36 to torque the lower nut before installing the wire connector. Then, place wire connector on post, install final nut and torque final nut to values shown in Figure 36.

4. Install drive belt to the starter/generator pulley and adjust belt tension by rotating the starter/generator away from the engine. When properly adjusted, the belt should deflect 1/4 inch (6 mm) with 10 lb (4.5 kg) of force on the center of the belt.

5. Fully tighten all fasteners that secure starter/generator to bracket; refer to Figure.35.

6. Connect battery cables to battery (see Battery Service in this section). Connect positive cable first and then connect negative cable.

7. Install rear frame panel cover to vehicle. Lower and secure the cargo bed.

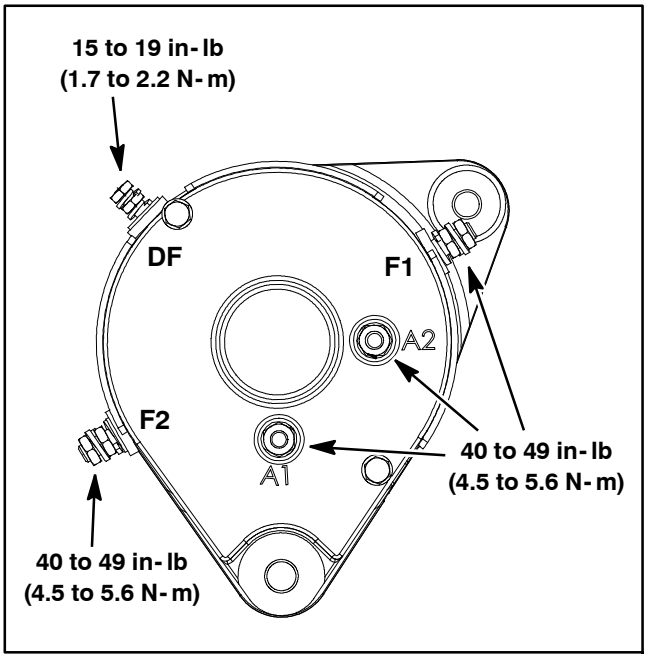

Figure 36

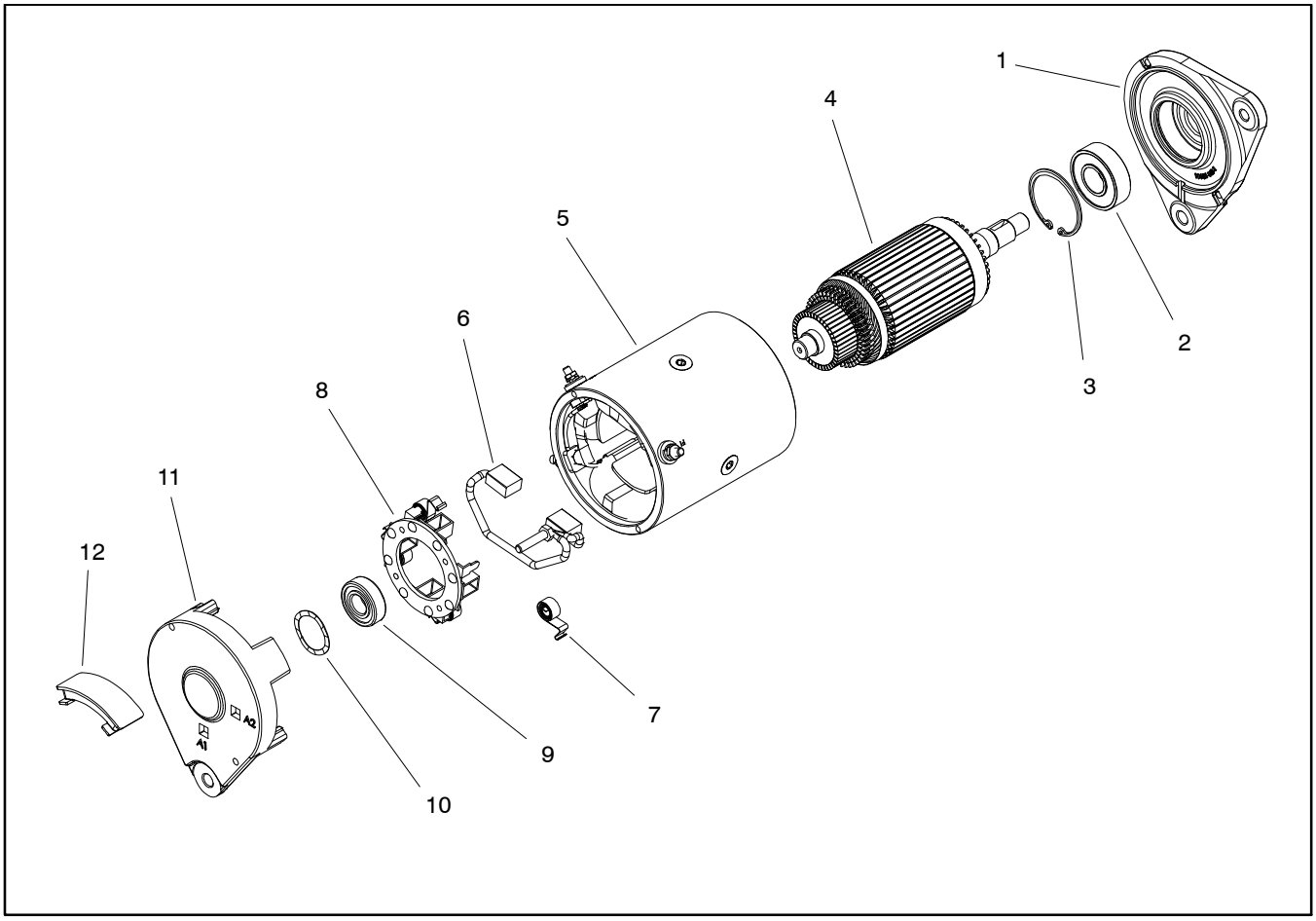

Figure 37

1. **Drive head end**
2. **Bearing**
3. **Retaining ring**
4. **Armature assembly**
5. **Frame and field assembly**
6. **Brush kit**
7. **Brush spring (4 used)**
8. **Brush box assembly**
9. **Bearing**
10. **Wave washer**
11. **Commutator end head**
12. **Rubber plug (4 used)**

NOTE: A troubleshooting guide for the Advanced Motors and Drive starter/generator is included at the end of this chapter. Refer to this guide when diagnosing a starter/generator problem on your Workman GTX vehicles.

Brush and Brush Spring Service

1. Gain access to brushes by carefully removing rubber plugs from commutator end head of starter/generator.

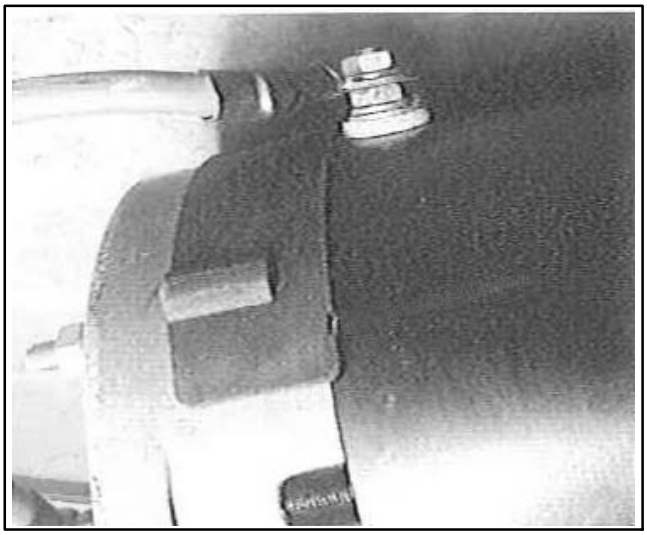

Figure 38

2. Check the length of the brush that extends from the top of the brush box. If the brush is less than **0.140" (3.5 mm)** from the top of the brush box, brush replacement is necessary.

Figure 39

3. Use a marker to make a **diagonal** line across the frame housing and end heads for assembly purposes. Position the starter/generator on the commutator end head and support the assembly to prevent damage to the terminals in the end head. Remove the two (2) screws that secure the drive end head to the frame housing.

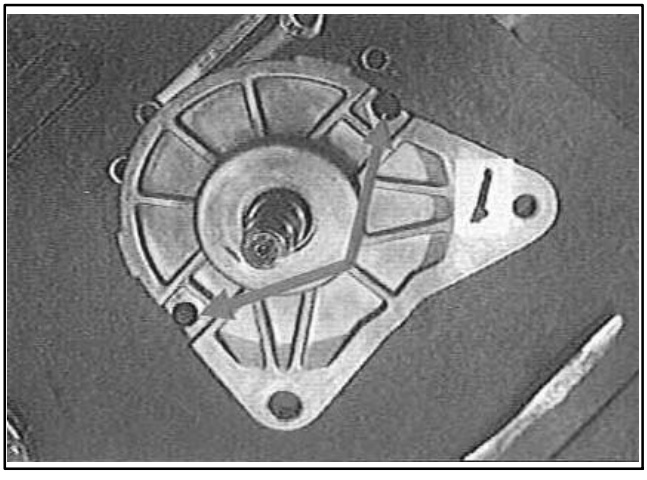

Figure 40

4. Pull drive head end along with attached armature from the frame housing.

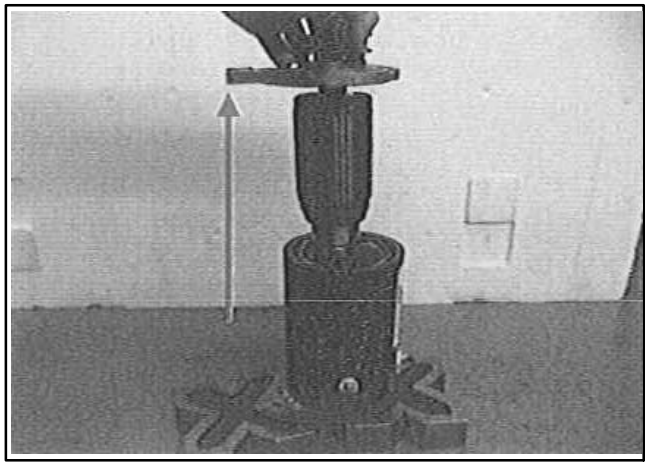

Figure 41

5. Position the motor so the commutator end head is facing upwards and remove the two (2) screws that secure the commutator end head. Lift commutator end head from frame housing.

6. Locate and retrieve wave washer from between armature and commutator end head.

IMPORTANT: Use clean, dry, lint–free rags when cleaning the starter/generator. When using compressed air, air should be filtered and should not exceed 15 PSI (103 kPa).

7. Clean inside of the frame housing with compressed air.

IMPORTANT: Remove bearings from armature only if they are to be replaced. Use proper bearing removal and installation tools.

8. Clean bearings using a clean cloth. Inspect bearings for damage. Replace both bearings if either bearing meets any of the following conditions:

A. Bearings do not spin smoothly, are noisy when rotated or have excessive end or axial play.

B. The bearing balls or rolling surfaces are pitted or worn.

C. The bearings are rusted, worn, cracked or show abnormal color due to overheating.

NOTE: Individual components in the frame housing are not available separately. Replace housing or complete starter/generator if damage exists in frame and field assembly.

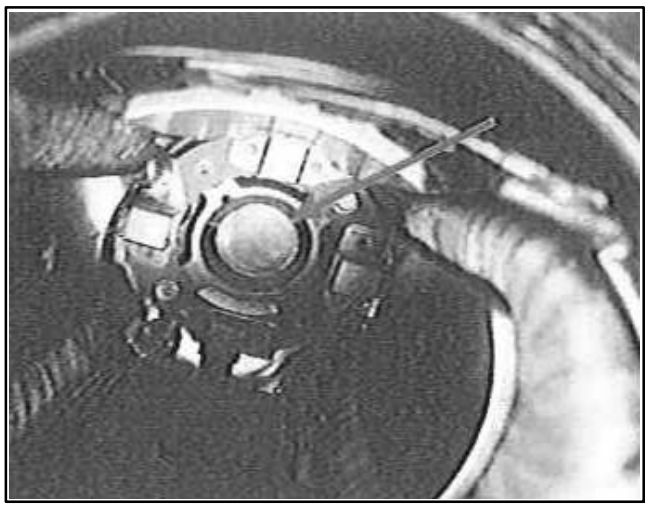

Figure 42

9. Remove nut, lock washer, flat washer and fiber washer from A1 and A2 terminals on commutator end head.

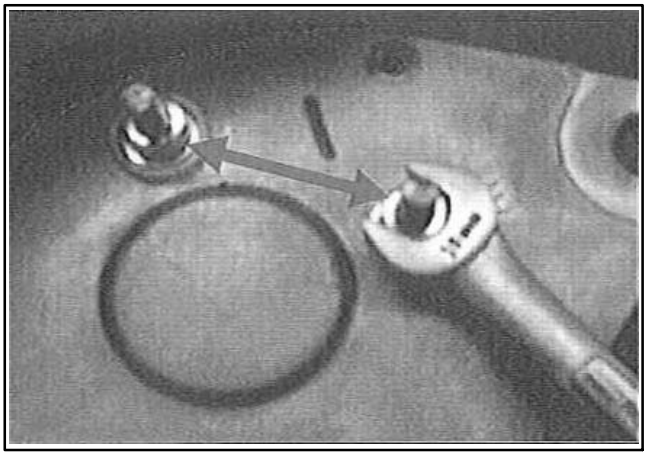

Figure 43

10. Remove two (2) screws that secure the brush box to the commutator end head. Carefully remove brush box from the commutator end head.

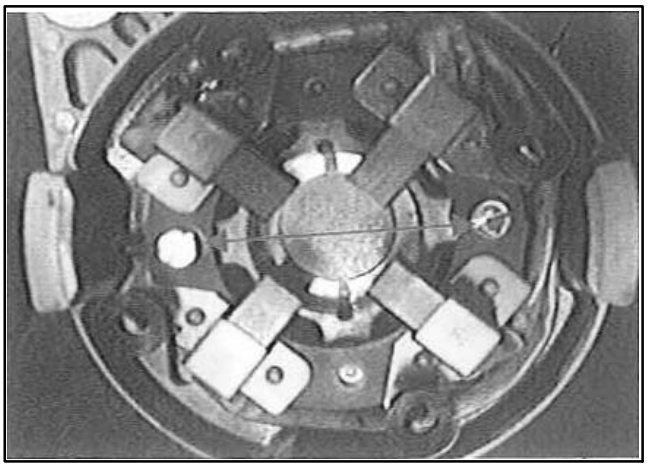

Figure 44

11. Remove brush assemblies from the brush box.

    Minimum brush length is **0.375 in (9.5 mm)**
    Maximum brush length is **0.790 in (20 mm)**

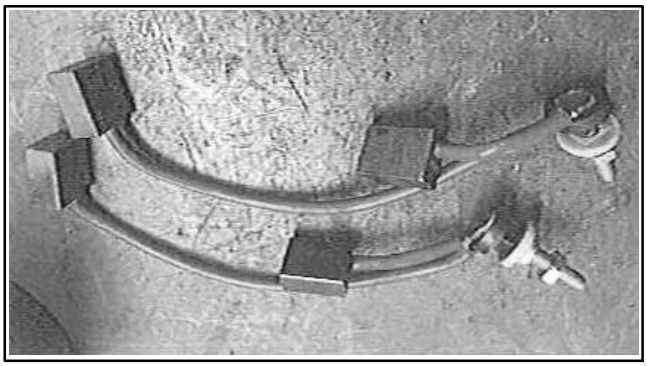

Figure 45

12. Assembly new brushes to the brush plate.

A. First, insert the brush with the short lead into one of the brush holders. Then rotate the brush plate 180º to insert the brush with the longer lead. Repeat for second brush assembly.

B. Be sure that terminal insulator is positioned on each terminal bolt after assembly. Also, be sure to have the brush springs against the side of the brushes so the brushes do not go into the brush box fully.

Figure 46

13. Verify the correct position of the brushes. If the brushes are not in the correct orientation, the starter/generator will not function.

A. Terminal A1 connects to brush boxes 2 and 4.

B. Terminal A2 connects to brush boxes 1 and 3.

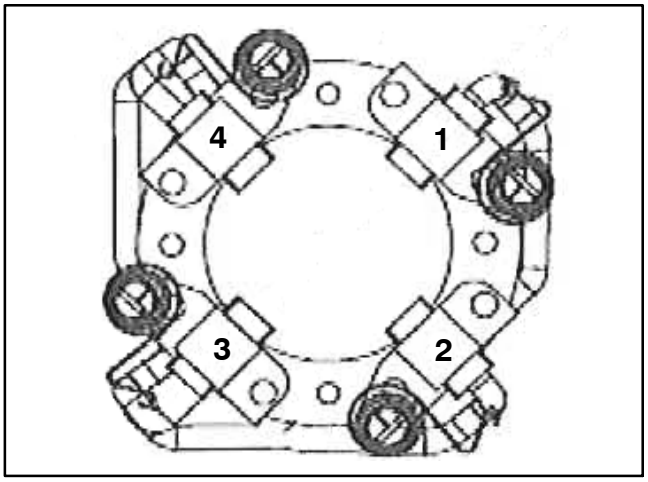

Figure 47

14. Assemble the brush box to the commutator end head. Make sure that the brush leads are dressed properly, that the leads are not pinched under the brush box and that the copper shunts do not contact the aluminum end head. Secure brush box to end head with two (2) screws. Torque screws from **22 to 26 in–lb (2.5 to 2.9 N–m)**.

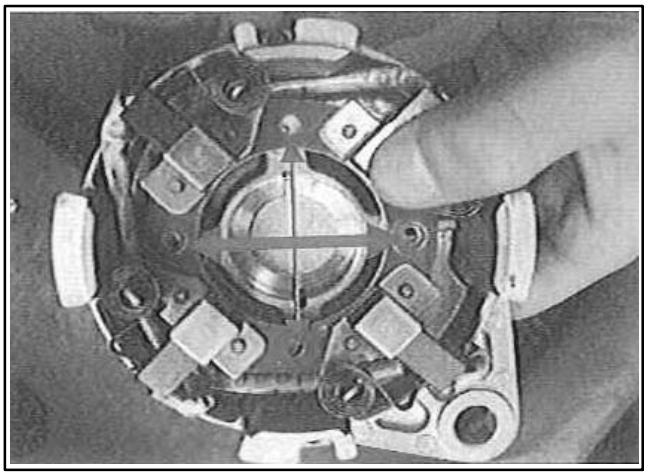

Figure 48

15. Secure A1 and A2 terminals to commutator end head with fiber washer, flat washer, lock washer and nut on each terminal. Torque nuts from **40 to 50 in−lb (4.6 to 5.6 N−m)**.

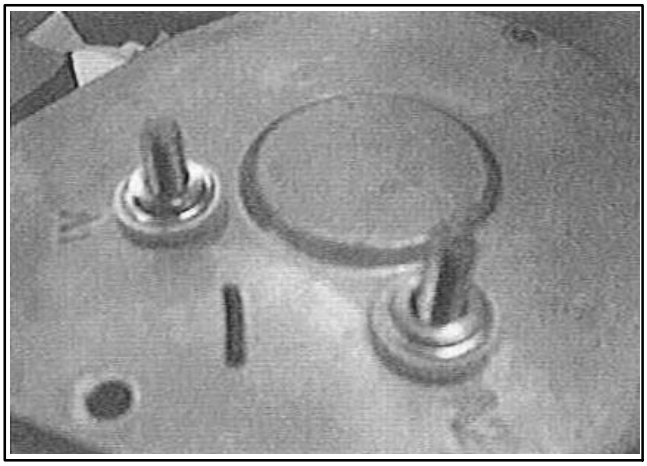

Figure 49

16. Secure commutator end head assembly to frame housing with two (2) screws. Use marks placed on end head and housing to properly orientate head. Torque screws from **49 to 66 in−lb (5.6 to 7.4 N−m)**.

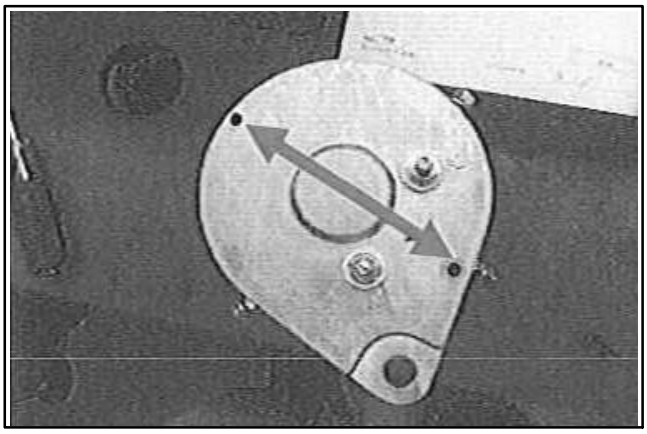

Figure 50

17. Position the starter/generator on the commutator end head and support the assembly to prevent damage to the terminals in the end head.

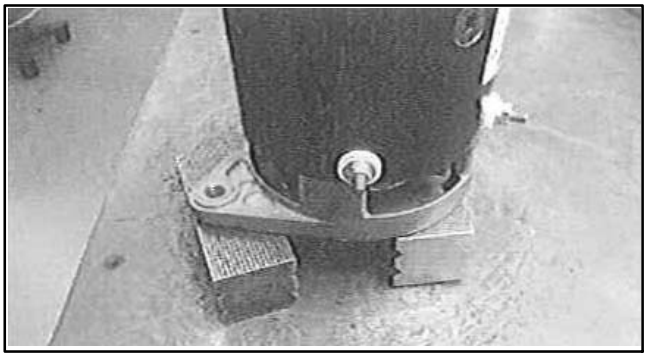

Figure 51

18. Make sure that brushes are pushed back in brush holders so they will not interfere with armature installation.

19. Position wave washer into bearing bore in commutator end head.

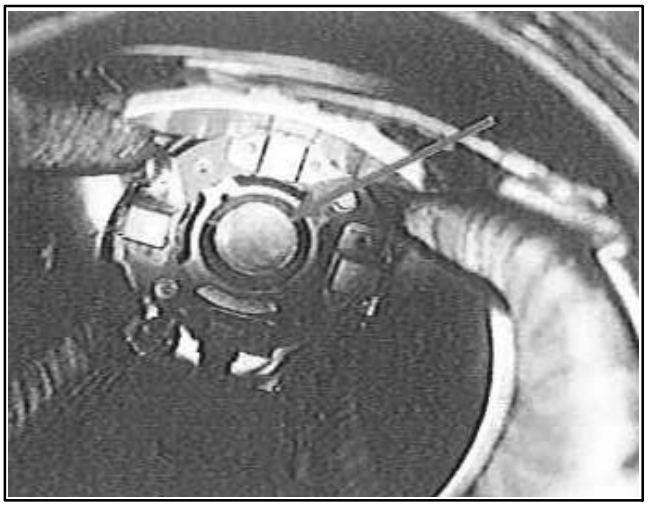

Figure 52

20. Carefully lower the armature and drive end head assembly into the frame housing making sure that armature bearing is inserted into bearing bore in commutator end head.

21. Use marks placed on drive end head and housing to properly orientate head. Secure drive end head to frame housing with two (2) screws. Torque screws from **49 to 66 in−lb (5.6 to 7.4 N−m)**.

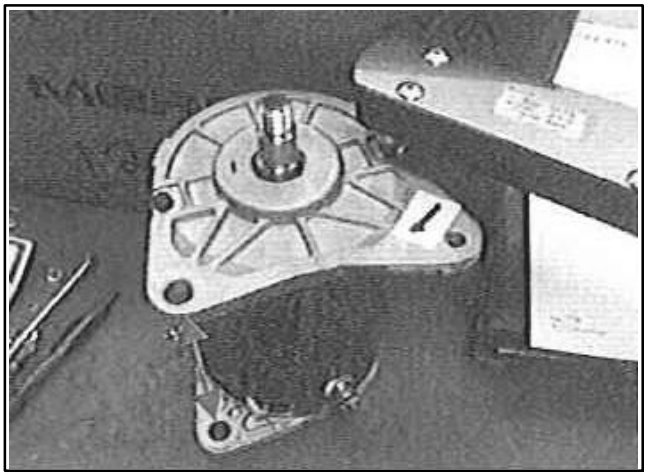

Figure 53

22. Release brushes and center the brush springs between the wire and the edge of the brush. Make sure that brushes move freely in brush holders.

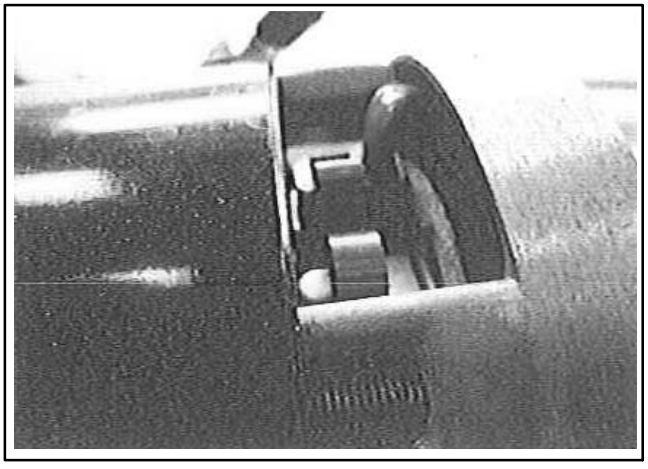

Figure 54

23. Install rubber plugs to the commutator end head.

24. Make sure that the armature rotates freely after assembly.

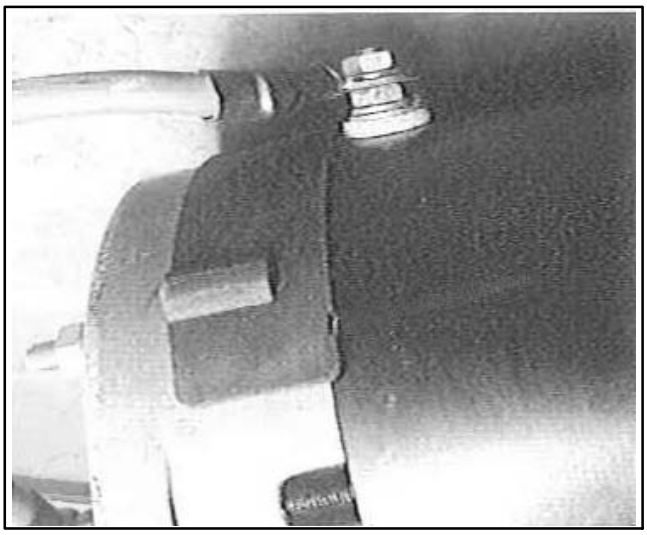

Figure 55

Starter/Generator Specifications

NOTE: Rework to the starter/generator must be performed by a properly trained technician using the correct tools and equipment for testing and reworking electrical motors and generators. It may be more economically feasible to replace the starter/generator than have it reworked.

Detail	Specification
Armature Resistance at 75F (24C)	0.0125 Ohms between bar 1 and 11
Field Resistance at 75F (24C)	0.0069 Series Ohms Total 3.20 Shunt Ohms Total
Maximum brush length	0.790 in (20 mm)
Minimum brush length	0.375 in (9.5 mm)
Commutator bars	41
Commutator original maximum diameter (new)	1.780 in (45.2 mm)
Commutator minimum diameter for re−slotting	1.650 in (41.9 mm)
Commutator replacement diameter	1.60 in (40.6 mm)

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Chapter 6

Chassis

Table of Contents

General Information

Operator's Manual

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

Thread Forming Fasteners

Numerous thread forming fasteners are used to secure Workman GTX frame components. If the threads in the frame are found to be stripped, a nut can be used on the backside of the frame to allow the fastener to be properly tightened.

Specifications

Item	Description
Front and Rear Tires Pressure Range	205/65 – 10 24 to 30 PSI (165 to 207 kPa)
Wheel Lug Nut Torque (all wheels)	75 to 95 ft-lb (102 to 128 N-m)
Front Wheel Toe-In	0 ± 0.125 inch (0 ± 3 mm)
Brake Fluid	DOT 3
Standard Front Suspension Strut Pre-load Adjustment Position	Lowest Position
Standard Rear Shock Absorber Pre-load Adjustment Position	Lowest Position

Special Tools

Order special tools from your Toro Distributor.

Spanner Wrench

Use spanner wrench to rotate collar on front suspension strut and rear shock absorber. Collar rotation may be necessary to accommodate installed accessories or heavier vehicle loads. Make sure that vehicle is jacked up off the ground to allow spring to be at full extension before using spanner wrench.

Toro Part Number: **TOR6010**

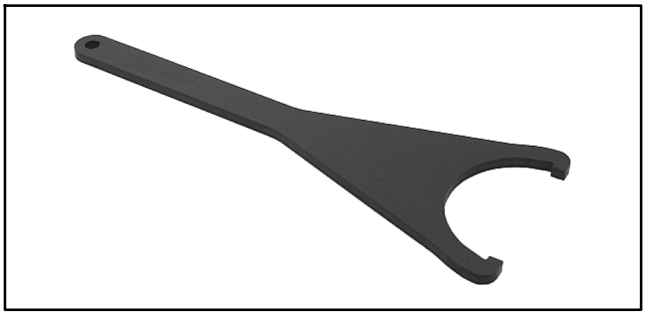

Figure 1

Shock Spring Compressor

Use shock spring compressor to remove and install spring from the rear shock absorber. Tool includes a bracket to secure the shock spring to the compressor spring plate to prevent unexpected movement of the shock spring during tool use. Secure compressor to bench for stability during use.

NOTE: The shock spring compressor can be modified for use with the Workman front suspension strut assembly by fabricating a bracket that will allow the strut mount to be secured to the spring compressor arm. An example of this modification is shown in Figure 3.

Toro Part Number: **TOR6015**

Figure 2

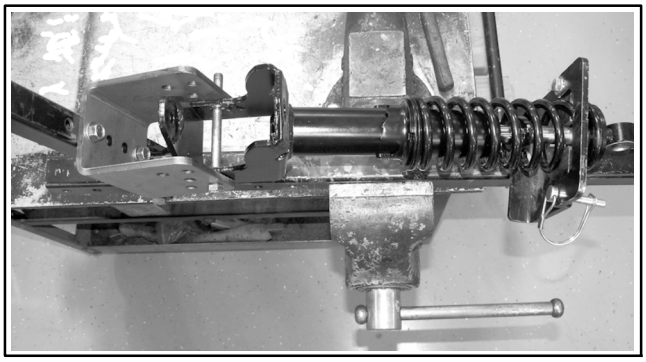

Figure 3

Tools for Frame Extension Kit

Use this tool kit (shown in Fig. 4) when installing or servicing the vehicle frame extension kit. The installed kit is shown in Figure 5.

When the front and rear frame components are separated, the rear frame of the machine can be supported with the legs included in this tool kit. The legs attach to the rear frame with two (2) flange head screws and nuts for each leg.

The bridge assembly is used to stabilize the swing arm assembly to the rear frame when the swing arm is disconnected from the front frame. Install bridge assembly as follows:

1. Remove flange head screw (item 2 in Fig. 6) that secures the right, front corner of the throttle bracket. There is no need to remove flange head screw that secures R−clamp (item 3 in Fig. 6) to engine.

2. Install threaded rod from tool kit fully into the engine and secure rod to engine with flange nut from tool kit.

3. Place bridge onto installed threaded rod making sure that the bridge extends across both rear frame tubes.

4. Secure bridge in place with second flange nut from tool kit. Do not over−tighten flange nut.

Toro Part Number: **TOR6040**

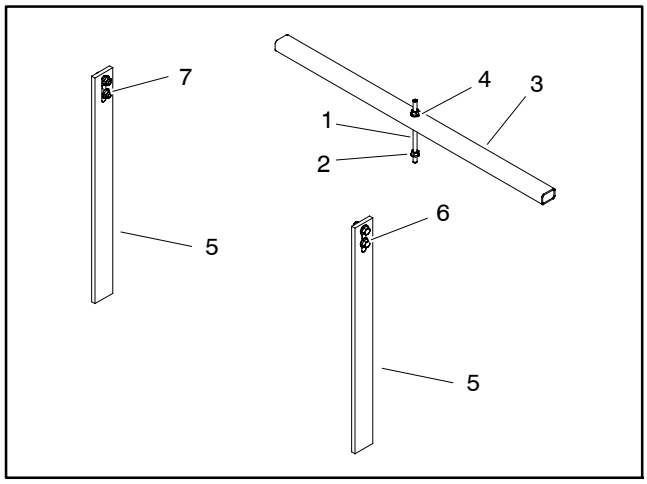

Figure 4

1. **Threaded rod**
2. **Flange nut (2 used)**
3. **Bridge**
4. **Flat washer**
5. **Leg (2 used)**
6. **Screw (4 used)**
7. **Flange nut (4 used)**

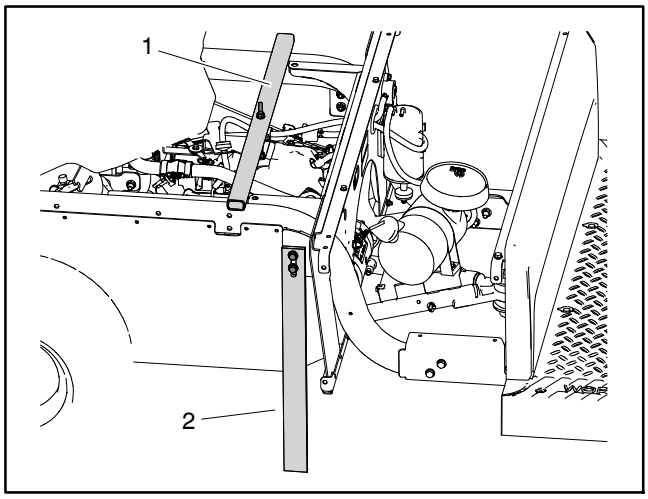

Figure 5

1. **Bridge**
2. **Leg (RH shown)**

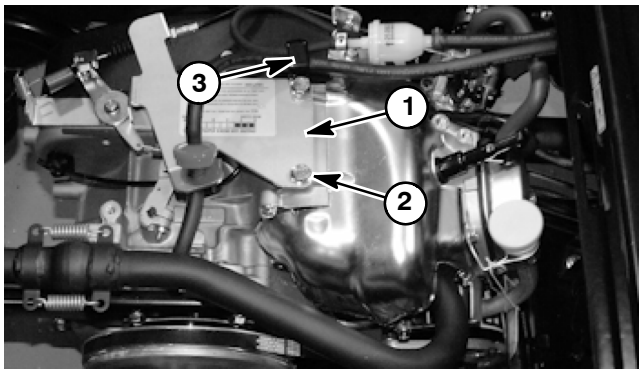

Figure 6

1. **Throttle bracket**
2. **Flange head screw**
3. **R−clamp**

Troubleshooting

Suspension and Steering

Problem	Possible Cause
Front end is noisy.	Front wheel lug nuts are loose. Front wheel bearings are loose or worn. Front suspension struts are loose or worn. Front end components (e.g. tie-rod, spindle, A-arm) are loose or worn. Steering rack assembly is damaged or worn.
Rear end is noisy.	Rear wheel lug nuts are loose. Rear suspension shocks are loose or worn. Rear wheel bearings are loose or worn. Rear end components (e.g. rubber bushing, stabilizer, anti-sway bar, A-arm) are loose or worn. Clutch or transaxle problem (see Chapter 4 - Drive Train).
Excessive steering play.	Front wheel lug nuts are loose. Front wheel bearings are loose or worn. Steering shaft joints are loose or worn. Tie rod ends are worn. Bushings in spindle or A-arm are loose or worn. Steering rack assembly is damaged or worn.
Vehicle is unstable or wanders.	Tire pressure is low or uneven between tires. Wheel lug nuts are loose. Front wheel bearings are loose or worn. Steering shaft bearings are worn. Front wheel alignment (toe-in) is incorrect. Bushings in spindle or A-arm are loose or worn. Rubber shock insert in front suspension strut is loose or worn. Steering rack assembly is damaged or worn.

Suspension and Steering (continued)

Problem	Possible Cause
Front end shimmies.	Front wheel lug nuts are loose. Front wheel alignment (toe-in) is incorrect. Front wheel bearings are loose or worn. Tie rod ends are loose or worn. Steering shaft bearings or joints are loose or worn. Bushings in spindle or A-arm are loose or worn.
Steering is hard.	Tire pressure is low or uneven between tires. Steering components are binding or damaged. Front wheel alignment (toe-in) is incorrect. Steering rack assembly is damaged or worn.
Vehicle pulls to one side when not braking.	Tire pressure is low or uneven between tires. Front wheel alignment (toe-in) is incorrect. Steering or suspension component may be damaged.

Brakes

Problem	Possible Cause
Brake pedal goes to the floor.	Brake fluid level in master cylinder is low. Brake fluid leak exists at master cylinder, brake hose or brake caliper. Brake pads are excessively worn. Brake master cylinder is faulty.
Brake pedal is spongy.	Air is trapped in brake lines. Transaxle bearings are loose or damaged. Brake master cylinder is faulty.

Brakes (continued)

Problem	Possible Cause
Brakes pull to either side.	Tire pressure is incorrect or uneven between tires. Brake pads are worn or contaminated. Front wheel alignment (toe-in) is incorrect. Brake rotors are bent or damaged. Tires on same axle are unmatched.
Brakes squeal.	Brake pads are worn or contaminated. Brake components are dirty. Brake rotors are scored or bent.
Brakes drag.	Parking brake is applied or incorrectly adjusted. Brake pedal is binding. Parking brake cable is binding. Brake pads are saturated. Floating calipers are binding due to dirt or corrosion. Brake rotors are bent.
Brake pedal is hard to push.	Incorrect brake pad material. Brake pedal is binding. New brake pads and/or rotors are not burnished.
Wheels lock-up when braking.	Brake pads are worn or contaminated. Wheel or transaxle bearings are damaged. Calipers are binding due to dirt or corrosion in the float pins or brake piston. Brake rotors are worn.
Brakes fade.	Brake rotors are overheated. Air is trapped in brake lines. Excessive moisture in brake fluid. Brake pads are saturated.
Vehicle surges at slow speeds and chatters at fast speeds.	Brake rotors are bent or damaged.

Adjust Parking Brake

Checking Parking Brake (Fig. 7)

1. Apply parking brake with brake lever on dash.

2. There should be tension felt when applying the parking brake within **4 " to 6 " (11.4 to 16.5 cm)** measured from the 'P' symbol that is molded into the recessed dash area directly in front of the parking brake lever.

3. If parking brake lever movement is incorrect, parking brake adjustment is necessary.

Parking Brake Adjustment (Fig. 8)

1. Make sure that the vehicle is on a level surface and that the parking brake is NOT applied. Also, move gear shift lever to the neutral position.

WARNING

Before jacking up the vehicle, review and follow Jacking Instructions in Chapter 1 - Safety.

2. Chock front wheels to prevent vehicle movement. Lift rear wheels off the ground using a jack and support rear of vehicle with appropriate jack stands beneath the frame.

3. Starting on one of the rear wheels, locate the parking brake rod on the inside of the rear brake caliper.

4. Using two (2) wrenches, loosen lock nut on parking brake rod while holding brake rod to prevent it from rotating.

5. Making sure that lock nut stays loose on parking brake rod, adjust brake rod until rear wheel rotates with little evidence of brake drag on brake rotor.

6. Hold parking brake rod in place and secure adjustment by tightening lock nut. Torque lock nut from **80 to 120 in-lb (9.1 to 13.5 N-m)**.

7. After securing parking brake adjustment, make sure that rear wheel still rotates with little evidence of brake drag.

8. Adjust other rear wheel using steps 4 to 7 above.

9. Check parking brake adjustment as described in Checking Parking Brake on this page. Make additional parking brake adjustments if necessary.

10. Lower vehicle to ground after brake adjustment is complete.

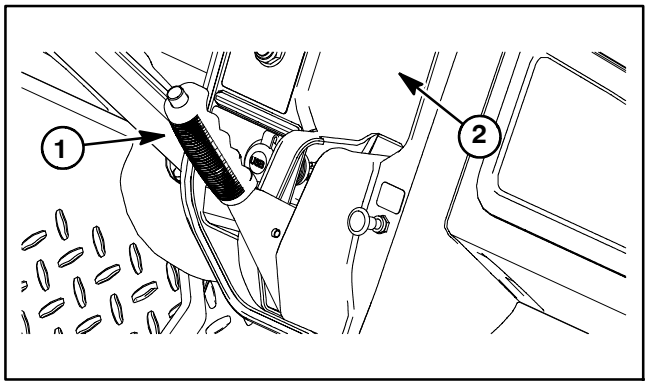

Figure 7

1. **Parking brake lever**
2. **Recessed dash area**

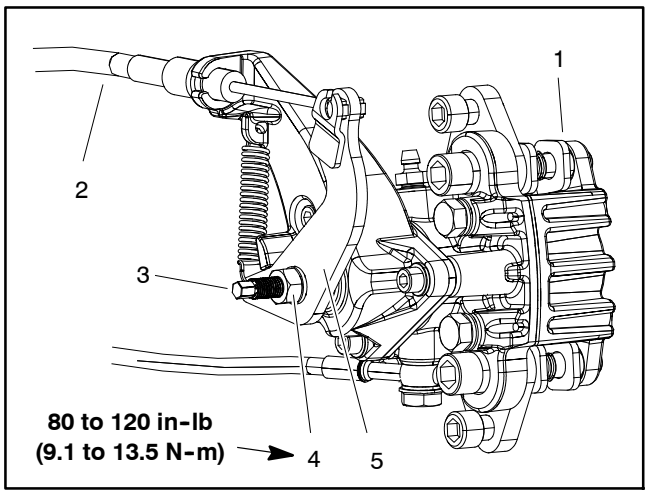

Figure 8

1. **Rear brake caliper (RH)**
2. **Parking brake cable**
3. **Parking brake rod**
4. **Lock nut**
5. **Parking brake lever**

Adjust Front Wheel Toe-in

1. Adjust tire pressures from 24 to 30 PSI (165 to 207 kPa) before checking front wheel toe-in.

2. Either have an operator on the vehicle operator's seat or add weight to the driver's seat equal to the average operator who will run the vehicle. The operator or weight must remain on the seat for the duration of the front wheel toe-in adjustment procedure.

3. On a level surface, roll the vehicle straight back 6 to 10 feet (2 to 3 meters) and then straight forward to the original starting position. This will allow the vehicle suspension to settle into the normal operating position.

4. Make sure that the front wheels are facing straight ahead.

5. Measure the distance between the front tires at axle height at both the front and rear of the tires (Fig. 9). Front wheel toe-in should be **0 ± 0.125 inch (0 ± 3 mm)**.

6. If the front wheel toe-in is incorrect, adjust as follows (Fig. 10):

   A. Loosen jam nuts at both ends of steering rack tie rods.

   B. Rotate both tie rods equally to move front of tires inward or outward.

   C. Tighten tie rod jam nuts when toe-in adjustment is correct. Tie rod jam nuts should be torqued from **45 to 55 ft-lb (62 to 74 N-m)**.

7. After toe-in adjustment has been completed, ensure that there is full steering travel in both directions. There should be no contact between any machine components as the wheels are moved from lock to lock. Adjust if necessary.

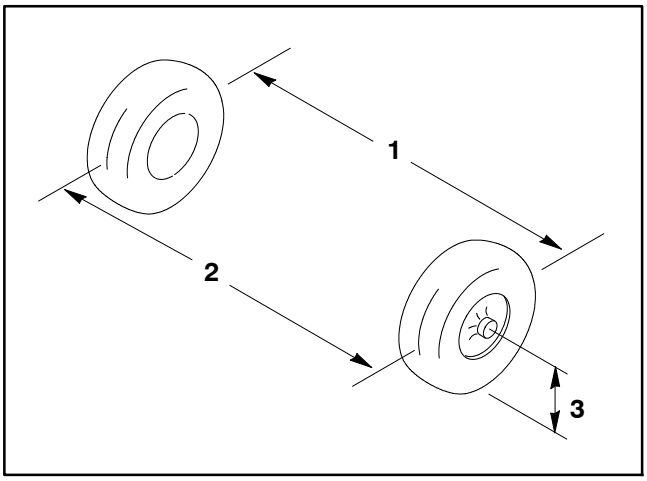

Figure 9

1. **Tire center line (back)**
2. **Tire center line (front)**
3. **Axle center line**

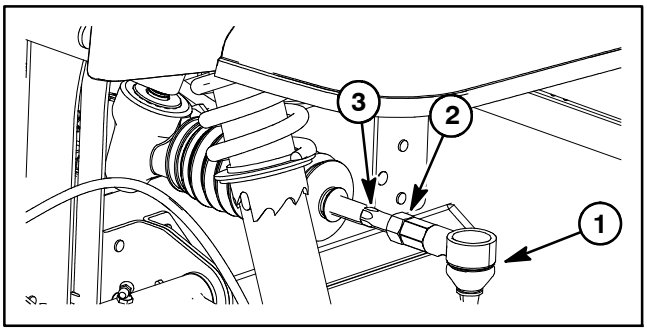

Figure 10

1. **Tie rod end**
2. **Jam nut**
3. **Steering rack tie rod**

Check Tire Pressure

The tire pressure range for front and rear tires is **24 to 30 PSI (165 to 207 kPa)**.

The air pressure needed is determined by the payload carried. **Lower** air pressure will provide less compaction, a smoother ride and fewer tire marks. Lower pressure should not be used for heavy payloads at higher speeds.

Higher pressures should be used for heavier payloads at higher speeds. Do not exceed the maximum tire pressure.

Inspect Tires and Wheels

Operating accidents, such as hitting curbs, can damage a tire or rim and also disrupt wheel alignment. Inspect tire and rim condition after any accident.

Check wheels to ensure they are mounted securely. Torque wheel lug nuts in a crossing pattern from **75 to 95 ft-lb (102 to 128 N-m)**.

Front Wheels and Hubs

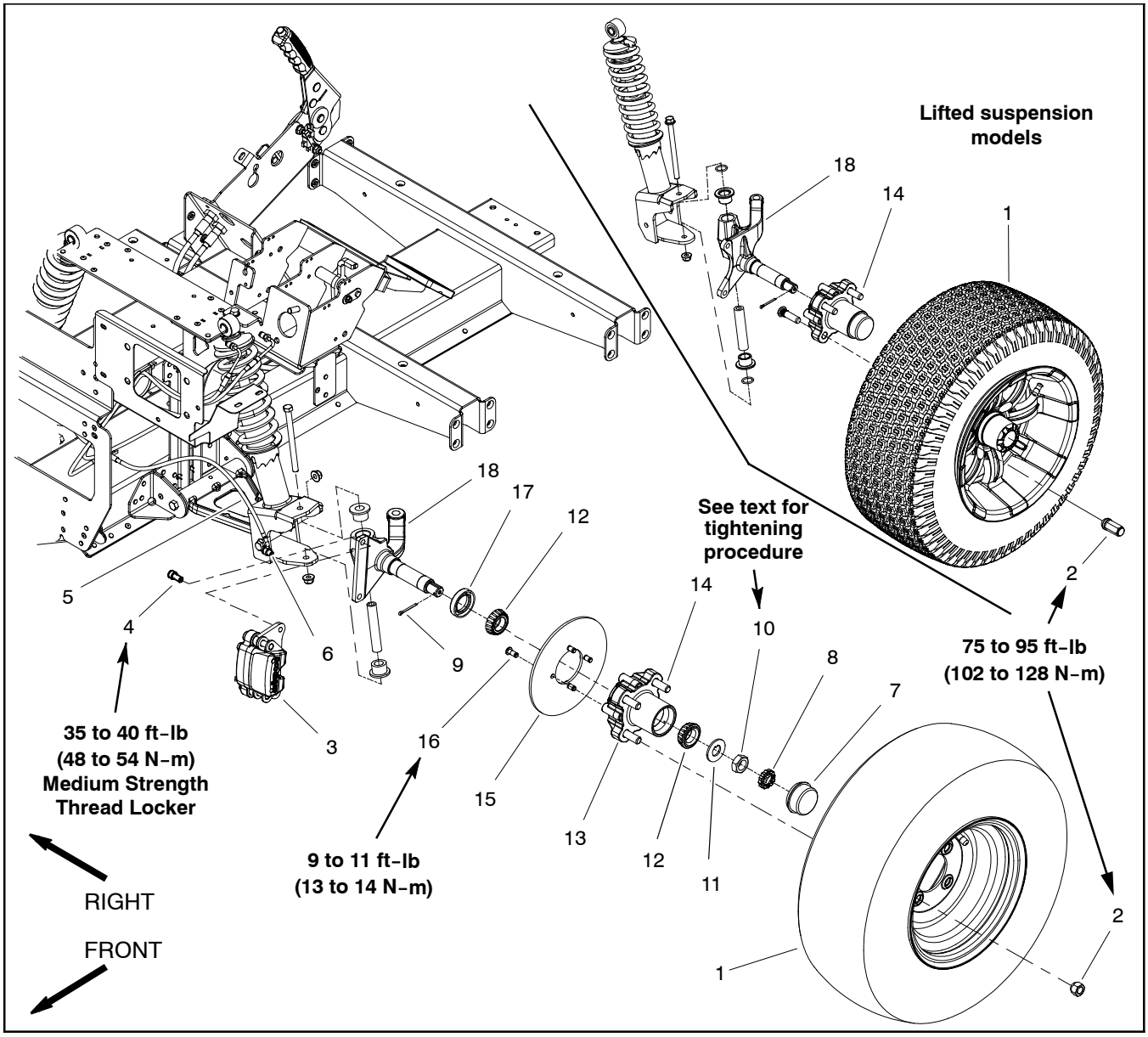

Figure 11

1. Front wheel assembly
2. Lug nut (4 per wheel)
3. Front brake caliper (LH shown)
4. Socket head screw (2 per caliper)
5. Front brake line
6. Banjo bolt and washers
7. Dust cap
8. Retainer
9. Cotter pin
10. Jam nut
11. Tab washer
12. Bearing (2 per hub)
13. Front wheel hub
14. Wheel stud (4 per hub)
15. Brake rotor
16. Socket head screw (4 per rotor)
17. Oil seal
18. Spindle (LH shown)

Removal (Fig. 11)

1. Park vehicle on a level surface, stop engine, set parking brake and remove key from the key switch.

WARNING

Before jacking up the vehicle, review and follow Jacking Instructions in Chapter 1 - Safety.

2. Chock wheels not being removed. Use a jack to raise front wheel that is to be removed off the ground. Support vehicle with appropriate jack stands beneath the frame.

3. Remove four (4) lug nuts and then remove front wheel assembly from the wheel hub.

4. Remove two (2) socket head screws that secure front brake caliper to the mounts on the spindle. Slide caliper assembly with attached brake line from brake rotor and support caliper away from the front wheel hub.

5. Remove the dust cap from the wheel hub.

6. Remove the cotter pin, retainer, jam nut and tab washer. Slide the front wheel hub from the spindle shaft.

7. Pull the seal out of the wheel hub. Discard seal.

8. Remove the bearing cones from both sides of the wheel hub. Clean the bearings in solvent. Make sure the bearings are in good operating condition. Clean the inside of the wheel hub. Check the bearing cups for wear, pitting or other damage. Replace worn or damaged parts.

9. If necessary, separate brake rotor from wheel hub by removing four (4) socket head screws.

10. If necessary, press wheel studs from wheel hub (Fig. 12).

Installation (Fig. 11)

1. If brake rotor was removed from wheel hub, place rotor on hub and secure with four (4) socket head screws. Torque screws from **9 to 11 ft-lb (13 to 14 N-m)**.

2. If any wheel studs were removed from wheel hub, use a press to install new studs into hub (Fig. 12). Make sure that stud shoulder is fully pressed against housing surface.

3. If bearing cups were removed from the wheel hub, press new cups into the hub until they seat against the shoulder of the hub (Fig. 12).

NOTE: Use High Temperature Mobil XHP-222 grease (or equivalent) when greasing front wheel hub components.

IMPORTANT: The lip of the oil seal must be toward the bearing. The seal should be pressed in so it is flush with the end of the wheel hub.

4. Pack both bearings with grease. Install one bearing into the bearing cup on inboard side of the wheel hub. Lubricate the inside of a new oil seal and press it into the wheel hub with the seal lip toward the bearing.

5. Fill wheel hub cavity between bearings approximately 50% full of grease. Position remaining bearing into the outer bearing cup.

6. Slide the wheel hub assembly onto the spindle shaft and secure it in place with the tab washer and jam nut. DO NOT fully tighten the nut.

7. While rotating the wheel hub by hand, torque the jam nut to 130 in-lb (14.7 N-m) to set the bearings. Then, loosen the nut until the hub has endplay.

8. While rotating the wheel hub by hand, torque the jam nut from **15 to 20 in-lb (1.7 to 2.3 N-m)**. After tightening, make sure that the wheel hub does not have any free play.

9. Install retainer with slot aligned to cotter pin hole in spindle. Install cotter pin.

10. Fill dust cap approximately 50% full of grease. Install dust cap to wheel hub.

IMPORTANT: The socket head screws that secure the brake calipers have a patch-lock feature. If screws are being re-installed on vehicle, apply medium strength thread locker to screw threads before installation.

11. Slide brake caliper onto brake rotor. Make sure that rotor is between the brake pads in the caliper. Secure caliper to the mounts on the spindle with socket head screws. Torque screws from **35 to 40 ft-lb (48 to 54 N-m)**.

12. Position wheel assembly to the vehicle with valve stem facing out and secure with four (4) lug nuts.

13. Lower vehicle to ground.

14. Torque lug nuts in a crossing pattern from **75 to 95 ft-lb (102 to 128 N-m)**.

CAUTION

After servicing brake system components, always check the brakes in a wide open, level area that is free of other persons and obstructions.

15. Check brake operation.

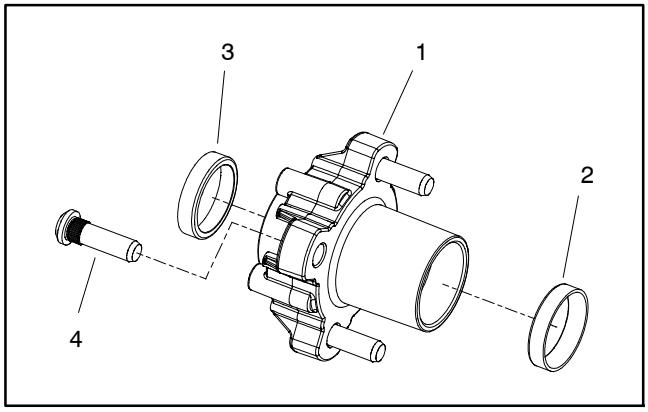

Figure 12

1. **Wheel hub**
2. **Outer bearing cup**
3. **Inner bearing cup**
4. **Wheel stud (4 used)**

Rear Wheels and Hubs

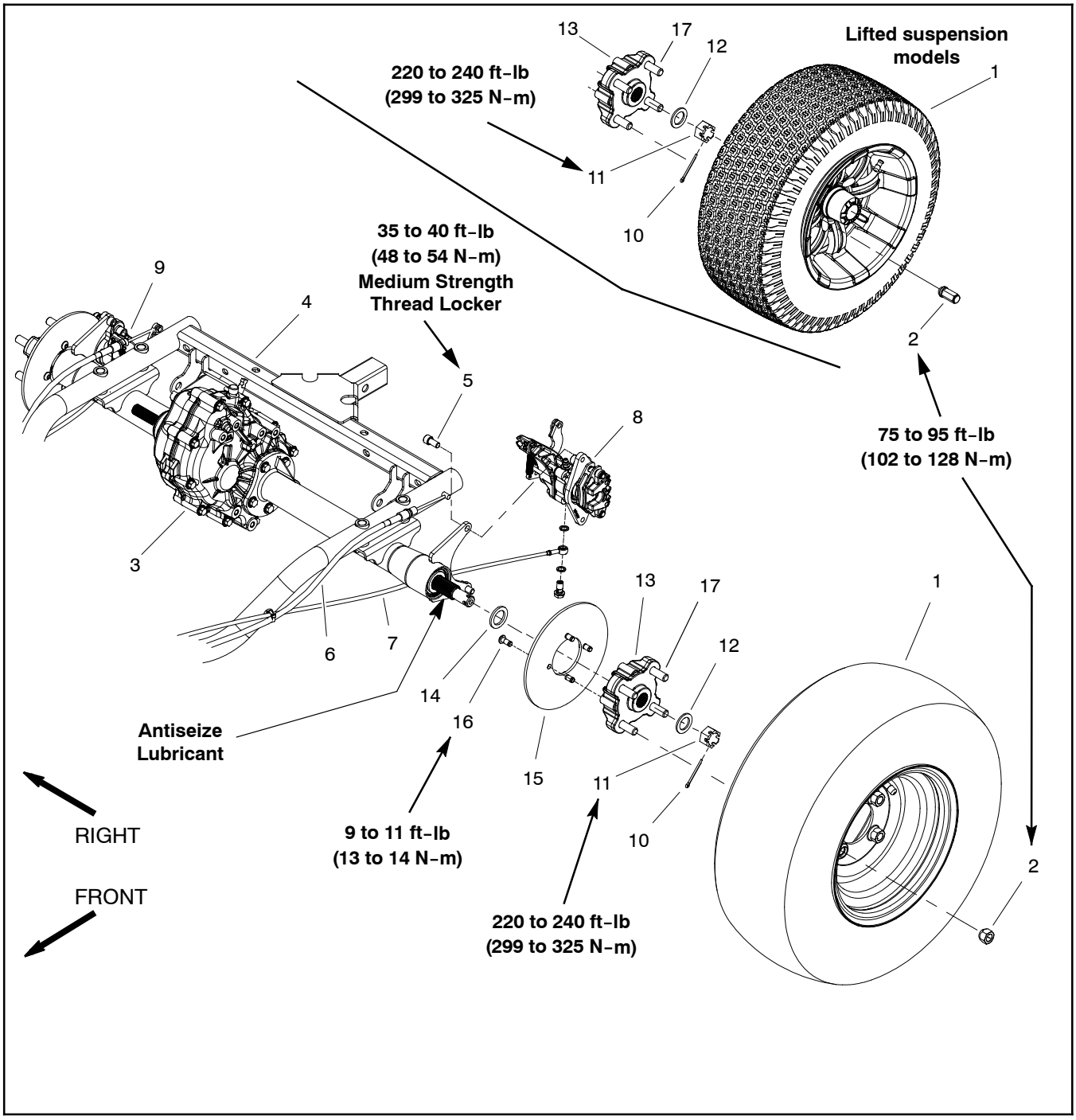

Figure 13

1. Rear wheel assembly
2. Lug nut (4 per wheel)
3. Transaxle assembly
4. Rear swing arm
5. Socket head screw (2 per caliper)
6. Parking brake cable (2 used)
7. Rear brake line
8. LH brake caliper
9. RH brake caliper
10. Cotter pin
11. Slotted hex nut
12. Thrust washer
13. Wheel hub
14. Hardened spacer
15. Brake rotor
16. Socket head screw (4 per rotor)
17. Wheel stud (4 per hub)

Removal (Fig. 13)

1. Park vehicle on a level surface, stop engine and remove key from the key switch. Do not apply parking brake.

WARNING

Before jacking up the vehicle, review and follow Jacking Instructions in Chapter 1 - Safety.

2. Chock wheels not being removed. Use a jack to raise rear wheel that is to be removed off the ground. Support vehicle with appropriate jack stands beneath the frame.

3. Remove four (4) lug nuts and then remove rear wheel assembly from the wheel hub.

4. Remove two (2) socket head screws that secure rear brake caliper to the mounts on the transaxle tube. Slide caliper assembly with attached brake line and parking brake cable from brake rotor and support it away from the rear wheel hub.

5. Remove rear wheel hub from transaxle shaft:

   A. Remove cotter pin from the slotted hex nut and transaxle shaft.

   B. Remove nut, thrust washer, wheel hub and hardened spacer from the shaft. During removal, note differences between thrust washer and hardened spacer for installation purposes. The hardened spacer has a slightly larger OD and ID than the thrust washer.

6. If necessary, separate brake rotor from wheel hub by removing four (4) socket head screws.

7. If necessary, press wheel studs from wheel hub.

Installation (Fig. 13)

1. If brake rotor was removed from wheel hub, place rotor on hub and secure with four (4) socket head screws. Torque screws from **9 to 11 ft-lb (13 to 14 N-m)**.

2. If any wheel studs were removed from wheel hub, use a press to install new studs into hub. Make sure that stud shoulder is fully pressed against housing surface.

IMPORTANT: Do not get antiseize lubricant onto brake rotor or brake pads.

3. Apply a light coating of antiseize lubricant to both the transaxle shaft and splines in wheel hub bore.

4. Install the wheel hub to the transaxle shaft:

   A. Install hardened spacer, wheel hub and then thrust washer onto the transaxle shaft.

   B. Secure wheel hub assembly with slotted hex nut. Torque slotted hex nut from **220 to 240 ft-lb (299 to 325 N-m)**. Make sure that slot in nut aligns with hole in transaxle shaft to allow installation of cotter pin. If necessary, tighten slotted hex nut slightly to align holes for cotter pin installation. DO NOT loosen slotted hex nut to align holes.

   C. Secure slotted hex nut to transaxle shaft with cotter pin.

IMPORTANT: The socket head screws that secure the brake calipers have a patch-lock feature. If screws are being re-installed on vehicle, apply medium strength thread locker to screw threads before installation.

5. Slide brake caliper onto brake rotor. Make sure that rotor is between the brake pads in the caliper. Secure caliper to the mounts on the transaxle tube with socket head screws. Torque screws from **35 to 40 ft-lb (48 to 54 N-m)**.

6. Position rear wheel assembly to the vehicle with valve stem facing out and secure with four (4) lug nuts.

7. Lower vehicle to ground.

8. Torque lug nuts in a crossing pattern from **75 to 95 ft-lb (102 to 128 N-m)**.

9. Check parking brake operation. Adjust parking brake if necessary (see Parking Brake Adjustment in the Adjustments section of this chapter).

CAUTION

After disassembling any brake system components, always check the brakes in a wide open, level area that is free of other persons and obstructions.

10. Check brake operation.

Front Brake Calipers

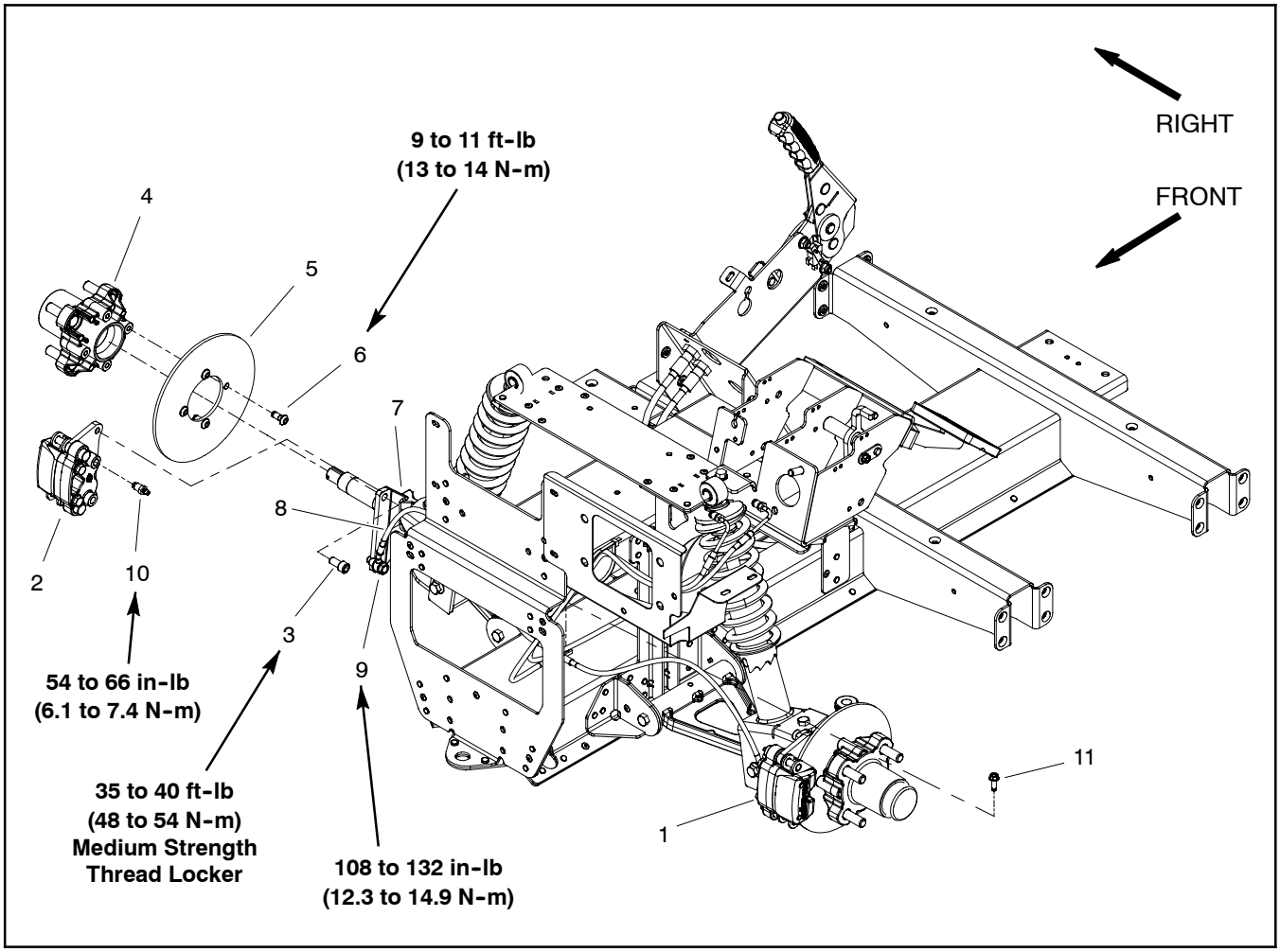

Figure 14

1. LH brake caliper
2. RH brake caliper
3. Socket head screw (2 per caliper)
4. Wheel hub assembly (2 used)
5. Brake rotor (2 used)
6. Socket head screw (4 per rotor)
7. Spindle (RH shown)
8. Front brake line
9. Banjo bolt
10. Bleed screw
11. Washer head screw

Disassembly (Fig. 14)

1. Park machine on a level surface, stop engine, set parking brake and remove key from the key switch.

> **WARNING**
>
> **Before jacking up the machine, review and follow Jacking Instructions in Chapter 1 - Safety.**

2. Chock wheels not being removed. Use a jack to raise front wheel that is to be removed off the ground. Support vehicle with appropriate jack stands beneath the frame.

3. Remove front wheel from machine (see Front Wheels and Hubs in this section).

4. Disconnect brake line from front caliper (Fig. 15):

   A. Clean hydraulic brake line area of brake caliper to prevent contamination of brake system.

   B. Remove banjo bolt that secures brake line fitting to caliper.

   C. Carefully separate brake line from caliper. Locate and retrieve two (2) banjo washers from sides of brake line fitting.

   D. Plug brake line and position it away from caliper.

5. Remove two (2) socket head screws that secure the brake caliper to the spindle.

6. Slide brake caliper from brake rotor and remove caliper from vehicle.

7. Inspect front brake rotor for wear or damage. Minimum brake rotor thickness is **0.154" (3.9 mm)**. If brake rotors need to be removed from vehicle, refer to Front Wheels and Hubs in this section.

Assembly (Fig. 14)

1. Make sure that brake rotor is properly secured to wheel hub (see Front Wheels and Hubs in this section).

2. Slide brake caliper onto brake rotor. Make sure that rotor is between brake pads.

IMPORTANT: The socket head screws that secure the brake calipers have a patch-lock feature. If screws are being re-installed on vehicle, apply medium strength thread locker to screw threads before installation.

3. Align caliper mounting holes with spindle. Secure caliper with two (2) socket head screws. Torque screws from **35 to 40 ft-lb (48 to 54 N-m)**.

4. Connect brake line to front brake caliper (Fig. 15):

   A. Position brake line to caliper.

   B. Place banjo washer on each side of brake line fitting.

   C. Install banjo bolt through brake line fitting and banjo washers and then thread into caliper. Torque banjo bolt from **108 to 132 in-lb (12.3 to 14.9 N-m)**.

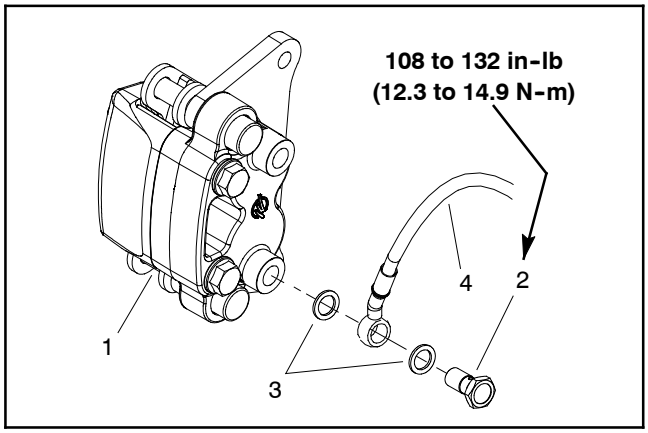

Figure 15

1. **Front caliper (RH)**
2. **Banjo bolt**
3. **Banjo washer (2 used)**
4. **Brake line**

5. Install front wheel assembly (see Front Wheels and Hubs in this section).

6. Lower machine to ground.

7. Make sure that wheel lug nuts are torqued in a crossing pattern from **75 to 95 ft-lb (102 to 128 N-m)**.

8. Bleed brakes (see Bleed Brake System in this section).

> **CAUTION**
>
> **After servicing brake system components, always check the brakes in a wide open, level area that is free of other persons and obstructions.**

9. Check brake operation.

Burnish Brake Pads

After brake pad replacement, burnish (break-in) the brakes before use.

1. Bring the machine to full speed and apply the brakes to rapidly stop the machine without skidding or locking up the wheels.

2. Repeat this procedure 10 times. To avoid overheating the brakes, wait 1 minute between each stop.

Front Brake Caliper Service

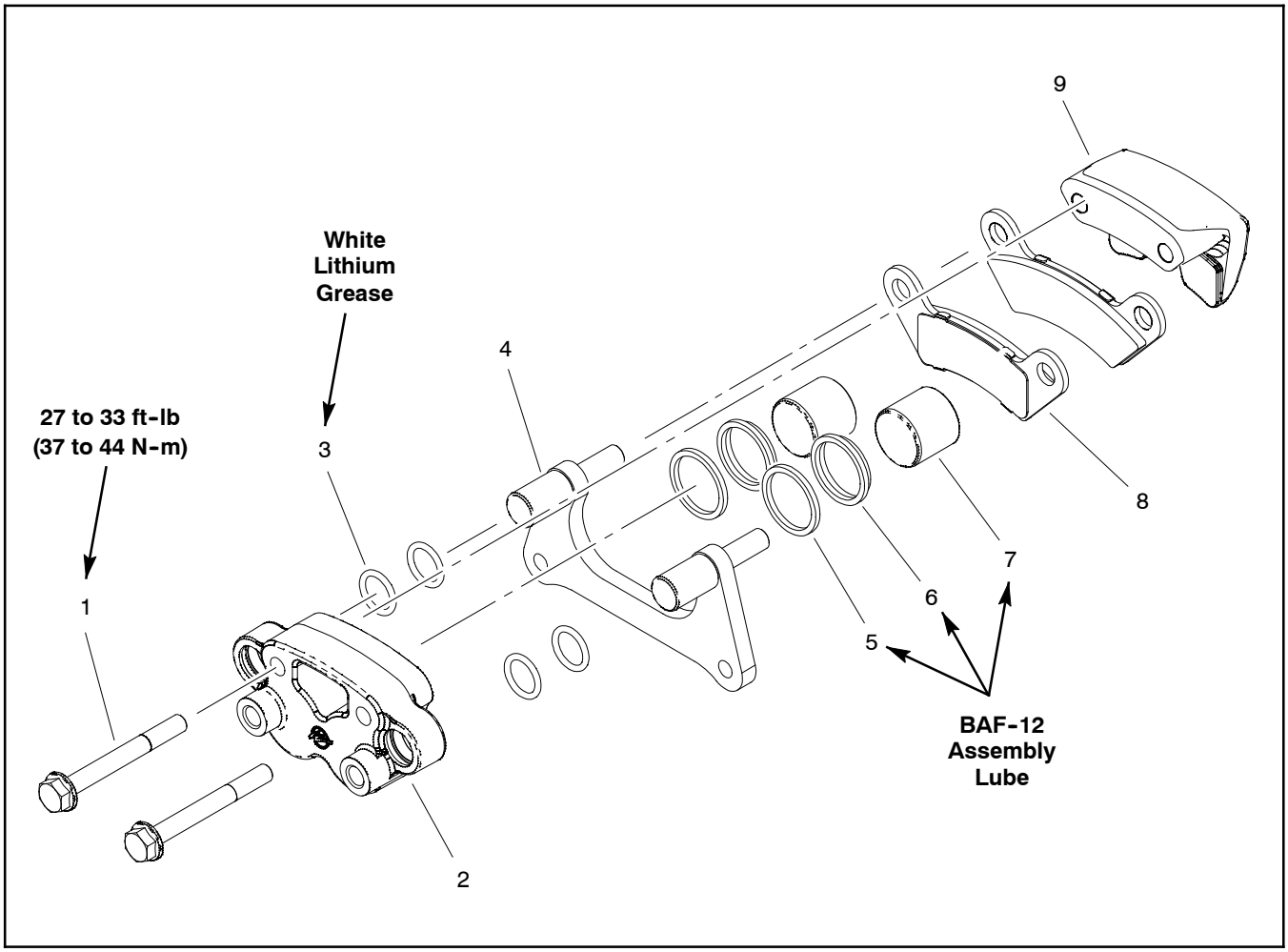

Figure 16

1. Bolt (2 used)
2. Caliper body
3. O-ring (4 used)
4. Caliper bracket
5. Square seal (2 used)
6. Dust seal (used)
7. Piston (2 used)
8. Brake pad (2 used)
9. Caliper anvil

Disassembly (Fig. 16)

1. Remove two (2) bolts that secure brake caliper body to the caliper anvil.

2. Remove caliper anvil and then slide brake pads from pins on caliper bracket.

3. Slide caliper body assembly from caliper bracket.

4. If necessary, remove remaining components from caliper body:

   A. Carefully remove pistons from caliper body making sure that outer surface of pistons are not damaged during removal.

   B. Carefully, remove and discard O−rings, square seals and dust seals from caliper body. Make sure that caliper body is not damaged during removal of O−rings and seals.

5. Clean caliper components with brake cleaner.

Inspection

1. Check brake pads for uneven wear that would indicate binding in the caliper assembly. Replace the brake pads if the friction material is worn to less than **1/16" (1.6 mm)**. Also, if pads are contaminated with grease or oil, they must be replaced.

2. Inspect brake pistons and piston bores in caliper body for damage or wear. Replace brake pistons or complete brake caliper assembly if necessary.

3. Check that pins on caliper bracket are not worn, corroded or damaged. Wear on the pins will prevent smooth brake operation.

Assembly (Fig. 16)

1. If caliper body was disassembled, install components in caliper body:

   A. Apply hydraulic brake cylinder assembly lube (BAF−12 or equivalent) to square seals, dust seals and piston before installation.

   B. Fit lubricated seals into grooves of caliper body. Make sure that seals are not twisted in groove after installation.

   C. Install lubricated pistons into caliper body bores. Pistons should slide into bores with light resistance.

   D. Lubricate O−rings with white lithium grease and install into grooves in caliper body.

   E. Slide caliper body assembly onto pins on caliper bracket.

NOTE: If brake pads are being replaced, it will be necessary to push caliper pistons back into the caliper bore before installing new pads.

2. Slide brake pads onto pins on caliper bracket. Make sure that friction material on pads is toward brake rotor position.

3. Fit caliper anvil to assembly and secure caliper components with two (2) bolts. Tighten bolts from **27 to 33 ft−lb (37 to 44 N−m)**.

Rear Brake Calipers

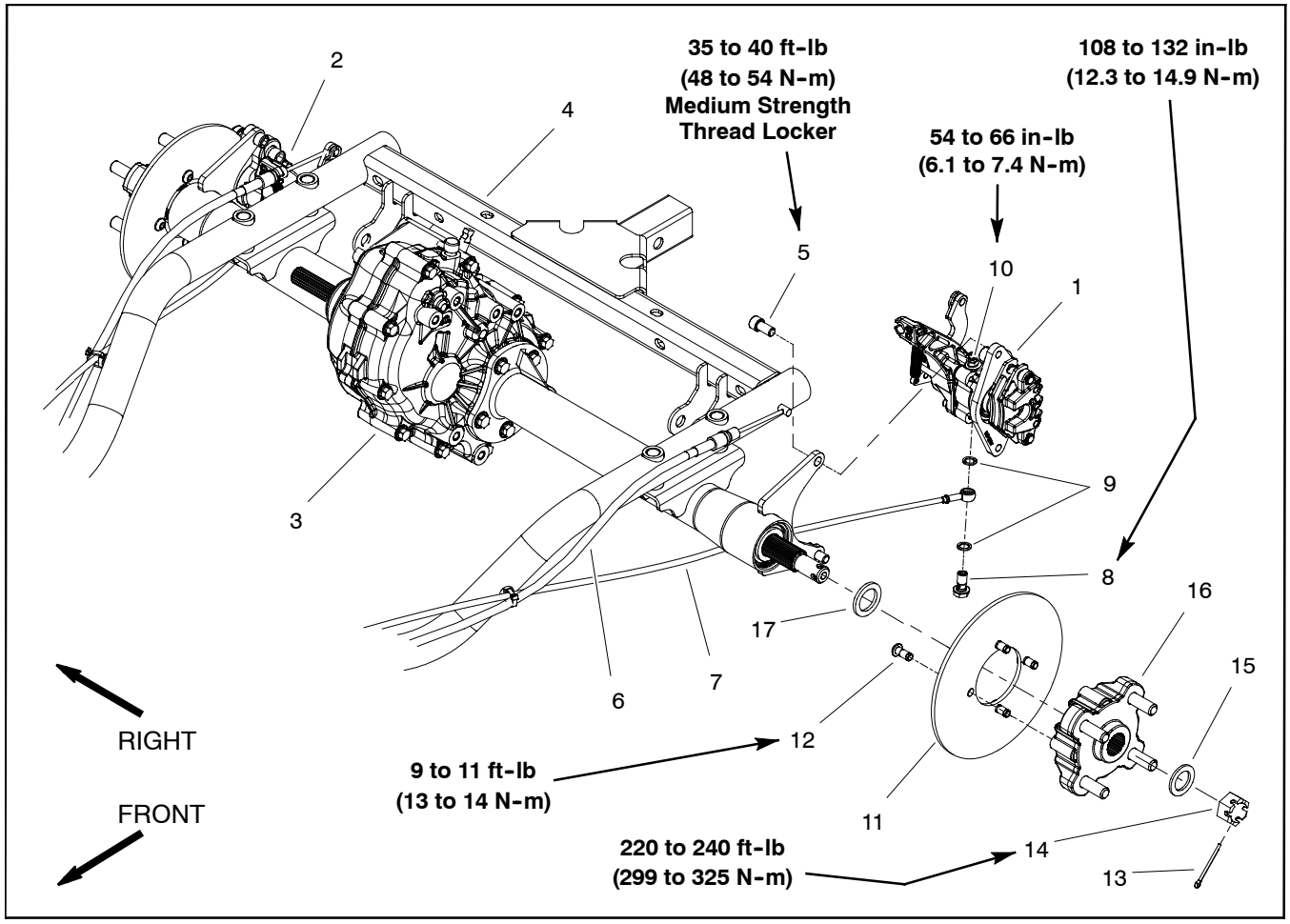

Figure 17

1. LH rear brake caliper assembly
2. RH rear brake caliper assembly
3. Transaxle assembly
4. Rear swing arm
5. Socket head screw (2 per caliper)
6. Parking brake cable (2 used)
7. Rear brake line
8. Banjo bolt
9. Banjo washer (2 per caliper)
10. Bleed screw
11. Rear brake rotor
12. Socket head screw (4 per rotor)
13. Cotter pin
14. Slotted hex nut
15. Thrust washer
16. Rear wheel hub
17. Hardened spacer

Removal (Fig. 17)

1. Park vehicle on a level surface, stop engine and remove key from the key switch. Do not apply parking brake.

WARNING

Before jacking up the vehicle, review and follow Jacking Instructions in Chapter 1 - Safety.

2. Chock wheels not being removed. Use a jack to raise rear wheel that is to be removed off the ground. Support vehicle with appropriate jack stands beneath the frame.

3. Remove rear wheel from machine (see Rear Wheels and Hubs in this section).

4. Disconnect parking brake cable from rear brake caliper (Fig. 18):

A. Make sure that parking brake is released.

B. Loosen parking brake adjustment by loosening lock nut and then loosen parking brake rod two (2) turns.

C. Rotate brake lever on caliper toward front of vehicle and hold lever in place. Carefully pull parking brake cable to release cable conduit from caliper bracket and then rotate parking cable to allow removal of cable end from parking brake lever.

D. Position disconnected parking brake cable away from brake caliper.

5. Disconnect brake line from rear brake caliper:

   A. Clean brake line area of brake caliper to prevent contamination of brake system.

   B. Remove banjo bolt that secures brake line fitting to caliper.

   C. Carefully separate brake line from caliper. Locate and retrieve two (2) banjo washers from sides of brake line fitting.

   D. Plug brake line and position it away from caliper.

6. Remove two (2) socket head screws that secure the brake caliper to the mounts on the transaxle tubes.

7. Slide brake caliper from brake rotor and remove caliper from vehicle.

8. Inspect rear brake rotor for wear or damage. Minimum brake rotor thickness is **0.154" (3.9 mm)**. If brake rotors need to be removed from vehicle, refer to Rear Wheels and Hubs in this section.

Installation (Fig. 17)

IMPORTANT: When installing rear brake calipers, make sure that parking brake levers extend toward the upper side of the calipers.

1. Make sure that brake rotor is properly secured to wheel hub (see Rear Wheels and Hubs in this section).

IMPORTANT: The socket head screws that secure the brake calipers have a patch-lock feature. If screws are being re-installed on vehicle, apply medium strength thread locker to screw threads before installation.

2. Slide rear brake caliper onto brake rotor. Make sure that rotor is between the brake pads in the caliper. Secure caliper to the mounts on the transaxle tube with socket head screws. Torque screws to **35 to 40 ft-lb (48 to 54 N-m)**.

3. Connect brake line to rear brake caliper:

   A. Place washer on each side of brake line fitting.

   B. Install banjo bolt through brake line fitting and banjo washers and then thread into caliper. Torque banjo bolt from **108 to 132 in-lb (12.3 to 14.9 N-m)**.

4. Connect parking brake cable to rear brake caliper (Fig. 18):

   A. Make sure that parking brake is not applied.

   B. Insert brake cable end into parking brake lever.

   C. Rotate brake lever on caliper toward front of vehicle and hold lever in place. Then, insert cable into caliper bracket and slowly release brake lever to align cable conduit with caliper bracket.

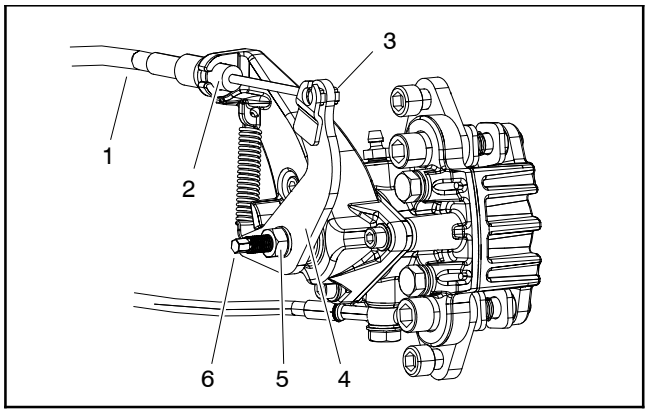

Figure 18

1. **Parking brake cable**
2. **Cable conduit**
3. **Cable end**
4. **Parking brake lever**
5. **Lock nut**
6. **Parking brake rod**

5. Install rear wheel assembly (see Rear Wheels and Hubs in this section).

6. Lower vehicle to ground.

7. Make sure that rear wheel lug nuts are torqued in a crossing pattern from **75 to 95 ft-lb (102 to 128 N-m)**.

8. Adjust parking brake (see Parking Brake Adjustment in the Adjustments section of this chapter).

9. Bleed brakes (see Bleed Brake System in this section).

CAUTION

After servicing brake system components, always check the brakes in a wide open, level area that is free of other persons and obstructions.

10. Check brake operation.

Burnish Brake Pads

After brake pad replacement, burnish (break-in) the brakes before use.

1. Bring the machine to full speed and apply the brakes to rapidly stop the machine without skidding or locking up the wheels.

2. Repeat this procedure 10 times. To avoid overheating the brakes, wait 1 minute between each stop.

Rear Brake Caliper Service

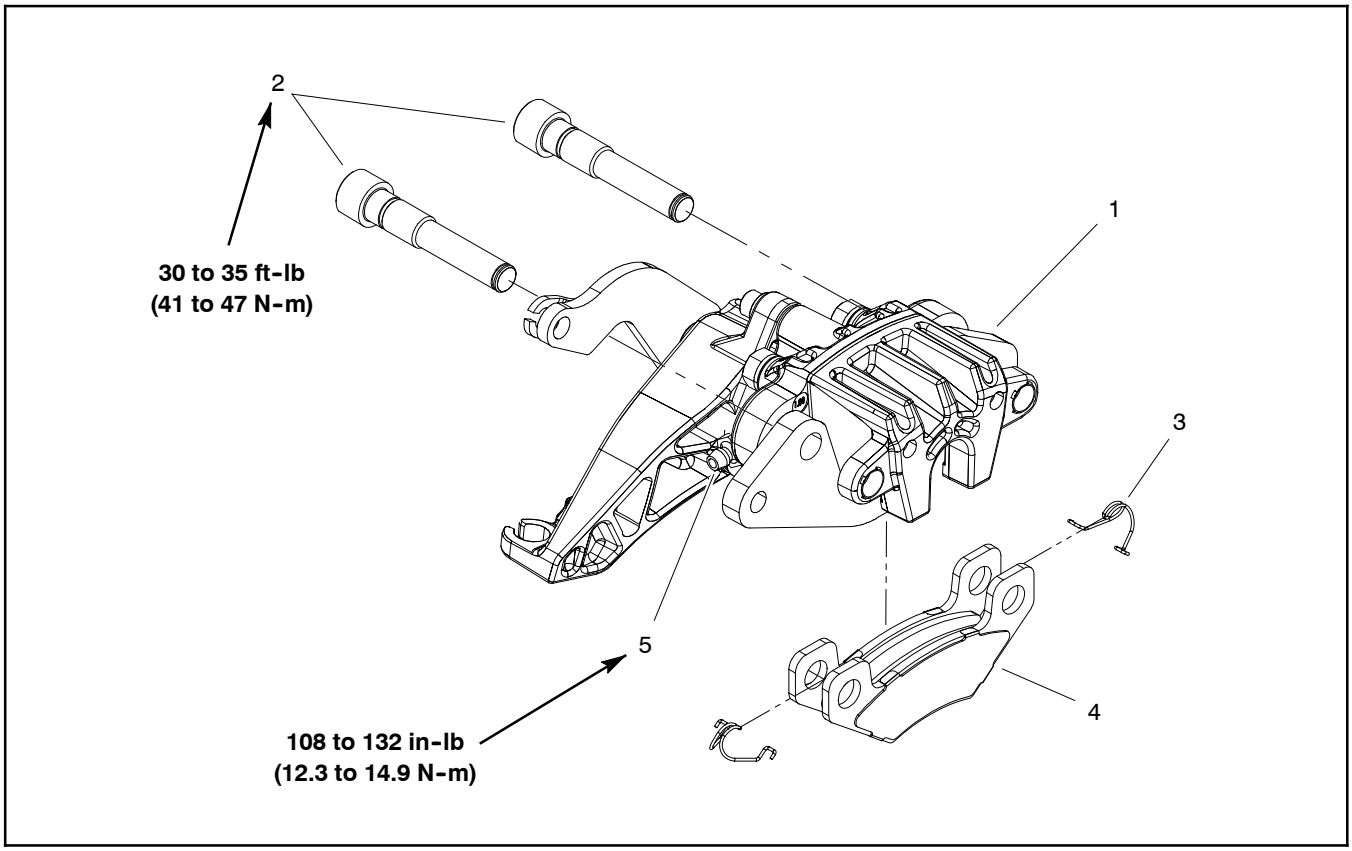

Figure 19

1. **Brake caliper assembly (LH shown)**
2. **Caliper slide pin (2 used)**
3. **Anti-rattle spring (2 used)**
4. **Brake pad assembly**
5. **Bleed screw**

NOTE: Replacement parts for the rear caliper assembly are limited to the brake pad assembly and bleed screw. If any other caliper components are damaged or worn, replace the caliper assembly.

Disassembly (Fig. 19)

1. Remove two (2) caliper slide pins that secure brake pads to the caliper assembly.

2. Slide brake pads with attached anti−rattle springs from caliper.

3. Remove anti−rattle springs from brake pads.

4. Clean caliper components with brake cleaner.

Inspection

1. Check brake pads for uneven wear that might indicate binding in the caliper assembly. Replace the brake pads if the friction material is worn to less than **1/16" (1.6 mm)**. Also, if pads are contaminated with grease or oil, they must be replaced.

2. Check that slide pins are not worn or damaged. Wear on the pins will prevent smooth brake operation.

3. If caliper damage or wear exists, replace complete brake caliper assembly as caliper components are not available separately.

Assembly (Fig. 19)

1. If brake pads are being replaced, it will be necessary to push the caliper piston back into the caliper bore before installing new pads:

   A. Loosen lock nut on parking brake push rod and then unscrew the push rod that threads into the brake armature in the caliper (Fig. 20).

   B. While loosening push rod, make sure that lock nut remains loose on push rod. Also, periodically push caliper piston back into caliper until there is sufficient room in the caliper for the brake pads and brake rotor.

   C. Leave lock nut on push rod loose so that parking brake can be adjusted after caliper installation.

2. Place brake pads with friction material positioned toward brake rotor position. Then, install anti−rattle springs to holes in brake pads.

3. Slide brake pads with attached anti−rattle springs into caliper. Make sure that friction material on pads is toward brake rotor location.

4. Secure brake pads to the caliper assembly with two (2) caliper slide pins. Make sure that the slide pins are inserted through the center of the anti−rattle springs. Tighten pins from **30 to 35 ft−lb (41 to 47 N−m)**.

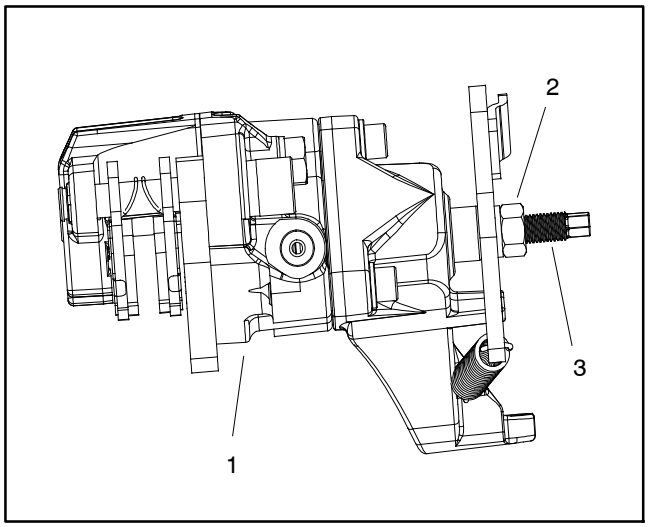

Figure 20

1. **Caliper (LH shown)**
2. **Lock nut**
3. **Parking brake rod**

Parking Brake Cables and Lever Assembly

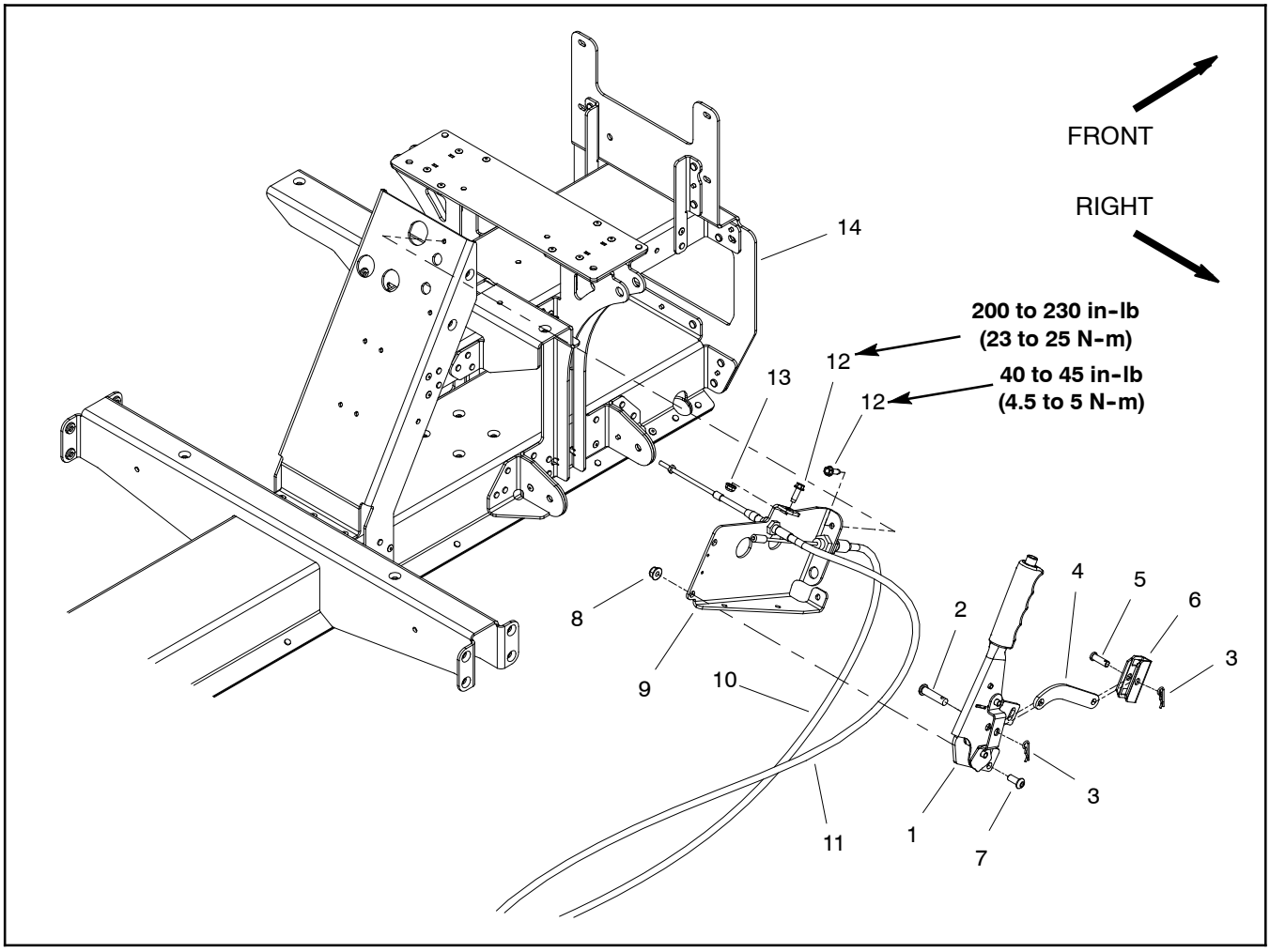

Figure 21

1. **Parking brake lever**
2. **Clevis pin**
3. **Hair pin (2 used)**
4. **Parking brake link**
5. **Clevis pin**
6. **Cable equalizer bracket**
7. **Button head screw (2 used)**
8. **Flange nut (2 used)**
9. **Parking brake mount**
10. **Parking brake cable (2 used)**
11. **Shift cable**
12. **Washer head screw (3 used)**
13. **Flange nut**
14. **Front frame**

NOTE: The parking brake assembly includes the dash mounted parking brake lever, two (2) identical brake cables and parking brake actuators in the rear brake calipers.

Disassembly (Fig. 21)

1. Park vehicle on a level surface, stop engine and remove key from the key switch. Chock wheels to prevent the vehicle from moving.

2. Disconnect both parking brake cables from rear brake calipers (Fig. 22):

   A. Make sure that parking brake is released.

   B. Loosen parking brake adjustment by loosening lock nut and then loosen parking brake rod two (2) turns.

   C. Rotate brake lever on caliper toward front of vehicle and hold lever in place. Carefully pull parking brake cable to release cable conduit from caliper bracket and then rotate parking cable to allow removal of cable end from parking brake lever.

   D. Position disconnected parking brake cable away from brake caliper.

3. Carefully separate parking brake cables from four (4) clips on swing arm.

4. Remove dash and position it toward the front of the vehicle to allow access to parking brake cables and brake lever (see Dash in this section). It is not necessary to remove choke cable from dash.

5. Loosen the jam nuts that secure parking brake cables to parking brake mount.

6. Remove clevis pin and hair pin that secure cable equalizer bracket (item 6) to parking brake link.

7. Remove parking brake cables from cable equalizer bracket. Once cables are removed from equalizer, remove ends of brake cables from jam nut and brake mount.

8. Note routing of brake cables for assembly purposes.

9. Carefully remove brake cables by pulling them through front frame toward front of vehicle.

10. If necessary, remove parking brake lever components using Figure 21 as a guide.

Assembly (Fig. 21)

1. Install removed parking brake lever components using Figure 21 as a guide.

2. Carefully route parking brake cables through the front frame and toward the rear wheels using cable routing noted during disassembly. Position the brake cables in the vehicle so that the cable ends are close to the rear brake calipers and the parking brake lever assembly.

3. Secure brake cables to parking brake lever assembly:

   A. Insert both brake cable ends through parking brake mount and then through jam nuts.

   B. Insert both cable ends into cable equalizer bracket.

   C. Secure cable equalizer bracket with attached cable ends to parking brake link with clevis pin and hair pin.

   D. Install and tighten the jam nuts to secure parking brake cables to parking brake mount.

4. Connect both parking brake cables to rear brake caliper (Fig. 22):

   A. Make sure that parking brake is not applied.

   B. Insert parking brake cable end into parking brake lever.

   C. Rotate brake lever on caliper toward front of vehicle and hold lever in place. Then, insert cable into caliper bracket and slowly release brake lever to align cable conduit with caliper bracket.

   D. Secure brake cables to swing arm with four (4) clips.

5. Adjust parking brake on both rear wheel calipers (see Parking Brake Adjustment in the Adjustments section of this chapter).

6. Check parking brake operation.

7. Carefully position and secure dash to vehicle (see Dash in this section).

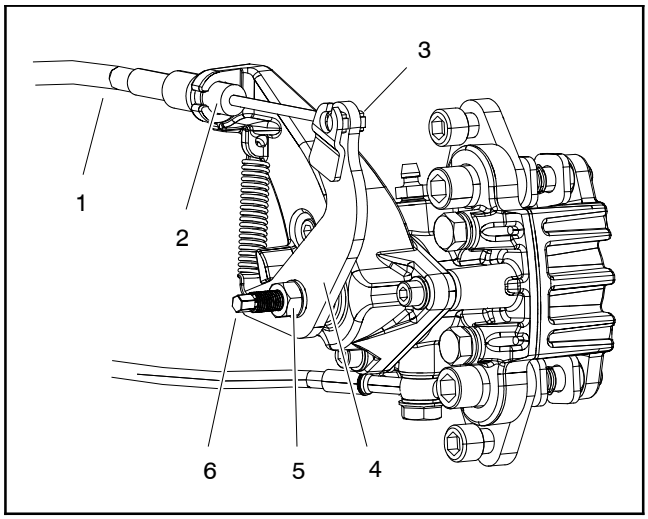

Figure 22

1. **Parking brake cable**
2. **Cable conduit**
3. **Cable end**
4. **Parking brake lever**
5. **Lock nut**
6. **Parking brake rod**

Brake Master Cylinder

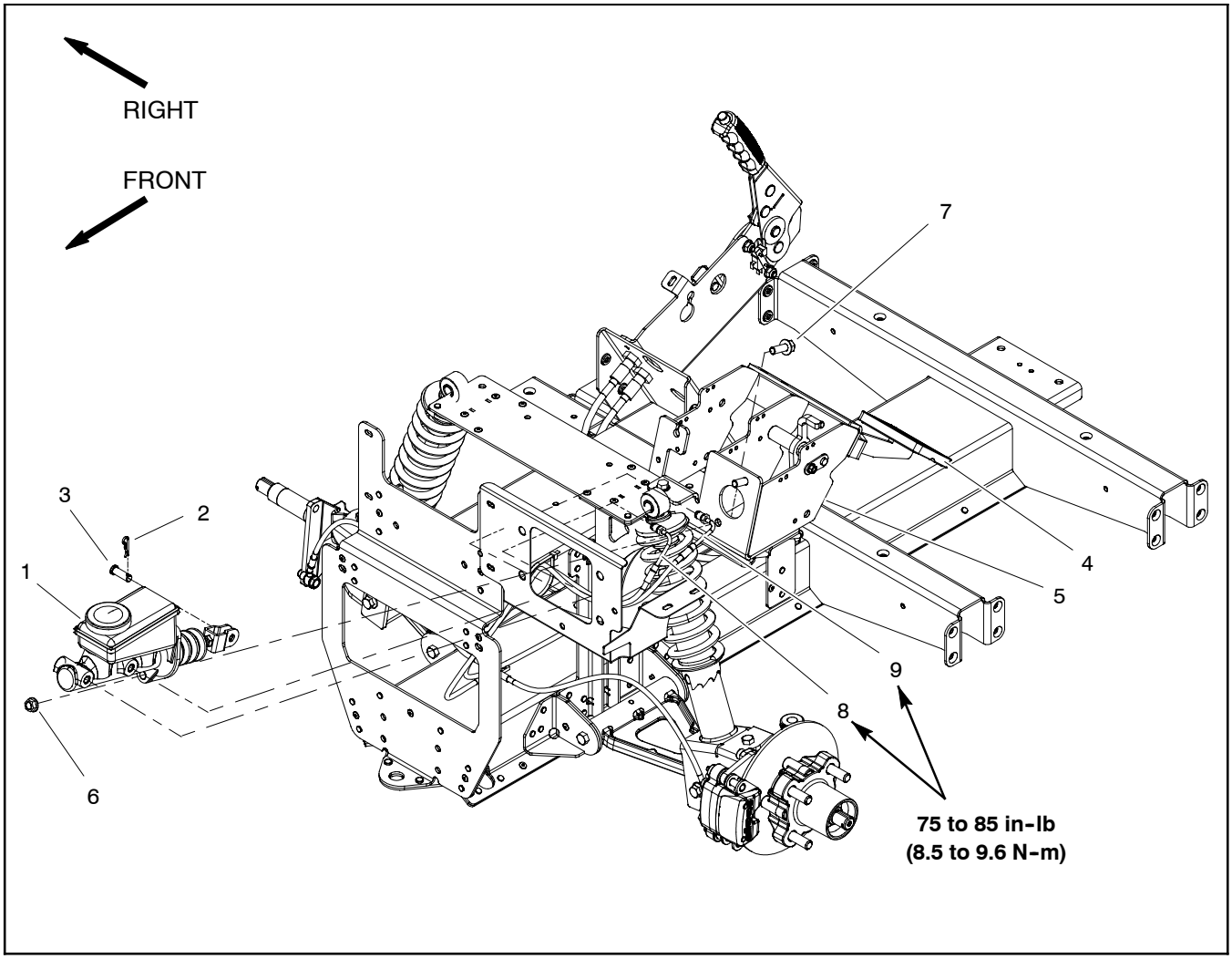

Figure 23

1. **Master cylinder**
2. **Hair pin**
3. **Clevis pin**
4. **Brake pedal**
5. **Pedal mount**
6. **Flange nut (2 used)**
7. **Flange head screw (2 used)**
8. **Front brake line**
9. **Rear brake line**

Removal (Fig. 23)

1. Park machine on a level surface, stop engine, set parking brake and remove key from the key switch.

2. Raise front hood to gain access to master cylinder.

3. Remove hair pin from the clevis pin that connects master cylinder to brake pedal.

IMPORTANT: To prevent contamination of the brake system, make sure to clean master cylinder components before disassembly.

4. Clean hydraulic brake line area of master cylinder to prevent contamination. Remove both brake lines from master cylinder. Cap ends of brake lines and carefully position them away from master cylinder.

5. Remove two (2) flange nuts and flange head screws that secure master cylinder to pedal mount.

6. Carefully remove master cylinder from vehicle.

Installation (Fig. 23)

1. Position master cylinder to pedal mount and secure with flange head screws and flange nuts.

2. Remove plugs from brake lines. Install brake lines to master cylinder. Torque brake lines from **75 to 85 in-lb (8.5 to 9.6 N-m)**.

3. Connect master cylinder to brake pedal with clevis pin and hair pin.

4. Bleed brakes (see Bleed Brake System in this section).

5. Lower and secure front hood.

CAUTION

After servicing brake system components, always check the brakes in a wide open, level area that is free of other persons and obstructions.

6. Check brake operation.

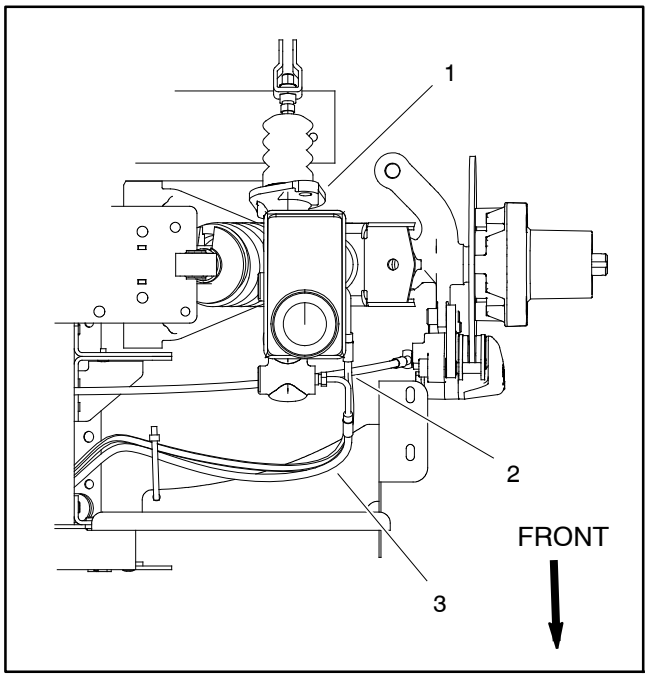

Figure 24

1. **Master cylinder**
2. **Rear brake line**
3. **Front brake line**

Brake Master Cylinder Service

Disassembly (Fig. 25)

1. Thoroughly clean outside of master cylinder before disassembly.

2. Remove reservoir and flange seal. Push in on the push rod so the stop pin can be removed.

3. Disconnect lower end of the dust cover from the housing.

4. Push in on the push rod and remove circlip, then remove push rod with dust cover and clevis. Remove retainer washer.

5. Remove primary piston assembly and secondary piston assembly from cylinder housing.

Inspection

CAUTION

Use eye protection such as goggles when using compressed air for master cylinder service.

1. Clean all metal parts with isopropyl alcohol, then clean out and dry grooves and passageways with compressed air. Make sure cylinder bore and component pieces are thoroughly clean.

2. Check cylinder bore, pistons and springs for damage or excessive wear. Replace brake cylinder assembly if signs of pitting, scoring or cracks are evident in cylinder bore.

Assembly (Fig. 25)

1. Apply a film of clean brake fluid to cylinder bore and piston assemblies.

2. Install secondary piston assembly and primary piston assembly into cylinder.

3. Install retainer washer.

4. Install push rod and secure in place with circlip. Install lower end of dust cover to housing.

5. Push in on push rod so stop pin can be installed to retain secondary piston assembly, then install flange seal and reservoir.

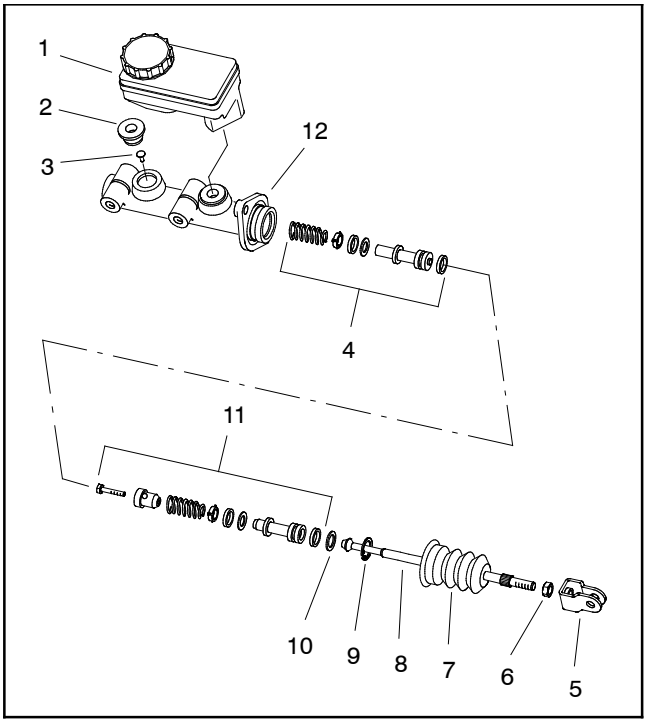

Figure 25

1. **Reservoir**
2. **Flange seal**
3. **Stop pin**
4. **Secondary piston assy**
5. **Clevis**
6. **Jam nut**
7. **Dust cover**
8. **Push rod**
9. **Circlip**
10. **Retainer washer**
11. **Primary piston assy**
12. **Cylinder housing**

Bleed Brake System

IMPORTANT: To prevent contamination of the brake system, make sure to clean components before disassembly.

1. Park machine on a level surface, stop engine and remove key from the key switch. Do not apply parking brake.

1. Connect a suitable transparent hose to bleeder valve on front or rear brake caliper. Submerge other end of hose in a glass container partially filled with clean brake fluid.

2. Have a second person pump brake pedal several times, then hold pedal down firmly.

3. With pedal firmly depressed, open bleeder valve of brake until pedal fades to floor. Close bleeder valve before releasing pedal.

4. Repeat procedure until a continuous flow of brake fluid, with no air bubbles, is released from bleeder valve. **Make sure fluid level is maintained in brake fluid reservoir at all times**.

5. Torque bleeder valve from **54 to 66 in-lb (6.1 to 7.4 N-m)**.

6. Repeat steps 1 to 5 for other brake calipers.

CAUTION

After servicing the brakes, always check the brakes in a wide open, level area that is free of other persons and obstructions.

7. After bleeding of brakes is completed, test vehicle to make sure brakes are operating correctly and brake pedal is firm when applying brakes.

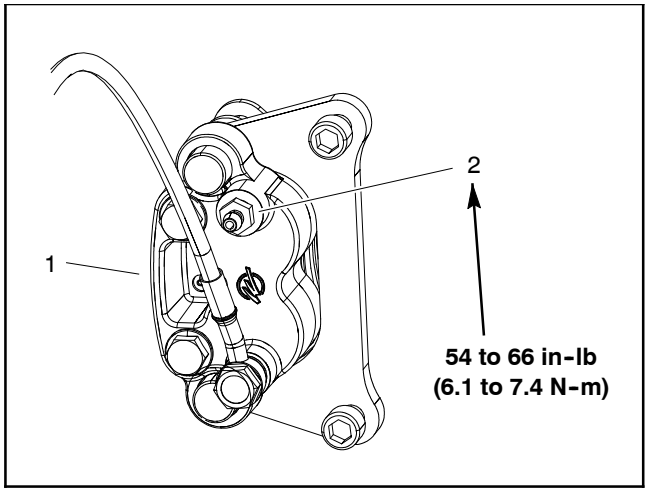

Figure 26

1. Front caliper (RH shown) 2. Bleeder valve

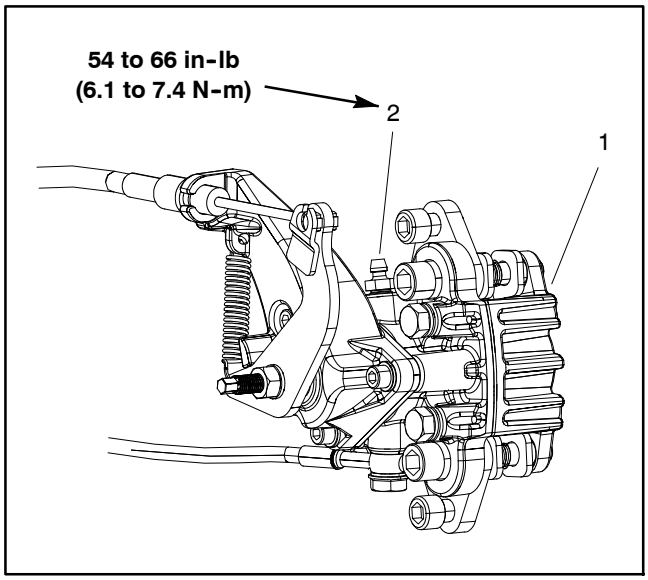

Figure 27

1. Rear caliper (RH shown) 2. Bleeder valve

Steering Assembly

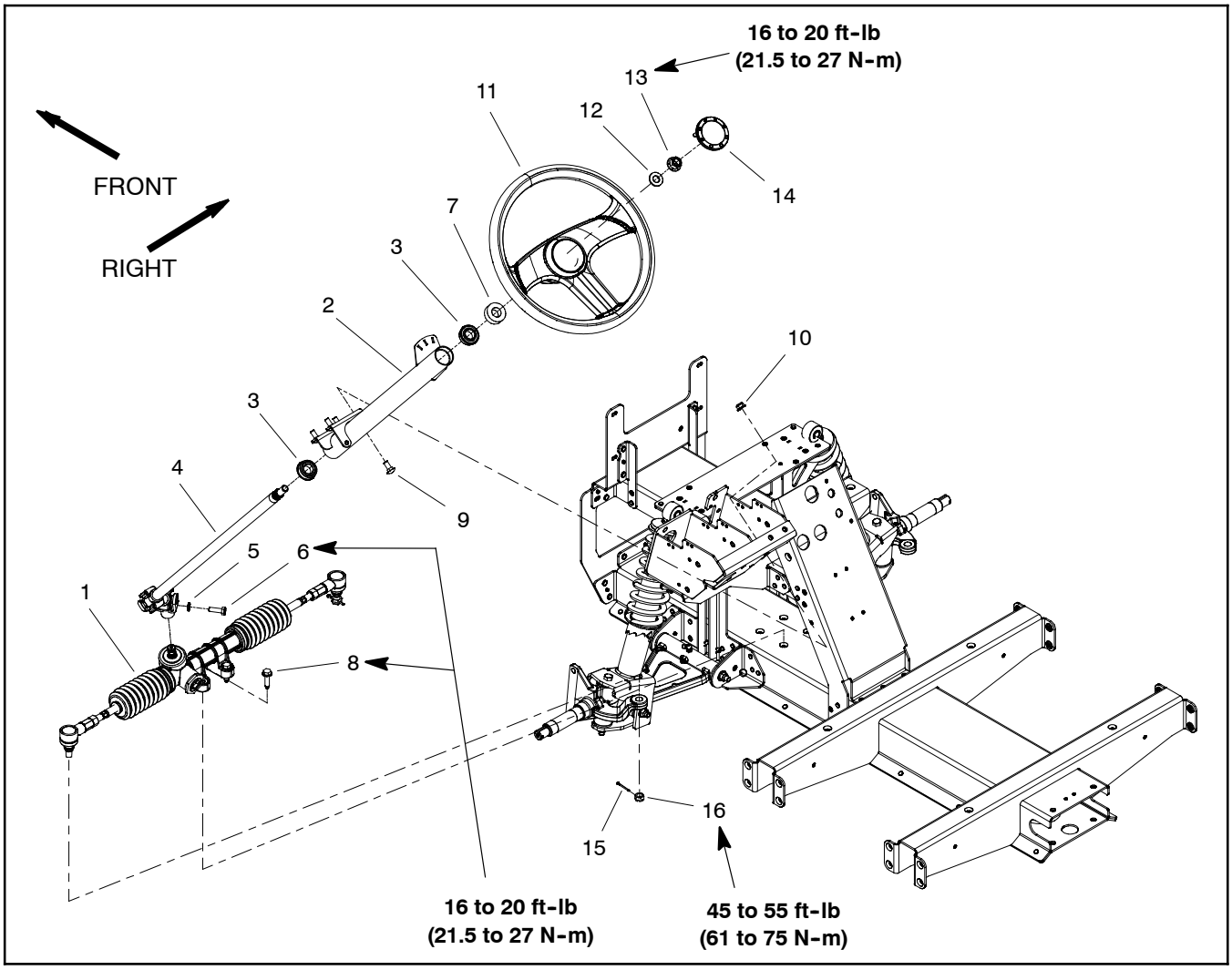

Figure 28

1. **Steering rack assembly**
2. **Steering column**
3. **Bearing (2 used)**
4. **Steering shaft**
5. **Lock washer**
6. **Cap screw**
7. **Dust cover**
8. **Washer head screw (4 used)**
9. **Carriage bolt (4 used)**
10. **Flange nut (4 used)**
11. **Steering wheel**
12. **Flat washer**
13. **Lock nut**
14. **Steering wheel cap**
15. **Cotter pin (2 used)**
16. **Slotted hex nut (2 used)**

Disassembly (Fig. 28)

1. Park vehicle on a level surface, stop engine, set parking brake and remove key from the key switch.

2. Raise front hood to gain access to the steering components.

3. Carefully remove steering wheel cover from the steering wheel. Remove nut and flat washer securing the steering wheel to the steering shaft.

4. Use suitable puller to remove steering wheel from steering shaft.

5. Remove dash and position it toward the front of the vehicle to allow the steering column to be moved (see Dash in this section). It is not necessary to remove choke cable from dash.

6. Remove cap screw and lock washer securing the lower steering shaft joint to the steering rack assembly input shaft.

7. Disconnect extension spring that tensions shift lever detent arm (Fig. 29).

8. Support steering column to prevent it from falling. Remove four (4) flange nuts and carriage bolts securing the steering column to the mounting plate on the frame.

9. Lift up on steering column assembly, slide lower steering shaft joint from the steering rack assembly input shaft and remove steering column from vehicle.

10. Remove dust cover from the steering shaft. Replace cover if damaged.

11. Slide steering shaft and bearings out of the steering column.

A. Check steering shaft universal joints for roughness that would indicate bearing wear or damage. Replace steering shaft if universal joint bearing damage exists.

B. Check bearings for evidence of wear or damage and replace bearings if necessary.

12. Disconnect both steering rack tie rods from the spindles at the front wheel hubs (see Front Suspension in this section).

13. Remove four (4) washer head screws that secure the steering rack assembly to the front frame. Remove rack assembly from the vehicle.

NOTE: Refer to Steering Rack Assembly Service in this chapter for information on repair of the steering rack assembly.

Assembly (Fig. 28)

1. Position steering rack assembly to the front frame with the input shaft toward the left side of the vehicle.

2. Secure rack assembly to the frame with four (4) washer head screws. Torque screws from **16 to 20 ft-lb (21.5 to 27 N-m)**.

3. Insert steering shaft up through the steering column.

4. Position steering column assembly to vehicle frame and slide lower steering shaft joint onto the steering rack input shaft. Secure steering column to the mounting plate on the frame with four (4) carriage bolts and flange nuts.

5. Secure lower steering shaft joint to the steering rack input shaft with cap screw and lock washer. Torque screw from **16 to 20 ft-lb (21.5 to 27 N-m)**.

6. Install extension spring to tension shift lever detent arm (Fig. 29).

7. Place dust cover onto the steering shaft.

8. Connect both steering rack tie rods to the spindles at the front wheel hubs (see Front Suspension in this section).

9. Make sure that front wheels are centered by the steering rack before securing the steering wheel.

A. Install steering wheel onto steering shaft. Leave steering wheel loose on shaft.

B. Rotate the steering wheel until the distance from the steering rack boot to the tie rod is equal on both sides of vehicle indicating that the front wheels are centered.

C. Rotate the steering wheel from lock to lock and check that the front wheel spindles have equal clearances at end of steering rotation. If one spindle contacts a steering component and the other spindle still has clearance, a rotation of the steering shaft is needed to center the wheels.

D. Once wheels are centered, position steering wheel onto steering shaft so that the steering wheel spokes are centered when the front wheels are centered.

10. Secure steering wheel to steering shaft with flat washer and lock nut. Torque nut from **16 to 20 ft-lb (21.5 to 27 N-m)**. Install steering wheel cover to steering wheel.

11. Carefully position and secure dash to vehicle (see Dash in this section).

12. Lower and secure front hood.

13. Check front wheel alignment and adjust as necessary (see Adjust Front Wheel Toe-in in the Adjustments section of this chapter).

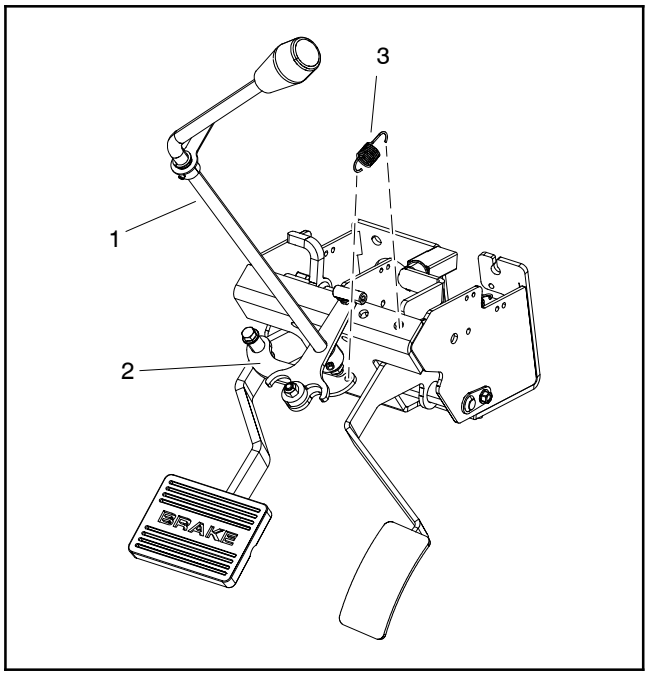

Figure 29

1. **Shift lever**
2. **Detent arm**
3. **Extension spring**

Steering Rack Assembly Service

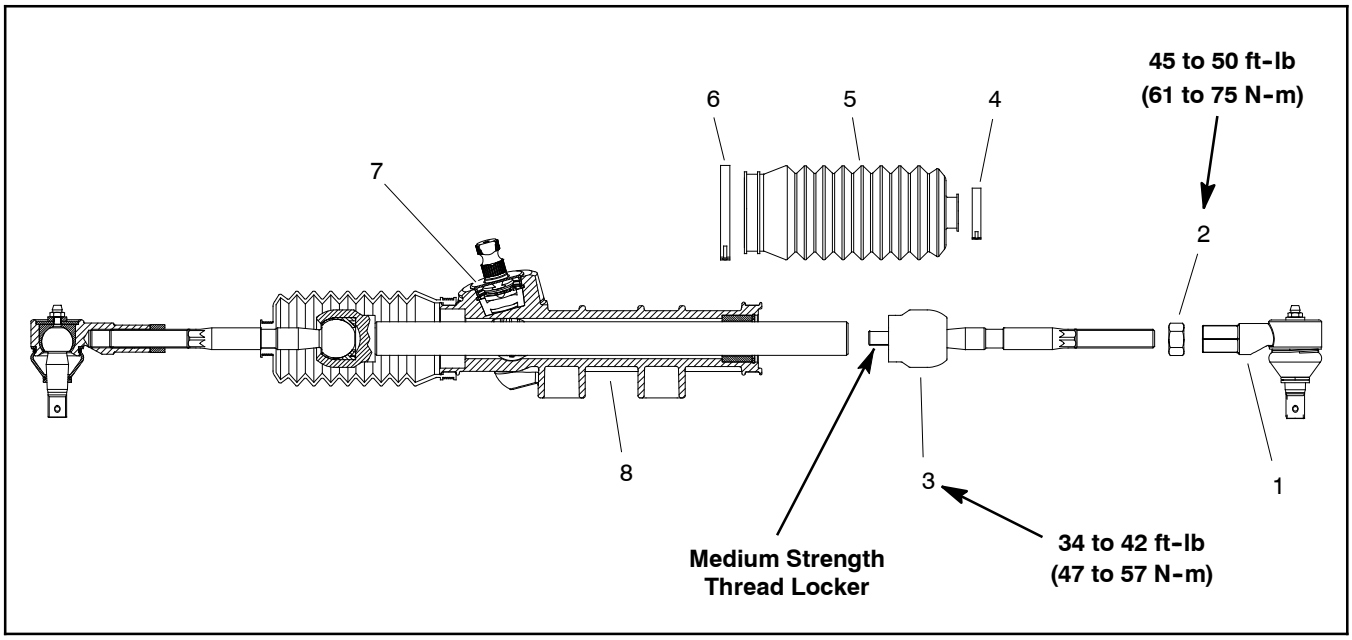

Figure 30

1. **Tie rod end (2 used)**
2. **Jam nut (2 used)**
3. **Tie rod track (2 used)**
4. **Bellows clamp (2 used)**
5. **Bellows (2 used)**
6. **Bellows clamp (2 used)**
7. **Input shaft seal**
8. **Steering rack assembly**

NOTE: Check parts catalog to identify individual components that are available for the steering rack assembly on your Workman GTX vehicle. Depending on wear or damage that exists with the steering rack, replacement of the complete steering rack assembly might be necessary.

Disassembly (Fig. 30)

1. For assembly purposes, measure the distance from shoulder on the tie rod track to the location of the tie rod end (Fig. 31). This will help to adjust front wheel toe-in during assembly of steering rack.

2. Loosen jam nut that secures tie rod end to tie rod track. Remove tie rod end and jam nut from end of tie rod track.

3. Remove clamps that secure bellows to the tie rod track and steering rack housing. Remove bellows from steering rack assembly.

4. Secure steering rack assembly in a vise with soft jaws. Clamp on the mounting surfaces of the rack to prevent damage to internal components.

5. Loosen and remove tie rack track from shaft of steering rack.

6. If necessary, remove input shaft seal from steering rack input shaft (Fig. 32):

   A. Mark and drill two (2) holes in the outer face of the seal.

   B. Thread two (2) self-tapping screws into the drilled holes in the face of the seal.

   C. Use the screws in the face of the seal to pull the seal from the steering rack assembly. Discard seal.

7. Clean and inspect all removed steering rack components. Replace parts that are worn or damaged.

8. Check teeth on steering rack shaft by rotating input shaft to extend rack shaft in one direction, inspect exposed rack teeth and then repeat in opposite direction. If any gear teeth are damaged, steering rack assembly replacement is necessary.

Assembly (Fig. 30)

1. If input shaft seal was removed from steering rack, install new seal into rack. Seal should be pressed fully into bore of rack until it contacts retaining ring in bore (Fig. 32).

2. Lubricate steering rack shaft by rotating input shaft to extend rack shaft in one direction and apply general purpose grease to exposed teeth on rack. Rotate input shaft to extend rack shaft in opposite direction and apply general purpose grease to exposed teeth on rack.

3. Secure steering rack in a vise with soft jaws. Clamp on the mounting surfaces of the rack to prevent damage to internal components.

4. Apply medium strength thread locker to threads of tie rack track. Install tie rack track into shaft of steering rack. Torque tie rack track from **34 to 42 ft-lb (47 to 57 N-m)**.

5. Carefully install bellows onto steering rack assembly. Secure bellows to the tie rod track and steering rack housing with new clamps. To prevent damage to bellows, do not over-tighten clamps.

6. Install jam nut and then tie rod end to tie rod track. Use measured distance made during disassembly to position the tie rod end. Leave jam nut loose to allow easier toe-in adjustment after steering rack assembly installation on vehicle.

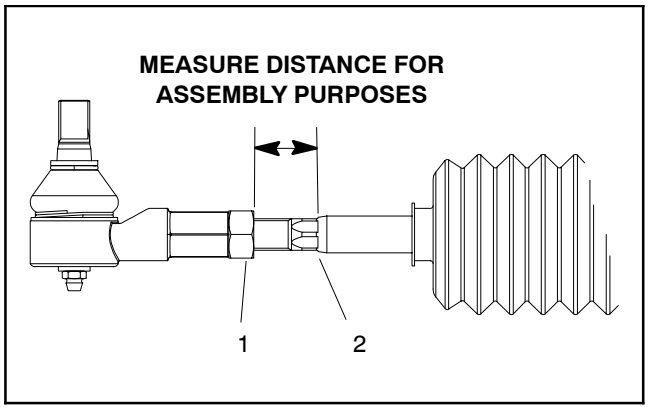

Figure 31

1. Jam nut **2. Track shoulder**

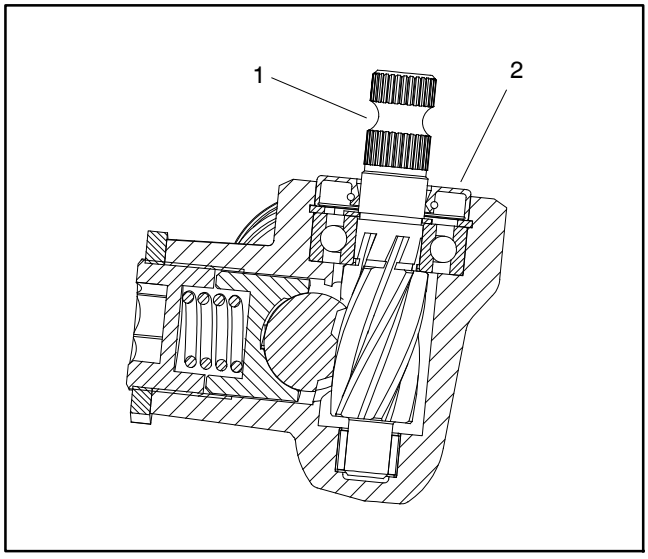

Figure 32

1. Input shaft **2. Input shaft seal**

Shift Lever Assembly

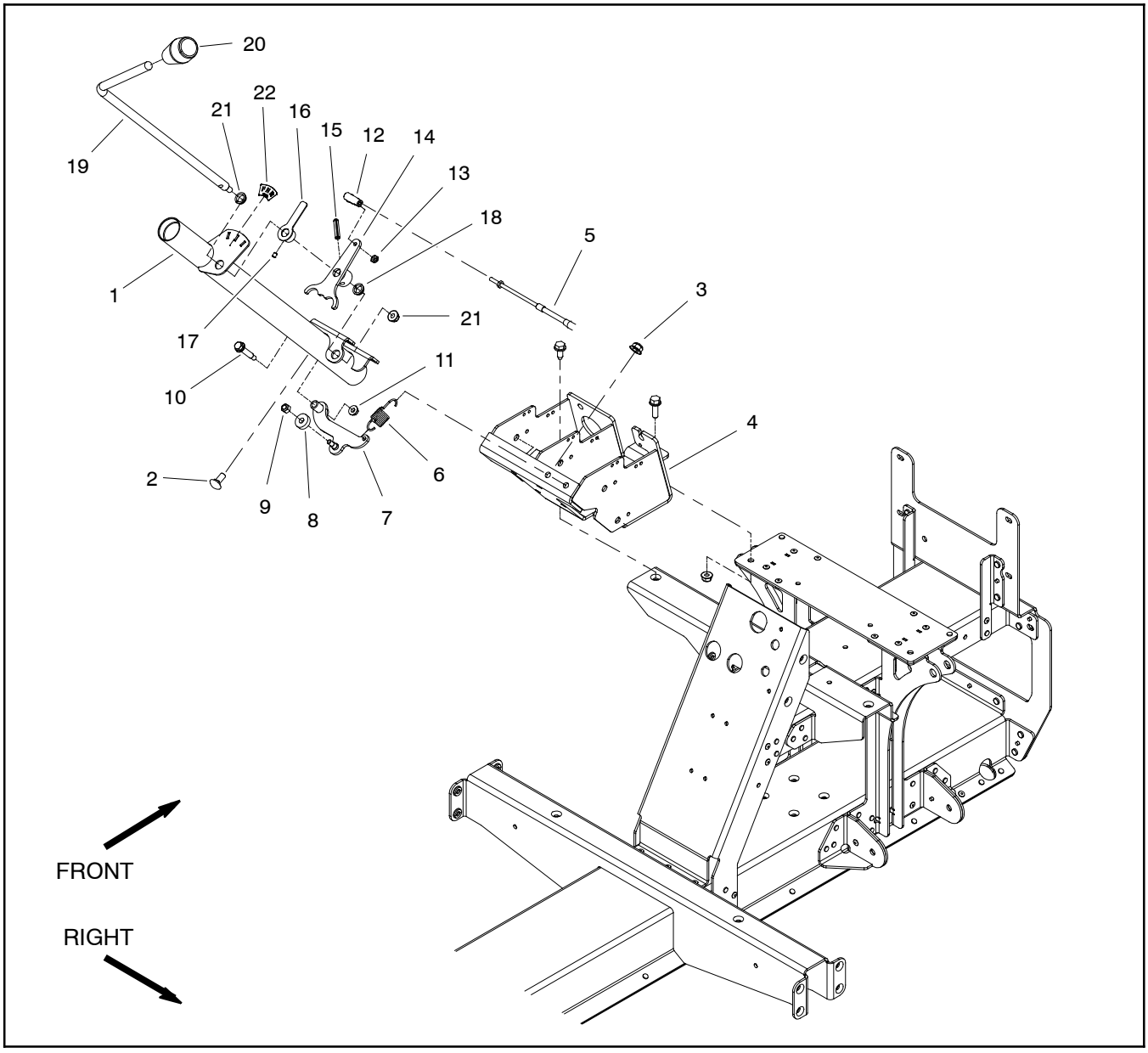

Figure 33

1. Steering column
2. Carriage screw (4 used)
3. Flange nut (4 used)
4. Pedal mount assembly
5. Shift cable
6. Extension spring
7. Detent arm
8. Bearing
9. Lock nut
10. Shoulder screw
11. Flange nut
12. Ball joint
13. Lock nut
14. Shift arm
15. Slotted roll pin
16. Shift indicator
17. Set screw
18. Snap bushing (2 used)
19. Shifter shaft
20. Knob
21. Flange nut
22. Shift decal

Disassembly (Fig. 33)

1. Park vehicle on a level surface, stop engine, set parking brake and remove key from the key switch.

2. Raise front hood to gain access to the steering components.

3. Remove dash and position it toward the front of the vehicle to allow access to the shift lever assembly (see Dash in this section). It is not necessary to remove choke cable from dash.

4. Disassemble shift lever as necessary using Figures 33 and 22 as guides.

Assembly (Fig. 33)

1. Assemble shift lever using Figures 33 and 34 as guides.

2. Carefully position and secure dash to vehicle (see Dash in this section).

3. Lower and secure front hood.

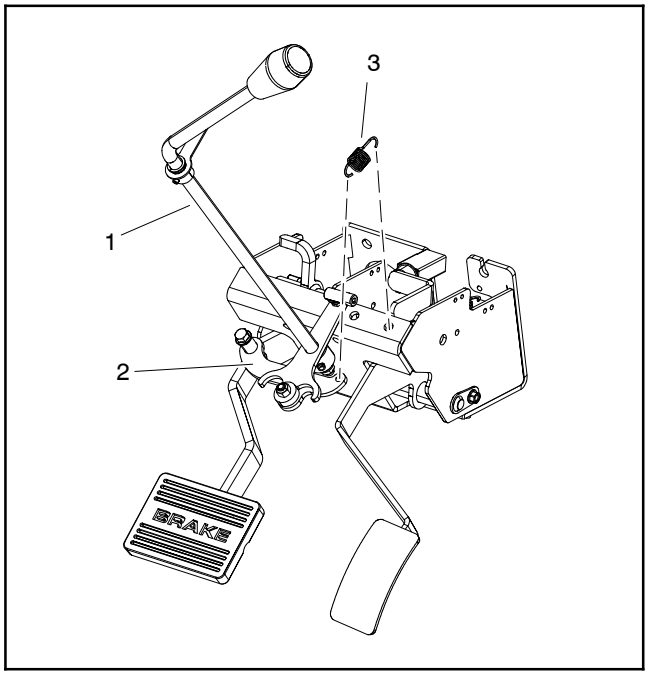

Figure 34

1. **Shift lever**
2. **Detent arm**
3. **Extension spring**

Front Suspension

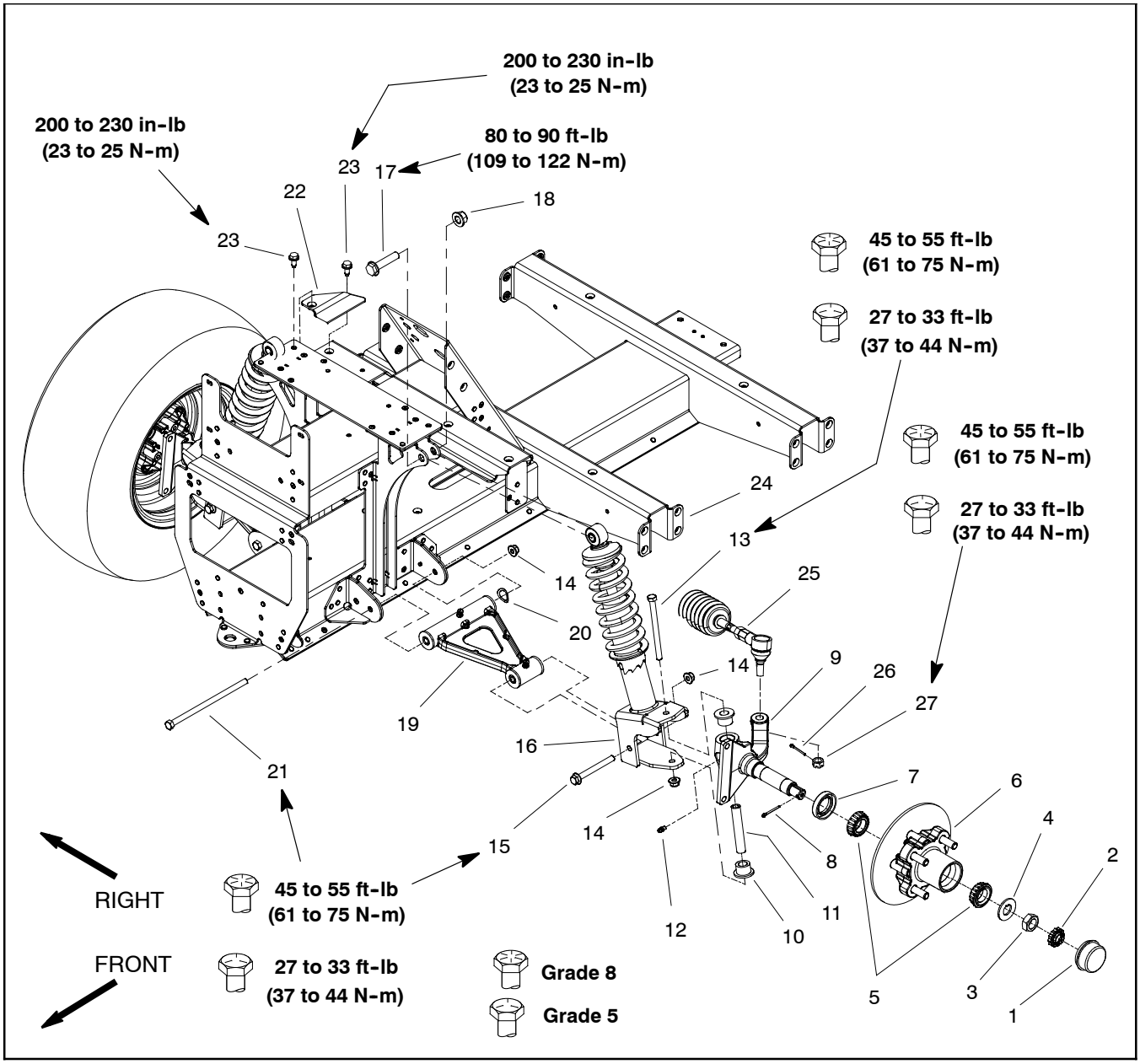

Figure 35

1. Dust cap
2. Retainer
3. Jam nut
4. Tab washer
5. Bearing (2 used)
6. Wheel hub & rotor assembly
7. Oil seal
8. Cotter pin
9. Spindle (LH shown)
10. Flange bushing (2 used per spindle)
11. Kingpin sleeve
12. Grease fitting
13. Cap screw
14. Flange nut (3 used per side)
15. Flange head screw
16. Suspension strut assembly (2 used)
17. Flange head screw
18. Lock nut
19. A-arm assembly (2 used)
20. Bowed washer
21. Cap screw
22. Reinforcement tower
23. Washer head screw (2 used)
24. Front frame
25. Steering rack assembly
26. Cotter pin
27. Slotted hex nut

Disassembly (Fig. 35)

1. Park vehicle on a level surface, stop engine, set parking brake and remove key from the key switch.

2. Raise hood to allow access to suspension components from above.

WARNING

Before jacking up the vehicle, review and follow Jacking Instructions in Chapter 1 - Safety.

3. Chock wheels not being removed. Use a jack to raise front wheel that is to be removed off the ground. Support vehicle with appropriate jack stands beneath the frame.

4. Remove front wheel assembly and wheel hub from vehicle (see Front Wheels and Hubs in this section).

5. Remove spindle assembly from vehicle:

A. Remove cotter pin and slotted hex nut securing steering rack tie rod ball joint stud to the spindle. Separate ball joint from the spindle.

B. Remove flange nut and cap screw securing the spindle assembly to the suspension strut assembly. Separate spindle from strut and remove spindle from vehicle.

6. Remove flange head screw and flange nut that secure lower end of suspension strut assembly to A-arm. Pivot strut assembly away from A-arm.

7. If suspension strut assembly removal is necessary, remove flange head screw and lock nut that secure the top of the strut assembly to the front frame. Remove strut assembly from vehicle.

8. Support A-arm to prevent it from falling.

9. Remove cap screw and flange nut that secure A-arm to frame. Remove A-arm assembly from frame.

10. Inspect sleeves and bushings in spindle (Fig. 35) and A-arm (Fig. 36) for wear or damage. If necessary, replace sleeves and bushings from spindle or A-arm:

A. Remove sleeves from flange bushings.

B. Remove flange bushings from spindle or A-arm. Take care to not damage bore of component during bushing removal. Clean the inside of the bore to remove all dirt, grease and foreign material.

C. Apply grease to the inside and outside of the new bushings. Use an arbor press to fully install the bushings into the spindle or A-arm.

D. Install sleeves into spindle or A-arm.

NOTE: On Workman GTX vehicles, suspension strut assembly should be set to lowest pre-load setting.

Assembly (Fig. 35)

IMPORTANT: Torque tighten the fasteners based on the fastener grade. Make sure to use the correct torque; refer to Figure 35.

1. Position A-arm to the frame. Secure A-arm to the frame with cap screw and flange nut. Torque screw; refer to Figure 35.

2. If suspension strut assembly was removed from vehicle, position the top of the strut assembly to the front frame and secure with flange head screw and lock nut. Torque screw from **80 to 90 ft-lb (109 to 122 N-m)**.

3. Position lower end of strut assembly to A-arm and secure with flange head screw and flange nut. Torque screw; refer to Figure 35.

4. Install spindle assembly to vehicle:

A. Position spindle to suspension strut assembly and secure with cap screw and flange nut. Torque screw; refer to Figure 35.

B. Clean tapers of steering rack tie rod ball joint stud and spindle bore.

C. Insert tie rod ball joint stud into spindle and secure with slotted hex nut. Torque slotted hex nut from **45 to 55 ft-lb (61 to 75 N-m)**. If necessary, tighten nut further until slot in nut aligns with hole in tie rod ball joint stud. Install cotter pin.

5. Install front wheel hub and wheel assembly to vehicle (see Front Wheels and Hubs in this section).

6. Lower vehicle to ground. Make sure that wheel lug nuts are properly torqued in a crossing pattern from **75 to 95 ft-lb (102 to 128 N-m)**.

7. Lubricate spindle and A-arm grease fittings with High-Temp Mobil XHP-222 grease (or equivalent).

8. Lower and secure hood.

9. Check front wheel toe-in and adjust if necessary (see Adjust Front Wheel Toe-in in the Adjustments section of this chapter).

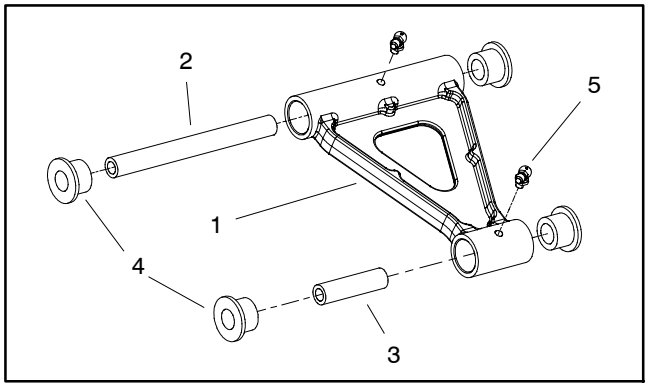

Figure 36

1. **A-arm**
2. **Inner sleeve**
3. **Outer sleeve**
4. **Flange bushing (4 used)**
5. **Grease fitting (2 used)**

Rear Suspension

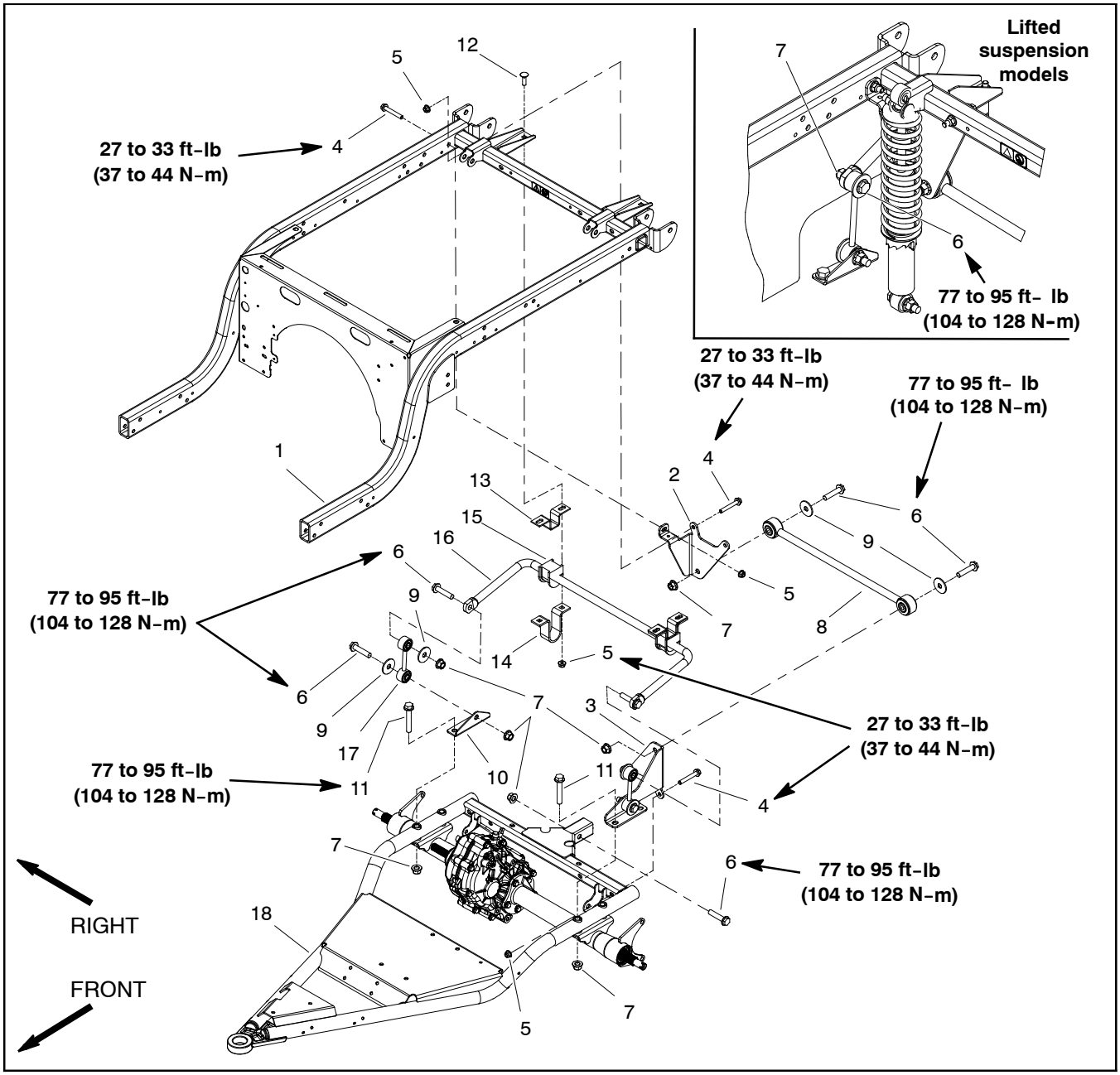

Figure 37

1. Rear frame
2. Stabilizer bar bracket
3. Stabilizer bar bracket
4. Flange head screw (5 used)
5. Flange nut (9 used)
6. Flange head screw (6 used)
7. Lock nut (10 used)
8. Panhard rod assembly
9. Thrust washer (6 used)
10. Sway bar link bracket
11. Flange head screw (4 used)
12. Carriage bolt (4 used)
13. Sway bar bracket (2 used)
14. Sway bar clamp (2 used)
15. Rubber bushing (2 used)
16. Anti-sway bar
17. Sway bar link (2 used)
18. Swing arm

Disassembly (Fig. 35)

1. Park vehicle on a level surface, stop engine, set parking brake and remove key from the key switch.

2. Raise and support cargo bed for access to rear suspension components from above.

WARNING

Before jacking up the vehicle, review and follow Jacking Instructions in Chapter 1 - Safety.

3. Chock front wheels. Use a jack to raise rear wheels off the ground. Support vehicle with appropriate jack stands beneath the rear frame.

4. Support transaxle from below to prevent the transaxle and swing arm from moving during rear suspension disassembly.

CAUTION

If stabilizer bar bracket (item 3) or sway bar link bracket need to be removed, make sure that transaxle is supported from below.

5. Remove rear suspension components as needed using Figure 35 as a guide.

A. Check for wear in bushings in panhard rod assembly and replace bushings and or spacers if necessary (shown in Fig. 39).

6. Inspect suspension components for wear or damage and replace parts as needed.

7. If necessary, remove rear shock absorber(s) (Fig. 38):

A. Remove flange head screws and lock nuts that secure shock absorber(s) to rear frame and swing arm.

B. Remove shock absorber(s) from vehicle.

NOTE: On Workman GTX vehicles, rear shocks should be set to lowest pre-load setting.

NOTE: Use spanner wrench TOR6010 (see Special Tools in this chapter) if rear shock spring pre-load requires adjustment. If the spring is to be removed from the shock absorber, shock spring compressor tool TOR6015 (see Special Tools in this chapter) can be used.

Assembly (Fig. 35)

IMPORTANT: During assembly of rear suspension components, install all components before fully tightening fasteners.

1. Install all removed rear suspension components using Figure 35 as a guide. After all parts have been installed fully tighten fasteners to secure suspension to vehicle. Torque fasteners to specifications listed in Figure 35.

2. Install rear shock absorber(s) if it was removed (Fig. 38):

A. Position shock absorber(s) to rear frame and swing arm brackets.

B. Secure shock absorber(s) to vehicle with flange head screws and lock nuts. Torque screws from **77 to 95 ft-lb (105 to 128 N-m)**.

3. Lower vehicle to ground and lower cargo bed.

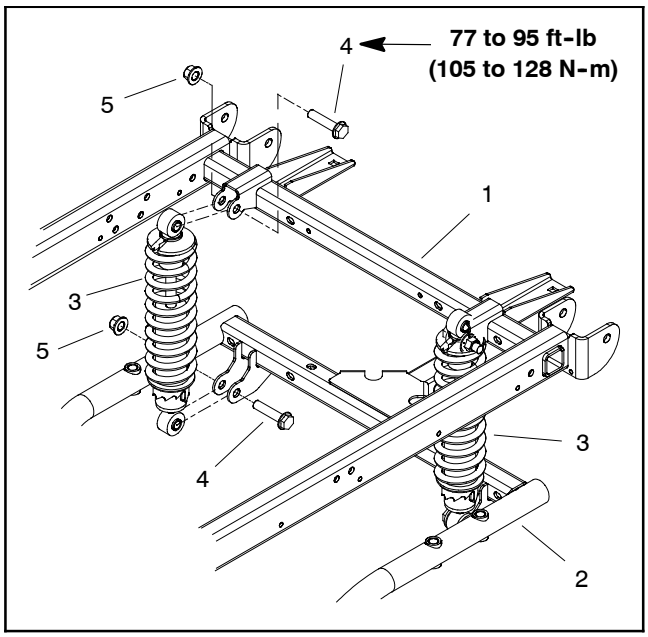

Figure 38

1. **Rear frame**
2. **Swing arm**
3. **Shock absorber**
4. **Flange head screw**
5. **Lock nut**

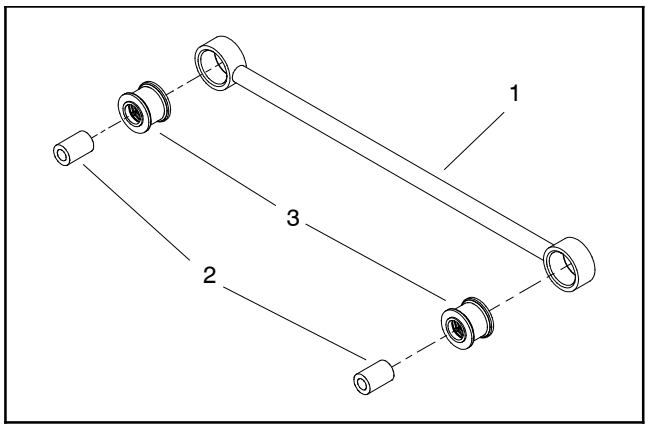

Figure 39

1. **Panhard rod**
2. **Spacer (2 used)**
3. **Bushing (2 used)**

Swing Arm Mount Assembly

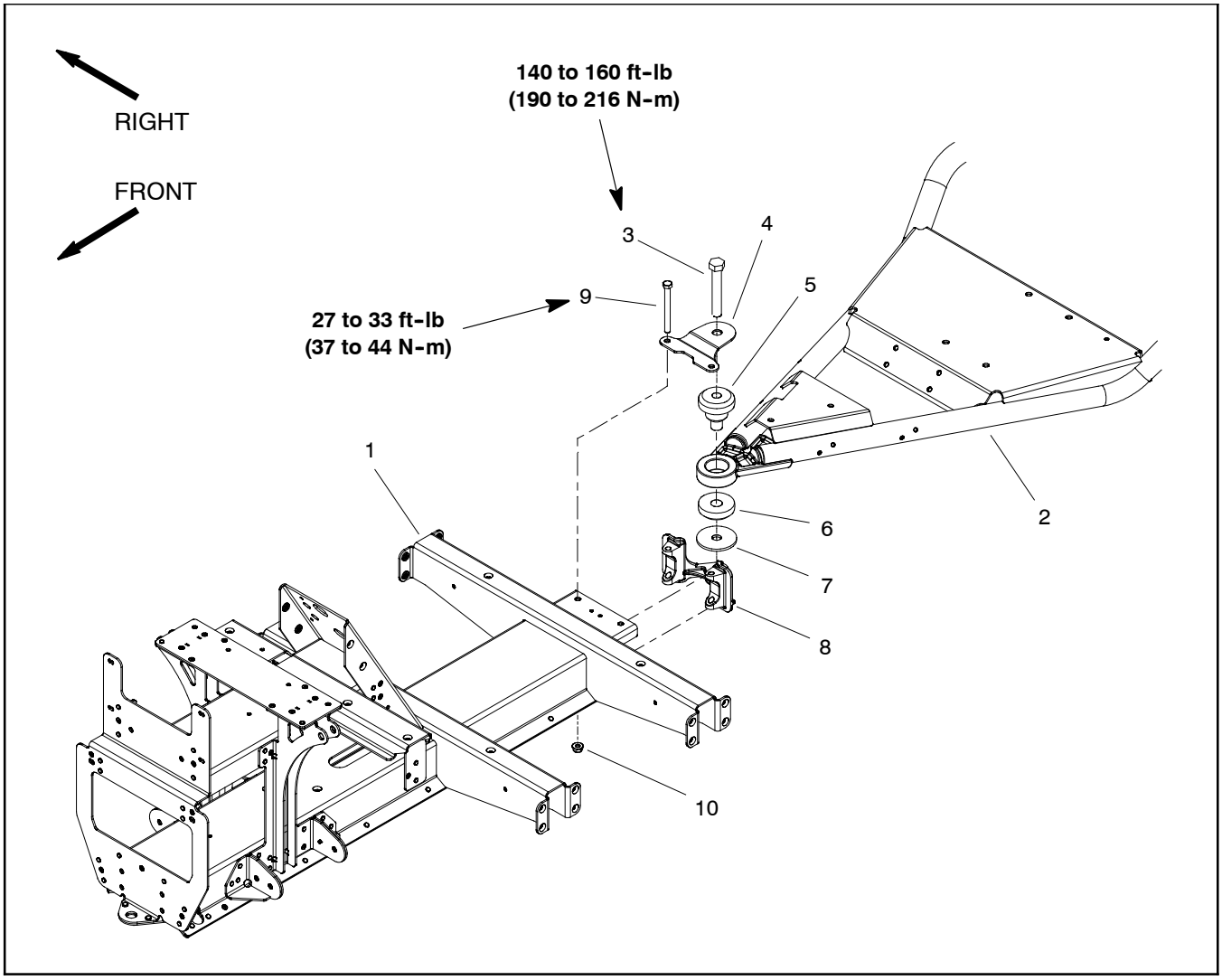

Figure 40

1. **Front frame**
2. **Swing arm**
3. **Cap screw**
4. **Upper plate**
5. **Isolator (upper portion)**
6. **Isolator (lower portion)**
7. **Snubbing washer**
8. **Rear suspension mount**
9. **Cap screw (2 used)**
10. **Flange nut (2 used)**

Removal (Fig. 40)

1. Park vehicle on a level surface, stop engine and remove key from the key switch. Make sure to set the parking brake.

2. Raise and support cargo bed with prop rod.

3. Chock the front and rear of both front tires to prevent the vehicle from moving.

IMPORTANT: Make sure to not damage the rear brake lines, electrical harness, parking brake cables or other parts while disassembling the swing arm mount.

4. Remove cap screw that secures swing arm to rear suspension mount.

5. Carefully, raise and support front of swing arm just enough to allow clearance for removal of isolator and snubbing washers.

6. Remove snubbing washers and isolator mount from bore in front of swing arm.

7. If necessary, remove two (2) cap screws, washers and flange nuts that secure the rear suspension mount to the front frame. Remove mount from front frame.

Installation (Fig. 40)

1. If rear suspension mount was removed, position mount to front frame and secure with two (2) cap screws, washers and flange nuts. Torque cap screws from **27 to 33 ft-lb (37 to 44 N-m)**.

IMPORTANT: Make sure to not damage the brake lines, electrical harness, parking brake cables or other parts while assembling the swing arm mount.

2. Insert upper portion of isolator mount down through the swing arm and into the lower portion of the mount.

3. Place snubbing washer between the bottom of the isolator mount and the top of the rear suspension mount.

4. Carefully lower front of swing arm so the holes in the isolator mount, snubbing washer and threaded hole in rear suspension mount are aligned.

5. Place second snubbing washer on the top of the isolator mount and then secure swing arm to rear suspension mount with cap screw. Torque screw from **140 to 160 ft-lb (190 to 216 N-m)**.

6. Lower and secure cargo bed.

Seat Base

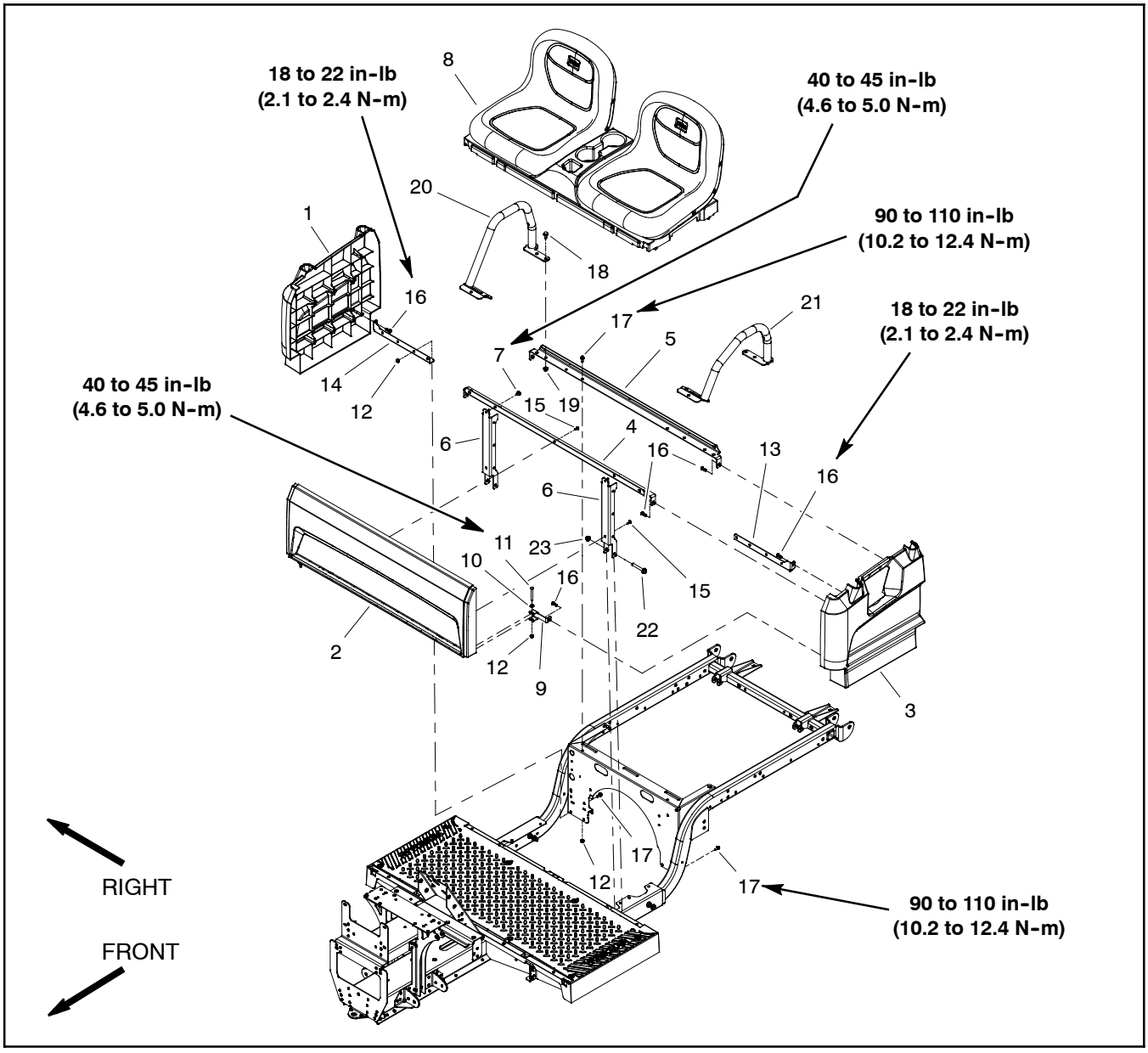

Figure 41

1. RH seat base side
2. Seat base front panel
3. LH seat base side
4. Seat support angle
5. Rear seat support angle
6. Seat support channel (2 used)
7. Screw with washer (2 used)
8. Seat base assembly
9. Floor plate clamp (2 used)
10. Flat washer (2 used)
11. Flange head screw (2 used)
12. Flange nut (8 used)
13. LH side support bracket
14. RH side support bracket
15. Washer head screw (5 used)
16. Screw (12 used)
17. Flange head screw (6 used)
18. Washer head screw (6 used)
19. Flange nut (6 used)
20. RH hip restraint
21. LH hip restraint
22. Flange head screw (2 used)
23. Flange nut (2 used)

Disassembly (Fig. 41)

1. Park vehicle on a level surface, stop engine, engage parking brake and remove key from the key switch.

2. Remove seat base assembly with attached seats from vehicle.

3. If right hand seat base side is to be removed from vehicle (Fig. 42):

   A. Remove battery from vehicle (see Battery Service in the Service and Repairs section of Chapter 5 – Electrical System).

   B. Support seat base side and remove two (2) screws that secure seat base side to battery base and

   C. Remove right hand seat base side from vehicle.

4. Remove remaining seat base supports from vehicle as needed using Figure 41 as a guide.

5. If needed, remove seats from seat base (Fig. 43).

Assembly (Fig. 41)

1. Secure seats to seat base if they were removed (Fig. 43). Torque cap screws from **90 to 110 in-lb (10.2 to 12.4 N-m)**.

2. Install all removed seat base supports to vehicle using Figure 41 as a guide. When securing seat base supports to vehicle, use torque values identified in Figures 41 and 42.

3. If battery was removed from vehicle, install battery (see Battery Service in the Service and Repairs section of Chapter 5 – Electrical System).

4. Install seat base assembly with attached seats to vehicle.

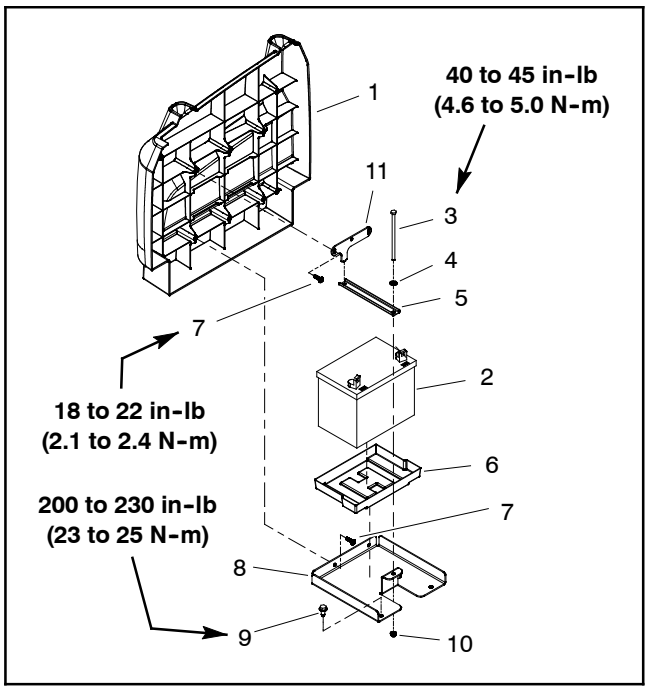

Figure 42

1. **RH seat base side**
2. **Battery**
3. **Cap screw**
4. **Flat washer**
5. **Battery clamp channel**
6. **Battery tray**
7. **Screw (4 used)**
8. **Battery base**
9. **Screw (2 used)**
10. **Flange nut**
11. **Battery clamp plate**

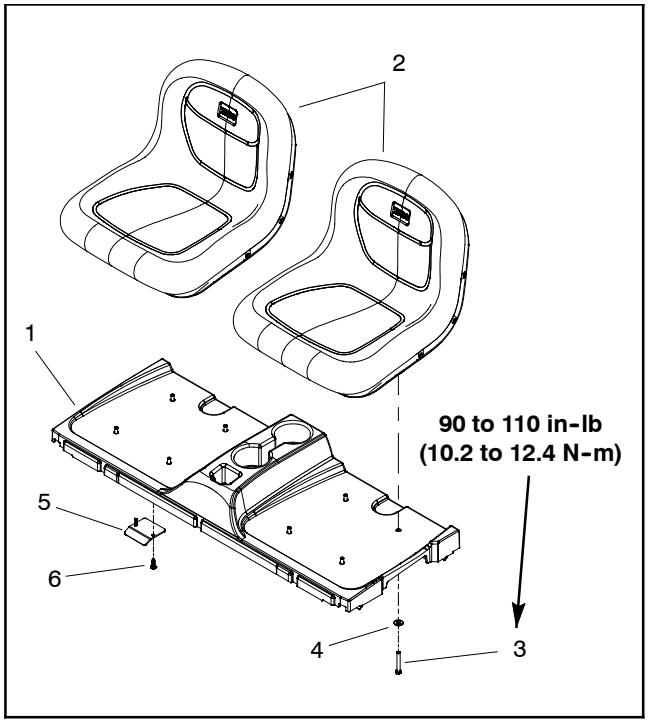

Figure 43

1. **Seat base**
2. **Seat (2 used)**
3. **Cap screw (8 used)**
4. **Flat washer (8 used)**
5. **Retainer (2 used)**
6. **Screw (4 used)**

Dash

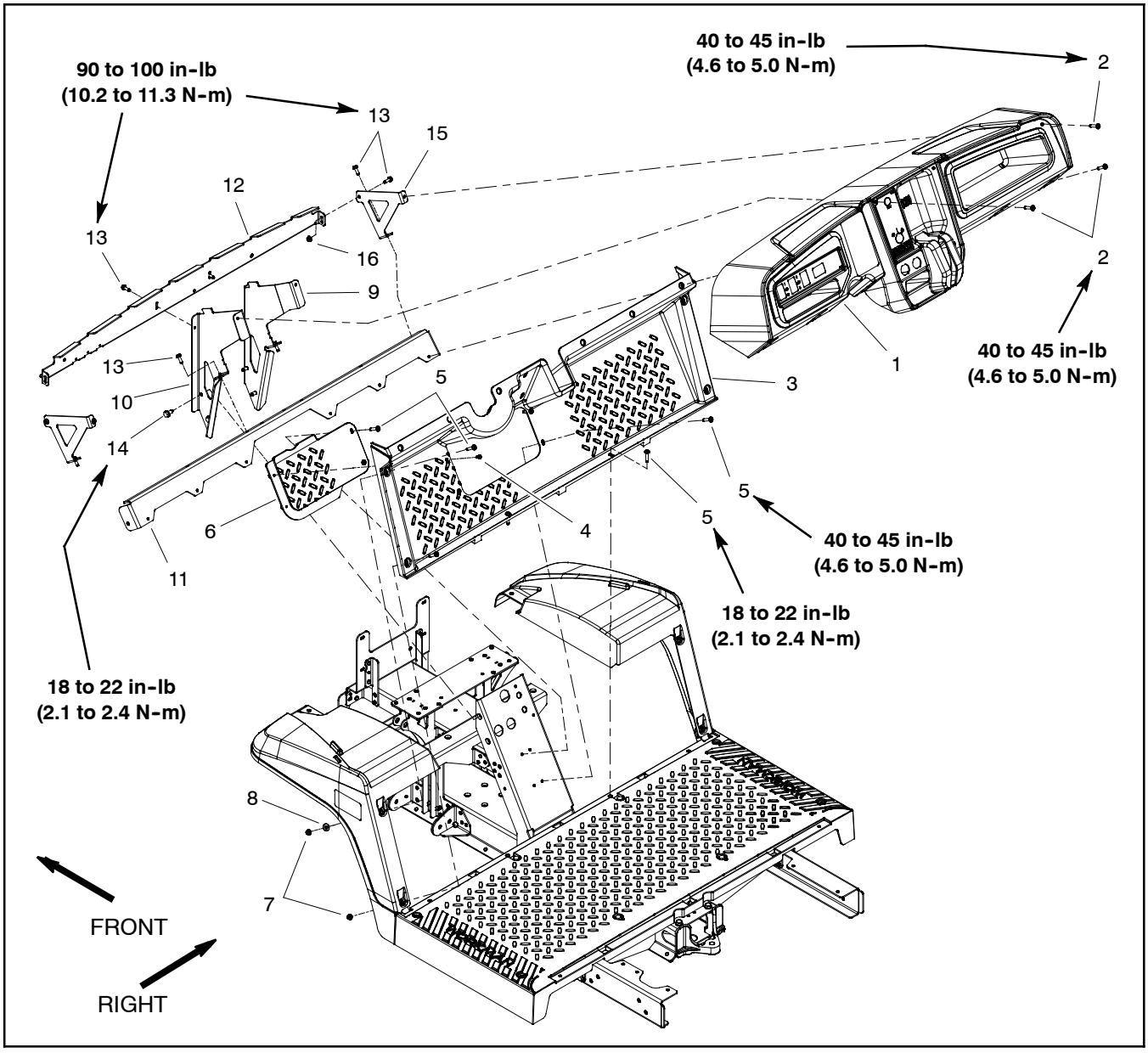

Figure 44

1. Dash
2. Washer head screw (10 used)
3. Foot board
4. Screw (2 used)
5. Washer head screw (10 used)
6. Foot board cover
7. Flange nut (4 used)
8. Flat washer (2 used)
9. RH dash bracket
10. LH dash bracket
11. Dash angle bracket
12. Dash bracket
13. Washer head screw (8 used)
14. Washer head screw (4 used)
15. Side dash bracket (2 used)
16. Flange nut (2 used)

Removal (Fig. 44)

1. Park vehicle on a level surface, stop engine, apply parking brake and remove key from the key switch.

2. Raise hood to allow access to wire harness connections to switches mounted in dash.

3. Disconnect wire harness connectors from all switches and power ports on dash.

4. Remove ten (10) washer head screws that secure dash to vehicle.

NOTE: It is not necessary to remove choke cable from dash unless dash needs to be completely removed from vehicle.

5. Carefully lift dash from vehicle supports until it clears the parking brake lever and position it toward the front of the vehicle.

6. If dash needs to be replaced or completely removed from vehicle, disconnect choke cable from engine and remove it from dash.

Installation (Fig. 44)

NOTE: Do not fully tighten fasteners securing dash until all fasteners are in place.

1. If choke cable was removed, install choke cable to dash and engine.

2. Carefully position dash to vehicle by lowering it over parking brake lever.

3. Secure dash with removed washer head screws using fastener torque specifications that are identified in Figure 44.

4. Make sure that choke operation is correct.

IMPORTANT: Make sure that the USB power point is connected with the correct polarity. The white (positive) harness wire should be connected to the upper USB power point terminal.

5. Connect wire harness connectors to all switches and power ports on dash.

6. Lower and secure front hood.

Front Fenders, Hood and Bumper

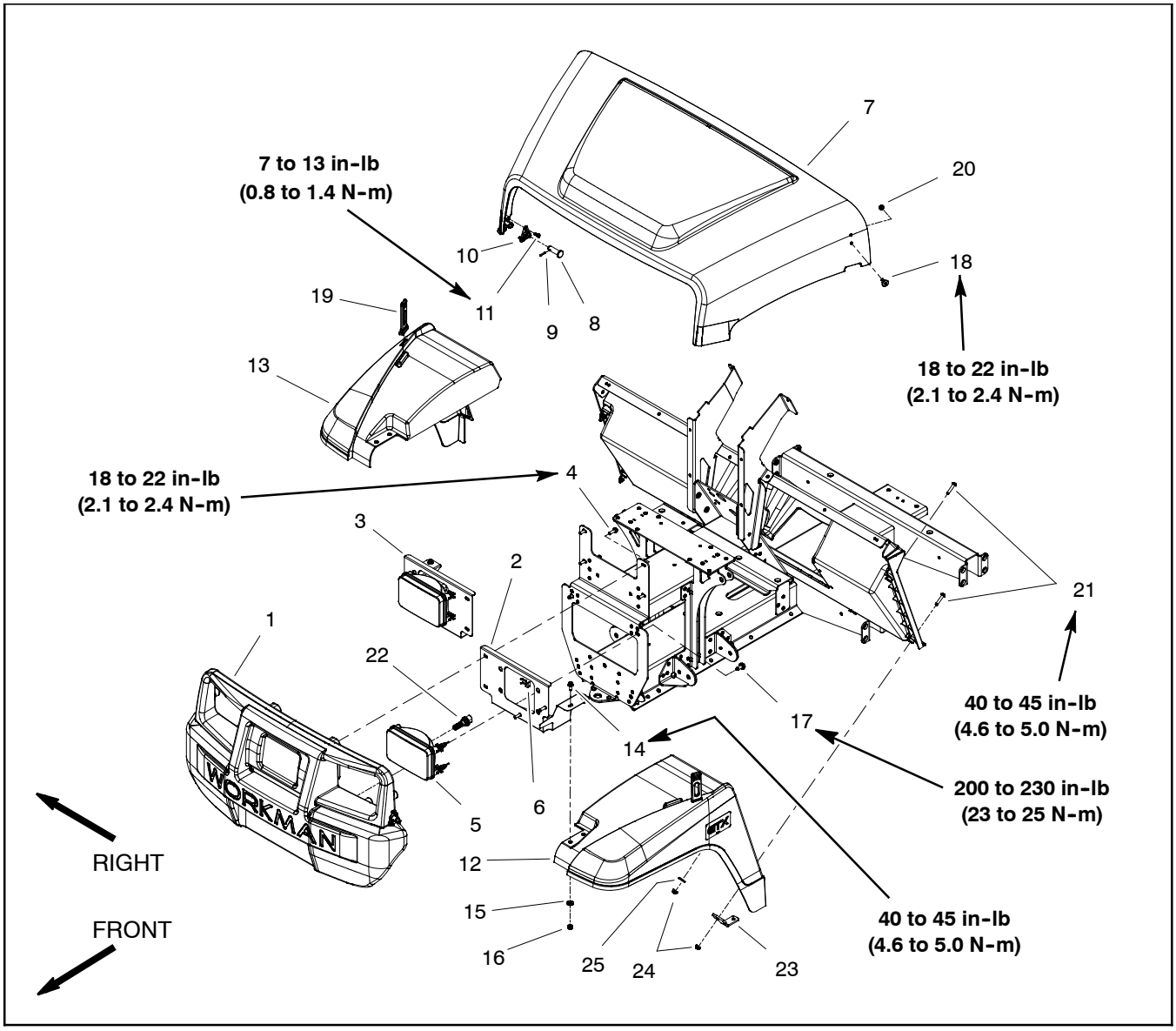

Figure 45

1. Bumper
2. LH headlight bracket
3. RH headlight bracket
4. Washer head screw (8 used)
5. Headlight assembly (2 used)
6. Speed clip (6 used)
7. Hood
8. Clevis pin (2 used)
9. Spring pin (2 used)
10. Retainer pin (2 used)
11. Washer head screw (6 used)
12. LH front fender
13. RH front fender
14. Flange head screw (4 used)
15. Flat washer (4 used)
16. Flange nut (4 used)
17. Washer head screw (2 used)
18. Screw (2 used)
19. Hold down strap (2 used)
20. Lock nut (2 used)
21. Washer head screw (4 used)
22. LED bulb (2 used)
23. Angle bracket (2 used)
24. Flange nut (4 used)
25. Flat washer (2 used)

Removal (Fig. 45)

1. Park vehicle on a level surface, stop engine, set parking brake and remove key from the key switch.

2. Remove front fenders, hood or front bumper using Figure 45 as a guide.

Installation (Fig. 45)

NOTE: Do not fully tighten fasteners securing body components until all fasteners are in place.

1. Install removed body components using Figure 45 as a guide. During assembly, use fastener torque specifications that are identified in Figure 45.

Cargo Bed

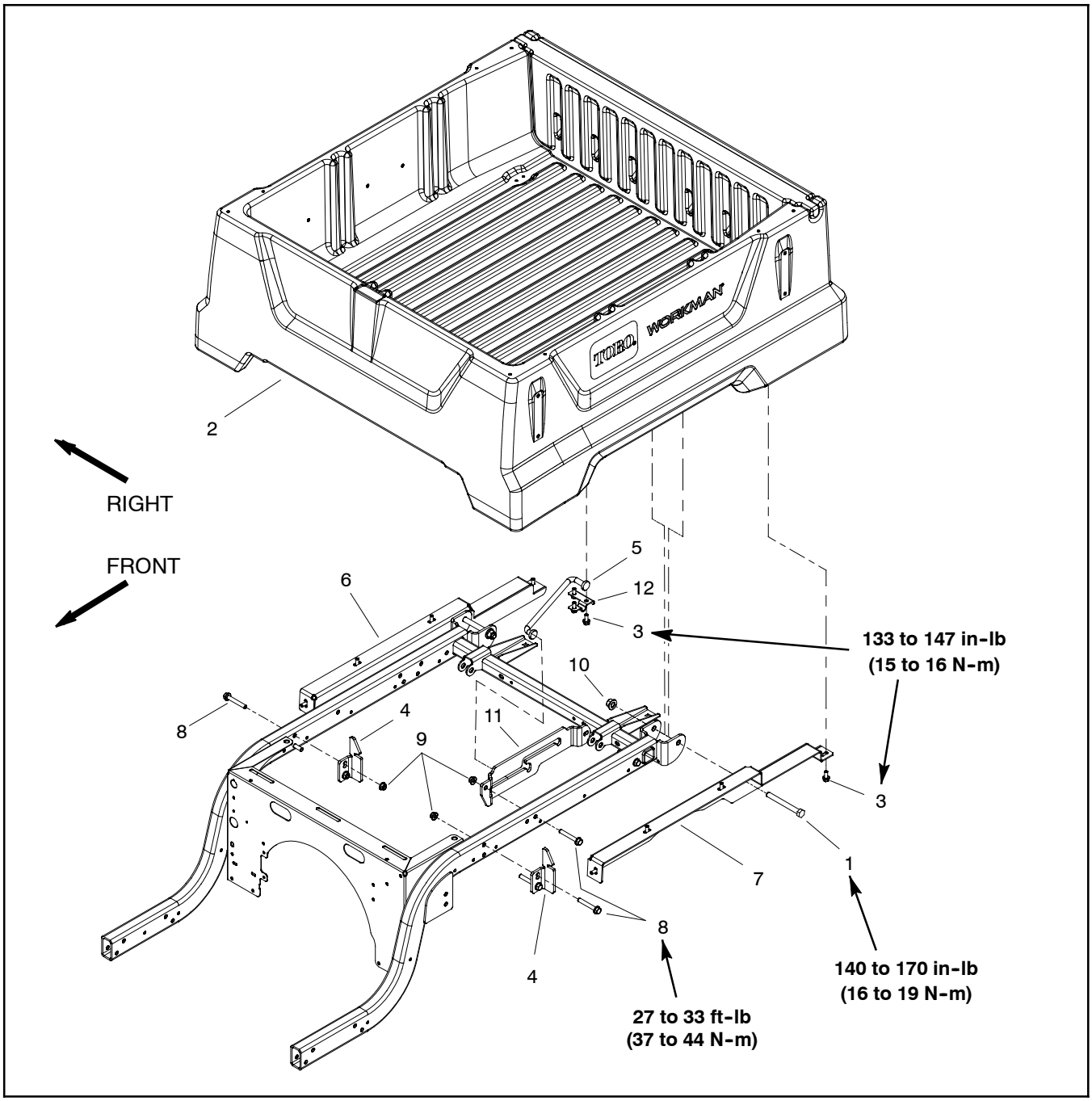

Figure 46

1. Cap screw (2 used)
2. Cargo bed assembly
3. Flange head screw
4. Bed latch striker (2 used)
5. Prop rod
6. RH cargo bed support
7. LH cargo bed support
8. Flange head screw (6 used)
9. Flange nut (6 used)
10. Lock nut (2 used)
11. Prop rod bracket
12. Prop rod U-bracket

Disassembly

1. Park vehicle on a level surface, stop engine, set parking brake and remove key from the key switch.

2. Make sure that cargo bed is empty.

3. If necessary, remove cargo bed from vehicle (Fig. 46):

   A. Raise cargo bed and support bed so that prop rod assembly can be removed from bottom of bed.

   B. Remove three (3) flange head screws that secure prop rod U-bracket (item 12) to bed and remove bracket and prop rod (item 5).

   C. Lower cargo bed to vehicle frame.

   D. Remove two (2) cap screws (item 1) and lock nuts (item 10) that secure cargo bed assembly to frame.

   E. Lift cargo bed assembly from vehicle.

4. Disassemble cargo bed as necessary using Figures 46, 47 and 48 as guides.

Assembly

1. Assemble cargo bed using Figures 46, 47 and 48 as guides.

   A. Use torque specifications that are identified in the illustrations when assembling cargo bed.

2. If removed, secure cargo bed to vehicle (Fig. 46):

   A. Position cargo bed assembly to vehicle.

   B. Secure cargo bed assembly to frame with two (2) cap screws (item 1) and lock nuts. Torque cap screws from **140 to 170 in-lb (16 to 19 N-m)**.

   C. Raise cargo bed and support bed so that prop rod assembly can be secured to bottom of bed.

   D. Make sure that end of prop rod (item 5) is installed into slot in prop rod bracket (item 11) attached to frame.

   E. Secure prop rod U-bracket (item 12) and prop rod to bed with three (3) flange head screws. Torque screws from **133 to 147 in-lb (15 to 16 N-m)**.

   F. Lower cargo bed to vehicle frame.

3. Adjust bed latch strikers (item 4 in Fig. 46) so that cargo bed closes completely and is latched at both sides. Strikers can be raised or lowered to latch bed.

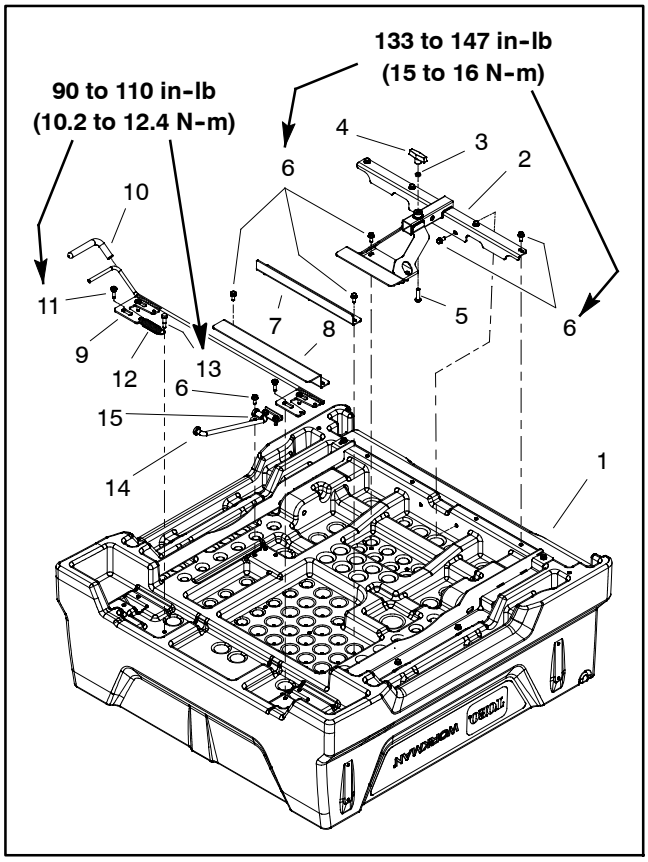

Figure 47

1. Cargo bed
2. Quick attachment
3. Jam nut
4. T handle
5. Screw
6. Flange head screw
7. Middle bed brace
8. Extended bed brace
9. Latch
10. Grip
11. Shoulder screw (4 used)
12. Extension spring
13. Shoulder screw
14. Prop rod
15. Prop rod U-bracket

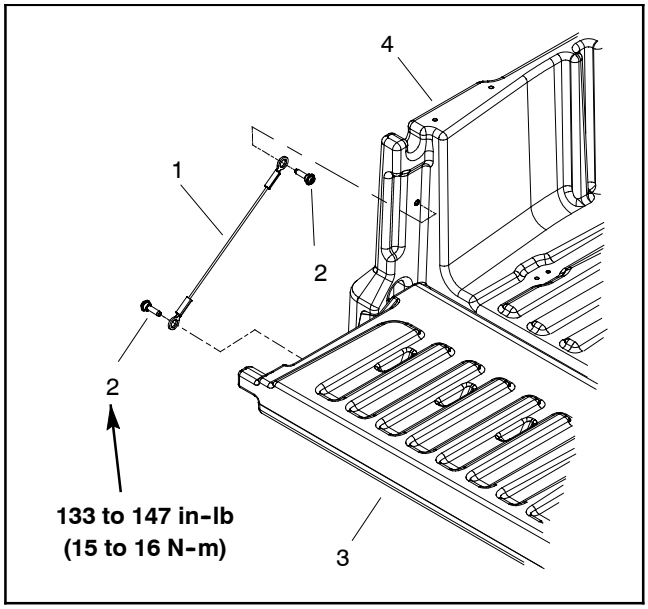

Figure 48

1. Tailgate lanyard
2. Shoulder screw (2 used)
3. Tailgate
4. Cargo bed

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Chapter 7

Electrical Drawings

Table of Contents

Electrical Drawing Designations

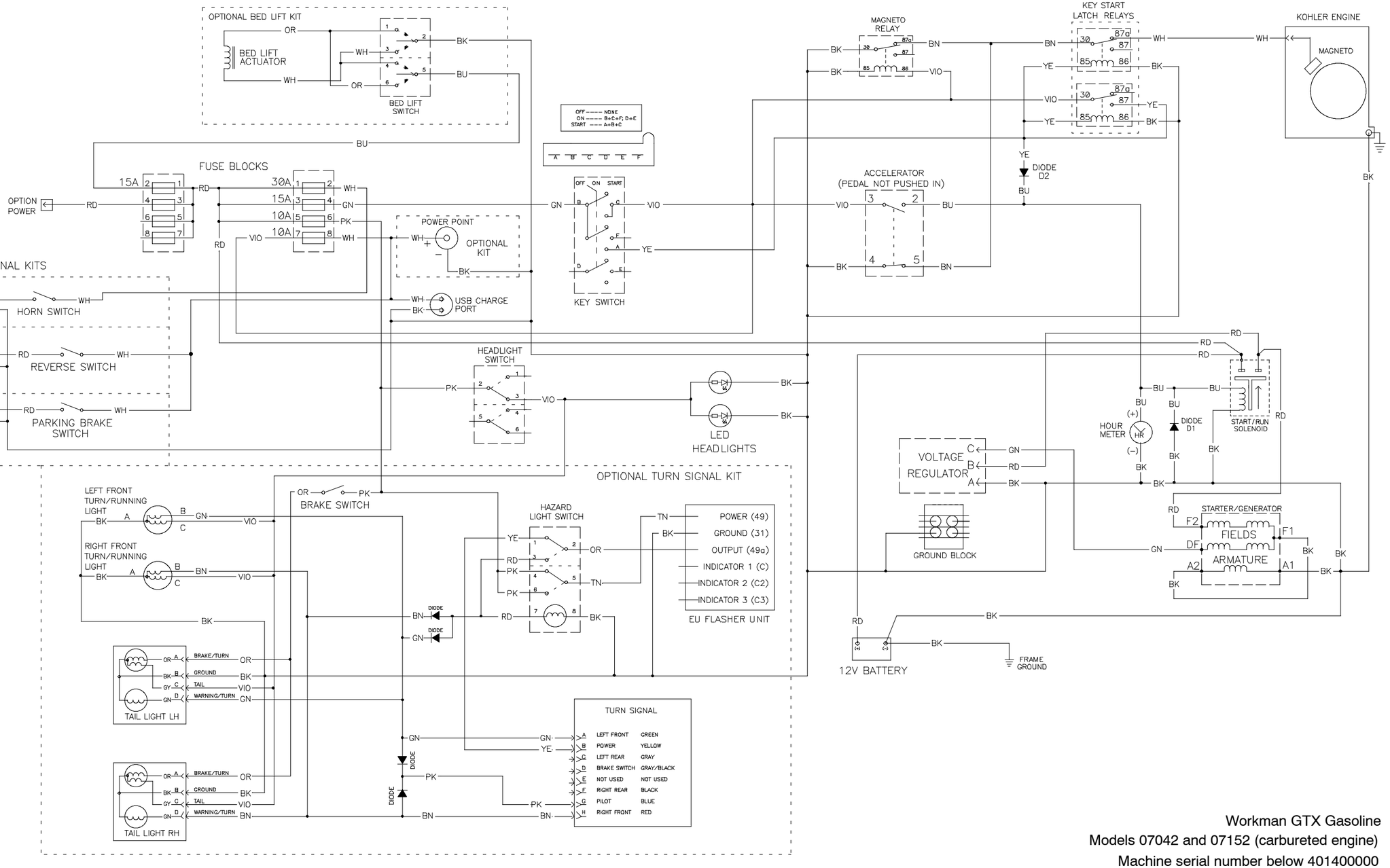
The following abbreviations are used for wire harness colors on the electrical schematics and wire harness drawings in this chapter.

ABBREVIATION	COLOR
BK	BLACK
BR or BN	BROWN
BU	BLUE
GN	GREEN
GY	GRAY
OR	ORANGE
PK	PINK
R or RD	RED
T or TN	TAN
VIO	VIOLET
W or WH	WHITE
Y or YE	YELLOW

Numerous harness wires used on Workman GTX vehicles include a line with an alternate color. These wires are identified with the wire color and line color with either a / or _ separating the color abbreviations listed above (e.g. R/BK is a red wire with a black line, OR_BK is an orange wire with a black line).

NOTE: The wire harness diagram in this chapter identifies both the wire color and the wire gauge. For example, 16 BK on a harness diagram identifies a 16 gauge wire that has a black insulator.

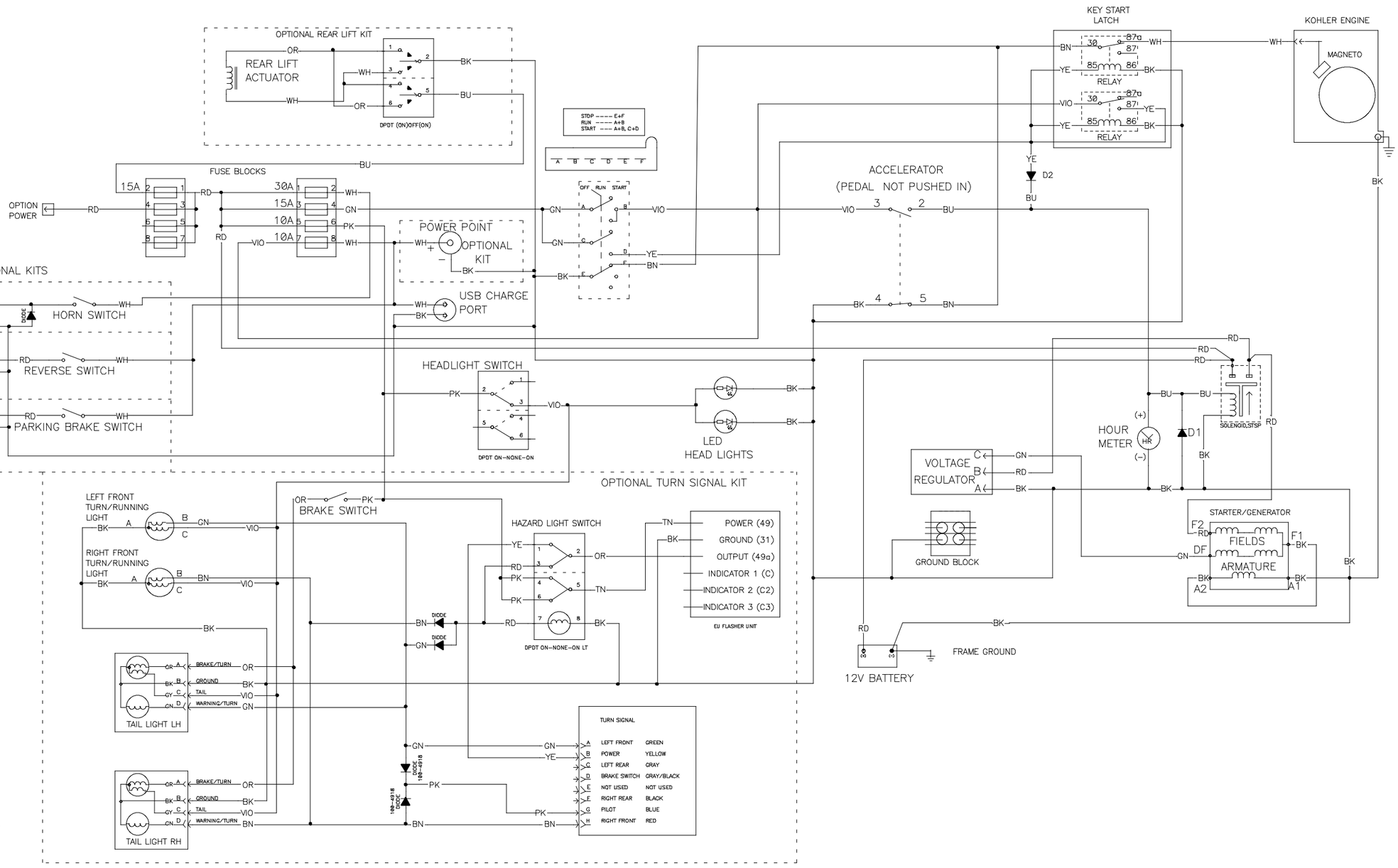
NOTE: A splice used in a wire harness will be identified on the wire harness diagram by SP. The manufacturing number of the splice is also identified on the wire harness diagram (e.g. SP01 is splice number 1).



Workman GTX Gasoline
Models 07042 and 07152 (carbureted engine)
Machine serial number below 401400000

Electrical Schematic

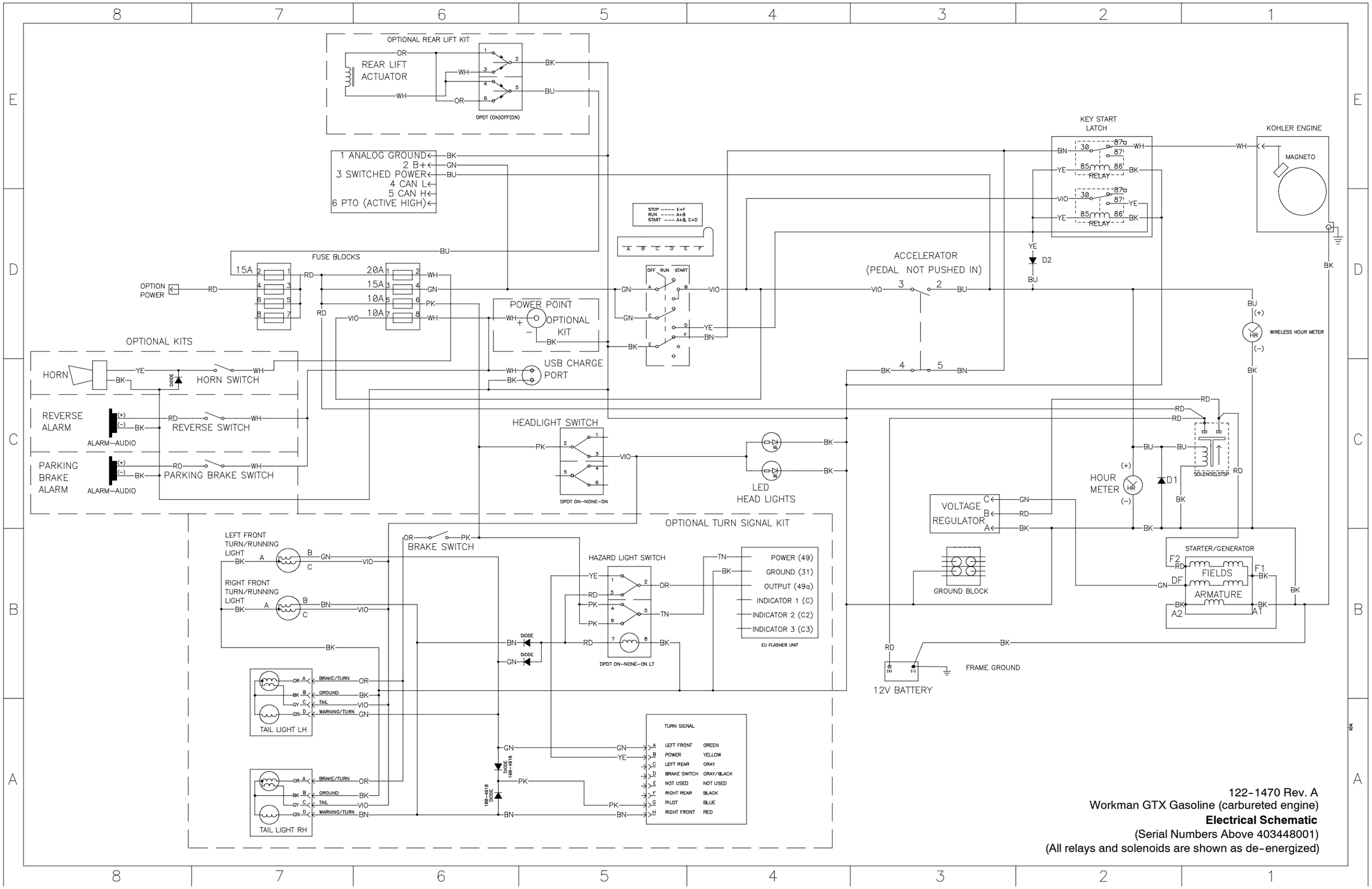
All relays and solenoids are shown as de-energized. All ground wires are black.



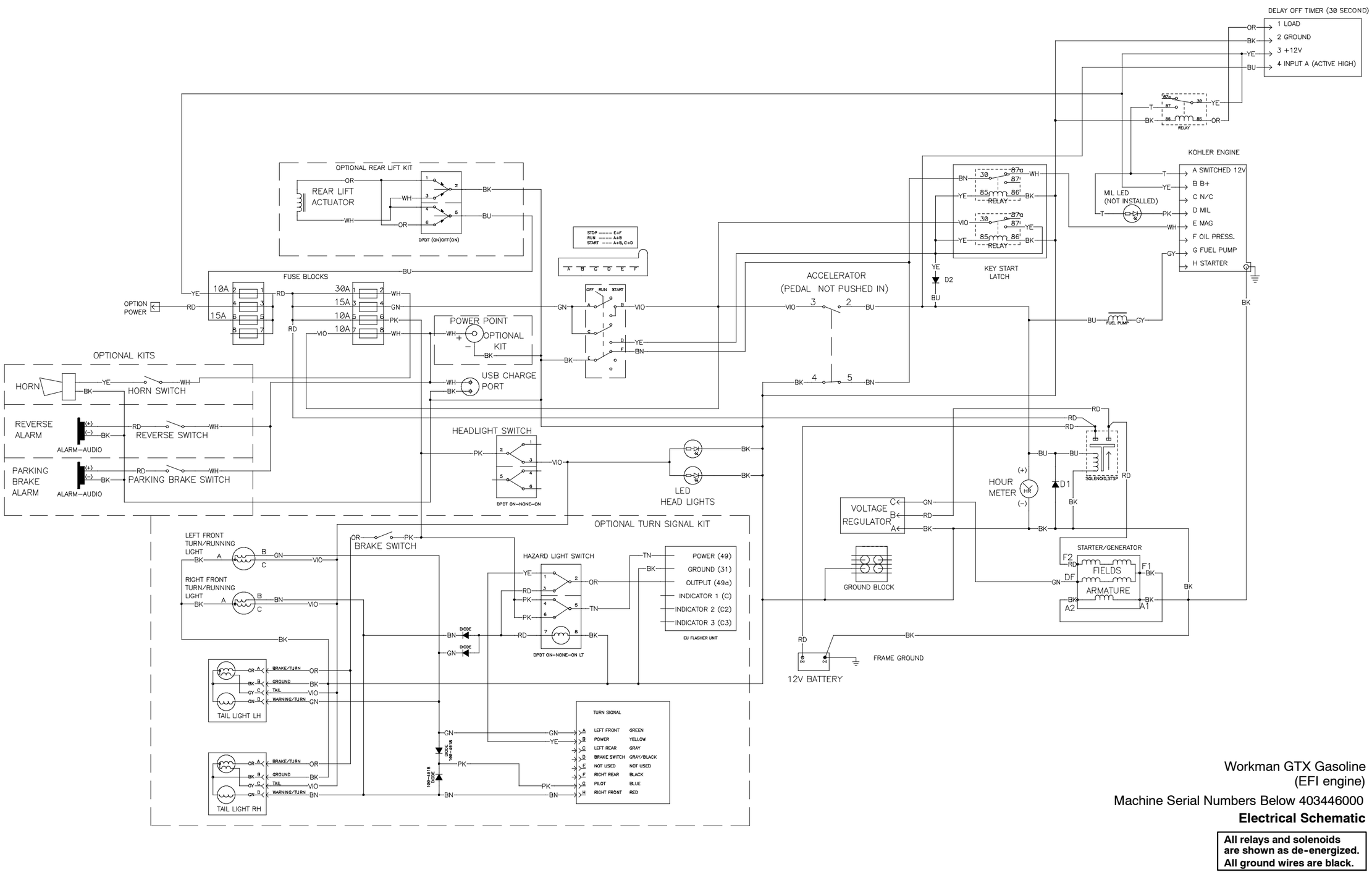
Workman GTX Gasoline
(carbureted engine)
Machine serial number
401400001 to 403448000

Electrical Schematic

All relays and solenoids are shown as de-energized. All ground wires are black.



122-1470 Rev. A
Workman GTX Gasoline (carbureted engine)
Electrical Schematic
(Serial Numbers Above 403448001)
(All relays and solenoids are shown as de-energized)

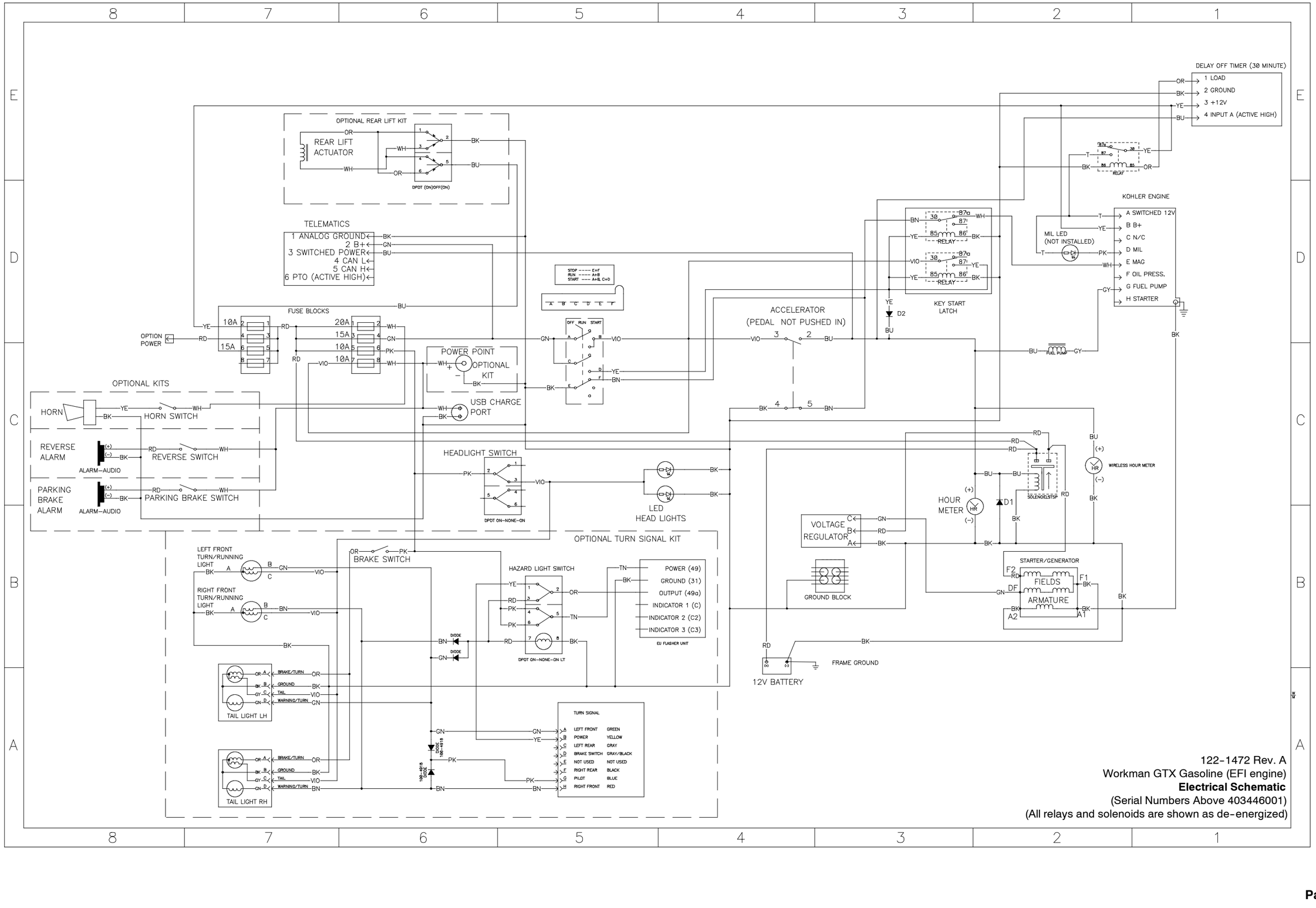


Workman GTX Gasoline
(EFI engine)

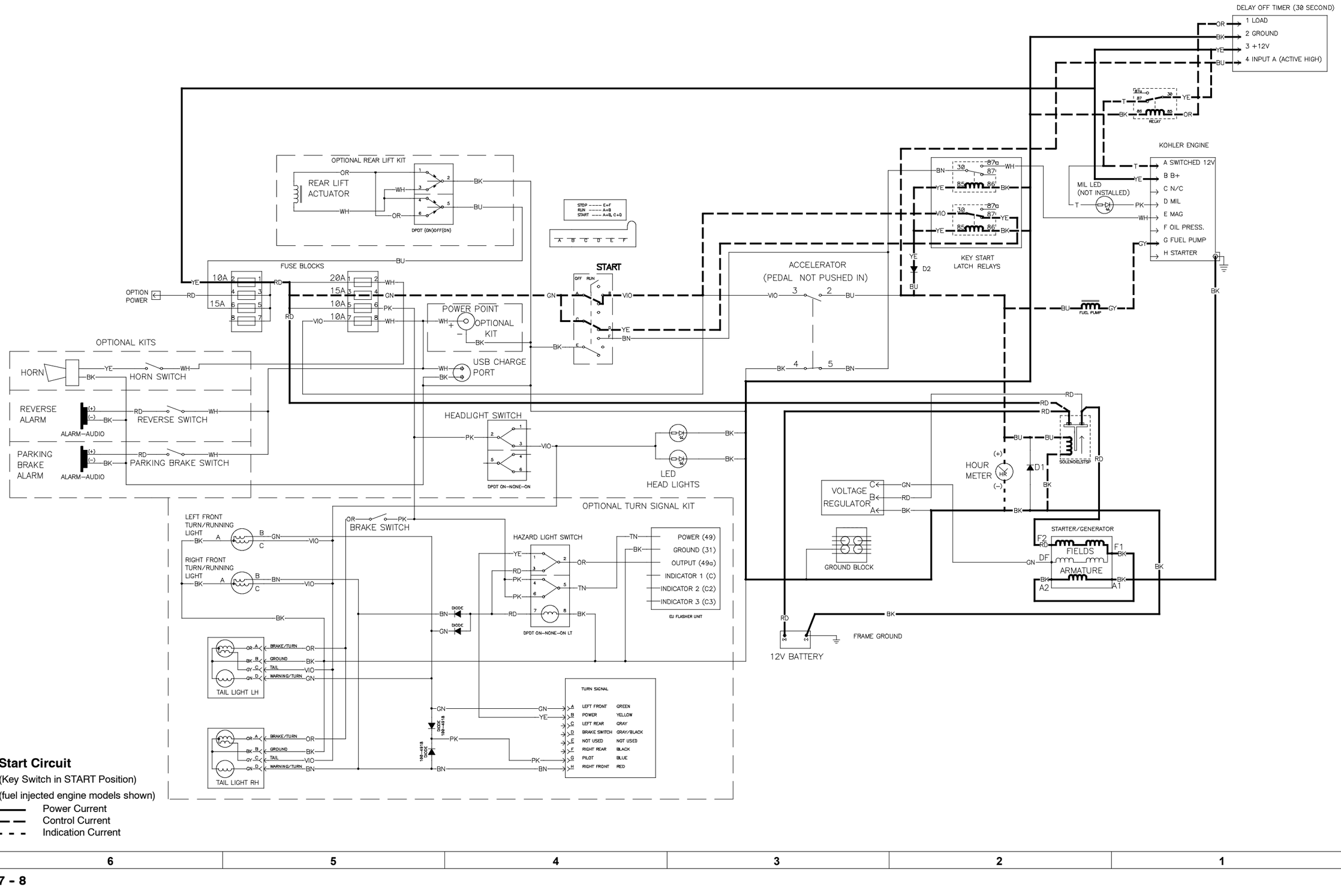
Machine Serial Numbers Below 403446000

Electrical Schematic

All relays and solenoids are shown as de-energized. All ground wires are black.



122-1472 Rev. A
Workman GTX Gasoline (EFI engine)
Electrical Schematic
(Serial Numbers Above 403446001)
(All relays and solenoids are shown as de-energized)



Start Circuit

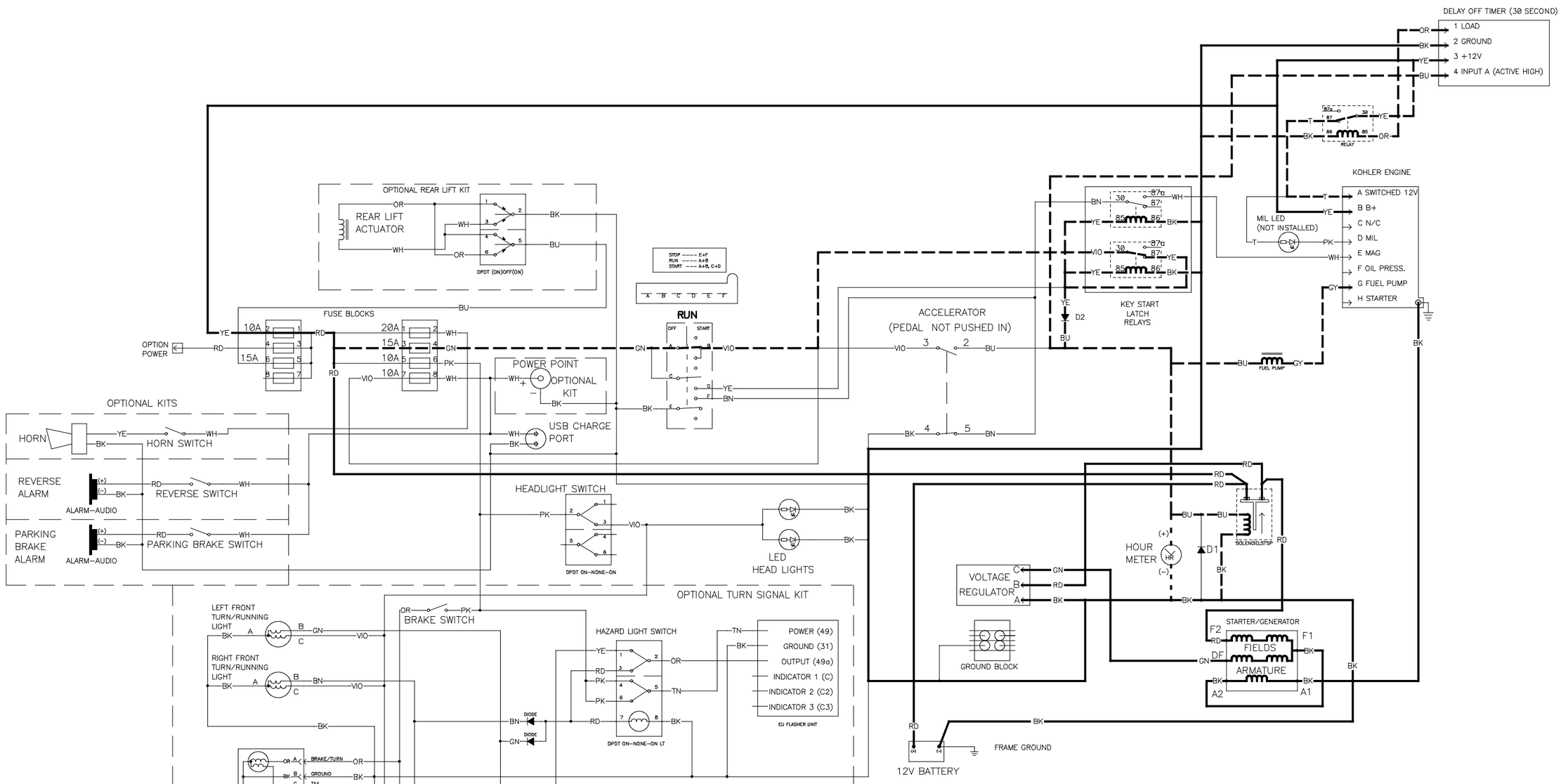
(Key Switch in START Position)

(fuel injected engine models shown)

——— Power Current

— — Control Current

- - - Indication Current



Run Circuit

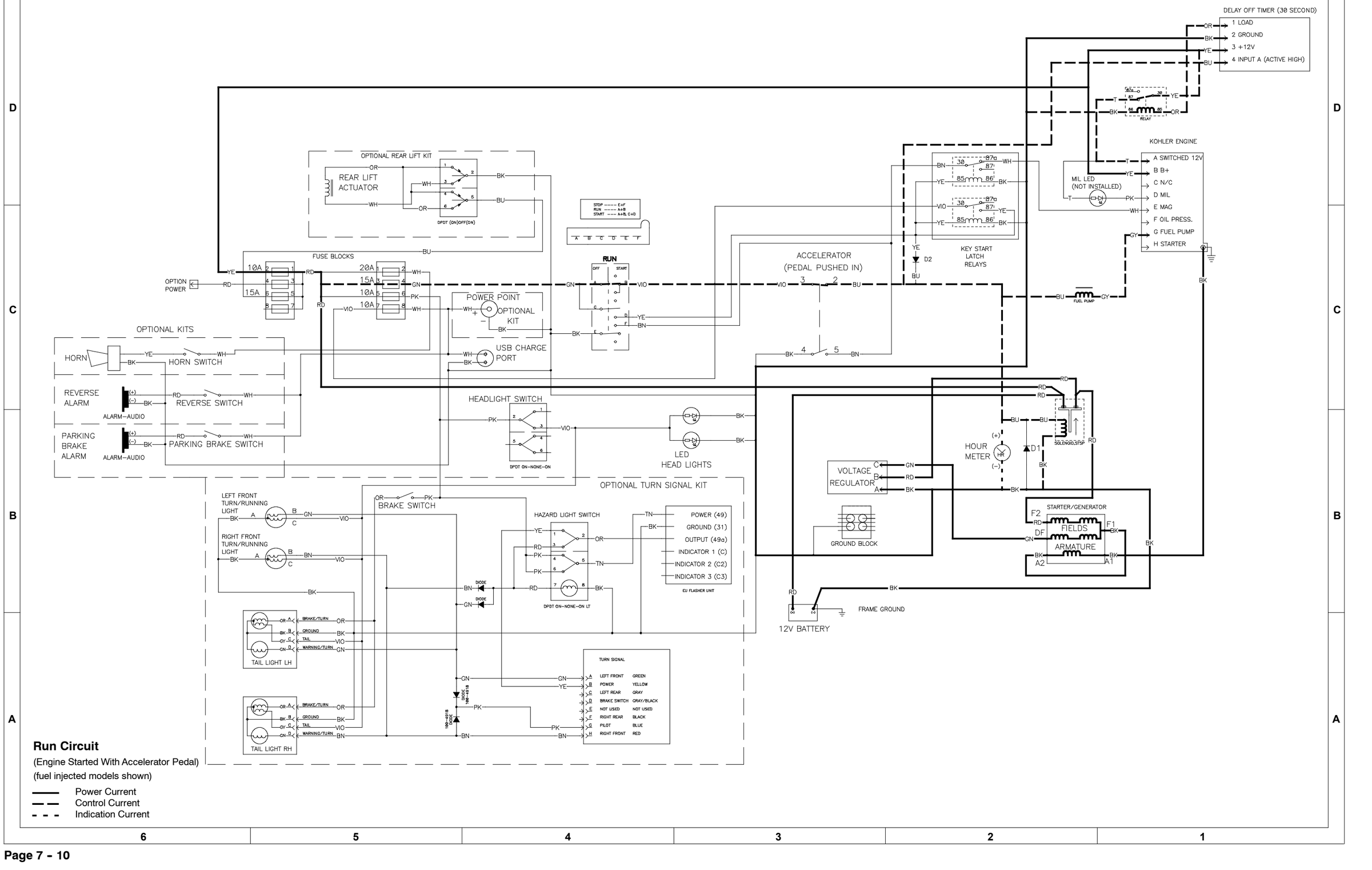
(Engine Started With Key Switch)

(fuel injected models shown)

Power Current

Control Current

Indication Current



Run Circuit

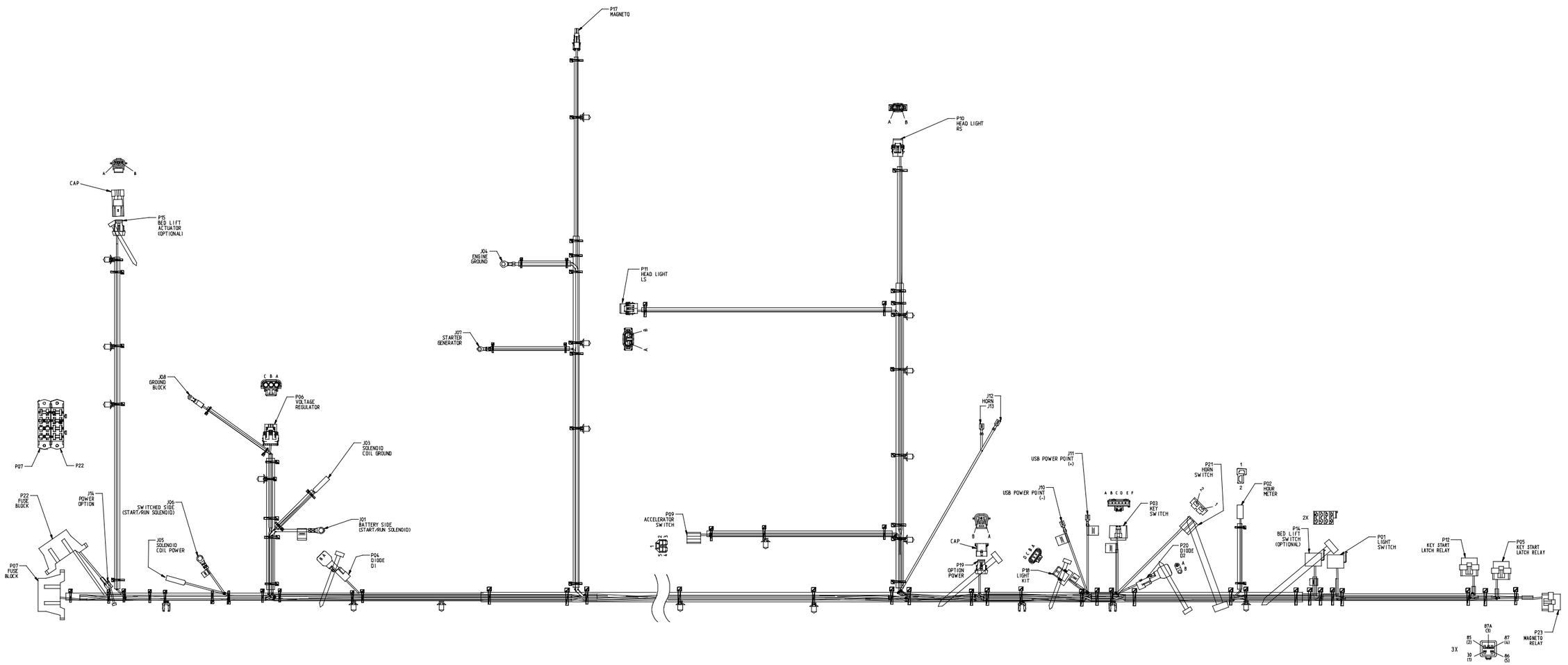
(Engine Started With Accelerator Pedal)

(fuel injected models shown)

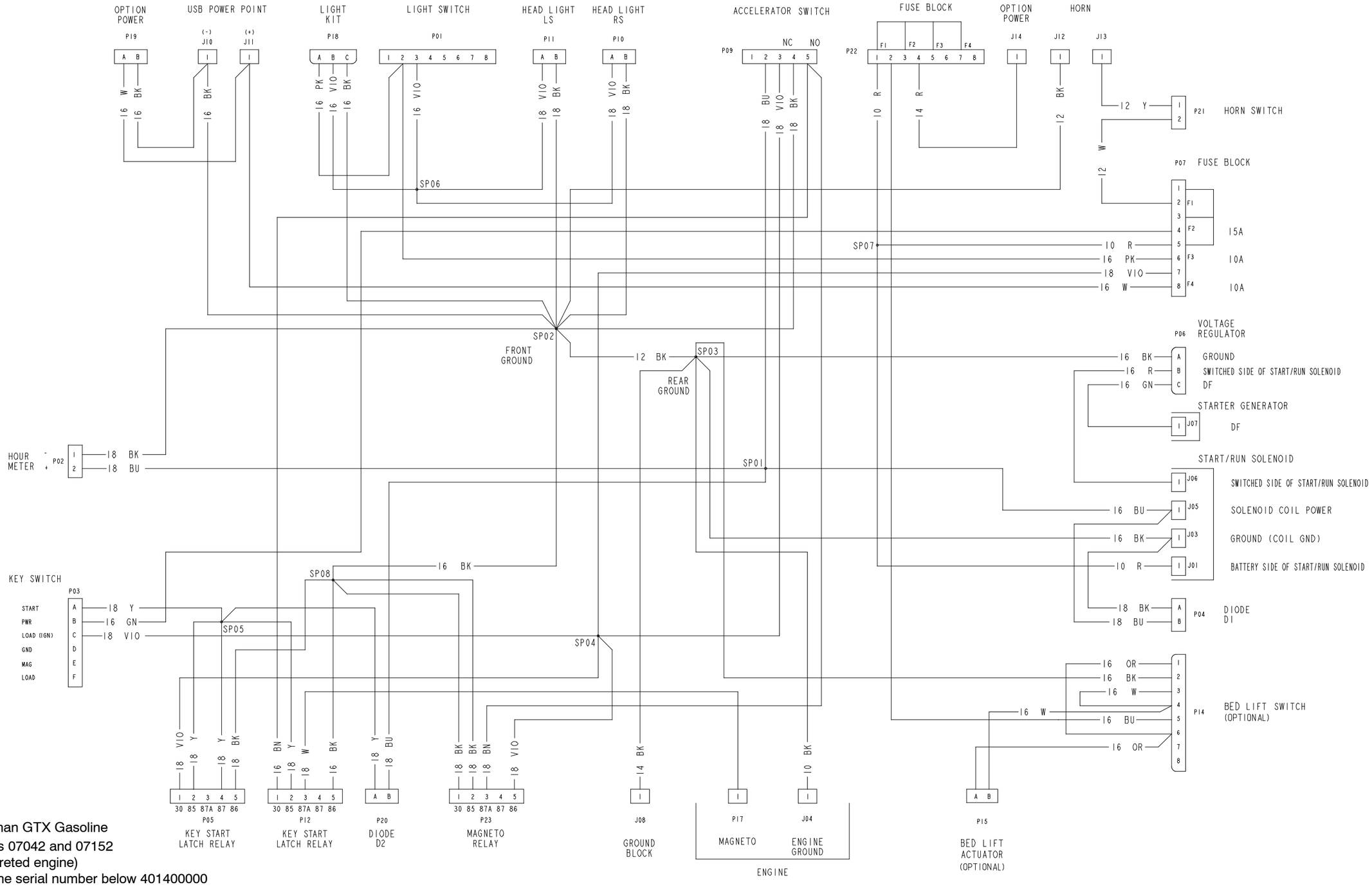
——— Power Current

— — Control Current

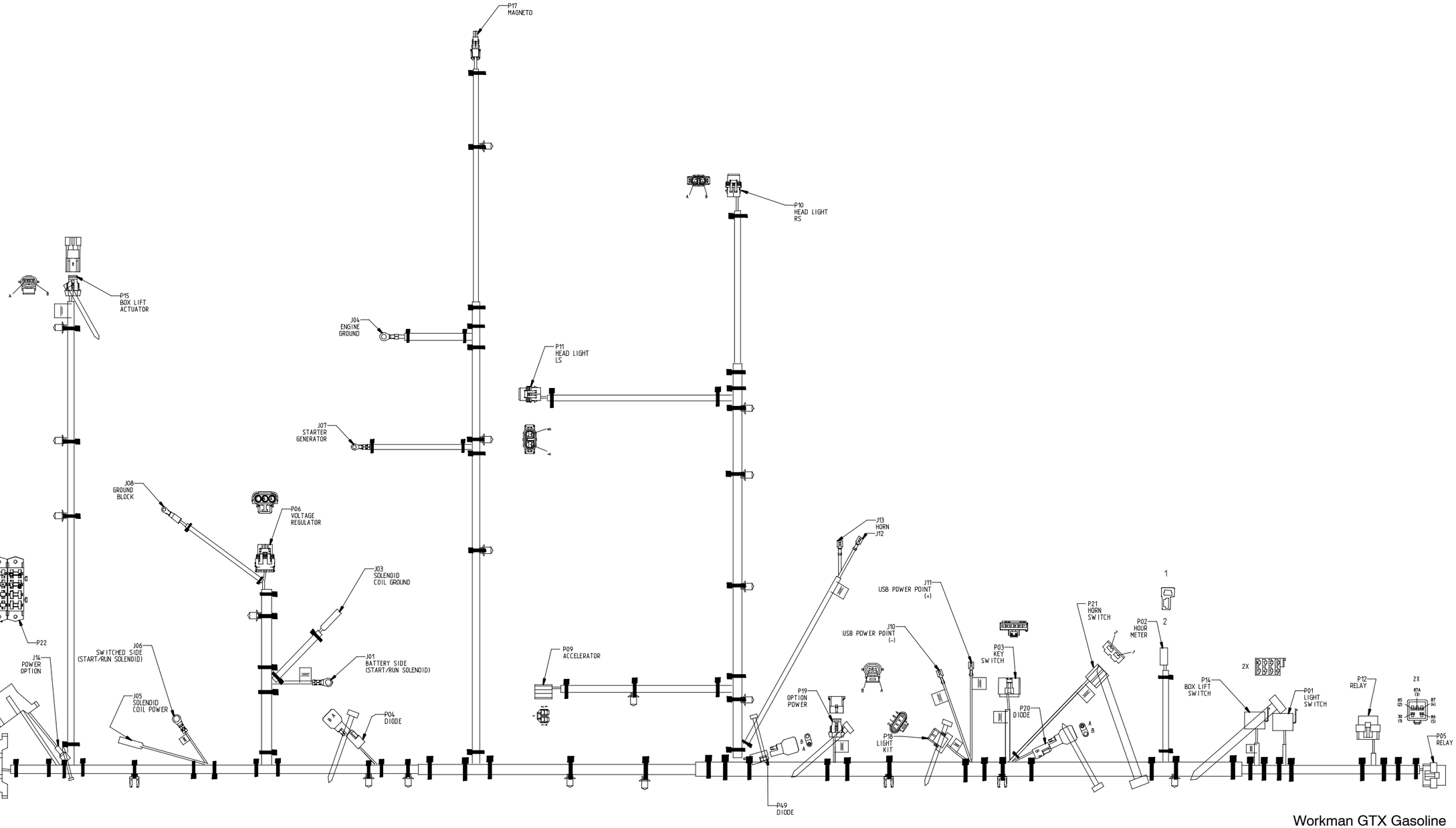
- - - Indication Current



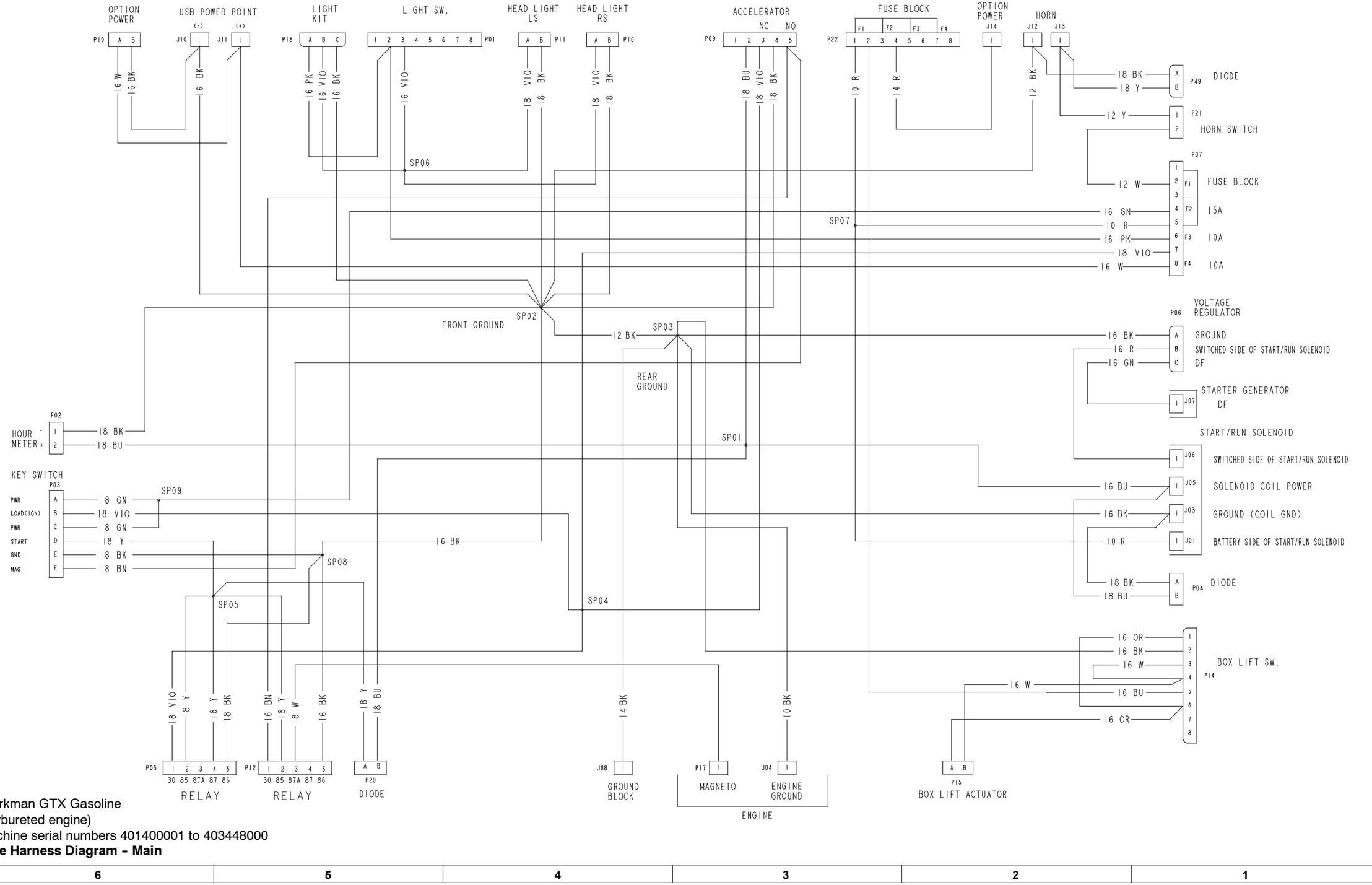
Workman GTX Gasoline
Models 07042 and 07152 (carbureted engine)
Machine serial number below 401400000
Wire Harness Drawing - Main



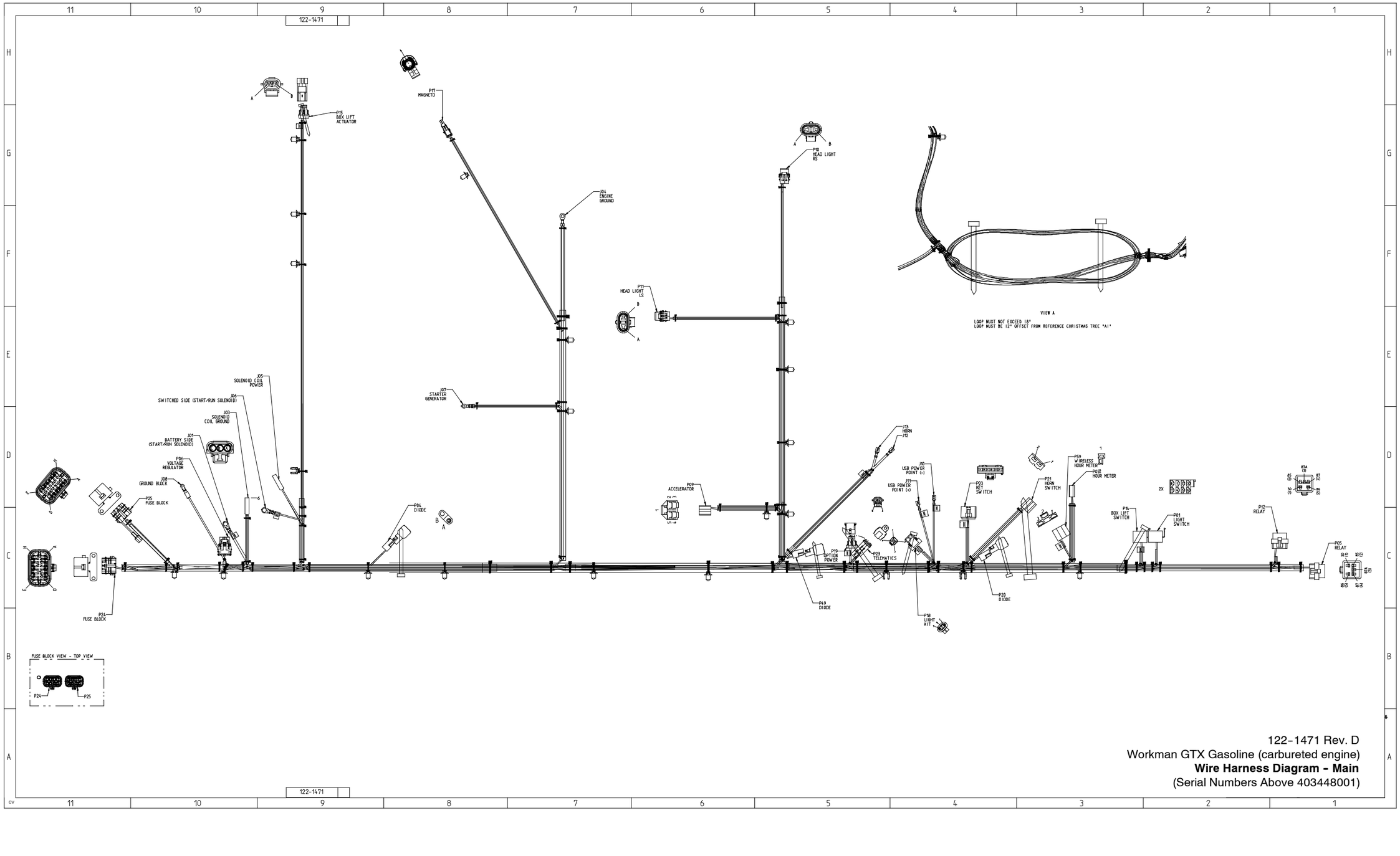
Workman GTX Gasoline
Models 07042 and 07152
(carbureted engine)
Machine serial number below 401400000
Wire Harness Diagram - Main

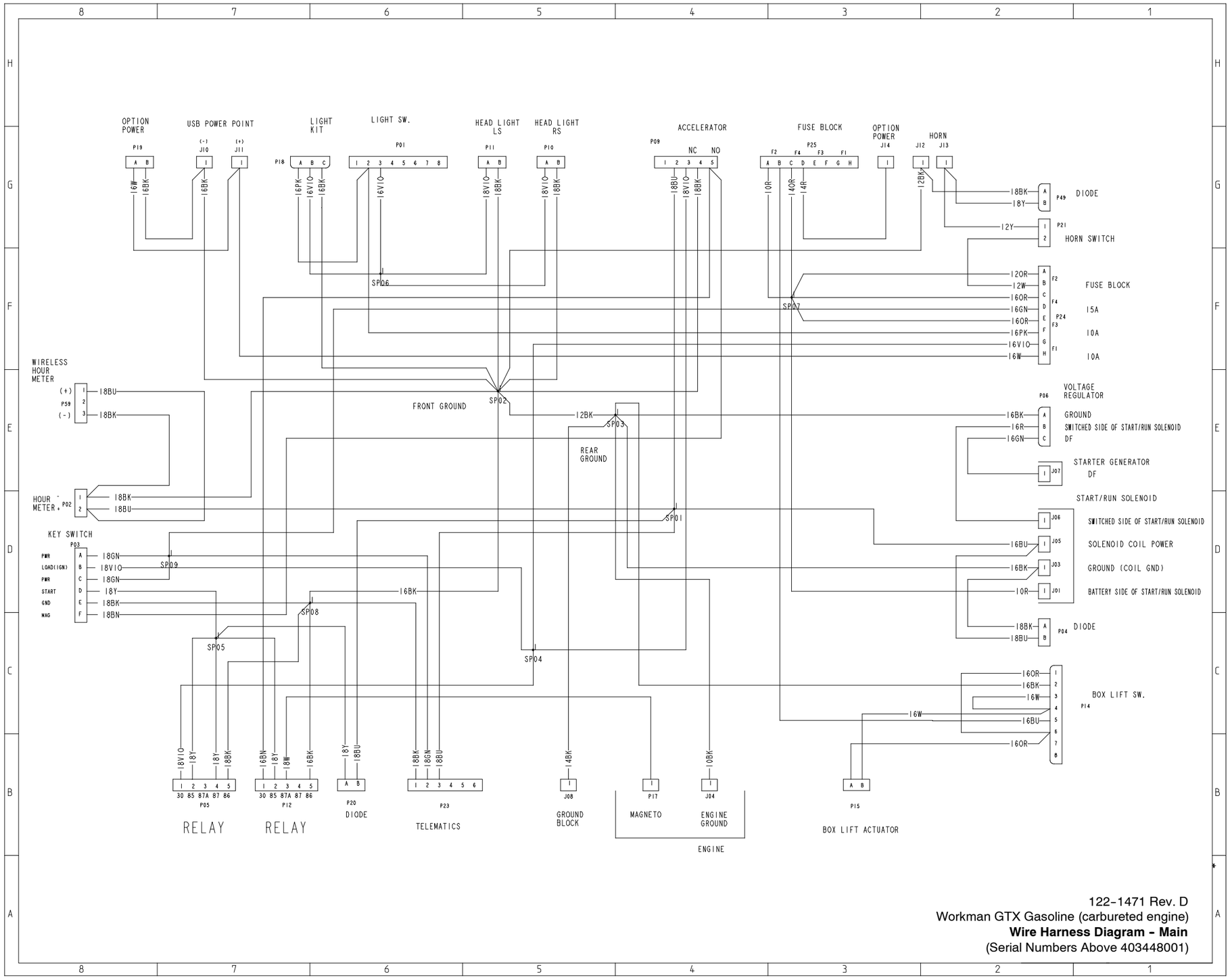


Workman GTX Gasoline
(Carbureted engine)
Machine serial numbers 401400001 to 403448000
Wire Harness Drawing - Main

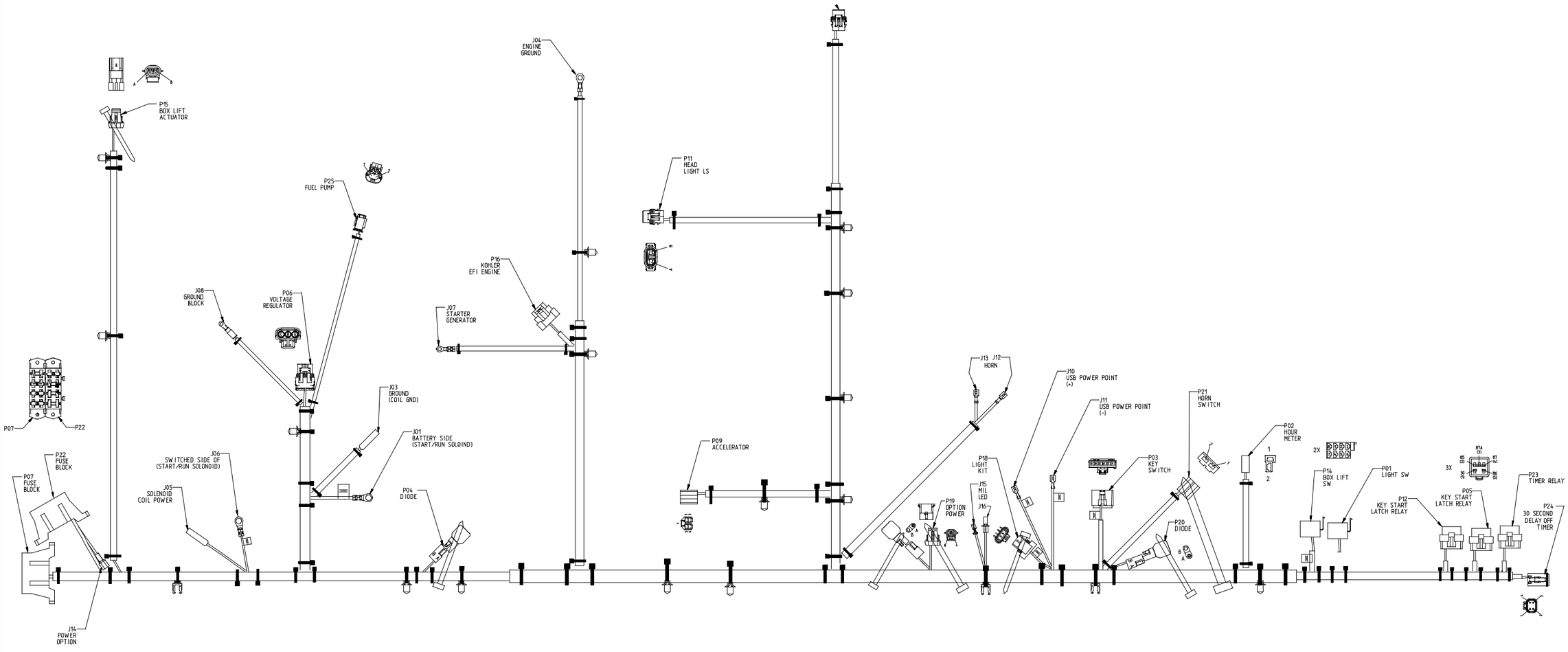


Workman GTX Gasoline
(carbureted engine)
Machine serial numbers 401400001 to 403448000
Wire Harness Diagram - Main

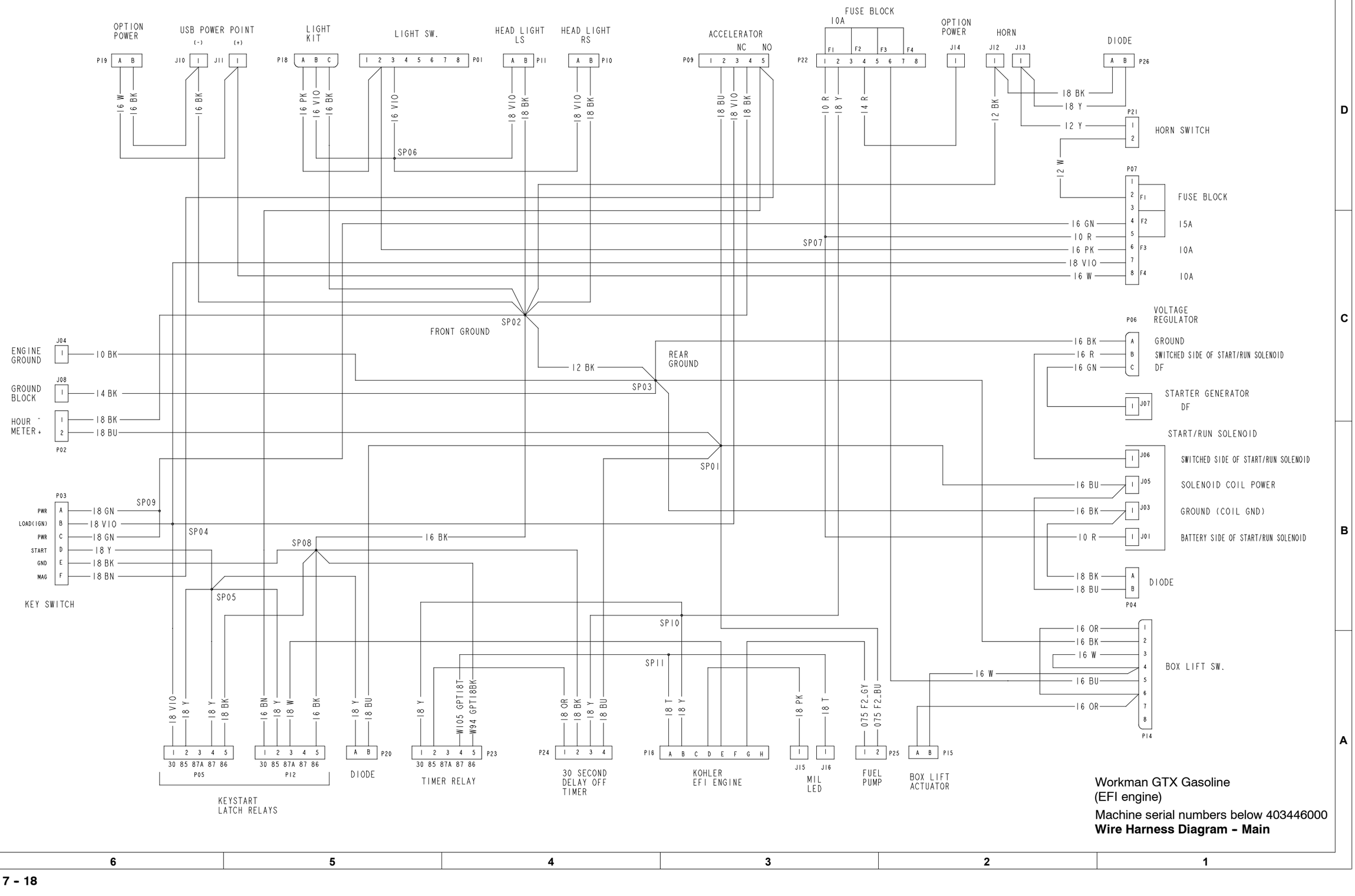

122-1471
P15
BOX LIFT
ACTUATOR
P17
MAGNETO
J04
ENGINE
GROUND
P10
HEAD LIGHT
RS
P11
HEAD LIGHT
LS
VIEW A
LOOP MUST NOT EXCEED 18"
LOOP MUST BE 12" OFFSET FROM REFERENCE CHRISTMAS TREE "A1"
J05
SOLENOID COIL
POWER
J06
SWITCHED SIDE (START/RUN SOLENOID)
J03
SOLENOID
COIL GROUND
J01
BATTERY SIDE
(START/RUN SOLENOID)
P06
VOLTAGE
REGULATOR
J08
GROUND BLOCK
P25
FUSE BLOCK
J07
STARTER
GENERATOR
P04
DIODE
P09
ACCELERATOR
J13
HORN
J12
J10
USB POWER
POINT (-)
J11
USB POWER
POINT (+)
P03
KEY
SWITCH
P21
HORN
SWITCH
P59
WIRELESS
HOUR METER
P02
HOUR METER
P19
OPTION
POWER
P23
TELEMATICS
P49
DIODE
P20
DIODE
P18
LIGHT
KIT
P16
BOX LIFT
SWITCH
P01
LIGHT
SWITCH
P12
RELAY
P05
RELAY
P24
FUSE BLOCK
FUSE BLOCK VIEW - TOP VIEW
P24
P25
122-1471 Rev. D
Workman GTX Gasoline (carbureted engine)
Wire Harness Diagram - Main
(Serial Numbers Above 403448001)

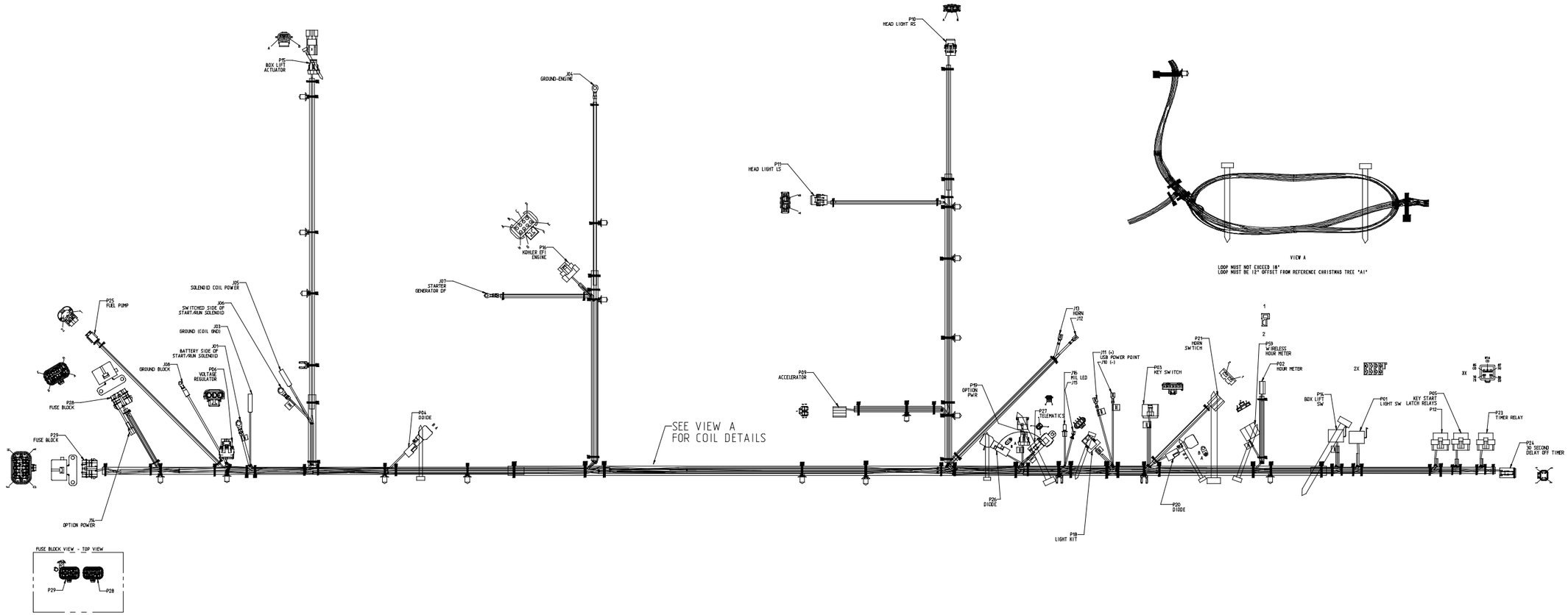


122-1471 Rev. D
Workman GTX Gasoline (carbureted engine)
Wire Harness Diagram - Main
(Serial Numbers Above 403448001)

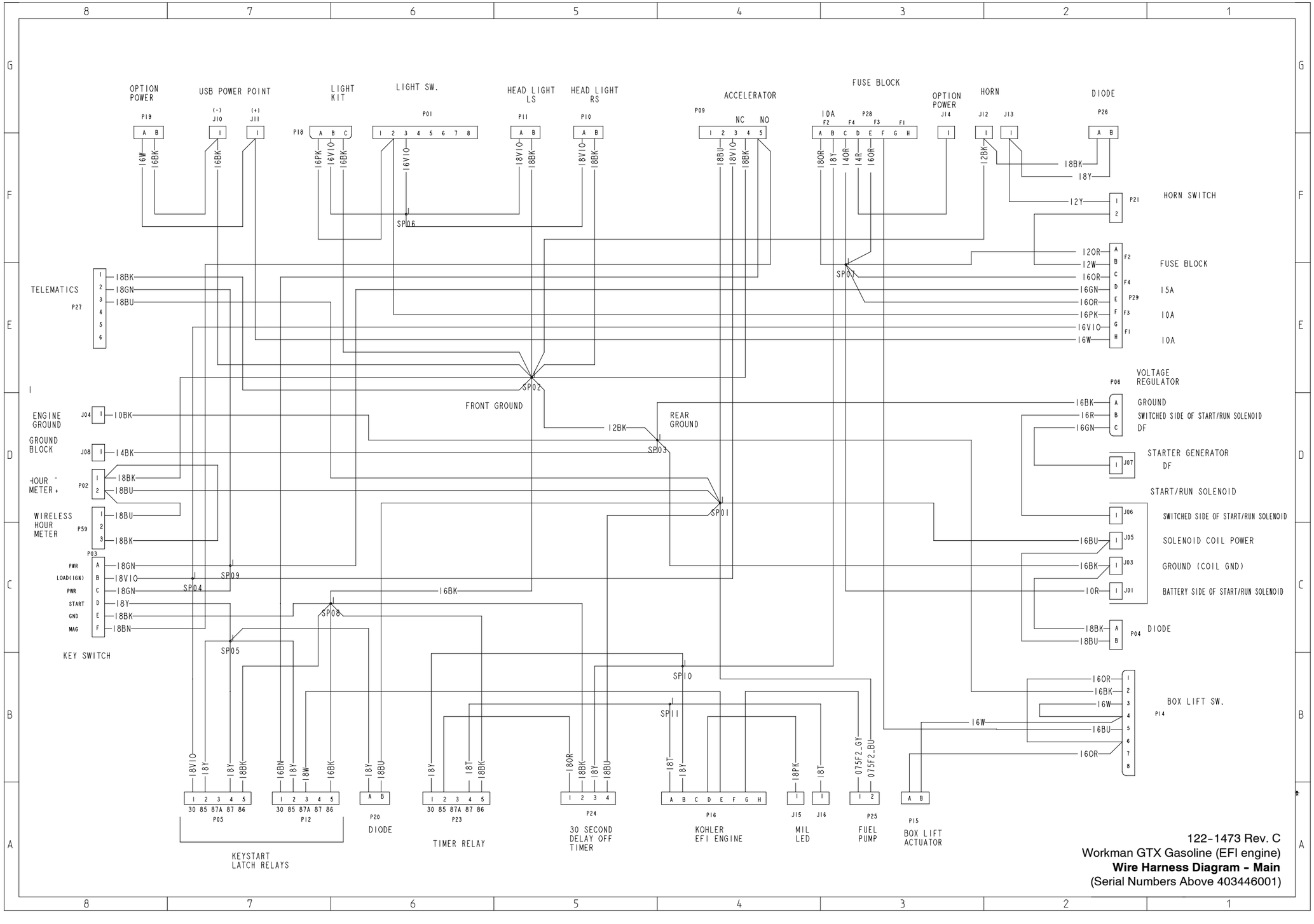


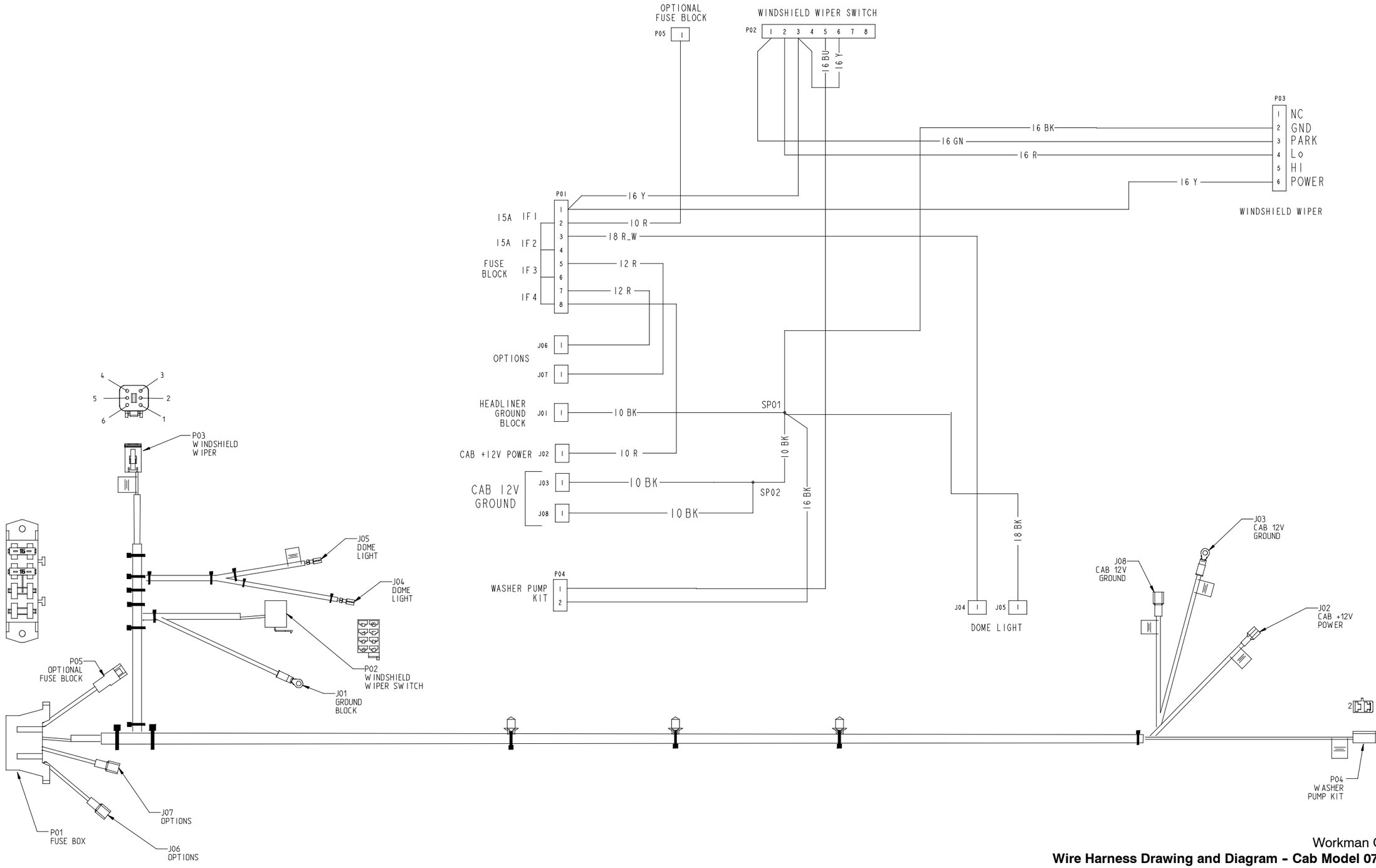
Workman GTX Gasoline
(EFI Engine)
Machine serial numbers below 403446000
Wire Harness Drawing - Main


OPTION POWER
P19 A B
16 W
16 BK
USB POWER POINT
(-) (+)
J10 1
J11 1
16 BK
LIGHT KIT
P18 A B C
16 PK
16 VIO
16 BK
LIGHT SW.
1 2 3 4 5 6 7 8 P01
16 VIO
HEAD LIGHT LS
A B P11
18 VIO
18 BK
HEAD LIGHT RS
A B P10
18 VIO
18 BK
ACCELERATOR
NC NO
P09 1 2 3 4 5
18 BU
18 VIO
18 BK
FUSE BLOCK
10A
F1 F2 F3 F4
P22 1 2 3 4 5 6 7 8
10 R
18 Y
14 R
OPTION POWER
J14 1
HORN
J12 1
J13 1
12 BK
DIODE
A B P26
18 BK
18 Y
12 Y
P21
1
2
HORN SWITCH
12 W
P07
1
2 F1
3
4 F2
5
6 F3
7
8 F4
FUSE BLOCK
15A
10A
10A
16 GN
10 R
16 PK
18 VIO
16 W
SP06
SP07
SP02
FRONT GROUND
SP03
REAR GROUND
12 BK
VOLTAGE REGULATOR
P06
A GROUND
B SWITCHED SIDE OF START/RUN SOLENOID
C DF
16 BK
16 R
16 GN
STARTER GENERATOR
DF
J07 1
START/RUN SOLENOID
J06 1 SWITCHED SIDE OF START/RUN SOLENOID
J05 1 SOLENOID COIL POWER
J03 1 GROUND (COIL GND)
J01 1 BATTERY SIDE OF START/RUN SOLENOID
16 BU
16 BK
10 R
DIODE
A
B
P04
18 BK
18 BU
ENGINE GROUND
J04 1
10 BK
GROUND BLOCK
J08 1
14 BK
HOUR METER
1
2
P02
18 BK
18 BU
SP01
SP09
SP04
SP08
16 BK
SP05
SP10
SP11
P03
PWR A 18 GN
LOAD(IGN) B 18 VIO
PWR C 18 GN
START D 18 Y
GND E 18 BK
MAG F 18 BN
KEY SWITCH
BOX LIFT SW.
1 16 OR
2 16 BK
3 16 W
4 16 W
5 16 BU
6
7
8 16 OR
P14
18 VIO
18 Y
18 Y
18 BK
16 BN
18 Y
18 W
16 BK
18 Y
18 BU
W105 GPT18T
W94 GPT18BK
18 Y
18 OR
18 BK
18 Y
18 BU
18 T
18 Y
18 PK
18 T
075 F2-GY
075 F2-BU
30 85 87A 87 86
P05
P12
DIODE
P20
TIMER RELAY
P23
30 SECOND DELAY OFF TIMER
P24
KOHLER EFI ENGINE
P16 A B C D E F G H
MIL LED
J15 J16
FUEL PUMP
P25
BOX LIFT ACTUATOR
P15
KEYSTART LATCH RELAYS
Workman GTX Gasoline
(EFI engine)
Machine serial numbers below 403446000
Wire Harness Diagram - Main



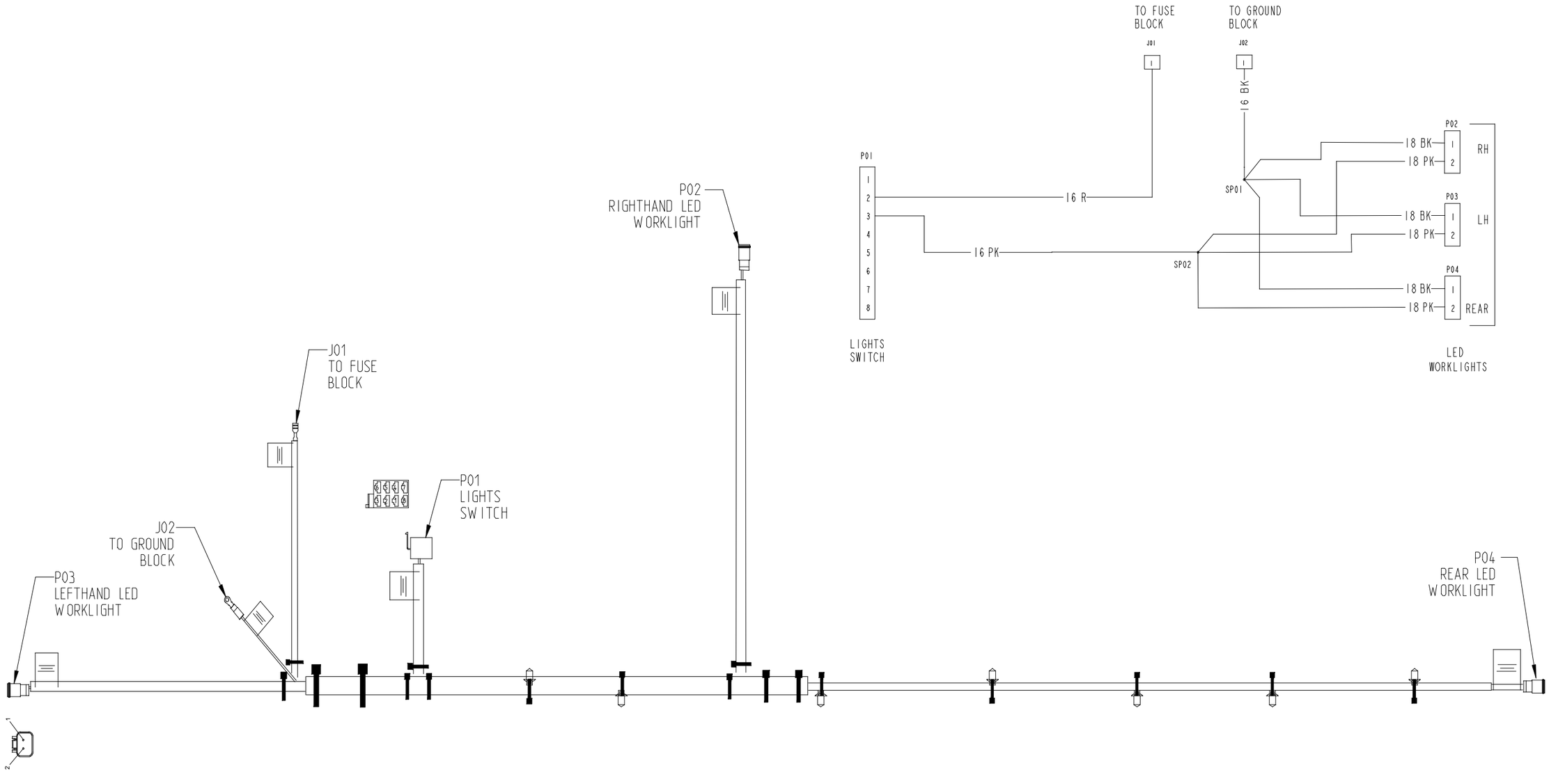
122-1473 Rev. C
Workman GTX Gasoline (EFI engine)
Wire Harness Diagram - Main
(Serial Numbers Above 403446001)


OPTION POWER
P19
A B
16W
16BK
USB POWER POINT
(-) J10
(+) J11
16BK
LIGHT KIT
P18
A B C
16PK
16VIO
16BK
LIGHT SW.
P01
1 2 3 4 5 6 7 8
16VIO
SP06
HEAD LIGHT LS
P11
A B
18VIO
18BK
HEAD LIGHT RS
P10
A B
18VIO
18BK
ACCELERATOR
P09
NC NO
1 2 3 4 5
18BU
18VIO
18BK
FUSE BLOCK
10A F2
P28
F4 F3 F1
A B C D E F G H
18OR
18Y
14OR
14R
16OR
OPTION POWER
J14
HORN
J12 J13
12BK
DIODE
P26
A B
18BK
18Y
12Y
HORN SWITCH
P21
1 2
SP07
TELEMATICS
P27
1 2 3 4 5 6
18BK
18GN
18BU
12OR
12W
16OR
16GN
16OR
16PK
16VIO
16W
FUSE BLOCK
P29
A B C D E F G H
F2 F4 F3 F1
15A
10A
10A
SP02
FRONT GROUND
12BK
SP03
REAR GROUND
VOLTAGE REGULATOR
P06
16BK
16R
16GN
A B C
GROUND
SWITCHED SIDE OF START/RUN SOLENOID
DF
ENGINE GROUND
J04
10BK
GROUND BLOCK
J08
14BK
STARTER GENERATOR
J07
DF
HOUR METER +
P02
1 2
18BK
18BU
START/RUN SOLENOID
SP01
WIRELESS HOUR METER
P59
1 2 3
18BU
18BK
J06
SWITCHED SIDE OF START/RUN SOLENOID
16BU
J05
SOLENOID COIL POWER
16BK
J03
GROUND (COIL GND)
10R
J01
BATTERY SIDE OF START/RUN SOLENOID
P03
PWR A 18GN
LOAD(IGN) B 18VIO
PWR C 18GN
START D 18Y
GND E 18BK
MAG F 18BN
SP04
SP09
16BK
SP08
SP05
KEY SWITCH
18BK
18BU
DIODE
P04
SP10
SP11
16OR
16BK
16W
16BU
16OR
BOX LIFT SW.
P14
1 2 3 4 5 6 7 8
16W
18VIO
18Y
18Y
18BK
16BN
18Y
18W
16BK
18Y
18BU
18T
18T
18BK
18OR
18BK
18BU
18T
18Y
18PK
18T
075F2.GY
075F2.BU
30 85 87A 87 86
P05
30 85 87A 87 86
P12
A B
P20
DIODE
30 85 87A 87 86
P23
1 2 3 4
P24
A B C D E F G H
P16
J15 J16
P25
P15
KEYSTART LATCH RELAYS
TIMER RELAY
30 SECOND DELAY OFF TIMER
KOHLER EFI ENGINE
MIL LED
FUEL PUMP
BOX LIFT ACTUATOR
122-1473 Rev. C
Workman GTX Gasoline (EFI engine)
Wire Harness Diagram - Main
(Serial Numbers Above 403446001)



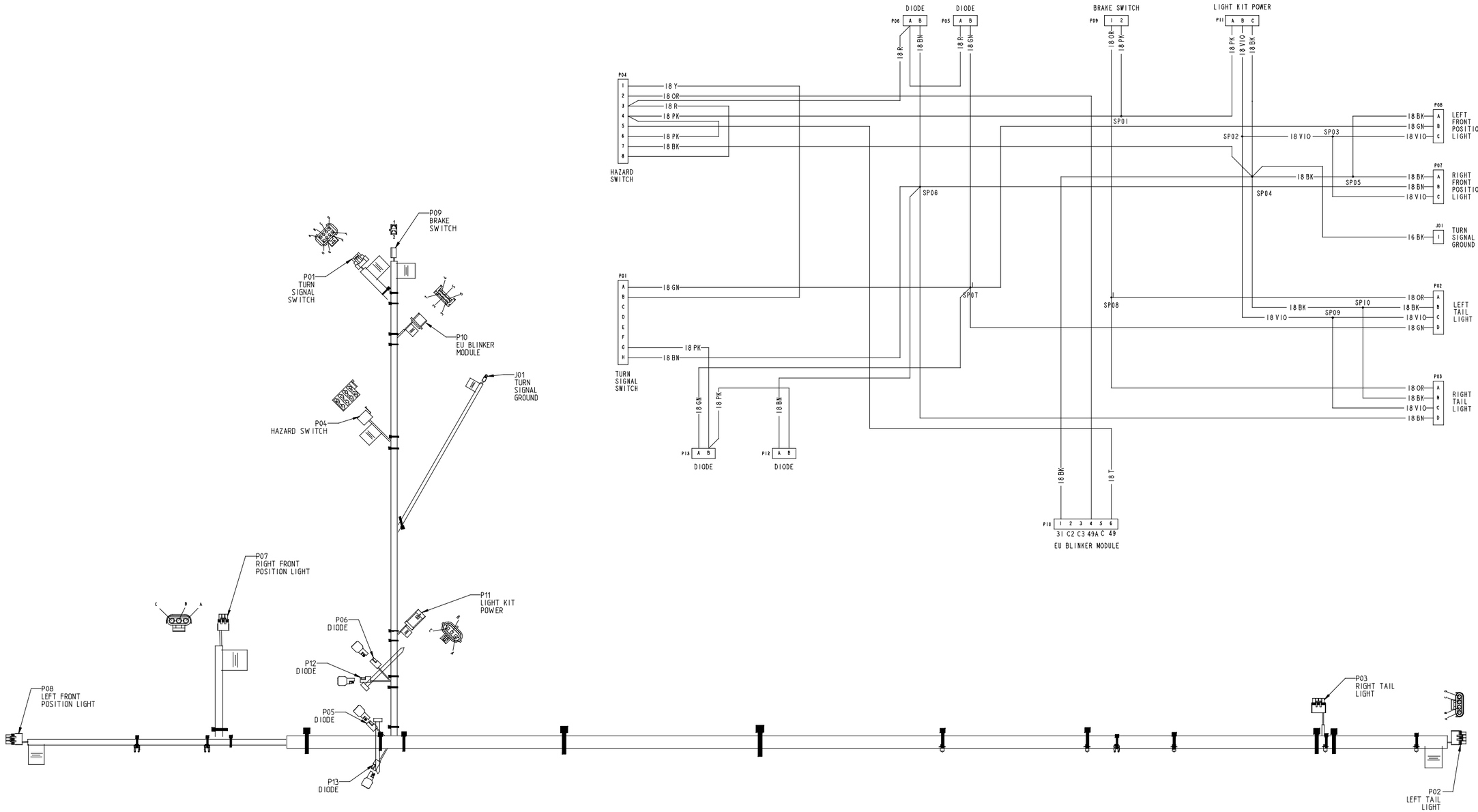
Workman GTX

Wire Harness Drawing and Diagram - Cab Model 07142



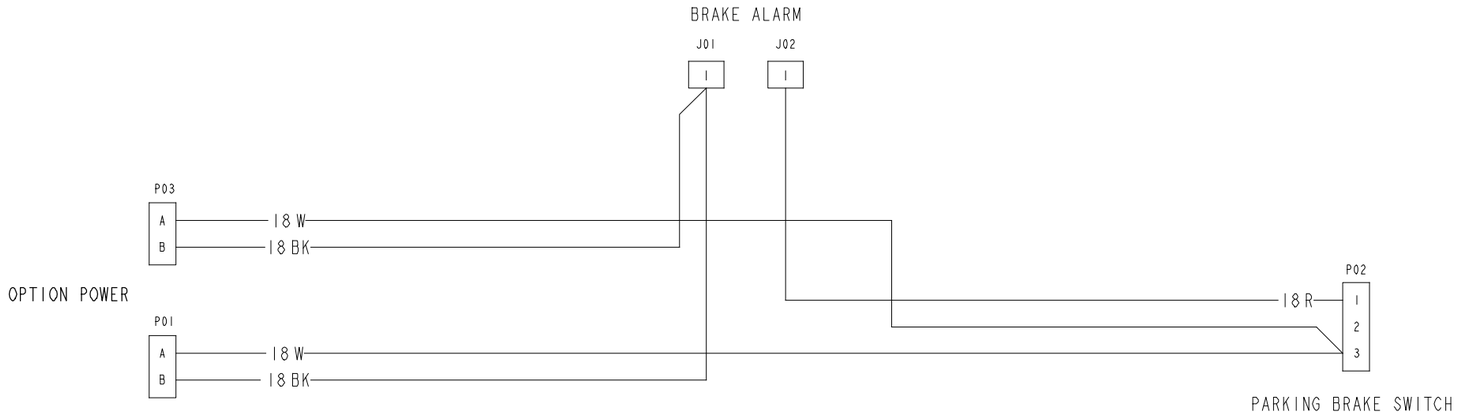
Workman GTX

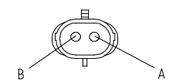
Wire Harness Drawing and Diagram - Light Kit (Cab)



Workman GTX

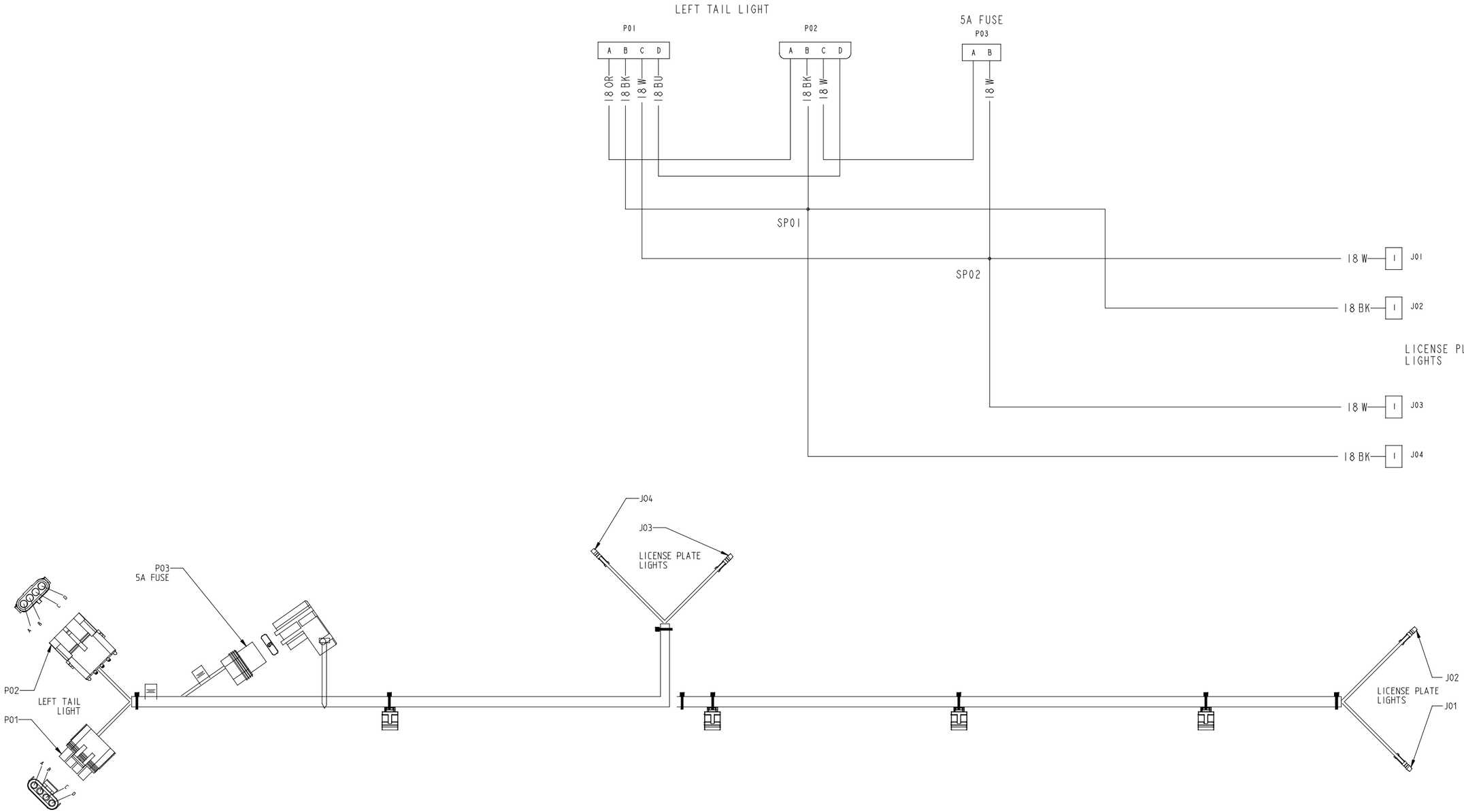
Wire Harness Drawing and Diagram - Light Kit (No Cab)





Workman GTX Gasoline

Wire Harness Drawing and Diagram - Parking Brake Alarm



Workman GTX

Wire Harness Drawing and Diagram - EU Tail Light Kit