Part No. 05137SL (Rev. A)

# Service Manual

# Pro Sweep 5200

## 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 Pro Sweep 5200.

REFER TO THE OPERATOR'S MANUAL FOR OPERATING, MAINTENANCE AND ADJUSTMENT INSTRUCTIONS. Space is provided in Chapter 2 of this book to insert the Operator's Manual and Parts Catalog for your machine. 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 Pro Sweep 5200 is designed and tested to offer safe service when operated and maintained properly. Although hazard control and accident prevention partially are dependent upon the design and configuration of the machine, these factors are also dependent upon the awareness, concern and proper training of the personnel involved in the operation, transport, maintenance and storage of the machine. Improper use or maintenance of the machine can result in injury or death. To reduce the potential for injury or death, comply with the following safety instructions.

**WARNING**

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

## Before Operating

1. Read and understand the contents of the Operator's Manual before starting and operating the machine. Become familiar with the controls and know how to stop the sweeper 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 machine. Also tighten any loose nuts, bolts or screws to ensure machine is in safe operating condition.

3. Make sure that the tow vehicle is carefully selected to assure the best performance and safe operation of the Pro Sweep 5200.

4. Assure sweeper interlock system functions correctly so sweeper brush does not rotate unless dump hopper is lowered.

5. Make sure that operator is familiar with tow vehicle operation.

## While Operating

1. Operator should be in the operators position when operating the tow vehicle and sweeper. Stay away from the sweeper when the brush is engaged.

2. Make sure that hitch pin is properly positioned in tow vehicle and sweeper. Hitch pin should be secured with hairpin clip.

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

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

5. If abnormal vibration is detected, stop tow vehicle and sweeper immediately and determine source of vibration. Correct problems before resuming the use of sweeper.

6. While operating, the Pro Sweep 5200 may exceed noise levels of 85dB(A) at the operator position. Hearing protection is recommended for prolonged exposure to reduce the potential of permanent hearing damage.

7. Before leaving the operator's position of the tow vehicle:

   A. Stop sweeper brush.

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

   C. Make sure that dump hopper is lowered.

8. Park on level surface, empty hopper and chock sweeper wheels before disconnecting Pro Sweep 5200 from tow vehicle.

## Maintenance and Service

1. Before servicing or making adjustments, empty sweeper hopper and position sweeper on a level surface. Chock sweeper wheels to prevent it from moving. If sweeper is attached to tow vehicle, engage tow vehicle parking brake, stop engine and remove key from the ignition switch.

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

3. Make sure all hydraulic line connectors are tight and all hydraulic hoses and lines are in good condition before applying pressure to the hydraulic system.

4. Keep body and hands away from pin hole leaks in hydraulic lines that eject high pressure hydraulic fluid. Use cardboard or paper to find hydraulic leaks. Hydraulic fluid escaping under pressure can penetrate skin and cause injury. Hydraulic fluid accidentally injected into the skin must be surgically removed within a few hours by a doctor familiar with this form of injury or gangrene may result.

5. Before disconnecting any hydraulic component or performing any work on the hydraulic system, all pressure in system must be relieved. See Relieving Hydraulic System Pressure in the General Information section of Chapter 3 – Hydraulic System.

6. If hopper is to be raised, make sure that sweeper is not placed in the offset position.

7. If hopper is raised, install lift cylinder stop to ensure that unexpected shifting of sweeper frame does not occur.

8. Disconnect electrical power harness from tow vehicle before servicing the sweeper.

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

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

11. When changing tires or performing other service, use correct blocks, hoists and jacks. Make sure machine is parked on a solid level floor such as a concrete floor with the hopper empty and lowered. Have sweeper attached to towing vehicle, engage vehicle parking brake, stop engine and remove key from the ignition switch. Always chock or block wheels. Use jack stands or solid wood blocks to support the raised machine. If the machine is not properly supported by blocks or jack stands, the machine may move or fall, which may result in personal injury (see Jacking Instructions).

# Jacking Instructions

**CAUTION**

**When changing tires or performing other service, use correct blocks, hoists and jacks to support sweeper. Make sure machine is parked on a solid level surface such as a concrete floor. Always chock or block wheels. Use jack stands or solid wood blocks to support the raised machine. If the machine is not properly supported by blocks or jack stands, the machine may move or fall, which may result in personal injury.**

1. Position sweeper on a level surface with dump hopper empty and lowered. Have sweeper attached to towing vehicle, engage vehicle parking brake, stop engine and remove key from the ignition switch. Chock sweeper wheels to prevent it from moving.

2. Position jack securely under the main sweeper frame (Fig. 1). Do not use the axle as a jacking point.

3. Carefully jack machine off the ground.

4. Position jack stands or hardwood blocks under the main frame to support the sweeper.

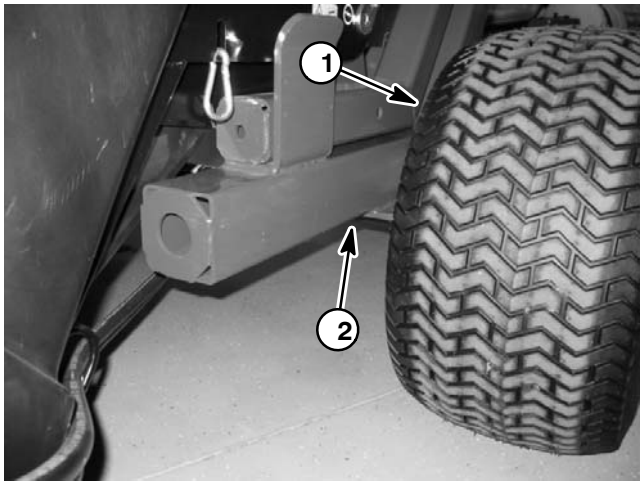


Figure 1

1. **Wheel**
2. **Frame jacking point**

# Securing Pro Sweep 5200 to Tow Vehicle

While operating or servicing the Pro Sweep 5200, make sure that hitch pin is properly positioned in tow vehicle hitch and sweeper tongue. Hitch pin should be secured with hairpin clip (Fig. 2).

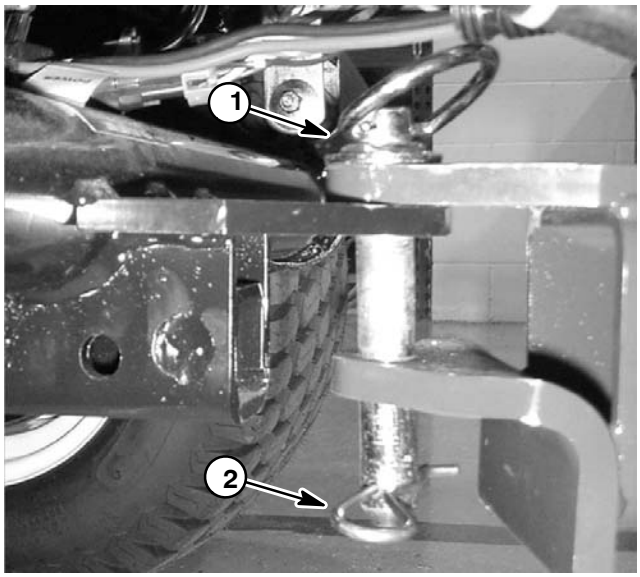


Figure 2

1. **Hitch pin**
2. **Hairpin clip**

# Safety and Instruction Decals

Numerous safety and instruction decals are affixed to the Pro Sweep 5200. If any decal becomes illegible or damaged, install a new decal. Part numbers for replacement decals are listed in your Parts Catalog. Order replacement decals from your Authorized Toro Distributor.

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Chapter 2

# Product Records and Maintenance

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## Product Records

Insert Operator's Manual and Parts Catalog for your Pro Sweep 5200 at the end of this chapter. Additionally, if any optional equipment or accessories have been installed to your machine, insert the Installation Instructions, Operator's Manuals and Parts Catalogs for those options at the end of this chapter.

## Maintenance

Maintenance procedures and recommended service intervals for the Pro Sweep 5200 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°<br>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, hardness of the surface underneath the fastener's head or similar condition which affects the installation.

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

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



## Fastener Identification

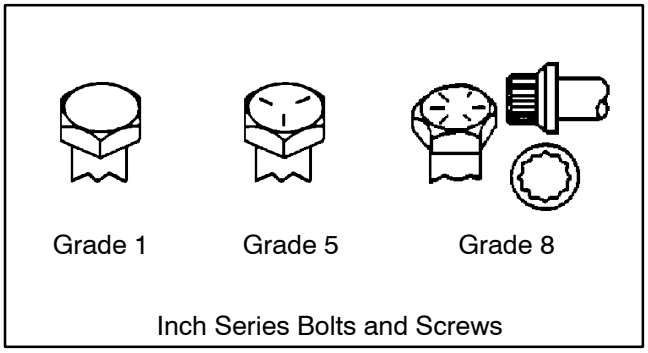


Figure 1

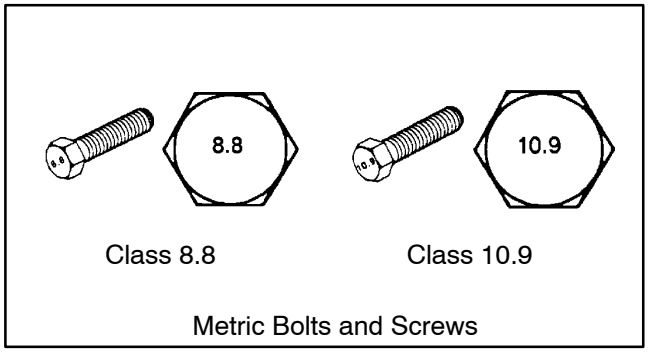


Figure 2

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

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

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

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

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

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

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

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

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

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

## Other Torque Specifications

**SAE Grade 8 Steel Set Screws**

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

**Wheel Bolts and Lug Nuts**

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

** For steel wheels and non–lubricated fasteners.

**Thread Cutting Screws (Zinc Plated Steel)**

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

**Thread Cutting Screws (Zinc Plated Steel)**

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

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

## Conversion Factors

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

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

Chapter 3

# Hydraulic System

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## Hydraulic Hoses

Hydraulic hoses are subject to extreme conditions such as pressure differentials during operation and exposure to weather, sun, chemicals, very warm storage conditions or mishandling during operation and maintenance. These conditions can cause damage or premature deterioration. Some hoses are more susceptible to these conditions than others. Inspect the hoses frequently for signs of deterioration or damage.

When replacing a hydraulic hose, be sure that the hose is straight (not twisted) before tightening the fittings. This can be done by observing the imprint on the hose. Use two wrenches; hold the hose straight with one wrench and tighten the hose swivel nut onto the fitting with the other wrench.

**WARNING**

**Before disconnecting or performing any work on hydraulic system, relieve all pressure in system. See Relieving Hydraulic System Pressure in this section.**

**Keep body and hands away from pin hole leaks or nozzles that eject hydraulic fluid under high pressure. Use paper or cardboard, not hands, to search for leaks. Hydraulic fluid escaping under pressure can have sufficient force to penetrate the skin and cause serious injury. If fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type of injury. Gangrene may result from such an injury.**

## Hydraulic Fitting Installation

### O–Ring Face Seal

1. Make sure both threads and sealing surfaces are free of burrs, nicks, scratches or any foreign material.

2. Make sure the o–ring is installed and properly seated in the groove. It is recommended that the o–ring be replaced any time the connection is opened.

3. Lubricate the o–ring with a light coating of oil.

4. Put the tube and nut squarely into position on the face seal end of the fitting and tighten the nut until finger tight.

5. Mark the nut and fitting body. Hold the body with a wrench. Use another wrench to tighten the nut to the correct Flats From Finger Tight (F.F.F.T.). The markings on the nut and fitting body will verify that the connection has been tightened.

| Size | F.F.F.T. |
|---|---|
| 4 (1/4 in. nominal hose or tubing) | 0.75 ± 0.25 |
| 6 (3/8 in.) | 0.75 ± 0.25 |
| 8 (1/2 in.) | 0.75 ± 0.25 |
| 10 (5/8 in.) | 1.00 ± 0.25 |
| 12 (3/4 in.) | 0.75 ± 0.25 |
| 16 (1 in.) | 0.75 ± 0.25 |

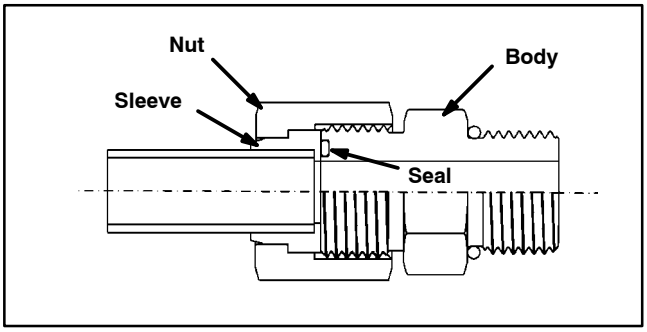



Figure 1

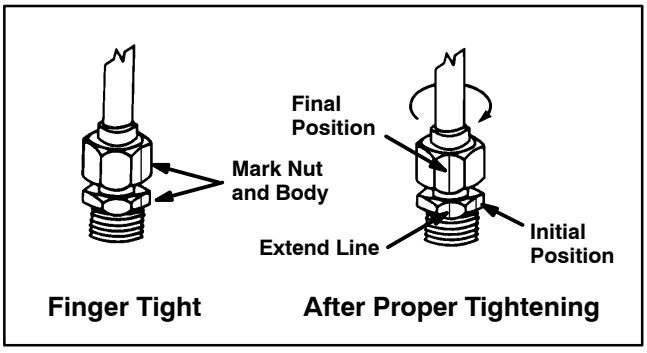



Figure 2

**SAE Straight Thread O–Ring Port – Non–adjustable**

1. Make sure both threads and sealing surfaces are free of burrs, nicks, scratches or any foreign material.

2. Always replace the o–ring seal when this type of fitting shows signs of leakage.

3. Lubricate the o–ring with a light coating of oil.

4. Install the fitting into the port and tighten it down full length until finger tight.

5. Tighten the fitting to the correct Flats From Finger Tight (F.F.F.T.).

| Size | F.F.F.T. |
|---|---|
| 4 (1/4 in. nominal hose or tubing) | 1.00 ± 0.25 |
| 6 (3/8 in.) | 1.50 ± 0.25 |
| 8 (1/2 in.) | 1.50 ± 0.25 |
| 10 (5/8 in.) | 1.50 ± 0.25 |
| 12 (3/4 in.) | 1.50 ± 0.25 |
| 16 (1 in.) | 1.50 ± 0.25 |

**NOTE:** Installation torque values for non–adjustable fittings are listed in Figure 4. These torque values should **only** be used when a fitting can be accessed with a socket. Use of an offset wrench (e.g. crowfoot wrench) will affect torque wrench accuracy and should not be used.

**SAE Straight Thread O–Ring Port – Adjustable**

1. Make sure both threads and sealing surfaces are free of burrs, nicks, scratches or any foreign material.

2. Always replace the o–ring seal when this type of fitting shows signs of leakage.

3. Lubricate the o–ring with a light coating of oil.

4. Turn back the jam nut as far as possible. Make sure the back up washer is not loose and is pushed up as far as possible (Step 1).

5. Install the fitting into the port and tighten finger tight until the washer contacts the face of the port (Step 2).

6. To put the fitting in the desired position, unscrew it by the required amount, but no more than one full turn (Step 3).

7. Hold the fitting in the desired position with a wrench and turn the jam nut with another wrench to the correct Flats From Finger Tight (F.F.F.T.) (Step 4).

| Size | F.F.F.T. |
|---|---|
| 4 (1/4 in. nominal hose or tubing) | 1.00 ± 0.25 |
| 6 (3/8 in.) | 1.50 ± 0.25 |
| 8 (1/2 in.) | 1.50 ± 0.25 |
| 10 (5/8 in.) | 1.50 ± 0.25 |
| 12 (3/4 in.) | 1.50 ± 0.25 |
| 16 (1 in.) | 1.50 ± 0.25 |

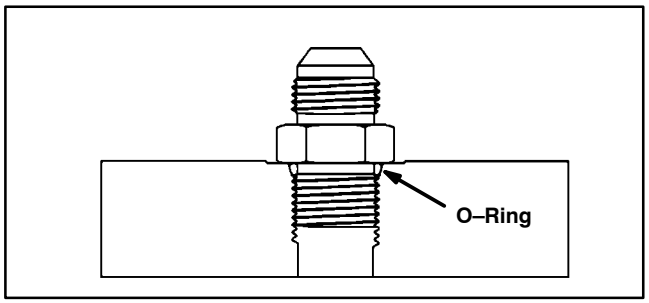



Figure 3

| Fitting Size | Installation Torque |
|---|---|
| 4 | 9–10 ft–lb (12–13 N–m) |
| 6 | 20–21 ft–lb (27–28 N–m) |
| 8 | 35–37 ft–lb (47–50 N–m) |
| 10 | 60–66 ft–lb (81–89 N–m) |
| 12 | 81–87 ft–lb (110–117 N–m) |
| 16 | 121–131 ft–lb (164–177 N–m) |

Figure 4

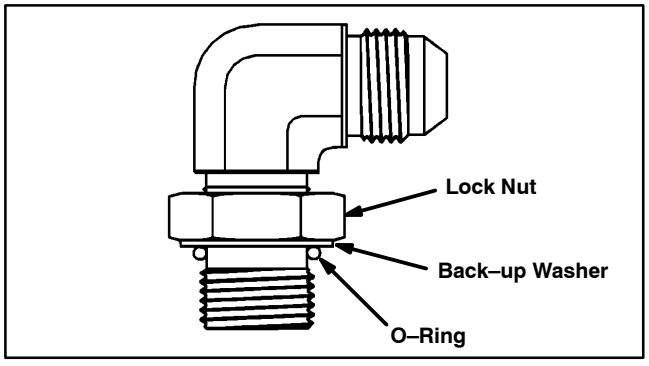



Figure 5

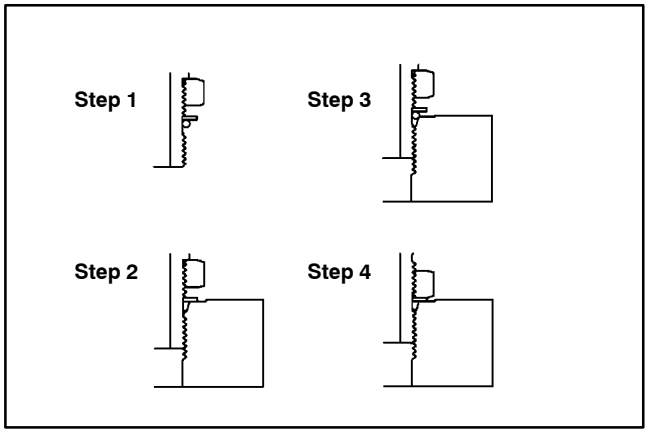



Figure 6

## Relieving Hydraulic System Pressure

**CAUTION**

**Operate all sweeper hydraulic controls to relieve system pressure and to avoid injury from pressurized hydraulic oil. See Relieving Hydraulic System Pressure in the General Information section of this chapter.**

Before disconnecting or performing any work on the sweeper hydraulic system, all pressure in the hydraulic system must be relieved. With the hopper fully lowered, turn tow vehicle key switch to OFF and allow engine to stop.

To relieve sweeper hydraulic system pressure, turn tow vehicle key switch to ON (engine not running). Press brush switch on and off. Press hopper switch to both raise and lower. After cycling the switches, return tow vehicle key switch to OFF and remove key from the ignition switch.

## Securing Sweeper to Tow Vehicle (Fig. 7)

While servicing the Pro Sweep 5200, make sure that the hitch pin is properly positioned in tow vehicle hitch and sweeper tongue. Hitch pin should be secured with hairpin clip.

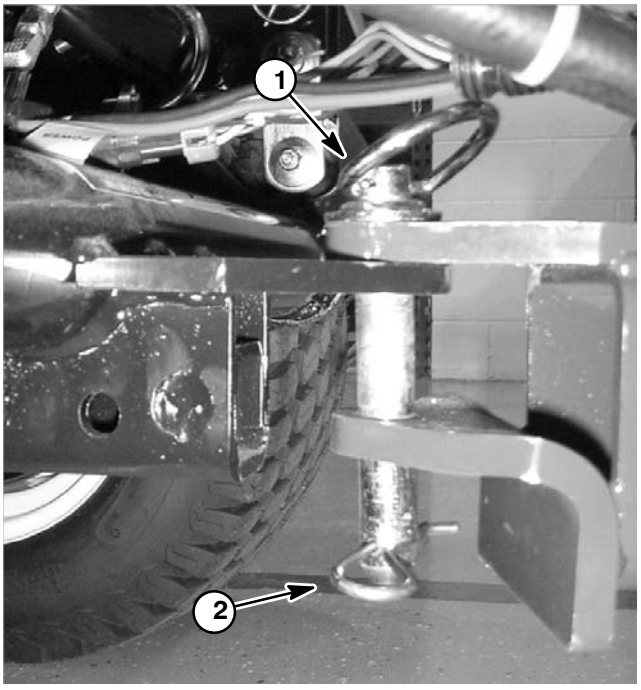
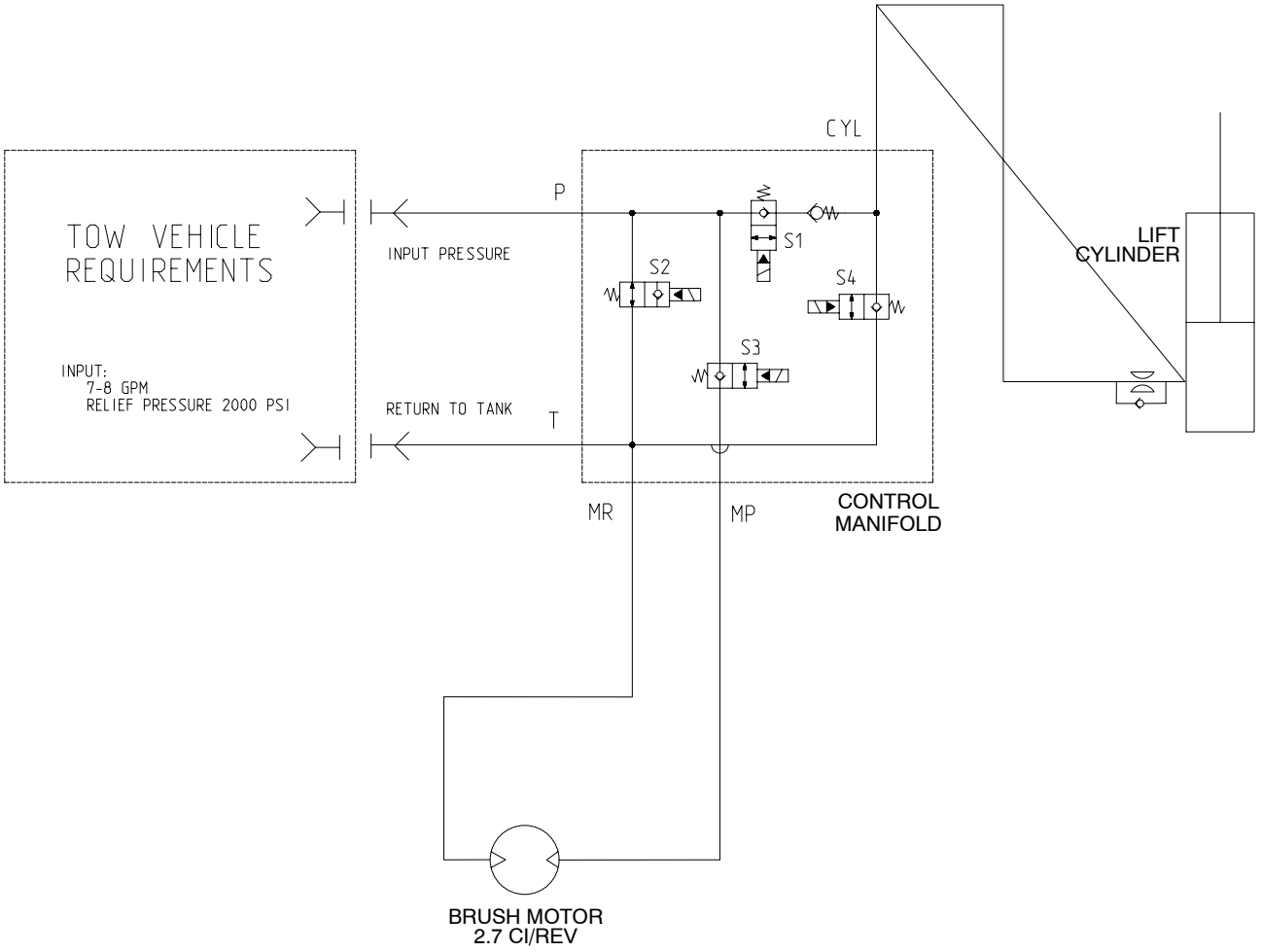



Figure 7

1. **Hitch pin**
2. **Hairpin clip**

# Hydraulic Schematic

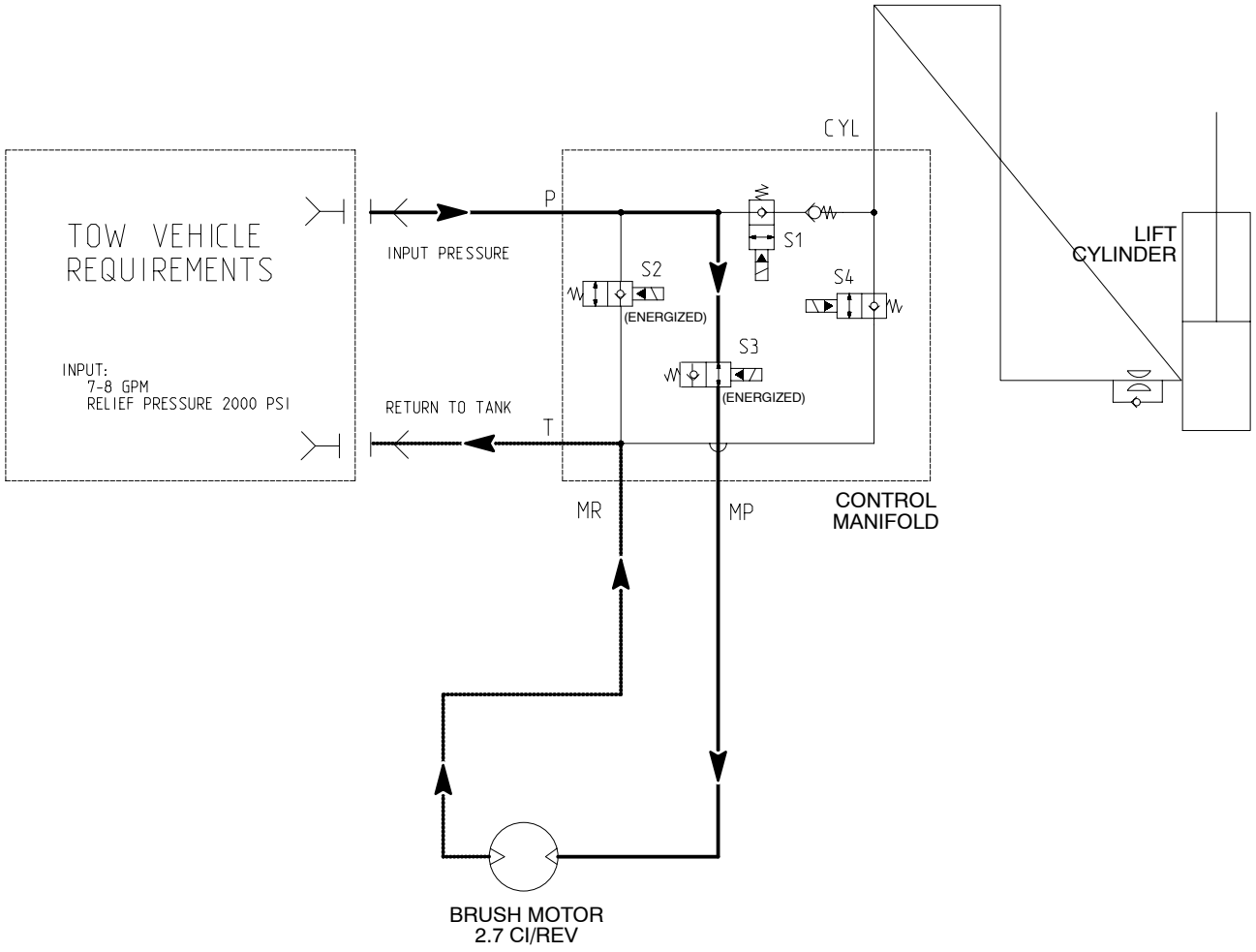



Pro Sweep 5200

**Hydraulic Schematic**

**All solenoids are shown as de–energized**

# Hydraulic Flow Diagrams




**Brush Circuit (Brush Rotating Shown)**

- Working Pressure
- Return
- Flow

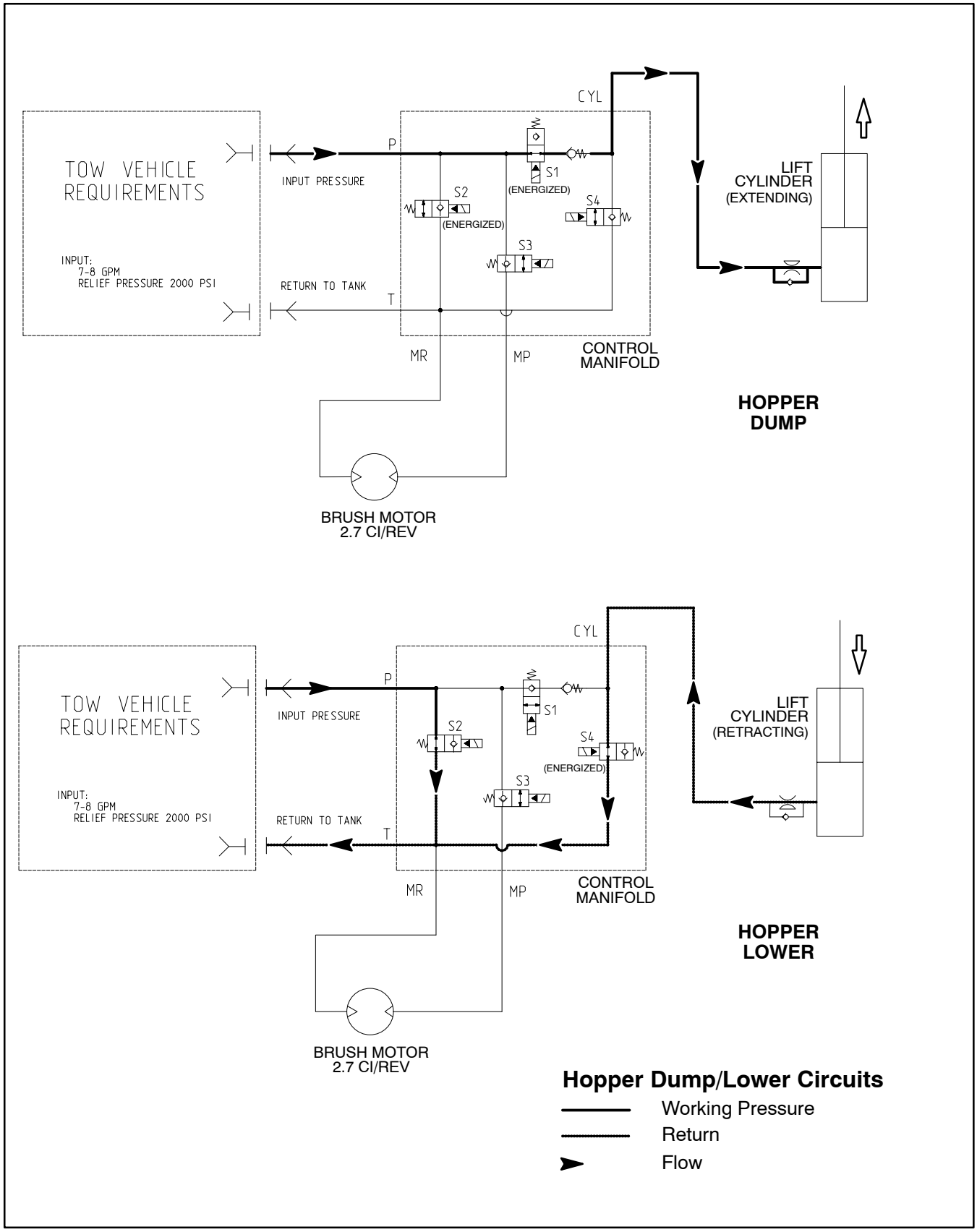
## Brush Circuit

**NOTE:** Hydraulic flow and relief pressure for the Pro Sweep 5200 are determined by the tow vehicle.

Hydraulic flow from the tow vehicle goes to the control manifold (port P) through the hydraulic input hose. When the sweeper brush motor is not engaged and the lift cylinder is stationary, hydraulic flow from the vehicle is directed by the un–energized demand solenoid valve (S2) to return to the tow vehicle through control manifold port T and the return to tank hose.

**NOTE:** The hopper must be lowered for the Pro Sweep 5200 brush to operate.

When the brush switch is pressed to engage, both the demand (S2) and brush (S3) solenoid valves in the hydraulic control manifold are energized. The valve shift of S2 prevents hydraulic flow return to the tow vehicle. The valve shift of S3 allows oil flow out of control manifold port MP and to the brush motor causing rotation of the sweeper brush. Oil return from the brush motor is routed to control manifold port MR, out control manifold port T and returns to the tow vehicle.


TOW VEHICLE REQUIREMENTS
INPUT:
7-8 GPM
RELIEF PRESSURE 2000 PSI
INPUT PRESSURE
RETURN TO TANK
P
T
CYL
S1
(ENERGIZED)
S2
(ENERGIZED)
S3
S4
MR
MP
CONTROL MANIFOLD
LIFT CYLINDER (EXTENDING)
HOPPER DUMP
BRUSH MOTOR 2.7 CI/REV
TOW VEHICLE REQUIREMENTS
INPUT:
7-8 GPM
RELIEF PRESSURE 2000 PSI
INPUT PRESSURE
RETURN TO TANK
P
T
CYL
S1
S2
S3
S4
(ENERGIZED)
MR
MP
CONTROL MANIFOLD
LIFT CYLINDER (RETRACTING)
HOPPER LOWER
BRUSH MOTOR 2.7 CI/REV
Hopper Dump/Lower Circuits
Working Pressure
Return
Flow

## Hopper Dump/Lower Circuits

**NOTE:** Hydraulic flow and relief pressure to the Pro Sweep 5200 are determined by the tow vehicle.

Hydraulic flow from the tow vehicle goes to the control manifold (port P) through the hydraulic input hose. When the sweeper brush motor is not engaged and the lift cylinder is stationary, hydraulic flow from the vehicle is directed by the un–energized demand solenoid valve (S2) to return to the tow vehicle through control manifold port T and the return to tank hose.

### Hopper Dump

When the hopper switch is pressed to dump, both the hopper up (S1) and demand (S2) solenoid valves in the hydraulic control manifold are energized. The valve shift of S2 prevents hydraulic flow return to the tow vehicle. The valve shift of S1 allows oil flow past the check valve in the control manifold, out of control manifold port CYL and to the lift cylinder. Hydraulic pressure against the lift cylinder rod extends the cylinder and dumps the hopper. The check valve fitting attached to the lift cylinder allows oil flow to bypass the orifice in the fitting for proper lift cylinder extension.

When the hopper switch is released, solenoid valves S1 and S2 in the hydraulic manifold are de–energized. The load holding check valve in the control manifold and the de–energized solenoid valve S4 prevent oil flow from the lift cylinder so the hopper remains in the raised (dump) position.

### Hopper Lower

When the hopper switch is pressed to lower, the hopper down (S4) solenoid valve in the hydraulic control manifold is energized. The valve shift of S4 allows a path for oil flow from the lift cylinder. The weight of the dump hopper and frame cause the lift cylinder to retract and the dump hopper to lower. Oil flow from the retracting lift cylinder returns to the control manifold port CYL, past S4, out manifold port T and returns to the tow vehicle. The orifice in the lift cylinder check valve fitting restricts oil flow from the cylinder to provide for proper lift cylinder retraction speed.

While lowering, if the hopper switch is released, solenoid valve S4 will de–energize and oil flow from the lift cylinder will cease. The hopper will remain in the partially lowered position.

# Troubleshooting

The cause of an improperly functioning hydraulic system is best diagnosed with the use of proper testing equipment and a thorough understanding of the complete hydraulic system.

A hydraulic system with an excessive increase in heat or noise has a potential for failure. Should either of these conditions be noticed, immediately stop the machine, turn off the engine, locate the cause of the trouble and correct it before allowing the machine to be used again. Continued use of an improperly functioning hydraulic system could lead to extensive hydraulic component damage.

The charts that follow contain information to assist in troubleshooting. There may possibly be more than one cause for a machine malfunction.

The successful operation of the Pro Sweep 5200 depends on the hydraulic system of the tow vehicle. When troubleshooting a sweeper hydraulic problem, make sure that the tow vehicle hydraulic system is evaluated as well.

**NOTE:** When troubleshooting a hydraulic problem on the Pro Sweep 5200, inspect tow vehicle hydraulic system if both sweeper brush motor and lift cylinder are malfunctioning. If one sweeper hydraulic component appears to be malfunctioning, check that component.

| Problem | Possible Cause |
|---|---|
| Hydraulic oil leaks. | Hydraulic fitting(s) or hose(s) are loose or damaged. |
| | O–ring(s) or seal(s) are missing or damaged. |
| Foaming hydraulic fluid. | Hydraulic oil level in tow vehicle reservoir is low. |
| | Hydraulic system has wrong kind of oil. |
| | Hydraulic system on tow vehicle is malfunctioning. |
| Hydraulic system operates hot. | Hydraulic oil level in tow vehicle reservoir is low. |
| | Excessive dirt and debris on hydraulic components. |
| | Oil is contaminated or too light. |
| | Brush motor is worn or damaged. |
| | Hydraulic system on tow vehicle is malfunctioning. |
| Brush motor will not turn. | Hydraulic hose(s) to tow vehicle are not connected. |
| | Control manifold brush solenoid (S2) is not being energized or cartridge is faulty. |
| | Control manifold demand solenoid (S3) is not being energized or cartridge is faulty. |
| | Internal brush motor components are damaged. |
| | Electrical problem exists (see Chapter 4 – Electrical System). |

| Problem | Possible Cause |
|---|---|
| Dump hopper will not lift or lifts slowly. | Hydraulic hose(s) to tow vehicle are not connected.<br>Hydraulic oil level in tow vehicle reservoir is low.<br>Lift cylinder is binding.<br>Sweeper frame components are binding.<br>Check valve fitting on lift cylinder is faulty.<br>Control manifold demand solenoid (S3) is not being energized or cartridge is faulty.<br>Control manifold hopper up solenoid (S1) is not being energized or cartridge is faulty.<br>Hydraulic system on tow vehicle is malfunctioning.<br>Electrical problem exists (see Chapter 4 – Electrical System). |
| Dump hopper raises, but will not stay up. | Control manifold hopper down cartridge (S4) is faulty.<br>Control manifold check valve leaks. |

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## General Precautions for Removing and Installing Hydraulic System Components

### Before Repair or Replacement of Components

1. Before removing any parts from the hydraulic system, empty sweeper hopper and position sweeper on a level surface. Chock sweeper wheels to prevent sweeper from moving. If sweeper is attached to tow vehicle, engage tow vehicle parking brake, stop engine and remove key from the ignition switch.

2. Clean machine before disconnecting, removing or disassembling any hydraulic components. Make sure hydraulic components, hoses, connections and fittings are cleaned thoroughly. Always keep in mind the need for cleanliness when working on hydraulic equipment.

**CAUTION**

**Operate all sweeper hydraulic controls to relieve system pressure and to avoid injury from pressurized hydraulic oil. See Relieving Hydraulic System Pressure in the General Information section of this chapter.**

3. Put caps or plugs on any hydraulic lines, hydraulic fittings or hydraulic components left open or exposed to prevent hydraulic system contamination.

4. Put labels on disconnected hydraulic lines and hoses for proper installation after repairs are completed.

5. Note the position of hydraulic fittings (especially elbow fittings) on hydraulic components before removal. Mark parts if necessary to make sure they will be aligned properly when reinstalling hydraulic hoses and tubes.

### After Repair or Replacement of Components

1. If component failure was severe or if hydraulic system is contaminated, drain entire hydraulic system. Drain and flush all hoses and components. Also, drain and refill tow vehicle hydraulic system reservoir and change oil filter.

2. Lubricate o–rings and seals with clean hydraulic oil before installing hydraulic components.

3. Make sure caps or plugs are removed from the hydraulic tubes, hydraulic fittings and components before reconnecting.

4. Use proper tightening methods when installing hydraulic hoses and fittings (see Hydraulic Fitting Installation in the General Information section of this chapter).

5. After repairs are completed but before operating the sweeper, check oil level in the hydraulic reservoir of the tow vehicle and add correct oil if necessary.

6. After disconnecting or replacing any hydraulic components, operate machine functions slowly until air is out of system.

7. Check for hydraulic oil leaks. Shut off tow vehicle engine and correct leaks if necessary. Check oil level in hydraulic reservoir and add correct oil if necessary.



## Check Hydraulic Lines and Hoses

**WARNING**

**Keep body and hands away from pin hole leaks or nozzles that eject hydraulic fluid under high pressure. Use paper or cardboard, not hands, to search for leaks. Hydraulic fluid escaping under pressure can have sufficient force to penetrate the skin and cause serious injury. If fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type of injury. Gangrene may result from such an injury.**

Check hydraulic lines and hoses daily for leaks, kinked lines, loose mounting supports, wear, loose fittings, weather deterioration and/or chemical deterioration. Make all necessary repairs before operating sweeper.

## Brush Motor

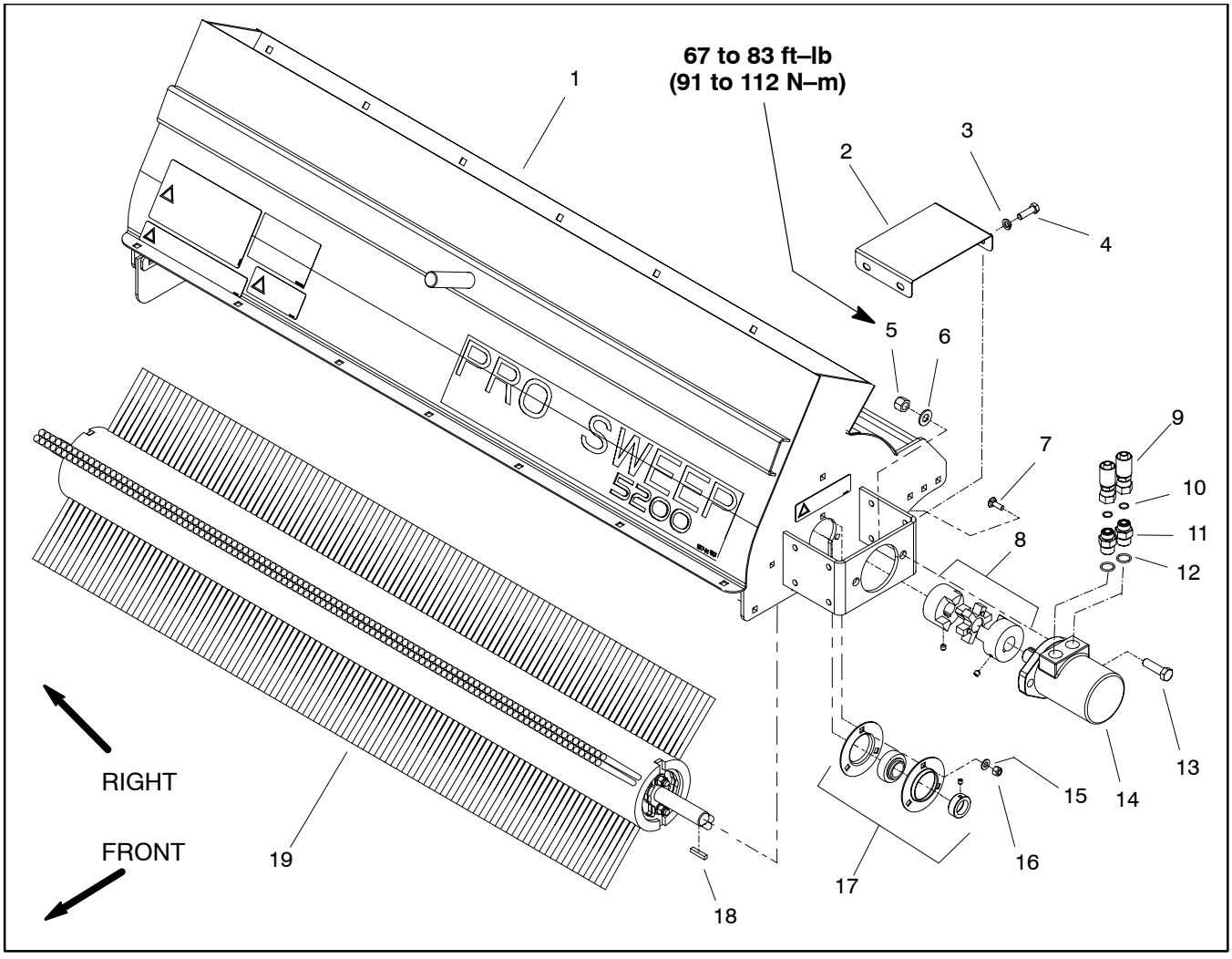


Figure 8

1. **Brush housing**
2. **Coupling cover (2 used)**
3. **Lock washer**
4. **Cap screw**
5. **Lock nut (2 used)**
6. **Flat washer (2 used)**
7. **Carriage bolt (6 used)**
8. **Coupling assembly**
9. **Hydraulic hose (2 used)**
10. **O–ring (2 used)**
11. **Hydraulic fitting (2 used)**
12. **O–ring (2 used)**
13. **Cap screw (2 used)**
14. **Hydraulic brush motor**
15. **Flat washer (6 used)**
16. **Lock nut (6 used)**
17. **Flange bearing (2 used)**
18. **Square key**
19. **Brush**

**Removal (Fig. 8)**

1. Empty sweeper hopper and position sweeper on a level surface. Chock sweeper wheels to prevent sweeper from moving. If sweeper is attached to tow vehicle, engage tow vehicle parking brake, stop engine and remove key from the ignition switch.

**CAUTION**

**Operate all sweeper hydraulic controls to relieve system pressure and to avoid injury from pressurized hydraulic oil. See Relieving Hydraulic System Pressure in the General Information section of this chapter.**

2. Relieve sweeper hydraulic system pressure.

3. Clean brush motor and hydraulic connections. Label hydraulic lines for assembly purposes.

4. Disconnect hydraulic lines from hydraulic fittings on brush motor. Allow hydraulic oil to drain from lines into a suitable container. Put caps or plugs on open hydraulic lines and fittings to prevent contamination.

5. Remove upper coupling cover from brush housing.

6. Support brush motor. Remove two (2) cap screws (item 14), flat washers (item 7) and lock nuts (item 6) that secure motor to frame. Pull brush motor (with coupling jaw attached) from the machine.

**IMPORTANT: To prevent damage to hydraulic motor, DO NOT hit coupling jaw or motor with a hammer during coupling jaw removal or installation.**

7. Loosen set screw that secures coupling jaw to brush motor shaft. Use puller to remove coupler from motor shaft. Locate and retrieve key from motor shaft.

8. If required, remove hydraulic fittings and o–rings from the wheel motor. Discard o–rings.

**Installation (Fig. 8)**

1. If removed, install hydraulic fittings with new o–rings into the brush motor ports (see Hydraulic Fitting Installation in the General Information section of this chapter).

2. If coupling jaw was removed from motor, position key into shaft keyway and slide coupling jaw onto shaft. Make sure that coupling spider is positioned into coupling jaw on brush shaft.

3. Position and support brush motor to the frame. Make sure to align coupling jaw on motor shaft with coupling spider.

4. Align motor shaft with brush shaft. Secure brush motor to frame with two (2) cap screws (item 14), flat washers (item 7) and lock nuts (item 6). Torque lock nuts from 67 to 83 ft–lb (91 to 112 N–m).

5. Position coupling jaw on motor shaft to allow a gap between coupler jaw valleys from .830" to .930" (21.1 to 23.6 mm) (Fig. 10). Apply Loctite #242 (or equivalent) to threads of coupling set screw. Secure coupling jaw to motor shaft by torquing set screw from 125 to 155 in–lb (14.1 to 17.5 N–m).

6. Remove caps or plugs that were put on any hydraulic lines or fittings during disassembly.

7. Install hydraulic hoses to hydraulic fittings on brush motor. Tighten connections.

8. Install upper coupling cover to brush housing.



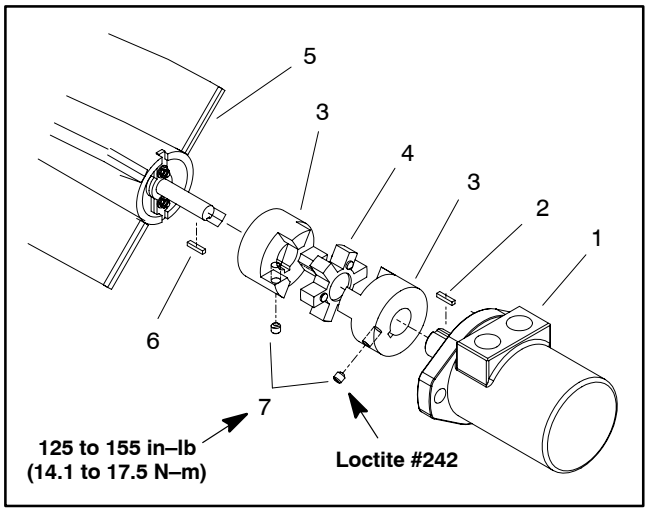


Figure 9

1. Hydraulic brush motor
2. Key
3. Coupling jaw
4. Coupling spider
5. Brush
6. Square key
7. Set screw

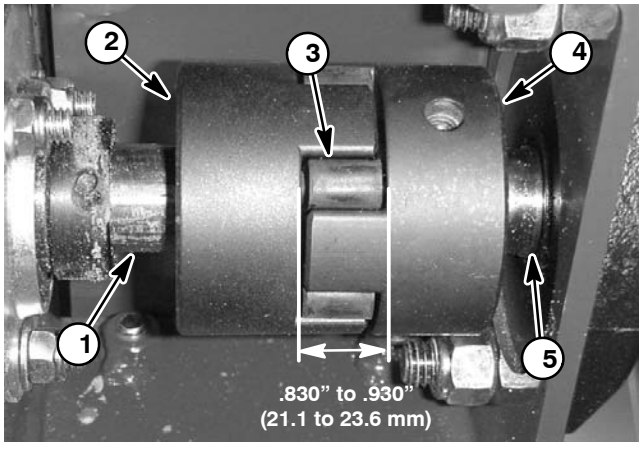


Figure 10

1. Brush shaft
2. Brush coupling jaw
3. Coupling spider
4. Motor coupling jaw
5. Motor shaft

## Brush Motor Service

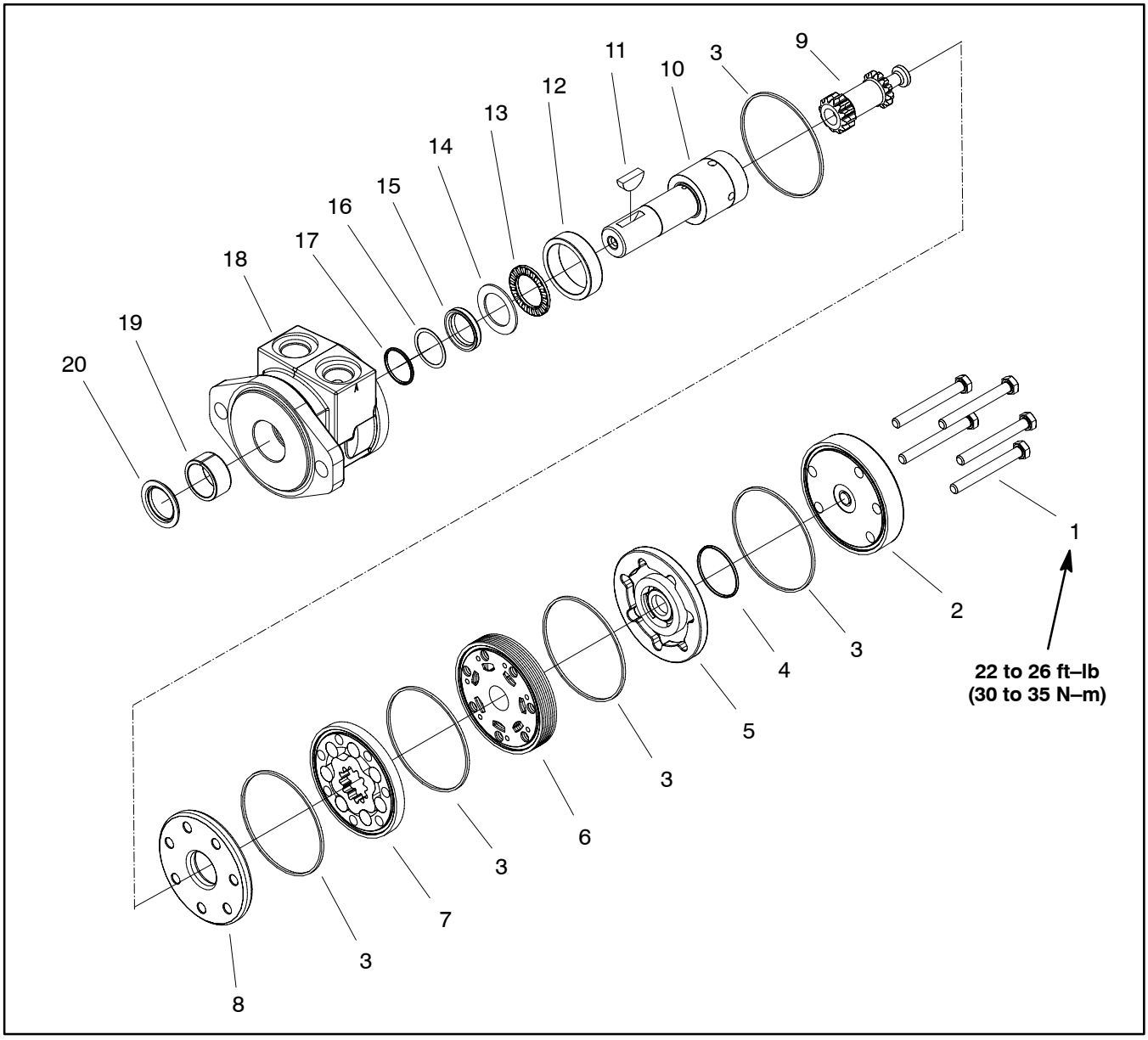


Figure 11

1. **Cap screw (5 used)**
2. **End cover**
3. **Ring seal**
4. **Commutator seal**
5. **Commutator and ring assembly**
6. **Manifold**
7. **Stator**
8. **Wear plate**
9. **Drive link**
10. **Coupling shaft**
11. **Woodruff key**
12. **Bushing**
13. **Thrust bearing**
14. **Thrust washer**
15. **Inner seal**
16. **Backup washer**
17. **O–ring**
18. **Housing**
19. **Bearing**
20. **Seal**

**NOTE:** For service of the hydraulic brush motor, see the Parker Torqlink™ Service Procedure at the end of this chapter.

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## Hydraulic Control Manifold

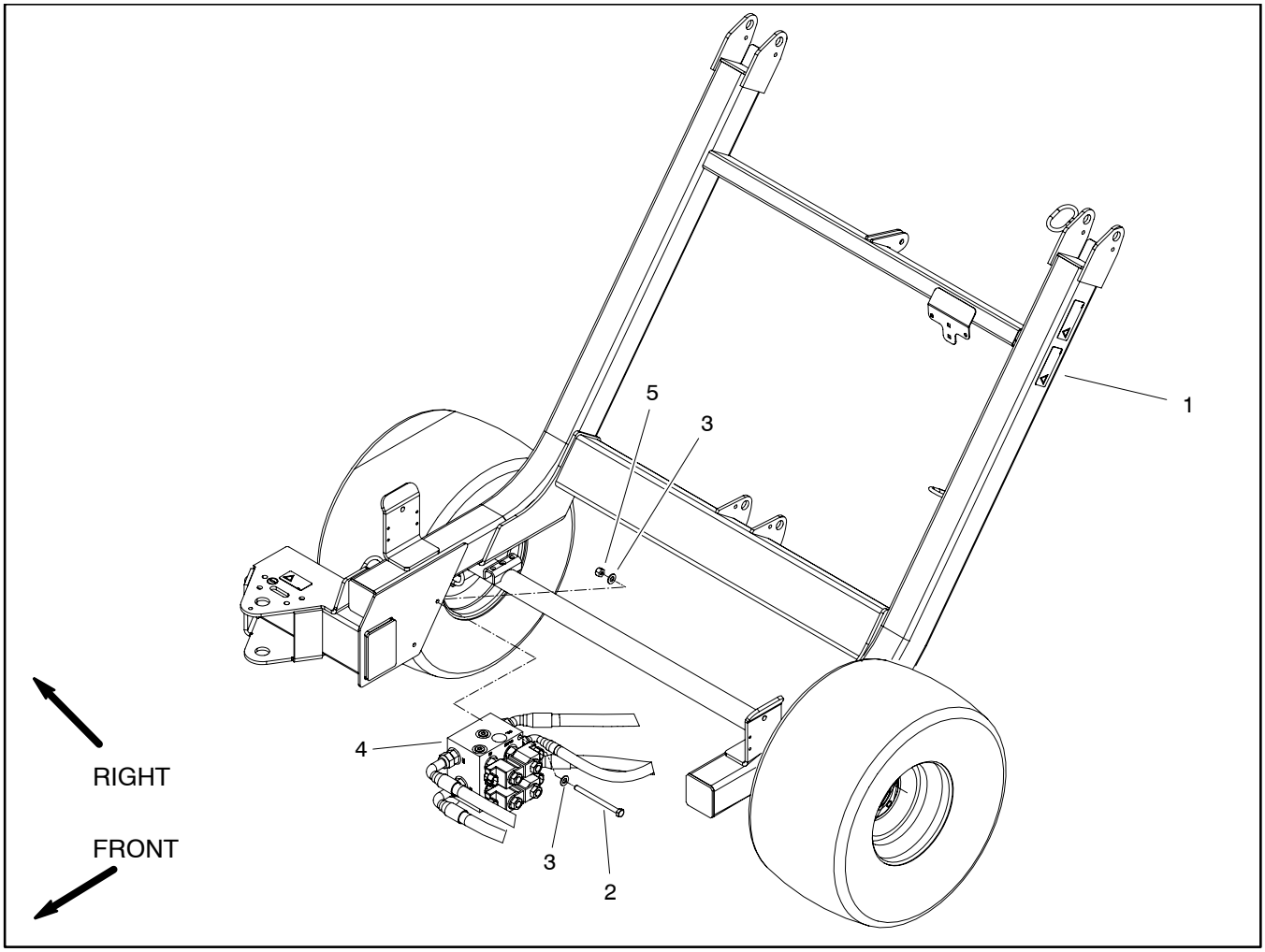


Figure 12

1. **Main frame**
2. **Cap screw (2 used)**
3. **Flat washer (4 used)**
4. **Hydraulic control manifold**
5. **Lock nut (2 used)**

**Removal (Fig. 12)**

1. Empty sweeper hopper and position sweeper on a level surface. Chock sweeper wheels to prevent sweeper from moving. If sweeper is attached to tow vehicle, engage tow vehicle parking brake, stop engine and remove key from the ignition switch.

**CAUTION**

**Operate all sweeper hydraulic controls to relieve system pressure and to avoid injury from pressurized hydraulic oil. See Relieving Hydraulic System Pressure in the General Information section of this chapter.**

2. Relieve sweeper hydraulic system pressure.

**NOTE:** The ports on the control manifold are marked to identify hydraulic hose connections. Example: P is the pump connection port (See Hydraulic Schematic to identify the function of the hydraulic lines and cartridge valves at each manifold port location).

3. Label all control manifold electrical and hydraulic connections for assembly purposes.

4. Disconnect wire harness electrical connectors from solenoid valves on control manifold.

5. Clean control manifold and manifold hydraulic connections. Disconnect hydraulic hoses from manifold fittings.

6. Allow disconnected hydraulic lines to drain into a suitable container. Put caps or plugs on disconnected hoses and fittings to prevent contamination. Discard any removed o–rings.

7. Support control manifold to prevent it from falling. Remove two (2) cap screws, flat washers and lock nuts that secure hydraulic manifold to the frame mounting bracket.

8. Remove hydraulic manifold from the machine.

9. Remove hydraulic fittings from manifold as needed (Fig. 13). Discard any removed o–rings.

**Installation (Fig. 12)**

1. Lightly oil new o–rings for all removed hydraulic fittings. Install hydraulic fittings to control manifold (see Hydraulic Fitting Installation in the General Information section of this chapter).

2. Position hydraulic manifold to the frame mounting bracket. Install cap screws, washers and lock nuts but do not fully tighten.

3. Make sure all hydraulic connections, ports and fittings are clean.

4. Remove caps or plugs that were put on hydraulic lines or fittings during disassembly.

5. Lightly oil new o–rings for hydraulic fitting and hose locations.

6. Correctly connect hydraulic lines to the manifold. Properly tighten all hydraulic connections (see Hydraulic Fitting Installation in the General Information section of this chapter).

7. Secure hydraulic manifold to machine by tightening cap screws and lock nuts.

8. Reconnect solenoid valve electrical connectors.

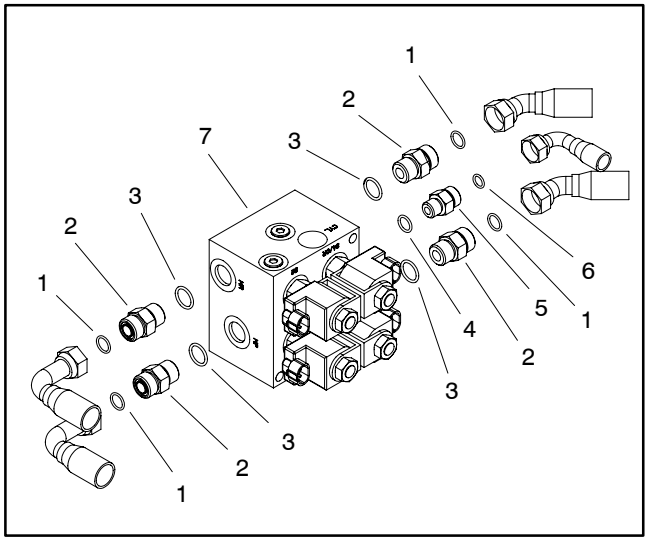


Figure 13

1. **O–ring**
2. **Hydraulic fitting**
3. **O–ring**
4. **O–ring**
5. **Hydraulic fitting**
6. **O–ring**
7. **Hydraulic manifold**

## Hydraulic Control Manifold Service

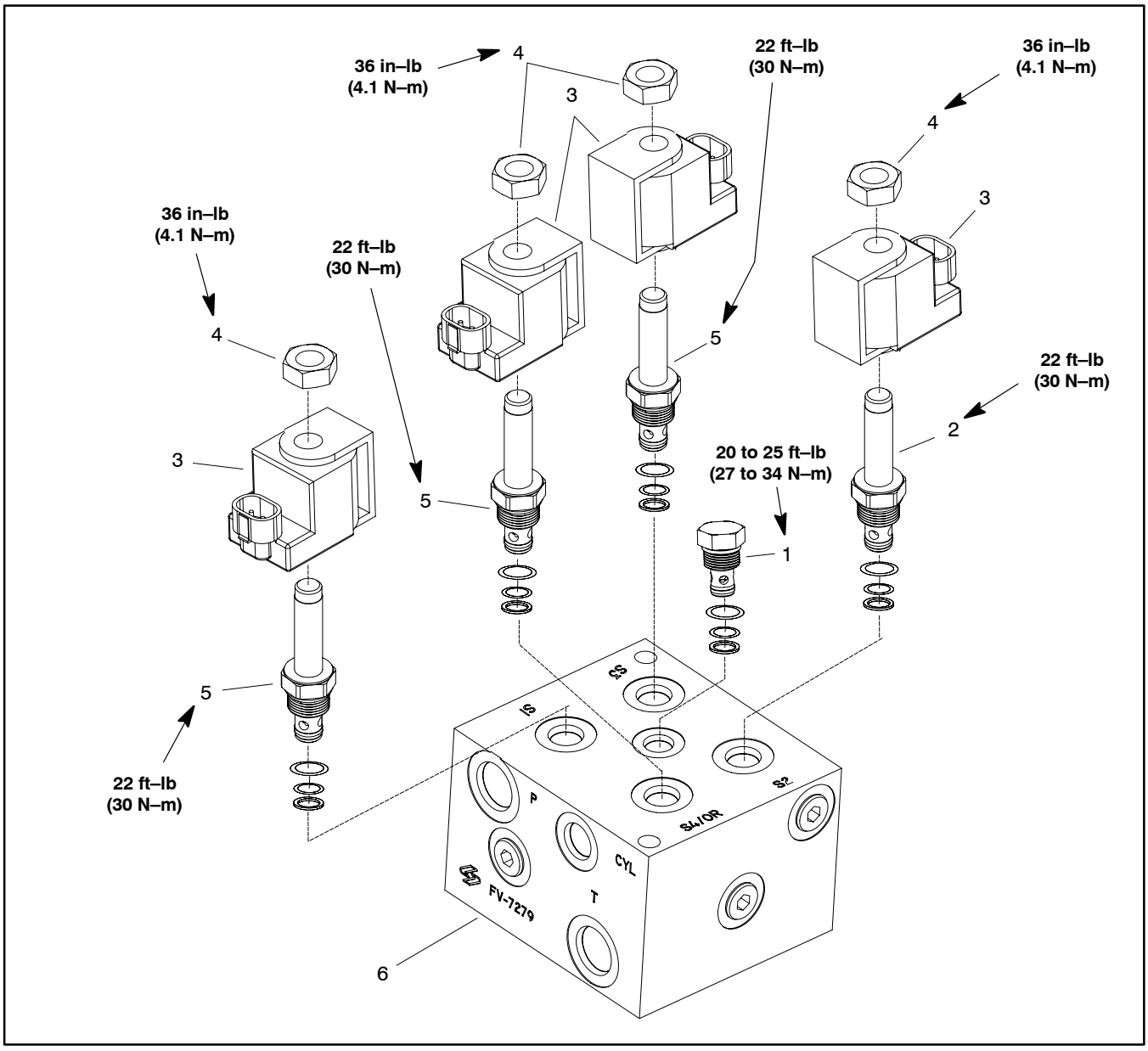


Figure 14

1. **Check valve**
2. **Demand solenoid (S2 port)**
3. **Solenoid coil**
4. **Nut**
5. **Solenoid valve (S1, S3 and S4 ports)**
6. **Hydraulic lift control manifold**

**NOTE:** The ports on the manifold are marked for easy identification of components. Example: P is the pump connection port (See Hydraulic Schematics to identify the function of the hydraulic lines and cartridge valves at each port).

**Hydraulic Manifold Service**

1. Make sure the control manifold is clean before removing any cartridge valve.

2. If solenoid cartridge is being serviced, remove nut securing solenoid to the cartridge valve. Carefully slide solenoid off the valve.

**CAUTION**

**Operate all sweeper hydraulic controls to relieve system pressure and to avoid injury from pressurized hydraulic oil. See Relieving Hydraulic System Pressure in the General Information section of this chapter.**

**IMPORTANT: Use care when handling the cartridge valve. Slight bending or distortion of the stem tube can cause binding and malfunction.**

3. Remove cartridge valve with a deep socket wrench. Note correct location for o–rings, sealing rings and backup rings. Remove and discard seal kit from valve.

4. Visually inspect the manifold port for damage to the sealing surfaces, damaged threads and contamination.

5. Visually inspect cartridge valve for damaged sealing surfaces and contamination.

A. Contamination may cause valves to stick or hang up. Contamination can become lodged in small valve orifices or seal areas causing malfunction.

B. If valve sealing surfaces appear pitted or damaged, the hydraulic system may be overheating or there may be water in the system.

**CAUTION**

**Use eye protection such as goggles when using compressed air for cartridge valve cleaning.**

**CAUTION**

**Abrupt movement of internal spools can cause stored fluid to be released suddenly.**

6. Clean cartridge valve by submerging valve in clean mineral spirits to flush out contamination. Particles as fine as talcum powder can affect the operation of high pressure hydraulic valves. If cartridge design allows, use a wood or plastic probe to push the internal spool in and out 20 to 30 times to flush out contamination. Be extremely careful not to damage cartridge. Use compressed air for cleaning.

7. Reinstall the cartridge valve into control manifold:

A. Lubricate new seal kit components with clean hydraulic oil and install on valve. The o–rings, sealing rings and backup rings must be arranged properly on the cartridge valve for proper operation and sealing.

**IMPORTANT: Use care when handling the valve cartridge. Slight bending or distortion of the stem tube can cause binding and malfunction.**

B. Thread cartridge valve carefully into correct manifold port. The valve should go in easily without binding.

C. Torque cartridge valve using a deep socket to values identified in Figure 14.

8. If solenoid cartridge was removed, carefully install solenoid coil onto the cartridge valve. Install nut and torque nut to 36 in–lb (4.1 N–m).

9. After assembly, if problems still exist, remove valve and clean again or replace valve.

## Lift Cylinder

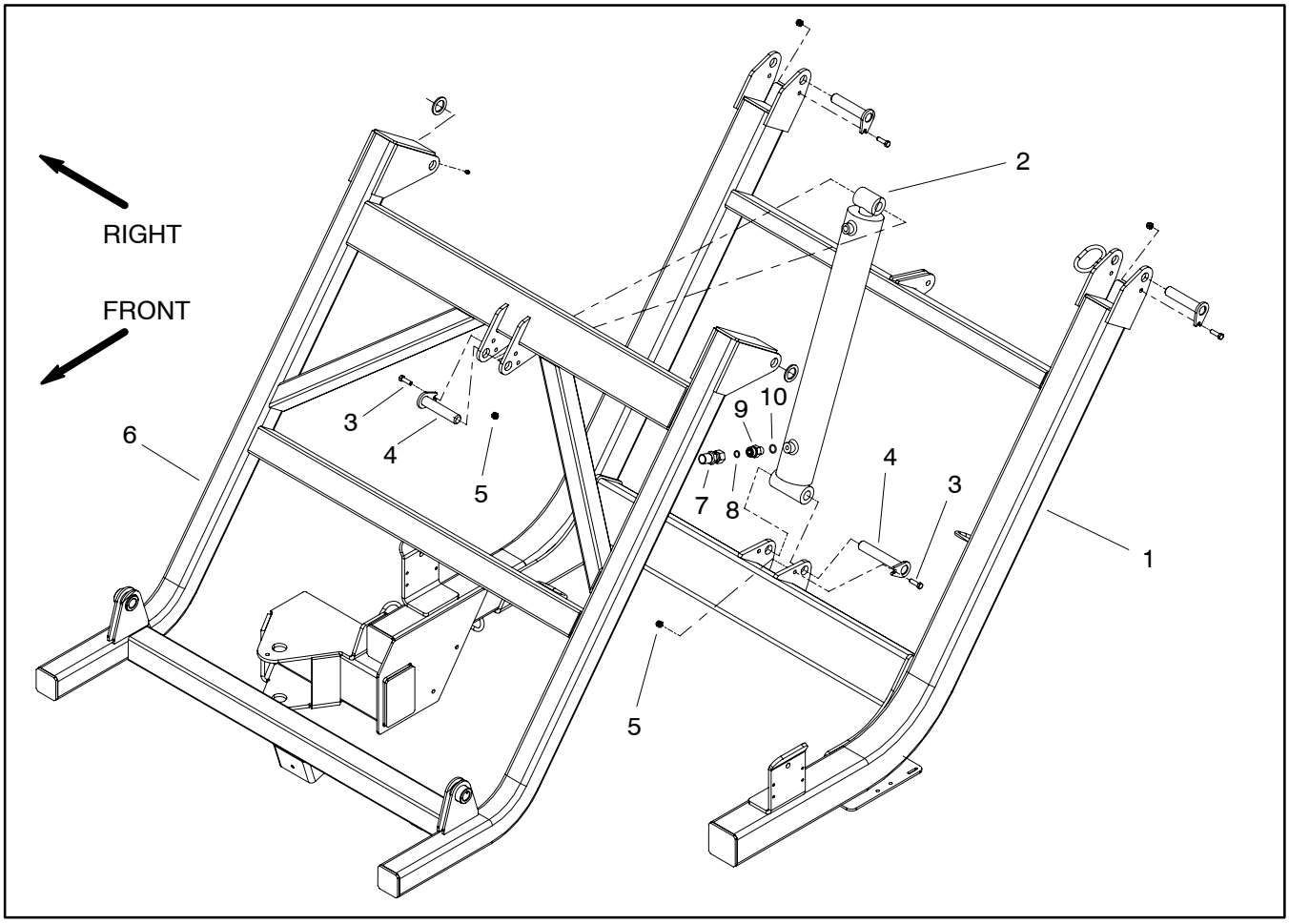


Figure 15

1. **Main sweeper frame**
2. **Lift cylinder**
3. **Cap screw**
4. **Pivot pin**
5. **Lock nut**
6. **Pitch frame**
7. **Hydraulic hose**
8. **O–ring**
9. **Check valve fitting**
10. **O–ring**

**Removal (Fig. 15)**

1. Empty sweeper hopper and position sweeper on a level surface. Chock sweeper wheels to prevent sweeper from moving. If sweeper is attached to tow vehicle, engage tow vehicle parking brake, stop engine and remove key from the ignition switch.

**CAUTION**

**Operate all sweeper hydraulic controls to relieve system pressure and to avoid injury from pressurized hydraulic oil. See Relieving Hydraulic System Pressure in the General Information section of this chapter.**

2. Relieve sweeper hydraulic system pressure.

3. Disconnect hydraulic hose from hydraulic fitting on lift cylinder. Locate and discard o–ring from between hose and fitting. Allow hose to drain into a suitable container.

4. Plug disconnected hose and fitting to prevent contamination.

5. Remove lock nuts (item 5) and cap screws (item 3) that are used to retain lift cylinder pivot pins (item 4) to sweeper frame.

**CAUTION**

**To prevent personal injury, make sure that lift cylinder is supported as it is removed from the machine. Lift cylinder weighs approximately 43 pounds (19.5 kg).**

6. Support lift cylinder and slide pivot pins from the lift cylinder and machine frame.

7. Remove lift cylinder from the machine.

8. If needed, remove hydraulic check valve fitting and o–ring from the lift cylinder. Discard o–ring.

**Installation (Fig. 15)**

1. If removed, install hydraulic check valve fitting and new o–ring into lift cylinder.

2. Position lift cylinder to the machine mounting points. Make sure the port of the lift cylinder faces the front of the machine.

3. Align lift cylinder mounting holes with frame mounts. Install pivot pins. Secure pivot pins to frame with cap screws and lock nuts.

4. Remove plugs from disconnected hose and fitting.

5. Connect hydraulic hose with new o–ring to hydraulic fitting on lift cylinder. Tighten hose connection.

## Lift Cylinder Service

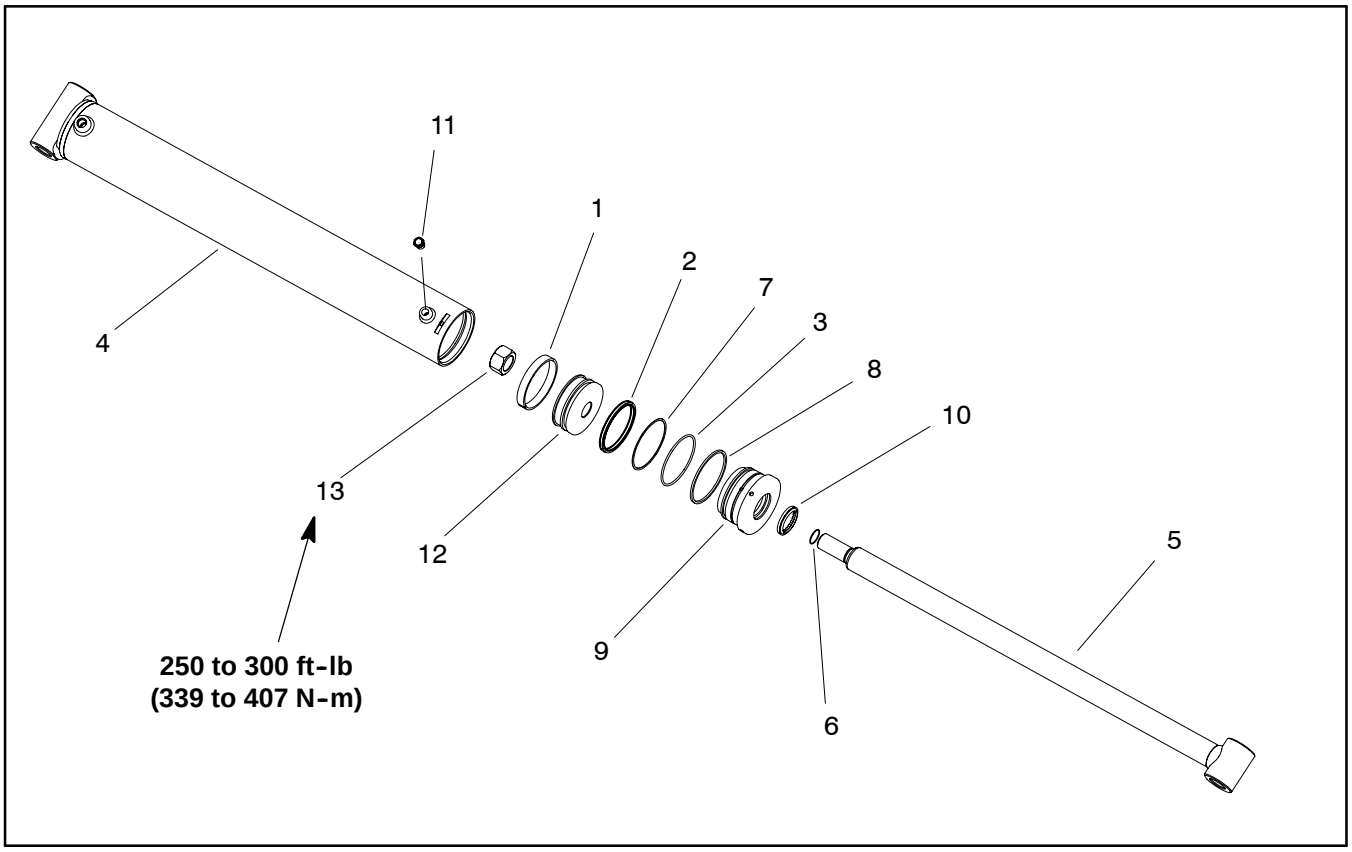


Figure 16

1. **Wear ring**
2. **Seal**
3. **O-ring**
4. **Tube**
5. **Rod**
6. **O-ring**
7. **Backup ring**
8. **Retaining ring**
9. **Head**
10. **Wiper**
11. **Breather plug**
12. **Piston**
13. **Lock nut**

**Disassembly (Fig. 16)**

1. Remove oil from the lift cylinder into a drain pan by **slowly** pumping the cylinder rod. Plug ports and clean the outside of the lift cylinder.

**IMPORTANT: Prevent damage when clamping the lift cylinder into a vise; clamp on the pivot only.**

2. Mount lift cylinder in a vise so that the shaft end tilts up slightly.

3. Using a spanner wrench, rotate head (item 9) clockwise until the edge of the retaining ring appears in the tube opening. Insert a screwdriver under the beveled edge of the retaining ring to start the retaining ring through the tube opening. Rotate the head counter-clockwise to remove retaining ring (item 8) as shown in Figure 17.

4. Grasp end of rod; extract rod assembly and head by carefully twisting and pulling on the rod.

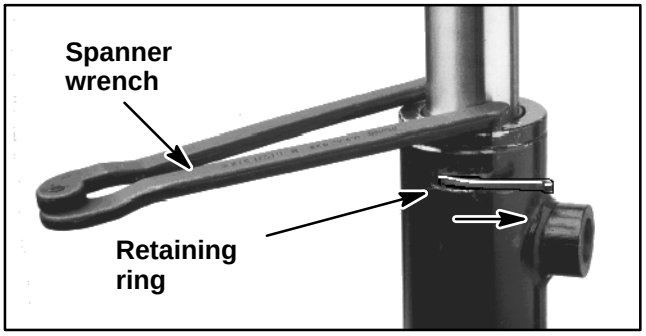


Figure 17

**IMPORTANT: Do not clamp vise jaws against rod surface. Protect rod surface before mounting in vise.**

5. Mount rod securely in a vise by clamping vise on the flats of the pivot. Remove lock nut (item 13) and carefully slide piston and head from the rod.

**IMPORTANT: When removing seal components, be careful not to scratch or damage piston or head.**

6. Remove and discard seal kit components from the head and piston.

**Inspection**

**CAUTION**

**Use eye protection such as goggles when using compressed air**

1. Wash all parts in solvent. Dry parts with compressed air.

2. Inspect internal surface of tube for deep scratches, out-of-roundness and bending. Replace if worn or damaged.

3. Inspect rod, piston and head for excessive pitting, scoring or wear. Replace any worn or damaged parts.

**Assembly (Fig. 16)**

1. Coat new seal kit components with clean hydraulic oil.

**IMPORTANT: When installing seal components, be careful not to scratch or damage piston or head.**

2. Install new seals to the head and piston.

**IMPORTANT: Do not clamp vise jaws against rod surface. Protect rod surface before mounting in vise.**

3. Mount rod securely in a vise by clamping vise on the pivot end of the shaft. Carefully slide head assembly and piston assembly onto the rod.

4. Thread lock nut (item 13) onto rod. Torque lock nut from 250 to 300 ft-lb (339 to 407 N-m).

5. Remove rod assembly from vise.

**IMPORTANT: Prevent damage when clamping the tube into a vise; clamp on the pivot end only.**

6. Mount tube in a vise so that the rod end tilts up slightly.

**IMPORTANT: When installing the head into the tube, pay careful attention to the retaining ring slot in the tube to insure that the backup ring does not lodge in the slot.**

7. Coat all internal lift cylinder parts with a light coating of clean hydraulic oil. Slide rod assembly into tube being careful not to damage the seals.

8. Secure head in tube by installing retaining ring (item 8). Align retaining ring hole in the head with the access slot in the tube. Insert the retaining ring hook into the hole and rotate head clockwise until the retaining ring is completely pulled into the tube and the ends are covered. Apply silicone sealer to barrel access slot.

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Chapter 4

# Electrical System

## Table of Contents



## Electrical Diagrams

The electrical schematic and wire harness drawings for the Pro Sweep 5200 are located in Chapter 6 – Electrical Diagrams.

## Special Tools

### Multimeter

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

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

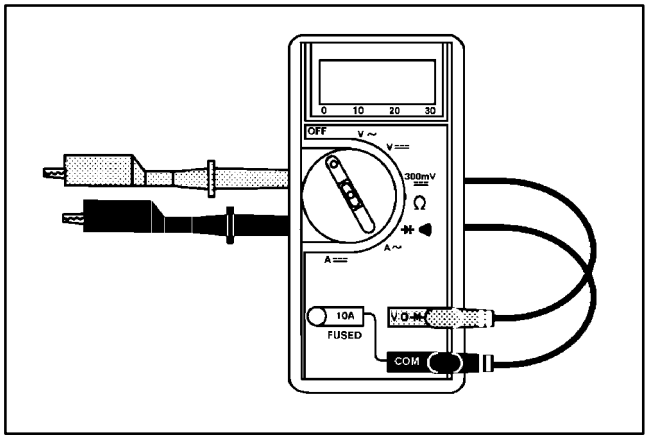



Figure 1

# Troubleshooting

**CAUTION**

**Remove all jewelry, especially rings and watches, before doing any electrical troubleshooting or testing. Disconnect the power harness from the vehicle unless the test requires battery voltage.**

For effective troubleshooting and repairs, you must have a good understanding of the electrical circuits (see Chapter 6 – Electrical Diagrams) and components used on this machine.

If the machine has the interlock switch by–passed, it must be reconnected for proper troubleshooting and safety.

| Problem | Possible Causes |
|---|---|
| Brush rotates (but should not) when dump hopper is raised. | Hopper down proximity switch is malfunctioning or faulty.<br>Brush relay is faulty.<br>Hopper switch or circuit wiring is faulty.<br>Logic diode is faulty. |
| Brush does not rotate. | Hopper is raised (brush should only rotate when hopper is fully lowered).<br>Hopper down proximity switch is malfunctioning or faulty.<br>Problem with power or ground from vehicle (other sweeper functions affected as well).<br>Fuse (20 Amp) is faulty (other sweeper functions affected as well).<br>Brush switch or circuit wiring is faulty.<br>Brush relay or circuit wiring is faulty.<br>Hopper down relay or circuit wiring is faulty.<br>Logic diode is faulty.<br>Demand solenoid valve coil (S2) or circuit wiring is faulty.<br>Brush solenoid valve coil (S3) or circuit wiring is faulty.<br>Hydraulic problem exists (see Chapter 3 – Hydraulic System). |

| Problem | Possible Causes |
|---|---|
| Dump hopper does not raise. | Fuse (20 Amp) is faulty (other sweeper functions affected as well).<br><br>Problem with power or ground from vehicle (other sweeper functions affected as well).<br><br>Hopper switch or circuit wiring is faulty.<br><br>Demand solenoid valve coil (S2) or circuit wiring is faulty.<br><br>Hopper up solenoid valve coil (S1) or circuit wiring is faulty.<br><br>Hydraulic problem exists (see Chapter 3 – Hydraulic System). |
| Dump hopper does not lower. | Fuse (20 Amp) is faulty (other sweeper functions affected as well).<br><br>Problem with power or ground from vehicle (other sweeper functions affected as well).<br><br>Hopper switch or circuit wiring is faulty.<br><br>Hopper down solenoid valve coil (S4) or circuit wiring is faulty.<br><br>Hydraulic problem exists (see Chapter 3 – Hydraulic System). |

# Safety Interlock System

**CAUTION**

**Do not disconnect the Pro Sweep 5200 hopper down proximity switch. It is for the operator's protection. Check operation of the switch daily to make sure the interlock system is operating correctly. If the switch is not operating properly, adjust or replace it before operating the sweeper.**

The safety interlock system of the Pro Sweep 5200 ensures that the brush will not rotate when the dump hopper is in the raised position.

Interlock system operation is described in the Pro Sweep 5200 Operator's Manual. Testing procedures for the interlock system hopper down proximity switch and brush relay are included in the Component Testing section of this Chapter.

# Component Testing

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

**CAUTION**

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

## Brush Switch

The brush switch is used to turn the sweeper brush on by energizing the brush motor solenoid (S3) and the demand solenoid (S2). When the brush switch is in the off position, the brush solenoid is not energized. The switch includes an indicator light that will illuminate when the brush switch is in the on position. This switch is located in the control box enclosure (Fig. 2).

**NOTE:** If the hopper is in the raised position or if the hopper switch is pushed to raise, the brush motor solenoid (S3) will be de–energized regardless of brush switch position.

### Testing

The brush switch terminals are marked as shown in Figure 3. The circuitry of this switch is shown in the chart below. 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 switch position. Verify continuity between switch terminals.

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

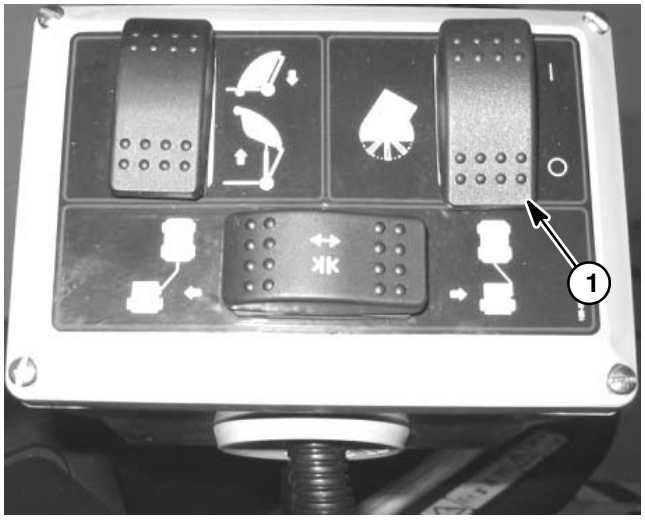
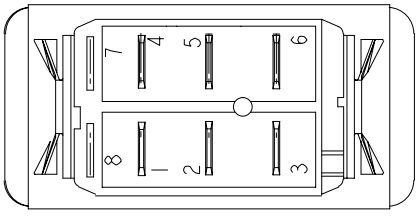



Figure 2

**1. Brush switch**




**BACK OF SWITCH**

Figure 3

## Hopper Switch

The hopper switch is used to raise or lower the hopper by energizing solenoids S1 (hopper up) or S4 (hopper down). This switch is located in the control box enclosure (Fig. 4).

When the hopper switch is pushed to raise the hopper, the demand solenoid (S2) and the hopper up solenoid (S1) are energized. These energized solenoids allow hydraulic flow to extend the lift cylinder and raise the hopper. Additionally, the brush relay is energized which ensures that the sweeper brush will not be rotating.

When the hopper switch is pushed to lower, the hopper down solenoid (S4) is energized allowing the raised hopper to contract the lift cylinder. The hopper down proximity switch prevents the sweeper brush from rotating until the hopper is fully lowered.

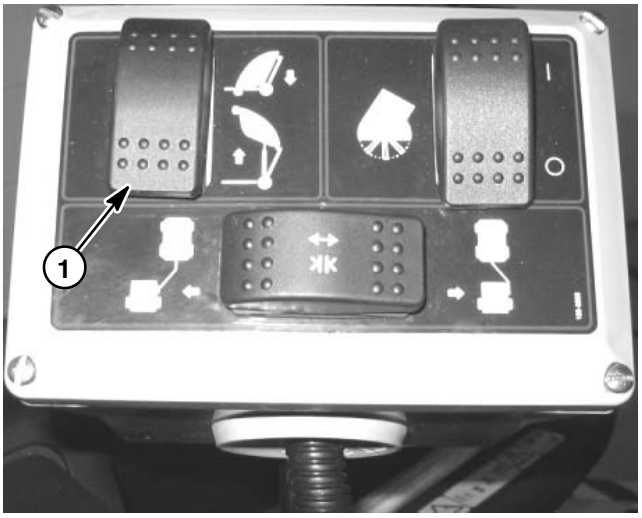
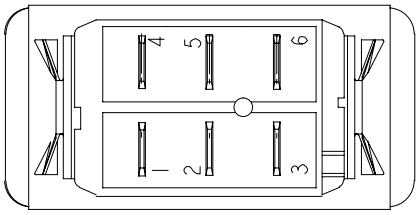



Figure 4

1. **Hopper switch**

### Testing

The hopper switch terminals are marked as shown in Figure 5. The circuitry of this switch is shown in the chart below. 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 switch position. Verify continuity between switch terminals.




**BACK OF SWITCH**

Figure 5

| SWITCH POSITION | NORMAL CIRCUITS | OTHER CIRCUITS |
|---|---|---|
| **RAISE** | 2 + 1 | 5 + 4 |
| **MIDDLE** | NONE | NONE |
| **LOWER** | 2 + 3 | 5 + 6 |

## Brush and Hopper Down Relays

The electrical system of the Pro Sweep 5200 includes two relays: the brush relay and the hopper down relay. These relays are identical and are located in the control box enclosure.

The brush relay is used to de–energize the brush motor solenoid (S3) when the hopper up/down switch is pushed to raise. When the brush relay is not energized, brush motor operation is possible.

The energized hopper down relay allows current to the brush switch when the hopper down switch is closed (hopper lowered). If the hopper is raised, the hopper down relay will not be energized to prevent brush operation.

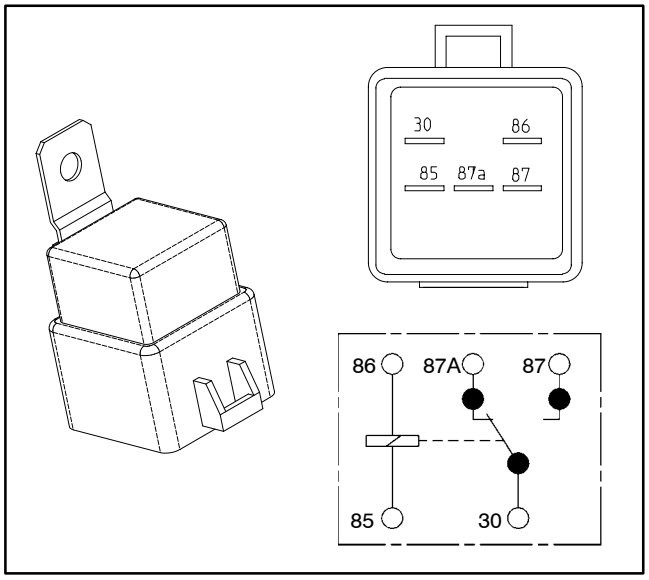


Figure 6

### 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.

1. Verify coil resistance between terminals 85 and 86 with a multimeter (ohms setting). Resistance should be from 70 to 90 ohms.

2. Connect multimeter (ohms setting) leads to relay terminals 30 and 87. 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.

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

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

5. Disconnect voltage and multimeter leads from the relay terminals.

## Fuse

The Pro Sweep 5200 uses a single 20 amp fuse for circuit protection. The fuse holder is located in the wiring harness (Fig. 7).

### Testing

Remove fuse from the fuse holder for testing. Fuse should have continuity between fuse terminals.

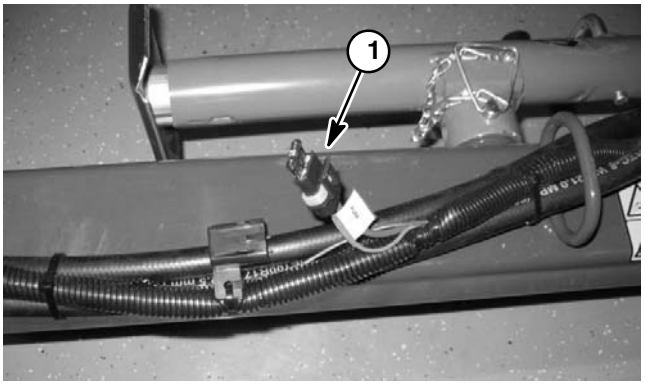



Figure 7

1. **Fuse holder**

## Diode Assembly

The diode assembly used in the Pro Sweep 5200 allows current flow to the demand solenoid (S2) when the brush switch is turned on. Additionally, the diode prevents current flow to the brush motor solenoid (S3) when the hopper switch is moved to the raise position. The diode plugs into the wire harness in the control box enclosure.

### Diode Test

The diode (Fig. 8) can be tested using a digital multimeter (diode test or ohms setting) and the table to the right.

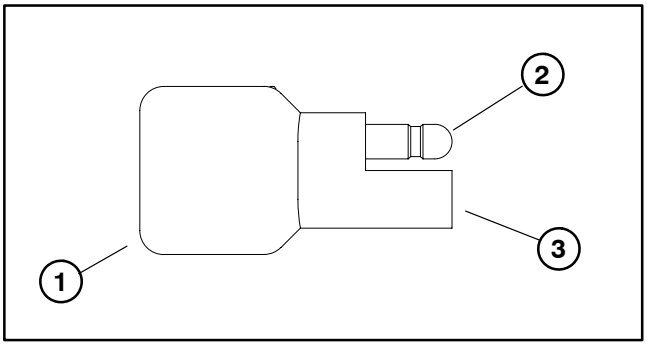



Figure 8

1. **Diode**
2. **Male terminal**
3. **Female terminal**

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

## Solenoid Valve Coil

The hydraulic system on the Pro Sweep 5200 uses four (4) solenoid valve coils on the hydraulic control manifold (Fig. 9).

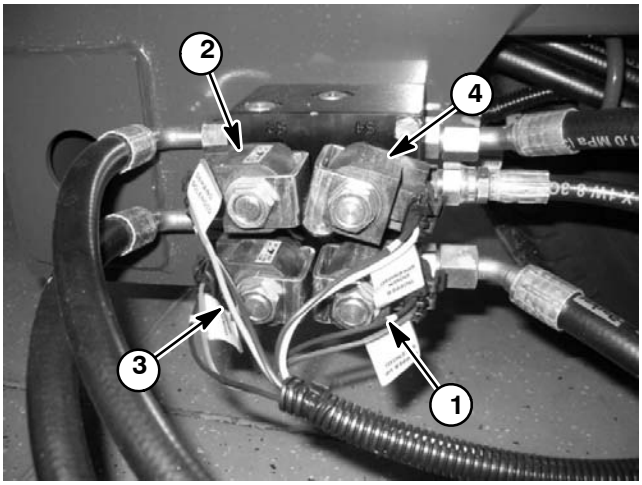



Figure 9

1. **Hopper up solenoid (S1)**
2. **Demand solenoid (S2)**
3. **Brush solenoid (S3)**
4. **Down solenoid (S4)**

### Testing

**NOTE:** The solenoid does not have to be removed from the cartridge valve for testing.

1. Make sure tow vehicle ignition switch is in the OFF position or that Pro Sweep power harness is unplugged from tow vehicle. Unplug solenoid valve coil electrical connector.

2. Apply 12VDC source directly to the solenoid coil. Listen for solenoid to switch on.

3. Remove 12VDC source from the solenoid coil. Listen for solenoid to switch off.

**NOTE:** Prior to taking small resistance readings with a digital multimeter, short the 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.

4. Measure resistance between the two coil connector terminals. Resistance of the solenoid coil should be approximately 7.6 ohms.

5. If solenoid coil needs replacement, see Solenoid Valve Coil in the Service and Repairs section of this chapter.

6. Reconnect electrical connector to the solenoid valve coil.

## Hopper Down Proximity Switch

The Pro Sweep 5200 uses a proximity switch as an interlock device to prevent brush operation (rotation) when the dump hopper is raised. This switch is normally open and closes when the pitch frame moves the switch cam near the target end of the switch (dump hopper lowered). The switch is mounted on the main sweeper frame (Fig. 10).

### Testing

1. Position sweeper on a level surface with dump hopper lowered. If sweeper is attached to towing vehicle, engage vehicle parking brake, stop engine and remove key from the ignition switch.

2. Locate hopper down switch. Disconnect switch from machine wiring harness.

3. Check the continuity of the switch by connecting a multimeter (ohms setting) across the switch connector terminals.

**NOTE:** Before checking switch continuity, clean target end of switch to make sure that there is no metallic debris on the switch that could prevent correct switch operation.

4. With the switch cam positioned near the target end of the switch (dump hopper lowered) (Fig. 11), there should be continuity across the switch terminals.

5. When the switch cam is positioned away from the target end of the switch (dump hopper raised) (Fig. 11), there should be no continuity across the switch terminals.

**IMPORTANT: Proper proximity switch operation requires aluminum switch spacer that positions the switch away from the sweeper frame. If switch is removed from machine, make sure that switch spacer is installed between switch and frame.**

6. Replace proximity switch as needed. Reconnect switch to machine wiring harness.

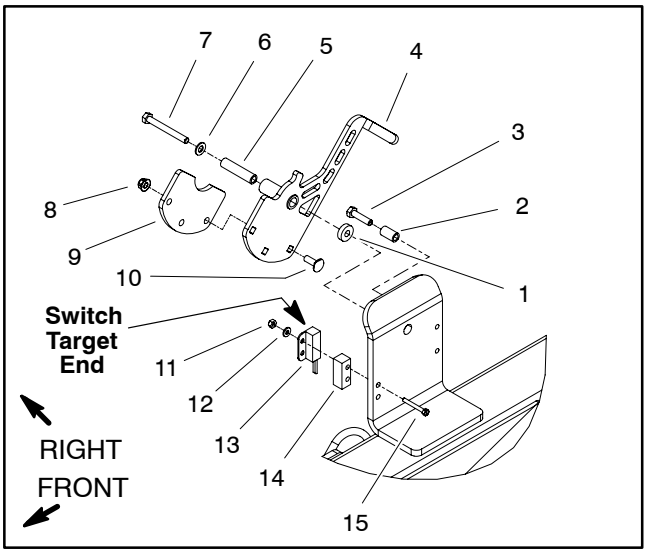



Figure 10

1. **Mounting spacer**
2. **Spacer**
3. **Cap screw**
4. **Switch cam**
5. **Cam spacer**
6. **Flat washer**
7. **Cap screw**
8. **Flange nut (3 used)**
9. **Switch cam weight**
10. **Carriage screw (3 used)**
11. **Lock nut (2 used)**
12. **Flat washer (2 used)**
13. **Hopper down switch**
14. **Switch spacer**
15. **Cap screw (2 used)**

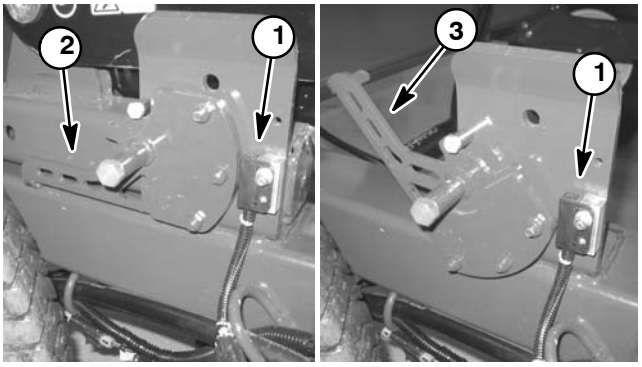



Figure 11

1. **Hopper down switch**
2. **Switch cam: dump hopper lowered**
3. **Switch cam: dump hopper raised**

## Solenoid Valve Coil

A solenoid valve coil on the hydraulic control manifold (Fig. 12) can be replaced without opening the hydraulic system.

### Removal

1. Position sweeper on a level surface with dump hopper lowered. If sweeper is attached to towing vehicle, engage vehicle parking brake, stop engine and remove key from the ignition switch.

2. Disconnect the machine wiring harness electrical connector from the solenoid coil to be replaced.

3. Remove the nut from the spool assembly.

4. Slide the coil assembly from the spool assembly. Discard the coil assembly.

5. Clean all corrosion or dirt from the spool assembly.

### Installation

1. Slide new coil assembly onto the spool assembly.

2. Install the nut onto the spool assembly and torque nut 36 in–lb (4.1 N–m) (do not over tighten).

3. Connect the machine wiring harness electrical connector to the solenoid coil.

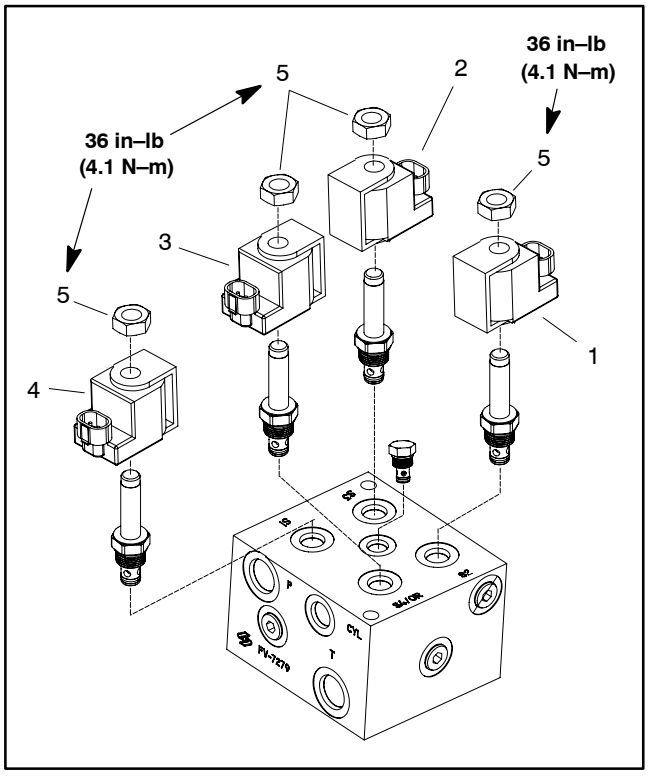



Figure 12

1. **Solenoid valve coil (S2)**
2. **Solenoid valve coil (S3)**
3. **Solenoid valve coil (S4)**
4. **Solenoid valve coil (S1)**
5. **Nut**

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# Chapter 5

# Chassis

## Table of Contents

# Specifications

| Item | Description |
|---|---|
| Tires<br>Size<br>Pressure | <br>26.5 x 14 – 12, 4 Ply, Tubeless<br>12.5 PSI (.862 Bar) |
| Wheel Lug Nut Torque | 70 to 90 ft–lb (95 to 122 N–m) |

# General Information

## Securing Pro Sweep 5200 to Tow Vehicle

While operating or servicing the Pro Sweep 5200, make sure that hitch pin is properly positioned in tow vehicle hitch and sweeper tongue. Hitch pin should be secured with hairpin clip (Fig. 1).

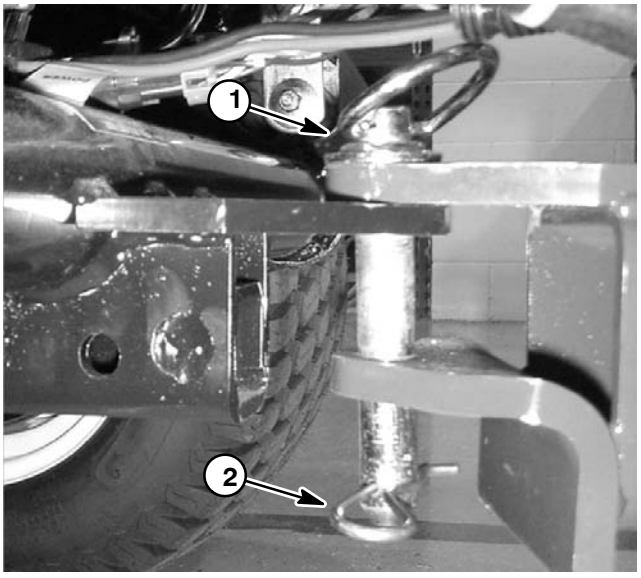


Figure 1

1. **Hitch pin**
2. **Hairpin clip**

## Wheels

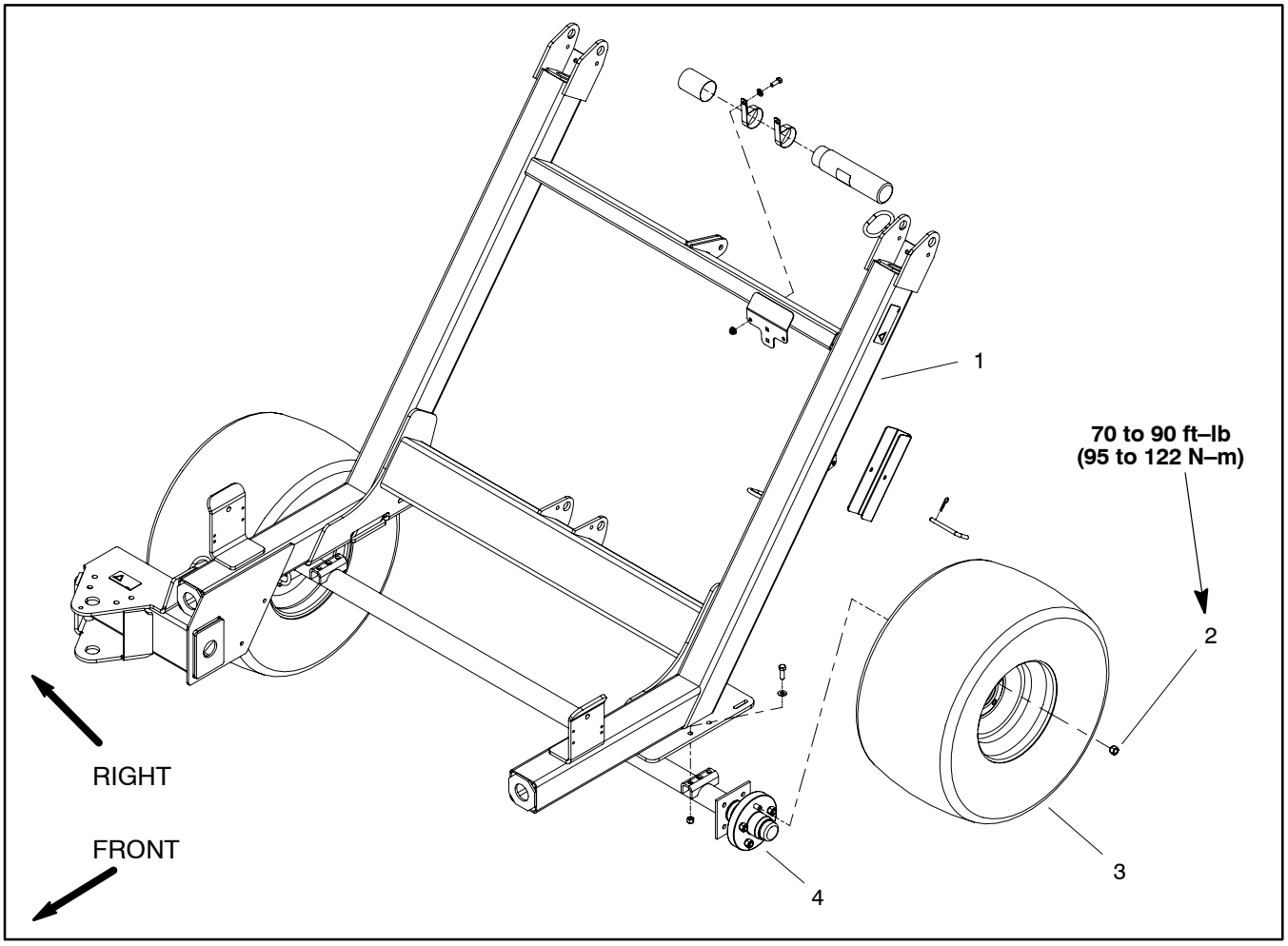


Figure 2

1. **Main frame**
2. **Lug nut (5 used per wheel)**
3. **Wheel and tire assembly**
4. **Wheel hub**

### Wheel Removal (Fig. 2)

1. Position sweeper on a level surface with dump hopper empty and lowered. Have sweeper attached to towing vehicle, engage vehicle parking brake, stop engine and remove key from the ignition switch. Chock sweeper wheels to prevent sweeper from moving.

2. Jack or hoist sweeper from ground and support machine with blocking or jack stands (see Operator's Manual and Jacking Instructions in Chapter 1 – Safety).

3. Loosen and remove five (5) lug nuts from wheel to be removed.

4. Pull wheel from sweeper.

### Wheel Installation (Fig. 2)

1. Position wheel to wheel hub.

**WARNING**

**Failure to maintain proper lug nut torque could result in failure or loss of wheel and may result in personal injury.**

2. Secure wheel to sweeper with five (5) lug nuts. Alternately torque lug nuts from 70 to 90 ft–lb (95 to 122 N–m).

3. Lower machine to ground.

## Wheel Bearings

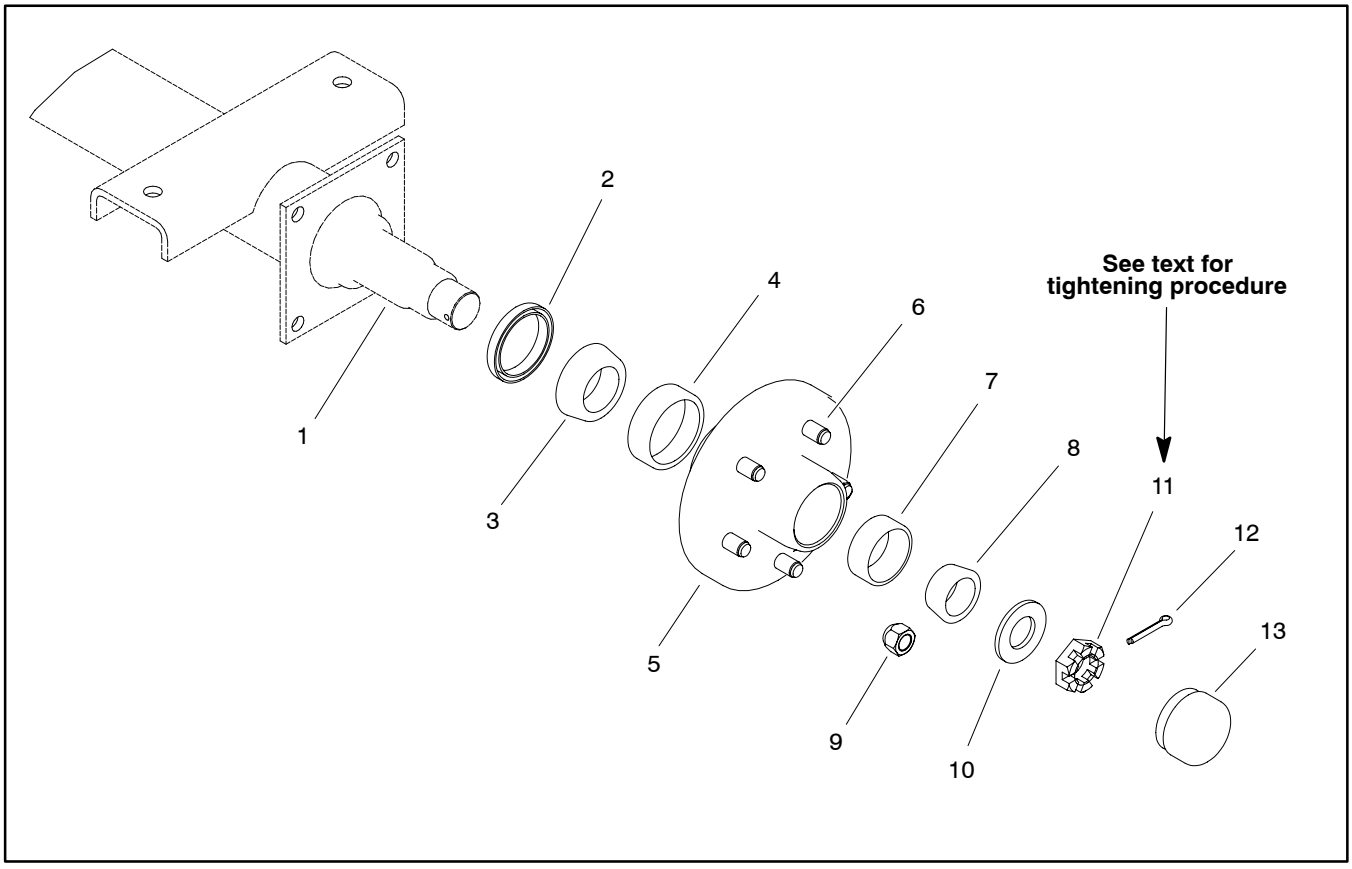


Figure 3

1. **Axle**
2. **Grease seal**
3. **Inner bearing cone**
4. **Inner bearing cup**
5. **Wheel hub**
6. **Lug bolt (5 used)**
7. **Outer bearing cup**
8. **Outer bearing cone**
9. **Lug nut (5 used)**
10. **Washer**
11. **Slotted hex nut**
12. **Cotter pin**
13. **Dust cup**

**Removal (Fig. 3)**

1. Position sweeper on a level surface with dump hopper empty and lowered. Have sweeper attached to towing vehicle, engage vehicle parking brake, stop engine and remove key from the ignition switch. Chock sweeper wheels to prevent sweeper from moving.

2. Jack or hoist sweeper from ground and support machine with blocking or jack stands (see Operator's Manual and Jacking Instructions in Chapter 1 – Safety).

3. Remove wheel assembly (see Wheel Removal in this section).

4. Carefully pry dust cap from wheel hub.

5. Remove cotter pin from axle spindle.

6. Remove slotted hex nut and washer that secures wheel hub to spindle. Slide wheel hub with bearings from spindle.

7. Disassemble wheel hub:

   A. Pull grease seal out of the wheel hub. Discard seal.

   B. Remove bearing cones from both sides of wheel hub. Clean bearings in solvent. Clean inside of hub.

   C. If necessary, remove bearing cups from hub using a hammer and punch.

   D. Inspect wheel bearings. Check the bearing cones and bearing cups for wear, pitting or other damage. Replace worn or damaged parts.

**Installation (Fig. 3)**

1. Clean all parts thoroughly before reassembly.

2. Assemble wheel hub:

   A. If bearing cups were removed from the wheel hub, press inner and outer cups into the hub until they seat against the hub shoulder.

   B. Pack both bearing cones with grease. Install greased inner bearing into the cup on inboard side of the wheel hub.

   C. Fill hub approximately 50% full of grease.

   **IMPORTANT: The grease seal must be pressed in so it is flush with the end of the hub. The lip of the seal must face the bearing.**

   D. Lubricate the inside of a new grease seal and press it into the wheel hub.

3. Install the wheel hub onto the axle spindle taking care to not damage grease seal in wheel hub.

4. Install greased outer bearing cone, washer and slotted hex nut onto spindle shaft.

5. While rotating the wheel hub by hand, torque the slotted hex nut from 75 to 180 in-lb (8.5 to 20.3 N–m) to seat bearings. Loosen nut until it is away from washer and hub has end play. Finally, while rotating hub, tighten slotted hex nut from 15 to 20 in–lbs (1.7 to 2.3 N–m).

6. Install cotter pin through axle spindle hole. Install dust cap to hub.

**WARNING**

**Failure to maintain proper lug nut torque could result in failure or loss of wheel and may result in personal injury.**

7. Install wheel assembly (see Wheel Installation in this section).

8. Carefully lower machine to ground.

## Servicing the Brush Housing

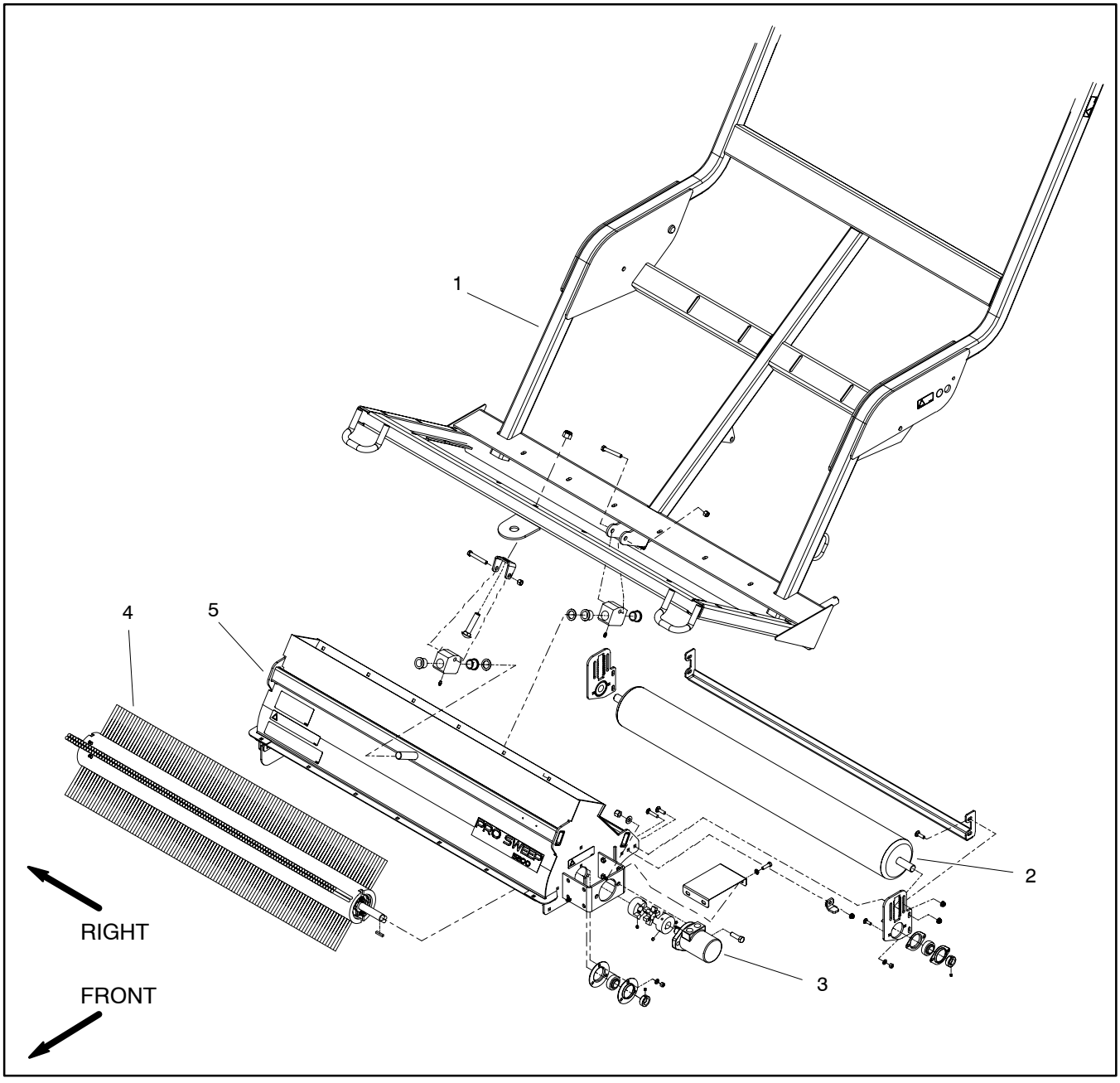


Figure 4

1. **Saddle frame**
2. **Roller**
3. **Hydraulic brush motor**
4. **Brush**
5. **Brush housing**

To perform service on the brush housing, brush assembly or roller, the following procedure can be used. These steps will reduce the chance that brush housing components will fall or shift during the service process.

1. Position sweeper on a level surface with dump hopper empty and lowered. Have sweeper attached to towing vehicle, engage vehicle parking brake, stop engine and remove key from the ignition switch. Chock sweeper wheels to prevent sweeper from moving.

2. With brush housing resting on the ground, remove fasteners that secure component(s) that are to be removed (see Brush, Brush Housing and/or Roller in this section).

3. Support component(s) to prevent it (them) from shifting position.

4. Start tow vehicle. Slowly raise sweeper hopper while allowing brush housing component(s) to remain on the ground.

5. Raise hopper and place cylinder stop on lift cylinder to secure sweeper frame.

6. Perform necessary service on removed component(s).

7. Once necessary service has been completed, position serviced component(s) under raised hopper.

8. Remove cylinder stop from lift cylinder. Slowly lower hopper to correctly position component(s) to be installed.

9. Install component(s) to machine (see Brush, Brush Housing and/or Roller in this section).

## Brush

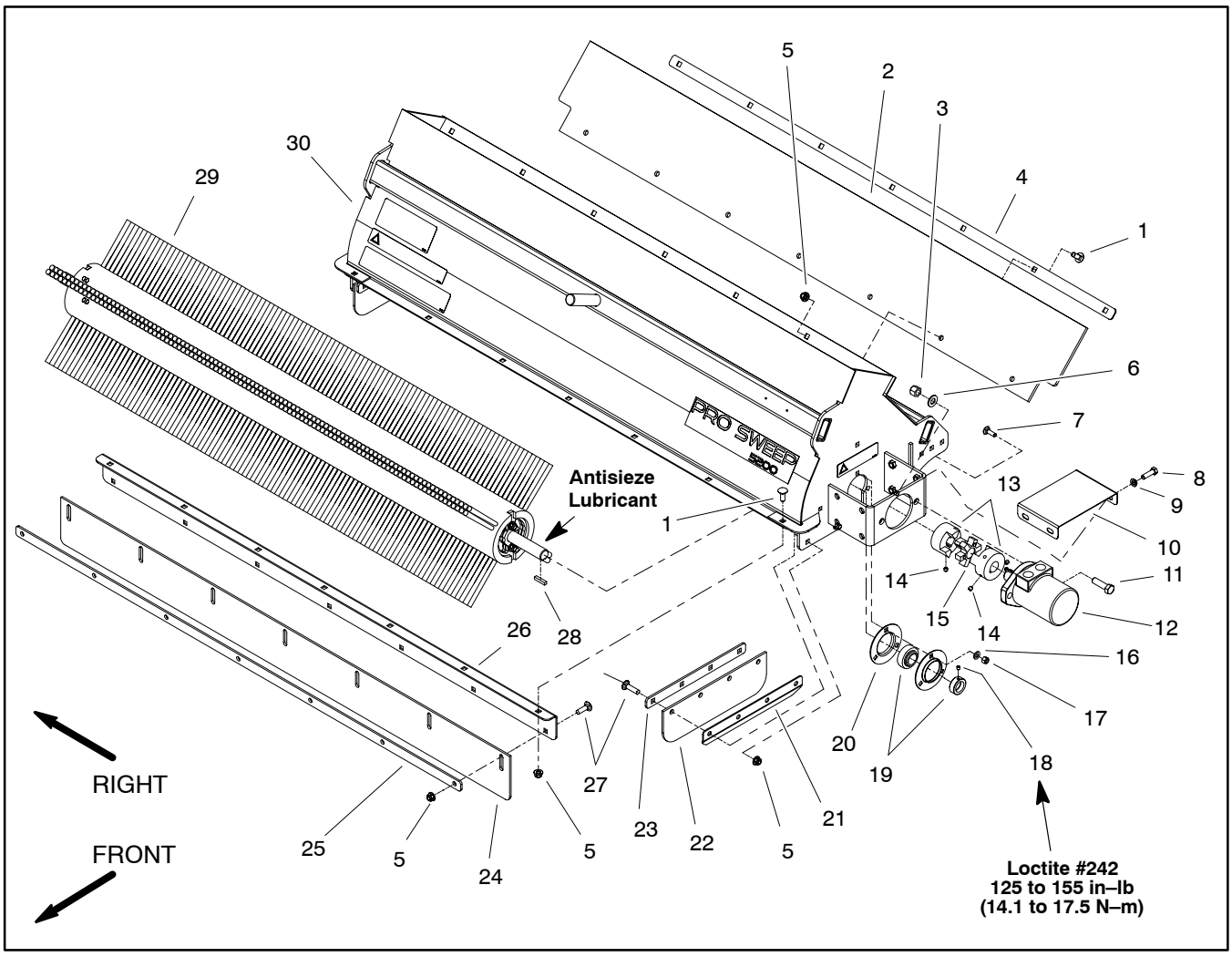


Figure 5

1. Carriage screw
2. Top rubber shield
3. Lock nut (2 used)
4. Top shield plate
5. Flange nut
6. Flat washer (2 used)
7. Carriage bolt (3 used per bearing)
8. Cap screw
9. Lock washer
10. Coupler cover (2 used)
11. Cap screw (2 used)
12. Hydraulic brush motor
13. Coupler jaw
14. Set screw (2 used per jaw)
15. Coupler spider
16. Flat washer (3 used per bearing)
17. Lock nut (3 used per bearing)
18. Set screw
19. Bearing with locking collar
20. Bearing flange (2 used per bearing)
21. Side angle plate (2 used)
22. Side rubber shield (2 used)
23. Side shield plate (2 used)
24. Front rubber shield
25. Front shield plate
26. Front angle plate
27. Carriage screw
28. Square key
29. Brush
30. Brush housing

**Removal (Fig. 5)**

1. Position sweeper on a level surface with dump hopper empty and lowered. Have sweeper attached to towing vehicle, engage vehicle parking brake, stop engine and remove key from the ignition switch. Chock sweeper wheels to prevent sweeper from moving.

2. Remove hydraulic brush motor from brush housing (see Hydraulic Brush Motor Removal in the Service and Repairs section of Chapter 3 – Hydraulic System). Remove coupler spider (item 15).

**NOTE:** If desired, brush housing (with brush installed) can be removed from sweeper to allow brush removal (see Brush Housing Removal in this section).

3. Remove carriage bolts (item 7), flat washers (item 16) and lock nuts (item 17) that secure bearing flanges to brush housing.

4. Refer to Servicing the Brush Housing in this section for procedure to remove brush from brush housing.

5. After raising hopper and placing lift cylinder stop, retrieve brush assembly.

6. Loosen set screws (item 14) that secure coupling jaw to brush shaft. Slide coupling jaw from brush. Locate and retrieve square key from brush shaft.

7. To remove bearing from brush shaft:

A. Loosen set screw that secures locking collar to shaft.

**NOTE:** Normal brush rotation is clockwise as viewed from left side of sweeper.

B. Using a punch and hammer, rotate locking collar in the opposite direction of normal brush rotation to loosen collar.

C. Slide bearing flanges, locking collar and bearing from brush shaft.

8. Disassemble brush using Figure 6 as a guide.

**Installation (Fig. 5)**

1. Assemble brush using Figure 6 as a guide.

2. Clean brush shaft and apply antisieze lubricant to shaft. Slide bearing flanges, bearing and locking collar to each end of brush shaft. Do not tighten set screw in locking collar.

3. Position square key in brush shaft. Slide coupling jaw onto drive end of brush shaft.

4. Position brush assembly under raised hopper.

5. Slowly lower hopper to position brush assembly to brush housing (see Servicing the Brush Housing in this section).

6. Secure bearing flanges to brush housing with carriage bolts (item 7), flat washers (item 16) and lock nuts (item 17). Center brush in brush housing.

**NOTE:** Normal brush rotation is clockwise as viewed from left side of sweeper.

7. Using a punch and hammer, rotate locking collar in the direction of normal brush rotation to tighten collar. Apply Loctite #242 (or equivalent) to set screw and torque set screw from 125 to 155 in–lb (14.1 to 17.5 N–m) to secure locking collar to brush shaft.

8. Place coupler spider into coupling jaw on brush shaft.

9. Install hydraulic brush motor to brush housing (see Hydraulic Brush Motor Installation in the Service and Repairs section of Chapter 3 – Hydraulic System). Make sure that coupling jaws have a gap between coupler jaw valleys from .830" to .930" (21.1 to 23.6 mm). Apply Loctite #242 (or equivalent) to threads of coupling set screws. Secure coupling jaws to motor shaft and brush shaft by torquing set screws from 125 to 155 in–lb (14.1 to 17.5 N–m) (Fig. 7).

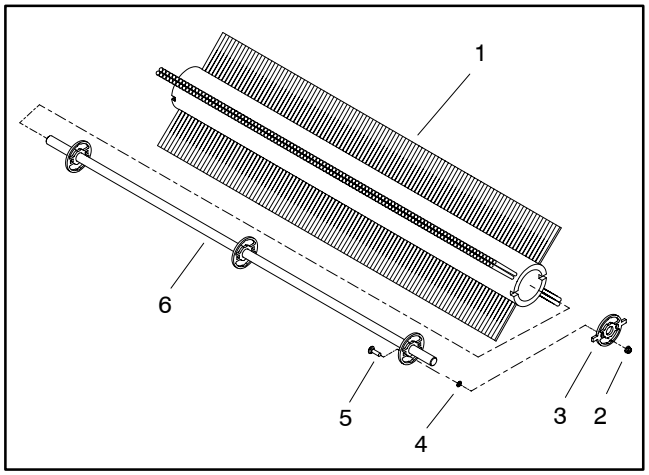


Figure 6

1. **Brush**
2. **Flange nut (4 used)**
3. **Brush drive (2 used)**
4. **Retaining ring (4 used)**
5. **Carriage screw (4 used)**
6. **Brush axle**

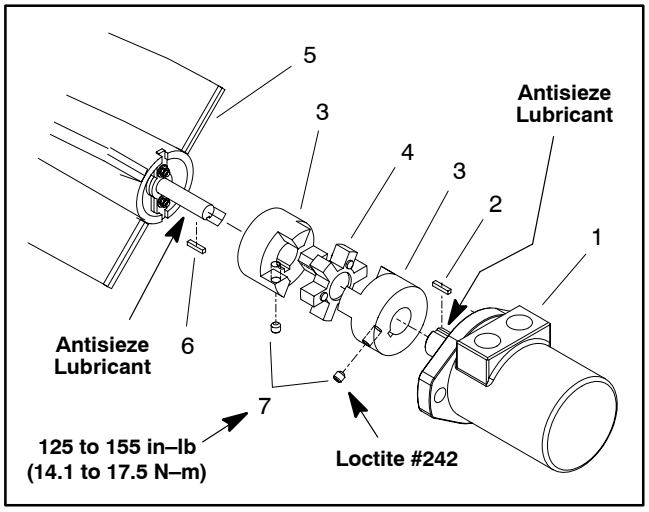


Figure 7

1. **Hydraulic brush motor**
2. **Key**
3. **Coupling jaw**
4. **Coupling spider**
5. **Brush**
6. **Square key**
7. **Set screw (2 per jaw)**

## Brush Housing

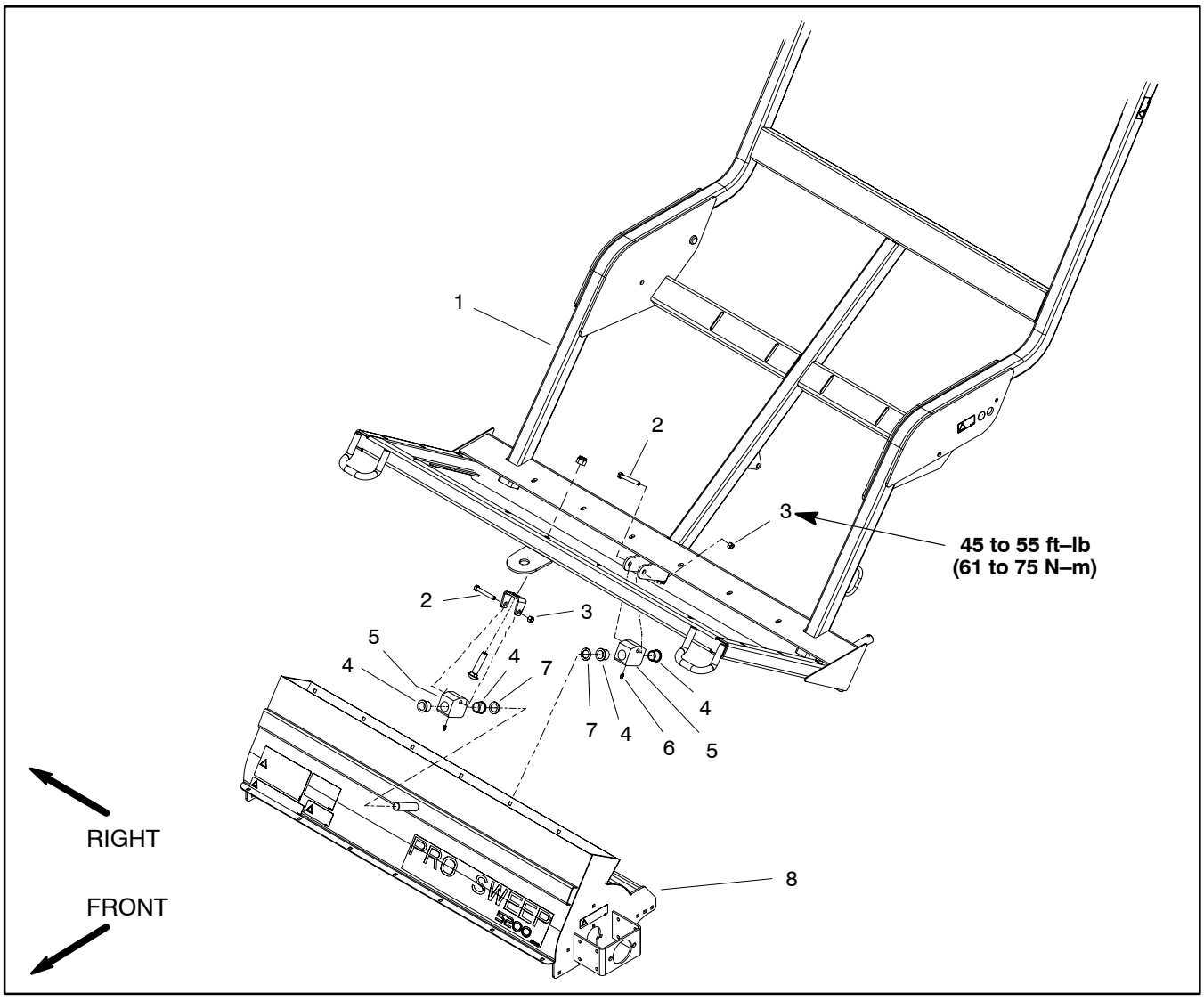


Figure 8

1. **Saddle frame**
2. **Cap screw**
3. **Lock nut**
4. **Flange bushing**
5. **Pivot mount**
6. **Grease fitting (2 used)**
7. **Thrust washer**
8. **Brush housing**

**Removal (Fig. 8)**

1. Position sweeper on a level surface with dump hopper empty and lowered. Have sweeper attached to towing vehicle, engage vehicle parking brake, stop engine and remove key from the ignition switch. Chock sweeper wheels to prevent sweeper from moving.

2. Remove hydraulic brush motor from brush housing (see Hydraulic Brush Motor Removal in the Service and Repairs section of Chapter 3 – Hydraulic System).

3. Support brush housing to prevent it from shifting.

4. Remove cap screws (item 2) and lock nuts (item 3) that secure pivot mounts to frame.

5. Refer to Brush Housing Service in this section for procedure to remove brush housing from saddle frame.

6. After raising hopper and placing lift cylinder stop, retrieve brush housing.

7. Remove pivot mounts from brush housing. Locate and retrieve thrust washers (item 7) from between pivot mount and brush housing.

8. If necessary, remove flange bushings from pivot mounts. Discard bushings if removed.

**Installation (Fig. 8)**

1. If flange bushings were removed from pivot mounts, press new bushings fully into mounts.

2. Place thrust washer and then pivot mount on both brush housing pins.

3. Position brush housing under raised hopper.

4. Slowly lower hopper to position brush housing to saddle frame (see Servicing the Brush Housing in this section).

5. Secure pivot mounts to frame with cap screws (item 2) and lock nuts (item 3). Torque lock nuts from 45 to 55 ft–lb (61 to 75 N–m).

6. Install hydraulic brush motor to brush housing (see Hydraulic Brush Motor Installation in the Service and Repairs section of Chapter 3 – Hydraulic System). Make sure that coupling jaws have a gap between coupler jaw valleys from .830" to .930" (21.1 to 23.6 mm). Apply Loctite #242 (or equivalent) to threads of coupling set screws. Secure coupling jaws to motor shaft and brush shaft by torquing set screws from 125 to 155 in–lb (14.1 to 17.5 N–m) (Fig. 9).

7. Lubricate grease fittings on pivot mounts (see Operator's Manual).

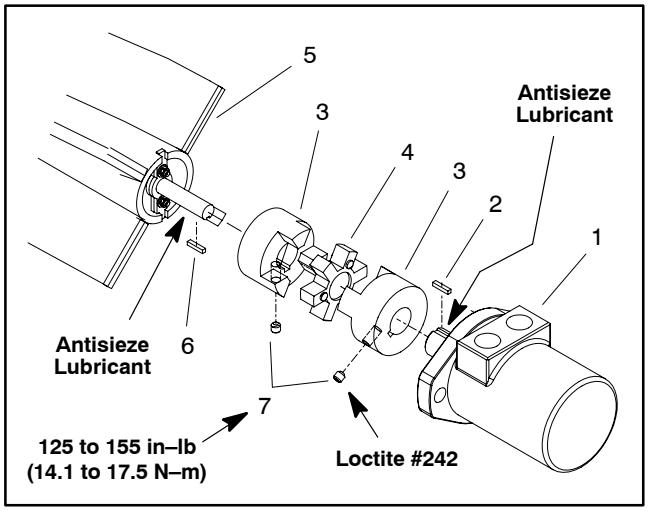


Figure 9

1. **Hydraulic brush motor**
2. **Key**
3. **Coupling jaw**
4. **Coupling spider**
5. **Brush**
6. **Square key**
7. **Set screw (2 per jaw)**

## Roller

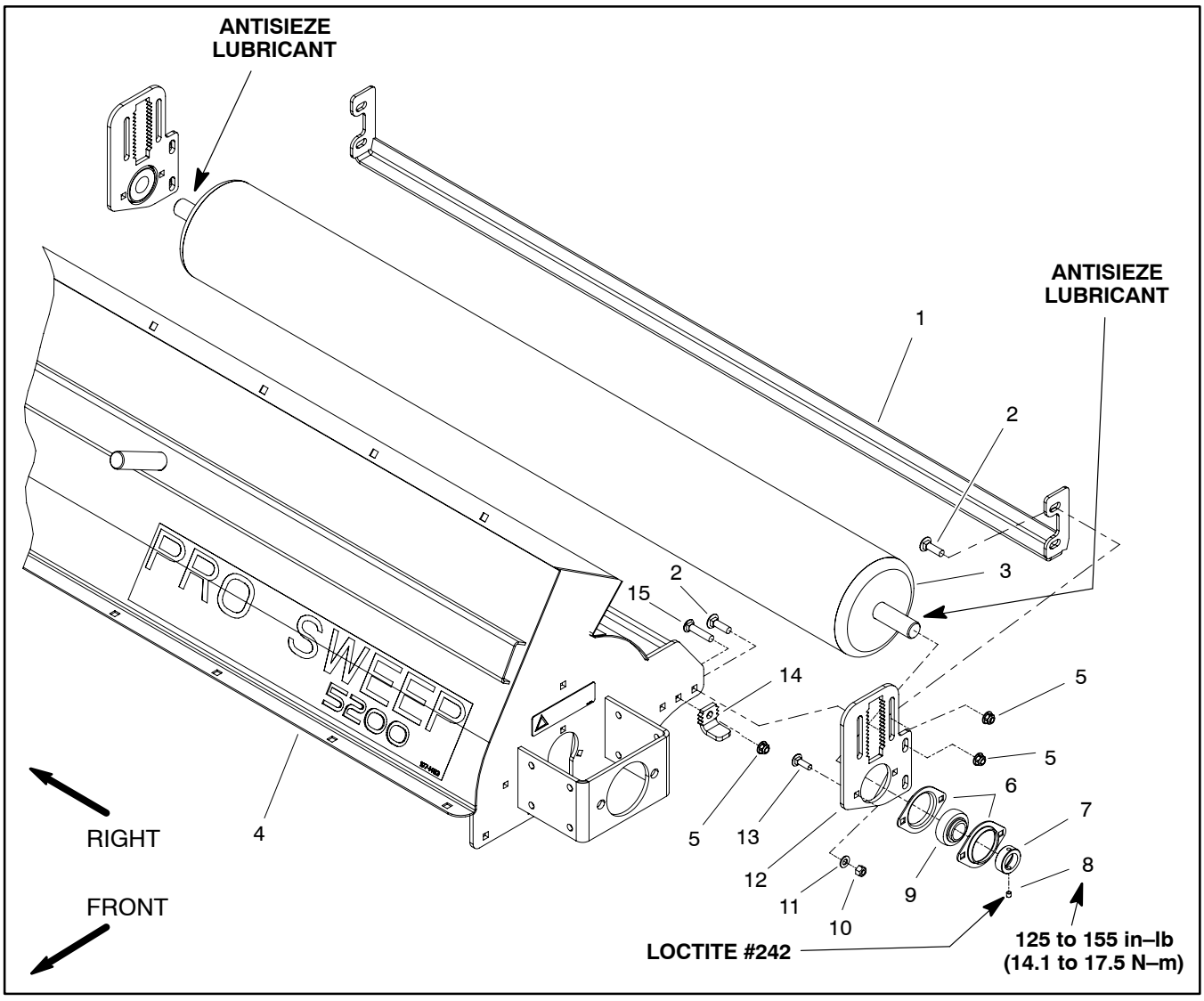


Figure 10

1. Roller scraper
2. Carriage screw (8 used)
3. Roller
4. Brush housing
5. Flange nut (10 used)
6. Bearing flange (2 used per bearing)
7. Locking collar (2 used)
8. Set screw (2 used)
9. Bearing (2 used)
10. Lock nut (4 used)
11. Flat washer (4 used)
12. Roller adjustment plate (2 used)
13. Carriage screw (4 used)
14. Adjuster key (2 used)
15. Carriage screw (2 used)

**Removal (Fig. 10)**

1. Position sweeper on a level surface with dump hopper empty and lowered. Have sweeper attached to towing vehicle, engage vehicle parking brake, stop engine and remove key from the ignition switch. Chock sweeper wheels to prevent sweeper from moving.

2. Remove flange nuts and carriage screws that secure roller scraper to roller adjustment plates. Remove roller scraper from machine.

**IMPORTANT: When fully lowered, the sweeper is supported by the roller. To service the roller, raise the sweeper slightly before carefully loosening fasteners that secure roller assembly.**

**CAUTION**

**To prevent personal injury, make sure that roller is supported as it is removed from the machine. Roller weighs approximately 80 pounds (36.3 kg).**

3. Support roller to prevent it from shifting.

4. Note location of roller adjustment plates and adjuster keys for reassembly purposes.

5. Remove flange nuts that secure roller adjustment plates and adjuster keys to brush housing.

6. Refer to Brush Housing Service in this section for procedure to remove roller assembly from brush housing.

7. After raising hopper and placing lift cylinder stop, retrieve roller assembly.

8. To remove bearings from roller:

   A. Remove set screw (item 8) that secures locking collar to roller shaft.

   **NOTE:** Normal roller rotation is counter–clockwise as viewed from left side of sweeper.

   B. Using a punch and hammer, rotate locking collar (item 7) in the opposite direction of normal roller rotation to loosen collar.

   C. Remove carriage screws (item 13), flat washers (item 11) and lock nuts (item 10) that secure bearing flanges to roller adjustment plate.

   D. Slide bearing flanges, locking collar and bearing from roller.

**Installation (Fig. 10)**

1. Clean roller shaft ends and apply antisieze lubricant to shaft ends. Place adjustment plate, bearing flanges, bearing and locking collar onto each end of roller shaft. Do not tighten set screws in locking collars.

2. Secure bearing flanges to roller adjustment plate with carriage screws (item 13), flat washers (item 11) and lock nuts (item 10).

3. Position roller assembly under raised hopper.

4. Slowly lower hopper to position roller assembly to housing (see Servicing the Brush Housing in this section).

5. Secure adjustment plates and adjuster keys to brush housing with carriage screws and flange nuts using location noted during removal.

6. Center roller between bearings.

**NOTE:** Normal roller rotation is counter–clockwise as viewed from left side of sweeper.

7. Using a punch and hammer, rotate locking collars in the direction of normal roller rotation to tighten collars.

8. Apply Loctite #242 (or equivalent) to threads of set screws (item 8). Install set screws into collars and torque from 125 to 155 in–lb (14.1 to 17.5 N–m) to secure locking collars to roller shaft.

9. Check that roller is free to rotate and no binding exists.

10. Position roller scraper to machine. Install carriage screws and flange nuts that secure roller scraper to roller adjustment plates.

11. Check roller height and roller scraper clearance and adjust if necessary (see Operator's Manual).

## Frame Assembly

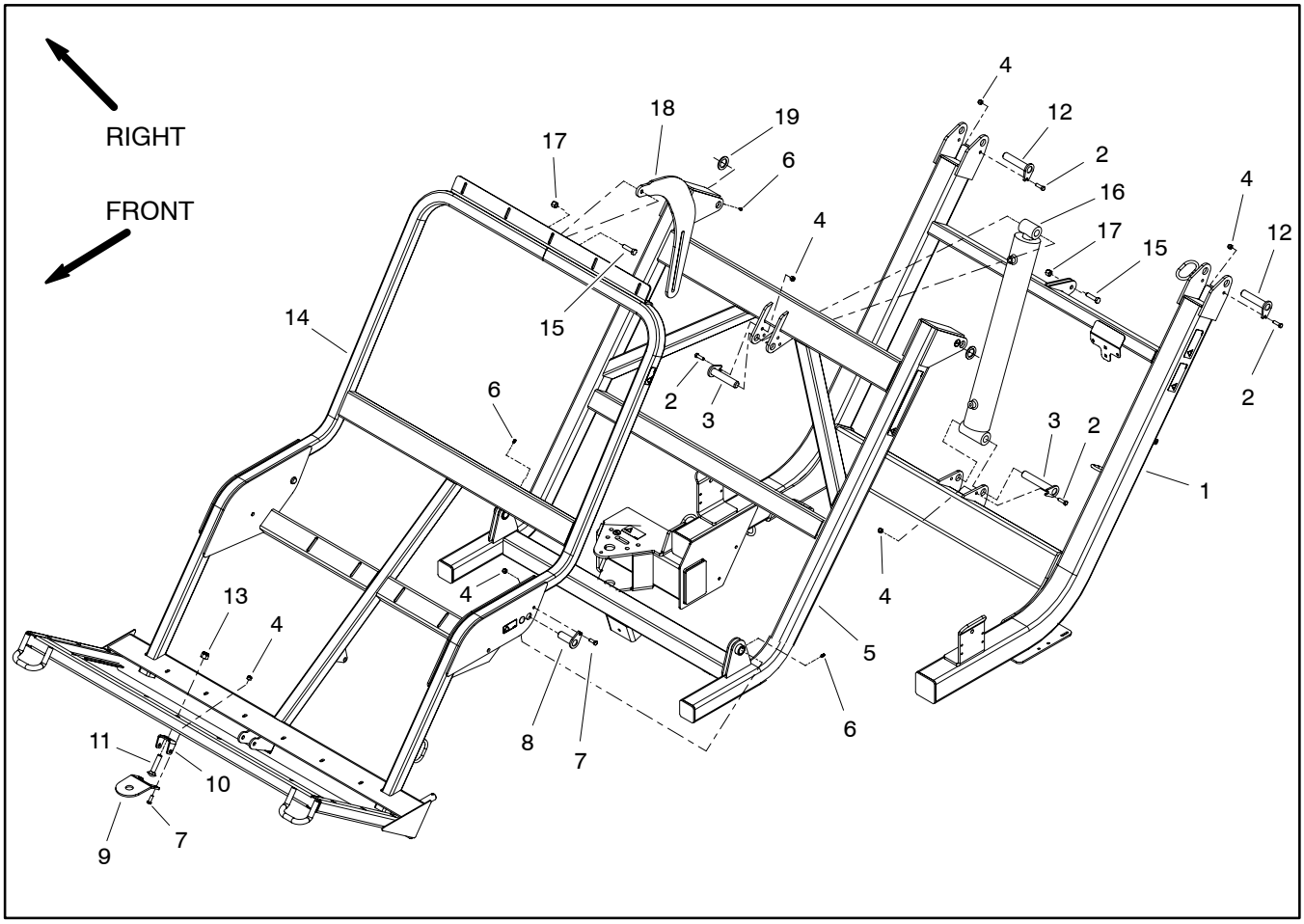


Figure 11

1. **Main frame**
2. **Cap screw**
3. **Pivot pin**
4. **Lock nut**
5. **Pitch frame**
6. **Grease fitting**
7. **Cap screw**
8. **Pivot pin**
9. **Tow hook plate**
10. **Pivot saddle**
11. **Carriage bolt**
12. **Pivot pin**
13. **Lock nut**
14. **Saddle frame**
15. **Cap screw**
16. **Lift cylinder**
17. **Lock nut**
18. **Link**
19. **Hardened spacer (2 used)**

**Disassembly (Fig. 11)**

1. Position sweeper on a level surface with dump hopper empty and lowered. Have sweeper attached to towing vehicle, engage vehicle parking brake, stop engine and remove key from the ignition switch. Chock sweeper wheels to prevent sweeper from moving.

2. Disassemble frame as needed using Figure 11 as a guide.

**Assembly (Fig. 11)**

1. Assemble frame using Figure 11 as a guide.

2. Lubricate pivot point grease fittings (see Operator's Manual).

Chapter 6

# Electrical Diagrams

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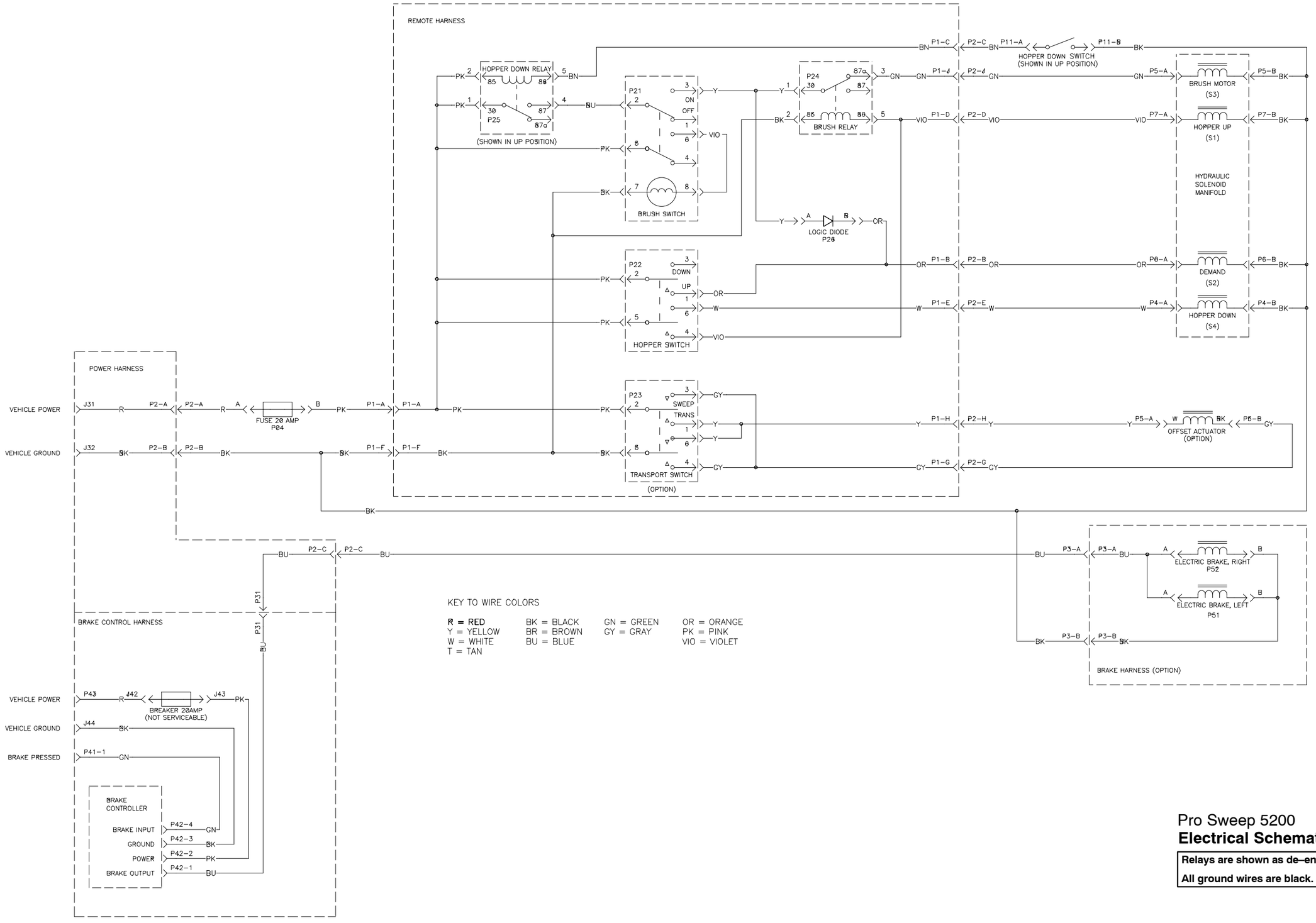



KEY TO WIRE COLORS

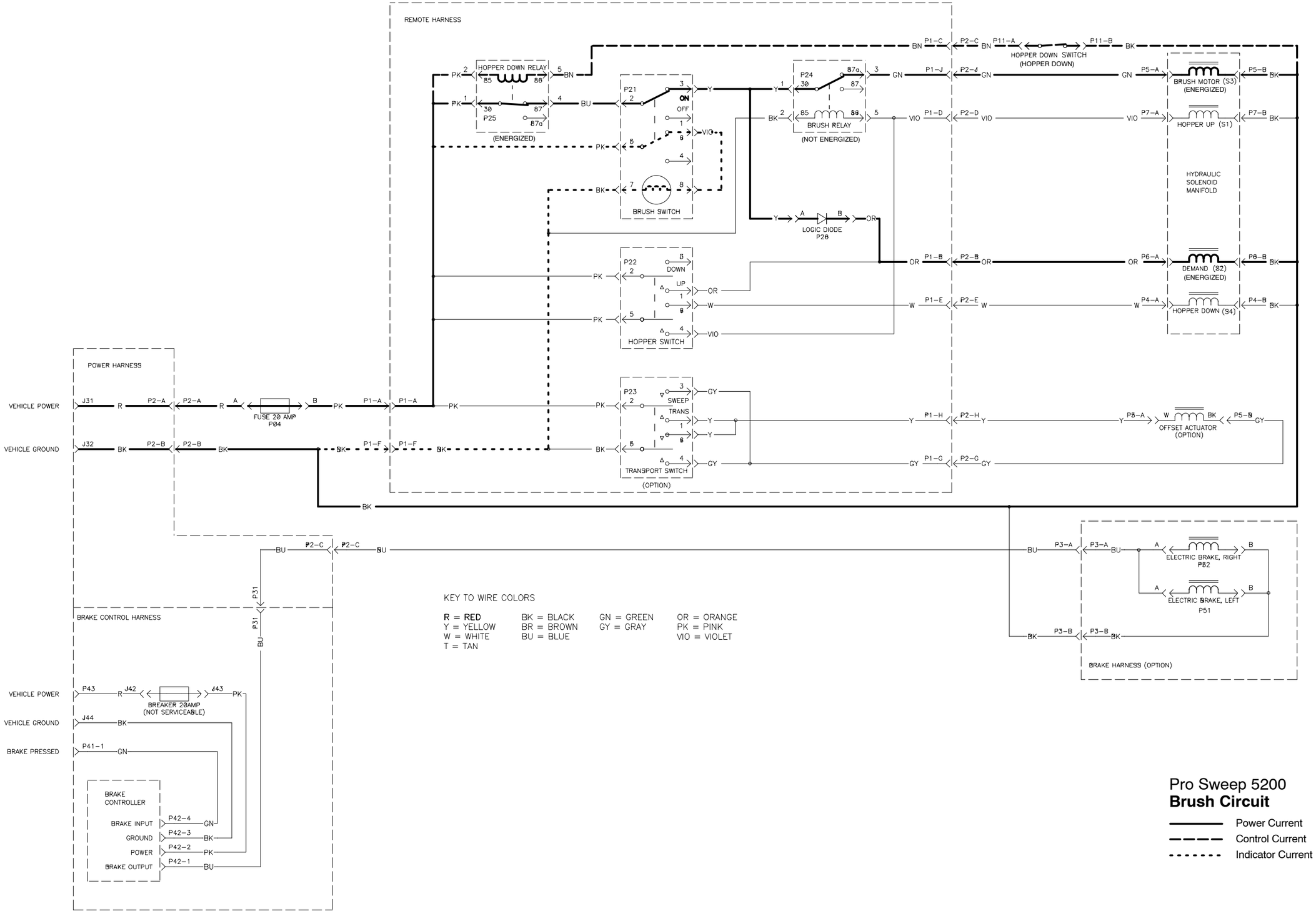
| | | | |
|---|---|---|---|
| R = RED | BK = BLACK | GN = GREEN | OR = ORANGE |
| Y = YELLOW | BR = BROWN | GY = GRAY | PK = PINK |
| W = WHITE | BU = BLUE | | VIO = VIOLET |
| T = TAN | | | |

Pro Sweep 5200

**Electrical Schematic**

**Relays are shown as de–energized**

**All ground wires are black.**

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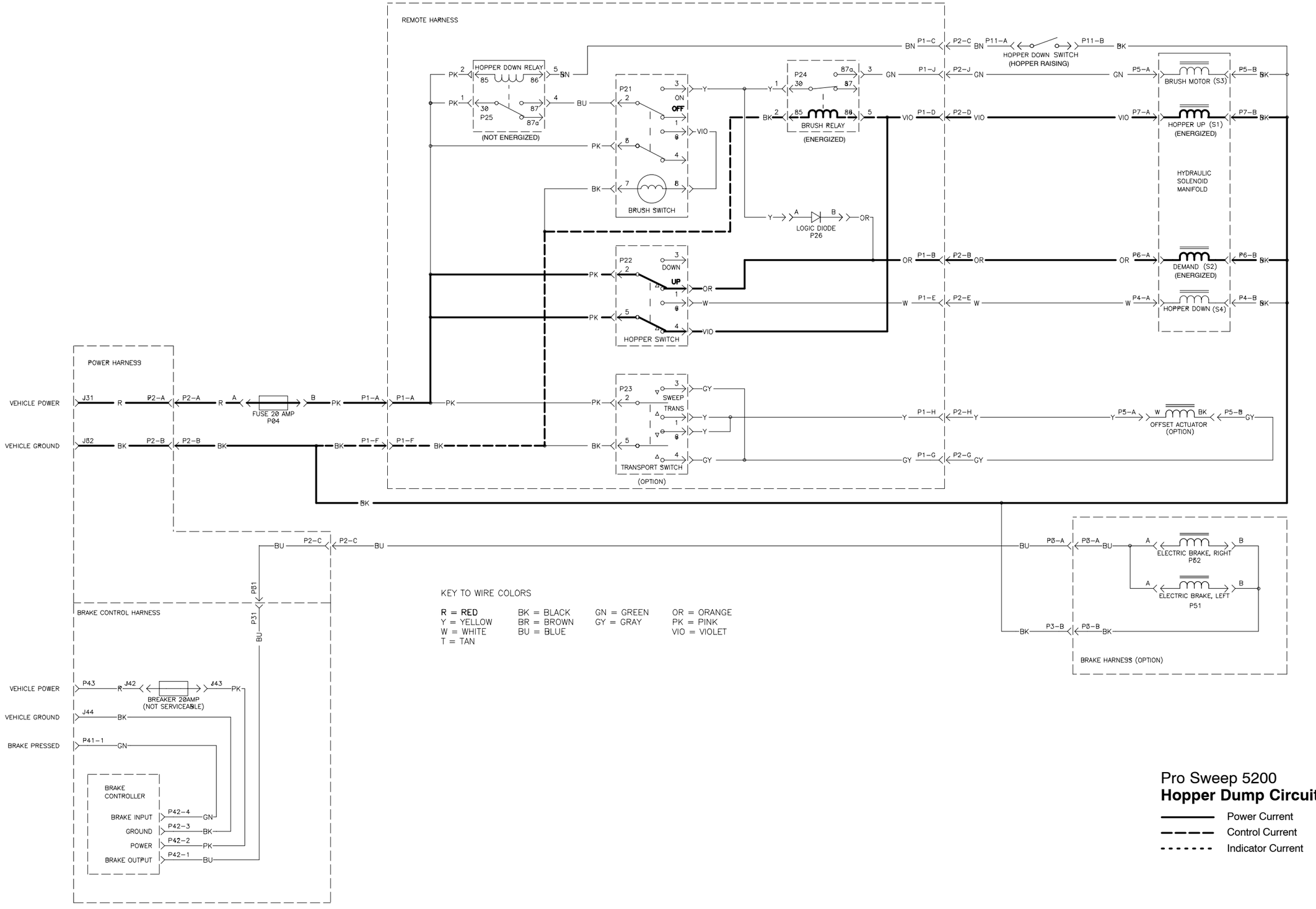
| T = TAN | | | |

Pro Sweep 5200
**Brush Circuit**

Power Current
Control Current
Indicator Current

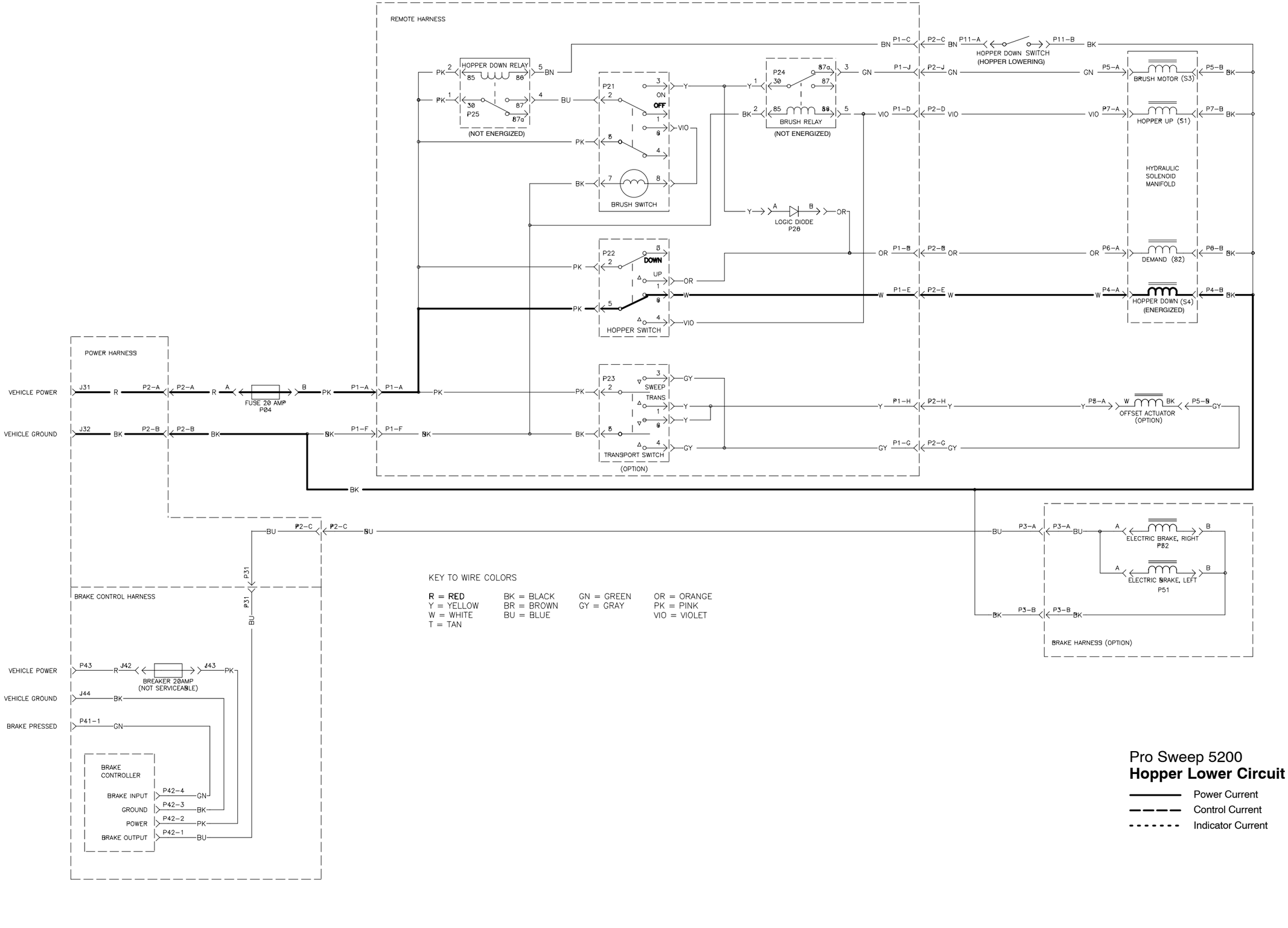



KEY TO WIRE COLORS

| | | | |
|---|---|---|---|
| R = RED | BK = BLACK | GN = GREEN | OR = ORANGE |
| Y = YELLOW | BR = BROWN | GY = GRAY | PK = PINK |
| W = WHITE | BU = BLUE | | VIO = VIOLET |
| T = TAN | | | |

Pro Sweep 5200
**Hopper Dump Circuit**

Power Current
Control Current
Indicator Current



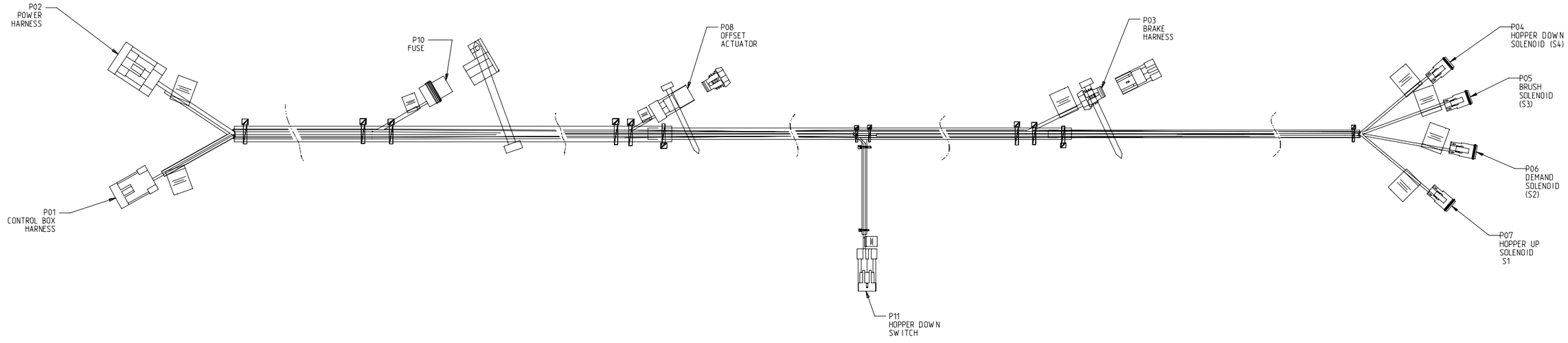

Pro Sweep 5200

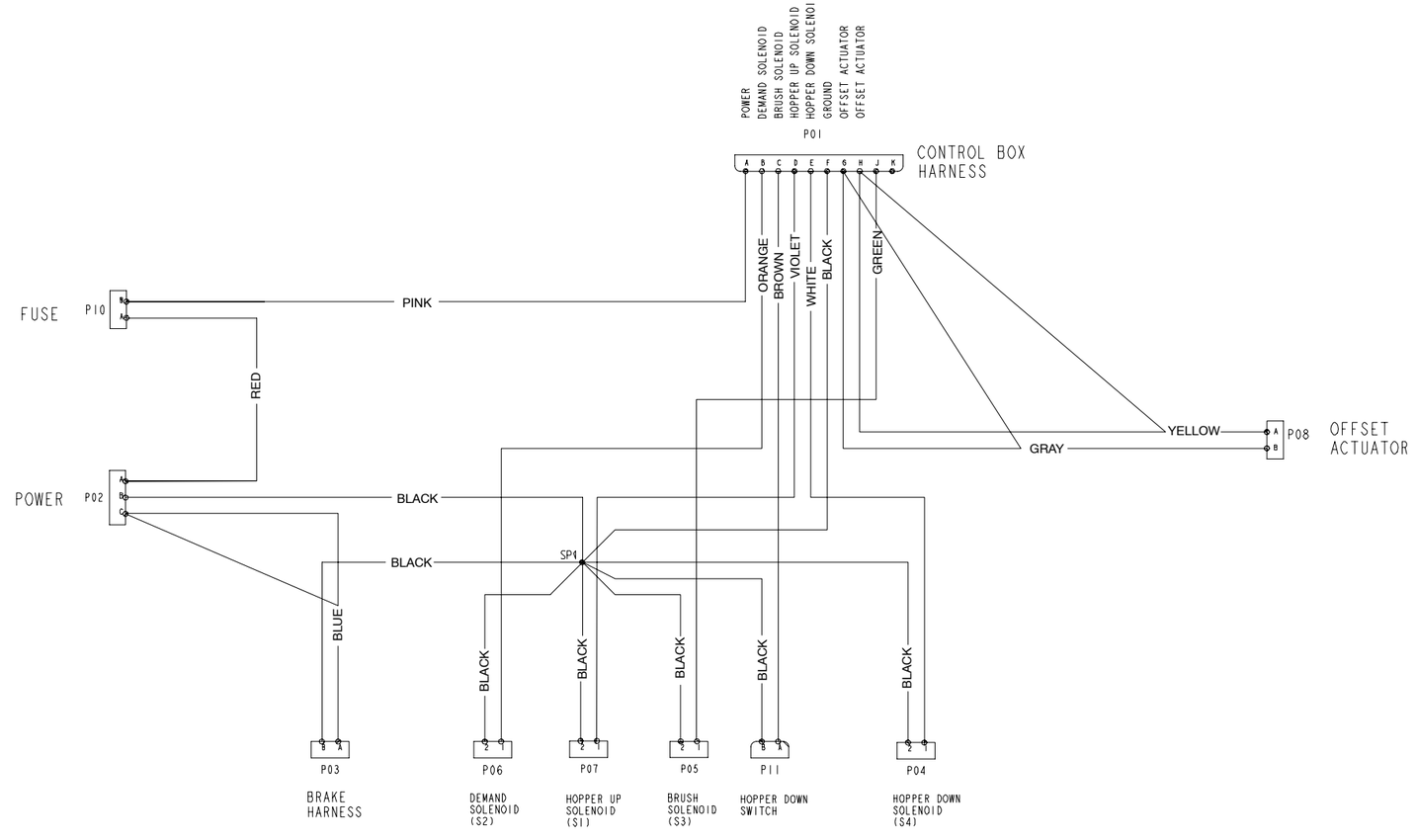
**Hopper Lower Circuit**

Power Current

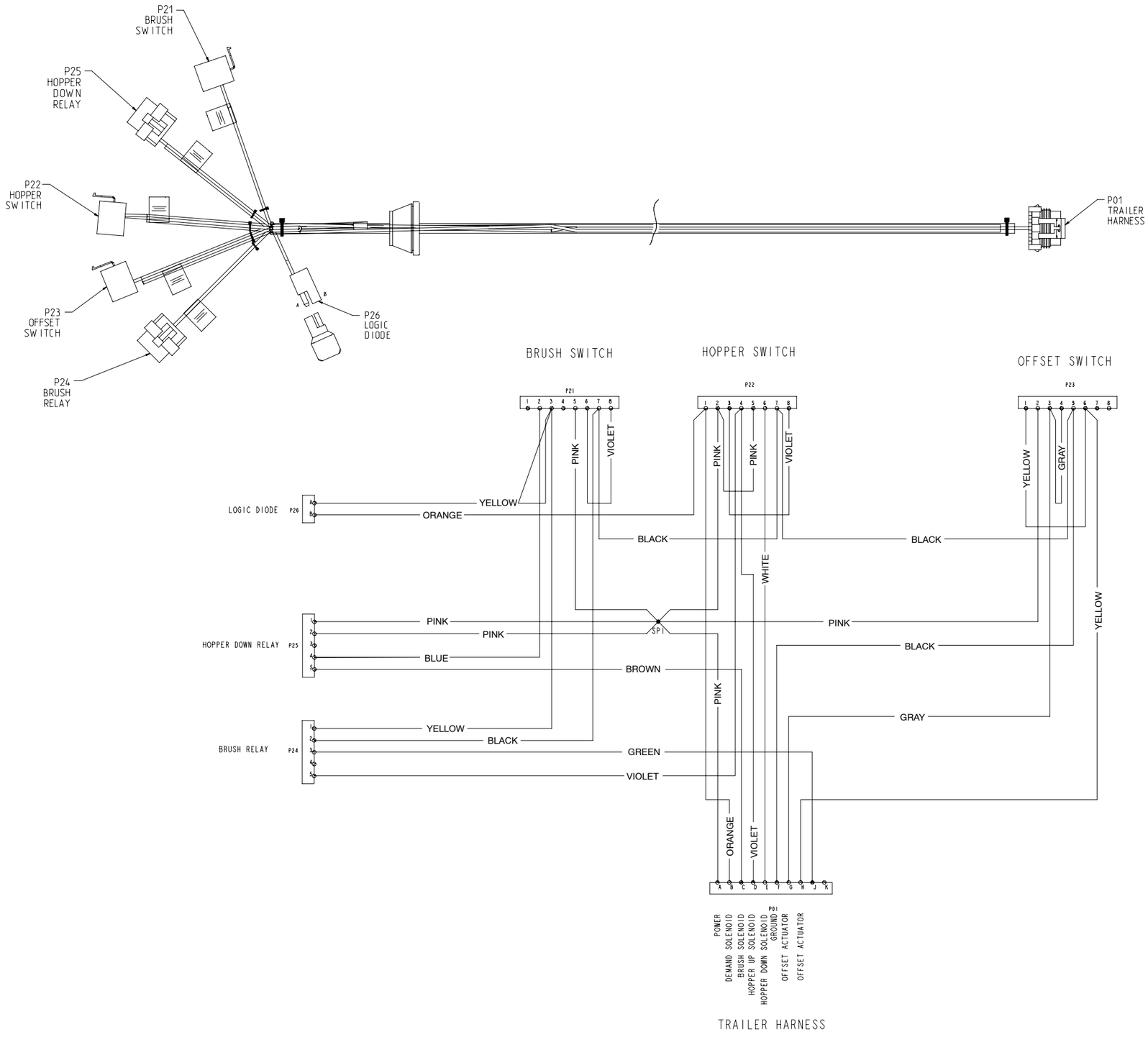
Control Current

Indicator Current

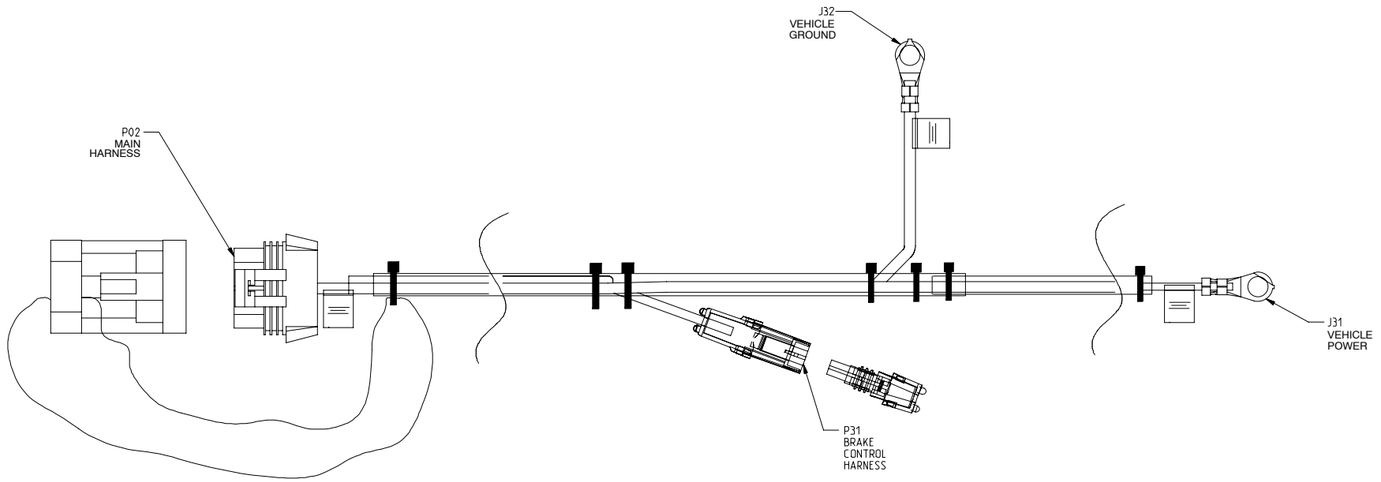



Pro Sweep 5200
**Main Wire Harness**




Pro Sweep 5200
**Control Box**
**Wire Harness**







Pro Sweep 5200
**Power Wire Harness**