



OPERATION & SERVICE MANUAL



Models: XM20 and XM30

12/2025 – Rev. 07

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| B | 12-Oct-2015 | Removed Section 9 (Options) from the Table of Contents and renumbered the remaining sections accordingly |
| C | 20-Jan-2015 | Renamed manual to Parts and Preventive Maintenance Manual |
| 04 | 11/2020 | Updated formatting and modified 14.10 Speed Sensor Assembly |
| 05 | 01/2022 | Updated 14.7 Hydraulic Pump and 14.8 Speed Sensor Subassembly |
| 06 | 11/2024 | Modified 16.6 Rear Louver Assembly and 16.7 Rear Louver Assembly to Tractor |
| 07 | 12/2025 | Modified 18.2 Eagle Warranty |



TABLE OF CONTENTS

PAGE

| | | |
|-------------|---|-----------|
| 1.0 | PRODUCT INFORMATION | 1 |
| 1.1 | DESCRIPTION | 1 |
| 1.2 | MODEL & SERIAL NUMBER | 1 |
| 1.3 | MANUFACTURER | 1 |
| 1.4 | TECHNICAL ASSISTANCE | 1 |
| 1.5 | SPECIFICATIONS | 1 |
| 1.6 | OPERATOR REQUIREMENTS | 5 |
| 1.7 | OPERATOR WORKSTATION | 5 |
| 2.0 | SAFETY INFORMATION | 6 |
| 2.1 | USAGE AND SAFETY INFORMATION | 6 |
| 2.2 | GENERAL | 6 |
| 3.0 | TRAINING | 7 |
| 3.1 | TRAINING REQUIREMENTS | 7 |
| 3.2 | TRAINING PROGRAM | 7 |
| 3.3 | OPERATOR TRAINING | 7 |
| 4.0 | PUTTING INTO SERVICE | 7 |
| 4.1 | UNPACKING AND SETTING UP | 7 |
| 5.0 | OPERATION | 8 |
| 5.1 | PRE-OPERATION INSPECTION CHECKLIST | 8 |
| 5.2 | STARTUP/SHUTDOWN AND SAFE TOWING | 9 |
| 5.2.1 | Starting the unit | 9 |
| 5.2.2 | Shutting down the unit | 9 |
| 5.2.3 | Load Towing and Pushing Safety | 9 |
| 5.3 | CONTROLS AND INSTRUMENTATION | 10 |
| 5.4 | COLD-WEATHER OPERATION | 13 |
| 5.4.1 | Engine Cold Start Assist | 13 |
| 5.4.2 | Transmission | 13 |
| 5.5 | NOISE AND VIBRATION EMISSION AND ELECTRO MAGNETIC COMPATIBILITY | 13 |
| 5.5.1 | Noise Emission Data | 13 |
| 5.5.2 | Vibration Emission Data | 13 |
| 5.5.3 | Electromagnetic Compatibility Data | 13 |
| 6.0 | SAFE HANDLING | 14 |
| 6.1 | TIE-DOWN PROVISIONS | 14 |
| 6.2 | LIFTING | 14 |
| 6.3 | JACKING AND JACK-STAND LOCATIONS | 15 |
| 6.4 | SAHR BRAKE QUICK RELEASE | 16 |
| 6.5 | TOWING AND MECHANICAL SAHR OVERRIDE | 17 |
| 6.6 | RELEASE OF SAHR MECHANICAL OVERRIDE | 18 |
| 6.7 | CENTER OF GRAVITY | 19 |
| 7.0 | MAINTENANCE | 20 |
| 7.1 | PREVENTIVE MAINTENANCE SCHEDULE | 20 |
| 7.2 | HYDRAULIC FLUID AND FILTER | 22 |
| 7.3 | AIR CLEANER | 23 |
| 7.4 | FUEL COMPONENTS | 23 |
| 7.5 | ENGINE | 24 |
| 7.6 | AXLES | 25 |
| 7.7 | TRANSMISSION | 26 |
| 7.8 | GREASE POINTS | 27 |
| 7.9 | CHARGE AIR COOLER DRAIN | 28 |
| 7.10 | COOLANT | 29 |
| 7.11 | HITCH WEAR | 29 |
| 8.0 | TROUBLE SHOOTING | 30 |
| 8.1 | READING CAN FAULT CODES | 30 |
| 8.2 | ENGINE FAULT CODES | 31 |
| 8.3 | TRACTOR CONTROL SYSTEM MESSAGES | 35 |
| 8.4 | ACCUMULATOR CHARGE VALVE ADJUSTMENT PROCEDURE | 36 |
| 9.0 | PROVISION OF SPARES | 37 |
| 9.1 | SOURCE OF SPARE PARTS | 37 |
| 9.2 | RECOMMENDED SPARE PARTS LISTS | 37 |
| 10.0 | DRIVE TRAIN | 38 |
| 10.1 | FRONT AXLE | 39 |



| | | |
|-------------|--|------------|
| 10.2 | REAR AXLE..... | 41 |
| 10.3 | FRONT DRIVESHAFT TO FRONT AXLE..... | 42 |
| 10.4 | FRONT AND REAR DRIVESHAFT TO TRANSMISSION | 43 |
| 10.5 | REAR DRIVESHAFT TO REAR AXLE | 44 |
| 10.6 | WHEELS AND TIRES..... | 45 |
| 11.0 | HYDRAULIC SYSTEM..... | 46 |
| 11.1 | SYSTEM SCHEMATIC | 47 |
| 11.2 | HYDRAULIC HOSES AND STEEL LINES..... | 48 |
| 11.2.1 | Hydraulic Hose Assemblies | 48 |
| 11.2.2 | Hydraulic Steel Lines | 49 |
| 11.3 | HYDRAULIC FITTINGS | 50 |
| 11.4 | HYDRAULIC CLAMP MOUNTING STUDS | 51 |
| 11.5 | STEEL HYDRAULIC LINES, LH SIDE..... | 52 |
| 11.6 | STEEL HYDRAULIC LINES, RH SIDE | 53 |
| 11.7 | MANIFOLD BLOCK INSTALL..... | 55 |
| 11.8 | TANK AND COOLER INSTALL | 56 |
| 11.9 | HOSE ROUTING, REAR | 57 |
| 11.10 | HOSE ROUTING, AXLES..... | 60 |
| 11.11 | HOSE ROUTING, FRONT | 61 |
| 12.0 | ELECTRICAL SYSTEM..... | 64 |
| 12.1 | RELAY AND FUSE PANEL SUBASSEMBLY..... | 65 |
| 12.2 | HINGED ELECTRICAL PANEL SUBASSEMBLY..... | 66 |
| 12.3 | BATTERY INSTALL..... | 67 |
| 12.4 | RELAY AND FUSE PANEL INSTALL..... | 68 |
| 12.5 | BATTERY BOX SUBASSEMBLY WIRING | 69 |
| 12.6 | BATTERY SUBASSEMBLY WIRING..... | 70 |
| 12.7 | FRONT LIGHTS..... | 71 |
| 12.8 | REAR LIGHTS | 73 |
| 12.9 | BATTERY CABLES | 74 |
| 12.10 | WIRE ROUTING | 75 |
| 12.11 | FUSE BOX LAYOUT..... | 85 |
| 13.0 | FUEL SYSTEM | 87 |
| 13.1 | FILTER/WATER SEPERATOR AND FUEL FILTER INSTALL | 88 |
| 13.2 | FUEL TANK INSTALL..... | 89 |
| 13.3 | FUEL SYSTEM LAYOUT | 90 |
| 13.4 | FUEL HOSE ROUTING | 91 |
| 14.0 | ENGINE SYSTEM..... | 93 |
| 14.1 | TRANSMISSION INSTALL | 94 |
| 14.2 | FLEXPLATE CONNECTION..... | 95 |
| 14.3 | MOTOR MOUNTS | 96 |
| 14.4 | COOLING FAN | 97 |
| 14.5 | ENGINE CRADLE..... | 98 |
| 14.6 | COOLER INSTALL | 99 |
| 14.7 | HYDRAULIC PUMP | 100 |
| 14.8 | SPEED SENSR SUBASSEMBLY..... | 101 |
| 14.9 | LH PIPE AND HOSE CONNECTIONS | 102 |
| 14.10 | LH PIPE AND HOSE CONNECTIONS | 103 |
| 14.11 | RH PIPE AND HOSE CONNECTIONS..... | 104 |
| 14.12 | RH PIPE AND HOSE CONNECTIONS..... | 105 |
| 14.13 | ENGINE VENT HOSES | 106 |
| 14.14 | ENGINE VENT HOSES | 107 |
| 14.15 | TRANSMISSION FLUID SCHEMATIC | 108 |
| 14.16 | FRONT AXLE DISCONNECT VALVE | 109 |
| 14.17 | TRANSMISSION FLUID LINES | 110 |
| 14.18 | TRANSMISSION HARNESS..... | 111 |
| 14.19 | ENGINE LIFTING..... | 112 |
| 14.20 | ENGINE INSTALL TO CHASSIS | 113 |
| 14.21 | ENGINE TO CHASSIS BRACKET..... | 114 |
| 14.22 | AIR CLEANER TO CHASSIS..... | 115 |
| 14.23 | AIR INTAKE PIPE | 116 |
| 14.24 | AIR INTAKE PIPE | 117 |
| 14.25 | EXHAUST SYSTEM | 118 |
| 14.26 | EXHAUST SYSTEM | 119 |
| 14.27 | EXHAUST HEAT SHIELD..... | 120 |
| 15.0 | OPERATOR INTERFACE..... | 121 |



| | | |
|-------------|--|------------|
| 15.1 | STEERING COLUMN AND WHEEL | 122 |
| 15.2 | THROTTLE AND BRAKE PEDALS | 123 |
| 15.3 | LH DASH PANEL COMPONENTS | 124 |
| 15.4 | LH DASH PANEL WIRING | 125 |
| 15.5 | RH DASH PANEL COMPONENTS..... | 126 |
| 15.6 | RH DASH PANEL WIRING | 127 |
| 15.7 | DASH PANELS, FUEL GAUGE AND INSTRUCTION PLATE..... | 128 |
| 15.8 | SEATS AND FLOOR MATS | 129 |
| 16.0 | CHASSIS SYSTEM..... | 130 |
| 16.1 | FRONT ENGINE COVER | 131 |
| 16.2 | REAR ENGINE COVER..... | 132 |
| 16.3 | ENGINE COVERS TO TRACTOR | 133 |
| 16.4 | SIDE COVERS (LH and RH)..... | 134 |
| 16.5 | SIDE COVERS TO TRACTOR (LH and RH) | 136 |
| 16.6 | REAR LOUVER ASSEMBLY | 137 |
| 16.7 | REAR LOUVER ASSEMBLY TO TRACTOR..... | 138 |
| 16.8 | FRONT COVERS..... | 139 |
| 16.9 | RH DASH COVERS..... | 140 |
| 16.10 | UNDER DASH COVERS | 141 |
| 16.11 | HOIST RING PLUGS | 142 |
| 16.12 | FOLDING STEPS | 143 |
| 17.0 | IN SERVICE SUPPORT | 144 |
| 17.1 | TECHNICAL ASSISTANCE | 144 |
| 18.0 | GUARANTEES/LIMITATION OF LIABILITY | 144 |
| 18.1 | VEHICLE ID INFORMATION | 144 |
| 18.2 | EAGLE 3-YEAR WARRANTY | 145 |
| 19.0 | APPENDICIES | 146 |



Read this manual in its entirety before putting your Eagle tow tractor into service. This manual contains important safety instructions. Improper usage or a failure to follow the safety requirements listed in this manual could result in severe injury or death.

**CALIFORNIA
Proposition 65 Warning**

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

Welcome to the growing family of Eagle tractor operators. This tractor was built with the operator's safety, comfort and ease of operation in mind. We hope you agree and enjoy your Eagle experience.

From everyone at Eagle Tugs, we would like to say thank you for purchasing an Eagle XL series tow tractor. We take a lot of pride in the quality of the products that we build, as well as, our continued customer service. Our goal is to build a long term relationship with our customers. We want you, the customer, to be 100% satisfied with your Eagle experience. To us, this means that your Eagle XL series tractor is functionally superior to any other products you have used. This also means that your Eagle product is continually supported in a professional, timely manner

1.0 PRODUCT INFORMATION

1.1 DESCRIPTION

This manual is designed as a quick guide to familiarize you with the correct and safe operation of your Eagle tow tractor. Your Eagle tractor was designed to do very specific tasks. For that reason, it will look, feel, drive and function differently than over-the-road trucks and automobiles, as well as various other types of vocational vehicles. It is the operator's responsibility to operate this equipment in a safe and prudent manner. Be alert; your safety and the safety of others is involved. The descriptions and specifications contained in this manual were in effect at the time the manual was printed. Eagle Tugs reserves the right to discontinue models at any time and/or to change specifications, designs or components used without notice and without incurring obligations.

1.2 MODEL & SERIAL NUMBER

Reference nameplate on unit

1.3 MANUFACTURER

TRONAIR, Inc./Eagle Tugs
1 Air Cargo Pkwy East
Swanton, Ohio 43558 USA

Telephone: (419) 866-6301 or 800-426-6301
Fax: (419) 867-0634
E-mail: sales@tronair.com
Website: www.tronair.com

1.4 TECHNICAL ASSISTANCE

When addressing a repair procedure or operational problem, please remember that Eagle technical support is only a phone call away. Eagle technicians are available to assist you in vehicle diagnostics and recommended repair procedures. We encourage you to use this service to reduce machine down-time and to gain a better understanding of proper repair procedures.

1.5 SPECIFICATIONS

| Tractor Model | GVW (lbs/kg) | Rated DBP* (lbf/kN) | Vertical Hitch Capacity (lbf/N) | Towing Capacity† (lbs/kg) |
|---------------|-----------------|------------------------|------------------------------------|------------------------------|
| XM-20 | 23,000 / 10.500 | 16,000 / 71 | 750 / 3300 | 210,000 / 95.000 |
| XM-30 | 32,000 / 14.500 | 16,000 / 71 | 750 / 3300 | 215,000 / 97.500 |

† Towing Capacity applies to 1% grade, wet surface condition.

| Engine Model | Emissions Rating | Power Rating (hp/kW) | Peak Torque (ft-lbf/N-m) | Fuel Sulfur Requirement (ppm) |
|---------------------|-------------------------|-------------------------|-----------------------------|----------------------------------|
| Cummins QSF 2.8 T4f | EPA Tier4f / EU Stage 4 | 75 / 55 | 221 / 300 | ≤ 15 |
| Cummins QSF Stage 3 | EPA Tier3 / EU Stage 3A | 72 / 54 | 199 / 270 | ≤ 2000 |



1.5 SPECIFICATIONS *(continued)*

CHASSIS SYSTEM:

| | |
|--------------------------------------|--------------------|
| Length (not including hitches) | 175.4 in (4455 mm) |
| Width | 85 in (2159 mm) |
| Height at Rear Deck | 46 in (1168 mm) |
| Height at Engine Covers | 56.6 in (1438 mm) |
| Height at Top of Cab | 83 in (2108 mm) |
| Step-in Height | 19 in (483 mm) |
| Ground Clearance | 8 in (203 mm) |

VEHICLE WEIGHTS:

| | |
|--|-------------------------|
| XM20 Gross Vehicle Weight (with Cab) | 23,200 lbs. (10,500 kg) |
| XM30 Gross Vehicle Weight (with Cab) | 32,000 lbs. (14,500 kg) |
| Weight Distribution With Cab | 50% Front / 50% Rear |
| Weight Distribution Without Cab | 49% Front / 51% Rear |

ENGINE:

| | |
|---|--|
| Model | Cummins QSF 2.8 |
| Displacement | 171 cubic in (2.8 l) |
| Configuration | Inline Four Cylinder |
| Rated Power | 74 hp (55 Kw) |
| Rated Peak Torque | 221 ft-lb @ 1600 rpm (300 Nm @ 1600 rpm) |
| Fuel Requirement Tier4f / Stage 4 | Ultra Low Sulfur Diesel, Sulfur ≤ 15 ppm |
| Fuel Requirement EDG (Tier3 / Stage 3A) | High Sulfur Diesel, Sulfur ≤ 2000 ppm |
| Rotation Direction | CCW Looking From Flywheel End |
| Lubrication Oil Volume | 5.25 qt (5 l) |
| Flywheel Housing | SAE 3 |

TRANSMISSION:

| | |
|---------------------------|-------------------------|
| Model | Dana/Clark T12000 |
| Type | 3 Speed Powershift |
| First Gear Ratio | 4.86 |
| Second Gear Ratio | 2.22 |
| Third Gear Ratio | .87 |
| Pump Drive | SAE B, 13T 16/32 Spline |
| Pump Drive Ratio | .97:1 With Engine Speed |
| Front Output Flange | 1410 Yoke |
| Rear Output Flange | 1410 Yoke |

AXLES:

| | |
|---|--|
| Model | Dana 212/112 |
| Type | Double-Reduction (Planetary) Drive/Steer |
| Wheelbase | 93 in (2362 mm) |
| Track Width | 75.6 in (1921 mm) |
| Inside Tire Steering Angle | 38° |
| Center Differential Ratio | 2.133 |
| Planetary Ratio | 6.0 |
| Overall Ratio | 12.80 |
| Maximum Brake Pressure | 425 psi (29.3 bar) |
| Service Brakes | Wet Immersed Disc, Front and Rear |
| Parking Brakes | Failsafe SAHR with Manual Override |
| Parking Brakes Release Pressure Min/Max | 218/435 (15/30 bar) |
| Input Flange | 100 mm DIN Flange |

TIRES:

| | |
|--------------------------|----------------------|
| Size | 250-15 |
| Capacity Rating | 7,555 lbs (3,425 kg) |
| Inflation Pressure | 145 psi (1000 kPa) |



1.5 SPECIFICATIONS *(continued)*

ELECTRICAL:

System Type 12 Volt Negative Ground
 Alternator Rating 14V, 70A
 Starter Rating 12V, 2.5 kW
 Battery Type Group 65, 860 CCA
 Battery Configuration Single Battery

FUEL TANK:

Capacity 19.3 gal (73 l)
 Tractor Run Time (50% of rated engine power) 7.6 hours
 Tractor Run Time (100% of rated engine power) 3.8 hours

PERFORMANCE: (S/N 40127 and ealier, 40129 thru 40132, 30103 and ealier)

Drawbar Pull Rating XL40 (.85 COF) 30,000 lbf (133 Kn)
 Drawbar Pull Rating XL30 (.85 COF) 28,000 lbf (125 Kn)
 Top Speed - First Gear 2.2 mph (3.5 kph)
 Top Speed - Second Gear 4.7 mph (7.6 kph)
 Top Speed - Third Gear 13.3 mph (21.4 kph)
 Outside Turning Radius 178 in (4520 mm)
 Approach Angle Without Hitch 9.7°
 Departure Angle Without Hitch 25.1°
 Breakover Angle 26.9°

PERFORMANCE: (S/N 40128, 40133 and later, 30104 and later)

Drawbar Pull Rating 16,000 lbf (71.2 Kn)
 Top Speed - First Gear 3.3 mph (5.3 kph)
 Top Speed - Second Gear 7.2 mph (11.6 kph)
 Top Speed - Third Gear 15 mph (24 kph)
 Outside Turning Radius 236 in (5994 mm)
 Approach Angle Without Hitch 11.2°
 Departure Angle Without Hitch 22.4°
 Breakover Angle 21.9°

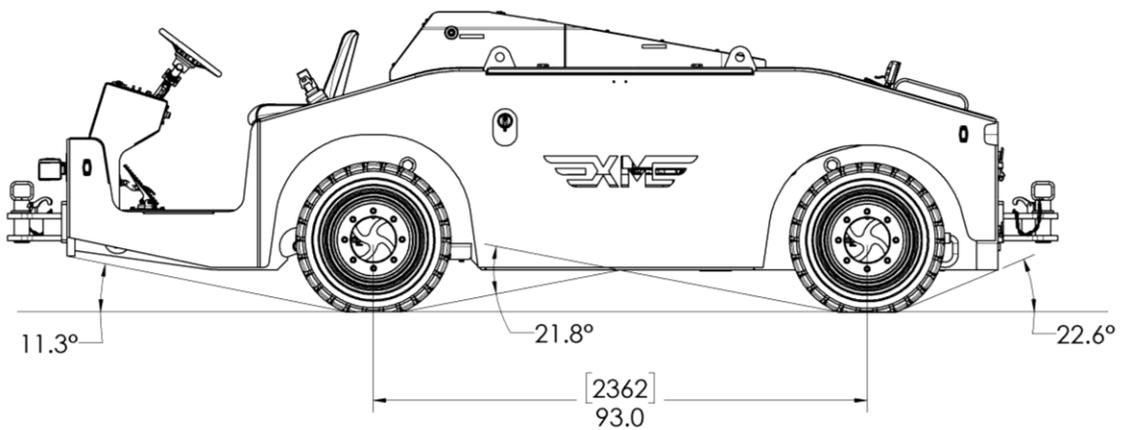
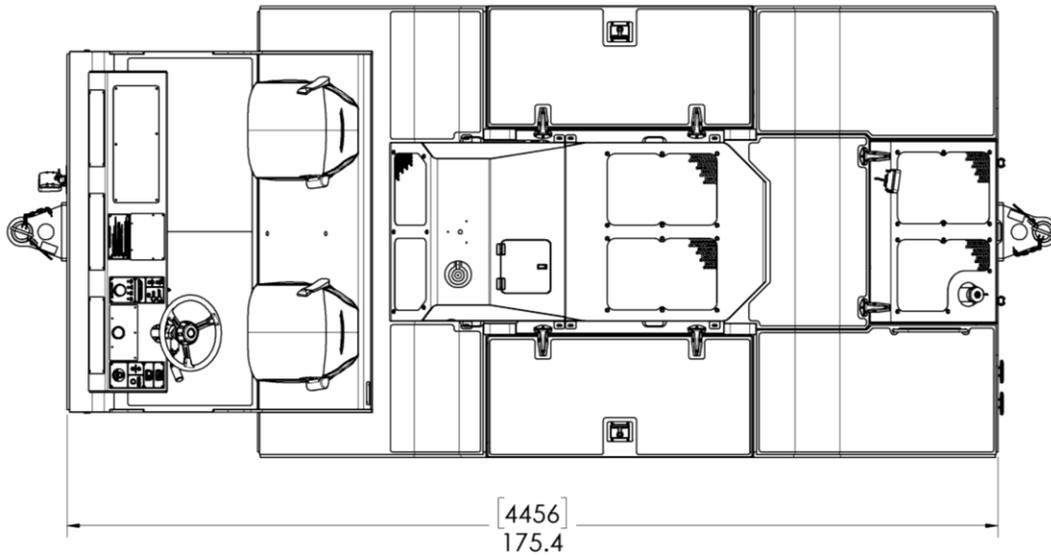
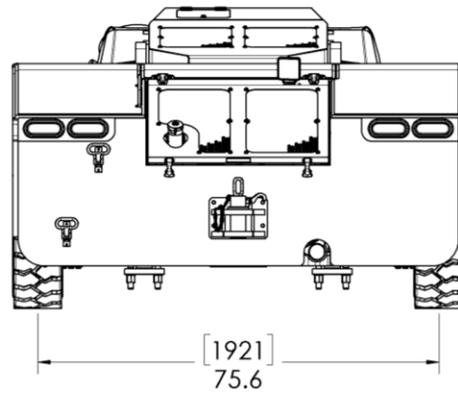
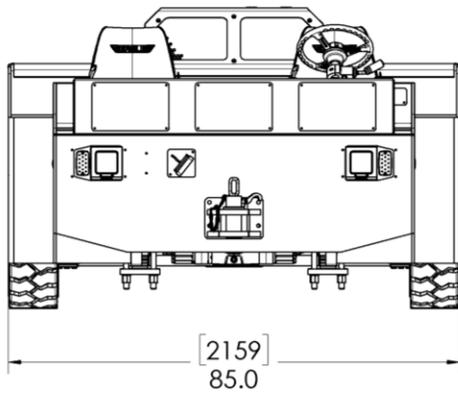
FLUID:

| Fluid | Recommendation | Requirement | Volume (approx.) |
|-----------------------|--|-------------------|------------------|
| Engine Oil (Tier 4f) | Shell Rotella T Triple Protection 15W-40 | Cummins CE 20081 | 5.25 qt (5 l) |
| Engine Oil (Stage 3A) | Shell Rotella T Triple Protection 15W-40 | Cummins CE 20077 | 5.25 qt (5 l) |
| Transmission Fluid | Castrol UTF | N/A | 5.1 gal (19.3 l) |
| Hydraulic Fluid | Castrol Dual Range HV 32 | N/A | 12 gal (45.4 l) |
| Front Axle Gear Oil | Castrol Trans-C SAE 50 | API GL4 | 9.6 qt (9.1 l) |
| Rear Axle Gear Oil | Castrol Trans-C SAE 50 | API GL4 | 9.6 qt (9.1 l) |
| Coolant | Shell Rotella Ultra ELC | Cummins CES 14603 | 4.8 gal (18.2 l) |

FILTER:

Engine Oil XM00-53-001-CA
 Transmission XM00-54-001-CA
 Hydraulic NVSP-09-018-CA
 Air Cleaner Primary XM00-56-001-CA
 Air Cleaner Safety XM00-56-002-CA
 Fuel Primary XM00-61-001-CA

1.5 SPECIFICATIONS (continued)



1.6 OPERATOR REQUIREMENTS

The XM series tow tractor is a piece of industrial equipment and has inherent safety risks. As such, the operator of the tow tractor is expected to have a fork truck or similar license, or be otherwise trained in the usage of material handling equipment.

The operator should read this manual in its entirety before operating the tow tractor.

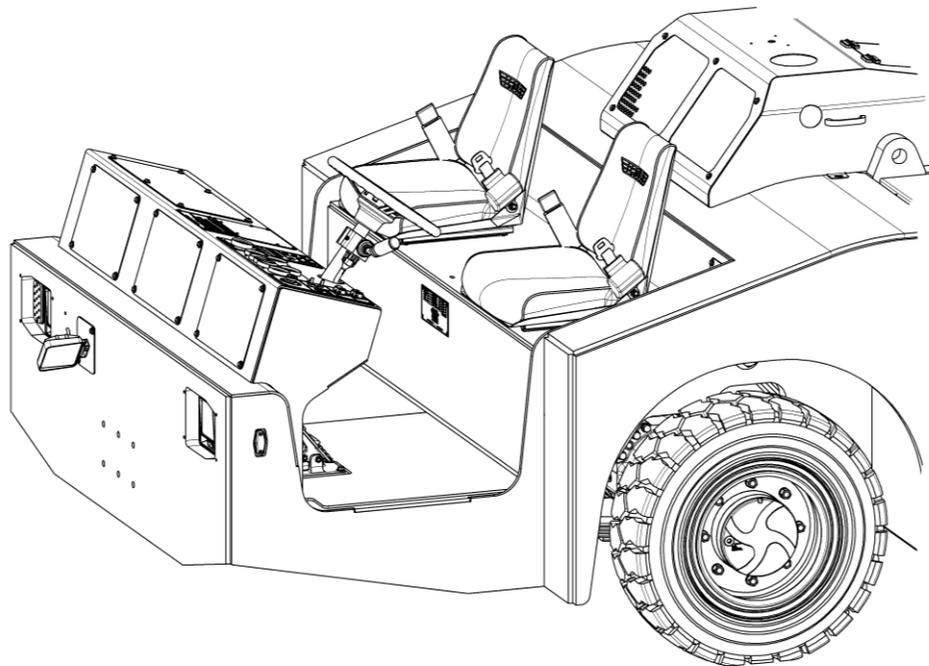
The operator should be familiar with all aspects of the tow tractor before operating it.

1.7 OPERATOR WORKSTATION

Your XM series tow tractor features an ergonomically designed operator's workstation. This is the only operator workstation on the tractor. Do not sit on or stand on the tractor outside of this area during tractor movement.

The operator and any passengers should be seated with the seatbelt secured when moving or operating the tractor.

Keep arms and legs within the perimeter of the tractor's frame to avoid injury. Always place the tractor in Neutral and apply the parking brake before exiting the tractor.



2.0 SAFETY INFORMATION

Appropriate service methods and proper repair procedures are essential for the safe and reliable operation of all industrial equipment as well as the personal safety of the individual performing the work. This service manual provides general directions for accomplishing service and repair work with tested and effective techniques. Following them will help assure reliability.

There are numerous variations in procedures, techniques, tools, and parts for servicing equipment, as well as in the skill of the individual doing the work. This manual cannot anticipate all such variations and provide advice or cautions as to each. Accordingly, anyone who departs from the instructions provided in this manual must first establish that he compromises his/her personal safety and/or the equipment integrity by his/her choice of methods, tools or parts.

2.1 USAGE AND SAFETY INFORMATION

To ensure safe operations please read the following statements and understand their meaning. Also refer to your equipment manufacturer's manual for other important safety information. This manual contains safety precautions which are explained below. Please read carefully.



WARNING!

Warning is used to indicate the presence of a hazard that can cause **severe personal injury, death, and/or substantial property damage** if the Warning Notice is ignored.



CAUTION!

Caution is used to indicate the presence of a hazard, which will or can cause **minor personal injury or property damage** if the Caution Notice is ignored.

2.2 GENERAL



WARNING!

Any Failure to comply with the following safety precautions can result in serious injury or death as well as equipment damage.

The following safety recommendations are not intended to cover all possible safety aspects of the XM series tow tractor. Please use common sense in addition to the safety recommendations that follow:

- Always do the Pre-Operation Inspection before using the tractor.
- If you have not operated this equipment previously, practice driving and operating it in a safe and clear (not congested) area until you are familiar with all aspects of its operation.
- Always operate the tractor at a speed appropriate for the environmental conditions and the towed load. Slow down in congested areas, when moving a large load, or when conditions reduce traction or visibility.
- Always take care when driving on a slope or uneven ground. Reduce speed and take turns slowly in a controlled manner.
- When working on or around the tractor, take care to keep well clear of any moving components including tires, fans, belts, and driveshafts. Also keep clear of hot surfaces such as exhaust and cooling components.
- The XM series tractor features a braking system that utilizes accumulators for backup pressure. These accumulators store hydraulic fluid at pressures up to 3,000 psi. Take extreme care when working with the hydraulics to bleed the accumulator pressure down. Fully press and release the service brake pedal 15 times to bleed down the pressure.
- The XM series tractor is intended to be operated on hard improved surfaces. Never drive on soft surfaces, and avoid potholes and damaged pavement.
- The engine of the tractor emits potentially harmful gases when running. Always operate the tractor outdoors or in an environment with adequate ventilation.



3.0 TRAINING

3.1 TRAINING REQUIREMENTS

The employer of the operator is responsible for providing a training program sufficient for the safe operation of the unit.

3.2 TRAINING PROGRAM

The employer provided operator training program should cover safety procedures concerning use of the unit in and around the intended aircraft at the intended aircraft servicing location.

3.3 OPERATOR TRAINING

The operator training should provide the required training for safe operation of the unit.

NOTE: Maintenance and Trouble Shooting are to be performed by a skilled and trained technician.

4.0 PUTTING INTO SERVICE

4.1 UNPACKING AND SETTING UP

The following directions specify the correct steps that should be taken once you receive delivery of your XM series tow tractor. These steps will ensure that the tow tractor will operate safely. Reference the Parts and Preventive Maintenance Sections for details as appropriate.

- During the unloading of your tractor, note any shipping damage and report it to Eagle Tugs and the shipping company. Verify that all components appear to be in order and undamaged.
- Remove manual and any shipped-loose components from the operator compartment.
- Install shipped-loose components per the Parts and Preventive Maintenance Manual.
- Read this manual in its entirety, paying close attention to all safety requirements.
- Verify that tires are inflated to 145 psi / 1000 kPa.
- Fill the fuel tank with the appropriate diesel fuel.
- Check the following fluid levels:
 - Engine Oil
 - Hydraulic Fluid
 - Transmission Fluid
 - Coolant
- Familiarize yourself with the tractor operation and control.

5.0 OPERATION

5.1 PRE-OPERATION INSPECTION CHECKLIST

The following inspections should be conducted as stated below. Additional inspections may be required due to unusual operating conditions.

| Daily Pre-Operation Checklist | Satisfactory | Service Required | Not Applicable |
|--|---------------------|-------------------------|-----------------------|
| Walk-Around Inspection | | | |
| Verify no evidence of leaks under and around the tractor | | | |
| Verify fuel cap securely in place | | | |
| Visually verify tires are fully inflated | | | |
| Verify rims and tires free from damage including tire tread | | | |
| Verify tire tread is free from debris | | | |
| Verify lights, mirrors, and reflectors are clean | | | |
| Operational Checks (tractor engine running) | | | |
| Verify that the dash LED indicators are free of errors and warnings | | | |
| Verify that battery voltage is above 13V | | | |
| Verify that horn is operational | | | |
| Verify that lights, flashers, and beacon (if equipped) work properly | | | |
| Cab Inspection (if equipped) | | | |
| Verify windows clean | | | |
| Verify windows free of cracks and chips | | | |
| Verify windshield wipers operate properly | | | |
| Verify heater and fans operate properly | | | |
| Weekly Operation Checklist | | | |
| Walk-around Inspection | | | |
| Verify tire inflation pressure at 145 psi / 1000 kPa | | | |
| Engine Compartment Inspection | | | |
| Check engine oil level (top off in necessary) | | | |
| Check engine coolant level (top off if necessary) | | | |
| Check hydraulic fluid level (top off if necessary) | | | |
| Check transmission fluid level (top off if necessary) | | | |
| Drain water from fuel/water separator | | | |
| Verify wiring, hoses, and tubing free of leaks and damage | | | |
| Remove dust from air cleaner dust valve | | | |

WARNING!



Any problems noted during inspection should be corrected as soon as possible. Failure to promptly attend to problems could compromise safety and/or the tractor's performance. Do not attempt to make repairs. Contact a qualified mechanic!



5.2 STARTUP/SHUTDOWN AND SAFE TOWING

5.2.1 Starting the unit

1. With feet firmly on floor mat, adjust the seat to a comfortable position.
2. Sit in operator seat and buckle the seat belt.
3. Verify that the gear selector is in the neutral position.
4. Start the engine with the ignition switch.
5. Select the desired transmission gear for the speed and drawbar requirements using the shift lever.
6. Select desired travel direction using the shift lever.
7. While holding the service brake pedal, press the parking brake engage/release button once to release the parking brake.
8. Verify that the intended path of the tractor is clear of obstructions and personnel and then proceed with driving

5.2.2 Shutting down the unit

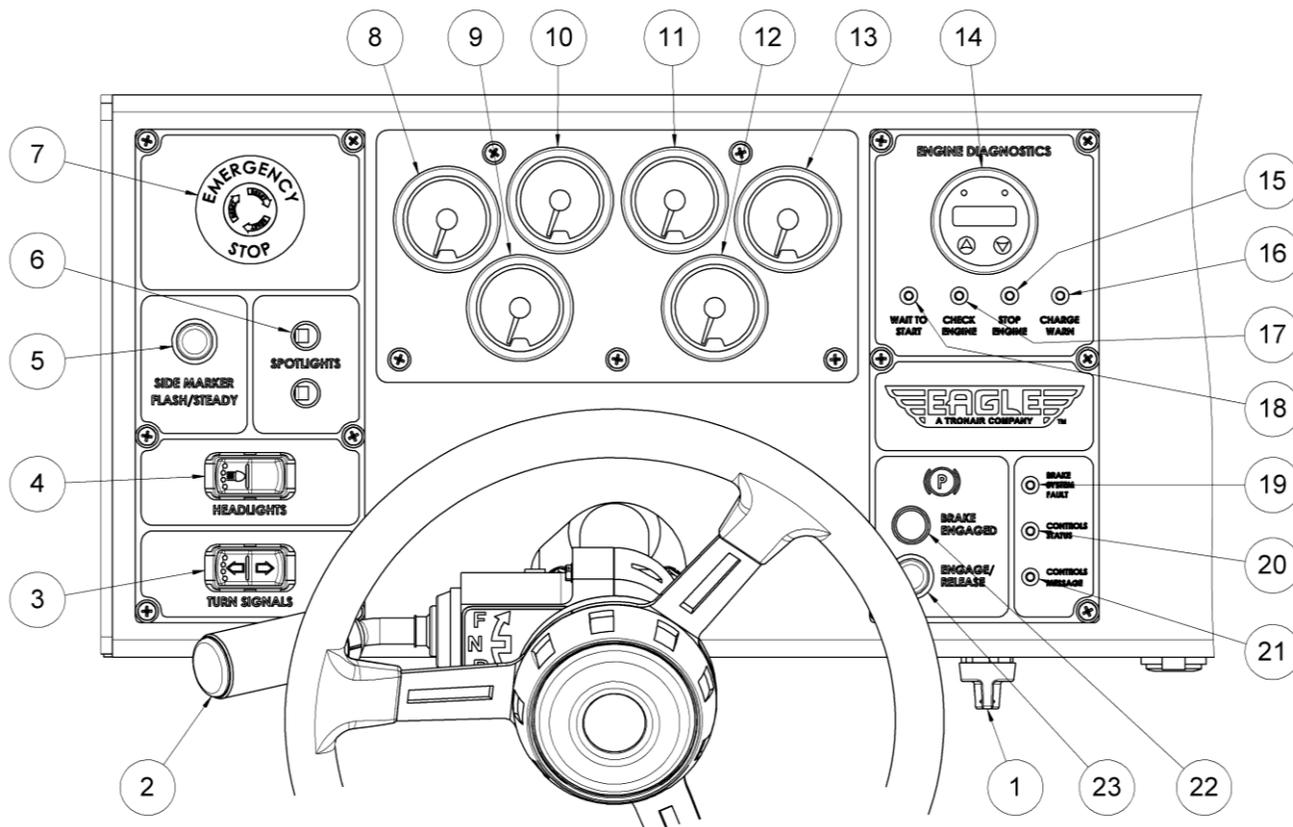
1. Bring the tractor to a complete stop with the service brake.
2. Put the tractor in Neutral using the shift lever.
3. Set the parking brake by pressing the parking brake engage/release button once.
4. Turn the tractor off by turning the ignition switch.

5.2.3 Load Towing and Pushing Safety

If towing or pushing a load, check to see that:

- The towed load is securely connected to the hitch of the tractor. Be sure hitch is locked/fastened into the closed position.
- For maximum tractor and load control and stability, as well as towing power, be sure the towbar is parallel to the ground when connected to the tractor's hitch.
- Ensure the plane or other towed load clears all obstacles when towing.

5.3 CONTROLS AND INSTRUMENTATION



| Item | Control | Description |
|------|-------------------------------|---|
| 1 | Ignition Switch | Your tractor is equipped with a keyed or keyless ignition switch. The switch provides power to the tractor and is used to crank the engine. |
| 2 | Transmission Shift Lever | <p>The transmission shift lever is used to select the desired tractor gear (1 thru 3), and to select the desired travel direction (F N R). Gear selection is made by rotating (twisting) the end of the shift lever. Travel direction can be selected by lifting the lever and moving it forward or backward.</p> <p>Changes to gear and directional selections can only be made when the tractor is at a stop. Changes made while moving will force the tractor to idle and not be effected until the tractor is brought to a stop.</p> <p>Gear 1: Use this gear for maximum towing capacity. The top speed is 3.3 mph / 5.3 kph Gear 2: Use this gear for light duty towing only. The top speed is 7.2 mph / 11.6 kph Gear 3: Use this gear for unloaded operation only. The top speed is 15 mph / 24 kph</p> |
| 3 | Turn Signal Switch (Optional) | <p>The turn signal switch causes the front and rear signal lights on the tractor to flash. The signals are self-cancelling and work in one of three modes.</p> <p>Mode 1: Press turn signal button for 1 second, turn signal light will flash for 7 seconds, then self cancel. Mode 2: Press turn signal button for 2 seconds, turn signal light will flash for 20 seconds, then self cancel. Mode 3: Press turn signal button for 4 seconds, turn signal light will flash for 75 seconds, then self cancel.</p> <p>All modes can be cancelled at any time by pressing the same turn signal button a second time</p> <p>Note that turn signals will not self-cancel while the service brake is active.</p> |

5.3 CONTROLS AND INSTRUMENTATION (continued)

| Item | Control | Description |
|------|-----------------------------------|---|
| 4 | Headlight Switch | The headlight switch is an on/off type. There is no hi/low beam control position. |
| 5 | Side Marker Switch | This switch controls the action of the marker lamps located on the corners of the tractor. The operator can select between solid or a safety flashing pattern. The selected pattern will be reflected by the backlight of the switch. |
| 6 | Spotlight Switches (Optional) | The spotlight switches are on/off types. The front and rear spotlights (if equipped) are controlled independently. |
| 7 | Emergency Stop | In the event of an emergency, the emergency stop button will shut down the engine of the tractor. Note that the parking brake is a failsafe type brake and will automatically engage and bring the tractor to a firm stop when the emergency stop is activated. Also note that steering functionality is greatly impeded when the engine is not running. |
| 8 | Oil Pressure Gage (Optional) | The oil pressure gage shows the current engine oil pressure as reported by the engine ECU. |
| 9 | Coolant Temp Gage (Optional) | The coolant temperature gage shows the current engine coolant temperature as reported by the engine ECU. |
| 10 | Engine Tachometer (Optional) | The engine tachometer gage shows the current engine rotational speed as reported by the engine ECU. |
| 11 | Fuel Level Gage | The fuel level gage shows the current fuel level in the fuel tank. |
| 12 | Transmission Temp Gage (Optional) | The transmission temperature gage shows the current transmission temperature. |
| 13 | Voltmeter (Optional) | The voltmeter gage shows the current tractor system voltage. |
| 14 | Engine Diagnostics Display | The engine diagnostic display module has two functions Parameter Display: The display module by default will show the following engine parameters. Additional parameters can be enabled through the menus. · Engine Speed · Oil Pressure · Coolant Temperature · System Voltage · Engine Hours J1939 Diagnostics: If an engine warning or error is active, the display module will show the SPN (Suspect Parameter Number), FMI (Failure Mode Identifier), and OC (Occurrence Count). These numbers can be cross referenced with a troubleshooting list to diagnose and correct engine issues. |
| 15 | Stop Engine Lamp | The stop engine lamp illuminates when a condition is detected that could cause damage to the engine (over-temp, low coolant, etc.). Should this occur, the engine should be shut down as soon as possible. Note that in some cases after the stop engine lamp is illuminated, the engine will shut down on its own to protect itself. An illuminated stop engine lamp will be accompanied by a J1939 error code on the engine diagnostic display to assist in troubleshooting. |
| 16 | Charge Warning Lamp | The charge warning lamp is illuminated any time the alternator is not charging properly. If the engine is running and the charge warning lamp illuminates, the charge system (alternator, battery, and battery cables) should be inspected by maintenance personnel. Continued usage with a faulty charging circuit will lead to a dead battery. |
| 17 | Check Engine Lamp | The check engine lamp is illuminated to indicate an engine error that needs to be resolved. Have the tractor inspected by maintenance personnel at the earliest convenience. An illuminated check engine lamp will be accompanied by a J1939 error code on the engine diagnostic display to assist in troubleshooting. |
| 18 | Wait to Start Lamp | The wait to start lamp is illuminated to indicate that the engine pre-heat is active. Wait until the lamp goes out before starting (cranking) the tractor. |
| 19 | Brake Fault Lamp | The brake fault lamp is illuminated when there is insufficient pressure in the service brake circuit to provide safe operation. The tractor will automatically be forced to idle if this error is active. The tractor should be removed from service immediately to prevent unsafe operation and inspected by maintenance personnel. |

5.3 CONTROLS AND INSTRUMENTATION (continued)

| Item | Control | Description |
|------|-------------------------------------|--|
| 20 | Controls Status Lamp | The controls status lamp is illuminated green when there are no active issues with the tractor control system. When the controls status lamp is off, the tractor requires operator intervention (see the Controls Message Lamp). |
| 21 | Controls Message Lamp | <p>The controls message lamp is used to communicate tractor control system messages to the operator. The lamp, when active, has two modes.</p> <p>Steady On: A controls change was made outside of allowable parameters. For instance, the transmission shift lever was moved from Forward to Reverse without coming to a stop. When the controls change is effected or the controls are returned to the correct position the lamp will turn off.</p> <p>Warning Message: The controls message lamp can display a blink code for many tractor issues and warnings. Blink codes are all two digits. There is a short pause between digits and a long pause between codes.</p> <p>The current list of available codes is provided below. See the troubleshooting section of the parts and preventive maintenance manual for additional details.</p> <ul style="list-style-type: none"> 21: J1939 CAN address claim fault 22: Throttle sensor primary wiper fault 23: Throttle sensor secondary wiper fault 24: Front axle disconnect solenoid fault 25: First gear solenoid fault 26: Fuel level sensor fault 27: Forward solenoid fault 28: Hydraulic fluid over temperature 29: Throttle wiper coordination fault 31: Reverse solenoid fault 32: Parking brake solenoid fault 33: Second gear solenoid fault 34: Transmission cold temperature interlock active 35: Transmission over temperature 36: Transmission temperature sender fault 37: Hydraulic temperature sender fault 39: Hydraulic fluid low 41: Sensor power fault 42: J1939 CAN fault 43: Throttle pedal calibration needed (primary wiper) 44: Throttle pedal calibration needed (secondary wiper) 45: Low brake accumulator pressure |
| 22 | Parking Brake Status Lamp | The parking brake status lamp is illuminated when the tractor is on and the parking brake is engaged (brake is on). No movement of the tractor is permitted with the brake engaged. The parking brake will always be engaged when the tractor is first started. |
| 23 | Parking Brake Engage/Release Switch | <p>The parking brake engage/release switch will engage or release the parking brake.</p> <p>To release the parking brake, the following condition must be met:</p> <ul style="list-style-type: none"> · Service brake pressed · Throttle pedal at idle <p>The engage the parking brake, the following conditions must be met:</p> <ul style="list-style-type: none"> · Service brake pressed · Throttle pedal at idle · Tractor speed below 0.5 mph / 0.8 kph <p>Attempting to engage the parking brake when the required conditions are not met (while driving at speed) will force the tractor to idle and neutral, which will bring it to a rolling stop (pressing the button additional times will not have any effect). Once stopped, the parking brake will engage. At this point normal operation can be resumed.</p> |



5.4 COLD-WEATHER OPERATION

5.4.1 Engine Cold Start Assist

When the engine coolant or air intake temperature is below 32°F / 0°C, the tractor will have a delay on startup while the air heater pre-heat is active. The wait to start lamp will illuminate during this time. When the wait to start lamp goes out, it is okay to start the engine.

For extreme cold weather operation an optional engine block heater is available. The optional block heater uses wall outlet power to pre-heat the engine block to make cold-weather starting easier.

5.4.2 Transmission

When the transmission fluid temperature is below minimum operating temperature (15°F / -10°C), the engine will be forced to idle until the transmission reaches operating temperature. During this time, the controls message lamp will blink message “34” and the throttle will be forced to idle. Once the transmission reaches operating temperature the blink code will discontinue and the controls status lamp will illuminate green. At this point normal operation can be resumed.

For extreme cold weather operation, a sump cartridge heater may be required. Contact Eagle Tugs for more information.

5.5 NOISE AND VIBRATION EMISSION AND ELECTRO MAGNETIC COMPATIBILITY

5.5.1 Noise Emission Data

Operator Workstation Noise Values at Idle:

Operator Cab 79 dB(A)
Front Hitch..... 70 dB(A)
Rear Hitch 80 dB(A)

Noise Emission While Driving:

Operator Cab 85 dB(A)
Operator Side 82 dB(A)
Passenger Side 82 dB(A)

Calculated Sound Power Level:

Stationary 93 dB(A)
Driving 109 dB(A)

The sound emission tests were performed in accordance with BS EN 1915-4.2004. Tests were performed in an open area on a flat asphalt surface. Noise emission data while driving was collected with the tractor driving in 2nd gear at full throttle.

5.5.2 Vibration Emission Data

Whole body vibration while driving does not exceed .5 m/s²

The vibration emission tests were performed in accordance with BS EN 1915-3.2009. Tests were performed on a flat asphalt surface.

5.5.3 Electromagnetic Compatibility Data

Electromagnetic radiation and immunity were tested by Automotive Testing Operations, LLC at the Milford Proving Ground facility in Milford, MI, USA, March 21-23, 2017.

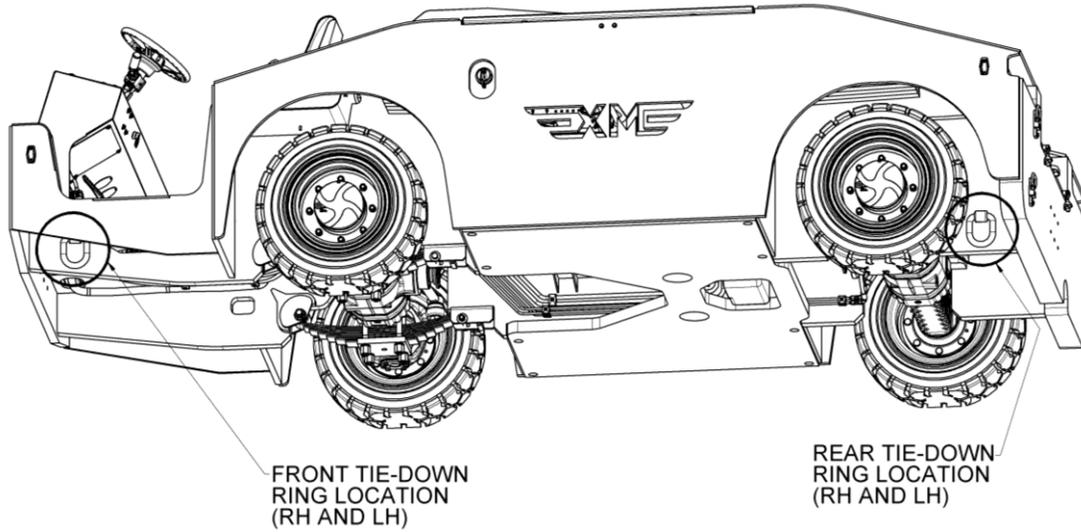
Electromagnetic Immunity:

The vehicle electromagnetic immunity was measured in accordance with BS EN 12895:2015. Vehicle was subjected to a electromagnetic field from 30MHz to 1000MHz and 1GHz to 2.5 GHz. No effects were observed on the functionality or operation of the vehicle. This is in conformance BS EN 12895:2015.

Electromagnetic Radiation:

The vehicle electromagnetic radiation was measured in accordance with BS EN 12895:2015 at frequencies from 30MHz to 1000MHz. All data was within limits established by BS EN 12895:2015.

6.0 SAFE HANDLING
6.1 TIE-DOWN PROVISIONS



The XM tractor is equipped with four heavy duty tie-down rings located on the main chassis runners. These tie-downs provide for safe transportation via ground or sea.

When securing the tractor, chains/straps should not make contact with the tractor in any area other than the tie-down rings. At no point should the hitches be used for securing the tractor.

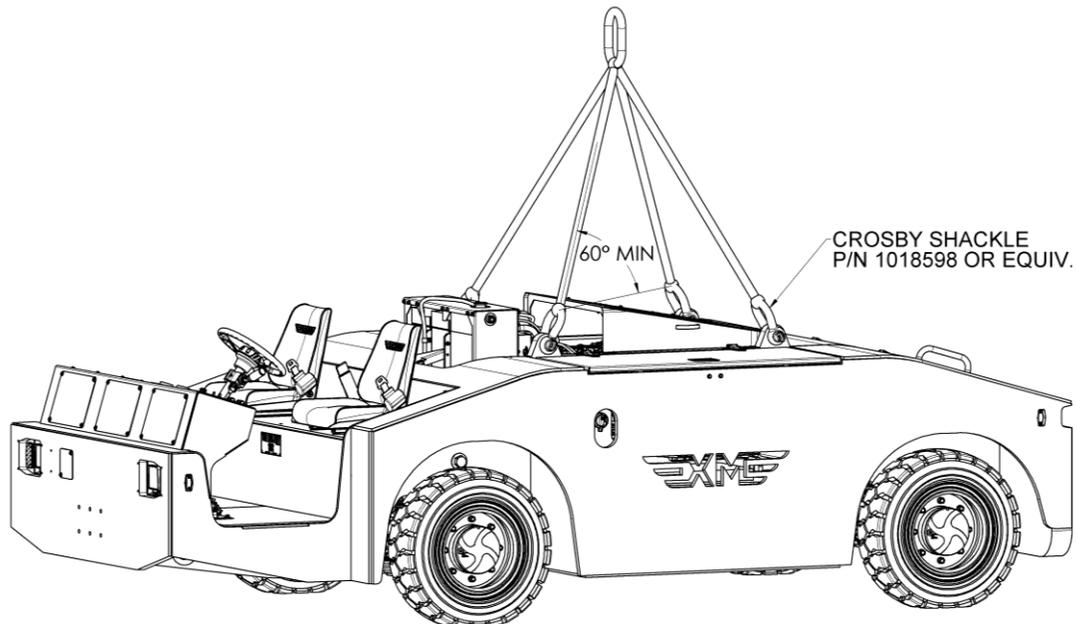
6.2 LIFTING

The XM tractor is equipped with four lift points on top of the chassis. Should it be necessary to lift the tractor, these points can be used to ensure safe lifting.

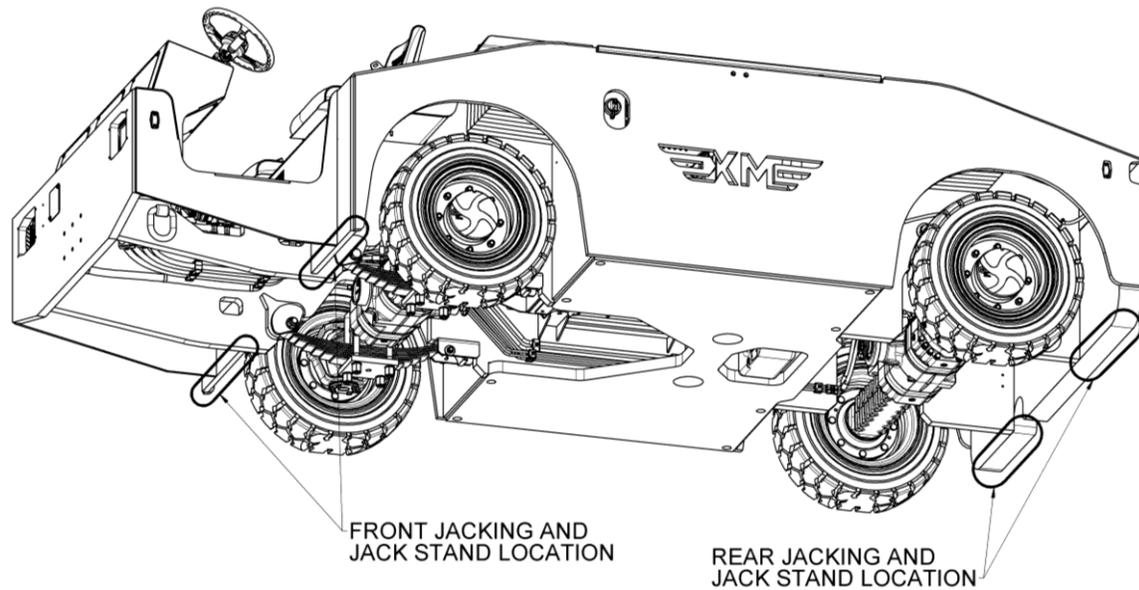
Eagle Tugs offers option OPT-XL00-017-A which is composed of a set of four shackles and a four-way sling.

When using a four-way sling, ensure that the sling is long enough to allow for a minimum pull angle of 60° as shown above. Failure to use the correct length sling can result in overloading of shackles or lift points.

Note that the front engine cover must be removed to make use of the lifting points.



6.3 JACKING AND JACK-STAND LOCATIONS



When lifting the XM tractor with jacks use the locations shown above for maximum safety.

The proper procedure to put the XM on jack stands is to jack up the rear of the truck first using two jacks, one on each side of the tractor. Lower the rear onto jack stands at the locations shown above. The front of the truck should then be lifted using two jacks and then lowered onto jack stands.

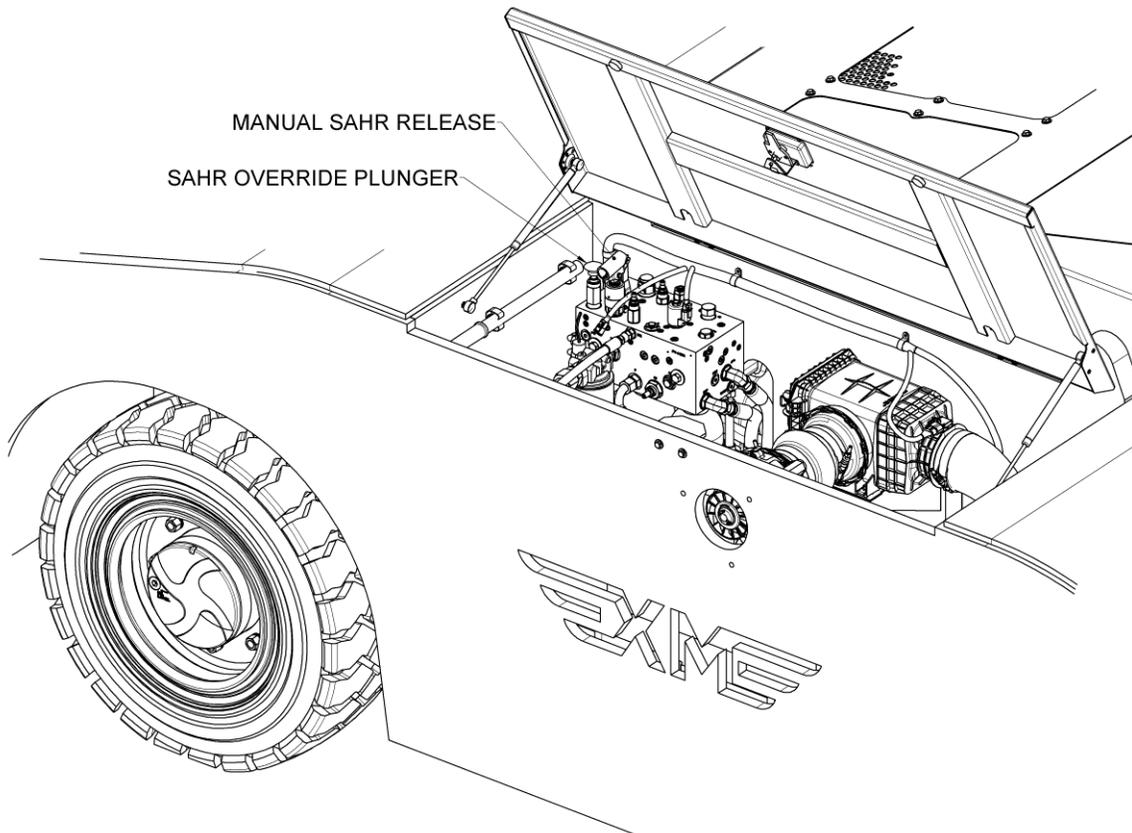
When lowering the tractor from stands, lower the front first and then the rear. Jacks and jack stands should be rated for 10 short tons or 9 metric tons minimum when using two concurrently as described above.

6.4 SAHR BRAKE QUICK RELEASE

Should the XM tractor ever lose hydraulic pressure, the SAHR parking brakes will apply automatically. The parking brakes may be temporarily released using the following steps:

1. Open the RH side hood and locate the hydraulic manifold block.
2. Remove the retainer clip from the hand pump valve.
3. Press the black plunger on the top of the hydraulic manifold block.
4. Use the provided lever arm (stowed in the spring clips on the wall adjacent to the manifold block) to pump the Manual SAHR Release valve until the SAHR parking brakes are released. Approximately 30 pumps will be required. When the brakes are released, the force required to pump the valve will increase significantly.
5. To re-enable the SAHR brake, pull up on the plunger to release pressure in the override valve. Note: restarting the tractor will also re-enable the SAHR brake.

The manual override release will only be effective for a few minutes. The override feature is intended to allow a disabled tractor to be quickly pushed/towed out of an active traffic area



6.5 TOWING AND MECHANICAL SAHR OVERRIDE

Should the XM tractor be disabled (engine not running), it can be flat towed for short distances without any modification as long as the following is observed:

- The SAHR brakes are mechanically released (see below).
- The maximum speed should never exceed 3 mph / 4.5 kph.
- The maximum distance should not exceed .5 mile / .8 kilometers.

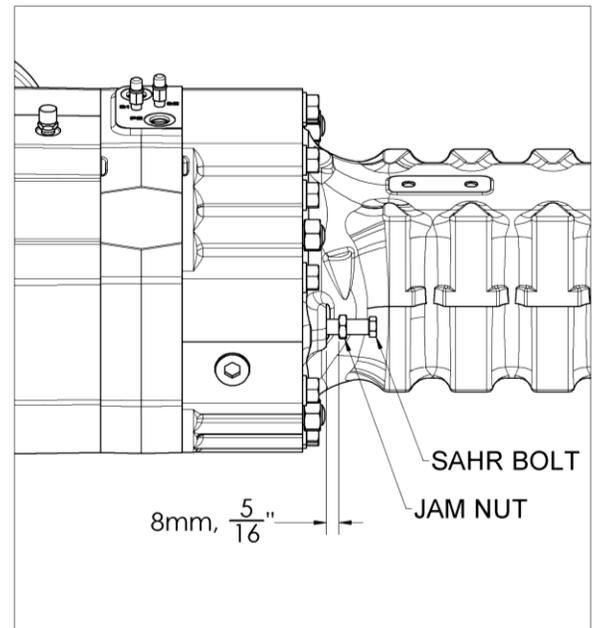
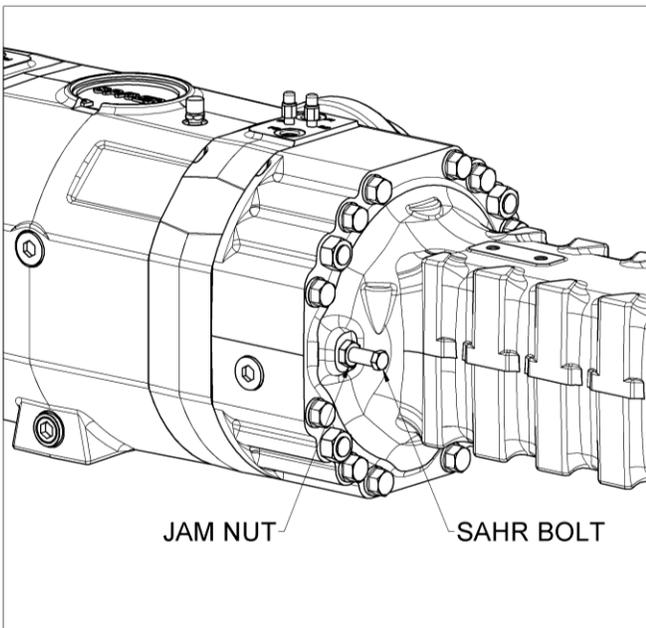
When it is necessary to tow the tractor farther, the front and rear driveshafts must be removed. With the driveshafts removed the XM tractor can be flat towed as long as the following is observed:

- The SAHR brakes are mechanically released (see below).
- The maximum speed should never exceed 13 mph / 21 kph.

Failure to follow these requirements will result in damage to the transmission and/or axles due to lack of lubrication and overheating.

To mechanically override the SAHR parking brake, engage all 8 SAHR release bolts (4 per axle, 2 each per axle side) using the following procedure:

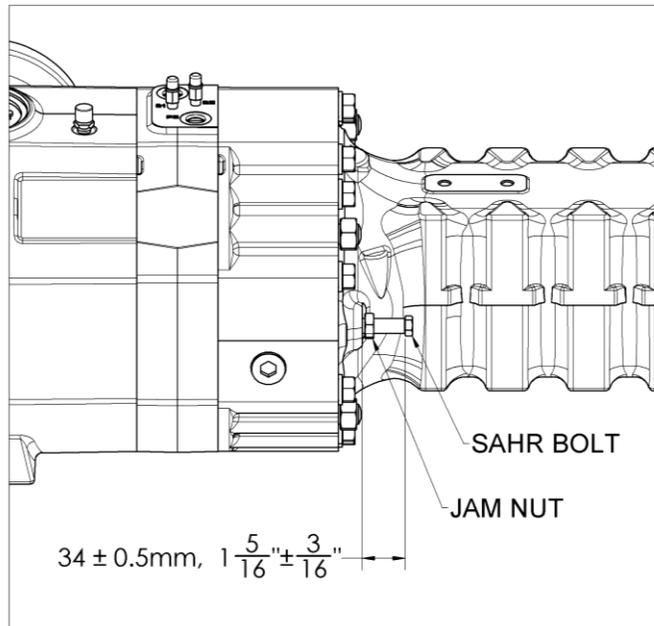
1. Starting at the left hand side of the rear axle center housing, locate both SAHR release bolts.
2. Loosen the jam nuts then back off only the jam nuts by approximately 8mm.
3. Tighten the SAHR release screws until resistance is felt.
4. Using a wrench, tighten the screws in alternate sequence by 1/4 turn at a time so as to compress the Belleville washers and disengage the braking disks.
5. Repeat the procedure for the right hand side of the rear center axle housing and both sides of the front axle.



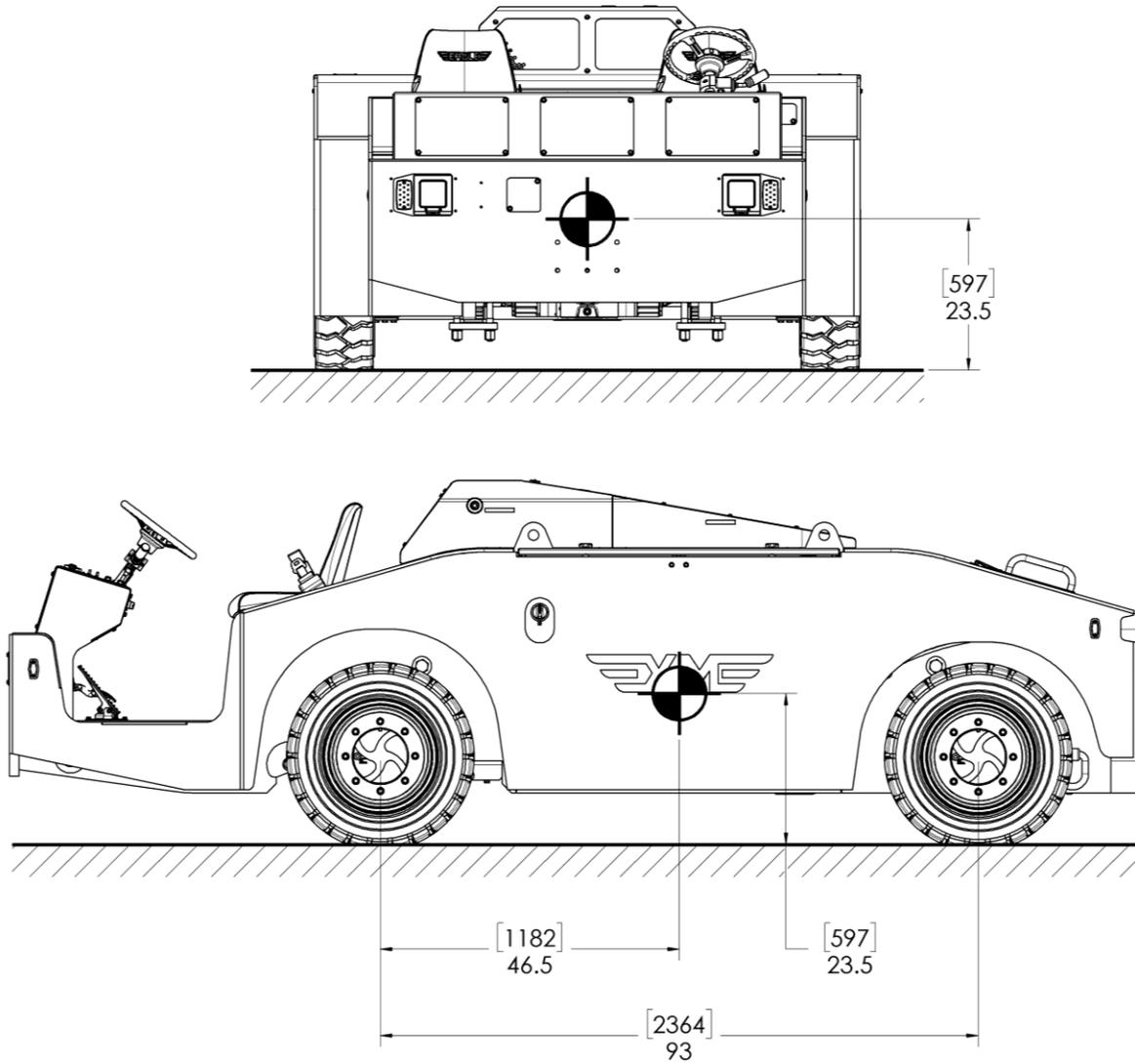
6.6 RELEASE OF SAHR MECHANICAL OVERRIDE

To revert the mechanical override of the SAHR parking brake, release all 8 SAHR release bolts (4 per axle, 2 each per axle side) using the following procedure:

1. Starting at the left hand side of the rear axle center housing, locate both SAHR release bolts.
2. Remove the screws complete with nuts and seals. Replace seals, apply silicone-based Tecno Lube/101 grease to the screws and install all parts into the axle center housing.
3. Adjust SAHR release bolts to obtain a distance of $34 \pm 0.5\text{mm}$ between the axle machined surface and the underside of the SAHR release bolt.
4. Lock the SAHR release bolts into position by tightening the jam nuts against the axle housing. Hold the SAHR release bolts in position while tightening the jam nuts.



6.7 CENTER OF GRAVITY



Gross Vehicle Weight (GVW)

| | |
|------------------------|------------------------|
| XM20 Without Cab | 23,200 lbs (10,525 kg) |
| XM20 With Cab | 24,000 lbs (10,900 kg) |
| XM30 Without Cab | 32,000 lbs (14,525 kg) |
| XM30 With Cab | 32,800 lbs (14,875 kg) |



7.0 MAINTENANCE

7.1 PREVENTIVE MAINTENANCE SCHEDULE

| Preventive Maintenance Item | Daily | Weekly | First 150 hrs | Every 250 hrs | Every 500 hrs | Every 1000 hrs | Every 1500 hrs or annually † |
|--|-------|--------|---------------|---------------|---------------|----------------|------------------------------|
| Any items found to be deficient during the preventive maintenance review should be repaired or replaced. All fluids found low should be topped off. | | | | | | | |
| Perform daily pre-operation checklist (see Operations Manual) | X | | | | | | |
| Check engine oil level and top off as necessary* | | X | | | | | |
| Check coolant level and top off as necessary* | | X | | | | | |
| Check transmission oil level and top off if necessary (engine at idle)* | | X | | | | | |
| Check hydraulic fluid level and top off if necessary* | | X | | | | | |
| Verify tire pressure at 145 psi / 1000 kPa and add air as necessary | | X | | | | | |
| Drain water from fuel/water separator* | | X | | | | | |
| Re-torque axle U-bolts | | X | | | | | |
| Drain and replace axle oil, center and planetaries (first time only)* | | | | | | | |
| Replace transmission oil filter (first time only)* | | | | | | | |
| Drain and replace engine oil and oil filter* | | | | | | | |
| Check axle oil level (center and planetaries) and top off if necessary* | | | X | | | | |
| Clean axle oil breathers* | | | X | | | | |
| Grease steering grease fittings on axles* | | | | | X | | |
| Grease driveshaft U-joints and slip shafts* | | | | | X | | |
| Inspect wheel lug nuts and tighten if necessary | | | | | X | | |
| Replace fuel filter cartridge* | | | | | X | | |
| Check serpentine belt for damage/wear and replace if necessary | | | | | X | | |
| Drain water from charge air tube port* | | | | | X | | |
| Check all battery cable connections for tightness and corrosion | | | | | X | | |
| Check coolant hoses for damage/wear and replace if necessary | | | | | X | | |
| Replace fuel/water separator cartridge* | | | | | X | | |
| Verify that the air cleaner cover clips are all present* | | | | | | X | |
| Drain and replace transmission fluid and change transmission filter* | | | | | | X | |
| Replace the air cleaner primary filter* | | | | | | X | |
| Check/replace the air cleaner safety filter* | | | | | | X | |
| Drain and replace axle oil (center and planetaries)* | | | | | | X | |
| Clean axle magnetic drain plugs | | | | | | X | |
| Check tractor batteries and replace if necessary | | | | | | X | |
| Drain hydraulic fluid from tank and replace* | | | | | | X | |
| Remove and clean hydraulic fluid magnetic drain plug* | | | | | | X | |
| Replace hydraulic filter* | | | | | | X | |
| Re-torque axle U-bolts if they show signs of loosening | | | | | | X | |
| Re-torque driveshaft flanges | | | | | | | |
| Check wet brake disc wear (see Appendix C) | | | | | | | |

* See relevant diagrams/instruction in this section for these items

† Whichever time period is shorter



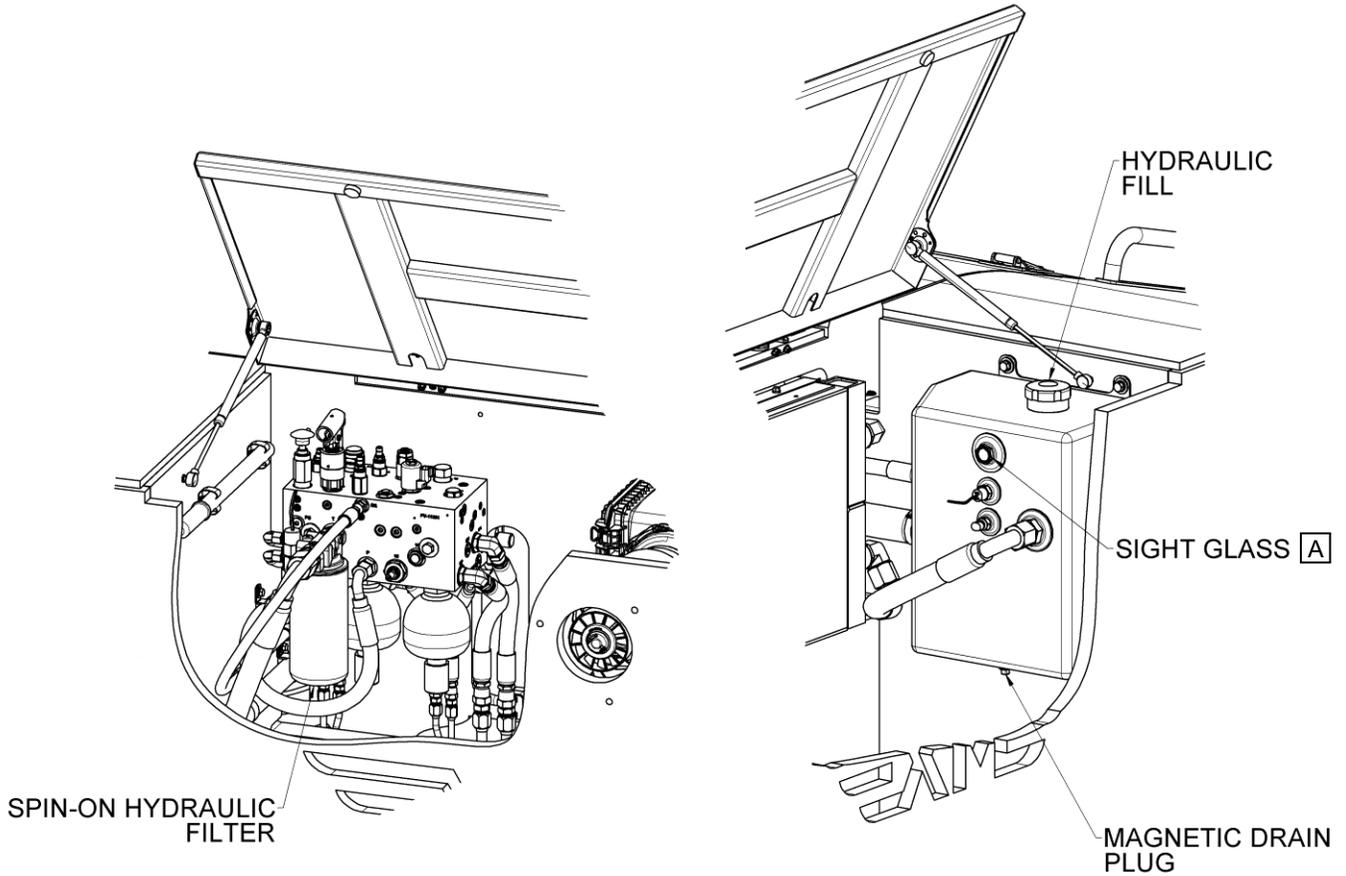
7.1 PREVENTIVE MAINTENANCE SCHEDULE *(continued)*

| Preventive Maintenance Item | Daily | Weekly | First 150 hrs | Every 250 hrs | Every 500 hrs | Every 1000 hrs | Every 1500 hrs or annually † |
|--|-------|--------|---------------|---------------|---------------|----------------|------------------------------|
| Any items found to be deficient during the preventive maintenance review should be repaired or replaced. All fluids found low should be topped off. | | | | | | | |
| Inspect steering tie-rod ball ends for play and replace if necessary | X | | | | | | |
| Inspect steering tie-rod adjustment nuts and tighten if necessary | | X | | | | | |
| Inspect steering stops and re-set/tighten if necessary (see Appendix C) | | X | | | | | |
| Inspect all hydraulic tubes and hoses for wear/damage and leaks | | X | | | | | |
| Inspect all hydraulic tube clamps and tighten if necessary | | X | | | | | |
| Inspect hitch pins for wear and replace if beyond specifications* | | X | | | | | |
| Inspect engine mount brackets and re-torque if necessary | | X | | | | | |
| Inspect transmission mount brackets and re-torque if necessary | | X | | | | | |
| Inspect engine/trans mount isolators and replace if necessary | | | | | | | |
| Drain and replace engine coolant | | | | | | | |
| Adjust engine overhead valve lash | | | | | | | |

* See relevant diagrams/instruction in this section for these items

† Whichever time period is shorter

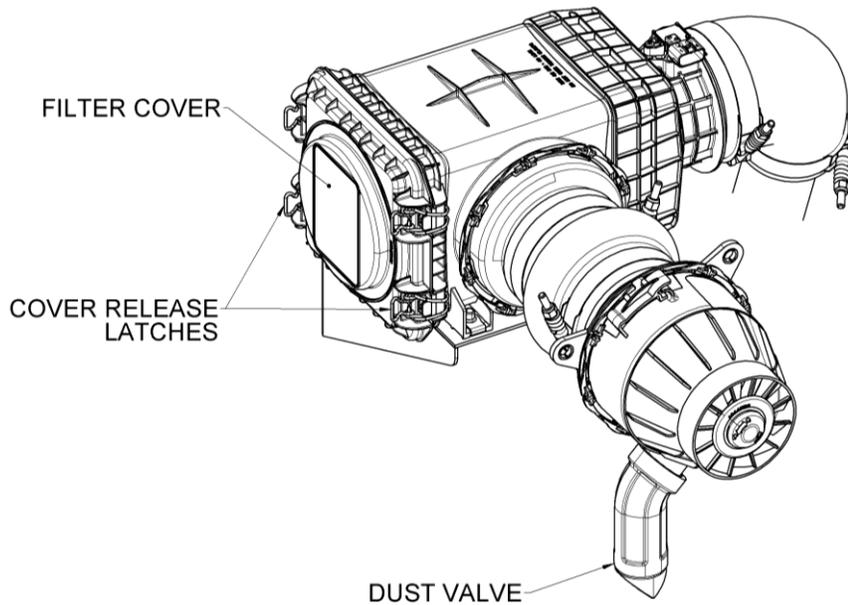
7.2 HYDRAULIC FLUID AND FILTER



[A] Warning: correct hydraulic level is to the center of the sight glass with the engine running. Filling past the sight glass can result in overflow due to stored volume in the brake accumulators.

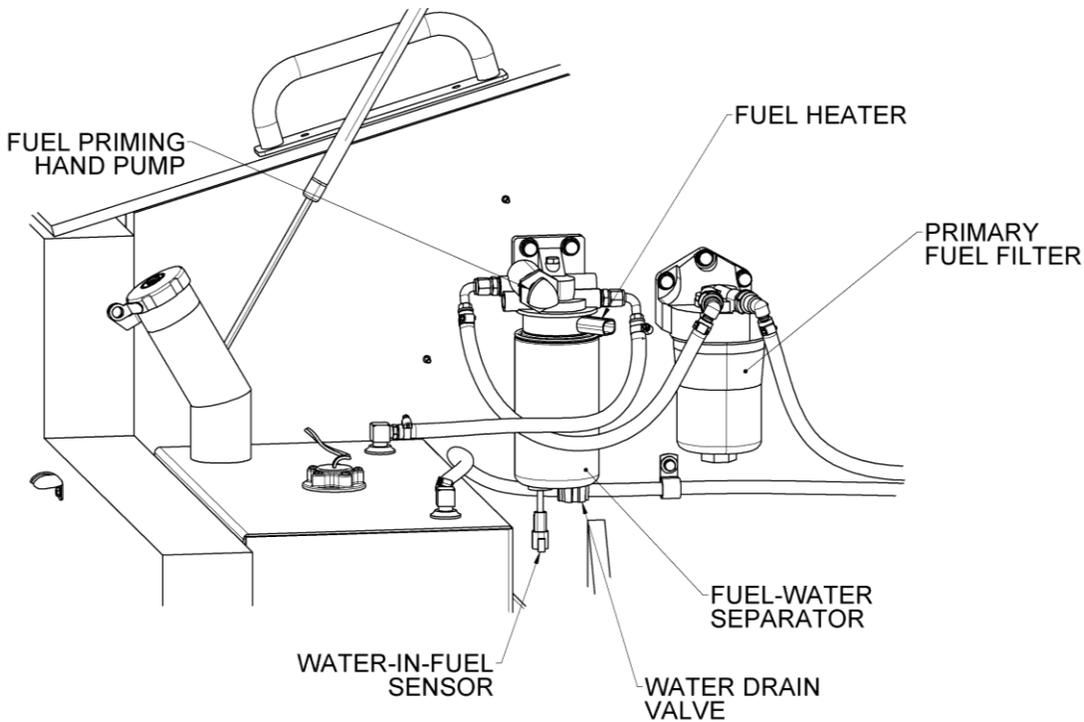
| | |
|----------------------|----------------------------|
| Fluid | Hydraulic |
| Recommendation | Castrol Dual Range HV 32 |
| Total Volume | 13 gal (49 l) approximate |
| Tank Volume | 9.5 gal (38 l) approximate |
| Filter | NVSP-09-018-CA |

7.3 AIR CLEANER



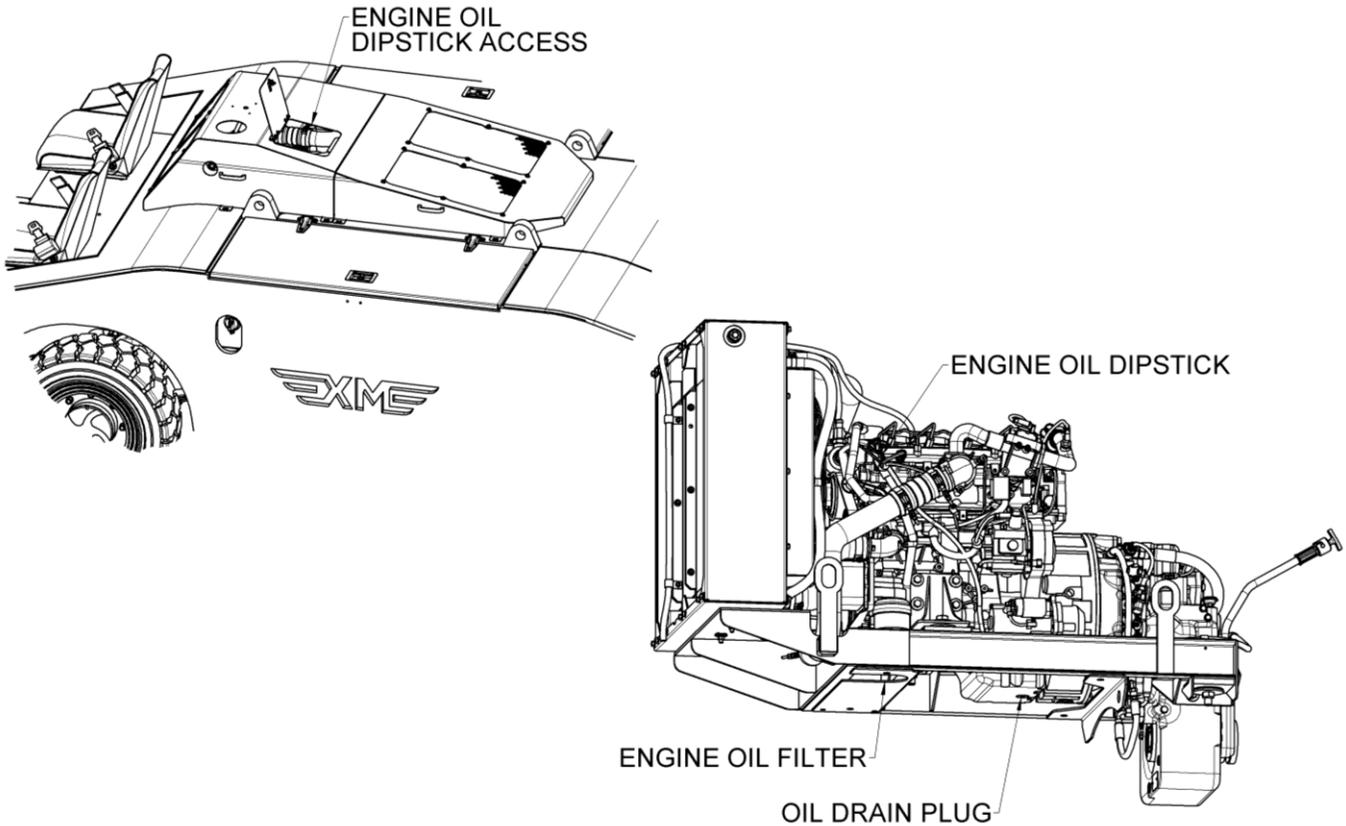
- Primary Filter..... XM00-56-001-CA
- Safety Filter..... XM00-56-002-CA

7.4 FUEL COMPONENTS



- Fuel Filter Cartridge..... XM00-61-001-CA
- Fuel/Water Separator..... XM00-61-002-CA

7.5 ENGINE



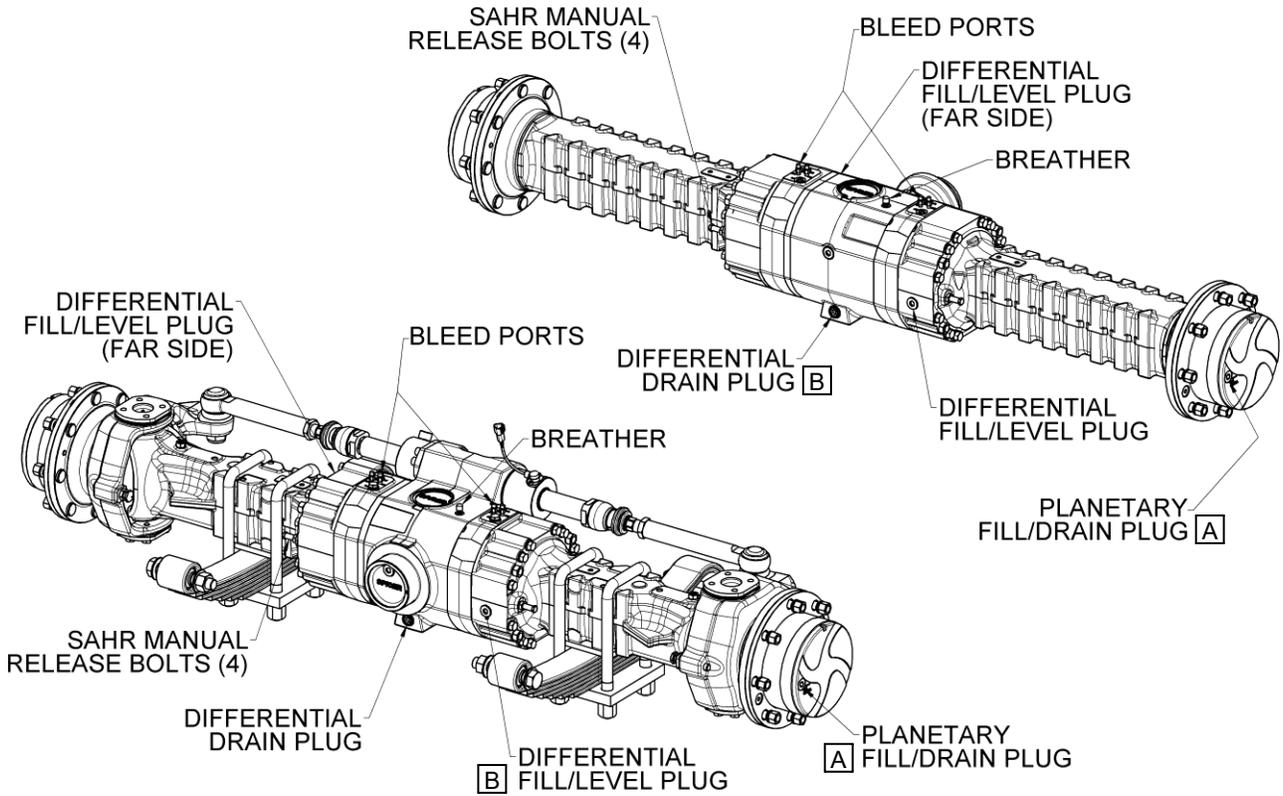
WARNING!



Failure to use oil that meets the Cummins CES 20081 requirement will result in significantly reduced engine oil life and possible damage to engine components. Tier4 engines require low ash oil to prevent damage to the emissions components. See the Cummins technical circular (available from Eagle) for more information.

| | |
|-----------------------------|--|
| Fluid | Engine Oil |
| Recommendation | Shell Rotella T Triple Protection 15W-40 |
| Requirement (Tier 4i) | Cummins CES 20081 |
| Requirement (Stage 3A)..... | Cummins CES 20077 |
| Volume | 5.25 qt (5 l) approximate |
| Engine Oil Filter..... | XM00-53-001-CA |
| Serpentine Belt..... | XM00-53-002-CA |

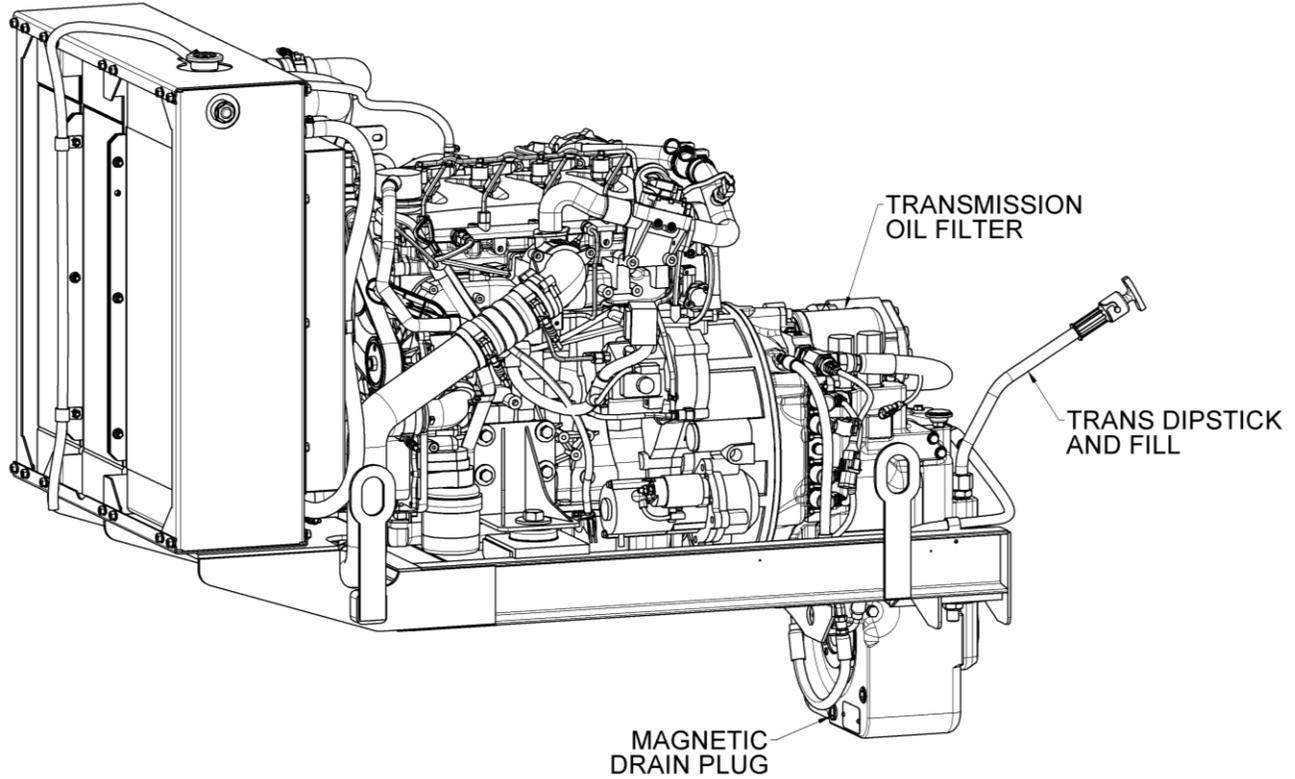
7.6 AXLES



- [A] Fill planetary ends to the bottom of the fill hole with the axle end rotated so that the arrow on the casting is horizontal. Axle must also be horizontal.
- [B] Fill to the bottom of the fill hole with the axle horizontal.

| | |
|---------------------------|----------------------------|
| Fluid | Axle Oil |
| Recommendation | Castrol Trans-C SAE 50 |
| Requirement..... | API GL4 |
| Center Diff Volume | 7.8 qt (7.4 l) approximate |
| Planetary End Volume..... | .9 qt (.85 l) approximate |

7.7 TRANSMISSION

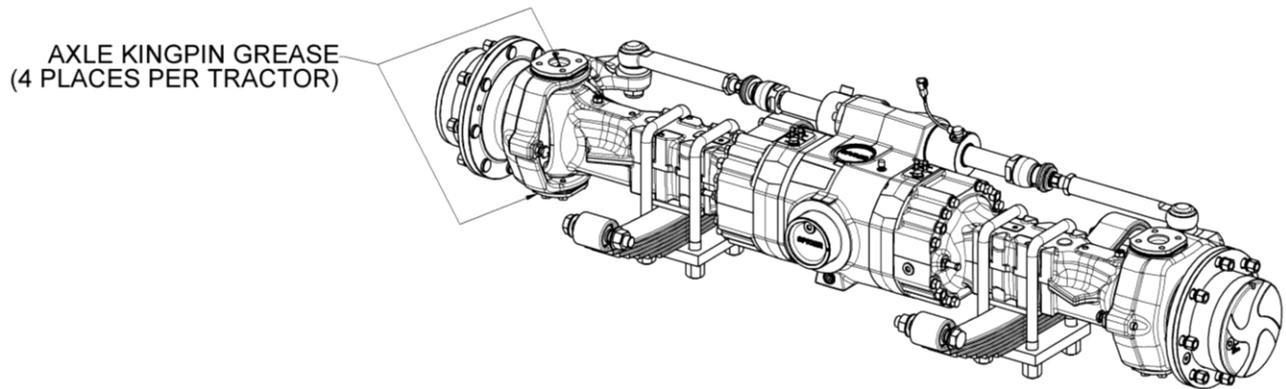
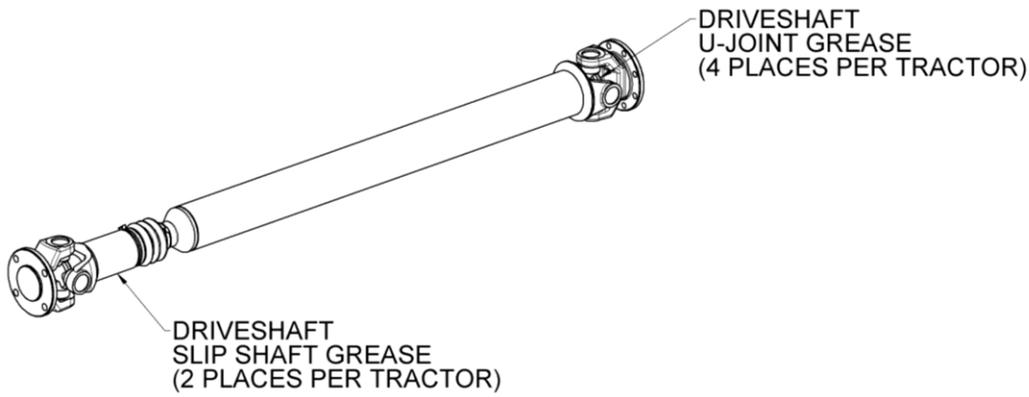


TRANSMISSION FLUID FILL PROCEDURE:

1. Drain transmission.
2. Clean the magnetic drain plug before re-installation.
3. Remove and discard filter. Install new filter.
4. Refill transmission to FULL mark using dipstick.
5. Run engine at idle to prime convertor and lines.
6. Recheck level with engine running at idle and add oil to bring level to LOW mark.
7. When oil temperature is hot 82.2 - 93.3 °C (180- 200 °F) make final oil level check and adjust if necessary to bring oil level to FULL mark.

Fluid Transmission
 Recommendation Castrol UTF
 Volume TBD
 Filter XL00-54-001-CA

7.8 GREASE POINTS

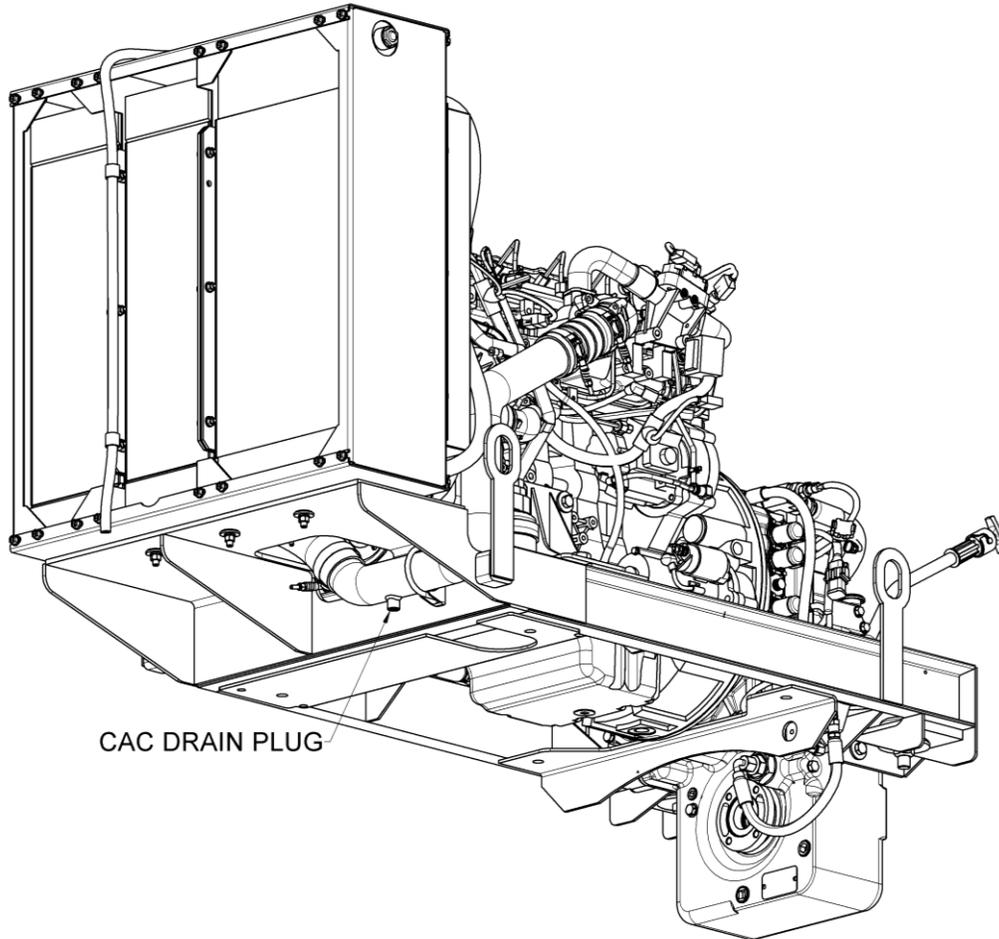


Grease points should have grease added per the Preventive Maintenance Schedule. Grease should be added until old grease is visible being extruded from the joint.

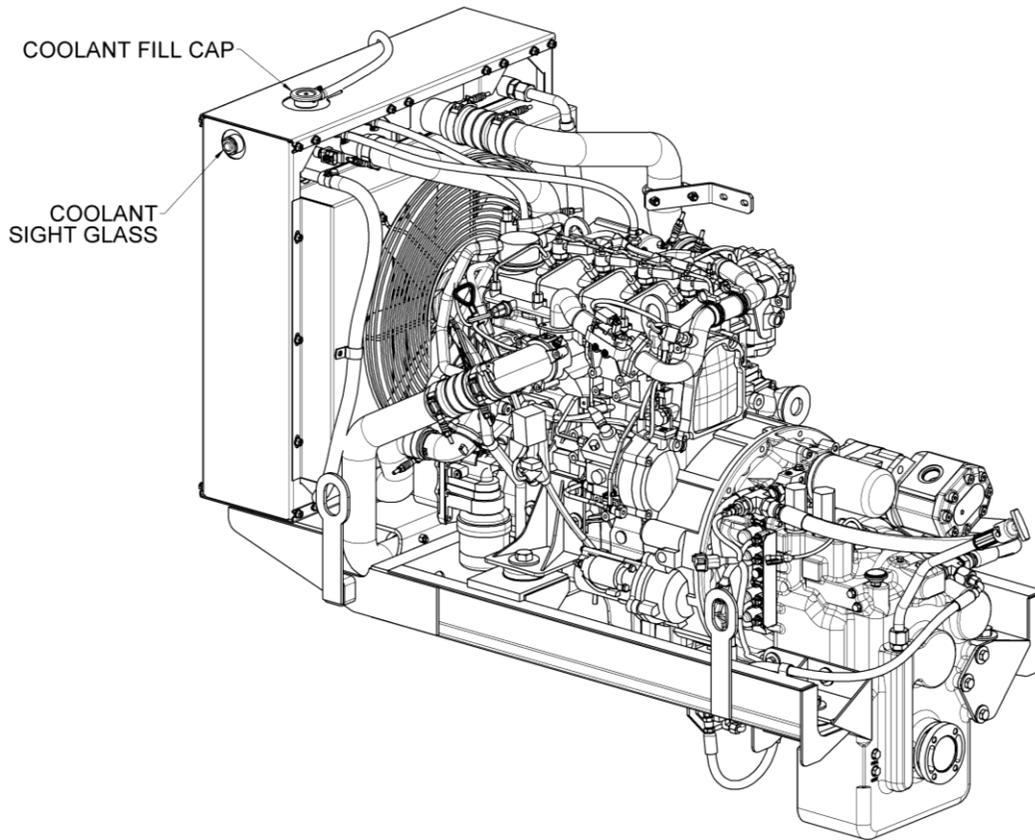
Fluid Multi Purpose Grease
Spec..... NGLI2

7.9 CHARGE AIR COOLER DRAIN

The CAC water condensate drain port is located at the bottom of the cold-side CAC tube.



7.10 COOLANT



- Coolant should always be present in the sight glass. If coolant is not present, add coolant.
- Coolant should be to the center of the rear sight glass when cold. Filling past this level will result in coolant overflow.

WARNING!

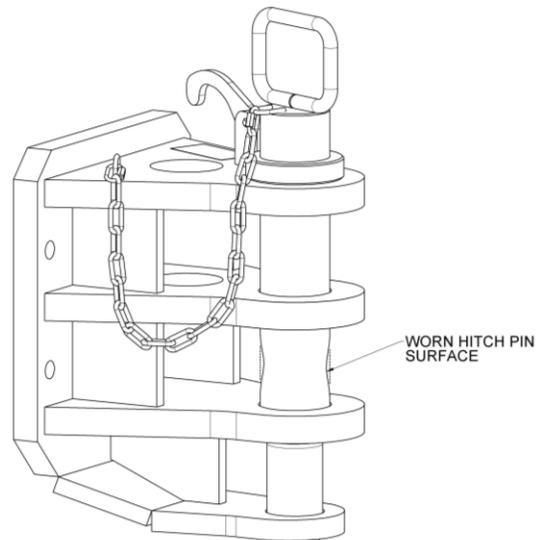


Failure to use the appropriate coolant can result in damage to the engine and cooling system components. Refer to the technical circular (available from Eagle) for recommended coolants meeting the Deutz requirements

| | |
|----------------------|-------------------------|
| Fluid | CoolantI |
| Recommendation | Shell Rotella Ultra ELC |
| Requirement | Cummins CES 14603 |
| Volume | TBD |

7.11 HITCH WEAR

Hitch pins should be replaced if the pin surface wear exceeds .125" or 3mm from the original surface profile (on any height position).



8.0 TROUBLE SHOOTING

8.1 READING CAN FAULT CODES

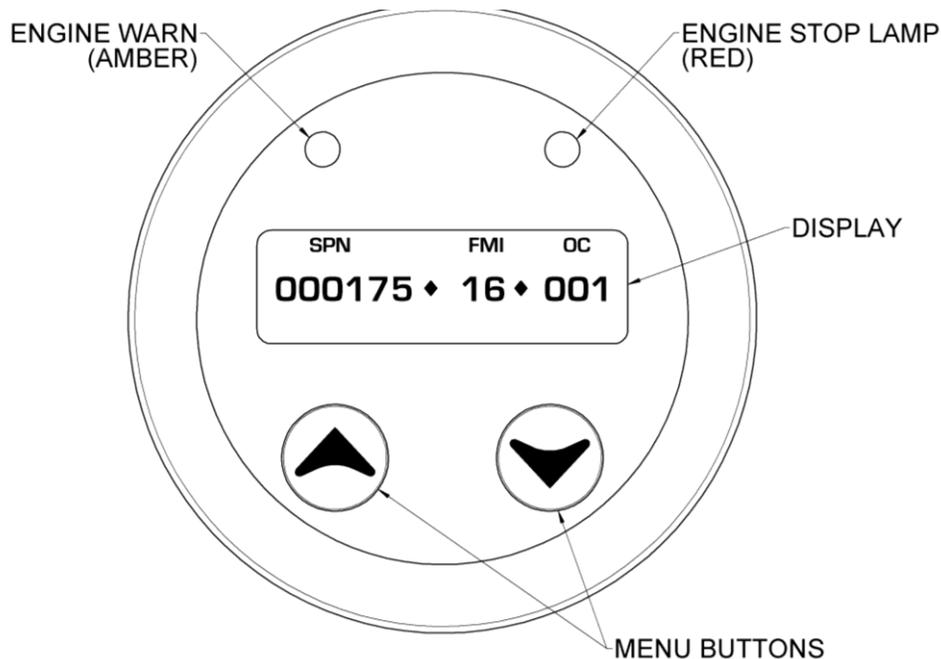
The XM tractor is equipped with a Cummins engine that communicates to the tractor electronic control system using an SAE J1939 Controller Area Network or CAN communication. This allows the engine to send and receive detailed operational and diagnostic data. Should the engine have an error, it is capable of providing helpful diagnostic information over this network that is then displayed on the engine diagnostic display.

The diagnostic data is transmitted as a collection of three numbers as described below:

- SPN or Suspect Parameter Number
- FMI or Failure Mode Identifier
- OC or Occurrence Count

These three values provide very important information on what is going on with the engine. When communicating with Eagle or a Cummins service representative, the CAN error codes are invaluable. A list of common CAN error messages is provided on the next page. Should a CAN error message be broadcast by the engine, the diagnostic display panel will display the error message as shown below.

Note that most codes will be cleared when the tractor is shut down. It is important to record errors while they are active.



Should a code be active, one of the two LED indicator lights will illuminate and the code will be displayed on screen as shown above. If more than one code is active, the codes will alternate. Record any active codes and refer to the following pages for a reference for common codes.

For codes not listed, please contact Eagle Tugs at 800-671-0431 for assistance.



8.2 ENGINE FAULT CODES

| SPN | FMI | Description |
|-----|-----|--|
| 27 | 3 | EGR Valve Position Circuit - Voltage above normal, or shorted to high source |
| 27 | 4 | EGR Valve Position Circuit - Voltage below normal, or shorted to low source |
| 84 | 2 | Wheel-Based Vehicle Speed - Data erratic, intermittent or incorrect |
| 84 | 9 | Wheel-Based Vehicle Speed - Abnormal update rate |
| 84 | 10 | Wheel-Based Vehicle Speed Sensor Circuit tampering has been detected - Abnormal rate of change |
| 84 | 19 | Wheel-Based Vehicle Speed - Received Network Data In Error |
| 91 | 0 | Accelerator Pedal or Lever Position Sensor 1 - Data valid but above normal operational range - Most Severe Level |
| 91 | 1 | Accelerator Pedal or Lever Position 1 Sensor Circuit Frequency - Data valid but below normal operational range - Most Severe Level |
| 91 | 2 | Accelerator Pedal or Lever Position Sensor 1 - Data erratic, intermittent or incorrect |
| 91 | 3 | Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage above normal, or shorted to high source |
| 91 | 4 | Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage below normal, or shorted to low source |
| 91 | 9 | SAE J1939 Multiplexed Accelerator Pedal or Lever Sensor System - Abnormal update rate |
| 91 | 19 | SAE J1939 Multiplexed Accelerator Pedal or Lever Sensor System - Received Network Data In Error |
| 93 | 2 | Auxiliary Alternate Torque Validation Switch - Data erratic, intermittent or incorrect |
| 97 | 0 | Water in Fuel Indicator - Data Valid But Above Normal Operating Range - Most Severe Level |
| 97 | 3 | Water in Fuel Indicator Sensor Circuit - Voltage above normal, or shorted to high source |
| 97 | 4 | Water in Fuel Indicator Sensor Circuit - Voltage below normal, or shorted to low source |
| 97 | 15 | Water in Fuel Indicator - Data Valid But Above Normal Operating Range - Least Severe Level |
| 97 | 16 | Water in Fuel Indicator - Data Valid But Above Normal Operating Range - Moderately Severe Level |
| 100 | 1 | Engine Oil Rifle Pressure - Data valid but below normal operational range - Most Severe Level |
| 100 | 2 | Engine Oil Rifle Pressure - Data erratic, intermittent or incorrect |
| 100 | 18 | Engine Oil Rifle Pressure - Data Valid But Below Normal Operating Range - Moderately Severe Level |
| 102 | 3 | Intake Manifold 1 Pressure Sensor Circuit - Voltage above normal, or shorted to high source |
| 102 | 4 | Intake Manifold 1 Pressure Sensor Circuit - Voltage below normal, or shorted to low source |
| 105 | 0 | Intake Manifold 1 Temperature - Data valid but above normal operational range - Most Severe Level |
| 105 | 3 | Intake Manifold 1 Temperature Sensor Circuit - Voltage above normal, or shorted to high source |
| 105 | 4 | Intake Manifold 1 Temperature Sensor Circuit - Voltage below normal, or shorted to low source |
| 105 | 15 | Intake Manifold 1 Temperature - Data Valid But Above Normal Operating Range - Least Severe Level |
| 108 | 3 | Barometric Pressure Sensor Circuit - Voltage above normal, or shorted to high source |
| 108 | 4 | Barometric Pressure Sensor Circuit - Voltage below normal, or shorted to low source |
| 110 | 0 | Engine Coolant Temperature - Data valid but above normal operational range - Most Severe Level |
| 110 | 3 | Engine Coolant Temperature 1 Sensor Circuit - Voltage above normal, or shorted to high source |
| 110 | 4 | Engine Coolant Temperature 1 Sensor Circuit - Voltage below normal, or shorted to low source |
| 110 | 15 | Engine Coolant Temperature - Data Valid But Above Normal Operating Range - Least Severe Level |
| 110 | 16 | Engine Coolant Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level |
| 110 | 16 | Engine Coolant Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level |

8.2 ENGINE FAULT CODES (continued)

| SPN | FMI | Description |
|-----|-----|--|
| 411 | 2 | Exhaust Gas Recirculation Differential Pressure - Data erratic, |
| 411 | 3 | Exhaust Gas Recirculation Differential Pressure Sensor Circuit - Voltage above normal, or shorted to high source |
| 411 | 4 | Exhaust Gas Recirculation Differential Pressure Sensor Circuit - Voltage below normal, or shorted to low source |
| 412 | 3 | Exhaust Gas Recirculation Temperature Sensor Circuit - Voltage above normal, or shorted to high source |
| 412 | 4 | Exhaust Gas Recirculation Temperature Sensor Circuit - Voltage below normal, or shorted to low source |
| 412 | 15 | Exhaust Gas Recirculation Temperature - Data Valid But Above Normal Operating Range - Least Severe Level |
| 412 | 16 | Exhaust Gas Recirculation Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level |
| 441 | 3 | Auxiliary Temperature Sensor Input 1 Circuit - Voltage above normal, or shorted to high source |
| 441 | 4 | Auxiliary Temperature Sensor Input 1 Circuit - Voltage below normal, or shorted to low source |
| 441 | 14 | Auxiliary Temperature Sensor Input 1 - Special Instructions |
| 558 | 2 | Accelerator Pedal or Lever Idle Validation Switch - Data erratic, intermittent or incorrect |
| 558 | 9 | Accelerator Pedal or Lever Idle Validation Switch - Abnormal update rate |
| 558 | 13 | Accelerator Pedal or Lever Idle Validation Switch Circuit - Out of Calibration |
| 558 | 19 | Accelerator Pedal or Lever Idle Validation Switch - Received Network Data In Error |
| 611 | 2 | Auxiliary Intermediate (PTO) Speed Switch Validation - Data erratic, intermittent or incorrect |
| 612 | 2 | Engine Magnetic Speed/Position Lost Both of Two Signals—Data erratic, intermittent or incorrect |
| 629 | 12 | Engine Control Module Critical Internal Failure - Bad intelligent device or component |
| 629 | 12 | Engine Control Module Warning Internal Hardware Failure - Bad intelligent device or component |
| 630 | 12 | Engine Control Module Calibration Memory - Bad intelligent device or component |
| 633 | 31 | Electronic Fuel Injection Control Valve Circuit - Condition Exists |
| 639 | 9 | SAE J1939 Multiplexing PGN Timeout Error - Abnormal update rate |
| 639 | 13 | SAE J1939 Multiplexing Configuration Error - Out of Calibration |
| 640 | 14 | Auxiliary Commanded Dual Output Shutdown - Special Instructions |
| 647 | 3 | Fan Control Circuit - Voltage above normal, or shorted to high source |
| 647 | 4 | Fan Control Circuit - Voltage below normal, or shorted to low source |
| 651 | 5 | Injector Solenoid Driver Cylinder 1 Circuit - Current below normal or open circuit |
| 651 | 13 | Injector Solenoid Driver Cylinder 1 - Out of Calibration |
| 652 | 5 | Injector Solenoid Driver Cylinder 2 Circuit - Current below normal or open circuit |
| 652 | 13 | Injector Solenoid Driver Cylinder 2 - Out of Calibration |
| 653 | 5 | Injector Solenoid Driver Cylinder 3 Circuit - Current below normal or open circuit |
| 653 | 13 | Injector Solenoid Driver Cylinder 3 - Out of Calibration |
| 654 | 5 | Injector Solenoid Driver Cylinder 4 Circuit - Current below normal or open circuit |
| 654 | 13 | Injector Solenoid Driver Cylinder 4 - Out of Calibration |
| 677 | 3 | Starter Relay Driver Circuit - Voltage above normal, or shorted to high source |
| 677 | 4 | Starter Relay Driver Circuit - Voltage below normal, or shorted to low source |
| 697 | 3 | Auxiliary PWM Driver 1 Circuit - Voltage above normal, or shorted to high source |

8.2 ENGINE FAULT CODES (continued)

| SPN | FMI | Description |
|------|-----|--|
| 697 | 4 | Auxiliary PWM Driver 1 Circuit - Voltage below normal, or shorted to low source |
| 701 | 14 | Auxiliary Input/Output 1 - Special Instructions |
| 701 | 14 | Auxiliary Input/Output 1 - Special Instructions |
| 702 | 3 | Auxiliary Input/Output 2 Circuit - Voltage above normal, or shorted to high source |
| 703 | 3 | Auxiliary Input/Output 3 Circuit - Voltage above normal, or shorted to high source |
| 723 | 2 | Engine Camshaft Speed / Position Sensor - Data erratic, intermittent or incorrect |
| 723 | 2 | Engine Camshaft Speed / Position Sensor - Data erratic, intermittent or incorrect |
| 723 | 2 | Engine Camshaft Speed / Position Sensor - Data erratic, intermittent or incorrect |
| 723 | 7 | Engine Speed / Position Camshaft and Crankshaft Misalignment - Mechanical system not responding or out of adjustment |
| 729 | 3 | Engine Intake Air Heater 1 Circuit - Voltage above normal, or shorted to high source |
| 729 | 4 | Engine Intake Air Heater 1 Circuit - Voltage below normal, or shorted to low source |
| 748 | 9 | Transmission Output Retarder - Abnormal update rate |
| 974 | 3 | Remote Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage above normal, or shorted to high source |
| 974 | 4 | Remote Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage below normal, or shorted to low source |
| 974 | 19 | SAE J1939 Multiplexing Remote Accelerator Pedal or Lever Position Sensor System - Received Network Data In Error |
| 1072 | 3 | Engine Brake Actuator Driver 1 Circuit - Voltage above normal, or shorted to high source |
| 1072 | 4 | Engine Brake Actuator Driver 1 Circuit - Voltage below normal, or shorted to low source |
| 1081 | 9 | Engine Wait to Start Lamp - Abnormal update rate |
| 1136 | 3 | Engine ECU Temperature Sensor Circuit - Voltage above normal, or shorted to high source |
| 1136 | 4 | Engine ECU Temperature Sensor Circuit - Voltage below normal, or shorted to low source |
| 1172 | 3 | Turbocharger 1 Compressor Intake Temperature Circuit - Voltage above normal, or shorted to high source |
| 1172 | 4 | Turbocharger 1 Compressor Intake Temperature Circuit - Voltage below normal, or shorted to low source |
| 1347 | 3 | Engine Fuel Pump Pressurizing Assembly 1 Circuit - Voltage above normal, or shorted to high source |
| 1347 | 4 | Engine Fuel Pump Pressurizing Assembly 1 Circuit - Voltage below normal, or shorted to low source |
| 1347 | 7 | Engine Fuel Pump Pressurizing Assembly 1 - Mechanical system not responding or out of adjustment |
| 1378 | 31 | Engine Oil Change Interval - Condition Exists |
| 1387 | 3 | Auxiliary Pressure Sensor Input 1 Circuit - Voltage above normal, or shorted to high source |
| 1387 | 4 | Auxiliary Pressure Sensor Input 1 Circuit - Voltage below normal, or shorted to low source |
| 1388 | 14 | Auxiliary Pressure Sensor Input 2 - Special Instructions |
| 1623 | 9 | Tachograph Output Shaft Speed - Abnormal update rate |
| 1623 | 19 | Tachograph Output Shaft Speed - Received Network Data In Error |
| 1639 | 0 | Fan Speed - Data Valid but Above Normal Operational Range—Most Severe Level |
| 1639 | 1 | Fan Speed - Data Valid but Below Normal Operational Range—Most Severe Level |
| 1675 | 31 | Engine Starter Mode Overcrank Protection - Condition Exists |
| 2623 | 3 | Accelerator Pedal or Lever Position Sensor 2 Circuit - Voltage above normal, or shorted to high source |
| 2623 | 4 | Accelerator Pedal or Lever Position Sensor 2 Circuit - Voltage below normal, or shorted to low source |

8.2 ENGINE FAULT CODES (continued)

| SPN | FMI | Description |
|------|-----|--|
| 2791 | 3 | EGR Valve Control Circuit - Voltage above normal, or shorted to high source |
| 2791 | 4 | EGR Valve Control Circuit - Voltage below normal, or shorted to low source |
| 2791 | 7 | EGR Valve Control Circuit - Mechanical System Not Responding or Out of Adjustment |
| 2791 | 9 | EGR Valve Control Circuit - Abnormal update rate |
| 2791 | 13 | EGR Valve Controller - Out of Calibration |
| 3510 | 3 | Sensor Supply 2 Circuit - Voltage above normal, or shorted to high source |
| 3510 | 4 | Sensor Supply 2 Circuit - Voltage below normal, or shorted to low source |
| 3511 | 3 | Sensor Supply 3 Circuit - Voltage above normal, or shorted to high source |
| 3511 | 4 | Sensor Supply 3 Circuit - Voltage below normal, or shorted to low source |
| 3512 | 3 | Sensor Supply 4 Circuit - Voltage above normal, or shorted to high source |
| 3512 | 4 | Sensor Supply 4 Circuit - Voltage below normal, or shorted to low source |
| 3513 | 3 | Sensor Supply 5 - Voltage above normal, or shorted to high source |
| 3513 | 4 | Sensor Supply 5 - Voltage below normal, or shorted to low source |
| 3597 | 2 | Power Supply Lost With Ignition On - Data erratic, intermittent or incorrect |
| 3597 | 12 | Injector Power Supply - Bad intelligent device or component |
| 5019 | 3 | Engine Exhaust Gas Recirculation Outlet Pressure Sensor Circuit - Voltage above normal, or shorted to high source |
| 5019 | 4 | Engine Exhaust Gas Recirculation Outlet Pressure Sensor Circuit - Voltage below normal, or shorted to low source |
| 5571 | 0 | High Pressure Common Rail Fuel Pressure Relief Valve - Data valid but above normal operational range - Most Severe Level |
| 5571 | 7 | High Pressure Common Rail Fuel Pressure Relief Valve - Mechanical system not responding or out of adjustment |

8.3 TRACTOR CONTROL SYSTEM MESSAGES

In addition to the engine CAN fault codes, the controls message lamp on the dash can communicate tractor control system messages to the operator as blink codes. Blink codes are all two digits. There is a short pause between digits and a long pause between codes. If more than one code is active, the codes will be “scrolled” through sequentially.

The current list of available codes and initial diagnostic responses is provided below. Note that blink codes are only shown while active. If an error persists, please contact Eagle Tugs for support.

| Code | Description | Details |
|------|---|--|
| 21 | J1939 CAN fault | CAN communication between the vehicle controller and the engine ECU has failed. Verify the CAN wiring, termination resistors, and shield grounds. |
| 22 | Throttle pedal primary sensor fault | The throttle pedal primary sensor is out of range, shorted, or open. Verify wiring and sensor connection. |
| 23 | Throttle pedal secondary sensor fault | The throttle pedal secondary sensor is out of range, shorted, or open. Verify wiring and sensor connection. |
| 24 | Front axle disconnect solenoid fault | The front axle disconnect solenoid is shorted or open. Verify wiring and solenoid connection. |
| 25 | Transmission solenoid fault - First | The “First” gear transmission solenoid is shorted or open. Verify wiring and solenoid connection. |
| 26 | Fuel level sensor fault | Fuel level sensor out of range, shorted, or open. Verify wiring and sensor connection. |
| 27 | Transmission solenoid fault - Fwd | The “Forward” gear transmission solenoid is shorted or open. Verify wiring and solenoid connection. |
| 28 | Hydraulic fluid over temperature | The hydraulic fluid temperature has exceeded the threshold. Verify that the cooler is functional and the fan is running and that the accumulator charge valve is properly adjusted (see this section for details) |
| 29 | Throttle wiper coordination fault | The throttle pedal primary and secondary sensors are not in sync. Verify throttle pedal electrical connections. |
| 31 | Transmission solenoid fault - Rev | The “Reverse” gear transmission solenoid is shorted or open. Verify wiring and solenoid connection. |
| 32 | Parking brake solenoid fault | The parking brake (SAHR) solenoid is shorted or open. Verify wiring and solenoid connection. |
| 33 | Transmission solenoid fault - Second | The “Second” gear transmission solenoid is shorted or open. Verify wiring and solenoid connection. |
| 34 | Tractor warm-up in process | Transmission fluid needs to heat up before full operation is allowed. The engine will idle until the transmission temperature reaches 15°F / -10°C |
| 35 | Trans temp high warning | The transmission temperature has exceeded the threshold. The truck will be forced to idle. Check cooler for airflow blockage or reduce duty cycle. |
| 36 | Transmission temp sender fault | The transmission temperature sender is out of range, shorted, or open. Verify wiring and sender connection. |
| 37 | Hydraulic temperature sender fault | The hydraulic temperature sender is out of range, shorted, or open. Verify wiring and sender connection. |
| 39 | Low hydraulic fluid | Verify hydraulic fluid level and check for leaks if low. |
| 41 | Sensor power fault | The controller sensor power is out of range. Verify throttle pedal wiring and connections to ensure there are no shorts. |
| 42 | J1939 CAN fault | CAN communication between the vehicle controller and the engine ECU has failed. Verify the CAN wiring, termination resistors, and shield grounds. |
| 43 | Throttle pedal calibration needed (primary) | The throttle pedal needs to be calibrated. With the key on, tractor in neutral, and parking brake engaged; press the throttle pedal firmly to the floor and hold for 5 seconds. |
| 44 | Throttle pedal calibration needed (secondary) | The throttle pedal needs to be calibrated. With the key on, tractor in neutral, and parking brake engaged; press the throttle pedal firmly to the floor and hold for 5 seconds. |
| 45 | Low brake accumulator pressure | The brake accumulator pressure is low. Tractor will be forced to engine idle to prevent unsafe operation. Verify hydraulic system functionality and that the accumulators are in good condition and holding a pre-charge. Verify that the accumulator charge valve is properly adjusted (see this section for details) |
| 46 | Low battery voltage | Battery voltage while the tractor is running is below 13 volts. Verify that charging system is properly connected and alternator fuse is not blown. |

8.4 ACCUMULATOR CHARGE VALVE ADJUSTMENT PROCEDURE

The accumulator charge valve should only need to be adjusted at the time of installation. Once installed and properly adjusted, no further changes should be required. Adjustment instructions are provided here for informational purposes should the valve or manifold block need to be replaced, or should the adjustment need to be altered in the field.

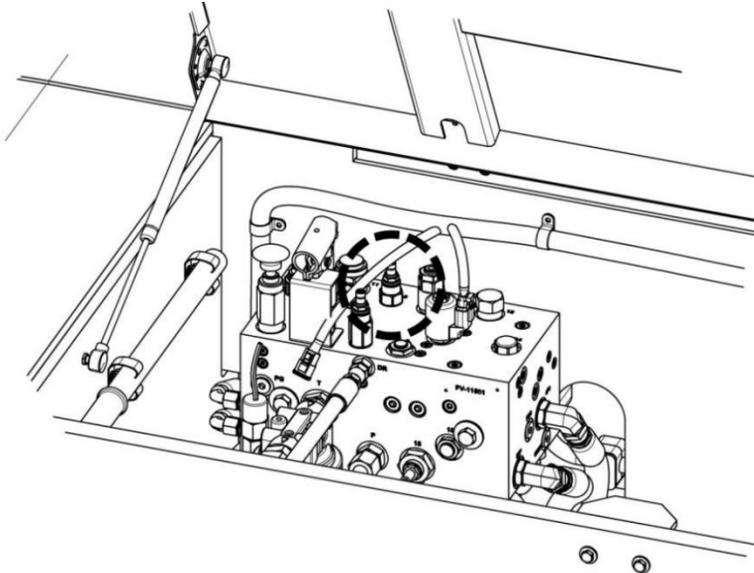
When to check valve adjustment:

- The tractor displays an error message (blink code 28) that the hydraulic fluid is over temperature.
- The tractor displays an error message (blink code 45) that the brake accumulator pressure is insufficient.

Before adjusting, validate the current adjustment settings by performing the following test:

- With the tractor off, pump the tractor service brakes 10 times to drain the brake accumulators.
- Start the tractor. The tractor will begin in the accumulator charging mode. The engine will be under load and there will be a hydraulic hissing sound from the steering valve area in the dash.
- After 5-15 seconds, the tractor should switch to idle mode. The engine idle will smooth out, and the hissing sound from the dash will stop.
- Pumping the service brakes ~10 times should start the charging mode again. Once again after 5-15 seconds the tractor should switch back to idle mode.
- The low brake pressure indicator light may flash while pumping the service brake, but it should not remain on steady and the system should not display a low pressure blink code.
- A valve that fails to cycle properly as indicated above needs to be adjusted.

The accumulator charge valve is located on top of the hydraulic manifold block in the center rear of the block (see image). The valve has a "6" etched on the block adjacent to it.



If the issue is high hydraulic fluid temperature, adjust the valve as follows:

- Loosen the adjustment lock nut with a wrench
- Turn the valve with an allen key counter-clockwise one quarter turn.
- Re-test the cycling behavior per the procedure on the previous page.
- If necessary continue to reduce the pressure on the valve until the system cycles reliably.
- Once the system cycles correctly, tighten the adjustment lock nut.

If the issue is low accumulator pressure, adjust the valve as follows:

- Loosen the adjustment lock nut with a wrench
- Turn the valve with an allen key clockwise one quarter turn.
- Re-test the cycling behavior per the procedure on the previous page.
- If necessary continue to increase the pressure on the valve until the system cycles reliably and the low pressure blink code warning disappears.
- Once the system cycles correctly, tighten the adjustment lock nut.



9.0 PROVISION OF SPARES

9.1 SOURCE OF SPARE PARTS

Spare parts may be obtained from the manufacturer:

TRONAIR, Inc./EagleTugs
1 Air Cargo Pkwy East
Swanton, Ohio 43558 USA

Telephone: (419) 866-6301 or 800-426-6301
Fax: (419) 867-0634
E-mail: sales@tronair.com
Website: www.tronair.com



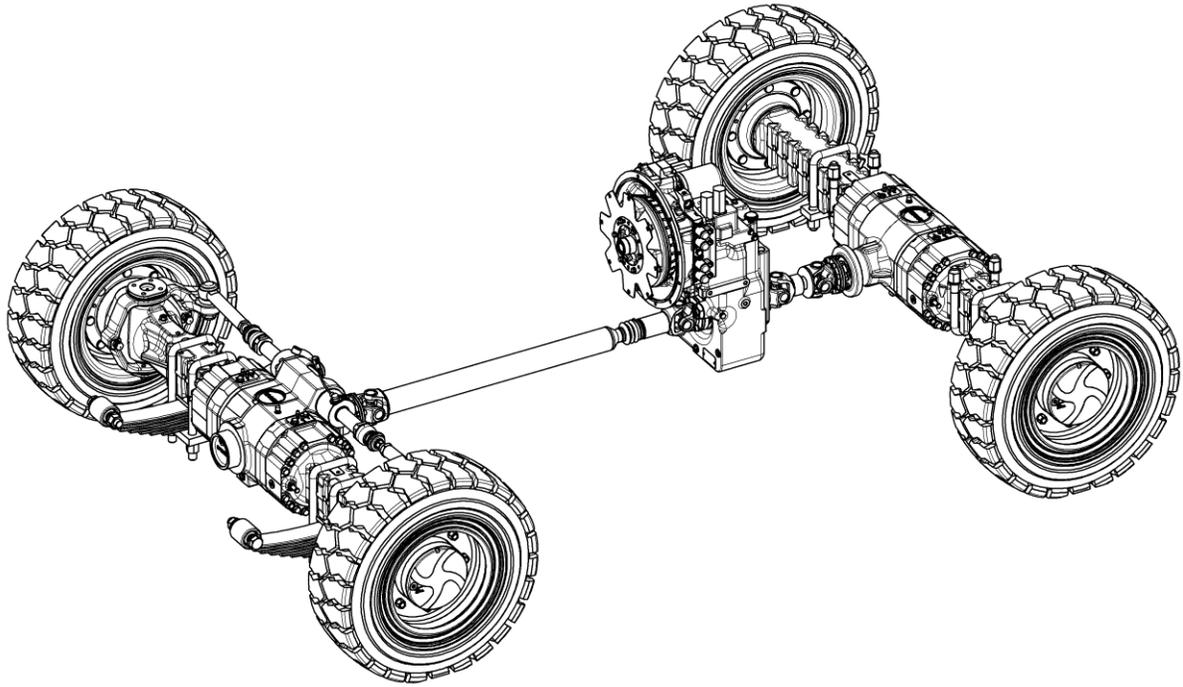
For Spare Parts, Operations & Service Manuals or Service Needs:
Scan the QR code or visit tronair.com/pages/tronair-information-center

9.2 RECOMMENDED SPARE PARTS LISTS

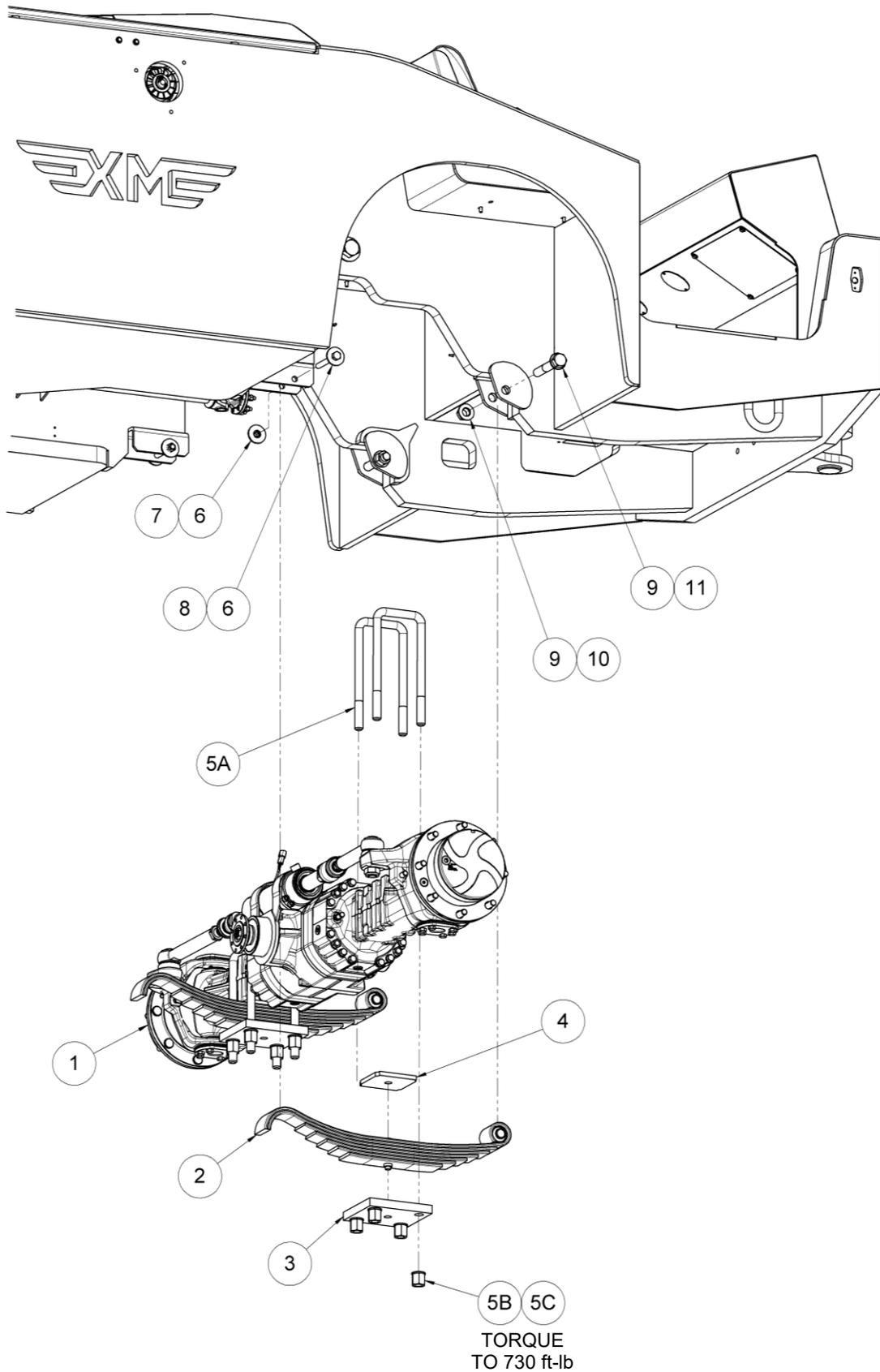
Reference the following page(s) for Replacement Parts and Kits available.

NOTE: Please check our website periodically for manual updates as well as service bulletins.

10.0 DRIVE TRAIN



10.1 FRONT AXLE





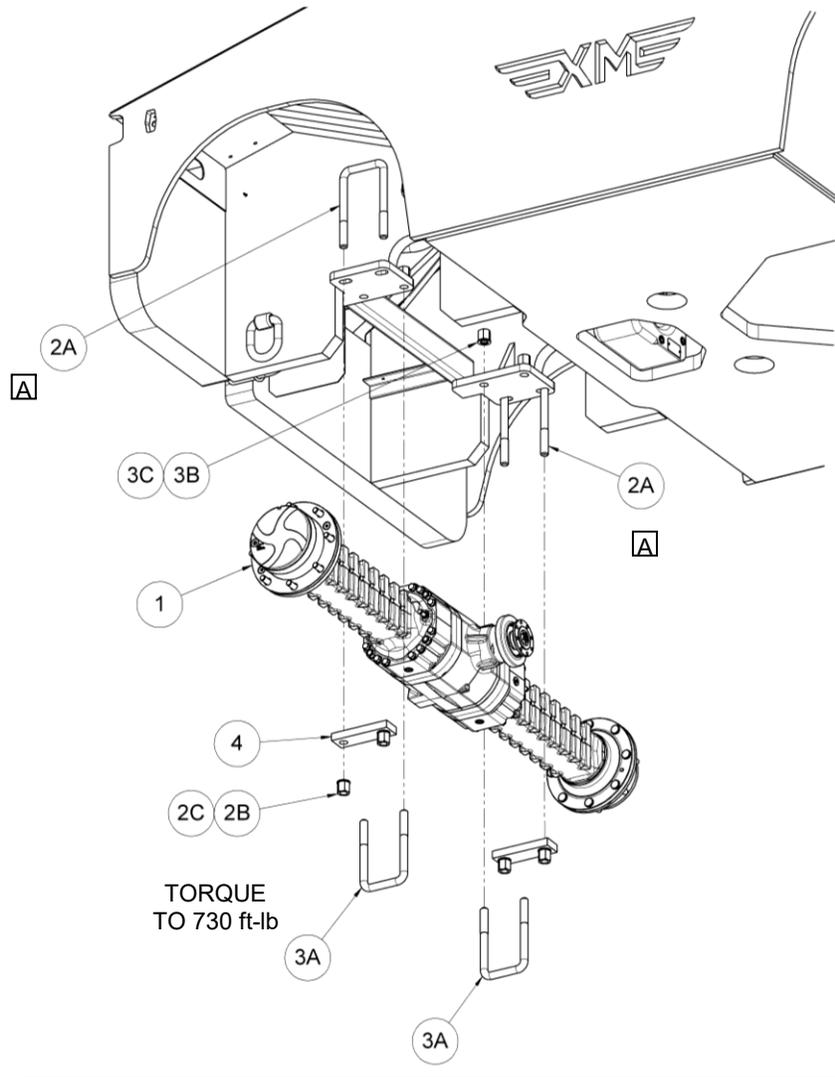
10.1 FRONT AXLE (continued)

Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|---|-------|
| 1 | XM00-04-001-SA | FRONT AXLE | 1 |
| 2 | XM00-04-003-SA | FRONT LEAF SPRING | 2 |
| 3 | XM00-04-004-SA | FRONT AXLE CLAMP PLATE | 2 |
| 4 | XM00-04-005-SA | FRONT AXLE SPACER PLATE | 2 |
| 5 | XM00-04-006-SA | FRONT AXLE U-BOLT KIT (INCLUDES ITEMS 5A THRU 5C) | 4 |
| 5A | N/A | U-BOLT, 1-14 X 5.31 INSIDE WIDTH X 12 LEG, GR 8 | 1/KIT |
| 5B | N/A | FLAT WASHER, 1 | 2/KIT |
| 5C | N/A | HIGH NUT, 1-14 | 2/KIT |
| 6 | NPN | FLAT WASHER, 5/8 | 4 |
| 7 | NPN | LOCK NUT, 5/8-11 UNC | 2 |
| 8 | NPN | HCS, 5/8-11 UNC X 5 | 2 |
| 9 | XM00-24-002-CA | FLAT WASHER, 1, HARDENED | 4 |
| 10 | XM00-24-003-CA | LOCK NUT, 1-14 UNS, GR C | 2 |
| 11 | XM00-24-004-CA | HCS, 1-14 UNS X 6, GR 8, ZN PLATED | 2 |

10.2 REAR AXLE



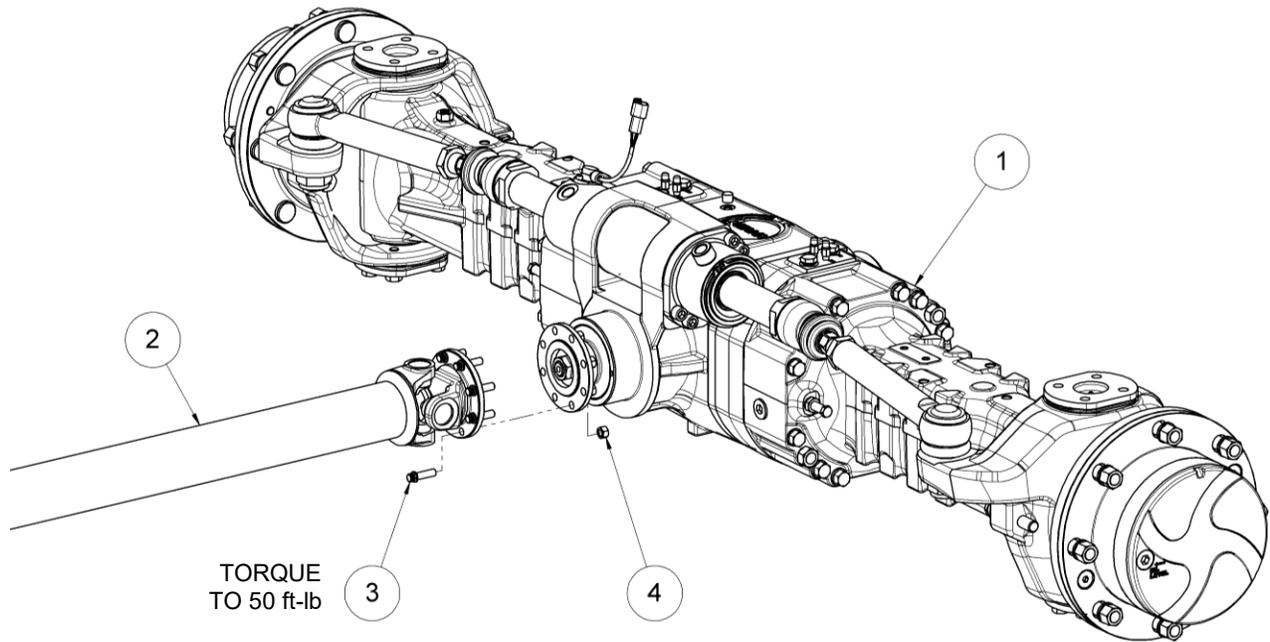
[A] The longer of the two U-bolts is installed to the outside of the tractor and points down.

Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|--|-------|
| 1 | XM00-04-002-SA | REAR AXLE | 1 |
| 2 | XM00-04-009-SA | REAR OUTSIDE AXLE U-BOLT KIT (INCLUDES ITEMS 2A THRU 2C) | 2 |
| 2A | N/A | U-BOLT, 1-14 X 4.83 INSIDE WIDTH X 10.08 LEG, GR 8 | 1/KIT |
| 2B | N/A | FLAT WASHER, 1 | 2/KIT |
| 2C | N/A | HIGH NUT, 1-14 | 2/KIT |
| 3 | XM00-04-008-SA | REAR INSIDE AXLE U-BOLT KIT (INCLUDES ITEMS 3A THRU 3C) | 2 |
| 3A | N/A | U-BOLT, 1-14 X 4.83 INSIDE WIDTH X 9.08 LEG, GR 8 | 1/KIT |
| 3B | N/A | FLAT WASHER, 1 | 2/KIT |
| 3C | N/A | HIGH NUT, 1-14 | 2/KIT |
| 4 | XM00-04-007-SA | REAR AXLE CLAMP BAR | 2 |

10.3 FRONT DRIVESHAFT TO FRONT AXLE



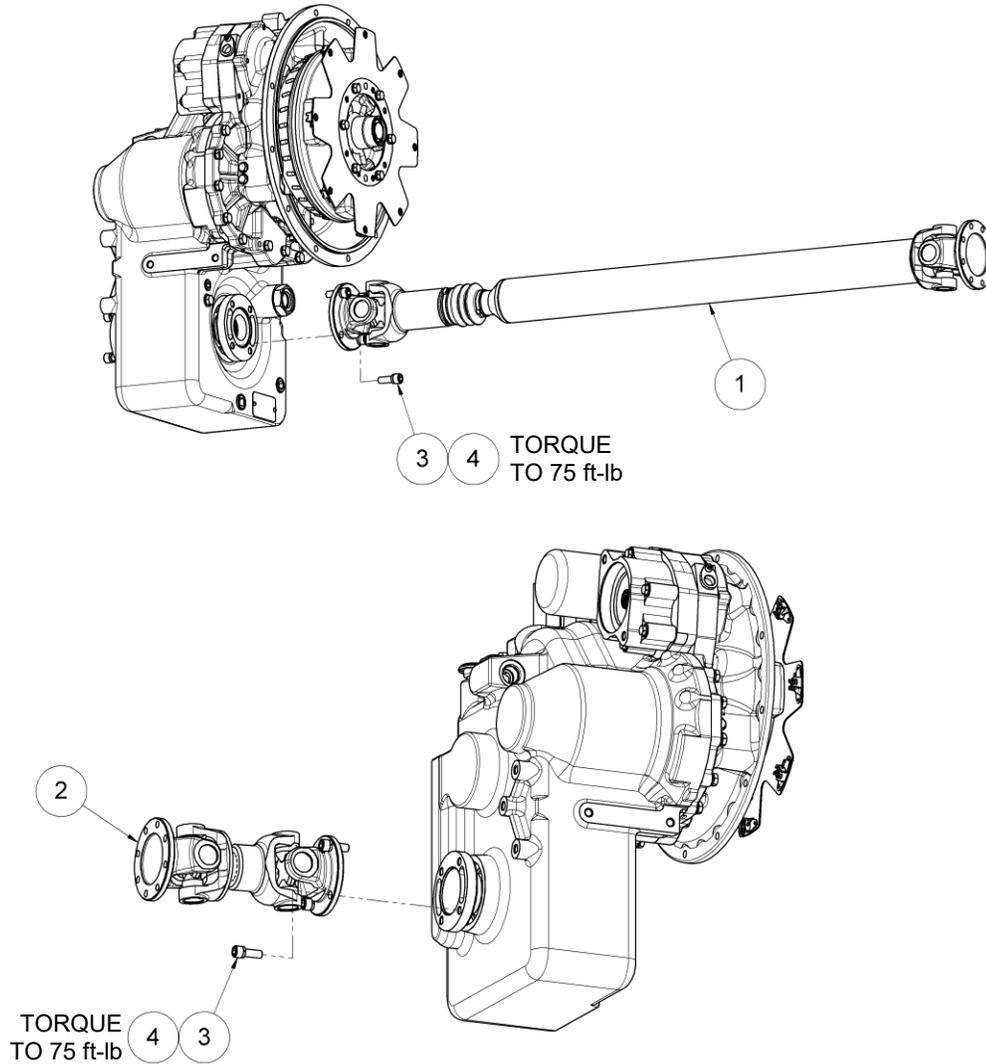
Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|---|-----|
| 1 | XM00-04-001-SA | FRONT AXLE | 1 |
| 2 | XM00-04-019-SA | FRONT DRIVESHAFT | 1 |
| 3 | NPN | 12 PT FLANGE HEAD BOLT, 3/8-24 UNF X 1.25 | 8 |
| 4 | NPN | HEX NUT, 3/8-24 UNF | 8 |

Item 4 install using Loctite® Thread Locker Blue 242® thread retaining compound or comparable.

10.4 FRONT AND REAR DRIVESHAFT TO TRANSMISSION

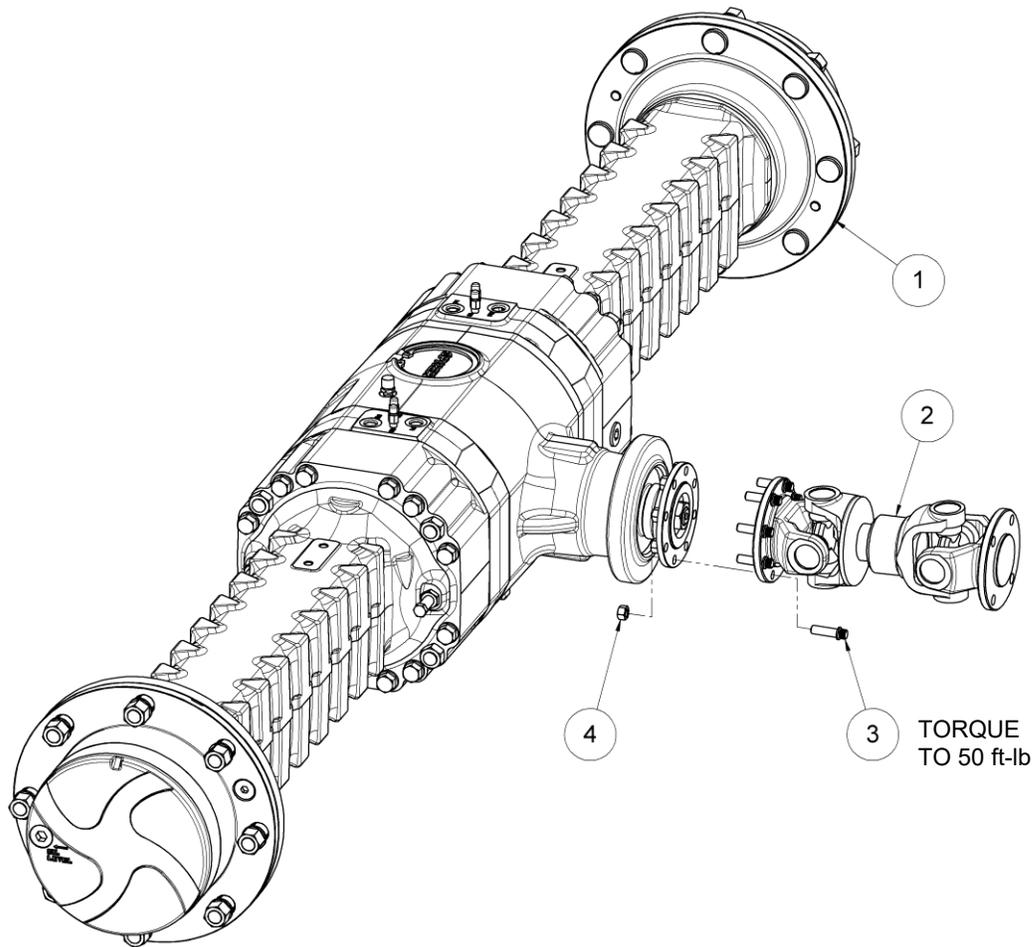


Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|------------------------------|-----|
| 1 | XM00-04-019-SA | FRONT DRIVESHAFT | 1 |
| 2 | XM00-04-020-SA | REAR DRIVESHAFT | 1 |
| 3 | NPN | LOCK WASHER, HI COLLAR, 7/16 | 8 |
| 4 | NPN | SHCS, 7/16-20 UNF X 1.25 | 8 |

10.5 REAR DRIVESHAFT TO REAR AXLE



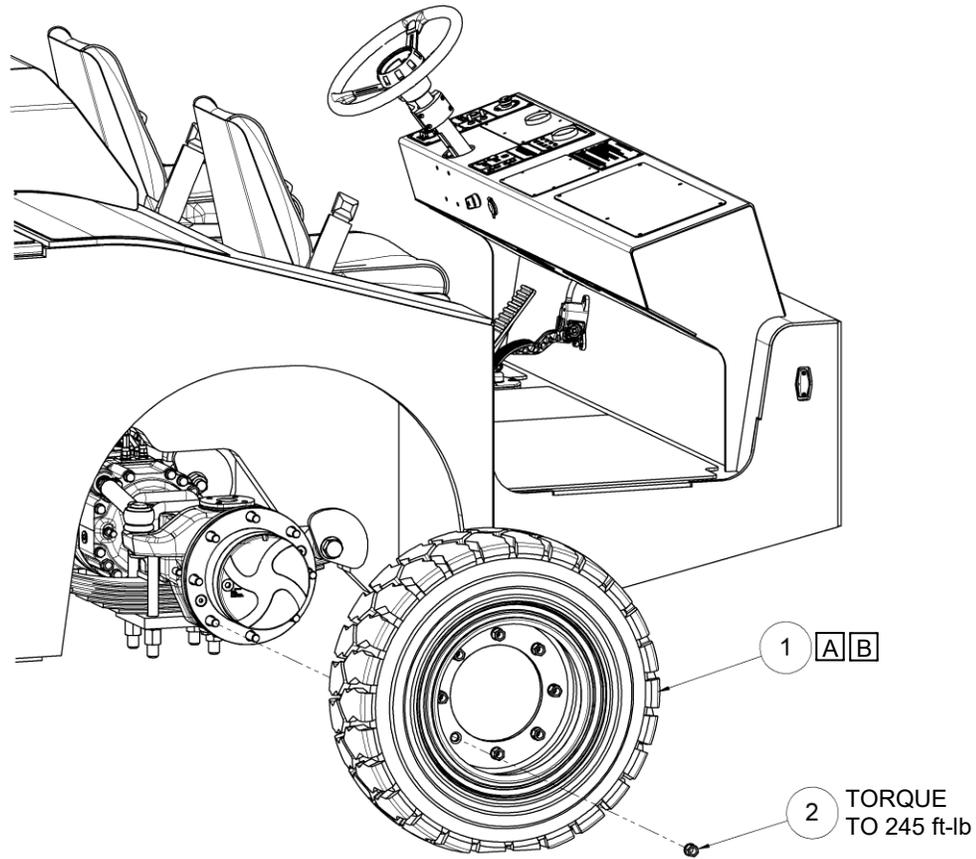
Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|---|-----|
| 1 | XM00-04-002-SA | REAR AXLE | 1 |
| 2 | XM00-04-020-SA | REAR DRIVESHAFT | 1 |
| 3 | NPN | 12 PT FLANGE HEAD BOLT, 3/8-24 UNF X 1.25 | 8 |
| 4 | NPN | HEX NUT, 3/8-24 UNF | 8 |

Item 4 install using Loctite® Thread Locker Blue 242® thread retaining compound or comparable.

10.6 WHEELS AND TIRES



A Recommended inflation pressure is 145 psi / 1000 kPa.

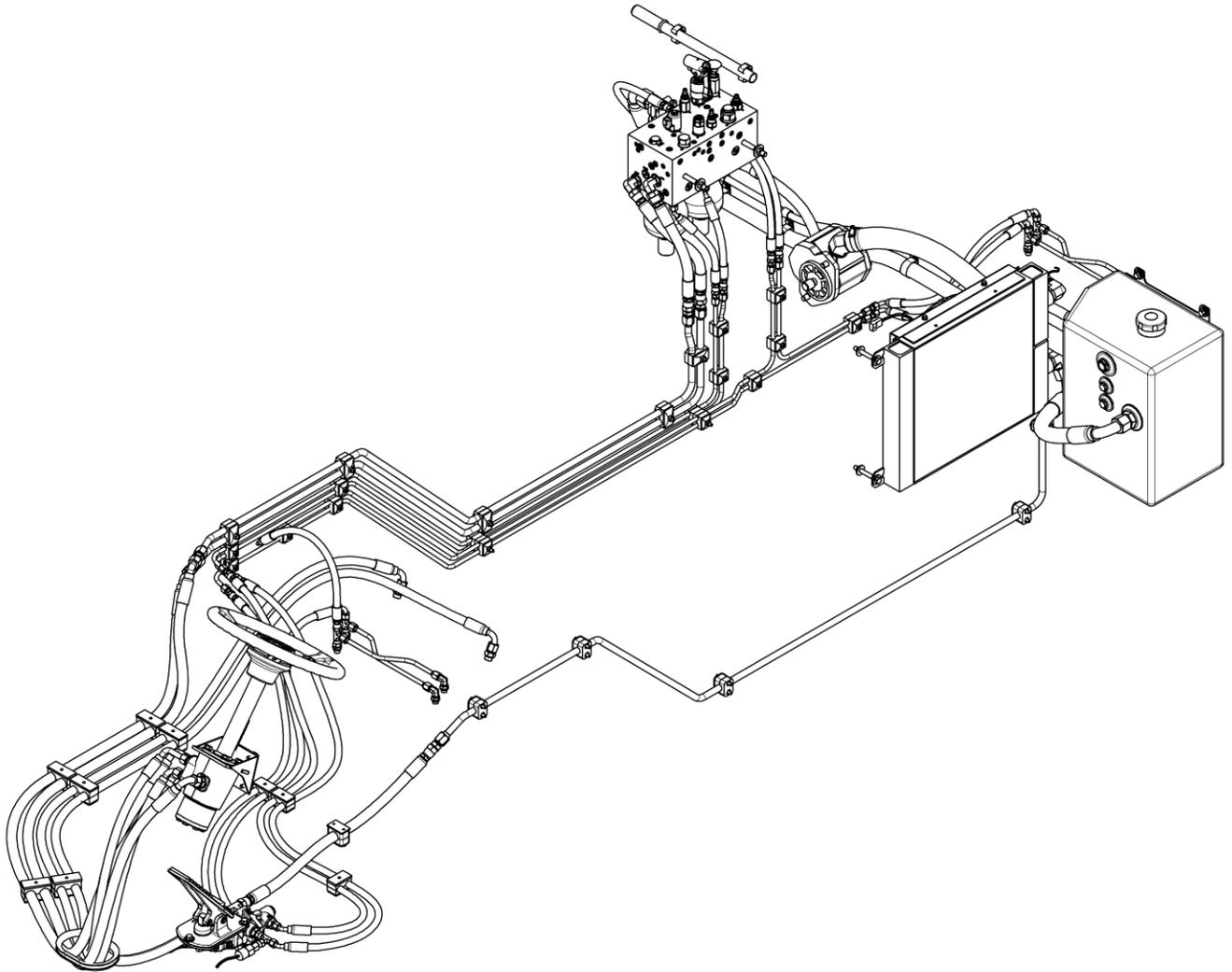
B Tires and/or tubes sold individually must be mounted to the rim by the customer with special equipment/tooling (not provided by Eagle Tugs).

Parts List

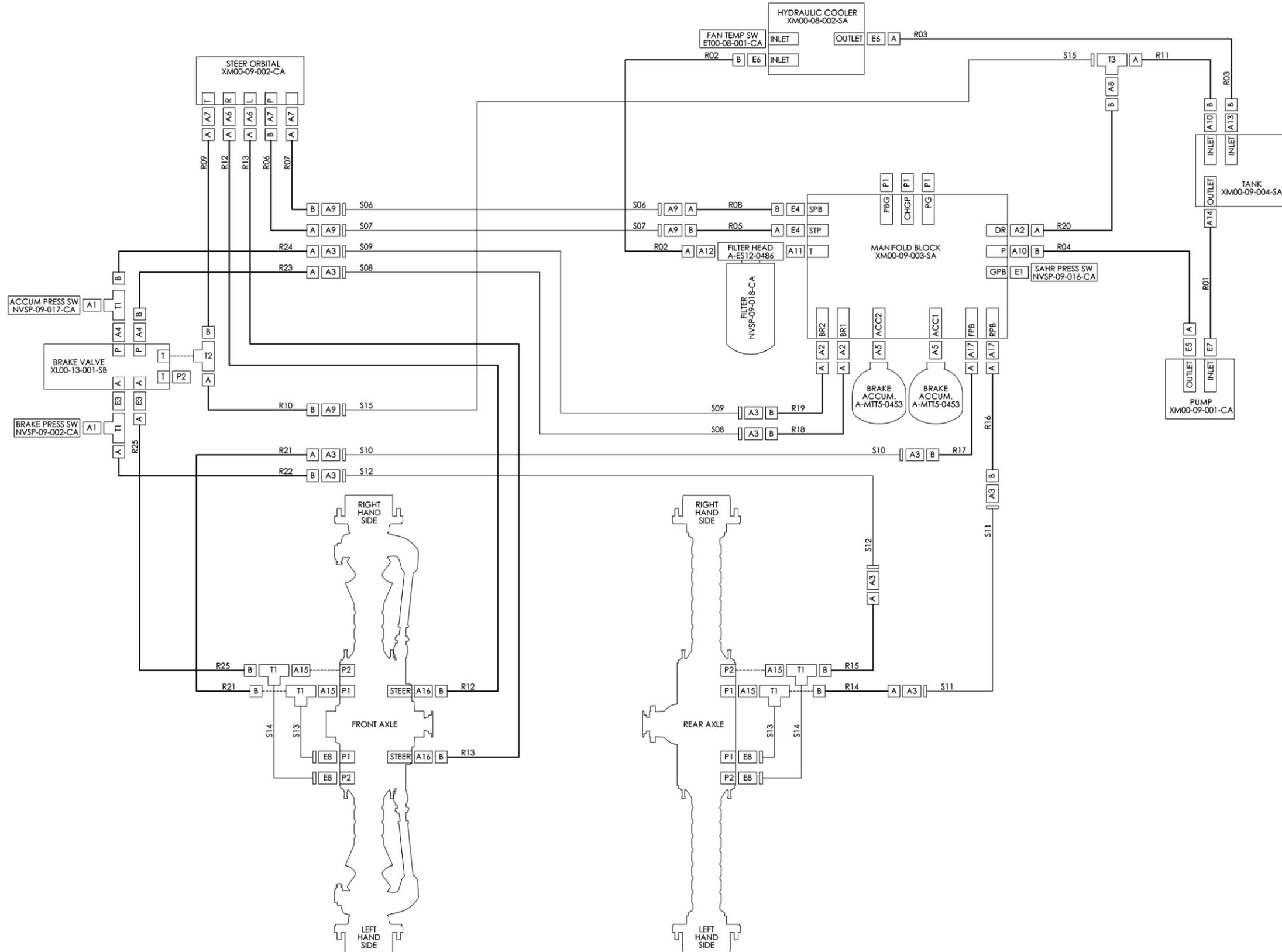
When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|--|-----|
| 1 | XM00-54-001-KA | WHEEL AND TIRE MOUNTED | 4 |
| 2 | XM00-54-002-CA | WHEEL NUT, M18X1.5, SPHERICAL COLLAR (INCLUDED WITH AXLES) | 32 |
| - | XM00-04-010-SA | WHEEL, 4 PIECE (INCLUDED WITH ITEM 1) | - |
| - | XM00-04-012-SA | 250-15 PNEUMATIC TIRE (INCLUDED WITH ITEM 1) | - |
| N/S | XM00-54-003-CA | REPLACEMENT TIRE TUBE | - |

11.0 HYDRAULIC SYSTEM



11.1 SYSTEM SCHEMATIC





- 11.2 HYDRAULIC HOSES AND STEEL LINES
- 11.2.1 Hydraulic Hose Assemblies

Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description |
|------|-------------|-------------------------------|
| R01 | K-5384-R01 | PUMP SUCTION |
| R02 | K-5384-R02 | MANIFOLD TO COOLER |
| R03 | K-5384-R03 | COOLER TO TANK |
| R04 | K-5384-R04 | PUMP PRESSURE |
| R05 | K-5384-R05 | STEER PRESSURE FROM BLOCK |
| R06 | K-5384-R06 | STEER PRESSURE TO ORBITAL |
| R07 | K-5384-R07 | POWER BEYOND TO ORBITAL |
| R08 | K-5384-R08 | STEER POWER BEYOND BLOCK FEED |
| R09 | K-5384-R09 | STEER RETURN |
| R10 | K-5384-R10 | STEER AND BRAKE RETURN |
| R11 | K-5384-R11 | SECONDARY COLLECTED RETURN |
| R12 | K-5384-R12 | FRONT AXLE RH STEER |
| R13 | K-5384-R13 | FRONT AXLE LH STEER |
| R14 | K-5384-R14 | REAR AXLE SAHR |
| R15 | K-5384-R15 | REAR AXLE BRAKE |
| R16 | K-5384-R16 | REAR SAHR BLOCK FEED |
| R17 | K-5384-R17 | FRONT SAHR BLOCK FEED |
| R18 | K-5384-R18 | BRAKE PRESSURE A BLOCK FEED |
| R19 | K-5384-R19 | BRAKE PRESSURE B BLOCK FEED |
| R20 | K-5384-R20 | MANIFOLD BLOCK DRAIN |
| R21 | K-5384-R21 | FRONT AXLE SAHR |
| R22 | K-5384-R22 | REAR BRAKE TO VALVE |
| R23 | K-5384-R23 | BRAKE PRESSURE A TO VALVE |
| R24 | K-5384-R24 | BRAKE PRESSURE B TO VALVE |
| R25 | K-5384-R25 | FRONT BRAKE TO VALVE |



11.2.2 Hydraulic Steel Lines

Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|------------------|-----|
| S06 | XM00-09-016-SA | STEER BEYOND | 1 |
| S07 | XM00-09-007-SA | STEER PRESSURE | 1 |
| S08 | XM00-09-008-SA | BRAKE PRESSURE A | 1 |
| S09 | XM00-09-009-SA | BRAKE PRESSURE B | 1 |
| S10 | XM00-09-010-SA | FRONT SAHR | 1 |
| S11 | XM00-09-011-SA | REAR SAHR | 1 |
| S12 | XM00-09-012-SA | REAR BRAKE | 1 |
| S13 | XM00-09-013-SA | SAHR CROSSOVER | 2 |
| S14 | XM00-09-014-SA | BRAKE CROSSOVER | 2 |
| S15 | XM00-09-015-SA | RETURN | 1 |



11.3 HYDRAULIC FITTINGS

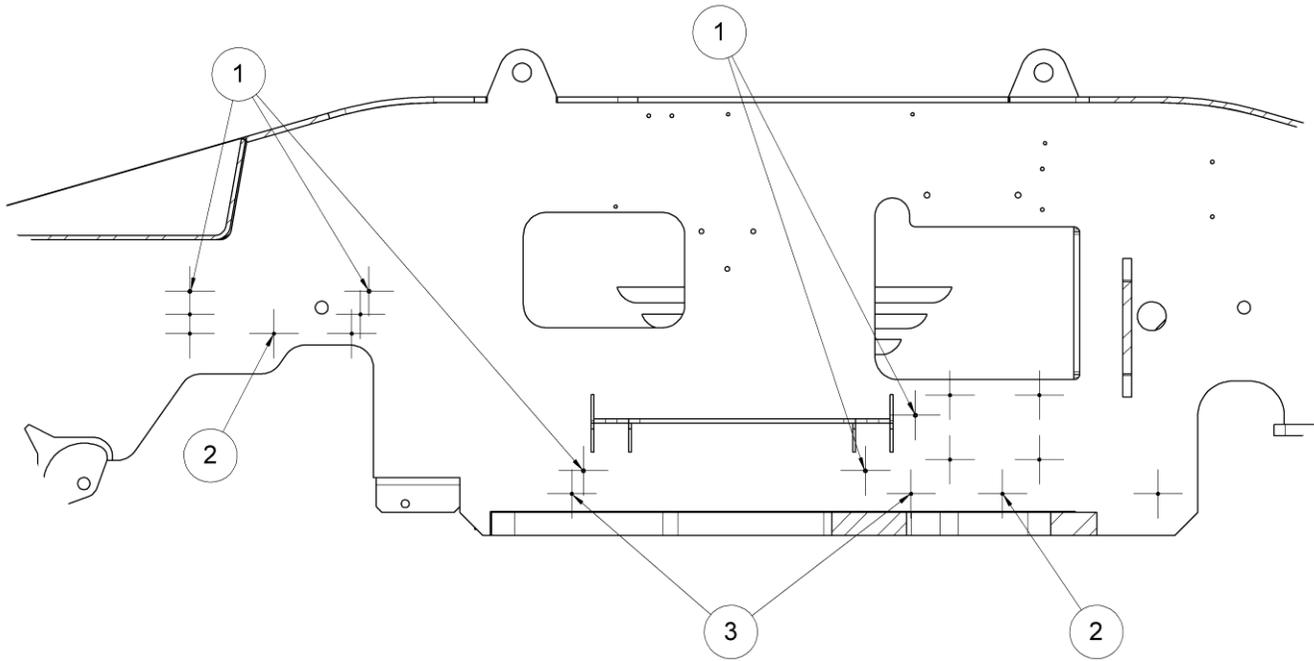
Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|---|-----|
| A1 | 6 G6X-S | ADAPTOR - 6 JIC F - 4 NPT F | 2 |
| A2 | C5315X6 | ADAPTOR - 6 SAE ORB M - 6 JIC M | 3 |
| A3 | C5305X6 | ADAPTOR - 6 JIC M - 6 JIC M | 10 |
| A4 | C5315X6X8 | ADAPTOR - 8 SAE ORB M - 6 JIC M | 2 |
| A5 | C5314X8X8 | ADAPTOR - 8 SAE ORB M - 8 SAE ORB M | 2 |
| A6 | C5315X8 | ADAPTOR - 8 SAE ORB M - 8 JIC M | 2 |
| A7 | C5315X10X8 | ADAPTOR - 8 SAE ORB M - 10 JIC M | 3 |
| A8 | 10-6 TRTX-S | ADAPTOR - 10 JIC F - 6 JIC M | 1 |
| A9 | C5305X10 | ADAPTOR - 10 JIC M - 10 JIC M | 5 |
| A10 | C5315X10 | ADAPTOR - 10 SAE ORB M - 10 JIC M | 2 |
| A11 | C5314X12X12 | ADAPTOR - 12 SAE ORB M - 12 SAE ORB M | 1 |
| A12 | C5315X16X12 | ADAPTOR - 12 SAE ORB M - 16 JIC M | 1 |
| A13 | C5315X16 | ADAPTOR - 16 SAE ORB M - 16 JIC M | 1 |
| A14 | 4404-24-20 | ADAPTOR - 20 M NPT - 24 HOSE BARB | 1 |
| A15 | MC5315X6X14 | ADAPTOR - M14x1.5 DIN M - 6 JIC M | 4 |
| A16 | MC5315X8X18 | ADAPTOR - M18x1.5 DIN M - 8 JIC M | 2 |
| A17 | 1906R-060 | RESTRICTOR - SAE ORB M - 6 JIC M | 2 |
| E1 | C3459X6 | ELBOW 90° - 6 SAE ORB M - 4 NPT F | 1 |
| E3 | C5515X6X8 | ELBOW 90° - 8 SAE ORB M - 6 JIC M | 2 |
| E4 | C5515X10 | ELBOW 90° - 10 SAE ORB M - 10 JIC M | 2 |
| E5 | C5515X10X12 | ELBOW 90° - 12 SAE ORB M - 10 JIC M | 1 |
| E6 | C5515X16 | ELBOW 90° - 16 SAE ORB M - 16 JIC M | 2 |
| E7 | 4603-24-16 | ELBOW 45° - 16 SAE ORB M - 24 HOSE BARB | 1 |
| E8 | MC5515X6X14 | ELBOW 90° - M14X1.5 - 6 JIC M | 4 |
| P1 | 7238X6 | PLUG - 6 SAE ORB HEX SOCKET | 3 |
| P2 | 7237X8 | PLUG - 8 SAE ORB HEX | 1 |
| T1 | C5706X6 | TEE - 2X 6 JIC M - 6 JIC F | 6 |
| T2 | 10-10-8 S5OX-S | TEE - 2X 10 JIC M - 8 SAE ORB M | 1 |
| T3 | C5705X10 | TEE - 3X 10 JIC M | 1 |

Use Loctite® 565™ Pipe Sealant or comparable on all NPT fitting connections.

11.4 HYDRAULIC CLAMP MOUNTING STUDS



INSIDE OF RH MAIN RUNNER

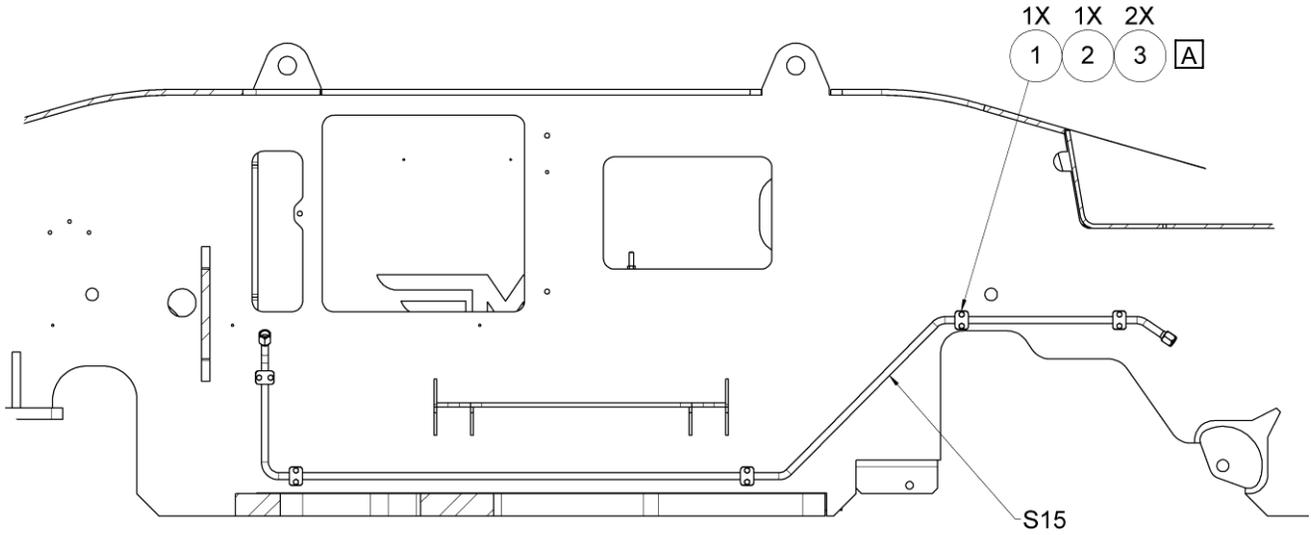
Install all components using Loctite® Thread Locker Red 263® thread retaining compound or comparable.
 Install item 1 with 1.9" of stud protruding from the panel.
 Install item 2 with 1.6" of stud protruding from the panel.
 Install item 3 with 3" of stud protruding from the panel.

Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|-------------------------|-----|
| 1 | NVSP-24-025-CB | STUD, 5/16-18 UNC X 2.5 | 5 |
| 2 | NVSP-24-024-CA | STUD, 1/4-20 UNC X 2 | 11 |
| 3 | NVSP-24-024-CD | STUD, 1/4-20 UNC X 3.5 | 2 |

11.5 STEEL HYDRAULIC LINES, LH SIDE



INSIDE OF LH MAIN RUNNER

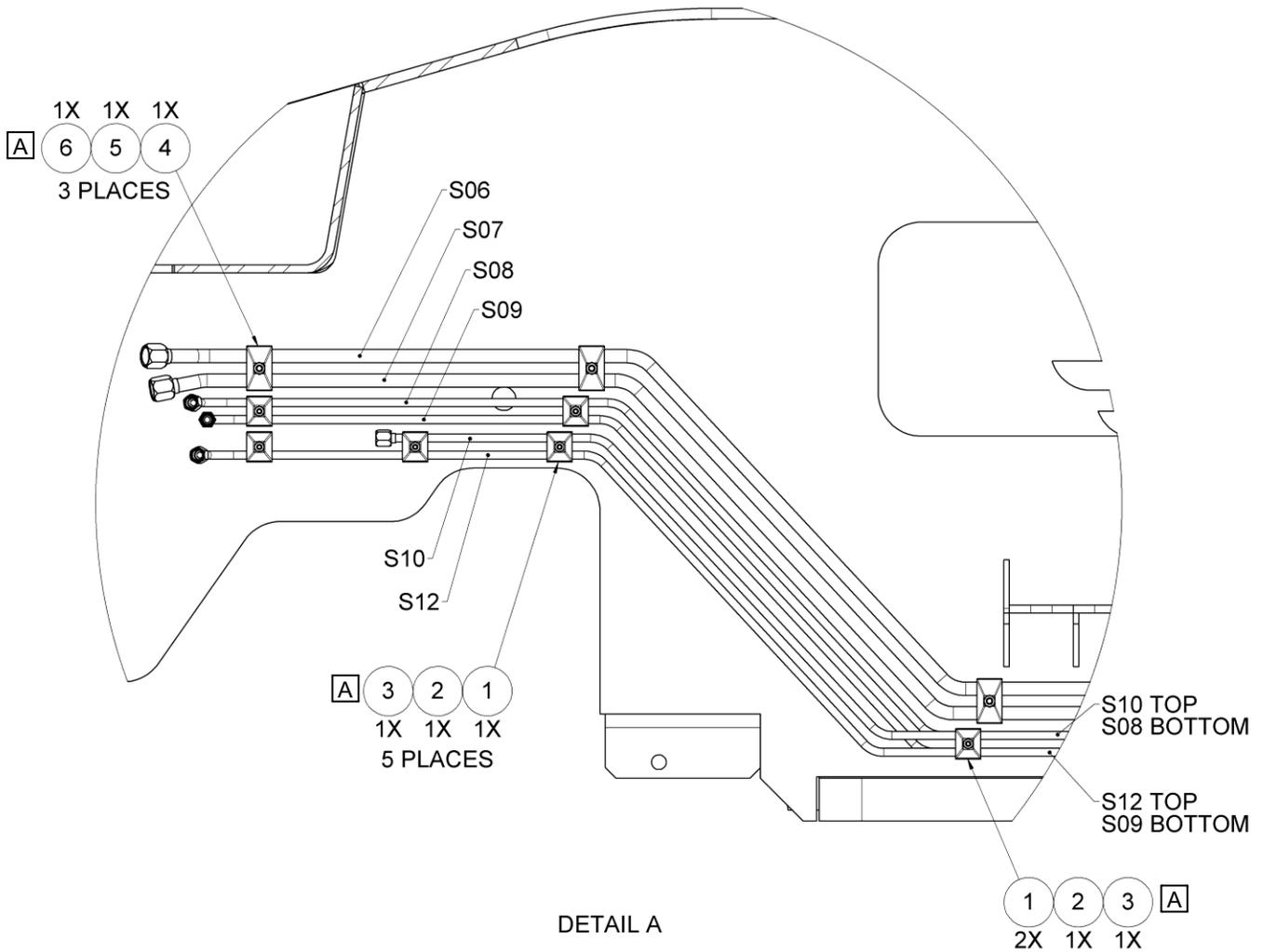
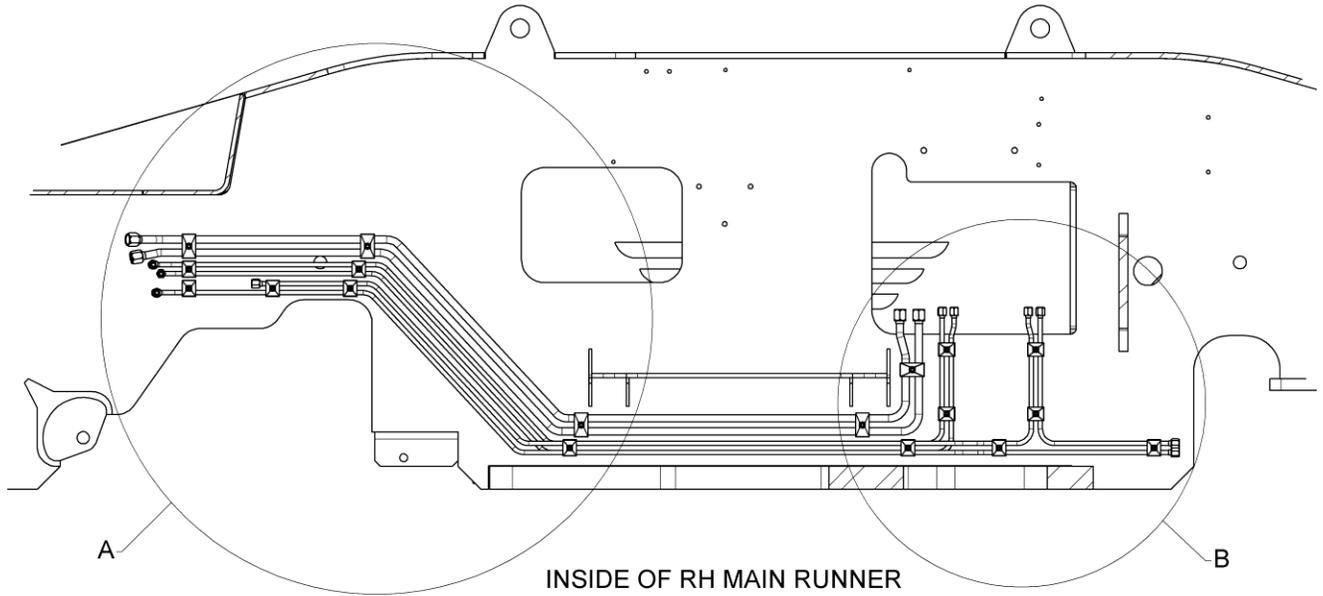
A Install specified components using Loctite® Thread Locker Red 263® thread retaining compound or comparable.

Parts List

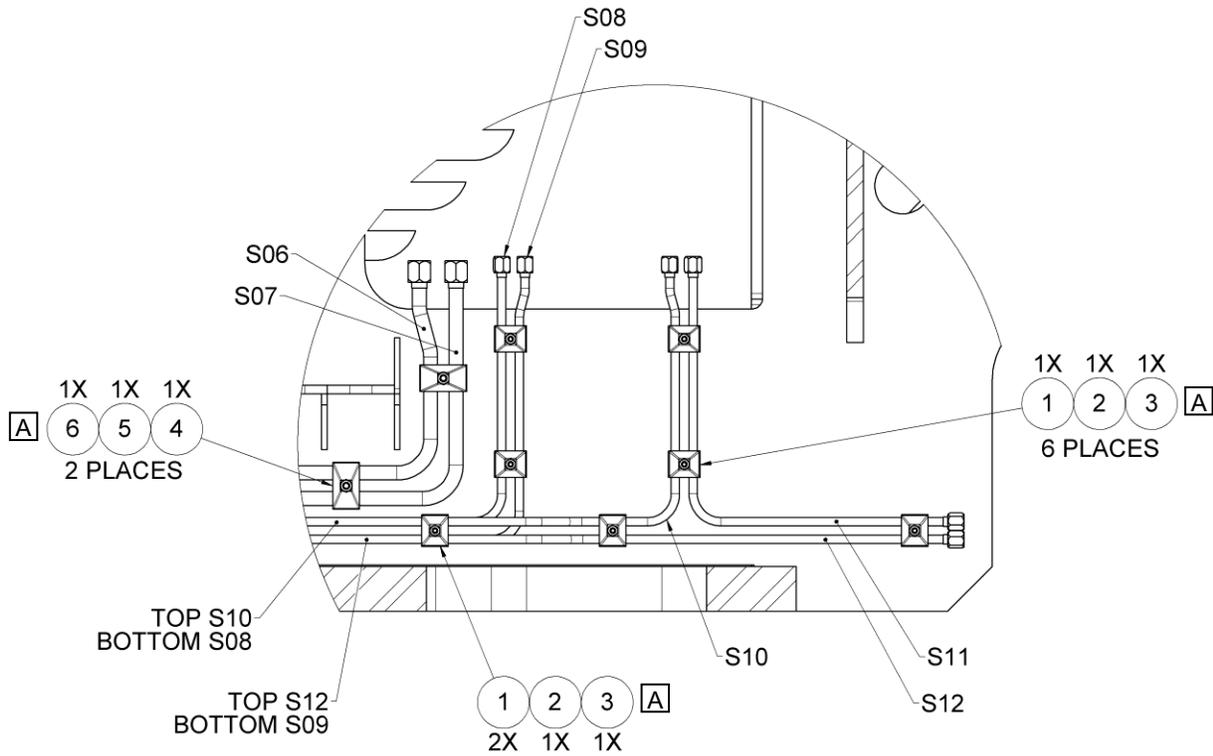
When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|--|-----|
| 1 | NVSP-24-015-CM | SINGLE 16MM PROFILED TUBE CLAMP BODY, 2 HALVES | 5 |
| 2 | NVSP-24-017-CD | SINGLE GROUP 2 COVER PLATE | 5 |
| 3 | NPN | HCS, 1/4-20 UNC X 1.75 | 10 |

11.6 STEEL HYDRAULIC LINES, RH SIDE



11.6 STEEL HYDRAULIC LINES, RH SIDE (continued)



DETAIL B

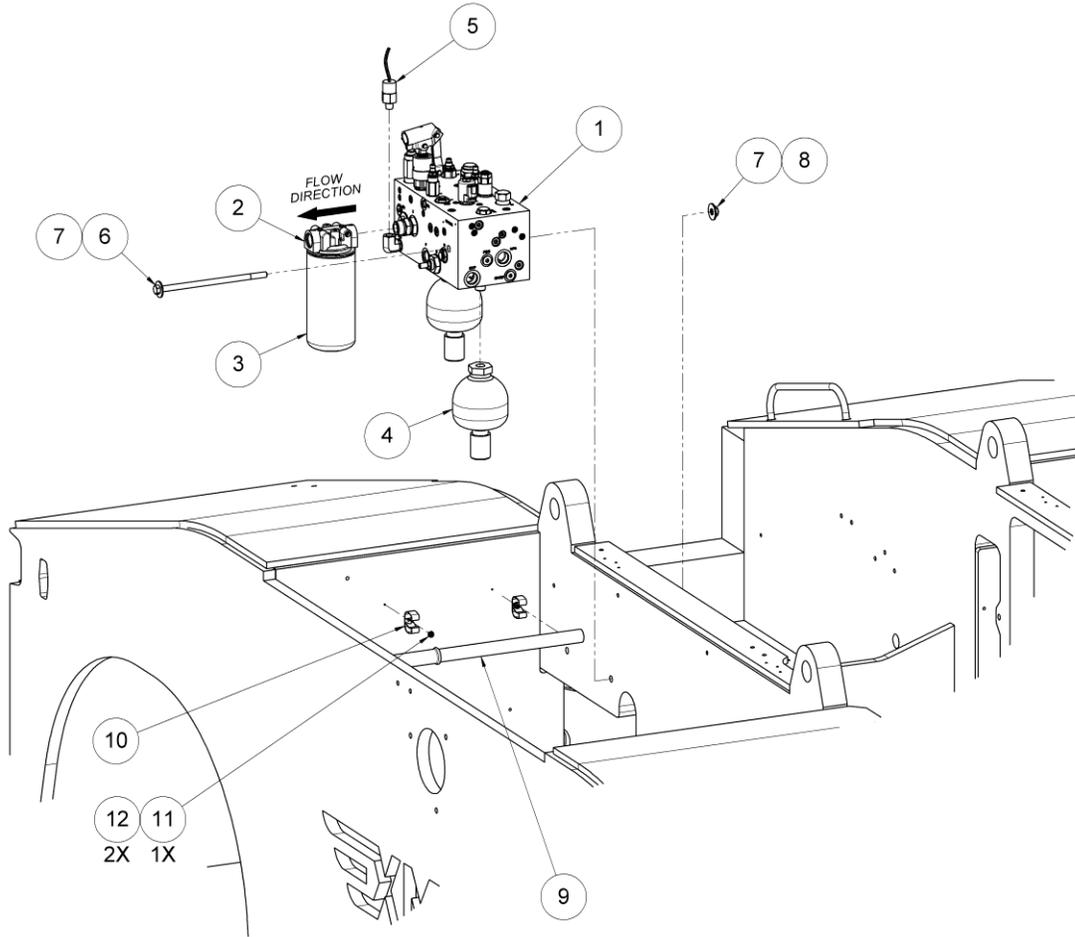
A Install all components using Loctite® Thread Locker Red 263® thread retaining compound or comparable.

Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|---|-----|
| 1 | NVSP-24-015-CC | DUAL 9.5MM PROFILED TUBE CLAMP BODY, 2 HALVES | 15 |
| 2 | NVSP-24-017-CE | DUAL GROUP 1D COVER PLATE | 13 |
| 3 | NPN | HEX NUT, 1/4-20 UNC | 13 |
| 4 | NVSP-24-015-CN | DUAL 16MM PROFILED TUBE CLAMP BODY, 2 HALVES | 5 |
| 5 | NVSP-24-017-CC | DUAL GROUP 2D COVER PLATE | 5 |
| 6 | NPN | HEX NUT, 5/16-18 UNC | 5 |

11.7 MANIFOLD BLOCK INSTALL



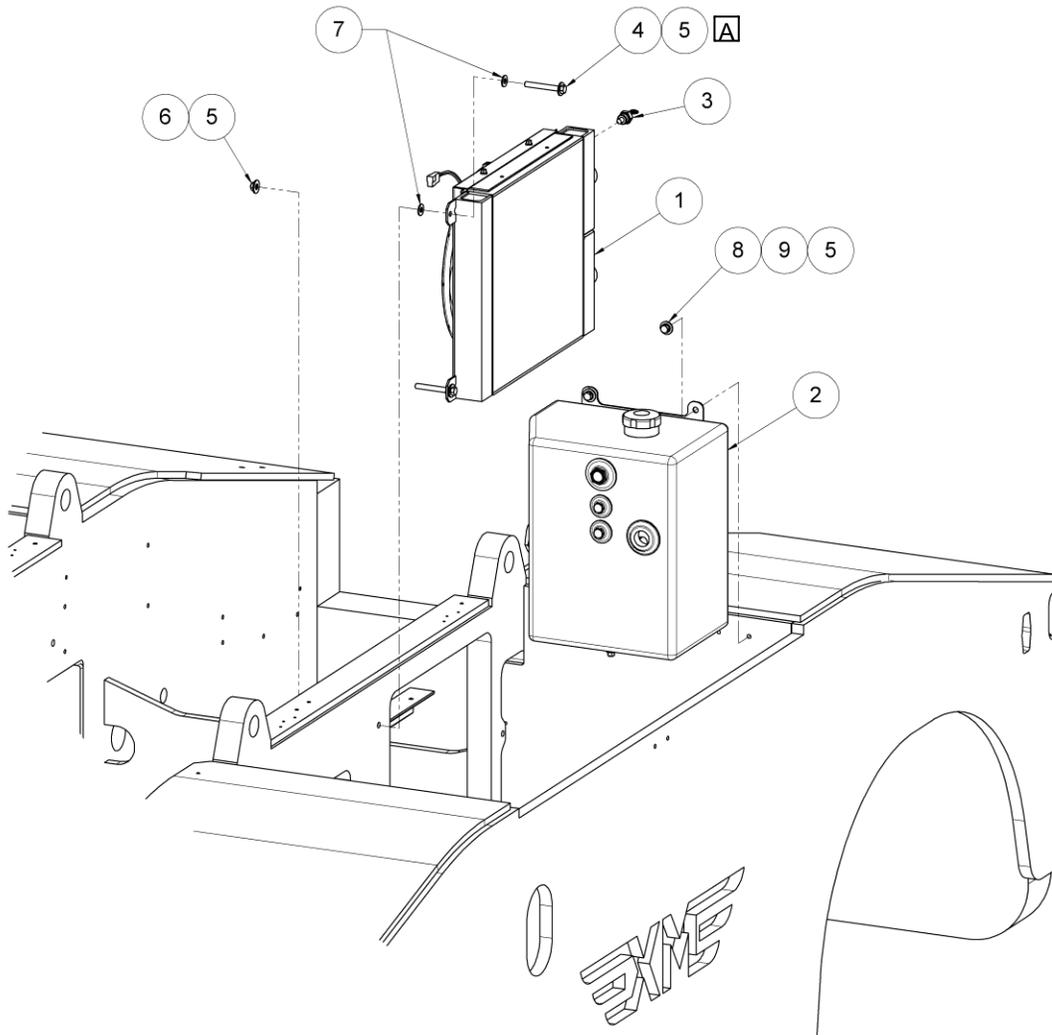
Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|---|-----|
| 1 | XM00-09-003-SA | MANIFOLD ASSEMBLY | 1 |
| 2 | A-ES12-0486 | FILTER HEAD | 1 |
| 3 | NVSP-09-018-CA | FILTER ELEMENT | 1 |
| 4 | A-MTT5-0453 | ACCUMULATOR, 30 CU INCH | 2 |
| 5 | NVSP-09-016-CA | SAHR PRESSURE SWITCH | 1 |
| 6 | NPN | HCS, 7/16-14 UNC X 9 | 2 |
| 7 | NPN | FLAT WASHER, 7/16 | 4 |
| 8 | NPN | LOCK NUT, 7/16-14 UNC | 2 |
| 9 | NPN | HAND VALVE LEVER ARM, Ø1 X 16 LONG (INCLUDED WITH ITEM 1) | 1 |
| 10 | NVSP-24-037-CA | SPRING CLAMP | 2 |
| 11 | NPN | PHS, #6-32 UNC X .375 | 2 |
| 12 | NPN | FLAT WASHER, #6 | 4 |

Item 1, see accumulator charge valve adjustment procedure in section 8.0 Trouble Shooting after installation

11.8 TANK AND COOLER INSTALL



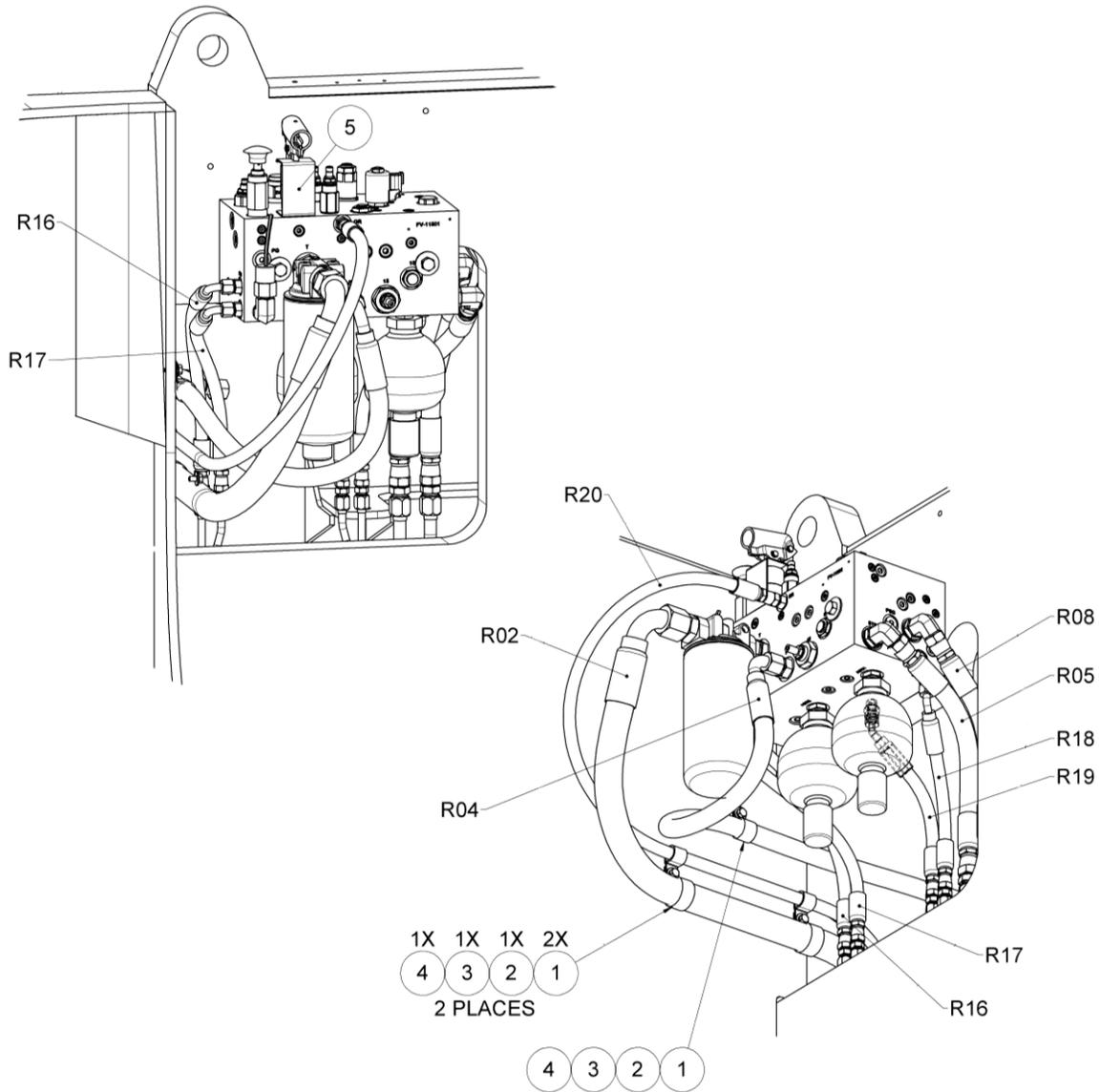
A Tighten securely, but do not torque down. Cooler must be free to expand and contract with temperature change.

Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|-----------------------|-----|
| 1 | XM00-08-002-SA | HYDRAULIC COOLER | 1 |
| 2 | XM00-09-004-SA | TANK ASSEMBLY | 1 |
| 3 | ET00-08-001-CA | FAN TEMP SWITCH | 1 |
| 4 | NPN | HCS, 3/8-16 UNC X 3 | 3 |
| 5 | NPN | FLAT WASHER, 3/8 | 9 |
| 6 | NPN | LOCK NUT, 3/8-16 UNC | 3 |
| 7 | NVSP-21-024-CA | PTFE WASHER, 3/8 | 6 |
| 8 | NPN | HCS, 3/8-16 UNC X .75 | 3 |
| 9 | NPN | LOCK WASHER, 3/8 | 3 |
| N/S | H002286 | SUCTION STRAINER | 1 |

11.9 HOSE ROUTING, REAR

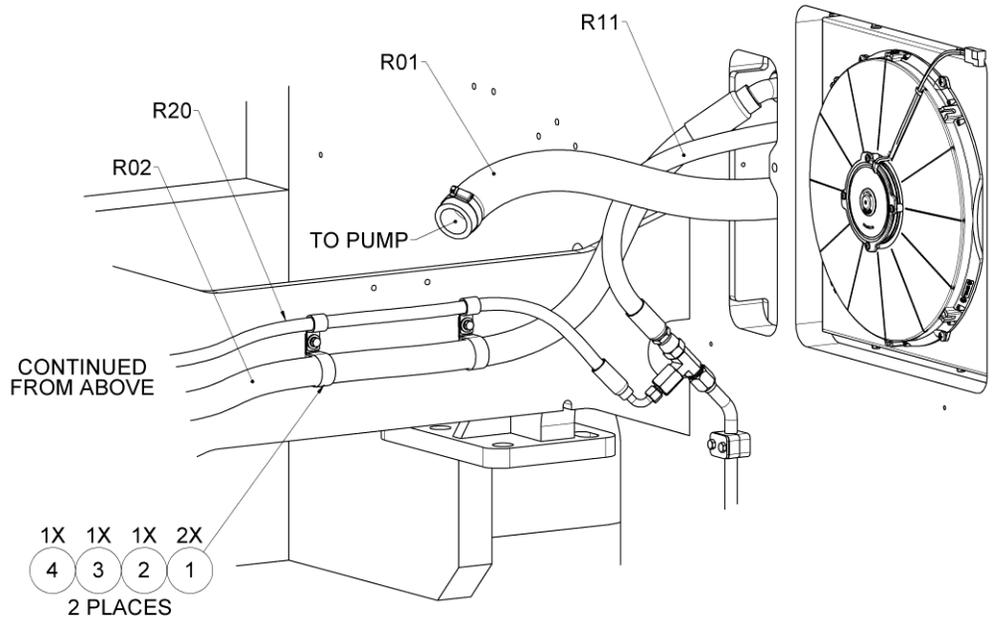
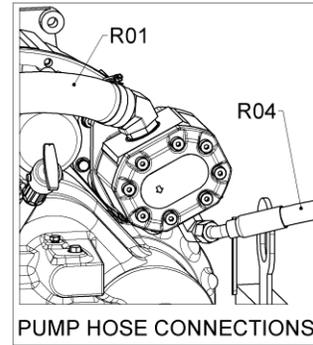
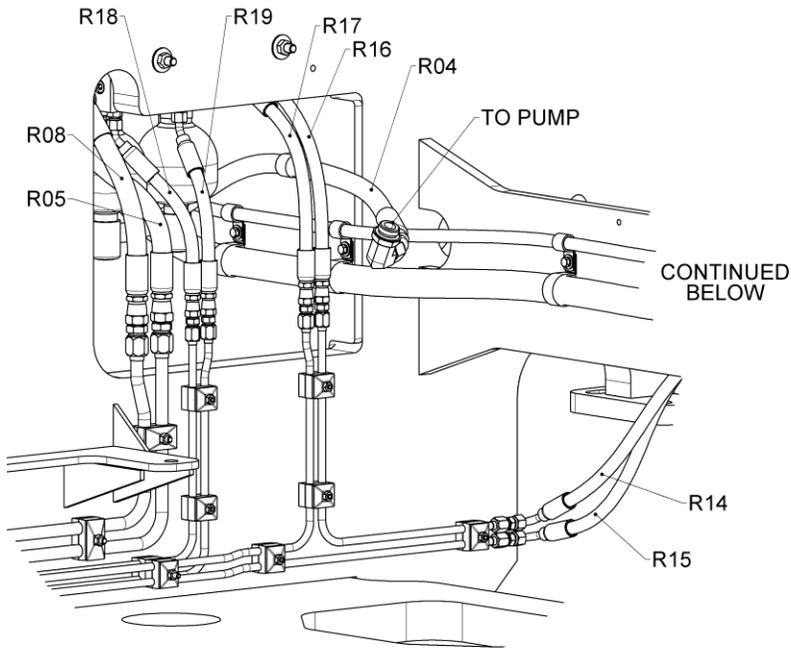


Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|-----------------------------|-----|
| 1 | NPN | CUSHIONED LOOP CLAMP | 5 |
| 2 | NPN | HCS, 1/4-20 UNC X .75 | 3 |
| 3 | NPN | LOCK WASHER, 1/4 | 3 |
| 4 | NPN | FLAT WASHER, 1/4 | 3 |
| 5 | XM00-09-006-SA | HAND VALVE RETAINER BRACKET | 1 |

11.9 HOSE ROUTING, REAR (continued)

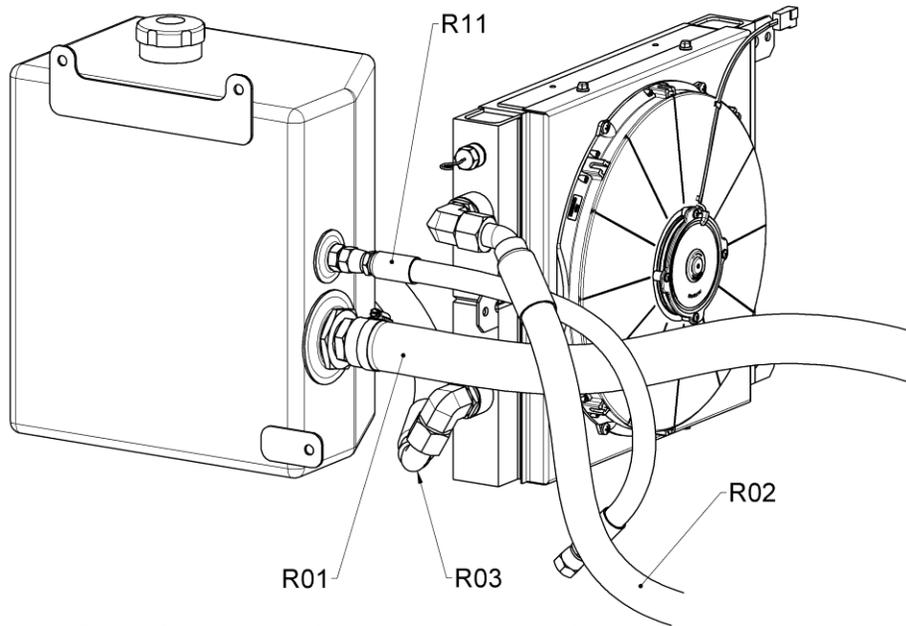


Parts List

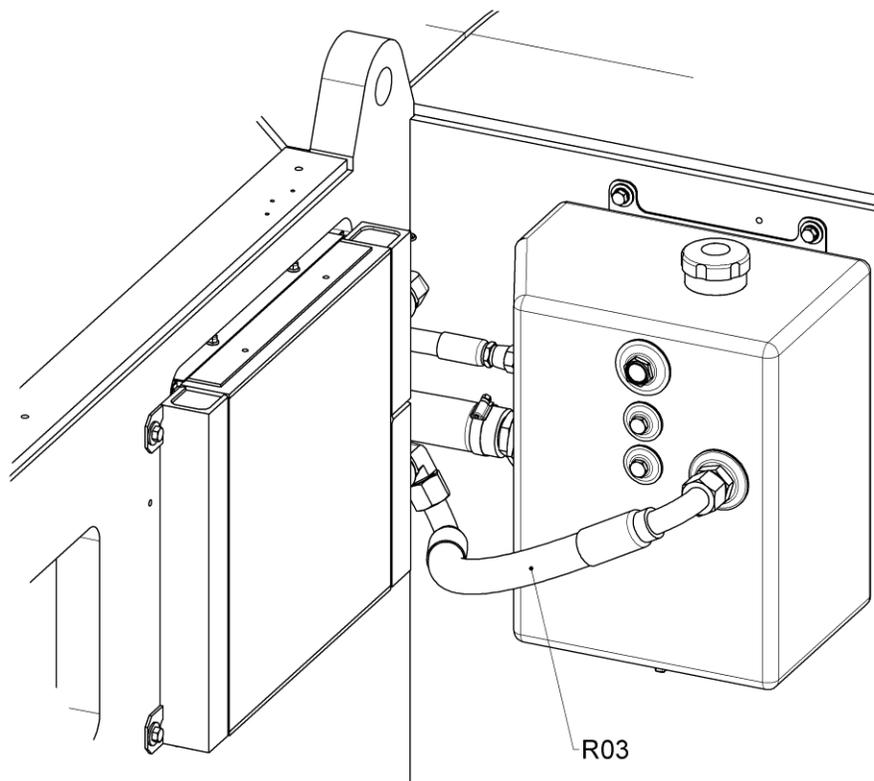
When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|-------------|-----------------------|-----|
| 1 | NPN | CUSHIONED LOOP CLAMP | 5 |
| 2 | NPN | HCS, 1/4-20 UNC X .75 | 3 |
| 3 | NPN | LOCK WASHER, 1/4 | 3 |
| 4 | NPN | FLAT WASHER, 1/4 | 3 |

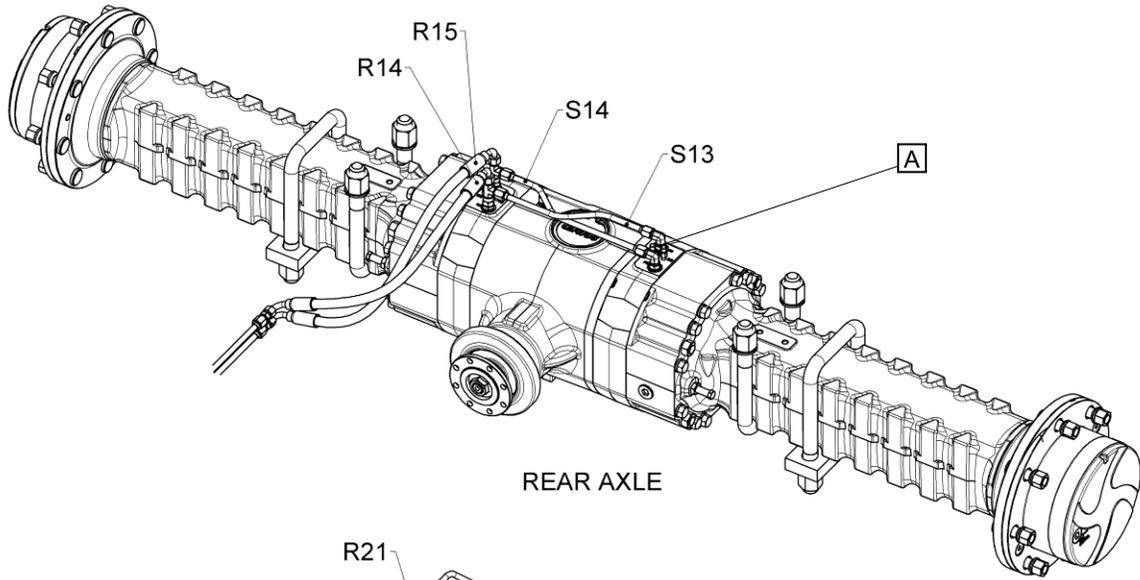
11.9 HOSE ROUTING, REAR (continued)



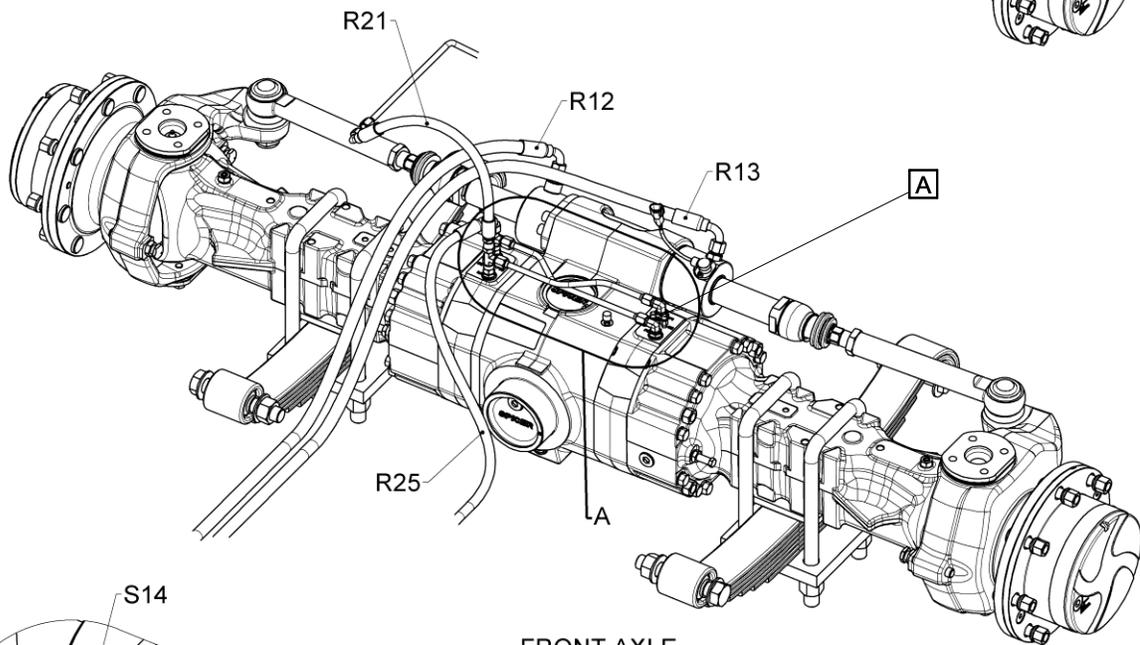
COMPONENTS SHOWN WITHOUT CHASSIS
TO CLARIFY HOSE CONNECTONS



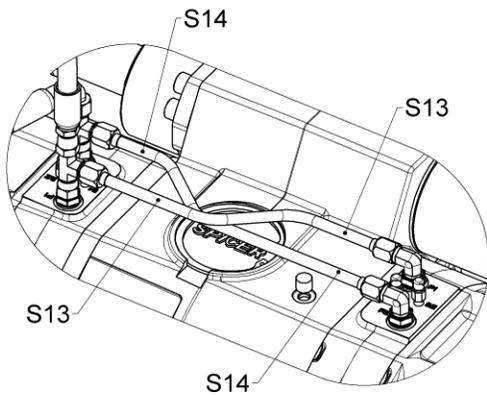
11.10 HOSE ROUTING, AXLES



REAR AXLE



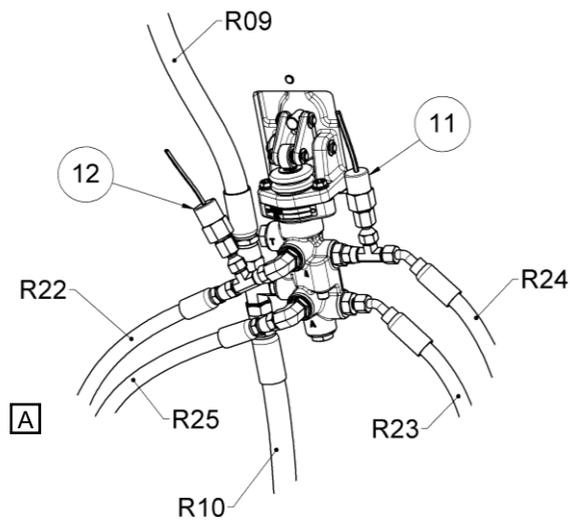
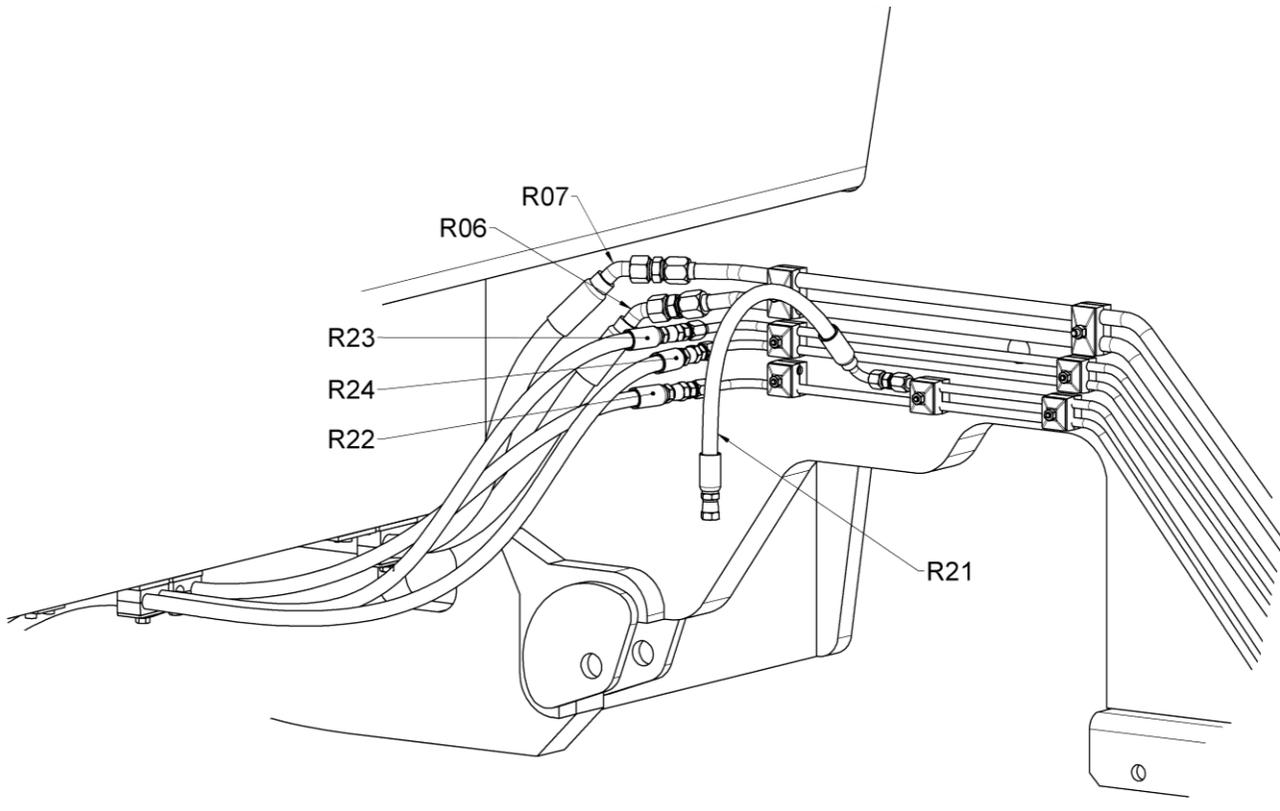
FRONT AXLE



DETAIL A
FRONT AND REAR

These axle fittings should have o-ring spacers removed before assembly to axle.

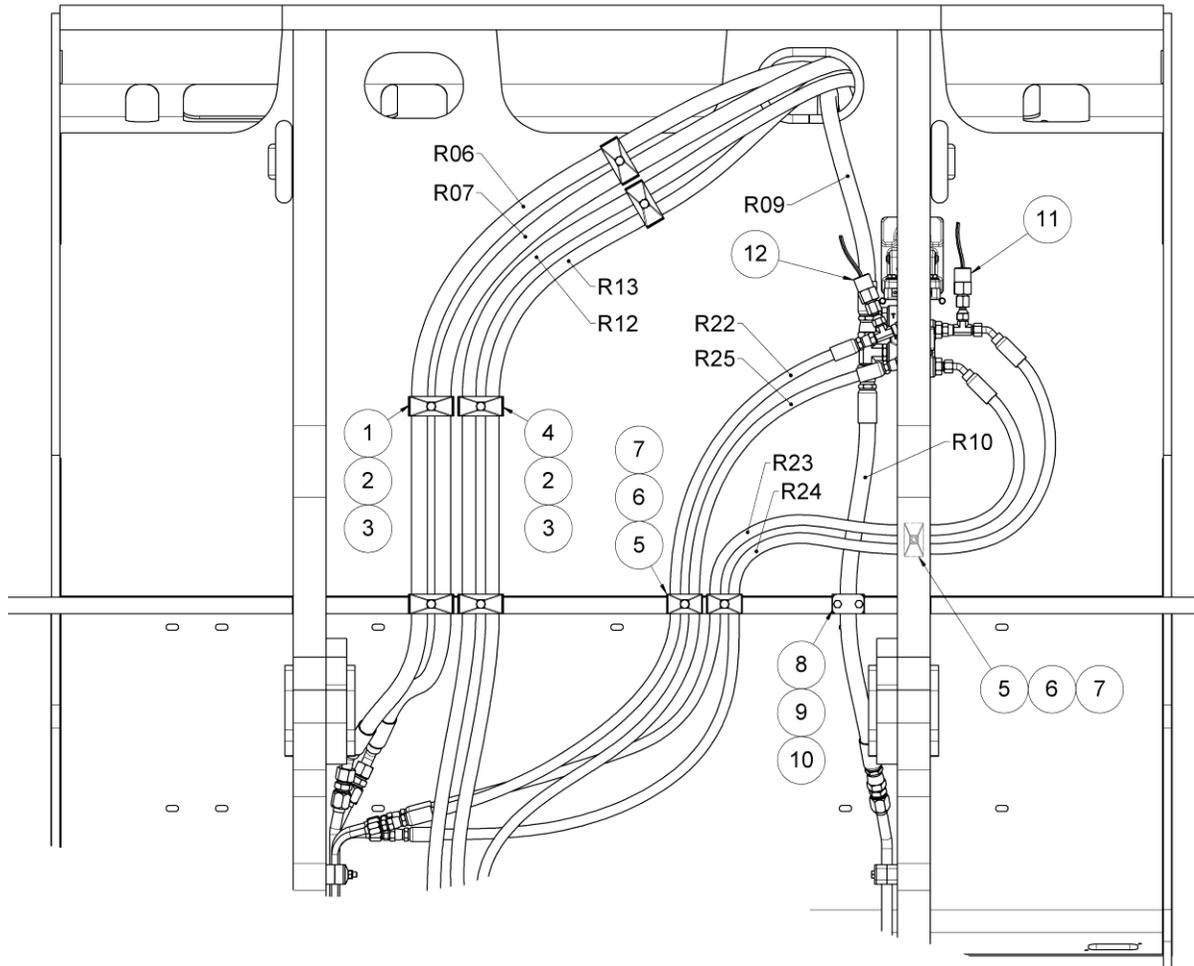
11.11 HOSE ROUTING, FRONT



BRAKE VALVE HOSES

A Tee fitting installed to “T” port on brake valve must be installed prior to installing brake valve.

11.11 HOSE ROUTING, FRONT (continued)



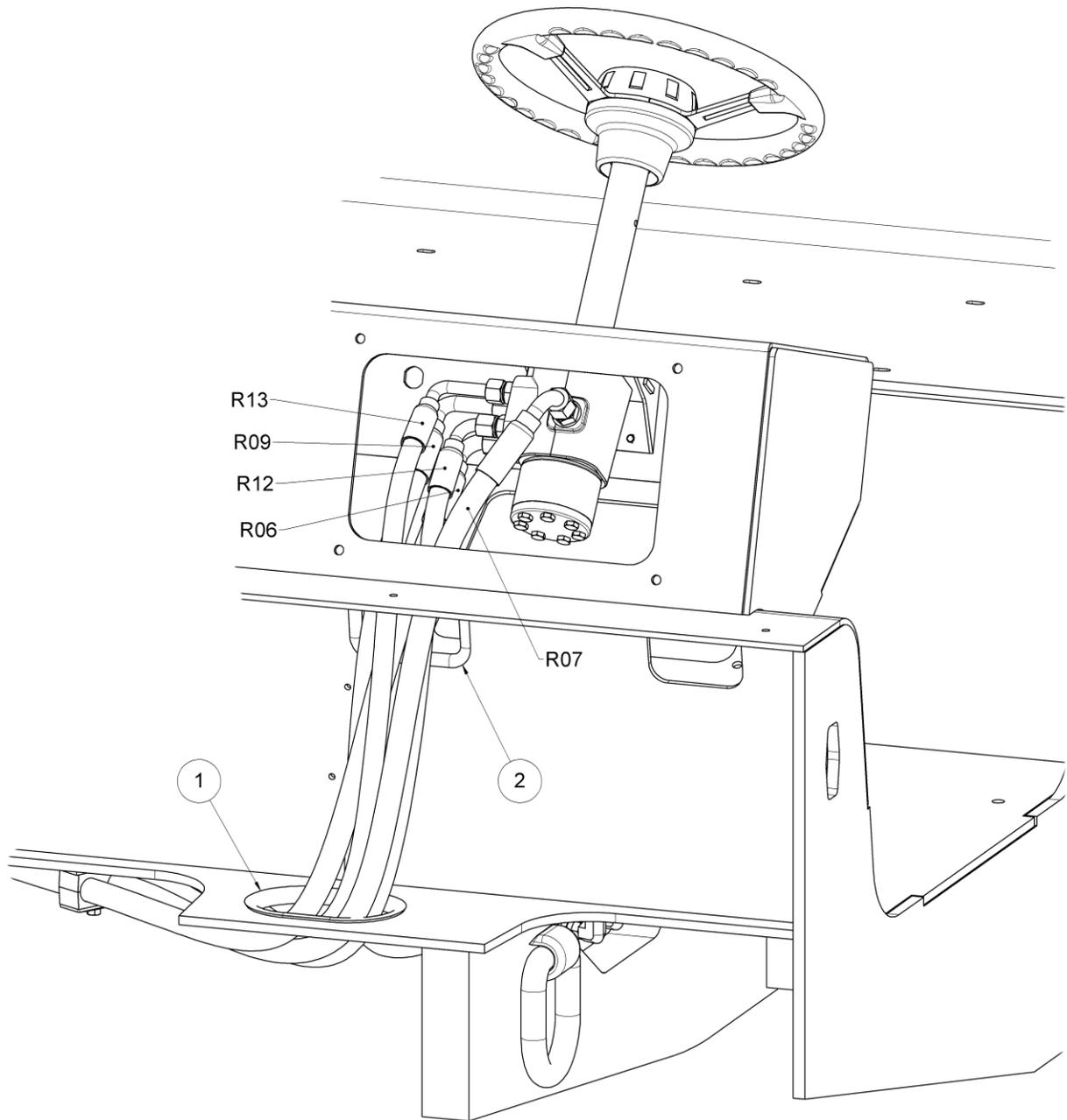
Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|--|-----|
| 1 | NVSP-24-015-CK | DUAL 25MM SMOOTH BORE CLAMP BODY, 2 HALVES | 3 |
| 2 | NVSP-24-017-CF | DUAL GROUP 3D COVER PLATE | 6 |
| 3 | NPN | HCS, 5/16-18 UNC X 1.75 | 6 |
| 4 | NVSP-24-015-CL | DUAL 21.3MM SMOOTH BORE CLAMP BODY, 2 HALVES | 3 |
| 5 | NVSP-24-015-CG | DUAL 16MM SMOOTH BORE CLAMP BODY, 2 HALVES | 3 |
| 6 | NVSP-24-017-CC | DUAL GROUP 2D COVER PLATE | 3 |
| 7 | NPN | HCS, 5/16-18 UNC X 1.5 | 3 |
| 8 | NVSP-24-015-CJ | SINGLE 25MM SMOOTH BORE CLAMP BODY, 2 HALVES | 1 |
| 9 | NVSP-24-017-CG | SINGLE GROUP 3 COVER PLATE | 1 |
| 10 | NPN | HCS, 1/4-20 UNC X 1.5 | 2 |
| 11 | NVSP-09-017-CA | PRESSURE SWITCH, BRAKE ACCUMULATOR | 1 |
| 12 | NVSP-09-002-CA | PRESSURE SWITCH, BRAKE | 1 |

See Section 15.0 Operator Interface for Brake Valve information.

11.11 HOSE ROUTING, FRONT (continued)



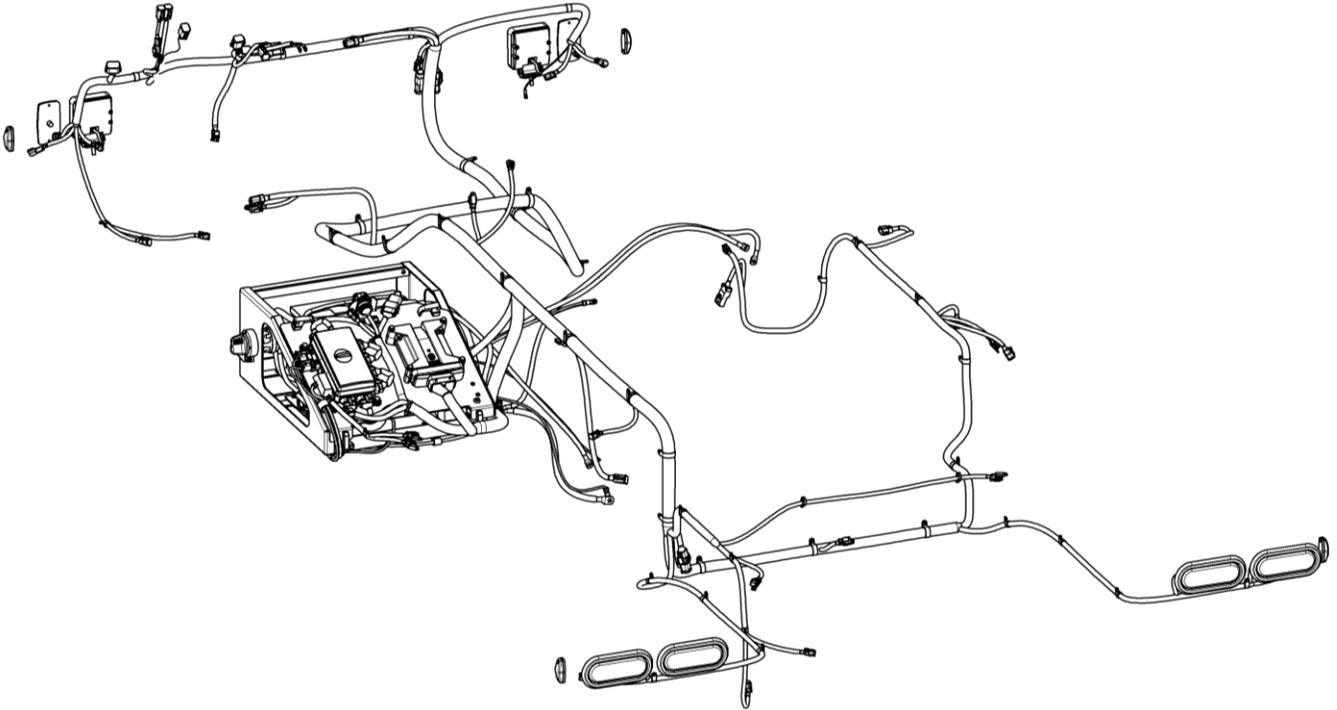
Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

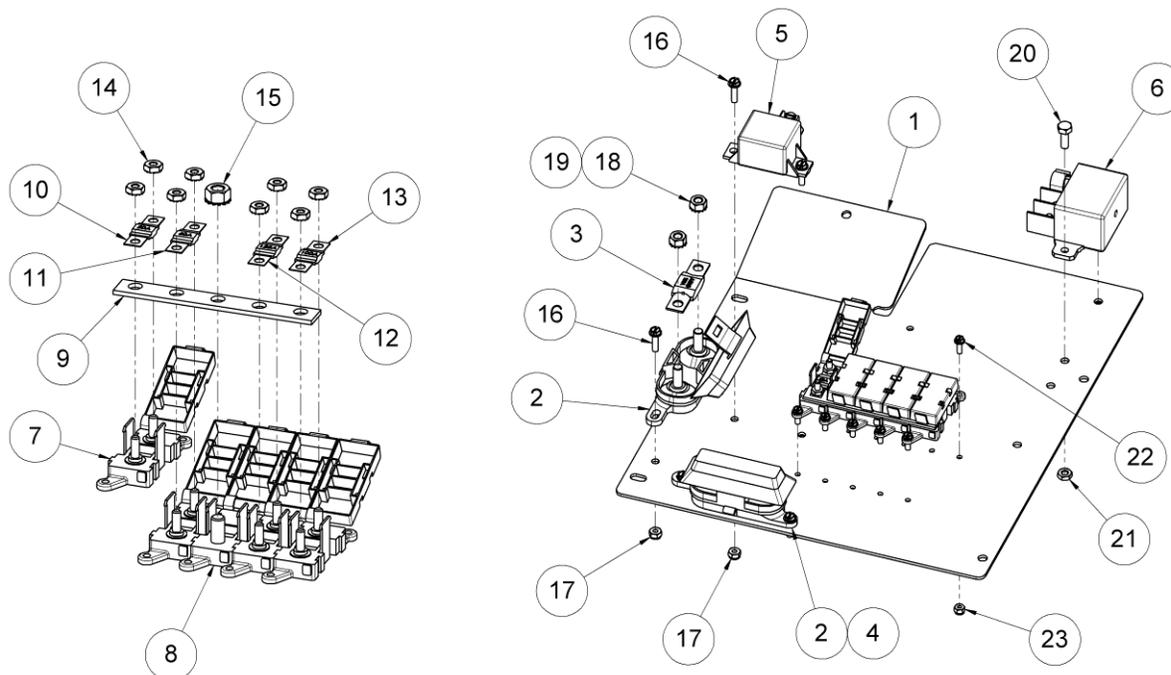
| Item | Part Number | Description | Qty |
|------|-------------|----------------------------------|-----|
| 1 | H10106 | HOSE, SLICED ALONG LENGTH, 16.5" | 1 |
| 2 | H10106 | HOSE, SLICED ALONG LENGTH, 18.5" | 1 |

See Section 15.0 Operator Interface for Steering Orbital information.

12.0 ELECTRICAL SYSTEM



12.1 RELAY AND FUSE PANEL SUBASSEMBLY



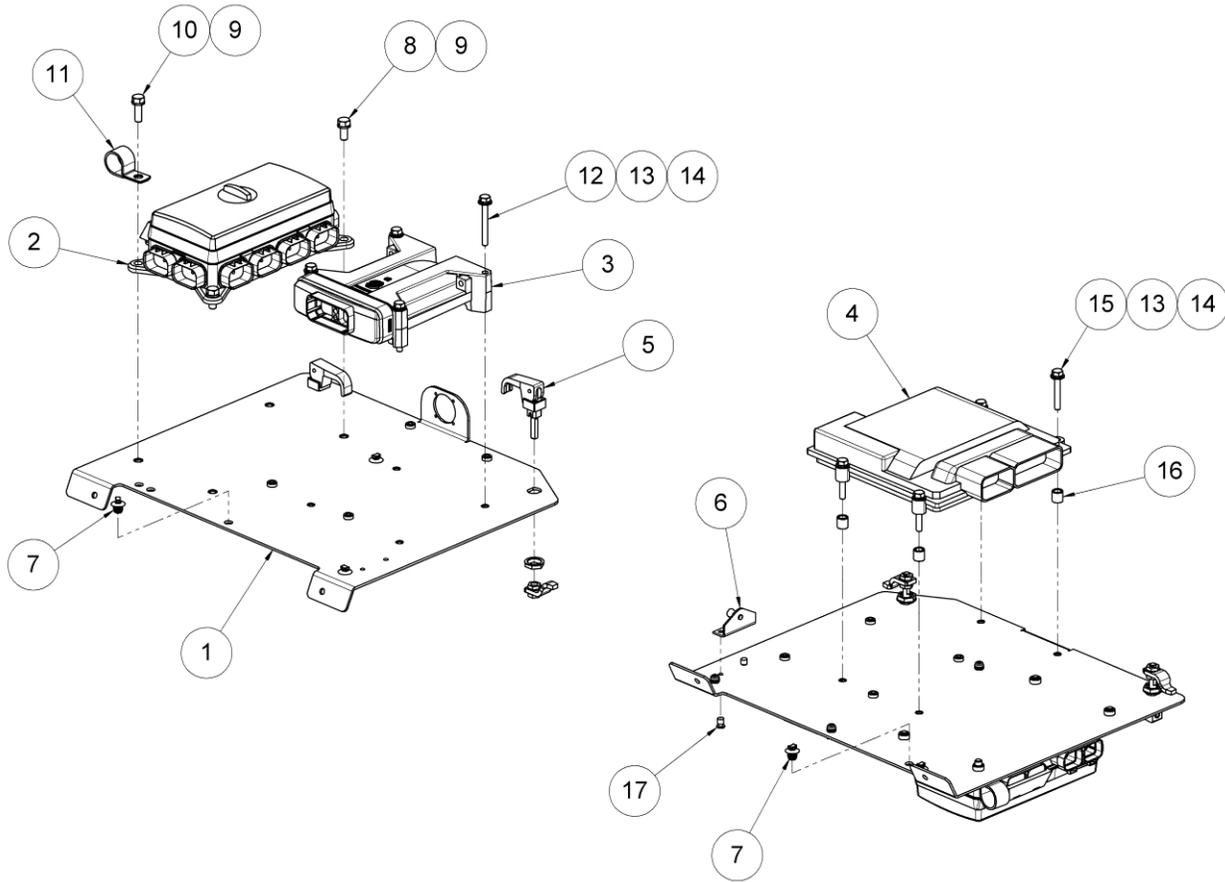
Additional components are installed if cab option is installed. See separate document.

Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|---|-----|
| 1 | XM00-02-013-SA | BOTTOM FUSE AND RELAY MOUNTING PANEL | 1 |
| 2 | NVSP-05-014-CA | FUSE HOLDER, AMG | 2 |
| 3 | NVSP-05-022-CA | FUSE, AMG, 100A | 1 |
| 4 | NVSP-05-023-CA | FUSE, AMG, 200A | 1 |
| 5 | 7A5012 | STARTER RELAY | 1 |
| 6 | NVSP-05-001-CA | PRE-HEAT RELAY | 1 |
| 7 | NVSP-05-025-CA | FUSE HOLDER, LMI | 4 |
| 8 | NVSP-05-024-CA | INPUT MODULE, LMI FUSE | 1 |
| 9 | NVSP-05-026-CA | BUS BAR, LMI | 1 |
| 10 | NVSP-05-027-CA | FUSE, MIDI, 50A | 1 |
| 11 | NVSP-05-028-CA | FUSE, MIDI, 60A | 1 |
| 12 | NVSP-05-030-CA | FUSE, MIDI, 125A | 1 |
| 13 | NVSP-05-029-CA | FUSE, MIDI, 100A | 1 |
| 14 | NPN | STAR LOCK NUT (INCLUDED WITH ITEM 7) | 8 |
| 15 | NPN | STAR LOCK NUT (INCLUDED WITH ITEM 8) | 1 |
| 16 | NPN | HCS, #10-32 UNF X .75 | 6 |
| 17 | NPN | LOCK NUT, #10-32 UNF | 6 |
| 18 | NPN | HEX NUT (INCLUDED WITH ITEM 2) | 4 |
| 19 | NPN | STAR LOCK WASHER (INCLUDED WITH ITEM 2) | 4 |
| 20 | NPN | HCS, 1/4-20 UNC X .75 | 2 |
| 21 | NPN | LOCK NUT, 1/4-20 UNC | 2 |
| 22 | NPN | HCS, #8-32 UNC X .5 | 10 |

12.2 HINGED ELECTRICAL PANEL SUBASSEMBLY

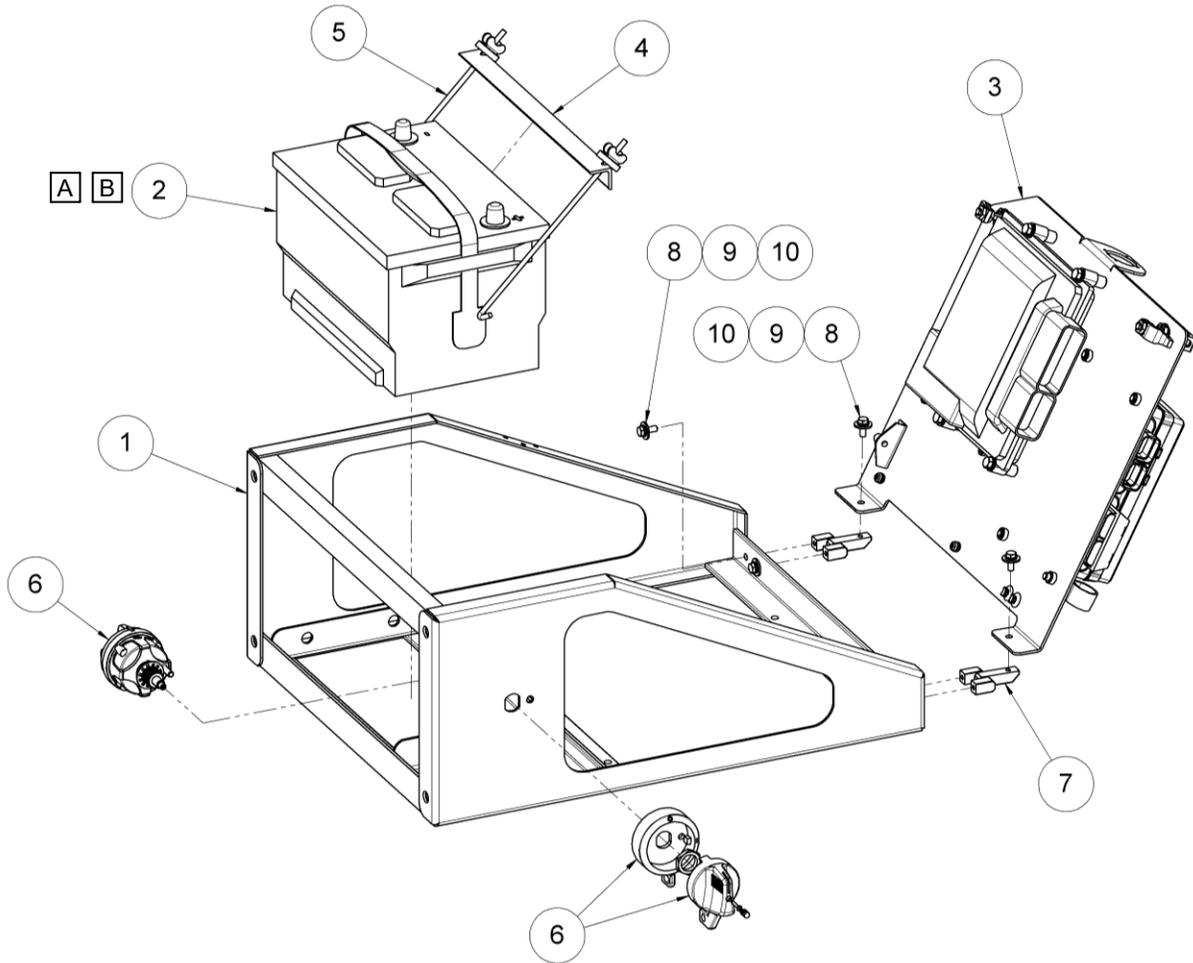


Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|-----------------------------------|-----|
| 1 | XM00-02-014-SA | HINGED ELECTRICAL PANEL | 1 |
| 2 | XM00-05-002-SA | POWER DISTRIBUTION BOX | 1 |
| 3 | XL00-10-002-CA | VEHICLE CONTROLLER MODULE | 1 |
| 4 | NPN | ENGINE CONTROLLER MODULE | 1 |
| 5 | NVSP-24-035-CA | LATCH, ELECTRICAL PANEL | 2 |
| 6 | NVSP-24-029-CA | GAS SHOCK ANCHOR BRACKET | 1 |
| 7 | NVSP-24-022-CA | CABLE TIE ANCHOR, Ø.375 X .27 THK | 5 |
| 8 | NPN | HCS, 5/16-18 UNC X .75 | 3 |
| 9 | NPN | FLAT WASHER, 5/16 | 4 |
| 10 | NPN | HCS, 5/16-18 X 1 | 1 |
| 11 | NPN | CUSHIONED LOOP CLAMP, .75 | 1 |
| 12 | NPN | HCS, 1/4-20 UNC X 2.25 | 4 |
| 13 | NPN | LOCK WASHER, 1/4 | 8 |
| 14 | NPN | FLAT WASHER, 1/4 | 8 |
| 15 | NPN | HCS, 1/4-20 UNC X 1.75 | 4 |
| 16 | NPN | SPACER, Ø.5 OD X .5 TALL | 4 |
| 17 | NPN | ALUMINUM POP RIVET, 3/16 | 2 |

12.3 BATTERY INSTALL



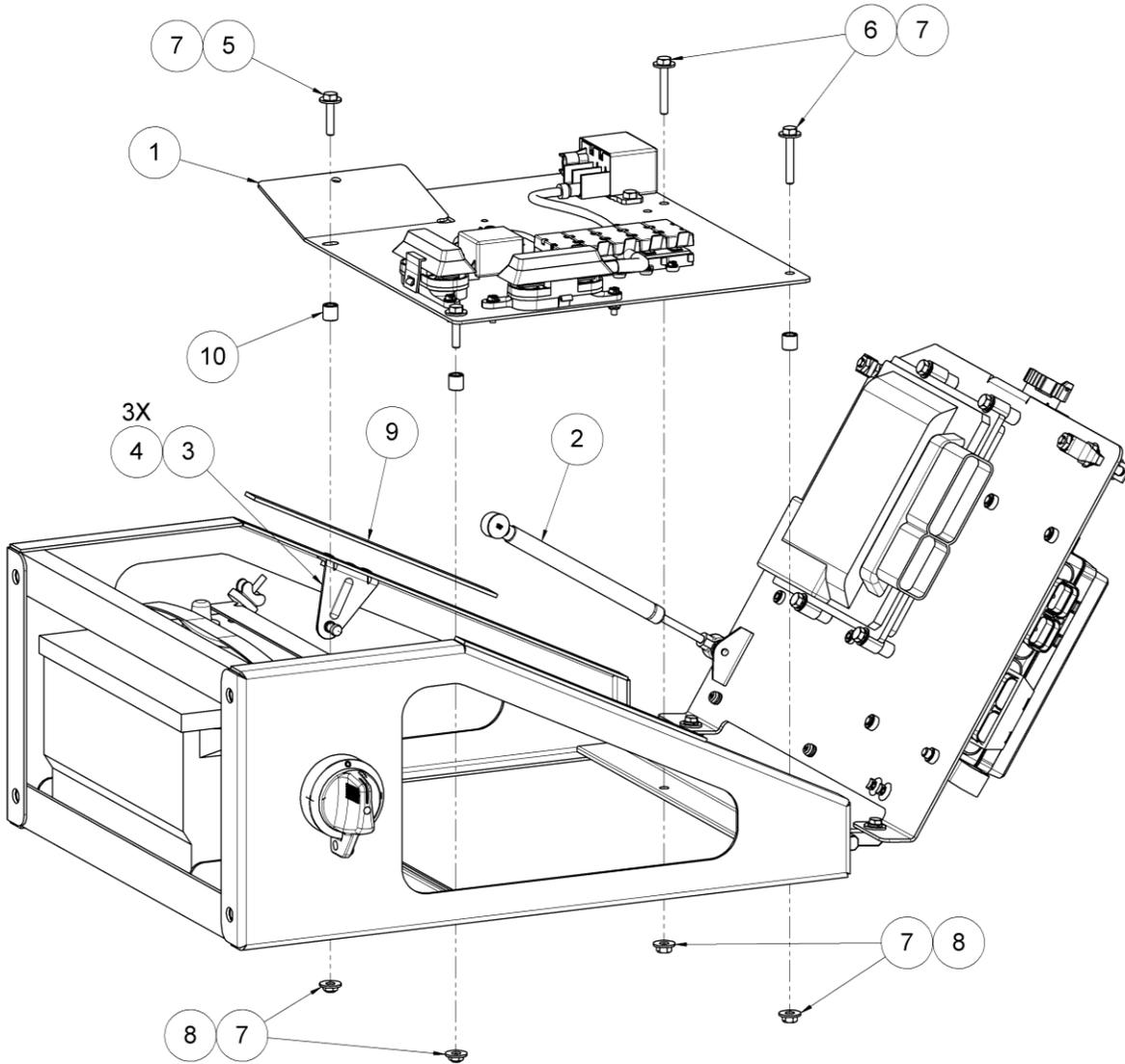
- A** The battery is best installed after the battery tray assembly is installed to the tractor.
- B** Eagle can not supply a replacement battery due to shipping restrictions. Contact local supplier for replacement.

Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|-------------------------------------|-----|
| 1 | XM00-02-012-SA | BATTERY TRAY WELDMENT | 1 |
| 2 | 65-72 | BATTERY, GROUP 65, 850 CCA | 1 |
| 3 | NPN | HINGED ELECTRICAL PANEL SUBASSEMBLY | 1 |
| 4 | NVSP-02-001-AA | BATTERY CLAMP ANGLE | 1 |
| 6 | A-TT3-0002 | BATTERY HOLD-DOWN BOLTS | 1 |
| 6 | NVSP-05-021-CA | BATTERY DISCONNECT SWITCH | 1 |
| 7 | NVSP-24-034-CA | HINGE, ELECTRICAL PANEL | 2 |
| 8 | NPN | HCS, M6X1.0 X 16 | 6 |
| 9 | NPN | LOCK WASHER, M6 | 6 |
| 10 | NPN | FLAT WASHER, M6 | 6 |

12.4 RELAY AND FUSE PANEL INSTALL

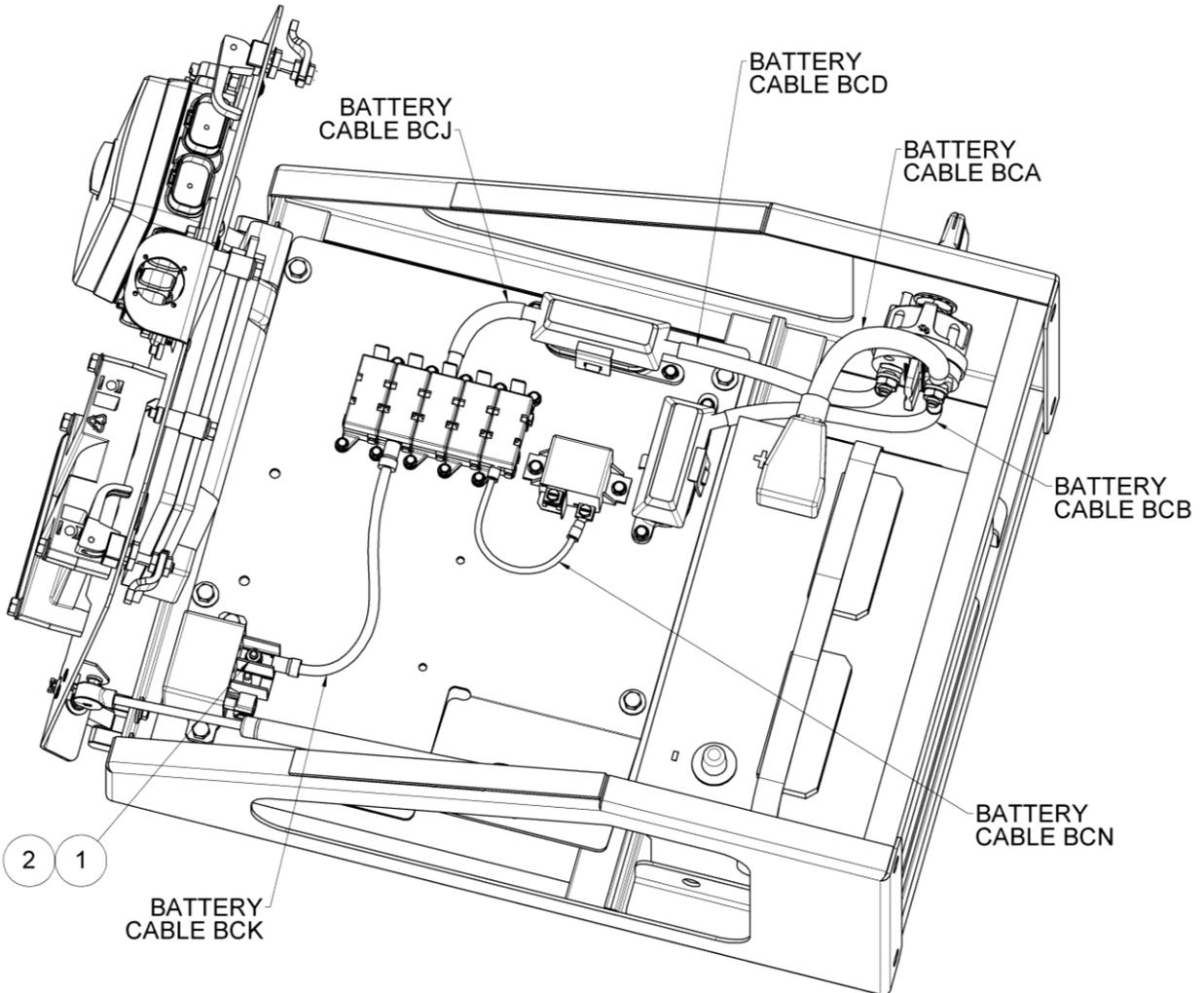


Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|----------------------------------|-----|
| 1 | NPN | RELAY AND FUSE PANEL SUBASSEMBLY | 1 |
| 2 | XM00-14-007-CA | GAS SHOCK | 1 |
| 3 | NVSP-24-036-CA | GAS SHOCK ANCHOR BRACKET | 1 |
| 4 | NPN | ALUMINUM POP RIVET, 3/16 | 3 |
| 6 | NPN | HCS, 1/4-20 UNC X 1.25 | 2 |
| 6 | NPN | HCS, 1/4-20 UNC X 1.75 | 2 |
| 7 | NPN | FLAT WASHER, 1/4 | 8 |
| 8 | NPN | LOCK NUT, 1/4 UNC | 8 |
| 9 | NPN | FOAM TAPE, 10" LONG | 2 |
| 10 | NPN | SPACER, Ø.5 X .5 LONG | 4 |

12.5 BATTERY BOX SUBASSEMBLY WIRING

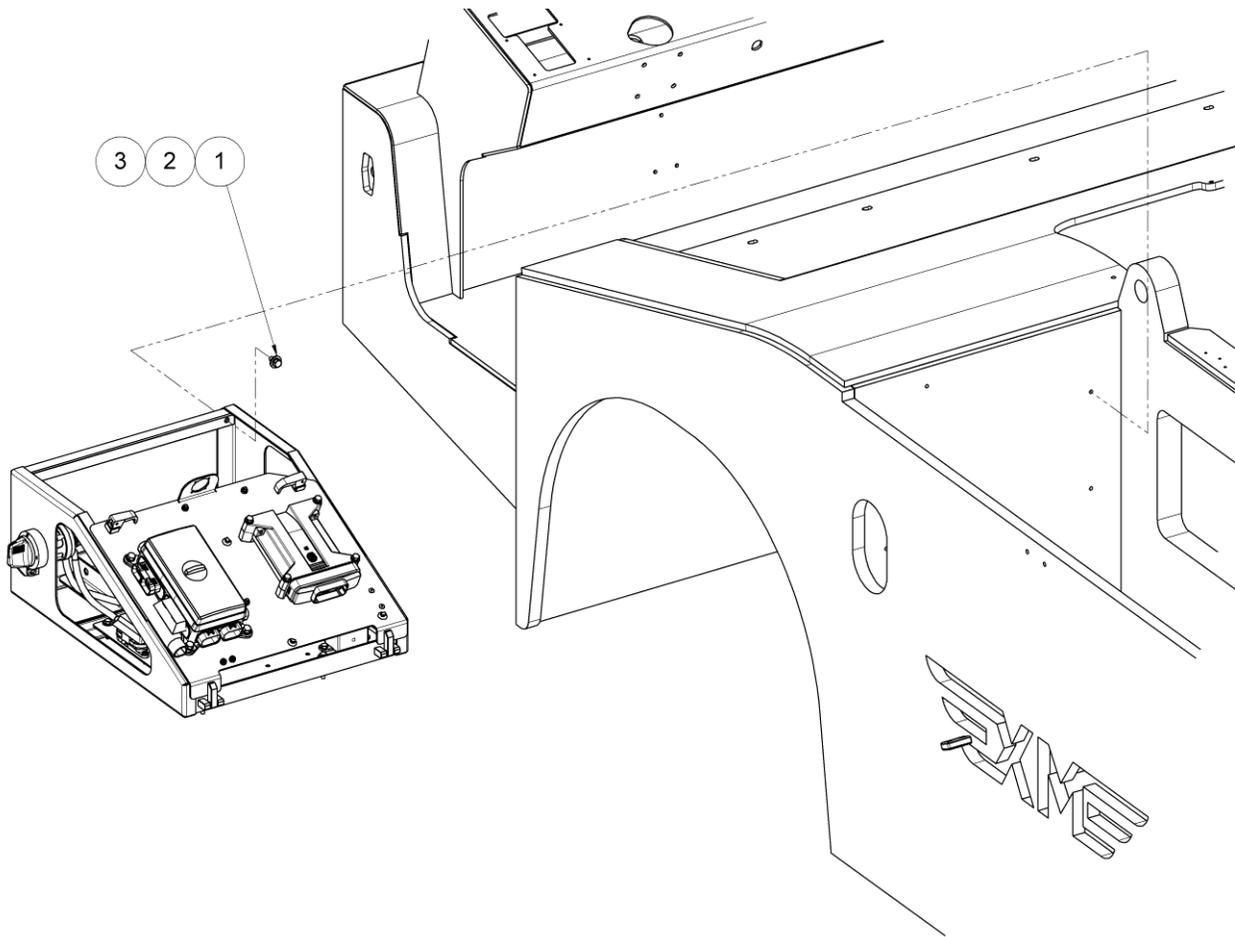


Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|-------------|-----------------|-----|
| 1 | NPN | HEX NUT, M6 | 1 |
| 2 | NPN | LOCK WASHER, M6 | 1 |

12.6 BATTERY SUBASSEMBLY WIRING

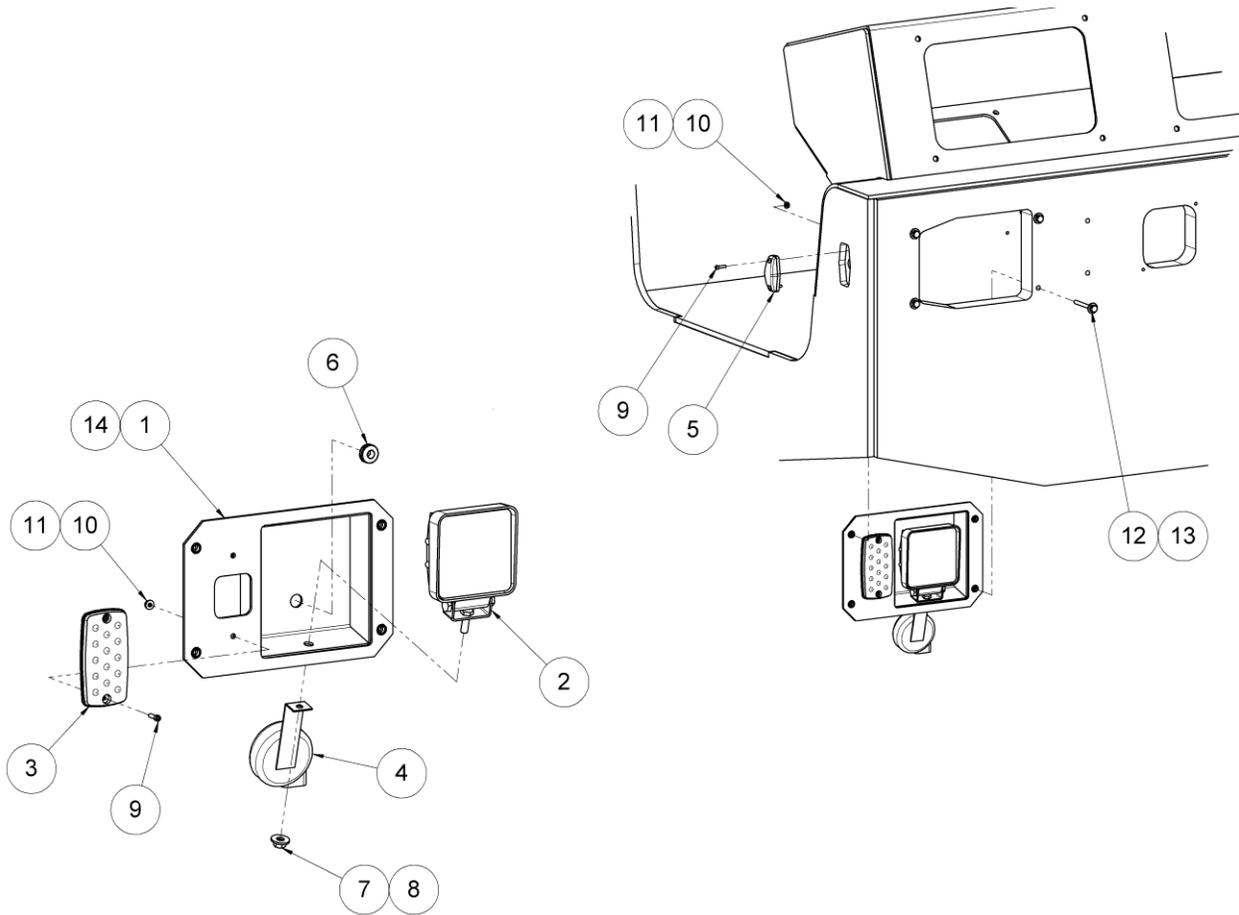


Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|-------------|----------------------|-----|
| 1 | NPN | HCS, 5/16-18 UNC X 1 | 4 |
| 2 | NPN | LOCK WASHER, 5/16 | 4 |
| 3 | NPN | FLAT WASHER, 5/16 | 4 |

12.7 FRONT LIGHTS



Item 4 is installed ONLY at RH headlight.

Item 2 to be wired as shown below.



Item 3 to be wired as shown below.



Item 5 to be wired as shown below.





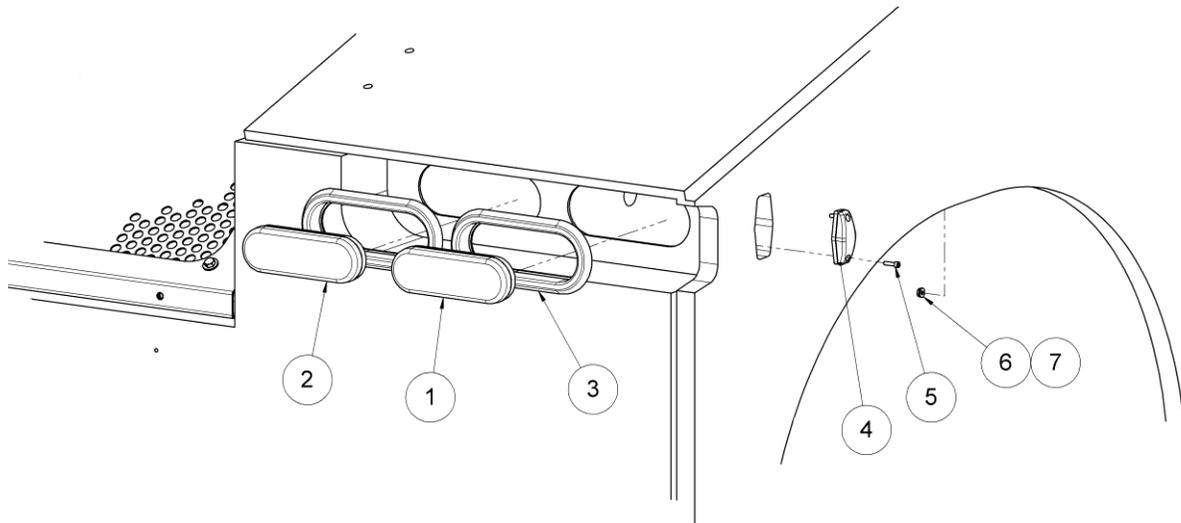
12.7 FRONT LIGHTS (continued)

Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|--|-----|
| 1 | ET12-02-001-SB | HEADLIGHT POCKET WELDMENT, RH | 1 |
| N/A | ET12-02-001-SA | HEADLIGHT POCKET WELDMENT, LH | 1 |
| 2 | NVSP-34-007-CA | HEADLIGHT, LED, SQUARE, 500 LUMENS | 2 |
| 3 | NVSP-34-006-CA | TURN INDICATOR | 2 |
| 4 | A-TT4-0052 | HORN (RIGHT SIDE ONLY) | 1 |
| 5 | A-EXL16-0490-1 | SIDE INDICATOR, AMBER | 2 |
| 6 | AE-OPT-0320-E | SILICONE GROMMET, 3/8" | 2 |
| 7 | NPN | LOCK WASHER (INCLUDED WITH ITEM 2) | 2 |
| 8 | NPN | NUT (INCLUDED WITH ITEM 2) | 2 |
| 9 | NPN | SHCS, #8-32 UNC X .625, SS | 8 |
| 10 | NPN | FLAT WASHER, #8, SS | 8 |
| 11 | NPN | LOCK NUT, NYLON INSERT, #8-32 UNC, SS | 8 |
| 12 | NPN | HCS, 1/4-20 UNC X 2.5 | 8 |
| 13 | NPN | FLAT WASHER, 1/4 | 8 |
| 14 | NPN | RIVNUT, 1/4-20 UNC, OPEN ENDED, .135 GRIP | 8 |
| N/A | DT04-2P | ELECTRICAL CONNECTOR (INSTALLED TO ITEM 2) | 2 |
| N/A | W2P | CONNECTOR LOCK (INSTALLED TO ITEM 2) | 2 |
| N/A | 0460-215-16141 | CONNECTOR PINS (INSTALLED TO ITEM 2) | 4 |
| N/A | DT04-3P | ELECTRICAL CONNECTOR (INSTALLED TO ITEM 3) | 2 |
| N/A | W3P | CONNECTOR LOCK (INSTALLED TO ITEM 3) | 2 |
| N/A | 0460-215-16141 | CONNECTOR PINS (INSTALLED TO ITEM 3) | 6 |
| N/A | DT06-2S | ELECTRICAL CONNECTOR (INSTALLED TO ITEM 5) | 2 |
| N/A | W2S | CONNECTOR LOCK (INSTALLED TO ITEM 5) | 2 |
| N/A | 0462-209-16141 | CONNECTOR SOCKETS (INSTALLED TO ITEM 5) | 4 |

12.8 REAR LIGHTS



Parts List

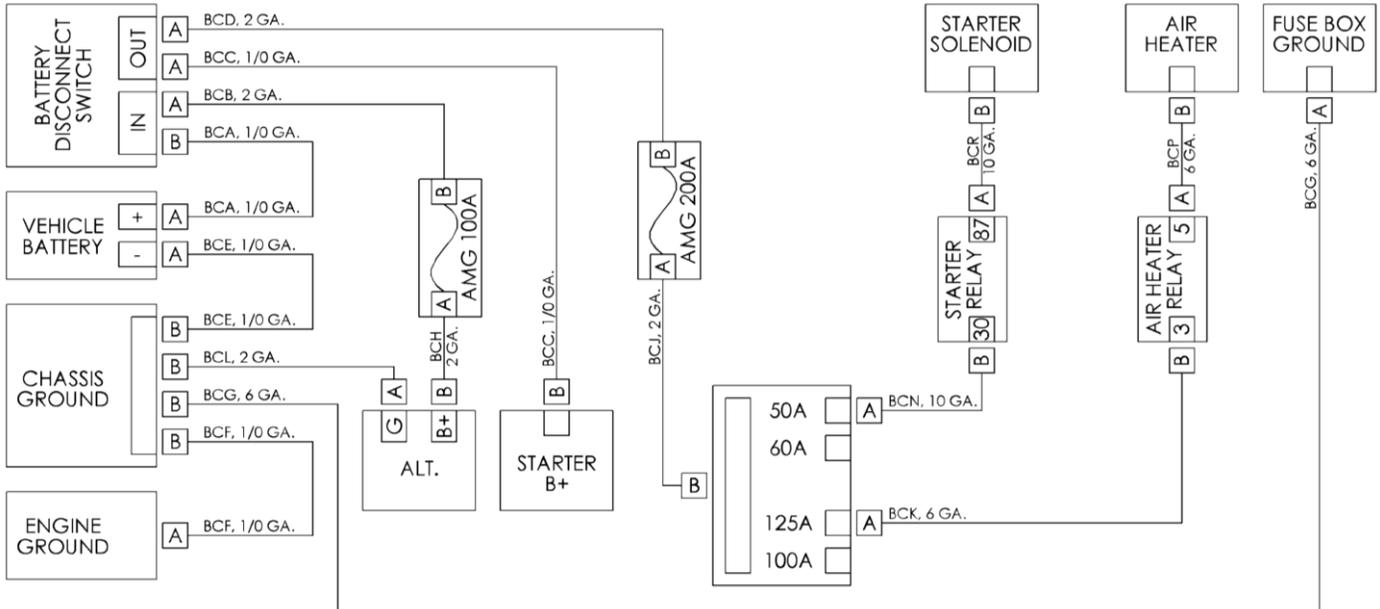
When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|--|-----|
| 1 | A-RTT12E-00292 | STOP LAMP | 2 |
| 2 | A-ES12-0494 | REVERSE LAMP | 2 |
| 3 | A-RTT12E-00287 | LIGHT GROMMET | 4 |
| 4 | NVSP-34-001-CA | SIDE INDICATOR, RED | 2 |
| 5 | NPN | SHCS, #8-32 UNC X .625, SS | 4 |
| 6 | NPN | FLAT WASHER, #8 | 4 |
| 7 | NPN | LOCK NUT, NYLON INSERT, #8-32 UNC, SS | 4 |
| N/A | DT06-2S | ELECTRICAL CONNECTOR (INSTALLED TO ITEM 4) | 2 |
| N/A | W2S | CONNECTOR LOCK (INSTALLED TO ITEM 4) | 2 |
| N/A | 0462-209-16141 | CONNECTOR SOCKETS (INSTALLED TO ITEM 4) | 4 |

Item 4 to be wired as shown below.



12.9 BATTERY CABLES

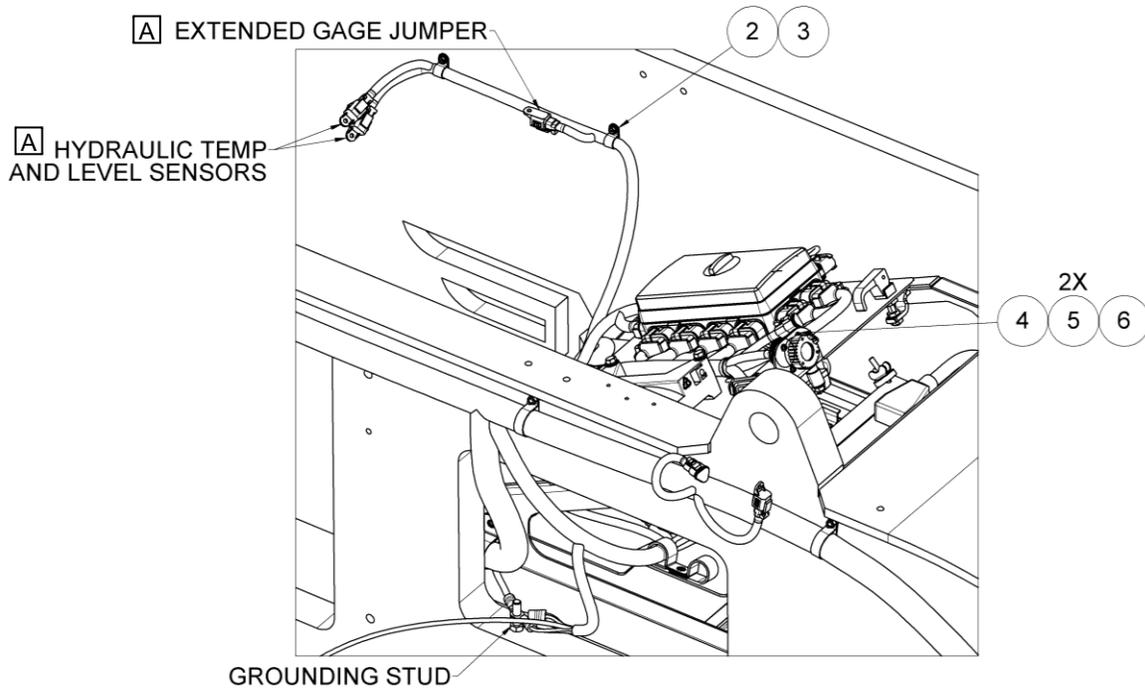
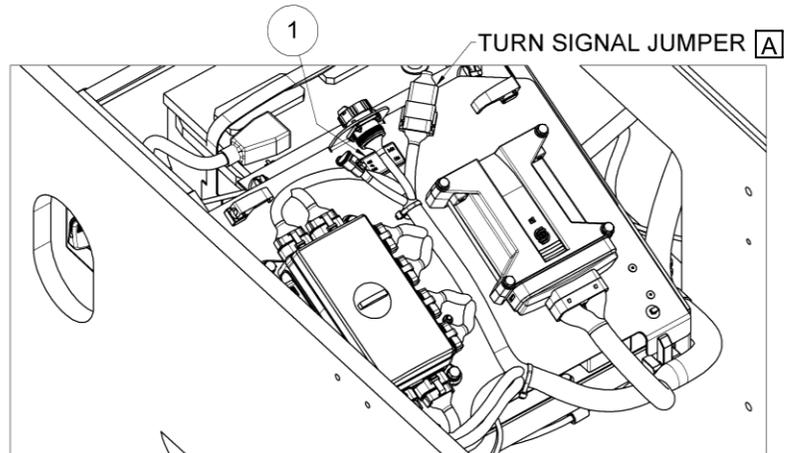


Additional cables are required if cab option is installed. See separate document.

| Item | Wire | | | | End A | | End B | |
|------|------|-------|----------------|--------|----------------------------------|----------------------|----------------|----------------|
| | Gage | Color | P/N | Length | P/N | Type | P/N | Type |
| BCA | 1/0 | RED | NVSP-33-010-CA | 8 | NVSP-05-036-CA NVSP-05-037-CA | POSITIVE W/ COVER | NVSP-05-038-CA | 3/8" LUG |
| BCB | 2 | RED | NVSP-33-003-CA | 9 | NVSP-33-001-CC | 3/8" LUG | NVSP-33-001-CB | 5/16" LUG |
| BCC | 1/0 | RED | NVSP-33-010-CA | 44 | NVSP-05-038-CA | 3/8" LUG | NVSP-05-038-CB | 5/16" LUG |
| BCD | 2 | RED | NVSP-33-003-CA | 9 | NVSP-33-001-CC | 3/8" LUG | NVSP-33-001-CB | 5/16" LUG |
| BCE | 1/0 | BLACK | A-ES12-0502 | 20 | NVSP-05-039-CA NVSP-33-008-CA | NEGATIVE W/ COVER | NVSP-05-038-CA | 3/8" LUG |
| BCF | 1/0 | BLACK | A-ES12-0502 | 17 | NVSP-05-038-CA | 3/8" LUG | NVSP-05-038-CA | 3/8" LUG |
| BCG | 6 | BLACK | NPN | 35 | NPN | 5/16" RING TERM | NPN | 3/8" RING TERM |
| BCH | 2 | RED | NVSP-33-003-CA | 51 | NVSP-33-001-CB | 5/16" LUG | NVSP-33-001-CA | 1/4" LUG |
| BCJ | 2 | RED | NVSP-33-003-CA | 4 | NVSP-33-001-CC | 3/8" LUG | NVSP-33-001-CC | 3/8" LUG |
| BCK | 6 | RED | NPN | 9 | NPN | #10 RING TERM | NPN | 1/4" RING TERM |
| BCL | 2 | BLACK | NVSP-33-003-CB | 42 | NVSP-33-001-CB | 5/16" LUG | NVSP-33-001-CC | 3/8" LUG |
| BCN | 10 | RED | NPN | 7 | NPN | #10 RING TERM | NPN | #10 RING TERM |
| BCP | 6 | RED | NPN | 31 | NPN | 1/4" RING TERM | NPN | 1/4" RING TERM |
| BCR* | 10 | RED | NPN | 34 | NPN | #10 RING TERM | NPN | 1/4" FQC |

* For Tier3 engines only, replace end A of BCR with a 1/4" female quick connect

12.10 WIRE ROUTING



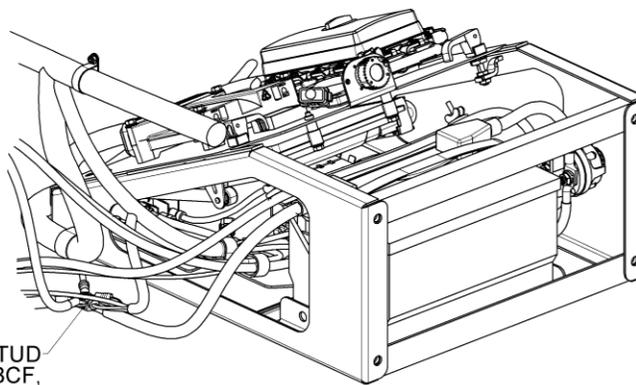
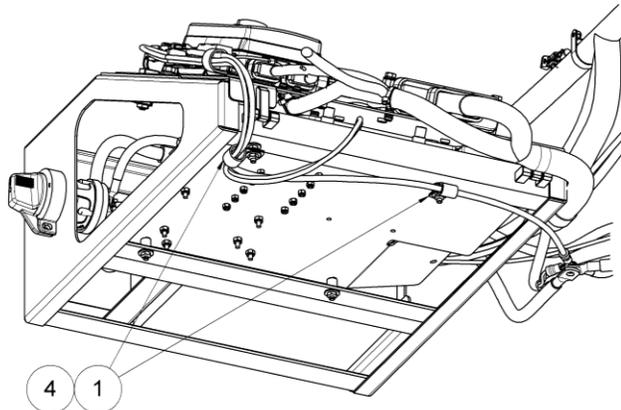
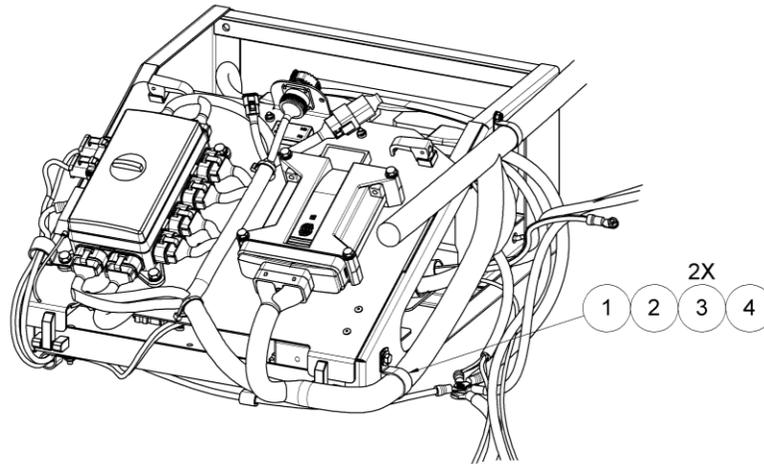
A Connector is tied to harness if optional equipment is not present.

Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|------------------------|-----|
| 1 | XL00-05-020-CB | SIDE INDICATOR FLASHER | 1 |
| 2 | NPN | PLASTIC LOOP CLAMP | 2 |
| 3 | NPN | HCS, #10-32 UNF X .5 | 2 |
| 4 | NPN | HCS, #4-40 UNC X .5 | 4 |
| 5 | NPN | FLAT WASHER, #4 | 8 |
| 6 | NPN | NUT, #4-40 UNC | 4 |

12.10 WIRE ROUTING (continued)



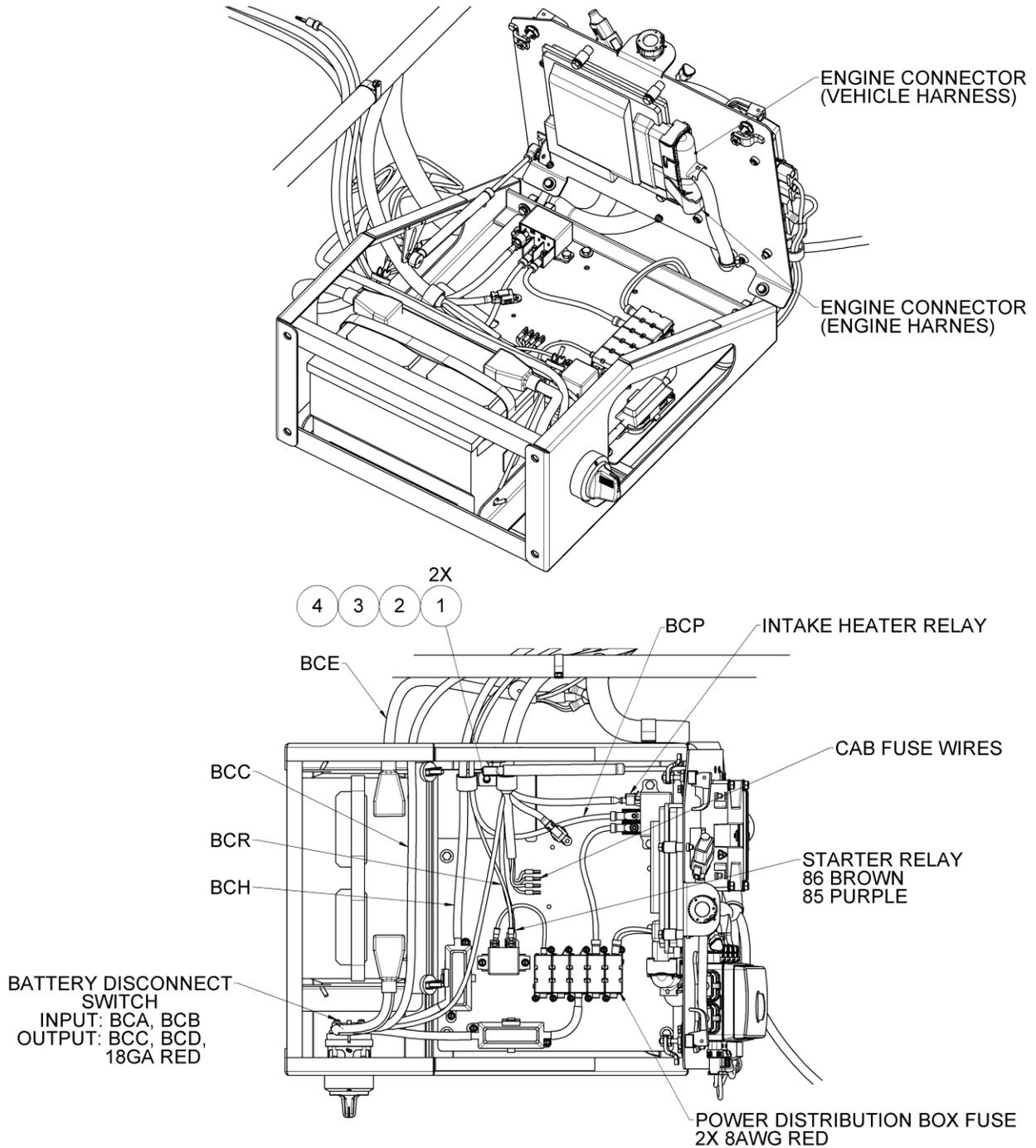
GROUND STUD
BCE, BCG, BCL, BCF,
2X DUAL 12GA BLACK

Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|-------------|----------------------|-----|
| 1 | NPN | CUSHIONED LOOP CLAMP | 3 |
| 2 | NPN | HCS, 1/4-20 UNC X 1 | 1 |
| 3 | NPN | FLAT WASHER, 1/4 | 2 |
| 4 | NPN | LOCK NUT, 1/4-20 UNC | 3 |

12.10 WIRE ROUTING (continued)

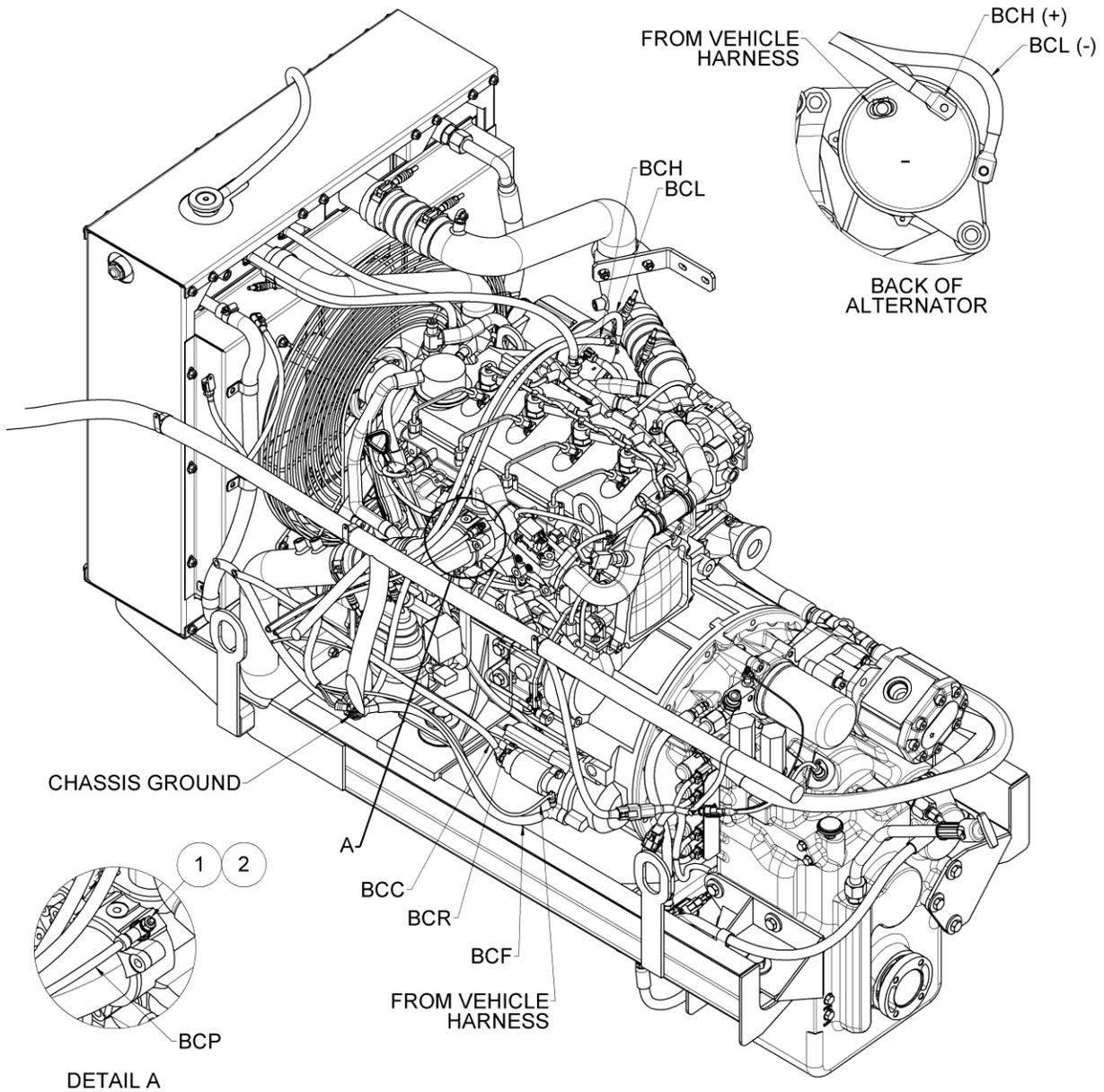


Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|-------------|----------------------|-----|
| 1 | NPN | CUSHIONED LOOP CLAMP | 1 |
| 2 | NPN | HCS, 1/4-20 UNC X 1 | 1 |
| 3 | NPN | FLAT WASHER, 1/4 | 1 |
| 4 | NPN | LOCK NUT, 1/4-20 UNC | 1 |

12.10 WIRE ROUTING (continued)

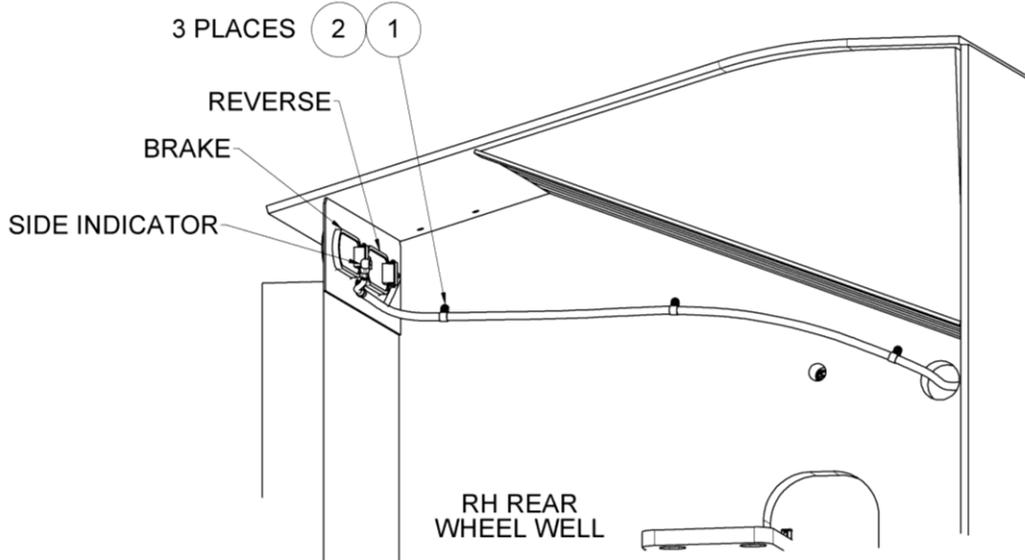
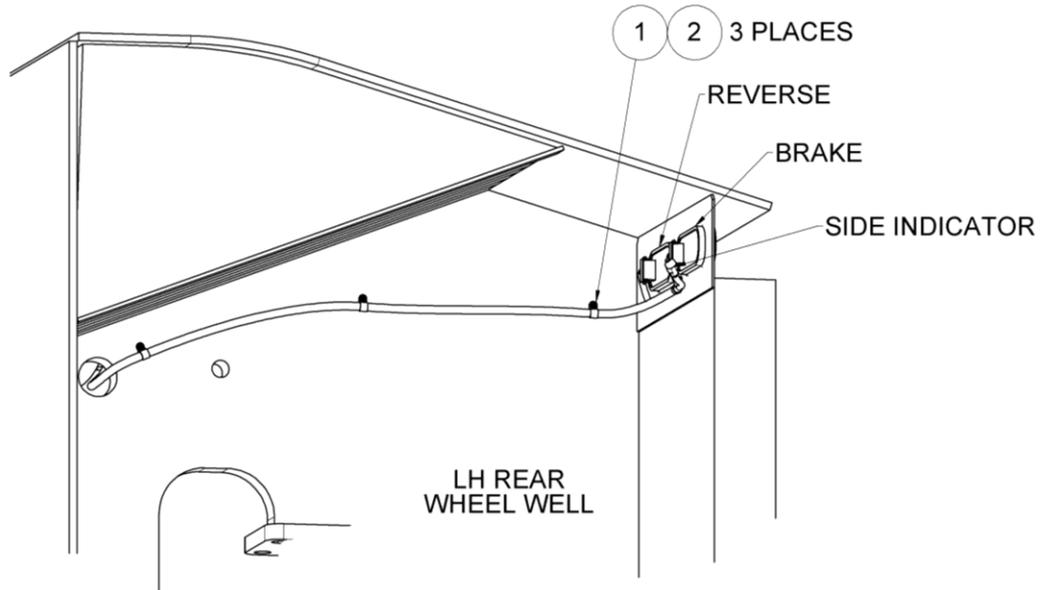


Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|-------------|-----------------|-----|
| 1 | NPN | HEX NUT, M6X1.0 | 1 |
| 2 | NPN | LOCK WASHER, M6 | 1 |

12.10 WIRE ROUTING (continued)

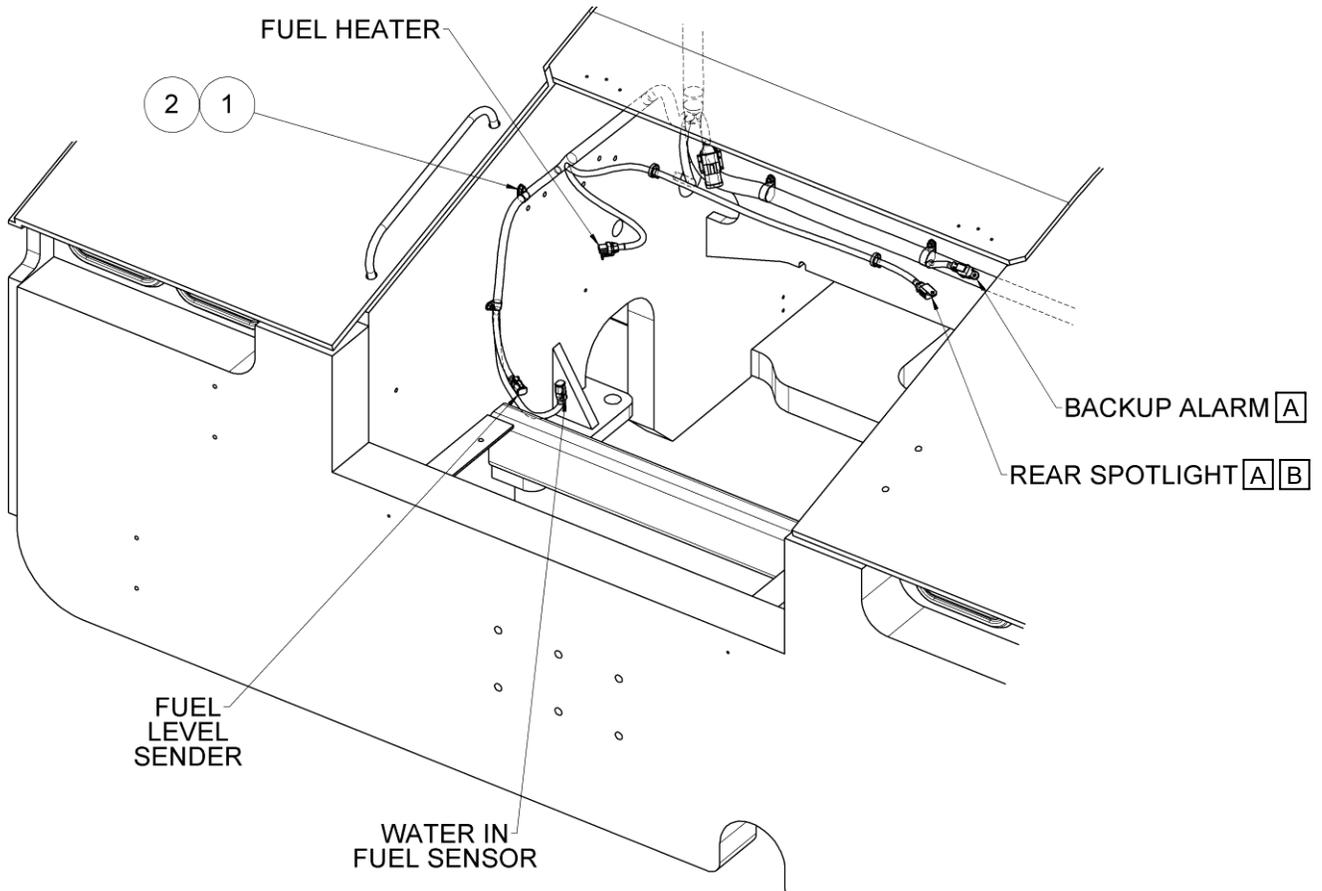


Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|-------------|----------------------|-----|
| 1 | NPN | PLASTIC LOOP CLAMP | 6 |
| 2 | NPN | LOCK NUT, #10-32 UNF | 6 |

12.10 WIRE ROUTING (continued)



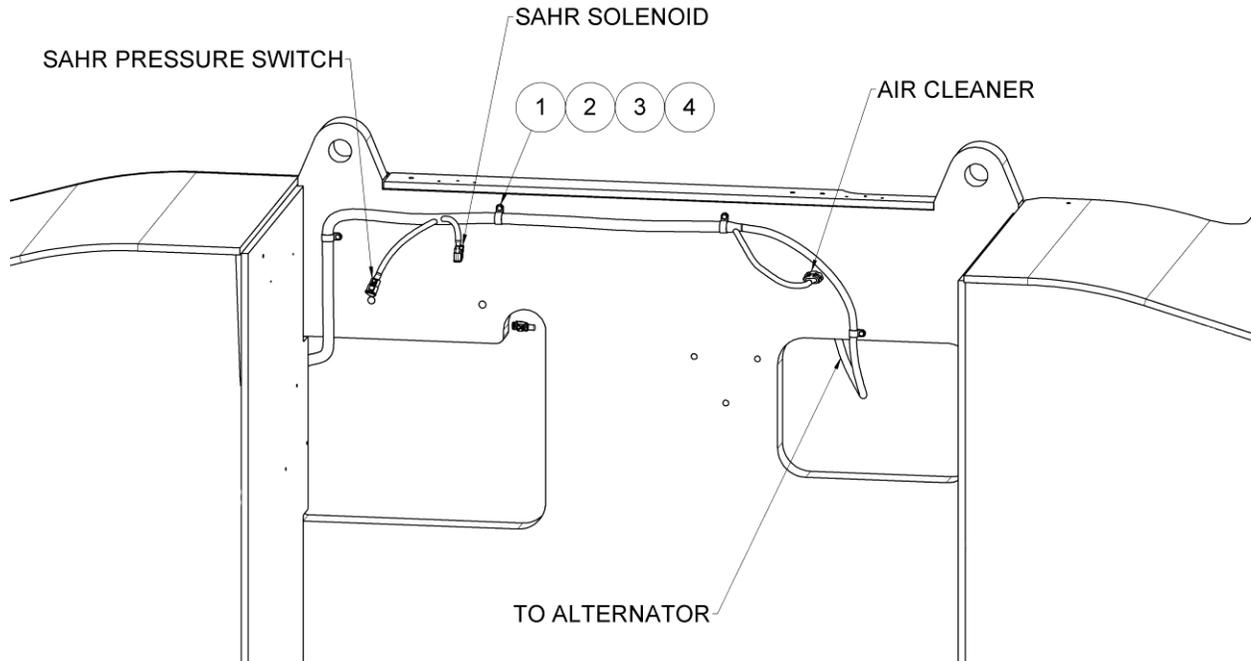
- [A] Connector is tied to harness if optional equipment is not present.
- [B] Rear Spotlight wire is zip tied to the under side of the louver if the option is present.

Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|-------------|----------------------|-----|
| 1 | NPN | PLASTIC LOOP CLAMP | AR |
| 2 | NPN | LOCK NUT, #10-32 UNF | AR |

12.10 WIRE ROUTING (continued)

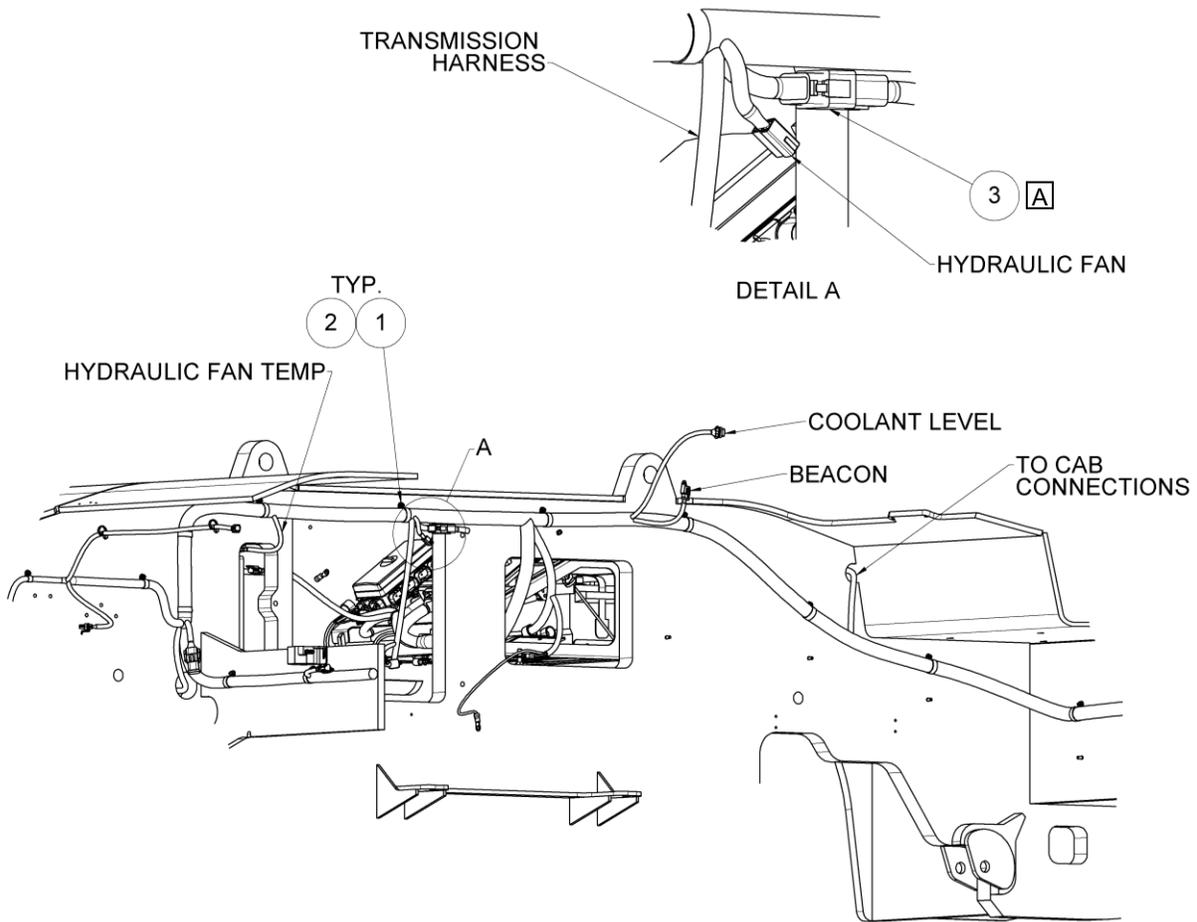


Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|-------------|-----------------------|-----|
| 1 | NPN | PLASTIC LOOP CLAMP | 4 |
| 2 | NPN | HCS, #10-32 UNC X 2.5 | 4 |
| 3 | NPN | FLAT WASHER, #10 | 4 |
| 4 | NPN | LOCK NUT, #10-32 UNF | 4 |

12.10 WIRE ROUTING (continued)



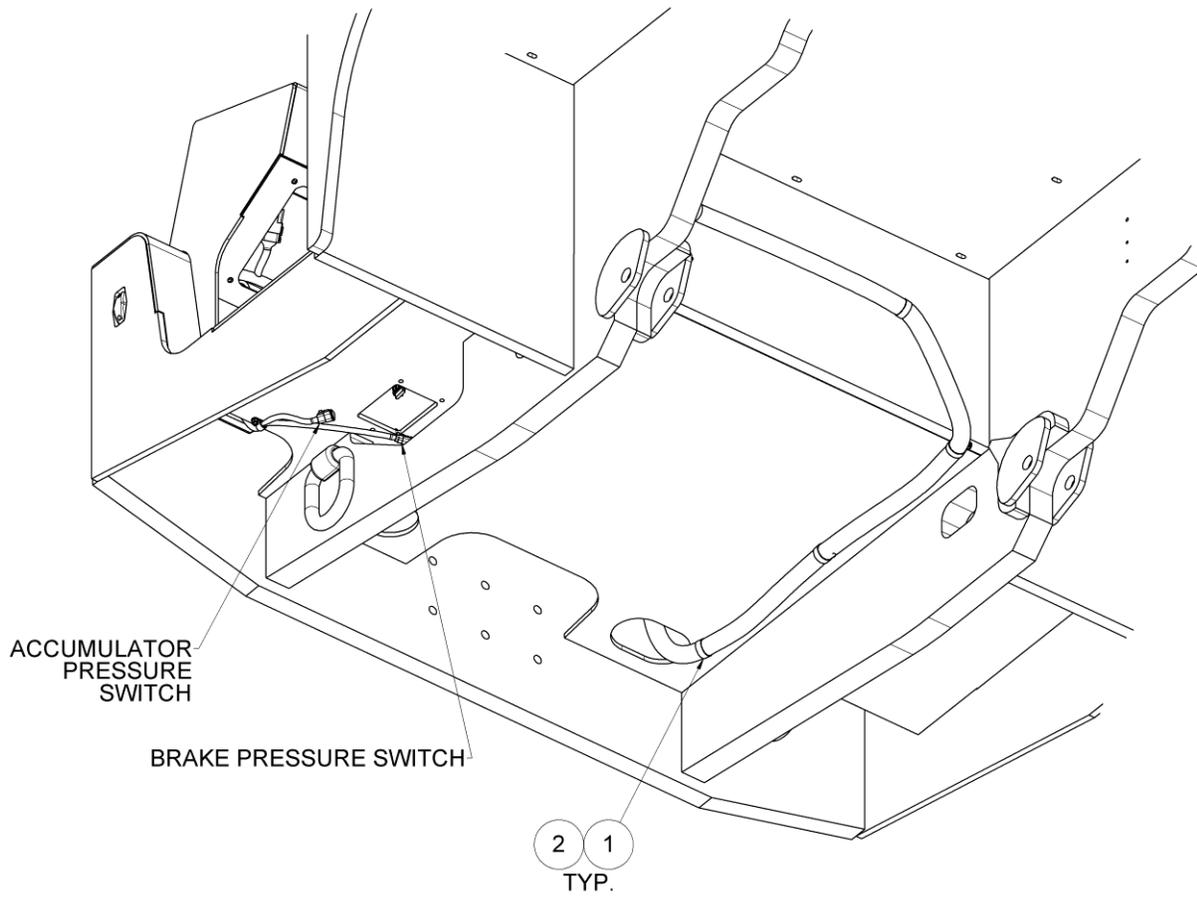
A Tier 3 harness jumper wire colors are light blue, tan, yellow, and grey.
 Tier 4 harness jumper wire colors are green, blue, orange, and purple.

Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|----------------|--------------------------|-----|
| 1 | NPN | PLASTIC LOOP CLAMP | AR |
| 2 | NPN | LOCK NUT, #10-32 UNF | AR |
| 3 | XM00-05-009-SA | XM TIER 4 HARNESS JUMPER | 1 |
| | XM00-05-010-SA | XM TIER 3 HARNESS JUMPER | 1 |

12.10 WIRE ROUTING (continued)

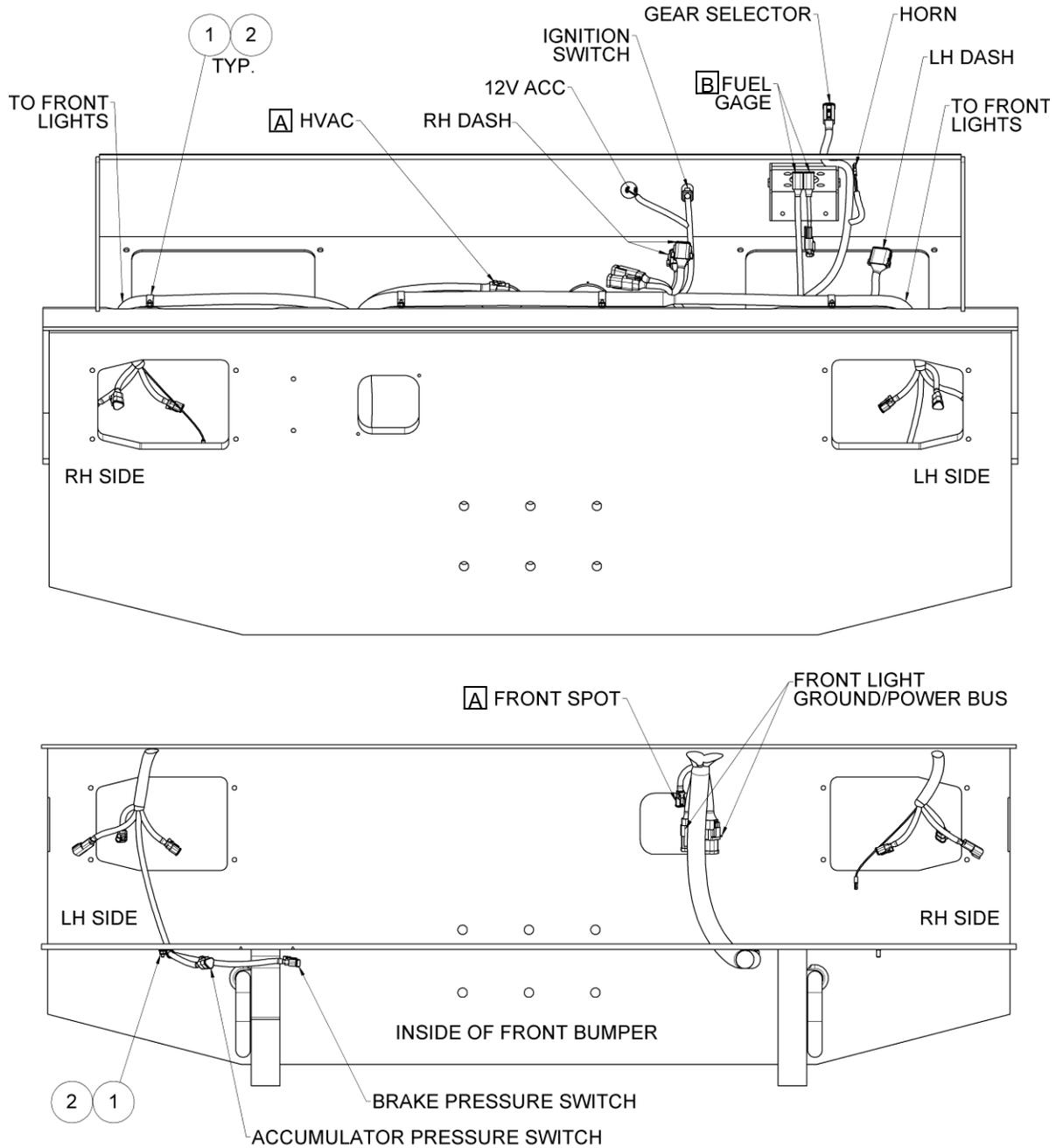


Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|-------------|----------------------|-----|
| 1 | NPN | PLASTIC LOOP CLAMP | AR |
| 2 | NPN | LOCK NUT, #10-32 UNF | AR |

12.10 WIRE ROUTING (continued)



[A] Connector is tied to harness if optional equipment is not present.

[B] Termination resistor must be installed. If Extended Gage Package option is purchased, the resistor is installed to the final gage in the chain. See separate documentation for more information.

Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Qty |
|------|-------------|----------------------|-----|
| 1 | NPN | PLASTIC LOOP CLAMP | AR |
| 2 | NPN | LOCK NUT, #10-32 UNF | AR |



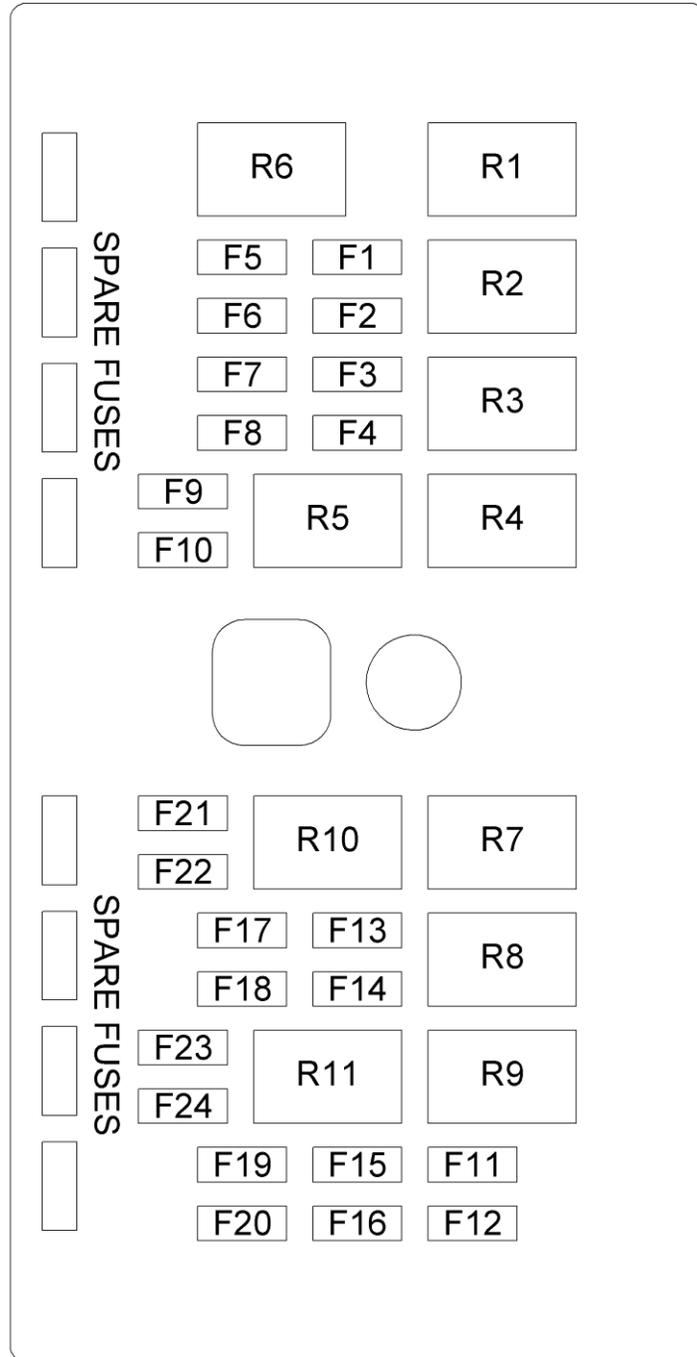
12.11 FUSE BOX LAYOUT

Parts List

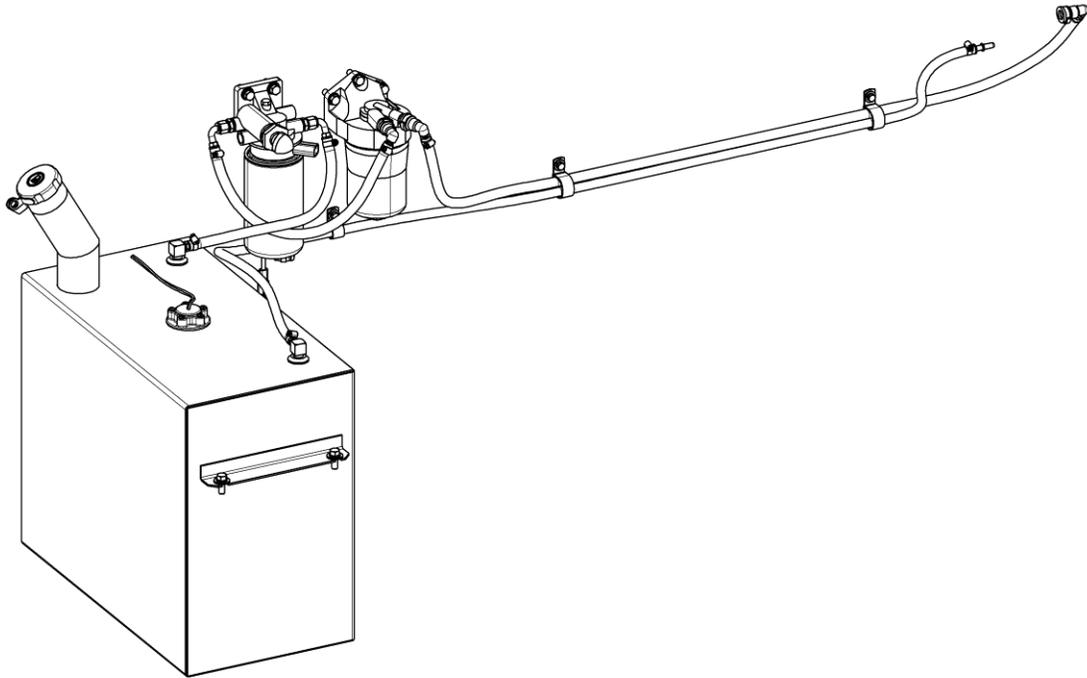
When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number | Description | Function |
|------|----------------|----------------------|-----------------------------|
| F1 | N/A | MINI FUSE, 2 AMP | SIDE MARKER LIGHTS |
| F2 | NPN | MINI FUSE, 20 AMP | HYDRAULIC FAN |
| F3 | NPN | MINI FUSE, 2 AMP | TAIL LIGHTS |
| F4 | NPN | MINI FUSE, 5 AMP | FRONT LIGHTS |
| F5 | N/A | MINI FUSE, 2 AMP | CAB LIGHTING |
| F6 | NPN | MINI FUSE, 10 AMP | CAN DIAGNOSTIC |
| F7 | NPN | MINI FUSE, 30 AMP | ENGINE ECU |
| F8 | NPN | MINI FUSE, 10 AMP | HORN |
| F9 | NPN | MINI FUSE, 2 AMP | REVERSE LIGHTS |
| F10 | N/A | MINI FUSE, 7.5 AMP | BACKUP ALARM |
| F11 | NPN | MINI FUSE, 15 AMP | AUX POWER SOCKET |
| F12 | NPN | MINI FUSE, 2 AMP | LOGIC SWITCHES AND SENSORS |
| F13 | NPN | MINI FUSE, 2 AMP | TRANS SPEED SENSOR |
| F14 | NPN | MINI FUSE, 25 AMP | FUEL HEATER |
| F15 | NPN | MINI FUSE, 2 AMP | IGNITION |
| F16 | NPN | MINI FUSE, 2 AMP | CAB RELAY |
| F17 | NPN | MINI FUSE, 5 AMP | ENGINE ECU IGNITION |
| F18 | NPN | MINI FUSE, 5 AMP | VEHICLE CONTROLLER IGNITION |
| F19 | NPN | MINI FUSE, 15 AMP | VEHICLE CONTROLLER |
| F20 | NPN | MINI FUSE, 2 AMP | BEACON |
| F21 | NPN | MINI FUSE, 5 AMP | TURN SIGNAL MODULE |
| F22 | NPN | MINI FUSE, 5 AMP | SPOTLIGHTS |
| F23 | NPN | MINI FUSE, 10 AMP | DASH PANEL |
| F24 | NPN | MINI FUSE, 15 AMP | VEHICLE CONTROLLER |
| R1 | XL00-81-001-CA | 12V, 35A MICRO RELAY | FLASHER |
| R2 | XL00-81-001-CA | 12V, 35A MICRO RELAY | HYDRAULIC FAN |
| R3 | XL00-81-001-CA | 12V, 35A MICRO RELAY | LIGHTS |
| R4 | XL00-81-001-CA | 12V, 35A MICRO RELAY | REVERSE |
| R5 | XL00-81-001-CA | 12V, 35A MICRO RELAY | HORN |
| R6 | XL00-81-001-CA | 12V, 35A MICRO RELAY | START LOCK |
| R7 | XL00-81-001-CA | 12V, 35A MICRO RELAY | IGNITION RELAY |
| R8 | XL00-81-001-CA | 12V, 35A MICRO RELAY | IGNITION RELAY |
| R9 | XL00-81-001-CA | 12V, 35A MICRO RELAY | IGNITION RELAY |
| R10 | XL00-81-001-CA | 12V, 35A MICRO RELAY | IGNITION RELAY |
| R11 | XL00-81-001-CA | 12V, 35A MICRO RELAY | IGNITION RELAY |

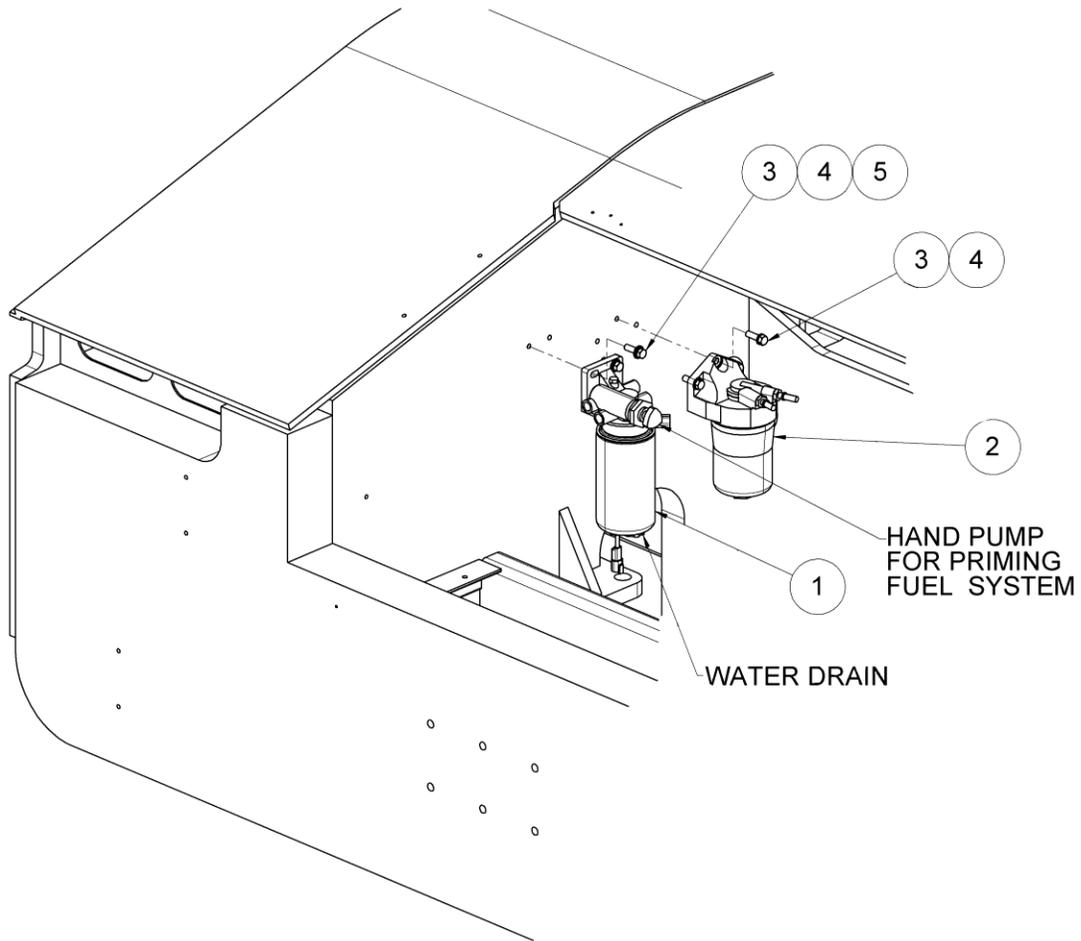
12.11 FUSE BOX LAYOUT (continued)



13.0 FUEL SYSTEM



13.1 FILTER/WATER SEPERATOR AND FUEL FILTER INSTALL

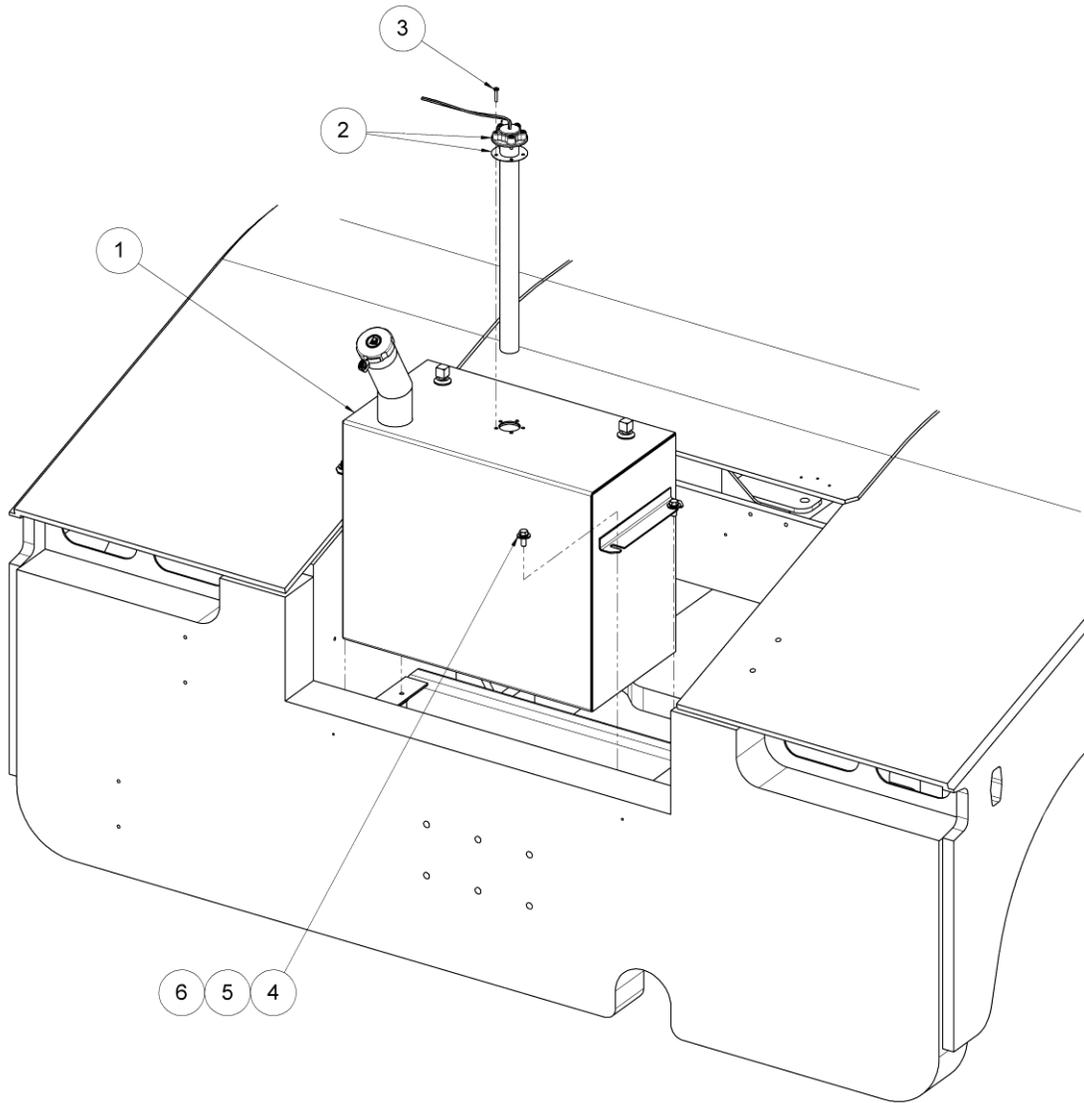


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|-------------|---|-----|
| 1 | NPN | FUEL WATER SEPARATOR (INCLUDED WITH ENGINE) | 1 |
| 2 | NPN | FUEL FILTER (INCLUDED WITH ENGINE) | 1 |
| 3 | NPN | HCS, 3/8-16 UNC X 1.25 | 5 |
| 4 | NPN | LOCK WASHER, 3/8 | 5 |
| 5 | NPN | FLAT WASHER, 3/8 | 3 |

13.2 FUEL TANK INSTALL



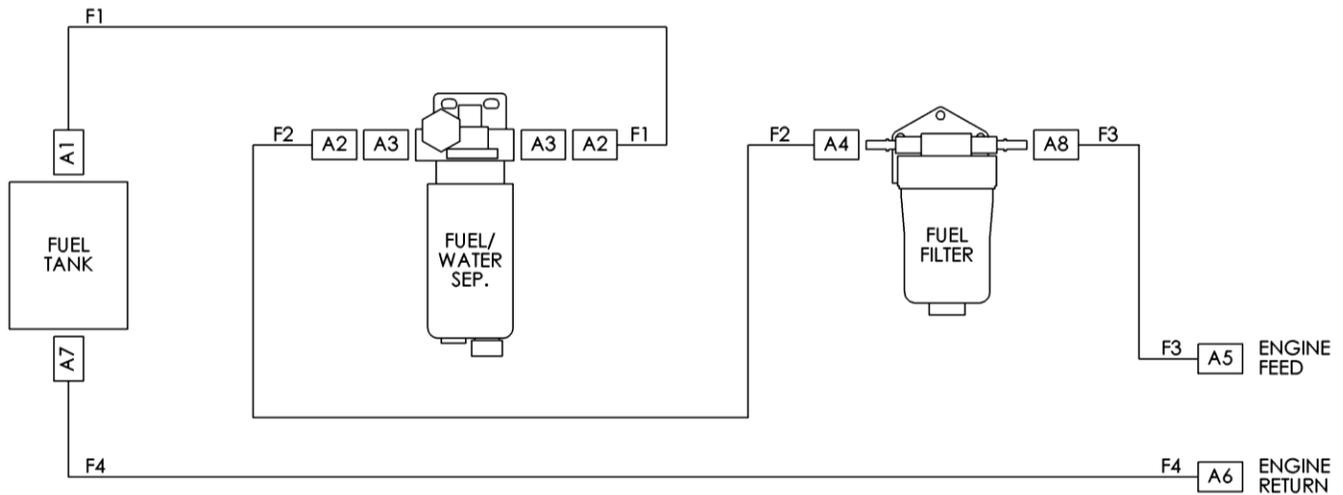
Exhaust heat shield is secured using two RH fuel tank bolts. Do not tighten without installing heat shield.

Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|--|-----|
| 1 | XM00-11-001-SA | FUEL TANK WITH FILLER NECK AND CAP | 1 |
| 2 | XM00-11-002-SA | FUEL SENDER WITH GASKET AND HARDWARE | 1 |
| 3 | NPN | BCS, #10-32 UNF X 1 (INCLUDED WITH ITEM 2) | 5 |
| 4 | NPN | HCS, 3/8-16 UNC X 1 | 4 |
| 5 | NPN | LOCK WASHER, 3/8 | 4 |
| 6 | NPN | FLAT WASHER, 3/8 | 4 |

13.3 FUEL SYSTEM LAYOUT



| Line | Size (ID) | Part Number | Description | Length (in) |
|------|-----------|-------------|--------------------------------|-------------|
| F1 | Ø3/8 | H10106 | TANK TO FUEL/WATER SEPARATOR | 14 |
| F2 | Ø3/8 | H10106 | FUEL/WATER SEPARATOR TO FILTER | 17 |
| F3 | Ø3/8 | H10106 | FILTER TO ENGINE | 60 |
| F4 | Ø5/16 | H05705 | ENGINE RETURN | 81 |

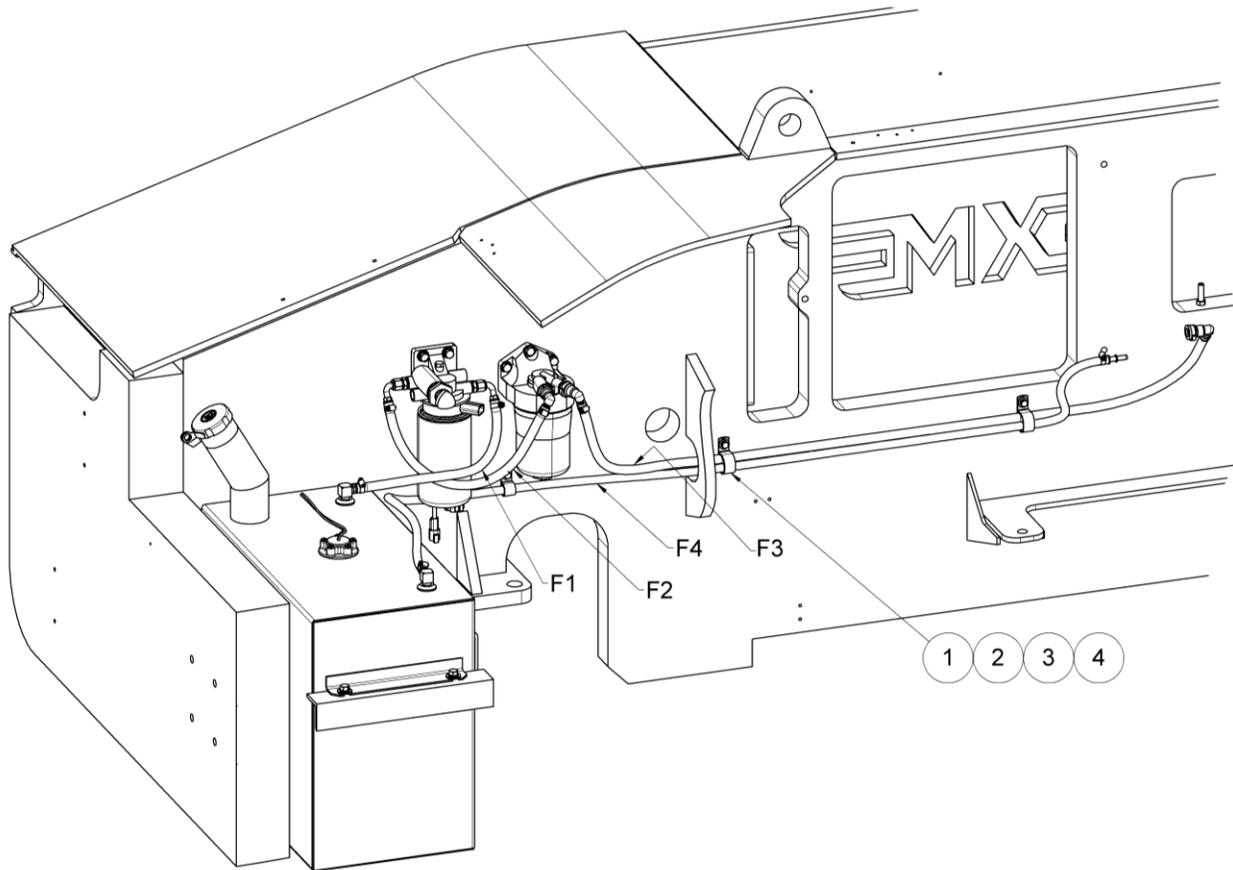
Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|--|-----|
| A1 | 05706B-104 | ADAPTOR - 4 JIC M - 3/8 BARB | 1 |
| A2 | 33982-6-6 | ELBOW 90° - 6 JIC F - 3/8 BARB | 2 |
| A3 | MC5315X6X14 | ADAPTOR - M14X1.5 DIN M - 6 JIC M | 2 |
| A4 | NVSP-11-08-CA | QUICK DISCONNECT 90° - 3/8 F - 3/8 BARB | 1 |
| A5 | NVSP-11-007-CA | QUICK DISCONNECT 90° - 5/16 F - 3/8 BARB | 1 |
| A6 | NVSP-11-009-CA | QUICK DISCONNECT - 5/16 M - 5/16 BARB | 1 |
| A7 | 05705B-104 | ADAPTOR - 4 JIC M - 5/16 BARB | 1 |
| A8 | NVSP-11-010-CA | QUICK DISCONNECT 90° - 10MM F - 3/8 BARB | 1 |

Install all NPT threaded components using Loctite® 565™ Pipe Sealant or comparable.

13.4 FUEL HOSE ROUTING



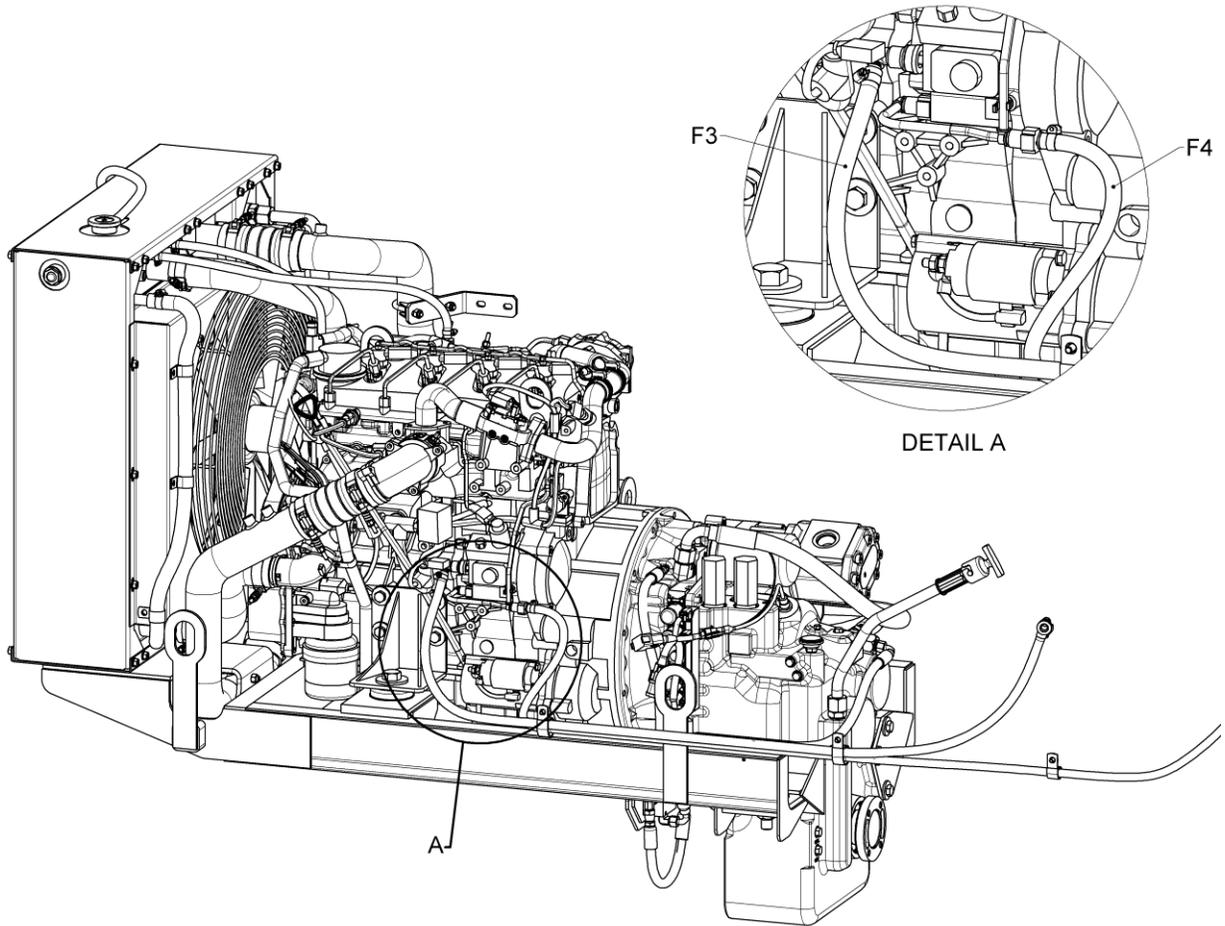
Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

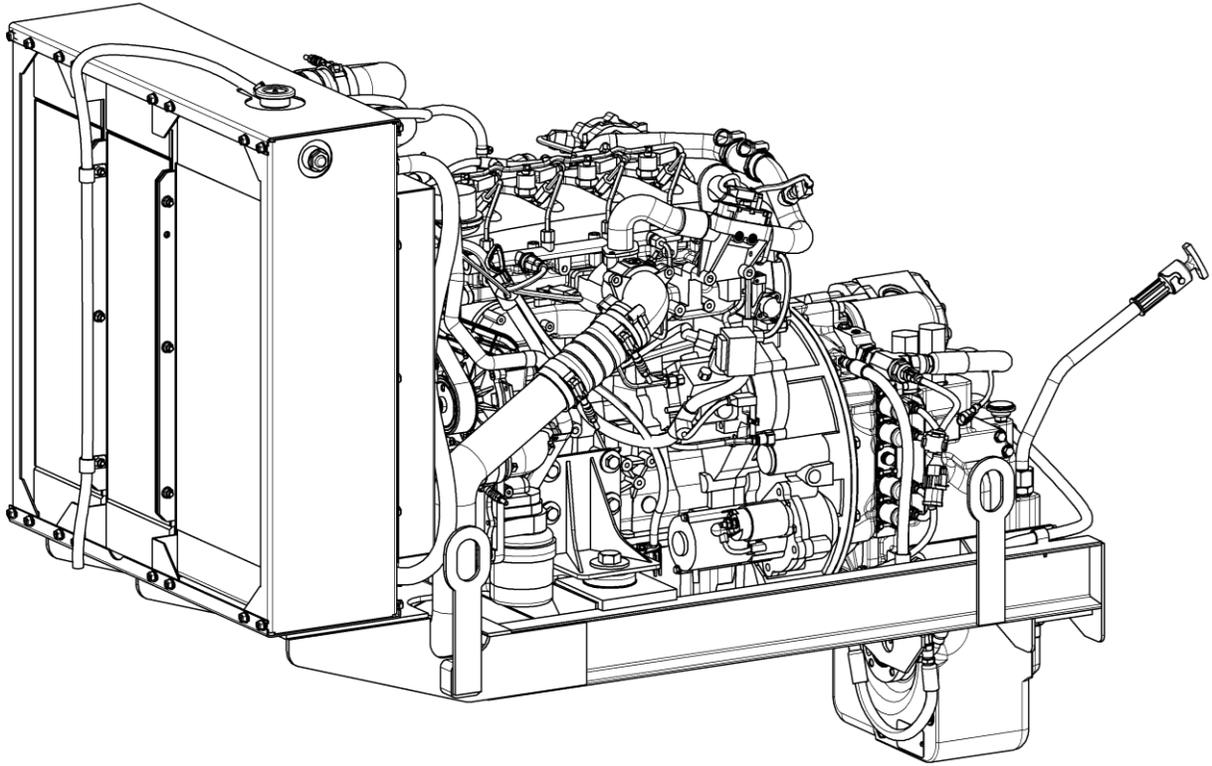
| Item | Part Number | Description | Qty |
|------|-------------|----------------------|-----|
| 1 | NPN | CUSHIONED LOOP CLAMP | 3 |
| 2 | NPN | HCS, 1/4-20 UNC X .5 | 3 |
| 3 | NPN | LOCK WASHER, 1/4 | 3 |
| 4 | NPN | FLAT WASHER, 1/4 | 3 |
| N/S | NPN | SAE HOSE CLAMP, #4 | A/R |

Install all NPT threaded components using Loctite® 565™ Pipe Sealant or comparable.

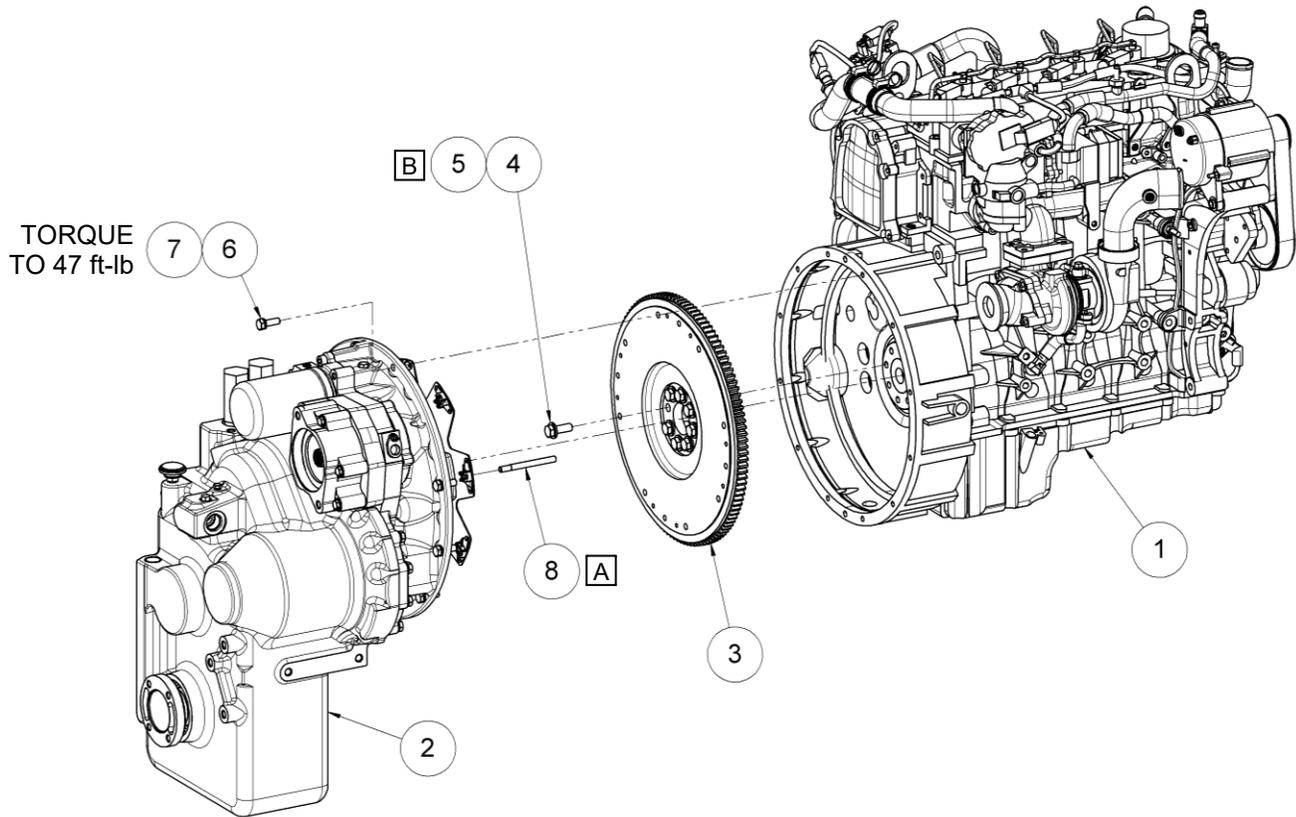
13.4 FUEL HOSE ROUTING (continued)



14.0 ENGINE SYSTEM



14.1 TRANSMISSION INSTALL



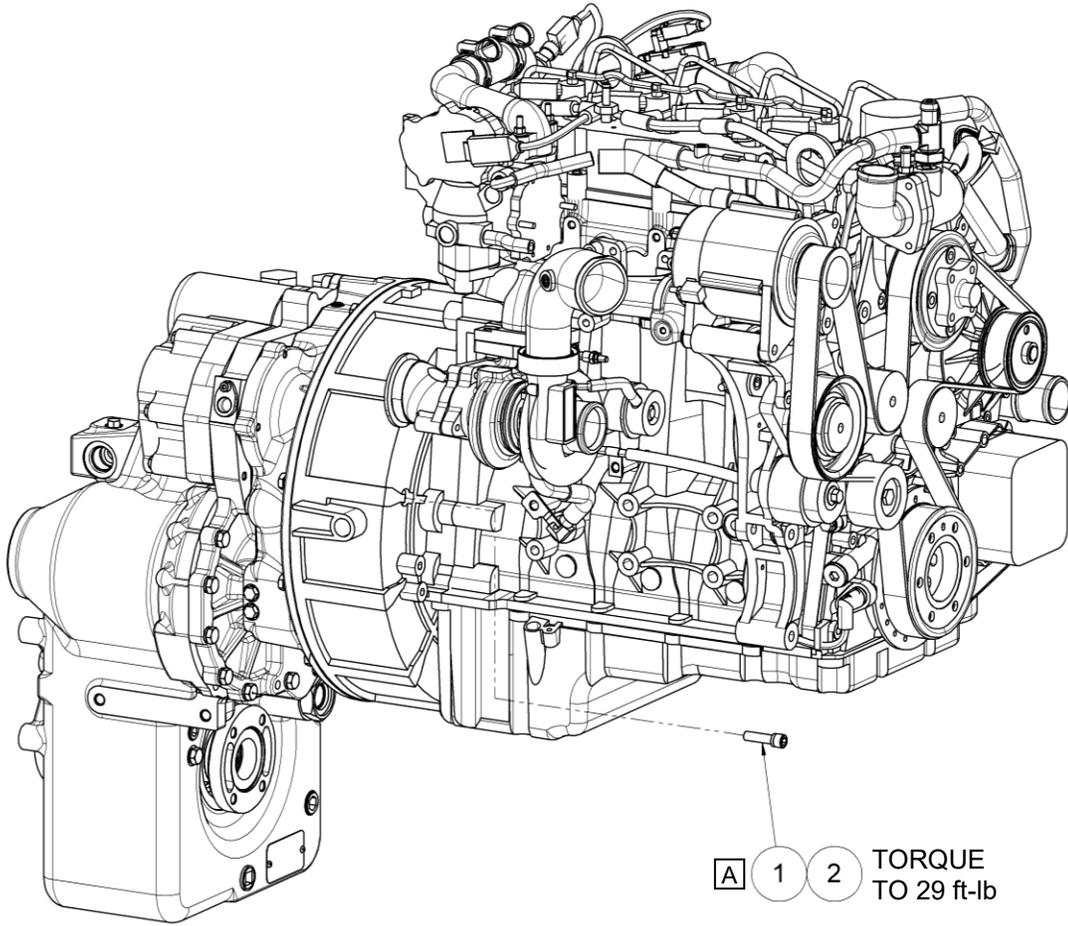
- A** The 3/8-24 UNF stud should be installed to the flexplate before transmission bolt-up. Ensure that the stud is aligned with both the flywheel and the access hole in the flywheel housing during transmission install. Do not remove the alignment stud until ready to install the flexplate hardware.
- B** The proper tightening procedure for the flywheel bolts is as follows:
- Tighten the bolts to 22 ft-lbs in a “star” pattern.
 - Loosen the bolts 1/2 turn
 - Re-tighten the bolts to 22 ft-lbs in a “star” pattern.
 - Tighten the bolts an additional 1/4 turn in a “star” pattern.

Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|--|-----|
| 1 | XM00-03-003-SA | CUMMINS QSF 2.8 ENGINE (TIER4F) | 1 |
| 2 | XM00-04-011-SA | T12000 POWERSHIFT TRANSMISSION | 1 |
| 3 | PENDING | QSF 2.8 FLYWHEEL (MODIFIED) | 1 |
| 4 | NPN | HCS, M12X1.25 X 35, GR 10.9 (INCLUDED WITH ITEM 1) | 8 |
| 5 | NPN | FLAT WASHER, M12 (INCLUDED WITH ITEM 1) | 8 |
| 6 | NPN | HCS, M10X1.5 X 30, GR 10.9, ZN PLATED | 11 |
| 7 | NPN | LOCK WASHER, M10 | 11 |
| 8 | NPN | ALIGNMENT STUD 3/8-24 UNF X 4 | 1 |

14.2 FLEXPLATE CONNECTION



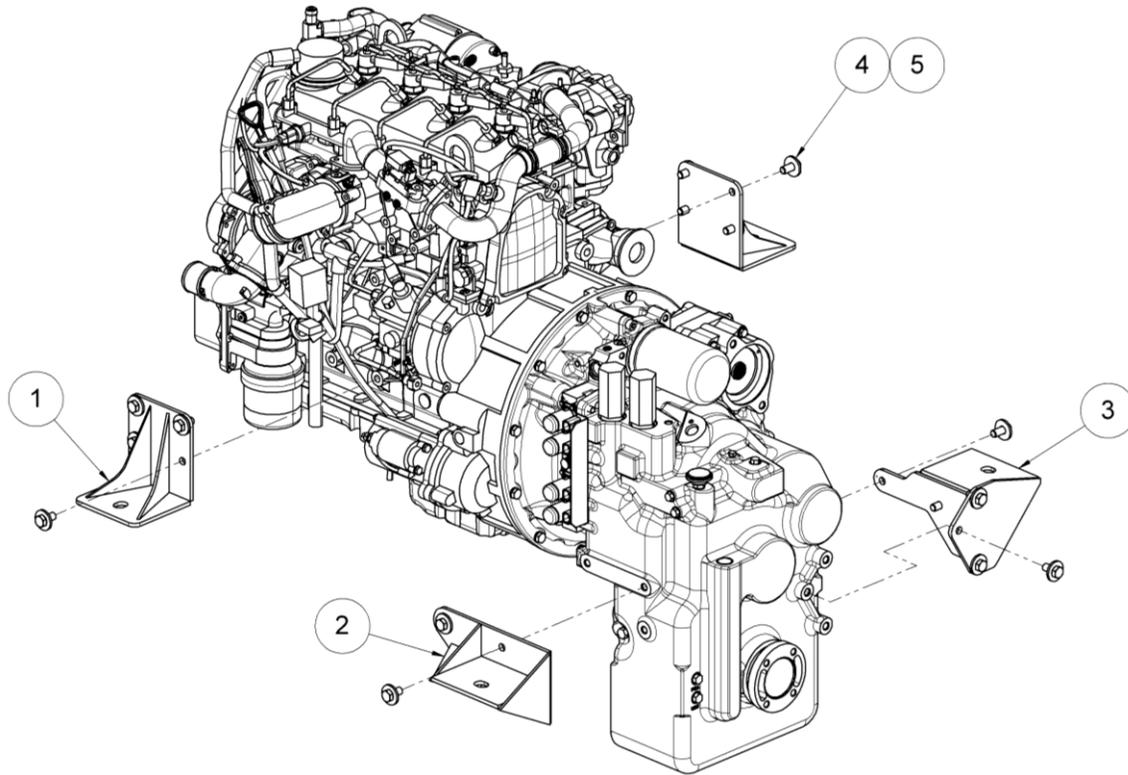
A Install all 8 bolts loosely, and then torque each to the value shown.

Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|-------------|-------------------------------|-----|
| 1 | NPN | SHCS, 3/8-24 UNF X 1.5, ALLOY | 8 |
| 2 | NPN | LOCK WASHER, 3/8, HIGH COLLAR | 8 |

14.3 MOTOR MOUNTS

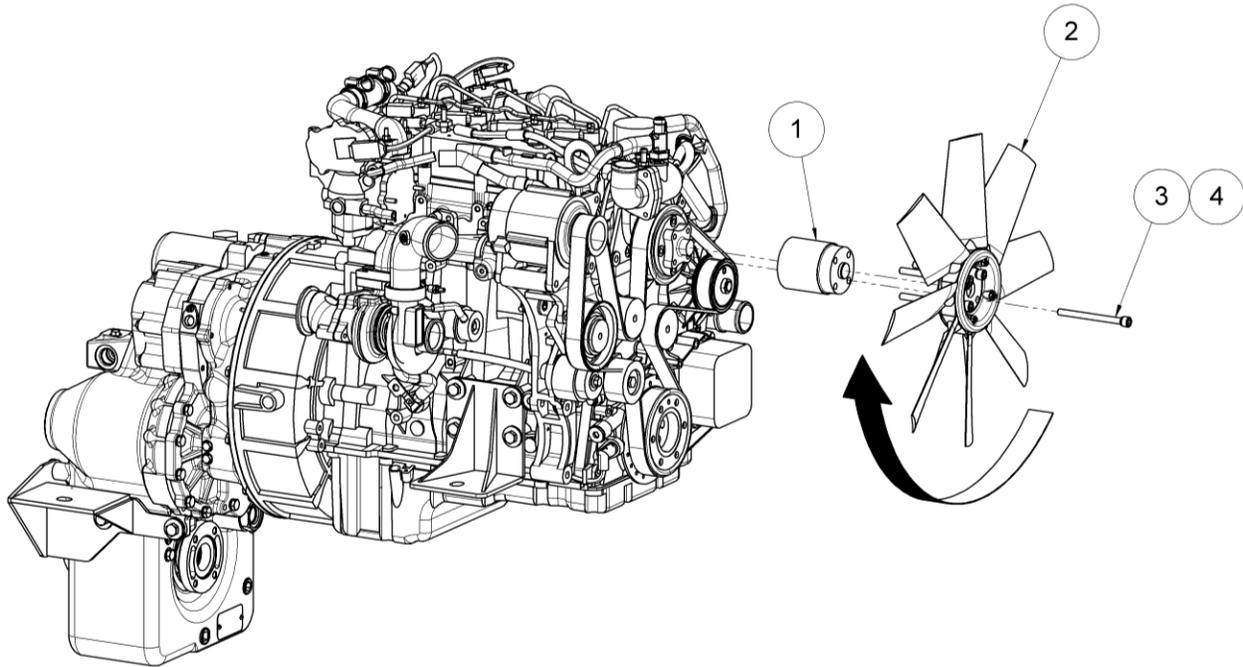


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|---------------------------------------|-----|
| 1 | XM00-03-005-SA | FRONT MOTOR MOUNT WELDMENT | 2 |
| 2 | XM00-03-007-SA | REAR LH MOTOR MOUNT WELDMENT | 1 |
| 3 | XM00-03-006-SA | REAR RH MOTOR MOUNT WELDMENT | 1 |
| 4 | NPN | HCS, M12X1.75 X 25, GR10.9, ZN PLATED | 16 |
| 5 | NPN | FLAT WASHER, M12 | 16 |

14.4 COOLING FAN



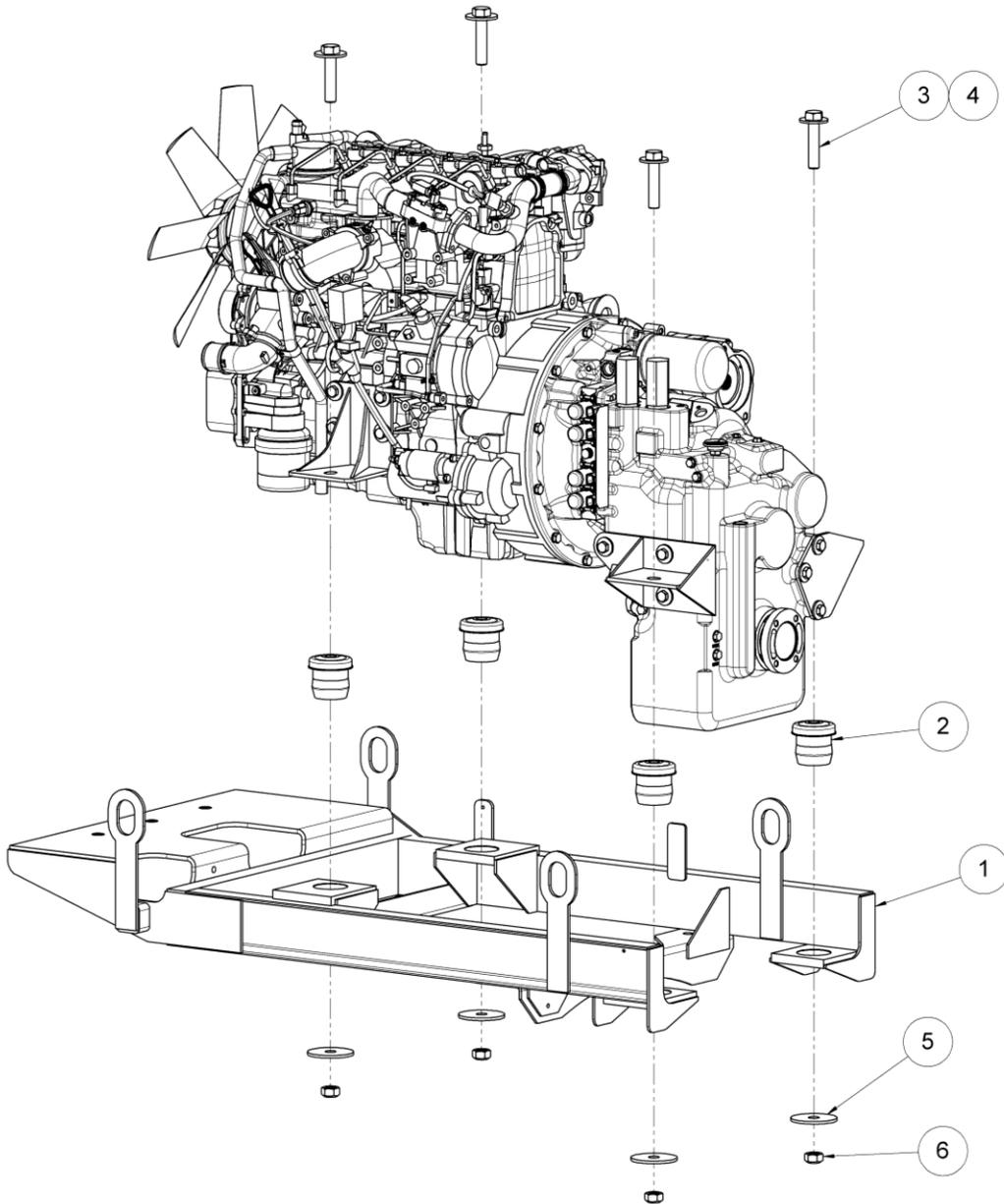
Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|-------------------------------|-----|
| 1 | XM00-03-009-SA | 3.75 IN FAN SPACER | 1 |
| 2 | XM00-03-008-SA | ENGINE COOLING FAN | 1 |
| 3 | NPN | SHCS, M10X1.5 X 120 | 4 |
| 4 | NPN | LOCK WASHER, M10, HIGH COLLAR | 4 |

Note proper rotation direction when installing the cooling fan.

14.5 ENGINE CRADLE

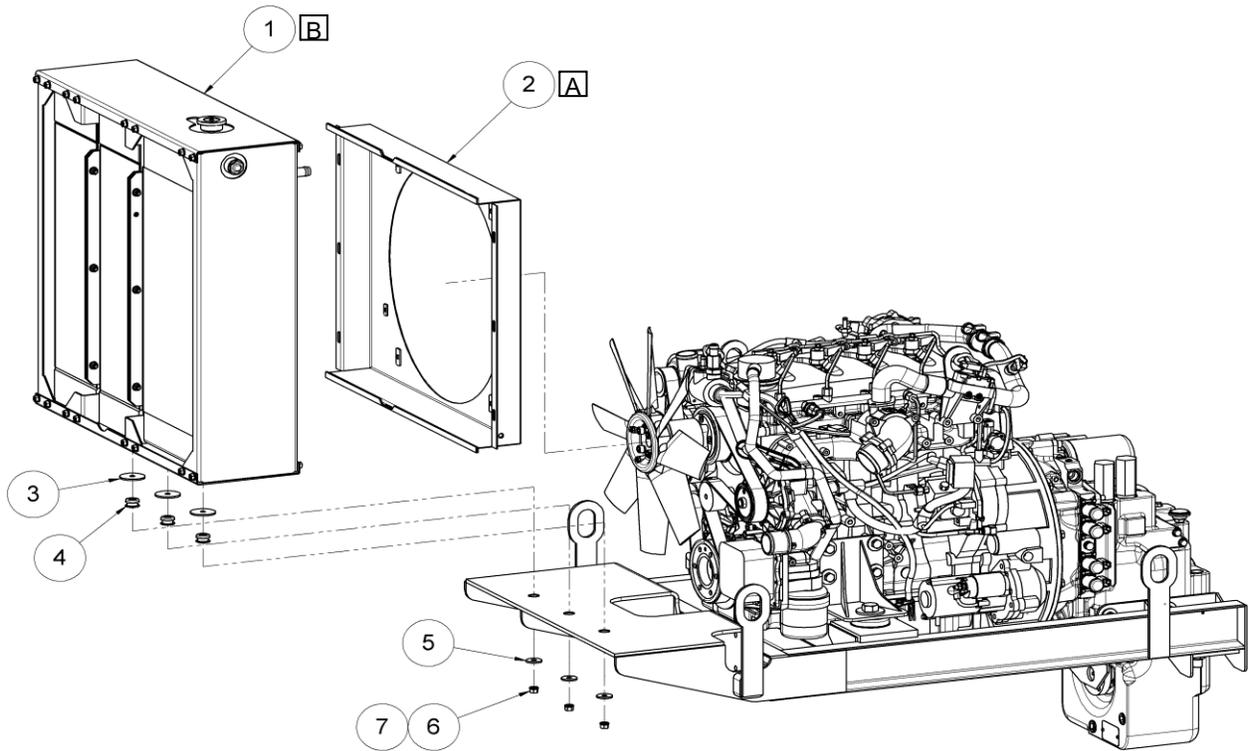


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|------------------------|-----|
| 1 | XM00-03-002-SA | ENGINE CRADLE WELDMENT | 1 |
| 2 | A-TT5D-00013-1 | ENGINE ISOLATOR MOUNT | 4 |
| 3 | NPN | HCS, 3/4-10 UNC X 3.5 | 4 |
| 4 | NPN | FLAT WASHER, 3/4 | 4 |
| 5 | A-TT5D-00010 | ENGINE MOUNT WASHER | 4 |
| 6 | NPN | LOCK NUT, 3/4-10 UNC | 4 |

14.6 COOLER INSTALL



A For combination cooler installation, the fan shroud and finger guard must be removed. The loose fan shroud should be placed over the engine fan before cooler installation. Once the combination cooler installation is complete, the fan shroud and finger guard can be installed to the combination cooler.

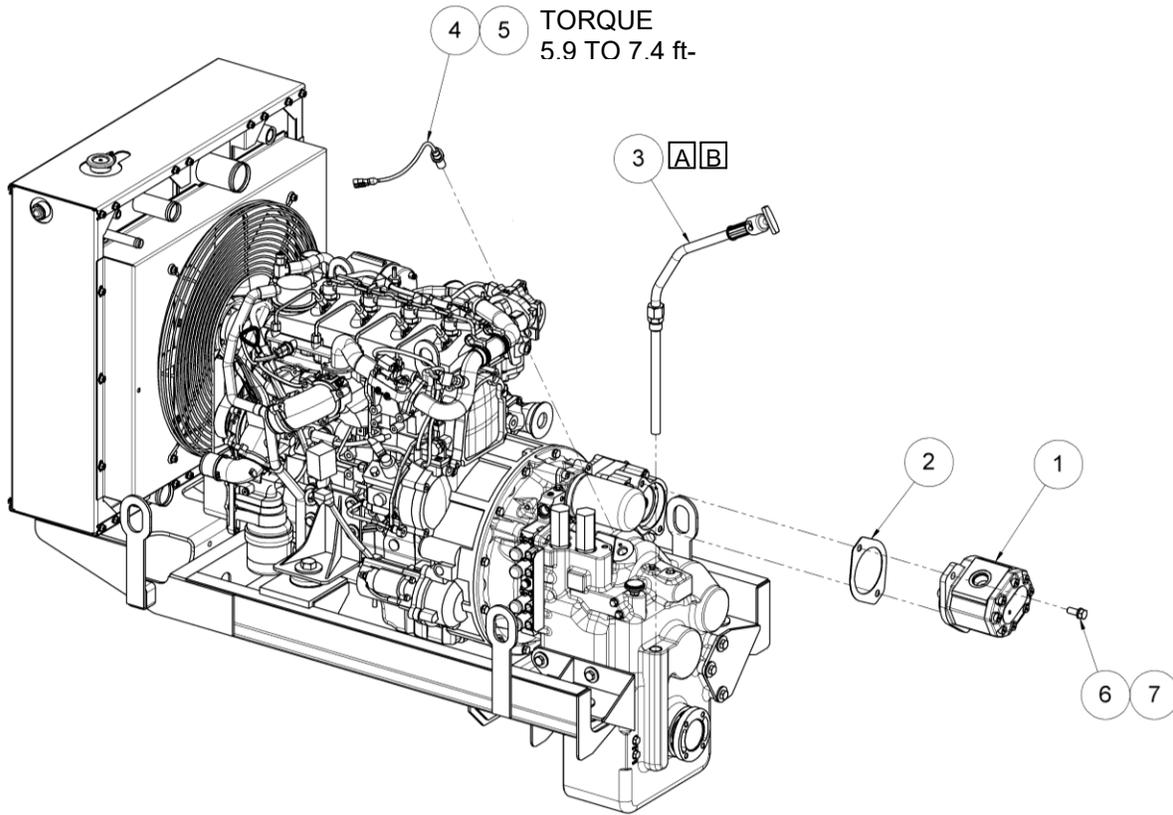
B The combination cooler must be supported until hose/pipe connections are made.

Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|-----------------------------------|-----|
| 1 | XM00-08-001-SA | COMBINATION COOLER | 1 |
| 2 | NPN | FAN SHROUD (INCLUDED WITH ITEM 1) | 1 |
| 3 | XM00-08-011-CA | COMBI COOLER LARGE WASHER | 3 |
| 4 | XM00-08-009-CA | COMBI COOLER ISOLATOR | 3 |
| 5 | XM00-08-010-CA | COMBI COOLER ISOLATOR WASHER | 3 |
| 6 | NPN | HEX NUT, 3/8-16 UNC | 3 |
| 7 | NPN | LOCK WASHER, 3/8 | 3 |

14.7 HYDRAULIC PUMP



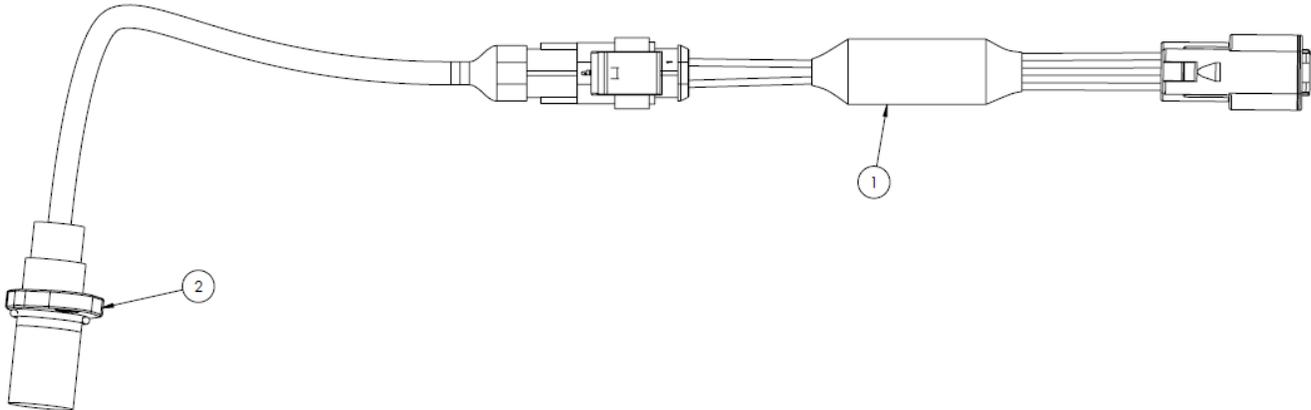
- A** Install specified components using Loctite® 565™ Pipe Sealant or comparable.
- B** Top portion of dipstick must be installed after engine cradle assembly is installed in tractor frame.

Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|------------------------------------|-----|
| 1 | XM00-09-001-CA | HYDRAULIC GEAR PUMP | 1 |
| 2 | XL00-09-030-CA | SAE B PUMP MOUNT GASKET | 1 |
| 3 | XL00-04-024-SA | TRANSMISSION DIPSTICK | 1 |
| 4 | Z-11472 | SPEED SENSOR ASSEMBLY W/ AMPLIFIER | 1 |
| 5 | NPN | BHCS, M6X1 X 12 | 1 |
| 6 | NPN | HCS, 1/2-13 UNC X 1.25 | 2 |
| 7 | NPN | LOCK WASHER, 1/2 | 2 |

14.8 SPEED SENSR SUBASSEMBLY



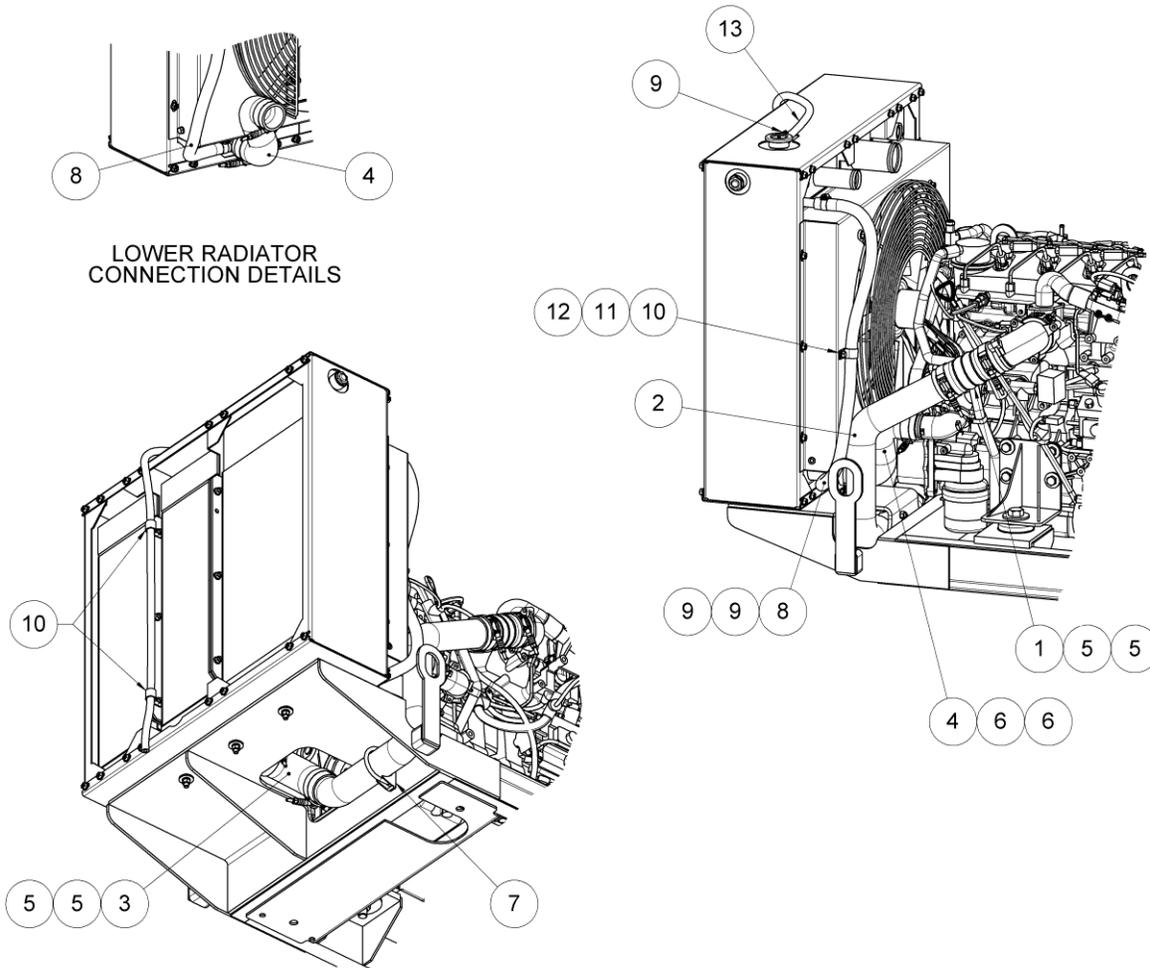
- A** Install specified components using Loctite® Threadlocker Blue 242® thread retaining compound or comparable.
- B** The dimension shown should be used as a reference. The sensor must be set 1/16" from the sensing gear teeth in the transmission.

Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|----------------------------|-----|
| - | Z-11472 | CONSISTS OF ITEMS 1 THRU 2 | |
| 1 | EC-3372 | SENSOR AMPLIFIER | 1 |
| 2 | XL00-04-023-CA | SPO – TRANS SPEED SENSOR | 1 |

14.9 LH PIPE AND HOSE CONNECTIONS
 Applies to tractors equipped with Tier 4F engines only

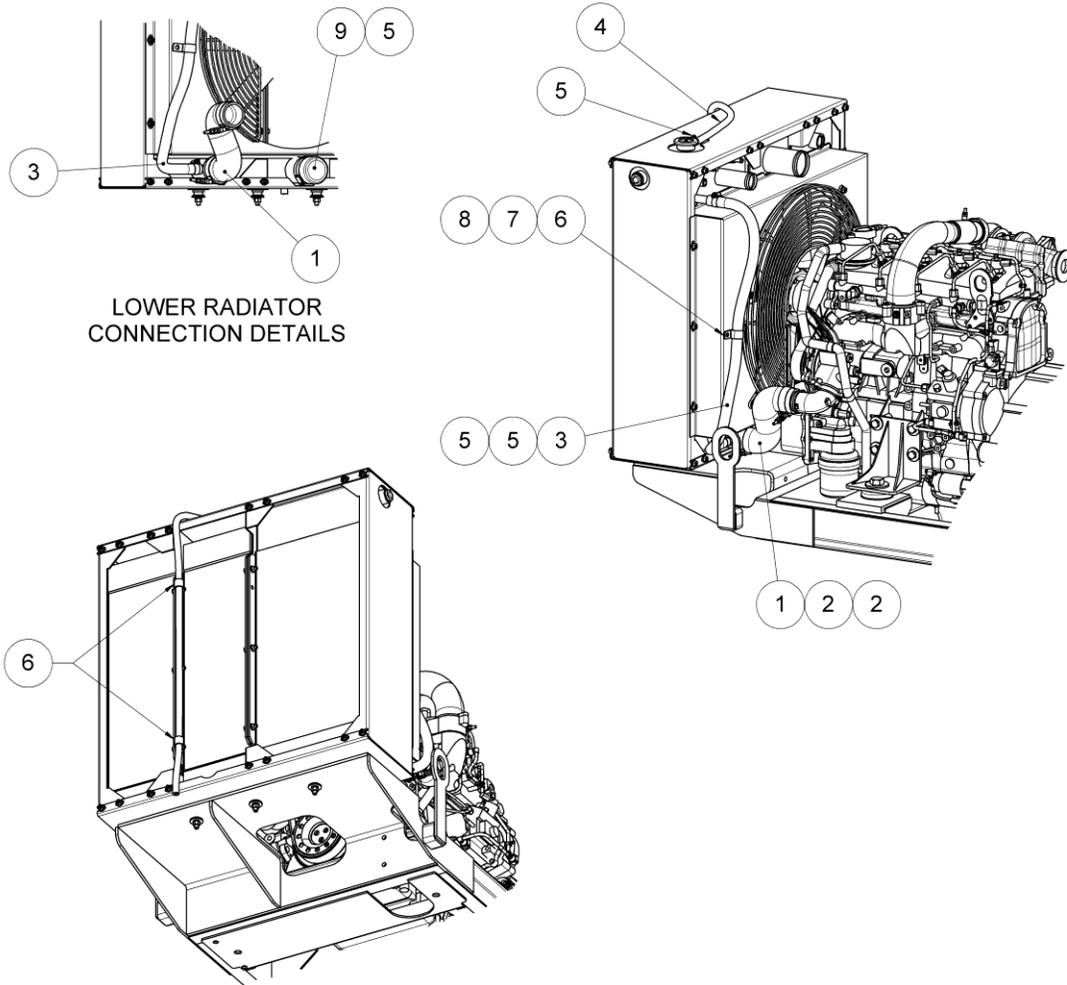


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|---|-----|
| 1 | XM00-08-007-CA | 2.5 IN ID CHARGE AIR HUMP HOSE | 1 |
| 2 | XM00-08-004-SA | CAC TUBE - COLD SIDE | 1 |
| 3 | XM00-08-008-SA | CAC ELBOW | 1 |
| 4 | XM00-08-006-SA | COOLANT HOSE - SUCTION SIDE | 1 |
| 5 | NVSP-24-038-CA | SPRING LOADED T-BOLT CLAMP - 2.875 IN | 4 |
| 6 | NVSP-24-038-CB | SPRING LOADED T-BOLT CLAMP - 2.125 IN | 2 |
| 7 | A-TT4-00398 | 2.5 IN HD CLAMP | 1 |
| 8 | NVSP-08-002-CA | 3/4 HEATER HOSE - WATER PUMP COMPENSATION | 34" |
| 9 | NPN | SAE HOSE CLAMP | 3 |
| 10 | NPN | CUSHION LOOP CLAMP | 3 |
| 11 | NPN | HCS, 1/4-20 UNC X 1.0 | 1 |
| 12 | NPN | LOCK WASHER, 1/4 | 1 |
| 13 | H10105 | RADIATOR OVERFLOW DRAIN HOSE | 46" |

14.10 LH PIPE AND HOSE CONNECTIONS
 Applies to tractors equipped with Tier 3 engines only

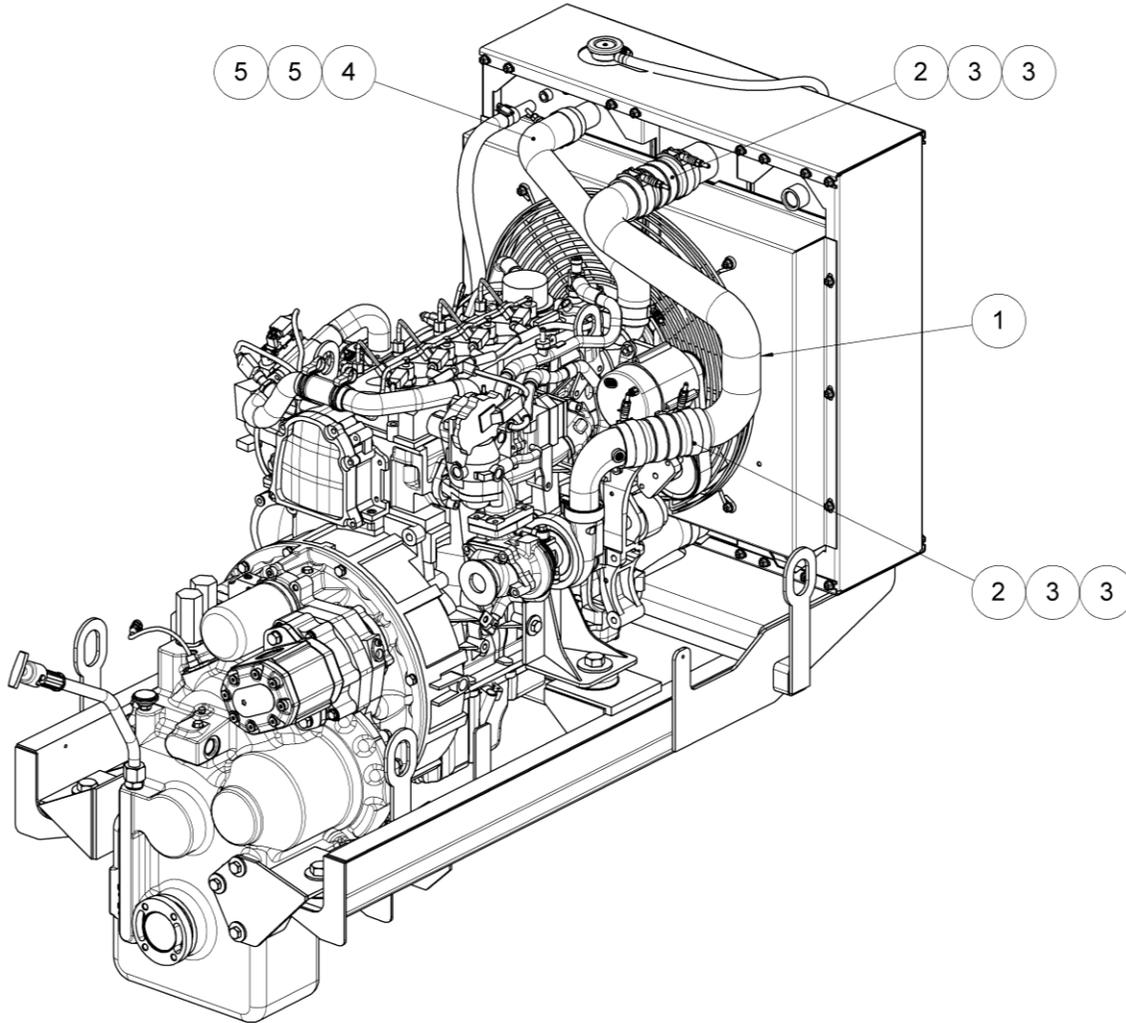


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|---|-----|
| 1 | XM00-08-006-SA | COOLANT HOSE - SUCTION SIDE | 1 |
| 2 | NVSP-24-038-CB | SPRING LOADED T-BOLT CLAMP - 2.125 IN | 2 |
| 3 | NVSP-08-002-CA | 3/4 HEATER HOSE - WATER PUMP COMPENSATION | 34" |
| 4 | H05705 | RADIATOR OVERFLOW DRAIN HOSE | 46" |
| 5 | NPN | SAE HOSE CLAMP | 4 |
| 6 | NPN | CUSHION LOOP CLAMP | 3 |
| 7 | NPN | HCS, 1/4-20 UNC X 1.0 | 1 |
| 8 | NPN | LOCK WASHER, 1/4 | 1 |
| 9 | XM00-08-015-CA | CAC PORT END CAP | 1 |

14.11 RH PIPE AND HOSE CONNECTIONS
 Applies to tractors equipped with Tier 4F engines only

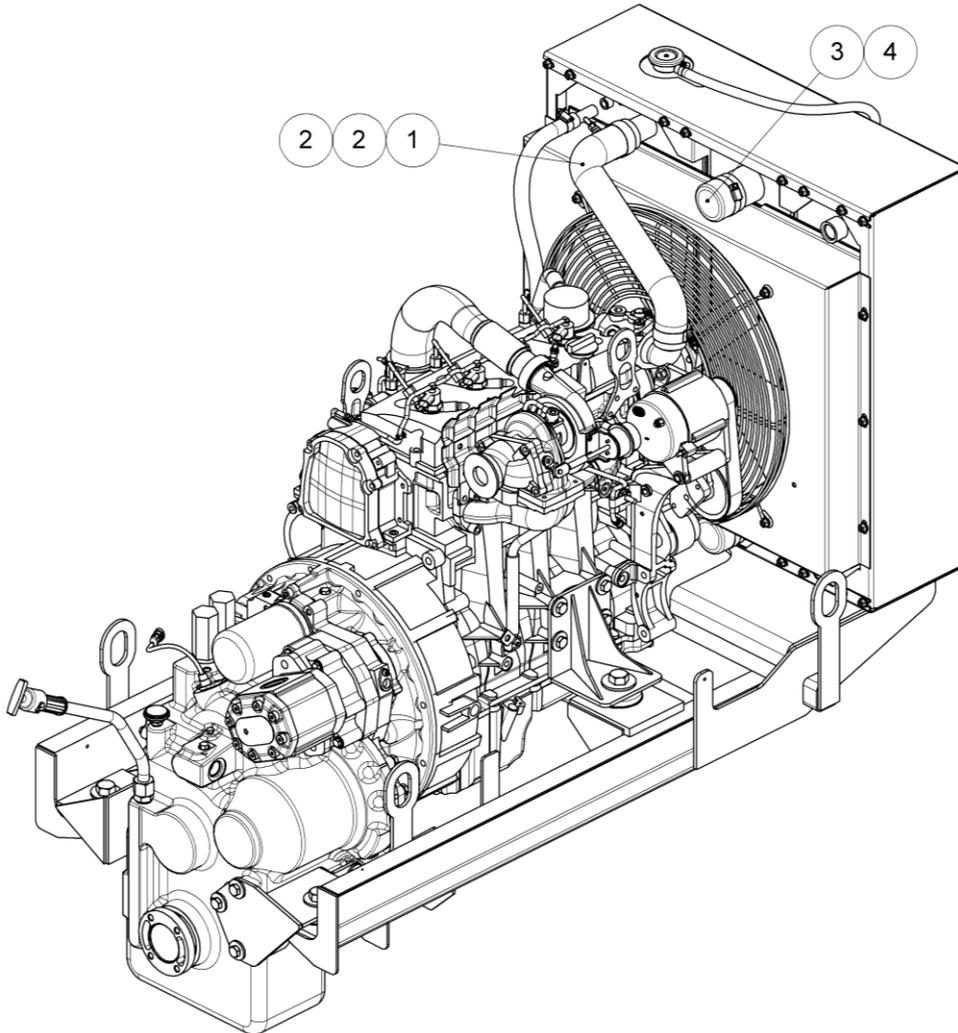


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|---------------------------------------|-----|
| 1 | XM00-08-003-SA | CAC TUBE - HOT SIDE | 1 |
| 2 | XM00-08-007-CA | 2.5 IN ID CHARGE AIR HUMP HOSE | 2 |
| 3 | NVSP-24-038-CA | SPRING LOADED T-BOLT CLAMP - 2.875 IN | 4 |
| 4 | XM00-08-005-SA | COOLANT HOSE - PRESSURE SIDE | 1 |
| 5 | NVSP-24-038-CB | SPRING LOADED T-BOLT CLAMP - 2.125 IN | 2 |

14.12 RH PIPE AND HOSE CONNECTIONS
 Applies to tractors equipped with Tier 3 engines only

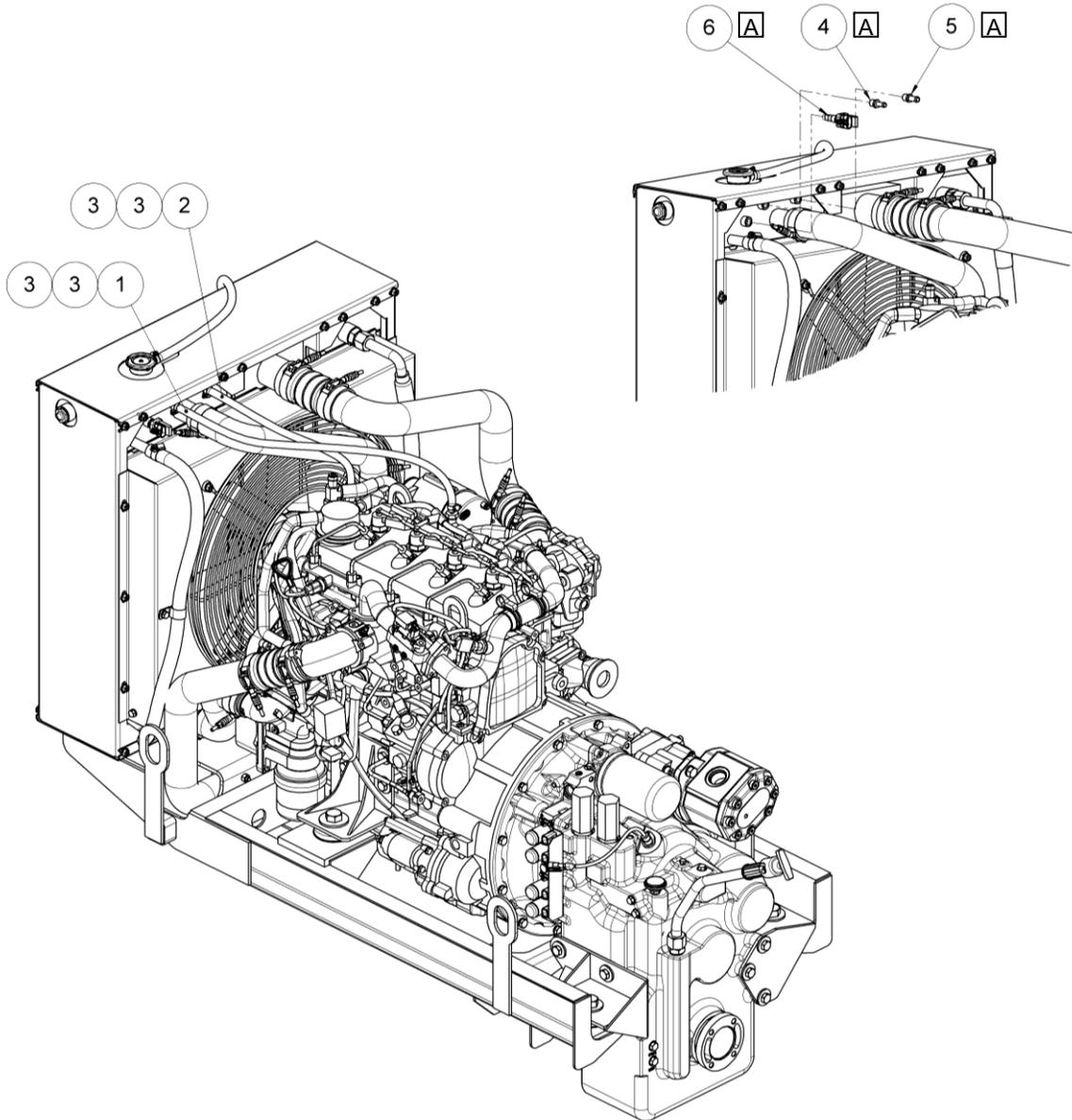


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|---------------------------------------|-----|
| 1 | XM00-08-005-SA | COOLANT HOSE - PRESSURE SIDE | 1 |
| 2 | NVSP-24-038-CB | SPRING LOADED T-BOLT CLAMP - 2.125 IN | 2 |
| 3 | XM00-08-015-CA | CAC PORT END CAP | 1 |
| 4 | NPN | SAE HOSE CLAMP | 1 |

14.13 ENGINE VENT HOSES
 Applies to tractors equipped with Tier 4F engines only



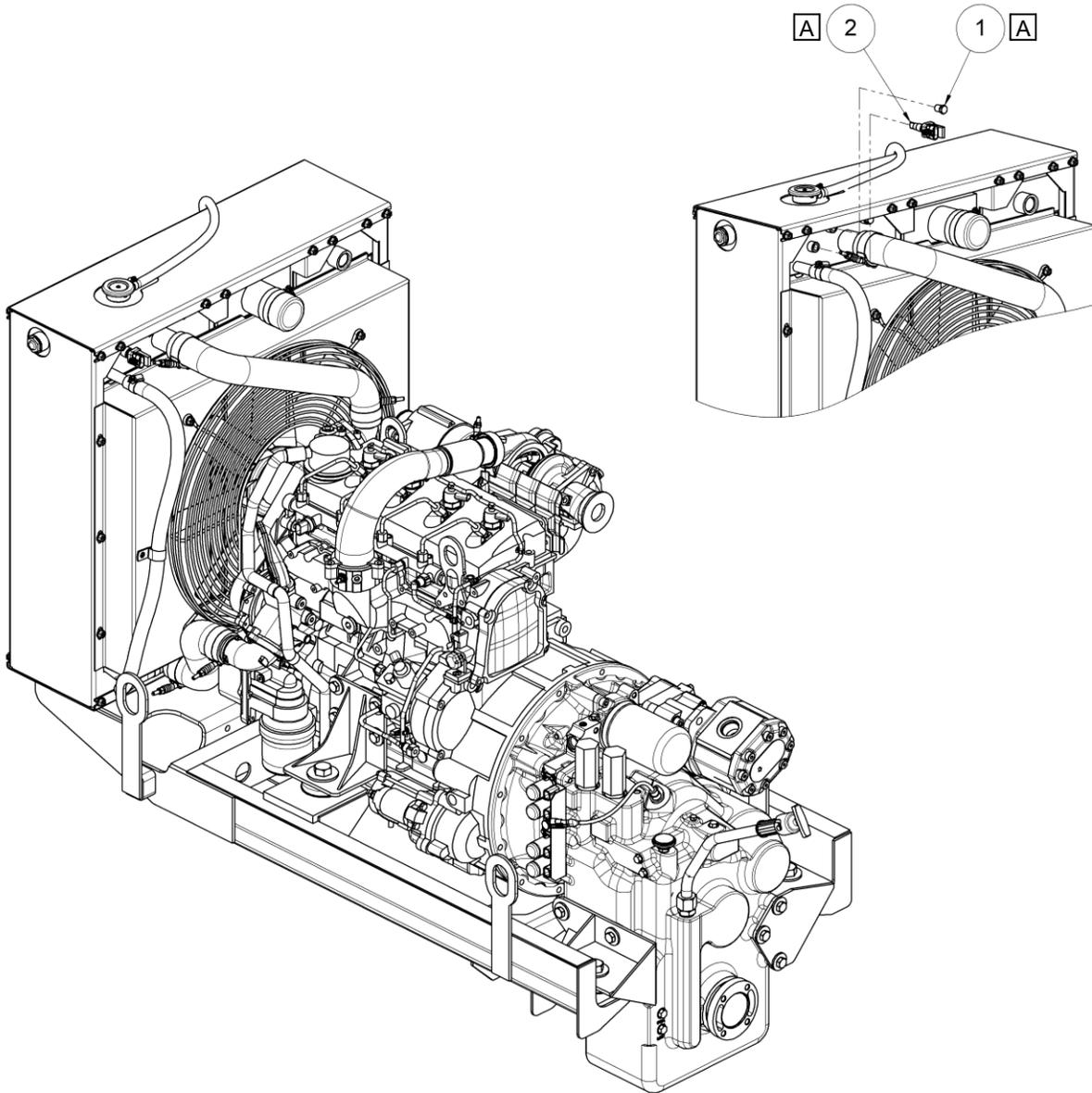
A Install specified components using Loctite® 565™ Pipe Sealant or comparable.

Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|--|-----|
| 1 | H05705 | VENT HOSE A | 27" |
| 2 | H10106 | VENT HOSE B | 19" |
| 3 | NPN | SAE HOSE CLAMP | 4 |
| 4 | 05705B-104 | STRAIGHT HOSE BARB - 1/4 NPT M - 5/16 BARB | 1 |
| 5 | 05706B-104 | STRAIGHT HOSE BARB - 1/4 NPT M - 3/8 BARB | 1 |
| 6 | XM00-08-012-CA | COOLANT LEVEL SENSOR | 1 |

14.14 ENGINE VENT HOSES
 Applies to tractors equipped with Tier 3 engines only



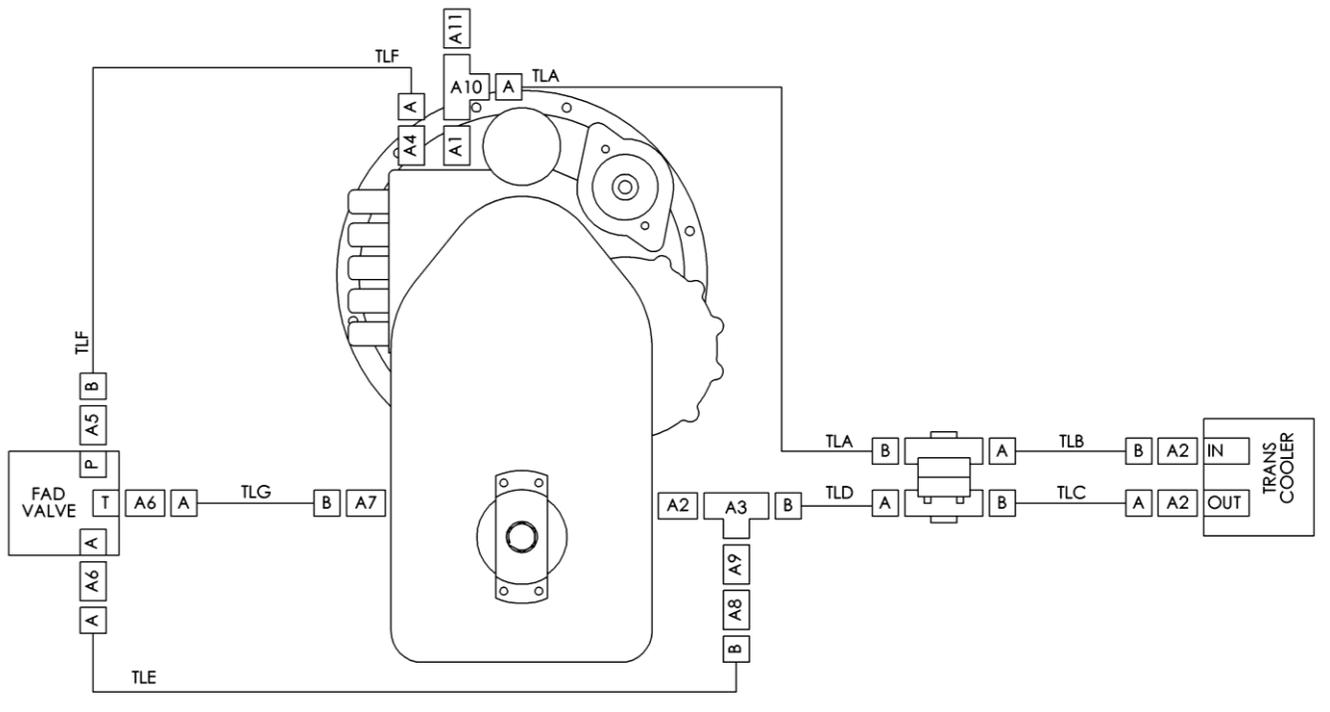
A Install specified components using Loctite® 565™ Pipe Sealant or comparable.

Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|----------------------|-----|
| 1 | 3152X4 | PLUG, 1/4 NPT | 2 |
| 2 | XM00-08-012-CA | COOLANT LEVEL SENSOR | 1 |

14.15 TRANSMISSION FLUID SCHEMATIC



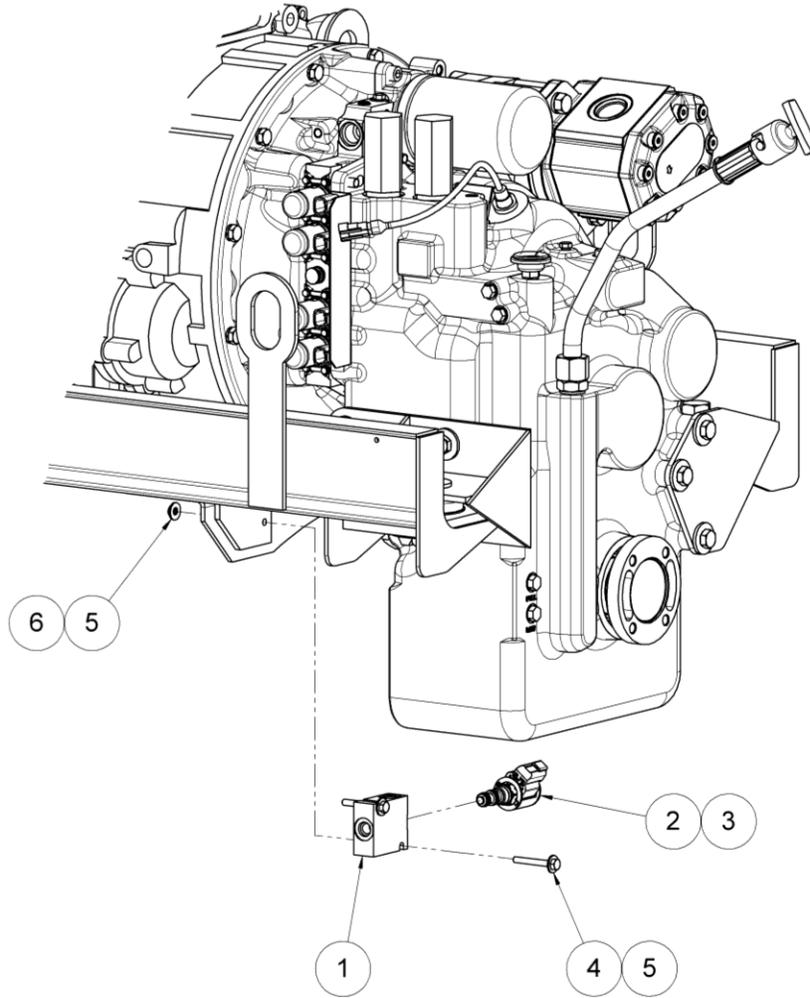
Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Hose | Description |
|------|-------------|--------|---|
| TLA | K-5384-TLA | H14512 | TRANSMISSION HOT TO THERMOSTAT VALVE |
| TLB | K-5384-TLB | H14512 | THERMOSTAT VALVE HOT TO COOLER |
| TLC | K-5384-TLC | H14512 | COOLER COLD TO THERMOSTAT VALVE |
| TLD | K-5384-TLD | H14512 | THERMOSTAT VALVE COLD TO TRANSMISSION |
| TLE | K-5384-TLE | H14506 | FRONT AXLE DISCONNECT VALVE RETURN |
| TLF | K-5384-TLF | H14506 | FRONT AXLE DISCONNECT VALVE PRESSURE |
| TLG | K-5384-TLG | H14506 | FRONT AXLE DISCONNECT VALVE TO TRANSMISSION |

| Item | Part Number | Description | Qty |
|------|---------------|-----------------------------------|-----|
| A1 | 12-10 F650X-S | ADAPTOR - 10 SAE ORB M - 12 JIC F | 1 |
| A2 | C5315X12 | ADAPTOR - 12 SAE ORB M - 12 JIC M | 3 |
| A3 | C5706X12 | RUN TEE - 12 JIC F - 2X 12 JIC M | 1 |
| A4 | C5205X4 | ADAPTOR - 4 JIC M - 1/8 NPT M | 1 |
| A5 | C5315X6 | ADAPTOR - 6 SAE ORB M - 6 JIC M | 1 |
| A6 | C5515X6 | ELBOW 90° - 6 SAE ORB M - 6 JIC M | 2 |
| A7 | C5315X8X12 | ADAPTOR - 12 SAE ORB M - 8 JIC M | 1 |
| A8 | C5015X12X6 | REDUCER - 12 JIC F - 6 JIC M | 1 |
| A9 | C5105X12 | JIC TUBE NUT - 12 | 1 |
| A10 | C5805X12 | RUN TEE - 3/4 NPT F - 2X 12 JIC M | 1 |
| A11 | C3109X12X6 | BUSHING - 3/4 NPT M - 3/8 NPT F | 1 |

14.16 FRONT AXLE DISCONNECT VALVE

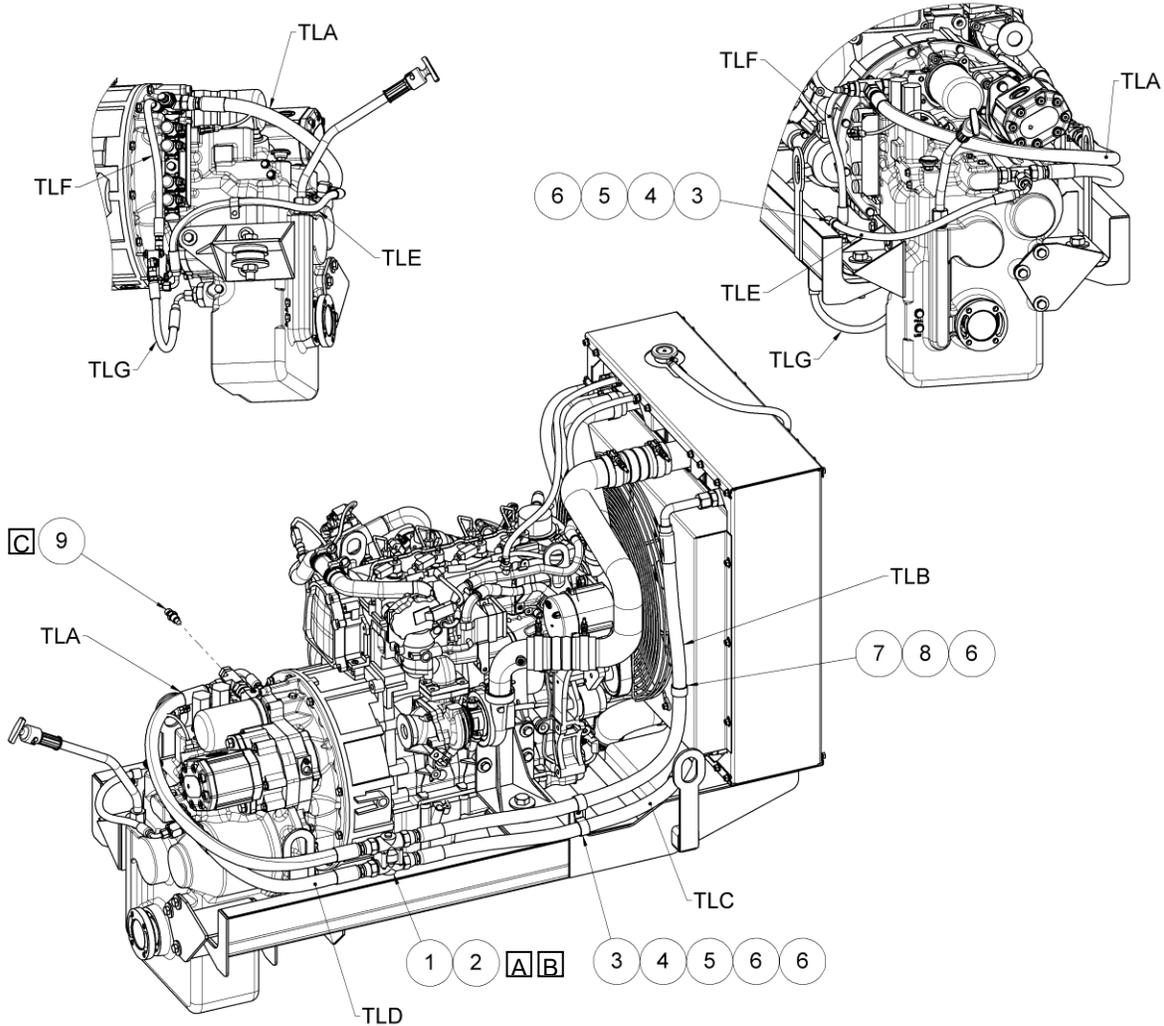


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|--------------------------------------|-----|
| 1 | XM00-04-016-CA | FRONT AXLE DISCONNECT VALVE HOUSING | 1 |
| 2 | XM00-04-015-CA | FRONT AXLE DISCONNECT SOLENOID VALVE | 1 |
| 3 | XM00-04-017-CA | FRONT AXLE DISCONNECT VALVE COIL | 1 |
| 4 | NPN | HCS, 1/4-20 UNC X 2 | 2 |
| 5 | NPN | FLAT WASHER, 1/4 | 4 |
| 6 | NPN | LOCK NUT, 1/4-20 UNC | 2 |

14.17 TRANSMISSION FLUID LINES



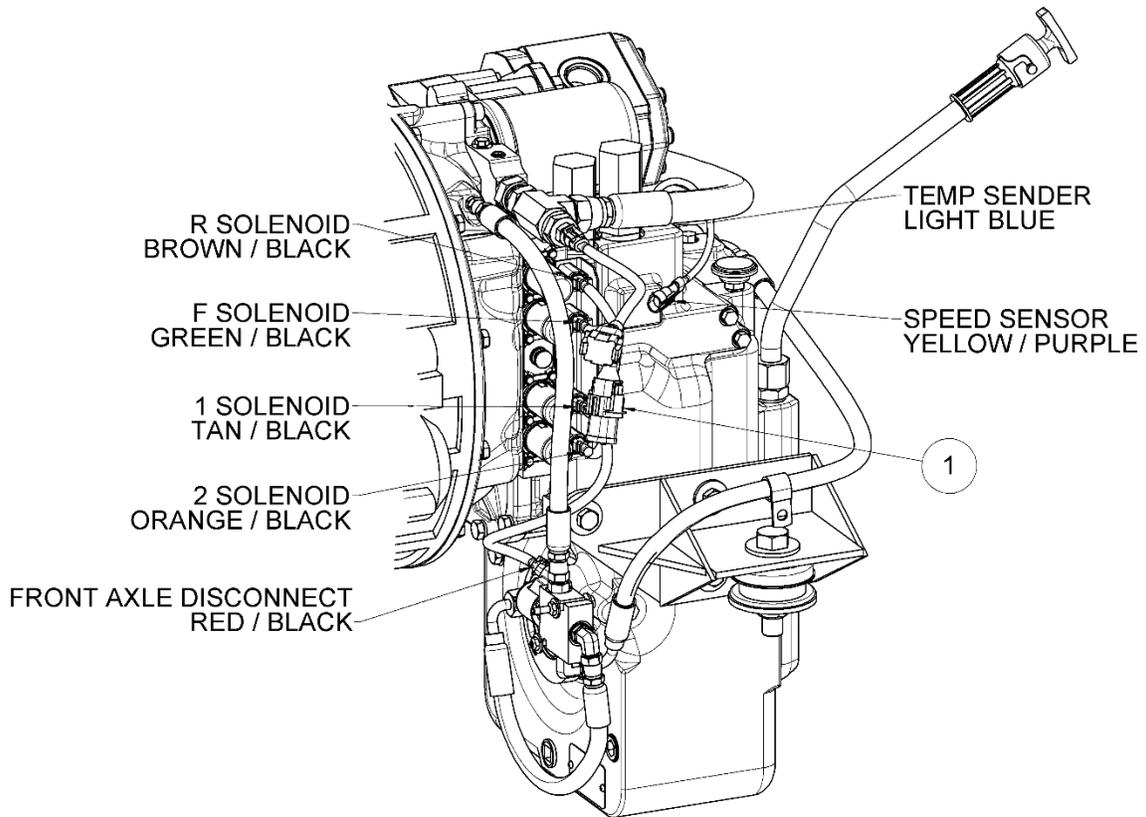
- A** Secure item 1 to the mounting tab on the engine cradle with an SAE hose clamp.
- B** Note orientation of Oil Thermostat. Screw Heads must be facing down.
- C** Install specified components using Loctite® 565™ Pipe Sealant or comparable.

Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|---------------------------------|-----|
| 1 | XL00-09-032-CA | OIL COOLER THERMOSTAT | 1 |
| 2 | NPN | SAE HOSE CLAMP | 1 |
| 3 | NPN | HCS, 1/4-20 UNC X .75 | 2 |
| 4 | NPN | LOCK WASHER, 1/4 | 2 |
| 5 | NPN | FLAT WASHER, 1/4 | 2 |
| 6 | NPN | CUSHION LOOP CLAMP | 4 |
| 7 | NPN | HCS, 5/16-18 UNC X 1.0 | 1 |
| 8 | NPN | LOCK WASHER, 5/16 | 1 |
| 9 | NVSP-09-012-CA | TRANSMISSION TEMPERATURE SENDER | 1 |

14.18 TRANSMISSION HARNESS

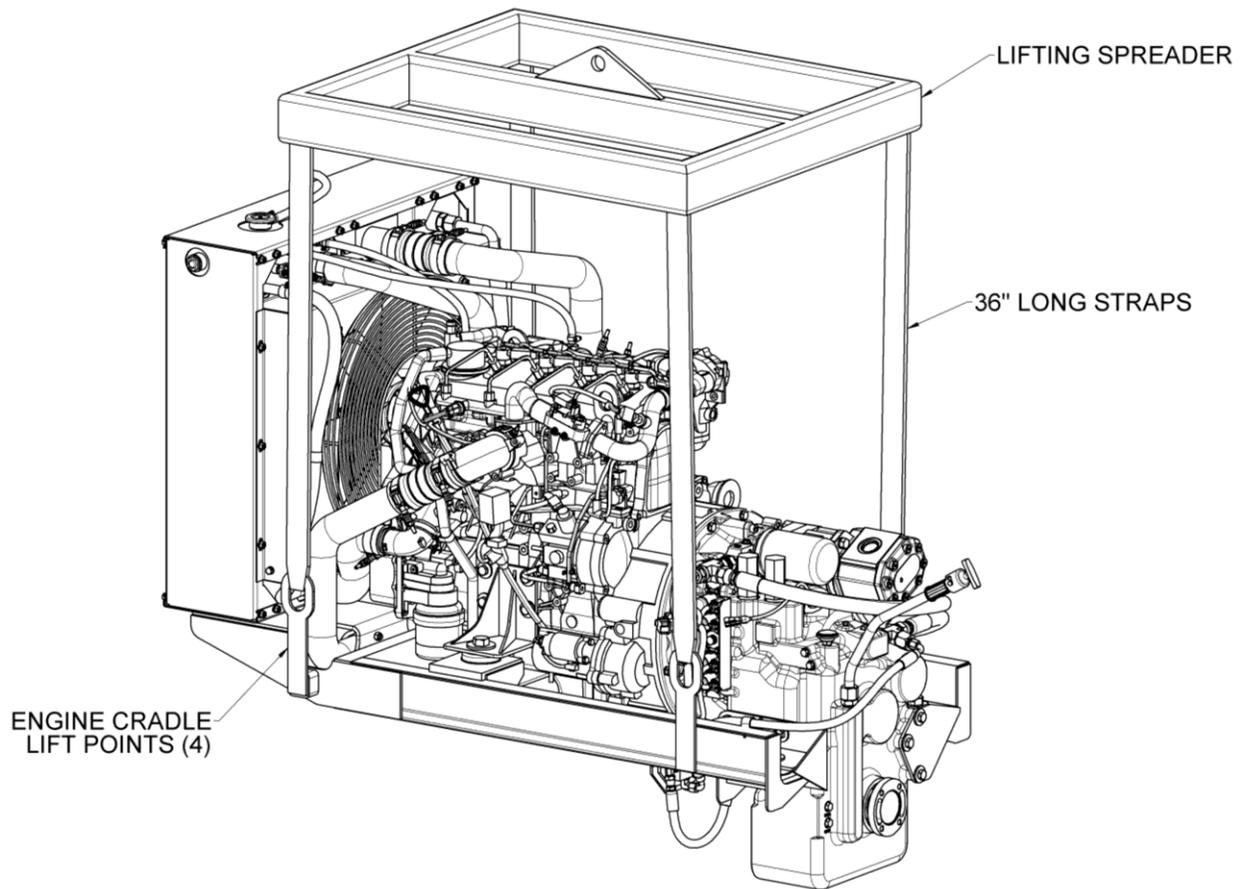


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|-----------------------------|-----|
| 1 | XM00-05-003-SA | TRANSMISSION WIRING HARNESS | 1 |

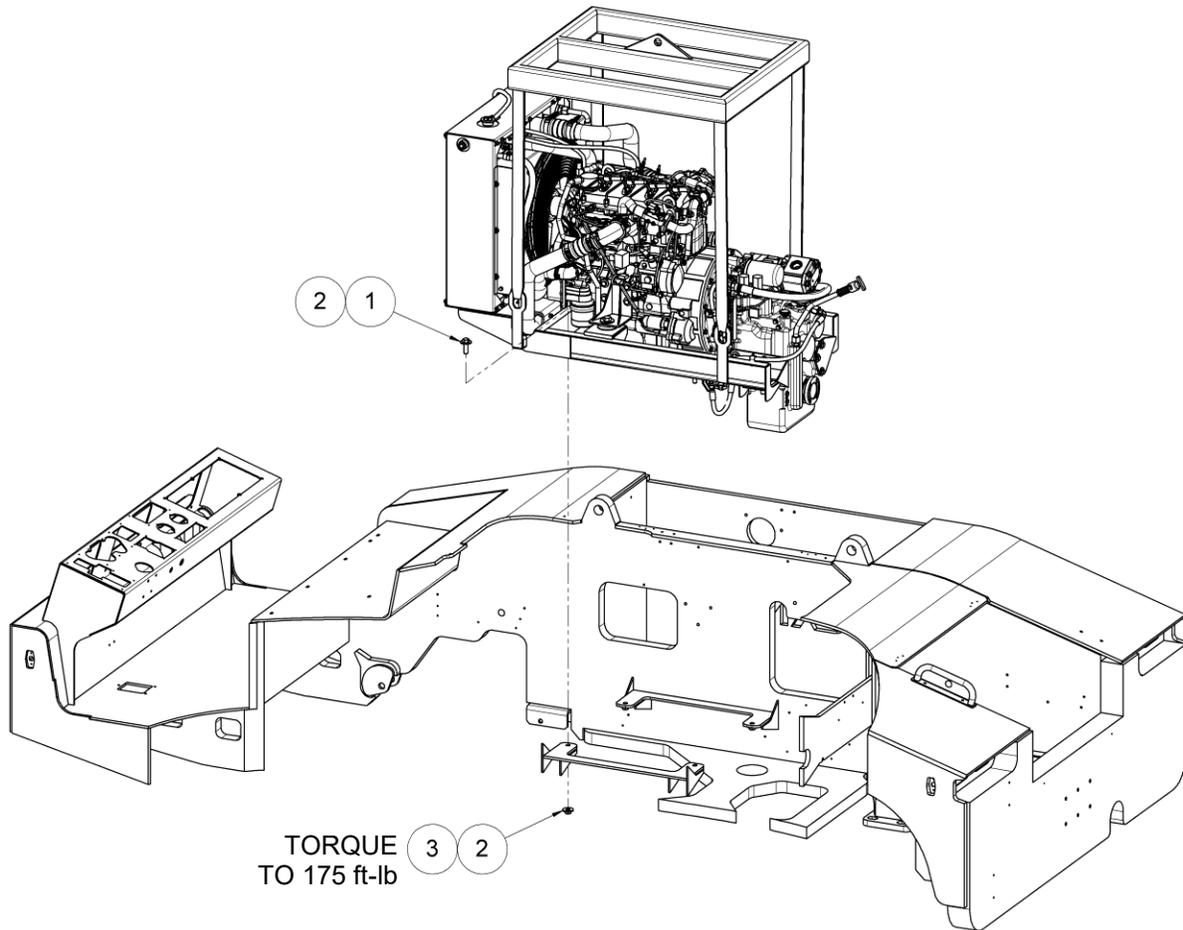
14.19 ENGINE LIFTING



To safely lift engine cradle assembly, lifting spreader (not provided) must be used. Spread distance is 36" front/rear and 30" side/side.

Weight of fully assembled engine package is approximately 1,500 lbs.

14.20 ENGINE INSTALL TO CHASSIS



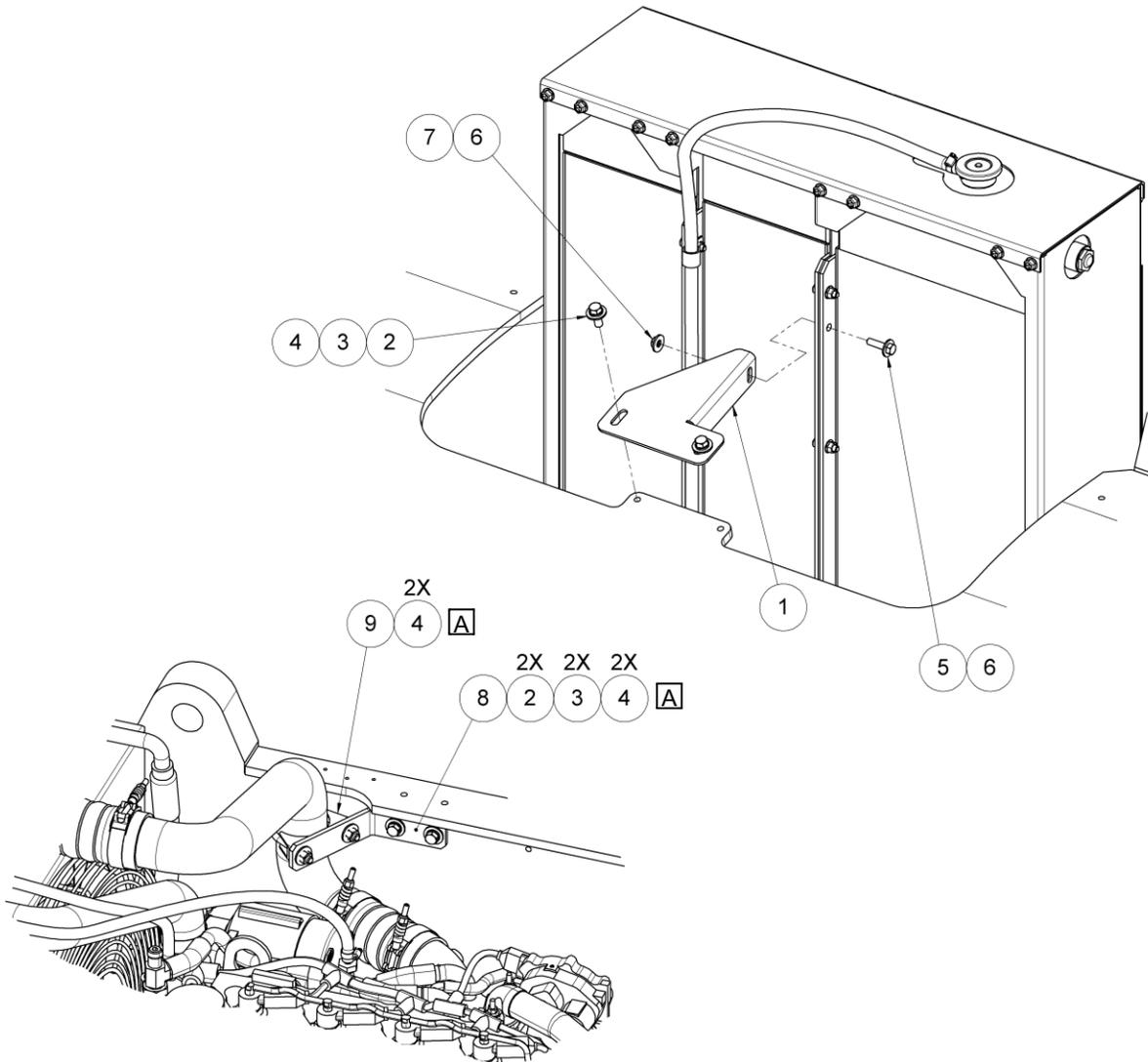
Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|-------------|--------------------------------------|-----|
| 1 | NPN | HCS, 5/8-11 UNC X 2, GR 8, ZN PLATED | 4 |
| 2 | NPN | FLAT WASHER, 5/8 | 8 |
| 3 | NPN | LOCK NUT, 5/8-11 UNC, GR C | 4 |

When installing or removing the engine assembly, go slowly and take care not to damage the cooler or other components.

14.21 ENGINE TO CHASSIS BRACKET



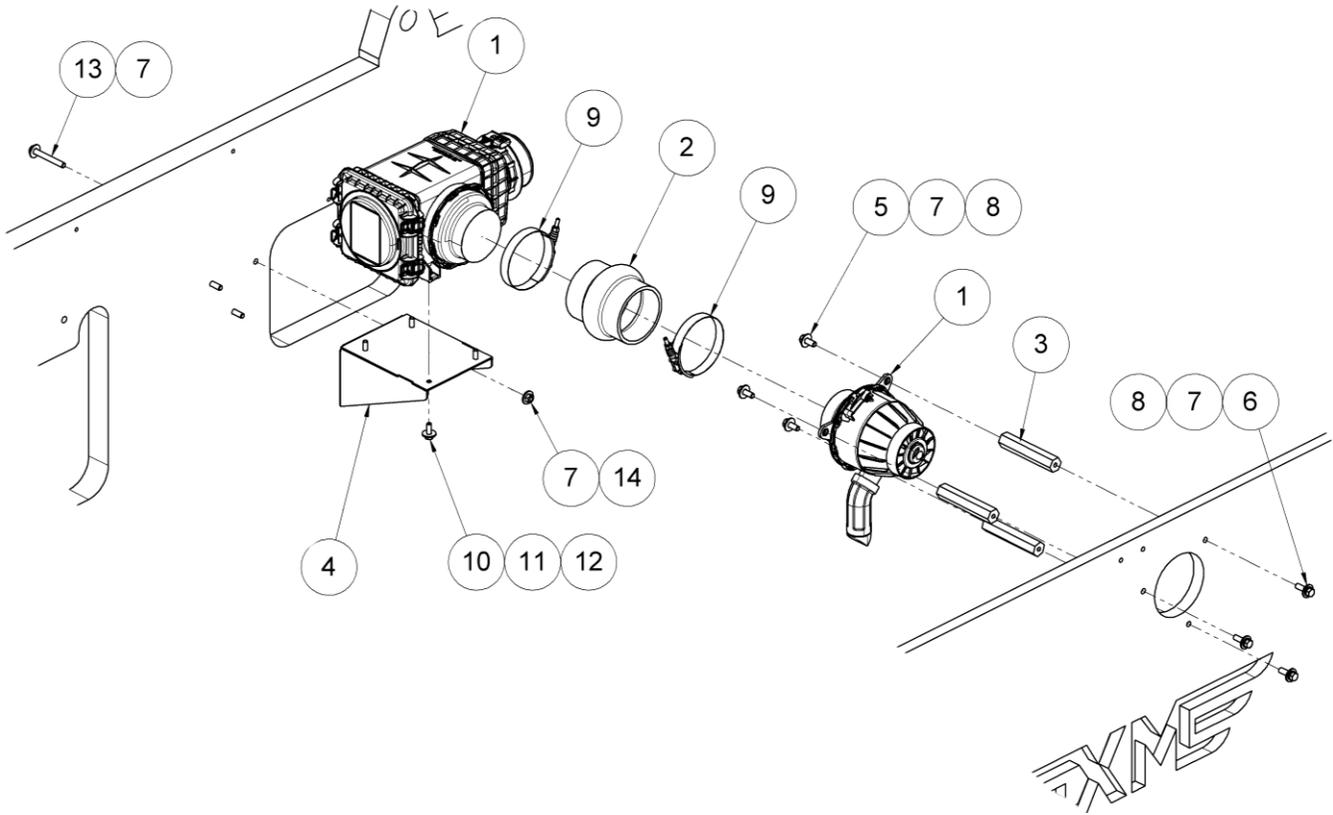
A Applies to tractors equipped with Tier 4F engines only

Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|-------------------------|-----|
| 1 | XM00-02-015-SA | RADIATOR TOP BRACKET | 1 |
| 2 | NPN | HCS, 3/8-16 UNC X 1 | 4 |
| 3 | NPN | LOCK WASHER, 3/8 | 4 |
| 4 | NPN | FLAT WASHER, 3/8 | 6 |
| 5 | NPN | HCS, 5/16-18 UNC X 1.25 | 1 |
| 6 | NPN | FLAT WASHER, 5/16 | 2 |
| 7 | NPN | LOCK NUT, 5/16-18 UNC | 1 |
| 8 | XM00-02-016-SA | TUBE BRACKET, 2.5IN | 1 |
| 9 | A-TT4-00398 | 2.5 IN DIA CLAMP | 1 |

14.22 AIR CLEANER TO CHASSIS

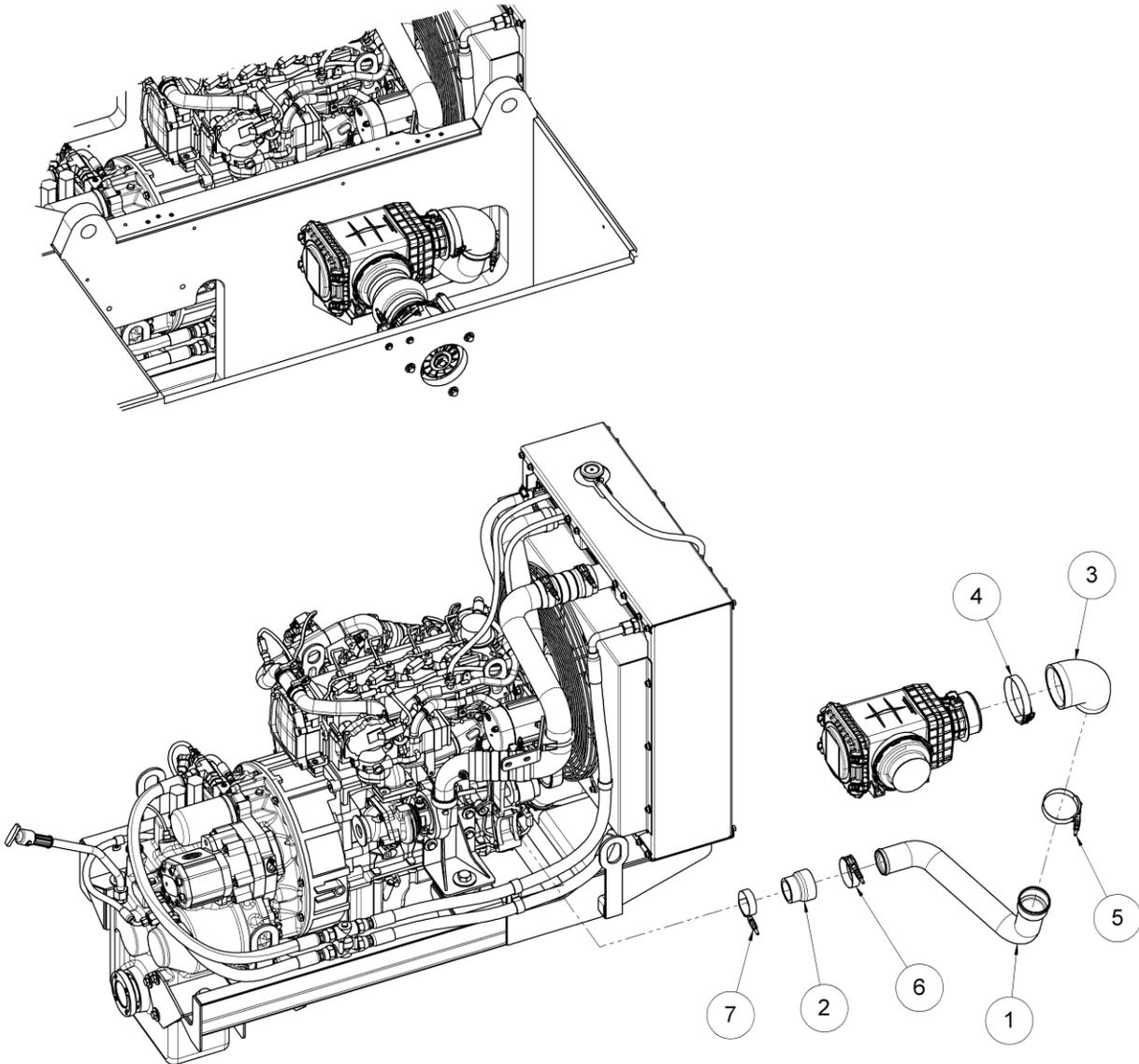


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|---------------------------------------|-----|
| 1 | XM00-03-011-SA | AIR CLEANER ASSEMBLY WITH PRE-CLEANER | 1 |
| 2 | XM00-06-001-CA | 4 IN STRAIGHT HUMP HOSE CONNECTION | 1 |
| 3 | XM00-06-006-SA | AIR INTAKE PRE-CLEANER SPACER | 3 |
| 4 | XM00-06-005-SA | AIR CLEANER BRACKET | 1 |
| 5 | NPN | HCS, 3/8-16 UNC X 1 | 3 |
| 6 | NPN | HCS, 3/8-16 UNC X 1.5 | 3 |
| 7 | NPN | LOCK WASHER, 3/8 | 6 |
| 8 | NPN | FLAT WASHER, 3/8 | 12 |
| 9 | NVSP-24-038-CC | SPRING LOADED T-BOLT CLAMP, 4.5 IN | 2 |
| 10 | NPN | HCS, M8X1.25 X 25 | 4 |
| 11 | NPN | LOCK WASHER, M8 | 4 |
| 12 | NPN | FLAT WASHER, M8 | 4 |
| 13 | NPN | HCS, 3/8-16 UNC X 3 | 3 |
| 14 | NPN | LOCK NUT, 3/8-16 UNC | 3 |

14.23 AIR INTAKE PIPE
 Applies to tractors equipped with Tier 4F engines only

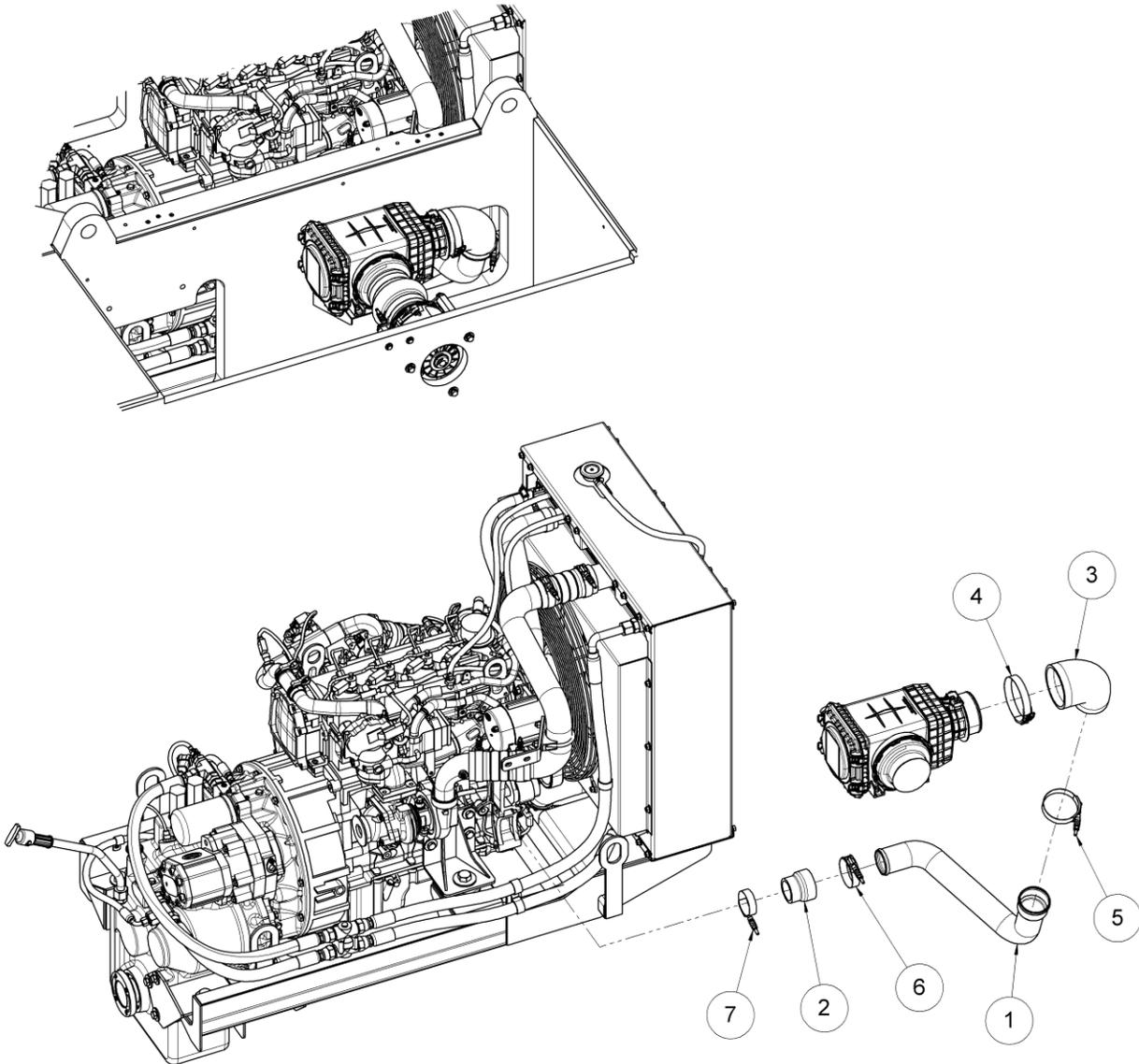


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|-----------------------------------|-----|
| 1 | XM00-06-002-SA | AIR INTAKE PIPE | 1 |
| 2 | XM00-06-004-CA | STRAIGHT REDUCER, 2.5 IN TO 2 IN | 1 |
| 3 | XM00-06-003-CA | ELBOW REDUCER, 4 IN TO 3 IN | 1 |
| 4 | NVSP-24-038-CC | SPRING LOADED T-BOLT CLAMP 4.5 IN | 1 |
| 5 | NVSP-24-038-CD | SPRING LOADED T-BOLT CLAMP 3.5 IN | 1 |
| 6 | NVSP-24-038-CE | SPRING LOADED T-BOLT CLAMP 3.0 IN | 1 |
| 7 | NVSP-24-038-CA | SPRING LOADED T-BOLT CLAMP 2.8 IN | 1 |

14.24 AIR INTAKE PIPE
 Applies to tractors equipped with Tier 3 engines only

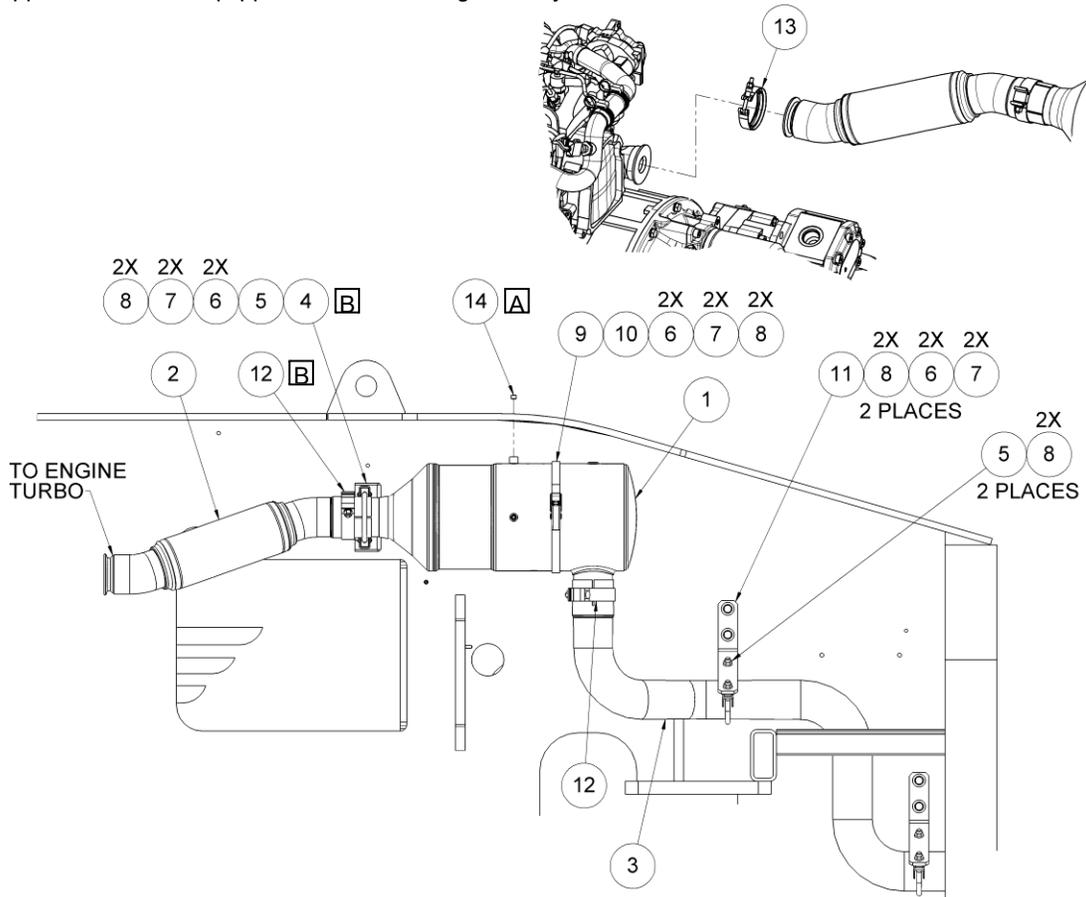


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|-----------------------------------|-----|
| 1 | XM00-06-008-SA | AIR INTAKE PIPE, TIER 3 | 1 |
| 2 | XM00-06-007-CA | ELBOW REDUCER, 3 IN TO 2 IN | 1 |
| 3 | XM00-06-003-CA | ELBOW REDUCER, 4 IN TO 3 IN | 1 |
| 4 | NVSP-24-038-CC | SPRING LOADED T-BOLT CLAMP 4.5 IN | 1 |
| 5 | NVSP-24-038-CD | SPRING LOADED T-BOLT CLAMP 3.5 IN | 2 |
| 6 | NVSP-24-038-CA | SPRING LOADED T-BOLT CLAMP 2.8 IN | 1 |
| 7 | XM00-06-009-CA | HEAT SHIELD SLEEVE, 24 IN LONG | 1 |

14.25 EXHAUST SYSTEM
 Applies to tractors equipped with Tier 4F engines only



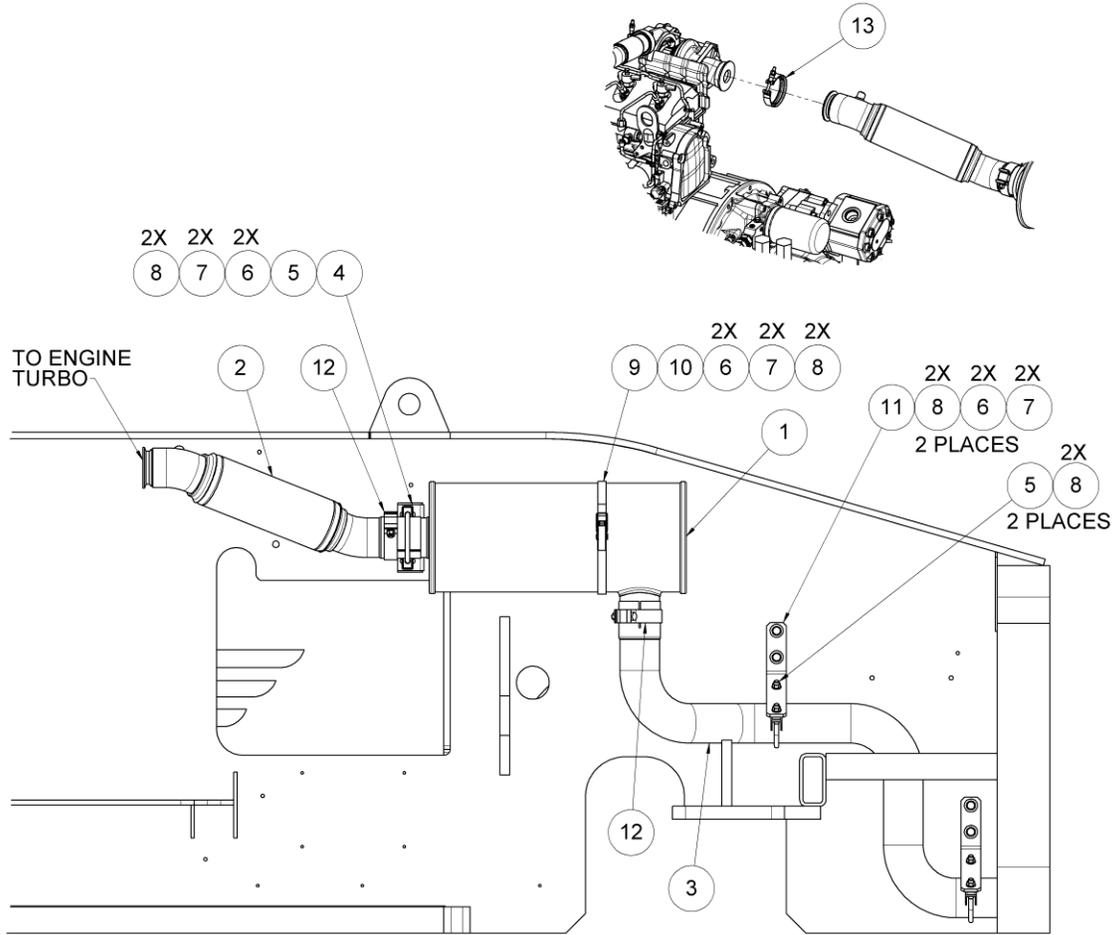
- A** Install specified components using Loctite® 565™ Pipe Sealant or comparable.
- B** Item 12 must be installed in front of alignment pins. Item 5 must be installed behind alignment pins. Bracket (Item 4) is slotted to allow proper installation.

Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|-------------------------------|-----|
| 1 | XM00-03-010-SA | DIESEL OXIDATION CATALYST | 1 |
| 2 | XM00-07-001-SA | EXHAUST PIPE A | 1 |
| 3 | XM00-07-002-SA | EXHAUST PIPE B | 1 |
| 4 | XM00-07-005-SA | FRONT EXHAUST BRACKET | 1 |
| 5 | NPN | 3" HD EXHAUST CLAMP | 3 |
| 6 | NPN | HCS, 3/8-16 UNC X 1 | 8 |
| 7 | NPN | LOCK WASHER, 3/8 | 8 |
| 8 | NPN | FLAT WASHER, 3/8 | 12 |
| 9 | XM00-07-006-SA | AFTERTREATMENT DOC BRACKET | 1 |
| 10 | XM00-07-007-SA | AFTERTREATMENT STRAP CLAMP | 1 |
| 11 | XM00-07-008-SA | REAR EXHAUST BRACKET | 2 |
| 12 | XM00-07-004-SA | 3 IN BAND-STYLE EXHAUST CLAMP | 2 |
| 13 | XM00-07-003-SA | EXHAUST CLAMP TURBO FLANGE | 1 |
| 14 | 1/8 HHP - SS | 1/8 NPT STAINLESS PIPE PLUG | 1 |

14.26 EXHAUST SYSTEM
Applies to tractors equipped with Tier 3 engines only

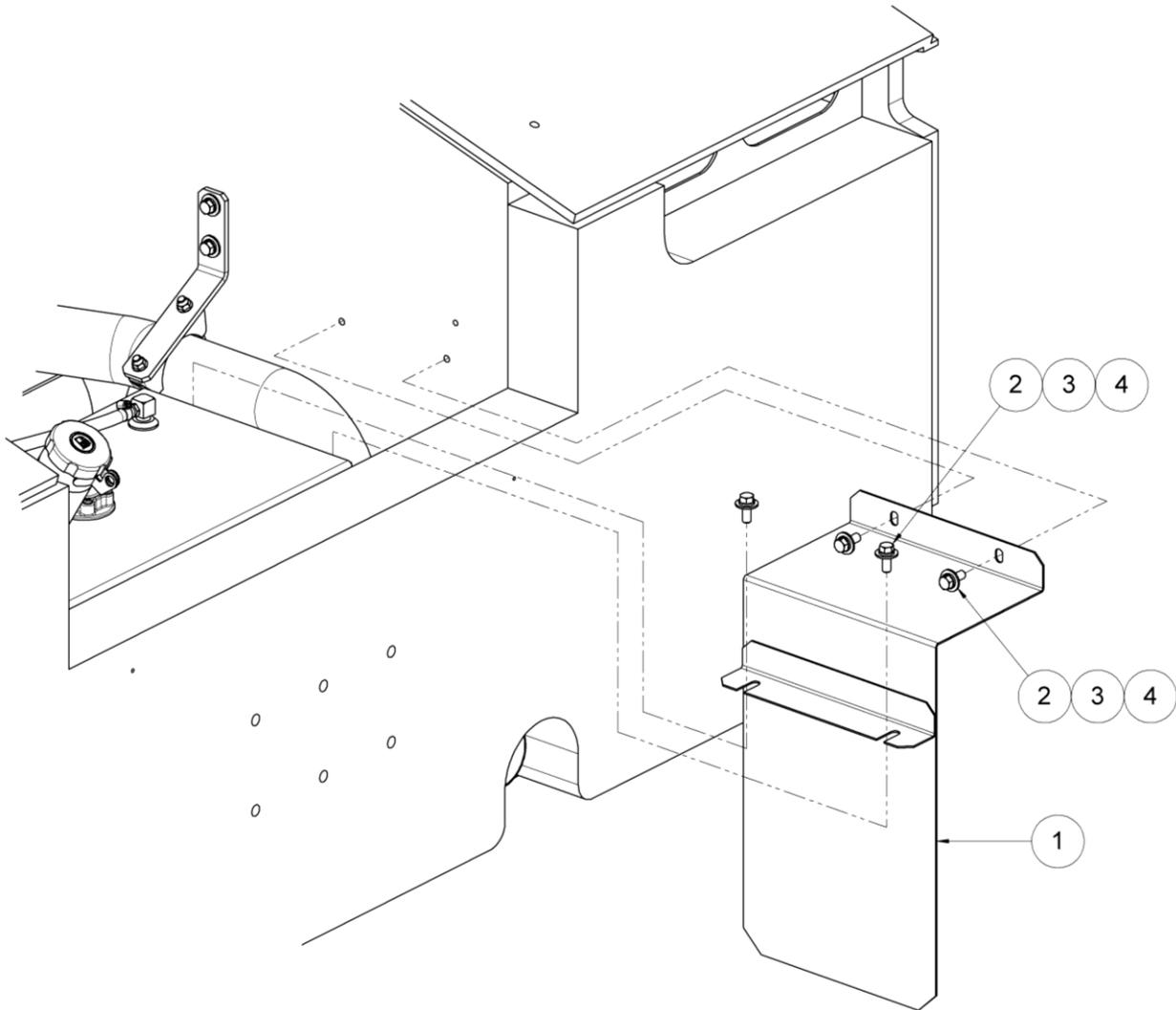


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|-------------------------------|-----|
| 1 | XM00-07-010-SA | MUFFLER, TIER 3 | 1 |
| 2 | XM00-07-011-SA | EXHAUST PIPE A, TIER 3 | 1 |
| 3 | XM00-07-002-SA | EXHAUST PIPE B | 1 |
| 4 | XM00-07-005-SA | FRONT EXHAUST BRACKET | 1 |
| 5 | NPN | 3" HD EXHAUST CLAMP | 3 |
| 6 | NPN | HCS, 3/8-16 UNC X 1 | 8 |
| 7 | NPN | LOCK WASHER, 3/8 | 8 |
| 8 | NPN | FLAT WASHER, 3/8 | 12 |
| 9 | XM00-07-006-SA | AFTERTREATMENT DOC BRACKET | 1 |
| 10 | XM00-07-007-SA | AFTERTREATMENT STRAP CLAMP | 1 |
| 11 | XM00-07-008-SA | REAR EXHAUST BRACKET | 2 |
| 12 | XM00-07-004-SA | 3 IN BAND-STYLE EXHAUST CLAMP | 2 |
| 13 | XM00-07-003-SA | EXHAUST CLAMP TURBO FLANGE | 1 |

14.27 EXHAUST HEAT SHIELD

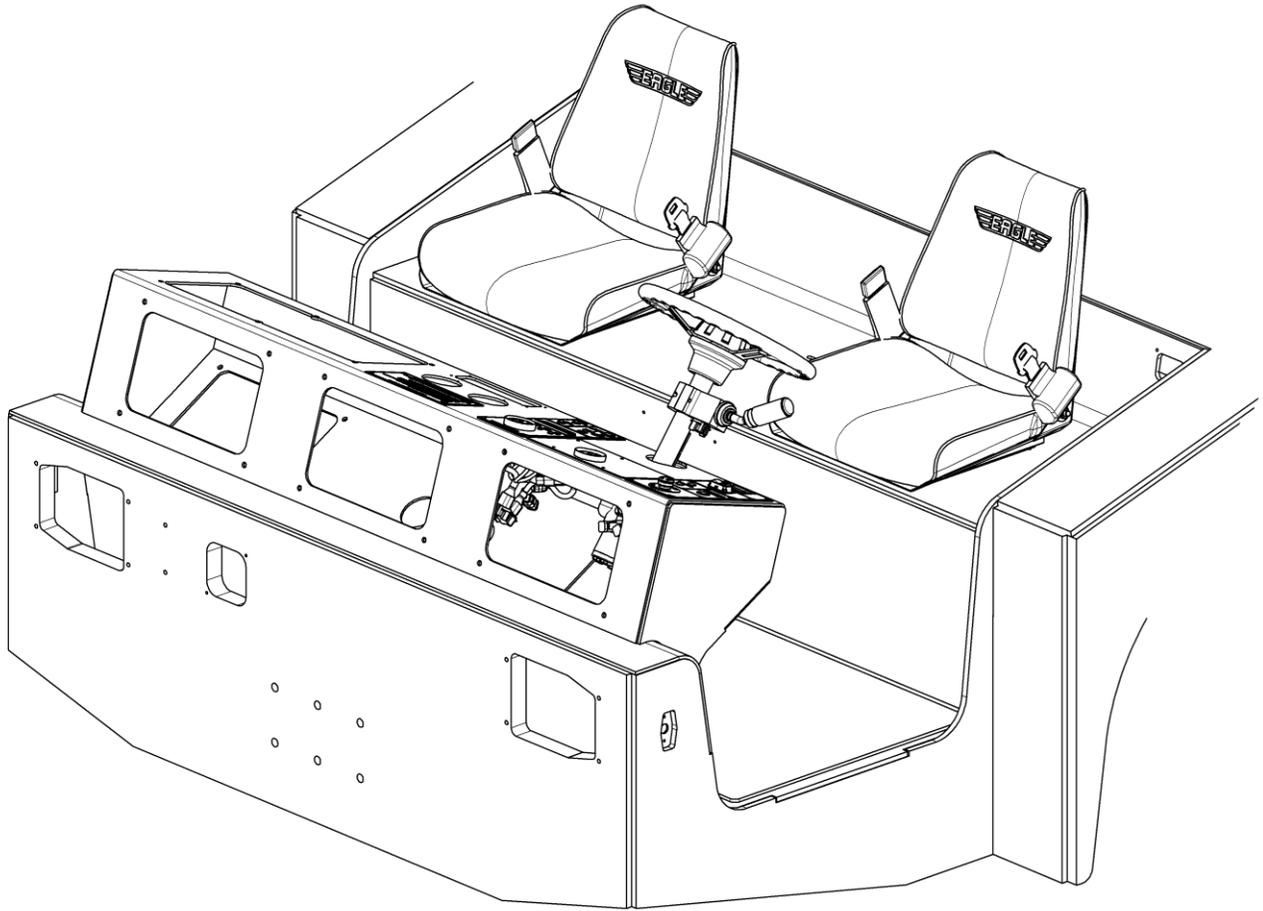


When ordering replacement parts/kits, please specify model and serial number your unit.

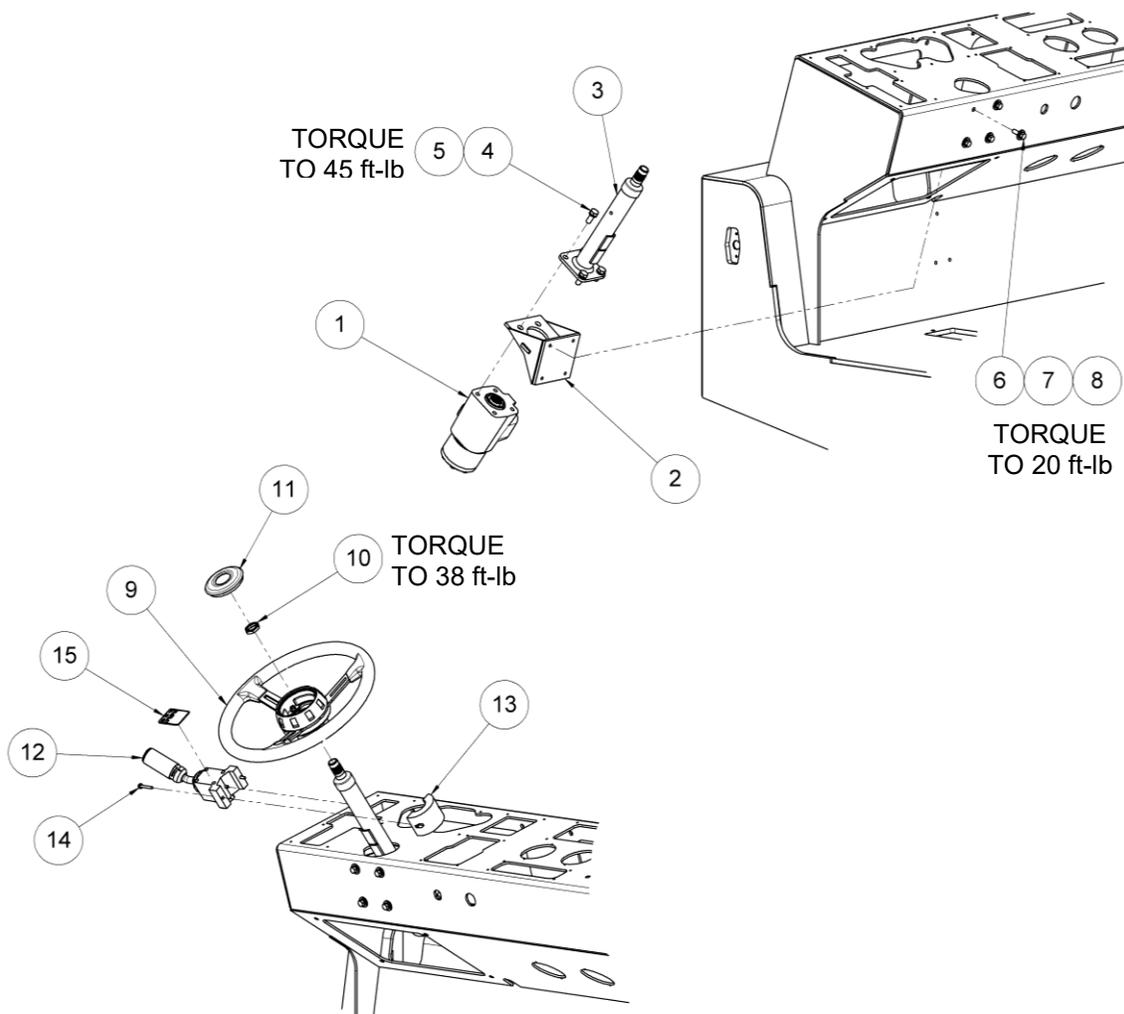
| Item | Part Number | Description | Qty |
|------|----------------|---------------------|-----|
| 1 | XM00-07-009-SA | EXHAUST HEAT SHIELD | 1 |
| 2 | NPN | HCS, 3/8-16 UNC X 1 | 4 |
| 3 | NPN | LOCK WASHER, 3/8 | 4 |
| 4 | NPN | FLAT WASHER, 3/8 | 4 |

Hardware stacks are shared with fuel tank installation. See Section 13.0 Fuel System for details.

15.0 OPERATOR INTERFACE



15.1 STEERING COLUMN AND WHEEL

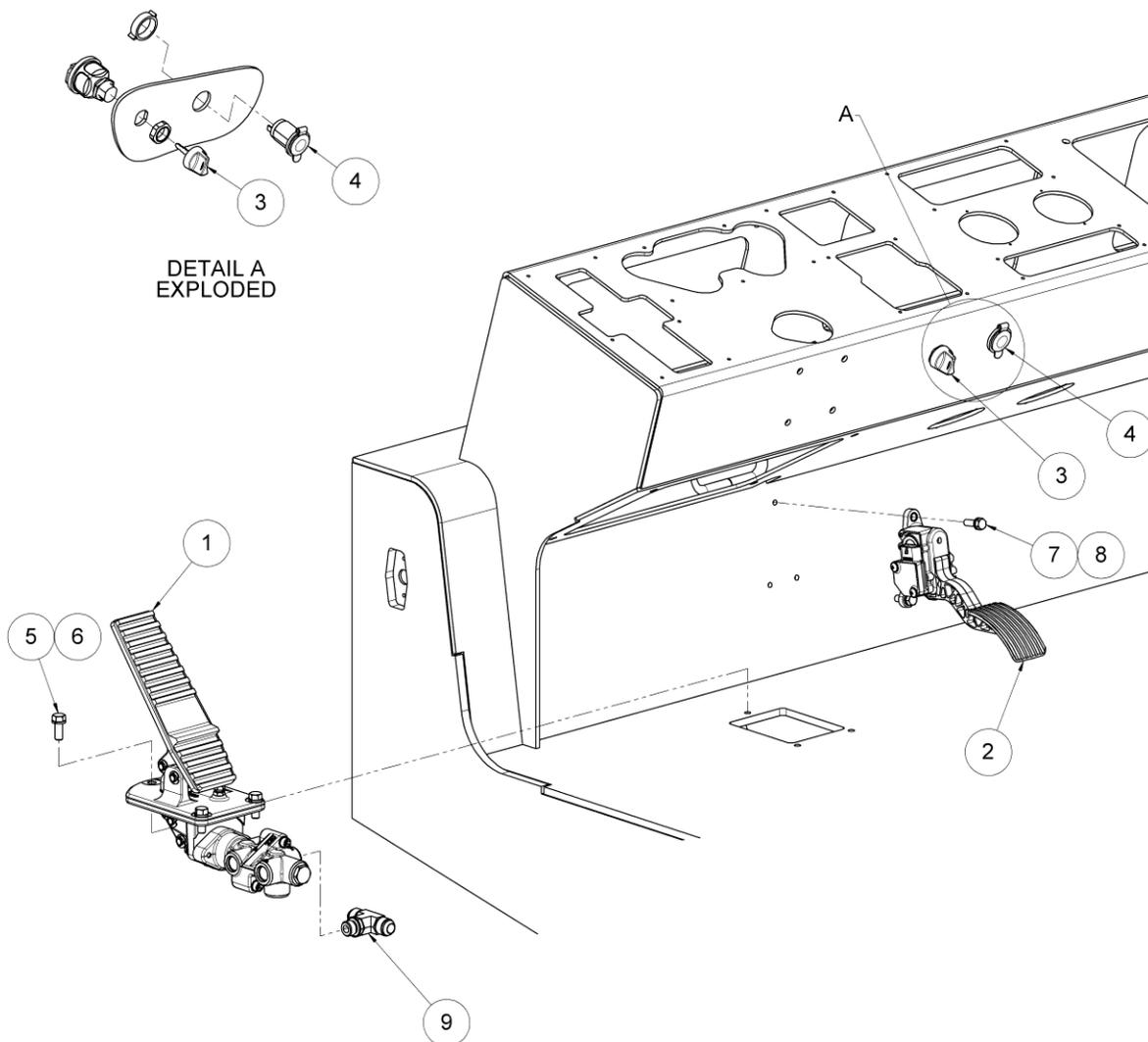


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|--|-----|
| 1 | XM00-09-002-CA | STEERING ORBITAL W/ POWER BEYOND | 1 |
| 2 | XL00-02-062-SA | STEERING COLUMN BRACKET | 1 |
| 3 | A-MTT5-0807 | STEERING COLUMN | 1 |
| 4 | NPN | HCS, M10X1.5 X 25 | 4 |
| 5 | NPN | LOCK WASHER, M10 | 4 |
| 6 | NPN | HCS, 5/16-18 UNC X 1 | 4 |
| 7 | NPN | LOCK WASHER, 5/16 | 4 |
| 8 | NPN | FLAT WASHER, 5/16 | 5 |
| 9 | A-TT10-00809 | STEERING WHEEL, 14" | 1 |
| 10 | A-TT10-00813 | WHEEL NUT, 13/16-20 UNEF | 1 |
| 11 | A-TT10-00811 | HORN BUTTON | 1 |
| 12 | NVSP-14-046-CA | TRANSMISSION SHIFT LEVER | 1 |
| 13 | NVSP-14-047-CA | TRANSMISSION SHIFT CLAMP | 1 |
| 14 | NPN | HCS, #10-32 UNF X 1.375 | 2 |
| 15 | XM00-14-020-SA | SHIFTER DATA PLACARD, F-N-R, SELF ADHESIVE | 1 |

15.2 THROTTLE AND BRAKE PEDALS



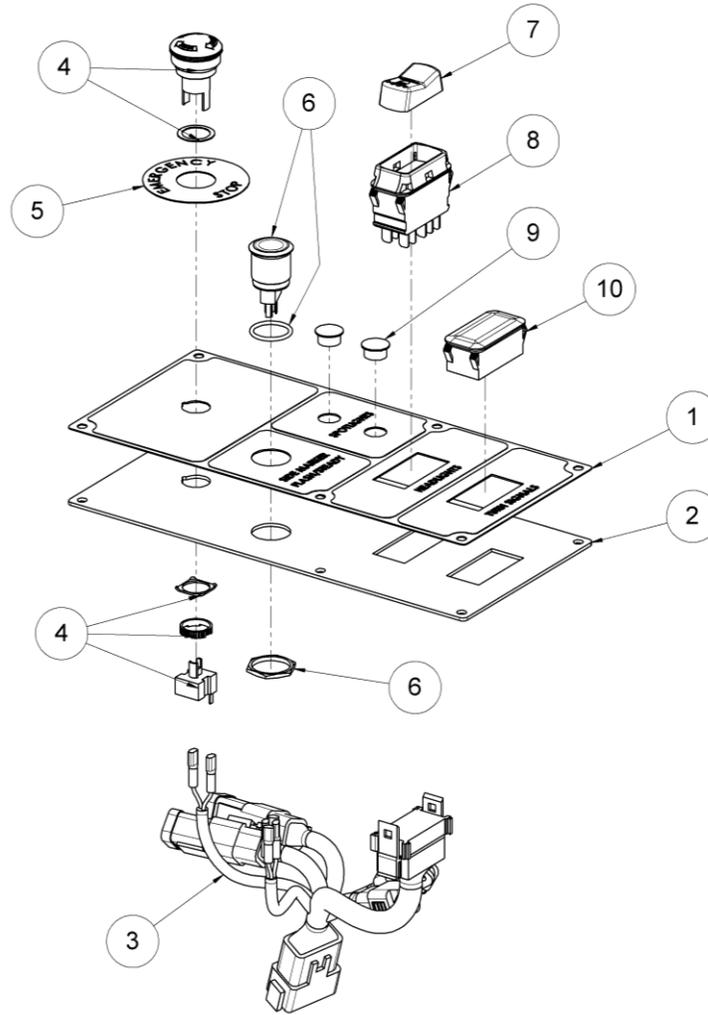
Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|------------------------------------|-----|
| 1 | XL00-13-001-SB | BRAKE PEDAL ASSEMBLY | 1 |
| 2 | NVSP-14-033-CA | THROTTLE PEDAL, DUAL ANALOG | 1 |
| 3 | NVSP-05-005-CA | IGNITION SWITCH KEYED | 1 |
| N/A | NVSP-05-005-CB | IGNITION SWITCH KEYLESS (OPTIONAL) | N/A |
| 4 | AE-OPT-0094 | 12V ACCESSORY OUTLET | 1 |
| 5 | NPN | HCS, 3/8-16 UNC X 1 | 3 |
| 6 | NPN | LOCK WASHER, 3/8 | 3 |
| 7 | NPN | HCS, 5/16-18 UNC X 1 | 3 |
| 8 | NPN | LOCK WASHER, 5/16 | 3 |
| 9 | C5706X6 | TEE - 2 x 10 JIC M - 6 JIC F | 1 |

Item 9 tee fitting installed to “T” port on brake valve must be installed prior to installing brake valve.

15.3 LH DASH PANEL COMPONENTS



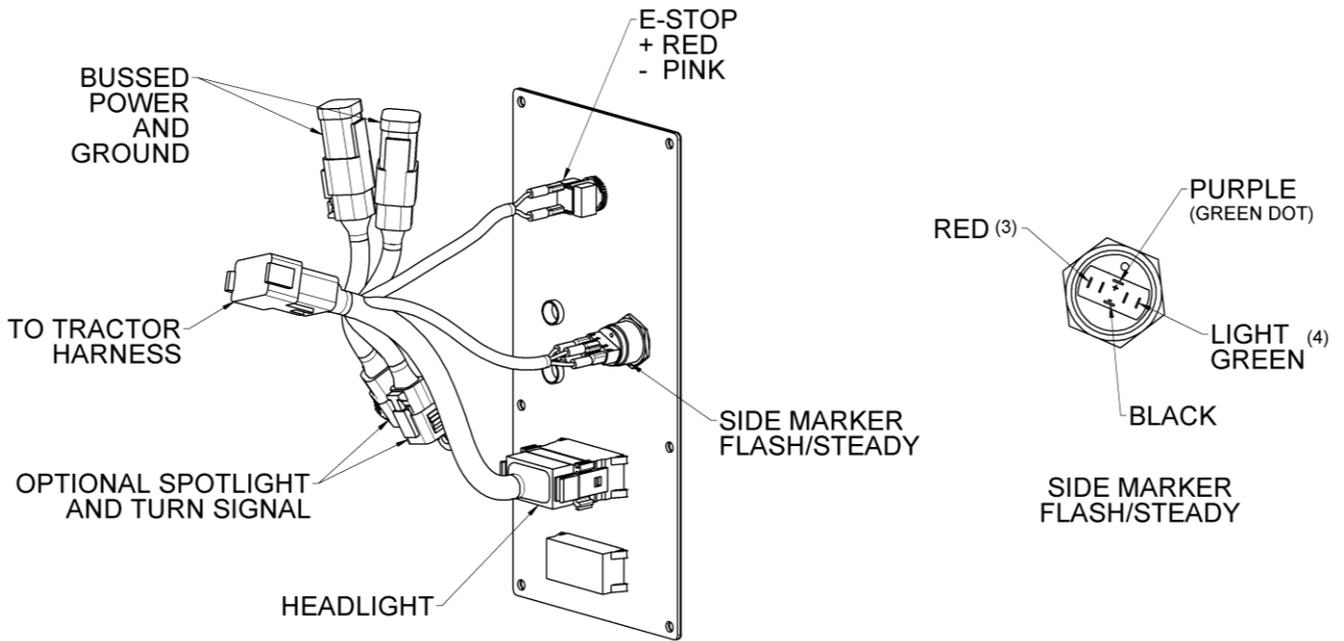
Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

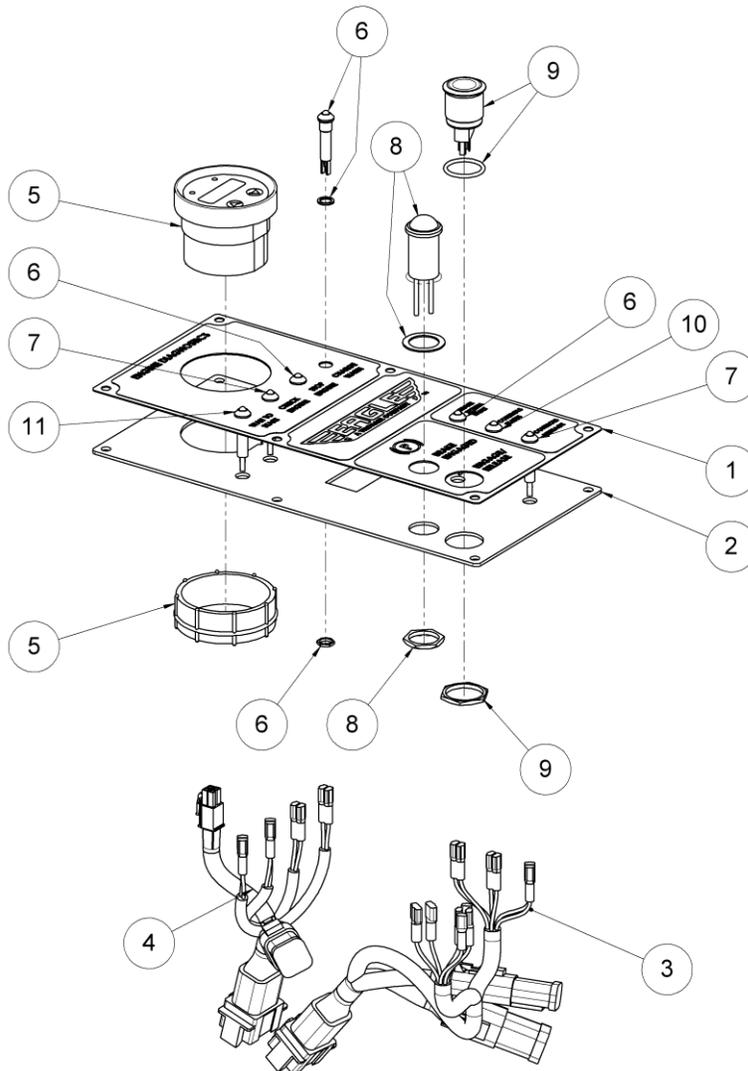
| Item | Part Number | Description | Qty |
|------|----------------|---|-----|
| 1 | XM00-14-003-SA | LH CONTROLS PLACARD | 1 |
| 2 | XM00-14-004-SA | LH CONTROLS PLACARD SPACER | 1 |
| 3 | XM00-05-005-SA | LH DASH HARNESS | 1 |
| 4 | NVSP-14-041-CA | E-STOP BUTTON | 1 |
| 5 | NVSP-14-042-CA | E-STOP PLACARD | 1 |
| 6 | NVSP-14-043-CA | RING ILLUMINATED PUSHBUTTON, MAINTAINED | 1 |
| 7 | NVSP-14-002-CD | HEADLIGHT ROCKER | 1 |
| 8 | NVSP-14-001-CD | OFF-ON SWITCH BASE | 1 |
| 9 | NVSP-14-044-CA | HOLE PLUG, 1/2" | 2 |
| 10 | NVSP-14-003-CA | EMPTY SWITCH PLUG | 1 |

Items 9 and 10 are standard equipment. See separate documentation if Spotlight or Turn Signal option is purchased.

15.4 LH DASH PANEL WIRING



15.5 RH DASH PANEL COMPONENTS

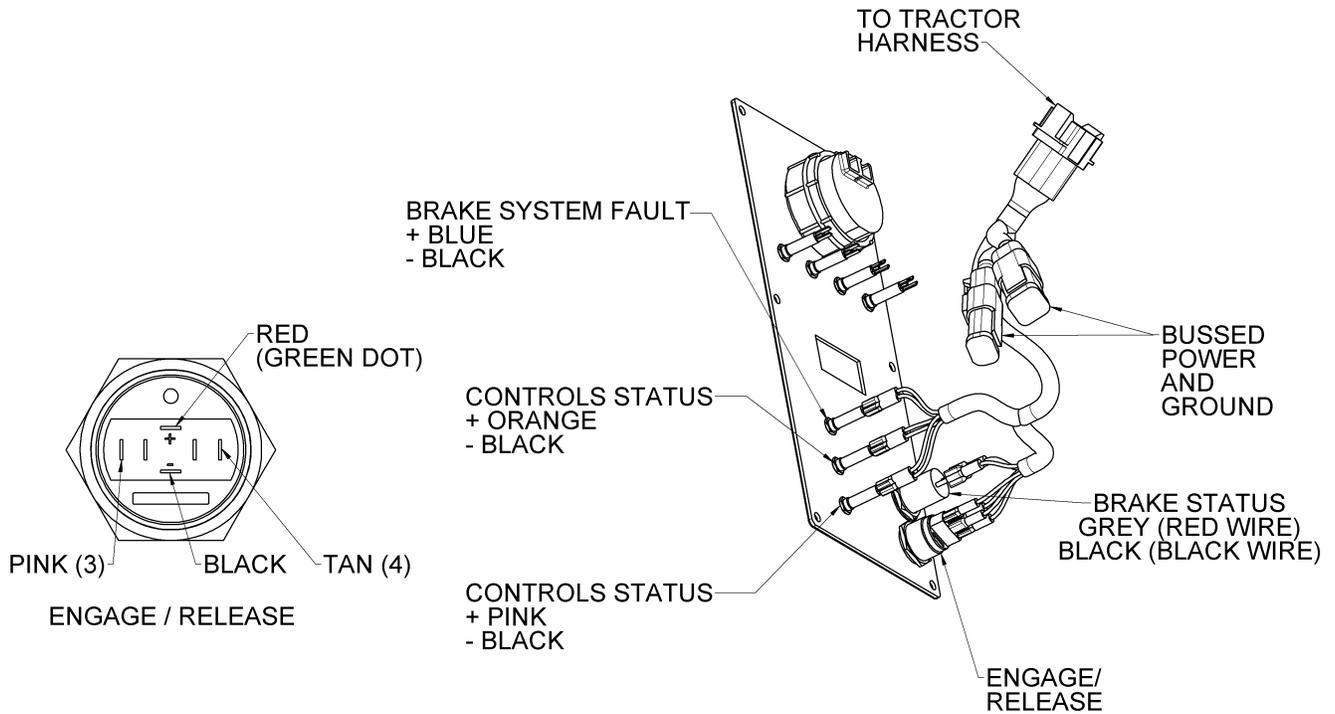
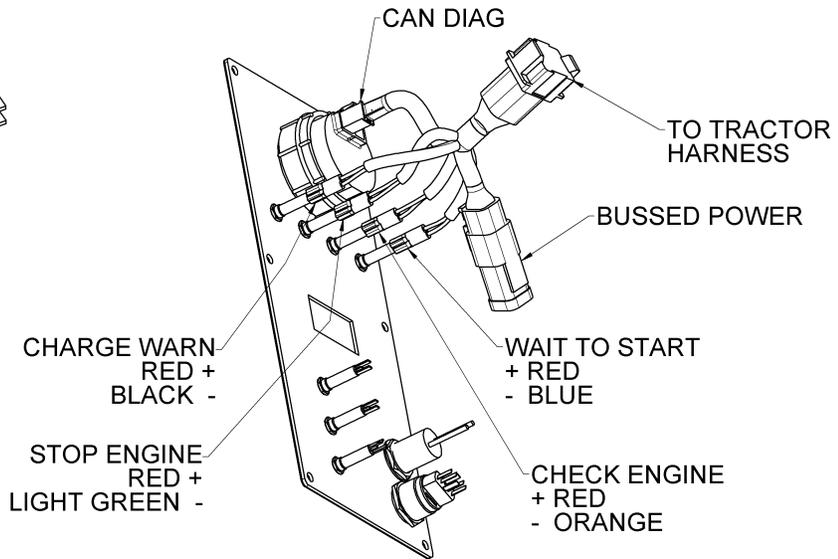


Parts List

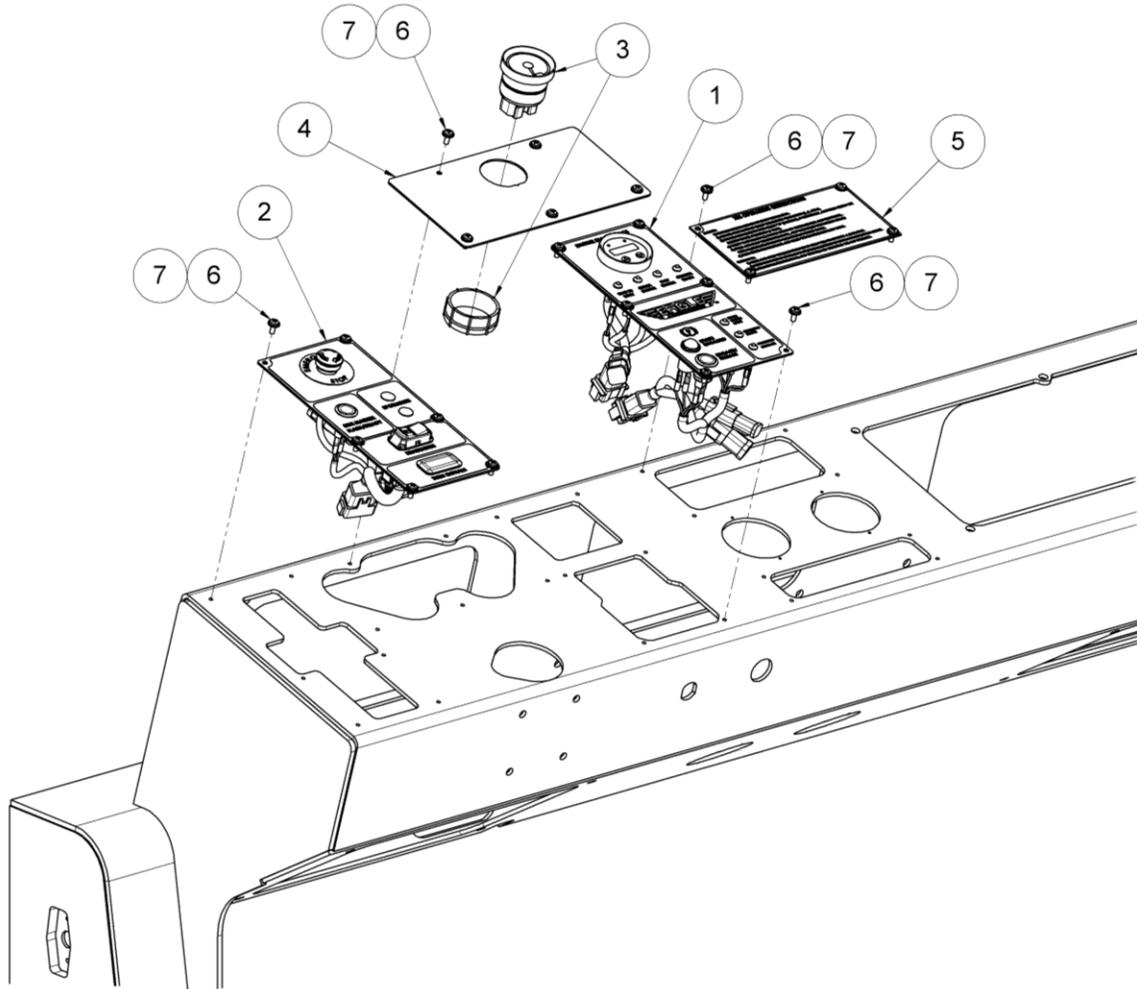
When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|--|-----|
| 1 | XM00-14-001-SA | RH CONTROLS PLACARD | 1 |
| 2 | XM00-14-002-SA | RH CONTROLS PLACARD SPACER | 1 |
| 3 | XM00-05-007-SA | RH BRAKE DASH HARNESS | 1 |
| 4 | XM00-05-004-SA | RH DIAGNOSTIC DASH HARNESS | 1 |
| 5 | NVSP-14-034-CA | CAN DIAGNOSTIC MODULE | 1 |
| 6 | NVSP-14-036-CA | LED PANEL INDICATOR, RED, 7MM | 3 |
| 7 | NVSP-14-035-CA | LED PANEL INDICATOR, YELLOW, 7MM | 2 |
| 8 | NVSP-14-052-CA | DAYLIGHT VISIBLE LED INDICATOR, RED | 1 |
| 9 | NVSP-14-038-CA | RING ILLUMINATED PUSHBUTTON, MOMENTARY | 1 |
| 10 | NVSP-14-051-CA | LED PANEL INDICATOR, GREEN, 7MM | 1 |
| 11 | NVSP-14-050-CA | LED PANEL INDICATOR, CLEAR, 7MM | 1 |

15.6 RH DASH PANEL WIRING



15.7 DASH PANELS, FUEL GAUGE AND INSTRUCTION PLATE



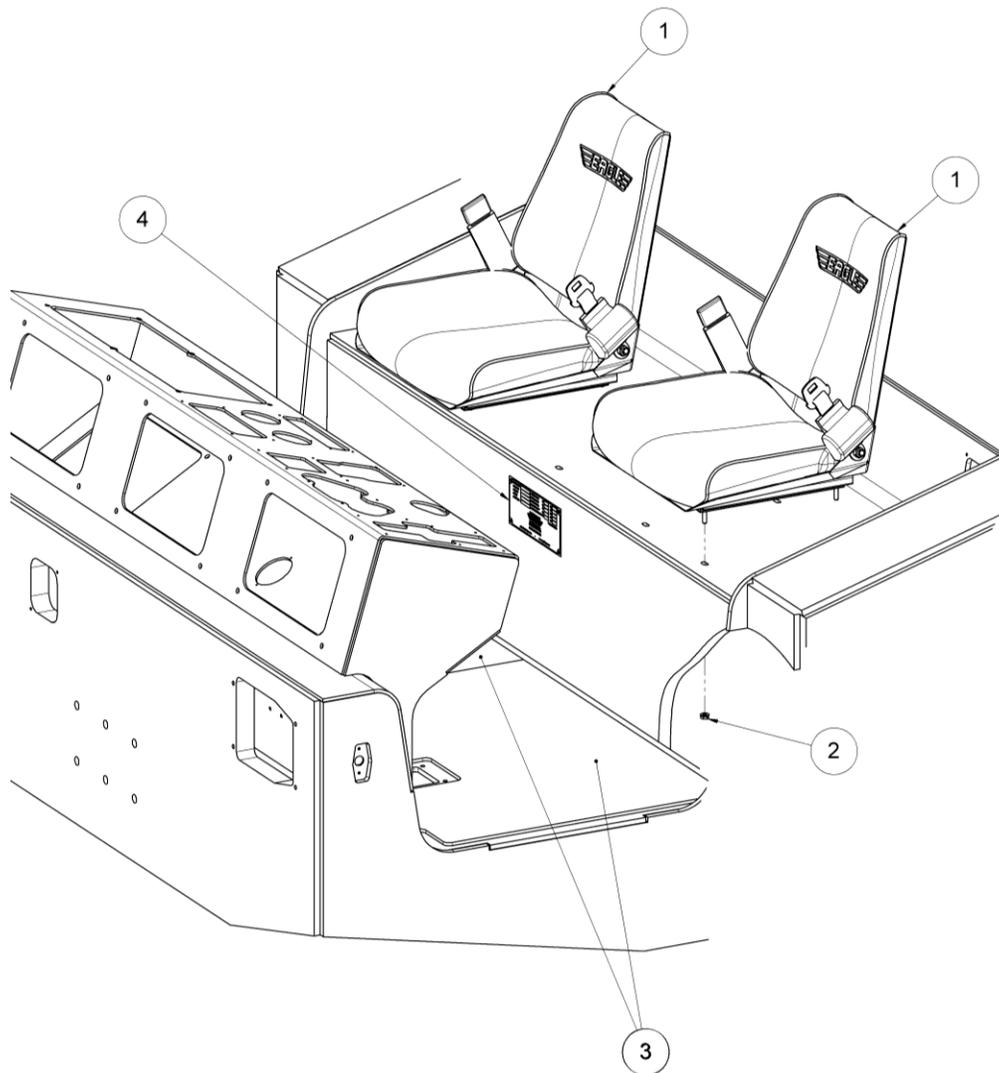
Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|---|-----|
| 1 | NPN | RH DASH PANEL ASSEMBLY (SEE PREVIOUS PAGES) | 1 |
| 2 | NPN | LH DASH PANEL ASSEMBLY (SEE PREVIOUS PAGES) | 1 |
| 3 | NVSP-14-045-CA | CAN FUEL GAGE | 1 |
| 4 | XM00-14-009-SA | STANDARD GAGE MOUNTING PANEL | 1 |
| 5 | XM00-14-012-SA | XM INSTRUCTIONAL PLACARD | 1 |
| 6 | NPN | BCS, #10-32 UNF X .5 | 21 |
| 7 | NPN | FLAT WASHER, #10 | 21 |

Items 3 and 4 are standard equipment. See separate documentation if Expanded Gage Package option is purchased.

15.8 SEATS AND FLOOR MATS



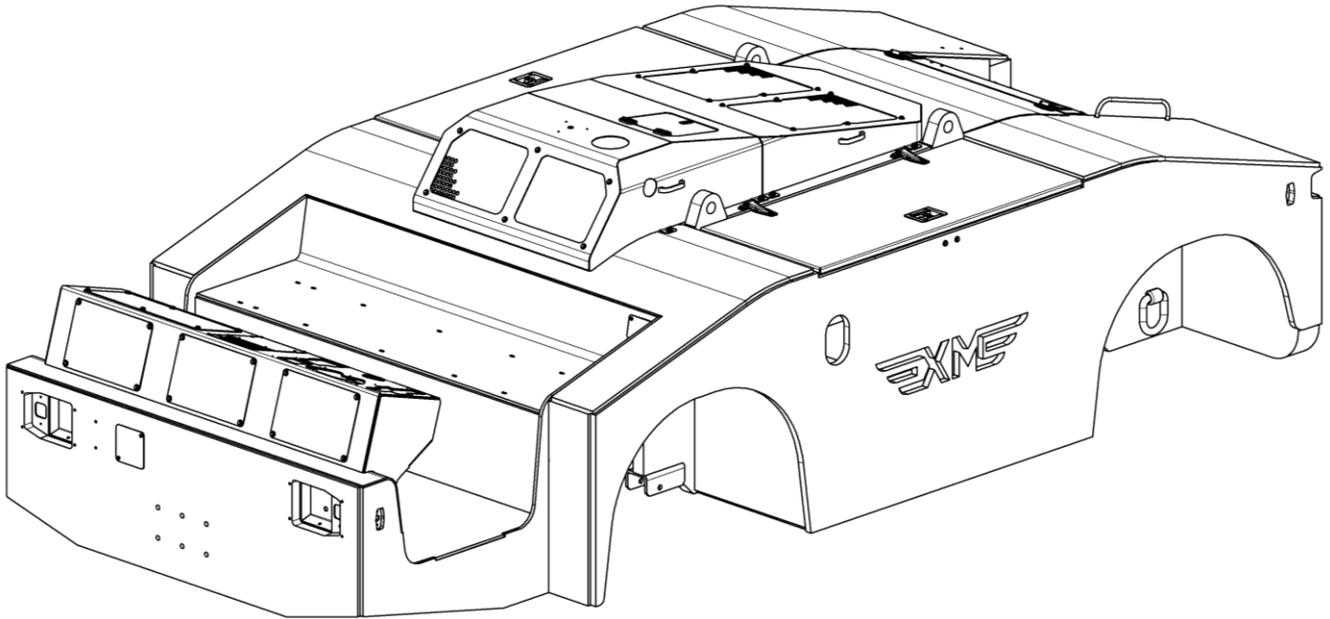
Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

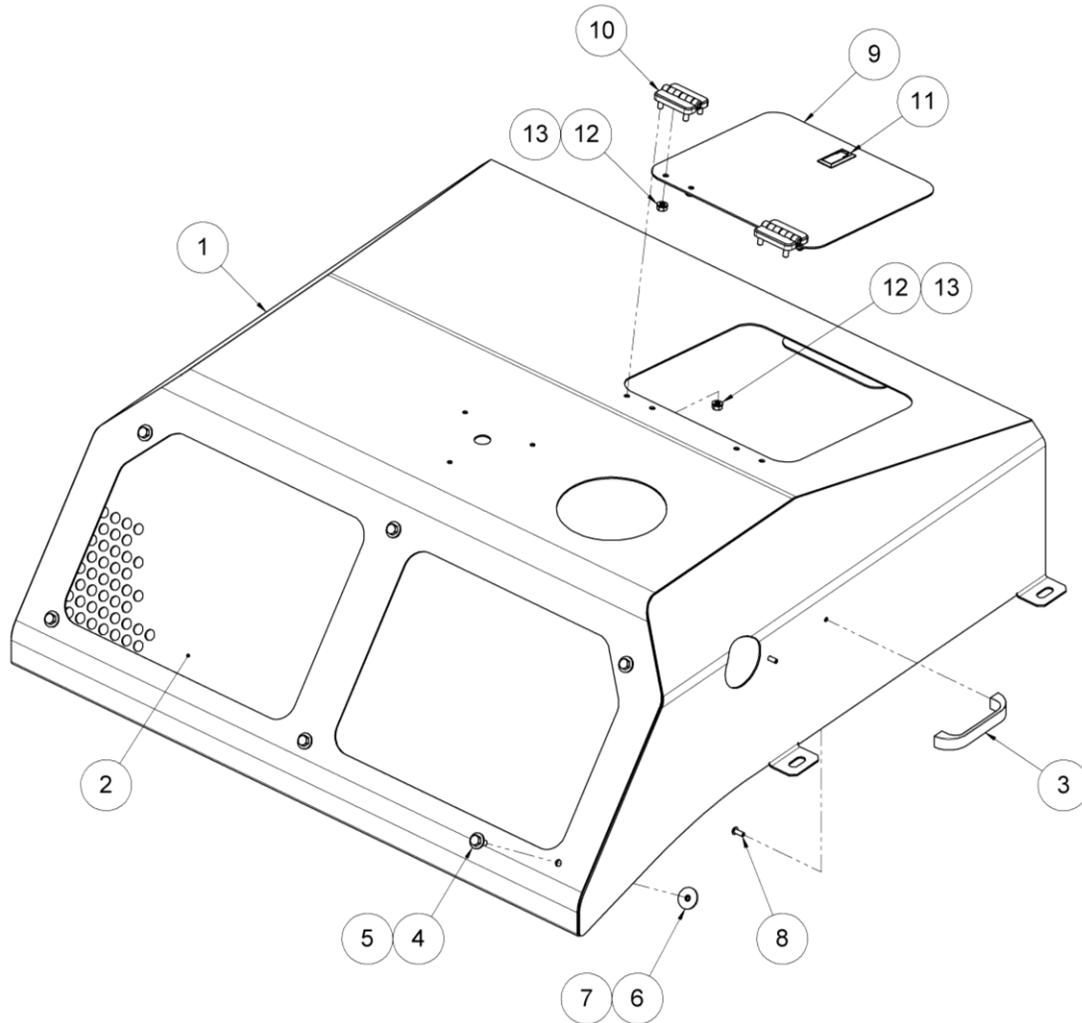
| Item | Part Number | Description | Qty |
|------|----------------|--|-----|
| 1 | A-TT4-0048-1 | STANDARD SEAT WITH SEATBELT | 1 |
| N/A | AE-OPT-0055-A | REPLACEMENT BOTTOM CUSHION, STANDARD SEAT | N/A |
| N/A | E10000 | REPLACEMENT SEAT BELT | N/A |
| N/A | A-TT10-00048 | BENCH SEAT WITH SEAT BELT (OPTIONAL, PASSENGER ONLY) | N/A |
| N/A | AE-OPT-0055-B | REPLACEMENT BOTTOM CUSHION, BENCH SEAT | N/A |
| 2 | XM00-14-009-SA | FLANGE NUT, SERRATED, 5/16-18 UNC (INCLUDED WITH ITEM 1) | 1 |
| 3 | XM00-14-013-SA | FLOOR MAT KIT | 1 |
| 4 | NPN | DATA PLACARD, DIESEL TRACTOR | 1 |

Item 4 is installed with 3/16" aluminum pop rivets.

16.0 CHASSIS SYSTEM



16.1 FRONT ENGINE COVER

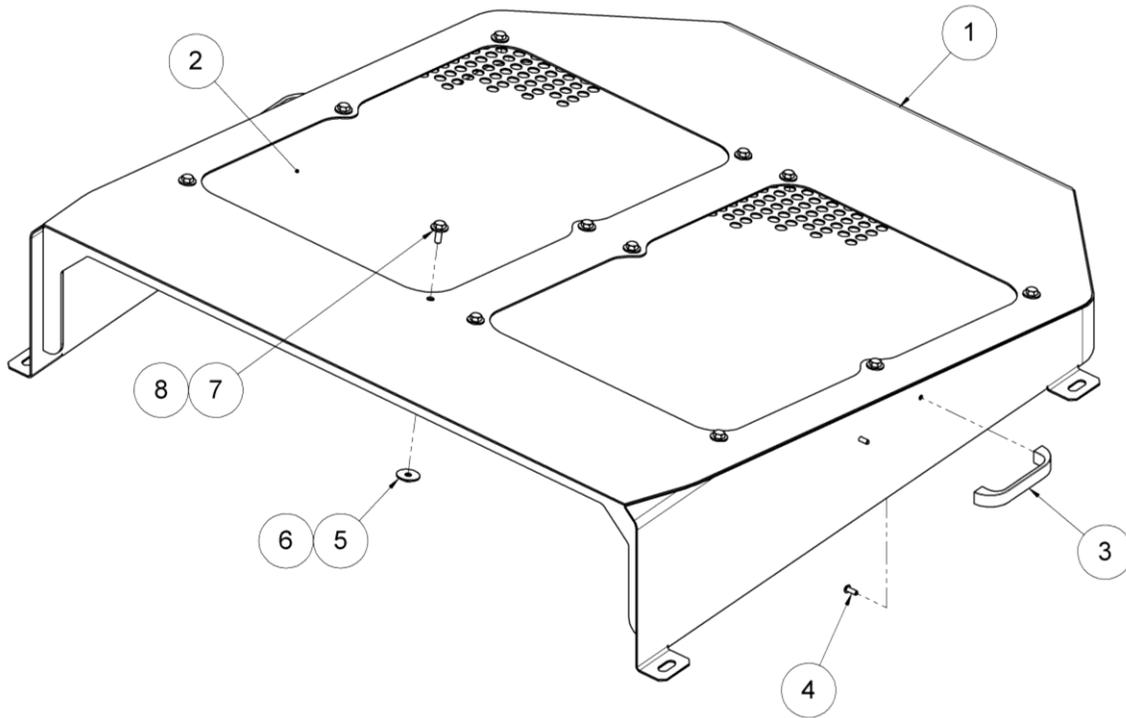


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|---|-----|
| 1 | XM00-02-003-SA | FRONT ENGINE COVER WELDMENT | 1 |
| 2 | XM00-02-008-SA | PERFORATED STAINLESS PANEL KIT, DET C (5 PIECE KIT) | 1 |
| 3 | XL00-02-055-SA | BOLT-ON HANDLE | 2 |
| 4 | NPN | FLAT WASHER, 1/4 | 6 |
| 5 | NPN | HCS, 1/4-20 UNC X .75 | 6 |
| 6 | NPN | FENDER WASHER, 1/4 | 6 |
| 7 | NPN | LOCK NUT, 1/4-20 UNC | 6 |
| 8 | NPN | BHCS, #10-24 UNC X .5 | 4 |
| 9 | XM00-02-009-SA | OIL CHECK ACCESS COVER | 1 |
| 10 | XL00-02-069-SA | SMALL HINGE | 2 |
| 11 | XL00-02-070-SA | COVER LATCH | 1 |
| 12 | NPN | LOCK WASHER, M6 (INCLUDED WITH ITEM 10) | 8 |
| 13 | NPN | HEX NUT, M6X1 (INCLUDED WITH ITEM 10) | 8 |

16.2 REAR ENGINE COVER

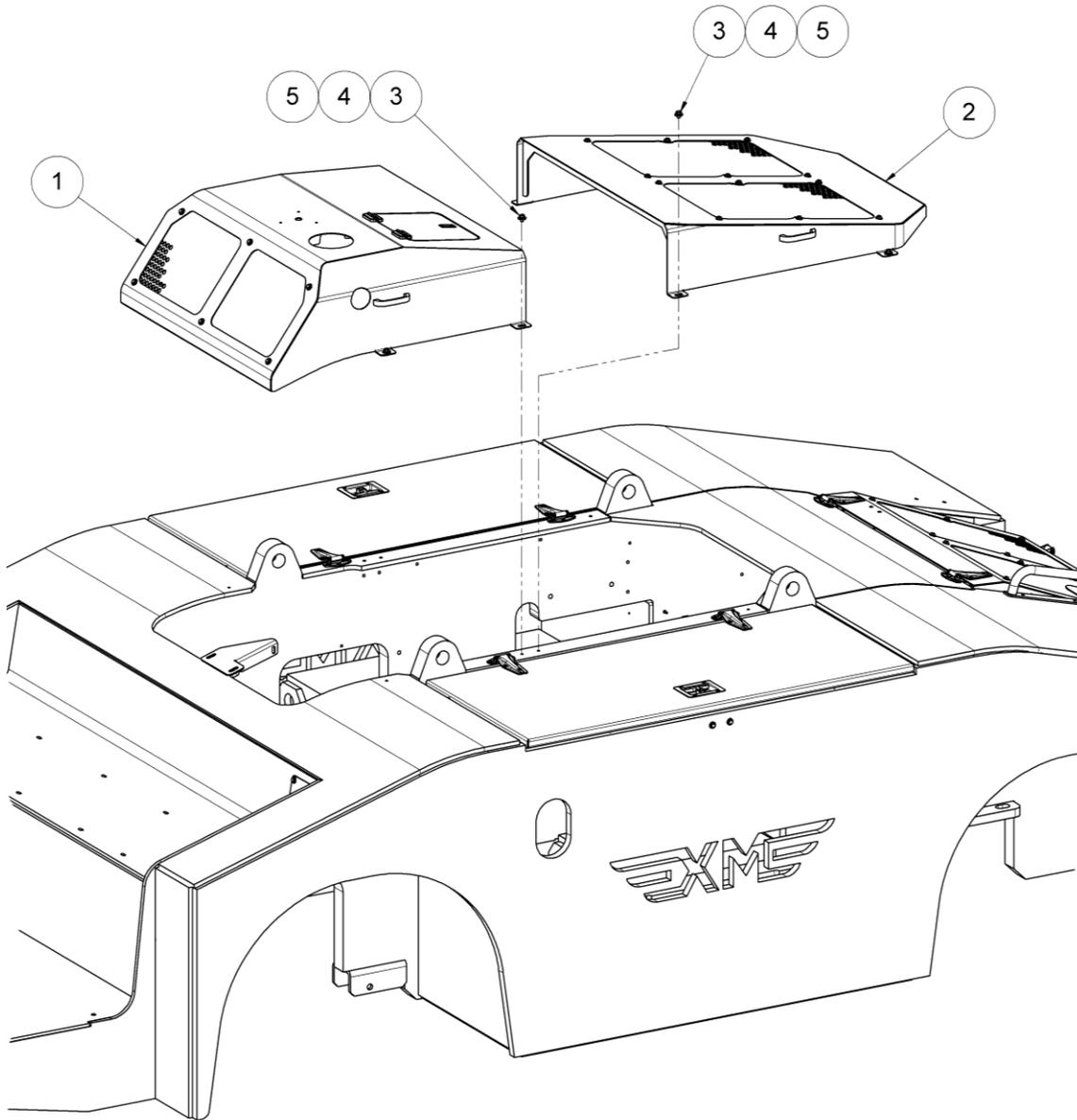


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|---|-----|
| 1 | XM00-02-004-SA | REAR ENGINE COVER WELDMENT | 1 |
| 2 | XM00-02-008-SA | PERFORATED STAINLESS PANEL KIT, DET B (5 PIECE KIT) | 2 |
| 3 | XL00-02-055-SA | BOLT-ON HANDLE | 2 |
| 4 | NPN | BHCS, #10-24 UNC X .5 | 4 |
| 5 | NPN | FENDER WASHER, 1/4 | 12 |
| 6 | NPN | LOCK NUT, 1/4-20 UNC | 12 |
| 7 | NPN | FLAT WASHER, 1/4 | 12 |
| 8 | NPN | HCS, 1/4-20 UNC X .75 | 12 |

16.3 ENGINE COVERS TO TRACTOR

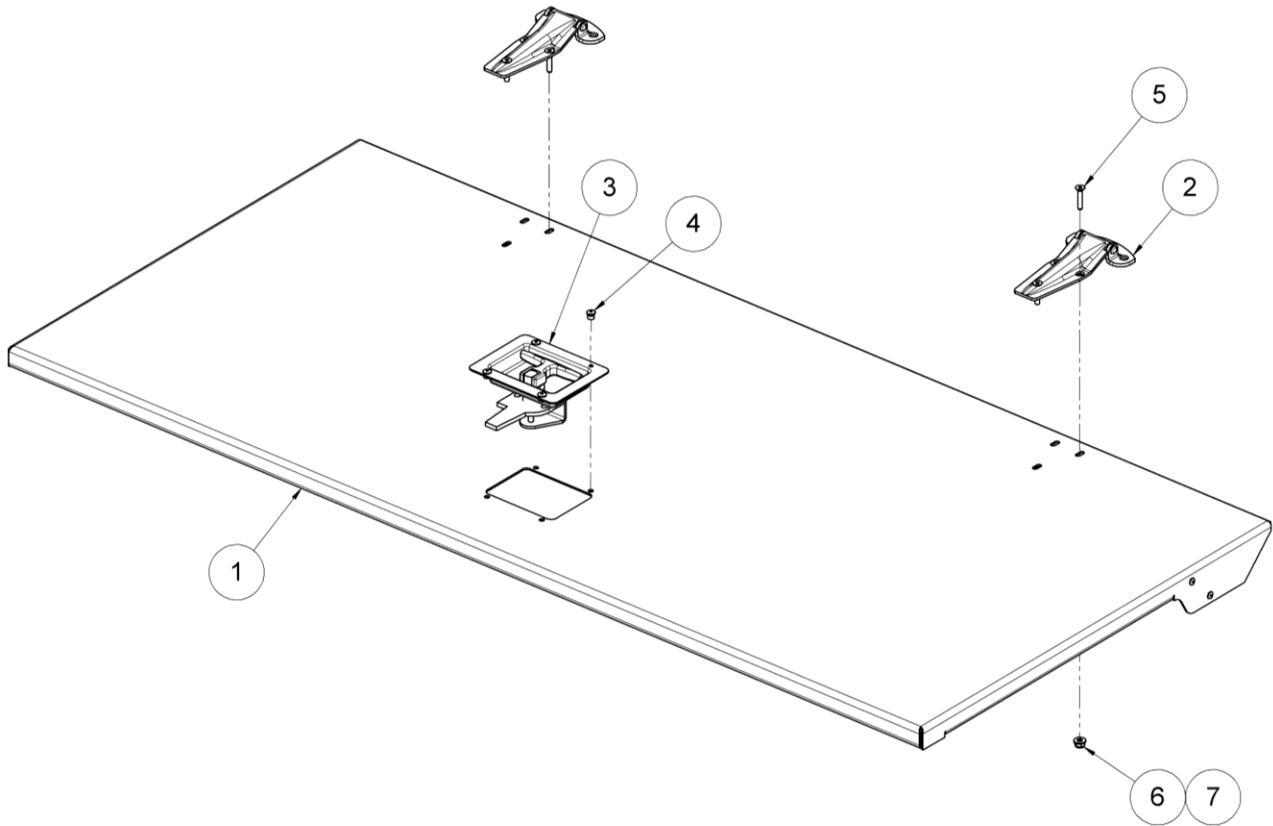


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|-------------|-----------------------------|-----|
| 1 | NPN | FRONT ENGINE COVER ASSEMBLY | 1 |
| 2 | NPN | REAR ENGINE COVER ASSEMBLY | 1 |
| 3 | NPN | FLAT WASHER, 5/16 | 8 |
| 4 | NPN | LOCK WASHER, 5/16 | 8 |
| 5 | NPN | HCS, 5/16-18 UNC X .50 | 8 |

16.4 SIDE COVERS (LH and RH)

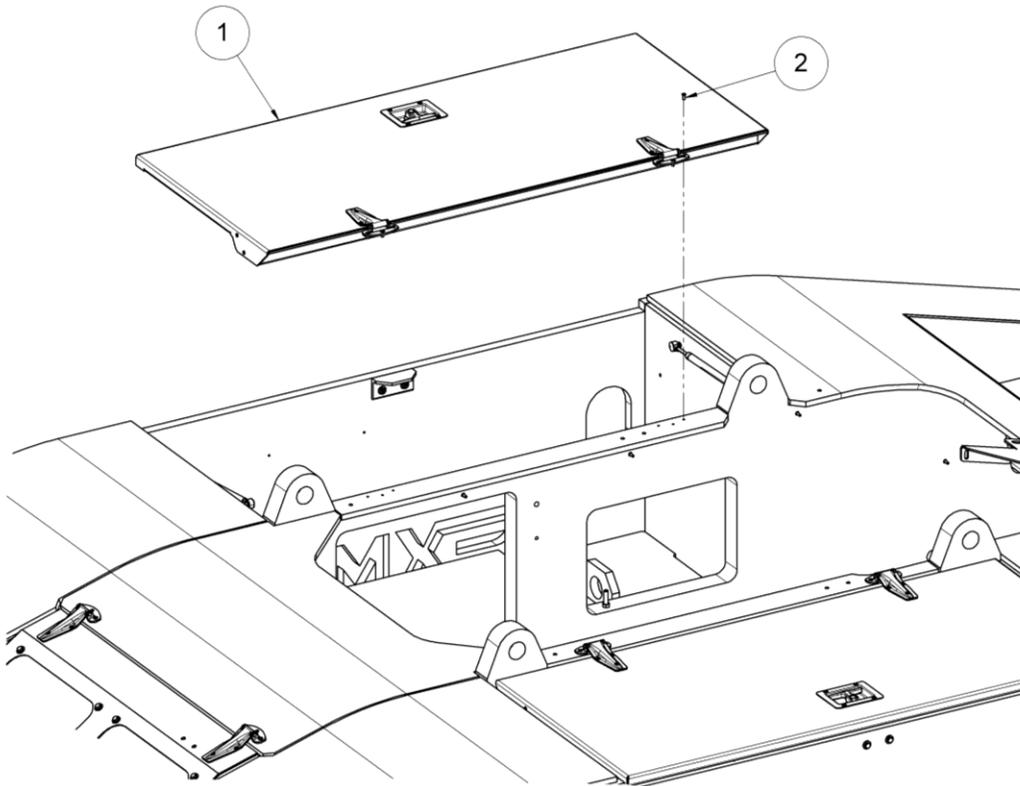


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|--------------------------|-----|
| 1 | XM00-02-002-SA | SIDE HOOD WELDMENT | 1 |
| 2 | XL00-02-068-SA | STAINLESS STRAP HINGE | 2 |
| 3 | C-TT4-0012-2 | T HANDLE LATCH | 1 |
| 4 | NPN | ALUMINUM POP RIVET, 3/16 | 4 |
| 5 | NPN | FHCS, #10-32 UNF X 1 | 6 |
| 6 | NPN | FLAT WASHER, #10 | 6 |
| 7 | NPN | LOCK NUT, #10-32 UNF | 6 |

16.4 SIDE COVERS (LH and RH) *(continued)*

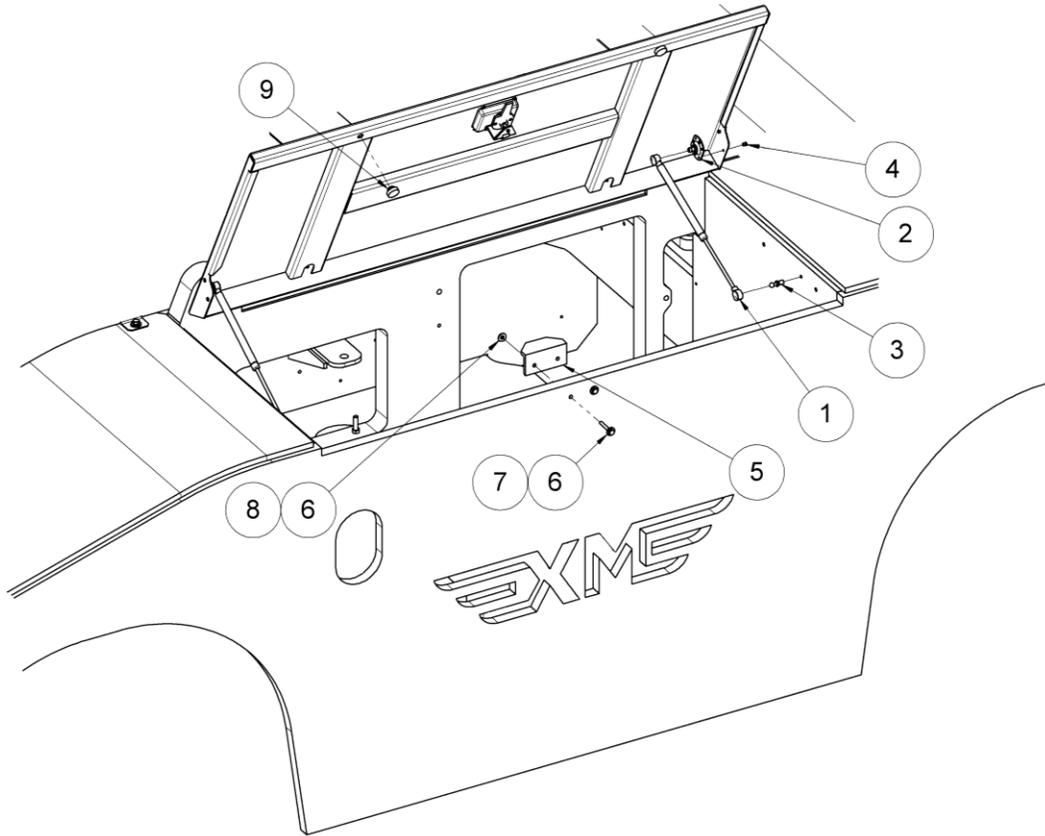


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|-------------|----------------------|-----|
| 1 | NPN | SIDE HOOD ASSEMBLY | 2 |
| 2 | NPN | FHCS, #10-32 UNF X 5 | 12 |

16.5 SIDE COVERS TO TRACTOR (LH and RH)

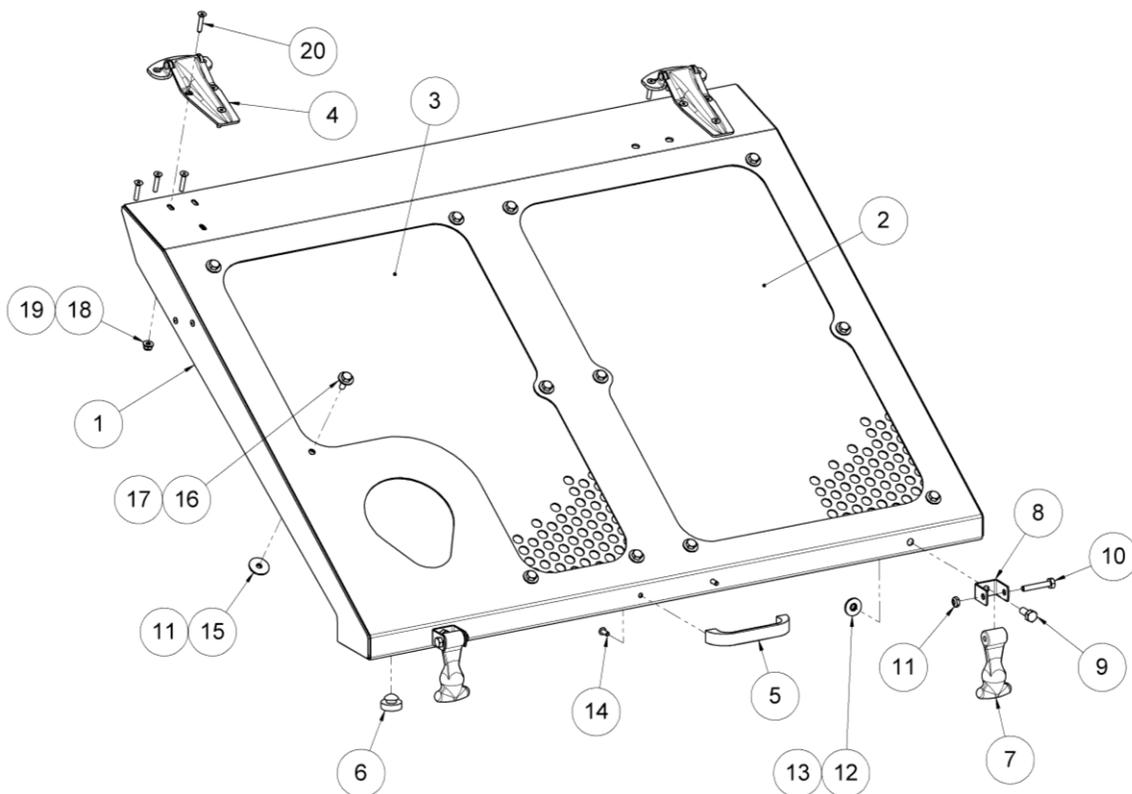


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|--------------------------|-----|
| 1 | XM00-14-006-CA | GAS SHOCK | 4 |
| 2 | SATS-14-003-CA | GAS SHOCK MOUNT | 4 |
| 3 | NVSP-24-020-CA | BALL STUD | 4 |
| 4 | NPN | ALUMINUM POP RIVET, 5/32 | 8 |
| 5 | XL00-02-063-SA | HOOD CATCH BRACKET | 2 |
| 6 | NPN | FLAT WASHER, 1/4 | 8 |
| 7 | NPN | HCS, 1/4-20 UNC X 1.75 | 4 |
| 8 | NPN | LOCK NUT, 1/4-20 UNC | 4 |
| 9 | NVSP-21-004-CA | RUBBER PRESS-IN BUMPER | 4 |

16.6 REAR LOUVER ASSEMBLY



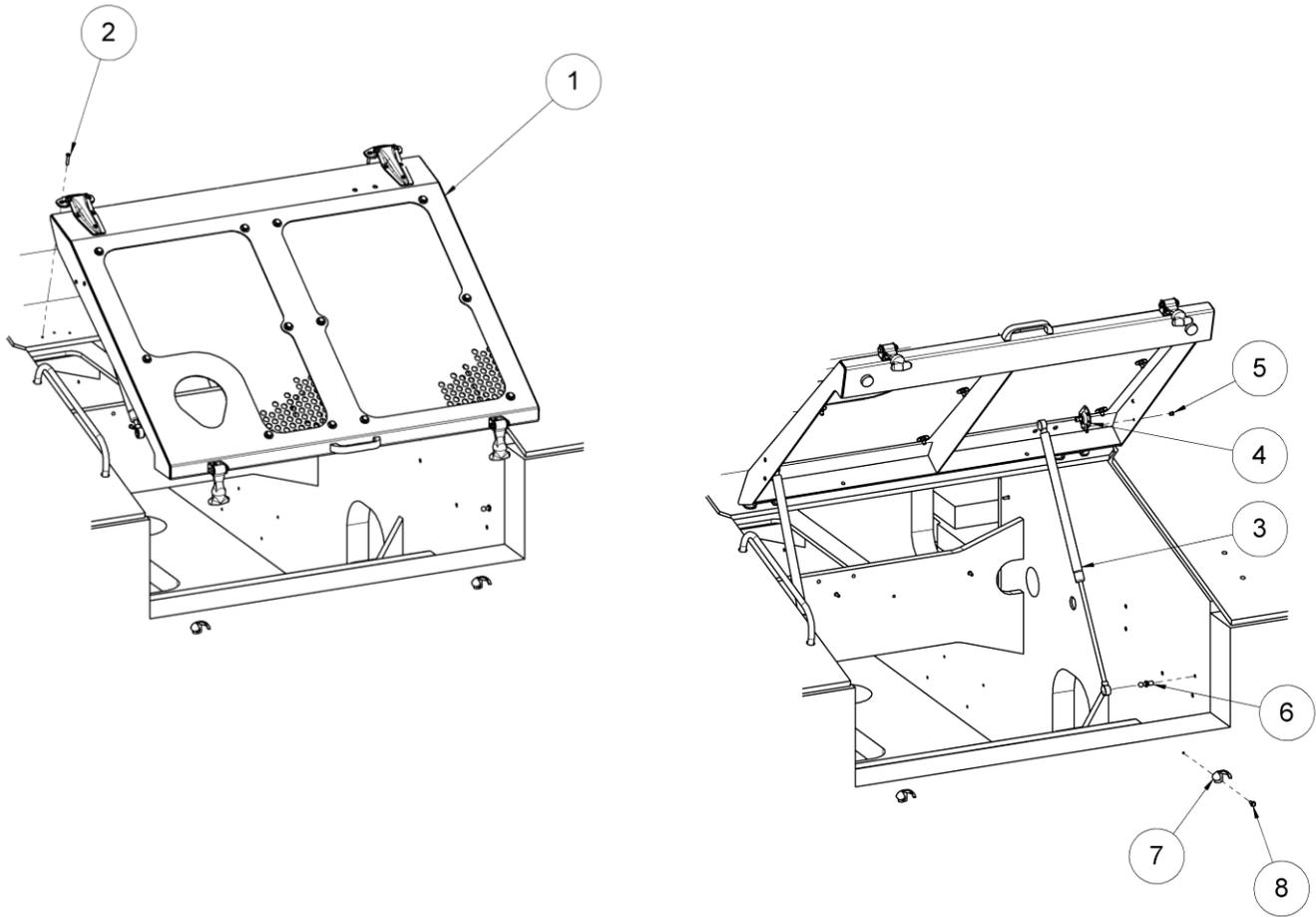
Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|---|-----|
| 1 | XM00-02-001-SA | REAR LOUVER WELDMENT | 1 |
| 2 | XM00-02-008-SA | PERFORATED STAINLESS PANEL KIT, DET A (5 PIECE KIT) | 1 |
| 3 | XM00-02-008-SA | PERFORATED STAINLESS PANEL KIT, DET B (5 PIECE KIT) | 1 |
| 4 | XL00-02-068-SA | STAINLESS STRAP HINGE | 2 |
| 5 | XL00-02-055-SA | BOLT-ON HANDLE | 1 |
| 6 | NVSP-21-004-CA | RUBBER PRESS-IN BUMPER | 2 |
| *7 | NVSP-24-003-CA | RUBBER HOLD-DOWN LATCH | 2 |
| *8 | NVSP-24-004-CA | RUBBER HOLD-DOWN PIVOT | 2 |
| *9 | NPN | HCS, 5/16-18 UNC X .75 | 2 |
| *10 | NPN | HCS, 1/4-20 UNC X 1.5 | 2 |
| *11 | NPN | LOCK NUT, 1/4-20 UNC | 14 |
| 12 | NPN | FLAT WASHER, 5/16 | 2 |
| 13 | NPN | LOCK NUT, 5/16-18 UNC | 2 |
| 14 | NPN | BHCS, #10-24 UNC X .5 | 2 |
| 15 | NPN | FENDER WASHER, 1/4 | 12 |
| 16 | NPN | FLAT WASHER, 1/4 | 12 |
| 17 | NPN | HCS, 1/4-20 UNC X .75 | 12 |
| 18 | NPN | FLAT WASHER, #10 | 6 |
| 19 | NPN | LOCK NUT, #10-32 UNF | 6 |
| 20 | NPN | FHCS, #10-32 UNF X 1 | 6 |

* For latch replacement parts, use Tronair K-5759

16.7 REAR LOUVER ASSEMBLY TO TRACTOR



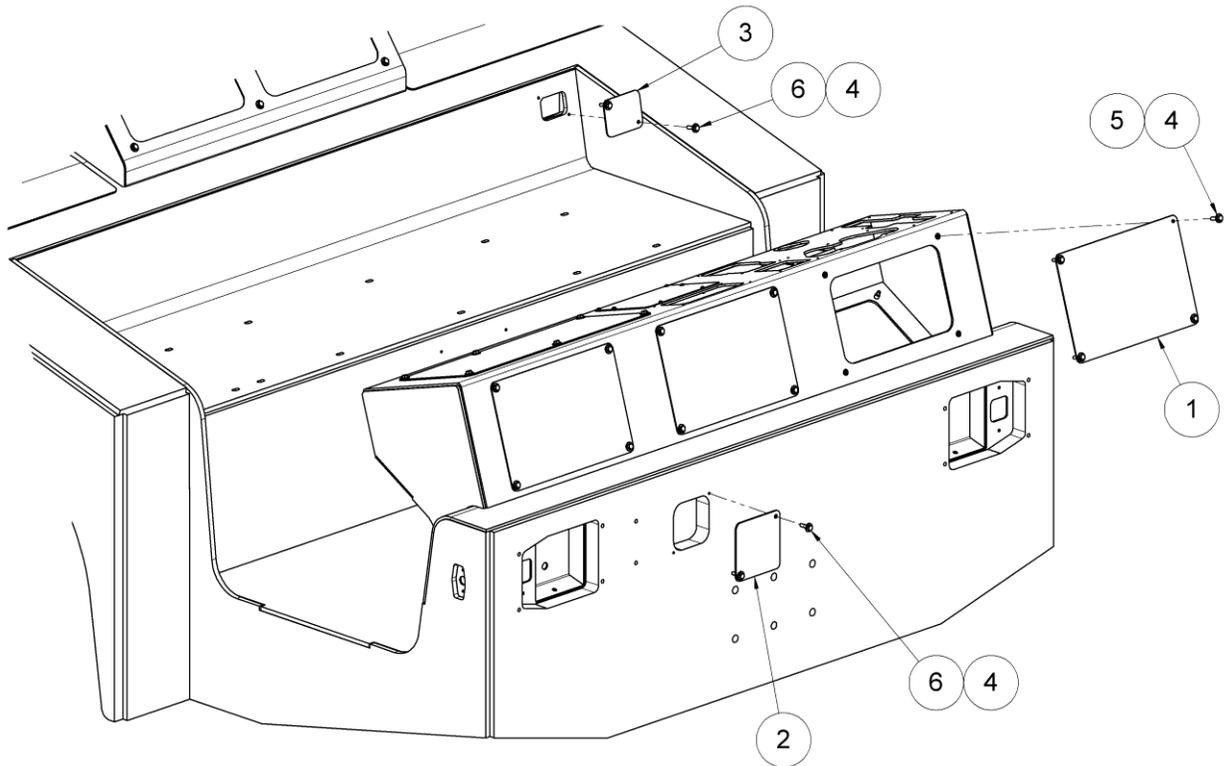
Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|--------------------------|-----|
| 1 | NPN | REAR LOUVER ASSEMBLY | 1 |
| 2 | NPN | FHCS, #10-32 UNF X 1 | 6 |
| 3 | XM00-14-005-CA | GAS SHOCK | 2 |
| 4 | SATS-14-003-CA | GAS SHOCK MOUNT | 2 |
| 5 | NPN | ALUMINUM POP RIVET, 5/32 | 4 |
| 6 | NVSP-24-020-CA | BALL STUD | 2 |
| *7 | NVSP-24-005-CA | RUBBER HOLD-DOWN CUP | 2 |
| *8 | NPN | HCS, #10-32 UNF X .5 | 2 |

* For latch replacement parts, use Tronair K-5759

16.8 FRONT COVERS

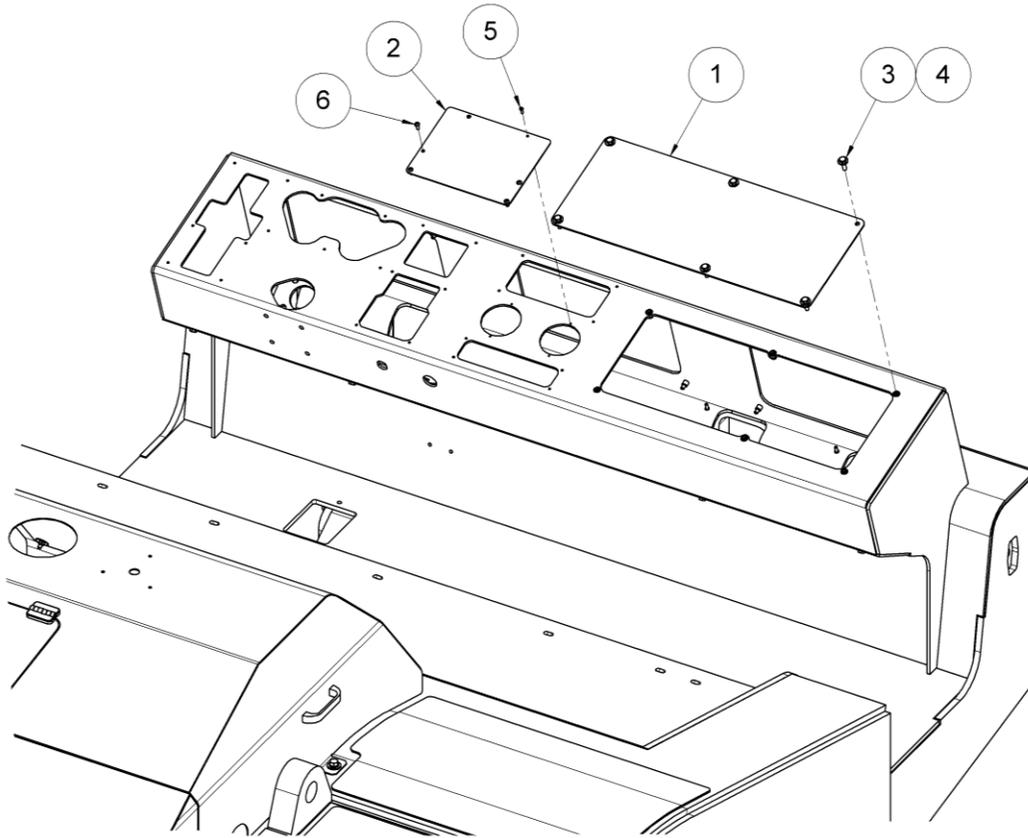


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|-----------------------------|-----|
| 1 | XM00-02-005-SA | FRONT DASH ACCESS PANEL | 3 |
| 2 | XL00-01-087-SA | FRONT SPOT COVER PLATE | 1 |
| 3 | XM00-02-011-SA | CAB ELECTRICAL ACCESS COVER | 1 |
| 4 | NPN | FLAT WASHER, 1/4 | 16 |
| 5 | NPN | HCS, 1/4-20 UNC X 1 | 12 |
| 6 | NPN | HCS, 1/4-20 UNC X .75 | 4 |

16.9 RH DASH COVERS

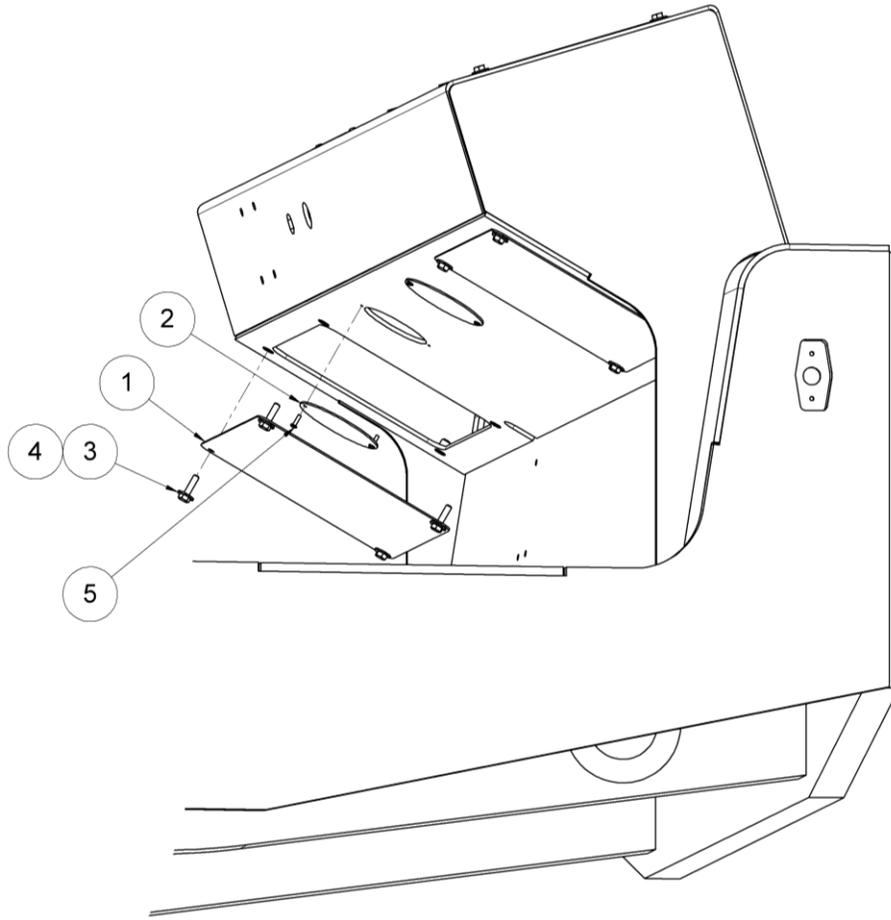


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|-----------------------|-----|
| 1 | XL00-02-067-SA | RH DASH ACCESS COVER | 1 |
| 2 | XM00-02-007-SA | HEATER CONTROLS COVER | 1 |
| 3 | NPN | FLAT WASHER, 1/4 | 6 |
| 4 | NPN | HCS, 1/4-20 UNC X 1 | 6 |
| 5 | NPN | BHCS, #6-32 UNC X .5 | 2 |
| 6 | NPN | BHCS, #10-32 UNF X .5 | 4 |

16.10 UNDER DASH COVERS

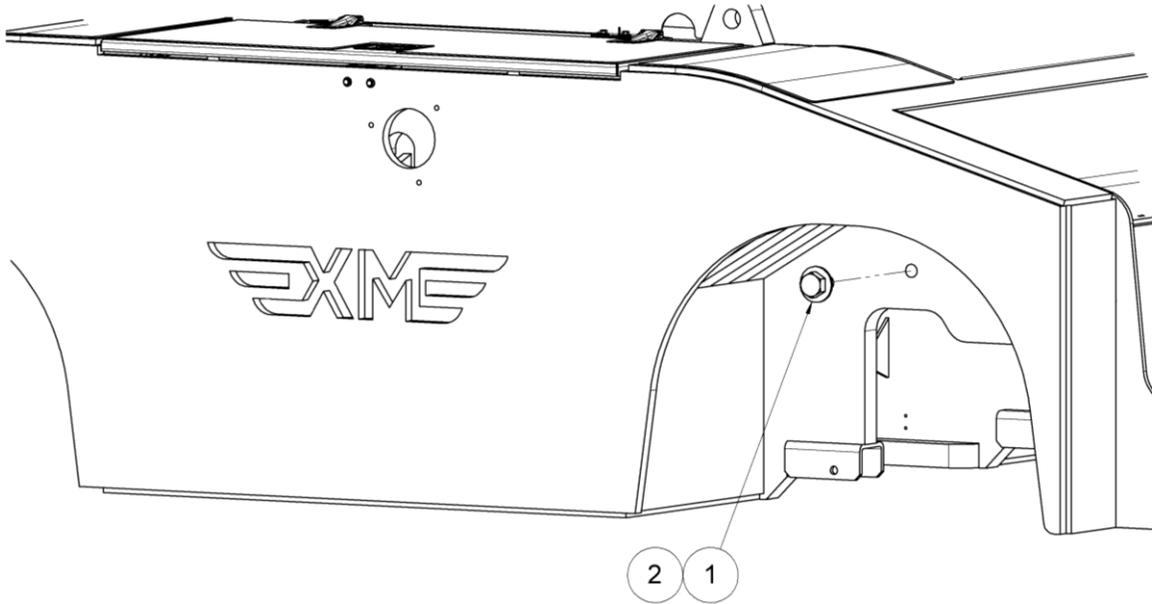


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|-------------------------|-----|
| 1 | XM00-02-005-SA | FRONT DASH ACCESS PANEL | 2 |
| 2 | XL00-02-093-SA | LOUVER COVER PLATE | 2 |
| 3 | NPN | FLAT WASHER, 1/4 | 8 |
| 4 | NPN | HCS, 1/4-20 UNC X 1 | 8 |
| 5 | NPN | BHCS, #6-32 UNC X .5 | 4 |

16.11 HOIST RING PLUGS

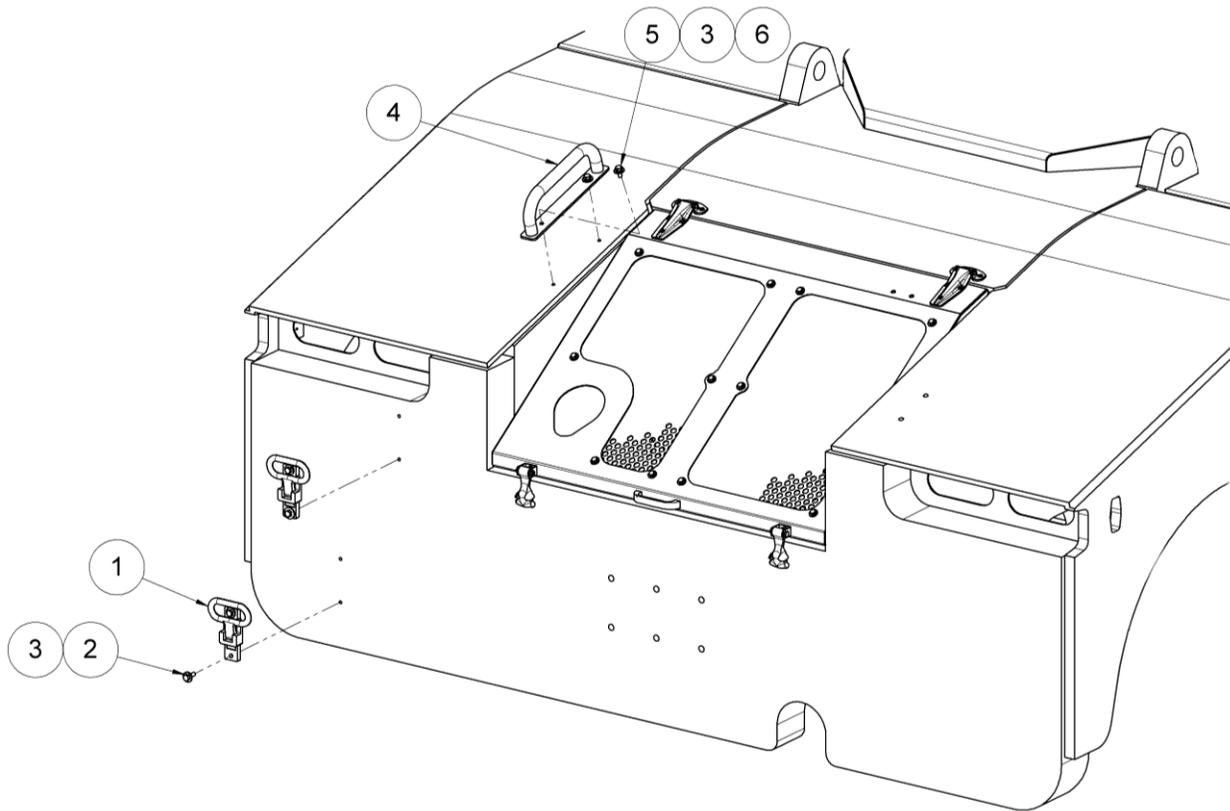


Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|-------------|---------------------|-----|
| 1 | NPN | FLAT WASHER, 1.25 | 4 |
| 2 | NPN | HCS 1 1/4-7 UNC X 2 | 4 |

16.12 FOLDING STEPS



Parts List

When ordering replacement parts/kits, please specify model and serial number your unit.

| Item | Part Number | Description | Qty |
|------|----------------|-------------------------|-----|
| 1 | XM00-24-004-CA | FOLDING STEP, STAINLESS | 2 |
| 2 | NPN | HCS, 5/16-18 UNC X 1 | 4 |
| 3 | NPN | FLAT WASHER, 5/16 | 6 |
| 4 | XM00-02-019-SA | GRAB BAR | 1 |
| 5 | NPN | HCS, 5/16-18 UNC X .75 | 2 |
| 6 | NPN | LOCK WASHER, 5/16 | 2 |



17.0 IN SERVICE SUPPORT

Contact Eagle Tugs. for technical services and information. See Section 1.3 – Manufacturer.

17.1 TECHNICAL ASSISTANCE

When addressing a repair procedure or operational problem, please remember that Eagle technical support is only a phone call away. Eagle technicians are available to assist you in vehicle diagnostics and recommended repair procedures. We encourage you to use this service to reduce machine down-time and to gain a better understanding of proper repair procedures.

18.0 GUARANTEES/LIMITATION OF LIABILITY

18.1 VEHICLE ID INFORMATION

When contacting Eagle Tugs for warranty or parts service, please have the following information ready:

- Tractor model number
- Tractor serial number
- Current hour reading
- Maintenance and Service records

This information can be found on the data plate located beside the driver seat with the exception of the hours which can be read using the display on the dash.



18.2 EAGLE 3-YEAR WARRANTY

Coverage Overview

The Eagle Warranty covers all new Eagle vehicles. Eagle, a Tronair company, warrants that these vehicles will be free from defects in material and workmanship for the period described based on the warranty period of the vehicles listed below. The warranty period begins on the date of shipment to the original purchaser. Coverage extends for the time period or operating hours specified for each vehicle series below, whichever limit is reached first. This warranty is non-transferable and applies only to the original purchaser of the vehicle.

Coverage by Vehicle Series

The Eagle Warranty provides 3-year or 3,000-hour coverage, whichever occurs first, for TT-series, TTR-series, eTT-series, eJP-series, XM-series, XL-series, and USATS vehicles when used in aviation applications. For non-aviation/industrial applications, the Eagle Warranty provides 1-year or 2,000-hour coverage, whichever occurs first, regardless of vehicle series. This includes MTT-series, STT-series, RTT-series, Bobtails, Transit Pro, and any aviation-series vehicle used in non-aviation/industrial applications. Bobtails are covered under Ford Motor Company's standard warranty (three-year/36,000-mile bumper-to-bumper and five-year/60,000-mile powertrain). Eagle provides supplementary 1-year/2,000-hour warranty coverage for Eagle-specific components not covered by Ford's warranty.

Exclusions

This warranty does not apply to any Eagle vehicle or component part(s) that have damage caused by: misuse of the vehicle, accidents, collision or objects striking the vehicle, vandalism, fire, explosion or water damage, using contaminated or improper fuel/fluids, customer-applied chemicals to painted surfaces, improper handling or application, or maintenance neglect including lack of lubricants or fluids. This warranty does not extend to Eagle vehicles and/or parts which have been repaired or altered outside of Eagle's plant or the facility of an Authorized Service Representative without the permission of Eagle.

Any modification to the electrical system must receive prior written approval from Eagle. Unauthorized electrical modifications will void warranty coverage for electrical components only.

This warranty does not apply to routine maintenance or wearable parts of the Eagle vehicle such as: tires, brake pads or shoes, ball joints, kingpins, u-joints, wheel bearings, filters, seals, spark plugs, hoses, belts, light bulbs, batteries (diesel and gas vehicles), fuses, or similar items.

Batteries, battery chargers, snowplows, and Transit Pro options are warranted directly to the user by their respective manufacturers and not by Eagle or an Authorized Service Representative.

This warranty does not cover or provide credit for the following: vehicle rental or other substitute equipment; lodging; loss of time, income, sales or profits; loss of the use of vehicle; telephone calls or communication expense; lift truck; storage fees; injury or death to persons or damage or destruction of property; or consequential, incidental or punitive damages.

Warranty Claim Procedure

When a warranty situation arises, it is essential that the customer contact Tronair Product Support at productsupport@tronair.com or +1 (419) 861-2560. The customer will need to provide Eagle with the vehicle serial number and operating hours. A representative will analyze the problem and determine the next steps. In many cases, technical support personnel will be able to analyze the problem and recommend a solution that will solve the problem and reduce downtime. If further service is required, a customer service representative will work with customer personnel to arrange a service provider and/or will send parts to your facility for the repair as quickly as possible. The determination of a warrantable claim will be at the sole discretion of Tronair.

Notice and Remedies

Notice of any claimed defect must be given to Eagle within the warranty period and within a reasonable time after such defect is discovered, not to exceed thirty (30) days. Liability under this warranty is limited to either replacing or repairing, at Eagle's election, any part or parts deemed defective after examination by Eagle or an Authorized Service Representative. Eagle reserves the right to use remanufactured parts as replacements in warranty claims.



18.2 EAGLE 3-YEAR WARRANTY *(continued)*

Third-Party Inspection and Return Requirements

At Eagle's election, any part replaced under warranty as defective can be sent out for third-party inspection. If the part is not found to be defective, or abuse was the cause of the failure, all associated costs related to the warranty claim may be charged to the customer. All parts returned to Eagle by a customer must be received without further damage. If returned items are not properly packaged for return shipping to Eagle or an Authorized Service Representative via prepaid transportation, the customer will be charged for the full value of the item that was damaged upon return. This warranty does not extend beyond its original term for any Eagle vehicle or part replaced or repaired under warranty. Any and all disputes or disagreements will be negotiated in good faith by both parties.

Labor Allowance

A labor allowance may be issued upon request at Tronair's discretion. Allowable labor hours and per-hour labor rate will be determined by Eagle according to reasonable automotive standards.

Limitation of Warranties

Except as set forth above, all warranties, conditions, representations, indemnities and guarantees, express or implied, whether arising by statute, custom of trade, or under oral or written statements made by or on behalf of Eagle in negotiations with customer, distributor, dealer, or any representative, are hereby waived and excluded, and no liability shall attach to Eagle, either in contract or in tort, or strict liability in tort, for any damage to property, loss of profits, damages, costs, charges, liability or expenses, whether direct or indirect, consequential or otherwise, which arise out of or in connection with the sale or use of any Eagle vehicle or the supply of services.

Definitions

Authorized Service Representative: Service providers approved by Eagle to perform warranty repairs. Contact Tronair Product Support for a list of Authorized Service Representatives in your area.

Eagle reserves the right to modify this warranty without prior notice.

19.0 **APPENDICIES**

APPENDIX I Engine Diagnostic Display

APPENDIX I

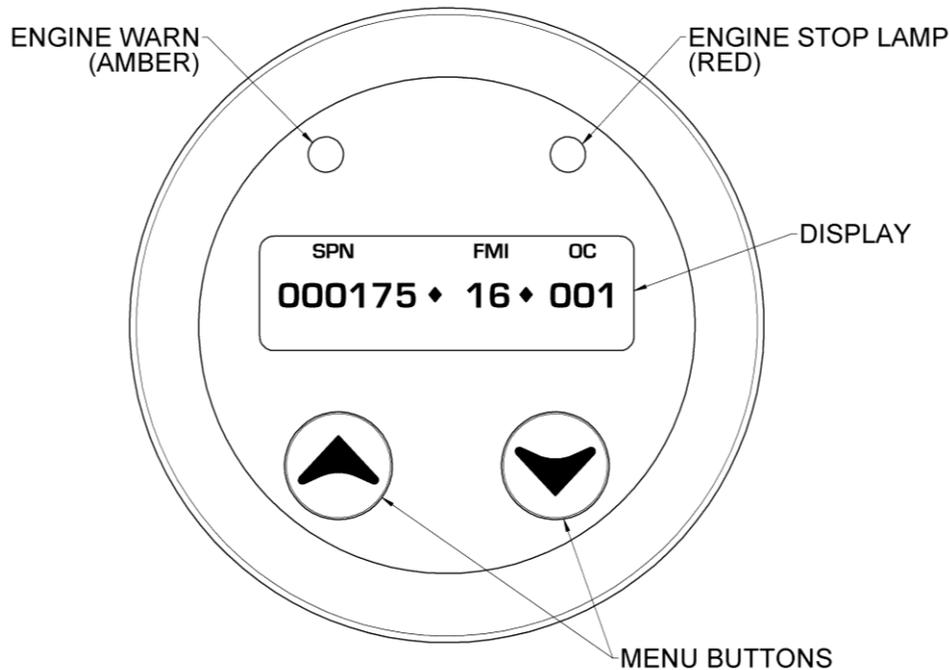
Engine Diagnostic Display

Display Operating Modes

The XM tractor features a modern Cummins engine that communicates to the tractor electronic control system using an SAE J1939 Controller Area Network or CAN communication. This allows the engine to send and receive detailed operational and diagnostic data.

The XM tractor is equipped with a digital diagnostic display that can read and display the engine information. This document provides basic operational instructions to best utilize the engine data.

The display module features a backlit LCD screen for displaying data, two notification LED indicator lights, and



two menu buttons for selecting data and navigating menus

The display module has three operating modes:

- **Parameter display** - The parameter display is the default function of the display module. This mode shows several engine operating parameters, which can be scrolled through using the up and down menu buttons. It is also referred to as the "1-UP" mode.
- **CAN error message display** - The display will show active engine code information in the SPN/FMI format. If appropriate, the engine warning and/or engine stop lamps will also illuminate to indicate the severity of the issue. See the troubleshooting section for a list of codes and common causes.
- **Main Menu** - The main menu allows you to view active and stored engine faults, set several operating features of the display module including unit preference, and set which parameters are displayed on the 1-UP mode.

Main Menu and Navigation

The main menu can be entered by momentarily pressing both the up and down buttons simultaneously. Note that pressing both buttons in this fashion acts like an “enter” function and is used throughout the menu navigation to make selections. The full menu is shown below:

- **SHOW 1-UP** - Enter on this item will return the display to parameter display mode
- **ACTIVE FLTS** - Shows all active faults, scrolling between them if more than one is active. Return to the main menu by pressing enter.
- **STORED FLTS** - Will show any faults stored by the engine ECU, scrolling between them if more than one is active. If no faults are stored it will show a series of dashes. Return to the main menu by pressing enter.
- **SET UNITS** - Allows you to select between several unit options. Select a choice using enter and return to the main menu by using enter on **EXIT**.
 - **English**
 - **Metric kPa**
 - **Metric BAR**
 - **Exit**
- **SET 1-UP** - This menu item allows the operator to customize what parameters are shown in the parameter display mode. Enter on a parameter will add a “*” to that parameter (and add it to the 1-UP screen display list). Items labeled with a “#” in the list below are set enabled by default at the Eagle factory.
 - **# Eng Spd - Engine speed in rpm**
 - **# Oil Pres - Engine oil pressure (psi, kPa, or bar depending on chosen units)**
 - **# Cool Tmp - Coolant temperature (°F or °C depending on chosen units)**
 - **# Sys Volt - System voltage**
 - **Bat Volt - Not applicable to the XM20**
 - **# Eng Hrs - Engine hours as reported by the engine ECU**
 - **Load@RPM - Engine percent of load at the current engine RPM**
 - **FuelUsed - Total engine fuel usage (G or L depending on chosen units)**
 - **AvgEcon - Not applicable to the XM20**
 - **TripFuel- Not applicable to the XM20**
 - **Oil Tmp - Not applicable to the XM20**
 - **Exh Tmp - Not applicable to the XM20**
 - **AirDifPr - Not applicable to the XM20**
- **SCROLL ON/OFF** - When set to on, parameters on the 1-UP display will automatically scroll without pressing the up and down arrows. Enter to change on/off.
- **MACH HRS ON/OFF** - When set to on, this option causes the display to track machine hours on its own, separately from the engine ECU. This machine hour parameter can then be added to the 1-UP menu display. Eagle recommends leaving this option set to off as it duplicates the built-in engine ECU hour meter.
- **TIER4 ON/OFF** - When set to on, this option enables specific Tier4 engine menu items related to diesel particulate filter and urea injection (SCR) systems. These systems are not applicable to the XM20 and the option should be left off.
- **BACKLIGHT** - Allows the operator to increase or reduce the brightness of the LCD backlight display. All other installed dash gages will also adjust their backlight to match