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MODEL R-150
"CUSHION-RIDE" RAILGEAR
INSTALLATION MANUAL

"ROTATING FRONT - ROTATING REAR"

READ THIS MANUAL BEFORE INSTALLING RAILGEAR EQUIPMENT

Application Models: 1999 - 2007 Dodge Dakota (All Models)
1999 - 2007 Dodge Durango (All Models)
2013 Ford Ranger XLT

Issued May 2022 (Rev C) Bulletin MI15RRD

Note:

The appendix of this manual includes the latest changes to the installation and operation of the railgear not included in the “body” of this manual.

Please refer to the appendix prior to installing and operating the railgear.

The information in the appendix supersedes whatever is mentioned in the “body” of this manual.

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TABLE OF CONTENTS

SECTION 1: INITIAL PREPARATION

1.0 SAFETY PRECAUTIONS

WARNING:

- **Refer to the Operating, Service and Parts manual for installation related warranty issues.**
- **Installation instructions provided below only address the Rafna Industries railgear equipment. Applicable railway company procedures and policies must be adhered to.**
- **Always disconnect the vehicle's battery when welding on the vehicle or railgear in order to protect the vehicle's electrical system.**
- **Before performing any work under the vehicle or railgear, ensure the engine is turned off and the parking brake is set.**
- **Beware of all pinch points on the railgear and keep all parts of the body clear.**
- **The following safety precautions should be taken before the vehicle is tested or operated:**
  - ✓ **Read the Operating, Service and Parts Manual**
  - ✓ **Visually inspect the railgear for damaged or worn parts**
  - ✓ **Perform the Alignment Procedure**
  - ✓ **Check for loose wheels and fasteners**
  - ✓ **Check for leaking hydraulic lines and cylinders**
  - ✓ **Check for proper lubrication**

Failure to heed to any of the above mentioned warnings could result in severe bodily injury and/or equipment damage.

IF ANY INSTALLATION PROBLEMS ARE ENCOUNTERED, PLEASE CALL G&B SPECIALTIES, INC. FOR TECHNICAL ASSISTANCE BEFORE CONTINUING WITH THE INSTALLATION PROCESS.

2.0 INSTALLATION PROCEDURE OVERVIEW

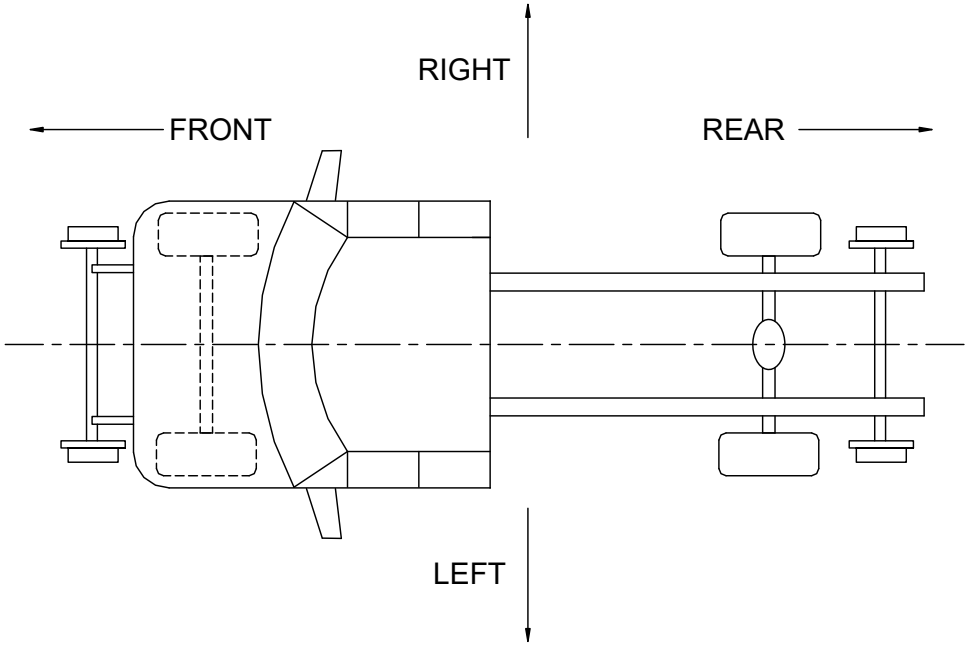
This manual covers the installation of the Rafna Industries rotating front and rotating rear R-150 railgear as applicable to multiple vehicles. If necessary, any difference in installation for specific vehicle and/or railgear models is clearly detailed by separate instructions for each. Otherwise the installation instructions are the same for all models. Please refer to the appendix for the latest additions that have not been included in this manual.

The Rafna Industries R-150 railgear is a hydraulically operated road-to-rail conversion system applicable to vehicles of up to 6,500 lbs. gross vehicle weight rating (GVWR). The front and rear railgear are frame mounted systems which are hydraulically raised and lowered. The hydraulic power is supplied by a 12 VDC electrical / hydraulic pump.

The installation procedure consist of first installing the front and rear railgear. The hydraulic and electrical installations follow and finally an adjustment of the equipment is performed.

This manual uses the orientation convention for the vehicle as shown in figure 1-1.

FIGURE 1-1 : ORIENTATION CONVENTION



3.0 PREPARATIONS FOR RAILGEAR INSTALLATION

The following steps must be performed on all vehicles prior to installation of the railgear equipment:

1. Disconnect the negative battery terminal.

2. Remove the spare wheel from under the vehicle's cargo box if so equipped. A new location must be found for the spare wheel and the necessary brackets fabricated.

3. Remove the front bumper and all related mounting brackets. Retain all parts for re-installation.

4. Remove the tail pipe section of the exhaust. Retain all parts for re-installation.

SECTION 2: RAILGEAR INSTALLATION

1.0 FRONT RAILGEAR MOUNTING PLATE INSTALLATION

This section covers the installation of the front railgear mounting plates. The hardware required for this installation is listed in table 2-1.

Table 2-1: Front Railgear Mounting Hardware

Part Number	Description	Qty
R-1783-1	Front Frame Reinforcement Plate	2
R-1783-2	Front Frame Reinforcement Plate	2
R-1800D	Front Mounting Plate (Left Side)	1
R-1800P	Front Mounting Plate (Right Side)	1
	½" UNC Gr. 8 Bolt x 2" Long	10
	½" Gr. 8 Washer	20
	½" UNC Gr. 8 Nylon Insert Lock Nut	10

The following procedure details the front mounting plate installation (refer to figure 2-1):

1. Position the front mounting plates (Item 1) around the frame rails (Item 2) as shown so that they cradle the frame rails.

2. Position the original Dodge inner bumper brackets (Item 3) in their original position. Slide the matching front frame reinforcement plates (Item 4) into the frame rails. The three holes in the front frame reinforcement plate, in the frame, in the front mounting plate and in the inner bumper bracket on each side should all align. Use six ½" x 2" long bolts, twelve ½" washers, and six ½" nuts (Item 5) to fasten all parts in place.

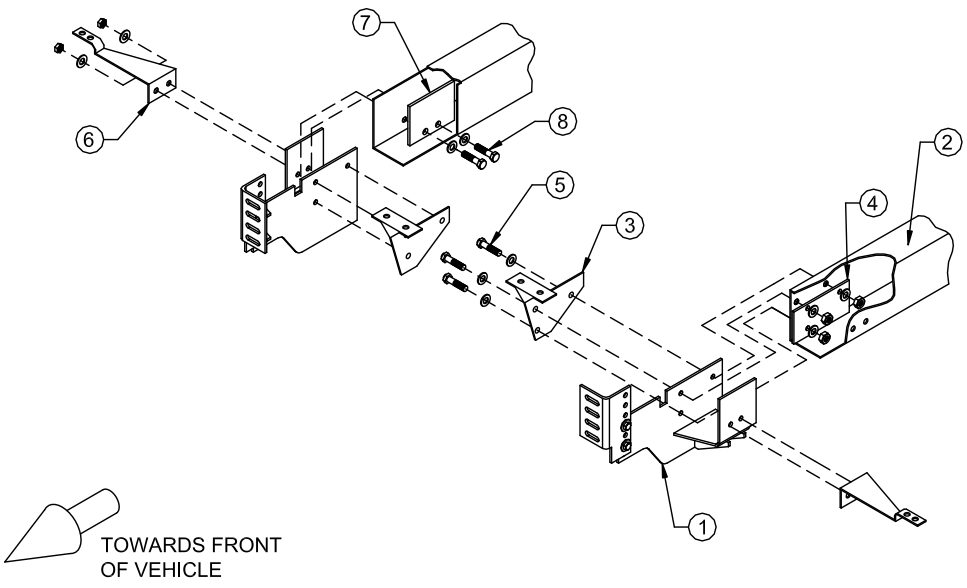
3. Remove and discard the clip-on nuts from the original Dodge outer bumper brackets (Item 6). Position the outer bumper brackets in their original position. Slide the matching front frame reinforcement plates (Item 7) into the frame rails. The two holes in the front frame reinforcement plate, in the frame rail, in the front mounting plate and in the outer bumper bracket on each side should all align. Use four ½" x 2" long bolts, eight ½" washers, and four ½" nuts (Item 8) to fasten all parts in place.

4. Ensure the front mounting plates are seated against the bottom of the frame and aligned with each other. Torque all ½" fasteners to 100 ft-lbs.

5. Modify the front bumper as required so that it can be re-installed with the mounting plates in place.

6. Re-install the front bumper using the original Dodge fasteners. Level the bumper and torque the original fasteners to Dodge specifications.

FIGURE 2-1 : FRONT MOUNTING PLATE INSTALLATION



2.0 FRONT RAILGEAR INSTALLATION

This section covers the installation of the front railgear. The hardware required for this installation is listed in table 2-2.

Table 2-2: Front Railgear Installation Hardware

Part Number	Description	Qty
R-1790E	Rotating Front Railgear	1
	½" UNC Gr. 8 Bolt x 2" Long	4
	½" Gr. 8 Washer	8
	½" UNC Gr. 8 Nylon Insert Lock Nut	4

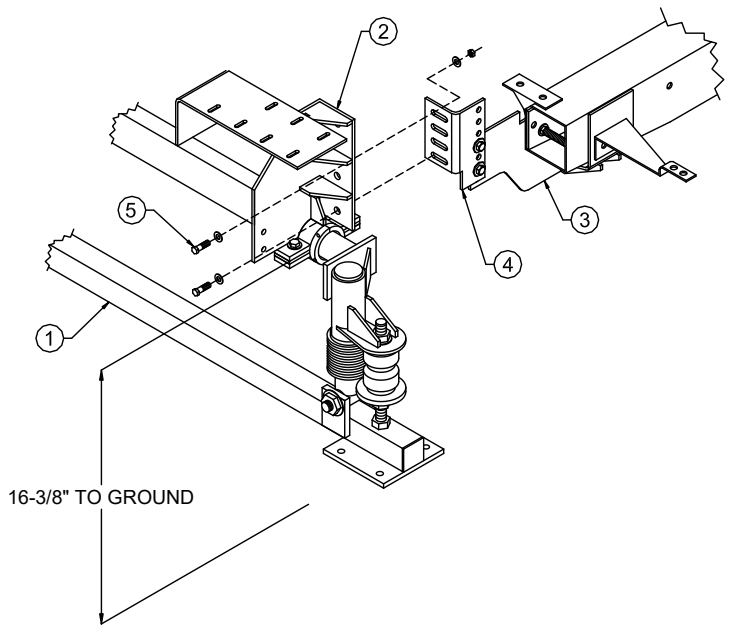
The following procedure details the front railgear installation (refer to figure 2-2):

1. Position the front railgear (Item 1) in front of the vehicle with the railgear mounting brackets (Item 2) facing the front mounting plates (Item 3) already installed on the vehicle.

2. The railgear has six mounting holes on each side to fit a wide variety of vehicle heights. The front mounting plates have four mounting slots and also have an adjustable height angle (Item 4). If the angles are moved on the front mounting plates, ensure that the ½" fasteners holding them in place are torqued to 100 ft-lbs. Ensure the vehicle is resting on its four properly inflated tires. Raise the railgear to the vehicle. Align the mounting holes such that the center of the railgear pivot point is approximately 16-$\frac{3}{8}$" from the ground. Fasten the railgear to the mounting plates using four ½" x 2" long bolts, eight ½" washers, and four ½" nuts (Item 5). The fasteners should span at least three mounting holes in height.

3. Tighten but do not torque the four ½" fasteners as they will be torqued following the railgear alignment procedure.

FIGURE 2-2 : FRONT RAILGEAR MOUNTING



3.0 REAR RAILGEAR MOUNTING PLATE INSTALLATION

This section covers the installation of the rear railgear mounting plates. The installation procedure follows for each applicable vehicle model.

3.1 1999 – 2007 DODGE DAKOTA

The hardware required for this installation is listed in table 2-3.

Table 2-3: 1999 – 2007 Dodge Dakota Rear Railgear Mounting Hardware

Part Number	Description	Qty
R-1731D	Rear Mounting Plate (Left Side)	1
R-1731P	Rear Mounting Plate (Right Side)	1
R-1733	Rear Operating Valve Support	1
	½" UNC Gr. 8 Bolt x 2" Long	6
	½" GR. 8 Washer	12
	½" UNC Gr. 8 Nylon Insert Lock Nut	6

The following procedure details the rear mounting plate installation (refer to figure 2-3):

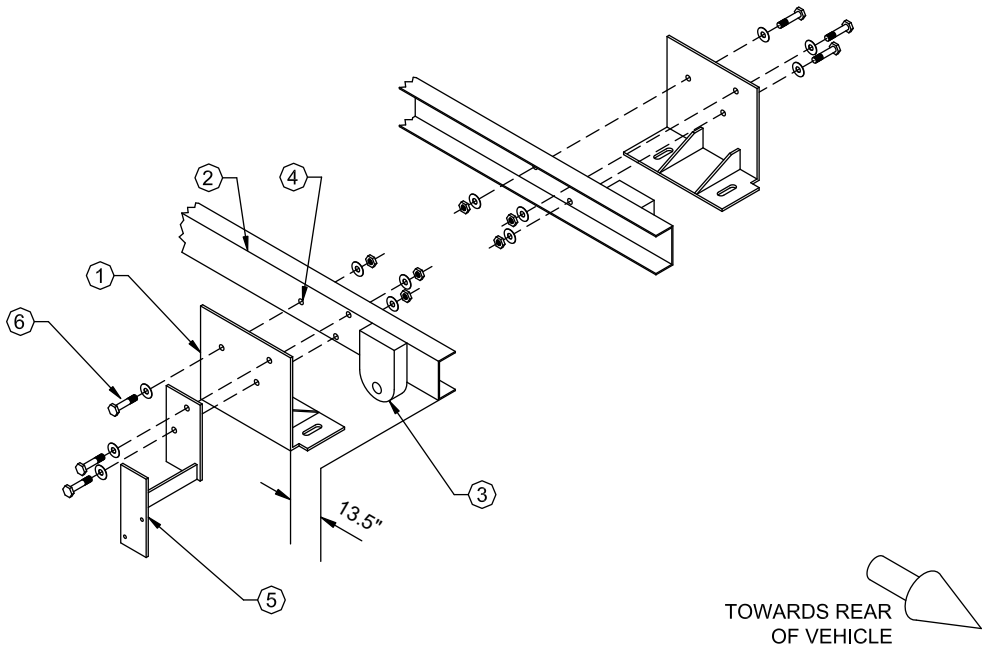
1. Place each rear mounting plate (Item 1) against the outside of the frame rails (Item 2) just forward of the rear spring hangers (Item 3). The rear edge of the mounting plates should be 13-½" from the end of the frame and the top edge of the mounting plates should be flush with the top of the frame. Ensure the mounting plates are level and aligned with each other.

2. Using the mounting plates as templates, drill three $^{17}/_{32}$" holes (Item 4) through each frame rail.

3. Place the rear operating valve support (Item 5) over the rear most two holes on the left side mounting plate as shown.

4. Fasten the mounting plates and operating valve support to the frame using six ½" x 2" long bolts, twelve ½" washers and six ½" nuts (Item 6). Torque the ½" fasteners to 100 ft-lbs.

FIGURE 2-3 : DAKOTA REAR MOUNTING PLATE INSTALLATION



3.2 1999 – 2007 DODGE DURANGO

The hardware required for this installation is listed in table 2-4.

Table 2-4: 1999 – 2007 Dodge Durango Rear Railgear Mounting Hardware

Part Number	Description	Qty
R-1695D	Rear Mounting Plate (Left Side)	1
R-1695P	Rear Mounting Plate (Right Side)	1
R-1698D	Rear Adapter Angle (Left Side)	1
R-1698P	Rear Adapter Angle (Right Side)	1
R-1723	Rear Operating Valve Support	1
	⅝" UNC Gr. 8 Bolt x 1-¾" Long	4
	⅝" GR. 8 Washer	8
	⅝" UNC Gr. 8 Nylon Insert Lock Nut	4

The following procedure details the rear mounting plate installation (refer to figure 2-4):

1. Remove the rear bumper, the two rear most bumper brackets (Item 1) and the two forward most bumper brackets (Item 2) from the frame rails (Item 3). Leave the bumper bracket retaining bolts (Item 4) in the frame. Retain all parts for re-installation.

2. Place each rear mounting plate (Item 5) against the outside of the frame rails around the rear spring hangers (Item 6). The holes in the mounting plates should align with the bumper bracket retaining bolts in the frame.

3. Place the rear operating valve support (Item 7) over the left side forward bumper bracket retaining bolts as shown.

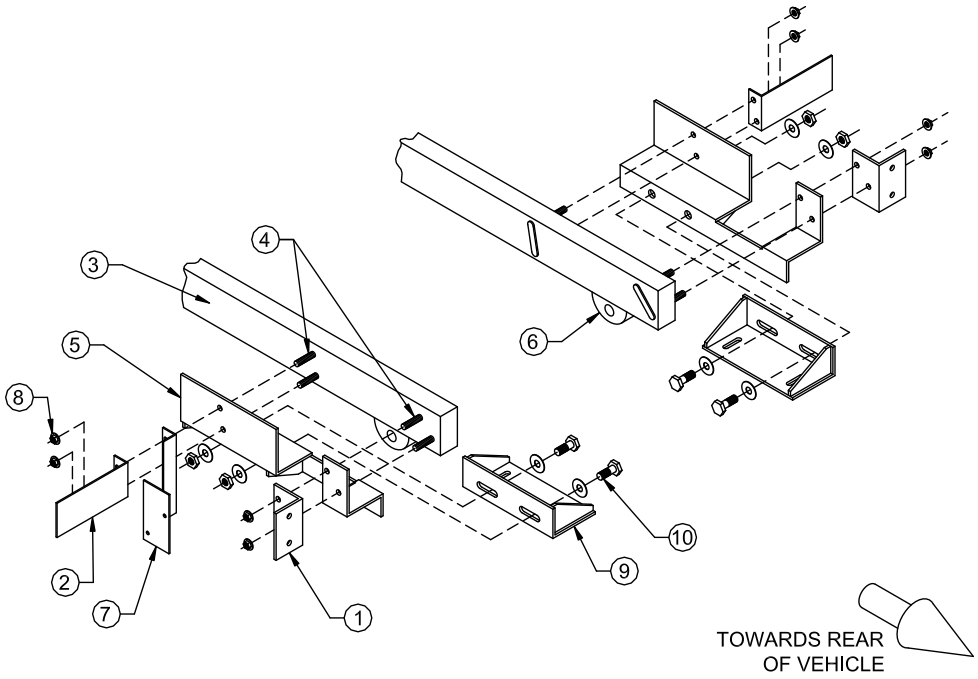
4. Place the bumper brackets back in their original position. The mounting plates and operating valve support should now be between the frame and the bumper brackets.

5. Fasten the mounting plates, operating valve support and bumper brackets to the frame using the original fasteners (Item 8). Ensure the mounting plates are level and aligned with each other. Torque the original fasteners to Dodge specifications.

6. Place and center the adapter angles (Item 9) against the inside of the mounting plates as shown.

7. Fasten the adapter angles to the mounting plates using four ⅝" x 1-¾" long bolts, eight ⅝" washers and four ⅝" nuts (Item 10). Tighten but do not torque the ⅝" fasteners yet.

FIGURE 2-4 : DURANGO REAR MOUNTING PLATE INSTALLATION



4.0 REAR RAILGEAR INSTALLATION

This section covers the installation of the rear railgear. The hardware required for this installation is listed in table 2-5.

Table 2-5: Rear Railgear Installation Hardware

Part Number	Description	Qty
R-1690D	Rotating Rear Railgear	1
R-1794-1	Shim	2
R-1794-2	Shim	2
R-1794-3	Shim	2
R-1725	Handle Holder	1
	¼" UNC Gr. 8 Bolt x 1" Long	1
	¼" SAE Washer	2
	¼" UNC Gr. 3 Nylon Insert Lock Nut	1
	½" UNC Gr. 8 Bolt x 2" Long	4
	½" Gr. 8 Washer	8
	½" UNC Gr. 8 Nylon Insert Lock Nut	4

The following procedure details the rear railgear installation (refer to figure 2-5):

1. Ensure the vehicle is resting on its four properly inflated tires. Position the rear railgear (Item 1) below the rear mounting plates or adapter angles (Item 2) with the hydraulic cylinder free end (Item 3) facing towards the front of the vehicle.

2. Raise the railgear to the mounting plates or adapter angles and align the mounting holes in the railgear with the slots in the mounting plates or adapter angles. The railgear should be installed so that the center of the railgear pivot point is approximately 16-3⁄8" from the ground. Use the supplied shims (Item 4) between the railgear and the mounting plates or adapter angles as necessary.

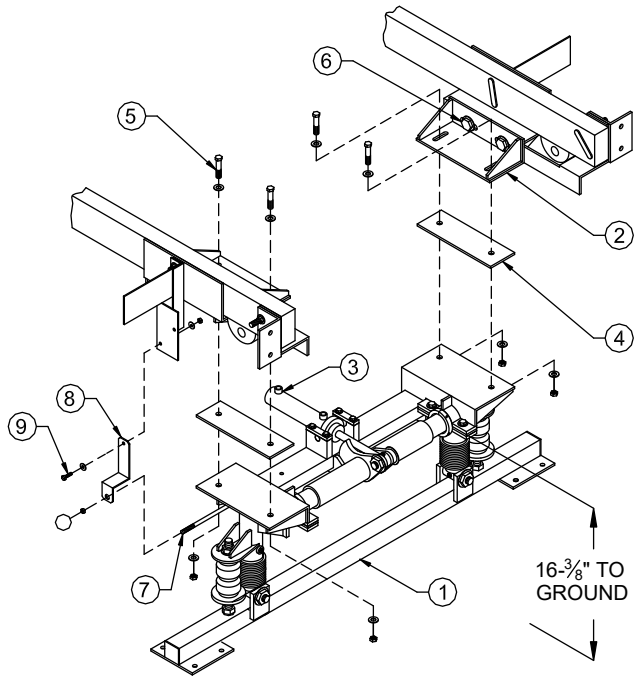
3. Fasten the railgear to the mounting plates or adapter angles using four ½" x 2" long bolts, eight ½" washers and four ½" nuts (Item 5). Tighten but do not torque the four ½" fasteners as they will be torqued following the railgear alignment procedure.

4. **On Durango Models:** The railgear and adapter angles can be moved forwards and backwards on the mounting plates in order to clear any obstructions. Attempt to position the railgear as far forward as possible and perpendicular to the vehicle frame. Torque the 5⁄8" fasteners (Item 6) holding the adapter angles to the mounting plates to 150 ft-lbs.

5. Remove the knob from the locking handle (Item 7) and slide the handle holder (Item 8) onto the locking handle as shown. Re-install the knob. Adjust the shape of the handle holder so that the it can be fastened to the rear operating valve support using one ¼" x 1" long bolt, two ¼" washers and one ¼" nut (Item 9) and the pre-drilled holes. The locking handle should operate freely. Torque the ¼" fastener to 12 ft-lbs.

6. **On Durango Models:** Using the original Dodge fasteners, re-install the rear bumper and torque the original fasteners to Dodge specifications.

FIGURE 2-5 : REAR RAILGEAR MOUNTING



NOTE: DURANGO SHOWN
DAKOTA IS SIMILAR

5.0 RAIL WHEEL AND RAIL SWEEP INSTALLATION

This section covers the installation of the front and rear rail wheels and rail sweeps. The hardware required for this installation is listed in table 2-6.

Table 2-6: Rail Wheel & Rail Sweep Installation Hardware

Part Number	Description	Qty
R-1653	8" Wheel Assembly	4
R-1672R	Front Rail Sweep (Right Side)	1
R-1672L	Front Rail Sweep (Left Side)	1
R-1677R	Rear Rail Sweep (Right Side)	1
R-1677L	Rear Rail Sweep (Left Side)	1
	½" UNC Gr. 8 Bolt x 2" Long	16
	½" Gr. 8 Washer	32
	½" UNC Gr. 8 Nylon Insert Lock Nut	16

The following procedure details the rail wheel and rail sweep installation (refer to figure 2-6 and figure 2-7):

1. Place the rail wheels (Item 1) below the mounting tables (Item 2) on the railgear axles (Item 3).

2. **On the front railgear:** Place the rail sweeps (Item 4) in **front** of the rail wheels and on top of the mounting tables. At this point the rail sweeps will be free to pivot. The rail sweep actuating mechanisms will be installed later.

3. **On the rear railgear:** Place the rail sweeps (Item 4) to the **rear** of the rail wheels and on top of the mounting tables.

4. Fasten the rail wheels and rail sweeps to the mounting tables with sixteen ½" x 2" long bolts, thirty-two ½" washers and sixteen ½" nuts (Item 5).

5. Tighten but do not torque the sixteen ½" fasteners as they will be torqued following the railgear alignment procedure.

FIGURE 2-6 : FRONT RAILSWEEP MOUNTING

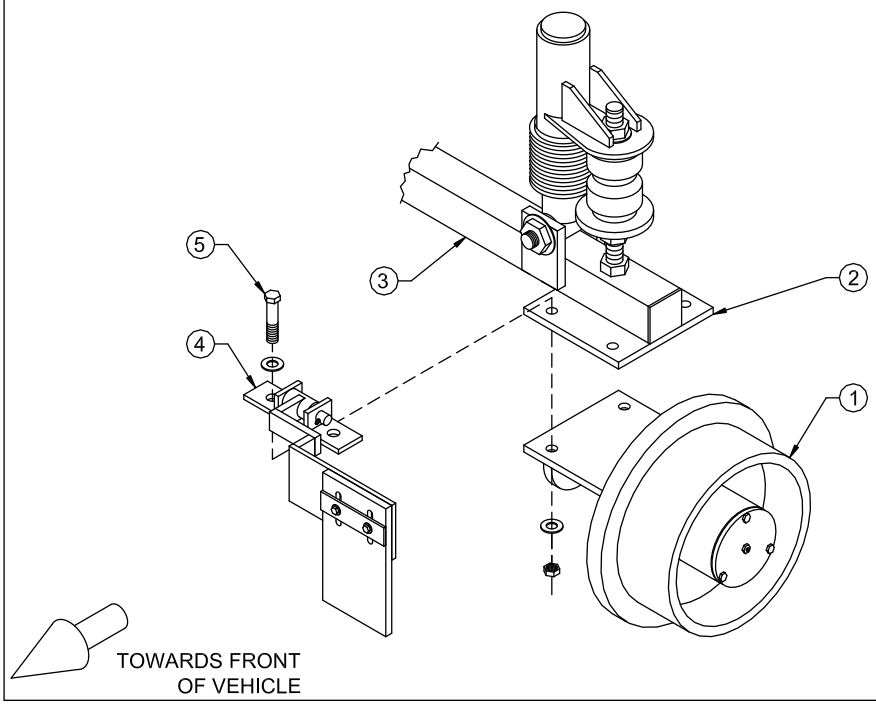
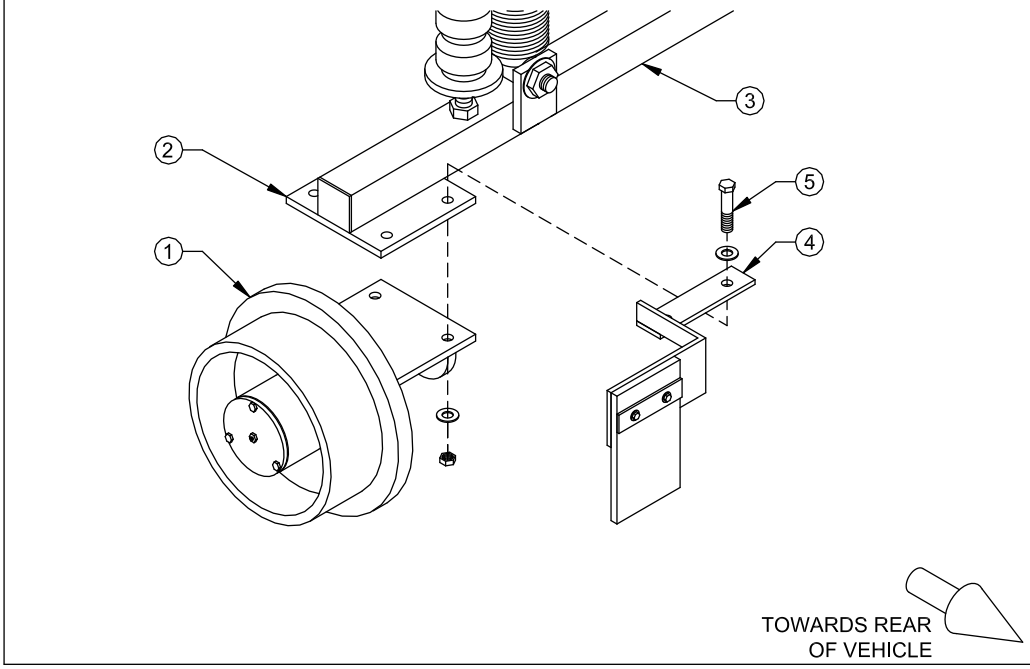


FIGURE 2-7 : REAR RAIL SWEEP MOUNTING



6.0 FRONT RAILGEAR BUMPER AND RAIL SWEEP ARM INSTALLATION

This section covers the installation of the front railgear bumper and rail sweep arms. The hardware required for this installation is listed in table 2-7.

Table 2-7: Front Railgear Bumper And Rail Sweep Arm Installation Hardware

Part Number	Description	Qty
R-1722	Front Bumper	1
R-051	Side Wand Set	1
R-1718D	Front Bumper Plate (Left Side)	1
R-1718P	Front Bumper Plate (Right Side)	1
R-1681	Rail Sweep Arm	2
R-1792	Rail Sweep Pivot Plate	2
	⅜" UNC Gr. 8 Bolt x 1-½" Long	12
	⅜" UNC Gr. 8 Bolt x 1-¾" Long	2
	⅜" SAE Washer	28
	⅜" UNC Gr. 3 Nylon Insert Lock Nut	14
	½" UNC Gr. 8 Bolt x 2-½" Long	2
	½" Gr. 8 Washer	8
	½" UNC Gr. 3 Jam Nut	2
	½" UNC Gr. 8 Nylon Insert Lock Nut	2

The following procedure details the front railgear bumper and rail sweep arm installation (refer to figure 2-8):

1. Place the front bumper brackets (Item 1) on the inside of the front railgear cross frame end plates (Item 2) as shown so that the holes align. Ensure the bumper brackets are level and aligned with each other. Fasten the bumper brackets to the end plates using four ⅜" x 1-½" long bolts, eight ⅜" washers and four ⅜" nuts (Item 3). Torque the ⅜" fasteners to 40 ft-lbs.

2. Place the front bumper (Item 4) on the bumper brackets as shown such that the holes align. Fasten the bumper to the bumper brackets using four ⅜" x 1-½" long bolts, eight ⅜" washers and four ⅜" nuts (Item 5). Torque the ⅜" fasteners to 40 ft-lbs.

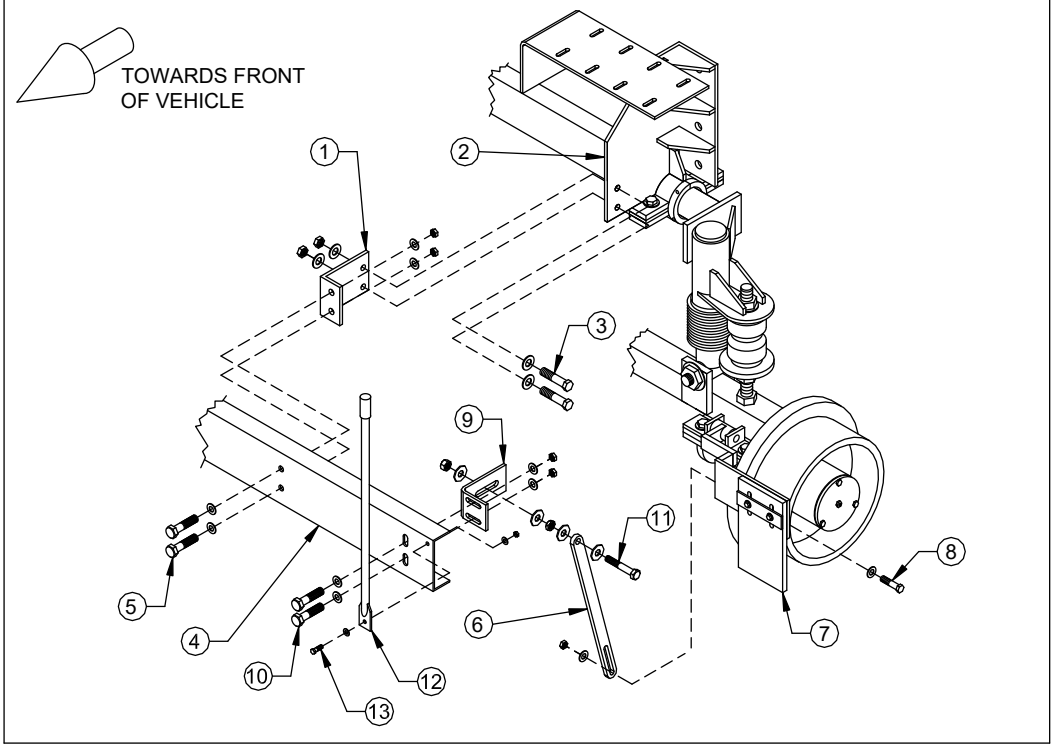
3. Place the rail sweep arms (Item 6) on the inside of the rail sweeps (Item 7) as shown such that the slots in the ends of the rail sweep arms align with the holes in rail sweeps. Fasten the rail sweep arms to the rail sweeps using two ⅜" x 1-¾" long bolts, four ⅜" washers and two ⅜" nuts (Item 8). Do not tighten these fasteners as they should be free to slide in the slots in the rail sweep arms.

4. Place the rail sweep pivot plates (Item 9) on the inside of the bumper as shown so that the slots in the pivot plates align with the holes in the bumper. Fasten the pivot plates to the bumper using four ⅜" x 1-½" long bolts, eight ⅜" washers and four ⅜" nuts (Item 10). Do not torque these fasteners yet.

5. Align the holes in the upper ends of the rail sweep arms with the slots in the rail sweep pivot plates. Fasten the rail sweep arms to the pivot plates as shown using two ½" x 2-½" long bolts, eight ½" washers, two ½" jam nuts and two ½" nuts (Item 11). Do not tighten the ½" fasteners yet as they will be tightened following the rail wheel load adjustment procedure. Slide the pivot plates on the bumper as required to align them beside the rail sweep arms. Torque the ⅜" fasteners to 40 ft-lbs.

6. Fasten the side wands (Item 12) to the front bumper with the supplied fasteners (Item 13). Bend the side wand mounting tabs and drill the bumper as required.

FIGURE 2-8 : FRONT RAILGEAR BUMPER AND RAIL SWEEP MOUNTING



SECTION 3: AUXILIARY INSTALLATIONS

1.0 STEERING WHEEL LOCK INSTALLATION

This section covers the installation of the steering wheel lock. The hardware required for this installation is listed in table 3-1.

Table 3-1: Steering Wheel Lock Installation Hardware

Part Number	Description	Qty
R-1623A	Steering Wheel Lock Retainer	1
R-1623C	Steering Wheel Lock	1
	Steering Wheel Lock Decal	1
	3⁄16” Self-Tapping Screw x ¾” Long	4
	¼” UNC Wing Nut	2

The following procedure details the steering wheel lock installation (refer to figure 3-1):

1. Place the steering wheel lock (Item 1) onto the lock retainer (Item 2) as shown. Fasten the steering wheel lock to the lock retainer using two ¼” wing nuts (Item 3).

2. Position the steering wheel lock and lock retainer on top of the steering column cover (Item 4). The hole in the lock retainer should fit over the hazard lights switch.

WARNING:

- **Ensure that the air bag / horn cover in the steering wheel is not obstructed by the installation of the steering wheel lock.**

3. Ensure the position will enable complete locking of the steering wheel (Item 5) while not obstructing the air bag / horn cover. Mark the location of the lock retainer on the steering column cover.

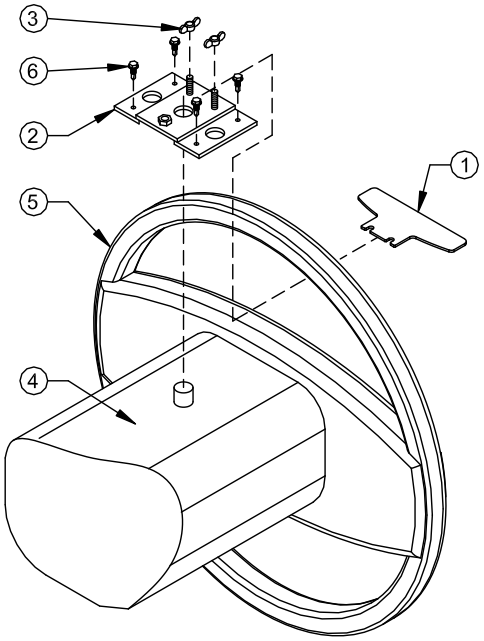
4. Remove the steering column cover and fasten the lock retainer to the steering column cover using four 3⁄16” x ¾” long self-tapping screws (Item 6).

5. Ensure that the screws will not interfere with components inside the steering column and replace the steering column cover.

6. Remove the steering wheel lock from the lock retainer by loosening the wing nuts. Leave the wing nuts on the lock retainer and store the steering wheel lock in the cab.

7. Locate and stick the steering wheel lock decal in a highly visible location on the dash.

FIGURE 3-1: STEERING WHEEL LOCK



2.0 HYDRAULIC SYSTEM INSTALLATION

This section covers the installation of the pump and hoses. The hardware required for this installation is listed in table 3-2.

Table 3-2: Hydraulic System Installation Hardware

Part Number	Description	Qty
R-060	Pump	1
	3/8" Male O-Ring Boss to ¼" Male JIC Straight Fitting	4
	¼" Hose 27" Long w/ straight end & 90° end	2
	¼" Hose 243" Long w/ straight end & 90° end	2
	3/8" UNC Gr. 8 Bolt x 1-¼" Long	4
	3/8" SAE Washer	8
	3/8" UNC Gr. 3 Nylon Insert Lock Nut	4

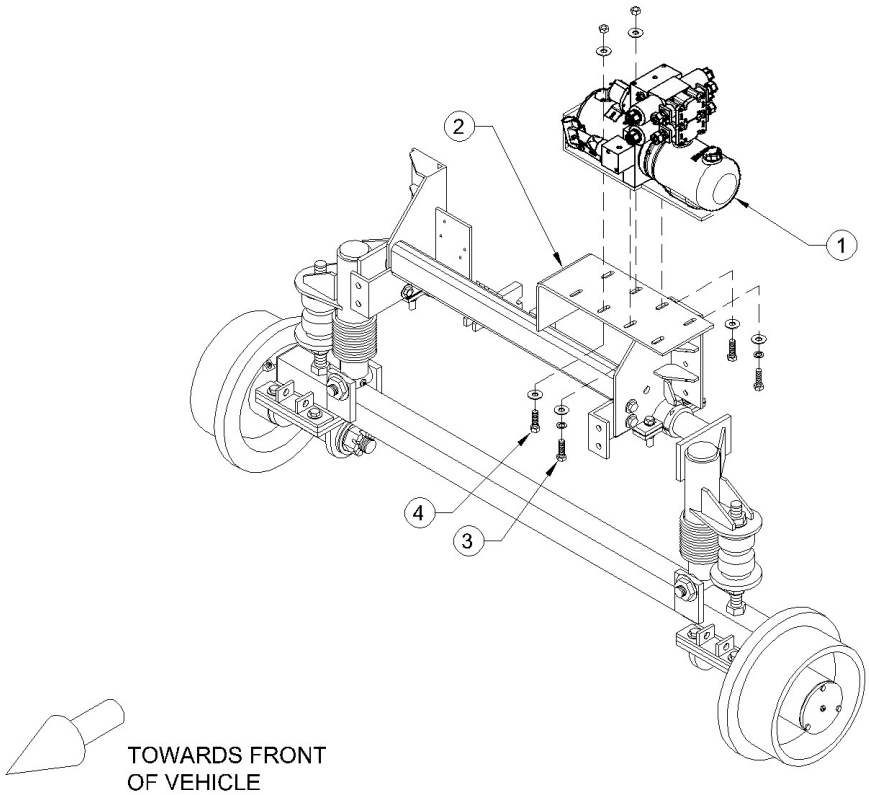
The following procedure details the pump installation (refer to figure 3-2):

1. Install a 3/8" male O-Ring Boss to ¼" male JIC straight fitting into the two A ports and the two B ports on the pump.

2. Remove the motor solenoid from the pump. Re-install the solenoid retaining screws into the pump to avoid water entering the pump motor. Install the solenoid in a suitable location under the hood near to the vehicle's battery with installer supplied hardware.

3. Place the pump (Item 1) on the mounting bracket (Item 2) on the front railgear as shown. There are multiple mounting slots in the mounting bracket to align with the holes in the pump bracket. Position the pump as close to the center of the railgear as possible and so that the tank end of the pump is towards the outside of the vehicle. Ensure that the pump will not block the vehicle's headlights. Fasten the pump to the mounting bracket using two 3/8" x 1-¼" long bolts, two 3/8" washers and two 3/8" lock washers (Item 3) through the pump bracket and into the pump body. Fasten the pump bracket to the mounting bracket using two 3/8" X 1-1/4" bolts, four 3/8" washers, and two 3/8" nuts (Item 4). Torque the 3/8" fasteners to 40 ft-lbs.

FIGURE 3-2: PUMP INSTALLATION



The following procedure details the hydraulic hose installation (refer to figure 3-3 or refer to the Operating, Service and Parts manual for more detailed hydraulic schematics):

IMPORTANT:

- **When routing hydraulic hoses, ensure that the hoses do not contact any sharp edges or hot surfaces.**

1. Connect one 27” long hydraulic hose (straight & 90° ends) between the lower A port on the pump and the rod end port on the front railgear cylinder. The 90° hose end should be at the pump port.

2. Connect another 27” long hydraulic hose (straight & 90° ends) between the lower B port on the pump and the blind end port on the front railgear cylinder. The 90° hose end should be at the pump port.

3. Connect one 243” long hydraulic hose (straight & 90° ends) to the upper A port on the pump and mark the other end of this hose as A. The 90° hose end should be at the pump port.

4. Connect another 243” long hydraulic hose (straight & 90° ends) to the upper B port on the pump and mark the other end of this hose as B. The 90° hose end should be at the pump port.

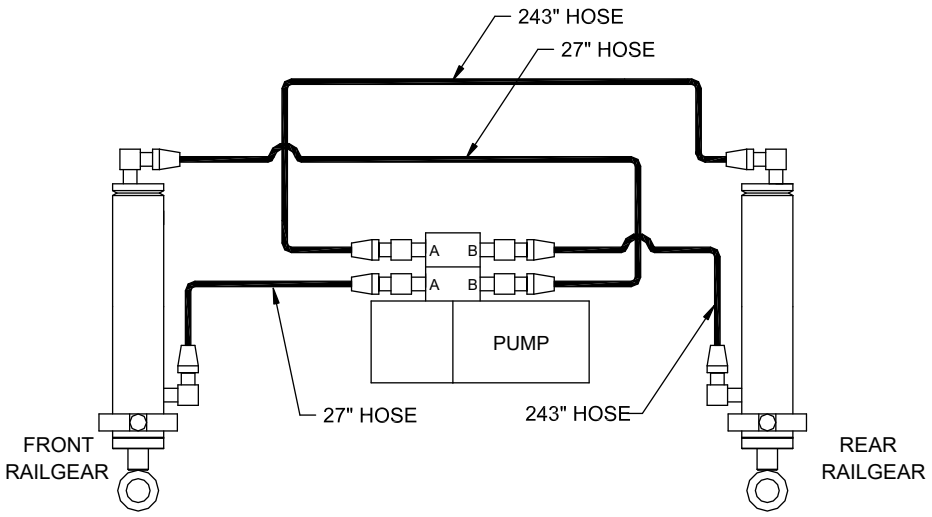
5. Route the two 243” long hydraulic hoses to the rear of the vehicle along the left side of the frame and secure in place with tie-wraps.

6. Connect the free end of the 243” long hydraulic hose marked A to the blind end port on the rear railgear cylinder.

7. Connect the free end of the 243” long hydraulic hose marked B to the rod end port on the rear railgear cylinder.

8. Ensure that none of the hoses contact any sharp edges or hot surfaces. Tie-wrap all hoses securely leaving enough slack for the railgear to function.

FIGURE 3-3: HYDRAULIC SYSTEM INSTALLATION



3.0 ELECTRICAL SYSTEM INSTALLATION

This section covers the installation of the electrical system. The hardware required for this installation is listed in table 3-3.

Table 3-3: Electrical System Installation Hardware

Part Number	Description	Qty
R-1567	Dash Switch	1
R-1577	5 Amp In-Line Fuse	1
Not Supplied	14 Gauge Stranded Copper Wire	As Req'd
Not Supplied	4 Gauge Copper Wire, Neoprene Jacketed (SAE J1127-type SRG)	As Req'd
Not Supplied	Cable Loom	As Req'd

The following procedure details the electrical system installation (refer to figure 3-4 or refer to the Operating, Service and Parts manual for more detailed electrical schematics):

IMPORTANT:

- **When routing electrical wires, ensure that the wires do not contact any sharp edges or hot surfaces.**
- **All wire connections are to be soldered and heat shrink sealed to prevent future corrosion related problems.**
- **All wires must be covered with protective cable loom.**

1. Install the dash switch in a convenient location in the dash.

2. The pump has two wire harnesses and four wires connected to it: there is one 3' wire harness for the front railgear and one 35' wire harness for the rear railgear each with a control box on the end, and there are two white and two black wires each with ring terminals on the ends.

3. Using suitable 14 gauge wire, cable loom, connectors, solder and heat shrink tubing:

   a) Connect the two white wires from the pump together and then to the switching terminal on the railgear pump solenoid previously mounted under the hood. Lengthen the wires as necessary.
   b) Cut and connect one of the black wires from the pump so that the cut off section is of suitable length to reach from the solenoid power terminal to the in-line fuse.
   c) Connect the two black wires from the pump together and lengthen them as necessary to reach from the pump, through the firewall to the load terminal on the dash switch.

d) Connect another black wire from the dash switch power terminal through the firewall to the in-line fuse.
e) Connect a ground wire from the dash switch ground terminal to a suitable ground location on the vehicle.

4. Using suitable 4 gauge wire, cable loom, connectors, solder and heat shrink tubing:

   a) Connect one wire from the vehicle's battery to the power terminal on the railgear pump solenoid.
   b) Connect another wire from the load terminal on the solenoid to the power terminal on the pump motor. Use silicone to protect the power terminal from shorting out.
   c) Ensure the pump motor base is properly grounded to the vehicle chassis by connecting a wire from the railgear pump motor base to a suitable ground location on the vehicle. The railgear may not be properly grounded due to paint on the mounting plates and coatings on the frame.

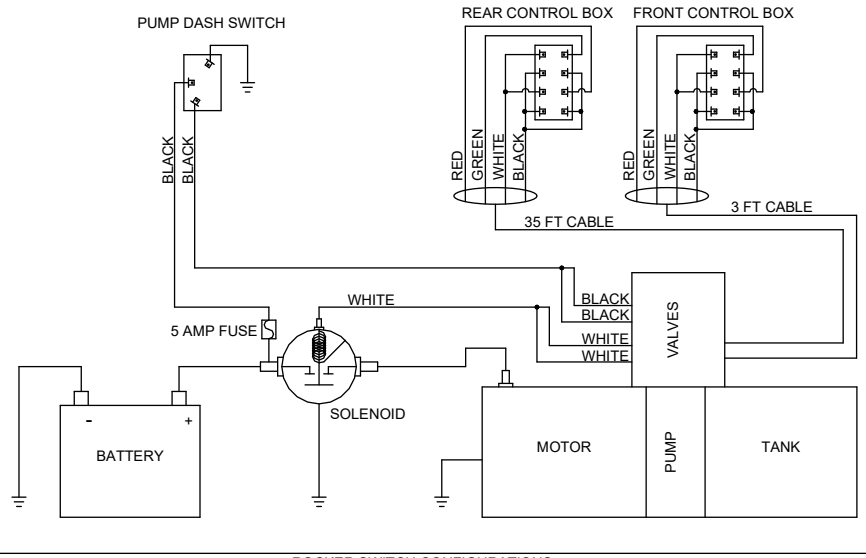
5. Route the 35' wire harness from the pump along the frame to the rear of the vehicle and secure in place with tie-wraps. If necessary the control box can be removed from and reinstalled on the wire harness to facilitate routing. Fabricate a bracket and mount the rear railgear control box with installer supplied hardware in a protected vertical position in a suitable location within reach of the rear locking handle.

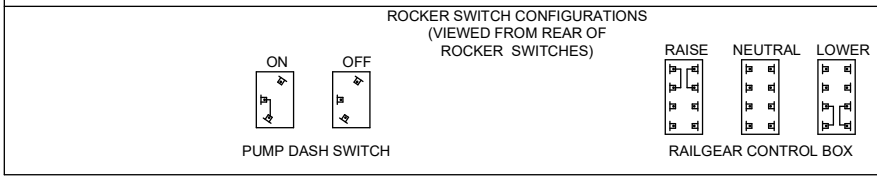
6. Route the 3' wire harness from the pump to the control box mounting bracket on the front railgear. Fasten the front railgear control box with installer supplied hardware in a protected vertical position to the rear side of the mounting bracket.

7. Ensure that the control boxes are mounted vertically so that the push buttons do not fill with water and freeze. They should also be mounted in a location protected from road spray etc.

8. Ensure all wires and terminals are soldered, heat shrink sealed, enclosed in protective cable loom and secured with tie-wraps.

FIGURE 3-4: ELECTRIC SYSTEM INSTALLATION





4.0 RAILGEAR SET-UP AND ADJUSTMENTS

This section covers the railgear set-up and adjustments required before the vehicle can be put in service. Read the entire Operating, Service and Parts Manual before operating the railgear equipped vehicle.

1. Manually rotate the front railgear up to the highway position. Take note of if and where the railgear contacts the front bumper (refer to figure 3-5) and trim accordingly. Ensure enough clearance is left to accommodate side to side adjustment and rail wheel load adjustment of the railgear.

FIGURE 3-5: FRONT BUMPER TRIMMING

2. Manually rotate the rear railgear up to the highway position. Take note of if and where the railgear contacts the rear fenders on Dakota models (refer to figure 3-6) or the rear bumper on Durango models (refer to figure 3-7) and trim accordingly. Ensure enough clearance is left to accommodate side to side adjustment and rail wheel load adjustment of the railgear.

FIGURE 3-6: DAKOTA REAR FENDER MODIFICATION

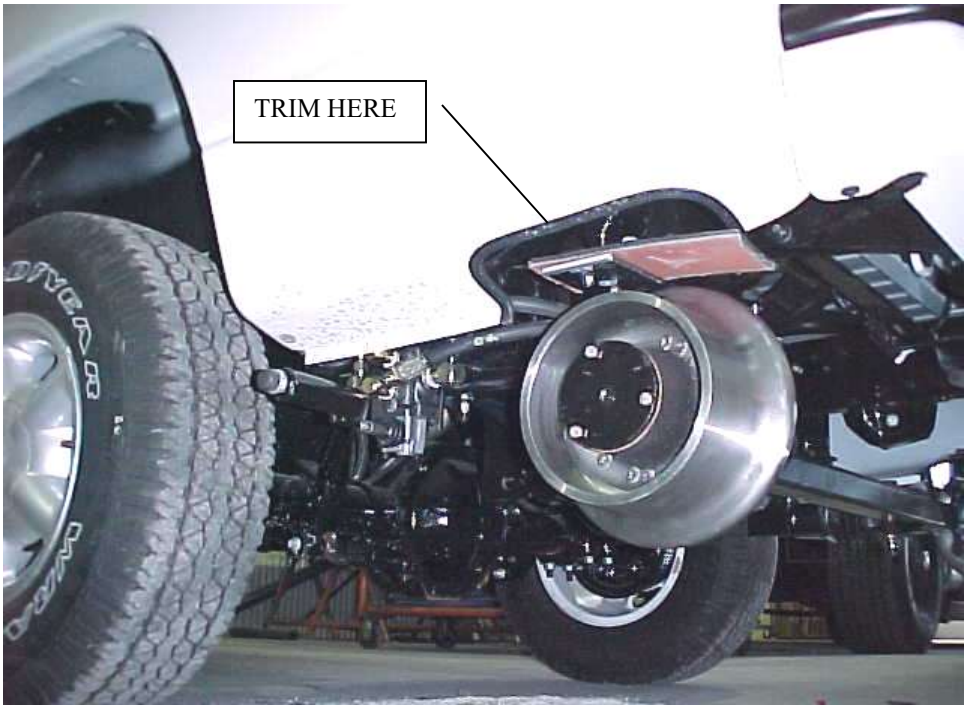


FIGURE 3-7: DURANGO REAR BUMPER TRIMMING

3. Re-install the tail pipe section of the exhaust. Take note of if and where the railgear contacts the exhaust and modify accordingly. Ensure that any modifications to the exhaust conform to applicable laws and regulations.

4. Fill the hydraulic system and bleed the air out:

   a) Fill the pump tank with **ESSO Univis N-22** (or equivalent) hydraulic fluid.
   b) Operate the front railgear up and down briefly to circulate the fluid and bleed the system of air (refer to the Operating, Service and Parts Manual for operating instructions).
   c) Refill the pump tank and repeat step b) until all air is removed from the front hydraulic system.
   d) Operate the rear railgear up and down briefly to circulate the fluid and bleed the system of air (refer to the Operating, Service and Parts Manual for operating instructions).
   e) Refill the pump tank and repeat step d) until all air is removed from the rear hydraulic system.
   f) With the front railgear locked in the rail position and the rear railgear locked in the highway position, fill the pump tank to the full line.

5. Follow the Hydraulic System Relief Valve Setting procedure detailed in the Operating, Service and Parts Manual.

6. Adjust the front and rear railgear rotational stop bolts so that the railgear cylinders can fully extend and retract and so that both front and rear railgear rotate 2-3° past vertical in the rail position.

7. Follow the Rail Wheel Load Adjustment procedure detailed in the Operating, Service and Parts Manual.

8. Follow the Railgear Alignment procedure detailed in the Operating, Service and Parts Manual. Be sure to torque the railgear mounting bolts and the rail wheel mounting bolts following the railgear alignment procedure.

9. Grease the railgear at all lubrication points as detailed in the Routine Service section of the Operating, Service and Parts Manual.

10. Adjust all rail sweep rubbers to have ⅛” clearance from the rail.

11. Torque all fasteners as detailed in the Routine Service section of the Operating, Service, and Parts Manual.

12. Complete the Pre-Delivery Check List in this manual to ensure the railgear has been installed and adjusted correctly.

5.0 PRE-DELIVERY CHECK LIST

RAFNA R-150 HD PRE-DELIVERY CHECK LIST			
Railgear Serial #:		Vehicle Year:	
Model:		Vehicle Make:	
Date Received:		Vehicle Model:	
Date Completed:		Vehicle V.I.N. :	
Installation By:		Inspection By:	
Check List Item		Approved/Value	Remarks
Hydraulic pump attached properly			
Hydraulic system bled of air			
Railgear pump relief set at 1800 PSI			
Split loom used on all exposed hyd. hoses			
Hyd. hoses clear of heat & sharp edges			
Hydraulic system free of leaks			
Hyd. pump grounded			
Electrical connections soldered and sealed			
Split loom uses on all exposed wires			
Wires clear of heat & sharp edges			
Rail sweeps installed			
Rear mounting plates parallel to the ground			
Rail wheel pressures adjusted			Check tire air press
Front left			
Front right			
Rear left			
Rear right			
Railgear alignment completed			
Distance between rail wheel flanges			
Front rail wheels			Min 53-7/16”
Rear rail wheels			Max 53-9/16”
Rail sweeps adjusted 1/8” above track			
Front railgear is 2-3° past vertical on rail			
Rear railgear is 2-3° past vertical on rail			
Rail wheel bearings end-play adjusted			
Distance front rail wheel flange to ground			Min 5-½”
Distance rear rail wheel flange to ground			Min 7-½”
Front and rear lock systems engage easily			

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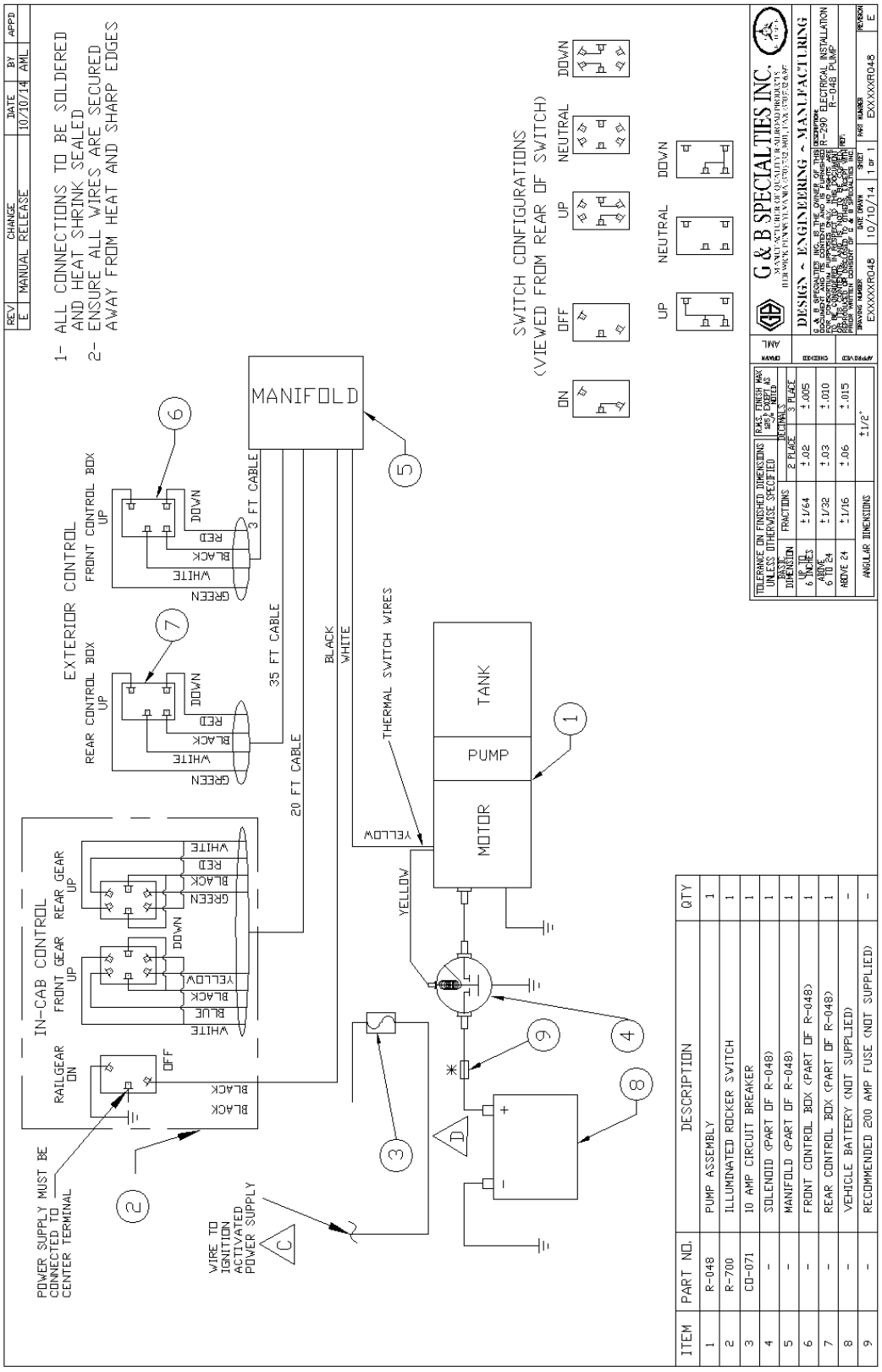
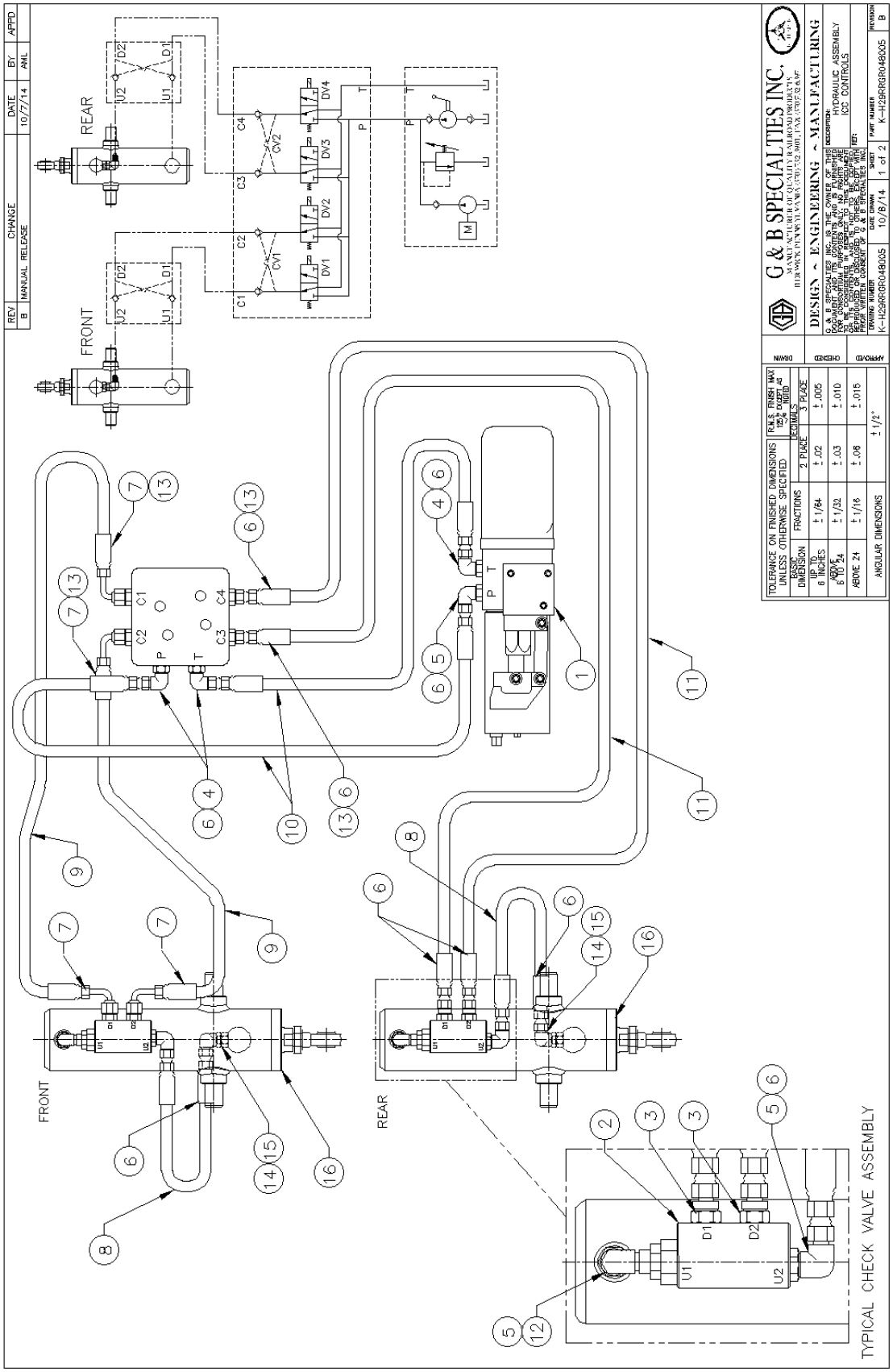
RAFNA R-150 HD PREDELIVERY CHECK LIST			
Railgear Serial #:		Vehicle Year:	
Model:		Vehicle Make:	
Date Received:		Vehicle Model:	
Date Completed:		Vehicle V.I.N. :	
Installation By:		Inspection By:	

Check List Item	Approved/Value	Remarks
Steering wheel lock system installed		
Bumpers installed level with body		
Side wands installed on front bumper		
Rims / Tires clear thru full range of motion		
Tail pipe clear of tire and railgear		
Steering lock decal installed on dash		
Railgear lubricated		
All bolts torqued as per specifications		See O.P.S. Manual
Vehicle track tested		
Operating, Service & Parts Manual in truck		

SECTION 4: APPENDIX



ITEM	PART NO.	DESCRIPTION	QTY
1	R-048	PUMP ASSEMBLY	1
2	R-700	ILLUMINATED ROCKER SWITCH	1
3	CD-071	10 AMP CIRCUIT BREAKER	1
4	-	SOLENOID (PART OF R-048)	1
5	-	MANIFOLD (PART OF R-048)	1
6	-	FRONT CONTROL BOX (PART OF R-048)	1
7	-	REAR CONTROL BOX (PART OF R-048)	1
8	-	VEHICLE BATTERY (NOT SUPPLIED)	-
9	-	RECOMMENDED 200 AMP FUSE (NOT SUPPLIED)	-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C4
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CV2
DV1
DV2
DV3
DV4
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T
M
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U2
D1
D2
FRONT
REAR
TYPICAL CHECK VALVE ASSEMBLY
REV
CHANGE
DATE
BY
APPD
B
MANUAL RELEASE
10/7/14
ANL
G & B SPECIALTIES INC.
DESIGN ~ ENGINEERING ~ MANUFACTURING
HYDRAULIC ASSEMBLY
ICC CONTROLS
DRAWING NUMBER
K-H29RRGR048005
SHEET
1 of 2
PART NUMBER
K-H29RRGR048005
REVISION
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10/8/14
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CHECKED
APPROVED
TOLERANCE ON FINISHED DIMENSIONS UNLESS OTHERWISE SPECIFIED
R.M.S. FINISH MAX 125 EXCEPT AS NOTED
BASIC DIMENSION
FRACTIONS
DECIMALS
2 PLACE
3 PLACE
UP TO 6 INCHES
± 1/64
± .02
± .005
OVER 6 TO 24
± 1/32
± .03
± .010
ABOVE 24
± 1/16
± .06
± .015
ANGULAR DIMENSIONS
± 1/2°

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ITEM	PART NO.	DESCRIPTION	QTY
1	R-048	ELECTRIC HYDRAULIC PUMP W/ MANIFOLD	1
2	S-002002	SINGLE P.O. CHECK VALVE	2
3	848FSO-04x06	3/8" MALE O-RING BOSS TO $\frac{1}{4}$" MALE JIC	4
4	849FSO-04-04	1/4" MALE O-RING BOSS TO 1/4" MALE JIC 90°	3
5	849FSO-04-06	3/8" MALE O-RING BOSS TO 1/4" MALE JIC 90°	3
6	HU-04-04NJ	1/4" FEMALE JIC STRAIGHT COUPLER	12
7	HU-04-04NJ90T	1/4" FEMALE JIC 90° COUPLER	4
8	HFS2-04	HOSE 16" LONG	2
9	HFS2-04	HOSE 80" LONG	2
10	HFS2-04	HOSE 33" LONG	2
11	HFS2-04	HOSE 336" LONG	2
12	C5216x4x6	1/4 JIC FEMALE X 3/8 MALE O-RING	2
13	848FSO-04x04	1/4" MALE O-RING BOSS TO 1/4" MALE JIC	4
14	848FSO-04x06	3/8" MALE O-RING BOSS TO $\frac{1}{4}$" MALE JIC	(2)*
15	897-FS-04	1/4" JIC FEMALE x 1/4" JIC MALE, 90° SWIVEL	(2)*
16	R-9115	HYDRAULIC CYLINDER ASSEMBLY	(2)

TOLERANCE ON FINISHED DIMENSIONS UNLESS OTHERWISE SPECIFIED		R.M.S. FINISH MAX 125 EXCEPT AS NOTED	
BASIC DIMENSION	FRACTIONS	DECIMALS 2 PLACE	DECIMALS 3 PLACE
UP TO 6 INCHES	± 1/64	± .02	± .005
ABOVE 6 TO 24	± 1/32	± .03	± .010
ABOVE 24	± 1/16	± .06	± .015
ANGULAR DIMENSIONS		± 1/2°	

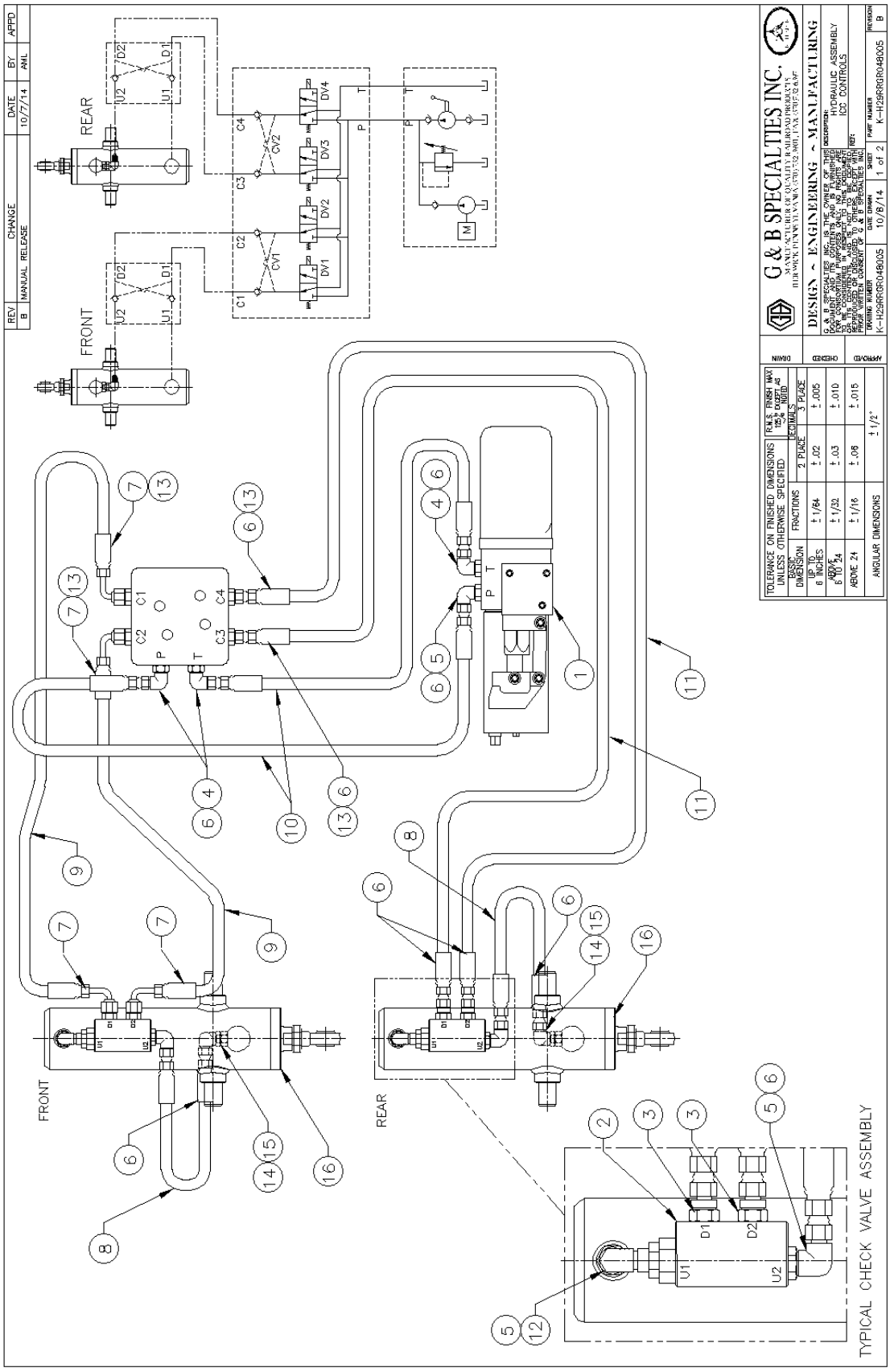
DRAWN: A.WL
CHECKED:
APPROVED:

G & B SPECIALTIES INC.
MANUFACTURER OF QUALITY RAILROAD PRODUCTS
BERWICK PENNSYLVANIA (570)752-5901, FAX (570)752-639

DESIGN ~ ENGINEERING ~ MANUFACTURING

DESCRIPTION: HYDRAULIC ASSY ICC CONTROLS
REF:

DRAWING NUMBER	DATE DRAWN	SHEET	PART NUMBER	REVISION
K-H29RRGR048005	10/8/14	2 OF 2	K-H29RRGR048005	B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DV2
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DV4
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U1
U2
P
T
M
FRONT
REAR
TYPICAL CHECK VALVE ASSEMBLY
G & B SPECIALTIES INC.
DESIGN ~ ENGINEERING ~ MANUFACTURING
HYDRAULIC ASSEMBLY
ICC CONTROLS
DRAWING NUMBER K-H25RRGR048005
PART NUMBER K-H25RRGR048005
REV B
MANUAL RELEASE
DATE 10/7/14
BY AML
APPD

Wabtec Components LLC.
G&B Specialties, Inc.

Wabtec Components LLC

535 West 3rd Street, Berwick, Pa 18603
Tel: (570) 752-5901
Fax: (570) 752-6397

MODEL R-150
"CUSHION-RIDE" RAILGEAR
OPERATING, SERVICE AND
PARTS MANUAL

"ROTATING FRONT - ROTATING REAR"

READ THIS MANUAL BEFORE OPERATING
RAILGEAR EQUIPPED VEHICLE

Application Models: 1999 - 2002 Dodge Dakota (All Models)
1999 - 2002 Dodge Durango (All Models)
2013 Ford Ranger XLT

Issued May 2022 (Rev B) Bulletin MO15RRD

Note:

The appendix of this manual includes the latest changes to the installation and operation of the railgear not included in the “body” of this manual.

Please refer to the appendix prior to installing and operating the railgear.

The information in the appendix supersedes whatever is mentioned in the “body” of this manual.

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G&B Specialties, Inc.

TABLE OF CONTENTS

SECTION 1: GENERAL INFORMATION

1.0 SAFETY INFORMATION

WARNING:

- **Read this manual completely before attempting operation of the railgear equipped vehicle.**
- **Before any maintenance or adjustments are performed under the vehicle or railgear, ensure the vehicle engine is turned off and the parking brake is set.**
- **Ensure that positions and functions of all railgear controls are known before attempting operation.**
- **Ensure all body parts and loose clothing are clear of any moving parts of the equipment.**
- **If misalignment of the railgear equipment is indicated, promptly perform the alignment procedure.**
- **Rail travel speed should always be in conformance with railway company regulations and should be reduce during inclement weather, passing through road crossings, switches, frogs, bridges and curves. Curves of greater than 20 degrees should be negotiated with extreme caution. Operation of this vehicle at unsafe speeds could result in derailment.**
- **The railgear is equipped with a safety lock pin on each railgear to prevent the railgear from moving. Ensure that both the front and rear railgear lock pins are engaged positively before initiating highway or rail travel.**
- **The following safety precautions should be taken before vehicle is operated:**
  - ✓ **Visually inspect the railgear prior to use for damaged or worn parts**
  - ✓ **Check for loose wheels and fasteners**
  - ✓ **Check for leaking hydraulic lines and cylinders**
  - ✓ **Check for proper lubrication**

Failure to heed to any of the above mentioned warnings could result in severe bodily injury and/or equipment damage.

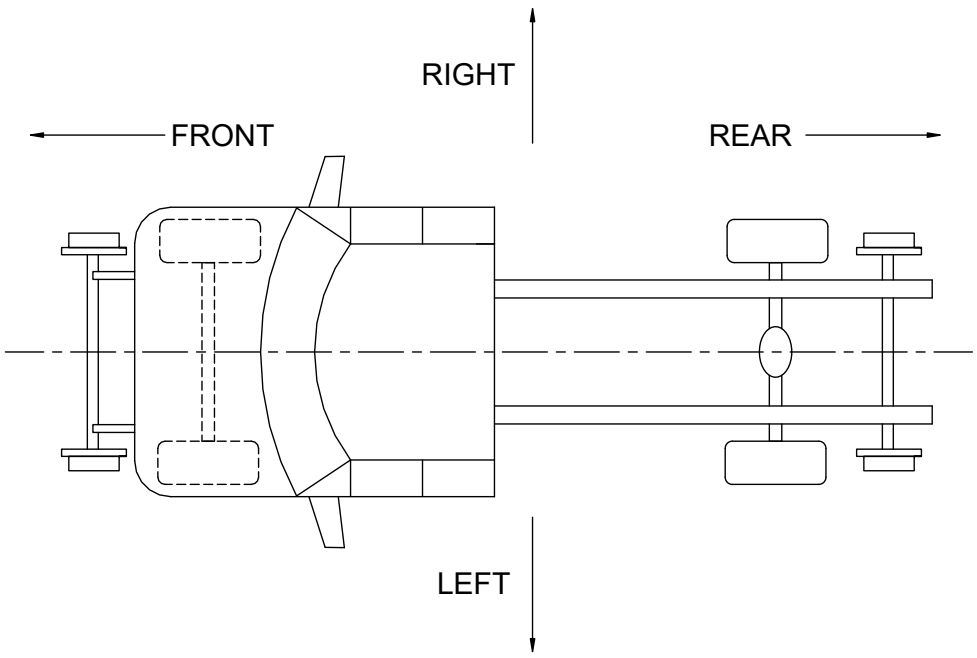
2.0 DESCRIPTION

This manual covers the operation, service and parts of the Rafna Industries rotating front and rotating rear R-150 railgear as applicable to multiple vehicles. If necessary, any difference in operation, service or parts for specific vehicle and/or railgear models is clearly detailed by separate instructions for each. Otherwise, the operation, service and parts instructions are the same for all models. Please refer to the appendix for the latest additions that have not been included in this manual.

The Rafna Industries R-150 railgear is a hydraulically operated road-to-rail conversion system applicable to vehicles of up to 6,500 lbs gross vehicle weight rating (GVWR). The front and rear railgear are frame mounted systems which are hydraulically raised and lowered. The hydraulic power is supplied by a 12 VDC electrical / hydraulic pump. During highway and rail travel, the front and rear railgear are mechanically locked in position. A steering wheel lock system keeps the vehicle's front wheels straight during rail travel. The railgear's spring suspension system ensures constant wheel to rail contact and a comfortable ride. Propulsion on rail is provided by the vehicle's rear tires' contact with the rail. Braking on rail is accomplished through the vehicle's original braking system.

This manual uses the orientation convention for the vehicle as shown in figure 1-1.

FIGURE 1-1 : ORIENTATION CONVENTION



3.0 WARRANTY

Rafna Industries Ltd.,
Limited Warranty

Rafna Industries' warranty covers a period of TWELVE (12) months after the date of the railgear's entry into service. The warranty asserts that each new railgear sold will be free from defects in material and workmanship under normal use and service. Rafna's obligation under this warranty is limited to repairing or replacing at its factory, or other locations as designated by the company. Any defective part or parts must be returned within 30 days of the date of failure or notice of defect for factory inspection or as designated by Rafna Industries Ltd.

Equipment or parts not manufactured by Rafna Industries, but which are furnished in connection with Rafna products are covered directly and solely by the warranty of the original equipment manufacturer supplying them.

The obligation of Rafna Industries under this warranty is limited to the replacement of parts that appear to be defective after review and inspection by our firm or designated representative. This warranty does not oblige Rafna Industries to bear the Customer's cost of labor or transportation charges concerning the return of defective parts. However, if found to be defective the outbound direct ground freight on the part will be prepaid to locations within continental United States and Canada by Rafna Industries Ltd. The warranty does not cover normal wear parts such as rail wheels, guide tubes, bearings, seals, rail sweeps or responsibility for customer's claims arising from abuse, misuse, neglect, or alteration of the railgear. All claims are subject to inspection of said parts by our firm.

This warranty is in lieu of other warranties, expressed or implied, including any implied warranties of merchantability or fitness for a particular purpose and any liability for special or consequential damages.

PRODUCT IMPROVEMENT LIABILITY DISCLAIMER

Rafna Industries Ltd., reserves the right to make any changes in or improvements on its products without incurring any liability or obligation whatever and without being required to make any corresponding changes or improvements in products previously manufactured or sold.

IMPORTANT NOTICE

This warranty will be considered void if Rafna Industries' Installation instructions or Service and Maintenance schedule is not followed according to the detailed instructions contained in both our Installation Manual and our Operation and Service Manual.

Rev. date: 21/09/01

Wabtec Components LLC.
G&B Specialties, Inc.

WARRANTY POLICIES AND PROCEDURES FOR INSTALLERS AND CUSTOMERS

Installers & Customer Warranty:

To prevent unnecessary delays or misunderstandings in handling Installers' or Customers' warranty claims, it is required that all warranty requests be authorized prior to any repairs, modifications or adjustments being started.

Warranty information and authorization can be obtained from Rafna Industries - Engineering Manager or Customer Service Manager who can be contacted at 1-888-525-3660.

Rafna's warranty will not apply if the Railgear or any of its components have been modified or replaced without the written consent of the company.

Additional Billing, Installers & Customers:

If, during installation, it is found that incorrect parts have been shipped. Rafna will cover all costs involved in replacing these parts and return of incorrectly shipped parts.

All warranty claims concerning short / incorrect shipment of parts or accessories must be made within 30 days of delivery.

In order to maintain control over extra or additional billing due to incorrect shipments, only the Engineering Manager or Customer Service Manager can issue a Purchase Order authorizing replacement parts, shipping or work to be performed by an outside source.

Warranty Claim information and requirements:

Rafna Industries will require the following information at time of claim as well as the a properly filled out **"Warranty Claim Form"** form reference "Warranty Form v#2 04/01"

Information Required:

1) Customer Purchase Order number.
2) Rafna railgear serial number.
3) Vehicle unit number.
4) Vehicle VIN number.
5) Purchaser of Rafna railgear.
6) Date of purchase.
7) Name of end user.
8) Company requesting warranty claim.
9) Ship to Address.
10) Bill to Address.

On approval of warranty claim, and where return of parts is requested by Rafna, the Installer or Customer will issue a Purchase Order to Rafna Industries Ltd. to cover the defective parts and out bound freight for part values exceeding $50.00 US and $75.00 CDN. Rafna will in turn ship all required parts pre-paid ground direct to the Installer or Customer. On receipt of claimed warranty parts, Rafna or their sub supplier will inspect defective parts and if deemed warranty, a credit will be issued to the Installer or Customer. If claimed warranty parts are not received within 30 days, a credit will not be issued.

Labor Warranty and /or additional labor charges:

Labor or additional labor charges such as travel are not covered by either the Rafna Warranty or any of Rafna's sub-suppliers.

Faulty Railgear Installations:

If a warranty claim arises due to incorrect installation by an installer who has not followed the written instructions as out lined in our manual or as trained by either Rafna Customer Service or Sales Department, warranty claims will not be honored.

Parts Warranty:

Rafna manufactured parts will be warranted and replaced if found to be defective due to poor materials or workmanship for up to one year from date of the railgear's entry into service. Parts not manufactured by Rafna Industries Ltd., will be covered by the Original Equipment Manufactures warranty. Based on the OEM's investigation of the warranty claim against their manufactured component their decision will stand.

Wabtec Components LLC.
G&B Specialties, Inc.

4.0 WARRANTY CLAIM FORM

This form must be completed prior to starting any warranty work Warranty #

Customer		Date	
Tel/Fax		Railgear S/N	
Vehicle No.		Vehicle VIN	
End User		Date of Purchase	
P.O. Number		Ref #	
Inv. Address		Ship to Address	
Inv. Address		Ship to Address	
Inv. Address		Ship to Address	
Inv. Address		Ship to Address	

Shipping instructions:

Standard Ground	Special Air

Standard 5 day +	Select 3 day	Expedition 2-3 day	Express 2 day

Shipper: Way Bill #

PART No.	QUANTITY	DESCRIPTION

PROBLEM DESCRIPTION

_____

_____

Required Documentation from the Customer (For issuing Credit)

Description of Rafna Parts (Ordered or Used)	Invoice #	Total Claimed $	US/CAD

RAFNA INDUSTRIES approved by: _____ DATE: _____

CUSTOMER'S REPRESENTATIVE: _____ DATE: _____

For Internal Use only:

Engineering	5825	Shipping	5826	Outside Supplier	5821
Manufacturing	5820	Service	5822	Installation	5824
			5823		

5.0 SERIAL NUMBERS

Following receipt of this manual, the serial numbers, model numbers and date of manufacture for both the front and rear railgear should be recorded below for future reference. This information is located on the identification plate (figure 1-2) mounted on each railgear.

Front Railgear:

Serial Number: _____

Model Number: _____

Date of Manufacture: _____

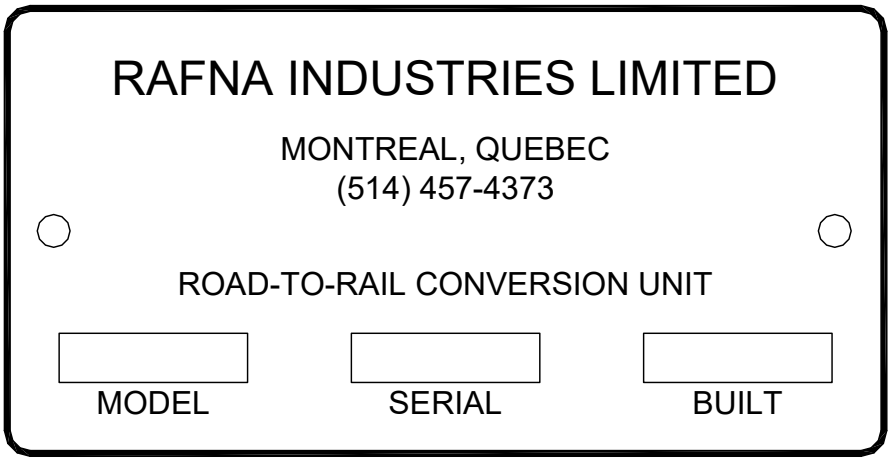
Rear Railgear:

Serial Number: _____

Model Number: _____

Date of Manufacture: _____

FIGURE 1-2: IDENTIFICATION PLATE



6.0 SPECIFICATIONS

Item	Metric	SAE
Installed Weight…..……....	249 Kg	550 lbs
Maximum Gross Vehicle Weight Rating (GVWR)…..….	2,948 Kg	6,500 lbs
Track Gauge……...	1,435 mm	56-½ in
Wheel Diameter……..	203 mm	8 in

SECTION 2: OPERATION

1.0 INSPECTIONS BEFORE OPERATION

Prior to each use of the railgear equipment, the following items should be inspected:

- ✓ Check for damaged or worn parts
- ✓ Check for loose wheels and/or fasteners
- ✓ Check for leaking or damaged hydraulic lines, fittings, and cylinders
- ✓ Check for proper lubrication at specified intervals

Also, the operator should ensure that the vehicle is in good operating condition by following the vehicle manufacturer's operating guide.

WARNING:

Following the first eight (8) hours of rail travel, an initial wheel bearing inspection and verification of sufficient wheel bearing grease should be performed. During this time period, the wheel bearings will have seated themselves and may require adjustment of endplay. If the endplay is not in accordance with specifications, bearing failure could occur and would not be covered under the Rafna Industries Warranty. Refer to the Rail Wheel Bearing Adjustment procedure in the Service section of this manual.

On newly installed railgear equipment, ensure that the Railgear Alignment procedure is performed before operation of the equipment. Note that excessively worn rail wheels, vehicle pulling to one side while on rail, and vibrations through the vehicle while on rail are indicators of mis-aligned railgear. If any of these situations are encountered, proceed to perform the Railgear Alignment procedure as described in the Service section of this manual as soon as possible to avoid damage to the equipment, vehicle and/or possible personal injury.

2.0 PLACING THE VEHICLE ON RAIL

WARNING:

- **Operating instructions provided below only address the Rafna Industries railgear equipment. Applicable railway company procedures and policies must be adhered to.**
- **At level rail crossings, ensure that no other vehicles are approaching and flag the crossing to ensure safety. This vehicle will not activate crossing signals.**
- **Understand equipment operation before operating equipment.**

1. At a suitable location, drive the vehicle past the rail crossing and reverse onto and parallel to the rails while aligning the rear rail wheels directly over the rails. At this point the front rail wheels should be somewhat aligned over the rails.

2. Place the vehicle's automatic transmission in "PARK" (manual transmission in "NEUTRAL") and apply the parking brake. Energize the railgear pump by turning on the respective dash switch. The dash switch light should come on at this point but the pump should not run yet. The pump is an intermittent duty pump which will only run while activating the railgear controls.

3. Note that in order to align the front rail wheels directly over the rails, the rear railgear must be deployed first, then the vehicle is reversed until the front is aligned.

4. The direction of hydraulic flow to the front and rear railgear is selected by pushing the "Up" or "Down" button on the respective control box. This switches the respective hydraulic solenoid valve and starts the pump motor.

5. Lower the rear railgear: (refer to figure 2-1)

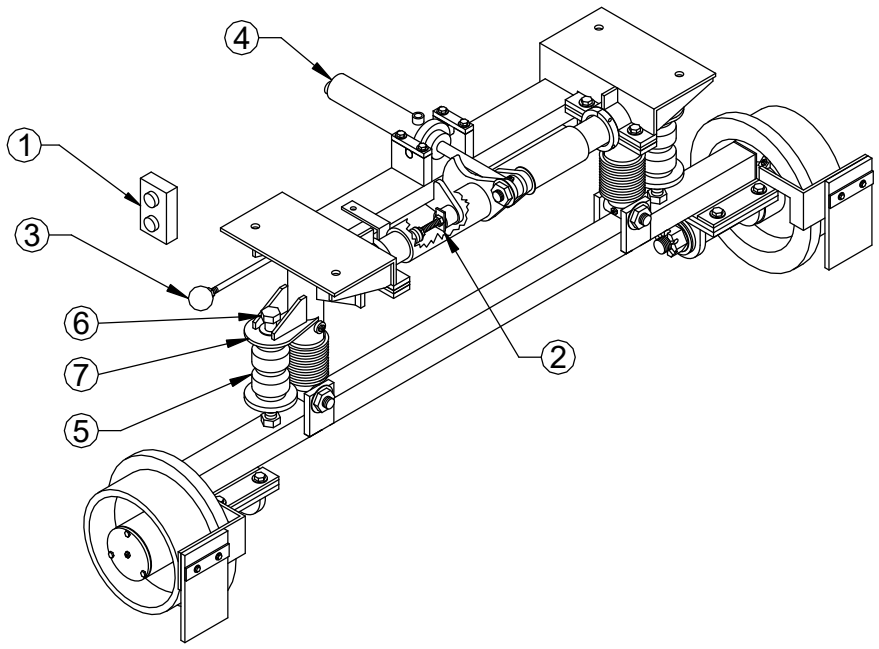
   a) Raise the railgear off the lock pin by selecting "Up" on the rear control box (Item 1).
   b) Disengage the lock pin (Item 2) by pulling the locking handle (Item 3). Do not force the handle. Raise the railgear further by selecting "Up" on the rear control box if necessary. Hold the locking handle in the disengaged position.
   c) Lower the railgear by selecting "Down" on the rear control box.
   d) Release the locking handle once the railgear has rotated below the highway locked position.
   e) Continue lowering the railgear until the hydraulic cylinder (Item 4) is fully extended and the lock pin clicks into the rail locked position. In this position, the railgear should be 2-3° past vertical.
   f) Release the rear control button.

g) Ensure that the rear railgear is properly deployed and that the lock pin is completely engaged before proceeding.

WARNING:

While the railgear is taking some of the vehicle's load, the railgear suspension (Item 5) should be observed compressing. With the vehicle unloaded, the bolt heads (Item 6) should be about ¾" above the spring plates (Item 7) once the railgear is fully deployed. If this is not the case, check for adequate guide tube lubrication and proper rail wheel load setting. If the guide tubes are not free to move or if the rail wheel load is incorrect, the spring suspension will not work correctly and may cause derailment.

FIGURE 2-1: REAR RAILGEAR OPERATION



6. Lower the front railgear: (refer to figure 2-2)

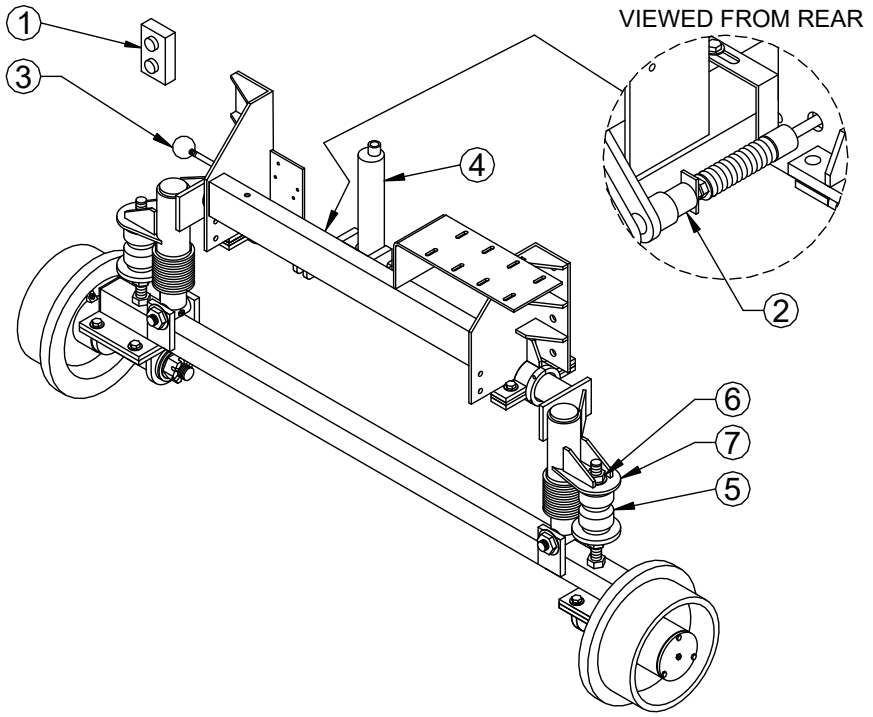
a) With the rear railgear correctly deployed on rail, reverse the vehicle until the front rail wheels are directly over the rails.
b) Place the vehicle's automatic transmission in "PARK" (manual transmission in "NEUTRAL"), apply the parking brake, and re-energize the pump if required by turning on the respective dash switch.
c) Raise the railgear off the lock pin by selecting "Up" on the front control box (Item 1).

d) Disengage the lock pin (Item 2) by pulling the locking handle (Item 3). Do not force the handle. Raise the railgear further by selecting "Up" on the front control box if necessary. Hold the locking handle in the disengaged position.
e) Lower the railgear by selecting "Down" on the front control box.
f) Release the locking handle once the railgear has rotated below the highway locked position.
g) Continue lowering the railgear until the hydraulic cylinder (Item 4) is fully retracted and the lock pin clicks into the rail locked position. In this position, the railgear should be 2-3° past vertical.
h) Release the front control button.
i) Ensure that the front railgear is properly deployed and that the lock pin is completely engaged before proceeding.

WARNING:

While the railgear is taking some of the vehicle's load, the railgear suspension (Item 5) should be observed compressing. With the vehicle unloaded, the nuts (Item 6) should be about ¾" above the spring plates (Item 7) once the railgear is fully deployed. If this is not the case, check for adequate guide tube lubrication and proper rail wheel load setting. If the inner tubes are not free to move or if the rail wheel load is not correct, the spring suspension will not work correctly and may cause derailment.

FIGURE 2-2: FRONT RAILGEAR OPERATION



7. De-energize the pump by turning off the respective dash switch.

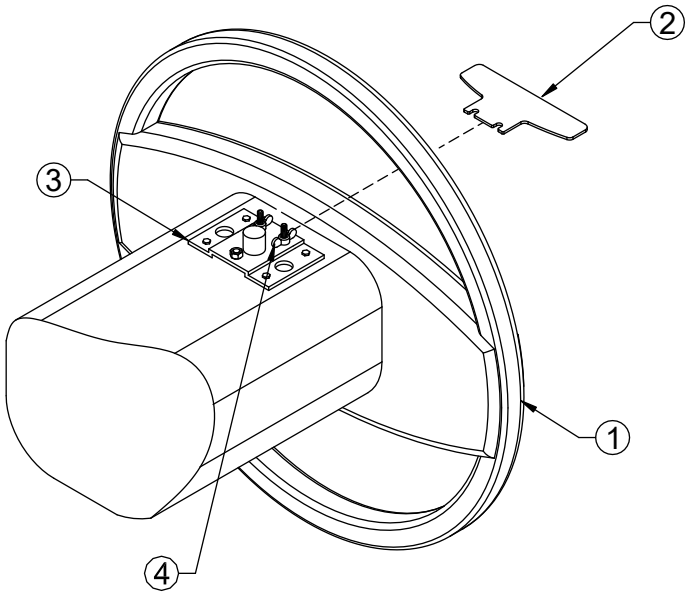
8. Engage the steering wheel lock: (refer to figure 2-3)

   a) Turn the steering wheel (Item 1) until the front tires point straight ahead.
   b) Pass the steering lock (Item 2) over the air bag / horn cover and onto the steering column lock retainer (Item 3). Tighten the wing nuts (Item 4) by hand to secure the steering wheel.

WARNING:

Ensure the steering lock secures the steering wheel and does not interfere with the driver's air bag / horn cover.

FIGURE 2-3: STEERING WHEEL LOCK OPERATION



3.0 TRAVELLING ON RAIL

Before proceeding to travel on rail, ensure that the railgear lock pins are fully engaged, that the steering wheel lock has been installed with the front wheels pointing straight ahead, and that the pump has been de-energized.

WARNING:

- **Railway company rules governing rail travel must be observed at all times.**
- **Before proceeding with rail travel, ensure both the front and rear railgear lock pins are completely engaged.**
- **Do not operate vehicle on rail if the vehicle weight exceeds either the maximum GVWR rating of the railgear or the GVWR of the vehicle.**
- **The steering wheel lock must be engaged at all times while on rail.**
- **Ensure that the railgear pump has been de-energized.**

The vehicle may now be driven as if on the highway without steering, however speed must be reduced. Note also that braking ability is decreased while on rail.

4.0 BRAKING ON RAIL

This railgear equipment allows the vehicle's tire contact with the rails to provide the braking action, identically as if on the highway. However, it is important to apply the brakes gradually in order to avoid locking up the vehicle's tires. Note also that braking ability while on rail is considerably reduced, and can be adversely effected during inclement weather.

5.0 REMOVING THE VEHICLE FROM RAIL

WARNING:

- **Operating instructions provided below only address the Rafna Industries railgear equipment. Applicable railway company procedures and policies must be adhered to.**
- **At level rail crossings, ensure that no other vehicles are approaching and flag the crossing to ensure safety. This vehicle will not operate crossing signals.**
- **Understand equipment operation before operating equipment.**

1. Approach a level crossing or other suitable location, and prepare to remove the vehicle from the rail by placing the vehicle's automatic transmission in "PARK" (manual transmission in "NEUTRAL") and applying the parking brake.

2. Energize the railgear pump by turning on the respective dash switch. The dash switch light should come on at this point but the railgear pump should not run yet. The pump is an intermittent duty pump which will only run while activating the railgear controls.

3. Note that the vehicle is removed from rail by first raising the front railgear and then raising the rear railgear. Finally the steering wheel lock is removed.

4. The direction of hydraulic flow to the front and the rear railgear is selected by pushing the "Up" or "Down" button on the respective control box. This switches the respective hydraulic solenoid valve and starts the pump motor

5. Raise the front railgear: (refer to figure 2-2)

   a) Lower the railgear off the lock pin by selecting "Down" on the front control box (Item 1).
   b) Disengage the lock pin (Item 2) by pulling the locking handle (Item 3). Do not force the handle. Lower the railgear further by selecting "Down" on the front control box if necessary. Hold the locking handle in the disengaged position.
   c) Raise the railgear by selecting "Up" on the front control box.
   d) Release the locking handle once the railgear has rotated above the rail locked position.
   e) Continue raising the railgear until the lock pin clicks into the highway locked position (the hydraulic cylinder will be completely extended).
   f) Ensure the lock pin is completely engaged before proceeding.

6. Raise the rear railgear: (refer to figure 2-1)

   a) Lower the railgear off the lock pin by selecting “Down” on the rear control box (Item 1).
   b) Disengage the lock pin (Item 2) by pulling the locking handle (Item 3). Do not force the handle. Lower the railgear further by selecting “Down” on the rear control box if necessary. Hold the locking handle in the disengaged position.
   c) Raise the railgear by selecting “Up” on the rear control box.
   d) Release the locking handle once the railgear has rotated above the rail locked position.
   e) Continue raising the railgear until the lock pin clicks into the highway locked position (the hydraulic cylinder will be completely retracted).
   f) Ensure the lock pin is completely engaged before proceeding.

7. De-energize the pump by turning off the respective dash switch.

8. Disengage the steering wheel lock: (refer to figure 2-3)

   a) Loosen the wing nuts (Item 4) and pull the steering lock (Item 2) out of the lock retainer (Item 3).
   b) Store the steering lock in a secure spot.

WARNING:

- **Before proceeding with highway travel, ensure both the front and rear railgear lock pins are completely engaged.**
- **Ensure that the railgear pump has been de-energized.**

9. Carefully drive the vehicle off rail and onto the highway.

SECTION 3: SERVICE

1.0 RAIL WHEEL BEARING ADJUSTMENT

The rail wheel bearings require periodic adjustment in order to keep the endplay within specification. If the rail wheel bearings are not correctly adjusted, failure may occur and will not be covered under the Rafna Industries Warranty.

The following procedure details the adjustment of the rail wheel bearings (refer to figure 3-1):

WARNING:

- **Before any maintenance or adjustments are performed under the vehicle or railgear, ensure the engine is turned off and the parking brake is set.**

1. Perform this procedure with the railgear in the highway position and with the rail wheels free to turn. If necessary, lower the railgear to ease access, but ensure the railgear axle is supported.

2. Using a magnetic base dial gauge measure the endplay of each rail wheel bearing.

3. Compare the above readings with the specifications in table 3-1 below.

Table 3-1: Rail Wheel Endplay Specifications

	Minimum	Maximum
Endplay	0.001”	0.005”

4. If rail wheel bearing endplay is not within specifications, proceed to adjust as follows.

5. Access the rail wheel bearings: Remove the wheel hub cap (Item 1) and gasket (Item 2) by unbolting the three hub cap retaining bolts (Item 3).

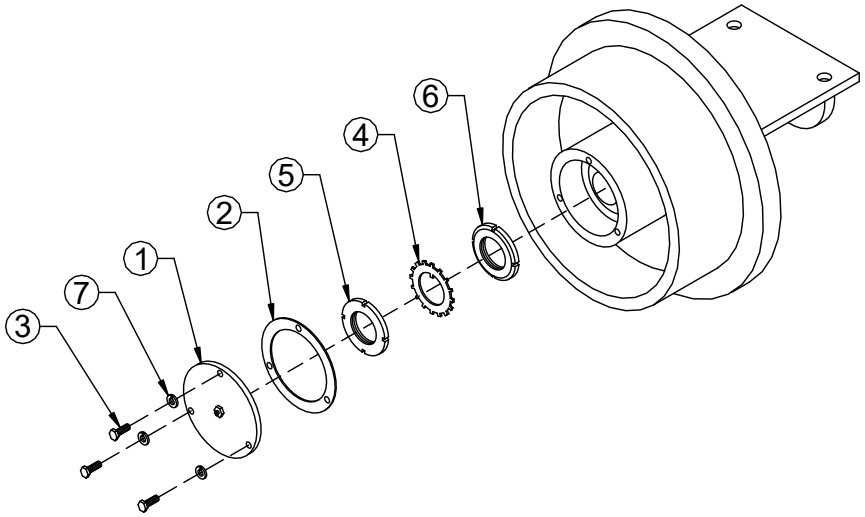
6. Adjust the rail wheel bearing:

   a) Unbend the lock washer (Item 4) tab. Remove the lock nut (Item 5) and lock washer.
   b) While rotating the rail wheel forward, torque the spindle nut (Item 6) to 12 ft-lbs.
   c) Slightly loosen the spindle nut.
   d) Re-torque the spindle nut to 6 ft-lbs.
   e) Recheck endplay and re-adjust if required.
   f) Re-install the lock washer and lock nut. Tighten the lock nut against the spindle nut and bend the lock washer tab to lock the nuts.
   g) Ensure the wheel bearing cavity is full of grease. Refer to the Routine Railgear Service section of this manual for lubrication points.
   h) Re-install the gasket, the hub cap, the bolts and lock washers (Item 7). Torque the hub cap retaining bolts to specifications.

If a torque wrench is not available, the following procedure may be substituted for steps 6. b) through 6. d) above:

b) Tighten the spindle nut until the wheel cannot be turned by hand.
c) Loosen the spindle nut until the wheel can be turned by hand.
d) Re-adjust when torque wrench is available.

FIGURE 3-1: RAIL WHEEL BEARING ADJUSTMENT



2.0 RAIL WHEEL LOAD ADJUSTMENT

The percentage of the vehicle load carried by the railgear must be properly adjusted to ensure sufficient traction and guidance while avoiding overloading the railgear. The load on the rail wheels is an indicator of the amount of load carried by the railgear and is adjusted as described below using a hydraulic bottle jack equipped with a gauge. If the gauge on the hydraulic bottle jack reads in Pounds per Square Inch (PSI), use Table 3-2 along with the jack bore diameter to convert this reading to Pounds (lbs). If the gauge reads in pounds, then no conversion is required. The rail wheel load adjustment is done at installation and only requires re-adjustment if the railgear is moved or vehicle equipment is changed. The rail wheel load need not be adjusted with minor load changes in the vehicle.

WARNING:

- **Before any maintenance or adjustments are performed under the vehicle or railgear, ensure the engine is turned off and the parking brake is set.**
- **The vehicle should only be carrying the permanently attached load and any normally carried non-attached load during this procedure. Do not include operator nor passengers.**
- **Ensure an inspection of the railgear has been carried out before any rail testing is performed.**
- **Ensure the vehicle tires have been aligned and inflated to the tire manufacturer's recommended air pressure.**

1. Place the vehicle on a straight and level section of rail with the railgear deployed to the rail position.

2. Ensure that the vehicle tires are not in contact with any obstructions except the rails and that they are inflated to the correct air pressure.

3. Check each rail wheel load as follows (refer to figure 3-2):

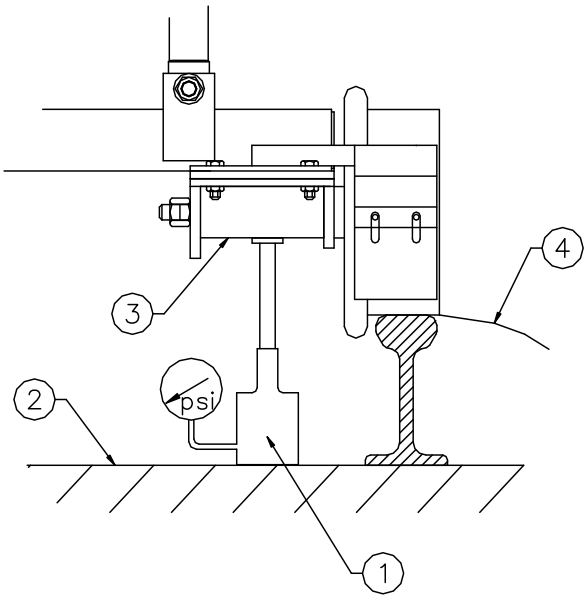
   a) Place the jack (Item 1) on a solid railway tie (Item 2) beneath the rail wheel spindle housing (Item 3) and jack the rail wheel off the rail.
   b) Insert a piece of paper (Item 4) between the rail and the rail wheel. Lower the jack until the rail wheel squeezes the paper so that it cannot be pulled out.
   c) Slowly jack up the rail wheel while pulling on the paper and observe the jack gauge. When the paper can be pulled out, stop jacking.
   d) Record the load or pressure reading on the jack gauge.
   e) If necessary convert the pressure reading to a load reading using table 3-2.

Table 3-2: Rail wheel Load vs Jack Pressure and Bore

Jack Pressure (psi)	Jack Cylinder Bore diameter (in)								
	7/8	15/16	1	1 1/16	1 1/8	1 3/16	1 1/4	1 5/16	1 3/8
300	180	210	240	270	300	330	370	410	450
310	190	210	240	270	310	340	380	420	460
320	190	220	250	280	320	350	390	430	480
330	200	230	260	290	330	370	400	450	490
340	200	230	270	300	340	380	420	460	500
350	210	240	270	310	350	390	430	470	520
360	220	250	280	320	360	400	440	490	530
370	220	260	290	330	370	410	450	500	550
380	230	260	300	340	380	420	470	510	560
390	230	270	310	350	390	430	480	530	580
400	240	280	310	350	400	440	490	540	590
410	250	280	320	360	410	450	500	550	610
420	250	290	330	370	420	470	520	570	620
430	260	300	340	380	430	480	530	580	640
440	260	300	350	390	440	490	540	600	650
450	270	310	350	400	450	500	550	610	670
460	280	320	360	410	460	510	560	620	680
470	280	320	370	420	470	520	580	640	700
480	290	330	380	430	480	530	590	650	710
490	290	340	380	430	490	540	600	660	730
500	300	350	390	440	500	550	610	680	740
510	310	350	400	450	510	560	630	690	760
520	310	360	410	460	520	580	640	700	770
530	320	370	420	470	530	590	650	720	790
540	320	370	420	480	540	600	660	730	800
550	330	380	430	490	550	610	670	740	820
560	340	390	440	500	560	620	690	760	830
570	340	390	450	510	570	630	700	770	850
580	350	400	460	510	580	640	710	780	860
590	350	410	460	520	590	650	720	800	880
600	360	410	470	530	600	660	740	810	890
610	370	420	480	540	610	680	750	830	910
620	370	430	490	550	620	690	760	840	920
630	380	430	490	560	630	700	770	850	940
640	380	440	500	570	640	710	790	870	950
650	390	450	510	580	650	720	800	880	970
660	400	460	520	590	660	730	810	890	980
670	400	460	530	590	670	740	820	910	990
680	410	470	530	600	680	750	830	920	1010
690	410	480	540	610	690	760	850	930	1020
700	420	480	550	620	700	780	860	950	1040
710	430	490	560	630	710	790	870	960	1050
720	430	500	570	640	720	800	880	970	1070
730	440	500	570	650	730	810	900	990	1080
740	440	510	580	660	740	820	910	1000	1100
750	450	520	590	660	750	830	920	1010	1110
760	460	520	600	670	760	840	930	1030	1130
770	460	530	600	680	770	850	940	1040	1140
780	470	540	610	690	780	860	960	1060	1160
790	480	550	620	700	790	870	970	1070	1170
800	480	550	630	710	800	890	980	1080	1190
810	490	560	640	720	810	900	990	1100	1200
820	490	570	640	730	820	910	1010	1110	1220
830	500	570	650	740	830	920	1020	1120	1230
840	510	580	660	740	830	930	1030	1140	1250
850	510	590	670	750	840	940	1040	1150	1260
860	520	590	680	760	850	950	1060	1160	1280
870	520	600	680	770	860	960	1070	1180	1290
880	530	610	690	780	870	970	1080	1190	1310
890	540	610	700	790	880	990	1090	1200	1320
900	540	620	710	800	890	1000	1100	1220	1340

Rail Wheel load in pounds

FIGURE 3-2: RAIL WHEEL PRESSURE MEASUREMENT



7. Compare the rail wheel load reading to the specifications in table 3-3.

Table 3-3: Rail Wheel Load Specifications

	Minimum	**Maximum**
Rail Wheel Load	350 lbs	400 lbs

8. If the load on the rail wheels are not within the specifications, proceed to adjust as follows.

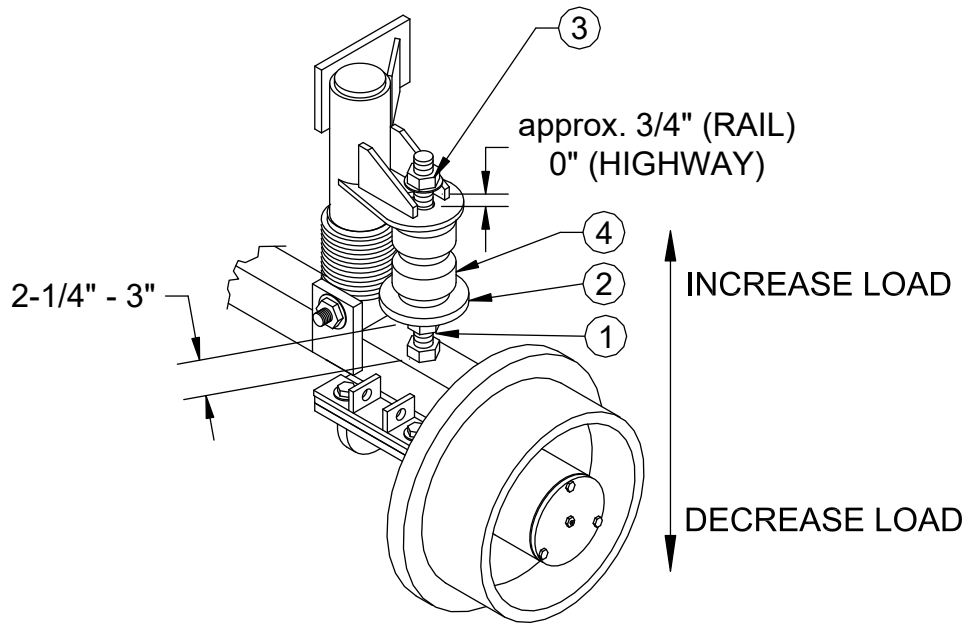
9. Adjust the front rail wheel load (refer to figure 3-3):

   a) Raise the front railgear until the front rail wheels are unloaded.
   b) For each front rail wheel, loosen the lower jam nut (Item 1) under the lower spring plate (Item 2).
   c) Adjust the lower spring plate and upper lock nut (Item 3) up to increase the load or down to decrease the load on the rail wheel. Both front rail wheels should be adjusted by the same amount.
   d) Once adjusted, there should be a gap of 2-¼" – 3" from the bottom of the lower spring plate to the top of the railgear axle. If the correct loads cannot be obtained within this range, adjust the height of the railgear in the mounting plate holes.
   e) Lower the railgear and recheck each rail wheel load. Re-adjust if necessary.
   f) Tighten the lower jam nuts against the lower spring plates.
   g) Raise the railgear and tighten the upper lock nuts until the rubber springs (Item 4) just start to compress. Do not pre-compress the rubber springs.

h) Lower the railgear to the rail position. The upper lock nut should be about ¾" above the upper spring plate.

i) Adjust the rail sweep arm in the slot on the rail sweep pivot plate so that the rail sweep is vertical when the railgear is in the rail position. Tighten the ½" jam nut against the ½" nut to hold the ½" in the slot. The rail sweep arm should be free to rotate on the ½" bolt.

FIGURE 3-3 : FRONT RAIL WHEEL LOAD ADJUSTMENT



10. Adjust the rear rail wheel load (refer to figure 3-4):

a) Raise the rear railgear until the rear rail wheels are unloaded.
b) For each rear rail wheel, loosen the upper jam nut (Item 1) under the lower spring plate (Item 2).
c) Adjust the lower spring plate and upper lock nut (Item 3) up to increase the load or down to decrease the load on the rail wheel. Both rear rail wheels should be adjusted by the same amount.
d) Once adjusted, there should be a gap of 2-¼" – 3" from the bottom of the lower spring plate to the top of the railgear axle. If the correct loads cannot be obtained within this range, adjust the height of the railgear in the mounting plate holes.
e) Lower the railgear and recheck each rail wheel load. Re-adjust if necessary.
f) Tighten the lower jam nut against the lower spring plate.
g) Raise the railgear and tighten the upper lock nuts until the rubber springs (Item 4) just start to compress. Do not pre-compress the rubber springs

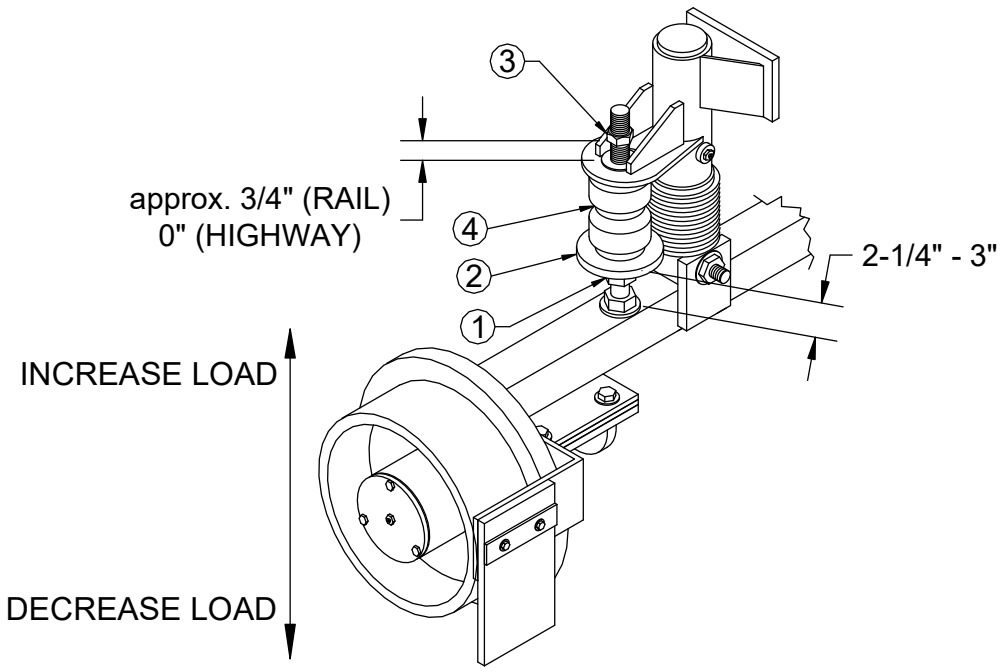
h) Lower the railgear to the rail position. The upper lock nut should be about ¾" – 1" above the upper spring plate.

11. Remove the vehicle from rail.

WARNING:

- **The rail wheels should be a minimum of 5-½" above the ground when in the highway position. If this minimum distance cannot be achieved with the correct rail wheel loads and the holes available in the mounting plates, contact Rafna Industries for assistance.**

FIGURE 3-4: REAR RAIL WHEEL LOAD ADJUSTMENT



3.0 RAILGEAR ALIGNMENT

The Rafna railgear must be correctly aligned in order to perform properly, safely, and avoid excessive wear. All four rail wheels can be independently aligned while lateral adjustment of the front and rear railgear is accomplished through adjusting the railgear on the mounting plates. A parallel line system and the following procedure should be used to perform the railgear alignment. Rafna Industries can also supply a special alignment tool kit (order part number R-066K) for steel rail wheels only, with which separate instructions are supplied.

WARNING:

- **The vehicle should have had a four-wheel alignment following the installation of the railgear but prior to performing the railgear alignment.**
- **This procedure should be done with the vehicle parked on a straight and level section of rail with the front tires pointing straight ahead in order to achieve correct alignment.**
- **Before any maintenance or adjustments are performed under the vehicle or railgear, ensure the engine is turned off and the parking brake is set.**

1. Fabricate a parallel string line system. Rafna Industries suggests the following (refer to figure 3-5):

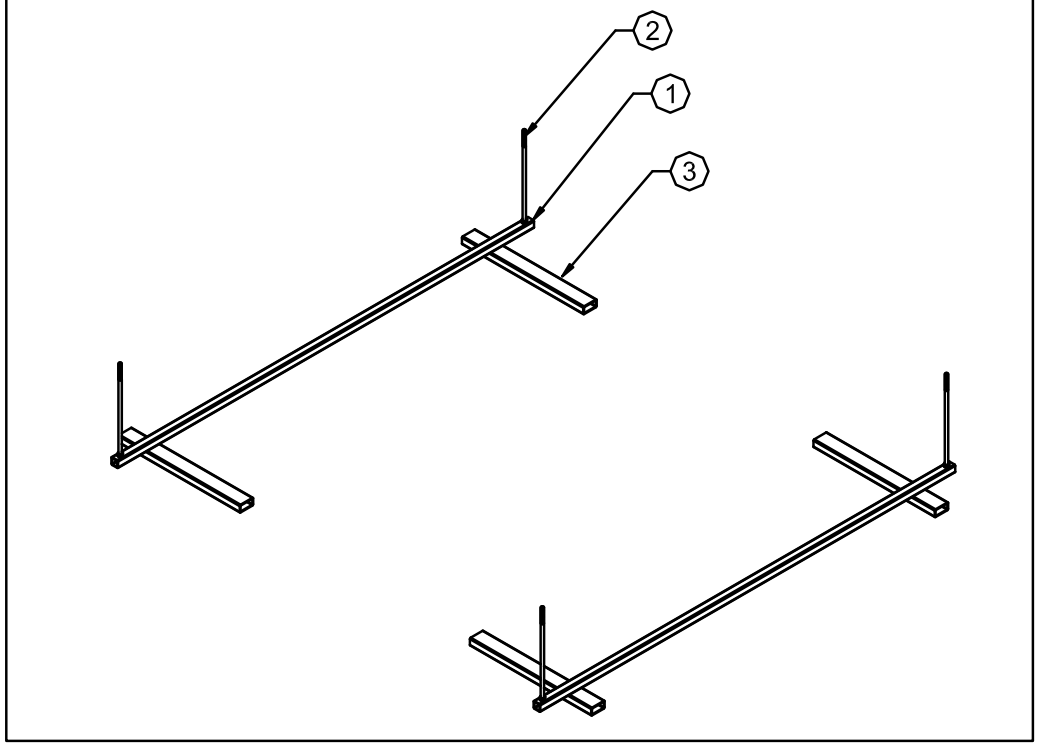
   a) Fabricate two metal alignment bars (Item 1) with ½" diameter posts (Item 2) on each end 18" tall and about 10' apart.
   b) The alignment bars may also have support legs (Item 3) to sit on the rail head.
   c) Create a series of circumferencial grooves in each post at 1" intervals to hold the string lines.
   d) Ensure that the two alignment bars are fabricated identical to within 1/32".

2. Ensure the vehicle has had a four-wheel alignment following the installation of the railgear but prior to performing the railgear alignment.

3. Lower the front and rear railgear to the rail position on a straight and level section of rail.

4. Ensure the vehicle front tires are pointing straight ahead and engage the steering lock.

FIGURE 3-5: RAILGEAR ALIGNMENT BARS



5. Set up the parallel string line system (refer to figure 3-6):

   a) Fasten the alignment bars to the head of the rail about 2' ahead of and behind the vehicle. Ensure that the alignment bars are perpendicular to the rail and can be slid side to side for adjustment.
   b) Run a string line from the front alignment bar post to the rear alignment bar post on each side of the vehicle using the appropriate grooves cut in the posts.
   c) Ensure that dimensions Y and Z are equal to within 1/32", and dimensions W and X are equal to within 1/32".
   d) Proceed to adjust the side to side location of the alignment bars until the distances between the vehicle's front wheels and each string line are equal to within 1/16" (dimensions A, B, C, and D) and the distances between the vehicle's rear wheels and each string line are equal to within 1/16" (dimensions E, F, G, and H). Note that dimensions A, B, C, and D may not equal dimensions E, F, G, and H. Measuring from the tire wall will not yield accurate measurements.

FIG 3-6: RAILGEAR ALIGNMENT MEASUREMENTS

ALIGNMENT MEASUREMENTS

Truck Model _____ Truck Number _____

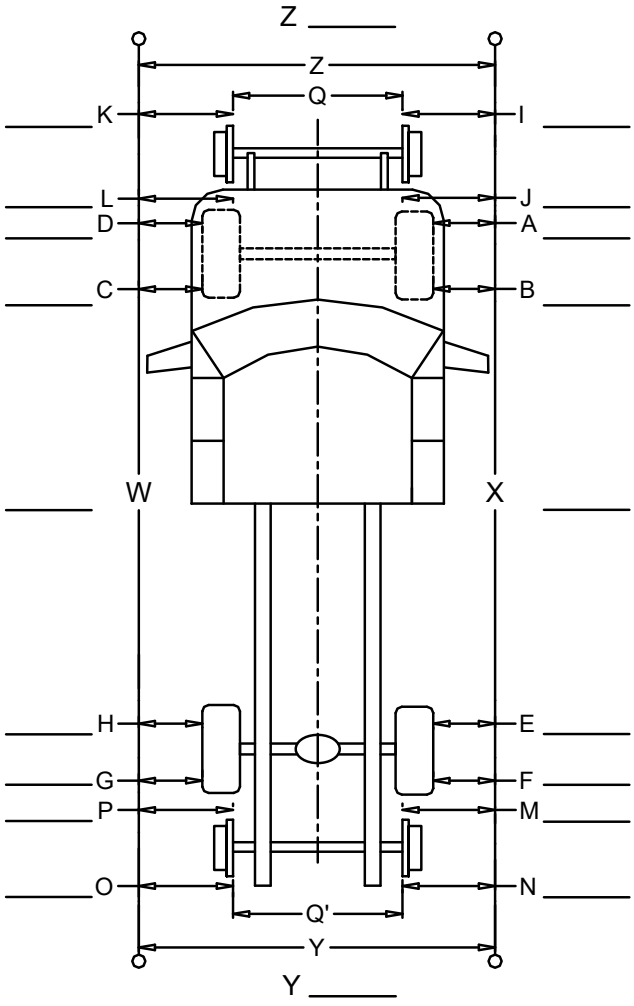
Rail Gear S/N _____

A,B,C,D Must be Equal within 1/16".
E,F,G,H Must be Equal within 1/16".
(A,B,C,D May not be Equal to E,F,G,H).

I and J Must be Equal within 1/16"
K and L Must be Equal within 1/16"
M and N Must be Equal within 1/16"
O and P Must be Equal within 1/16"

K and I Must be Equal within 1/8"
L and J Must be Equal within 1/8"
P and M Must be Equal within 1/8"
O and N Must be Equal within 1/8"

W and X Must be Equal within 1/32"
Y and Z Must be Equal within 1/32"



Rail wheel Load (lbs)

Left Front _____
Right Front _____
Right Rear _____
Left Rear _____

Rail wheels Flange To Flange 53 7/16" to 53 9/16"

		Q			Q'
Front	Front	_____	Rear	Front	_____
	Rear	_____		Rear	_____

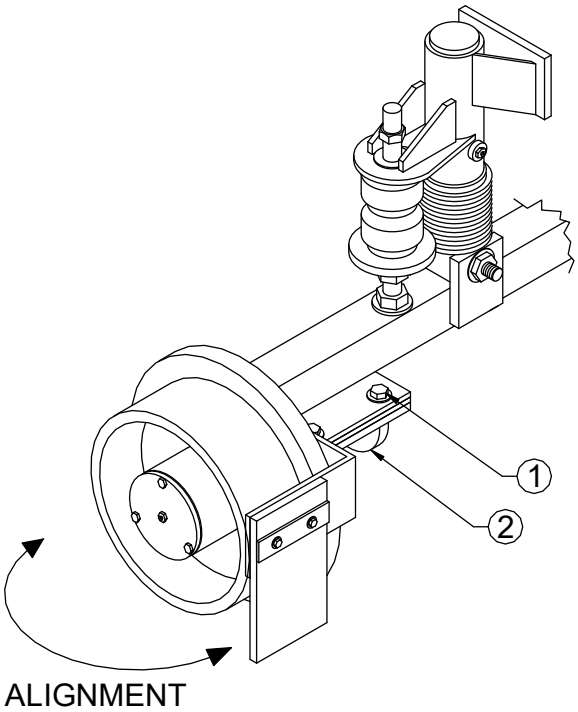
Rail wheel Flange To Gound

Front	_____
Rear	_____

6. Rail wheel alignment (refer to figure 3-6 and 3-7):

   a) Secure an 18” long straightedge to the backside of each rail wheel flange.
   b) Measure the distance between the front-most and rear-most points of each straightedge and the parallel lines (dimensions I, J, K, and L in the front and M, N, O, and P in the rear). Also measure the distance between front-most and rear-most points of the straighedges (dimensions Q and Q’).
   c) Dimensions I and J should be equal to within 1/16”. Dimensions K and L should be equal to within 1/16”. Dimensions M and N should be equal to within 1/16”. Dimensions O and P should be equal to within 1/16”. Dimensions Q and Q’ should be between 53-7/16” and 53-9/16”. If this is not the case, adjust the rail wheel alignment as follows.
   d) Loosen the four bolts and nuts (Item 1) securing each rail wheel spindle housing (Item 2) to the railgear axles (Item 3) such that the wheels are free to rotate on the horizontal plane yet snug enough to stay in place.
   e) Adjust each wheel to the centered position (I and J equal, K and L equal, M and N equal, and O and P equal). Note that dimensions I and J may not equal K and L and dimensions M and N may not equal O and P at this point. Also ensure that dimensions Q and Q’ are between 53-7/16” and 53-9/16”.
   f) Re-torque the rail wheel fasteners to specifications.
   g) Recheck alignment measurements, and re-adjust if necessary.
   h) Leave the straightedges in place, and proceed with the lateral alignment.

FIGURE 3-7: RAIL WHEEL ALIGNMENT



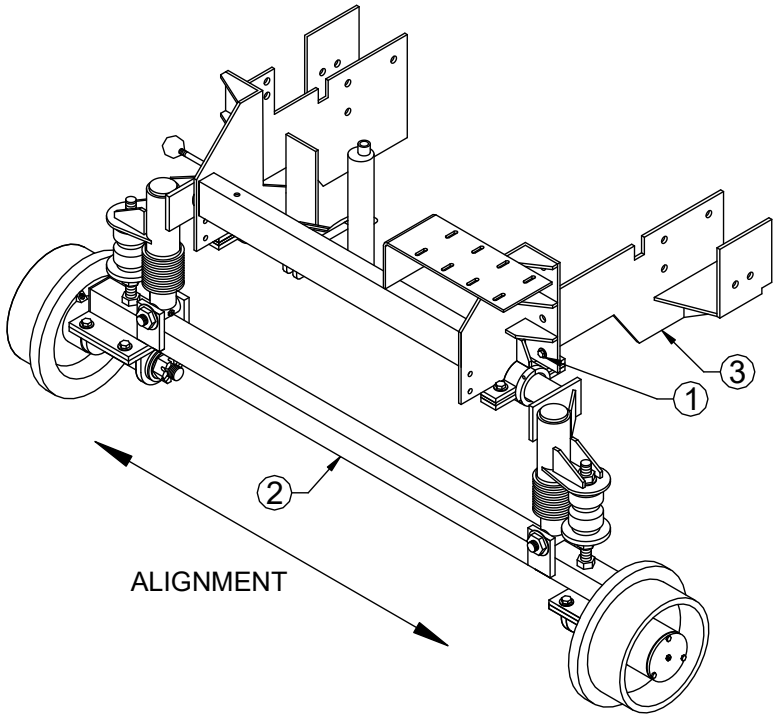
WARNING:

- **When adjusting the lateral alignment of the front and rear railgear, do not use any force against the suspension guide tube assemblies. This may cause damage which would restrict the suspension movement of the railgear.**

7. Front railgear lateral alignment (refer to figure 3-6 and 3-8):

a) With a straightedge secured to the backside of each front rail wheel flange, measure the distance from the front-most and rear-most points of the two straightedges to the parallel lines (dimensions I, J, K, and L).
b) Dimensions I and K should be equal to within 1/8". Dimensions J and L should be equal to within 1/8". If this is not the case, adjust the front railgear lateral alignment as follows.
c) Raise the railgear off rail and loosen the four bolts (Item 1) that secure the railgear (Item 2) to the front mounting plates (Item 3).
d) Adjust the railgear laterally until centered (I and K equal, and J and L equal).
e) Re-torque the four mounting bolts to specifications.
f) Lower the railgear to rail position and re-check the dimensions. Re-adjust if necessary.

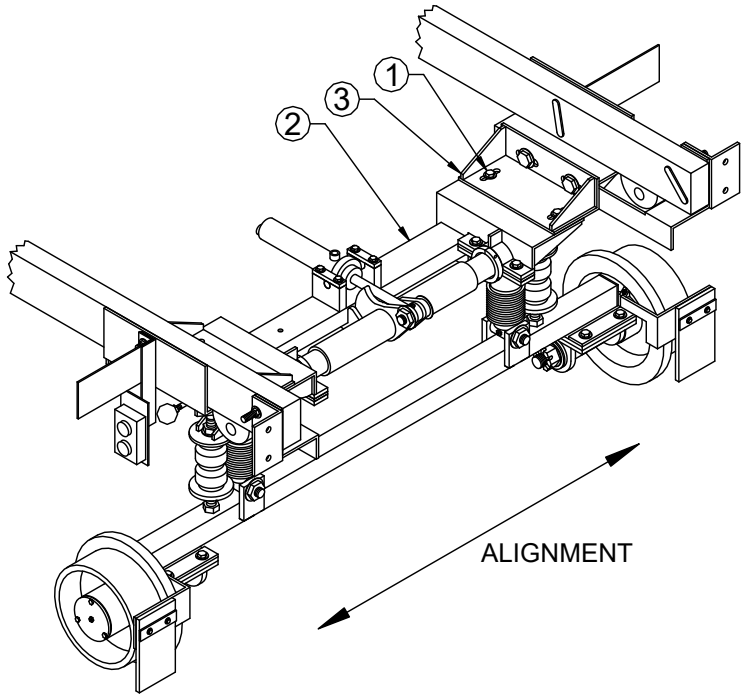
FIGURE 3-8: FRONT RAILGEAR LATERAL ADJUSTMENT



8. Rear railgear lateral alignment (refer to figure 3-6 and 3-9):

   a) With a straightedge secured to the back side of each rear rail wheel flange, measure the distance from the front-most and rear-most points of the two straightedges to the parallel lines (dimensions M,N,O and P).
   b) Dimensions M and P should be equal to within 1/8". Dimensions N and O should be equal to within 1/8". If this is not the case, adjust the rear railgear lateral alignment as follows.
   c) Raise the railgear off rail and loosen the four bolts (Item 1) that secure the railgear (Item 2) to the rear mounting plates (Item 3).
   d) Adjust the railgear laterally until centered (M and P equal, and N and O equal).
   e) Re-torque the four mounting bolts to specifications.
   f) Lower the railgear to the rail position and re-check the dimensions. Re-adjust if necessary.

FIGURE 3-9: REAR RAILGEAR LATERAL ADJUSTMENT



9. Remove the straightedges form the rail wheels, remove the parallel string lines, and remove the vehicle from rail.

4.0 ROUTINE RAILGEAR SERVICE

The railgear must be serviced to ensure proper operation and avoid damage to the equipment. Refer to table 3-4 for the Recommended Service Schedule.

Grease fittings are provided at all lubrication points on the Rafna railgear (refer to figures 3-10 and 3-11). The recommended lubricant for this equipment is **ESSO LONAX EP2 GREASE** or equivalent (operating range –30°C to 135°C) for all lubrication points. In cold weather areas and/or winter seasons, use low temperature grease such as **SHELL DARINA XL 102** or equivalent.

Should any loose nuts and bolts be encountered on the railgear during the inspections or during maintenance of the railgear units, first refer to figures 3-12 & 3-13 for non-standard bolt torques and then to table 3-5 for standard bolt torques.

WARNING:

- **If the vehicle should derail, a thorough inspection of the complete railgear assemblies for damaged parts should be carried out before being put back into service.**

Table 3-4: Recommended Service Schedule

	Service Required	Initial 8hr of use	Daily	Weekly	Monthly	Every 3 Months	Every 6 Months
1	Visually inspect the railgear prior to use for damaged or worn parts.		✓	✓	✓	✓	✓
2	Check for loose rail wheels and fasteners.		✓	✓	✓	✓	✓
3	Ensure the rail gear locking mechanism is functioning properly.		✓	✓	✓	✓	✓
4	Check and adjust vehicle tire pressure as per the manufacturer's specifications.		✓	✓	✓	✓	✓
5	Ensure the vehicle is in good operating condition based on the vehicle operating and maintenance instructions.		✓	✓	✓	✓	✓
6	Check and adjust rail wheel bearing endplay (0.001" to 0.005" max.).	✓				✓	✓
7	Inspect railgear wheel flanges for wear. Use the Rafna Wheel Flange Indicator for measurement.			✓	✓	✓	✓
8	Inspect all hydraulic fittings and hoses for leaks or wear.			✓	✓	✓	✓
9	Inspect rail sweeps for close proximity to rail head. (1/8" max.)			✓	✓	✓	✓
10	Grease hydraulic cylinder pivot points.				✓	✓	✓
11	Grease inner tube lower pivot points.				✓	✓	✓
12	Grease guide tubes.				✓	✓	✓
13	Grease locking mechanism.				✓	✓	✓
14	Check fluid level in hydraulic reservoir. Top off with appropriate filtered fluid.				✓	✓	✓
15	Grease rail wheel bearings (3 months or 3,000 rail kms (1,900 rail miles), whichever is less).	✓				✓	✓
16	Inspect and repack rail wheel bearings.						✓

FIGURE 3-10: FRONT RAILGEAR LUBRICATION POINTS

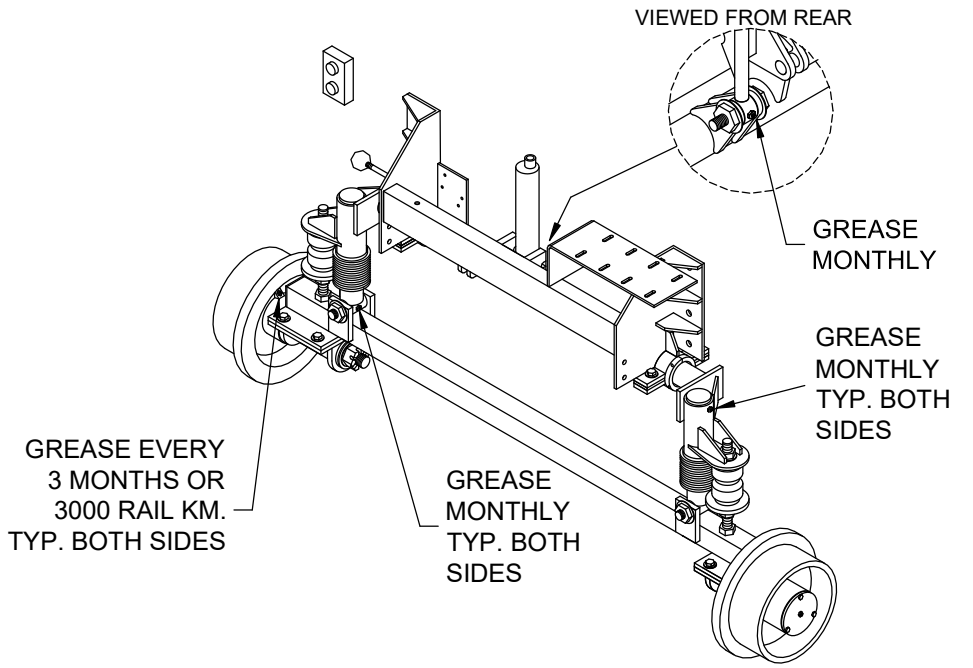


FIGURE 3-11: REAR RAILGEAR LUBRICATION POINTS

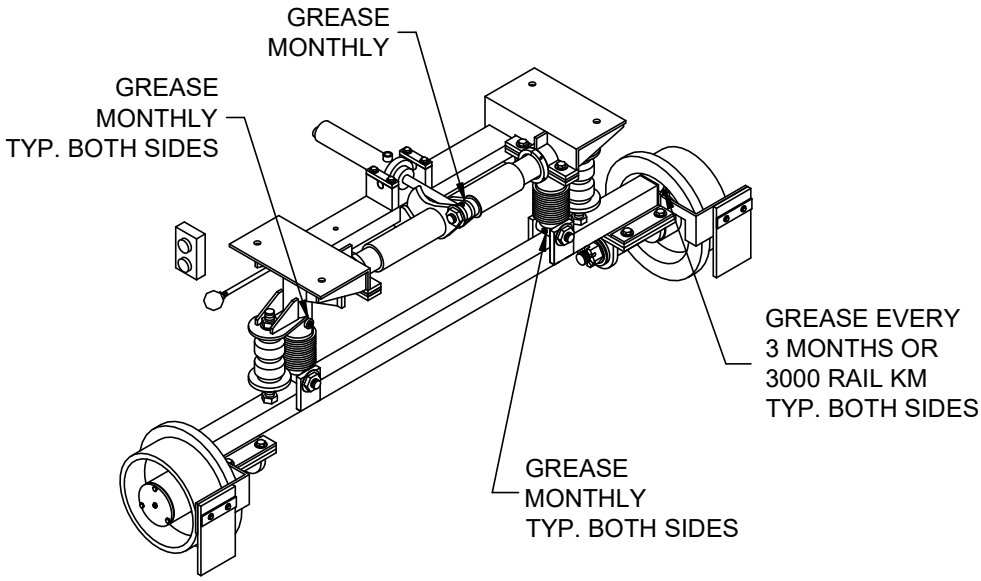


FIGURE 3-12: FRONT RAILGEAR NON-STANDARD BOLT TORQUES

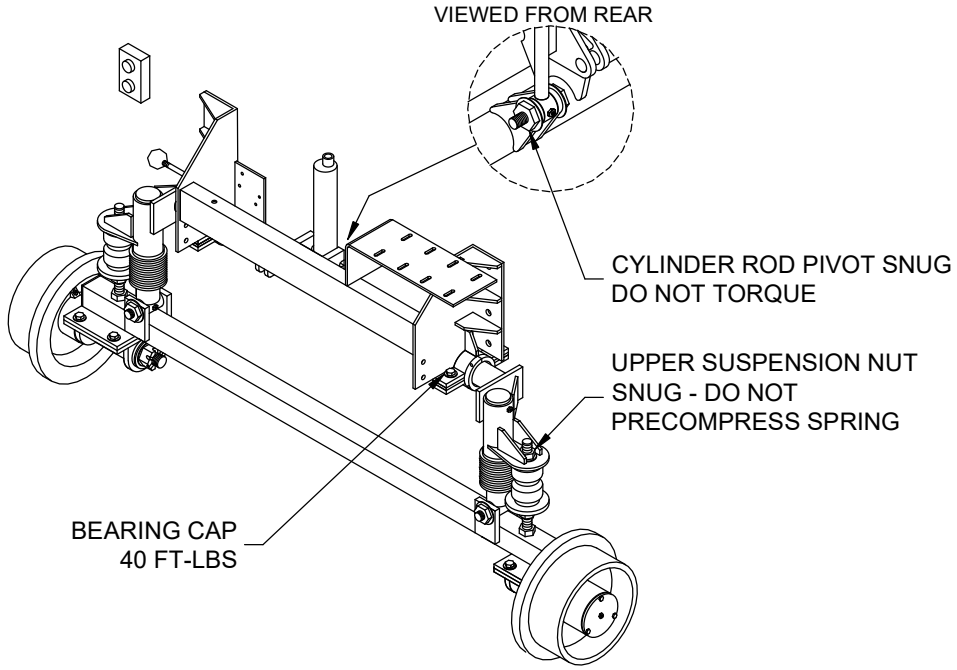


FIGURE 3-13: REAR RAILGEAR NON-STANDARD BOLT TORQUES

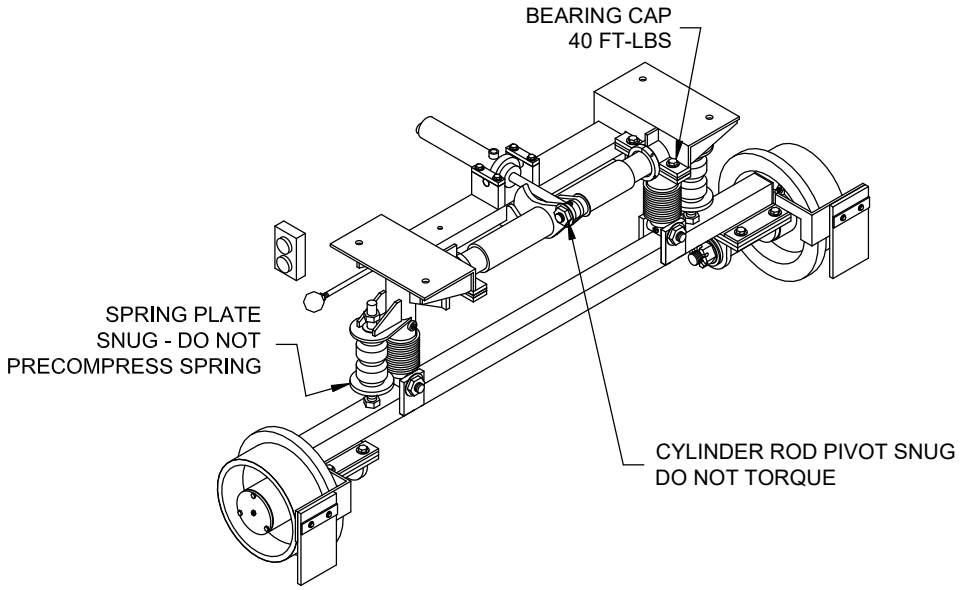


Table 3-5: Standard Bolt Torque Values

Bolt Detail	Bolt Torque Value (ft-lbs)
¾" UNC Gr. 8 Fasteners	175
5/8" UNC Gr. 8 Fasteners	150
½" UNC Gr. 8 Fasteners	100
3/8" UNC Gr. 8 Fasteners	40
¼" UNC Gr. 8 Fasteners	12

5.0 HYDRAULIC SYSTEM RELIEF VALVE SETTING

This system is equipped with one relief valve located on the railgear pump. The relief valve will require adjustment at installation and if ever there appears to be inadequate hydraulic pressure to operate the railgear. Refer to figure 3-14 throughout the following adjustment procedure.

1. Locate the hydraulic hose (Item 1) that supplies the blind end (the end opposite the rod end) of the front railgear hydraulic cylinder from the pump pressure port and disconnect it from the pump.

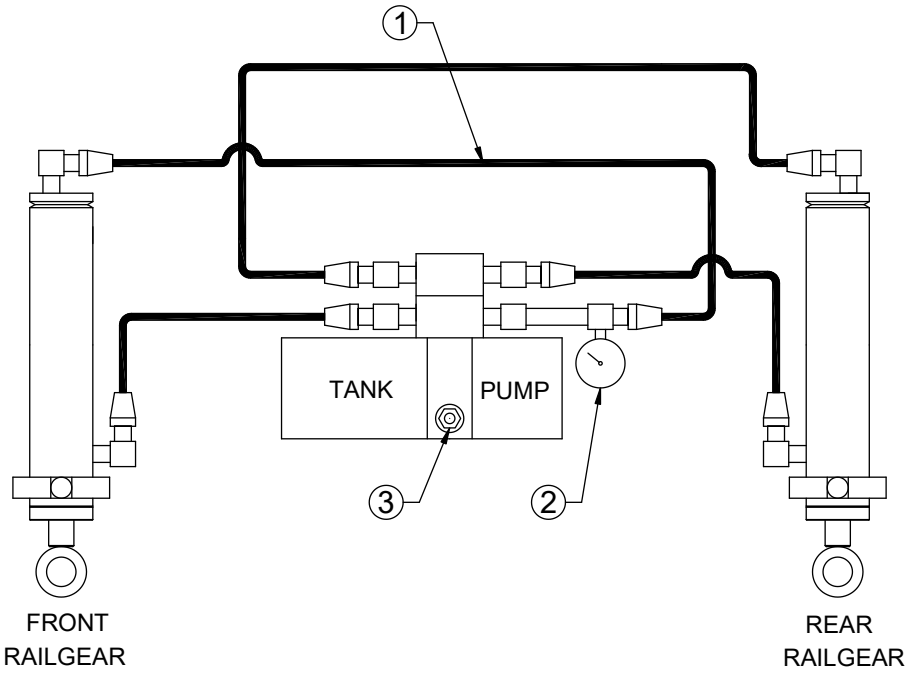
2. Install a hydraulic pressure gauge (up to 3000 PSI) (Item 2) between the disconnected hydraulic hose and the pump pressure port. The pressure gauge will indicate the relief valve (Item 3) setting when the pump is loaded.

3. Raise the front railgear completely. Push the "Up" button on the front control box so that the hydraulic cylinder creates a load on the pump by trying to "dead-head". The pump should start and the pressure reading on the pressure gauge should climb to 1800 PSI.

4. If the pressure is not correct, release the front control and adjust the relief valve on the pump accordingly. Loosen the lock nut and turn the allen head screw in to increase the pressure or out to decrease the pressure.

5. Once the correct pressure on the pump relief valve is obtained, ensure the lock nut on the relief valve is tightened. Release the pressure in the system and remove the pressure gauge. Re-connect all hydraulic hoses.

FIGURE 3-14: HYDRAULIC SYSTEM RELIEF VALVE SETTING



6.0 ELECTRICAL SYSTEM TROUBLESHOOTING

The following basic tests can be performed to check the integrity of the railgear electrical system. Refer to the electrical schematic in figure 3-15.

Should the railgear pump fail to operate, first check the fuse or the circuit breaker and all wiring for shorts. Then the following tests can be performed.

1. Pump motor solenoid shift test and voltage test (use a Volt-Meter in Volts-DC mode):

    a) Disconnect the wire from the solenoid load terminal to the railgear pump motor.
    b) Ensure the solenoid power terminal is connected to the positive terminal of the battery and the solenoid base is properly grounded. There should be 12 VDC between the solenoid power terminal and the solenoid base and 0 VDC between the solenoid load terminal and the solenoid base.
    c) Connect one end of a 14 gauge shunt wire to the solenoid switching terminal and touch the other end to the solenoid power terminal. The solenoid should shift in the housing producing a distinctive “click”.
    d) With the shunt wire connected as above, the voltage between the solenoid load terminal and the solenoid base should be 12 VDC.
    e) If the solenoid does not “click” and/or the voltage measured above is not correct then the solenoid is inoperative and must be replaced.
    f) If the solenoid does ‘click’, and there is 12 VDC on the load terminal, then there may be a fault in the wiring to the front and/or rear controls or with the control switches themselves.

2. Pump motor solenoid resistance test (use Ohm-Meter):

    a) Disconnect all wiring to the solenoid.
    b) Connect an Ohm-Meter to the solenoid switching terminal and to the solenoid base. The resistance should be about 20 Ohms.
    c) Connect an Ohm-Meter to the solenoid load terminal and to the solenoid switching terminal. The resistance should be infinite (open). Zero resistance with this connection will indicate a shorted solenoid.
    d) Connect an Ohm-Meter to the solenoid power terminal and to the solenoid switching terminal. The resistance should be infinite (open). Zero resistance with this connection will indicate a shorted solenoid.
    e) If the solenoid resistances are not within specifications, the solenoid must be replaced.

3. Pump motor test:

    a) Disconnect the wire from the pump motor power terminal.
    b) Ensure the pump base is properly grounded.
    c) Connect one end of a 4 gauge shunt wire to the pump motor power terminal and touch the other end to the battery positive terminal.

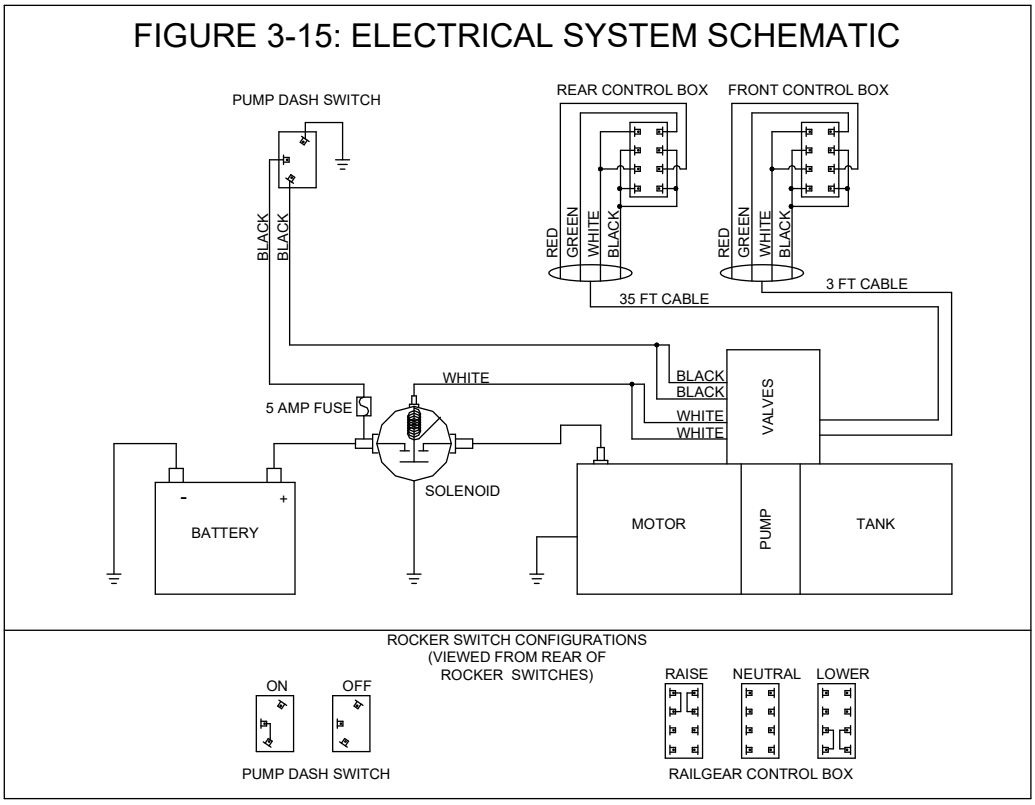
d) The pump motor should run upon touching the shunt wire.
e) If the pump does not run, the pump motor is defective.

Should the pump motor start running immediately following turning on the respective dash switch, all wiring should be checked for shorts and the following should be performed.

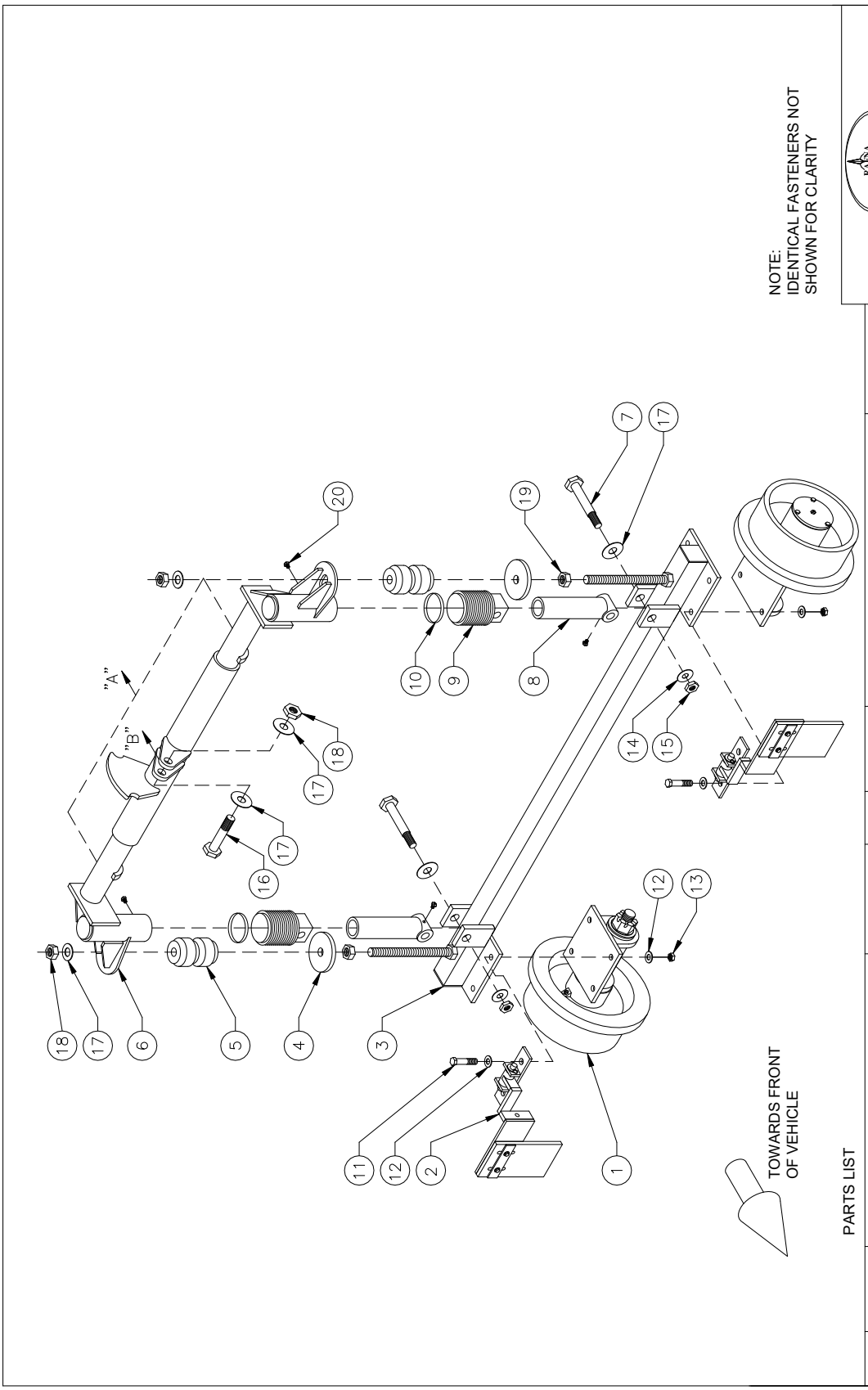
1. Check the front and rear control switches for sticking or shorting out.

2. Disconnect the wire from the solenoid switching terminal. If the pump continues to run, then the solenoid is defective.

FIGURE 3-15: ELECTRICAL SYSTEM SCHEMATIC



SECTION 4: PARTS



PARTS LIST

ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY
1	R-1653	8" WHEEL ASSEMBLY	2
2	R-1672L/R	FRONT RAIL SWEEP	2
3	R-1717	FRONT AXLE ASSEMBLY	1
4	R-3562	SPRING PLATE	2
5	R-130	RUBBER SPRING - DAKOTA ONLY	2
	R-1544	RUBBER SPRING - DURANGO ONLY	
6	R-1663	FRONT CROSS FRAME ASSEMBLY	1
7	R-1798	3/4" X 3.6" SHOULDER BOLT	2
8	R-2609	INNER TUBE	2
9	R-1505	BELLOWS	2
10	R-601	BELLOWS CLAMP	2

ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY
11	-	1/2" UNC GR. 8 BOLT X 2" LONG	8
12	-	1/2" GR. 8 WASHER	16
13	-	1/2" UNC GR. 8 NYLON INSERT LOCK NUT	8
14	-	5/8" GR. 8 WASHER	2
15	-	5/8" UNC GR. 8 NYLON INSERT LOCK NUT	2
16	-	3/4" UNC GR. 8 BOLT x 3.5 LONG	1
17	-	3/4" GR. 8 WASHER	6
18	-	3/4" UNC GR.3 NYLON INSERT LOCK NUT	3
19	-	3/4" UNC JAM NUT	2
20	-	1/8" NPT GREASE FITTING	4

RAILGEAR

RAFNA INDUSTRIES LIMITED
A Global Railway Industries Company
19300 Clark Graham, Baie D'Urfe, Quebec Canada H9X-3R8

TITRE/TITLE: ROTATING FRONT RAILGEAR
LOWER ASSEMBLY
R-150

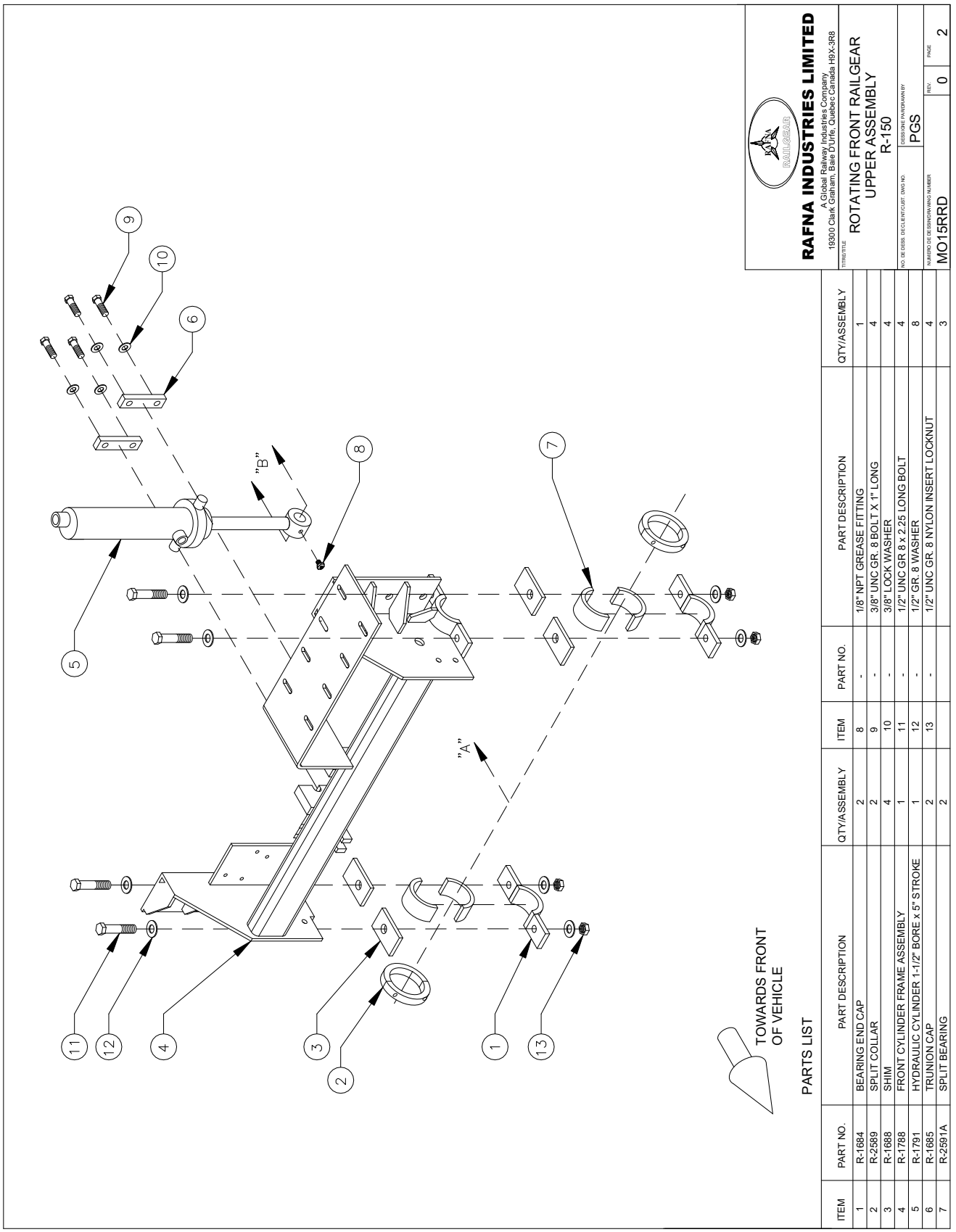
NO. DE DESS. DE CLIENT/CUST. DWG NO.:

DESSINÉ PAR/DRAWN BY: PGS

NUMÉRO DE DESSIN/DRAWING NUMBER: MO15RRD

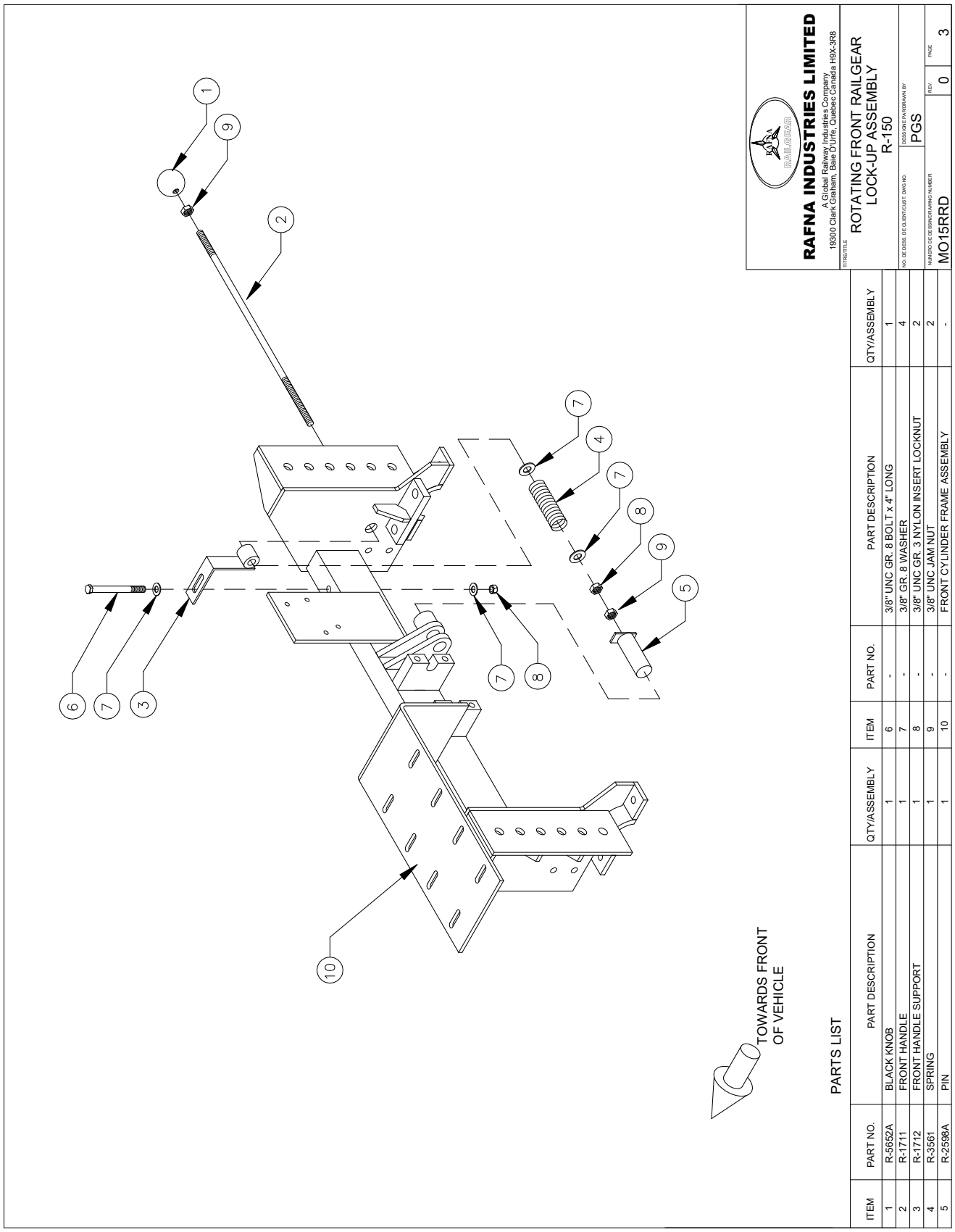
REV: 0

PAGE: 1

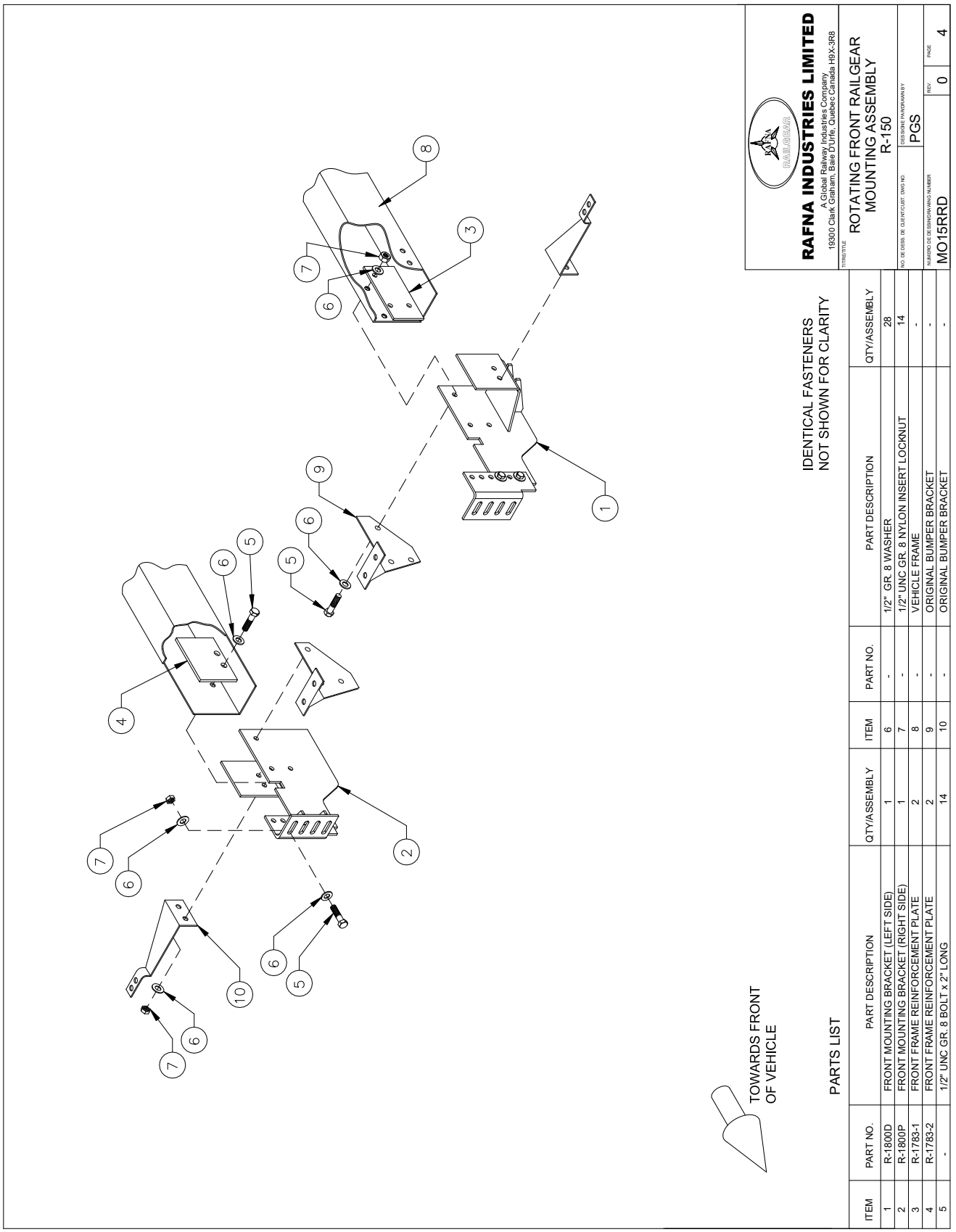


PARTS LIST

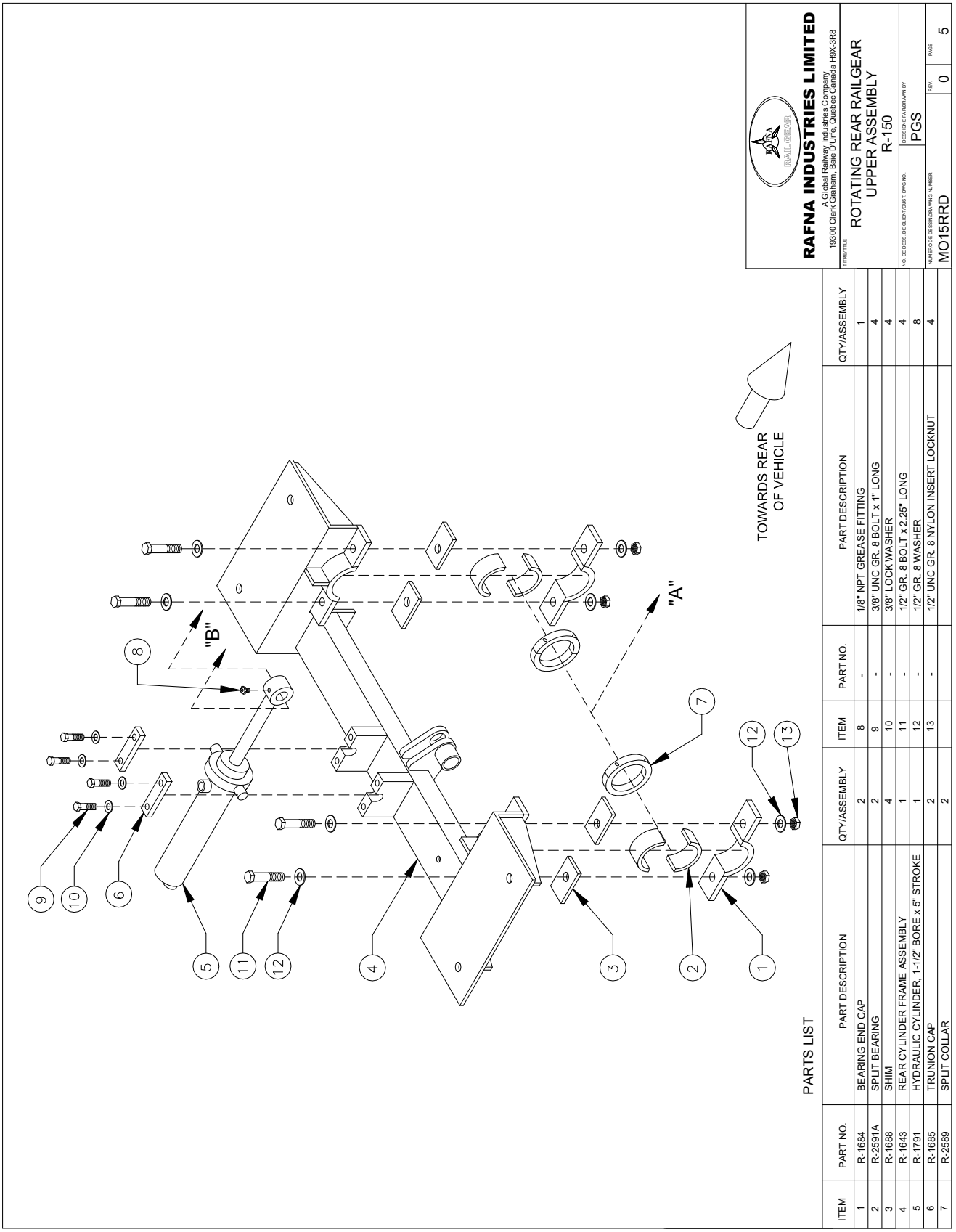
ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY	ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY
1	R-1684	BEARING END CAP	2	8	-	1/8" NPT GREASE FITTING	1
2	R-2589	SPLIT COLLAR	2	9	-	3/8" UNC GR. 8 BOLT X 1" LONG	4
3	R-1688	SHIM	4	10	-	3/8" LOCK WASHER	4
4	R-1788	FRONT CYLINDER FRAME ASSEMBLY	1	11	-	1/2" UNC GR 8 x 2.25 LONG BOLT	4
5	R-1791	HYDRAULIC CYLINDER 1-1/2" BORE x 5" STROKE	1	12	-	1/2" GR. 8 WASHER	8
6	R-1685	TRUNION CAP	2	13	-	1/2" UNC GR. 8 NYLON INSERT LOCKNUT	4
7	R-2591A	SPLIT BEARING	2				3



ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY
1	R-5652A	BLACK KNOB	1
2	R-1711	FRONT HANDLE	1
3	R-1712	FRONT HANDLE SUPPORT	1
4	R-3561	SPRING	1
5	R-2598A	PIN	1
6	-	3/8" UNC GR. 8 BOLT x 4" LONG	1
7	-	3/8" GR. 8 WASHER	4
8	-	3/8" UNC GR. 3 NYLON INSERT LOCKNUT	2
9	-	3/8" UNC JAM NUT	2
10	-	FRONT CYLINDER FRAME ASSEMBLY	-



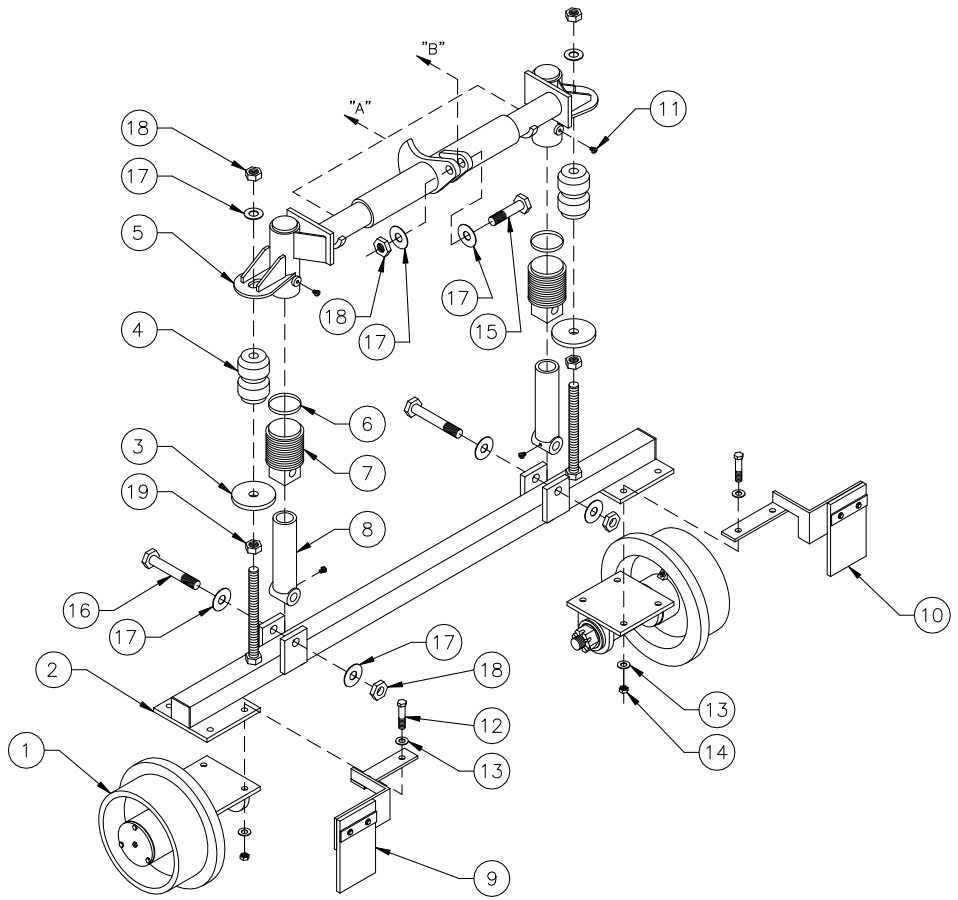
ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY
1	R-1800D	FRONT MOUNTING BRACKET (LEFT SIDE)	1
2	R-1800P	FRONT MOUNTING BRACKET (RIGHT SIDE)	1
3	R-1783-1	FRONT FRAME REINFORCEMENT PLATE	2
4	R-1783-2	FRONT FRAME REINFORCEMENT PLATE	2
5	-	1/2" UNC GR. 8 BOLT x 2" LONG	14
6	-	1/2" GR. 8 WASHER	28
7	-	1/2" UNC GR. 8 NYLON INSERT LOCKNUT	14
8	-	VEHICLE FRAME	-
9	-	ORIGINAL BUMPER BRACKET	-
10	-	ORIGINAL BUMPER BRACKET	-



ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY	ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY
1	R-1684	BEARING END CAP	2	8	-	1/8" NPT GREASE FITTING	1
2	R-2591A	SPLIT BEARING	2	9	-	3/8" UNC GR. 8 BOLT x 1" LONG	4
3	R-1688	SHIM	4	10	-	3/8" LOCK WASHER	4
4	R-1643	REAR CYLINDER FRAME ASSEMBLY	1	11	-	1/2" GR. 8 BOLT x 2.25" LONG	4
5	R-1791	HYDRAULIC CYLINDER, 1-1/2" BORE x 5" STROKE	1	12	-	1/2" GR. 8 WASHER	8
6	R-1685	TRUNION CAP	2	13	-	1/2" UNC GR. 8 NYLON INSERT LOCKNUT	4
7	R-2589	SPLIT COLLAR	2				

G&B Specialties Inc. 535 West 3rd Street, Berwick, PA, USA Tel: 1-570-752-5901 Fax: (570) 752-639

Wabtec Components LLC.
G&B Specialties, Inc.



NOTE:
IDENTICAL FASTENERS NOT SHOWN FOR CLARITY

TOWARDS REAR OF VEHICLE

PARTS LIST

ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY	ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY
1	R-1653	8" WHEEL ASSEMBLY	2	12	-	1/2" UNC GR. 8 BOLT x 2" LONG	8
2	R-1640	REAR AXLE ASSEMBLY	1	13	-	1/2" GR. 8 WASHER	16
3	R-3562	SPRING PLATE	2	14	-	1/2" UNC GR. 8 NYLON INSERT LOCKNUT	8
4	R-130	RUBBER SPRING	2	15	-	3/4" UNC GR. 8 BOLT x 4.0" LONG	1
5	R-1634	REAR CROSS FRAME ASSEMBLY	1	16	-	3/4" UNC GR. 8 BOLT x 4.75" LONG	2
6	R-601	BELLOWS CLAMP	2	17	-	3/4" GR.8 WASHER	8
7	R-1505	BELLOWS	2	18	-	3/4" UNC GR. 3 NYLON INSERT LOCKNUT	5
8	R-2609	INNER TUBE	2	19	-	3/4" UNC JAM NUT	2
9	R-1677L	RAIL SWEEP, LEFT SIDE	1				
10	R-1677R	RAIL SWEEP, RIGHT SIDE	1				
11	-	1/8" NPT GREASE FITTING	4				

RAFNA RAILGEAR

RAFNA INDUSTRIES LIMITED
A Global Railway Industries Company
19300 Clark Graham, Baie D'Urfe, Quebec Canada H9X-3R8

TITRE/TITLE
ROTATING REAR RAILGEAR
LOWER ASSEMBLY
R-150

NO. DE DESS. DE CLIENT/CUST. DWG NO.

DESSIGNE PAR/DRAWN BY
PGS

NUMERO DE DESSIN/DRAWING NUMBER
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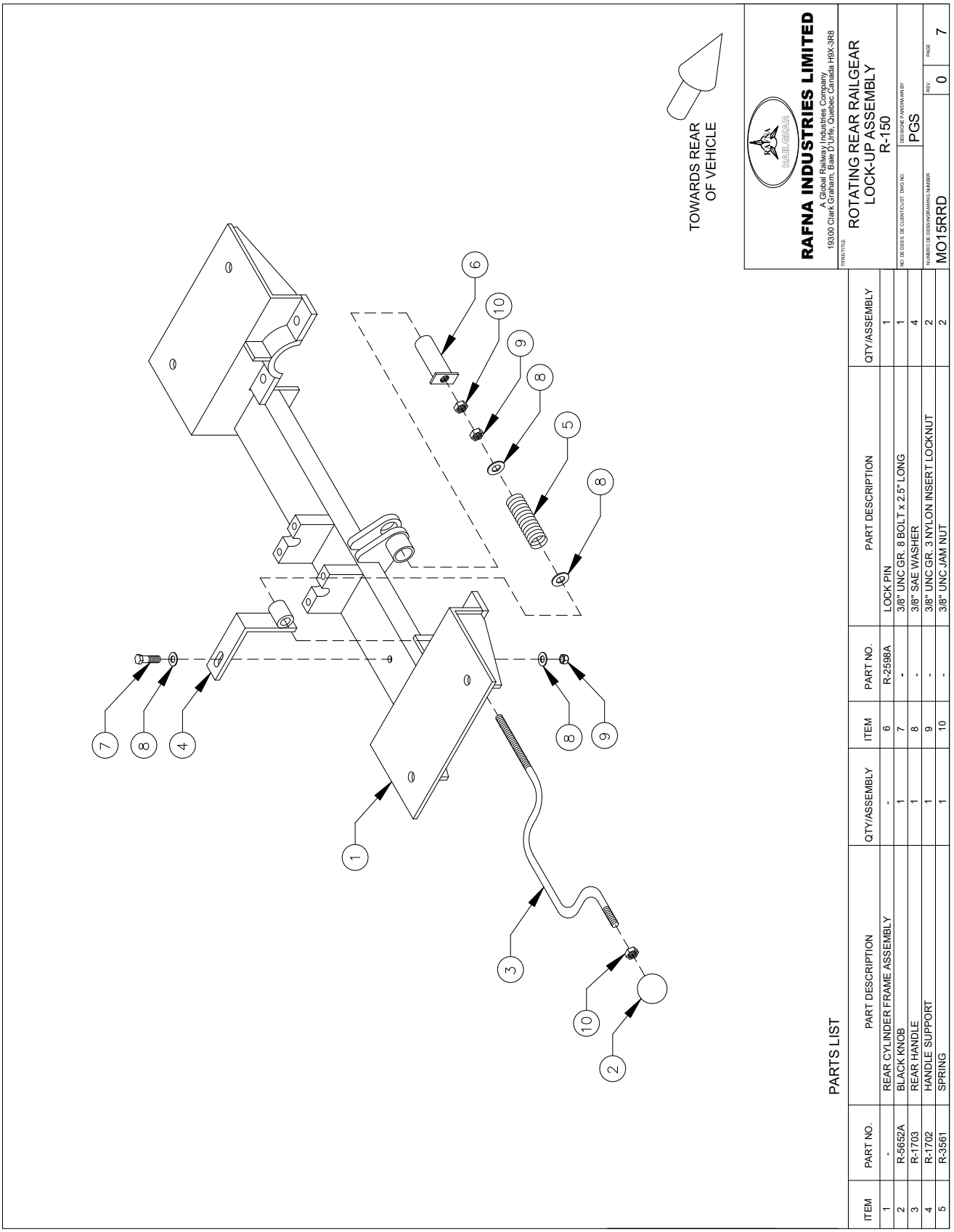
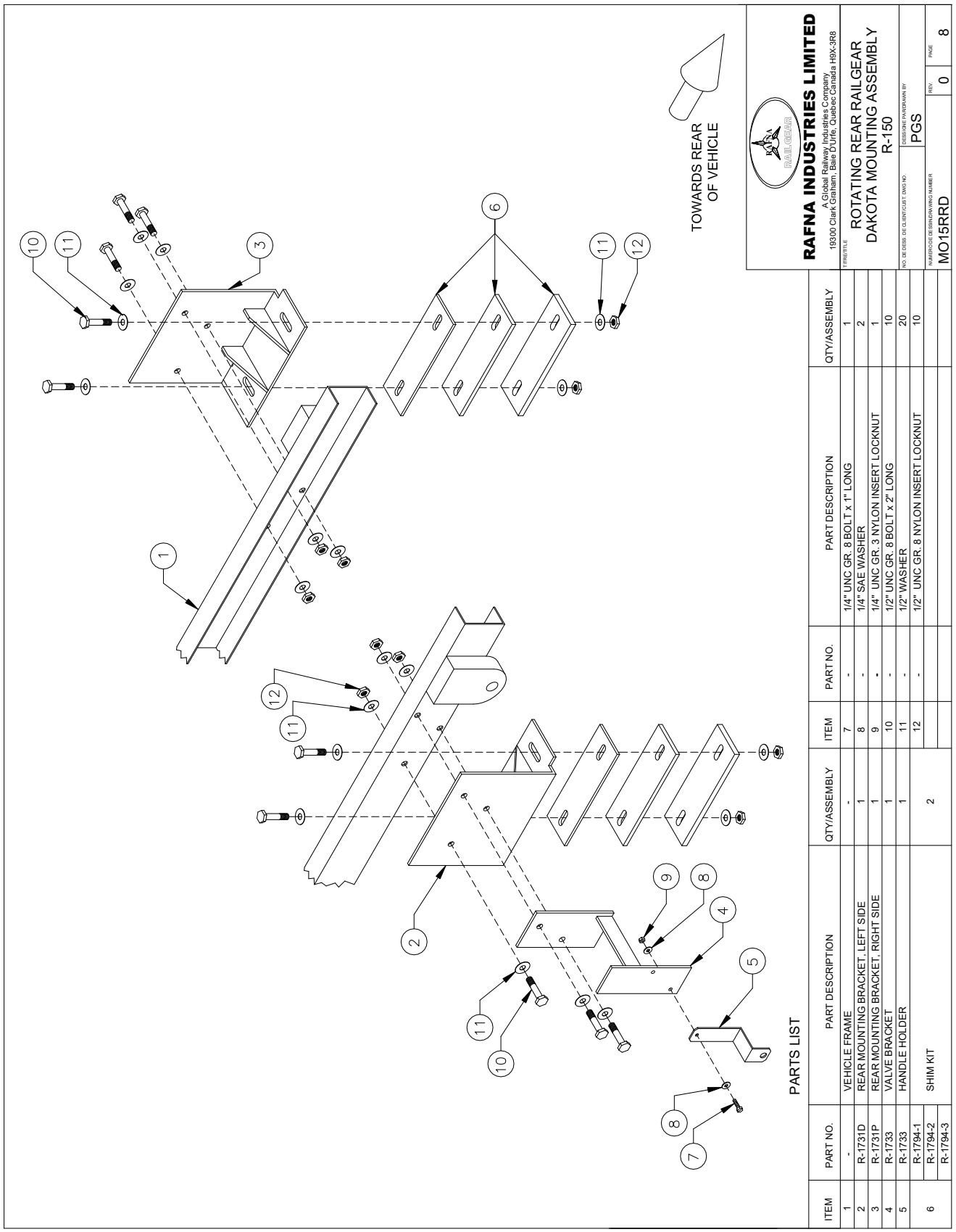


PARTS LIST

ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY	ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY
1	-	REAR CYLINDER FRAME ASSEMBLY	-	6	R-2598A	LOCK PIN	1
2	R-5652A	BLACK KNOB	1	7	-	3/8" UNC GR. 8 BOLT x 2.5" LONG	1
3	R-1703	REAR HANDLE	1	8	-	3/8" SAE WASHER	4
4	R-1702	HANDLE SUPPORT	1	9	-	3/8" UNC GR. 3 NYLON INSERT LOCKNUT	2
5	R-3561	SPRING	1	10	-	3/8" UNC JAM NUT	2



PARTS LIST

ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY
1	-	VEHICLE FRAME	-
2	R-1731D	REAR MOUNTING BRACKET, LEFT SIDE	1
3	R-1731P	REAR MOUNTING BRACKET, RIGHT SIDE	1
4	R-1733	VALVE BRACKET	1
5	R-1733	HANDLE HOLDER	1
6	R-1794-1	SHIM KIT	2
	R-1794-2		
	R-1794-3		

ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY
7	-	1/4" UNC GR. 8 BOLT x 1" LONG	1
8	-	1/4" SAE WASHER	2
9	-	1/4" UNC GR. 3 NYLON INSERT LOCKNUT	1
10	-	1/2" UNC GR. 8 BOLT x 2" LONG	10
11	-	1/2" WASHER	20
12	-	1/2" UNC GR. 8 NYLON INSERT LOCKNUT	10

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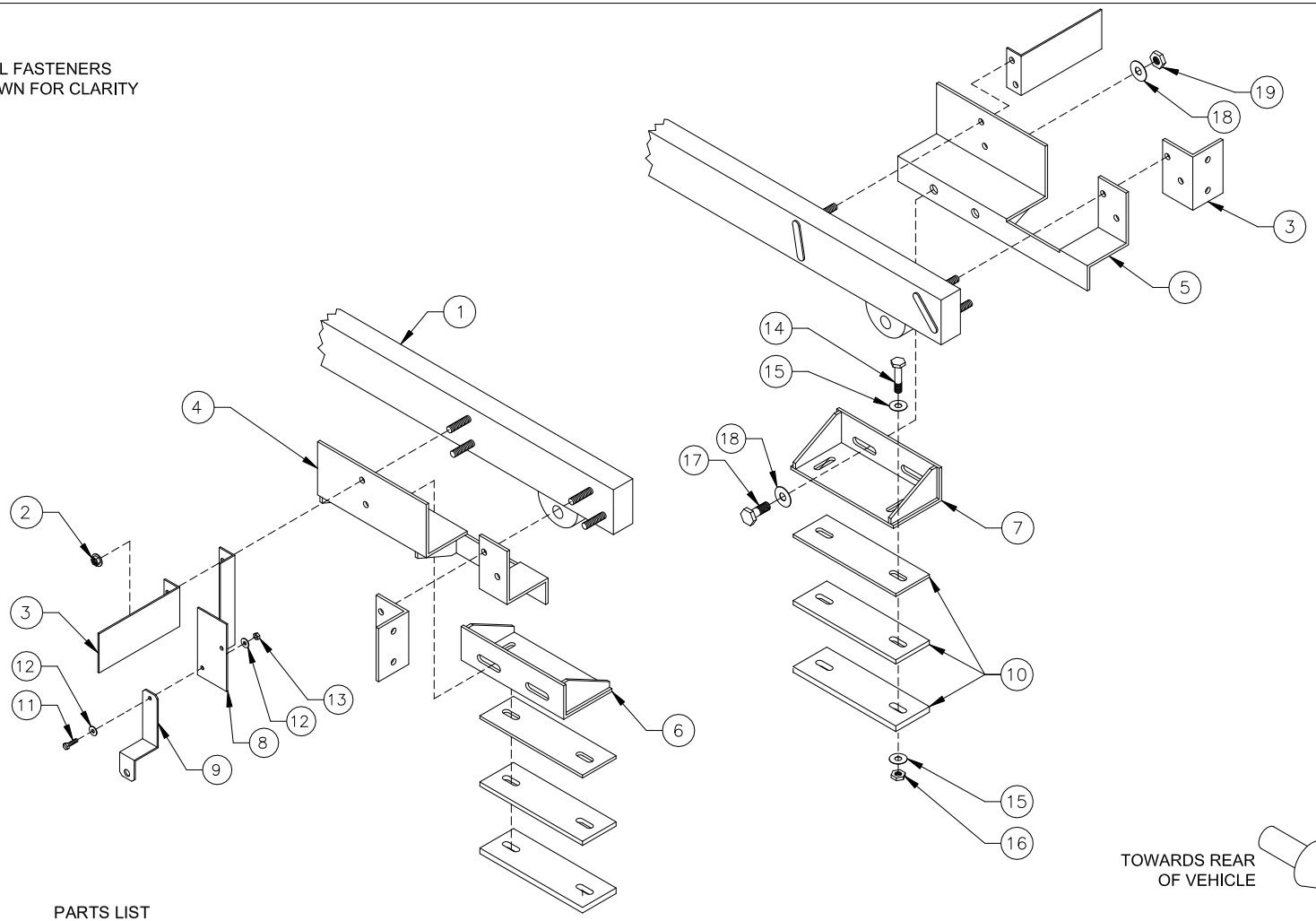
G&B Specialties, Inc.

NOTE:
IDENTICAL FASTENERS
NOT SHOWN FOR CLARITY



PARTS LIST

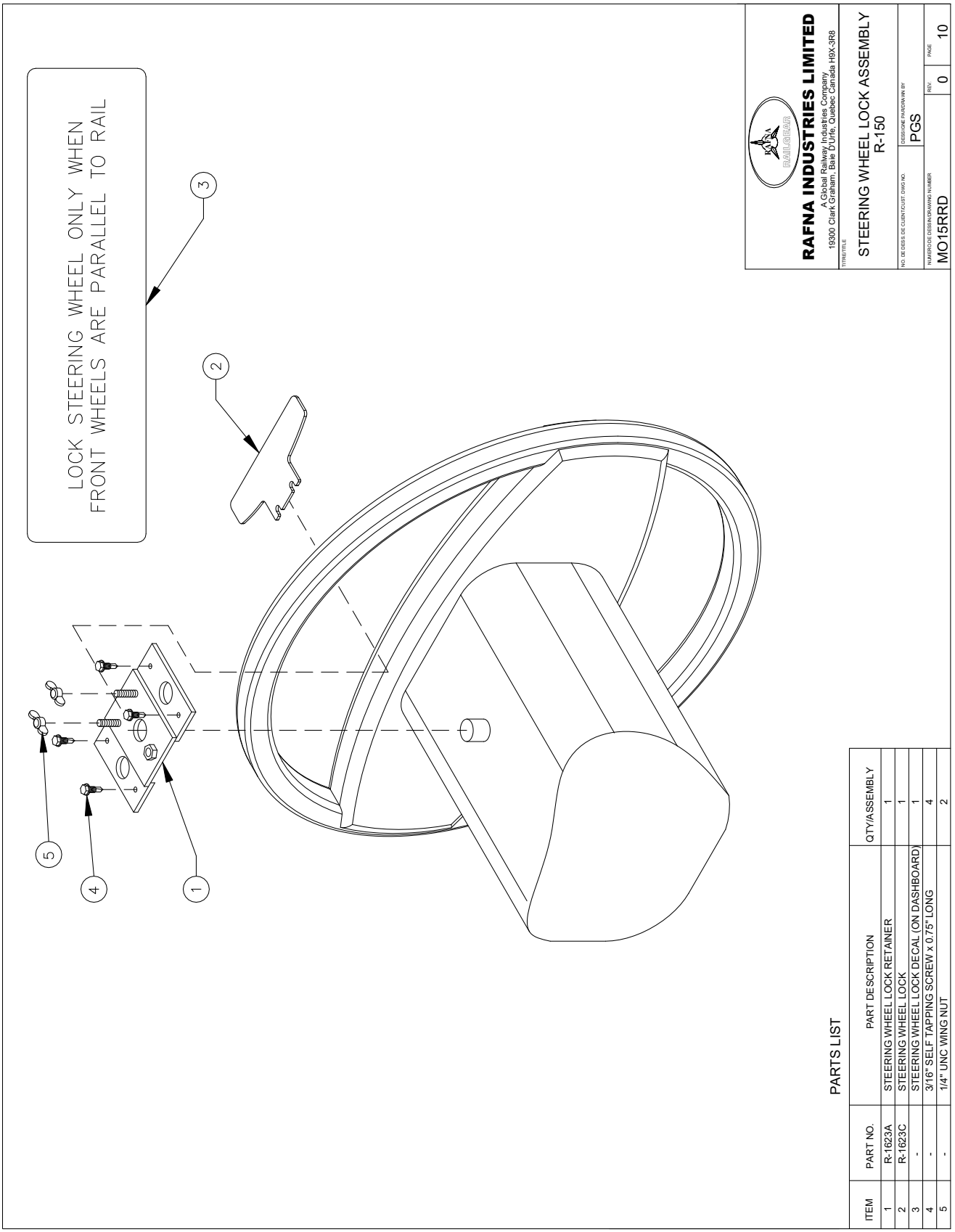
ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY		PART NO.	PART DESCRIPTION	QTY/ASSEMBLY
1	-	VEHICLE FRAME	-	11	-	1/4" UNC GR. 8 BOLT x 1" LONG	1
2	-	ORIGINAL DODGE FASTENERS	-	12	-	1/4" SAE WASHER	2
3	-	ORIGINAL DODGE BUMPER BRACKETS	-	13	-	1/4" UNC GR. 3 NYLON INSERT LOCKNUT	1
4	R-1695D	REAR MOUNTING BRACKET, LEFT SIDE	1	14	-	1/2" UNC GR. 8 BOLT x 2" LONG	4
5	R-1695P	REAR MOUNTING BRACKET, RIGHT SIDE	1	15	-	1/2" GR. 8 WASHER	8
6	R-1698D	REAR ADAPTER ANGLE, LEFT SIDE	1	16	-	1/2" UNC GR. 8 NYLON INSERT LOCKNUT	4
7	R-1698P	REAR ADAPTER ANGLE, RIGHT SIDE	1	17	-	5/8" UNC GR. 8 BOLT x 1.75" LONG	4
8	R-1733	VALVE BRACKET	1	18	-	5/8" GR. 8 WASHER	8
9	R-1725	HANDLE HOLDER	1	19	-	5/8" UNC GR. 8 NYLON INSERT LOCKNUT	4
10	R-1794-1 R-1794-2 R-1794-3	SHIM KIT	2				

RAFNA INDUSTRIES LIMITED
A Global Railway Industries Company
19300 Clark Graham, Baie D'Urfe, Quebec Canada H9X-3R8

TITRE/TITLE
ROTATING REAR RAILGEAR
DURANGO MOUNTING ASSEMBLY
R-150

NO. DE DESS. DE CLIENT/CUST. DWG NO.
DESSIGNE PAR/DRAWN BY: PGS

NUMERO DE DESSIN/DRAWING NUMBER: MO15RRD
REV: 0
PAGE: 9



RAFNA INDUSTRIES LIMITED
A Global Railway Industries Company
19300 Clark Graham, Baie D'Urfe, Quebec Canada H9X-3R8

TITRE/TITLE: STEERING WHEEL LOCK ASSEMBLY R-150

NO. DE DESS. DE CLIENT/CUST. DWG NO.:

DESSIGNE PAR/DRAWN BY: PGS

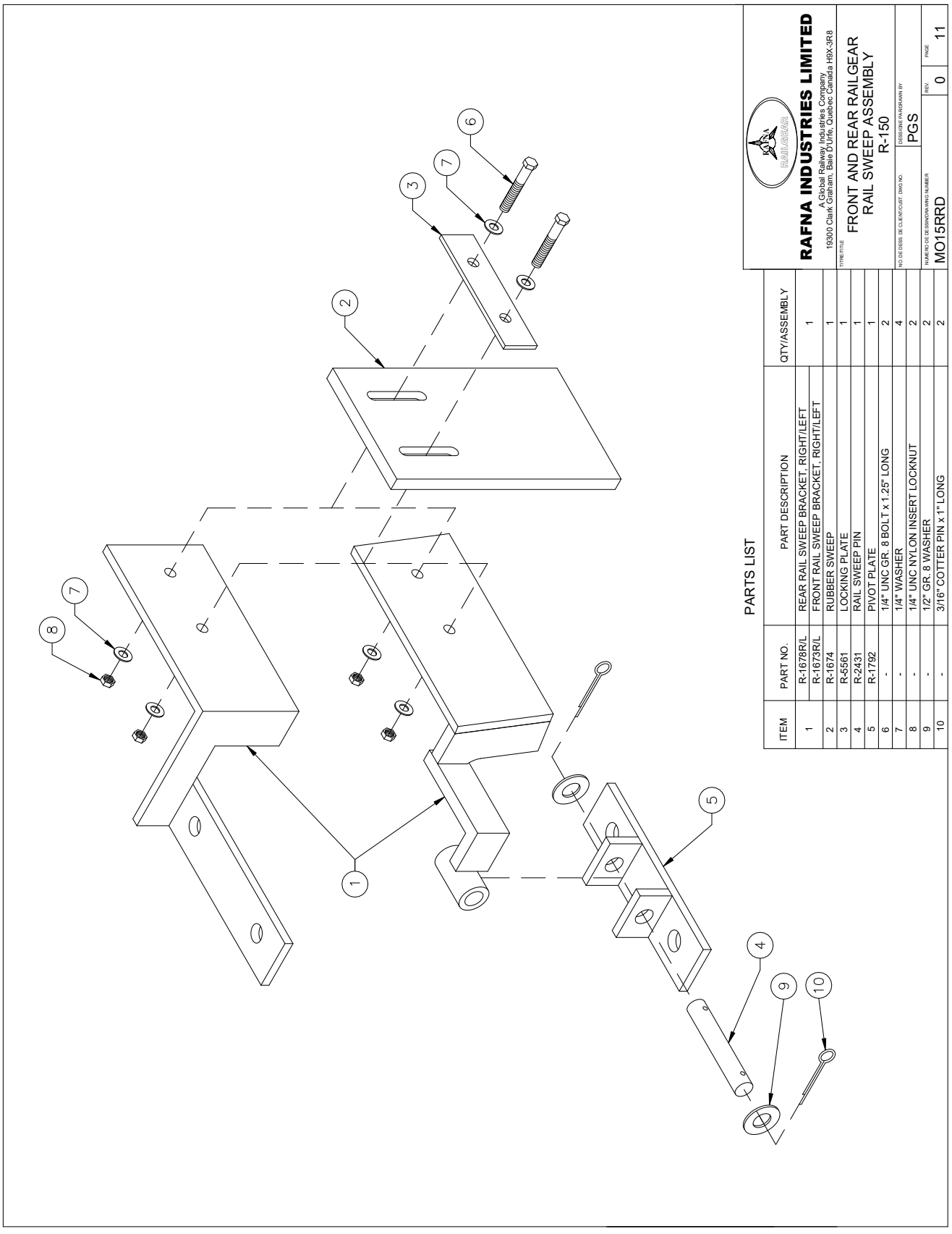
NUMERO DE DESSIN/DRAWING NUMBER: MO15RRD

REV.: 0

PAGE: 10

PARTS LIST

ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY
1	R-1623A	STEERING WHEEL LOCK RETAINER	1
2	R-1623C	STEERING WHEEL LOCK	1
3	-	STEERING WHEEL LOCK DECAL (ON DASHBOARD)	1
4	-	3/16" SELF TAPPING SCREW x 0.75" LONG	4
5	-	1/4" UNC WING NUT	2



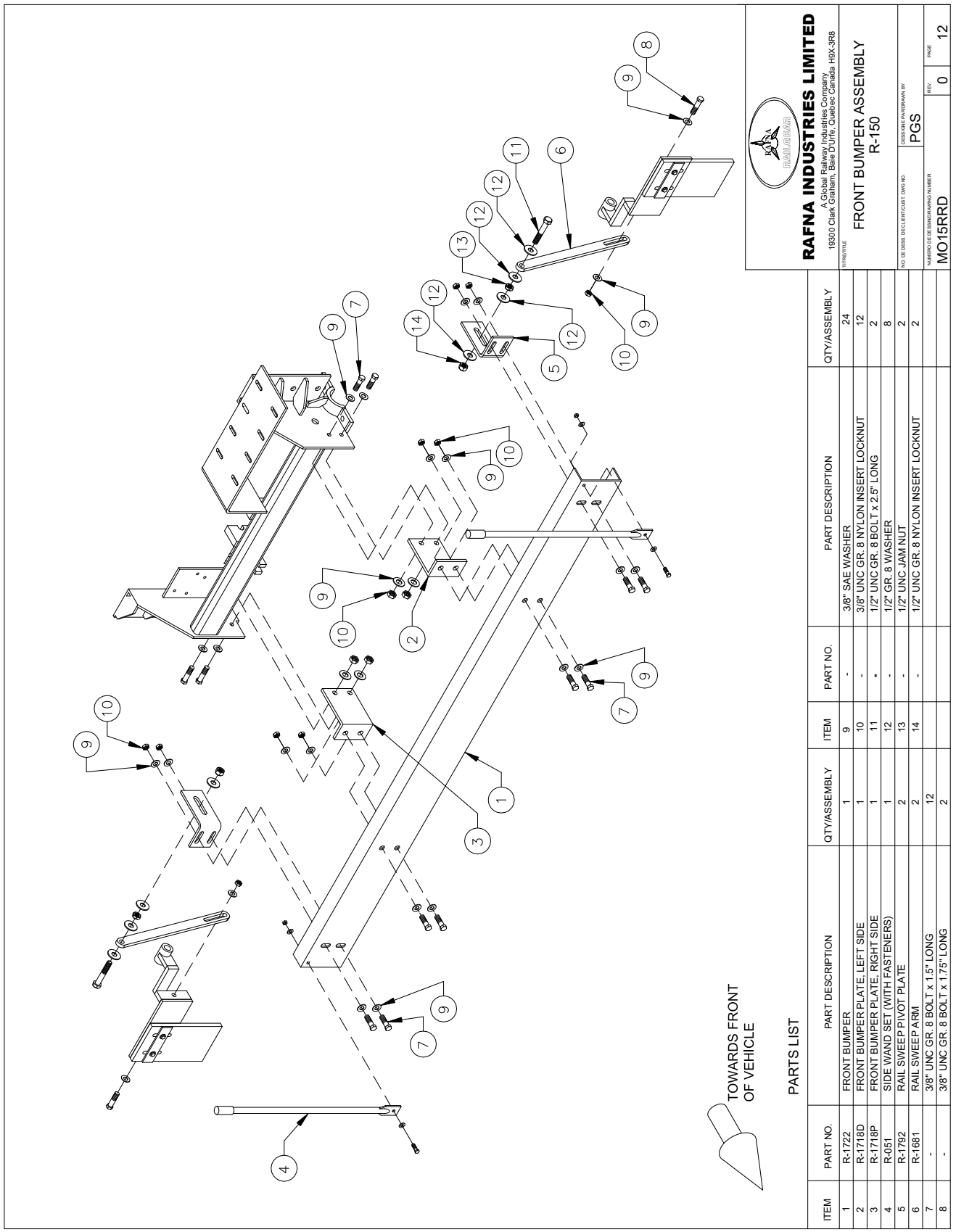
PARTS LIST

ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY
1	R-1678R/L	REAR RAIL SWEEP BRACKET, RIGHT/LEFT	1
	R-1673R/L	FRONT RAIL SWEEP BRACKET, RIGHT/LEFT	
2	R-1674	RUBBER SWEEP	1
3	R-5561	LOCKING PLATE	1
4	R-2431	RAIL SWEEP PIN	1
5	R-1792	PIVOT PLATE	1
6	-	1/4" UNC GR. 8 BOLT x 1.25" LONG	2
7	-	1/4" WASHER	4
8	-	1/4" UNC NYLON INSERT LOCKNUT	2
9	-	1/2" GR. 8 WASHER	2
10	-	3/16" COTTER PIN x 1" LONG	2

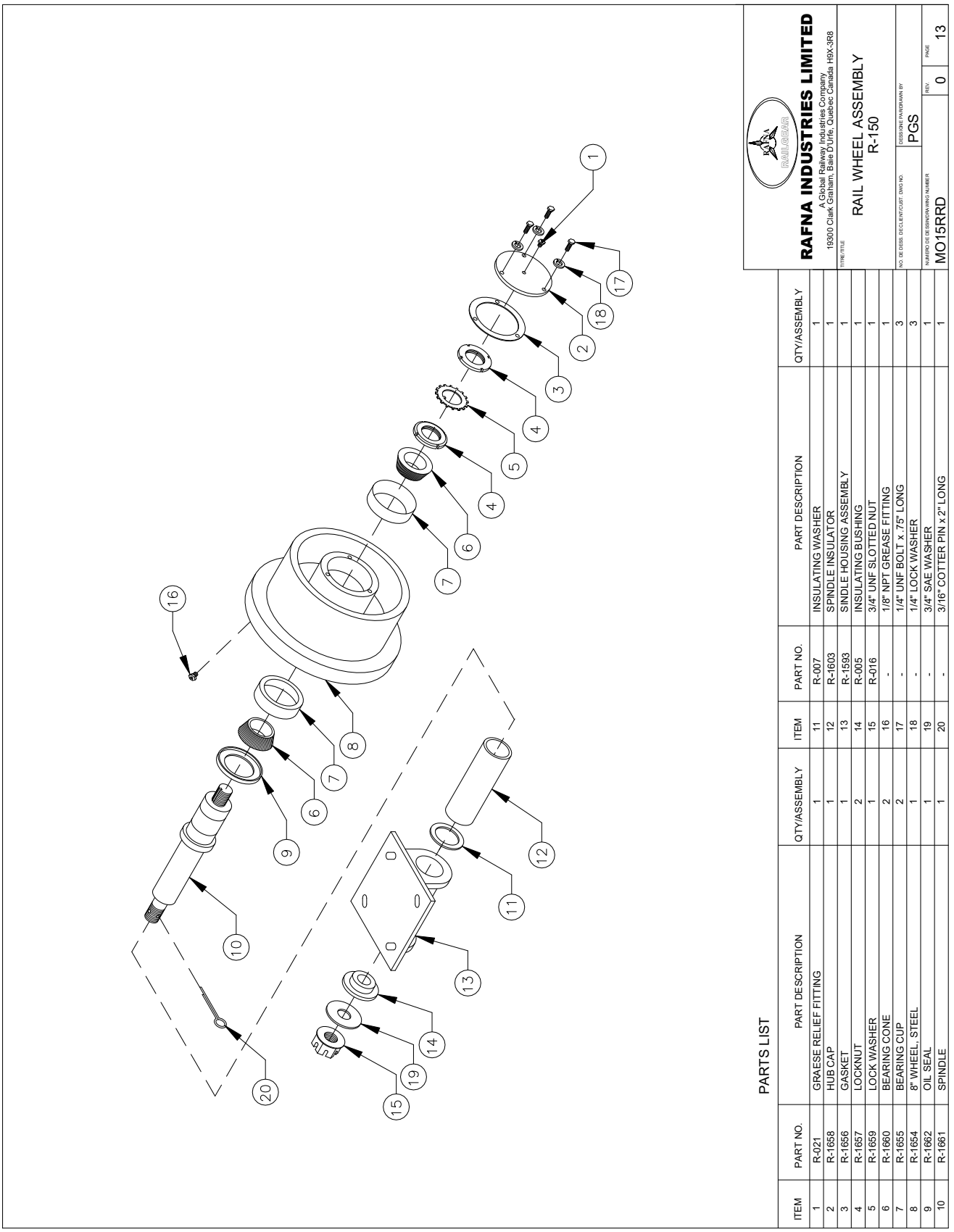
RAFNA INDUSTRIES LIMITED
A Global Railway Industries Company
19300 Clark Graham, Baie D'Urfe, Quebec Canada H9X-3R8

TITRE/TITLE: FRONT AND REAR RAILGEAR
RAIL SWEEP ASSEMBLY
R-150

NO. DE DESS. DE CLIENT/CUST. DWG NO.: MO15RRD
DESSINÉ PAR/DRAWN BY: PGS
NUMÉRO DE DESSIN/DRG NUMBER
REV: 0
PAGE: 11



ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY
1	R-1722	FRONT BUMPER	1
2	R-1718D	FRONT BUMPER PLATE, LEFT SIDE	1
3	R-1718P	FRONT BUMPER PLATE, RIGHT SIDE	1
4	R-051	SIDE WAND SET (WITH FASTENERS)	1
5	R-1792	RAIL SWEEP PIVOT PLATE	2
6	R-1681	RAIL SWEEP ARM	2
7	-	3/8" UNC GR. 8 BOLT x 1.5" LONG	12
8	-	3/8" UNC GR. 8 BOLT x 1.75" LONG	2
9	-	3/8" SAE WASHER	24
10	-	3/8" UNC GR. 8 NYLON INSERT LOCKNUT	12
11	-	1/2" UNC GR. 8 BOLT x 2.5" LONG	2
12	-	1/2" GR. 8 WASHER	8
13	-	1/2" UNC JAM NUT	2
14	-	1/2" UNC GR. 8 NYLON INSERT LOCKNUT	2



PARTS LIST

ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY	ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY
1	R-021	GRAESE RELIEF FITTING	1	11	R-007	INSULATING WASHER	1
2	R-1658	HUB CAP	1	12	R-1603	SPINDLE INSULATOR	1
3	R-1656	GASKET	1	13	R-1593	SINDLE HOUSING ASSEMBLY	1
4	R-1657	LOCKNUT	2	14	R-005	INSULATING BUSHING	1
5	R-1659	LOCK WASHER	1	15	R-016	3/4" UNF SLOTTED NUT	1
6	R-1660	BEARING CONE	2	16	-	1/8" NPT GREASE FITTING	1
7	R-1655	BEARING CUP	2	17	-	1/4" UNF BOLT x .75" LONG	3
8	R-1654	8" WHEEL, STEEL	1	18	-	1/4" LOCK WASHER	3
9	R-1662	OIL SEAL	1	19	-	3/4" SAE WASHER	1
10	R-1661	SPINDLE	1	20	-	3/16" COTTER PIN x 2" LONG	1

RAILGEAR

RAFNA INDUSTRIES LIMITED
A Global Railway Industries Company
19300 Clark Graham, Baie D'Urfe, Quebec Canada H9X-3R8

TITRE / TITLE: RAIL WHEEL ASSEMBLY R-150

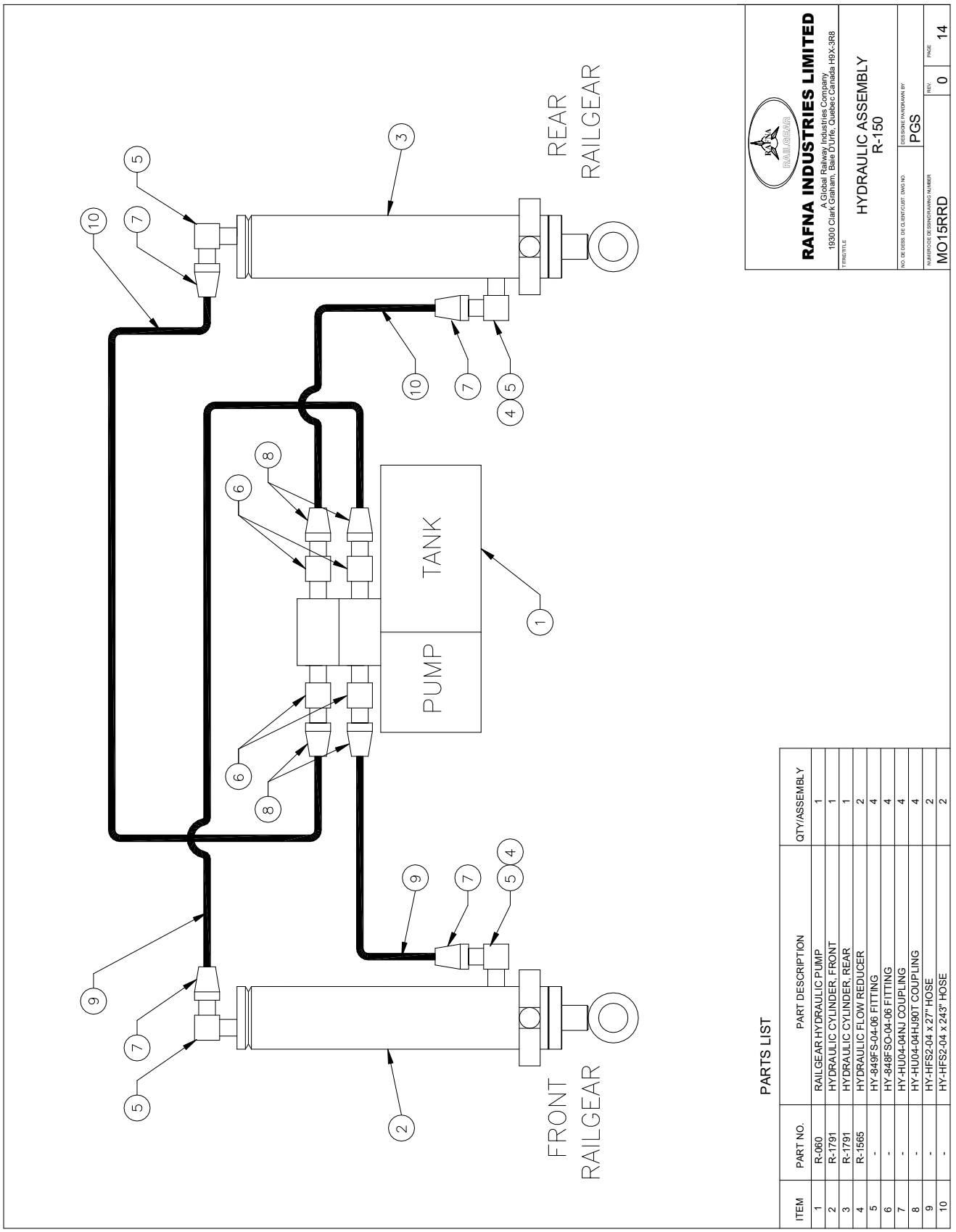
NO. DE DESS. DE CLIENT/CUST. DWG NO.: MO15RRD

DESSINÉ PAR/DRAWN BY: PGS

NUMÉRO DE DESSIN/DRAWING NUMBER

REV.: 0

PAGE: 13



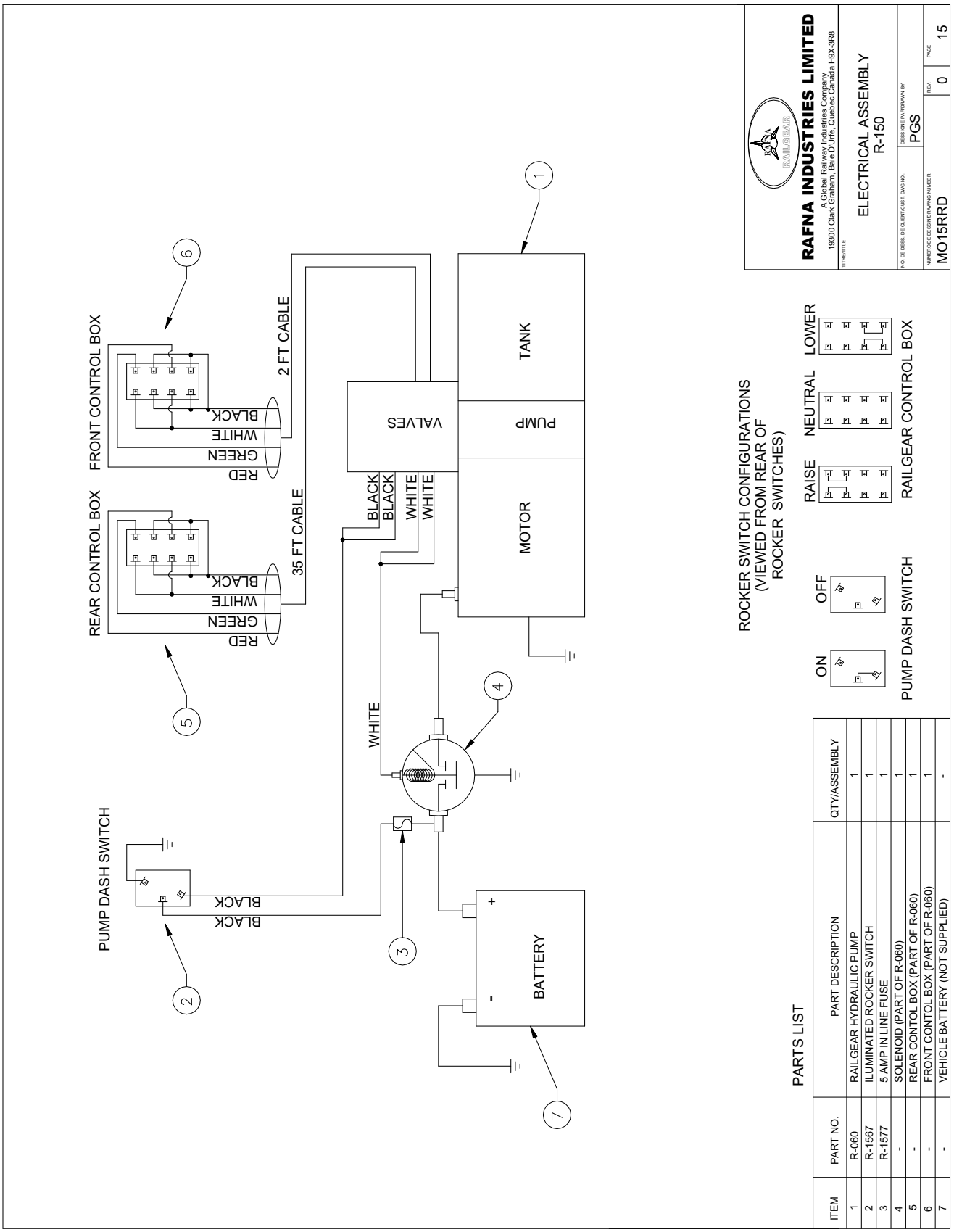
RAFNA INDUSTRIES LIMITED
A Global Railway Industries Company
19300 Clark Graham, Baie D'Urfe, Quebec Canada H9X-3R8

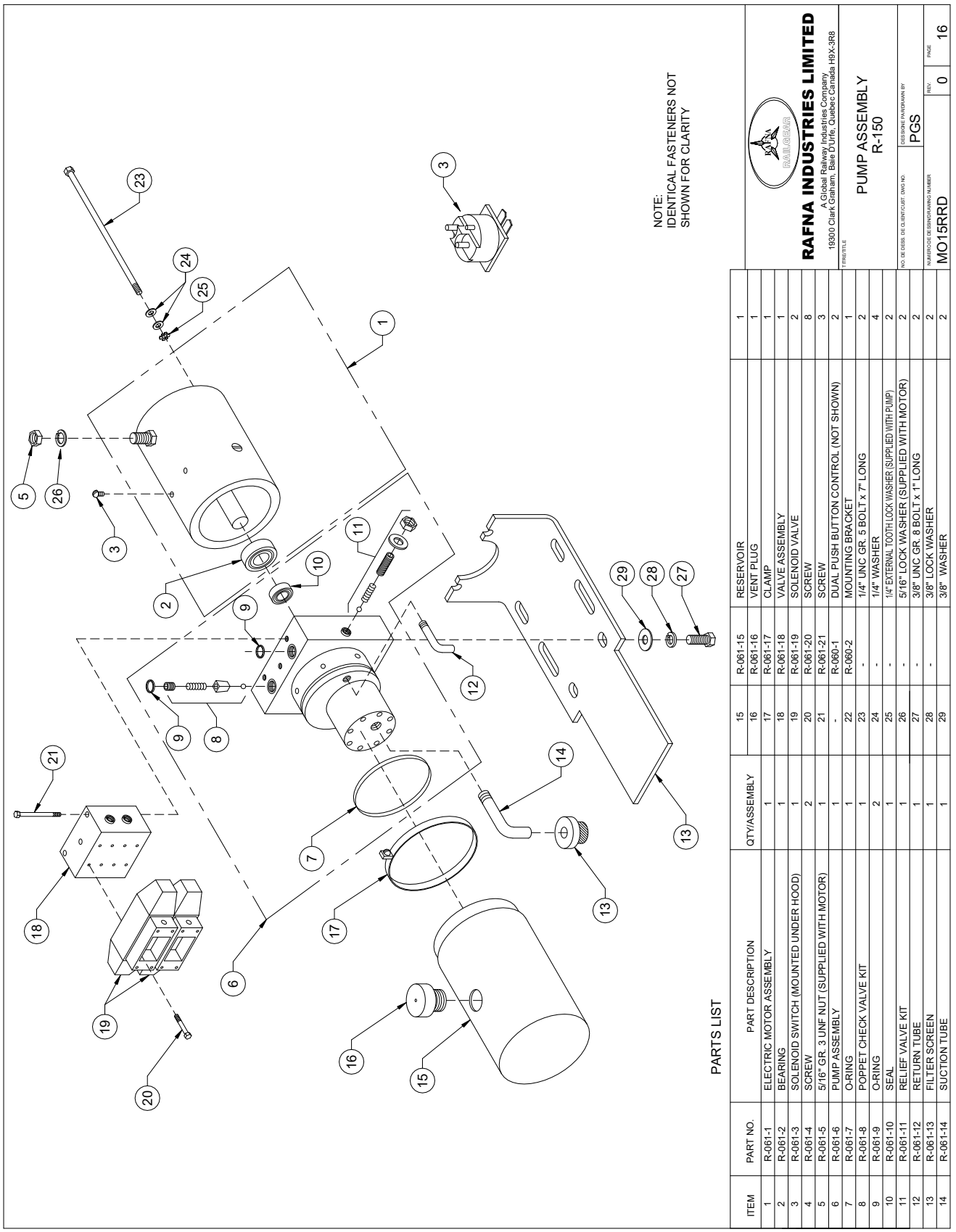
TITRE/TITLE: HYDRAULIC ASSEMBLY R-150

NO. DE DESS. DE CLIENT/CUST. DWG NO.: MO15RRD
DESSINE PAR/DRAWN BY: PGS
NUMERO DE DESSIN/DRAWING NUMBER
REV: 0
PAGE: 14

PARTS LIST

ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY
1	R-060	RAILGEAR HYDRAULIC PUMP	1
2	R-1791	HYDRAULIC CYLINDER, FRONT	1
3	R-1791	HYDRAULIC CYLINDER, REAR	1
4	R-1565	HYDRAULIC FLOW REDUCER	2
5	-	HY-849FS-04-06 FITTING	4
6	-	HY-848FSO-04-06 FITTING	4
7	-	HY-HU04-04NJ COUPLING	4
8	-	HY-HU04-04HJ90T COUPLING	4
9	-	HY-HFS2-04 x 27" HOSE	2
10	-	HY-HFS2-04 x 243" HOSE	2


RAFNA INDUSTRIES LIMITED
A Global Railway Industries Company
19300 Clark Graham, Baie D'Urfe, Quebec Canada H9X-3R8
TITRE/TITLE
ELECTRICAL ASSEMBLY
R-150
NO. DE DESS. DE CLIENT/CUST. DWG NO.
DESSIGNE PAR/DRAWN BY
PGS
NUMERO DE DESIN/DRAWING NUMBER
MO15RRD
REV.
0
PAGE
15
RAILGEAR
PARTS LIST
ITEM
PART NO.
PART DESCRIPTION
QTY/ASSEMBLY
1
R-060
RAILGEAR HYDRAULIC PUMP
1
2
R-1567
ILUMINATED ROCKER SWITCH
1
3
R-1577
5 AMP IN LINE FUSE
1
4
-
SOLENOID (PART OF R-060)
1
5
-
REAR CONTOL BOX (PART OF R-060)
1
6
-
FRONT CONTOL BOX (PART OF R-060)
1
7
-
VEHICLE BATTERY (NOT SUPPLIED)
-
ROCKER SWITCH CONFIGURATIONS
(VIEWED FROM REAR OF
ROCKER SWITCHES)
ON
OFF
PUMP DASH SWITCH
RAISE
NEUTRAL
LOWER
RAILGEAR CONTROL BOX
PUMP DASH SWITCH
BLACK
BLACK
WHITE
BATTERY
+
-
BLACK
BLACK
WHITE
WHITE
VALVES
PUMP
MOTOR
TANK
2 FT CABLE
35 FT CABLE
FRONT CONTROL BOX
RED
GREEN
WHITE
BLACK
REAR CONTROL BOX
RED
GREEN
WHITE
BLACK
1
2
3
4
5
6
7



PARTS LIST

ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY
1	R-061-1	ELECTRIC MOTOR ASSEMBLY	1
2	R-061-2	BEARING	1
3	R-061-3	SOLENOID SWITCH (MOUNTED UNDER HOOD)	1
4	R-061-4	SCREW	2
5	R-061-5	5/16" GR. 3 UNF NUT (SUPPLIED WITH MOTOR)	1
6	R-061-6	PUMP ASSEMBLY	1
7	R-061-7	O-RING	1
8	R-061-8	POPPET CHECK VALVE KIT	1
9	R-061-9	O-RING	2
10	R-061-10	SEAL	1
11	R-061-11	RELIEF VALVE KIT	1
12	R-061-12	RETURN TUBE	1
13	R-061-13	FILTER SCREEN	1
14	R-061-14	SUCTION TUBE	1
15	R-061-15	RESERVOIR	1
16	R-061-16	VENT PLUG	1
17	R-061-17	CLAMP	1
18	R-061-18	VALVE ASSEMBLY	1
19	R-061-19	SOLENOID VALVE	2
20	R-061-20	SCREW	8
21	R-061-21	SCREW	3
-	R-060-1	DUAL PUSH BUTTON CONTROL (NOT SHOWN)	2
22	R-060-2	MOUNTING BRACKET	1
23	-	1/4" UNC GR. 5 BOLT x 7" LONG	2
24	-	1/4" WASHER	4
25	-	1/4" EXTERNAL TOOTH LOCK WASHER (SUPPLIED WITH PUMP)	2
26	-	5/16" LOCK WASHER (SUPPLIED WITH MOTOR)	2
27	-	3/8" UNC GR. 8 BOLT x 1" LONG	2
28	-	3/8" LOCK WASHER	2
29		3/8" WASHER	2

RAFNA INDUSTRIES LIMITED
A Global Railway Industries Company
19300 Clark Graham, Baie D'Urfe, Quebec Canada H9X-3R8

TITRE/TITLE: PUMP ASSEMBLY R-150

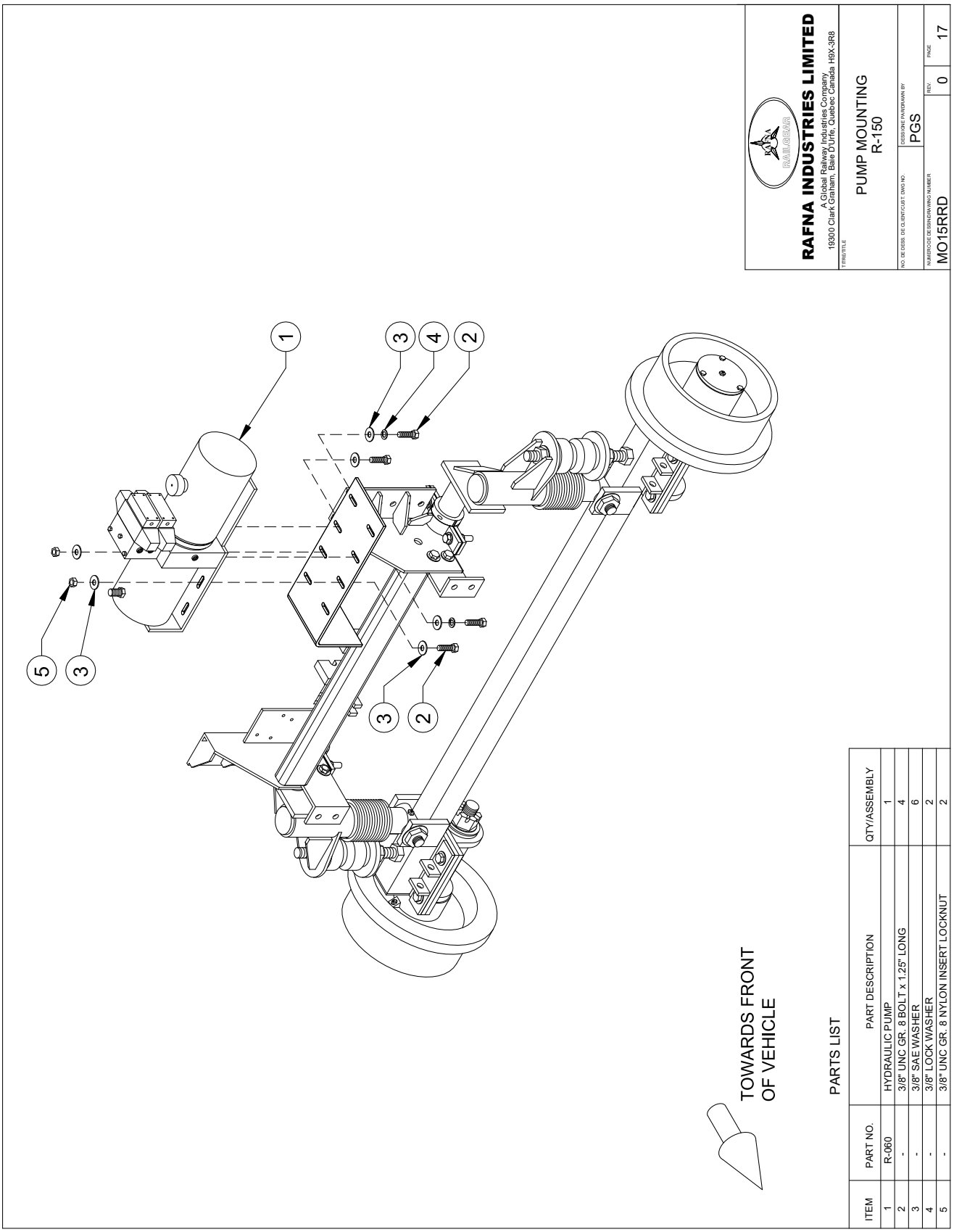
NO. DE DESS. DE CLIENT/CUST. DWG NO.

DESSINE PAR/DRAWN BY: PGS

NUMERO DE DESIN/DRAWING NUMBER: MO15RRD

REV: 0

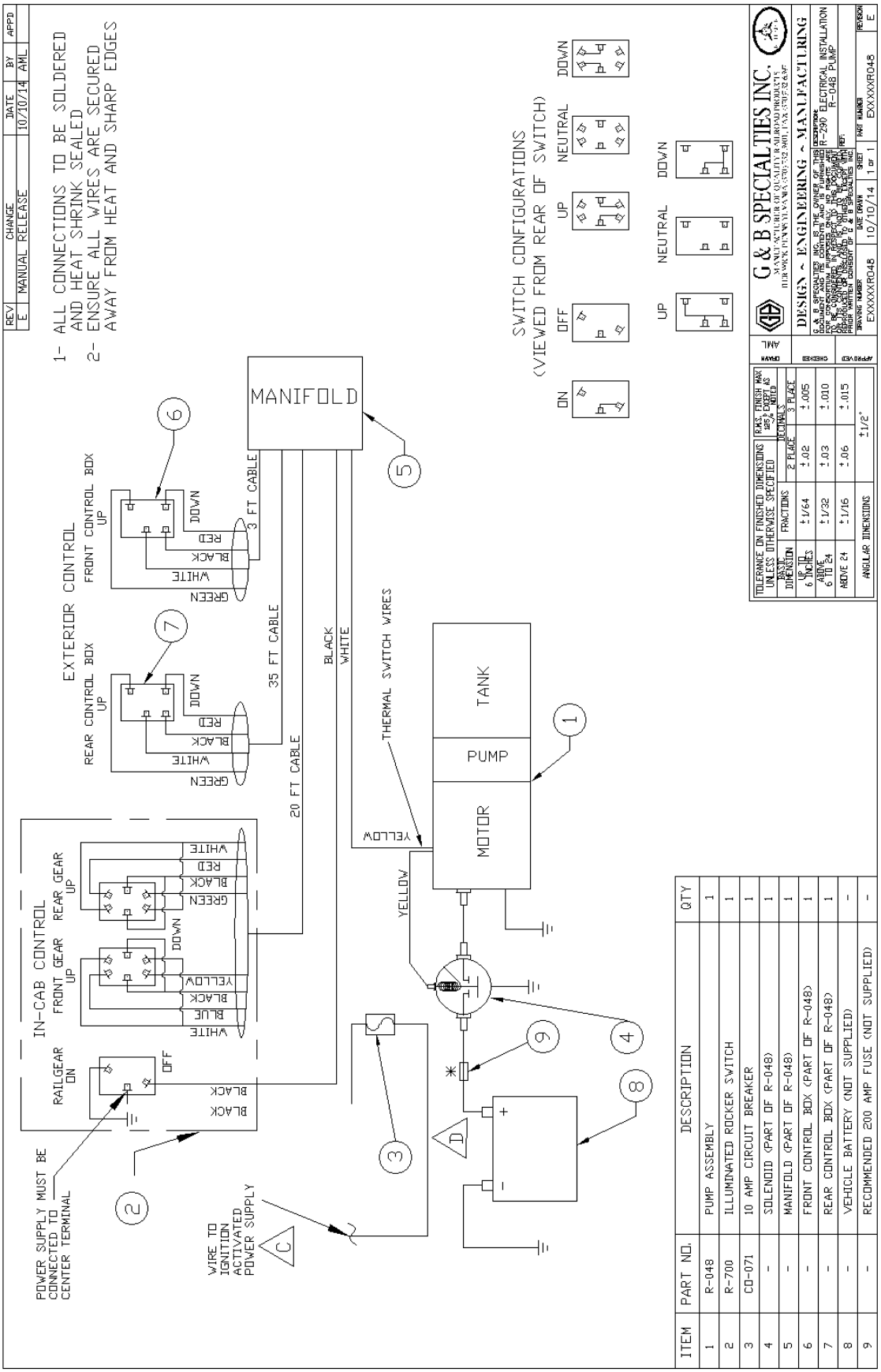
PAGE: 16

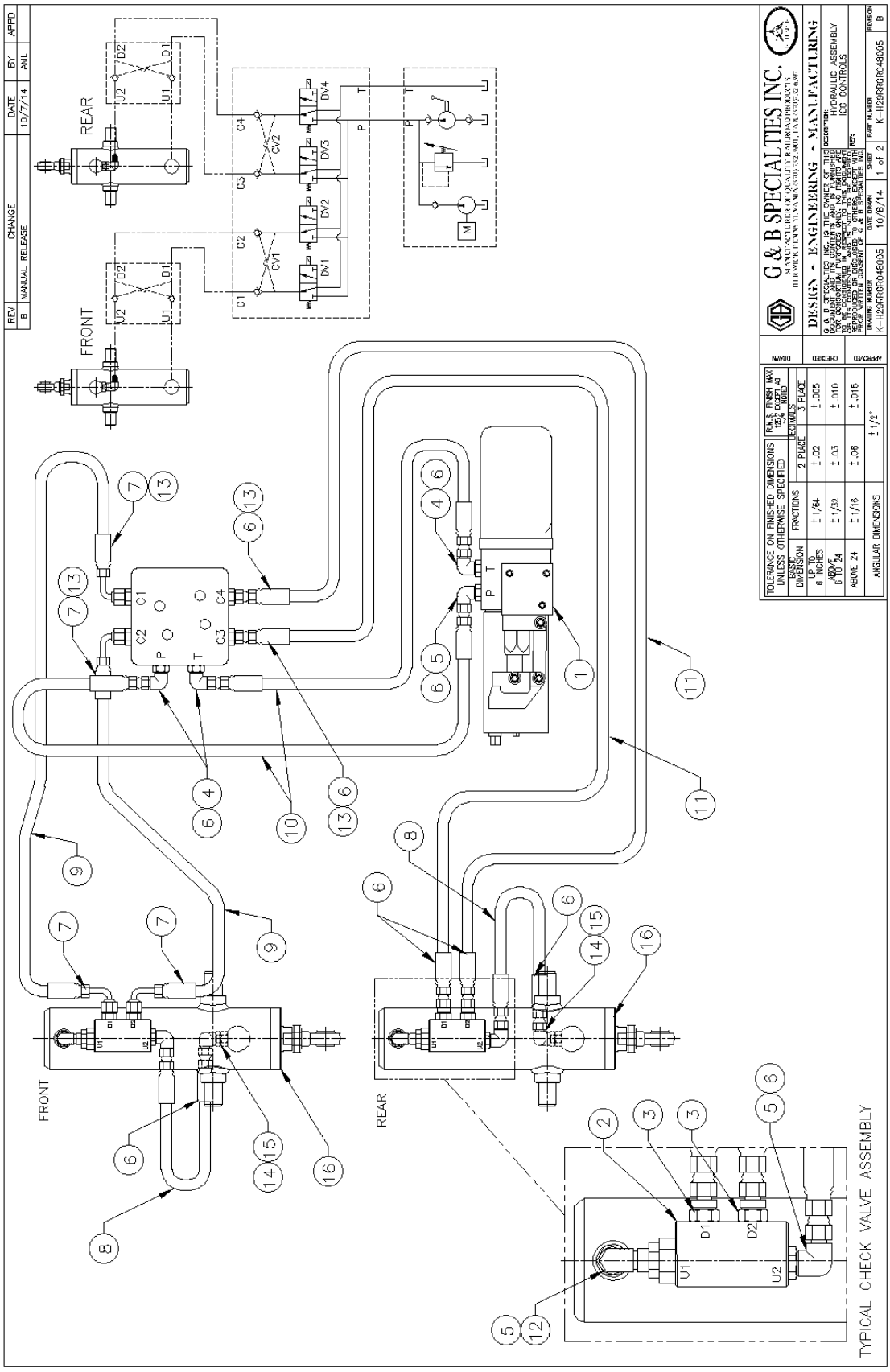


PARTS LIST

ITEM	PART NO.	PART DESCRIPTION	QTY/ASSEMBLY
1	R-060	HYDRAULIC PUMP	1
2	-	3/8" UNC GR. 8 BOLT x 1.25" LONG	4
3	-	3/8" SAE WASHER	6
4	-	3/8" LOCK WASHER	2
5	-	3/8" UNC GR. 8 NYLON INSERT LOCKNUT	2

SECTION 5: APPENDIX


REV
CHANGE
DATE
BY
APPD
E
MANUAL RELEASE
10/10/14
AML
1- ALL CONNECTIONS TO BE SOLDERED AND HEAT SHRINK SEALED
2- ENSURE ALL WIRES ARE SECURED AWAY FROM HEAT AND SHARP EDGES
SWITCH CONFIGURATIONS (VIEWED FROM REAR OF SWITCH)
ON
OFF
UP
NEUTRAL
DOWN
UP
NEUTRAL
DOWN
MANIFOLD
EXTERIOR CONTROL
FRONT CONTROL BOX
REAR CONTROL BOX
UP
DOWN
RED
BLACK
WHITE
GREEN
3 FT CABLE
35 FT CABLE
20 FT CABLE
BLACK
WHITE
THERMAL SWITCH WIRES
YELLOW
YELLOW
TANK
PUMP
MOTOR
IN-CAB CONTROL
RAILGEAR ON
OFF
FRONT GEAR UP
REAR GEAR UP
DOWN
BLUE
BLACK
YELLOW
WHITE
RED
GREEN
BLACK
BLACK
POWER SUPPLY MUST BE CONNECTED TO CENTER TERMINAL
WIRE TO IGNITION ACTIVATED POWER SUPPLY
TOLERANCE ON FINISHED DIMENSIONS UNLESS OTHERWISE SPECIFIED
BASIC DIMENSION
FRACTIONS
DECIMALS
2 PLACE
3 PLACE
UP TO 6 INCHES
ABOVE 6 TO 24
ABOVE 24
ANGULAR DIMENSIONS
±1/64
±1/32
±1/16
±1/2°
±.02
±.03
±.06
±.005
±.010
±.015
MAX. FINISH MAY BE USED AS DATUM
DRAWN
AML
CHECKED
APPROVED
G & B SPECIALTIES INC.
DESIGN ~ ENGINEERING ~ MANUFACTURING
G & B SPECIALTIES INC., IS THE OWNER OF THIS DOCUMENT AND ITS CONTENTS AND IS FURNISHED TO BE CONSIDERED IN RESPECT TO THE EQUIPMENT DESCRIBED HEREIN AND FOR NO OTHER PURPOSE.
DESCRIPTION: R-290 ELECTRICAL INSTALLATION R-048 PUMP
DRAWING NUMBER: EXXXXXR048
DATE DRAWN: 10/10/14
SHEET: 1 of 1
PART NUMBER: EXXXXXR048
REVISION: E
ITEM
PART NO.
DESCRIPTION
QTY
1
R-048
PUMP ASSEMBLY
1
2
R-700
ILLUMINATED ROCKER SWITCH
1
3
CO-071
10 AMP CIRCUIT BREAKER
1
4
-
SOLENOID (PART OF R-048)
1
5
-
MANIFOLD (PART OF R-048)
1
6
-
FRONT CONTROL BOX (PART OF R-048)
1
7
-
REAR CONTROL BOX (PART OF R-048)
1
8
-
VEHICLE BATTERY (NOT SUPPLIED)
-
9
-
RECOMMENDED 200 AMP FUSE (NOT SUPPLIED)
-


REAR
FRONT
C1
C2
C3
C4
CV1
CV2
DV1
DV2
DV3
DV4
D1
D2
U1
U2
P
T
M
FRONT
REAR
TYPICAL CHECK VALVE ASSEMBLY
G & B SPECIALTIES INC.
DESIGN ~ ENGINEERING ~ MANUFACTURING
HYDRAULIC ASSEMBLY
ICC CONTROLS
K-H2SRRGR048005
10/6/14
1 of 2
REV
CHANGE
DATE
BY
APPD
B
MANUAL RELEASE
10/7/14
AML

ITEM	PART NO.	DESCRIPTION	QTY
1	R-048	ELECTRIC HYDRAULIC PUMP W/ MANIFOLD	1
2	S-002002	SINGLE P.O. CHECK VALVE	2
3	848FSO-04x06	3/8" MALE O-RING BOSS TO $\frac{1}{4}$" MALE JIC	4
4	849FSO-04-04	1/4" MALE O-RING BOSS TO 1/4" MALE JIC 90°	3
5	849FSO-04-06	3/8" MALE O-RING BOSS TO 1/4" MALE JIC 90°	3
6	HU-04-04NJ	1/4" FEMALE JIC STRAIGHT COUPLER	12
7	HU-04-04NJ90T	1/4" FEMALE JIC 90° COUPLER	4
8	HFS2-04	HOSE 16" LONG	2
9	HFS2-04	HOSE 80" LONG	2
10	HFS2-04	HOSE 33" LONG	2
11	HFS2-04	HOSE 336" LONG	2
12	C5216x4x6	1/4 JIC FEMALE X 3/8 MALE O-RING	2
13	848FSO-04x04	1/4" MALE O-RING BOSS TO 1/4" MALE JIC	4
14	848FSO-04x06	3/8" MALE O-RING BOSS TO $\frac{1}{4}$" MALE JIC	(2)*
15	897-FS-04	1/4" JIC FEMALE x 1/4" JIC MALE, 90° SWIVEL	(2)*
16	R-9115	HYDRAULIC CYLINDER ASSEMBLY	(2)

TOLERANCE ON FINISHED DIMENSIONS UNLESS OTHERWISE SPECIFIED		R.M.S. FINISH MAX 125 EXCEPT AS NOTED	
BASIC DIMENSION	FRACTIONS	DECIMALS 2 PLACE	DECIMALS 3 PLACE
UP TO 6 INCHES	± 1/64	± .02	± .005
ABOVE 6 TO 24	± 1/32	± .03	± .010
ABOVE 24	± 1/16	± .06	± .015
ANGULAR DIMENSIONS		± 1/2°	

DRAWN A.M.L.
CHECKED
APPROVED

G & B SPECIALTIES INC.
MANUFACTURER OF QUALITY RAILROAD PRODUCTS
BERWICK PENNSYLVANIA (570)752-5901, FAX (570)752-639

DESIGN ~ ENGINEERING ~ MANUFACTURING

DESCRIPTION: HYDRAULIC ASSY ICC CONTROLS
REF:

DRAWING NUMBER	DATE DRAWN	SHEET	PART NUMBER	REVISION
K-H29RRGR048005	10/8/14	2 OF 2	K-H29RRGR048005	B