

RAFNA INDUSTRIES LIMITED

19300 Clark Graham, Baie d'Urfé, Québec

Tel: (514) 457-4373 or 1-888-525-3660

Fax: (514) 457-3567

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

"ROTATING FRONT - ROTATING REAR"

READ THIS MANUAL BEFORE INSTALLING RAILGEAR EQUIPMENT

Application Models: 1999 - 2002 Dodge Dakota (All Models)
1999 - 2002 Dodge Durango (All Models)

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.

TABLE OF CONTENTS

Initial Preparation	Section 1
Safety Precautions	1-2
Installation Procedure Overview	1-3
Preparations For Railgear Installation	1-4
Railgear Installation	Section 2
Front Railgear Mounting Plate Installation	2-2
Front Railgear Installation	2-4
Rear Railgear Mounting Plate Installation	2-6
Rear Railgear Installation	2-10
Rail Wheel And Rail Sweep Installation	2-12
Front Railgear Bumper And Rail Sweep Arm Installation	2-14
Auxiliary Installations	Section 3
Steering Wheel Lock Installation	3-2
Hydraulic System Installation	3-4
Electrical System Installation	3-7
Railgear Set-Up And Adjustments	3-10
Pre-Delivery Check List	3-13
Appendix	Section 4

SECTION 1: INITIAL PREPARATION

SAFETY PRECAUTIONS	1-2
INSTALLATION PROCEDURE OVERVIEW	1-3
PREPARATIONS FOR RAILGEAR INSTALLATION	1-4

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 RAFNA INDUSTRIES LTD. FOR TECHNICAL ASSISTANCE BEFORE CONTINUING WITH THE INSTALLATION PROCESS.

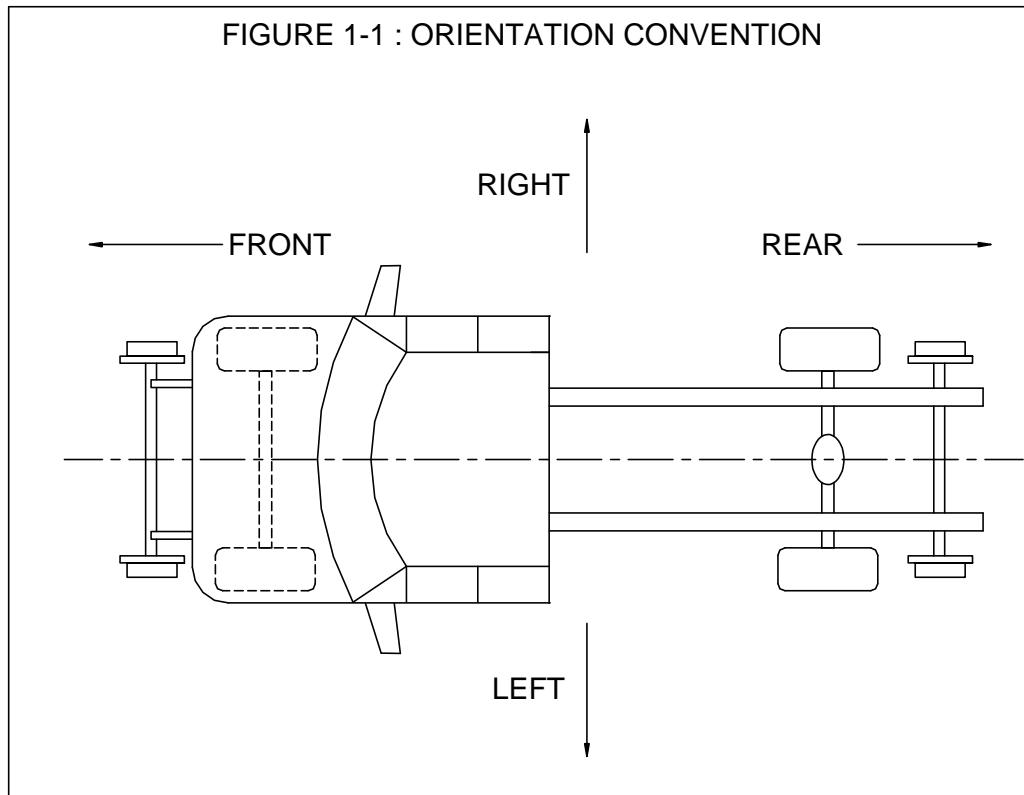
2.0 INSTALLATION PROCEDURE OVERVIEW

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.



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

FRONT RAILGEAR MOUNTING PLATE INSTALLATION	2-2
FRONT RAILGEAR INSTALLATION	2-4
REAR RAILGEAR MOUNTING PLATE INSTALLATION	2-6
REAR RAILGEAR INSTALLATION	2-10
RAIL WHEEL AND RAIL SWEEP INSTALLATION	2-12
FRONT RAILGEAR BUMPER AND RAIL SWEEP ARM INSTALLATION	2-14

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.

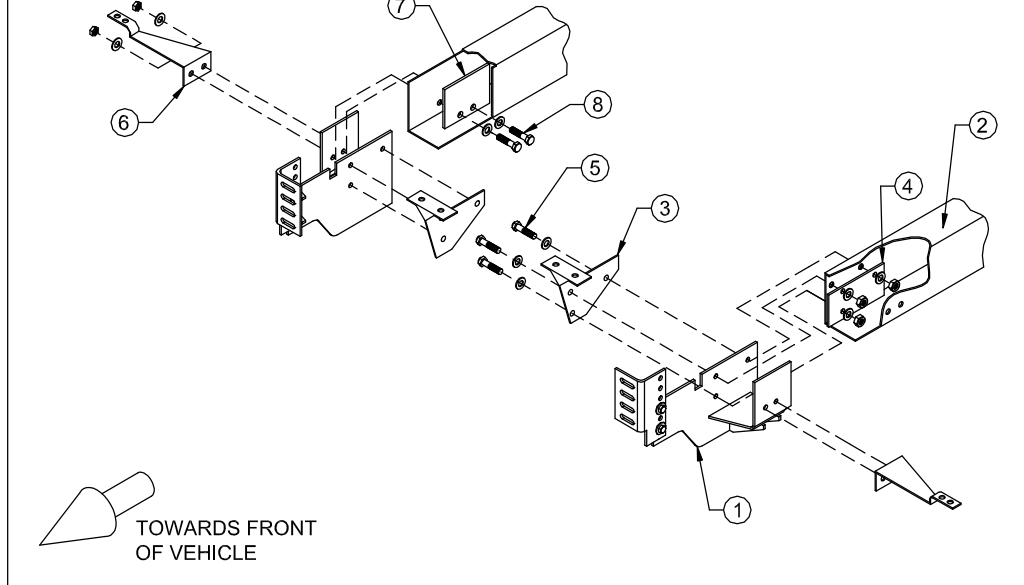
Table 2-1: Front Railgear Mounting Hardware

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.

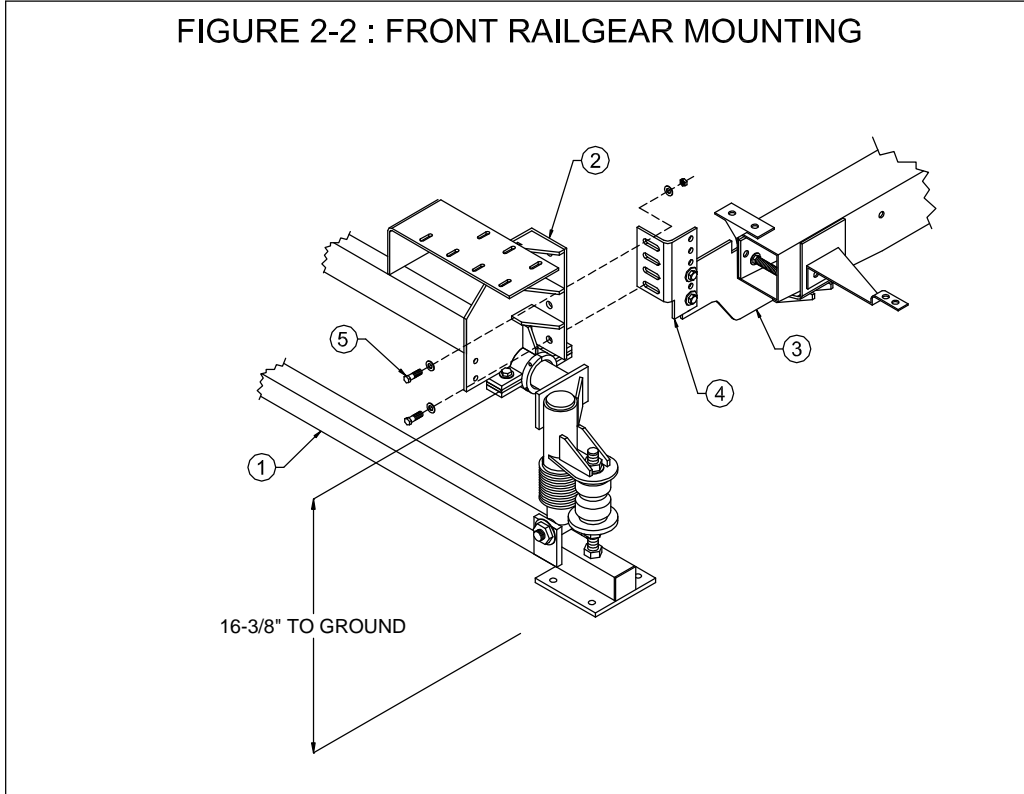
Table 2-2: Front Railgear Installation Hardware

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 16-³/₈" 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 – 2002 DODGE DAKOTA

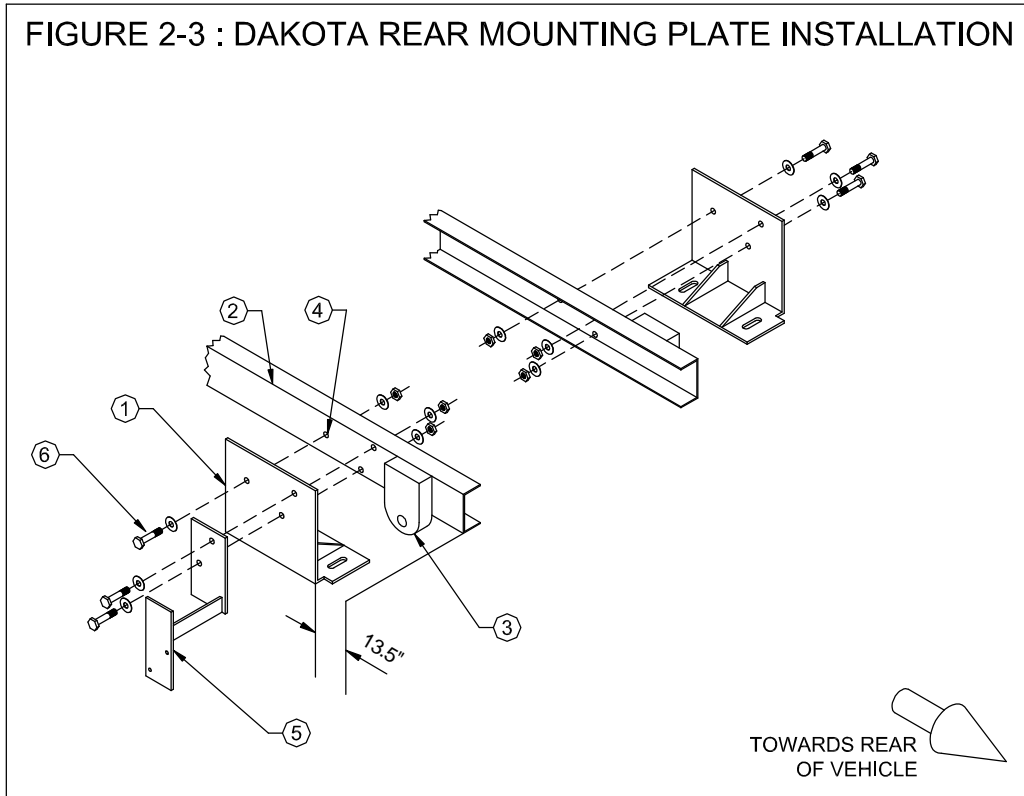
The hardware required for this installation is listed in table 2-3.

Table 2-3: 1999 – 2002 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.



3.2 1999 – 2002 DODGE DURANGO

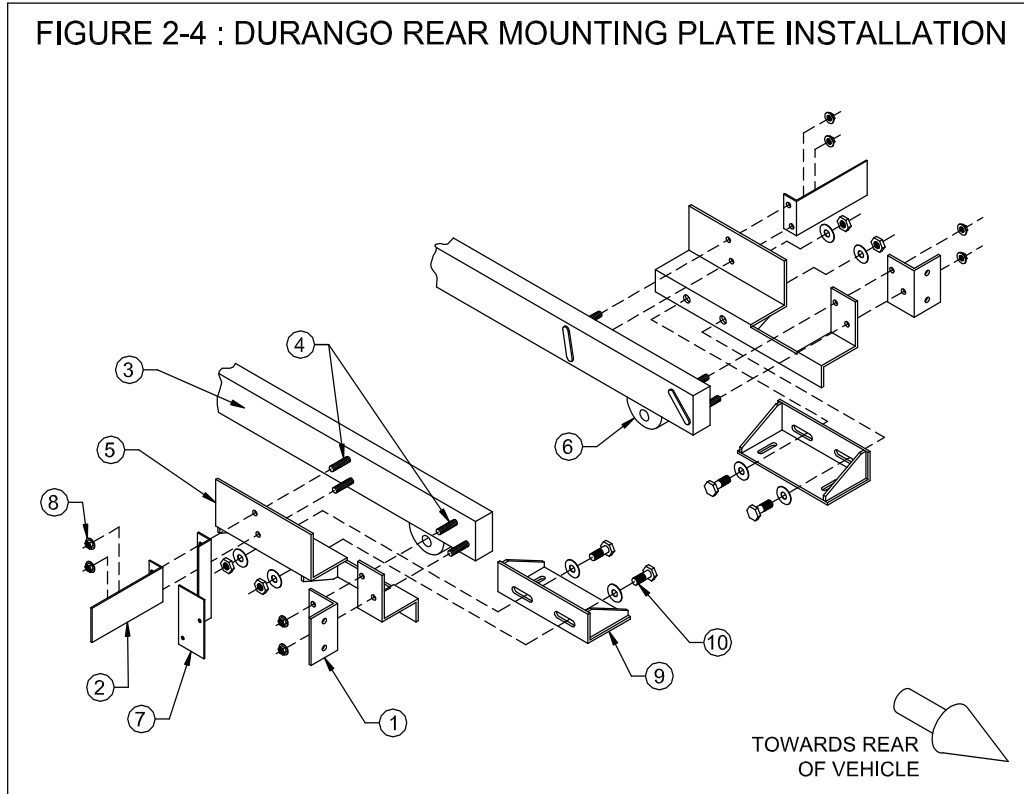
The hardware required for this installation is listed in table 2-4.

Table 2-4: 1999 – 2002 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
	$\frac{5}{8}$ " UNC Gr. 8 Bolt x 1- $\frac{3}{4}$ " Long	4
	$\frac{5}{8}$ " GR. 8 Washer	8
	$\frac{5}{8}$ " 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 $\frac{5}{8}$ " x 1- $\frac{3}{4}$ " long bolts, eight $\frac{5}{8}$ " washers and four $\frac{5}{8}$ " nuts (Item 10). Tighten but do not torque the $\frac{5}{8}$ " fasteners yet.



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.

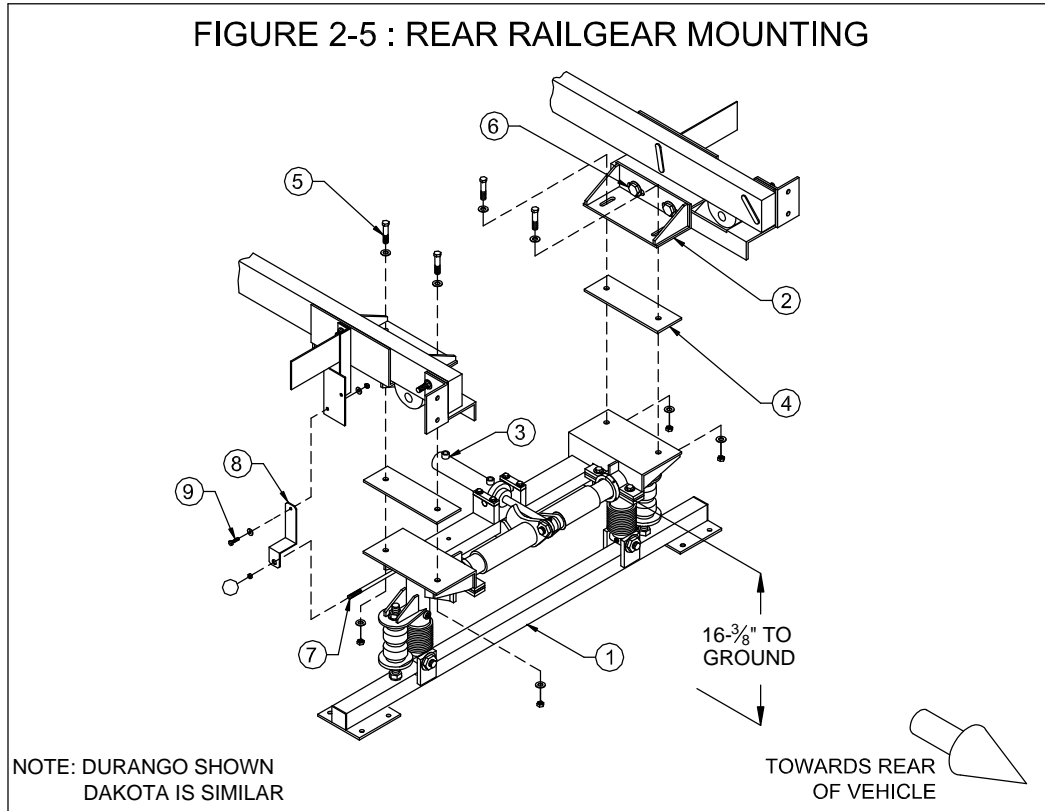
Table 2-5: Rear Railgear Installation Hardware

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- $\frac{3}{8}$ " 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 $\frac{5}{8}$ " 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 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.



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

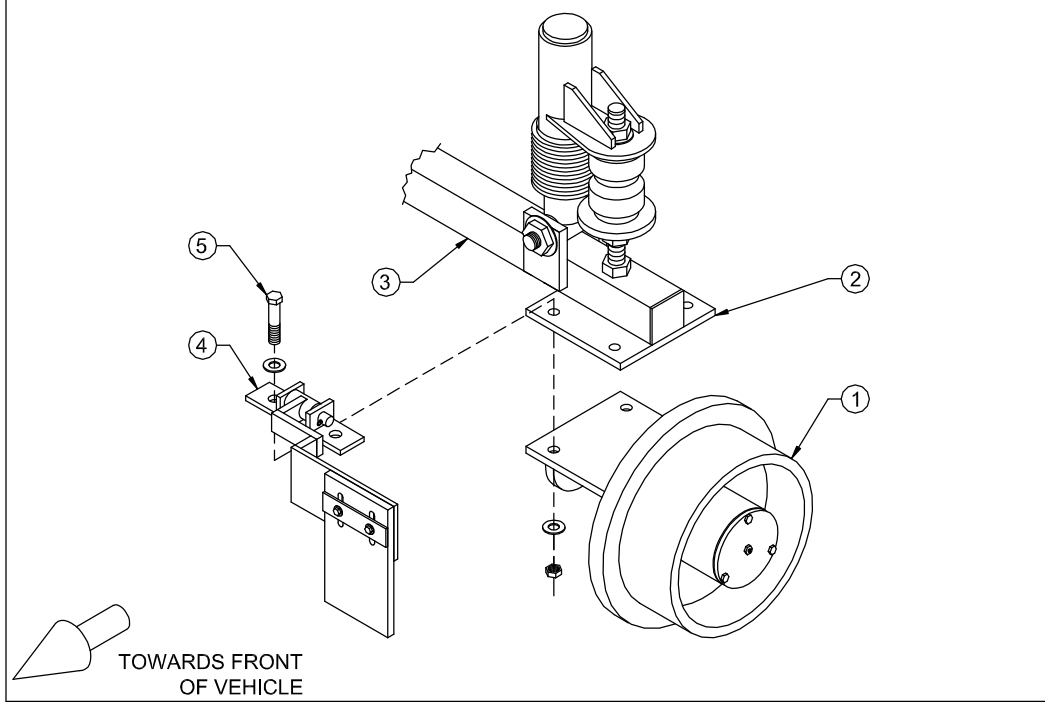
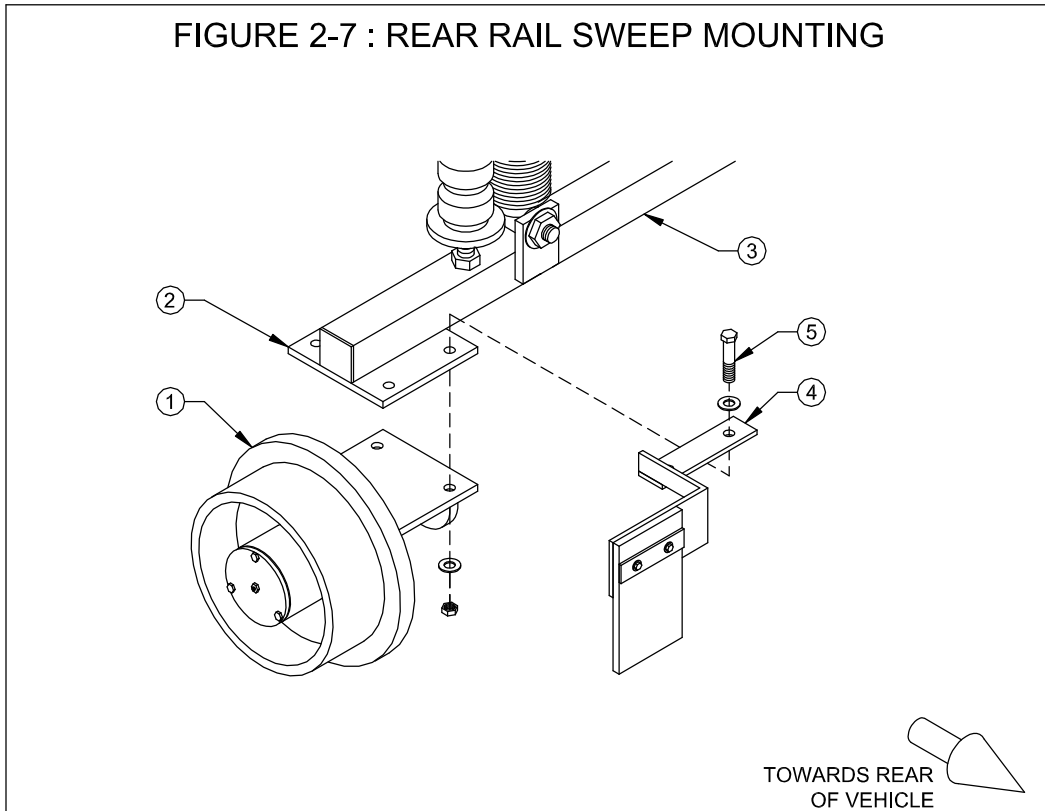


FIGURE 2-7 : REAR RAIL SWEEP MOUNTING



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.

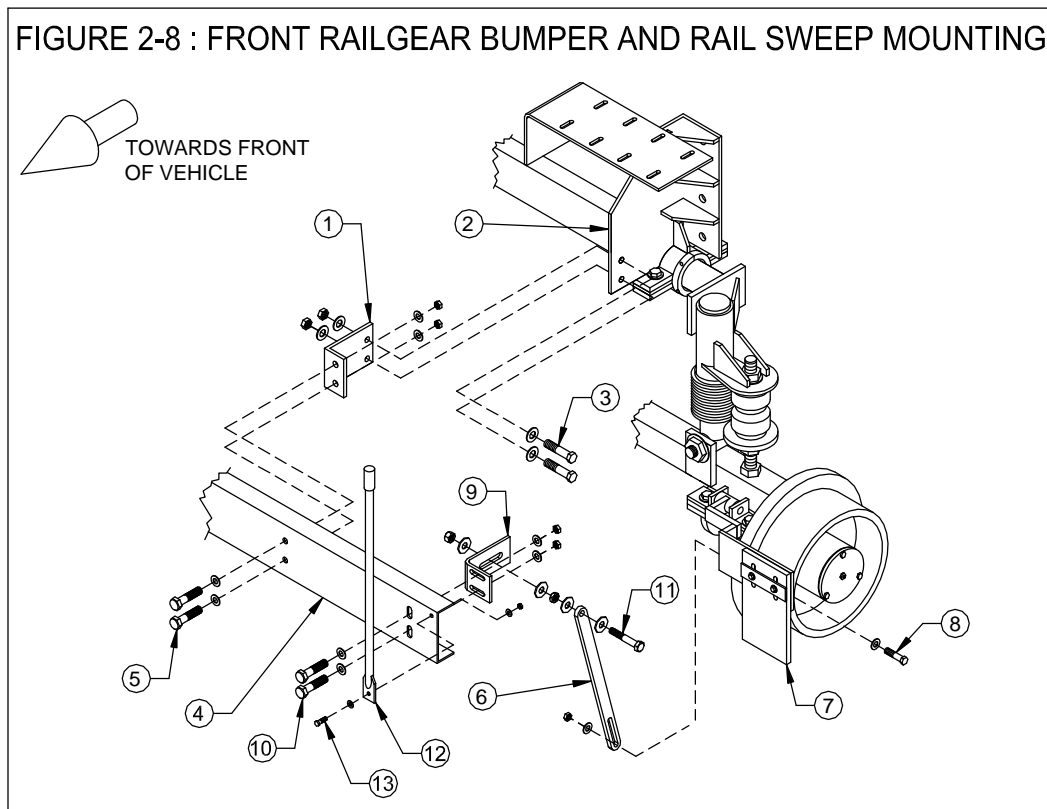
Table 2-7: Front Railgear Bumper And Rail Sweep Arm Installation Hardware

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
	$\frac{3}{8}$ " UNC Gr. 8 Bolt x 1- $\frac{1}{2}$ " Long	12
	$\frac{3}{8}$ " UNC Gr. 8 Bolt x 1- $\frac{3}{4}$ " Long	2
	$\frac{3}{8}$ " SAE Washer	28
	$\frac{3}{8}$ " UNC Gr. 3 Nylon Insert Lock Nut	14
	$\frac{1}{2}$ " UNC Gr. 8 Bolt x 2- $\frac{1}{2}$ " Long	2
	$\frac{1}{2}$ " Gr. 8 Washer	8
	$\frac{1}{2}$ " UNC Gr. 3 Jam Nut	2
	$\frac{1}{2}$ " 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 $\frac{3}{8}$ " x 1- $\frac{1}{2}$ " long bolts, eight $\frac{3}{8}$ " washers and four $\frac{3}{8}$ " nuts (Item 3). Torque the $\frac{3}{8}$ " 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 $\frac{3}{8}$ " x 1- $\frac{1}{2}$ " long bolts, eight $\frac{3}{8}$ " washers and four $\frac{3}{8}$ " nuts (Item 5). Torque the $\frac{3}{8}$ " 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 $\frac{3}{8}$ " x 1- $\frac{3}{4}$ " long bolts, four $\frac{3}{8}$ " washers and two $\frac{3}{8}$ " 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 $\frac{3}{8}$ " x 1- $\frac{1}{2}$ " long bolts, eight $\frac{3}{8}$ " washers and four $\frac{3}{8}$ " 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 $\frac{1}{2}$ " x $2\frac{1}{2}$ " long bolts, eight $\frac{1}{2}$ " washers, two $\frac{1}{2}$ " jam nuts and two $\frac{1}{2}$ " nuts (Item 11). Do not tighten the $\frac{1}{2}$ " 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 $\frac{3}{8}$ " 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.



SECTION 3: AUXILIARY INSTALLATIONS

STEERING WHEEL LOCK INSTALLATION	3-2
HYDRAULIC SYSTEM INSTALLATION	3-4
ELECTRICAL SYSTEM INSTALLATION	3-7
RAILGEAR SET-UP AND ADJUSTMENTS	3-10
PRE-DELIVERY CHECK LIST	3-13

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
	$\frac{3}{16}$ " Self-Tapping Screw x $\frac{3}{4}$ " Long	4
	$\frac{1}{4}$ " UNC Wing Nut	2

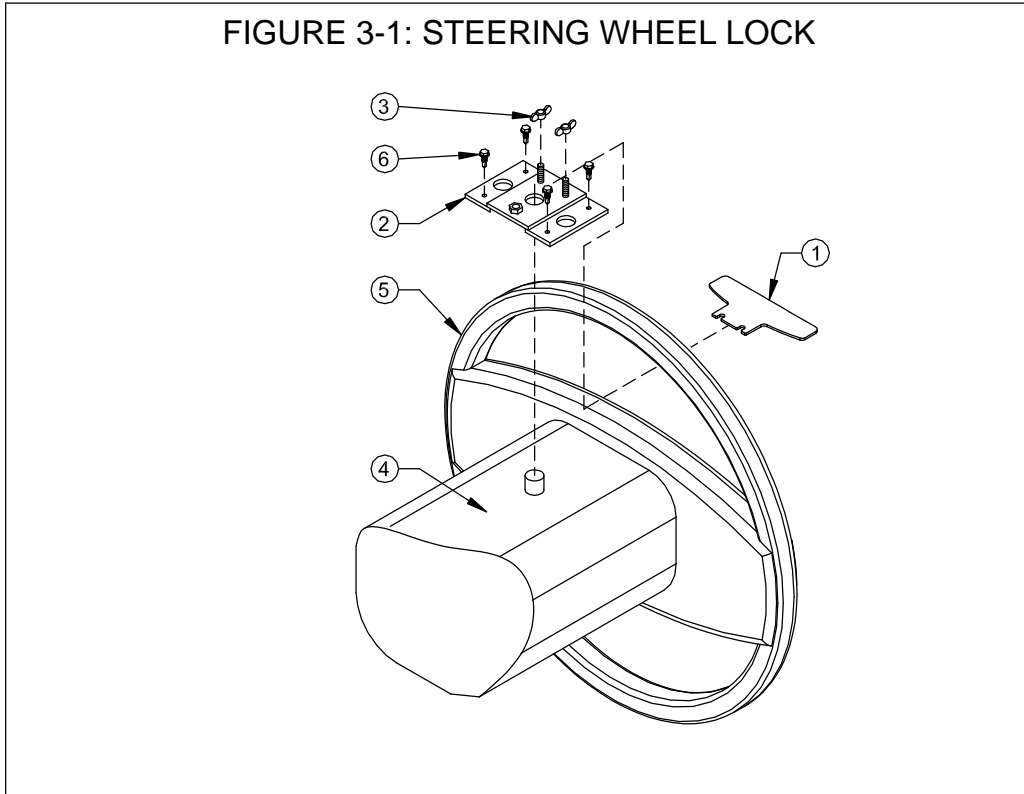
The following procedure details the steering wheel lock installation (refer to figure 3-1):

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 $\frac{1}{4}$ " 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 $\frac{3}{16}$ " x $\frac{3}{4}$ " 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.



2.0 HYDRAULIC SYSTEM INSTALLATION

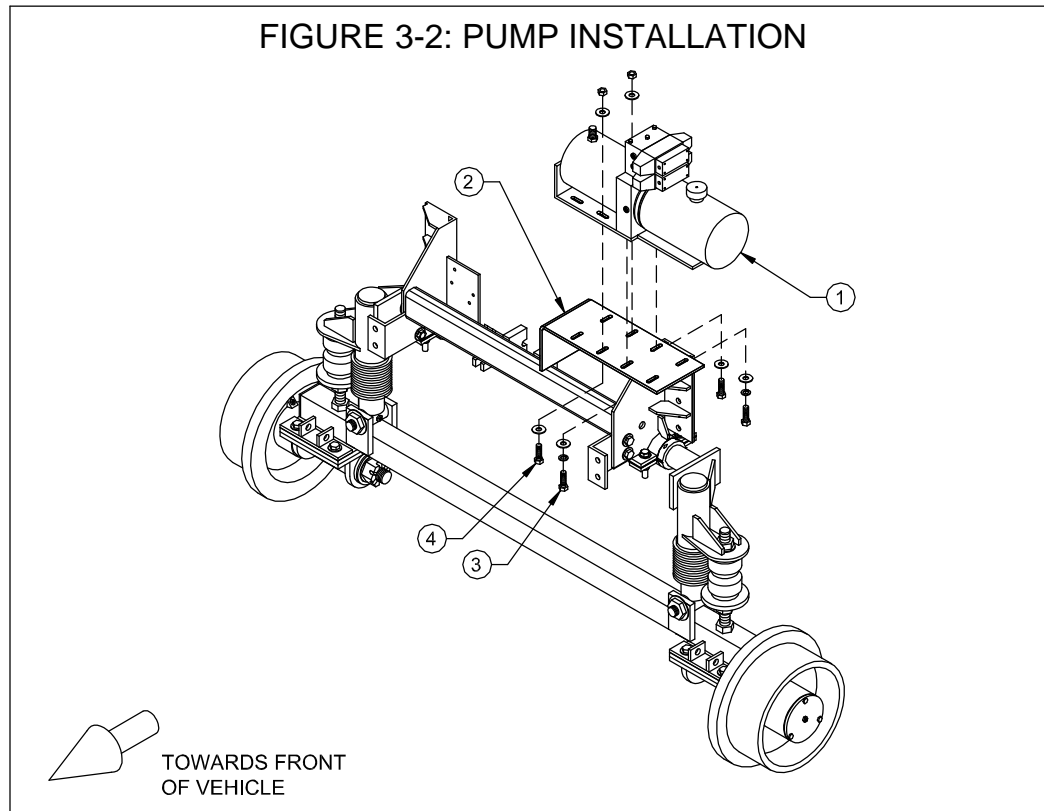
This section covers the installation of the pump and hoses. The hardware required for this installation is listed in table 3-2.

Table 3-2: Hydraulic System Installation Hardware

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

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

1. Install a $\frac{3}{8}$ " male O-Ring Boss to $\frac{1}{4}$ " 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 $\frac{3}{8}$ " x 1- $\frac{1}{4}$ " long bolts, two $\frac{3}{8}$ " washers and two $\frac{3}{8}$ " lock washers (Item 3) through the pump bracket and into the pump body. Fasten the pump bracket to the mounting bracket using two $\frac{3}{8}$ " X 1- $\frac{1}{4}$ " bolts, four $\frac{3}{8}$ " washers, and two $\frac{3}{8}$ " nuts (Item 4). Torque the $\frac{3}{8}$ " fasteners to 40 ft-lbs.



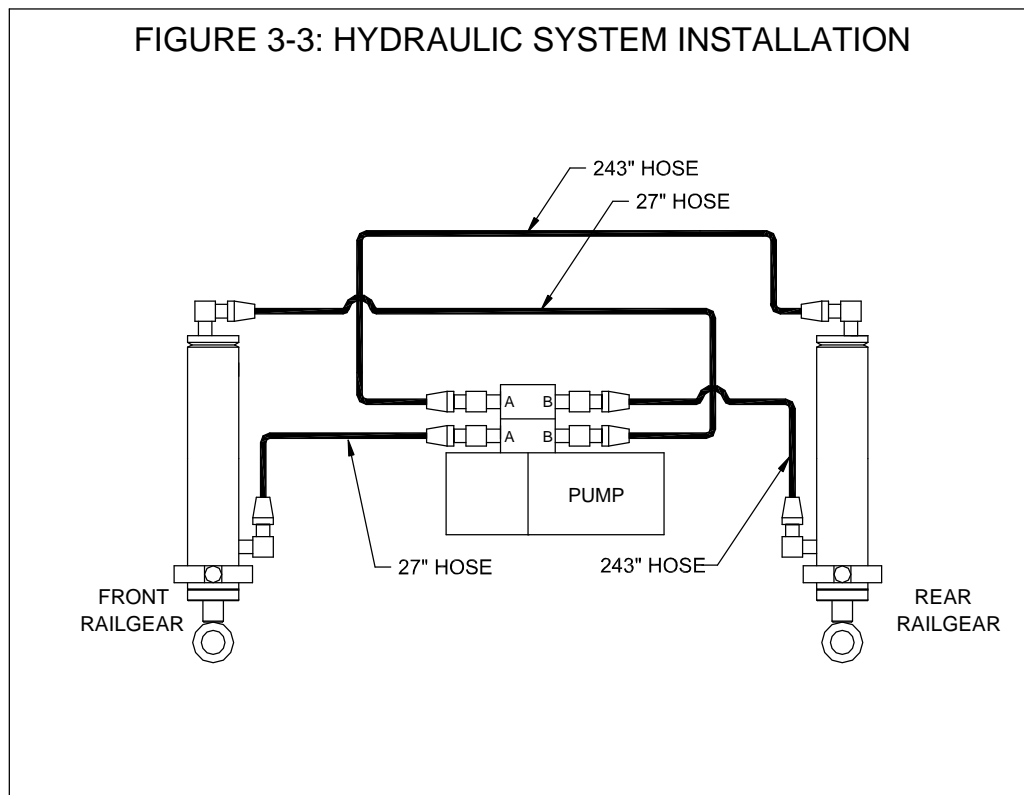
The following procedure details the hydraulic hose installation (refer to figure 3-3 or refer to the Operating, Service and Parts manual for more detailed hydraulic schematics):



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.



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):

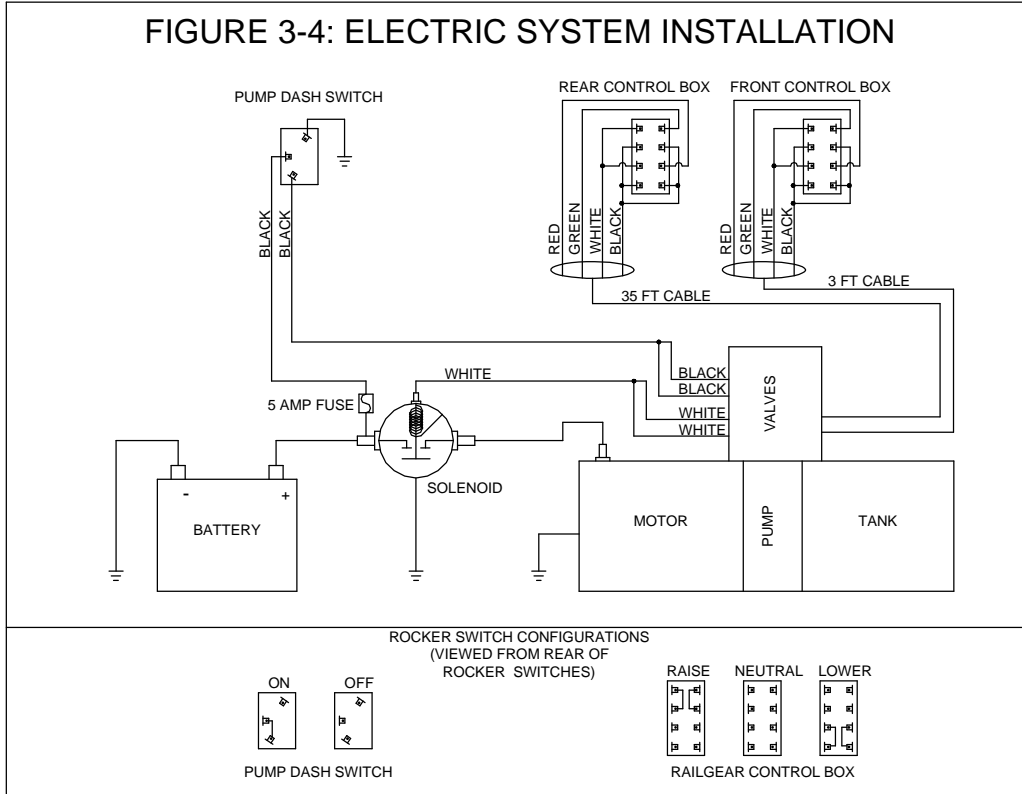


IMPORTANT:

- **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.

AUXILIARY INSTALLATIONS

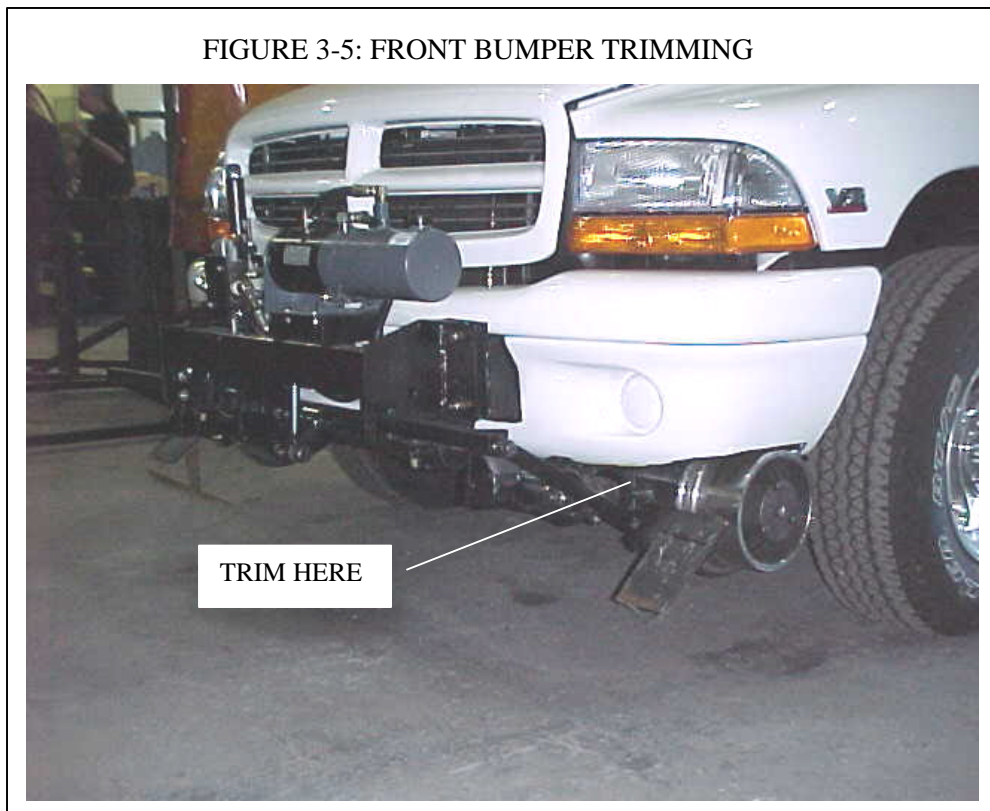


4.0 RAILGEAR SET-UP AND ADJUSTMENTS

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

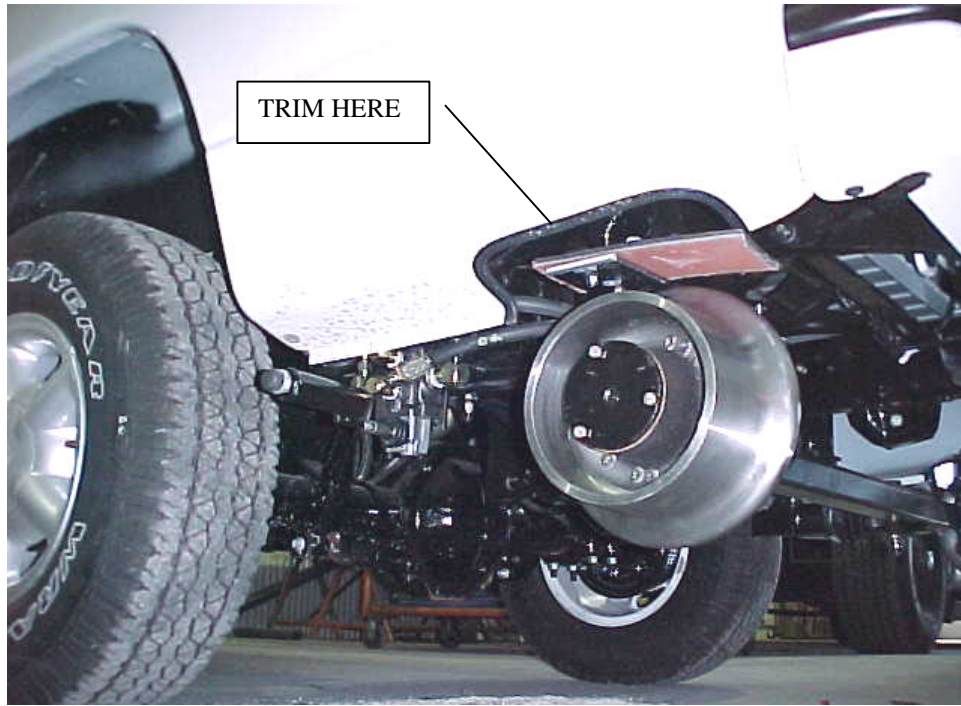


FIGURE 3-7: DURANGO REAR BUMPER TRIMMING



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 $\frac{1}{8}$ " 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 $\frac{1}{8}$ " 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- $\frac{1}{2}$ "
Distance rear rail wheel flange to ground			Min 7- $\frac{1}{2}$ "
Front and rear lock systems engage easily			

AUXILIARY INSTALLATIONS

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