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MODEL R-850

"CUSHION-RIDE" RAILGEAR INSTALLATION MANUAL

*"VERTICAL FRONT / ROTATING FRONT / VERTICAL FRONT
BEHIND CAB – VERTICAL REAR / ROTATING REAR"*

READ THIS MANUAL BEFORE INSTALLING RAILGEAR EQUIPMENT

Rafna Model Numbers:	CR-850-007
	CR-850-008
	CR-850-009
	CR-850-010
	CR-850-011
	CR-850-012
	CR-850-013
	CR-850-015
	CR-850-021
	CR-850-022

Note:

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

Please refer to the appendix prior to installing the railgear.

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

INITIAL PREPARATION

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INITIAL PREPARATION

SECTION 1: INITIAL PREPARATION

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1.0 SAFETY PRECAUTIONS



WARNING:

- **Installation instructions provided below only address the Rafna Industries railgear equipment. Applicable railway company procedures and polices, and safe shop practices 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.

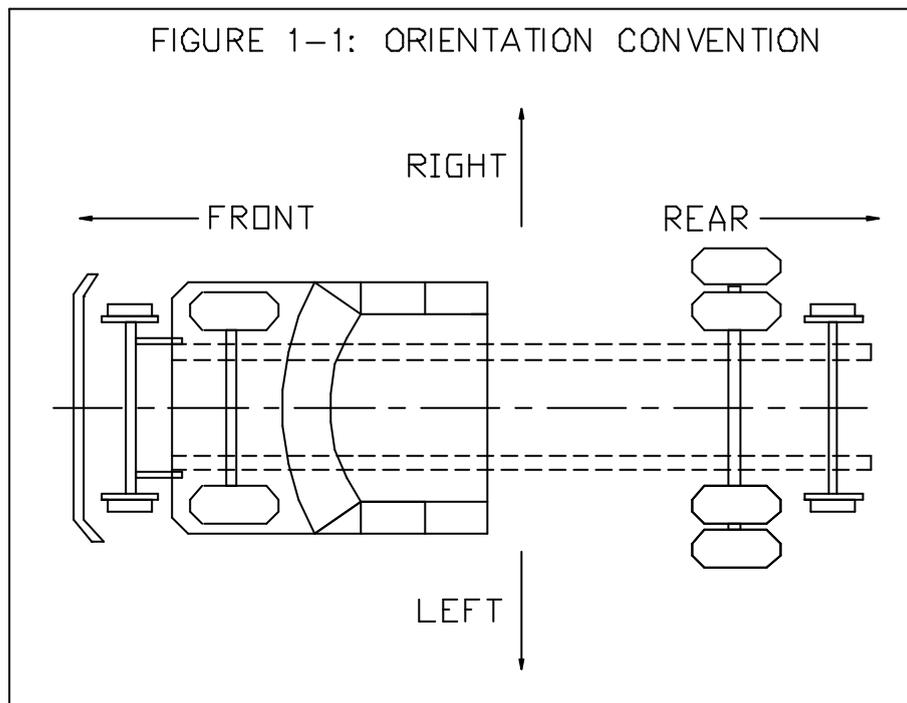
2.0 INSTALLATION PROCEDURE OVERVIEW

This manual covers the installation of the Rafna Industries R-850 railgear. There are three front railgear models available: vertical front, rotating front and vertical front behind cab. There are also two rear railgear models available: vertical rear and rotating rear. The Rafna Industries R-850 railgear is a hydraulically operated system applicable to vehicles of up to 80,000 lbs. G.V.W.R. Both front and rear units are hydraulically moved from rail to highway and highway to rail positions. The hydraulic power may be supplied either by the vehicle's own system or an optional auxiliary electrical hydraulic pump.

Before starting with the installation process, read the entire Operating, Service and Parts Manual, read the entire Installation Manual, and ensure that the Rafna Industries Warranty and Warranty Policy are clearly understood.

The installation procedure consists of first installing the front and rear railgear. The hydraulic installation follows 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. Relocate any equipment previously installed on the vehicle frame where the railgear must be installed. It may be necessary to relocate air reservoirs, fuel tanks, or other equipment.
3. Reroute wiring, hoses, etc., which run along the inside of the frame, which might interfere with the mounting of any of the railgear components.

SECTION 2: RAILGEAR INSTALLATION

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1.0 VERTICAL FRONT RAILGEAR INSTALLATION

This section covers the installation of the R-850 vertical front railgear. Note that the vehicle will require a front frame extension to install this railgear. The frame extension is not supplied with the package and should therefore be ordered with the vehicle.

The hardware required for this installation is listed in table 2-1.

Table 2-1: Vertical Front Railgear Installation Hardware

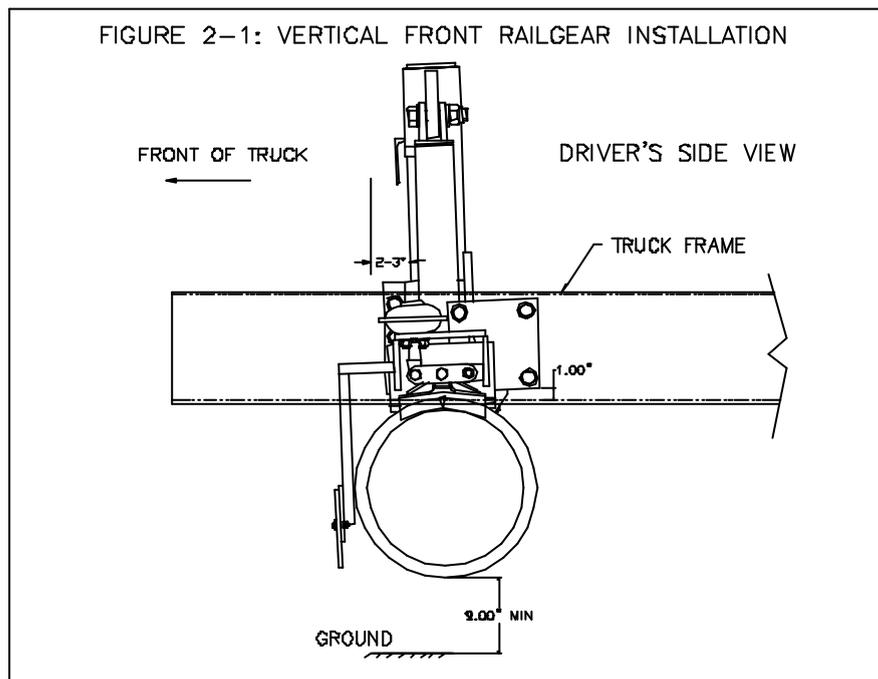
Part Number	Description	Qty
R-8845C	R-850 Vertical Front Railgear Assembly	1
R-8841	Rail Sweep	2
	3/4" UNC Gr. 8 Bolt x 3.25" Long	8
	3/4" Gr. 8 Washer	16
	3/4" UNC Gr. 8 Nylon Insert Lock Nut	8

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

1. Remove the front bumper from the front frame extension.
2. The railgear is slid into the front frame extension and bolted to the frame extension. The outer width of the front railgear mounting plates is 33". Measure the inside width of the vehicle front frame extension. If necessary, fabricate shims so that the railgear mounting plates will fit snug inside the frame rails. The same amount of shim material should be used on either side of the frame in order to center the railgear on the vehicle.
3. Place the assembled railgear in front of the truck with the mechanical locking handle facing towards the front of the truck.
4. Raise the railgear up in front of the frame extensions and slide it rearward between the frame rails. Position the railgear assembly as close to the front grill as possible while still leaving room for the hood to open around the railgear (fixed grill application). Note on butterfly hood applications, the railgear should be mounted as close to the grill as possible. Pivot the railgear so that it is inclined forward 2-3° (top ahead of the bottom) and position it so that the bottom of the mounting plate is about 1" above the lower radius in the frame rail.
5. With the necessary shims in place and the correct position, clamp the railgear in this position.
6. Drill four 0.781" diameter holes through the frame, shims, and each railgear mounting plate at each corner of the mounting plate. The holes should be about 1" from each edge of the mounting plates.

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7. Fasten the railgear to the frame of the truck using eight $\frac{3}{4}$ " x 3.25" long fasteners through the holes drilled previously. Torque the eight $\frac{3}{4}$ " fasteners to 175 ft-lbs.
8. Position each rail sweep in front of each rail wheel such that the rubber sweep is about $\frac{1}{8}$ " higher than the tread of the rail wheel when the rubber sweep is in the middle of its adjustment range. The end of the rail sweep bracket should be butted up against the brake housing and the rail sweep should be perpendicular to the rail.
9. Weld the rail sweep bracket to the brake housing all around.
10. Re-install the original front bumper in front of the railgear. It may be necessary to make new brackets between the bumper and the frame.
11. Weld a piece of $\frac{3}{8}$ " key stock to the railgear lock up hook mounting assembly to limit the rotation of the railgear lock up hook. The hook should be able to rotate out of the way to unlock, but should be limited from rotating rearward where it could come over the railgear axle and get jammed as the railgear raises to the highway position.



2.0 ROTATING FRONT RAILGEAR INSTALLATION

This section covers the installation of the R850 rotating front railgear. Note that the vehicle will require a front frame extension to install this railgear. The frame extension is not supplied with the package and should therefore be ordered with the vehicle.

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

Table 2-2: Rotating Front Railgear Installation Hardware

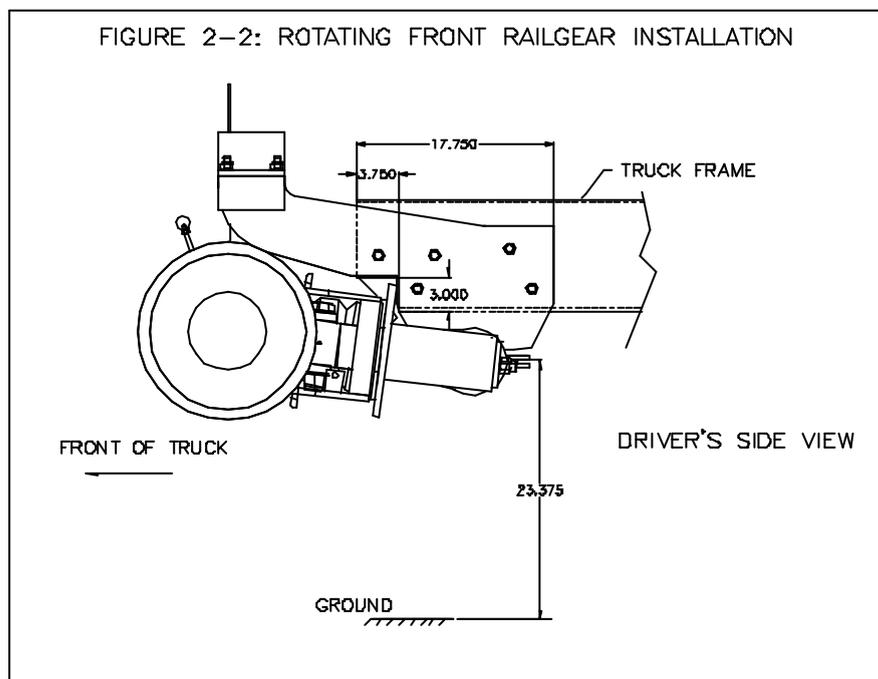
Part Number	Description	Qty
R-8550D	R-850 Rotating Front Railgear Assembly	1
R-8501	14" Rail Wheel	2
R-8570L	Rail Sweep Left Side	1
R-8570R	Rail Sweep Right Side	1
R-8544P	Air Brake Package Right Side	1
R-8544D	Air Brake Package Left Side	1
	5/8" UNC Gr. 8 Bolt x 2.5" Long	18
	5/8" Gr. 8 Washer	36
	5/8" UNC Gr. 8 Nylon Insert Lock Nut	18

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

1. Remove the front bumper from the front frame extension.
2. For ease of shipment, the railgear is shipped assembled by Rafna Industries. For installation it must be partially disassembled as follows: remove the cylinders, upper cylinder frame, and side mounting plates from the railgear. Retain all parts for re-assembly. Refer to the parts section of the Operating, Service, and Parts Manual for order of re-assembly.
3. Position the mounting plates against the outside of the front frame extensions as far rearward as possible (against the front spring hanger) with the center of the bearing housing about 23-3/8" above the ground on an unloaded chassis. Ensure that the hood can still open completely, that the mounting plates are level and that the bearing housings are in line with each other. Mark and cut the frame extensions as shown in Figure 2-2. Clamp the mounting plates back in place. Each mounting plate must be fastened in place with five 5/8" x 2.5" long fasteners. Use existing holes if possible, or drill five 11/16" diameter holes through each mounting plate and the frame. Install and torque the 5/8" fasteners to 150 ft-lbs.
4. Install the split bearings into the bearing housings and caps. Position the railgear lower assembly under the mounting plates with the small keystone on the underside of the axle facing rearward. Raise the railgear into the bearings and install the bearing caps.

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5. Make sure that the split bearings are in place and snug the bolts on the bearing caps. Do not torque as this will be done following the railgear alignment.
6. Re-install the upper cylinder frame and hydraulic cylinders with the hydraulic fittings facing upwards. Torque all fasteners to specifications.
7. Position the rail wheel assemblies below each wheel alignment table on the front railgear axle. Place the air brake assemblies on top of the wheel mounting tables with the air chambers towards the front of the vehicle.
8. Using eight 5/8" x 2.5" fasteners, secure the rail wheels and air brake assemblies to the wheel alignment tables. Tighten but do not torque the 5/8" bolts yet as they will be torqued following the alignment procedure.
9. Position each rail sweep in front of each rail wheel such that the rubber sweep is about 1/8" higher than the tread of the rail wheel when the rubber sweep is in the middle of its adjustment range. The end of the rail sweep bracket should be butted up against the air brake housing and the rail sweep should be perpendicular to the rail.
10. Weld the rail sweep bracket to the air brake housing all around.
11. Re-install the original front bumper in front of the railgear. It may be necessary to make new brackets between the bumper and the frame.



3.0 VERTICAL FRONT BEHIND CAB RAILGEAR INSTALLATION

This section covers the installation of the R-850 vertical front behind cab railgear.

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

Table 2-3: Vertical Front Behind Cab Railgear Installation Hardware

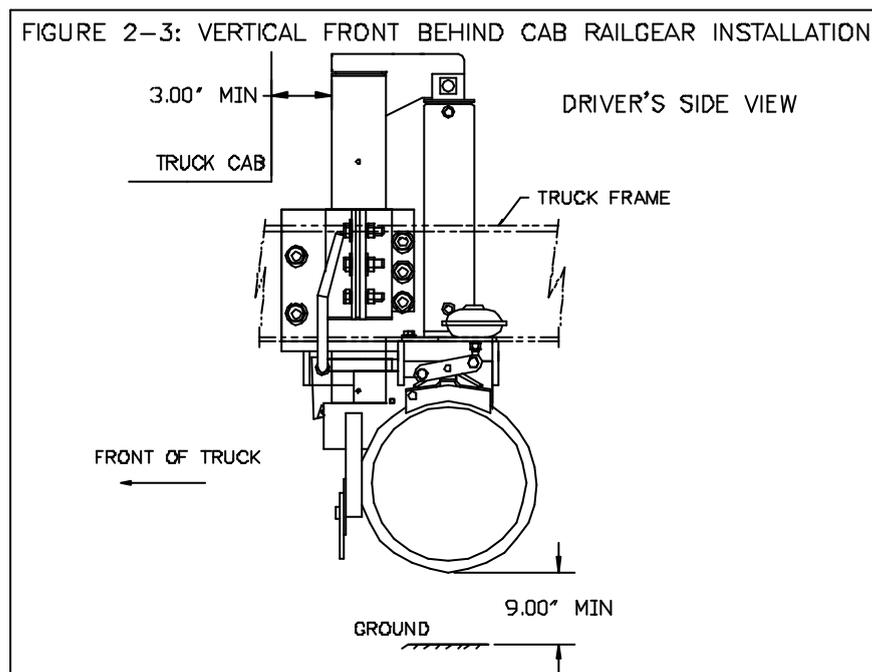
Part Number	Description	Qty
R-8678B	R-850 Vertical Front Behind Cab Railgear Assembly	1
R-8501	14" Rail Wheel Assembly	2
R-8631AL	Front Rail Sweep (Left Side)	1
R-8631AR	Front Rail Sweep (Right Side)	1
R-6610C	3/8" x 3/8" Square Bar x 2 1/2" long	2
	3/4" UNC Gr. 8 Bolt x 3" Long	10
	3/4" Gr. 8 Washer	20
	3/4" UNC Gr. 8 Nylon Insert Lock Nut	10
	5/8" UNC Gr. 8 Bolt x 2.25" Long	8
	5/8" Gr. 8 Washer	16
	5/8" UNC Gr. 8 Nylon Insert Lock Nut	8

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

1. Measure the width of the truck frame just behind the cab. The dimension between the front railgear mounting plates is 34 3/4". If necessary, fabricate shims so that the railgear mounting plates will fit snug to the frame. The same amount of shim material should be used on either side of the frame.
2. Place the assembled railgear under the frame of the truck with the hydraulic cylinders towards the rear of the truck and the inner/outer tubes towards the front of the truck.
3. Raise the railgear up to the frame and position it as close to the cab as possible while maintaining a minimum behind cab clearance of 3". The railgear should be perpendicular to the frame rails. The flanges of the railgear mounting plates should contact the lower frame rail flanges.
4. With the necessary shims in place, clamp the railgear in this position.
5. Using the railgear mounting plates as templates, drill five 25/32" diameter holes through the frame and shims on either side of the truck.
6. Fasten the railgear to the frame of the truck using ten 3/4" fasteners through the holes drilled previously. Torque the ten 3/4" fasteners to 175 ft-lbs.
7. Position the rail wheel assemblies below each wheel alignment table on the front railgear axle.

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8. Using eight 5/8" fasteners, secure the rail wheels to the wheel alignment tables. Tighten but do not torque the 5/8" bolts yet as they will be torqued following the alignment procedure.
9. Position each rail sweep in front of each rail wheel such that the rubber sweep is about 1/8" higher than the tread of the rail wheel when the rubber sweep is in the middle of its adjustment range. The end of the rail sweep bracket should be butted up against the lower inner tube framing and the rail sweep should be perpendicular to the rail.
10. Weld the rail sweep bracket to the lower inner tube framing all around.
11. Weld a piece of 3/8" key stock to the mounting plates to limit the rotation of the each railgear lock up hook. The hooks should be able to rotate out of the way to unlock, but should be limited from rotating rearward where they could come over the railgear axle and get jammed as the railgear raises to the highway position.



4.0 VERTICAL REAR RAILGEAR INSTALLATION

This section covers the installation of R-850 vertical rear railgear.

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

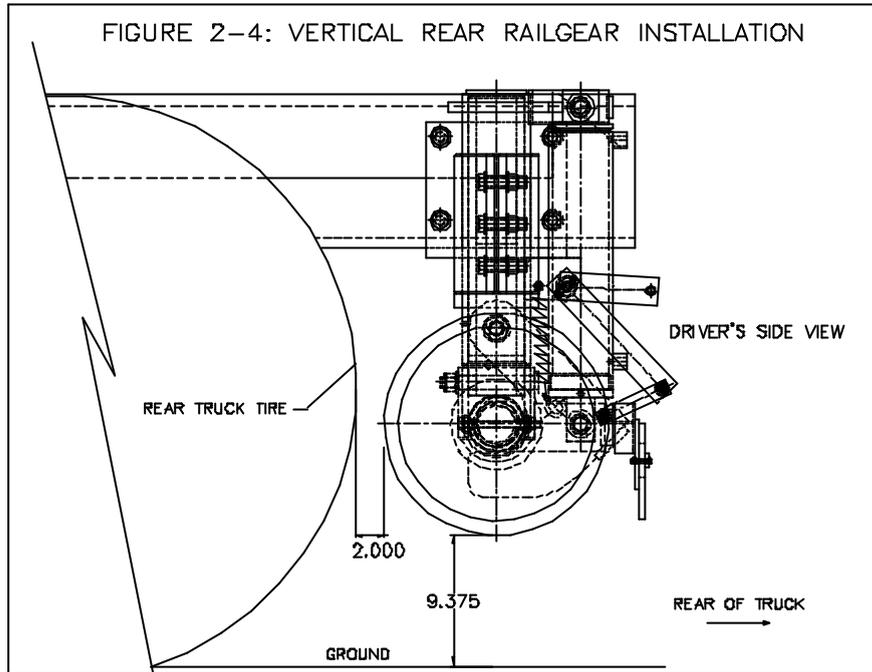
Table 2-4: Vertical Rear Railgear Installation Hardware

Part Number	Description	Qty
R-8765E	R-850 Vertical Rear Railgear Assembly	1
R-8767L	Rear Rail Sweep (Left Side)	1
R-8767R	Rear Rail Sweep (Right Side)	1
	¾" UNC Gr. 8 Bolt x 4" Long	8
	¾" Gr. 8 Washer	16
	¾" UNC Gr. 8 Nylon Insert Lock Nut	8

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

1. Measure the width of the truck frame just behind the rear axle. The dimension between the rear railgear mounting plates is 36 ¼". If necessary, fabricate shims so that the railgear mounting plates will fit snug to the frame. The same amount of shim material should be used on either side of the frame.
2. Place the assembled railgear under the frame of the truck with the hydraulic cylinders towards the rear of the truck and the inner/outer tubes towards the front of the truck.
3. Raise the railgear up to the frame behind the rear axle and position it as close to the rear axle as possible while maintaining a minimum tire to railgear clearance of 2". The railgear should be perpendicular to the frame rails. The flanges of the railgear mounting plates should contact the lower frame rail flanges.
4. With the necessary shims in place, clamp the railgear in this position.
5. Drill four 25/32" diameter holes through the railgear mounting plate, frame and shims on either side of the truck.
6. Fasten the railgear to the frame of the truck using eight ¾" fasteners through the holes drilled previously. Torque the eight ¾" fasteners to 175 ft-lbs.
7. Position each rail sweep behind each rail wheel such that the rubber sweep is about 1/8" higher than the tread of the rail wheel when the rubber sweep is in the middle of its adjustment range. The end of the rail sweep bracket should be butted up against the lower cylinder attachment framing and the rail sweep should be perpendicular to the rail.
8. Weld the rail sweep bracket to the lower cylinder attachment framing all around.

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5.0 ROTATING REAR RAILGEAR INSTALLATION

This section covers the installation of the R-850 rotating rear railgear.

The hardware required for this installation is listed in table 2-5.

Table 2-5: Rotating Rear Railgear Installation Hardware

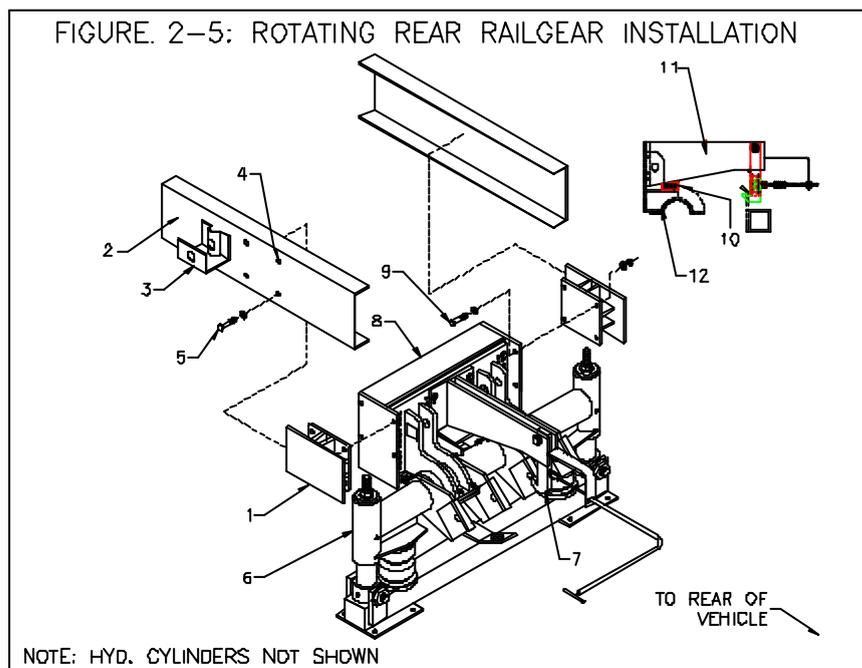
Part Number	Description	Qty
R-8855	Rotating Rear Railgear Assembly	1
R-8501	12" Wheel Assembly	2
R-8787D	Optional Air Brake Assembly Left Side	1
R-8787P	Optional Air Brake Assembly Right Side	1
R-8631R	Rail Sweep Right Side (no rear air brake option only)	1
R-8631L	Rail Sweep Left Side (no rear air brake option only)	1
R-8570R	Rail Sweep Right Side (with rear air brake option only)	1
R-8570L	Rail Sweep Left Side (with rear air brake option only)	1
R-6866	Wedge	1
R-6797	Over Center Stops	2
R-6610C	3/8" x 3/8" Square Bar x 2 1/2" long	1
	5/8" UNC Gr. 8 Bolt x 2.5" Long	16
	5/8" Washer	32
	5/8" UNC Nylon Insert Lock Nut	16

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

1. For ease of shipment, the railgear is shipped assembled by Rafna Industries. For installation it must be partially disassembled as follows: remove the side mounting plates from the railgear. Retain all parts for re-assembly. Refer to the parts section of the Operating, Service, and Parts Manual for order of re-assembly.
2. Position the mounting brackets (1) against the inside of the frame (2) just behind the rear spring hanger (3) and 1" above the bottom of the frame. If any cross-members are in the way, they may be removed or relocated as the railgear itself acts as a reinforced cross-member.
3. Clamp the mounting brackets to the frame such that they are level and in line with each other. Ensure that there is 26" between the inner faces of the two mounting brackets. If necessary fabricate shims and insert them between the frame and the mounting brackets to obtain the 26" measurement.
4. Drill four 11/16" diameter holes (4) through the frame and each mounting bracket. Use existing holes if possible. Bolt the mounting brackets to the frame using 5/8" x 2.5" fasteners (5).
5. Position the assembled railgear (6) below the mounting brackets with the lock-up hook (7) facing rearward. Jack the railgear up between the mounting brackets until

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- the holes in the mounting plate assembly (8) align with the holes in the mounting brackets. Bolt the railgear in place with 5/8" fasteners (9).
6. Insert and weld the supplied wedge (10) between the hook support bracket (11), and the railgear adjustment plate assembly (12).
 7. Torque all 5/8" fasteners to 150 ft-lbs.
 8. Locate and fabricate a bracket to hold the locking hook handle. Note that the lock hook handle should be located near to where the rear hydraulic operating valve will be situated.
 9. Place the rail wheels below the mounting tables on the railgear axle.
 10. **On Rotating Rear Railgear With Rear Railgear Brake Option:** Place the air brake assemblies on top of the wheel mounting tables with the air chambers towards the front of the vehicle.
 11. Secure the rail wheels and optional air brake housings to the mounting tables with 5/8" x 2.5" fasteners. Do not torque the 5/8" fasteners as this will be done after the railgear alignment procedure.
 12. Place the rail sweeps to the rear of each rear wheel and butted up against the inner tube support lug or optional air brake housing. Adjust the position of the rail sweep so that it is in line with the rail wheel and such that the rubber will be close to the rail



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yet still allow for adjustment as the rubber wears. Weld the rail sweep to the inner tube lug or optional air brake housing all around.

FRONT AXLE LOCK-UP SYSTEM INSTALLATION

This section covers the installation of the front axle lock-up system.

The hardware required for this installation is listed in table 2-6.

Table 2-6: Front Axle Lock-Up Installation Hardware

Part Number	Description	Qty
R-6712	Axle Lock-Up Bracket	2
R-6711	Axle Lock-Up Hook Extension	2
R-5682	Axle Lock-Up Hydraulic Cylinder	1
R-6710	Axle Lock-Up Hook	2
R-5635	Plastic Washer	4
R-6610C	3/8" x 3/8" Square Bar x 2.5" Long	2
	3/8" UNC Gr. 8 Bolt x 2" Long	6
	3/8" Washer	12
	3/8" UNC Nylon Insert Lock Nut	6
	1/2" UNC Gr. 8 Bolt x 2 1/4" Long	4
	1/2" Washer	8
	1/2" UNC Nylon Insert Lock Nut	4
	3/4" UNC Gr. 8 Bolt x 2.5" Long	2
	3/4" UNC Gr. 8 Bolt x 3.5" Long	2
	3/4" Washer	8
	3/4" UNC Nylon Insert Lock Nut	4

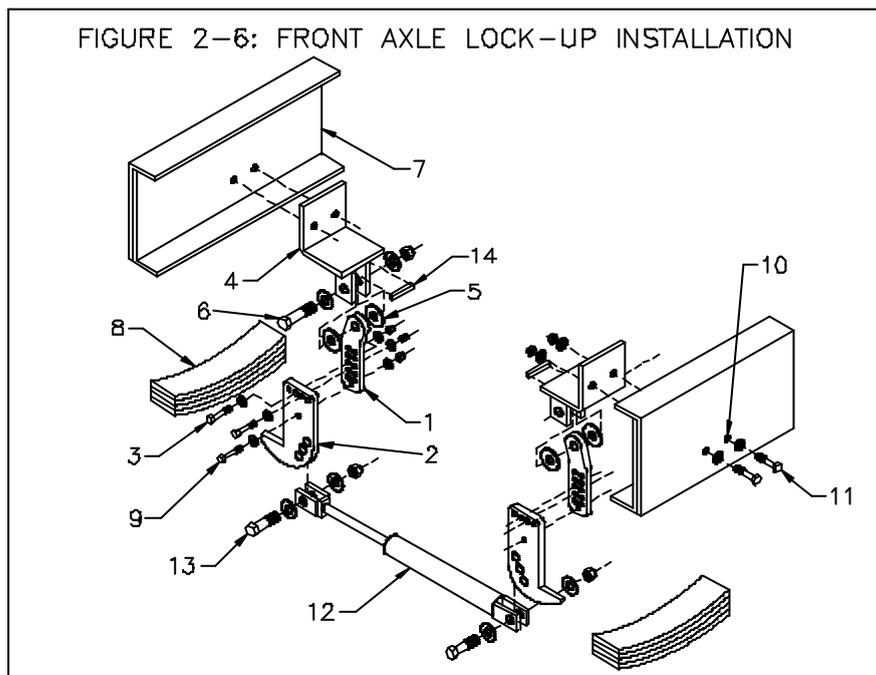
The following procedure details the front axle lock-up installation: (refer to figure 2-6)

1. Assemble the hook extension (1) and the hook (2) with two 3/8" fasteners (3) each and torque to 40 ft-lbs. A third 3/8" fastener is installed following verification of hook location.
2. Install the hook assemblies into the axle lock-up brackets (4) with a plastic washer (5) on each side using two 3/4" x 3.5" long fasteners (6). Do not torque, as the hooks must be free to swing.
3. Position the axle lock-up brackets and hooks on the inside of the frame (7) such that the hooks will hang down about 2.5" rearward of the front axle. (Note: some trucks, i.e., Kenworth, do not have the required clearance rearward of the front axle in this case it is recommended to install the axle lockup just ahead of the front axle). Ensure that the hooks will be able to go under the springs (8) by about 1/2" and that they will move unobstructed. Ensure that the hydraulic cylinder will not hit anything once installed, and with the hooks extended and retracted. Adjust the hooks in the hook extensions as necessary then drill the hooks to accept the third 3/8" fastener (9).

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4. Clamp the brackets in this position and drill two 17/32" diameter holes (10) through each bracket and frame rail. Fasten the brackets in place with two 1/2" fasteners (11) each. Torque to 100 ft-lbs.
5. Install the axle lock-up cylinder (12) between the two hooks with the hydraulic fittings facing forward using two 3/4" x 2.5" long fasteners (13). Do not torque, as the hooks must be free to move.
6. Retract the hydraulic cylinder completely and ensure that the hooks do not interfere with the vehicle suspension in this position.
7. With the cylinder fully retracted, weld the 3/8" square bars (14) to the inside of the brackets to limit the hook's inward swing.



SECTION 3: AUXILIARY INSTALLATIONS

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1.0 INTERNATIONAL & FREIGHTLINER W/ TELESCOPING STEERING COLUMN STEERING LOCK INSTALLATION

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-050C	Steering Column Brace (International Only)	1
R-5903	Steering Column Brace (Freightliner Only)	1
R-6506	Steering Wheel Lock (International Only)	1
R-5902	Steering Wheel Lock (Freightliner Only)	1
R-2586B	Spring Pin (International Only)	1
	#10 x 1/2" Long Self Tapping Screw	2

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

1. Install the steering column brace (1) on the steering column so that the bracket is upwards. Tighten the hose clamp snug.
2. Insert the steering wheel lock (2) into the steering column brace and secure with the spring pin (3) (not require on Freightliner). Position the steering column brace so that the lock positively engages the steering wheel (4).
3. Tighten the hose clamp and use two #10 self-tapping screws to fasten the steering column brace in place.
4. Remove the spring pin (not on Freightliner) and steering wheel lock and store them in the glove box.

2.0 FREIGHTLINER NON-TELESCOPING STEERING WHEEL LOCK INSTALLATION

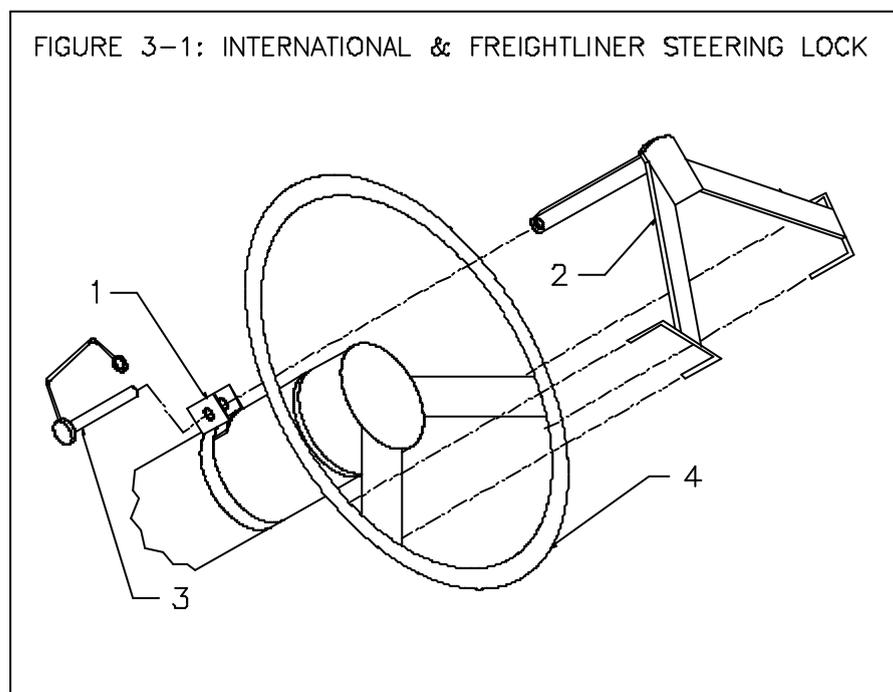
The hardware required for this installation is listed in table 3-2.

Table 3-2: Steering Wheel Lock Installation Hardware

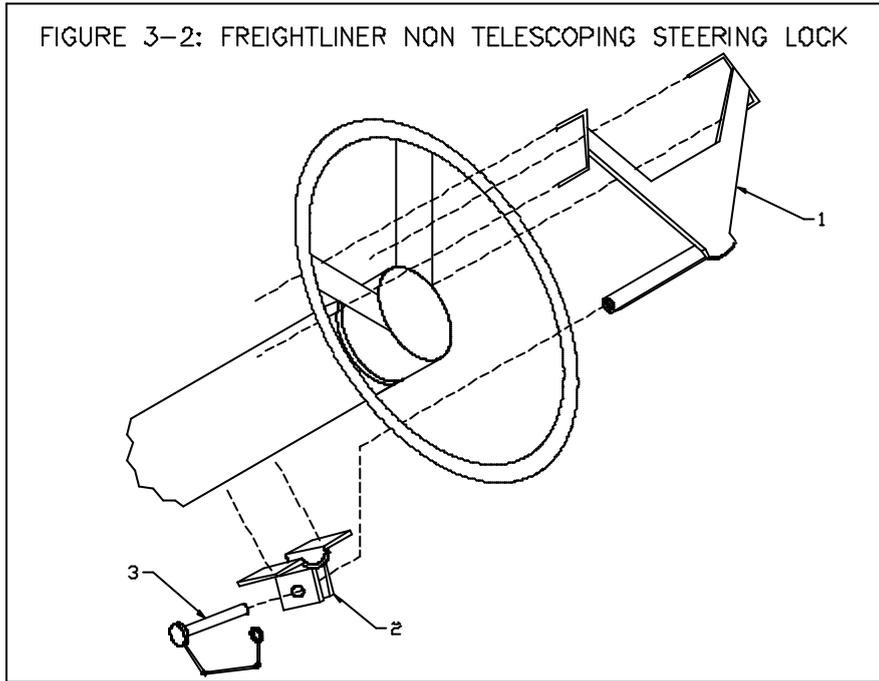
Part Number	Description	Qty
R-5898	Steering Column Brace	1
R-5899	Steering Wheel Lock Bracket	1
R-2586B	Spring Pin	1

The following procedure details the steering wheel lock installation: (refer to figure 3-2)

1. Insert the steering wheel lock bracket (1) into the steering wheel webs with the long arm on the rear side of the steering column. Position the steering column brace (2) so that the holes in the brace align with the hole in the steering wheel lock bracket and insert the spring pin (3).
2. The two holes in the steering column brace should now align with existing steering column bolts. Remove these bolts, position the steering column brace over the factory holes and re-install the bolts.
3. Remove the spring pin and steering wheel lock bracket. Re-install the spring pin and store the steering lock bracket in a safe spot.



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3.0 KENWORTH NON-TELESCOPING STEERING WHEEL LOCK INSTALLATION

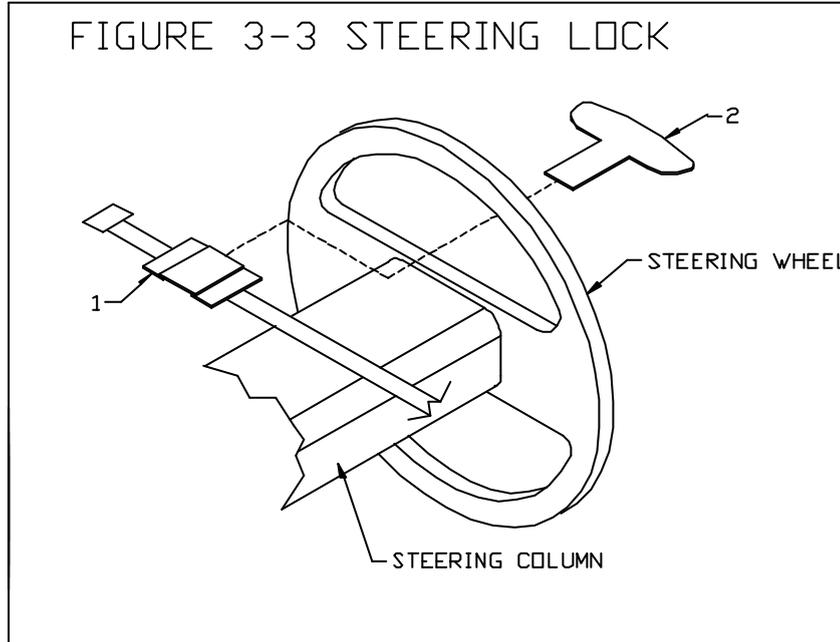
The hardware required for this installation is listed in table 3-3.

Table 3-3: Steering Wheel Lock Installation Hardware

Part Number	Description	Qty
R-8742A	Steering Column Brace	1
R-8742B	Steering Wheel Lock Bracket	1

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

4. Position the steering wheel lock bracket (1) onto the steering column with the straps extending either side of the column. Position the steering wheel lock brace (2) so that end can be easily inserted into the bracket (1). Ensure the brace (2) and the bracket (1) does not interfere with any of the components needed to operate the truck (i.e., hazard lights, turn signal, air bag, etc.).
5. Tighten the strap around the steering column, cutting off any extending length that may interfere.



4.0 HYDRAULIC SYSTEM INSTALLATION

This section covers the installation of the hydraulic system. Certain hydraulic hoses are already installed on the railgear as delivered. Refer to the appropriate hydraulics schematic in the parts section of the Operating, Service, and Parts Manual.

The following procedure details the hydraulic system installation:



IMPORTANT:

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

1. Install the front railgear hydraulics:

Vertical Front and Rotating Front Railgear Models:

- a) The only hydraulic installation required is to connect the axle lock up system hydraulics as per the hydraulic schematics.
- b) Ensure that the rod end of the axle lock up cylinder is connected to the ball valve located on the railgear assembly.

Vertical Front Behind Cab Railgear Models:

- a) The only hydraulic installation required is to mount and connect the operating valve, and to connect the axle lock up system hydraulics as per the hydraulic schematic.
- b) Ensure that the rod end of the axle lock up cylinder is connected to the ball valve located on the railgear assembly.

2. Install the rear railgear hydraulics:

Rotating Rear Railgear Models:

- a) The only hydraulic installation required is to mount and connect the operating valve as per the hydraulic schematic.
- b) Ensure that the operating valve is located within arm length from the rear railgear lock up cable.

Vertical Rear Railgear Models:

- a) The only hydraulic installation required is to mount and connect the operating valve, and to mount and connect the nitrogen over oil accumulator system hydraulics as per the hydraulic schematic.
- b) Ensure that the operating valve is located within arm length from the rear railgear lock up handle.

RAILGEAR INSTALLATION

3. Connect the front and rear railgear to the vehicle's hydraulic system:
 - a) The railgear should be supplied with 3-5 GPM of hydraulic oil at 2000 PSI.
 - b) Make to fit a suitable 3/8" hydraulic hose assembly to connect the front operating valve pressure port to the hydraulic pump pressure port through a main relief valve.
 - c) Make to fit a suitable 3/8" hydraulic hose assembly to connect the front operating valve tank port to the rear operating valve pressure port.
 - d) Make to fit a suitable 3/8" hydraulic hose assembly to connect the rear operating valve tank port to the hydraulic tank return line filter.

4. Ensure the railgear hydraulics are connected as per the schematics in the Operating, Service, and Parts Manual.

5.0 PREPARATIONS FOR OPERATION

This section covers the preparation of the vehicle before having it put in service.

1. Connect the each rail wheel air brake system to the respective vehicle wheel air brake line. Use only DOT approved air brake hose and fittings.
2. Adjust each brake pad to rail wheel to a clearance of 1/8" by adjusting the air brake chamber clevis up or down on the threaded actuator rod. It may be necessary to trim the extra length off the threaded actuator rod. Following adjustment the rail wheel should be free to turn, i.e. no brake drag.
3. **On Vertical Rear Railgear Models:** Charge the accumulator to 175 PSI of nitrogen.
4. Fill the hydraulic system and bleed the air out:
 - a) Fill the hydraulic 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 hydraulic pump tank and repeat step b) until all air is removed from the front hydraulic system. (the fluid level will be constant)
 - 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 hydraulic pump tank and repeat step d) until all air is removed from the rear hydraulic system. (the fluid level will be constant)
5. Perform the Hydraulic Relief Valve Setting Adjustment Procedure detailed in the Operating, Service and Parts Manual.
6. **On Vertical Rear Railgear Models:** Adjust the rear railgear up or down in the guide tube clamps such that there is a minimum of 9-3/8" clearance between the bottom of the rail wheel and the ground, when in the highway position, and such that when on rail with the railgear supported on the stiff legs, there is 7-10" of vehicle rear tire contact with the rail. Note that the length of the stiff legs may be adjusted by adding or removing shims. Position the half moon stoppers against the outside of the outer guide tubes and snug up against the bottom of the guide tube clamps. Stitch weld the stoppers to the guide tubes.
7. **On Vertical Front & Vertical Front Behind Cab Railgear Models:** Adjust the front railgear up or down in the guide tube clamps such that there is a minimum of 9" clearance between the bottom of the rail wheel and the ground when in the highway position and also a minimum of 3" clearance between the bottom of the truck front tires and the rail head when on rail. Position the half moon stoppers against the

outside of the outer guide tubes and snug up against the bottom of the guide tube clamps. Weld the stoppers to the guide tubes.

8. Perform the Railgear and Rail Wheel Alignment Procedure detailed in the Operating, Service and Parts Manual. Be sure to torque the railgear mounting bolts and the rail wheel mounting bolts to specifications following the alignment procedure.
9. **On Rotating Front Railgear Models:** With the railgear alignment completed and the railgear centered on the vehicle, deploy the rear railgear completely and rotate the front railgear down into the rail position and set it at 2-3° over center. Position the railgear over center stops (R-8579) on the railgear cross frame just outboard of the pivot bearings. Position the rotational stop bars (R-8579C) and gussets (R-8579B) against the outside of the railgear mounting plates. The rotational stop bars should contact the over center stops and prevent the railgear from rotating beyond 2-3° over center. Also, the over center stops should prevent the railgear lower assembly from moving side to side in the pivot bearings. Weld the over center stops to the cross frame and weld the rotational stop bars and gussets to the railgear mounting plates.
10. **On Rotating Rear Railgear Models:** With the railgear alignment completed and the railgear centered on the vehicle, deploy the front railgear completely and rotate the rear railgear down into the rail position and set it at 2-3° over center. Position the over center stops (R-6797) on the cross frame inboard of the pivot bearings. The over center stops should contact the mounting plate assembly stopper reinforcement prevent the lower railgear assembly from moving side to side and from rotating beyond 2-3° over center. Weld the over center stops to the cross frame.
11. Check for lubrication at all lubrication points detailed in the Operating, Service and Parts Manual.
12. Check for correct bolt torque values as detailed in the Operating, Service, and Parts Manual.
13. Adjust all rail sweeps have 1/8" clearance from the track by loosening the rubber sweep retaining bolts and adjusting as necessary. Be sure to tighten the rubber sweep retaining bolts following adjustment.
14. Install the steering wheel lock decal on the dash.
15. Place the Operating, Service, and Parts manual in the cab of the truck for the operator.
16. Complete the Installation Check List in the following section to make sure nothing has been forgotten.
17. Read the entire Operating, Service, and Parts Manual before attempting operation of the railgear equipped vehicle.

RAILGEAR INSTALLATION

RAFNA R-850 PREDELIVERY CHECK LIST			
Railgear Serial #:		Vehicle Year:	
Model:		Vehicle Make:	
Date Received:		Vehicle Model:	
Date Completed:		Vehicle V.I.N. :	
Installed By:		Inspection By:	
Check List Item	Approved/Value	Remarks	
Hydraulics connected as per schematics			
Hydraulic system bled of air			
Hydraulic pump relief set at 2000 PSI			
Front Operating valve relief set at 1800 PSI			
Rear Operating valve 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			
Rail sweeps installed			
Railgear alignment completed			
Distance between front tire and rail head		3" Minimum	
Distance between rail wheel flanges		53-7/16" to 53-1/2"	
Front rail wheels			
Rear rail wheels			
Rail sweeps adjusted 1/8" above track			
Rail wheel brake clearance adj. to 1/8"			
Steering wheel lock system installed			
Rail wheel bearings end-play adjusted			
Distance front rail wheel flange to ground		Min 9"	
Distance rear rail wheel flange to ground		Min 9.375"	
Vertical railgear half moon stoppers welded to outer tubes		Front & Rear	
Rotating railgear over center stops weld on		Front & Rear	
Front and rear lock systems engage easily			
Maximum speed decal installed on dash			
Steering lock decal installed on dash			
Railgear lubricated			
All bolts torqued as per specifications		See O.P.S. Manual	
Axle lock-up system clears vehicle			
Axle lock-up hooks clearance to springs		1/4" to 1/2"	
Vehicle track tested			
Operating, Service & Parts Manual in truck			

APPENDIX

MANUAL ADDENDUM

MA #: MI65-0-MA01

Date: June 4, 2002

Affected Manual / Railgear

Railgear Model: R-650/850

Manual #: MI-0019B & M-0022 & MI-0024B

Affected Page(s): Assorted

Addendum Information:

Preparations for Railgear Mounting:

This addendum adds the precaution for modifying the vehicle frame. In many cases, the frame is treated, and care must be taken when drilling or welding to the frame. Before drilling or welding to the frame, consult the appropriate body builder's book for the particular type of vehicle being fitted, and follow their recommendations.

MANUAL ADDENDUM

MA #: MI65-0-MA02

Date: June 4, 2002

Affected Manual / Railgear

Railgear Model: R-650/850
Manual #: MI-0019B & M-0022 & MI-0024B
Affected Page(s): Assorted

Addendum Information:

Rear railgear Mounting:

This addendum updates the installation manual for the option of having the railgear lock-up cable routed to the front of the railgear. In some cases, the vehicle type and purpose do not allow for a rear routed lock-up cable.

Rafna Industries will supply the variant, with the following parts modified: Lock-up Hook Assembly (R-6785A), and Locking Hook Support Assembly (R-6872A). The installation and operation are still the same.

When routing the cable, ensure a minimum bend radius of 3". Ensure the cable is clear of any moving parts.

MANUAL ADDENDUM

MA #: MI0024-B-MA04

Date: March 7, 2003

AFFECTED MANUAL / RAILGEAR

Railgear Model: R-850

Manual #: MI-0024 Rev B

Affected Page(s): Section 3, sub-section 5 (page 3-8)

Addendum Information:

This addendum updates the Installation manual to include a safety clause in regards to rail wheel air brake installation.

This clause should be the first item in the 'Preparations for Operation' section of the manual.

For vehicles equipped with optimal pneumatic rail wheel brakes only:

It is the sole responsibility of the installer to ensure the vehicle and railgear pneumatic brake system comply with FMVSS-121* / CMVSS-121** regulations. The modification to the vehicle's brake system must also comply with any federal, state / provincial and local regulations. Failure to do so may impede the effectiveness of the vehicle's braking ability.

* Federal Motor Vehicle Safety Standards regulation #121

** Canadian Motor Vehicle Safety Standards regulation #121