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MI-0019-B REV C

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MODEL R-650
"CUSHION-RIDE" RAILGEAR
INSTALLATION MANUAL

"VERTICAL & ROTATING FRONT - ROTATING REAR"

READ THIS MANUAL BEFORE INSTALLING RAILGEAR EQUIPMENT

Application Models : International 4900 Series

Ford F-800
GMC C-Series
GMC T-Series
Freightliner FL70
Sterling L75

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.

TABLE OF CONTENTS

SECTION 1: INITIAL PREPARATION

1.0 SAFETY PRECAUTIONS

WARNING:

- Installation instruction provided below only address the Rafna 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 brake operation
  ✓ 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 R-650 vertical and rotating front railgear and rotating rear railgear on the following vehicles:

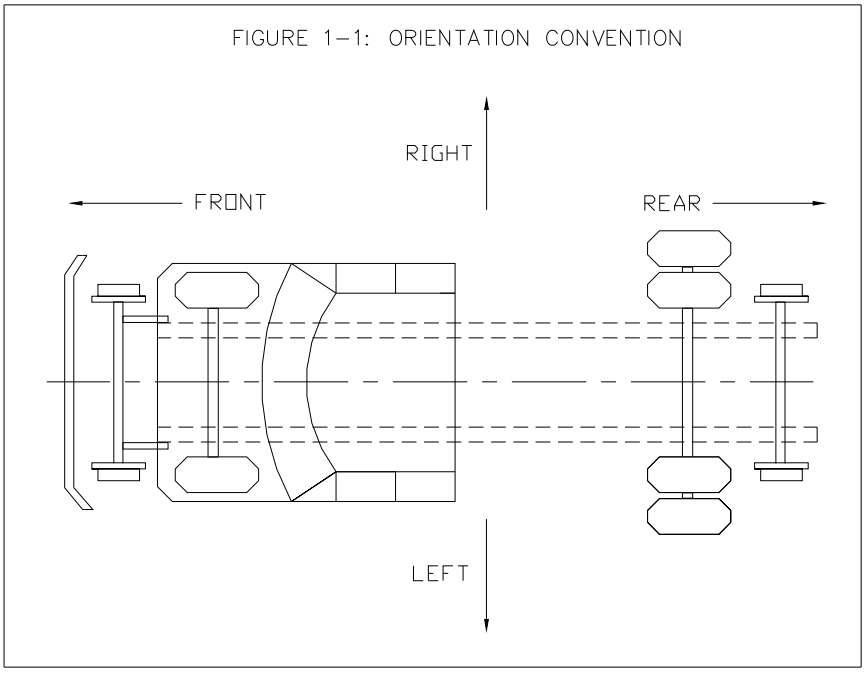
- International 4000 Series
- Ford F-800
- GMC C-Series
- GMC T-Series
- Freightliner FL70
- Sterling L7500

The Rafna Industries R-650 railgear is a hydraulically operated system applicable to vehicles of up to 39,000 lbs. G.V.W.R. Both front and rear units are hydraulically moved from rail to highway and highway to rail positions and are mounted to the vehicle frame. The hydraulic power is supplied through Rafna Industries' auxiliary electrical hydraulic pump or through the vehicles PTO hydraulic system. An optional air brake package on the front and/or rear rail wheels aid in on-rail braking.

The installation procedure consists of first installing the front railgear and then the rear railgear. The hydraulic, electrical, and optional brake 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 front bumper and all related mounting brackets. Retain fasteners for re-installation.

On models where a vertical front railgear is to be installed and the hood does not provide butterfly openings or a fixed grille:

1. Remove the front grille from the hood.

2. Modify the front grille so that it is fixed in front of the radiator and does not tilt with the hood.

3. This will enable the hood to be opened fully over the vertical front railgear.

SECTION 2: RAILGEAR INSTALLATION

1.0 VERTICAL FRONT RAILGEAR INSTALLATION

The installation procedure for the vertical front railgear is identical for all vehicles covered by this manual, except where indicated. 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-6715C	Vertical Front Railgear Assembly	1
	5/8" UNC Gr. 8 Bolt x 3" Long	8
	5/8" Gr. 8 Washer	16
	5/8" UNC Gr. 8 Nylon Insert Lock Nut	8

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

1. On vehicles not equipped with a frame extension, a front frame extension will have to be fabricated by the installer. The railgear is mounted as close as possible to the front grill and the frame extension is cut down, as it cannot extend through the railgear.

2. Clamp the vertical front railgear (1) onto the outside of the front frame extensions (2). The inside dimension of the railgear mounting plates is fixed at 34 ⅞". If the frame outside dimension is less than this value, fabricate and insert spacer plates between the frame and the railgear mounting plates as required. The spacer plates should be drilled to match the mounting plates and similar in size.

3. Position the railgear such that, with the cylinders (3) fully retracted and the vehicle on level ground, the rail wheel mounting tables are about 19" above the ground. Final adjustment of this height will be done later by loosening the outer guide tube clamps.

4. Using the railgear mounting flanges (4) as templates, drill the uppermost hole on each side through the frame. Bolt the railgear snuggly with one 5/8" x 3" long fastener (5) per side.

5. Unclamp the railgear. It should now be able to pivot about the two 5/8" fasteners.

6. Pivot the railgear until it is 2-3° over center (top of railgear forward of bottom).

7. Clamp the railgear in this position and drill three other holes per side using the mounting flanges as templates. Note that the mounting flanges have six holes each to accommodate different frame heights yet only four holes are required for mounting.

8. Fasten the railgear in place with six additional 5/8" x 3" long fasteners and torque all 5/8" fasteners to 150 ft-lbs.

9. 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.

2.0 ROTATING FRONT RAILGEAR INSTALLATION

The installation procedure for the rotating front railgear is identical for all vehicles covered by this manual, except where indicated. 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-6706	Rotating Front Railgear Assembly	1
	5/8" UNC Gr. 8 Bolt x 2.75" Long	8
	5/8" Gr. 8 Washer	16
	5/8" UNC Gr. 8 Nylon Insert Lock Nut	8

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

1. For ease of shipment, the railgear is 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.

2. Except for GMC T-Series, on vehicles not equipped with a frame extension, a frame extension will have to be fabricated by the installer.

3. **On GMC T-Series Models:** Position the mounting plates (1) against the **inside** of the front frame rails (2) such that the holes in the mounting plates align with the existing bolts. Note which bolts will be used, remove the mounting plates and remove the required bolts. The center of the bearing housing should be about 19.5" above the ground on an unloaded chassis. Re-install the mounting plates to align with the required bolt holes. Re-install the bolts and torque to 150 ft-lbs. Cut the front bumper to fit around the mounting plates and re-install it in its original position.

4. **On All Other Models:** Position the mounting plates (1) against the **outside** of the front frame extensions (2) as far rearward as possible (against the front spring hanger) with the center of the bearing housing about 19.5" 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. Each mounting plate must be fastened in place with four 5/8" x 2.75" long fasteners. Use existing holes if possible, or drill four 11/16" diameter holes (3) through each mounting plate and the frame. Install and torque the 5/8" fasteners (4) to 150 ft-lbs.

5. Install the split bearings into the bearing housings and caps. Position the railgear lower assembly under the mounting plates with the small keystock on the underside of the axle facing rearward. Raise the railgear into the bearings and install the bearing caps.

6. 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.

7. Re-install the upper cylinder frame and hydraulic cylinders with the hydraulic fittings facing upwards. Torque all fasteners to specifications.

8. **On All Models Except GMC T-Series:** 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.

FIGURE 2–1: VERTICAL FRONT RAILGEAR INSTALLATION

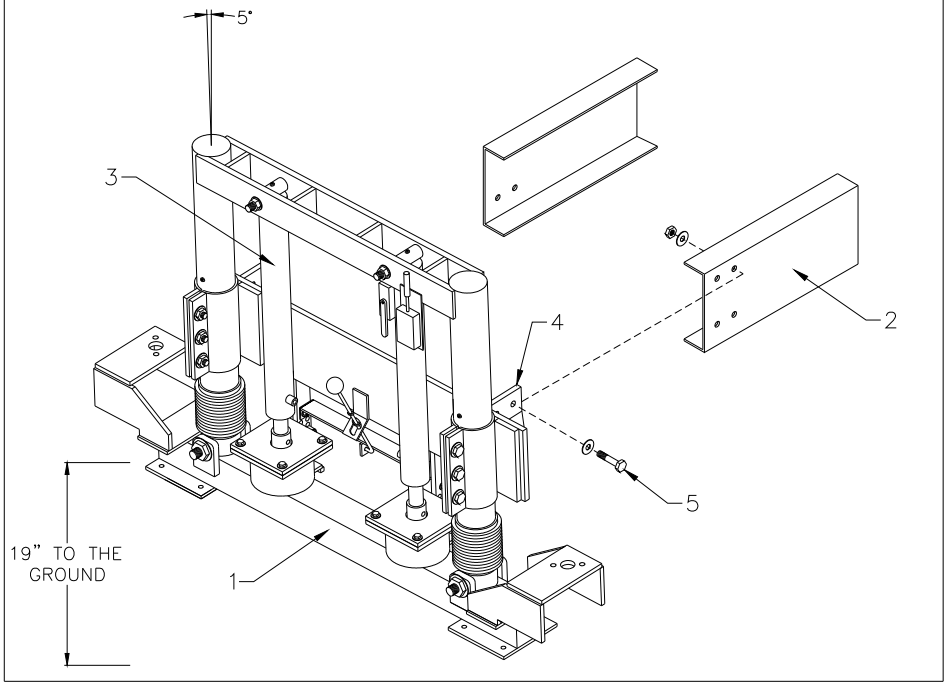
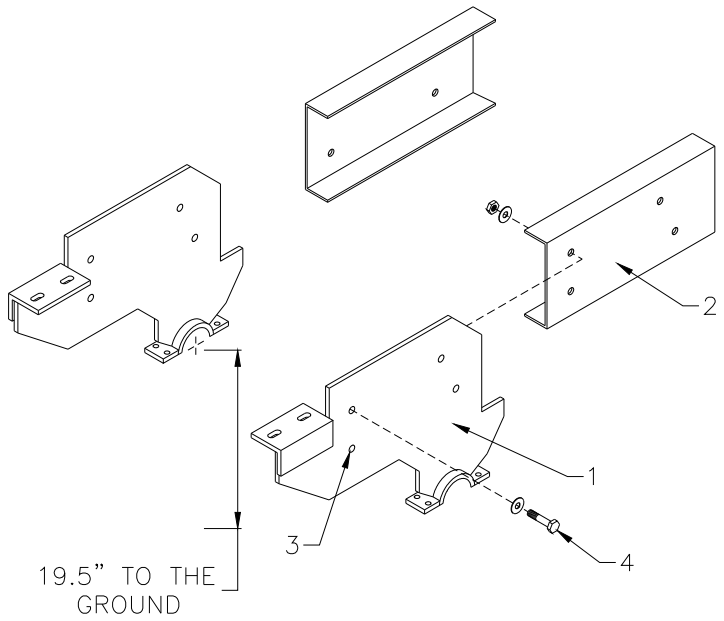


FIGURE 2–2: ROTATING FRONT RAILGEAR INSTALLATION



3.0 ROTATING REAR RAILGEAR INSTALLATION

The installation procedure for the rotating rear railgear is identical for all vehicles covered by this manual, except where indicated. The hardware required for this installation is listed in table 2-3.

Table 2-3: Rotating Rear Railgear Installation Hardware

Part Number	Description	Qty
R-6873	Rotating Rear Railgear Assembly	1
R-6792	Mounting Bracket	2
	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 2-3)

1. 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.

2. 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.

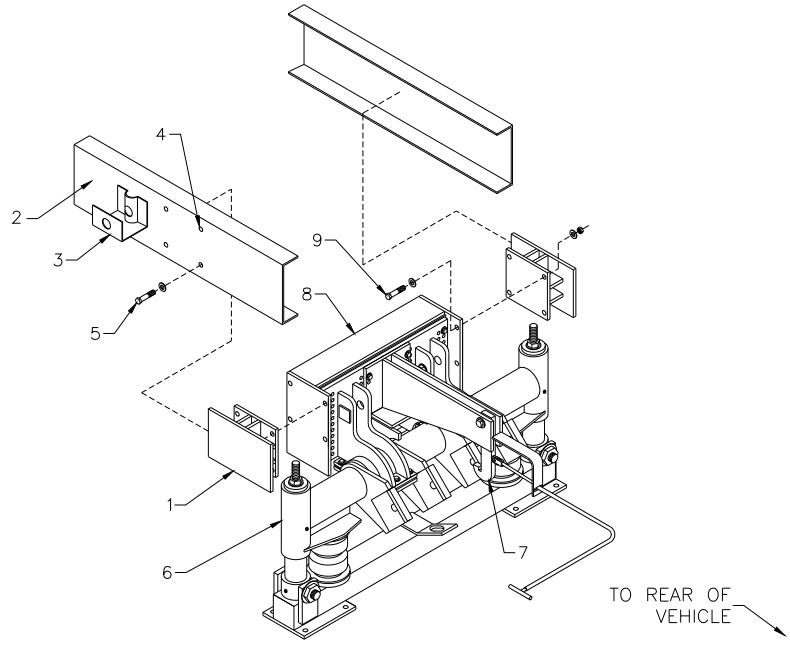
3. Drill four 11/16" diameter holes (4) through the frame and each mounting bracket. Use existing holes if possible. Bolt the mounting brackets to the frame using 5/8" fasteners (5).

4. 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 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).

5. Torque all 5/8" fasteners to 150 ft-lbs.

6. 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.

FIGURE 2–3: ROTATING REAR RAILGEAR INSTALLATION



NOTE: HYD. CYLINDERS NOT SHOWN

4.0 FRONT RAIL WHEEL & FRONT RAIL SWEEP INSTALLATION

The installation procedure for the rail wheels and rail sweeps on the front railgear is identical for all vehicle models covered by this manual. The hardware required for this installation is listed in table 2-4.

Table 2-4: Rail Wheel and Rail Sweep Installation Hardware

Part Number	Description	Qty
R-5501	12" Wheel Assembly	2
R-5557R	Rail Sweep (Right Side)	1
R-5557L	Rail Sweep (Left Side)	1
	½" UNC Gr. 8 Bolt x 2 ¼" Long	8
	½" Washer	16
	½" UNC Nylon Insert Lock Nut	8

The following procedure details the wheel and sweeper installation: (refer to figure 2-4)

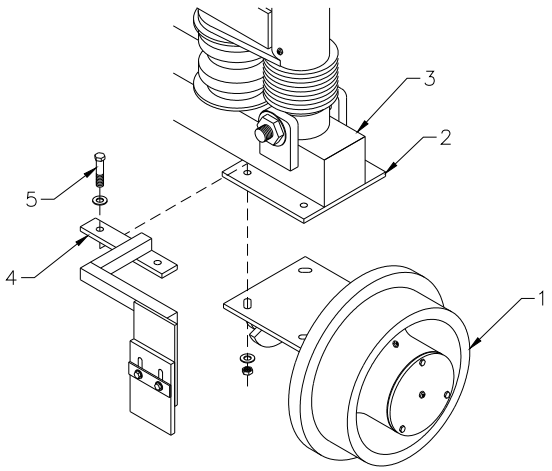
1. Place the rail wheels (1) below the mounting tables (2) on the railgear axle (3).

2. Place the rail sweeps (4) on top of the mounting tables in front of each front wheel.

3. Bolt the rail wheels and rail sweeps to the mounting tables with eight ½" bolts (5) each.

4. Tighten but do not torque the ½" bolts. These bolts will be torqued following the rail wheel alignment.

FIGURE 2–4: FRONT RAIL WHEEL & RAIL SWEEP INSTALLATION



5.0 REAR RAIL WHEEL & REAR RAIL SWEEP INSTALLATION

The installation procedure for the rail wheels and rail sweeps on the rear railgear is identical for all vehicle models covered by this manual. The hardware required for this installation is listed in table 2-5.

Table 2-5: Rail Wheel and Rail Sweep Installation Hardware w/o brakes

Part Number	Description	Qty
R-6812	12" Wheel Assembly	2
R-8631R	Rail Sweep (Right Side)	1
R-8631L	Rail Sweep (Left Side)	1
	5/8" UNC Gr. 8 Bolt x 2 ¼" Long	8
	5/8" Washer	16
	5/8" UNC Nylon Insert Lock Nut	8

Table 2-5a: Rail Wheel and Rail Sweep Installation Hardware with brakes

Part Number	Description	Qty
R-6812	12" Wheel Assembly	2
R-8570R	Rail Sweep (Right Side)	1
R-8570L	Rail Sweep (Left Side)	1
	5/8" UNC Gr. 8 Bolt x 2 ½" Long	8
	5/8" Washer	16
	5/8" UNC Nylon Insert Lock Nut	8

The following procedure details the wheel and sweeper installation: (refer to figure 2-5)

Note:

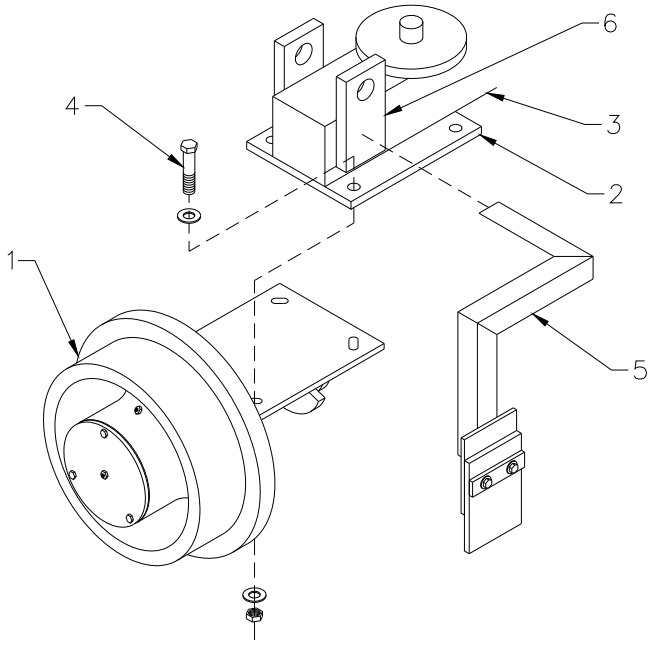
If the railgear is purchased with the optional brake package, install the rail sweeps after the brake package has been installed.

1. Place the rail wheels (1) below the mounting tables (2) on the railgear axle (3). If the brake package option has been purchased, install the brake housing above the mounting table (2).

2. Secure the rail wheels to the mounting tables with 5/8" fasteners (4). Do not torque the 5/8" fasteners as this will be done after the railgear alignment procedure.

3. Place the rail sweeps (5) to the rear of each rear wheel and butted up against the inner tube support lug (6) (or brake housing if so provided). 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 yet still allow for adjustment as the rubber wears. Weld the rail sweep to the inner tube lug all around.

FIGURE 2–5: REAR RAIL WHEEL & RAIL SWEEP INSTALLATION



6.0 FRONT AXLE LOCK-UP INSTALLATION

This section covers the installation of the front axle lock-up system for each applicable vehicle models.

6.1 INTER 4900, FORD F-800, FREIGHTLINER FL70, STERLING L7500 & GMC C-SERIES AXLE LOCK-UP INSTALLATION

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
	½" UNC Gr. 8 Bolt x 2 ¼" Long	4
	½" Washer	8
	½" UNC Nylon Insert Lock Nut	4
	¾" UNC Gr. 8 Bolt x 2.5" Long	2
	¾" UNC Gr. 8 Bolt x 3.5" Long	2
	¾" Washer	8
	¾" 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 extensions (1) and the hooks (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 ¾" 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. Ensure that the hooks will be able to go under the springs (8) by about ½" with the truck body on and the truck unloaded. Ensure that they move unobstructed and that they do not hit any truck components (i.e., steering linkages, tie rods, etc.) with the truck wheels turned in either direction as well as in the straight position. Adjust the hooks in the hook extensions as necessary then drill the hooks to accept the third 3/8" fastener (9).

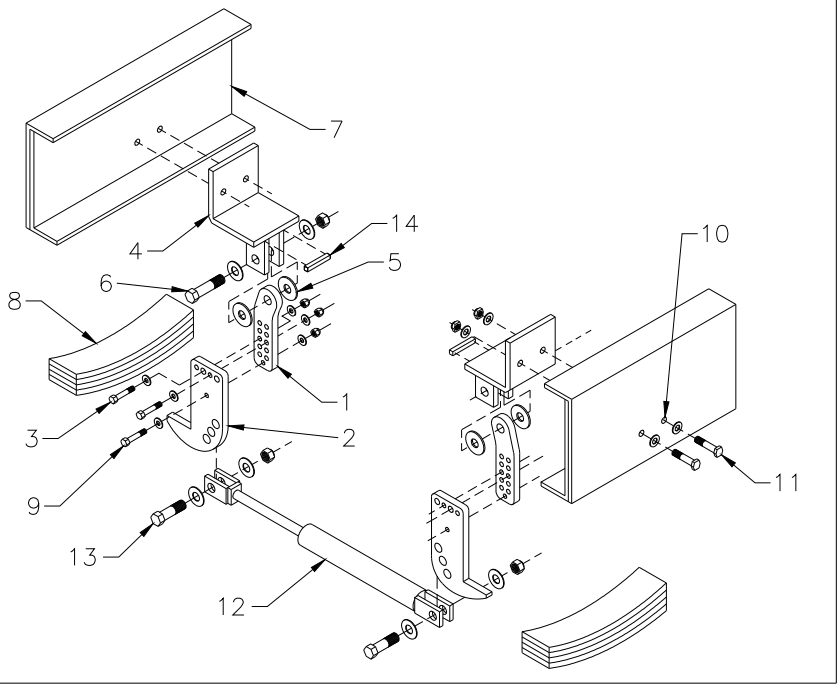
4. Clamp the brackets in this position and drill two 17/32" diameter holes (10) through each bracket and frame rail. Fasten the brackets in place with two ½" fasteners (11) each. Torque to 100 ft-lbs.

5. Install the axle lock-up cylinder (12) between the two hooks with the hydraulic fittings facing forward using two ¾" 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 or with any other vehicle components (i.e., steering linkages, tie rods, etc.) in this position or with the truck wheels turned in either direction.

7. With the cylinder fully retracted, weld the 3/8" square bars (14) to the inside of the brackets to limit the hooks from swinging inwards.

FIGURE 2-6: FRONT AXLE LOCK-UP INSTALLATION



6.2 GMC T-SERIES AXLE LOCK-UP INSTALLATION

The hardware required for this installation is listed in table 2-7.

Table 2-7: Front Axle Lock-Up Installation Hardware

Part Number	Description	Qty
R-5635	7/8" Plastic Washer	4
R-5682	Hydraulic Cylinder	1
R-6735	Hook	2
R-6736	Hook Bracket	2
R-6610C	3/8" x 3/8" Square Bar x 2.5" Long	2
	½" UNC Gr. 8 Bolt x 2 ¼" Long	4
	½" Gr. 8 Washer	8
	½" UNC Nylon Insert Lock Nut	4
	¾" UNC Gr. 8 Bolt x 2.5" Long	2
	¾" UNC Gr. 8 Bolt x 3.5" Long	2
	¾" Gr. 8 Washer	8
	¾" UNC Nylon Insert Lock Nut	4

The following procedure details the front axle lock-up installation: (refer to figure 2-7)

1. Install the hooks (1) into the hook brackets (2) with a plastic washer (3) on each side using two ¾" x 3.5" long fasteners (4). Do not torque as the hooks must be free to swing.

2. Position the hook brackets and hooks on the inside of the frame (5) such that the hooks will hang down rearward of the front axle. Ensure that the hooks will be able to go under the springs (6) by about ½" and that they will move unobstructed.

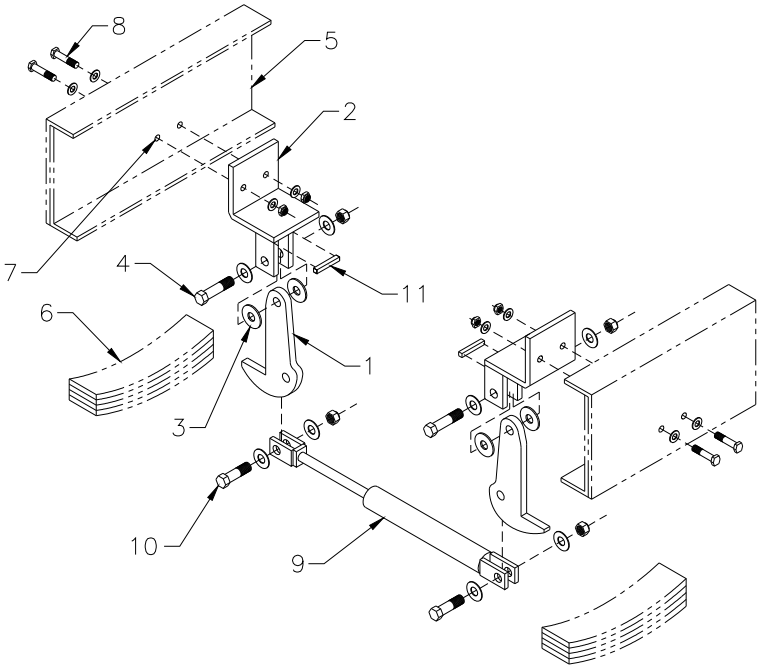
3. Clamp the brackets in this position and drill two 17/32" diameter holes (7) through each bracket and frame rail. Fasten the brackets in place with two ½" fasteners (8) each. Torque to 100 ft-lbs.

4. Install the hydraulic cylinder (9) between the two hooks using two ¾" x 2.5" long fasteners (10). Do not torque as the hooks must be free to move.

5. Retract the hydraulic cylinder completely and ensure that the hooks do not interfere with the vehicle suspension in this position.

6. With the cylinder fully retracted, weld the 3/8" square bars (11) to the inside of the brackets to limit the hooks from swinging inwards.

FIGURE 2–7: FRONT AXLE LOCK–UP INSTALLATION



SECTION 3: AUXILIARY INSTALLATIONS

1.0 STEERING WHEEL LOCK INSTALLATION

This section covers the installation of the steering wheel lock for each vehicle model.

1.1 INTER 4900, FREIGHTLINER & STERLING L7500 W/ TELESCOPING STEERING & GMC T-SERIES 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 (Inter 4900 only)	1
R-050M	Steering Column Brace (GMC T-Series only)	1
R-5902	Steering Wheel Lock (F.L. w/ tele. steering only)	1
R-5903	Steering Column Brace (F.L. w/ tele. steering only)	1
R-8742A	Steering Wheel Lock (Sterling w/ tele. steering only)	1
R-8742B	Steering Column Brace (Sterling w/ tele. steering only)	1
R-6506	Steering Wheel Lock (Inter 4900 only)	1
R-6734	Steering Wheel Lock (GMC T-Series only)	1
R-2586B	Spring Pin (all except Freightliner & Sterling)	1
	#10 x ½" 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.

1.2 FORD F-800 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-050F	Steering Column Brace	1
R-6688A	Steering Wheel Lock	1
R-2586B	Spring Pin	1
	#10 x ½" Long Self Tapping Screw	2

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

1. Install the steering column brace (1) on the steering column so that the bracket is to the side and clears the flasher lever. Tighten the hose clamp snug.

2. Insert the steering wheel lock (2) into the steering column brace and secure with the spring pin (3). 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 and steering wheel lock and store them in the glove box.

1.3 GMC C-SERIES 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-5661A	Steering Wheel Lock Pivot	1
R-5661B	Steering Wheel Lock Stopper	1
R-5665A	Steering Wheel Lock Latch	1
	3/16" x ½" Long Self Tapping Screw	3
	¼" UNC Gr. 8 Bolt x 2" Long	1
	¼" SAE Washer	2
	¼" UNC Gr. 3 Nylon Insert Lock Nut	1

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

1. Insert the steering wheel lock latch (1) into the steering wheel lock pivot (2) and secure with a ¼" fastener (3).

2. Position the steering wheel lock assembly on the steering column so that the pivot point is on the top of the column. Tighten the hose clamp (4) snug.

3. Position the steering wheel lock stopper (5) on the horn cover. Flip the latch over so that it engages the stopper. Slide the pivot up or down the column if necessary. Use a self-tapping screw (6) near the pivot point to hold the steering lock pivot in place and two self-tapping screws (7) to secure the stopper to the horn cover. Be sure not to catch any wires when installing the self-tapping screws.

4. Tighten the hose clamp.

FIGURE 3–1: STEERING LOCK INSTALLATION

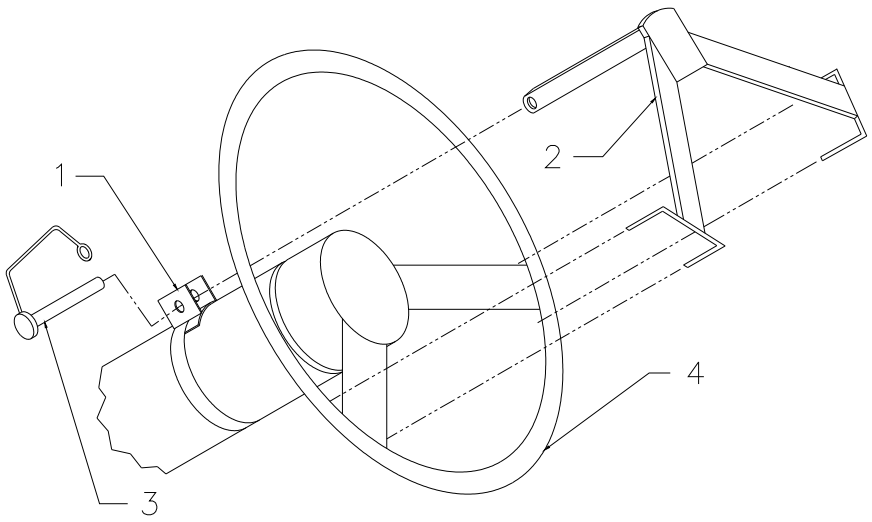
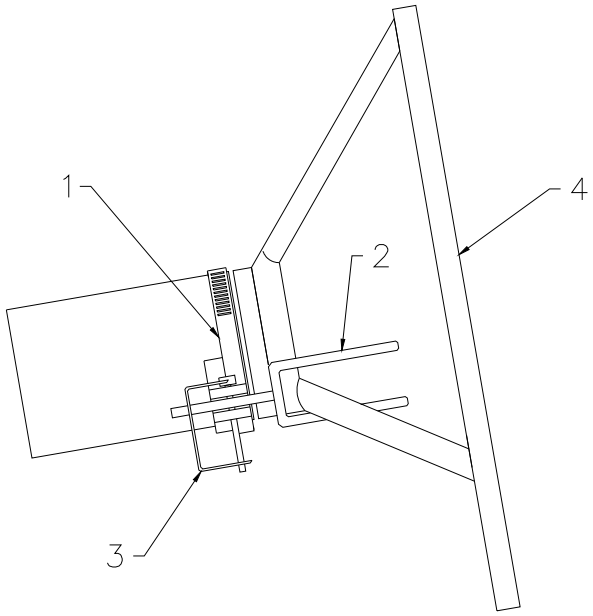


FIGURE 3–2: FORD F–800 STEERING LOCK INSTALLATION



1.4 FREIGHTLINER FL70 NON-TELESCOPING STEERING WHEEL LOCK INSTALLATION

The hardware required for this installation is listed in table 3-4.

Table 3-4: 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 3-4)

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.

FIGURE 3–3: GMC C–SERIES STEERING LOCK INSTALLATION

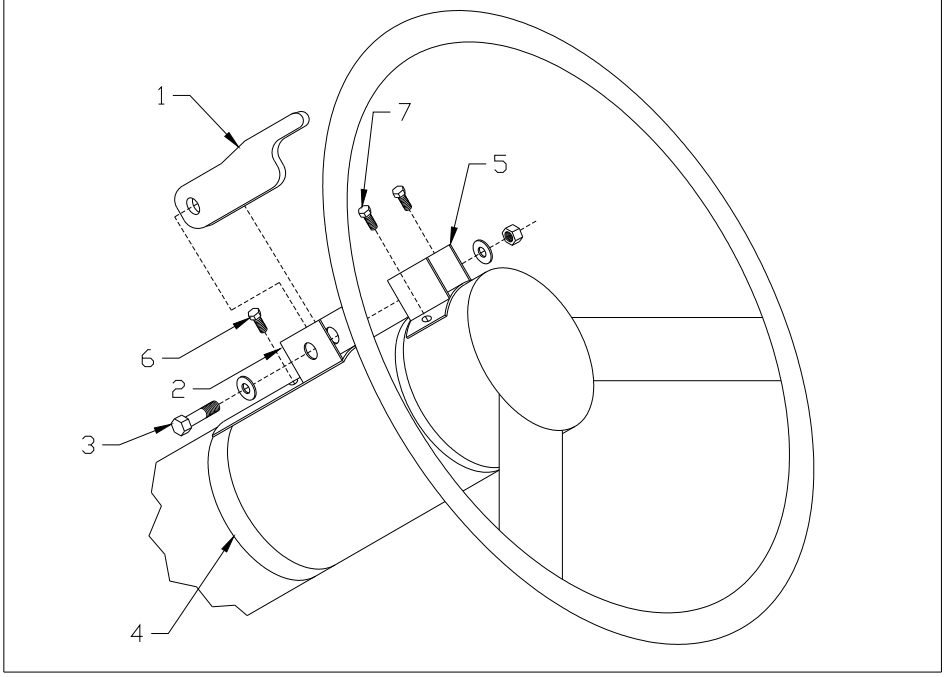
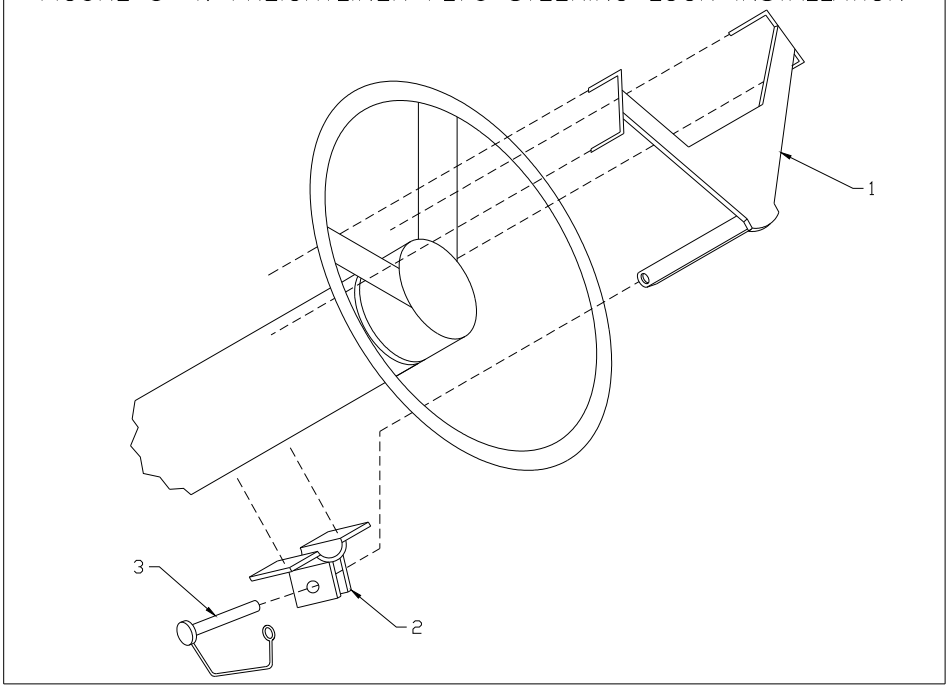


FIGURE 3–4: FREIGHTLINER FL70 STEERING LOCK INSTALLATION



2.0 HYDRAULIC SYSTEM INSTALLATION

This section covers the installation of the hydraulic hoses, operating valves and optional electrical hydraulic pump. The installation procedure is identical for all models covered by this manual. This procedure may be modified by the installer in order to connect to an alternate hydraulic power source (PTO). The hardware required for this installation is listed in table 3-5.

Table 3-5: Hydraulic System Installation Hardware

Part Number	Description	Qty
R-053A	Optional Electrical Hydraulic Pump with Coil	1
R-559M	Operating Valve	2
R-559-39	Optional Operating Valve Handle (w/switch for use w/R-053A)	2
R-559-11	Operating Valve Handle (for use with PTO pumps)	2
	Hydraulic Hose	
	Hydraulic Fittings	

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 optional 12 VDC electrical hydraulic pump:

    a) Remove the coil from the pump motor and mount it near the battery. Re-install the coil mounting screws into the pump motor.
    b) The hydraulic pump should be mounted in a convenient location on the vehicle.
    c) Install an 849 FS 06-06 hydraulic fitting on the pressure port of the hydraulic pump and an 849 FS 06-04 hydraulic fitting on the tank port of the hydraulic pump.

2. Install the operating valve handles on the operating valves.

3. Install the front operating valve on the mounting plate provided on the front railgear with ¼" fasteners.

4. Install the rear operating valve in a convenient location near the rear railgear locking cable handle.

5. Connect the vertical front railgear hydraulics according to drawing MO-0018B page 14 (Vertical Front Hydraulics) in the Operating, Service and Parts Manual. (Note: Certain hoses and all fittings are installed on the railgear at Rafna Industries.)

6. Connect the rotating front railgear hydraulics according to drawing MO-0018B page 15 (Rotating Front Hydraulics) in the Operating, Service, and Parts Manual. (Note: Certain hoses and all fittings are installed on the railgear at Rafna Industries.)

7. Connect the rotating rear railgear hydraulics according to drawing MO-0018B page 16 (Rotating Rear Hydraulics) in the Operating, Service, and Parts Manual. (Note: Certain hoses and all fittings are installed on the railgear at Rafna Industries.)

8. Make to fit and route one hydraulic hose from the optional hydraulic pump pressure port (or PTO pump pressure line) to the inlet port on the front operating valve.

   Note: Installer to ensure that the pressure from the PTO pump to the railgear does not exceed 2,000 psi.

9. Make to fit and route one hydraulic hose from the front operating valve outlet port to the rear operating valve inlet port.

10. Make to fit and route one hydraulic hose from the rear operating valve outlet port to the optional hydraulic pump return port or the PTO pump return line.

11. Ensure all hydraulic hoses and fittings have been correctly installed, then tighten all fittings and tie-wrap all hoses securely so they do not rub.

3.0 OPTIONAL ELECTRICAL SYSTEM INSTALLATION

This section covers the installation of the 12 VDC electrical system for the optional electrical hydraulic pump. The hardware required for this installation is listed in table 3-6.

Table 3-6: Electrical System Installation Hardware

Part Number	Description	Qty
R-1567	Illuminated Rocker Switch	1
R-1577	5A In-Line Fuse	1
CO-124	Relay	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 3-5)

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.**
- **This procedure and equipment is for a 12 VDC electrical system.**

1. Install the illuminated rocker switch in a convenient location on the dashboard.

2. Using suitable 4 gauge wire, cable loom, connectors, solder and heat shrink tubing:
   a) Connect one wire from the positive terminal on the vehicle's battery to the "Batt" terminal on the hydraulic pump coil mounted under the hood.
   b) Connect another wire from the "Motor" terminal on the coil to the terminal on the pump motor.
   c) Apply a small amount of silicon sealant to the pump motor terminal to protect it from shorting out or rusting.

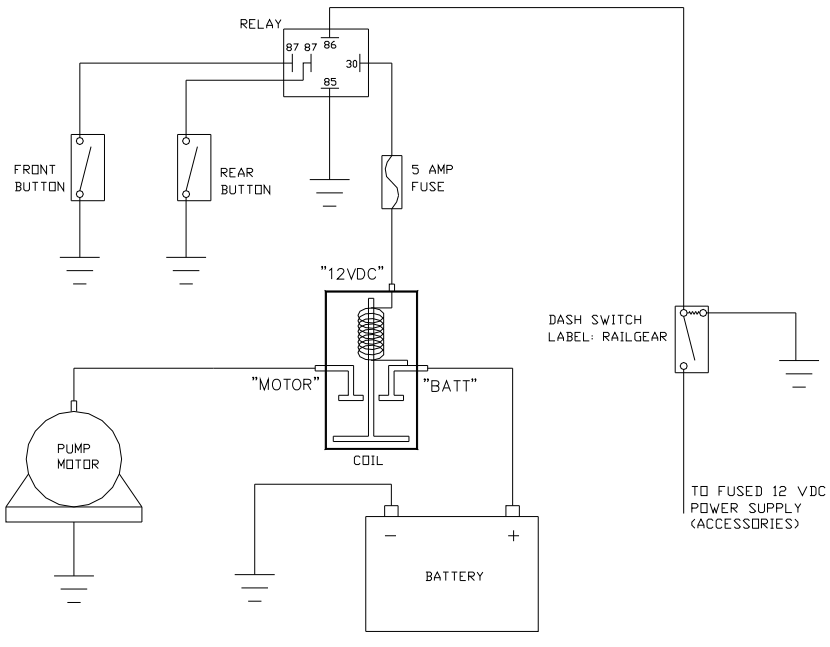
3. Ensure that the pump motor base is properly grounded to the vehicle chassis.

4. Install the relay under the hood close to the solenoid.

5. Using suitable 14 gauge wire, cable loom, connectors, solder and heat shrink tubing:
   a) Connect a wire from the “12 VDC” terminal on the hydraulic pump coil to the 5A inline fuse.
   b) Connect a wire from the 5A inline fuse to the “30” terminal on the relay.
   c) Connect a wire to each “87” terminal on the relay; route one along the driver’s side of the frame to the rear operating valve and route one to the front operating valve.
   d) At the front and rear operating valves, connect the above-mentioned wires to the pump start buttons. Note that the wire that comes out of the pump start buttons with a ring connector on the end should be grounded through one of the operating valve mounting bolts.
   e) Connect a wire from the “85” terminal on the relay to a suitable ground.
   f) Connect a wire from the “86” terminal on the relay through the firewall to the “Load” terminal on the dash switch.
   g) Connect a wire from the “Supply” terminal on the dash switch to a fused 12 VDC power supply preferably on the vehicle accessories circuit.
   h) Connect a wire from the “Ground” terminal on the dash switch to a suitable ground.

6. Ensure all wires are enclosed in cable loom, soldered and secured with tie-wraps.

FIGURE 3–5: ELECTRICAL INSTALLATION – MECHANICAL OPERATING VALVES



4.0 OPTIONAL AIR BRAKE SYSTEM INSTALLATION

This section covers the installation of the air brake system on the front and rear railgear. The railgear air brake system must be incorporated into the vehicles air brake system.

1. Assemble the rail wheel brake system as shown in drawing M0018-8 of the Operating, Service and Parts Manual if not done at the factory.

2. Insert a tee fitting in the air brake line leading to the left front vehicle brake.

3. Connect an air brake hose from this fitting to the left railgear brake chamber. Ensure that there is enough slack in the hose to accommodate the movement of the railgear.

4. Do the same on the right front side of the vehicle.

5. Do the same on the right and left rear of the vehicle.

IMPORTANT:

- **Use only DOT approved air brake components when tapping into the vehicle brake system.**

- **Tie-wrap all hoses to prevent wear on sharp edges.**

5.0 PREPARATIONS FOR OPERATION

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

1. 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)

2. Perform the Hydraulic Relief Valve Setting Adjustment Procedure detailed in the Operating, Service and Parts Manual.

3. Perform the Rear Railgear Pressure Adjustment Procedure detailed in the Operating, Service and Parts Manual. Be sure to torque the railgear to mounting plate assembly bolts to specifications.

4. Perform the Railgear and Rail Wheel Alignment Procedure detailed in the Operating, Service and Parts Manual. Be sure to torque the railgear mounting bolts, railgear bearing cap bolts, and rail wheel mounting bolts to specifications following the alignment procedure.

5. **On Vertical Front Railgear:** Adjust the height of the front railgear by loosening the six guide tube clamping bolts and moving the railgear up or down to get a minimum of 3" clearance between the vehicle tires and the head of the rail when on the tracks. Re-torque the bolts to specification. Adjust the railgear lock-up system such that the hooks engage completely with the railgear in the highway position.

6. **On Rotating Front Railgear:** Install the rotational stops as shown in figure 3-6. Rotate the railgear down until it is 2-3° over center. Position the rotational stops (1) snug against the bearing housings (2) and the stop blocks (3) against the mounting plates (4). The rotational stops should function as rotational limiters as well as side to side limiters by contacting the bearing housings. The rotational stops are welded to the cross frame (5) inward of the bearing housings and the stop blocks are welded to the mounting plates.

7. **On Rotating Rear Railgear:** Install the rotational stops as shown in figure 3-7. Rotate the railgear down until it is 2-3° over center. Position the rotational stops (1) on the cross frame (2) so that they contact the inner edge of the stopper block (3) on the mounting plate assembly. The rotational stops should function as rotational limiters as well as side to side limiters by contacting the stopper block. Weld the rotational stops to the cross frame all around.

8. Check for lubrication at all lubrication points detailed in the Operating, Service and Parts Manual.

9. Check for correct bolt torque values as detailed in the Operating, Service, and Parts Manual.

10. 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.

11. Complete the Installation Checklist in the following section to make sure nothing has been forgotten.

12. Read the entire Operating, Service, and Parts Manual before attempting operation of the railgear equipped vehicle.

FIGURE 3–6: FRONT RAILGEAR ROTATIONAL STOP INSTALLATION

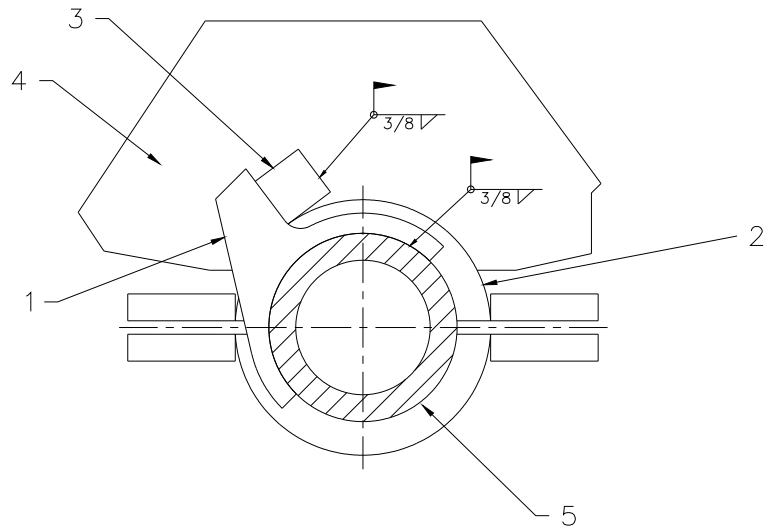
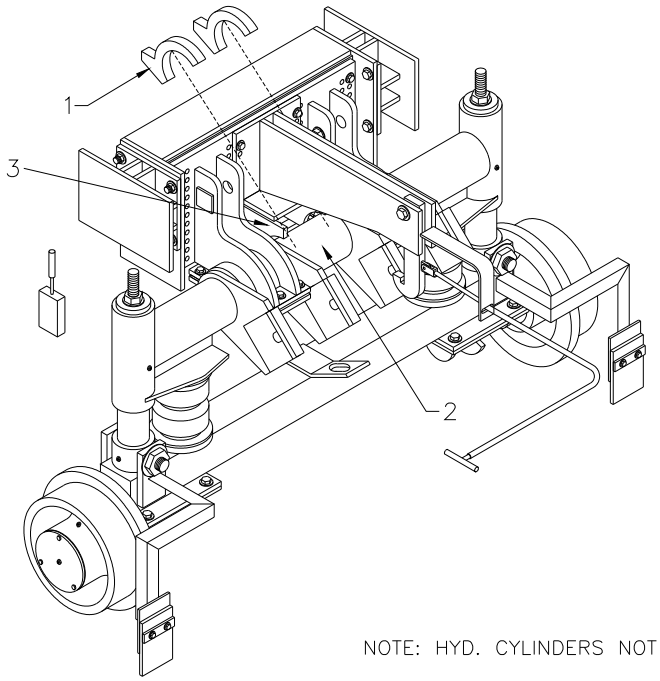


FIGURE 3–7: REAR ROTATIONAL STOP INSTALLATION



RAFNA R-650 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
Hydraulic pump attached properly			
Hydraulic system bled of air			
Hydraulic pump relief set at 2000 PSI			Mechanical Valves
Operating valve relief set at 1800 PSI			Mechanical Valves
Split loom used on all exposed hyd. hoses			
Hyd. hoses clear of heat & sharp edges			
Hydraulic system free of leaks			
Hyd. pump & valve grounds checked			
Electrical connections soldered and sealed			
Split loom used on all exposed wires			
Wires clear of heat & sharp edges			
Axle lockup clears all possible obstructions -with wheel straight and turned			
Third bolt installed in axle lockup			
Stops welded to axle lockup housing to prevent sway.			
Rail sweeps installed			
Front railgear is 3-5° over center on track			
Front rotational stops installed			
Rear railgear is 3-5° over center on track			
Rear rotational stops installed			
Rear rail wheel pressures adjusted			Check tire air press
Rear left			7-10”
Rear right			7-10”
Railgear alignment completed			
Distance between front tire and rail			3” Minimum

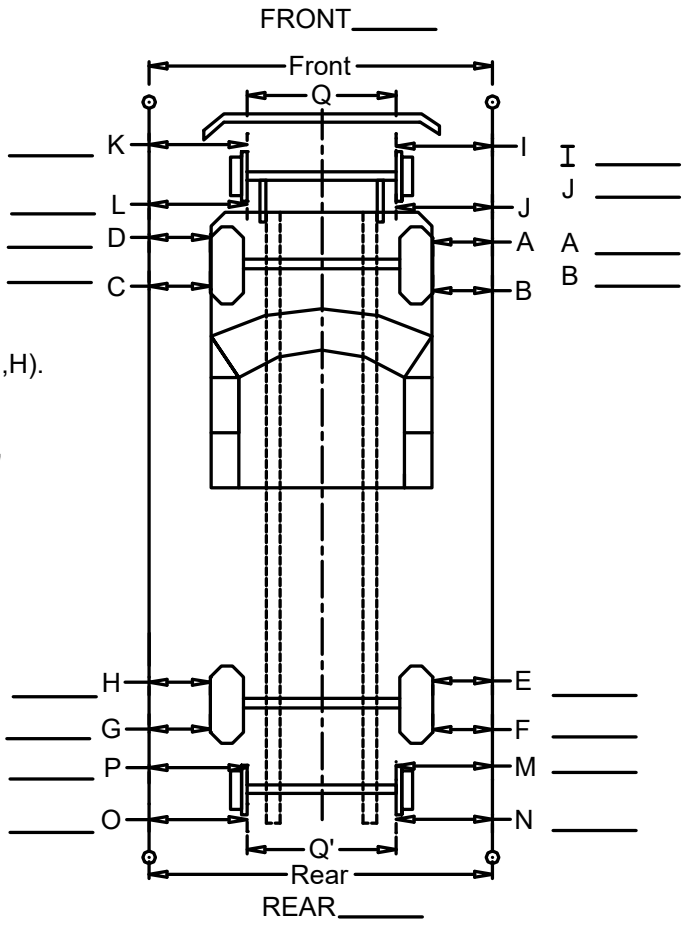
head		
Distance between rail wheel flanges		53-7/16" to 53-½"
Front rail wheels		
Rear rail wheels		
Rail sweeps adjusted 1/8" above track		
Rail wheel bearings end-play adjusted		
Distance front rail wheel flange to ground		Min 9"
Distance rear rail wheel flange to ground		Min 9"
Front and rear lock systems engage easily		

RAFNA R-650 PREDELIVERY CHECKLIST			
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
Steering wheel lock system installed			
Bumpers installed level with body			
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			

ALIGNMENT MEASUREMENTS

Truck Model _____ Truck Number _____

Hi-Rail S/N _____



A,B,C,D Must be Equal.
E,F,G,H Must be Equal.
(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"

The front and rear dimensions between the string lines should be equal.
The dimensions from front to rear should also be equal.

Rail wheel Load (lbs)

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

Rail wheel Flange To Gound

Front _____
Rear _____

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

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

RAFNA INDUSTRIES LIMITED MONTREAL, QUE.	
NOTE: NOT FULL SCALE ON PAPER	
DESCRIPTION: ALIGNMENT MEASUREMENTS	
REFERENCE:	
MAT'L:	
PART NO.:	DATE: JAN 07/02
DRAWN: S.R.	APPROVED:
DIM:	DRAWING SCALE:
PAGE OF	DRAWING NO.:

Appendix