

INSTALLATION OF R-890 VERTICAL SLEWING REAR RAILGEAR KIT

SAFETY PRECAUTIONS

If any installation problems are encountered, please call Rafna Industries Ltd. for technical assistance before continuing with the installation process.



- Failure to heed to any of the following warnings could result in severe bodily injury and/or equipment damage.
- Read and understand this manual completely before attempting installation of the equipment.
- Installation instructions provided below only address the Rafna railgear equipment. Applicable railway company procedures and policies must be adhered to.
- Before performing any work under the vehicle or railgear, ensure that 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.
- Always disconnect the vehicle's battery when welding on the vehicle or railgear in order to protect the vehicle's electrical system.

INSTALLATION OF RAILGEAR KIT

The following procedure details the installation of the rear slewing railgear kit. The hardware required for this installation is listed in table 1.

Table 1: Railgear Kit Installation Parts

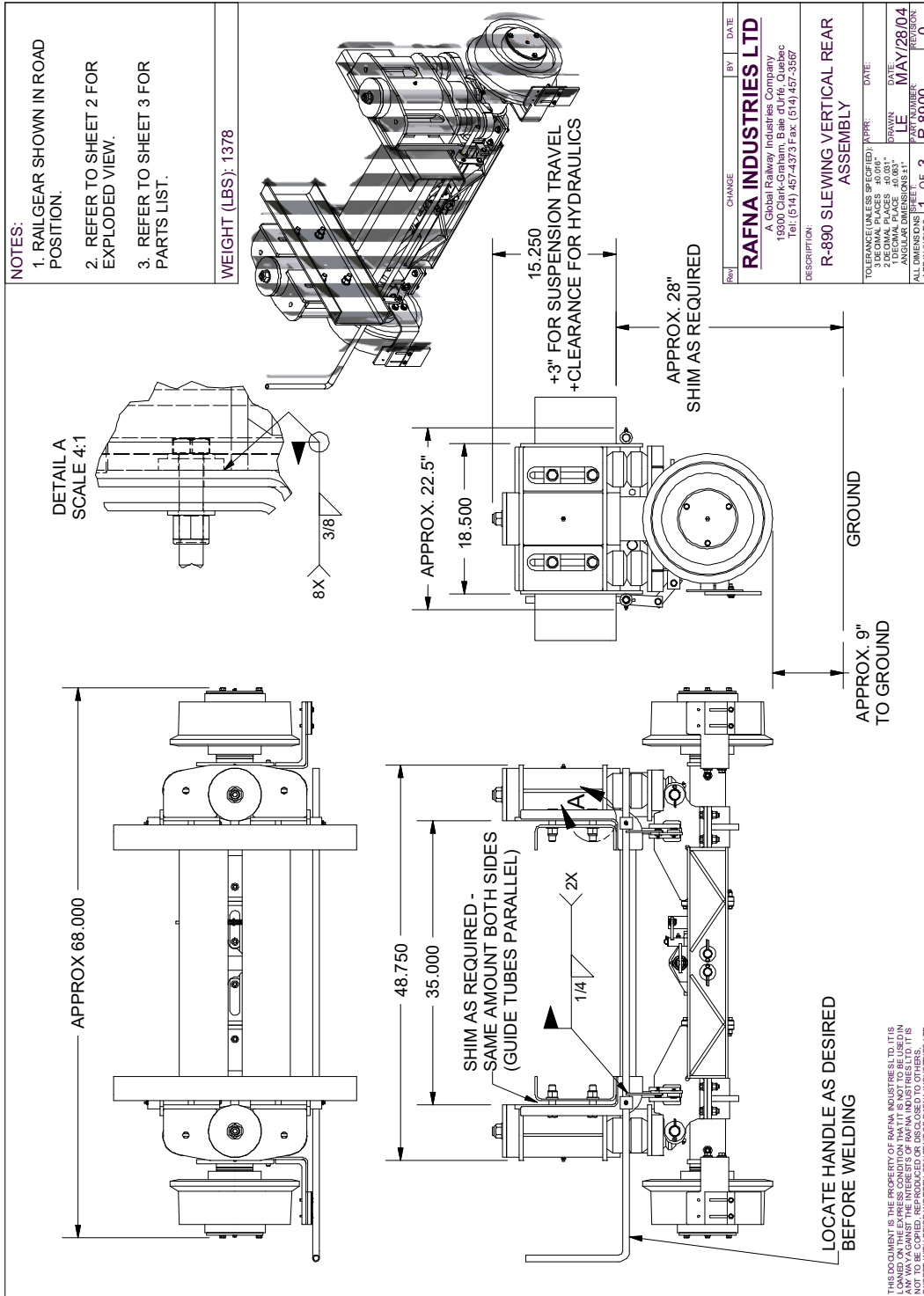
| Part Number | Description | Qty |
|-------------|---|-----|
| R-8900 | R-890 Vertical Slewing Rear Railgear | 1 |
| R-8961 | Handle (Included w/R-8900) | 1 |
| R-8998 | Washer Plate (Included w/ R-8900) | 8 |
| | $\frac{3}{4}$ " UNC Gr. 8 Bolt x 3.5" Long (Included w/ R-8900) | 8 |
| | $\frac{3}{4}$ " Gr. 8 Washer (Included w/ R-8900) | 16 |
| | $\frac{3}{4}$ " UNC Gr. 8 Nylock Nut (Included w/ R-8900) | 8 |

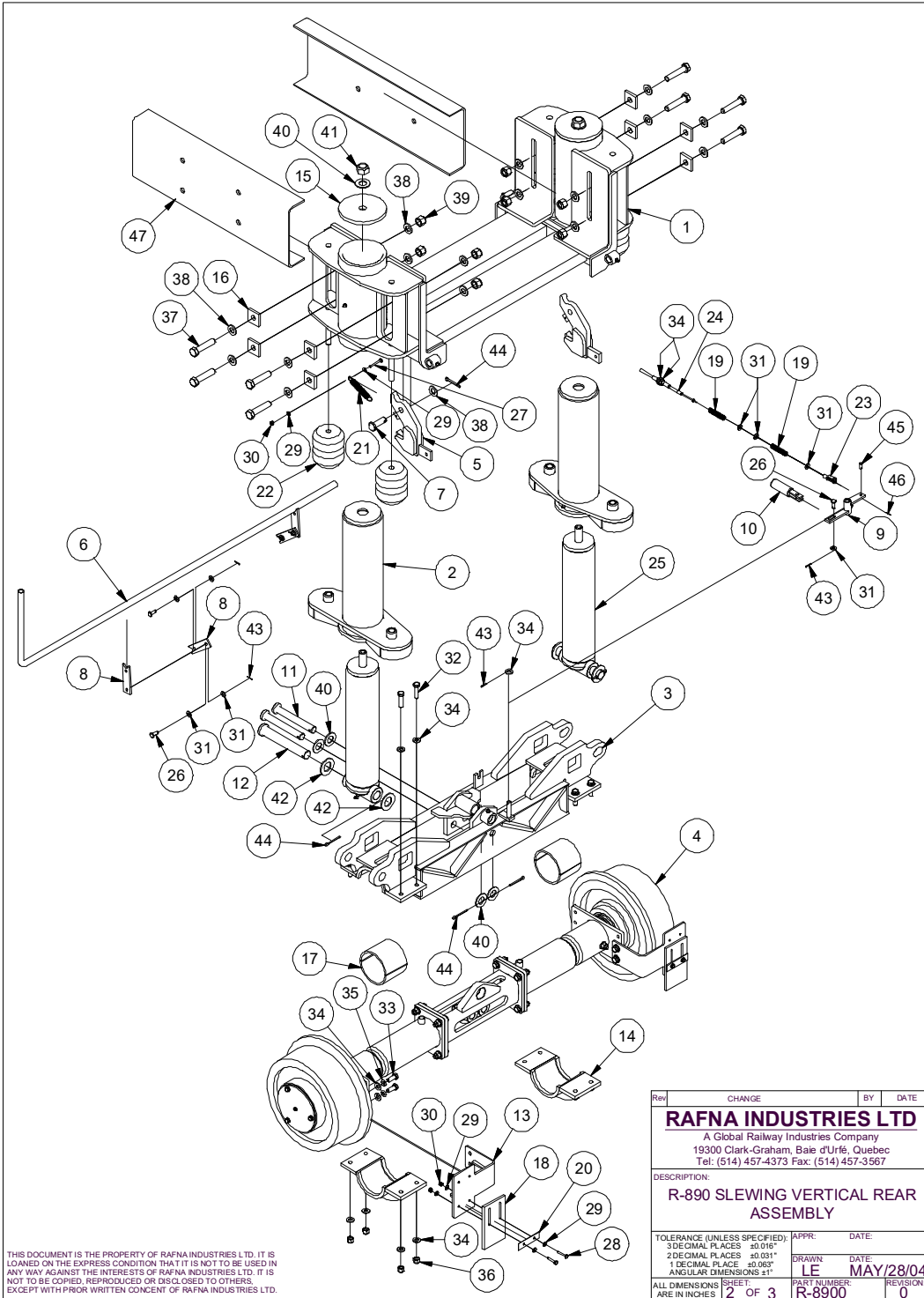
1. Ensure that the vehicle has at least 20" of after-frame beyond the rear-most point of the rear tire, the rear suspension and any other rear axle accessories (i.e. brakes).
2. Prior to installing the railgear, the vehicle's rear axle(s) should be aligned to zero tolerance by a qualified alignment professional. The rear axles should be parallel to each other and perpendicular to and centered on the frame.
3. The railgear is supplied with the necessary installation fasteners, which are packaged separately, and integral "L" shaped mounting brackets. The railgear should be mounted as close as possible beyond the rear-most axle of the vehicle without interfering with other components of the vehicle. Ensure that there is a minimum of 18.5" of the length of the frame to accommodate the railgear. Remove or relocated any accessories that may interfere with the railgear.
4. The railgear is symmetrical and has no "front" or "back" and can therefore be mounted in either direction as long as the rail sweeps will be facing rearward. If the opposite mounting direction is desired, the rail sweeps can be removed and re-installed on the opposite side of the railgear. Ensure that the slew lock cable handle will be accessible to the operator when installing the railgear in its reverse direction. Similarly, the vertical lock system can be installed on the opposite side of the railgear at any time by re-installing the lock hook, return spring and lock handle on the opposite side. If this is done, replace any cotter pins that are removed with new cotter pins. Torque the $\frac{1}{4}$ " fasteners to 12 ft-lbs dry. Do not over torque.
5. Position and support the railgear on the exterior of the frame. Use appropriate shims between the bottom of the frame and the horizontal part of the railgear mounting brackets to achieve the correct mounting height of 28" from the mounting bracket to the ground. Use appropriate shims between the outside face of the web of the frame and the railgear mounting brackets to center the railgear on the frame. Tack weld all shims together and to the railgear so that they cannot fall out. Using multiple thin shims in place of one thick shim will make future adjustments much easier.

6. Align the railgear as per the Railgear Operation, Service and Parts manual.
7. Using the slots in the mounting brackets as guides, drill four $\frac{3}{4}$ " holes a minimum of 5" apart in each side of the frame extension. Ensure that all vehicle manufacturer frame-drilling guidelines are followed. Ensure that enough room is left in the slots for future height adjustments.
8. Fasten the railgear to the frame extension using the supplied $\frac{3}{4}$ " mounting fasteners including the washer plates, which should be centered over the slots in the mounting brackets. Torque all $\frac{3}{4}$ " fasteners to 175 ft-lbs dry. Do not over torque.
9. Insert the vertical lock handle through the bushings provided on the railgear above the lock hooks. The handle can be angled, cut and/or modified as desired. Ensure that there will be sufficient room for the handle to rotate. Ensure that the handle will be positioned close to the slewing rear railgear hydraulic operating valve. Align the links that are attached to the vertical lock-up hook onto the handle. The links should be on the inside of the bushings. Weld the links to the handle using a $\frac{1}{4}$ " fillet weld around the outside surface of the links. Ensure that the weld will not interfere with the motion of the handle and links. Ensure that the hooks can be fully engaged and disengaged from the axle.
10. Cut off any excess frame and remount any accessories that were removed.
11. Torque all fasteners as per the Railgear Kit Operation, Service and Parts manual.
12. Grease the railgear at all lubrication points as described in the Railgear Kit Operation, Service and Parts manual.

Following the installation of the railgear Hydraulic Kit, the railgear will need to be adjusted:

13. Perform the Railgear Alignment procedure as described in the Railgear Kit Operation, Service and Parts manual.
14. Adjust the rail sweeps as described in the Railgear Kit Operation, Service and Parts manual.





THIS DOCUMENT IS THE PROPERTY OF RAFNA INDUSTRIES LTD. IT IS LOANED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED IN ANY WAY AGAINST THE INTERESTS OF RAFNA INDUSTRIES LTD. IT IS NOT TO BE COPIED, REPRODUCED OR DISCLOSED TO OTHERS, EXCEPT WITH PRIOR WRITTEN CONSENT OF RAFNA INDUSTRIES LTD.

| Rev | CHANGE | BY | DATE |
|---|---------|--------------|-----------|
| RAFNA INDUSTRIES LTD | | | |
| A Global Railway Industries Company 19300 Clark-Graham, Bate d'Urfé, Quebec Tel: (514) 457-4373 Fax: (514) 457-3567 | | | |
| DESCRIPTION: | | | |
| R-890 SLEWING VERTICAL REAR ASSEMBLY | | | |
| TOLERANCE (UNLESS SPECIFIED): | | APPR: | DATE: |
| 3 DECIMAL PLACES | ±0.018" | | |
| 2 DECIMAL PLACES | ±0.031" | DRAWN: | DATE: |
| 1 DECIMAL PLACE | ±0.063" | LE | MAY/28/04 |
| ANGULAR DIMENSIONS | ±1° | PART NUMBER: | REVISION: |
| ALL DIMENSIONS SHEET: | 2 OF 3 | R-8900 | 0 |
| ARE IN INCHES | | | |

| ITEM | PART No. | DESCRIPTION | QTY |
|------|----------|----------------------------------|-----|
| 1 | R-8920 | OUTER GUIDE TUBE FRAME | 1 |
| 2 | R-8930 | INNER GUIDE TUBE ASSEMBLY | 2 |
| 3 | R-8940 | SLEW FRAME | 1 |
| 4 | R-8950 | SLEW AXLE ASSEMBLY | 1 |
| 5 | R-8960 | HOOK ASSEMBLY | 2 |
| 6 | R-8961 | HANDLE | 1 |
| 7 | R-8964 | PIN | 2 |
| 8 | R-8966 | LINK | 4 |
| 9 | R-8983 | LEVER ASSEMBLY | 1 |
| 10 | R-8986 | PIN | 1 |
| 11 | R-8988 | PIN | 2 |
| 12 | R-8991 | PIN | 2 |
| 13 | R-8992 | RAIL SWEEP BRACKET ASSEMBLY | 2 |
| 14 | R-8993 | BEARING CAP | 2 |
| 15 | R-8997 | TOP PLATE | 2 |
| 16 | R-8998 | WASHER PLATE | 8 |
| 17 | R-8999 | BEARING | 2 |
| 18 | R-2411 | RUBBER SWEEP | 2 |
| 19 | R-3561 | SPRING | 2 |
| 20 | R-5561 | SWEEPER PLATE | 2 |
| 21 | R-5604 | SPRING | 2 |
| 22 | R-5683 | TIMBREN 540/75 SPRING | 4 |
| 23 | R-6784 | CLEVIS | 1 |
| 24 | R-6860 | 2" PUSH-PULL CABLE | 1 |
| 25 | R-9116 | HYDRAULIC CYLINDER ASSEMBLY | 2 |
| 26 | S-005001 | 3/8" OD X 3/4" LONG PIN | 5 |
| 27 | - | 1/4" UNC GR. 8 BOLT X 2.25" LONG | 2 |
| 28 | - | 1/4" UNC GR. 8 BOLT X 1.5" LONG | 4 |
| 29 | - | 1/4" SAE WASHER | 12 |
| 30 | - | 1/4" UNC GR. 3 NYLOCK NUT | 6 |
| 31 | - | 3/8" SAE WASHER | 12 |
| 32 | - | 1/2" UNC GR. 8 BOLT X 2" LONG | 8 |
| 33 | - | 1/2" UNC GR. 8 BOLT X 1.25" LONG | 4 |
| 34 | - | 1/2" GR. 8 WASHER | 23 |
| 35 | - | 1/2" LOCK WASHER | 4 |
| 36 | - | 1/2" UNC GR. 8 NYLOCK NUT | 8 |
| 37 | - | 3/4" UNC GR. 8 BOLT X 3.5" LONG | 8 |
| 38 | - | 3/4" GR. 8 WASHER | 18 |
| 39 | - | 3/4" UNC GR. 8 NYLOCK NUT | 8 |
| 40 | - | 1" GR. 8 WASHER | 6 |
| 41 | - | 1" UNC STOVER NUT | 2 |
| 42 | - | 1.25" GR. 8 WASHER | 4 |
| 43 | - | 3/32" COTTER PIN X 0.75" LONG | 6 |
| 44 | - | 1/4" COTTER PIN X 2" LONG | 6 |
| 45 | - | PIN (INCL W/R-6784) | 1 |
| 46 | - | COTTER PIN (INCL W/R-6784) | 1 |
| 47 | - | VEHICLE FRAME | 2 |

ALL OF ITEMS 16, 37 AND 39, AS WELL AS ONLY 16X ITEM 38,
ARE TO BE PACKAGED TOGETHER FOR SHIPPING.

ITEM 6 IS TO BE SHIPPED LOOSE.

REFER TO DRAWINGS H89VVX001 AND H89XSX001
FOR HYDRAULIC PARTS.

THIS DOCUMENT IS THE PROPERTY OF RAFNA INDUSTRIES LTD. IT IS
LOANED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED IN
ANY WAY AGAINST THE INTERESTS OF RAFNA INDUSTRIES LTD. IT IS
NOT TO BE COPIED, REPRODUCED OR DISCLOSED TO OTHERS.
EXCEPT WITH PRIOR WRITTEN CONSENT OF RAFNA INDUSTRIES LTD.

| Rev | CHANGE | BY | DATE |
|---|--------|---------------|------------------|
| RAFNA INDUSTRIES LTD | | | |
| A Global Railway Industries Company 19300 Clark-Graham, Baie d'Urfé, Quebec Tel: (514) 457-4373 Fax: (514) 457-3567 | | | |
| DESCRIPTION: | | | |
| R-890 SLEWING VERTICAL REAR ASSEMBLY | | | |
| TOLERANCE (UNLESS SPECIFIED): | | APPR: | DATE: |
| 3 DECIMAL PLACES ±0.016" | | | |
| 2 DECIMAL PLACES ±0.031" | | DRAWN: | DATE: |
| 1 DECIMAL PLACE ±0.063" | | LE | MAY/28/04 |
| ANGULAR DIMENSIONS ±1° | | PART NUMBER: | REVISION: |
| ALL DIMENSIONS ARE IN INCHES | | R-8900 | 0 |
| SHEET: 3 OF 3 | | | |

OPERATION, SERVICE AND PARTS OF R-890 SLEWING REAR RAILGEAR KIT

SAFETY PRECAUTIONS

If any operating, services or parts problems are encountered, please call Rafna Industries Ltd. for technical assistance.



CAUTION
WARNING

- Failure to heed to any of the following warnings could result in severe bodily injury and/or equipment damage.
- Read and understand this manual completely before attempting operation of the railgear equipped vehicle.
- Operating instructions provided below only address the Rafna railgear equipment. Applicable railway company procedures and policies must be adhered to.
- Railway company rules governing rail travel must be observed at all times.
- Ensure that the position and function of all railgear controls are known before attempting operation.
- Ensure that the railgear slew axle is locked in the center position before starting rail travel.
- Ensure the railgear is locked in road position before starting road travel.
- Ensure all body parts and loose clothing are clear of any moving parts of the equipment.
- If misalignment of the railgear equipment is indicated, promptly perform the alignment procedure.
- Before performing any work under the vehicle or railgear, ensure the engine is turned off and the parking brake is set.
- Never operate the vehicle if the Gross Vehicle Weight Rating (GVWR), Gross Axle Weight Rating Front or Rear (GAWR), or the wheel or tire load ratings are exceeded.
- Always disconnect the vehicle's battery when welding on the vehicle or railgear in order to protect the vehicle's electrical system.

OPERATION OF SLEWING REAR RAILGEAR KIT

With the railgear kit installed on this vehicle, it may be operated as normal. The vehicle, however, has decreased ground clearance and angles of approach and departure due to the railgear. Caution must be used when operating the vehicle.

Never operate the vehicle if the Gross Vehicle Weight Rating (GVWR), Gross Axle Weight Rating Front or Rear (GAWR), or the wheel or tire load ratings are exceeded.

Refer to the Hydraulic Kit Operation, Service, and Parts manual for information on the location and operation of the railgear hydraulic system controls.

Placing The Vehicle On Rail - To Lower The Railgear:

The slew (side-to-side) feature of this railgear can align the vehicle with the rails if the vehicle is on a level crossing and up to 3" out of alignment with the rails. If this is not the case, the vehicle will have to be manoeuvred to align it with the rails.

1. Disengage the railgear's vertical lock hooks by rotating the lock handle appropriately. If the hooks cannot be disengaged, raise the railgear slightly. Hold the lock handle in the disengaged position.
2. Lower the railgear until it is within 6" of the rails. Release the lock handle once the railgear axle has lowered sufficiently that the lock hooks will not engage the axle.
3. Disengage the railgear's slewing lock pin by pulling the lock cable handle to its fully extended position. If the slewing lock pin cannot be disengaged, slew the railgear slightly to either side and pull on the lock cable handle again. Hold the lock cable handle in the disengaged position.
4. Slew the railgear in the desired direction to align the rail wheels with the rails. Release the lock cable handle.
5. Continue lowering the railgear. Ensure that the rail wheels are aligned with the rails correctly. There can be several steps of lowering and slewing to achieve the correct alignment.
6. As the railgear reaches the rails, it will begin taking some of the vehicle's load. The railgear's rubber suspension springs should be observed compressing under this load. (If this is not the case, **DO NOT use the railgear**. Inspect the railgear for lubrication and damage.)
7. Continue lowering the railgear until the hydraulic cylinders are fully extended. Ensure that the railgear is fully deployed.
8. Slew the railgear back to its center position. This will drag the vehicle across the level crossing by up to 3" to return it to its centered position over the railgear.

9. When the railgear is centered, the slewing lock pin will move into the locked position. Stop slewing the railgear at this time.
10. Ensure that the slewing lock pin is in the fully locked position.

Removing The Vehicle From Rail - To Raise The Railgear:

1. Raise the railgear fully. The railgear's vertical lock hooks should automatically engage the axle in the locked position.
2. Ensure that the vertical lock hooks are engaged and that the railgear is locked in the road position.
3. Ensure that the slewing lock pin is fully engaged.

SERVICE OF SLEWING REAR RAILGEAR KIT

The railgear kit must be serviced regularly to avoid damage to the equipment. Table 1 below provides the Recommended Service Schedule and the detailed service procedures follow.

Table 2 provides the Standard Fastener Torque Values.

Grease fittings are provided at all railgear lubrication points as shown in Figure 1. The recommended lubricant for all lubrication points on this railgear is MYSTIK JT-6 LOW TEMP grease or equivalent. In cold weather areas/seasons, SHELL DARINA XL102 or equivalent may be used.

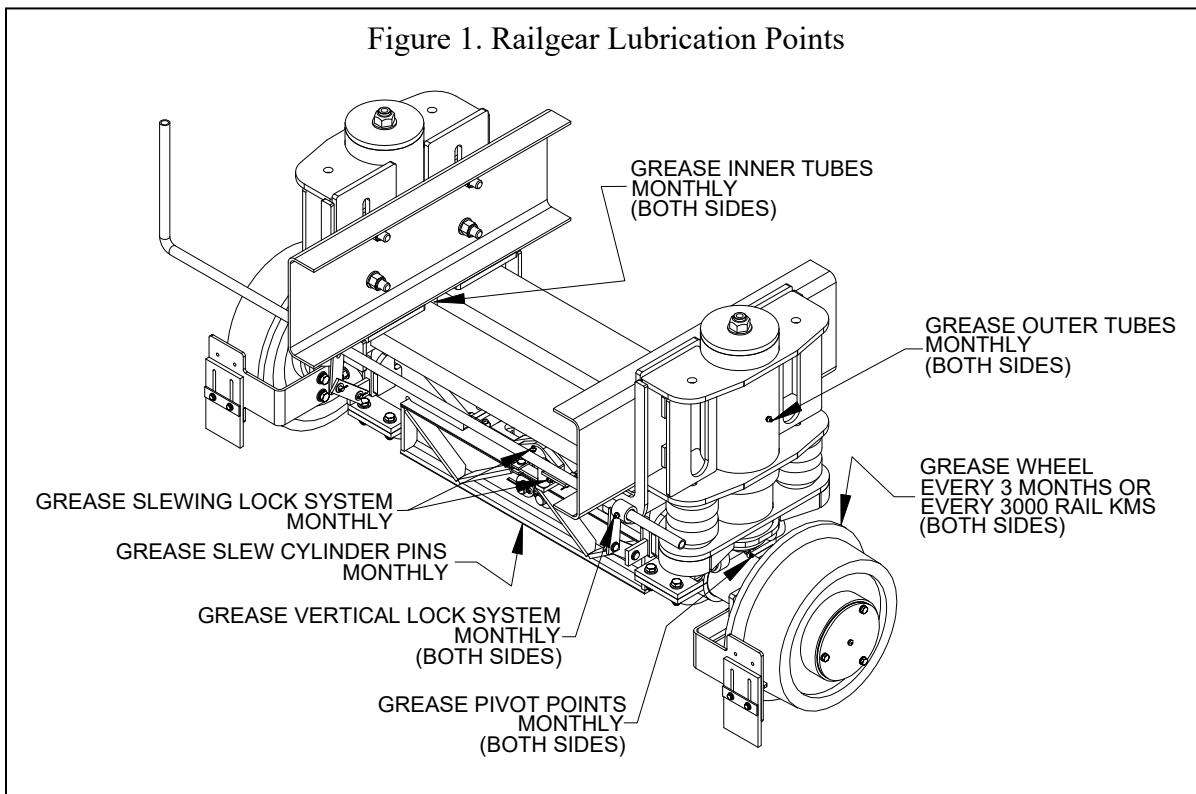
Table 1: Recommended Service Schedule

| Service Required | Daily | Weekly | Monthly | 3 Months | 6 Months |
|---|-------|--------|---------|----------|----------|
| Ensure that the vehicle is in good operating condition | ✓ | ✓ | ✓ | ✓ | ✓ |
| Check for loose rail wheels and fasteners (re-torque if required) | ✓ | ✓ | ✓ | ✓ | ✓ |
| Ensure railgear vertical lock is functioning correctly | ✓ | ✓ | ✓ | ✓ | ✓ |
| Visually inspect the railgear for damaged or worn parts | ✓ | ✓ | ✓ | ✓ | ✓ |
| Ensure that railgear slew lock is functioning properly | ✓ | ✓ | ✓ | ✓ | ✓ |
| Inspect the rail wheel flanges for wear (use Rafna wear gauge) | | ✓ | ✓ | ✓ | ✓ |
| Inspect all hydraulic components for leaks or wear | | ✓ | ✓ | ✓ | ✓ |
| Check and adjust rail sweeps | | ✓ | ✓ | ✓ | ✓ |
| Check and adjust rail wheel bearing end-play | | | ✓ | ✓ | ✓ |
| Grease railgear outer guide tubes | | | ✓ | ✓ | ✓ |
| Grease railgear inner tubes | | | ✓ | ✓ | ✓ |
| Grease lower cylinder pivot points | | | ✓ | ✓ | ✓ |
| Grease railgear lock guide handle bushings | | | ✓ | ✓ | ✓ |
| Grease slewing lock system | | | ✓ | ✓ | ✓ |
| Grease slewing cylinder pins | | | ✓ | ✓ | ✓ |
| Grease rail wheel bearings (every 3000 rail kms or 1900 rail miles) | | | | ✓ | ✓ |
| Check and adjust railgear alignment | | | | | ✓ |
| Check and repack rail wheel bearings | | | | | ✓ |

| | | | | | |
|--|--|--|--|--|---|
| Check and adjust rail wheel load / vehicle rear wheel traction | | | | | ✓ |
|--|--|--|--|--|---|

Table 2: Standard Fastener Torque Values

| Fastener Size | Fastener Torque Value (ft-lbs) Dry |
|--------------------------|------------------------------------|
| 1" UNC Gr. 8 Fasteners | 250 |
| 3/4" UNC Gr. 8 Fasteners | 175 |
| 5/8" UNC Gr. 8 Fasteners | 150 |
| 1/2" UNC Gr. 8 Fasteners | 100 |
| 3/8" UNC Gr. 8 Fasteners | 40 |
| 1/4" UNC Gr. 8 Fasteners | 12 |

Figure 1. Railgear Lubrication Points


RAIL SWEEP ADJUSTMENT

The distance between the rail sweep rubber and the rail is adjustable and should be maintained at approximately $\frac{1}{8}$ ". To adjust the rail sweep rubber, with the railgear in the rail position, loosen the two $\frac{1}{4}$ " fasteners that secure the rail sweep rubber to the rail sweep

G&B Specialties Inc. 535 West 3rd Street, Berwick, PA, USA Tel: (570) 752-5901 Fax: (570) 752-6397
 US Field Service: 570-441-6988; CAN Field Service 570-854-0482; www.rafna.com

bracket. Slide the rail sweep rubber up or down for the correct clearance. Tighten and torque the ¼" fasteners to 12 ft-lbs dry. Do not over torque.

RAIL WHEEL BEARING ADJUSTMENT

The rail wheel bearings require periodic adjustment in order to keep the endplay within specification. If the rail wheel bearings are not correctly adjusted, failure may occur and will not be covered under the railgear warranty. Check and adjust the bearing endplay with the railgear in the road position and with the rail wheels free to turn.

Use a magnetic base dial gauge to measure the endplay of each rail wheel bearing. The bearing endplay must be between 0.001" and 0.005". If this is not the case, adjust as follows:

1. Remove the rail wheel hubcap and gasket by removing the three ¾" bolts and ¾" lock washers.
2. Remove the lock tab from the spindle by removing the ¼" bolt and ¼" lock washer.
3. Ensure that the wheel bearing cavity is full of grease.
4. While rotating the rail wheel forward, torque the spindle nut to 20 ft-lbs. Then loosen the spindle nut and re-torque it to 6 ft-lbs. Re-check and re-adjust the bearing end-play if required. If no torque wrench is available, tighten the spindle nut until the rail wheel is difficult to turn by hand. Then loosen the spindle nut and retighten it just until no looseness can be felt in the bearings. Re-adjust the bearing end-play with a torque wrench as soon as possible.
5. Re-install the lock tab with the ¼" bolt and a new ¼" lock washer. Tighten the spindle nut slightly if needed to insert the lock tab. Torque the ¼" bolt to 12 ft-lbs dry. Do not over torque.
6. Re-install the hubcap and gasket using the ¾" bolts and new ¾" lock washers. Blue Loctite can be used on the bolts as an added safety measure. Tighten and torque the ¾" fasteners to 40 ft-lbs dry. Do not over torque.

RAIL WHEEL LOAD / VEHICLE REAR WHEEL TRACTION ADJUSTMENT

During rail travel, the railgear removes a predetermined portion of the vehicle's load from the vehicle's rear wheels and carries it on the rail wheels. A minimum amount of load must be maintained on the rail wheels in order to avoid derailment. Likewise, a minimum amount of load must be maintained on the vehicle rear wheels in order to provide traction for acceleration and braking. Also, with the railgear in road position, the rail wheels should be at least 9" above the road surface to provide sufficient road clearance.

The rail wheel load / rear tire traction should be adjusted following the installation of the railgear once the vehicle has had all of its permanent load (service body, crane, welders, etc) installed. The rail wheel load / rear tire traction requires periodic checks; however it should only require re-adjustment if the railgear is moved, the vehicle equipment is changed, or the vehicle suspension settles or is changed. As non-permanent load is added to and/or removed from the vehicle, the rail wheel load will also change. This is acceptable as long as the weight ratings of the vehicle, axle, wheels, tires and railgear are not exceeded and as long as the minimum rail wheel load, rear wheel traction and road clearance are maintained.

The rail wheel load is checked on rail by ensuring that the railgear suspension is compressed a minimum of 1" to avoid derailment and approximately 2" during normal use.

The rear wheel traction is checked on rail by ensuring that the vehicle rear wheels do not spin during normal acceleration and/or skid during normal braking.

The rail wheel road clearance is checked with the railgear in the road position by ensuring that the distance between the bottom of the rail wheel and the road surface is at least 9".

The rail wheel load / rear wheel traction is adjusted by changing the railgear mounting height on the vehicle frame as follows:

1. Determine how much the railgear must be adjusted up or down on the vehicle frame in order to obtain the correct rail wheel load / rear wheel traction.
2. With the railgear in the road position, support the railgear and grind off the welds from the washer plates. Loosen the eight ¾" mounting bolts.
3. Add or remove shims as necessary between the bottom of the flange of the frame and the top surface of the mounting brackets.
4. Tack weld the shims to each other and to the railgear so they will not fall out.
5. Torque the ¾" fasteners to 175 ft-lbs dry. Do not over torque.
6. Re-check the rail wheel load / rear wheel traction and re-adjust if necessary.

7. Ensure that the rail wheel road clearance is at least 9". If this minimum clearance cannot be met after adjusting the rail wheel load and rear wheel traction, then the cylinder stopper can be removed from inside the hydraulic cylinders to provide 1" more cylinder travel.
8. Re-weld the washer plates using a $\frac{3}{8}$ " fillet weld all around.

RAILGEAR ALIGNMENT

The railgear must be correctly aligned in order to perform properly and safely, and to avoid excessive wear and derailment. The railgear rail wheels must be aligned to point in the same direction as and be centered on the vehicle rear tires. The railgear is supplied with fixed non-adjustable rail wheels. In order for the rail wheels to be aligned with the vehicle rear wheels, the entire railgear must be moved on the vehicle frame.

Prior to performing the railgear alignment, the vehicle should have a rear axle alignment done to within zero tolerance by a qualified alignment professional and the tires should be properly inflated.

The railgear alignment is checked with the vehicle on a straight, level section of rail with the railgear in the rail position. Ensure that the railgear slewing lock is engaged and that the railgear is in the center position. Refer to figure 2 for railgear alignment measurements and specifications.

In order to move the railgear on the vehicle frame, raise the railgear until it is just off the rails, support the railgear and then loosen the eight $\frac{3}{4}$ " mounting fasteners. In order to center the railgear on the vehicle rear tires (lateral alignment), adjust the shim thicknesses between the railgear mounting brackets and the web of the vehicle frame. Ensure that the railgear guide tubes remain parallel to each other and that the railgear mounting brackets remain at 35" apart. In order to align the rail wheels to point in the same direction as the vehicle tires (directional alignment), move the railgear mounting brackets forwards or backwards with respect to each other along the vehicle frame. This will change the directional angle of the railgear axle and wheels. It may be necessary to weld closed the $\frac{3}{4}$ " mounting holes in the vehicle frame and drill new holes.

When the railgear is correctly aligned, the $\frac{3}{4}$ " mounting fasteners should be torqued to 175 ft-lbs dry. Do not over torque. Ensure that the washer plates are welded to the railgear mounting brackets with a $\frac{3}{8}$ " fillet weld all around.

Check the railgear clearance to all vehicle components throughout the full range of railgear and railgear suspension movement.

Figure 2. Railgear Alignment

VEHICLE MODEL: _____

VEHICLE UNIT #: _____

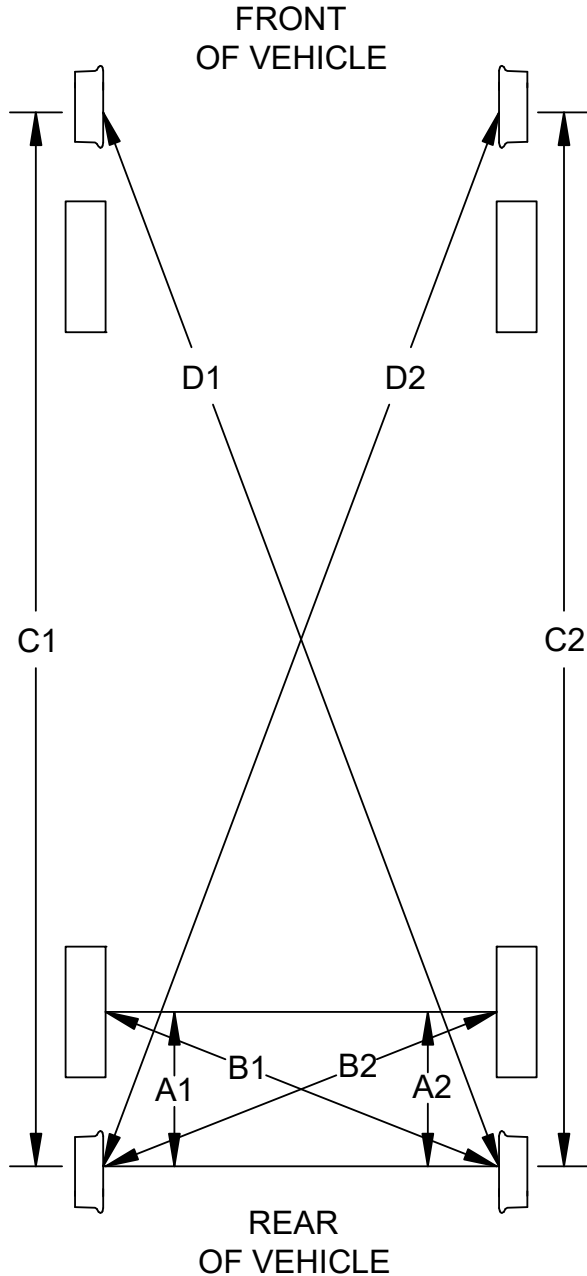
RAILGEAR S/N: _____

ALIGN REAR RAILGEAR
A1 & A2 MUST BE EQUAL WITHIN 1/16"
B1 & B2 MUST BE EQUAL WITHIN 1/8"

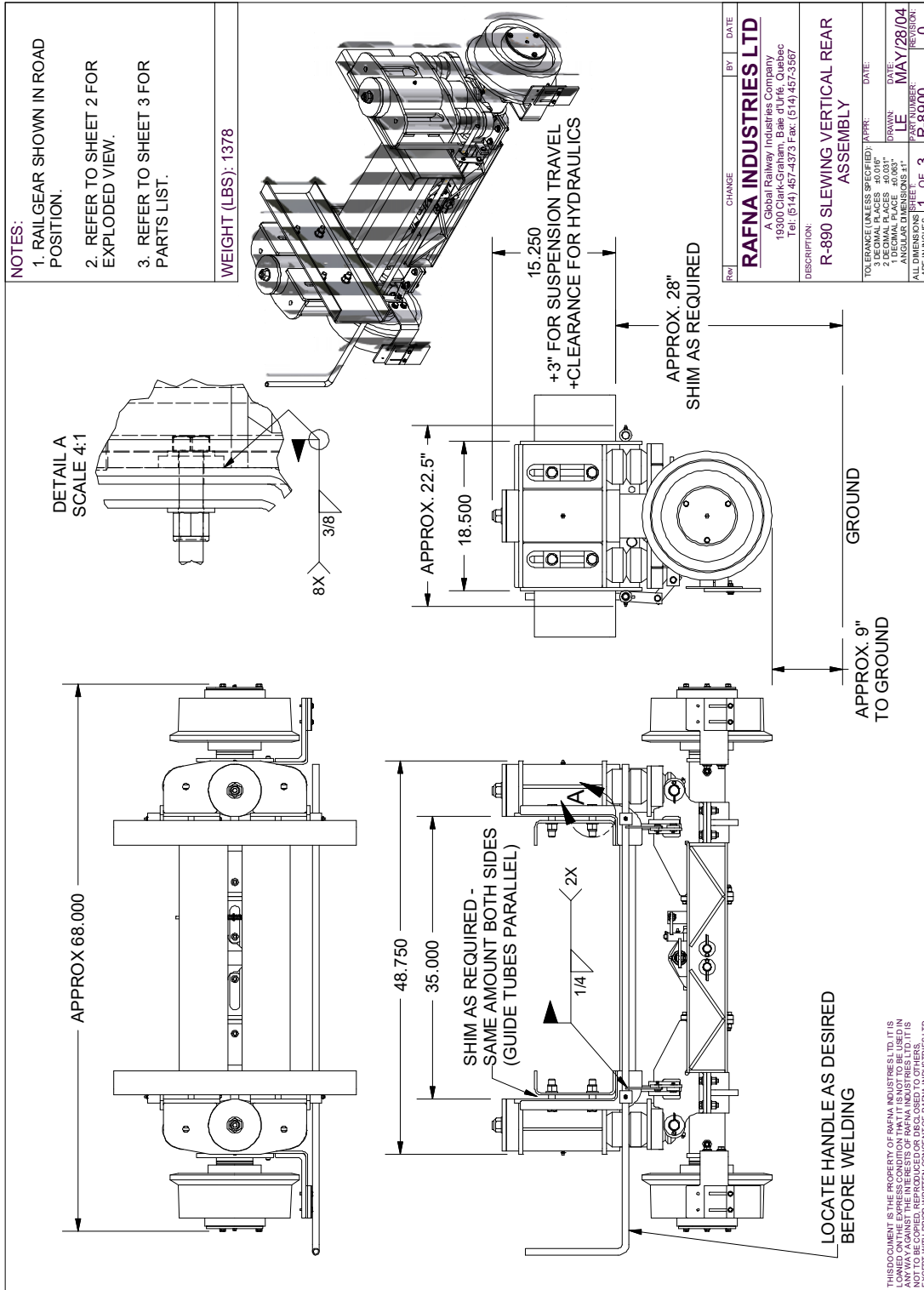
ALIGN FRONT RAILGEAR TO REAR
C1 & C2 MUST BE EQUAL WITHIN 1/8"
D1 & D2 MUST BE EQUAL WITHIN 1/8"

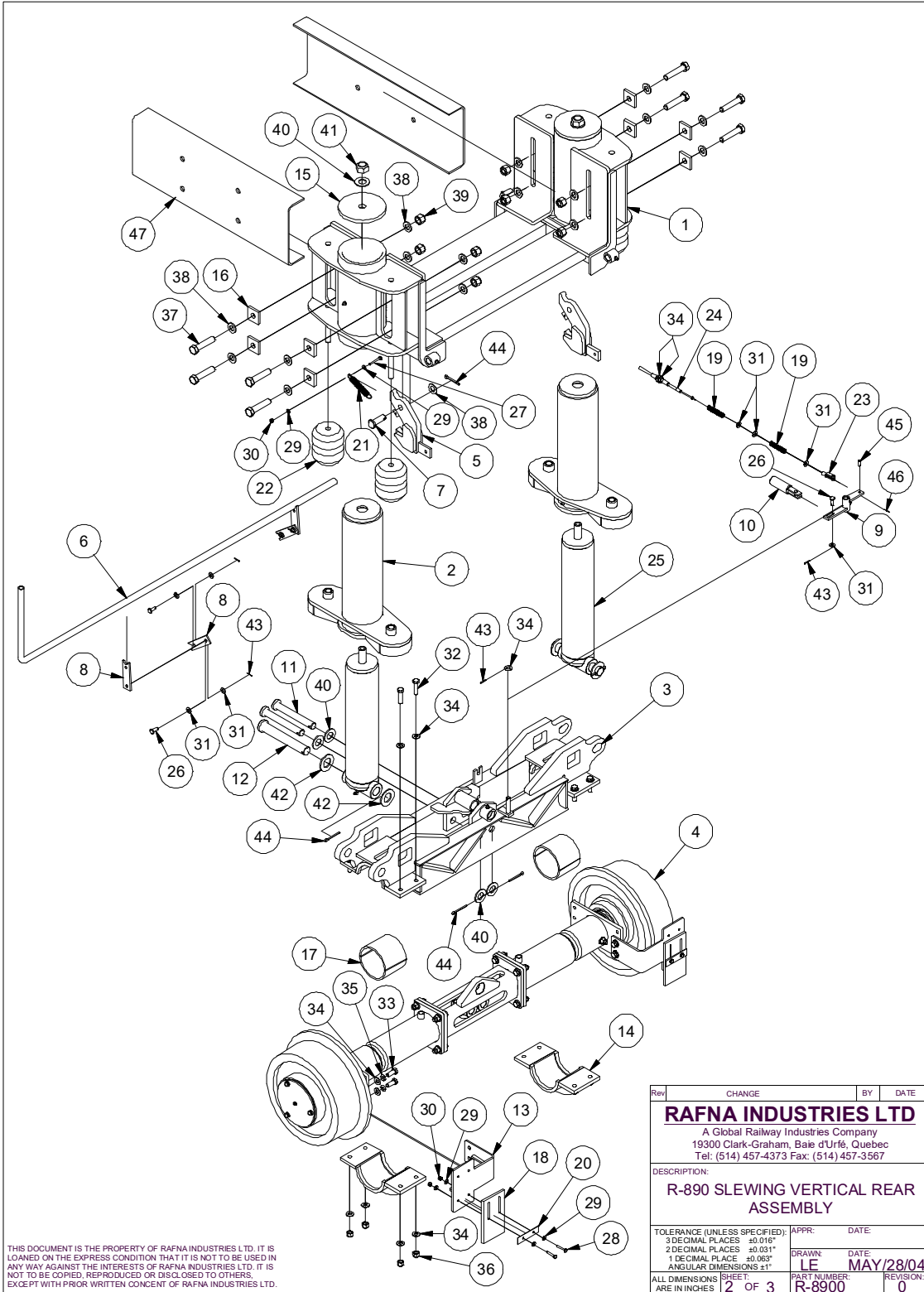
RAIL WHEEL FLANGE TO
GROUND CLEARANCE

- LEFT FRONT _____
- RIGHT FRONT _____
- LEFT REAR _____
- RIGHT REAR _____



PARTS OF SLEWING REAR RAILGEAR KIT





THIS DOCUMENT IS THE PROPERTY OF RAFNA INDUSTRIES LTD. IT IS LOANED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED IN ANY WAY AGAINST THE INTERESTS OF RAFNA INDUSTRIES LTD. IT IS NOT TO BE COPIED, REPRODUCED OR DISCLOSED TO OTHERS, EXCEPT WITH PRIOR WRITTEN CONSENT OF RAFNA INDUSTRIES LTD.

| REV | CHANGE | BY | DATE |
|---|--------------|---------------------|-----------------|
| RAFNA INDUSTRIES LTD | | | |
| A Global Railway Industries Company 19300 Clark-Graham, Baie d'Urfe, Quebec Tel: (514) 457-4373 Fax: (514) 457-3567 | | | |
| DESCRIPTION: | | | |
| R-890 SLEWING VERTICAL REAR ASSEMBLY | | | |
| TOLERANCE (UNLESS SPECIFIED): | | APPR: | DATE: |
| 3 DECIMAL PLACES ±0.016" | | | |
| 2 DECIMAL PLACES ±0.031" | | | |
| 1 DECIMAL PLACE ±0.063" | | | |
| ANGULAR DIMENSIONS ±1° | | | |
| ALL DIMENSIONS ARE IN INCHES | SHEET 2 OF 3 | PART NUMBER: R-8900 | DATE: MAY/28/04 |
| | | | REVISION: 0 |

| ITEM | PART No. | DESCRIPTION | QTY |
|------|----------|----------------------------------|-----|
| 1 | R-8920 | OUTER GUIDE TUBE FRAME | 1 |
| 2 | R-8930 | INNER GUIDE TUBE ASSEMBLY | 2 |
| 3 | R-8940 | SLEW FRAME | 1 |
| 4 | R-8950 | SLEW AXLE ASSEMBLY | 1 |
| 5 | R-8960 | HOOK ASSEMBLY | 2 |
| 6 | R-8961 | HANDLE | 1 |
| 7 | R-8964 | PIN | 2 |
| 8 | R-8966 | LINK | 4 |
| 9 | R-8983 | LEVER ASSEMBLY | 1 |
| 10 | R-8986 | PIN | 1 |
| 11 | R-8988 | PIN | 2 |
| 12 | R-8991 | PIN | 2 |
| 13 | R-8992 | RAIL SWEEP BRACKET ASSEMBLY | 2 |
| 14 | R-8993 | BEARING CAP | 2 |
| 15 | R-8997 | TOP PLATE | 2 |
| 16 | R-8998 | WASHER PLATE | 8 |
| 17 | R-8999 | BEARING | 2 |
| 18 | R-2411 | RUBBER SWEEP | 2 |
| 19 | R-3561 | SPRING | 2 |
| 20 | R-5561 | SWEEPER PLATE | 2 |
| 21 | R-5604 | SPRING | 2 |
| 22 | R-5683 | TIMBREN 540/75 SPRING | 4 |
| 23 | R-6784 | CLEVIS | 1 |
| 24 | R-6860 | 2" PUSH-PULL CABLE | 1 |
| 25 | R-9116 | HYDRAULIC CYLINDER ASSEMBLY | 2 |
| 26 | S-005001 | 3/8" OD X 3/4" LONG PIN | 5 |
| 27 | - | 1/4" UNC GR. 8 BOLT X 2.25" LONG | 2 |
| 28 | - | 1/4" UNC GR. 8 BOLT X 1.5" LONG | 4 |
| 29 | - | 1/4" SAE WASHER | 12 |
| 30 | - | 1/4" UNC GR. 3 NYLOCK NUT | 6 |
| 31 | - | 3/8" SAE WASHER | 12 |
| 32 | - | 1/2" UNC GR. 8 BOLT X 2" LONG | 8 |
| 33 | - | 1/2" UNC GR. 8 BOLT X 1.25" LONG | 4 |
| 34 | - | 1/2" GR. 8 WASHER | 23 |
| 35 | - | 1/2" LOCK WASHER | 4 |
| 36 | - | 1/2" UNC GR. 8 NYLOCK NUT | 8 |
| 37 | - | 3/4" UNC GR. 8 BOLT X 3.5" LONG | 8 |
| 38 | - | 3/4" GR. 8 WASHER | 18 |
| 39 | - | 3/4" UNC GR. 8 NYLOCK NUT | 8 |
| 40 | - | 1" GR. 8 WASHER | 6 |
| 41 | - | 1" UNC STOVER NUT | 2 |
| 42 | - | 1.25" GR. 8 WASHER | 4 |
| 43 | - | 3/32" COTTER PIN X 0.75" LONG | 6 |
| 44 | - | 1/4" COTTER PIN X 2" LONG | 6 |
| 45 | - | PIN (INCL W/R-6784) | 1 |
| 46 | - | COTTER PIN (INCL W/R-6784) | 1 |
| 47 | - | VEHICLE FRAME | 2 |

ALL OF ITEMS 16, 37 AND 39, AS WELL AS ONLY 16X ITEM 38,
ARE TO BE PACKAGED TOGETHER FOR SHIPPING.

ITEM 6 IS TO BE SHIPPED LOOSE.

REFER TO DRAWINGS H89VVX001 AND H89XSX001
FOR HYDRAULIC PARTS.

THIS DOCUMENT IS THE PROPERTY OF RAFNA INDUSTRIES LTD. IT IS
LOANED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED IN
ANY WAY AGAINST THE INTERESTS OF RAFNA INDUSTRIES LTD. IT IS
NOT TO BE COPIED, REPRODUCED OR DISCLOSED TO OTHERS.
EXCEPT WITH PRIOR WRITTEN CONSENT OF RAFNA INDUSTRIES LTD.

| Rev | CHANGE | BY | DATE |
|--|--------|---------------------|------|
| RAFNA INDUSTRIES LTD | | | |
| <small>A Global Railway Industries Company 19300 Clark-Graham, Baie d'Urfé, Quebec Tel: (514) 457-4373 Fax: (514) 457-3567</small> | | | |
| DESCRIPTION: R-890 SLEWING VERTICAL REAR ASSEMBLY | | | |
| TOLERANCE (UNLESS SPECIFIED): | | APPR: DATE: | |
| 3 DECIMAL PLACES ±0.016" | | | |
| 2 DECIMAL PLACES ±0.031" | | DRAWN DATE: | |
| 1 DECIMAL PLACE ±0.063" | | LE MAY/28/04 | |
| ANGULAR DIMENSIONS ±1° | | PART NUMBER: R-8900 | |
| ALL DIMENSIONS SHEET: ARE IN INCHES 3 OF 3 | | REVISION: 0 | |

NOTES:

- PRESS ITEM 13 FLUSH INTO ITEM 9.
- DRILL INSULATING TUBE TO FIT FOR 1/2" BOLT INSTALLATION.
- PRESET BEARINGS AS PER MANUAL INSTRUCTIONS.

WEIGHT (LBS): 629

THIS DOCUMENT IS THE PROPERTY OF RAFNA INDUSTRIES LTD. IT IS LOANED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED IN ANY WAY AGAINST THE INTERESTS OF RAFNA INDUSTRIES LTD. IT IS EXCEPT WITH PRIOR WRITTEN CONSENT OF RAFNA INDUSTRIES LTD.

| ITEM | PART No | DESCRIPTION | QTY | ITEM | PART No | DESCRIPTION | QTY |
|------|---------|---------------------------|-----|------|----------|---------------------------------|-----|
| 1 | R-8510 | BEARING CONE | 4 | 13 | R-8996 | INSULATING TUBE | 2 |
| 2 | R-8511 | BEARING CUP | 4 | 14 | S-801001 | OIL SEAL | 2 |
| 3 | R-8513 | LOCK TAB | 2 | 15 | - | 1/4" UNF GR. 8 BOLT X 1" LONG | 2 |
| 4 | R-8515 | GASKET | 2 | 16 | - | 1/4" LOCK WASHER | 2 |
| 5 | R-8516 | 2-1/2" - 12 SLOTTED NUT | 2 | 17 | - | 3/8" UNC GR. 8 BOLT X 1" LONG | 6 |
| 6 | R-8517 | HUB CAB | 2 | 18 | - | 3/8" LOCK WASHER | 6 |
| 7 | R-8520 | 14" RAIL WHEEL | 2 | 19 | - | 1/2" UNC GR. 8 BOLT X 5.5" LONG | 2 |
| 8 | R-8951 | SLEW AXLE CENTER ASSEMBLY | 1 | 20 | - | 1/2" UNC GR. 8 BOLT X 2" LONG | 8 |
| 9 | R-8955 | SLEW AXLE HALF ASSEMBLY | 2 | 21 | - | 1/2" GR. 8 WASHER | 20 |
| 10 | R-8985 | BUSHING | 2 | 22 | - | 1/2" UNC GR. 8 NYLOCK NUT | 10 |
| 11 | R-8994 | SPINDLE | 2 | 23 | - | 1/8" NPT GREASE ZERK | 2 |
| 12 | R-8995 | INSULATING WASHER | 2 | | | | |

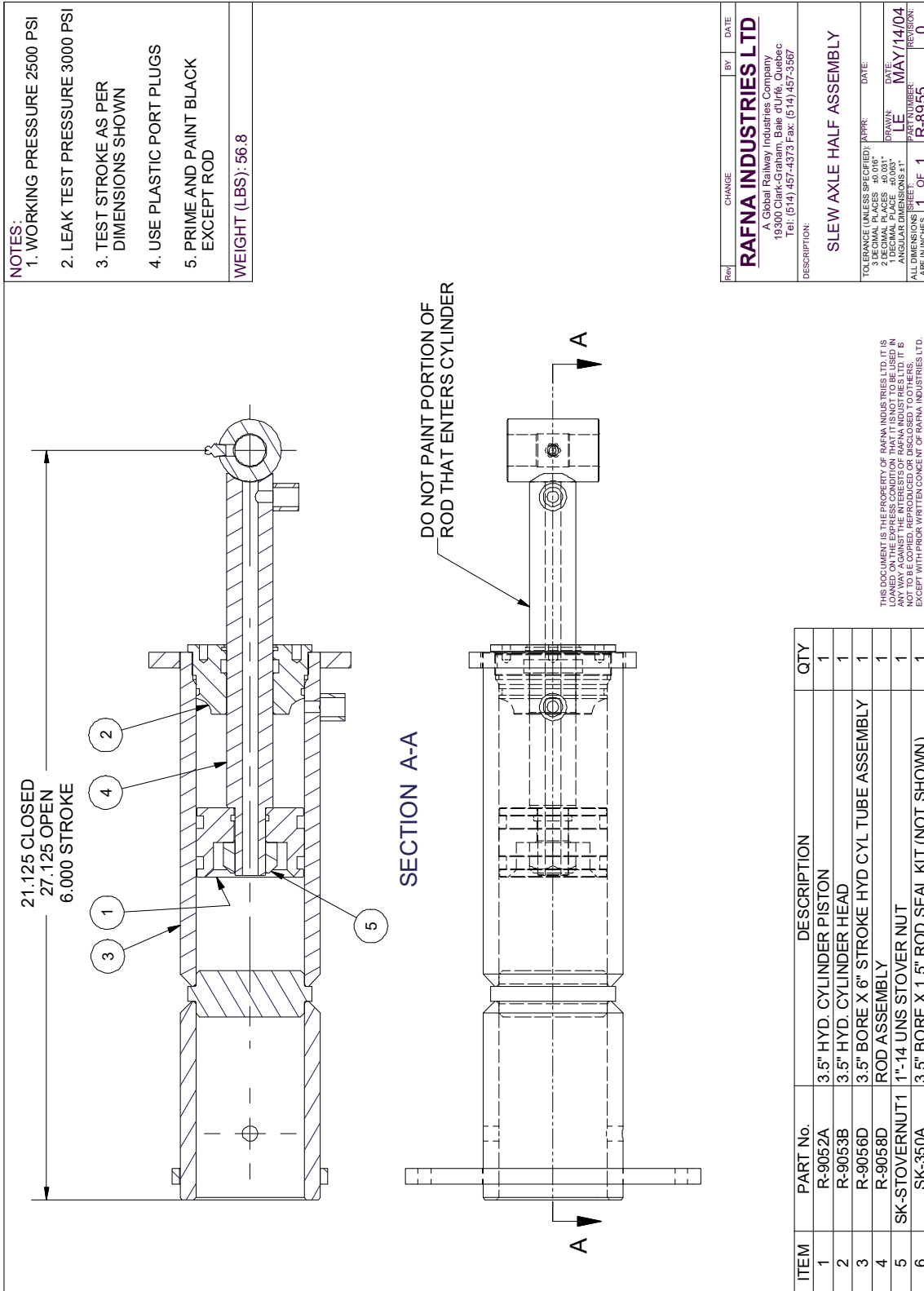
DESCRIPTION: SLEW AXLE ASSEMBLY

TOLERANCE (UNLESS SPECIFIED): APPR. DATE:

1 DECIMAL PLACES ±0.005" DRAWN DATE: MAY 14/04

2 DECIMAL PLACES ±0.001" I.E. PART NUMBER: R-8950 REVISION: 0

ALL DIMENSIONS ARE IN INCHES. SHEET 1 OF 1



| Rev | CHANGE | BY | DATE |
|-----|--------|----|------|
| | | | |

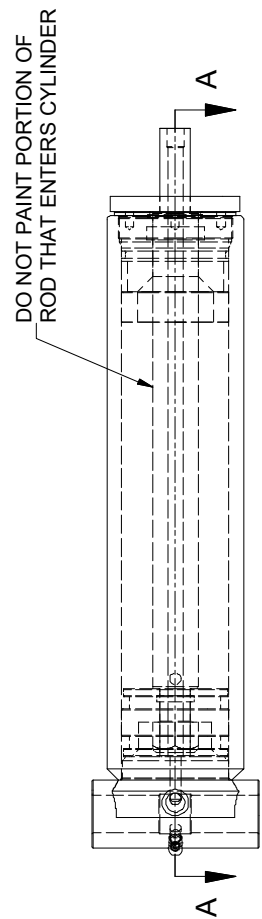
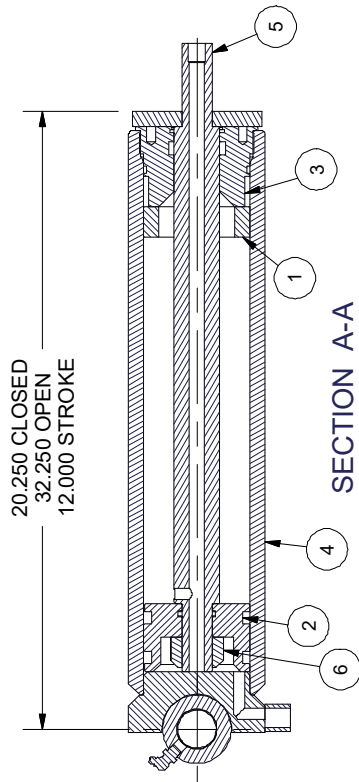
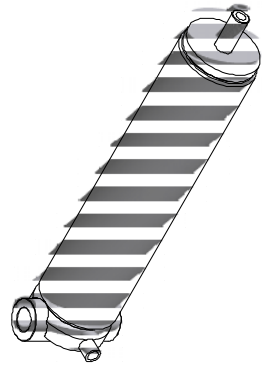
RAFNA INDUSTRIES LTD
A Global Railway Industries Company
19300 Clark-Graham, Bala c'Urif, Quebec
Tel: (514) 457-4573 Fax: (514) 457-5567

DESCRIPTION: **SLEW AXLE HALF ASSEMBLY**

| TOLERANCE (UNLESS SPECIFIED): | APPR: | DATE: |
|-------------------------------|---------|-------|
| 3 DECIMAL PLACES | ±0.016" | |
| 2 DECIMAL PLACES | ±0.031" | |
| 1 DECIMAL PLACE | ±0.062" | |
| ALL DIMENSIONS | ±0.062" | |
| ANGULAR DIMENSIONS | ±1° | |
| ARE IN INCHES | 1 OF 1 | |

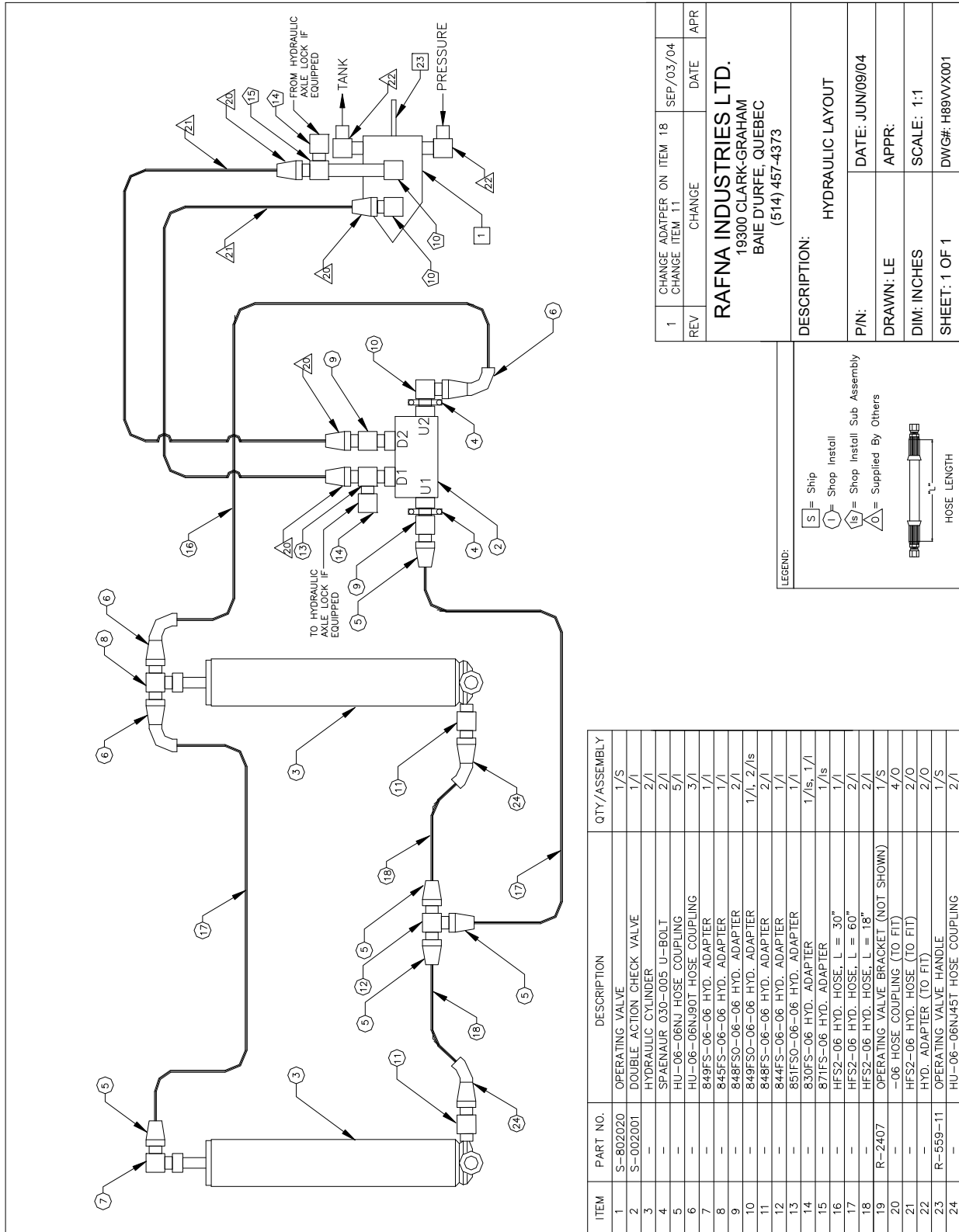
DRAWN: **LE** DATE: **MAY/14/04**
PART NUMBER: **R-89355** REVISION: **0**

- NOTES:**
1. WORKING PRESSURE 2500 PSI
 2. LEAK TEST PRESSURE 3000PSI
 3. TEST STROKE AS PER DIMENSIONS SHOWN
 4. USE PLASTIC PORT PLUGS
 5. PRIME AND PAINT BLACK EXCEPT ROD
- WEIGHT (LBS): 60.2



| | | | | | |
|--|----|------|--------|----|----------|
| 1 | UP | DATE | ITEM 4 | LE | OCT04B04 |
| Rev | | | CHANGE | BY | DATE |
| RAFNA INDUSTRIES LTD 1 Global Railway Industries Company 19200 Old Court Tel: (514) 457-4373 Fax: (514) 457-3567 | | | | | |
| DESCRIPTION: 3.5" BORE X 12" STROKE HYDRAULIC CYLINDER ASSEMBLY | | | | | |
| TOLERANCE (UNLESS SPECIFIED): APPR. DATE: 3 DECIMAL PLACES ±0.016" 2 DECIMAL PLACES ±0.008" 1 DECIMAL PLACE ±0.005" ANGULAR DIMENSIONS ±1° | | | | | |
| ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED ARE IN INCHES | | | | | |
| DRAWN: DATE: LE MAY/12/04 CHECKED: DATE: LE PART NUMBER: R-9116 REVISION: 1 | | | | | |

| ITEM | PART No. | DESCRIPTION | QTY |
|------|----------------|--|-----|
| 1 | R-9048 | CYLINDER STOPPER | 1 |
| 2 | R-9052A | 3.5" HYD. CYLINDER PISTON | 1 |
| 3 | R-9053A | 3.5" HYD. CYLINDER HEAD | 1 |
| 4 | R-9056C | 3.5" BORE X 13" STROKE HYD CYL TUBE ASSEMBLY | 1 |
| 5 | R-9058C | ROD ASSEMBLY | 1 |
| 6 | SK-S TOVERNUT1 | 1"-14 UNS STOVER NUT | 1 |
| 7 | SK-350A | 3.5" BORE X 1.5" ROD SEAL KIT (NOT SHOWN) | 1 |



| | | |
|-----|---------------------------|-----------|
| 1 | CHANGE ADAPTER ON ITEM 18 | SEP/03/04 |
| | CHANGE ITEM 11 | |
| REV | CHANGE | DATE |
| | | APR |

RAFNA INDUSTRIES LTD.
 19300 CLARK-GRAHAM
 BAIE D'URFE, QUEBEC
 (514) 457-4373

DESCRIPTION: HYDRAULIC LAYOUT

P/N: DATE: JUN/09/04

DRAWN: LE APPR:

DIM: INCHES SCALE: 1:1

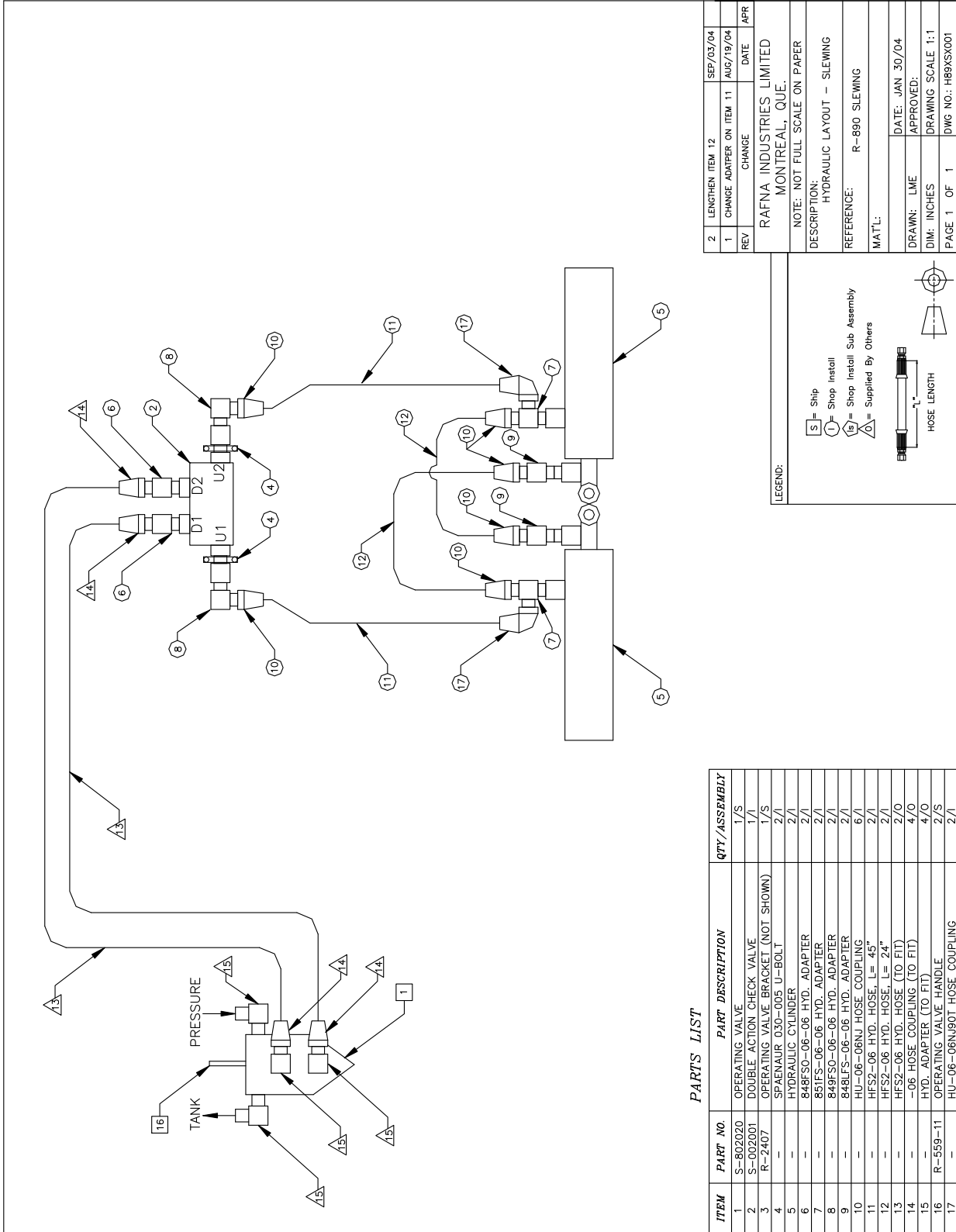
SHEET: 1 OF 1 DWG#: H89VX001

LEGEND:

S = Ship
 I = Shop Install
 (S) = Shop Install Sub Assembly
 Δ = Supplied By Others

HOSE LENGTH

| ITEM | PART NO. | DESCRIPTION | QTY/ASSEMBLY |
|------|---------------|-------------------------------------|--------------|
| 1 | S-802020 | OPERATING VALVE | 1/S |
| 2 | S-002001 | DOUBLE ACTION CHECK VALVE | 1/I |
| 3 | - | HYDRAULIC CYLINDER | 2/I |
| 4 | - | SPAENAUER 030-005 U-BOLT | 2/I |
| 5 | HU-06-06NJ | HOSE COUPLING | 5/I |
| 6 | HU-06-06NJ90T | HOSE COUPLING | 3/I |
| 7 | 849FS-06-06 | HYD. ADAPTER | 1/I |
| 8 | 845FS-06-06 | HYD. ADAPTER | 1/I |
| 9 | 848FS-06-06 | HYD. ADAPTER | 2/I |
| 10 | 849FSO-06-06 | HYD. ADAPTER | 1/I, 2/I |
| 11 | 848FS-06-06 | HYD. ADAPTER | 2/I |
| 12 | 844FS-06-06 | HYD. ADAPTER | 1/I |
| 13 | 851FSO-06-06 | HYD. ADAPTER | 1/I |
| 14 | 850FS-06 | HYD. ADAPTER | 1/I, 1/I |
| 15 | 871FS-06 | HYD. ADAPTER | 1/I |
| 16 | HFS2-06 | HYD. HOSE, L = 30" | 1/I |
| 17 | HFS2-06 | HYD. HOSE, L = 60" | 2/I |
| 18 | HFS2-06 | HYD. HOSE, L = 18" | 2/I |
| 19 | R-2407 | OPERATING VALVE BRACKET (NOT SHOWN) | 1/S |
| 20 | - | -06 HOSE COUPLING (TO FIT) | 4/0 |
| 21 | - | HFS2-06 HYD. HOSE (TO FIT) | 2/0 |
| 22 | - | HYD. ADAPTER (TO FIT) | 2/0 |
| 23 | R-559-11 | OPERATING VALVE HANDLE | 1/S |
| 24 | - | HU-06-06NJ45T HOSE COUPLING | 2/I |



PARTS LIST

| ITEM | PART NO. | PART DESCRIPTION | QTY./ASSEMBLY |
|------|----------|-------------------------------------|---------------|
| 1 | S-802020 | OPERATING VALVE | 1/S |
| 2 | S-002001 | DOUBLE ACTION CHECK VALVE | 1/I |
| 3 | R-2407 | OPERATING VALVE BRACKET (NOT SHOWN) | 1/S |
| 4 | — | SPACER/UBR 030-005 U-BOLT | 2/I |
| 5 | — | HYDRAULIC CLENDER | 2/I |
| 6 | — | 848FS0-06-06 HYD. ADAPTER | 2/I |
| 7 | — | 848FS0-06-06 HYD. ADAPTER | 2/I |
| 8 | — | 848FS0-06-06 HYD. ADAPTER | 2/I |
| 9 | — | 848LFS-06-06 HYD. ADAPTER | 2/I |
| 10 | — | HU-06-06NU HOSE COUPLING | 6/I |
| 11 | — | HFS2-06 HYD. HOSE, L= 45" | 2/I |
| 12 | — | HFS2-06 HYD. HOSE, L= 24" | 2/I |
| 13 | — | HFS2-06 HYD. HOSE (TO FIT) | 2/O |
| 14 | — | -06 HOSE COUPLING (TO FIT) | 4/O |
| 15 | — | HYD. ADAPTER (TO FIT) | 4/O |
| 16 | R-559-11 | OPERATING VALVE HANDLE | 2/S |
| 17 | — | HU-06-06NU90T HOSE COUPLING | 2/I |

| REV | CHANGE | DATE | APR |
|-----|---------------------------|-----------|-----|
| 1 | CHANGE ADAPTER ON ITEM 11 | AUG/19/04 | |
| 2 | LENGTHEN ITEM 12 | SEP/03/04 | |

RAFNA INDUSTRIES LIMITED
MONTREAL, QUE.

NOTE: NOT FULL SCALE ON PAPER

DESCRIPTION: HYDRAULIC LAYOUT - SLEWING
REFERENCE: R-890 SLEWING
MATERIAL:

DRAWN: LME
DATE: JAN 30/04
APPROVED:

DIM: INCHES
DRAWING SCALE 1:1
PAGE 1 OF 1
DWG NO: H89XS001

LEGEND:

[S] = Ship
[L] = Shop Install
[8] = Shop Install Sub Assembly
[Δ] = Supplied By Others

HOSE LENGTH

