

INSTALLATION OF R-290 FRONT AND/OR REAR HYDRAULIC BRAKE KIT

INSTALLATION SAFETY PRECAUTIONS

If any installation problems are encountered, please call G&B Specialties, Inc. 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 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.
- When routing hydraulic hoses, ensure that the hoses do not contact any sharp edges or hot surfaces.
- All wire connections should be soldered and heat shrink sealed to prevent future corrosion-related problems.
- All wires must be covered with protective cable loom.
- Always disconnect the vehicle's battery when welding on the vehicle or railgear to protect the vehicle's electrical system.
- Do not use regular brake fluid in the hydraulic brake system, as it will damage the hydraulic brake pump and the brake cylinders.

INSTALLATION OF FRONT AND/OR REAR HYDRAULIC BRAKE KIT

The following procedure details the installation of the Front and/or Rear Hydraulic Brake Kit on the R-290 railgear.

Hydraulic Brake Kit

| Part Number | Description | Quantity |
|-------------------------------|---|----------|
| R-20229D | Hydraulic Brake Assy, Driver Side | 1 |
| R-20229P | Hydraulic Brake Assy, Passengers Side | 1 |
| R-31540 | Mtg Brkt, Brake Assy | 1 |
| R-31541 | Mtg Brkt, Brake Assy | 1 |
| P-00011 | Pump Mounting Plate | 1 |
| CO-106 | Dash Switch | 1 |
| R-1577 | 5A In-Line Fuse | 1 |
| R-5670 | Hydraulic Brake Pump | 1 |
| R-5692 | Electric Brake Control | 1 |
| CO-130H | "Railgear Brake Pump" Decal | 1 |
| 844FS-04-04 | 1/4" Male JIC to 1/4" Male JIC Tee | 1 |
| HFS2-04 | Hose 32" Long | 1 |
| HFS2-04 | Hose 36" Long | 2 |
| HU04-04NJ | 1/4" Female Hose Straight Coupling (Installed on hoses) | 4 |
| HU04-04MF | 1/4" Male Swivel Inverted Coupling (Installed on hoses) | 2 |
| R-990KIT-261 | 1/4" UNC Gr.8 Bolt x 1.25" Long | 3 |
| | 1/4" Type-A Gr.8 Flat Washer | 3 |
| | 1/4" Lock Washer | 3 |
| R-990KIT-269 (2 Kits Per) | 1/2" UNC Gr.8 Bolt x 1.50" Long | 8(16) |
| | 1/2" Gr.8 Washer, Flat | 16(32) |
| | 1/2" UNC Gr.8 Nylock Jam Nut | 8(16) |
| R-990KIT-204C (2 Kits Per) | 1/2" UNC Gr.8 Bolt x 2" Long | 2(4) |
| | 1/2" UNC Gr.8 Bolt x 2.25" Long | 2(4) |
| | 1/2" Gr.8 Washer, Flat | 8(16) |
| | 1/2" UNC Gr.8 Nylock Nut | 4(8) |

Included When Rear Brakes Are Ordered

| Part Number | Description | Quantity |
|-------------------------------|---|----------|
| R-20229D | Hydraulic Brake Assy, Driver Side | 1 |
| R-20229P | Hydraulic Brake Assy, Passengers Side | 1 |
| R-31540 | Mtg Brkt, Brake Assy | 1 |
| R-31541 | Mtg Brkt, Brake Assy | 1 |
| 844FS-04-04 | 1/4" Male JIC to 1/4" Male JIC Tee | 2 |
| HFS2-04 | Hose 360" Long | 1 |
| HFS2-04 | Hose 36" Long | 2 |
| HU04-04NJ | 1/4" Female Hose Straight Coupling (Installed on hoses) | 4 |
| HU04-04MF | 1/4" Male Swivel Inverted Coupling (Installed on hoses) | 2 |
| R-990KIT-261 | 1/4" UNC Gr.8 Bolt x 1.25" Long | 3 |
| | 1/4" Type-A Gr.8 Flat Washer | 3 |
| | 1/4" Lock Washer | 3 |
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| R-990KIT-204C (2 Kits Per) | 1/2" UNC Gr.8 Bolt x 2" Long | 2(4) |
| | 1/2" UNC Gr.8 Bolt x 2.25" Long | 2(4) |
| | 1/2" Gr.8 Washer, Flat | 8(16) |
| | 1/2" UNC Gr.8 Nylock Nut | 4(8) |

1. Ensure that the rail wheels have been installed on the front railgear prior to installation of the Front Hydraulic Brake Kit.

If the rail wheels have already been installed and the railgear unit has already been aligned prior to installing the brake units, it is recommended that the rail wheel mounting plate be tack welded to the axle wheel table before proceeding as it is necessary to remove the wheel mounting bolts to install the brakes

2. Starting with the Driver or the Passenger side, assemble the brake assembly mounting brackets to the wheel mounting tables as follows:
 - Remove the 1/2" wheel mounting hardware from either side of the rail wheel, as shown.
 - Assemble the mounting bracket to the wheel mounting table and rail wheel, as shown.
 - Loosely tighten the wheel mounting hardware.
 - Repeat for the (3) remaining mounting brackets

3. Assemble the Brake assemblies to the mounting brackets as shown, ensuring that the brake housings are on the correct sides of the railgear axle. **The brake shoe linkage of each brake housing should be toward the front of the vehicle for the front, and toward the rear of the vehicle for the rear.** It may be necessary to loosen the wheel mounting hardware to allow the mounting brackets to be adjusted for proper assembly and alignment. Torque the 1/2" x 1.50" bolts to 75 ft-lbs dry. Tighten, but do not torque, the wheel mounting hardware.

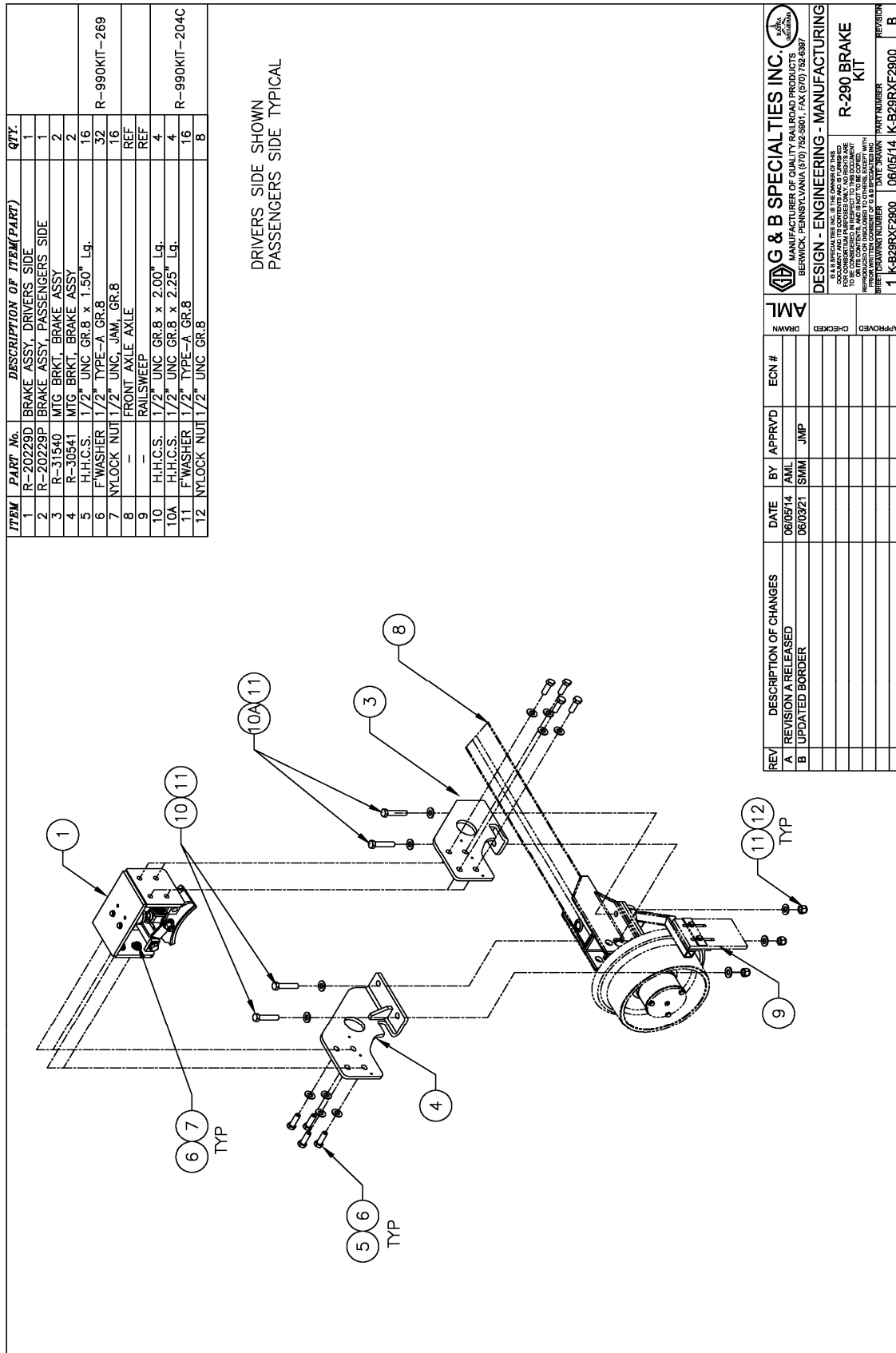
If the rail wheels have already been installed and the railgear unit has already been aligned prior to installing the brake units, it is recommended that the wheel mounting hardware be torque at this time before proceeding to next step

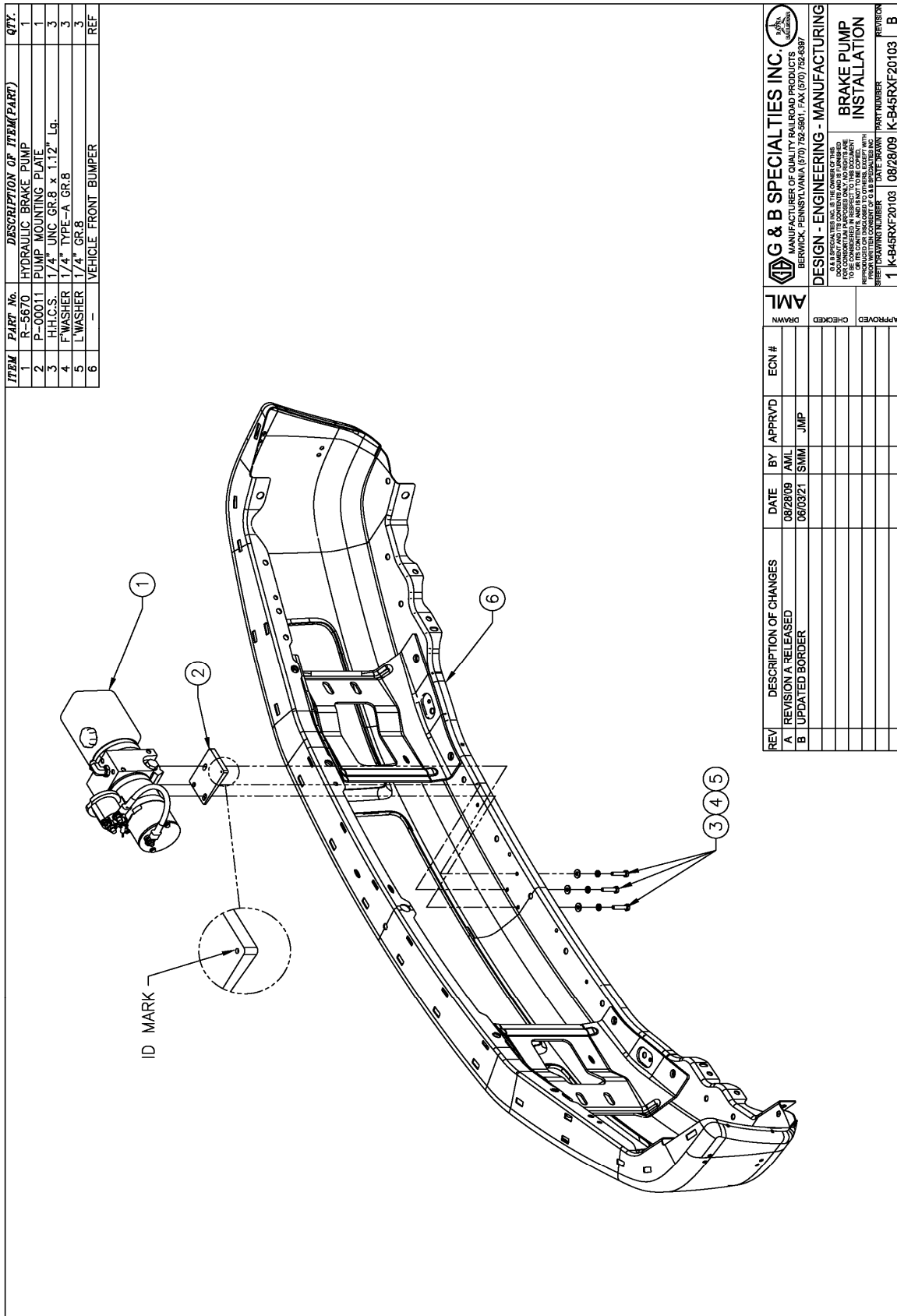
4. Mount the brake pump to the vehicle front bumper as shown using the supplied pump mounting plate and 1/4" hardware. The rear slot in the mounting plate should align with several existing holes in the bottom flange of the front bumper. This allows for maximum flexibility when choosing a suitable pump location. The location of the remaining two holes, in the pump mounting plate, will need to be transferred to the bumper and a 9/32" diameter hole will need to be drilled.
5. Position the electric brake control under the hood on or close to the vehicle firewall. Fasten the electric brake control to the vehicle using installer-supplied self-tapping screws. The brake controller can be mounted inside the cab of the vehicle at the installer's discretion.
6. Choose a suitable location on the vehicle dash and install the dash switch.
7. Affix the "Railgear Brake Pump" decal in a suitable location adjacent to the dash switch.
8. Using suitable 14 gauge wire, cable loom, connectors, solder and heat shrink tubing:
 - a) Lengthen as required, terminate and connect one of the red wires from the brake pump valve to reach to terminal 2 on the electric brake control.
 - b) Lengthen as required, terminate and connect the other red wire from the brake pump valve to a suitable ground location.
 - c) Terminate and connect a black wire from the power terminal on the brake pump solenoid to one end of the in-line fuse.
 - d) Terminate and connect another length of black wire from the other end of the in-line fuse through the firewall to the power terminal on the dash switch.
 - e) Terminate and connect a wire from the dash switch ground terminal to a suitable ground location on the vehicle.
 - f) Terminate and connect a wire from the load terminal on the dash switch to terminal 3 on the electric brake control.
 - g) Terminate and connect a wire from the switching terminal on the brake pump solenoid to terminal 6 on the electric brake control.
 - h) Terminate and connect a wire from terminal 7 on the electric brake control to a suitable ground location.
 - i) Terminate and connect a wire to terminal 1 on the electric brake control and splice it into the load wire from the vehicle service brake light switch behind the brake pedal.

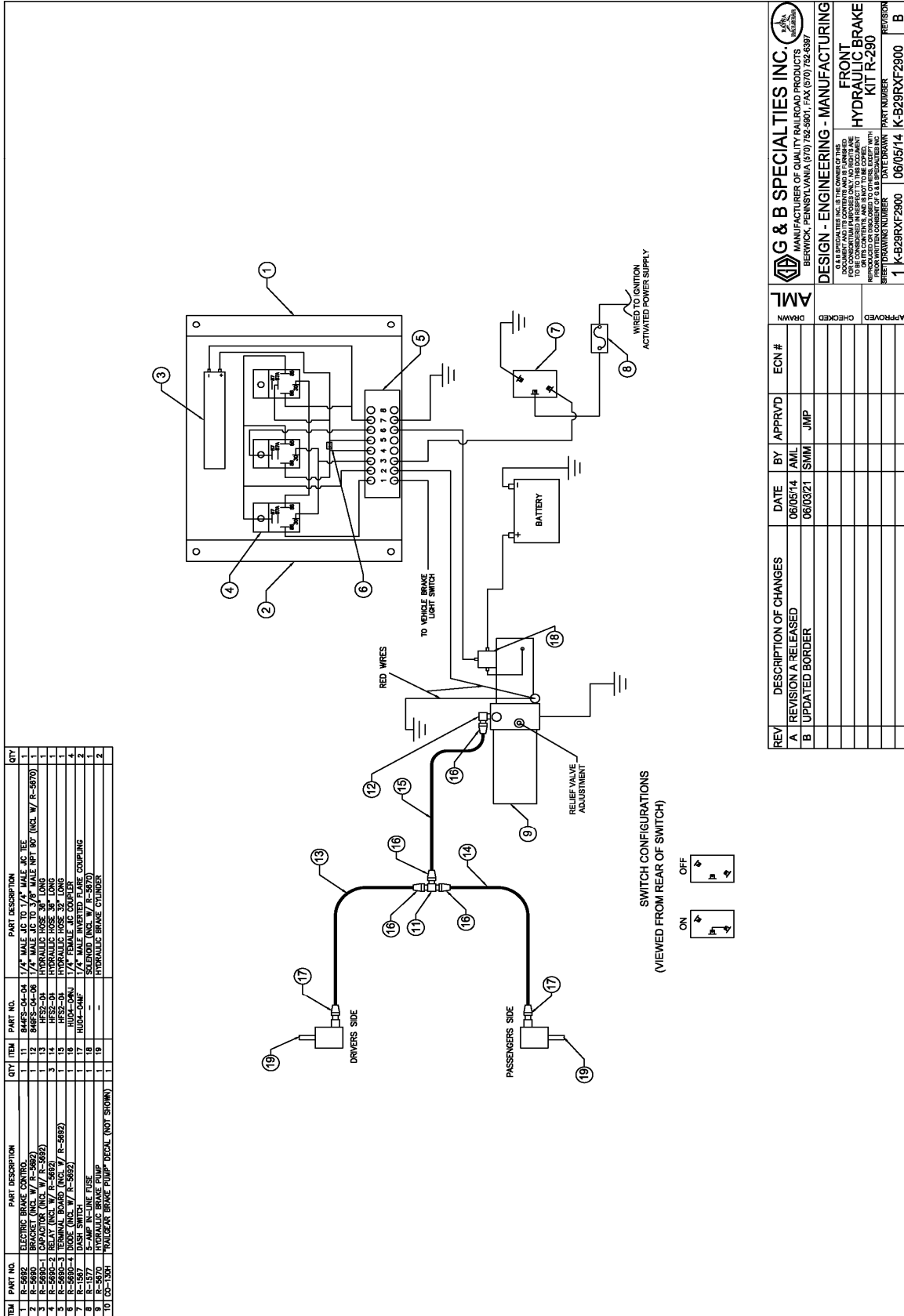
9. Optional Upfitter Switch Installation:

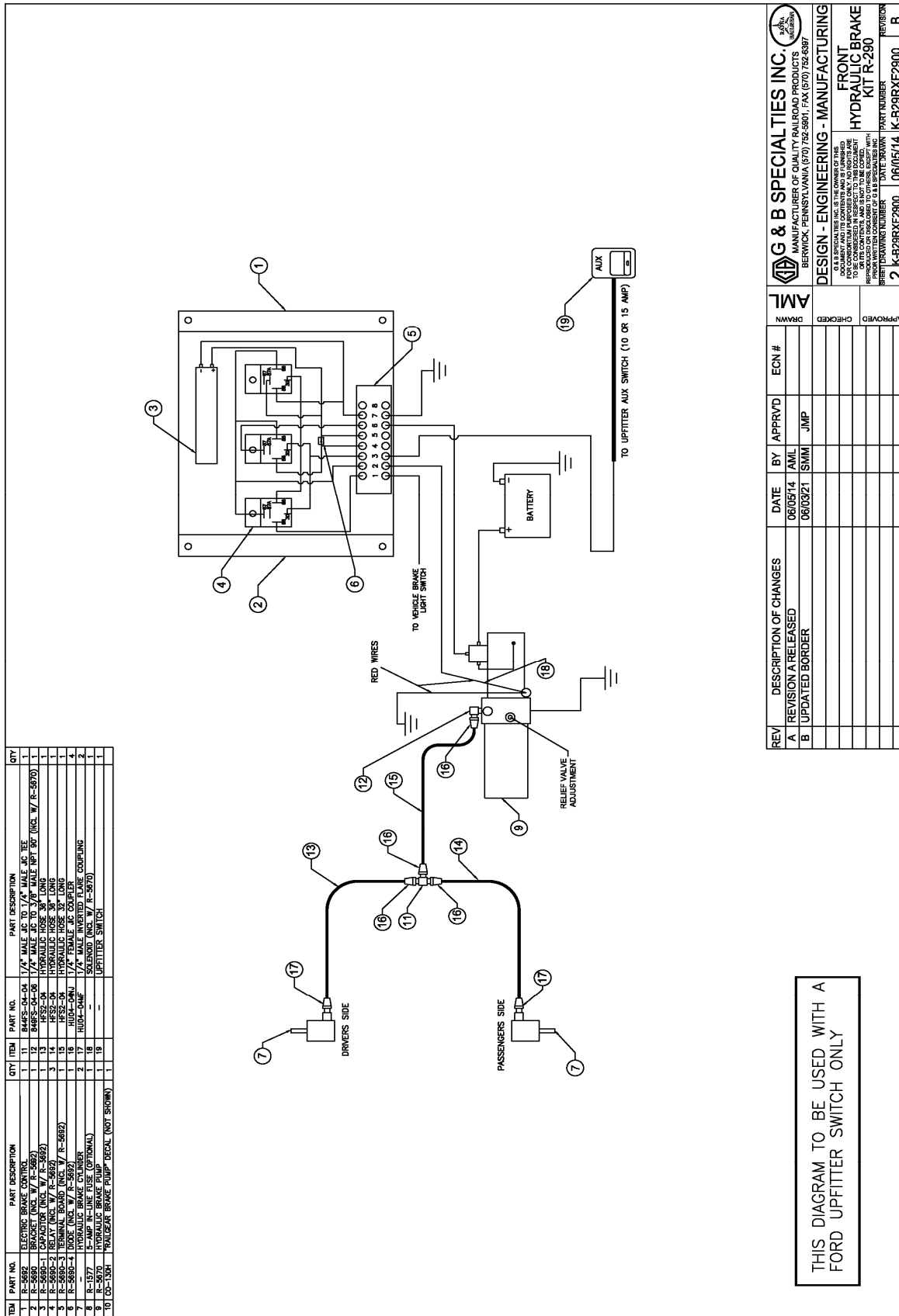
- Using suitable 14 gauge wire, cable loom, connectors, solder and heat shrink tubing:
- a) Lengthen as required, terminate and connect one of the red wires from the brake pump valve to reach to terminal 2 on the electric brake control.
 - b) Lengthen as required, terminate and connect the other red wire from the brake pump valve to a suitable ground location.
 - c) Terminate and connect a black wire from terminal 3 on the electric brake control to one end of the in-line fuse.
 - d) Terminate and connect another length of black wire from the other end of the in-line fuse to the upfitter switch of choice.
 - e) Terminate and connect a wire from the switching terminal on the brake pump solenoid to terminal 6 on the electric brake control.
 - f) Terminate and connect a wire from terminal 7 on the electric brake control to a suitable ground location.
 - g) Terminate and connect a wire to terminal 1 on the electric brake control and splice it into the load wire from the vehicle service brake light switch behind the brake pedal.
10. Using suitable 4 gauge wire, cable loom, connectors, solder and heat shrink tubing:
- a) Terminate and connect one wire from the vehicle's battery to the power terminal on the brake pump solenoid.
 - b) Terminate and connect another wire from the load terminal on the brake pump solenoid to the power terminal on the brake pump motor.
 - c) Apply a small amount of silicon sealant to the pump motor and solenoid terminals to protect them from shorting out or rusting.
 - d) Ensure the brake pump motor base is properly grounded to the vehicle chassis by connecting a wire from the brake pump motor base to a suitable ground location on the vehicle. The railgear may not be properly grounded due to paint on the mounting plates and tar on the frame.
11. Connect the 32" long hydraulic hose to the 90° hydraulic fitting on the pump. A TEE fitting will be supplied when using front and rear brakes. The 360" long hydraulic hose will be connected to the other end and ran to the rear of the truck for the rear brakes.
12. Connect the 1/4" Male JIC to 1/4" Male JIC tee fitting to the loose end of the 32" long hose. If using rear brakes, same process applies to the 360" long hose.
13. Connect the end of one 36" long hydraulic hose to the passenger side brake cylinder.
14. Connect the end of the second 36" long hydraulic hose to the driver side brake cylinder.
15. Connect the loose ends of both 36" long hydraulic hoses to the TEE attached to the end of the 32" hose, 360" hose in the rear when using rear brakes.
16. Ensure that none of the hoses contact any sharp edges or hot surfaces. Tie-wrap all hoses securely leaving enough slack for the railgear to function.
17. Ensure that all wires and terminals are soldered, heat shrink sealed, enclosed in protective cable loom and secured with tie-wraps.

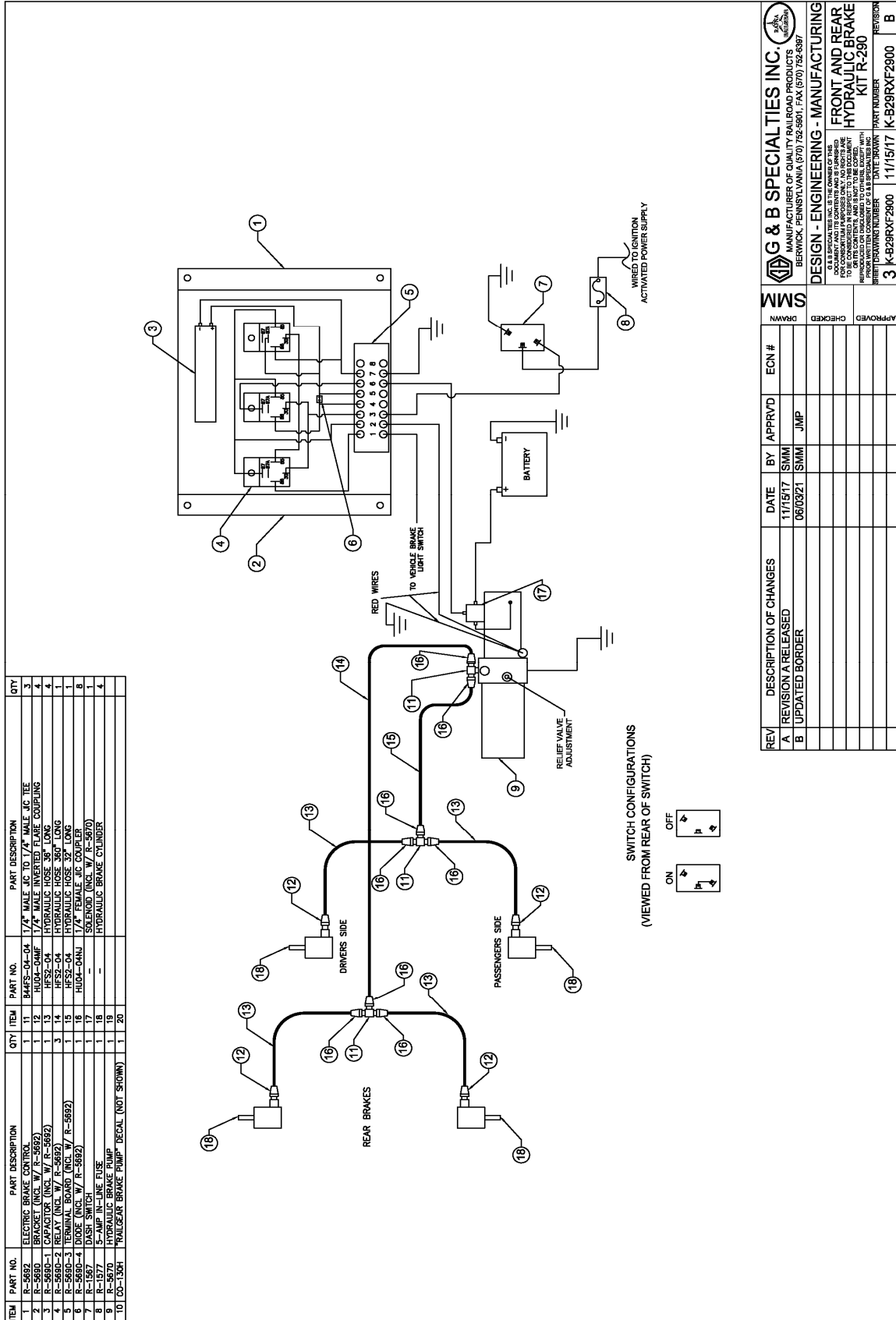
18. Ensure that any holes in the firewall are sealed and protected with a grommet.
19. Fill the hydraulic brake system and bleed the air out:
 - a) Fill the hydraulic brake pump tank with **Dexron III** (or equivalent) hydraulic fluid.
 - b) Turn on the dash switch. Depress and hold the vehicle brake pedal. The hydraulic brake pump should start.
 - c) Open the air bleed valve on each brake cylinder to allow air to escape.
 - d) Close the air bleed valve on each brake cylinder.
 - e) Release the brake pedal.
 - f) Re-fill the hydraulic brake pump tank with hydraulic fluid.
 - g) Repeat the above steps until only oil and no more air comes out of the air bleed valve.
 - h) Fill the hydraulic brake pump tank to the fill line.
20. Paint any parts that were welded.
21. Follow the Hydraulic Brake Relief Valve Setting procedure detailed in the Operation, Service and Parts section of this manual.
22. Follow the Brake Shoe To Rail Wheel Clearance Adjustment procedure detailed in the Operation, Service and Parts section of this manual.
23. Test the operation of the hydraulic brakes as per the Operation, Service and Parts section of this manual.

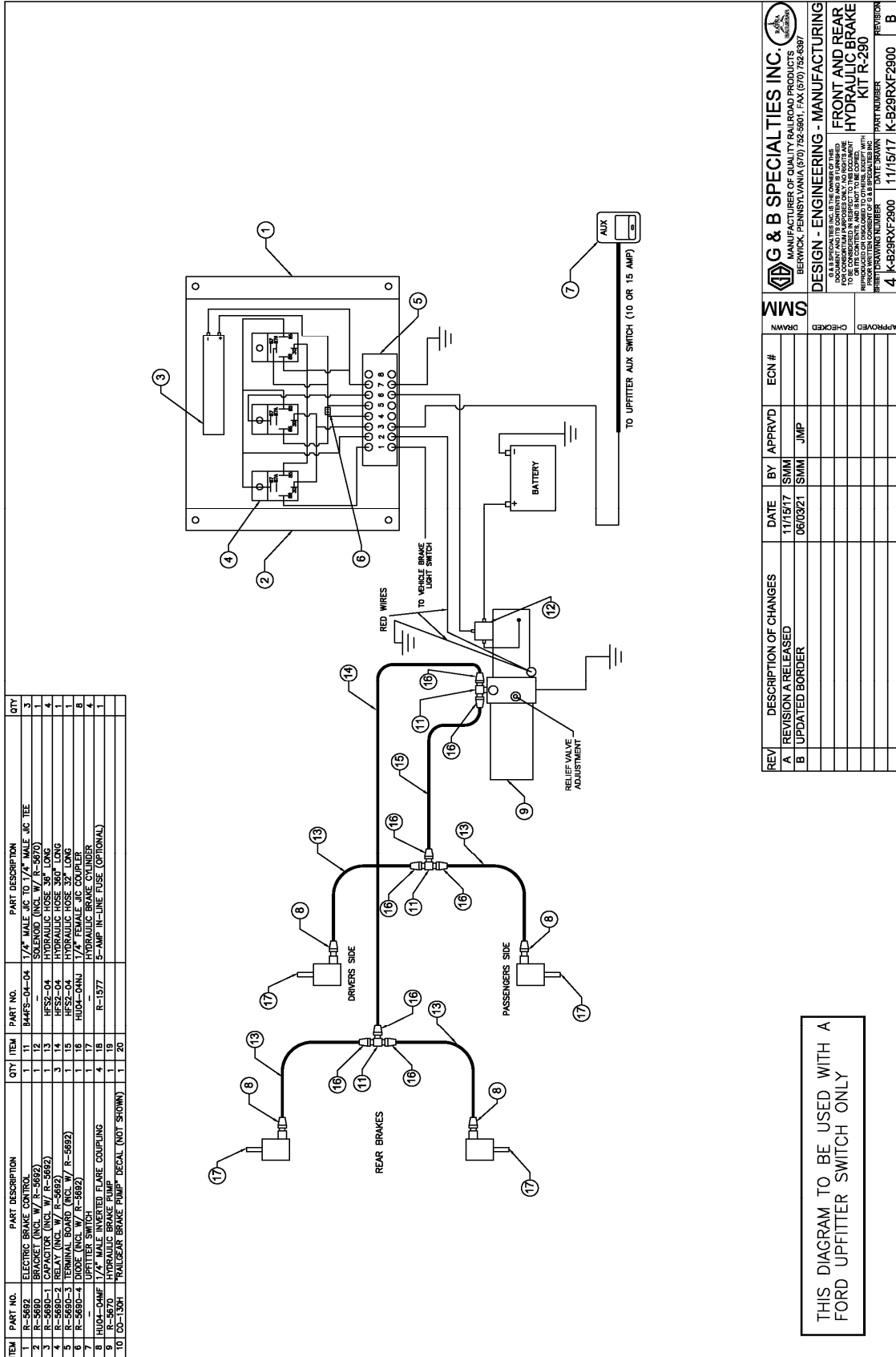












OPERATION AND SERVICE OF R-290 FRONT AND/OR REAR HYDRAULIC BRAKE KIT

OPERATION SAFETY PRECAUTIONS

If any operating, service or parts problems are encountered, please call G&B Specialties, Inc. for technical assistance.



- 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.
- Before performing any work under the vehicle or railgear, ensure the engine is turned off and the parking brake is set.
- Ensure all body parts and loose clothing are clear of any moving parts of the railgear. Be aware of all pinch points.
- Despite the added braking power provided by the railgear brakes, braking distance while on rail is greater than when on road.
- 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.
- Do not use regular brake fluid in the hydraulic brake system, as it will damage the hydraulic brake pump and the brake cylinders.

OPERATION OF FRONT AND/OR REAR HYDRAULIC BRAKE KIT

With the front and/or rear hydraulic brake kit installed on this vehicle, it may be operated as normal, however the hydraulic brake pump must be turned "Off" during road travel and "On" during rail travel. The hydraulic brake kit provides additional braking power when on rail. Braking distance on rail is much greater than when on road and will be adversely affected by inclement weather.

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.

A dash switch is provided to turn off the power to the hydraulic brake pump, which prevents the railgear brakes from functioning during road travel. When travelling on rail, with the dash switch in the "On" position, the railgear hydraulic brakes act together with the vehicle's brakes to provide added braking power through the rail wheels.

To Operate The Vehicle On Rail:

1. Turn the "Railgear Brake Pump" dash switch to the "On" position.
2. Proceed with rail travel. The railgear hydraulic brakes will function with the vehicle brakes when the vehicle brake pedal is depressed.

To Operate The Vehicle On Road:

1. Turn the "Railgear Brake Pump" dash switch to the "Off" position.
2. Proceed with road travel. The railgear hydraulic brakes will remain in-active.

SERVICE OF HYDRAULIC BRAKE KIT

The hydraulic brake 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.

Do not torque the 1/2" fasteners that pass through the brake shoe linkage. These fasteners must remain slightly loose to allow the hydraulic brakes to function freely. Table 2 provides all other Standard Fastener Torque Values.

The recommended oil for the railgear hydraulic system is **DEXRON III** or equivalent. In extremely cold weather areas/seasons, Tellus S4 VX32 or equivalent may be used.

Table 1: Recommended Service Schedule

| Service Required | Initial 100 km (62 Miles) of road and/or rail use | Monthly | 6 Months | Yearly |
|---|--|---------|----------|--------|
| Inspect hydraulic brake kit fasteners (re-torque if required) | ✓ | | ✓ | ✓ |
| Inspect all hydraulic fittings and hoses for leaks and wear | ✓ | ✓ | ✓ | ✓ |
| Check oil in hydraulic reservoir (fill if required) | ✓ | ✓ | | ✓ |
| Check / adjust brake shoe to rail wheel clearance (see procedure) | ✓ | | ✓ | ✓ |

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 |

BRAKE SHOE TO RAIL WHEEL CLEARANCE ADJUSTMENT

The clearance between the brake shoe and the rail wheel must be correctly adjusted to prevent brake drag and to ensure proper braking ability. Check and adjust the brake shoe to rail wheel clearance as follows:

1. With the hydraulic brake dash switch turned "Off" and the railgear hydraulic brakes in the retracted position, visually inspect the railgear hydraulic brake components for excessive damage and/or wear and measure the brake shoe to rail wheel clearance.

| |
|--|
| Acceptable Brake Shoe To Rail Wheel Clearance |
|--|

| |
|--------------------|
| 1/8" - 1/4" |
|--------------------|

2. If the brake shoe to rail wheel clearance is not within specifications, adjust as follows:
 - Loosen the jam nut above the clevis on the clevis push rod.
 - Turn the clevis push rod to adjust the clevis up to increase the clearance or down to decrease the clearance.
 - When moving the clevis down on the clevis push rod, do not move the clevis down beyond the point at which the inside bottom face of the clevis is flush with the end of the push rod. Replace the brake shoe and re-adjust.
 - Tighten the jam nut above the clevis on the clevis push rod.
3. Re-check the brake shoe to rail wheel clearance and re-adjust as necessary.

HYDRAULIC BRAKE RELIEF VALVE SETTING

The hydraulic brake pump is equipped with one relief valve located on the hydraulic pump body. This relief valve protects the entire hydraulic brake system from over pressurization. The relief valve will require adjustment at installation and if ever there appears to be inadequate hydraulic pressure to operate the hydraulic brakes or if the rail wheels are found to skid when the brakes are applied.

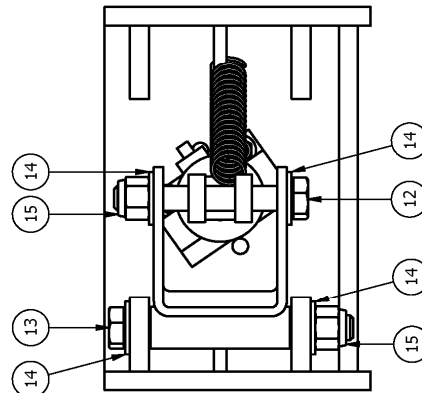
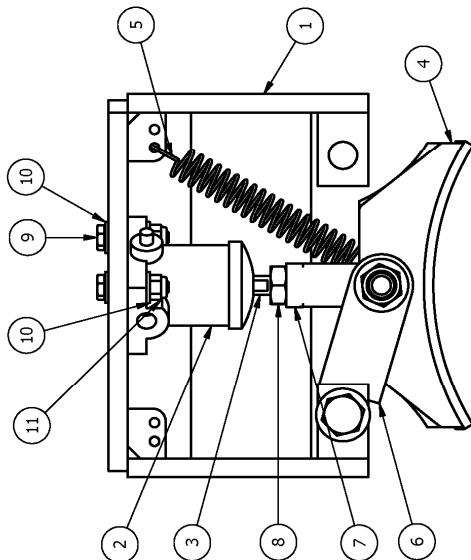
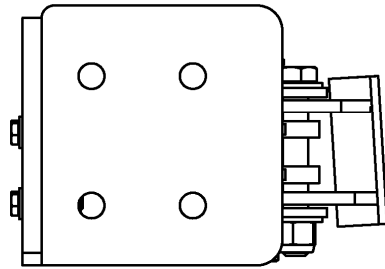
1. Disconnect the hydraulic hose from the pump.
2. Install a hydraulic pressure gauge (up to 3000 PSI) between the disconnected hydraulic hose and the pump port. The pressure gauge will indicate the relief valve setting when the pump is loaded.
3. Turn the "Railgear Brake Pump" dash switch to the "On" position and depress the vehicle brake pedal so that activating the brakes creates a load on the pump. The pressure reading on the pressure gauge should climb to 700 PSI.
4. If the pressure is not correct, release the brake pedal and adjust the relief valve on the pump accordingly. Loosen the lock nut and turn the setscrew in to increase the pressure or out to decrease the pressure. Re-check the pressure.
5. Once the correct pressure on the pump relief valve is obtained, ensure that the lock nut on the relief valve is tightened. Release the pressure in the system and remove the pressure gauge. Re-connect the hydraulic hose.
6. Ensure that the hydraulic hoses are connected properly and that the hydraulic brakes are functioning properly.

PARTS


| BILL OF MATERIAL /PARTS LIST | | | |
|------------------------------|-------------|-----------------------------|-----|
| ITEM | PART NUMBER | DESCRIPTION | QTY |
| 1 | R-20230 | BRAKE HOUSING | 1 |
| 2 | R-5603 | HYDRAULIC BRAKE CYLINDER | 1 |
| 3 | R-5602 | HYDRAULIC BRAKE PUSH ROD | 1 |
| 4 | R-4554 | BRAKE SHOE | 1 |
| 5 | R-5604 | SPRING | 1 |
| 6 | R-4557 | BRAKE SHOE LINKAGE | 1 |
| 7 | R-5601 | CLEVIS ASSY | 1 |
| 8 | JAM HEX NUT | 1/2" UNF. GR.8 JAM HEX | 1 |
| 9 | H.H.C.S. | 1/4" X 1 1/4" LG, UNC, GR.8 | 2 |
| 10 | F' WASHER | 1/4" TYPE A, GR. 8 | 4 |
| 11 | NYLOCK NUT | 1/4" UNC, GR.8 STD NYLOCK | 2 |
| 12 | H.H.C.S. | 1/2" X 3 1/2" LG, UNC, GR.8 | 1 |
| 13 | H.H.C.S. | 1/2" X 4 1/2" LG, UNC, GR.8 | 1 |
| 14 | F' WASHER | 1/2" TYPE A, GR. 8 | 4 |
| 15 | NYLOCK NUT | 1/2" UNC, GR.8 STD NYLOCK | 2 |

NOTES:

1. ASSEMBLE AS SHOWN
2. DRIVERS SIDE SHOWN, PASSENGERS SIDE OPPOSITE
3. CYLINDER MAY BE MOUNTED OPPOSITE IF DESIRED



| REV/DESCRIPTION OF CHANGES | DATE | BY | APPROVD | ECN # | AML | DATE |
|----------------------------|----------|-----|---------|------------|-----|------|
| A REVISION A RELEASED | 09/30/09 | AML | | ECN-08-430 | | |
| B REVISED ITEM #1 | 10/30/09 | AML | | ECN-20-371 | | |
| C UPDATED ITEM #1 | 05/21/20 | SDB | SMM | | | |



G & B SPECIALTIES INC.
 MANUFACTURER OF QUALITY RAILROAD PRODUCTS
 BERWICK, PENNSYLVANIA (570) 752-5901 FAX (570) 752-6387

DESIGN - ENGINEERING - MANUFACTURING

BRAKE ASSEMBLY

DRIVERS SIDE

1 R202290

06/30/09 R-202290

1 C

AS SHOWN ON THIS DRAWING, THE WORK IS TO BE DONE IN ACCORDANCE WITH THE REQUIREMENTS OF THE PROJECT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE LOCAL, STATE AND FEDERAL AGENCIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE LOCAL, STATE AND FEDERAL AGENCIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE LOCAL, STATE AND FEDERAL AGENCIES.

ALL WELDS TO CONFORM
TO AWS D1.1

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