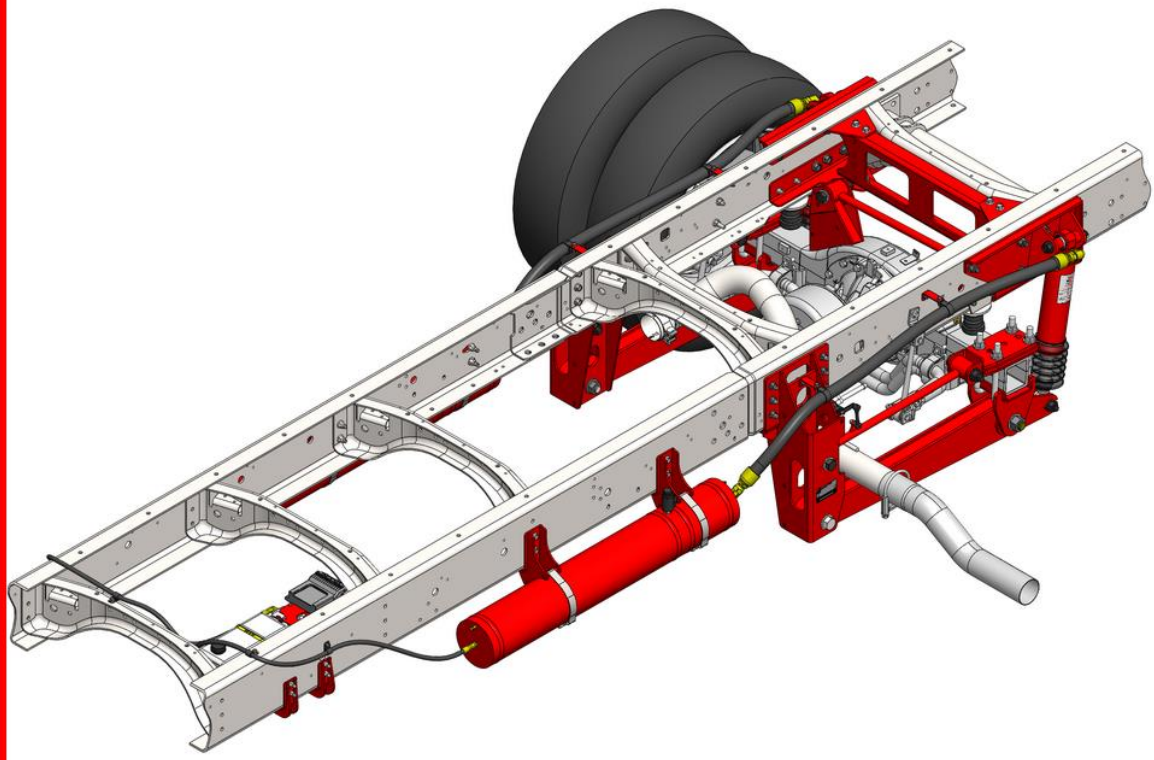
CLASS®

DS120F53
DS150F53
DS175F53

Rear Axle Suspension System
for Ford F-53 Chassis



LIQUIDSPRING™ LLC

Installation / Operator Manual

D11343 Rev W 6/2019

Contents

Introduction

This manual provides installation information for the LiquidSpring **CLASS**® F53 series of rear axle suspension systems for the Ford F-53 Cab Chassis.

Before you begin installation of the suspension system:

1. Read and understand all instructions and procedures prior to installation of components.
2. Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.
3. Follow your company's maintenance and service, installation, and diagnostics guidelines.
4. Use special tools when required to help avoid serious personal injury and damage to components.

Throughout this manual, important product information is preceded by the terms "NOTE", "IMPORTANT", "CAUTION", and "WARNING". These terms are defined as follows:

NOTE: Includes additional information to enable accurate and easy performance of procedures.

IMPORTANT: Includes additional information that if not followed could lead to hindered product performance and/or product failure.

CAUTION: A caution indicates procedures that must be followed exactly. Damage to equipment or suspension components and personal injury can occur if the procedure is not followed.

WARNING: A warning indicates procedures that must be followed exactly. Serious personal injury can occur if the procedure is not followed.

LiquidSpring LLC reserves the right to modify the suspension and/or procedures and to change specifications at any time without notice and without incurring obligation.

Suspension Application

LiquidSpring offers the following versions of the F53 line of suspensions:

Suspension	Application
DS120F53	Conversion of 16,000 & 18,000 lbs. GVWR F-53s with 178", 190", 208", and 228" wheelbases
DS150F53	Conversion of 20,000 & 22,000 lbs. GVWR F-53s with 208", 228", and 242" wheelbases
DS175F53	Conversion of 24,000 & 26,000 lbs. GVWR F-53s with 228", 242", and 252" wheelbases

Suspension Rating

Suspension ratings are based on the OEM rear axle rating of each chassis:

Model	Ford F53
DS120F53	11,000 & 12,000 lbs. GAWR
DS150F53	13,500 & 15,000 lbs. GAWR
DS175F53	15,500 & 17,500 lbs. GAWR

The rear axle GAWR with LiquidSpring F53s installed is the lessor of either the OEM original rear rating (as published) or the above suspension rating.

WARNING: Overloading suspension system may result in abnormal handling characteristics and premature wear of components.

Serial Number Tag Information

The serial number is found on an aluminum tag (Figure 1) that is riveted to the Left Hand Suspension Hanger as shown in Figure 2. This information will aid you when contacting the chassis manufacturer or LiquidSpring LLC.

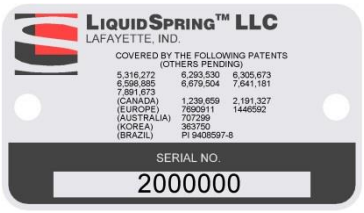


Figure 1. Serial Tag

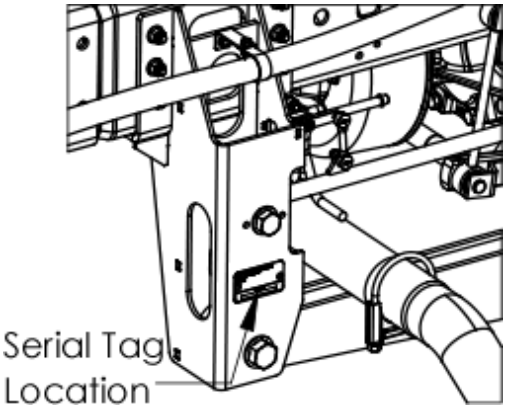


Figure 2. Serial Number Tag Location

Vehicle Towing and Jacking Information

Before attempting any type of towing procedures, the vehicle manufacturer must be referred to for the recommended towing methods.

NOTE: Before towing vehicle, check with local authorities, such as Department of Transportation, for permissible towing methods. Some states do not permit towing vehicles by chains or towing straps.

Do not attach tow apparatus (hooks, chains, straps, etc.) to the suspension components.

WARNING: Attaching towing equipment to improper locations and failure to utilize OEM/Coach Builder recommended towing methods could result in one or more of the following:

Damage to the suspension and/or vehicle,

Loss of vehicle control,

Possible disconnect from the vehicle.

WARNING: Do not apply jack to bottom of front hanger or other suspension components. Appling a jack to improper locations can result in damage to the suspension and/or vehicle and severe personal injury.

Abbreviations

The following abbreviations will be used throughout the manual.

HCS	Hex Cap Screw
HFB	Hex Flange Bolt
SHCS	Socket Head Cap Screw
SFHS	Serrated Flange Hex Screw
STS	Self Tapping Screw
HN	Hex Nut, Non-locking
LHN	Locking Hex Nut
LFN	Locking Flange Nut
CHN	Castle Hex Nut
HTCN	Hex Thin Castle Nut
HFW	Hardened Flat Washer
SLW	Spring Lock Washer
FW	Flat Washer
SAE	SAE O-Ring Fitting
37°	SAE or JIC 37° Flare Fitting (F – Female)
LH	Left Handed Part
RH	Right Handed Part
UCA	Upper Control Arm
LCA	Lower Control Arm

Special Tools

The following tools can assist in installation of the LiquidSpring system.

Bleed Kit (Actron 7840 shown, others similar).

Hydraulic Fitting Assembly

SAE O-Ring Adjustable Fittings

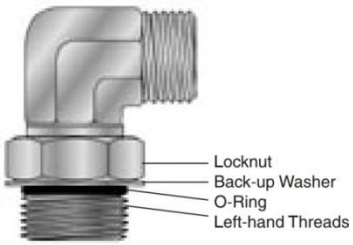


Figure 3. Adjustable SAE fitting

- Inspect components to ensure that male and female port threads and sealing surfaces are free of burrs, nicks and scratches, or any foreign material.
- If O-ring or seal is not pre-installed to fitting male port end, install proper size O-ring or seal, taking care not to damage it.
- Lubricate O-ring with light coat of the system fluid or a compatible lubricant to help the O-ring slide smoothly into the port and avoid damage.

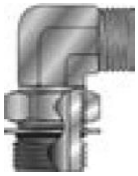


Figure 4. Locknut completely backed off.

- Back off lock nut as far as possible. Make sure back-up washer is not loose and is pushed up as far as possible.
- Screw fitting into port until the back-up washer or the retaining ring contacts face of the port. Light wrenching may be necessary. Over tightening may damage washer.
- To align the tube end of the fitting to accept incoming hose assembly, unscrew the fitting by the required amount, but not more than one full turn.
- Using two wrenches, hold fitting in desired position and tighten locknut to the proper torque value:
  -4 fitting: **14-16 ft-lbs (168-192 in-lbs)**
  -12 fitting: **75-83 ft-lbs.**
- Inspect to ensure that O-ring is not pinched and that washer is seated flat on face of port.

SAE O-Ring Non-Adjustable Fitting

- Inspect components to ensure that male and female port threads and sealing surfaces are free of burrs, nicks and scratches, or any foreign material.
- If O-ring or seal is not pre-installed to fitting male port end, install proper size O-ring or seal, taking care not to damage it.
- Lubricate O-ring with light coat of the system fluid or a compatible lubricant to help the O-ring slide smoothly into the port and avoid damage.
- Screw fitting into port and tighten to proper torque:
  -4 fitting: **26-28 ft-lbs (310-341 in-lbs)**
  -12 fitting: **75-83 ft-lbs.**

JIC 37° Fitting

- Inspect components to ensure that male and female threads and sealing surfaces are free of burrs, nicks and scratches, or any foreign material. Annular tool marks of 100µin with the thread are permissible.
- Lubricate the threads and the entire surface of the cone with system fluid.
- Align mating components for hand connection and turn flare nut until sealing surfaces make full contact.
- Using two wrenches, hold fitting in desired position and tighten to the proper torque:

-4 fitting: **9-12 ft-lbs**	-10 fitting: **36-63 ft-lbs**
-8 fitting: **27-39 ft-lbs**	-12 fitting: **65-88 ft-lbs**

Pre-Installation

1. Check the vehicle rear wheel alignment prior to installation to insure pre-existing conditions do not exist.
2. Measure and record the wheelbase and rear tire-to-frame dimensions on each side prior to disassembly.
3. A chassis lift can be used in assistance of the installation of the suspension system.
4. Removal of wheels and tires can ease installation.
5. Motorhomes built by different manufacturers will have different compartments. It is important to test fit/pre-measure volumes and hose lengths to confirm placement for proper installation. See Figure A 6 or Figure A 7 for **recommended** locations.
6. Contact LiquidSpring LLC if you need assistance with volume placement, hose length measurements, or any other fitment issues.
7. If you are installing on a Winnebago, check passenger side area where the Upper Strut Mount will be located. If a gas line is in the way please contact LiquidSpring LLC for a gas line relocation kit.

Frame Preparation

1. Chock the front tires.
2. Disconnect negative vehicle battery cable.
3. Jack up the rear frame of the vehicle to remove load from the rear suspension.
4. Place jack stands under the frame and block the rear tires from moving.

Note: Jack stands can be placed under the axle and the tires removed for ease of access. It is recommended to place an additional jack stand under the pinion to prevent the axle from rotating.

5. Remove the OEM shock absorbers, leaf springs, front hanger, and rear hanger.

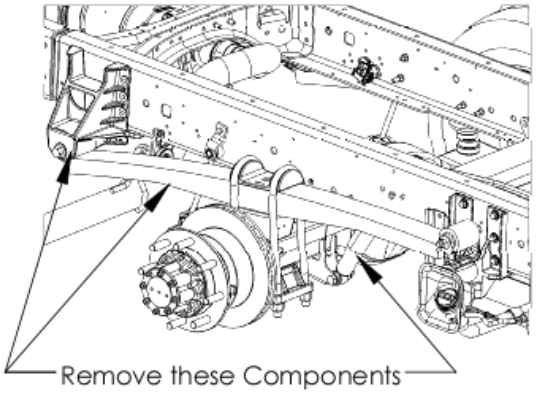


Figure 5. OEM Components to remove

6. Remove the two bolts from the tubular crossmember as shown in Figure 6.

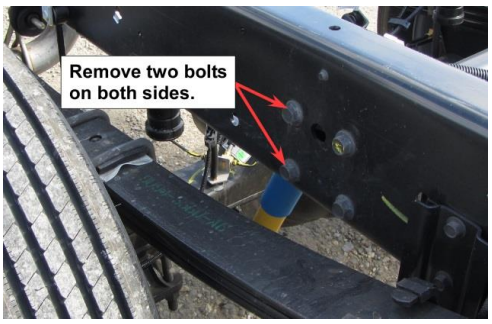


Figure 6. Remove Two Bolts from Both Sides of Vehicle

For DS150F53 and DS175F53: **Remove Jounce bumpers and retain for later re-installation** For DS120F53: **Remove Jounce bumpers and retain the hardware for installing the Upper Strut Mounts/Crossmember.**

Note: If you have a DS120F53 or DS150F53 kit, you will use the Upper Strut Mounts as a template to mark and drill the frame holes. If you have a DS175F53 kit, you will use the Frame Drilling Template included in your kit. Skip steps 8, 9, and 10 for DS175F53.

7. **For DS120F53 and DS150F53:** Locate the two upper strut mounts and place along the frame as shown in Figure 7 and Appendix C: Frame Drilling Locations, Figure A 1 and Figure A 2.
8. Center punch or mark the holes indicated in Appendix C: Frame Drilling Locations.
9. Drill the holes as indicated.

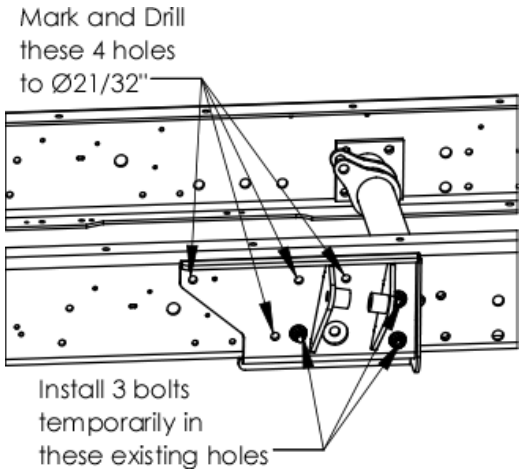


Figure 7. Location Upper Strut Mount on Driver Side of Frame – DS150

10. **For DS175F53:** Locate the frame drilling template (10811-026) and place along the frame as shown in Figure 8 and Appendix C: Frame Drilling Locations, Figure A 3 and Figure A 4.
11. Center punch or mark the holes indicated in Appendix C: Frame Drilling Locations.
12. Drill the holes as indicated.

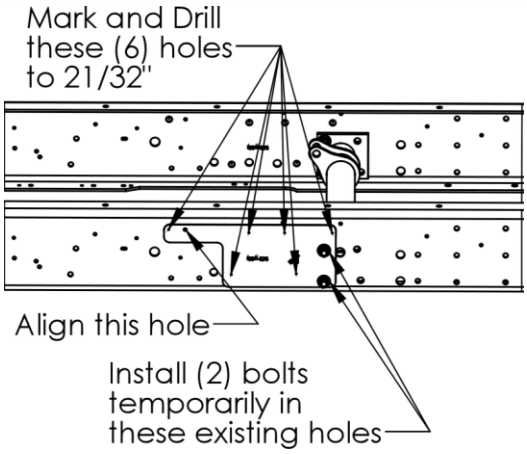


Figure 8. Location of Drilling Template on Driver Side of Frame – DS175

Axle Preparation

Axle Prep DS150F53 and DS175F53 Only

1. Locate bolts attaching parking brake and hydraulic brake lines to axle. Remove both bolts on both sides of the axle; retain these bolts for future use. Remove spacers sitting on top of the axle and on the backside of the axle as shown in Figure 9.

Note: Grinding/torching will be required to cut welds holding the spacers to the axle.

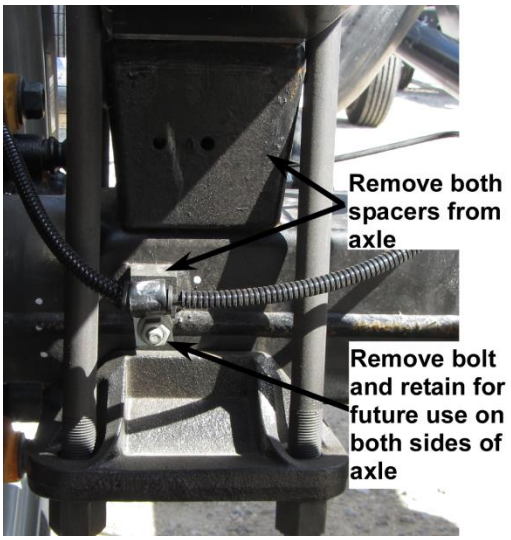


Figure 9. Remove Axle Spacer and Bolts

2. Top of axle should be smooth so Upper Axle Clamp sits parallel and flat with axle.

Note: Do not grind/cut into tube during removal of spacers on axle.

3. Repeat for driver side of vehicle.

Axle Clamp Pin DS150F53 and DS175F53

1. Move any Parking Brake Cables and wiring from top of axle and position away from the axle.
2. Place the Template on the axle. If you have a DS150F53 kit, see Figure 10 for proper placement. If you have a DS175F53 kit, see Figure 11.

Note: It is very important that template is located properly on axle, otherwise suspension may not align properly.

3. Outline the hole on the Template.
4. Remove the Template from the axle and grind away the area that was previously outlined to bare metal.
5. Reattach the Template and Tube (10800-004) onto the axle as shown in Figure 10 or Figure 11, depending on which suspension kit you have.

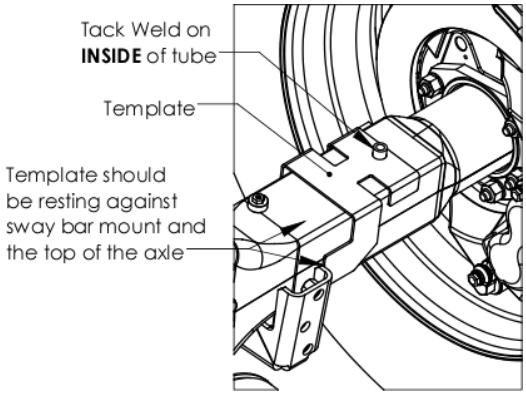


Figure 10. Tube Welding to Axle – DS150F53

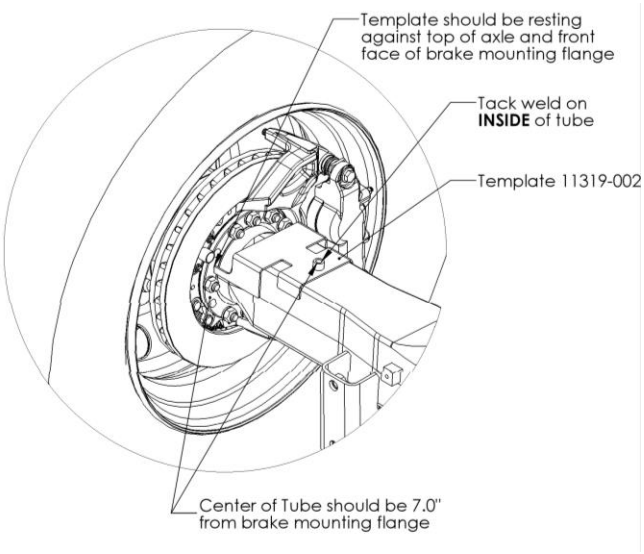


Figure 11. Tube Welding to Axle – DS175F53

1. Place two tack welds on the inside of the tube.
2. Remove the template and repeat for the passenger side.
3. Apply touch up paint to any bare metal showing on the axle.

Brake Lines

Brake Lines DS120F53

NOTE: The following procedures should be used in conjunction with OEM Hydraulic Brake service instructions and procedures.

1. Locate the hydraulic brake line, and copper crush washers included in the kit.

Figure 12: Brake Line Kit P/N: 11456

2. On the rear axle, locate the OEM RH Rear brake outer flexible hose.

NOTE: Removal of the wheel and tires may aid in the following steps, but not necessary.

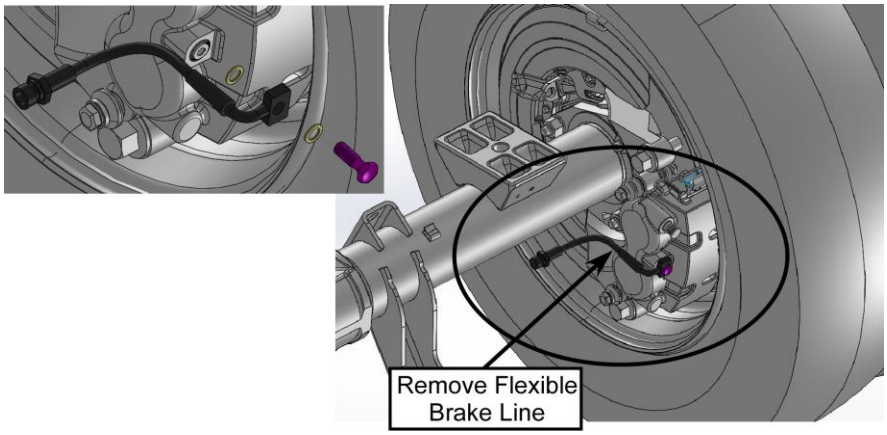


Figure 13: OEM Brake Line Removal

3. Remove the banjo bolt and disconnect the brake hose from the RH caliper. Retain the banjo bolt.
4. Disconnect the brake tube fitting.
5. Connect the brake line into the tube fitting – torque to 159 in-lbs and install the banjo fitting with the banjo bolt and crush washers to the caliper – torque to 12-14 ft-lbs.
6. Bleed the brake system. Refer to OEM service instructions (206-00 Brake System – General Information, General Procedures).

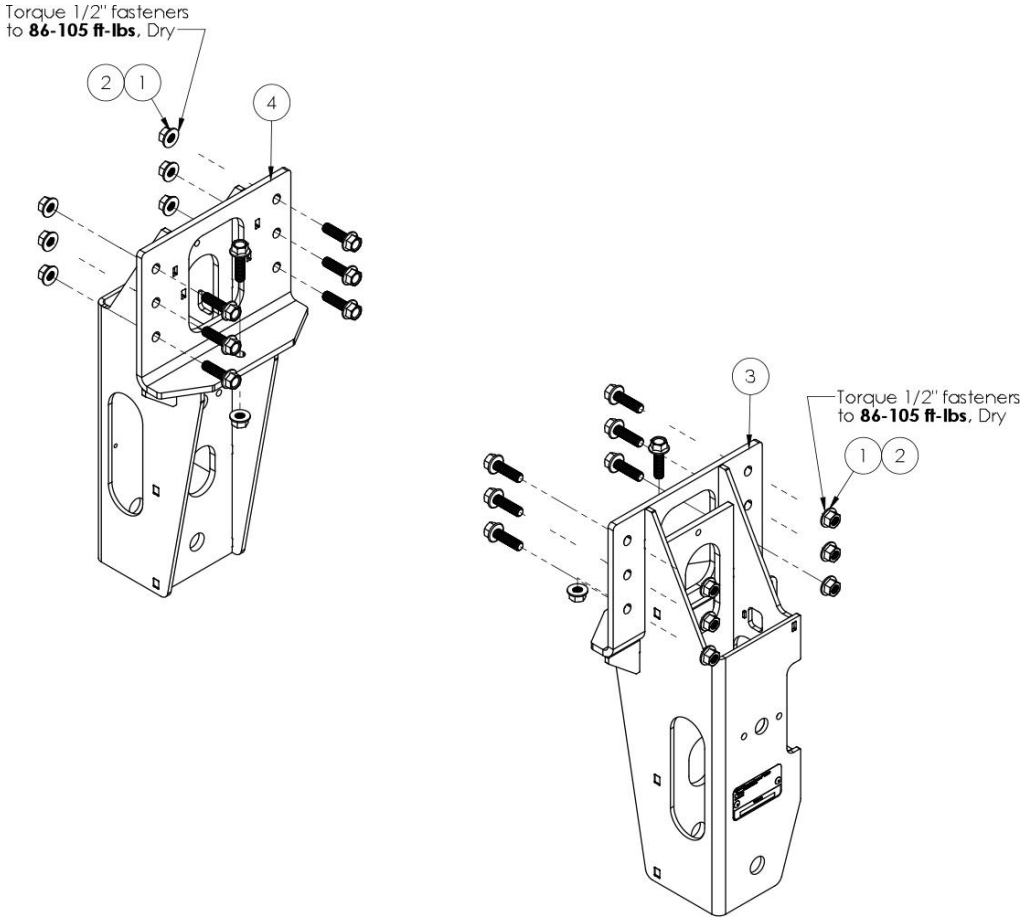
NOTE: Follow OEM specified brake bleeding procedure. Use DOT 4 Low Viscosity High Performance Motor Vehicle Brake Fluid, such as Motorcraft PM-20.

NOTE: A pressure bleed system may be used to simplify one-man operation. See Figure 14.

Figure 14: An example of pressure bleed system: Mityvac MV6840

Installation

Front Hangers



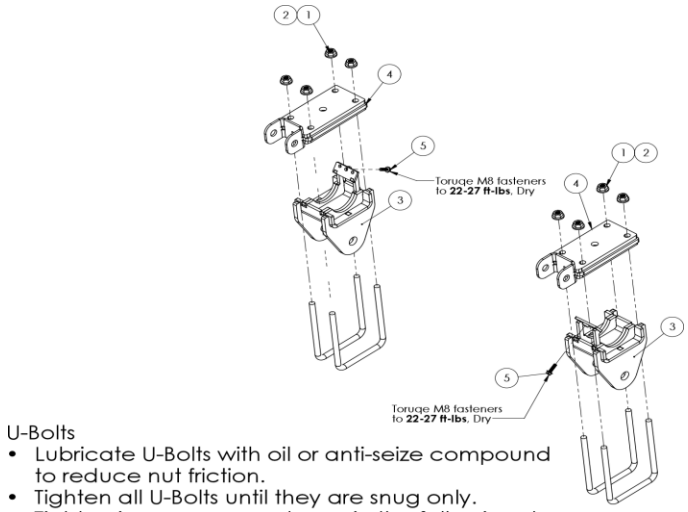
ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	14	10012-007	LFN 1/2-13 Gr. G	3	1	11083-005	LH Front Hanger – **DS150**
						11083-007	LH Front Hanger – **DS175**
						11083-008	LH Front Hanger – **DS120**
2	14	10885-175	HFB 1/2-13 x 1.75” Gr. 8	4	1	11084-010	RH Front Hanger – **DS150**
						11084-014	RH Front Hanger – **DS175**
						11084-016	RH Front Hanger – **DS120**

1. Install the Left Hand Front Hanger (with the serial tag) on to the driver side of the frame.

Note: Snug fasteners on frame flange prior to tightening the six fasteners on the outside.

2. Verify that the hanger is parallel to the framerail.
3. Torque all 1/2”-13” fasteners to **86-105 ft-lbs** as specified above.
4. Repeat for the Right Hand Front Hanger (without the serial tag) on to the passenger side of the frame.

Axle Connection – DS120



U-Bolts
- Lubricate U-Bolts with oil or anti-seize compound to reduce nut friction.
- Tighten all U-Bolts until they are snug only.
- Tighten in a sequence shown in the following stages
  - Stage 1 50 ft-lbs.
  - Stage 2 100 ft-lbs.
  - Stage 3 150 ft-lbs.
  - Stage 4 175 ft-lbs.

ITEM	QTY	PART	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	8	10012-013	LFN 5/8-18, Gr. G	4	2	10949-009	Upper Axle Clamp
2	4	10642-003	U-Bolt 5/8-18 x 9.19 Tri-8	5	2	11003-030	HFB M8-1.25 x 30
3	2	10947-015	Lower Axle Clamp				

1. Locate the Upper and Lower Axle Clamp and 5/8" U-Bolts.
2. Place the Upper Axle Clamp on to the driver's side axle. The Upper Axle Clamp should be flush with the top of the axle seat with the locating pin in the center hole.
3. Remove the bolt from the axle seat as shown in Figure 15.

Figure 15. Remove Bolt from Axle Seat

4. Place the Lower Axle Clamp under the axle. Using the M8 bolt that was provided with the kit, attach it through the Lower Axle Seat location plate as shown in Figure 16.

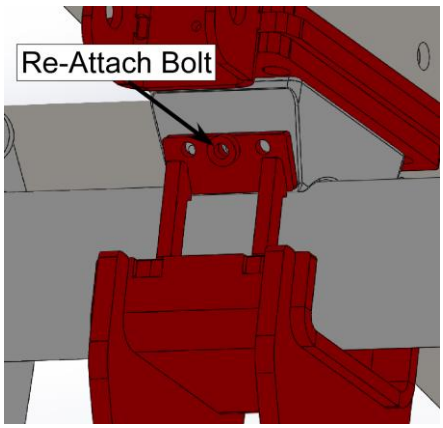


Figure 16. Re-attach Bolt

IMPORTANT: To aid control arm installation, do not torque until after control arms are installed.

5. Loosely attach to the Upper Axle Clamp and Lower axle clamp by slipping the 5/8" U-Bolts into position. **Torque, the U-Bolt nuts evenly in an X-type pattern in 5 stages:**

   - **Stage 1: Tighten snug only.**
   - **Stage 2: Torque to 50 ft-lbs.**
   - **Stage 3: Torque to 100 ft-lbs.**
   - **Stage 4: Torque to 150 ft-lbs.**
   - **Stage 5: Torque to 175 ft-lbs.**

6. Reattach the brake lines to the flanges on the Lower Axle Clamp as shown in Figure 17, using the M8 bolt and spacer provided.
7. Check that brake lines are not contacting u-bolts or any other components. It may be necessary to slightly bend wire clip for proper brake line spacing.

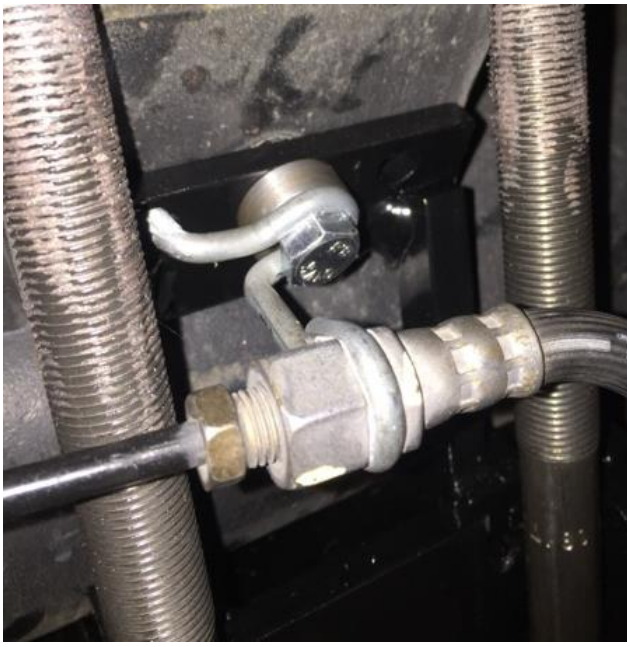
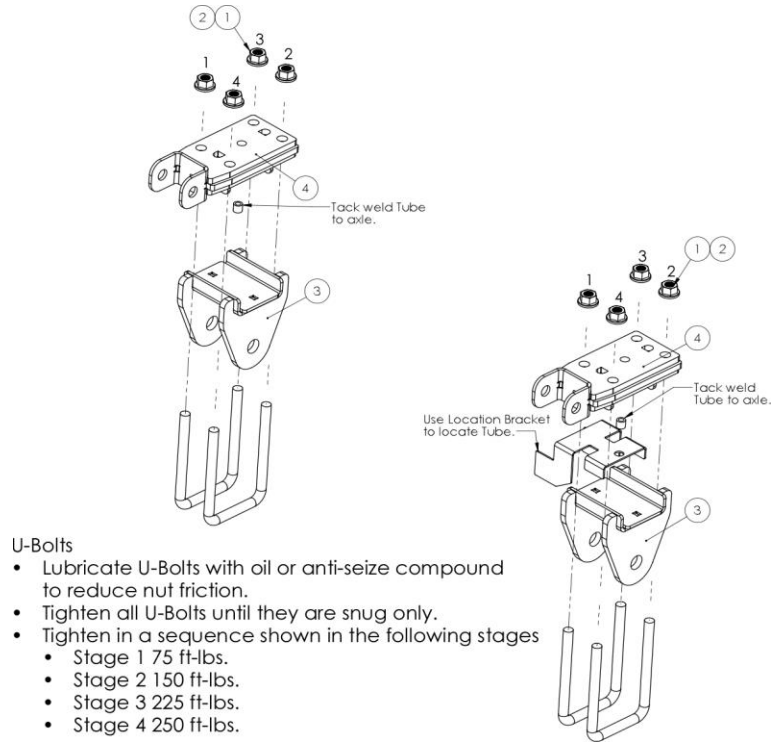


Figure 17. Brake Line Re-Attached to Lower Axle Clamp

8. Repeat on passenger side.

Axle Connection – DS150



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	8	10012-012	LFN 3/4-16, Gr. G	4	2	10947-009	Lower Axle Clamp
2	4	10064-004	U-Bolt 3/4-16 x 7.75 Tri-8	5	2	10949-005	Upper Axle Clamp
3	2	10800-004	Tube	6	1	11319-001	Axle Template

1. Locate the Upper and Lower Axle Clamp and 3/4" U-Bolts.
2. Place the Upper Axle Clamp on to the driver's side axle. The Upper Axle Clamp should be flush with the top of the axle with the locating pin in the center hole.

   IMPORTANT: To aid control arm installation, do not torque until after control arms are installed.

3. Place the Lower Axle Clamp under the axle and loosely attach to the Upper Axle Clamp by slipping the 3/4" U-Bolts into position. **Torque, the U-Bolt nuts evenly in an X-type pattern in 5 stages:**

   - **Stage 1: Tighten snug only.**
   - **Stage 2: Torque to 75 ft-lbs.**
   - **Stage 3: Torque to 150 ft-lbs.**
   - **Stage 4: Torque to 225 ft-lbs.**
   - **Stage 5: Torque to 250 ft-lbs.**

4. Reattach the brake lines to the flanges on the Upper Axle Clamp as shown in Figure 18, using OEM hardware.
5. Repeat on passenger side

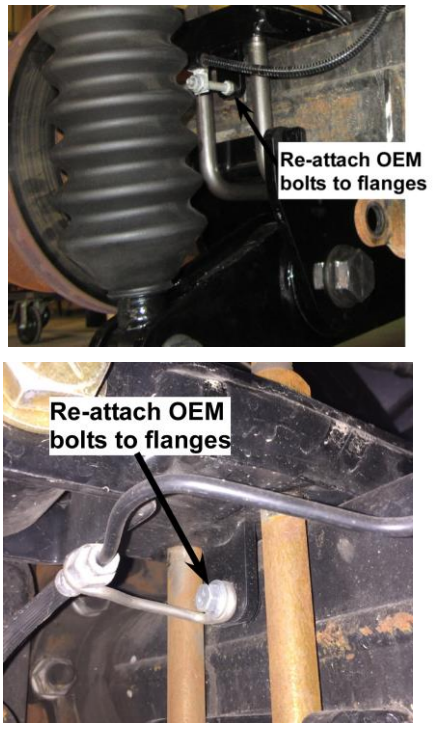
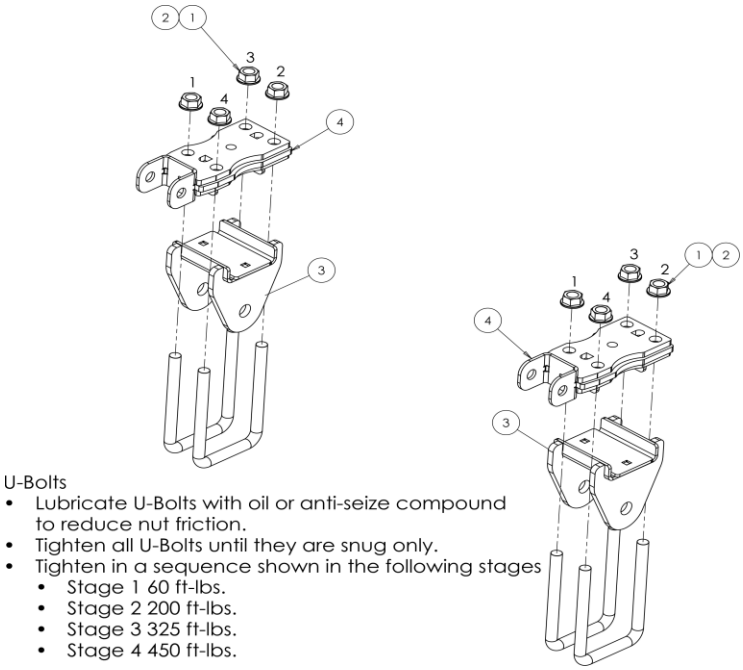


Figure 18. Attach OEM Bolts to Upper Axle Clamp Flange

Axle Connection - DS175



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	8	10012-016	LFN 7/8-14, Gr. G	3	2	10947-014	Lower Axle Clamp
2	4	10064-008	U-Bolt 7/8-14 x 8-15/16 Tri-8	4	2	10949-009	Upper Axle Clamp

1. Locate the Upper and Lower Axle Clamp and 7/8" U-Bolts.
2. Place the Upper Axle Clamp on to the driver's side axle. The Upper Axle Clamp should be flush with the top of the axle with the locating pin in the center hole.

   IMPORTANT: To aid control arm installation, do not torque until after control arms are installed.
3. Place the Lower Axle Clamp under the axle and loosely attach to the Upper Axle Clamp by slipping the 7/8" U-Bolts into position. **Torque, the U-Bolt nuts evenly in an X-type pattern in 5 stages:**

   - **Stage 1: Tighten snug only.**
   - **Stage 2: Torque to 60 ft-lbs.**
   - **Stage 3: Torque to 200 ft-lbs.**
   - **Stage 4: Torque to 325 ft-lbs.**
   - **Stage 5: Torque to 450 ft-lbs.**
4. Reattach the brake lines to the flanges on the Upper Axle Clamp as shown in Figure 19, using OEM hardware. It may be necessary to bend the wire clips slightly to make sure all brake lines clear struts and components.
5. Reattach the ABS lines to the flanges on the Upper Axle Clamp, using OEM hardware.
6. Repeat on passenger side

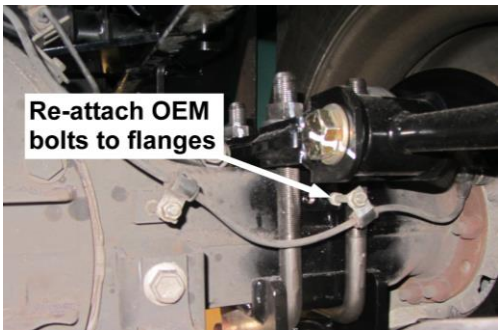
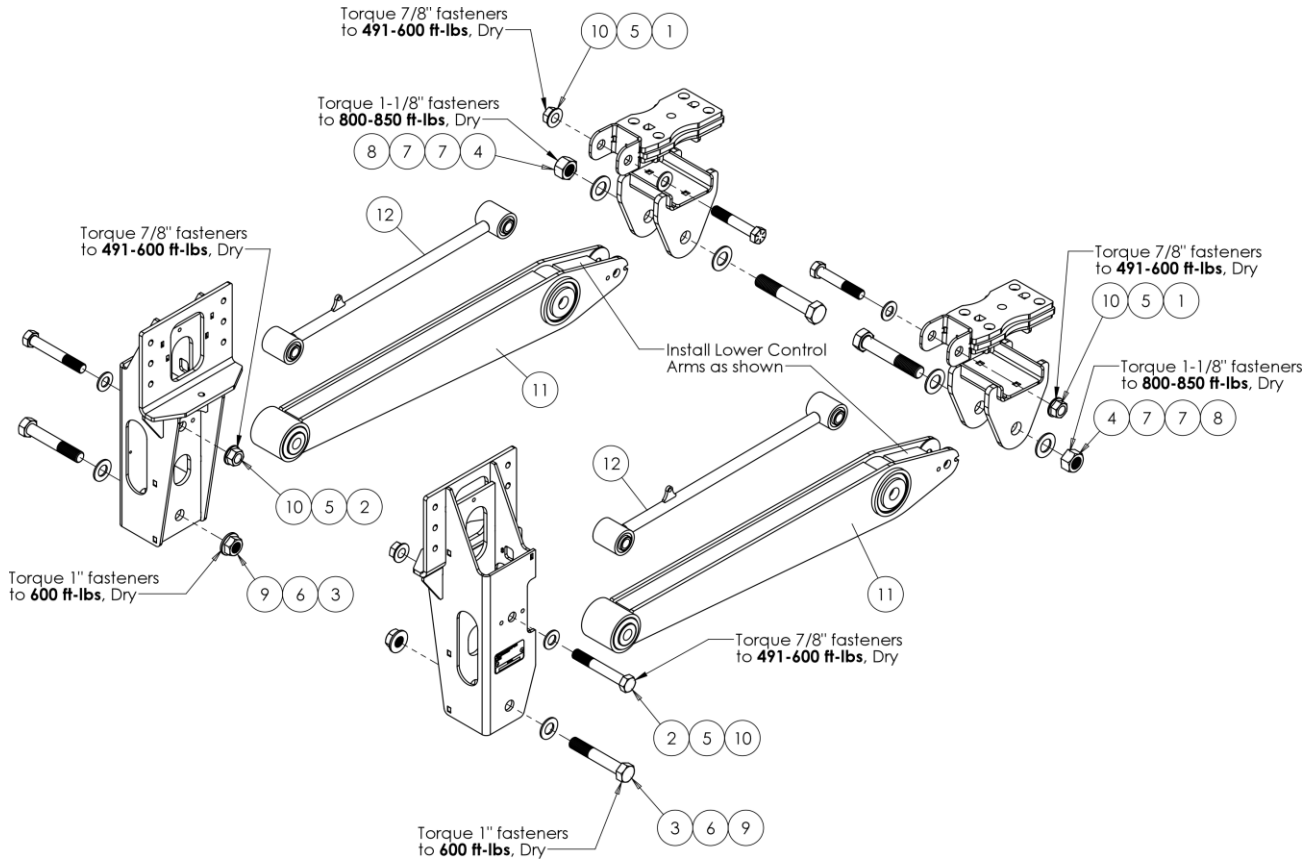


Figure 19. Attach OEM Bolts to Upper Axle Clamp Flange

Control Arms



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	10002-500	HCS 7/8-9x5” Gr 8	8	2	10008-003	HCS 1.125-7x6.50, Gr. 8
2	2	10002-600	HCS 7/8-9x6” Gr 8	9	2	10012-003	LFN 1-8, Gr. G
3	2	10003-003	HB 1-8 x 6.00”, Gr. 8	10	4	10012-017	LFN 7/8-9 Gr. G
4	2	10004-014	LHN 1.125-7	11	2	10953-007	Lower Control Arm – **DS150**
5	4	10006-003	HFW 7/8”			10953-010	Lower Control Arm – **DS175**
6	4	10006-004	HFW 1”			10953-012	Lower Control Arm – **DS120**
7	4	10006-005	HFW 1.125	12	2	11198-004	Upper Control Arm

1. Install the upper and lower control arms between the driver side front hanger and upper / lower axle clamp loosely with hardware shown above.

2. Check that control arms are oriented as shown above, with Upper Control Arm height sensor tabs pointing upward and forward, and Lower Control Arm rear plates pointing upward.

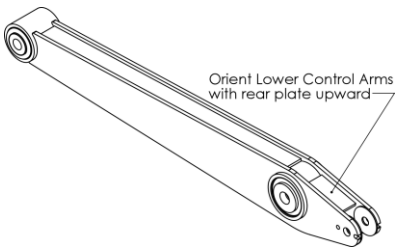


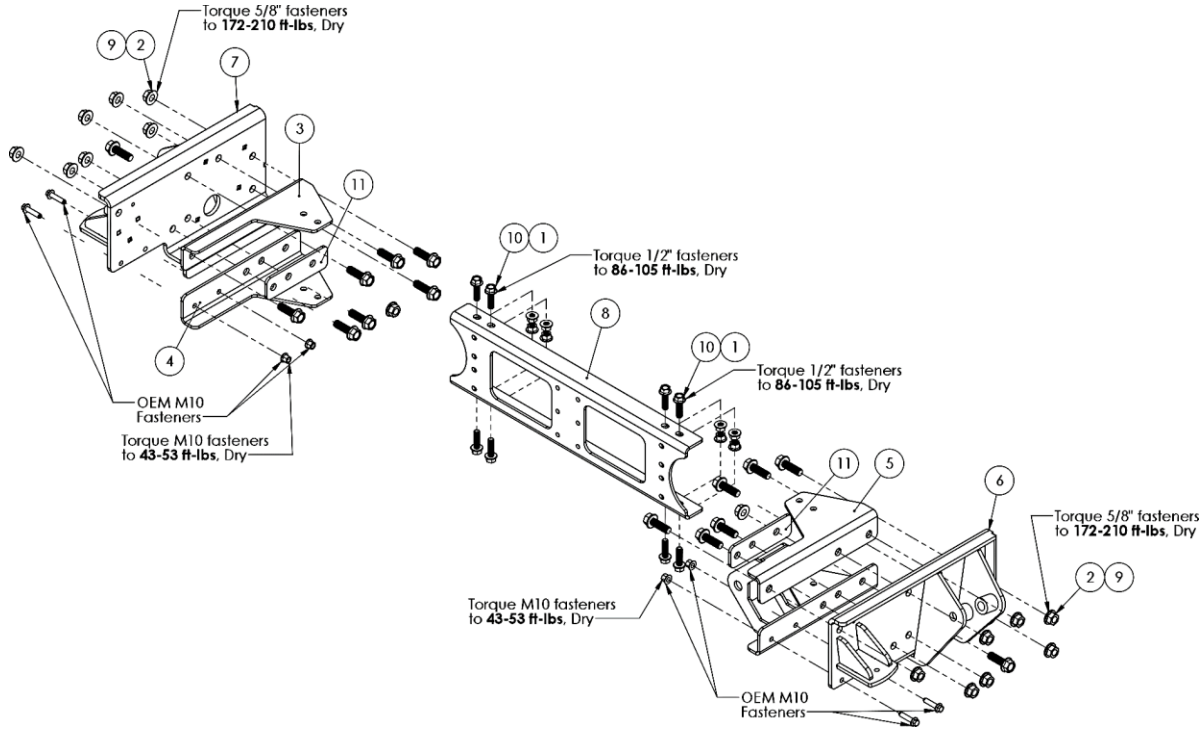
Figure 20. Correct LCA Orientation

IMPORTANT: Bolts inserted at the axle seat must point outboard (towards tire).

3. Do not tighten control arm fasteners until track rod is in place and vehicle is set to ride height, see Figure 25.

Note: Axle must be held at ride height for tightening control arm bolts to prevent preloading the bushings.

Upper Strut Mounts/Crossmember – DS120



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	8	10012-007	LFN 1/2-13, Gr. G	7	1	10790-042	USM, RH
2	16	10012-008	LFN 5/8-11 Gr. G	8	1	10796-011	Cross-member Channel
3	1	10787-018	Cross-member Mount, Upper	9	16	10874-200	HFB 5/8-11x2”, Gr. 8
4	1	10787-019	Cross-member Mount, Lower	10	8	10885-175	HFB 1/2-13x1.75”, Gr. 8
5	1	10789-018	Track Rod Mount	11	2	11250-003	Backer Plate
6	1	10790-041	USM, LH				

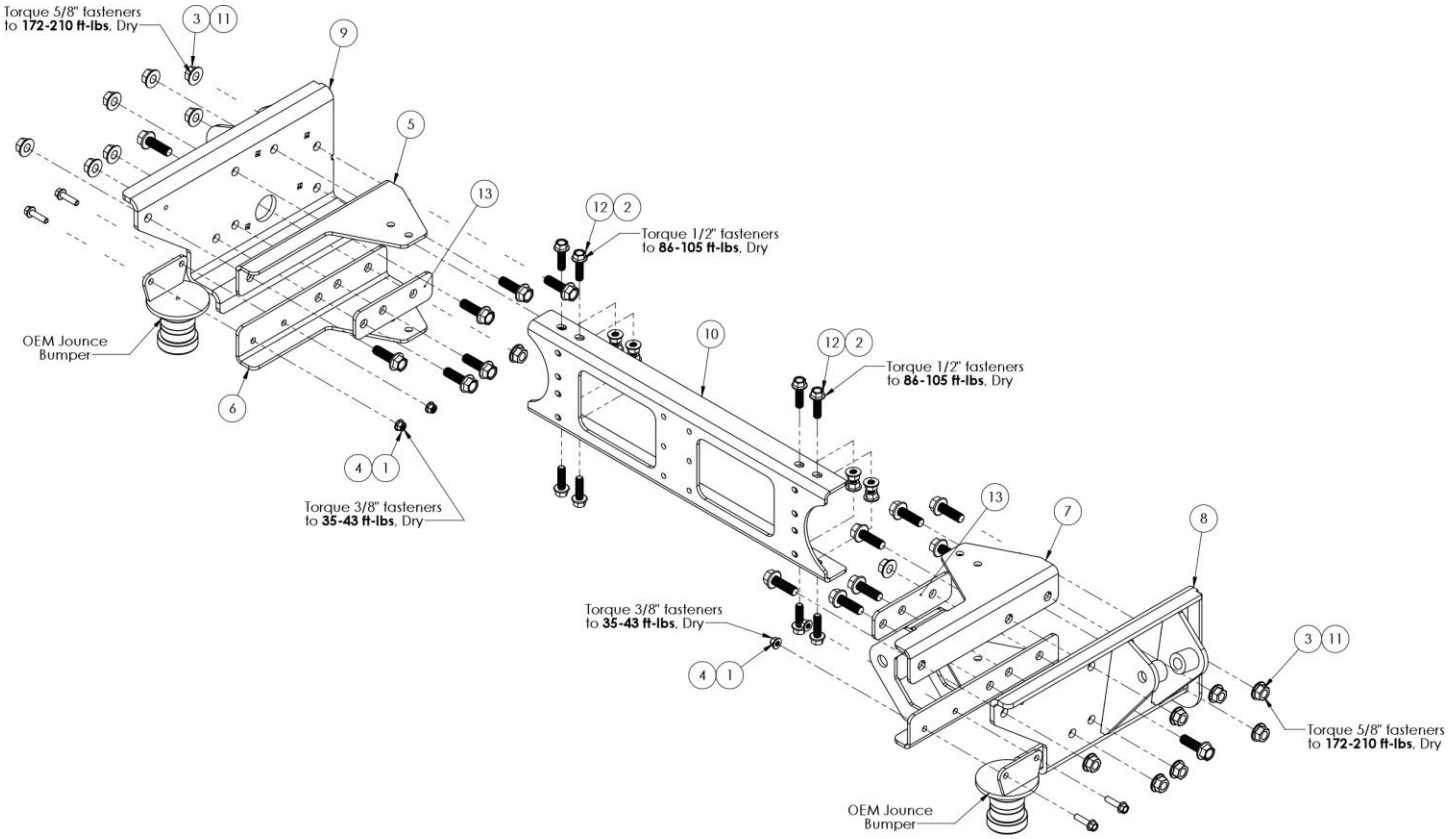
1. Loosely attach the LH Upper Strut Mount and Track Rod Mount to the frame located just behind the axle using the 5/8”-11 fasteners.
2. Repeat with RH Upper Strut Mount and the two Cross-member Mounts.
3. Install the Cross-member Channel with 1/2”-13 hardware with nuts inside the channel as shown.
4. Re-use the OEM M10 fasteners that came off the OEM Jounce Bumper mounts.

IMPORTANT: Bolts must be installed in directions as shown to provide clearance to the Struts and other Moving parts.

IMPORTANT: Before tightening fasteners, verify the top of each upper strut mount is level with the top of the frame.

5. Torque all 5/8”-11 nuts to **172-210 ft-lbs**.
6. Torque all 1/2”-13 nuts to **86-105 ft-lbs.**
7. Torque all 3/8”-16 nuts to **35-43 ft-lbs.**
8. Torque all M10 nuts to **43-53 ft-lbs.**

Upper Strut Mounts/Crossmember – DS150



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	4	10012-005	LFN 3/8-16, Gr. G	8	1	10790-029	USM, LH
2	8	10012-007	LFN 1/2-13, Gr. G	9	1	10790-030	USM, RH
3	16	10012-008	LFN 5/8-11 Gr. G	10	1	10796-011	Cross-member Channel
4	4	10501-150	HFB 3/8-16 x 1.500, Gr. 8	11	16	10874-200	HFB 5/8-11x2", Gr. 8
5	1	10787-018	Cross-member Mount, Upper	12	8	10885-175	HFB 1/2-13x1.75", Gr. 8
6	1	10787-019	Cross-member Mount, Lower	13	2	11250-003	Backer Plate
7	1	10789-018	Track Rod Mount				

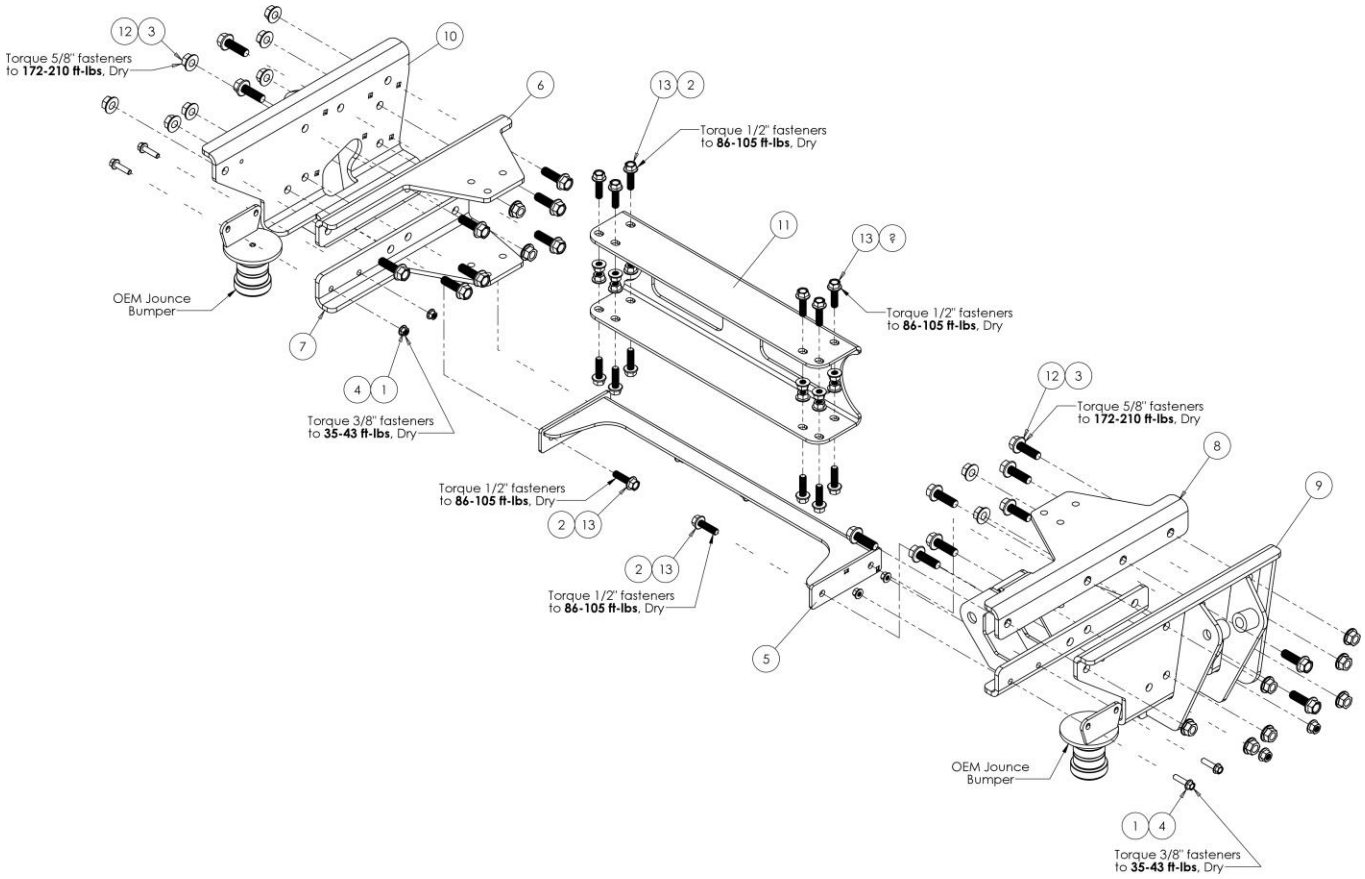
1. Loosely attach the LH Upper Strut Mount, Backer Plate, and Track Rod Mount to the frame located just behind the axle using the 5/8"-11 fasteners.
2. Repeat with RH Upper Strut Mount, Backer Plate, and the two Cross-member Mounts.
3. Install the Cross-member Channel with 1/2"-13 hardware with nuts inside the channel as shown.

IMPORTANT: Bolts must be installed in directions as shown to provide clearance to the Struts and other Moving parts.

IMPORTANT: Before tightening fasteners, verify the top of each upper strut mount is level with the top of the frame.

4. Torque all 5/8"-11 nuts to **172-210 ft-lbs**.
5. Torque all 1/2"-13 nuts to **86-105 ft-lbs.**
6. Torque all 3/8"-16 nuts to **35-43 ft-lbs.**

Upper Strut Mounts/Crossmember – DS175



ITEM	QTY	PART NUMBER	DESCRIPTION
1	4	10012-005	LFN 3/8-16, Gr. G
2	16	10012-007	LFN 1/2-13, Gr. G
3	18	10012-008	LFN 5/8-11 Gr. G
4	4	10501-150	HFB 3/8-16 x 1.500, Gr. 8
5	1	10782-006	Cross-member Reinforcement
6	1	10787-024	Cross-member Mount, Upper
7	1	10787-025	Cross-member Mount, Lower

ITEM	QTY	PART NUMBER	DESCRIPTION
8	1	10789-021	Track Rod Mount
9	1	10790-039	USM, LH
10	1	10790-040	USM, RH
11	1	10796-015	Cross-member Channel
12	18	10874-200	HFB 5/8-11x2", Gr. 8
13	16	10885-175	HFB 1/2-13x1.75", Gr. 8

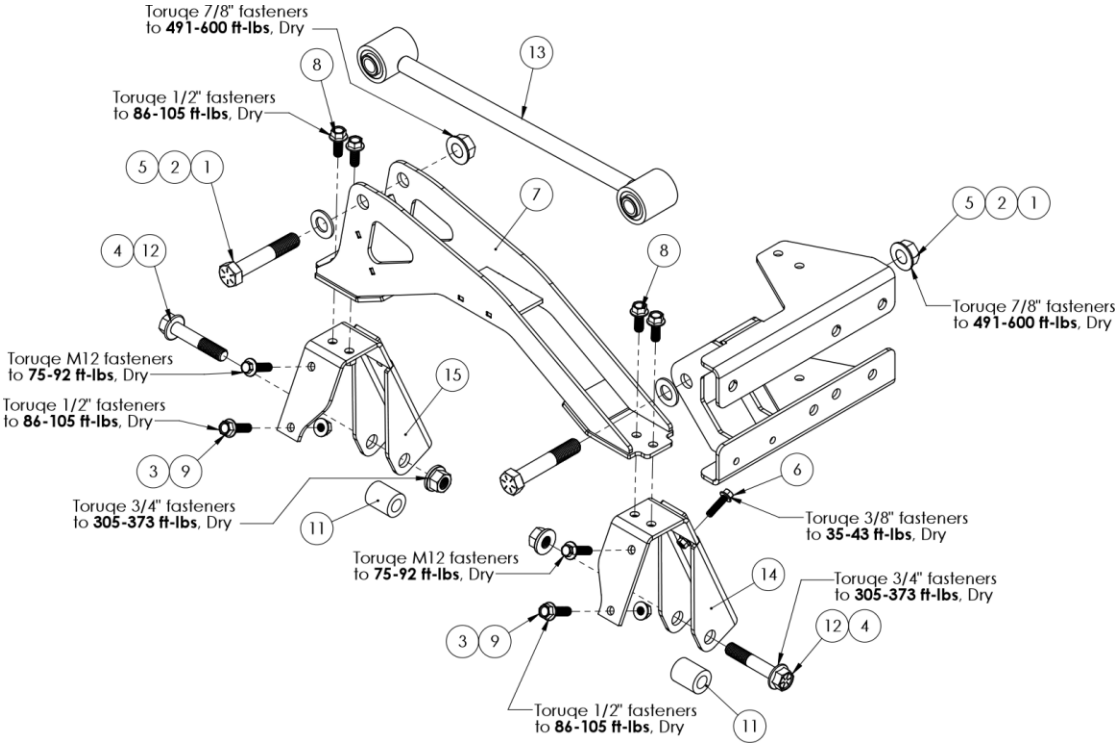
1. Loosely attach the LH Upper Strut Mount and Track Rod Mount to the frame located just behind the axle using the 5/8"-11 fasteners.
2. Repeat with RH Upper Strut Mount and the two Cross-member Mounts.
3. Install the Cross-member Channel with 1/2"-13 hardware with nuts inside the channel as shown.

IMPORTANT: Bolts must be installed in directions as shown to provide clearance to the Struts and other Moving parts.

IMPORTANT: Before tightening fasteners, verify the top of each upper strut mount is level with the top of the frame.

4. Torque all 5/8"-11 nuts to **172-210 ft-lbs**.
5. Torque all 1/2"-13 nuts to **86-105 ft-lbs.**
6. Torque all 3/8"-16 nuts to **35-43 ft-lbs.**

Track Rod and Bridge – DS120



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	10002-500	HCS 7/8-9	9	2	10885-175	HFB 1/2-13 x 1.75, Gr. 8
2	2	10006-003	HFW .875	10	2	11012-045	HFB M12-1.75 x 45
3	2	10012-007	LFN 1/2-13	11	2	11100-004	Spacer
4	2	10012-014	LFN 3/4-10	12	2	11102-400	HFB 3/4-10 x 4, Gr. 8
5	2	10012-017	LFN 7/8-9	13	1	11198-003	Track Rod
6	1	10501-150	HFB 3/8-16x1.5, Gr. 8	14	1	11448-001	Axle Mount, LH
7	1	10762-013	Bridge	15	1	11148-002	Axle Mount, RH
8	4	10885-125	HFB 1/2-13 x 1.25				

1. Detach the sway bar and sway bar bushing from the axle. Do not remove the bushing from the sway bar.
2. Remove the D-Ring and drill out one of the holes so a 1/2" bolt can pass through.
3. Remove the lower weld nut from both sway bar mounts. See Figure 21

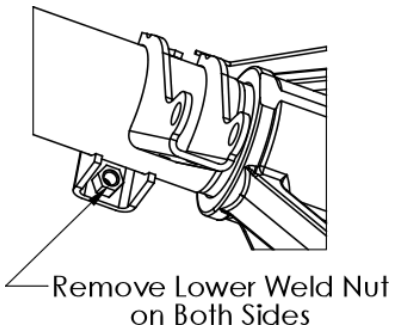


Figure 21. Remove Weld Nut

4. Locate the brake block located on the Driver side of the axle and remove it.
5. Put the vent hose back into the axle, without the brake block attached, and tighten it all the way down.
6. Wrap the vent hose with Spiral Cable Wrap, that's provided in the kit, and wrap it from the base up.
7. Locate the left-hand Axle Mount and place it on top of the axle so that it rests on top of the sway bar mount. See Figure 22

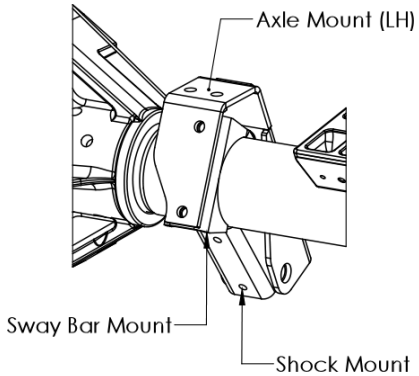


Figure 22. Axle Mount Positioned on Axle

8. Locate one (1) M12 bolt, and one (1) 1/2-13 x 1.75 bolt with a 1/2-13 nut. Loosely fasten the M12 bolt and the 1/2" fasteners to the sway bar mount.
9. Locate the spacer and 3/4” hardware and loosely fasten them to the shock mount on the axle.
10. Using the 3/8” bolt, re-attach the brake block onto the back side of the Axle Mount as shown in Figure 23

Figure 23. Installed Brake Block

11. Once the bolts are loosely fastened tighten them to hand tight.
12. Repeat for the passenger side.
13. Install the Bridge on top of the Axle Mounts using the 1/2”-13 x 1.25 bolts.
14. Apply the Spiral Cable Wrap to brake hoses where needed.
15. Loosely attach the Track Rod Assembly to the Bridge and to the Frame Mount using the 7/8” fasteners.
16. Jack each side of the axle or adjust frame height until approximately design ride height position. See Figure 24.

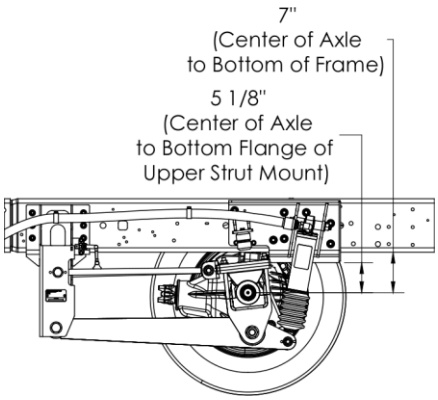
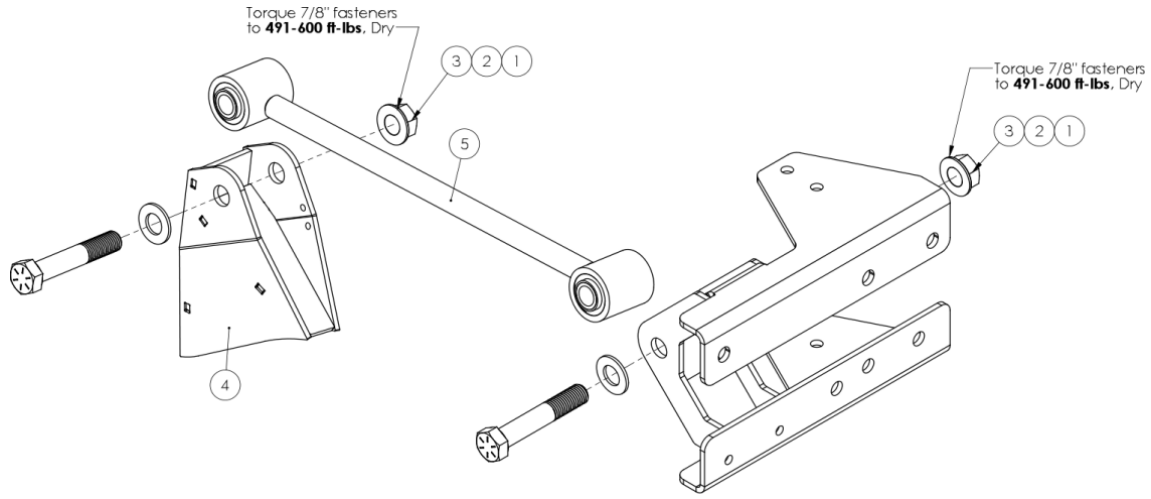


Figure 24. DS120 - Ride Height

17. Torque the two (2) M12 bolts to **75-92 ft-lbs.**
18. Torque the one (1) 3/8-16 bolt to **35-43 ft-lbs.**
19. Torque the six (6) 1/2-13 bolts to **86-105 ft-lbs.**
20. Torque the two (2) 3/4" nuts to **305-373 ft-lbs.**
21. Torque the two (2) 7/8” Track Rod mounting bolts to **491-600 ft-lbs.**
22. Torque the four (4) 7/8” Control Arm mounting bolts to **491-600 ft-lbs.**
23. Torque the two (2) 1” Control Arm mounting bolts to **600 ft-lbs.**
24. Torque the two (2) 1-1/8” Control Arm mounting bolts to **800-850 ft-lbs.**

IMPORTANT: Torque all control arm fasteners while axle is at approximate ride height.

Track Rod and Mount – DS150 and DS175



ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	10002-500	HCS 7/8-9 x 5.00" Gr 8
2	2	10006-003	HFW 7/8"
3	2	10012-017	LFN 7/8-9 Gr G
4	1	10951-008	Axle Mount – **DS150**

ITEM	QTY	PART NUMBER	DESCRIPTION
4	1	10951-010	Axle Mount – **DS175**
5	1	11198-003	Track Rod - **DS150**
		11198-005	Track Rod - **DS175**

1. Loosely attach the Track Rod to the Track Rod Axle Mount and to the Frame Mount using the 7/8" fasteners.
2. Jack each side of the axle or adjust frame height until approximately design ride height position. See Figure 25.
3. Torque the four (4) 7/8" Control Arm mounting bolts to **491-600 ft-lbs.**
4. Torque the two (2) 1" Control Arm mounting bolts to **600 ft-lbs.**
5. Torque the two (2) 1-1/8" Control Arm mounting bolts to **800-850 ft-lbs.**

IMPORTANT: Torque all control arm fasteners while axle is at approximate ride height.

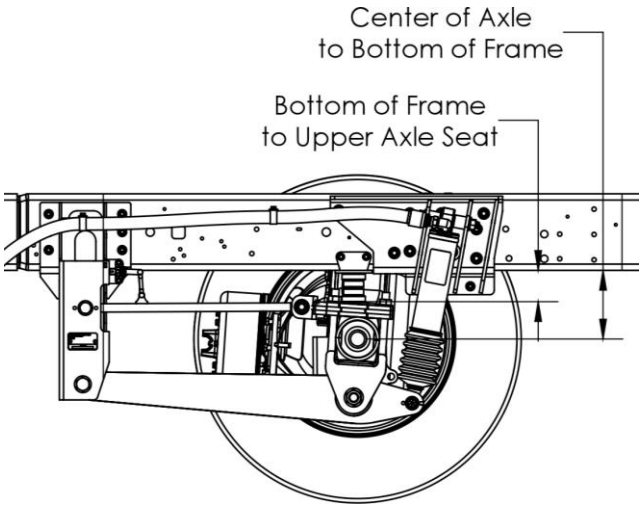


Figure 25. Design Ride Height

SUSPENSION	CENTER AXLE TO BOTTOM FRAME	UPPER AXLE SEAT TO BOTTOM FRAME
DS150F53	7-3/4"	3-7/8"
DS175F53	8-1/4"	3-3/4"
DS120F53	7"	N/A

Track Rod Mount Welding – DS150 and DS175

1. Move brake cables, parking brake cables, ABS lines, and axle breather from top of axle and position away from the axle.

IMPORTANT: Hangers, Axle Clamps, Control Arms, Upper Strut Mounts, Crossmember, and Track Rod components must be installed before proceeding with axle mount welding.

2. Lift axle to LiquidSpring Ride Height and ensure axle is centered in the vehicle.
3. If axle is not centered, adjust as necessary. Refer to Figure 26 for examples of axle centering, and Figure 25 for correct ride height measurements.

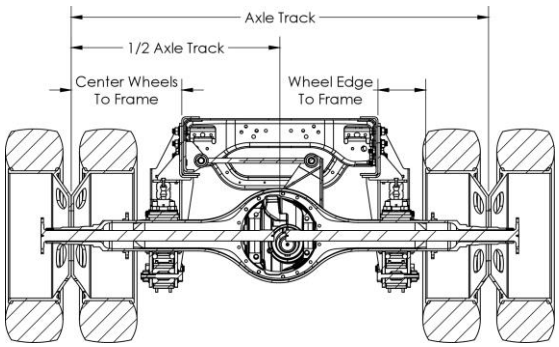


Figure 26. Checking Axle Center.

4. Temporarily place the mount onto the axle as shown in Figure 27. The mount profile should approximately match the axle profile.

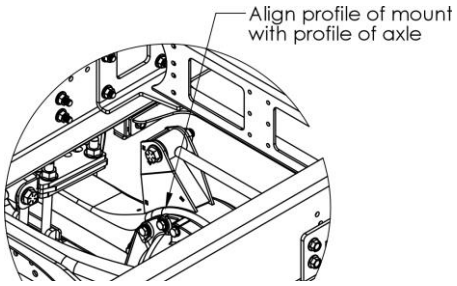


Figure 27. Position Axle Mount

5. Outline the axle mount with a visible paint marker.
6. Swing the axle mount and track rod out of the way and grind away the outlined area and ½" beyond to bare metal.
7. Swing the mount back down onto the axle, again aligning the profiles.
8. Tack weld all four sides of the axle mount to the axle housing as shown in Figure 28.

IMPORTANT: Before final weldment, ensure that vehicle is at ride height, axle is centered, and track rod is approximately level horizontally.

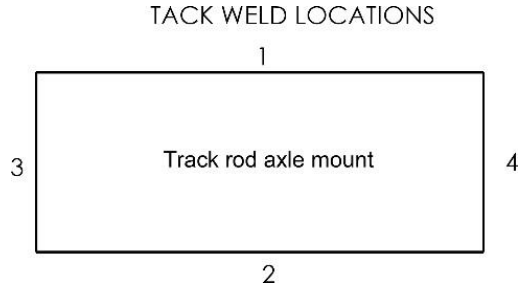


Figure 28. Tack Welding Axle Mount

9. Unbolt track rod from axle mount.

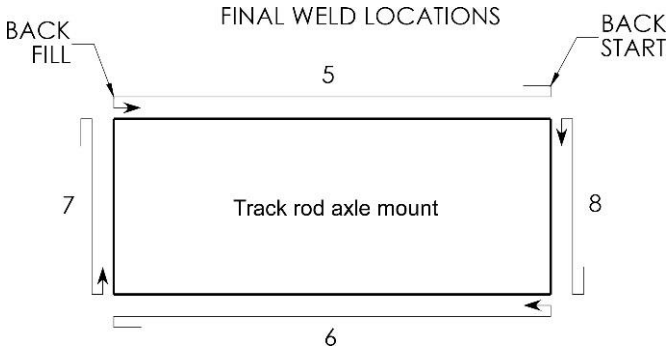


Figure 29. Final Welding on Axle Mount

10. Beginning at the indicated location, back step the start of the weld from 0.315-0.512" to prevent a cold start.
11. Lay a full fillet in a single pass: Fillet size 0.375-0.50".
12. Back fill the end of the weld 0.315-0.512" to eliminate craters.
13. Complete the welding on all sides of the bracket using Steps 9-12.

IMPORTANT: If welding equipment is not capable of welding a single pass as specified, multiple passes will be required.

Note: When welding multiple passes, the first pass should be centered over the fit-up line. The second pass should be placed slightly above the first. Blend the weld smoothly with the axle mount and the first pass. The third pass should penetrate the lower half of the second pass to the edge of the axle housing. When making the second and third passes the direction should be reversed. Refer to steps above for back start and back fill. Clean weld before each pass.

14. Once the axle has cooled, re-install the track rod, and torque the 7/8" fasteners to **491-600 ft-lbs**.
15. Apply touch up paint to any bare metal showing on the axle mount and housing.

16. Reattach all brake lines to the axle. If you have a DS175F53 kit, be sure that brake line flange is turned slightly towards front of vehicle, to avoid brake lines bouncing on track rod. See Figure 30 for reference.

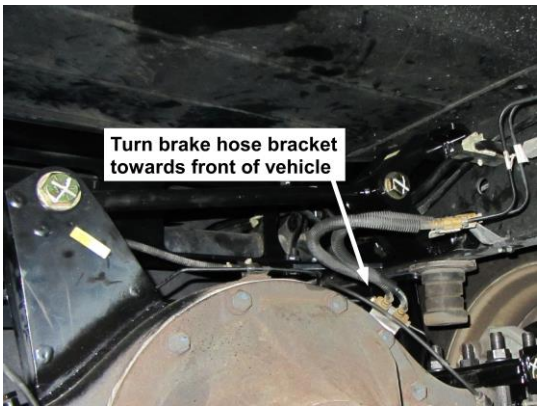
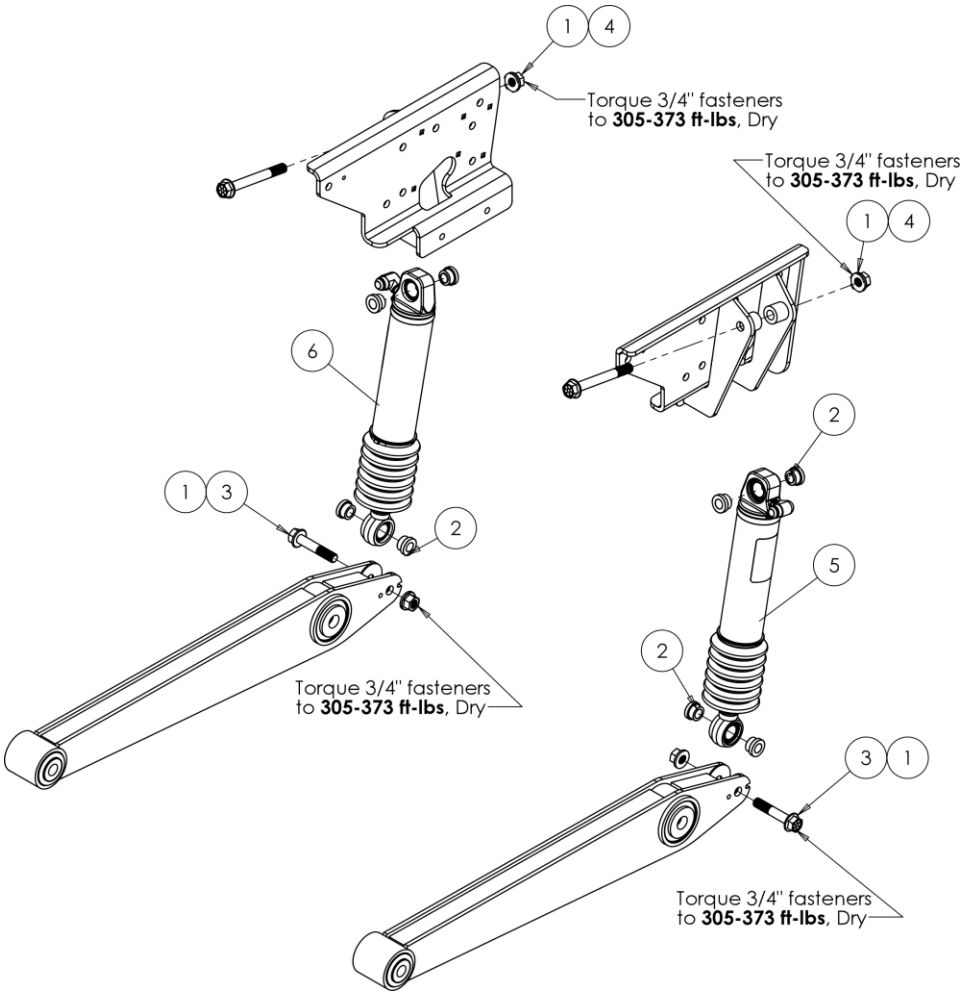


Figure 30. Brake Line Bracket (DS175F53)

17. Reattach the ABS lines to the top of the axle.
18. Reinstall the axle breather assembly.
19. Be sure that all brake lines and ABS lines are not contacting the track rod or the axle mount. Make any adjustments as necessary.

Struts



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	4	10012-014	LFN 3/4-10 Gr G	5	1	11185-009	Strut Assembly, LH - **DS150**
						11177-007	Strut Assembly, LH - **DS175**
2	8	10640-005	Bearing Spacer			11057-015	Strut Assembly, LH – **DS120**
3	2	11102-400	HFB 3/4-10 x 4” Gr 8	6	1	11185-010	Strut Assembly, RH - **DS150**
4	2	11102-650	HFB 3/4-10 x 6-1/2” Gr 8			11177-008	Strut Assembly, RH - **DS175**
						11057-016	Strut Assembly, RH - **DS120**

1. Install the Left Hand Strut Assembly as shown making sure to install bearing spacers on lower connection and on upper connection.

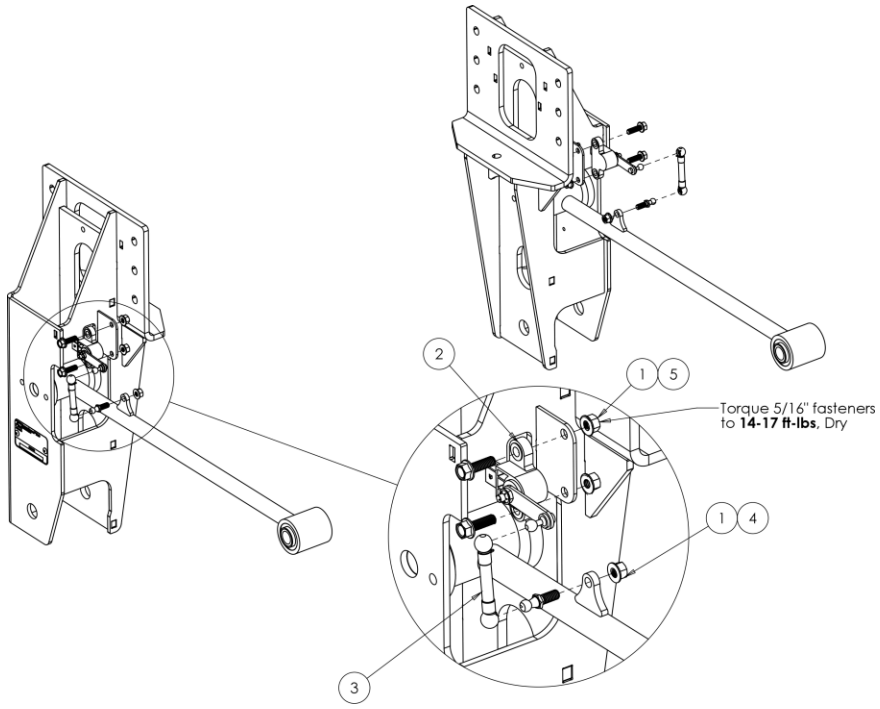
Note: Point strut hydraulic port forward on both sides.

IMPORTANT: Bolts must be installed in directions as shown to provide clearance to the Struts and other Moving parts.

2. Repeat for installation of Right Hand Strut Assembly, Bearing Spacers, and Hardware.

3. Torque Upper and Lower strut fasteners to **305-373 ft-lbs**. *Do not over torque.*

Height Sensors



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	6	10012-010	LFN 5/16-18, Gr. G	4	2	10591-003	Ball Stud 5/16-18 x .75L
2	2	10586-001	Height Sensor Assembly	5	4	10886-100	HFB 5/16-18 x 1.00”, Gr. 8
3	2	10587-005	Linkage Assembly				

IMPORTANT: Strut assemblies must be installed prior to the installation of the height sensors.

1. Install Height Sensor components and hardware as shown.
2. Torque all 5/16 hardware to **14-17 ft-lbs.**
3. Snap the Linkage Assemblies to the ball studs attached to the upper control arms and to the ball studs on the Height Sensor arms. Refer to **Figure 31 or Figure 32** for linkage detail**.**

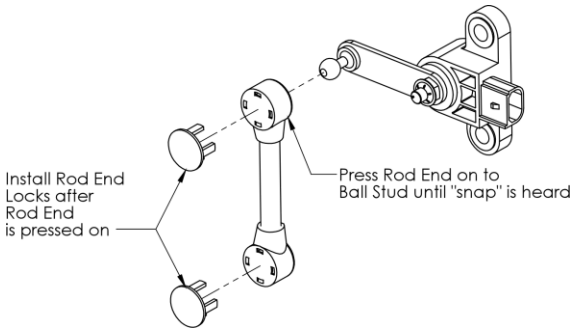


Figure 31. Height Sensor Plastic Linkage End Installation

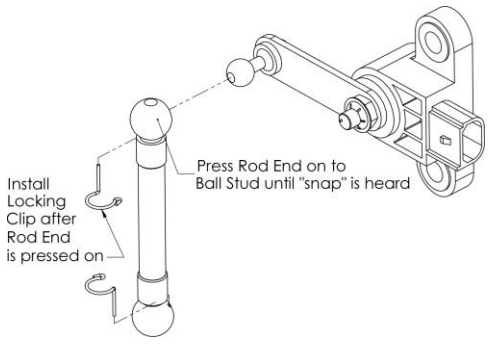
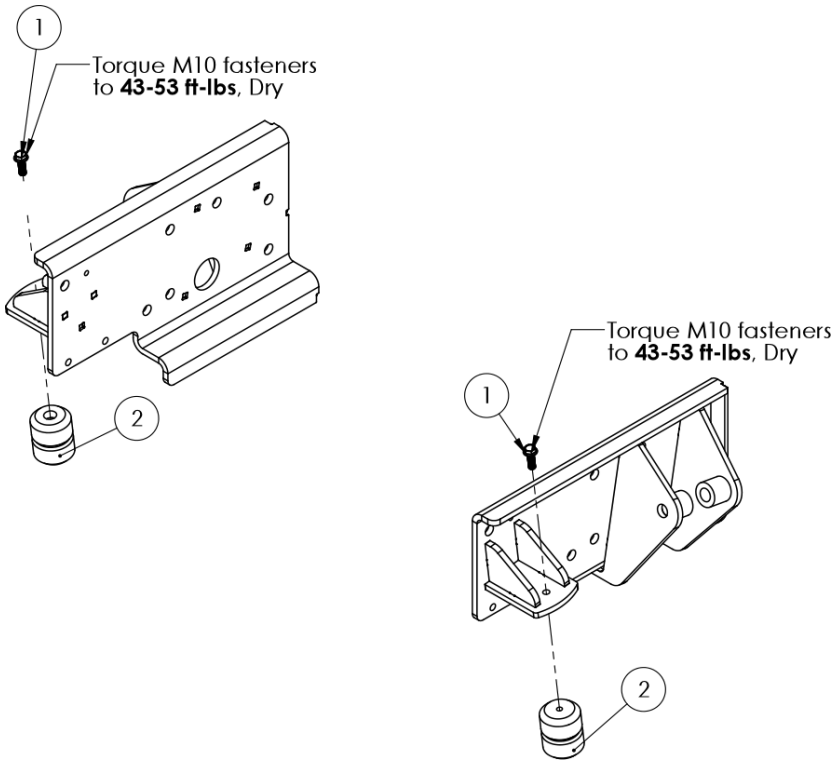


Figure 32. Height Sensor Metal Linkage End Installation.

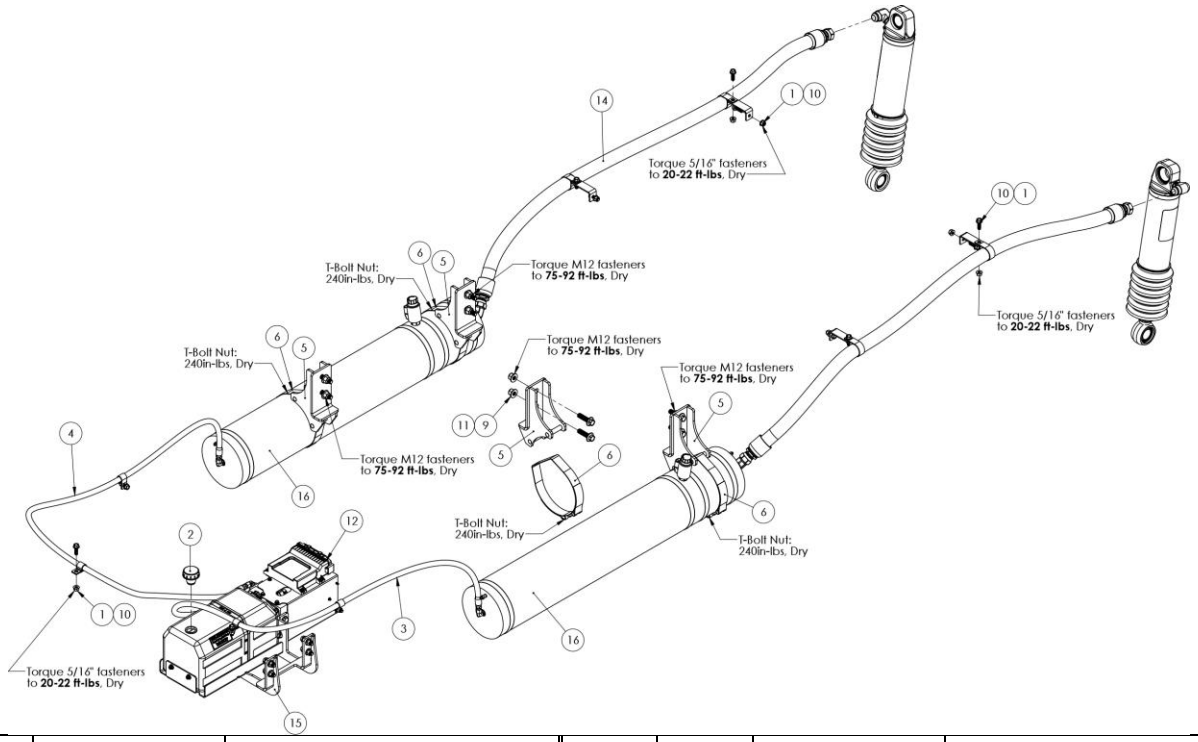
Jounce Bumpers – DS120



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	10502-001	HFB M10-1.5 x 30 CL 10.9	2	2	10867-003	Jounce Bumper

1. Locate and install Jounce Bumpers using M10 bolts.
2. Torque M10 bolts to **43-53 ft-lbs.**

Secondary Volumes – DS120



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	12	10012-010	LFN 5/16-16, Gr. G	9	8	10873-004	LFN M12-1.75, CL 10.9
2	1	10614-001	Breather Cap	10	12	10886-100	HFB 5/16-18 x 1” Gr 8
3	1	10675-013	Hyd. Hose, -4 x 64-5/8” L	11	8	11012-045	HFB M12-1.75 x 45, CL 10.9
4	1	10675-016	Hyd. Hose, -4 x 88-3/8” L	12	1	11287-011	Power Module, F53
5	4	10830-022	Volume Mount	13	4	11263-003	Hose Bracket
6	4	10843-004	T-Bolt Clamp	14	2	11336-001	Hyd. Hose, -16 x 59-1/8” L
7	4	10855-001	Loop Clamp, 1.5” ID	15	1	11380	Kit, Power Module Mounting
8	4	10855-003	Loop Clamp, 5/8” ID	16	2	11454-001	Volume

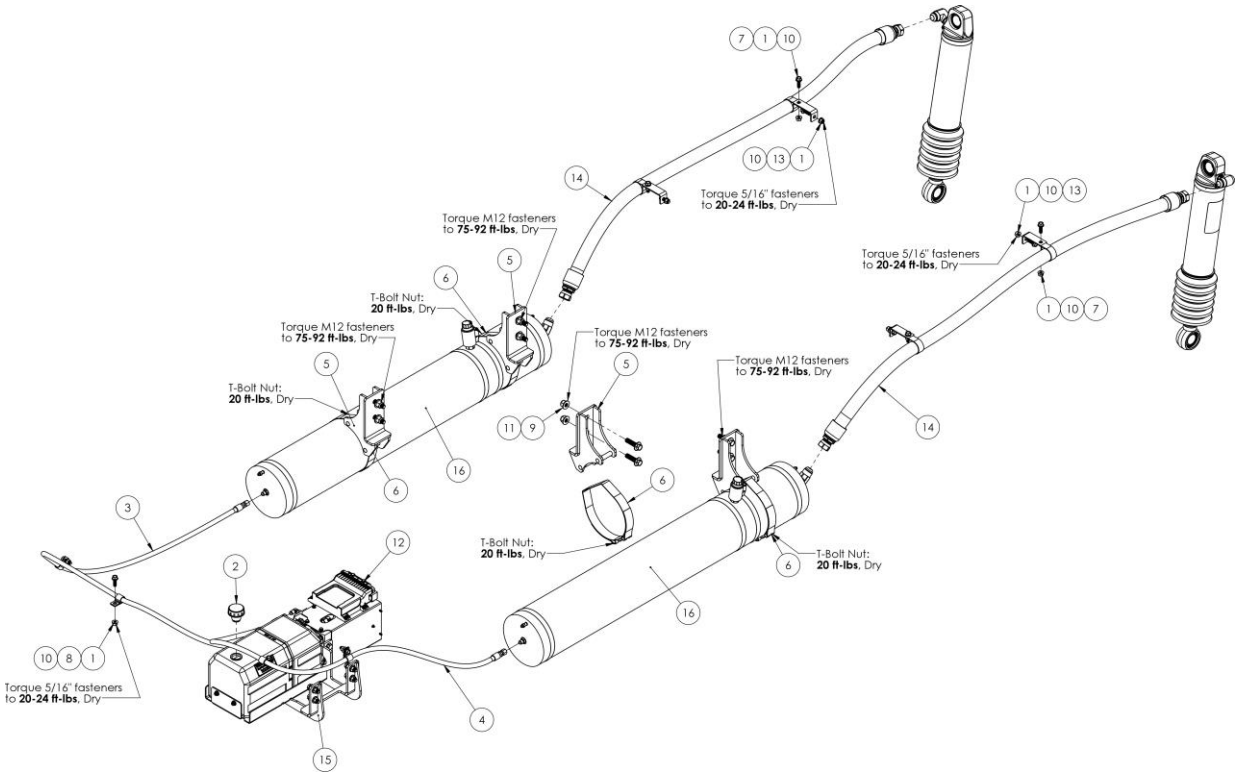
WARNING: Each Volume Assembly is heavy (in excess of 100 lbs). Use of a portable lift, crane, or suitable jack is recommended to support the Volume Assembly during installation.

1. Locate (2) Volume Mounts.
2. Using the Volume Mount, mark and drill holes as shown in Figure A 6 or Figure A 7.

Note: An extra set of Volume Mounts (10830-026) are included with this kit. These mounts can be used to tuck the volume farther underneath the frame to allow more clearance for compartments.

3. Verify that the mount is held flush to the bottom of the frame and utilizing the mount holes and drill (4) Ø7/16” holes.
4. Attach the two mounts with M12 Flange Bolts and Nuts. Torque to **75-92 ft-lbs**.
5. Repeat with Volume Mounts on the passenger side of the frame.
6. Locate the Volume Assembly.
7. Raise the volume assembly until the volume contacts both mounts. Rotate the volume assembly until the bleed screws are located to the top and as vertical as possible.
8. Locate (2) T-Bolt Clamps, open the clamps, and place them in the mounts around the two pegs.
9. Secure both clamps around the volume and torque the T-Bolt nut to **20 ft-lbs** (**240 in-lbs)**.
10. Repeat with opposite side.
11. Attach the -4 hoses to the Volumes and route them as shown.
12. Attach the -16 hoses to the Volumes and route the hoses as shown.
13. Torque -4 hose fitting to **14-18 ft-lbs.**
14. Torque -12 hose fitting to **75-83 ft-lbs.**

Secondary Volumes – DS150 and DS175



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	12	10012-010	LFN 5/16-18 Gr. G	8	4	10855-003	Vinyl Coated Loop Clamp 5/8”
2	1	10614-001	Breather/Fill Cap	9	8	10873-004	LFN M12-1.75, CL 10.9
3	1	10675-002	Hyd. Hose, -4 x 64-5/8” – **DS150**	10	12	10886-100	HFB 5/16-18 x 1” Gr 8
		10675-006	Hyd. Hose, -4 x 97-5/8” – **DS175**	11	8	11012-045	HFB M12-1.75 x 45, CL 10.9
4	1	10675-013	Hyd. Hose, -4 x 52-5/8” – **DS150**	12	1	11287-010	Power Module, F53
		10675-006	Hyd. Hose, -4 x 97-5/8” – **DS175**	13	4	11263-003	Hose Bracket
5	4	10830-022	Volume Mount Weldment	14	2	11336-001	Hyd. Hose, -16 x 59-1/8”
6	4	10843-004	T-Bolt Clamp	15	1	11380	Kit, Power Module Mounting
7	4	10855-001	Vinyl Coated Loop Clamp 1.5”	16	2	11454-002	Volume

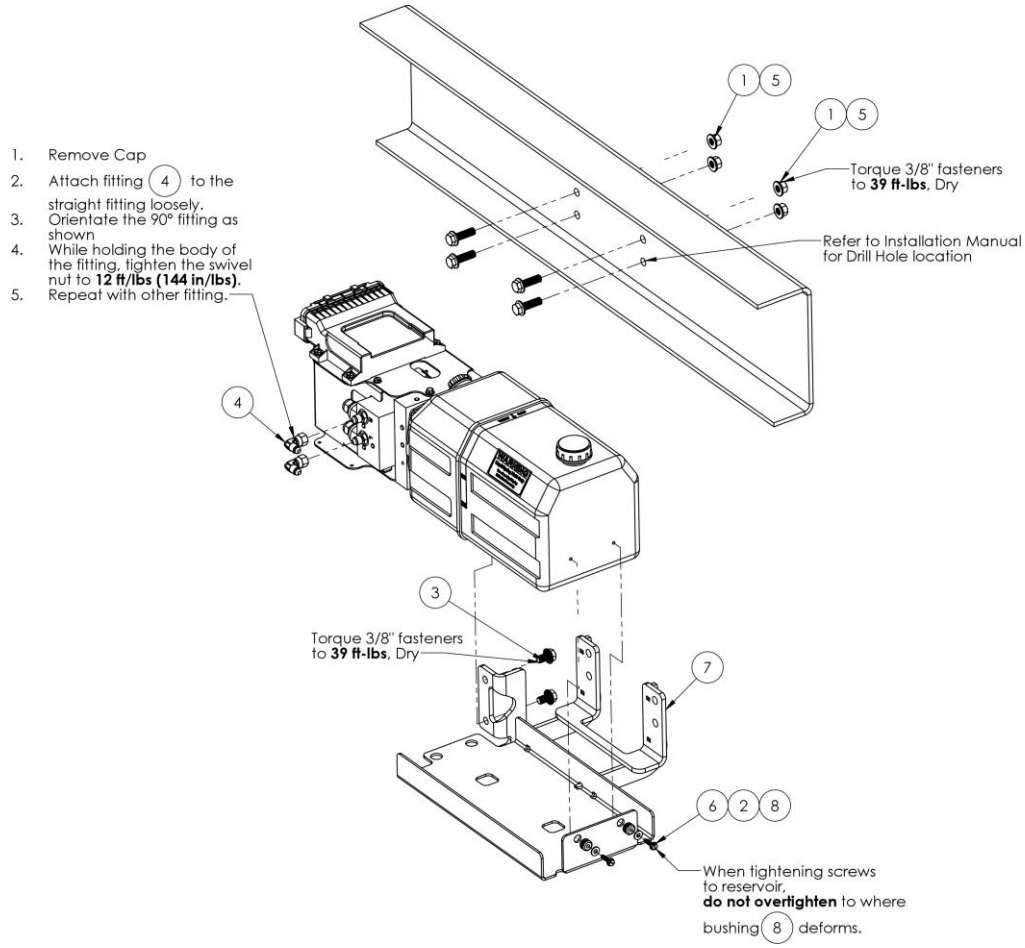
WARNING: Each Volume Assembly is heavy (in excess of 100 lbs). Use of a portable lift, crane, or suitable jack is recommended to support the Volume Assembly during installation.

1. Locate (2) Volume Mounts.
2. Using the Volume Mount, mark and drill holes as shown in Figure A 6 or Figure A 7.

Note: An extra set of Volume Mounts (10830-026) are included with this kit. These mounts can be used to tuck the volume farther underneath the frame to allow more clearance for compartments.

3. Verify that the mount is held flush to the bottom of the frame and utilizing the mount holes and drill (4) Ø7/16” holes.
4. Attach the two mounts with M12 Flange Bolts and Nuts. Torque to **75-92 ft-lbs**.
5. Repeat with Volume Mounts on the passenger side of the frame.
6. Locate the Volume Assembly.
7. Raise the volume assembly until the volume contacts both mounts. Rotate the volume assembly until the bleed screws are located to the top and as vertical as possible.
8. Locate (2) T-Bolt Clamps, open the clamps, and place them in the mounts around the two pegs.
9. Secure both clamps around the volume and torque the T-Bolt nut to **20 ft-lbs** (**240 in-lbs)**.
10. Repeat with opposite side.
11. Attach the -4 hoses to the Volumes and route them as shown.
12. Attach the -16 hoses to the Volumes and route the hoses as shown.
13. Torque -4 hose fitting to **14-18 ft-lbs.**
14. Torque -12 hose fitting to **75-83 ft-lbs.**

Power Module Installation

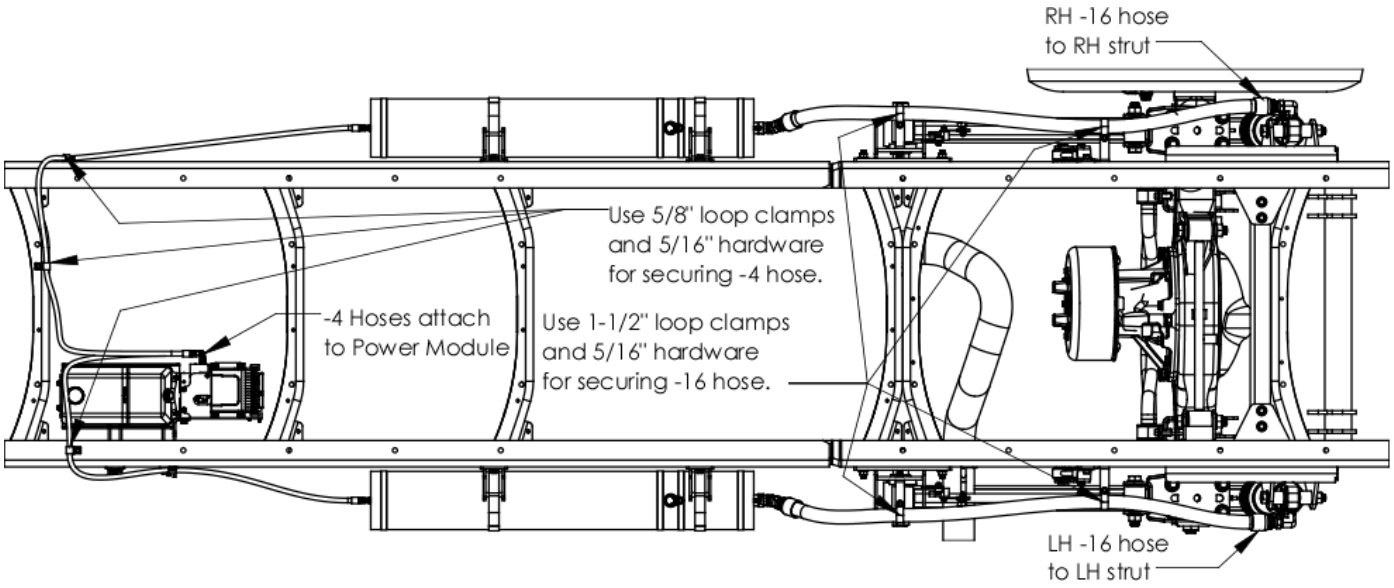


ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	4	10012-005	LFN 3/8-16 Gr G	5	4	10501-002	HFB 3/8-16 x 1.250, Gr 8
2	2	10088-001	FW #10	6	2	10510-002	STS #10-16 x 3/4" Hex Head
3	2	10252-003	SFHS 3/8-16 x 5/8" Gr 8.2	7	1	10798-030	Power Module Mount
4	2	10322-021	Hyd. Fit. 90, -4 37 x -4 37 F	8	2	10805-004	Grommet

1. Locate the Power Module Assembly and Power Module Mounting Kit.
2. Using the Power Module Reservoir Mount, mark and drill holes shown in Figure A 6 or Figure A 7.
3. Verify that the mount is held flush to the bottom of the frame and utilizing the mount hole pattern. Mark the location of the mounting holes and drill (4) Ø7/16" holes.
4. Install the Power Module Mount using the 3/8" fasteners and Torque to **35-43 ft-lbs.**
5. Follow instruction supplied with the hardware for attaching Power Module to Mount.

Note: Fill Power Module reservoir all the way to the top (past the full line) with compressible fluid (10474-005) before mounting. The larger -16 hoses will require the extra fluid.

Hydraulic Hose Attachment and Routing



CAUTION: Attachment of the hydraulic hoses may result in some spillage of fluid. Use of oil absorbent mats is recommended.

1. Locate -16 hose on Left Hand (driver side) Secondary Volume.
2. Route hose to strut area, over front hanger and axle.
3. Locate 3/16" ID PVC Tubing (not included with kit). Note: Alternatively, a bleed kit similar to the Actron 7840 Bleed Kit can be used.
4. Attach the PVC tubing to the bleed screw on the -16 hose side of the Left Hand Secondary Volume Assembly and place the other end in a bucket.

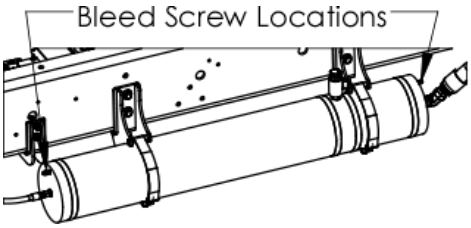


Figure 33. Bleed screw locations.

5. Open the bleed screw slightly to relieve any residual pressure.
6. After pressure is relieved, close the bleed screw and torque to **13-18 ft-lbs.**
7. Remove the cap from the strut port.
8. Raise the end of the -16 (1") hose, attached to the volume assembly, above the secondary volume to prevent fluid loss.
9. Remove the plug from the end of the hose.
10. Attach the hose end to the strut port.
11. Torque to **75-83 ft-lbs.**
12. Secure hose with clamps and 5/16" hardware making sure to secure hoses from movement or chafing. Drill attaching Ø3/8" holes as necessary.
13. Repeat with the opposite side.

CAUTION: Make sure the hose is not chafing or in contact with any sharp edges.

14. Route the Left Hand (Driver side) -4 (1/4") hydraulic hose to the Power Module as shown in previous page. Use hose clamps to secure the hose from movement or chafing
15. Attach the PVC tubing to the bleed screw on the -4 hose side of the Left Hand Secondary Volume Assembly and place the other end in a bucket.
16. Open the bleed screw slightly to relieve any residual pressure.
17. After pressure is relieved, close the bleed screw and torque to **13-18 ft-lbs.**

CAUTION: Make sure the hose is not chafing or in contact with any sharp edges.

18. Attach the hose end to the fitting in the port marked "L". Torque to **12 ft-lbs. Do not over tighten.**
19. Repeat with the opposite side.
20. Attach the hose end to the fitting in the port marked "R". Torque to **12 ft-lbs. Do not over tighten.**
21. Clean up any fluid spillage.
22. Check that the parking brake cable does not contact volumes. If contact occurs, it may be necessary to relocate cable by drilling new 9/16" holes. Contact LiquidSpring LLC for assistance.

Steering Sensor Installation

1. Find the encoder wheel situated underneath the dash as shown in Figure 34.

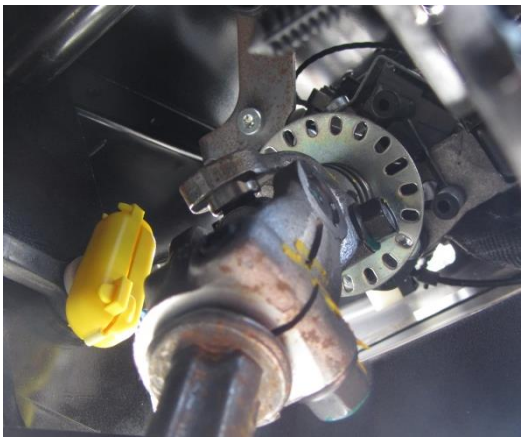


Figure 34. Encoder Wheel Underneath Dash

2. Locate the Steering Sensor and (2) #8 x .50 Pan Head Sheet Metal Screws
3. Install the Sensor as shown in Figure 35.

Note: Spring can be compressed to ease installation.

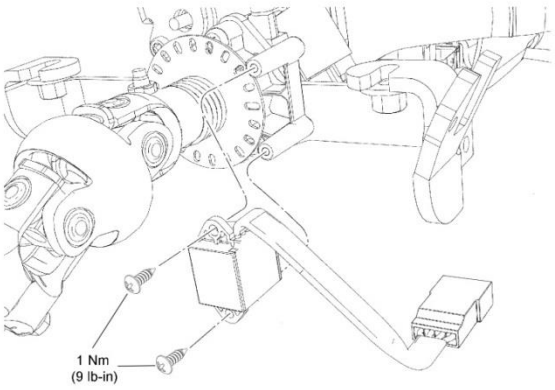


Figure 35. Steering Sensor Installation.

External Electrical Installation:

1. Locate the External Electrical Harness attached to the power module.
2. Unroll the wiring harness and using the External Electrical Harness wiring diagram, found in the Electrical Schematics section, and identify the connection ends.
3. Locate the trunk containing Height Sensor (J21 and J22) and the Rate Valve (J23 and J24) connections.
4. Route the trunk towards the height sensors and rate valves.

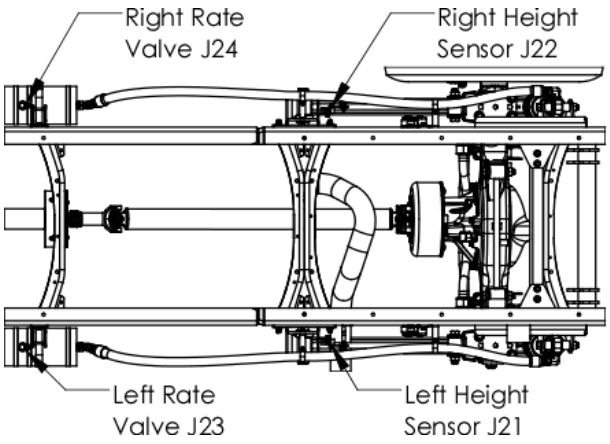


Figure 36. Rate valve and height sensor electrical connections.

5. Connect height sensor and rate valve connections. Note: Connection after routing the harness and prior to installing the height sensor may aid in electrical connection.
6. Secure harness to frame, cross-members, etc. as necessary. Use of the down clips or clamps is recommended
7. Locate the Black 8ga wire ground ring terminal, J30, branch near the power module.
8. Locate and drill Ø1/4" hole in frame. Remove frame coating(s) as needed to ensure metal-to-metal contact between the ring terminal and frame.
9. Attach the ground ring terminal, J30, to the chassis frame for grounding. Sealant should be applied after ring terminal is secured.
10. Route the remaining trunk (containing blunt wires, 8ga battery wire, and steering sensor J35 connection) towards the firewall. Secure harness to frame, cross-members, etc. as necessary. Use of the down clips or clamps is recommended.
11. Route blunt cut wires and J35 wires (steering) through the firewall rubber pass through grommet on the driver side. You may need to create a hole in the grommet.
12. Locate the Red 8ga battery connection branch and route to the battery positive terminal.
13. Locate the Battery Fuse Lead containing the 80 amp fuse and crimp the fuse lead to the 8ga battery connection branch blunt end.
14. Melt the heat shrink on the crimped connection to seal the splice.
15. Remove the 80 amp fuse and retain.
16. Connect to the positive terminal post per OEM Upfitter wiring instructions.

Dash Harness Installation

TABLE 1 *The following wire connections to the vehicle are required.*					
Name	***Harness***	***LS Color-Size***	***OEM Color-Size***	***Input Signal***	***Recommended Location***
Brake	Dash Harness	Pink/Black – 18ga	Lt. Green – 18ga	Brake Switch	Driver Side Near Steering Column 16-Pin Connector – Pin 3
Ignition	Dash Harness	Yellow – 18ga	White/Light Blue – 18ga	Key On	Driver Side Near Steering Column. 16-Pin Connector – Pin 5
Battery	Dash Harness	Red – 18ga	Brown/Pink – 16ga	Constant 12V	Driver Side Near Steering Column 16-Pin Connector – Pin 9
Park	Dash Harness	Yellow/Black – 18ga	Lt. Green/Red – 20ga	Trans. Park Signal	Driver Side Near Steering Column Blunt Cut Wires
Speed	Dash Harness	Violet/White – 18ga	White/Orange – 20ga	VSS	Driver Side Near Steering Column Blunt Cut Wires

1. Locate the dash harness.

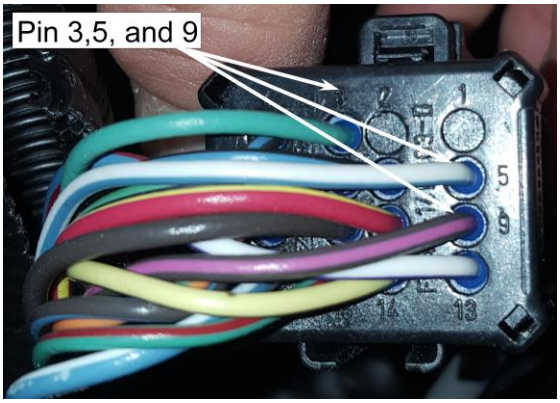
2. Locate and identify the following 18ga wires in the two external wiring harness branches passed through the firewall:
   Red (Battery Power)
   Yellow (Ignition)
   Black (Ground)
   White (CAN High)
   White/Black (CAN Low)
   Yellow/Black (Park)
   Violet/White (Speed)
   Pink/Black (Brake)
   Orange/Blk (Str-)
   Gray (Str S)
   Brown/Wht (Str +)

3. Crimp each wire to the corresponding blunt wire in the dash harness. Match wire colors, crimp using butt splices, and install heat shrink.

4. Locate the five (5) wires in the LS Dash Harness labeled “Chassis Connections”.

5. Make the following connections outlined in Table 1: Crimp each wire using butt splices. Heat shrink sealing is recommended.

6. Find the 16-pin connector. Splice into pin 3 (Brake), 5 (Ignition), and 9 (Battery) with corresponding LS wires from Table 1.



7. Find the blunt cut wires and splice into Yellow/Orange (Speed) and Lt. Green/Red (Park) with corresponding LS wires from Table 1.

8. Attach the Ground ring terminal (J32) from the dash harness to a ground post.

9. Connect the 6-pin connector (J11 on Dash Harness) to the steering sensor.

10. Secure Dash Harness to prevent wires from getting entangled in drivers feet.

Driver Interface Installation:

1. Locate the Driver Interface.

2. Mount the Driver Interface to the dash in an appropriate location.

3. Route the Driver Interface harness to the dash harness connector, J26, and connect.

4. Secure all wires under the dash.

5. Replace the 80 amp fuse at the battery.

Optional Door Electrical Harness Installation:

The optional door harness can be used to remotely activate the system “kneeling” feature in which the suspension automatically lowers to a point slightly less than maximum jounce travel. The door harness can be utilized in two actuation methods.

IMPORTANT: Do not connect positive (12VDC) signal to either the W98 Tan/Blk or W93 Brown wires. Applying positive (12VDC) to either of these wires can result in ECU failure.

A. Single Wire - Ground Signal From Source

Ground is provided to the door harness Brown (W93) wire from a grounding source (e.g. multiplex signal, switch, etc.). If a remote switch is used, it is recommended to use a normally closed (NC) door switch which remains open when the door is closed (or closed when the door is opened). One side of the switch must be connected to a ground source and the other side

routed to the door harness. If multiple switches are used, they should be wired in a parallel arrangement with the door harness. Requires single wire routed from source to door harness.

B: Dual Wire – Ground Signal From System

Ground is provided by the suspension system when the Brown (W93) wire is connected to the Tan/Black (W98) wire of the door harness. This arrangement requires a remote switch that is a normally closed (NC) door switch which remains open when the door is closed (or closed when the door is opened). One side of the switch needs to be connected to the door harness Brown (W93) wire and the other side to the door harness Tan/Black (W98) wire. Requires two wires routed from switch to door harness.

1. Door harness wires are located on the main external wiring harness as a branch near the power module.
2. Unwrap the door harness wires.
3. Based on the selected actuation method above, strip the end(s) of the door harness blunt wire(s) and connect the end(s) to the signal source using a heat shrinkable butt-splice. Crimp the connection(s) accordingly and apply heat to the insulator to seal the connection(s).

Initial System Fill

1. Install the wheels and tires. Torque wheel nuts to OEM specifications.
2. Reconnect the negative cable to the vehicle battery.
3. Verify that the front wheels are steered straight ahead.
4. Lower the vehicle to the ground and remove any jack stands from under the vehicle. The suspension should be in the kneeled position.
5. Turn the ignition key to “Run” and ensure that the LiquidSpring driver display LEDs light up and that the red “Warning” LED is not lit. If the red “Warning” LED is lit, proceed to the Trouble Shooting Section.

WARNING: Do not run vehicle in an enclosed building without adequate ventilation or without ducting exhaust fumes outside. Operation of a vehicle inside an enclosed building can lead to serious injury or death.

6. Press and release the Red ON/OFF button on the driver display. All LEDs on the driver display should go out.
7. Press and release the Red ON/OFF button again. The LEDs on the driver display should all flash and then only the four yellow arrow LEDs, one green ride mode indicator LED, and one green ride height indicator LED should remain lit.
8. The green ride height indicator LED should indicate “Low” and begin flashing as the pump/motor starts. If pump/motor does not start, check Trouble Shooting Electrical Section.
9. Monitor the fluid level in the reservoir. If the level drops below 1/4 of the tank, press and release the Red ON/OFF button to shut off the system, refill the reservoir, and turn the system back on by pressing the Red ON/OFF button.

Note: It may take longer than (3) minutes to fill the -16 hoses, and system may fault. If this occurs, turn system off and back on again to start the pump, then proceed to Step 10.

10. If the suspension system does not begin to rise to a preset ride height after an additional (3) minutes, stop the system and check the following first and then repeat this step:
    a. Check for any fluid leaks.
    b. Check that the hoses are properly connected.
    c. Completely depressurize the system. See Depressurizing the System section, under System Operation
11. After the suspension system stops leveling, check the fluid level in the reservoir. If low, fill to the indicated line. Use of a small transfer pump can assist power module filling.
12. Be sure to replace breather cap after filling.

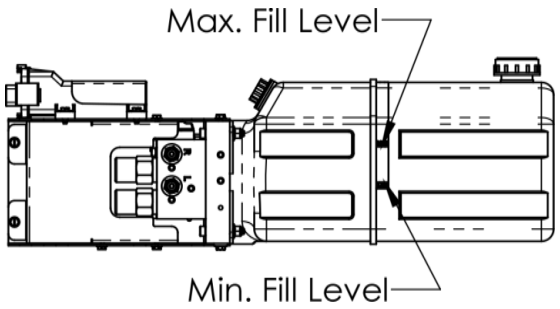


Figure 37. Final fill fluid level.

Bleeding the System

1. Wait 5-10 mins before bleeding the system after initial system fill. This allows the air to separate from the fluid.
2. Locate 3/16” ID PVC Tubing (not included with kit). Note: Alternatively, a bleed kit similar to the Actron 7840 Bleed Kit or Lisle 19200 Brake Bleeding Kit (found at Sears) can be used.

3. Attach the PVC tubing to one of the upper bleed screws on the Left Hand Secondary Volume Assembly and place the other end in a bucket.

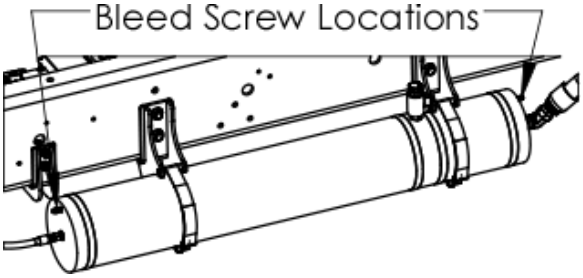


Figure 38. Bleed screw locations.

4. Open the bleed screw slightly.
5. After air bubbles are no longer present, close the bleed screw and torque to **13-18 ft-lbs.**

13. Repeat with remaining three bleed screws.

Calibrating the System

IMPORTANT: Proper calibration of the system must be conducted with the vehicle loaded to the as delivered condition with body installed. For calibration on an empty chassis cab, LiquidSpring recommends weight be added to the frame approximately equal to the planned body to allow for proper bushing deflections.

Note: The LiquidSpring Calibration routine will automatically determine maximum and minimum suspension ride height. Based on those ride heights, the system will determine the correct normal design ride height. The calibration system will also calibrate the steering sensor.

1. Verify that the front wheels are steered straight ahead.
2. Lower the vehicle to the ground and remove any jack stands and any other obstructions from under the vehicle.
3. To begin the calibration, turn the ignition key to "Run" and ensure that the LiquidSpring driver display lights up and that the red "Warning" LED is not lit or flashing.

WARNING: Do not run vehicle in an enclosed building without adequate ventilation or without ducting exhaust fumes outside. Operation of a vehicle inside an enclosed building can lead to serious injury or death.

4. Press and release the Red ON/OFF button on the driver display. All LEDs on the driver display should go out.
5. Press and release the Red ON/OFF button again. The LEDs on the driver display should all flash and then only the four yellow arrow LEDs, one green ride mode indicator LED, and one green ride height indicator LED should remain lit.
6. Press and hold both Ride Height Adjustment Buttons simultaneously until the SPORT, COMFORT, HIGH, and LOW green LED's begin to flash. The suspension system will begin to rise to the full high position, and then lower to the full lowered position.
7. After the system completes the calibration routine, the suspension will return to the original ride height.
8. Turn off the ignition for at least 3 minutes. Note: The suspension system will not use the calibrated ride height settings until power has been cycled.

Note: Pressing the red ON/OFF button on the driver display does not cycle power to the LiquidSpring suspension system, but only will enable/disable the system.

9. Turn the ignition back to Run.
10. Press and release the Red ON/OFF button on the driver display. All LEDs on the driver display should go out.
11. Press and release the Red ON/OFF button again. The LEDs on the driver display should all flash and then only the four yellow arrow LEDs, one green ride mode indicator LED, and one green ride height indicator LED should remain lit.
12. Calibration is now completed.

Post Installation Welding

WARNING: Prior to any chassis welding conducted after the installation of the LiquidSpring suspension system, disconnect cables from battery, disconnect ECU Header connectors (see below), and Power Module ground connection (see below).

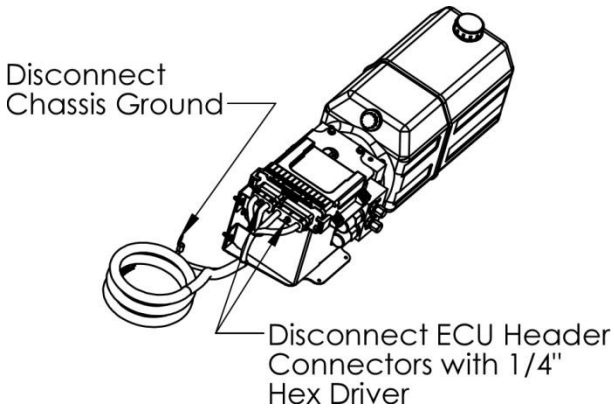
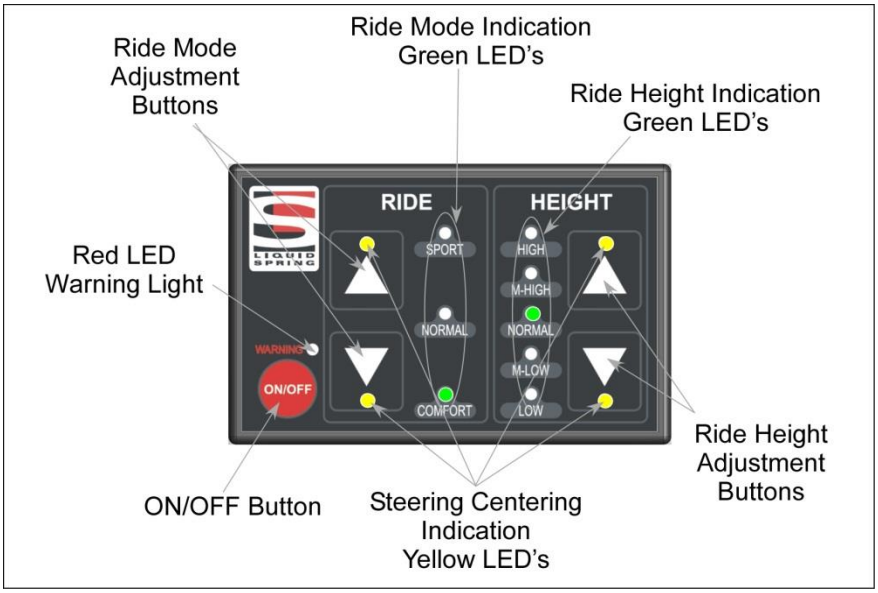


Figure 39. ECU disconnects prior to welding on chassis.

System Operation



System Start Up:

- In most instances, the suspension system can be left alone to operate automatically.
- After startup, all the indicator lights will flash on for 1-2 seconds, and then the Green Ride Height Indication LED and Green Ride Mode Indication LED will light to show the current Ride Mode and Ride Height.
- The four yellow LED's will light up if the steering wheel is approximately 10°-20° each side of straight ahead, but will not light up when steering wheel exceeds 20° from center. If the vehicle is steered straight ahead and the four yellow LED's are not lit (and the red warning LED is not lit) see Calibrating the Steering Sensor Only.
- When the steering wheel is turned more than 20° off center, the four Yellow Steering Centering Indication LED will not be lit.

ON/OFF Button:

Pressing the ON/OFF button will enable/disable the suspension. When the suspension is ON, relevant LED's are lit up. When the suspension is OFF, none of the LED's are lit. It is recommended to leave the suspension ON at all times unless the vehicle or suspension is being serviced.

IMPORTANT: After turning the vehicle ignition off, the suspension system will remain powered for 1 hour before shutting off.

Warning Light:

If the Red LED warning light is continuously illuminated along with one or more of the other indicator lights, please refer to the **Troubleshooting**

Section on page 38.

Ride Mode Adjustment:

Press the UP/DOWN arrow buttons to change the ride mode between SPORT, NORMAL, and COMFORT. The Green indicator light will show the set mode.

- **Comfort Mode** provides a smooth, soft ride. Use for normal city and highway driving.
- **Sport Mode** provides more "feel" or response to the road conditions. Use where road conditions or personal preference demand more control.
- **Normal Mode** is a balance between Comfort and Sport. Use where more control than Comfort is desired, but better ride than Sport.

The setting can be changed at any time. Based on road conditions, steering wheel angle, and the vehicle speed, the system automatically adjusts to provide the best handling while providing a smooth ride. All three settings will feel similar on a smooth road.

Ride Height Adjustment:

Press the UP/DOWN arrow buttons to change ride height from NORMAL to HIGH (body up) or LOW (body down).

- A solid green LED will indicate the selected height. A flashing green LED will indicate the current height and that height adjustment is

occurring. When a single solid green LED is lit, the selected height has been achieved.

- Two solid green LEDs will be lit if the current height is not the selected height and height adjustment is not occurring.
- If LOW or HIGH heights are selected while the vehicle is traveling at less than 10 mph or stopped, the suspension height is either lowered or raised.
- If LOW or HIGH heights are selected while the vehicle is traveling at greater than 10 mph, the suspension will ignore the selected height and remain in NORMAL height unless the vehicle speed goes below 10 mph within 2 minutes of selecting the height. In this instance, the NORMAL height green LED will flash and the selected height green LED will be lit solid until the speed goes below 10 mph within 2 minutes of selecting the height. If the vehicle speed doesn't go below 10mph within the 2 minute period, the suspension will remain in NORMAL height indicated by only the NORMAL height green LED lit solid.
- If LOW height is selected and the ignition is turned off before LOW height is achieved, the system will continue to lower to LOW height. When LOW height is selected the system will monitor and maintain the kneeled position by only lowering as needed for 1 hour after the ignition is turned off.
- If HIGH height is selected and the ignition is turned off before HIGH height is achieved, the system will stop adjusting ride height. When HIGH height is selected the system will monitor and maintain the current position by only lowering as needed for 1 hour after the ignition is turned off.
- The door switch function (if equipped) is disabled when the driver display LOW or HIGH height is selected before the door is opened on vehicles equipped with a door switch for kneeling.

IMPORTANT: While parked for an extended time with the vehicle and/or suspension system turned off, suspension ride will change with temperature change. Increases in ambient temperature or parking in direct sunlight can cause the suspension ride height to increase. As temperature lowers, the suspension ride height can decrease.

Depressurizing the System

1. Turn the ignition key to "Run" and ensure that the LiquidSpring driver display LEDs light up and that the red "Warning" LED is not lit. If the red "Warning" LED is lit, proceed to the Trouble Shooting Section.

WARNING: Do not run vehicle in an enclosed building without adequate ventilation or without ducting exhaust fumes outside. Operation of a vehicle inside an enclosed building can lead to serious injury or death.

1. Press and release the Red ON/OFF button on the driver display. All LEDs on the driver display should go out.
2. Press and release the Red ON/OFF button again. The LEDs on the driver display should all flash and then only the four yellow arrow LEDs, one green ride mode indicator LED, and one green ride height indicator LED should remain lit.
3. Press and release the HEIGHT DOWN arrow button to lower the vehicle to the LOW height.
4. Press and hold the HEIGHT DOWN arrow button for approximately 2 minutes.
5. Release the HEIGHT DOWN arrow button.
6. Press and release the ON/OFF button to disable the system.
7. Turn off the vehicle ignition.

If any of the hydraulic connected components is to be removed and serviced, it is recommended to also follow the following steps:

8. Locate 3/16" ID PVC Tubing. Note: Alternatively, a bleed kit similar to the Actron 7840 Bleed Kit can be used.
9. Attach the PVC tubing to one of the upper bleed screws on the Left Hand Secondary Volume Assembly and place the other end in a bucket.

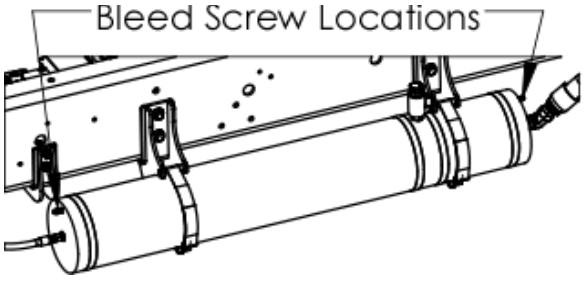


Figure 40. Bleed screw locations.

10. Open the bleed screw slightly to relieve any residual pressure.

11. After pressure is relieved, close the bleed screw and torque to 13-18 ft-lbs.

Notes:

- Jacking up the chassis of a lowered, depressurized chassis will cause a slight vacuum in the system and minimize fluid loss while disconnecting hoses.
- For service of non-hydraulic connected suspension components, the suspension system can be first raised to the HIGH height, appropriate jack stands placed under the chassis, then depressurized as listed above lowering the chassis onto the jack stands.

Calibrating the Steering Sensor Only

Note: The yellow lights only light up when the steering sensor indicates the center location. They will not be lit outside of 10°-20° off center.

IMPORTANT: The LiquidSpring CLASS® system includes an automatic self-centering routine. In conditions such as driving on highway with significant side wind, the yellow lights may temporarily not be lit when the steering wheel is exactly centered. Rotate slowly from center to full steering stop, then repeat the opposite direction. If the yellow lights momentarily light up during the travel in one or the other direction, the system is operating normally and the steering sensor does not need to be manually re-centered. Continue operating normally.

If the yellow lights do not light up at all during turning the steering wheel, following the instructions below.

1. Verify that the front wheels are steered straight ahead.
2. To begin the calibration, turn the ignition key to "Run" and ensure that the LiquidSpring driver display lights up and that the red "Warning" LED is not lit or flashing.

WARNING: Do not run vehicle in an enclosed building without adequate ventilation or without ducting exhaust fumes outside. Operation of a vehicle inside an enclosed building can lead to serious injury or death.

3. Press and release the Red ON/OFF button on the driver display. All LEDs on the driver display should go out.
4. Press and release the Red ON/OFF button again. The LEDs on the driver display should all flash and then only the four yellow arrow LEDs, one green ride mode indicator LED, and one green ride height indicator LED should remain lit.
5. Press and hold both Ride Height Adjustment Buttons simultaneously until the SPORT, COMFORT, HIGH, and LOW green LED's begin to flash.
6. As soon as the four green LED's begin to flash, press the ON/OFF button to stop the process.
7. Verify that the four yellow arrow LED's are lit.
8. Steering calibration is completed.

Calibrating the System (Full)

See Section *Calibrating the System*, on page 33

Checking Fluid Level

1. Turn the ignition key to "Run" and ensure that the LiquidSpring driver display LEDs light up and that the red "Warning" LED is not lit. If the red "Warning" LED is lit, proceed to the Trouble Shooting Section.

WARNING: Do not run vehicle in an enclosed building without adequate ventilation or without ducting exhaust fumes outside. Operation of a vehicle inside an enclosed building can lead to serious injury or death.

2. Press and release the Red ON/OFF button on the driver display. All LEDs on the driver display should go out.
3. Press and release the Red ON/OFF button again. The LEDs on the driver display should all flash and then only the four yellow arrow LEDs, one green ride mode indicator LED, and one green ride height indicator LED should remain lit.
4. After the suspension system stops leveling, check the fluid level in the reservoir. If low, fill to the indicated line.

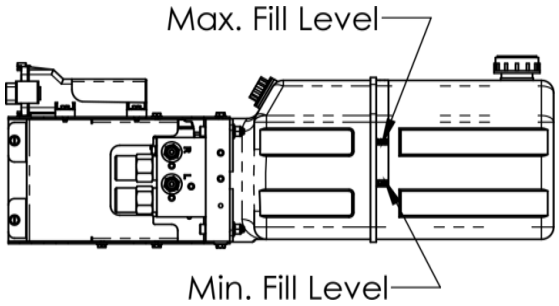


Figure 41. Final fill fluid level.

5. To add fluid, remove filler/breather cap on reservoir.
6. Locate a container of Compressible Fluid.
7. Add fluid to the reservoir until the fluid level is within the band shown in Figure 41.
8. Replace filler/breather cap and retighten.

Checking Fittings for Leaks

WARNING: The system operates under high fluid pressure (up to 3500 psi). Do not attempt to locate leaks by feeling with hands or any part of the body. High pressure fluids can penetrate the skin and cause severe tissue damage.

1. While system is at ride height and pressurized, visually examine fittings and hose connections for any source of leaks. Do not use hands to search for leak. If the source of the leak is a fitting or other component, depressurize the system and repair or replace as needed.
2. Tighten hose nuts if the leak is coming from the connection between the hose nut and a fitting. Depressurize the system before tightening anything. Replace hose if the leak is coming from anywhere else on the hose.

WARNING: Never tighten a hydraulic fitting or hose under pressure. Always depressurize the system before adjusting fittings and hoses.

3. Clean all fluid from hose and fittings to visually identify any leaks.

IMPORTANT: Over-tightening hoses and fittings can damage components and lead to leaks.

Service Intervals

Once Daily or Before Each Shift of Usage

- Check the suspension system to be sure it is fully operational.
    - After starting vehicle, verify all LED's on the driver display flash briefly, then the Green Ride Height and Ride Mode LED's are lit and the Red Warning LED does not stay on or flash.
    - Verify the four Yellow LED's are lit when the steering wheel is centered.
    - Verify that they system is at NORMAL ride height, with a steady green LED.
        - If the Driver Display indicates a blinking ride height LED, allow the system to complete leveling as indicated by a steady green LED.
        - If LOW or HIGH height is shown with a solid green LED, use the arrow buttons to raise or lower the suspension to NORMAL height.
- Visually inspect struts, hoses, and fittings for signs of leakage.
    - For leakage resulting in fluid pooled on the floor greater than 1" in diameter, it is recommended to service the system immediately.
    - For signs of leakage or weeping that results in wetness on components or a single drop, it is recommended to monitor the leak and schedule repair service accordingly.

Initial 1,000 mile (1,600 km) Inspection

- Inspect bolts and nuts at the control arm pivots to assure they are properly torqued.
- Inspect u-bolts to assure they are properly torqued.
- Thoroughly inspect all hydraulic connections for signs of leakage.
- Inspect reservoir fluid level.

Routine Maintenance 25,000 miles (40,000 km) or 6 month maximum Interval

- Check all suspension components for any signs of damaged/broken components, looseness, or wear.
- Inspect bolts and nuts at the control arm pivots to assure they are properly torqued.
- Inspect bolts and nuts at both the frame and axle mount ends of the track rod to assure they are properly torqued.
- Inspect u-bolts to assure they are properly torqued.
- Thoroughly inspect all hydraulic connections for signs of leakage.
- Inspect reservoir fluid level.

Troubleshooting

The LiquidSpring CLASS® system includes on-board diagnostics to assist in pin-pointing potential issues. When a fault in the system occurs, the red warning light on the Drivers Interface will light along with one or more of the other lights on the interface.

Driver Interface Lights	Condition	Cause	Correction
Warning + RIDE: SPORT	Battery Voltage in excess of 16VDC	Vehicle charging system providing incorrect voltage.	Inspect and replace as necessary.
		LiquidSpring system not connected to 12VDC electrical system	Inspect and replace as necessary
Warning + RIDE: NORMAL	Pump Motor runs in excess of 3 minutes	See *Issues with Vehicle Raising/Pump Section*	See *Issues with Vehicle Raising/Pump Section*
Warning + RIDE: COMFORT	Battery Voltage below 9 VDC	Vehicle charging system providing incorrect voltage	Inspect and replace as necessary
		80A fuse blown / Loss of battery voltage On circuit W25	Inspect / Repair Replace as necessary
Warning + HEIGHT: HIGH	Issue with Right Hand Height Sensor	See *Issues with Height Sensors Section*	See *Issues with Height Sensors Section*
Warning + HEIGHT: NORMAL	System kneels in excess of 3 minutes without suspension movement	See *Issues with Vehicle Lowering/Dump Valve Section*	See *Issues with Vehicle Lowering/Dump Valve Section*
Warning + HEIGHT: LOW	Issue with Left Hand Height Sensor	See *Issues with Height Sensors Section*	See *Issues with Height Sensors Section*
Slow or Fast Blinking Warning Light	Driver Interface can not communicate with ECU.	See *Issues with Driver Interface*	See *Issues with Driver Interface*

Issues with Vehicle Raising/Pump

Condition	Cause	Correction
Vehicle Leveled, Pump continues to run	Pump motor shorted out.	Contact LiquidSpring for further instructions.
	Software issue	Turn off ignition, wait 30 seconds, restart vehicle.
	Excessive noise in height sensor	See *Issues with Height Sensors*
Vehicle Not Leveled (or Raised), Pump runs	Reservoir fluid level low	Fill reservoir to specified level.
	Hydraulic leak in system	Check for fluid leaks and repair or replace.
	Vehicle overloaded	Check vehicle loading and correct.
	Air in pump	Check fluid level in reservoir and fill accordingly. Fully depressurize system and restart leveling.
	Internal leak in power module	Replace power module.
	Height sensor error	See *Issues with Height Sensors*
Vehicle Not Leveled (or Raised), Pump does not run	System not turned on.	Turn system on.
	Blown fuse	Check system fuses
	Loss of electrical power	Check wiring between power module and battery.
Pump runs for short time then stops	Motor controller over temperature	Contact LiquidSpring for further instructions.
Pump runs intermittently	Loose connector or wiring	Check wiring harness connections and battery connections. Repair as necessary.

Issues with Vehicle Lowering/Dump Valve

Condition	Cause	Correction
Vehicle does not lower (kneel).	System not turned on	Turn system on
	Blown fuse	Check system fuses and replace as necessary
	Obstacle under vehicle frame	Remove obstacle
	Wiring harness disconnected	Check wiring harness connections and reconnect
	Loss of electrical power	Check wiring between power module and battery
	Power module filters plugged	Contact LiquidSpring for further instructions
	Internal power module blockage	Contact LiquidSpring for further instructions
Vehicle slow lowering (kneeling)	Partial internal power module blockage	Contact LiquidSpring for further instructions

Issues with One Corner Not Leveling Properly

Condition	Cause	Correction
One side will not raise or lower	Internal power module blockage	Contact LiquidSpring for further instructions
	Low voltage	Check battery voltage.
	Wiring harness disconnected	Check wiring harness connections and reconnect
	Obstacle under vehicle frame	Remove obstacle
	Power module filters plugged	Contact LiquidSpring for further instructions
	Height sensor error	See *Issues with Height Sensors*
One corner raises and lowers slower than other corners	Internal power module blockage	Contact LiquidSpring for further instructions
	Filter partially clogged	Contact LiquidSpring for further instructions

Issues with Height Sensors

Condition	Cause	Correction
Vehicle or corner stops leveling at incorrect height	Damaged height sensor and/or linkage	Inspect height sensor components. Replace as necessary.
	Incorrect calibration	Recalibrate vehicle – see System Operation section.
	Incorrect height sensor installation	Inspect height sensor components and correct.
Corner height where leveling stops is inconsistent	Sensor or Linkage loose	Inspect installation of height sensor and linkages and tighten if necessary
	Loose connector / wire	Inspect wiring between sensor and power module for loose connection
Vehicle will not level - no height sensor signal	Height Sensor wiring shorted, broken, or disconnected	Inspect wiring between sensor and power module.
	Malfunction in Sensor	Replace sensor.
No Height Sensor Signal change while driving	Linkage broken/disconnected	Inspect installation of height sensor and linkages. Correct and/or replace.

Issues with Ride/Handling

Condition	Cause	Correction
Vehicle rolls side to side excessively	System inactive (Drivers interface dark)	Turn system on (press On/Off button)
	No electrical power to system	Inspect and replace as necessary
	Strut bushings worn	Inspect and replace as necessary
	Control arm bushings worn	Inspect and replace as necessary
	Sway bar bushings worn	Inspect and replace as necessary
	Strut mounting loose	Inspect and replace as necessary
	Rate Valve wiring shorted, broken, or disconnected	Inspect wiring and correct/replace as necessary.
	Voltage to Rate Valve solenoid too low	Check battery voltage.
	Rate Valve Poppet Jammed open	Contact LiquidSpring for further instructions
	No vehicle speed signal	See Issues with Vehicle Speed Signal section.
Excessive stiffness when on flat, straight road	Short to Rate Valve	Check wiring between rate valve (on secondary volume) and power module for signs of shorts. Replace as necessary.
	Wiring to Rate Valve incorrect	Inspect wiring and correct as necessary

Issues with Steering Sensor

Condition	Cause	Correction
No steering signal (reduced roll control when cornering)	Steering sensor wiring broke or incorrect.	Inspect wiring to steering sensor and correct as necessary.
	Steering sensor malfunction	Replace sensor
	Steering sensor not installed correctly	Inspect installation and correct as necessary
Yellow lights on driver display not lit when steered straight ahead.	Zero point of steering sensor incorrect.	See *Calibrating the Steering Sensor Only.*
Intermittent steering sensor signal	Loose connector / wire	Check wiring between Steering sensor and Power module for loose connection.

Issues with Vehicle Speed Signal

Condition	Cause	Correction
System leveling excessively while driving.	Speed Sensor wiring shorted, broken, or disconnected	Inspect wiring and repair/replace as necessary
	Speed signal malfunction	Replace OEM speed sensor. See OEM service manual.
Intermittent speed sensor signal	Loose connector / wire	Check wiring between Speed sensor and Power module for loose connection.

Issues with Vehicle Brake Signal

Condition	Cause	Correction
Vehicle will not level	Brake signal wire not correctly tapped.	Inspect wiring and repair/replace as necessary.
	Brake switch malfunction	Replace OEM speed sensor. See OEM service manual.
Intermittent leveling	Loose connector / wire	Inspect wiring and repair/replace as necessary.

Issues with Door Switch

Condition	Cause	Correction
Vehicle will not kneel when rear door opened	Short or break in wiring between door switch and power module.	Inspect wiring and repair/replace as necessary.
	Door switch malfunction	Inspect door switch and repair/replace as necessary
Vehicle kneels whenever speed below 5mph	Short or break in wiring between door switch and power module.	Inspect wiring and repair/replace as necessary.
	Door Switch out of adjustment	Check installation of door switch and adjust as necessary
	Door switch malfunction	Inspect and replace per body builder instructions.
Intermittent door switch signal	Loose connector / wire	Inspect wiring and repair/replace as necessary.

Issues with Vehicle Ignition Signal

Condition	Cause	Correction
System does not turn on (no leveling or stiffness control)	No ignition signal to controller or driver interface	Inspect wiring and repair/replace as necessary.
	Ignition "sensor" malfunction	Inspect and replace per OEM service manual.
System does not turn off once ignition switched off	Signal side short to battery	Inspect wiring and repair/replace as necessary.
	Ignition "sensor" malfunction	Inspect and replace per OEM service manual.
System intermittently works	Loose connector / wire	Inspect wiring and repair/replace as necessary.

Issues with Vehicle Park Signal

Condition	Cause	Correction
System will start up but won't level when parked	No park signal to controller	Inspect wiring and repair/replace as necessary.
	Park sensor malfunction	Inspect and replace per OEM service manual.
System levels when stopped and not in park	Park signal always on	Inspect wiring and repair/replace as necessary.
	Park sensor malfunction	Inspect and replace per OEM service manual.
Intermittent leveling when stopped in or out of park	Loose connector / wire	Inspect wiring and repair/replace as necessary.

Issues with Driver Interface

Condition	Cause	Correction
Warning light blinks, system appears to level.	CAN wires crossed or not connected.	Inspect wiring and repair/replace as necessary.
	Malfunctioning Driver Interface	Inspect and replace as necessary.
Warning light blinks, system does not appear to operate (level)	No power to ECU (5A 18ga Red Wire)	Inspect wiring and repair/replace as necessary.
	No ignition signal to ECU (Yellow Wire)	Inspect wiring and repair/replace as necessary.
	CAN wires crossed or not connected.	Inspect wiring and repair/replace as necessary.

Issues with Power Module

Condition	Cause	Correction
Pump exhibits high pitch whine immediately after pump stops or when vehicle lowering	The Check Valve is stuck open	Replace Power Module
Pump running under heavy load and leveling slow	The Check Valve is only partially open	Replace Power Module
Pump running under heavy load and no leveling	The Check valve is stuck closed	Replace Power Module
Hydraulic fluid leaking from Power Module	O-ring failure	Replace O-ring
	Manifold cracked	Replace Power Module
	Fitting loose	Tighten fittings
	Valve loose	Tighten valves to correct torque
	Bolts between manifolds loose/broken	Replace and /or tighten bolts to correct torque
	Hydraulic line loose	Tighten hydraulic line correctly
	Bolts between reservoir and manifold loose/broken	Replace and/or tighten bolts to required torque
	Broken / cracked reservoir	Replace reservoir

Issues with Strut Assembly

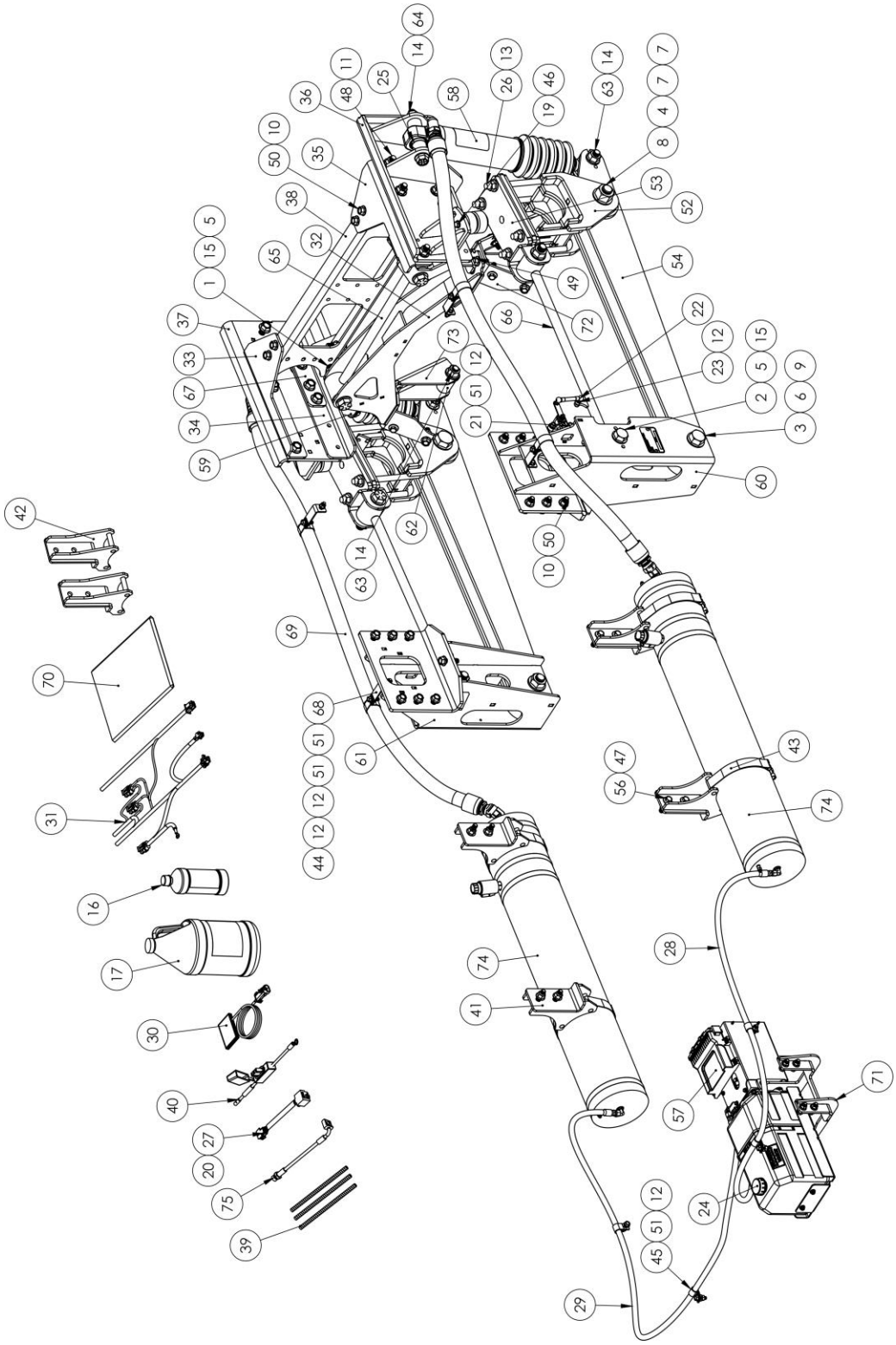
Condition	Cause	Correction
Hydraulic Leak	Weld failure between cylinder and end	Replace strut
	Cylinder fracture	Replace strut
	Threads stripped between cylinder and gland	Replace strut
	Seals worn out	Replace strut
	Rod severely scratched or dented	Replace strut
	Fitting loose	Tighten or replace fittings
	Hose failure	Replace failed hose
	Hose cut	Replace failed hose
Rod broken at bushing housing	Weld failure	Replace strut
Rod doesn't move freely in/out cylinder	Piston jammed in cylinder	Replace strut
Rod moves very easily in/out cylinder	Piston broken therefore no damping	Replace strut
Reduced damping level	Damping components broken/worn out	Replace strut
Strut upper mount not securely attached to frame or Strut	Bolts attaching bracket to frame broken / came out	Replace bolts and tighten to required torque
	Bolt attaching strut to bracket broke / came out	Replace bolts and tighten to required torque
	Weld Failure	Replace strut upper mount
	Structural failure	Replace strut upper mount
Strut lower mount not securely attached to axle or strut	Bolts attaching bracket to axle broken / came out	Replace bolts and tighten to required torque
	Bolt attaching strut to bracket broke / came out	Replace bolts and tighten to required torque
	Weld Failure	Replace strut lower mount
	Structural failure	Replace strut lower mount

Issues with Secondary Volume Assembly

Condition	Cause	Correction
Hydraulic Leak	Weld failure between tube and end	Replace secondary volume welded assembly
	Weld failure between tube and manifold	Replace secondary volume welded assembly
	Cylinder fracture	Replace secondary volume welded assembly
	Bleed screw loose	Tighten bleed screws to appropriate torque
	Fitting loose	Tighten all fittings
	Hose failure	Replace failed hose
	Hose cut	Replace failed hose
loose or no longer attached	Bolts attaching bracket to frame broken / came out	Replace bolts and tighten to required torque
	Bolt attaching volumes to bracket broke / came out	Replace bolts and tighten to required torque
	Weld Failure	Replace brackets
	Structural failure	Replace brackets

Appendix A: Part Identification:

DS120F53



DS120F53 BOM

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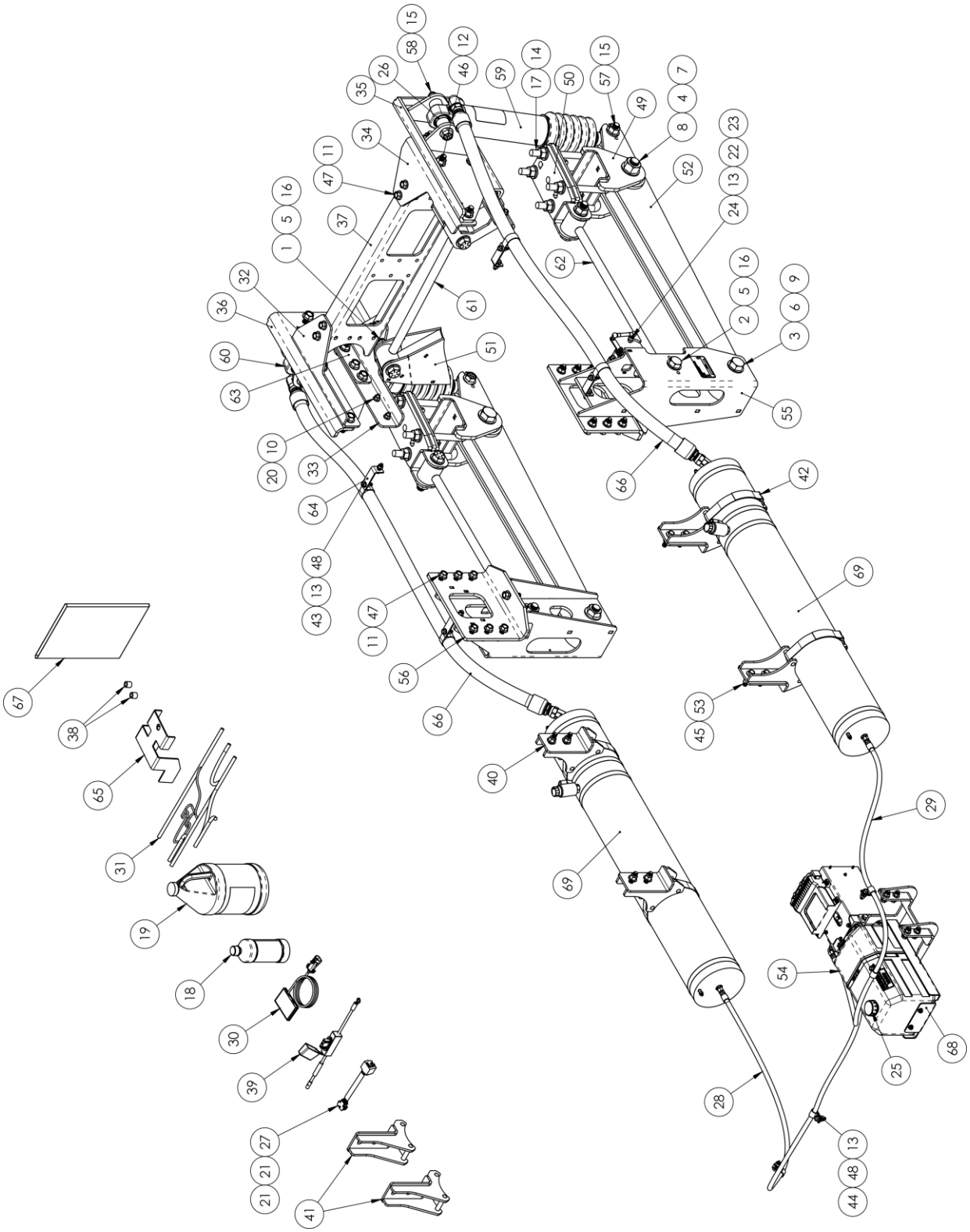
ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	4	10002-500	HCS 7/8-9 x 5" Gr 8	39	3	10804-002	Spiral Cable Wrap
2	2	10002-600	HCS 7/8-9 x 6" Gr. 8	40	1	10815-001	Fused Battery Lead
3	2	10003-003	HB 1.000-8 x 6.00", Gr. 8	41	4	10830-022	Volume Mount
4	2	10004-014	LHN 1.125-7 Gr. C, Zinc	42	2	10830-026	Volume Mount
5	6	10006-003	HFW .875	43	4	10843-004	T-Bolt Clamp
6	2	10006-004	HFW 1.000	44	4	10855-001	Loop Clamp, 1.5”ID
7	4	10006-005	HFW 1.125	45	4	10855-003	Loop Clamp, 5/8”ID
8	2	10008-003	HCS 1.125-7x6.50	46	2	10867-003	Jounce Bumper
9	2	10012-003	LFN 1-8, Gr G	47	8	10873-004	LFN M12-1.75
10	24	10012-007	LFN 1/2-13, Gr. G	48	16	10874-200	HFB 5/8-11x2.00
11	16	10012-008	LFN 5/8-11 Gr G	49	4	10885-125	HFB 1/2-13x1.25
12	18	10012-010	LFN 5/16-18, Gr. G	50	24	10885-175	HFB 1/2-13x1.75
13	8	10012-013	LFN 5/8-18, Gr. G	51	16	10886-100	HFB 5/16-18x1.00
14	6	10012-014	LFN 3/4-10 Gr G	52	2	10947-015	Lower Axle Clamp
15	6	10012-017	LFN 7/8-9, Gr. G	53	2	10949-009	Upper Axle Clamp
16	1	10474-001	Compressible Fluid, 16 oz.	54	2	10953-012	LCA
17	1	10474-005	Compressible Fluid, 1 Gal.	55	2	11003-030	HFB M8-1.25 x 30
18	1	10501-150	HFB 3/8-16 x 1.50	56	10	11012-045	HFB M12-1.75 x 45
19	2	10502-001	HFB M10-1.8 x 30 CL 10.9	57	1	11287-011	Power Module, DS120F53
20	2	10510-003	SMS #8-15 x .500	58	1	11057-015	Strut, LH
21	2	10586-001	Height Sensor	59	1	11057-016	Strut, RH
22	2	10587-005	Linkage	60	1	11083-008	Hanger, LH
23	2	10591-003	Ball Stud 5/16-18 x .75L	61	1	11084-016	Hanger, RH
24	1	10614-001	Cap, Filler/Breather	62	2	11100-004	Spacer
25	8	10640-005	Bearing Spacer	63	4	11102-400	HFB 3/4-10x4
26	4	10642-003	U-Bolt 5/8-18 x 9.19 Tri-8	64	2	11102-650	HFB 3/4-10x6.50
27	1	10649-001	Steering Sensor	65	1	11198-003	Track Rod
28	1	10675-013	Hyd. Hose, -4 x 64-5/8” L	66	2	11198-004	UCA
29	1	10675-016	Hyd. Hose, -4 x 88-3/8” L	67	2	11250-003	Backer Plate, Track Rod Mount
30	1	10680-001	Driver Interface	68	4	11263-003	Hose Bracket
31	1	10704-002	Wiring Harness, Dash	69	2	11336-001	Hyd. Hose, -16 x 59-1/8” L
32	1	10762-013	Bridge	70	1	11344	Kit, Documents
33	1	10787-018	Crossmember Mount, Upper	71	1	11380	Kit, Power Module Mounting
34	1	10787-019	Crossmember Mount, Lower	72	1	11448-001	Axle Mount, LH
35	1	10789-018	Track Rod Mount	73	1	11448-002	Axle Mount, RH
36	1	10790-041	USM, LH	74	2	11454-001	Volume
37	1	10790-042	USM, RH	75	1	11456	Kit, Hyd. Brake Hose
38	1	10796-011	Crossmember Channel				

DS150F53



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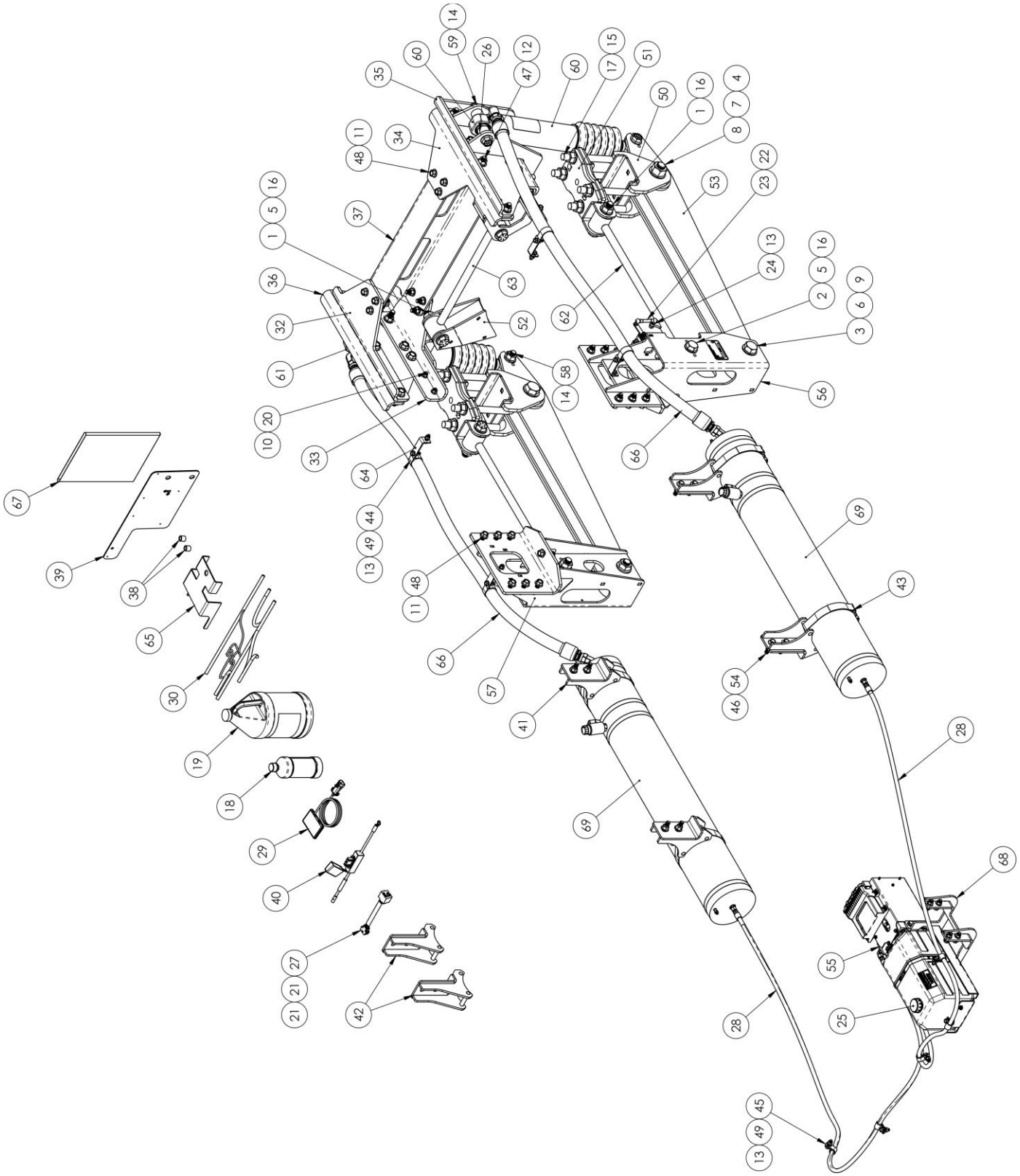
ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	4	10002-500	HCS 7/8-9 x 5" Gr 8	36	1	10790-030	USM, RH
2	2	10002-600	HCS 7/8-9 x 6" Gr. 8	37	1	10796-011	Crossmember Channel
3	2	10003-003	HB 1.000-8 x 6.00", Gr. 8	38	2	10800-004	Tube
4	2	10004-014	LHN 1.125-7 Gr. C, Zinc	39	1	10815-001	Fused Battery Lead
5	6	10006-003	HFW .875	40	4	10830-022	Volume Mount
6	2	10006-004	HFW 1.000	41	2	10830-026	Volume Mount
7	4	10006-005	HFW 1.125	42	4	10843-004	T-Bolt Clamp
8	2	10008-003	HCS 1.125-7x6.50	43	4	10855-001	Loop Clamp, 1.5”ID
9	2	10012-003	LFN 1-8, Gr G	44	4	10855-003	Loop Clamp, 5/8”ID
10	4	10012-005	LFN 3/8-16, Gr G	45	8	10873-004	LFN M12-1.75
11	22	10012-007	LFN 1/2-13, Gr. G	46	16	10874-200	HFB 5/8-11 x 2.00
12	16	10012-008	LFN 5/8-11 Gr G	47	22	10885-175	HFB 1/2-13 x 1.75
13	18	10012-010	LFN 5/16-18, Gr. G	48	16	10886-100	HFB 5/16-18 x 1.00
14	8	10012-012	LFN 3/4-16, Gr. G	49	2	10947-009	Lower Axle Clamp
15	4	10012-014	LFN 3/4-10 Gr G	50	2	10949-005	Upper Axle Clamp
16	6	10012-017	LFN 7/8-9, Gr. G	51	1	10951-008	Track Rod Axle Mount
17	4	10064-004	U-Bolt 3/4-16 x 7.75 Tri-8	52	2	10953-007	LCA
18	1	10474-001	Compressible Fluid, 16 oz.	53	8	11012-045	HFB M12-1.75x45
19	1	10474-005	Compressible Fluid, 1 Gal.	54	1	11287-010	Power Module
20	4	10501-150	HFB 3/8-16 x 1.500, Gr. 8	55	1	11083-005	Hanger, LH
21	2	10510-003	SMS #8-15 x .500	56	1	11084-010	Hanger, RH
22	2	10586-001	Height Sensor	57	2	11102-400	HFB 3/4-10x4
23	2	10587-005	Linkage	58	2	11102-650	HFB 3/4-10x6.50
24	2	10591-003	Ball Stud 5/16-18 x .75L	59	1	11185-009	Strut, LH
25	1	10614-001	Cap, Filler/Breather	60	1	11185-010	Strut, RH
26	8	10640-005	Bearing Spacer	61	1	11198-003	Link, 21.31”
27	1	10649-001	Steering Sensor	62	2	11198-004	UCA
28	1	10675-002	Hyd. Hose, -4 x 64-5/8” L	63	2	11250-003	Backer Plate
29	1	10675-013	Hyd. Hose, -4 x 52-5/8” L	64	4	11263-003	Hose Bracket
30	1	10680-001	Driver Interface	65	1	11319-001	Axle Template
31	1	10704-002	Wiring Harness, Dash	66	2	11336-001	Hyd. Hose, -16 x 59-1/8”
32	1	10787-018	Crossmember Mount, Upper	67	1	11344	Kit, Documents
33	1	10787-019	Crossmember Mount, Lower	68	1	11380	Kit, Power Module Mounting
34	1	10789-018	Track Rod Mount	69	2	11454-002	Volume
35	1	10790-029	USM, LH				

DS175F53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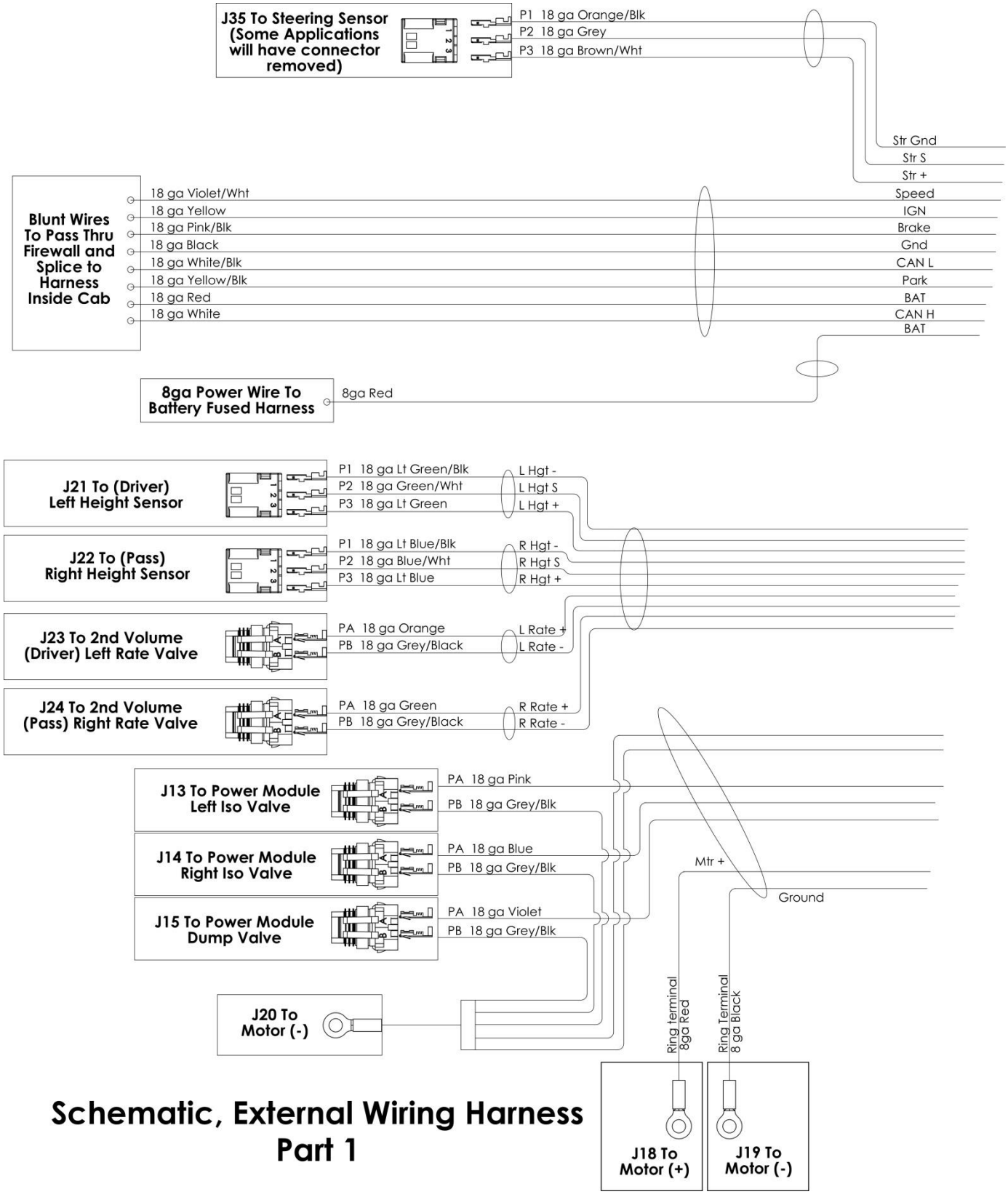
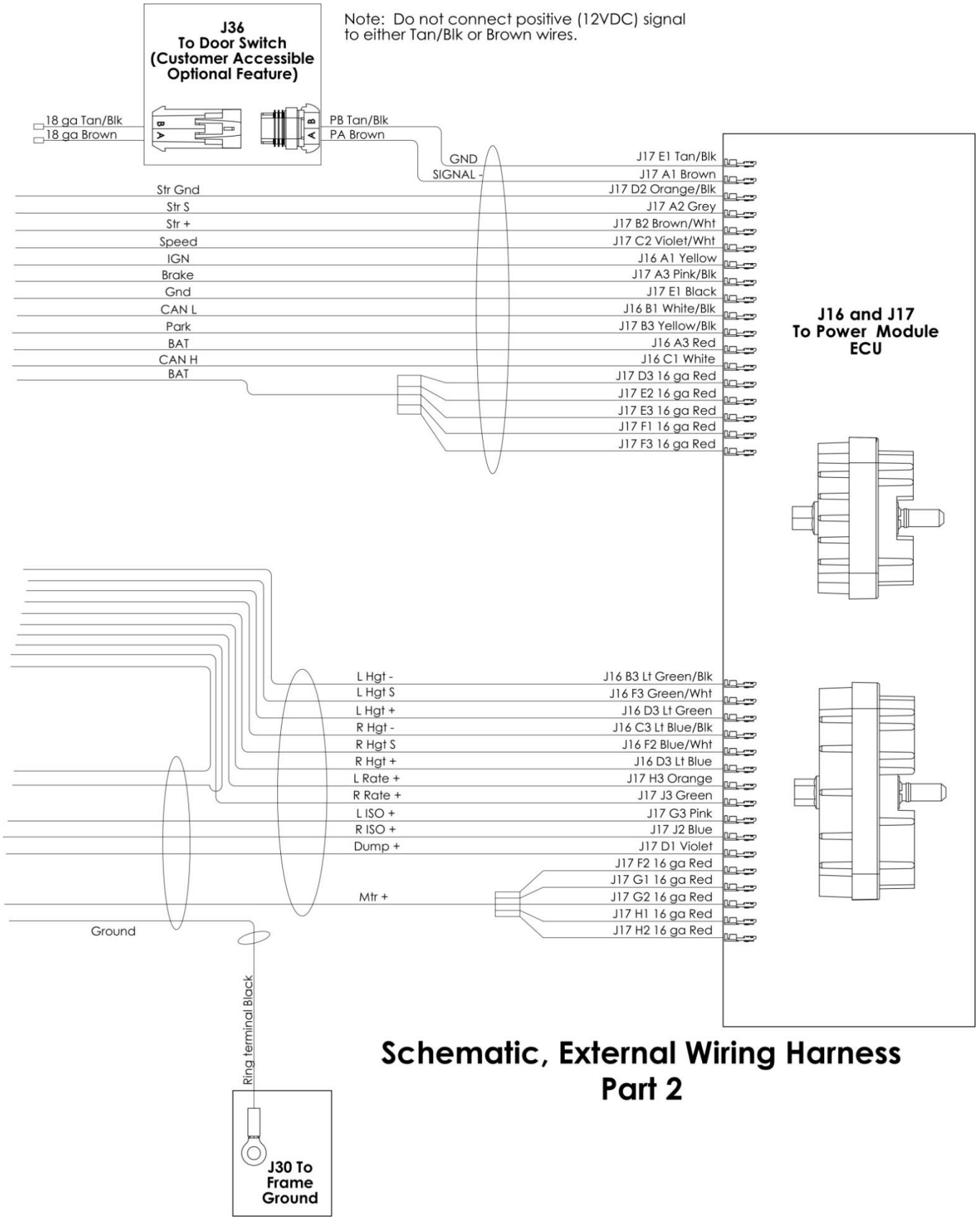
DS175F53							
ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	4	10002-500	HCS 7/8-9 x 5.0" Gr 8	36	1	10790-040	USM, RH
2	2	10002-600	HCS 7/8-9 x 6.0" Gr. 8	37	1	10796-015	Crossmember Channel
3	2	10003-003	HB 1.000-8 x 6.0", Gr. 8	38	2	10800-004	Tube
4	2	10004-014	LHN 1.125-7 Gr. C	39	1	10811-026	Template, Frame Drilling
5	6	10006-003	HFW .875	40	1	10815-001	Fused Battery Lead
6	2	10006-004	HFW 1.000	41	4	10830-022	Volume Mount
7	4	10006-005	HFW 1.125	42	2	10830-026	Volume Mount
8	2	10008-003	HCS 1.125-7 x 6.50”, Gr. 8	43	4	10843-004	T-Bolt Clamp
9	2	10012-003	LFN 1-8, Gr G	44	4	10855-001	Loop Clamp, 1.5”ID
10	4	10012-005	LFN 3/8-16, Gr G	45	5	10855-003	Loop Clamp, 5/8”ID
11	30	10012-007	LFN 1/2-13, Gr. G	46	8	10873-004	LFN M12-1.75
12	18	10012-008	LFN 5/8-11 Gr G	47	18	10874-200	HFB 5/8-11x2.00
13	19	10012-010	LFN 5/16-18, Gr. G	48	30	10885-175	HFB 1/2-13x1.75
14	4	10012-014	LFN 3/4-10 Gr. G	49	17	10886-100	HFB 5/16-18x1.00
15	8	10012-016	LFN 7/8-14 Gr. G	50	2	10947-014	Lower Axle Clamp
16	6	10012-017	LFN 7/8-9, Gr. G	51	2	10949-008	Upper Axle Clamp
17	4	10064-008	U-Bolt 7/8-14 x 8-15/16 Tri-8	52	1	10951-010	Track Rod Axle Mount
18	1	10474-001	Compressible Fluid, 16 oz.	53	2	10953-010	Lower Control Arm
19	1	10474-005	Compressible Fluid, 1 Gal.	54	8	11012-045	HFB M12-1.75x45
20	4	10501-150	HFB 3/8-16 x 1.5”, Gr. 8	55	1	11287-010	Power Module
21	2	10510-003	SMS #8-15 x .50”	56	1	11083-007	Front Hanger, LH
22	2	10586-001	Height Sensor	57	1	11084-014	Front Hanger, RH
23	2	10587-005	Linkage	58	2	11102-400	HFB 3/4-10 x 4”, Gr. 8
24	2	10591-003	Ball Stud 5/16-18 x .75L	59	2	11102-650	HFB 3/4-10 x 6.5”, Gr. 8
25	1	10614-001	Cap, Filler/Breather	60	1	11177-007	Strut, LH
26	8	10640-005	Bearing Spacer	61	1	11177-008	Strut, RH
27	1	10649-001	Steering Sensor	62	2	11198-004	Upper Control Arm
28	2	10675-006	Hyd. Hose, -4 x 97-5/8” L	63	1	11198-005	Track Rod
29	1	10680-001	Driver Interface	64	4	11263-003	Hose Bracket
30	1	10704-002	Wiring Harness, Dash	65	1	11319-002	Axle Template
31	1	10782-006	Crossmember Reinforcement	66	2	11336-001	Hyd. Hose, -16 x 59-1/8” L
32	1	10787-024	Crossmember Mount, Upper	67	1	11344	Kit, Documents
33	1	10787-025	Crossmember Mount, Lower	68	1	11380	Kit, Power Module Mounting
34	1	10789-021	Track Rod Mount	69	2	11454-002	Volume
35	1	10790-039	USM, LH				

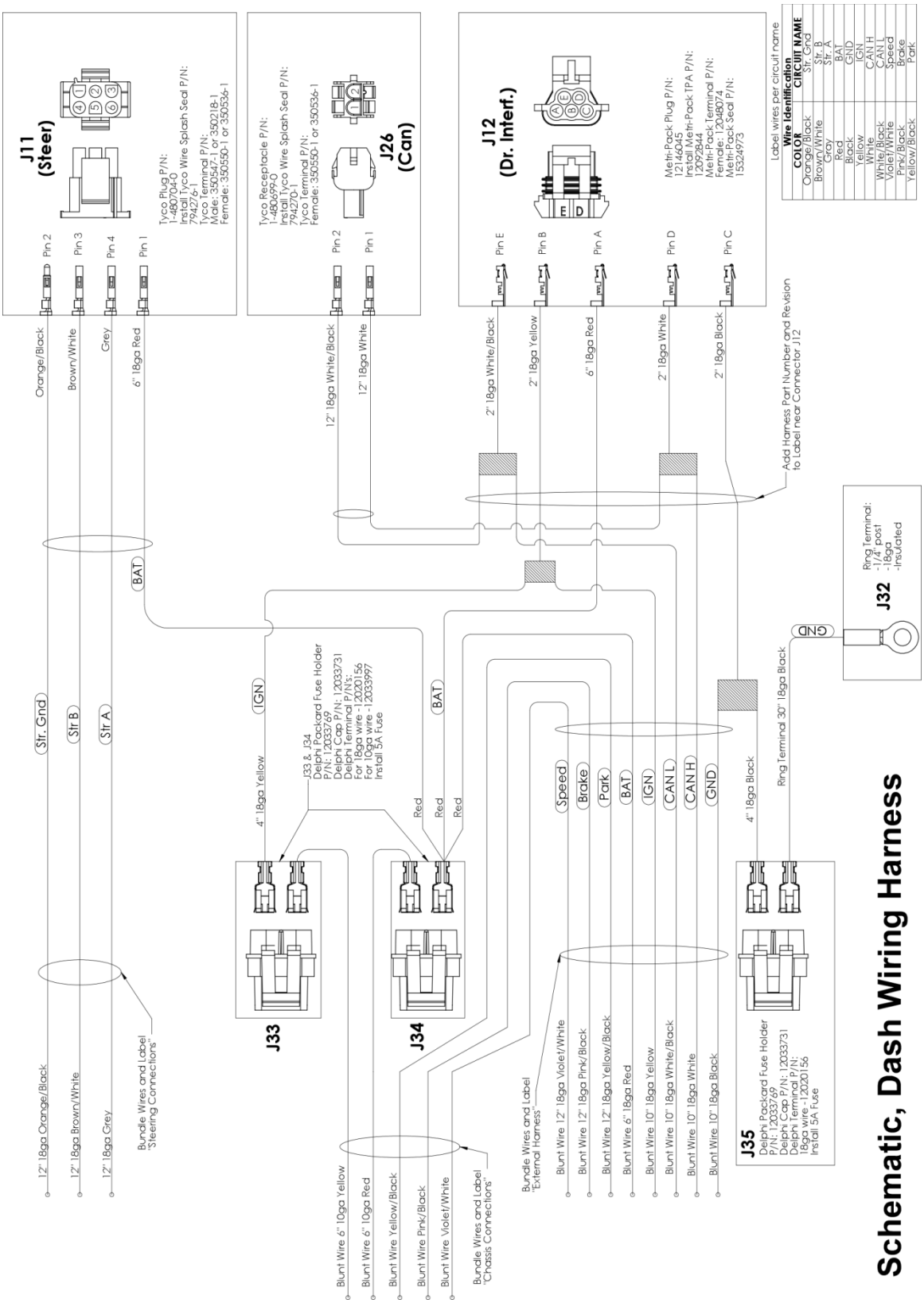
Appendix B: Electrical Schematics



Schematic, External Wiring Harness Part 1



Schematic, External Wiring Harness Part 2


J11
(Steer)
Pin 2
Pin 3
Pin 4
Pin 1
Tyco Plug P/N:
1-480704-0
Install Tyco Wire Splash Seal P/N:
794276-1
Tyco Terminal P/N:
Male: 350547-1 or 350218-1
Female: 350550-1 or 350536-1
J26
(Can)
Tyco Receptacle P/N:
1-480699-0
Install Tyco Wire Splash Seal P/N:
794270-1
Tyco Terminal P/N:
Female: 350550-1 or 350536-1
J12
(Dr. Interf.)
Pin E
Pin B
Pin A
Pin D
Pin C
Metri-Pack Plug P/N:
12146045
Install Metri-Pack TPA P/N:
12092844
Metri-Pack Terminal P/N:
Female: 12040074
Metri-Pack Seal P/N:
15324973
Label wires per circuit name
Wire Identification
COLOR
CIRCUIT NAME
Orange/Black
Str. Gnd
Brown/White
Str. B
Gray
Str. A
Red
BAT
Black
GND
Yellow
IGN
White
CAN H
White/Black
CAN L
Violet/White
Speed
Pink/Black
Brake
Yellow/Black
Park
12" 18ga Orange/Black
12" 18ga Brown/White
12" 18ga Grey
Bundle Wires and Label
"Steering Connections"
6" 18ga Red
12" 18ga White/Black
12" 18ga White
2" 18ga White/Black
2" 18ga Yellow
6" 18ga Red
2" 18ga White
2" 18ga Black
Add Harness Part Number and Revision
to Label near Connector J12
Str. Gnd
Str B
Str A
BAT
IGN
4" 18ga Yellow
J33 & J34
Delphi Packard Fuse Holder
P/N: 12033769
Delphi Cap P/N: 12033731
Delphi Terminal P/N:
For 18ga wire - 12015056
For 10ga wire - 12033997
Install 5A Fuse
Red
Red
Red
BAT
J33
J34
Speed
Brake
Park
BAT
IGN
CAN L
CAN H
GND
4" 18ga Black
Ring Terminal 30" 18ga Black
GND
J32
Ring Terminal:
-1/4" post
-18ga
-Insulated
Blunt Wire 6" 10ga Yellow
Blunt Wire 6" 10ga Red
Blunt Wire Yellow/Black
Blunt Wire Pink/Black
Blunt Wire Violet/White
Bundle Wires and Label
"Chassis Connections"
Bundle Wires and Label
"External Harness"
Blunt Wire 12" 18ga Violet/White
Blunt Wire 12" 18ga Pink/Black
Blunt Wire 12" 18ga Yellow/Black
Blunt Wire 6" 18ga Red
Blunt Wire 10" 18ga Yellow
Blunt Wire 10" 18ga White/Black
Blunt Wire 10" 18ga White
Blunt Wire 10" 18ga Black
J35
Delphi Packard Fuse Holder
P/N: 12033769
Delphi Cap P/N: 12033731
Delphi Terminal P/N:
18ga wire - 12020156
Install 5A Fuse
Schematic, Dash Wiring Harness

Appendix C: Frame Drilling Locations

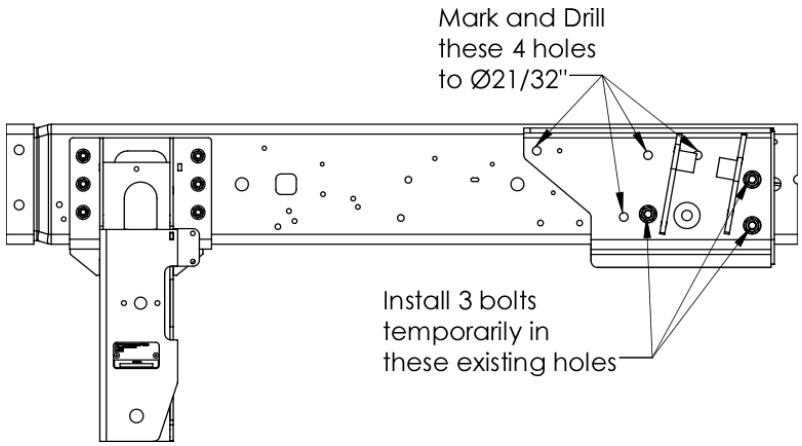


Figure A 1: Driver side template location for upper strut mount frame drilling –DS120F53 & DS150F53

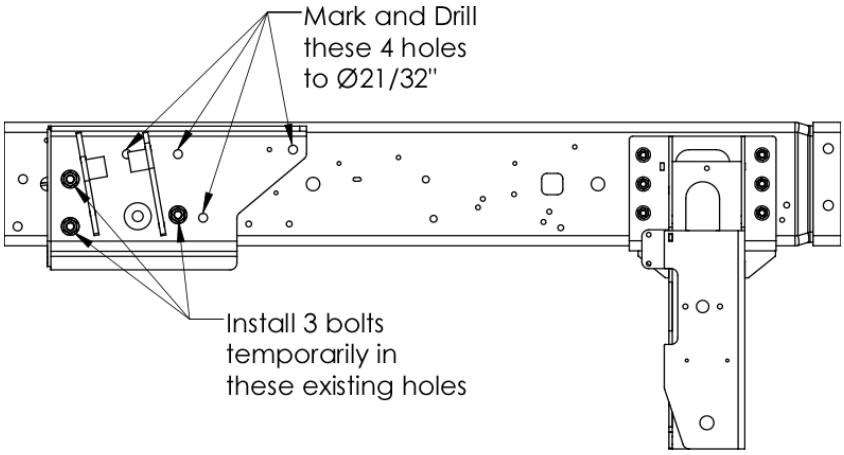


Figure A 2: Passenger side template location for upper strut mount frame drilling – DS120F53 & DS150F53

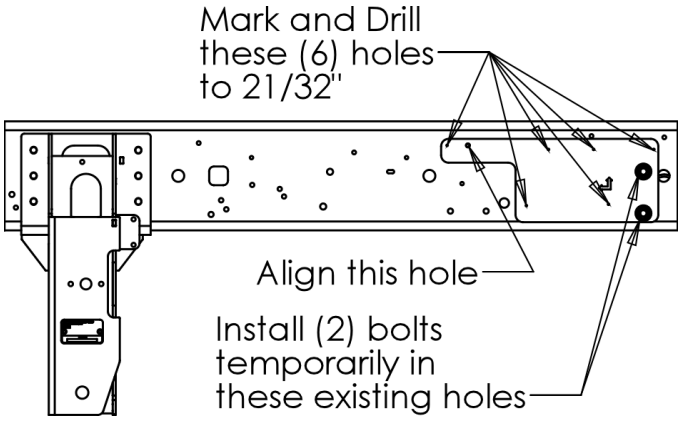


Figure A 3: Driver side template location for upper strut mount frame drilling – DS175F53

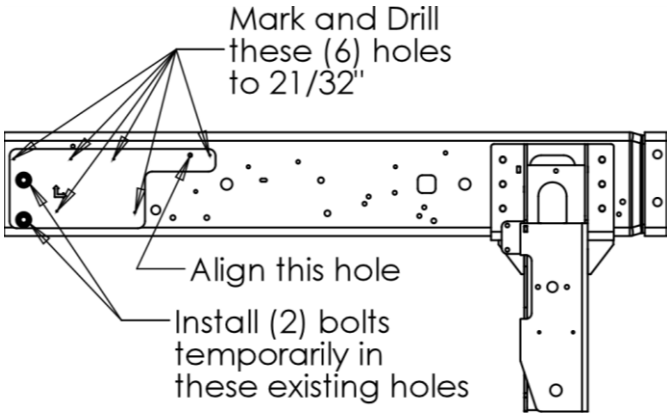


Figure A 4: Passenger side template location for upper strut mount frame drilling – DS175F53

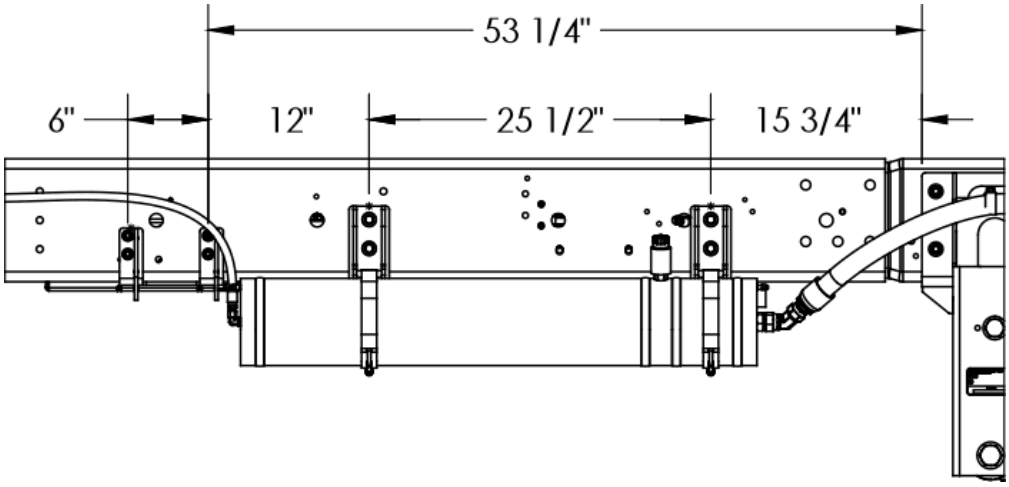


Figure A 5: Recommended Volume and Power Module Mount Locations – 178" WB

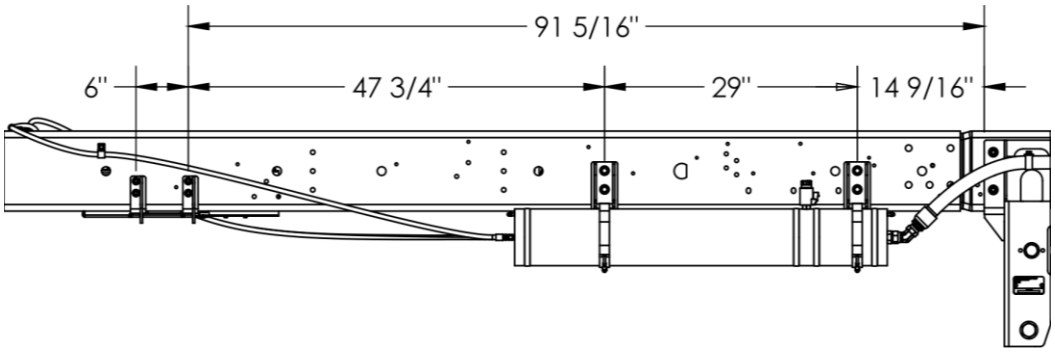


Figure A 6. Recommended Volume and Power Module Mount Locations – 242" WB

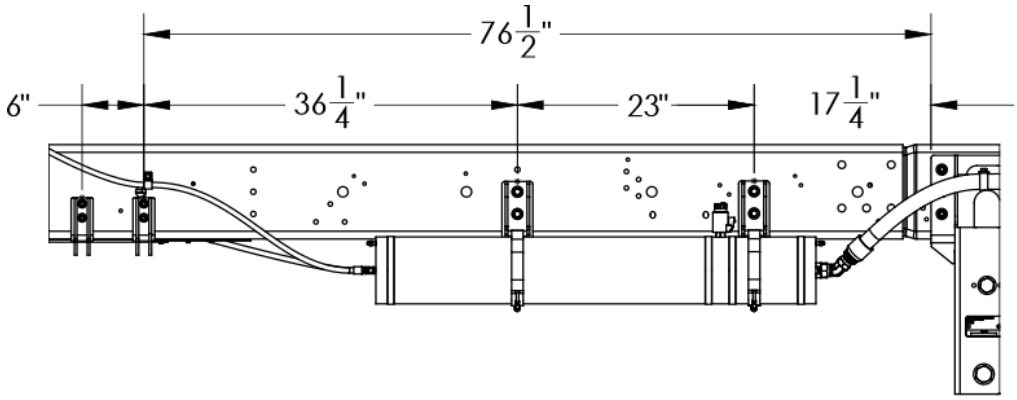


Figure A 7. Recommended Volume and Power Module Mount Locations – 228” WB

LiquidSpring™ LLC
4899 E 400 S
Lafayette, IN 47905

Phone: 765-474-7816
Fax: 765-474-7826
Web: www.liquidspring.com

CLASS® Product Limited Warranty

LIQUIDSPRING™ LLC
4899 E 400 S
LAFAYETTE, IN 47905
PH: 765-474-7816, FAX: 765-474-7826
WWW.LIQUIDSPRING.COM

Warranty Conditions

LiquidSpring LLC warrants that all **CLASS®** products shall be free of defects in material and workmanship provided the product has been properly assembled, installed by a designated/qualified installer, properly maintained, serviced, and used normally for the given application and within the rated capacities. The end user is responsible for operating, inspecting, and maintaining the product according to applicable product and vehicle owner's manuals and for instructing all operators and maintenance personnel on proper use and maintenance.

Coverage

The starting date for warranty coverage will be the earlier date of the date purchased by the first end user or when the vehicle is put into service and ends when the time period is reached in the warranty coverage period below. Proof of such date is the responsibility of the first end user. If the starting date cannot be satisfactorily determined, then the date of product manufacture based on the product serial number shall be used as the effective starting date.

Main Structural Components – 48 Months or 100,000 miles whichever occurs first.

Major structural components are defined as frame hangers, control arms, axle clamp group, transverse torque arm, axle and frame mounts, and secondary volumes. All wear items such as bushings and strut seals are excluded.

Other Components – 36 Months or 50,000 miles whichever occurs first.

Other components include all power module components, electrical components, wire harnesses; valves, hydraulic lines, and wear items such as bushings and strut seals.

Labor – 12 Months

Estimated labor time and cost must be pre-approved prior to conducting warranty repair work for reimbursement consideration.

Claims

1. Review warranty conditions and coverage to determine if component is warrantable.
2. Locate product serial number, warranty starting date (see Coverage above), vehicle manufacturer, mileage, and VIN.
3. Contact LiquidSpring LLC to address claim.

Components must be returned to LiquidSpring LLC **Prepaid** and identified with a LiquidSpring LLC issued Returned Goods Authorization Number (RGA#) in order to qualify for reimbursement by LiquidSpring LLC. LiquidSpring LLC must authorize all warranty repairs at a cost determined and approved by LiquidSpring LLC **before any repairs are started**.

Warranty Contact: (765) 474-7816 (Option #1)
Service@liquidspring.com

Limitations and Exclusions

The liability of LiquidSpring LLC under this limited warranty is solely limited to the repair or replacement of defective material and workmanship by an authorized party. LiquidSpring LLC shall not be liable for use of non-LiquidSpring LLC components or for repairs performed by unauthorized parties. This warranty does not include any expense of or related to transportation of parts outside the Continental United States or compensation for inconvenience or loss of use while the product is being repaired. LiquidSpring LLC shall not be liable for any expense, loss, or damage (direct, incidental, consequential or exemplary – including, but not limited to towing expenses, travel expenses, vehicle rental, downtime expenses, incidental charges or any other losses arising in connection with the sale, use or inability to use the product) resulting from the warranty-covered component found to be defective.

No expressed warranty is given by LiquidSpring LLC with respect to its product except at specifically set forth herein. Any warranty implied by law, including any warranty of merchantability or fitness for particular purpose, is limited to the expressed warranty term provided in the warranty coverage. The expressed warranty does not apply in the event of: use of non-LiquidSpring LLC replacement components; improper installation, maintenance or repair; misuse, negligence, or abuse including but not limited to overloading, unauthorized alterations or modifications.

CLASS® Product Limited Warranty

LIQUIDSPRING™ LLC
4899 E 400 S
LAFAYETTE, IN 47905
PH: 765-474-7816, FAX: 765-474-7826
WWW.LIQUIDSPRING.COM

Warranty Labor Coverage

COMPONENT	ALLOWABLE LABOR HOURS (*)
Strut (each)	**0.75**
Wiring Harness (Rear Main)	**3.00**
Power Module	**1.00**
Pressure Relief Valve/ Isolation Valve	**0.50****
ECU (External)	**0.50**
Hose Replacement (each)	**0.75**
Height Sensor	**0.50**
Steering Sensor	**0.75**
Rate Valve	**0.50**
Track Rod	**1.50**
One Control Arm	**1.50**
Pair of Control Arms	**2.00**
12V Motor	**1.00**
General Diagnostics	**Contact Customer Service**

(FOR ANY COMPONENT(s) NOT LISTED ABOVE, THE ALLOWABLE LABOR HOURS MUST BE APPROVED BY **LIQUIDSPRING LLC.** PRIOR TO THE WORK BEING PREFORMED.)

*LABOR HOURS BASED ON $85.00 PER HOUR.

*LABOR FOR DIAGNOSIS WILL NOT BE COVERED WITHOUT PRIOR CONSENT FROM **LIQUIDSPRING LLC.**

**0.50hr. FOR FIRST VALVE REMOVAL 0.25hr. FOR EACH ADDITIONAL

Obtaining Warranty Parts

1. Obtain **LiquidSpring LLC** suspension serial number
(Located on driver's side front hanger see Operator's Manual for details)
2. Obtain mileage of suspension
3. Obtain In-service date of suspension
4. Give a detailed description of the problem

Contact LiquidSpring LLC

Customer Service Dept. - Phone: 765-474-7816 (Option #1) Email: Service@liquidspring.com

Installation Check List

Installer:	Installation Date:
Inspector:	Inspection Date:
Suspension S/N:	VIN:

FRAME PREPARATION:

☐Battery Disconnected
☐Upper Strut Mount, Volume, and Power Module Mount holes drilled.
☐Test fit Volumes to confirm placement and hydraulic hose lengths.
☐Winnebago ONLY – Check for gas line on passenger side of vehicle where Upper Strut Mount mounts.

AXLE PREPARATION DS150 & DS170:

☐Weld Track Rod Mount to Axle
☐Weld Axle Seat Pins.
☐OEM M14 Bolts reinstalled and torqued to **135 ft-lbs**.
☐DS120 ONLY – Passenger whip hose replaced

FRONT HANGER INSTALLATION:

☐1/2”-13 Nuts torqued to **86-105 ft-lbs**.

UPPER STRUT MOUNT/ CROSSMEMBER/TRACK ROD FRAME MOUNT*:*

☐Upper Strut Mounts level with top of frame.
☐Upper Cross member orientated correctly.
☐Bolts oriented per Installation Manual Views.
☐5/8”-11 Nuts torqued to **172-210 ft-lbs**.
☐1/2”-13 Nuts torqued to **86-105 ft-lbs**.
☐3/8”-16 Nuts torqued to **35-43 ft-lbs**.
☐DS120 ONLY - M10 Nuts torqued to **43-53 ft-lbs.**
☐DS120 ONLY – Backer Plate installed.

AXLE CLAMP INSTALLATION:

☐5/8”-18 U-Bolts torqued in stages up to **175 ft-lbs**.
☐3/4”-16 U-Bolts torqued in stages up to **250 ft-lbs**.
☐7/8”-14 U-Bolts torqued in stages up to **450 ft-lbs**.
☐Re-attached OEM bolts and brake lines.

CONTROL ARMS INSTALLATION:

☐Upper Control Arms correctly orientated.
☐1-1/8”-7 Nuts torqued to **800-850 ft-lbs**, at ride height.
☐1”-8 Nuts torqued to **600 ft-lbs**, at ride height.
☐7/8”-9 Nuts torqued to **491-600 ft-lbs.** at ride height.

TRACK ROD INSTALLATION DS150 & DS175:

☐Spacers Installed
☐1/2”-13 Nuts Torqued to **86-105 ft-lbs**, at ride height.
☐M12 Bolts Torqued to **75-92 ft-lbs**, at ride height.
☐3/4”-10 Nuts Torqued to **305-373 ft-lbs**, at ride height.
☐7/8”-9 Nuts Torqued to **491-600 ft-lbs**, at ride height.

BRIDGE AND TRACK ROD INSTALLATION DS120:

☐Brake Block Relocated
☐Vent hose re-installed and spiral cable wrap applied

☐M12 Bolts torqued to **75-92 ft-lbs**.
☐3/8-16 bolt torqued to **35-43 ft-lbs**.
☐1/2-13 bolts torqued to **86-105 ft-lbs**.
☐3/4-10 bolts torqued to **303-373 ft-lbs**.

STRUT INSTALLATION:
☐3/4”-10 Upper Nuts torqued to **305-373 ft-lbs**.
☐3/4”-10 Lower Nuts torqued to **305-373 ft-lbs**.

JOUNCE BUMPER DS150 & DS175:
☐OEM fasteners replaced with 3/8”-16 fasteners
☐3/8”-16 Nuts torqued to **35-43 ft-lbs**.

JOUNCE BUMPER DS120:
☐M10-1.5 Bolts torqued to **43-53 ft-lbs**.

HEIGHT SENSOR INSTALLATION:
☐5/16”-18 Nuts torqued to **14-17 ft-lbs**.
☐Locking Clips installed.

POWER MODULE/SECONDARY VOLUME INSTALLATION:
☐3/8”-16 Screws torqued to **35 ft-lbs**, manifold.
☐3/8”-16 Bolts torqued to **35-43 ft-lbs**, Power Module Mount.
☐Reservoir Mount Self Tapping Screws tightened to **snug only**.
☐M12 bolts, volume mounts, torqued to **75-92 ft-lbs**.
☐5/16”-24 T-bolt Clamp Fasteners torqued to **20 ft-lbs** (**240 in-lbs)**.

HOSE INSTALLATION:
☐-4 Fittings torqued to **12 ft-lbs.**
☐-16 Fittings torqued to **65-88 ft-lbs.**
☐Bleed Screws closed and torqued to **13-18 ft-lbs.**
☐Hoses secured with loop clamps.

STEERING SENSOR INSTALLATION:
☐Steering Sensor encoder installed.

WIRING HARNESS INSTALLATION:
☐Dash harness installed
☐Dash harness connected to steering sensor.
☐All appropriate wiring splices made.
☐Driver Interface installed and connected to Dash Harness.
☐External harness routed and secured.
☐External harness connected to Rate Valves, Height Sensors.
☐Battery harness installed with Fuse Lead and connected to Battery and Power Module.
☐Door harness installed (if equipped with rear door switch).
☐All connections sealed.
☐All harnesses properly secured from chaffing, heat, and located away from moving parts.

CALIBRATION/FINAL CHECK:
☐Battery connected.
☐Suspension rose to ride height.
☐Reservoir at proper level.
☐Brakes bled (DS120F53).
☐Calibration completed.
☐No leaking fluid.