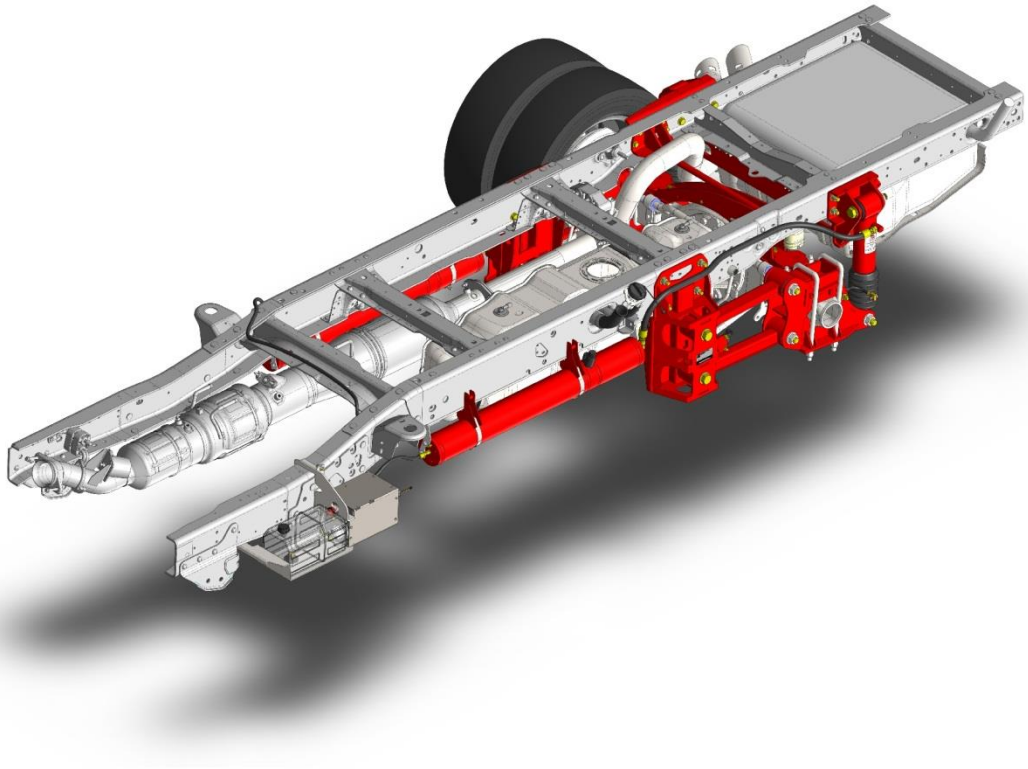
DS120F-A

DS120F-A

Rear Axle Suspension System
for Ford SuperDuty F450
based Ambulance, Transit Bus
and Limo



LIQUIDSPRING™ LLC

Installation / Maintenance Manual

D10857 Rev AB, 12/18

Contents

Introduction

This manual provides installation information for the LiquidSpring CLASS® DS120F-A series of rear axle suspension systems for the Ford F450 SuperDuty 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 proceeded 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 Rating

The LiquidSpring DS120F suspension is rated for **12,000 lbs.**

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

Serial Number Tag Information

The suspension model, serial number, and maximum axle capacity are found on an aluminum tag 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.

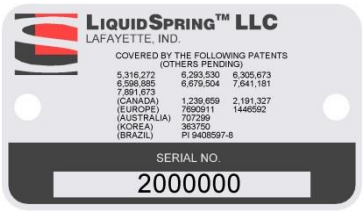


Figure 1. Suspension Identification

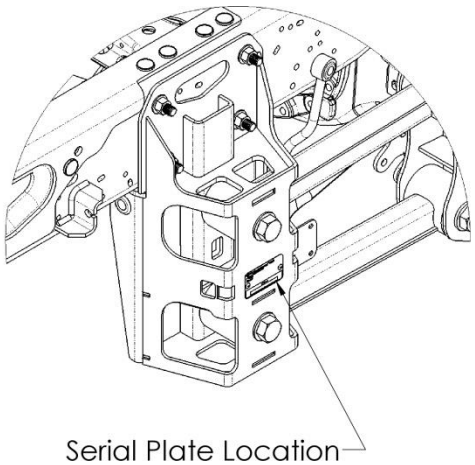


Figure 2. Serial Number Tag Location

Vehicle Towing and Jacking Information

Before attempting any type of towing procedures, the OEM/Coach Builder 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.

Torque Specifications

Most of the fasteners used in this suspension are graded fasteners. These fasteners have the strength and hardness properties required for their particular function. If replaced, they must be replaced with fasteners of the same grade, size, and form as the original in order to prevent failure.

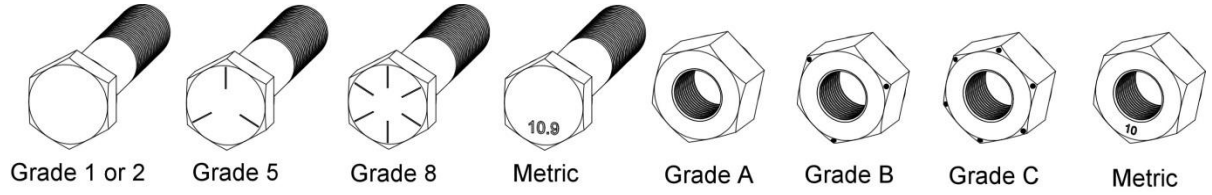


Figure 3. Identification of fastener grades.

Description	Size	Grade	Torque Specification	
			Lb-ft	Nm
Axle Clamp Attachment Nuts	1/2-13	C	86-105	117-142
Axle Clamp Attachment Screw	1/2-13	C	86-105	117-142
Axle Clamp Brake Line Screw (OEM Reuse)	M8-1.2	N/A	18	25
Axle Clamp U-Bolt Flange Nuts	3/4-16	G	See Procedure	
Bleed Screws	3/8-24	N/A	13-18	1-2
Bridge, Brake Line Securing Nut	1/4-20	C	10-12	14-16
Bridge Mount Nuts	5/8-11	C	172-210	233-285
Bridge U-Bolt Flange Nuts	5/8-18	G	180	244
Control Arm Flange Nuts	1-8	G	600	813
Cross Member Reinforcement Nuts	1/2-13	C	86-105	117-142
Hanger Mount Bolts (OEM Reuse)	M14-2	10.9	120-145	163-197
Hanger Mount Nuts	5/8-11	C	172-210	233-285
Height Sensor Linkage Ball Stud Nut	5/16-18	C	14-17	19-23
Height Sensor Mount Nuts	5/16-18	C	14-17	19-23
Hose Connections, -10	7/8-14	N/A	36-63	4-7
Hose Connections, -4	7/16-20	N/A	12	1
Jounce Stop Bolt	M10-1.5	10.9	42	57
Jounce Stop Seat Screw	1/2-13	C	86-105	117-142
Power Module Manifold Bracket Screws	3/8-16	8	39	53
Power Module Reservoir Support Screws	#10	N/A	Snug Only	
Power Module J-Bolt Nut	3/8-16	5	28	38
Power Module Mount Nuts	3/8-16	8	35-43	47-58
Steering Sensor Bracket Nuts (OEM Reuse)	M14-2	10.9	120-145	163-197
Steering Sensor Linkage Ball Stud	5/16-18	N/A	14-17	19-23
Steering Sensor Linkage Bracket U-Bolt Nuts	1/4-20	2	60-85 in-lbs	7-10
Steering Sensor Mounting Screws	5/16-18	8	14-17	19-23
Strut Lower Mount Flange Nuts	1-8	G	250	339
Strut Upper Mount Flange Nuts	1-8	G	600	813
Track Rod Frame Mount Nuts	1/2-13	C	86-105	117-142
Track Rod Nuts	5/8-11	C	172-210	233-285
Upper Strut Mount Bracket Nuts	5/8-11	C	172-210	233-285
Volume Mount Clamps	5/16-24	N/A	240 in-lbs	27
Volume Mount Nuts	3/8-16	C	35-43	47-58

Hydraulic Fitting Assembly

SAE O-Ring Adjustable Fittings

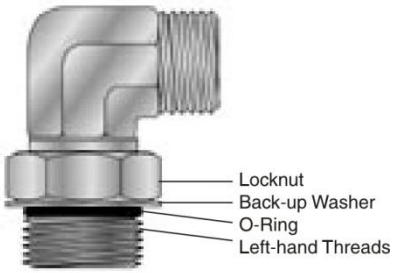


Figure 4. Adjustable SAE fitting

1. Inspect components to ensure that male and female port threads and sealing surfaces are free of burrs, nicks and scratches, or any foreign material.
2. 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.
3. 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.

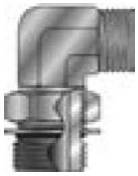


Figure 5. Locknut completely backed off.

4. Back off lock nut as far as possible. Make sure back-up washer is not loose and is pushed up as far as possible.
5. 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.
6. 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.
7. 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.**
8. 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

1. Inspect components to ensure that male and female port threads and sealing surfaces are free of burrs, nicks and scratches, or any foreign material.
2. 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.
3. 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.
4. 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

1. 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.
2. Lubricate the threads and the entire surface of the cone with system fluid.
3. Align mating components for hand connection and turn flare nut until sealing surfaces make full contact.
4. Using two wrenches, hold fitting in desired position and tighten to the proper torque:
   -4 fitting: **9-12 ft-lbs**
   -8 fitting: **27-39 ft-lbs**
   -10 fitting: **36-63 ft-lbs**
   -12 fitting: **65-88 ft-lbs**.

Pre-Installation

1. Check the vehicle wheel alignment prior to installation to insure pre-existing conditions do not exist.
2. It is suggested, but not required, to remove the attached body to ease installation.
3. A chassis lift can be used in assistance of the installation of the suspension system.
4. Measure and record the wheelbase and tire-to-frame dimensions on each side prior to disassembly.

Frame Preparation

1. Chock the front tires.
2. Jack up the rear frame of the vehicle to remove the load from the rear leaf springs.
3. 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.

4. Disconnect the negative cable from the vehicle battery.
5. Remove the OEM shock absorbers.
6. Remove the OEM leaf springs and rear shackles.
7. If equipped with the midship fuel tank, dropping the tank may ease installation.
8. Remove the OEM Axle Stop Bumpers from under the frame.
9. Verify the Parking Brake is released.
10. Release the tension on the rear parking brake by pulling back on the cable-to-cable connector and removing it from the frame.

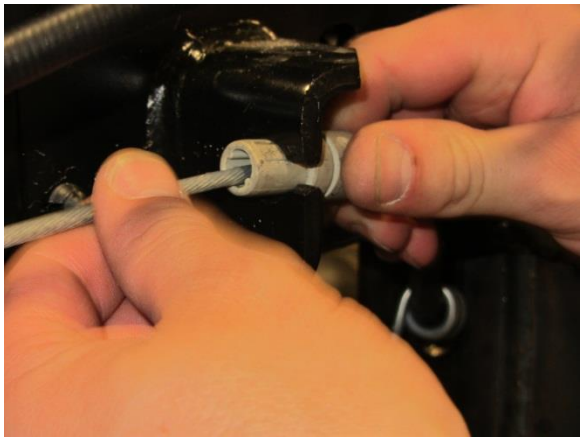


Figure 6. Releasing the parking brake cable tension.

11. Unhook the passenger side Parking Brake Cable from the equalizer.

Figure 7. Unhooking the passenger side Parking Brake Cable.

12. Remove the driver side Parking Brake Cable wire form brackets and position the cable and conduit aside.
13. Remove the passenger side Parking Brake Cable wire form brackets from the driver side frame rail and position the cable and conduit aside.
14. Remove the forward leaf hanger, rear leaf shackle hanger brackets, and overload pads.

IMPORTANT: Retain the fasteners (M14 Flange Bolts and Lock Nuts) which secure the forward leaf hangers to the bottom of the frame (2 per side). These fasteners will be reused.

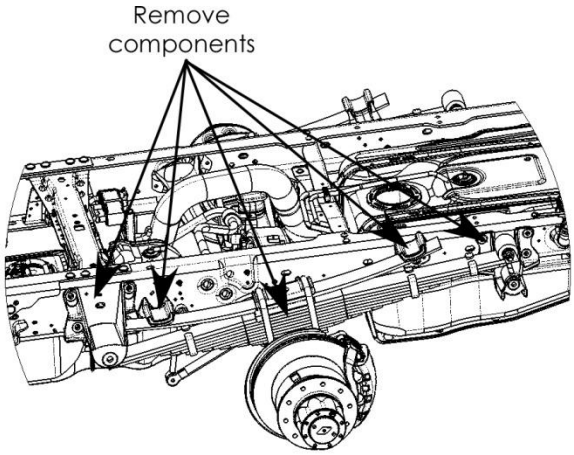


Figure 8. Components to remove.

IMPORTANT: Do not remove sway bar or sway bar mounting components.

15. Locate the drilling template and place it along the driver side frame as shown in Figure 9 and Appendix A, Figure A1.

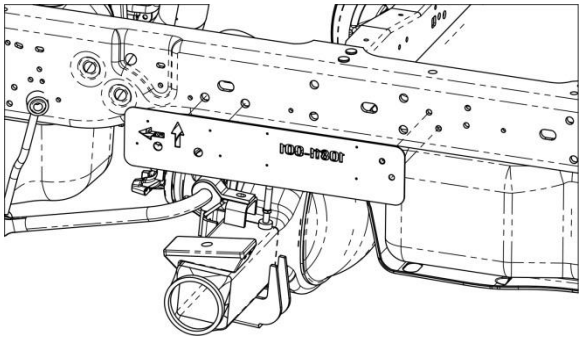


Figure 9. Location of Drilling Template on Driver Side Frame.

16. Center punch or mark the holes indicated in Appendix A, Figure A1.
17. Remove the template and drill the marked holes to Ø21/32”
18. Place the template along the passenger side frame as shown in Figure 10 and Appendix A, Figure A2.

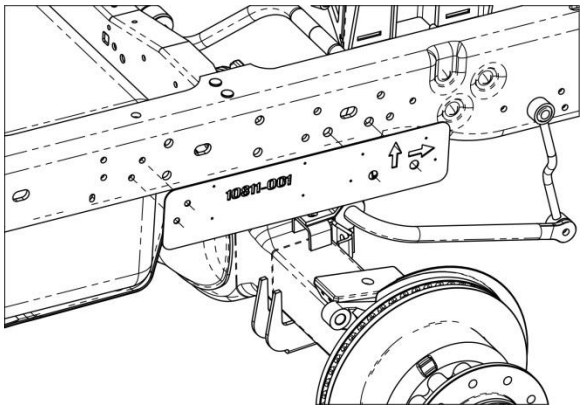


Figure 10. Location of Drilling Template on Passenger Side Frame.

19. Mark the indicated holes.
20. Remove the template and drill the rear holes to Ø21/32” and the holes directly over the axle to Ø17/32.

Note: See *Secondary Volumes* section, page 13, for additional frame drill hole requirements.

Installation

Front Hangers

1. Locate the Front Hangers.
2. Install the Left Hand Front Hanger (with the serial tag) on to the drivers side of the frame, using the (4) 5/8”-11 x 1.75” Hex Flange Bolts and (4) 5/8”-11 Flange Lock Nuts.

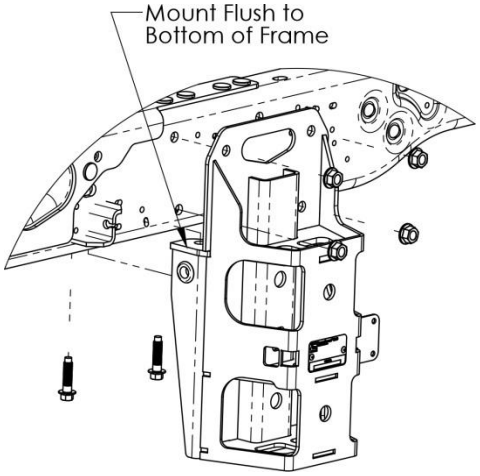


Figure 11. Installation of Front Hanger

3. Verify that the hanger is flush to the bottom of the frame.
4. Install the (2) reused OEM M14 Flange Screws and Lock Nuts to attach the bottom of the Front Hanger to the lower frame flange. Refer to Figure 11.
5. Torque 5/8”-11 nuts to **172 -- 210 ft-lbs.**
6. Torque the reused OEM M14 Flange Screws to **120 -- 145 ft-lbs.**
7. Repeat for the Right Hand Front Hanger (without the serial tag) on to the passenger side of the frame, using the (4) 5/8”-11 x 1.75” Hex Flange Bolts, (4) 5/8”-11 Flange Lock Nuts, and the (2) reused OEM M14 Flange Screw and Lock Nuts.
8. Torque 5/8”-11 nuts to **172 -- 210 ft-lbs.**
9. Torque the reused OEM M14 Flange Screws to **120 -- 145 ft-lbs.**

Upper Strut Mounts

1. Locate the Left Hand Upper Strut Mount.
2. Loosely attach the LH Upper Strut Mount to the frame at the four Ø21/32” holes previously drilled and utilizing (4) 5/8”-11 x 1.75” Hex Flange Bolts and (4) 5/8”-11 Flange Lock Nuts..

CAUTION: All screws must point away from the fuel tank to prevent puncture during accidents.

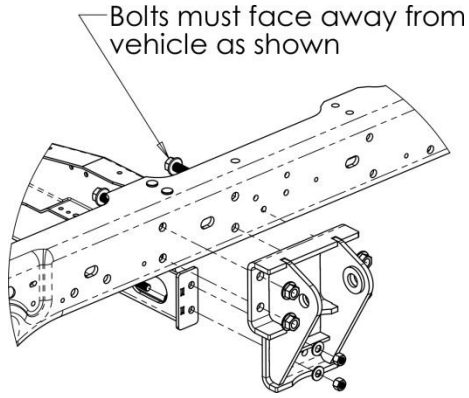


Figure 12. Installation of Left Hand Upper Strut Mount

3. Locate the Right Hand Upper Strut Mount.
4. Loosely attach the RH Upper Strut Mount to the frame at the four Ø21/32" holes previously drilled and utilizing (4) 5/8"-11 x 1.75" Hex Flange Bolts and (4) 5/8"-11 Flange Lock Nuts..

CAUTION: All screws must point away from the fuel tank to prevent puncture during accidents.

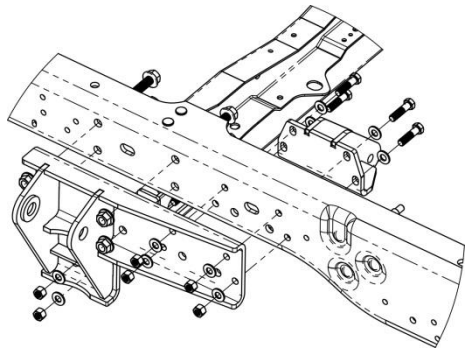


Figure 13. Installation of Right Hand Upper Strut Mount.

5. Locate the Upper Track Rod Mount.
6. Loosely attach to the inside of the Passenger Side Frame Rail utilizing (4) 1/2"-13 x 2.00" Hex Flange Bolts and (4) 1/2"-13 Locking Flange Nuts, through the Ø17/32" holes previously drilled. See Figure 13 and Figure 14.

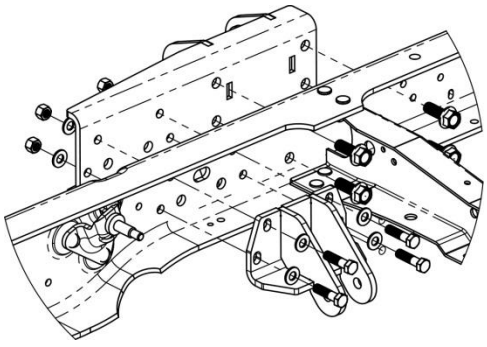


Figure 14. Installation of Upper Track Rod Mount.

7. Locate the Cross-member Reinforcement.
8. Loosely attach the Cross-member reinforcement to both the Left Hand and Right Hand Upper Strut Mounts through the forward-most mounting holes utilizing (4) 1/2"-13 x 1.75" Hex Flange Bolts and (4) 1/2"-13 Locking Flange Nuts.

CAUTION: All screws must point away from the fuel tank to prevent puncture during accidents.

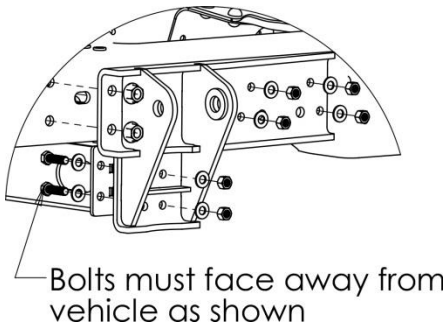


Figure 15. Installation of Cross-member Reinforcement (Passenger side shown)

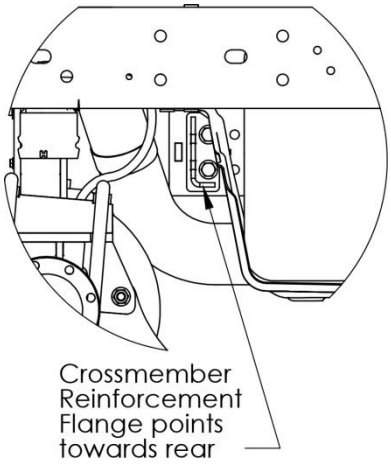


Figure 16. Orientation of Cross-member Reinforcement

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

9. Torque all 5/8"-11 nuts to **172-210 ft-lbs**.
10. Torque all 1/2"-13 nuts to **86-105 ft-lbs**.

Axle Clamp Hangers

1. Detach the hydraulic brake line flexible hose bracket from both the driver and passenger side axle seats. Retain mounting hardware for reuse.

Figure 17. Driver side brake line bracket to detach.

Figure 18. Passenger brake line bracket to remove.

2. Locate the Left Hand Axle Seat Weldment, Axle Cradle, and 3/4" U-Bolts.
3. Place the Axle Seat on to the Drivers Side axle spring seat. The Axle Seat should be flush to the top of the axle spring seat.
4. Place the Axle Cradle under the axle tube and loosely attach to the Axle Seat using the (1) 1/2" -13 x 5.00" Hex Flange Bolt and (1) 1/2"-13 Locking Hex Nut at the rear connection point. Use (1) 1/2"-13 x 1.50" Hex Flange Bolt at the front connection point. See Figure 19.

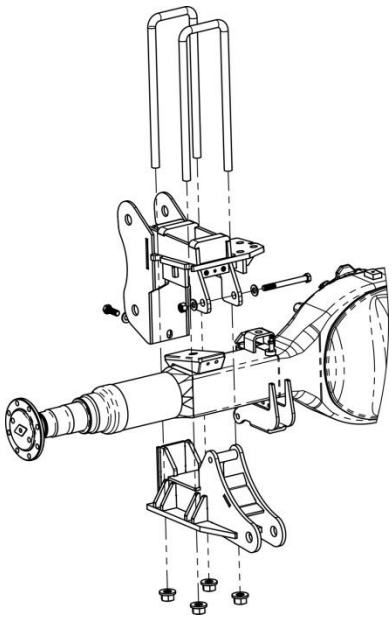


Figure 19. Axle Clamp assembly

5. Slip the 3/4" U-bolts into position. Lightly tighten u-bolts utilizing the (4) 3/4"-16 Locking Flange Nut.
6. Repeat to install the Right Hand Axle Seat Weldment, Axle Cradle, and 3/4" U-bolts.
7. Locate the parking brake cable / hydraulic brake line mounting bracket located on top of the axle differential housing.

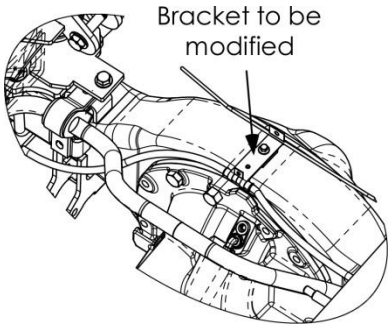


Figure 20. Parking Brake Cable/Hydraulic Brake Line Mounting Bracket Location

8. Cut the OEM brake line bracket between the rivet hole and mounting bolt as shown in Figure 19. Leave the hydraulic brake line portion attached to the axle housing.

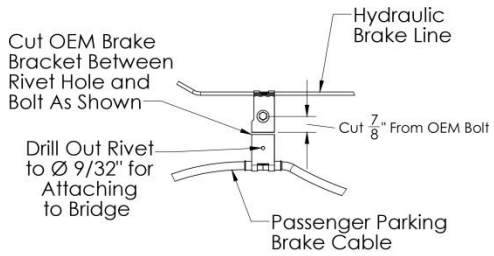


Figure 21. Mounting Bracket Modifications

9. Drill out the rivet on the parking brake cable portion to Ø9/32".
10. Locate the Bridge Weldment and 5/8" Slanted U-Bolts.
11. Loosely attached the Bridge Weldment to both Axle Seat Weldments utilizing (4) 5/8"-11 x 2.00" Hex Flange Bolts and (4) 5/8"-11 Flange Lock Nuts.

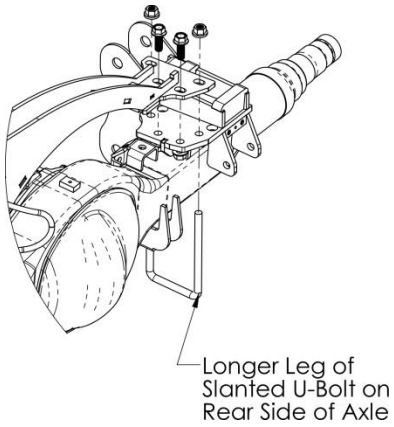


Figure 22. Installing Bridge Weldment

12. Slip the 5/8" Slanted U-bolts under the axle, as shown in Figure 22, and through the Axle Seat and Bridge on both sides utilizing (4) 5/8"-18 Locking Flange Nuts.

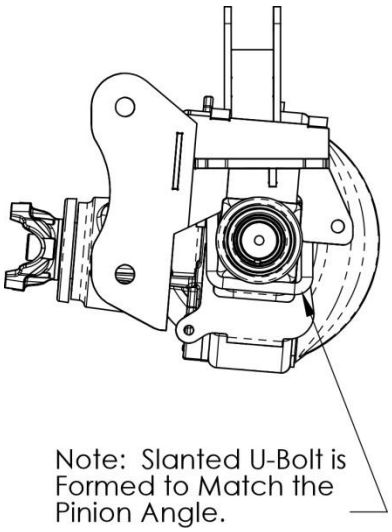


Figure 23. Installing Slanted U-bolts.

13. **Torque, the 3/4"-16 U-bolt nuts evenly in an X-type pattern in 4 stages:**
    - **Stage 1: Torque to 74 ft-lbs [100 Nm].**
    - **Stage 2: Torque to 148 ft-lbs [200 Nm].**
    - **Stage 3: Torque to 222 ft-lbs [300 Nm].**
    - **Stage 4: Torque to 295 ft-lbs [400 Nm].**
14. Torque the 1/2" Fasteners to **86-105 ft-lbs.**
15. Torque the 5/8" Fasteners to **172-210 ft-lbs.**
16. Torque the 5/8"-18 Slanted U-bolt nuts evenly up to **180 ft-lbs.**
17. Attach the modified parking brake cable bracket to the front of the Bridge Weldment utilizing (1) 1/4"-20 x 1.00" Hex Cap Screw, (1) 1/4"-20 Lock Nut, and (2) 1/4" Hardened Washers.

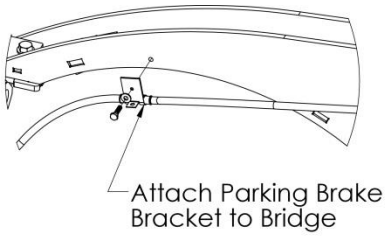


Figure 24. Attaching modified Parking Brake Bracket

18. Torque the 1/4"-20 Lock Nut to **10-12 ft-lbs.**
19. Reinstall the brake flexible line mounting brackets to back of the Axle Seat Weldments.

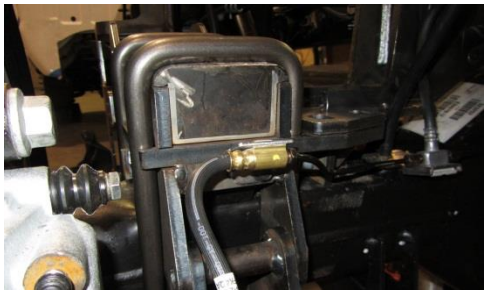


Figure 25. Attachment of driver side brake flexible line.

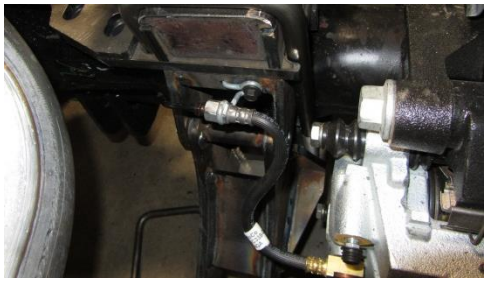


Figure 26. Attachment of passenger side brake flexible line

20. Torque to **18 ft-lbs**.
21. Adjust brackets on each side upward to gain clearance between the brake hose and the strut boot. Note: Only bend OEM bracket and not the welded LiquidSpring bracket on driver side.
22. Locate the Left Hand Bumper Pad Weldment.
23. Install the Bumper Pad onto the driver side of the Bridge Weldment, as shown in Figure 27, using (1) 1/2”-13 x 1.50” Hex Flange Bolt.

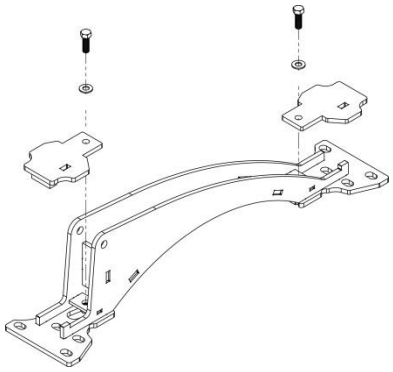


Figure 27. Installation of Bumper Pads.

24. Torque to **86-105 ft-lbs**.
25. Locate the Right Hand Bumper Pad Weldment.
26. Install the Bumper Pad onto the Passenger side of the Bridge Weldment using (1) 1/2”-13 x 1.50” Hex Cap Screw and (1) 1/2” Hardened Flat Washer.
27. Torque to **86-105 ft-lbs.**

Control Arms

1. Locate (1) Upper Control Arm Assembly and (1) Left Hand (Driver Side) Lower Control Arm Assembly. See Figure 29 for lower control arm identification.
2. Install the control arms between the driver side front hanger and axle hangers loosely with (4) 1”-8 x 6.00” Hex Cap Screws, (4) 1” Hardened Flat Washers, and (4) 1”-8 Locking Flange Nuts. See Figure 28.

   Note: Orientate the lower control arm with the height sensor linkage tab inboard and closer to the front hanger.

   IMPORTANT: Verify that the driver side parking brake cable is routed between the control arms.

   IMPORTANT: Bolts inserted into the front hanger must point inboard (towards the frame). Bolts inserted at the axle hanger must point outboard (towards tire). Orienting the bolts incorrectly may result in damage to the frame rail.

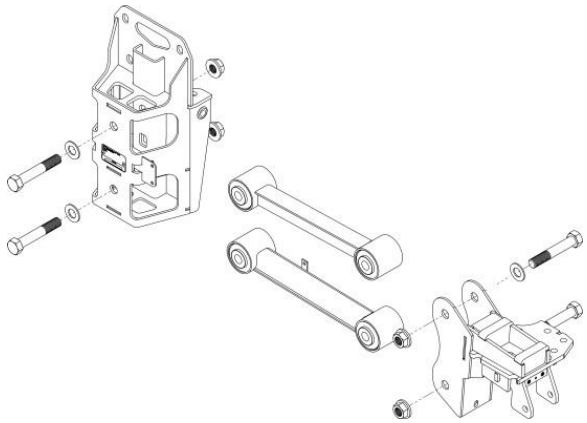


Figure 28. Control Arm installation. Driver side shown.

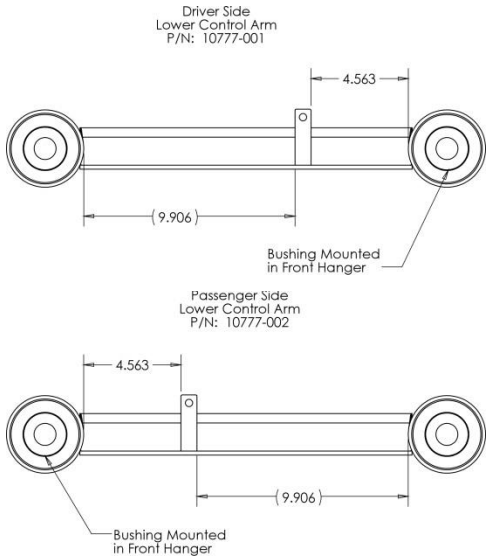


Figure 29. Lower Control Arm identification.

3. Locate (1) Upper Control Arm Assembly and (1) Right Hand (Passenger Side) Lower Control Arm Assembly.

   Install the control arms between the driver side front hanger and axle hangers loosely with (4) 1”-8 x 6.00” Hex Cap Screws, (4) 1” Hardened Flat Washers, and (4) 1”-8 Locking Flange Nuts.

   Note: Orientate the lower control arm with the height sensor linkage tab inboard and closest to the front hanger.

   IMPORTANT: Verify that the passenger side parking brake cable is routed below the lower control arm.

   IMPORTANT: Bolts inserted into the front hanger must point inboard (towards the frame). Bolts inserted at the axle hanger must point outboard (towards tire). Orienting the bolts incorrectly may result in damage to the frame rail.

Track Rod and Mount

1. Locate the Track Bar.
2. Loosely attach the Track Bar and Spacers to the Track Rod Mount Bridge using (1) 5/8”-11 x 4.00” Hex Flange Bolt and (1) 5/8”-11 Flange Lock Nut.
3. Loosely attach the Track Bar to the frame mounted Track Rod Mount using (1) 5/8”-11 x 3.75” Hex Flange Bolt and (1) 5/8”-11 Flange Lock Nut.
4. Jack each side of the axle until approximately design ride height position. See Figure 30.

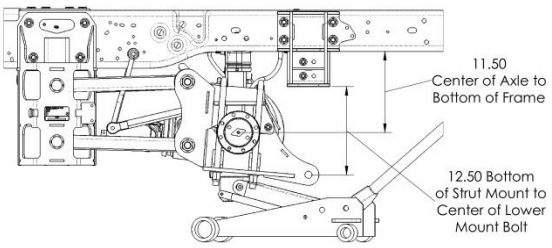


Figure 30. Lift to Design Ride Height

5. Torque the two (2) 5/8” Track Rod mounting bolts to **172-210 ft-lbs.**
6. Torque the eight (8) 1” Control Arm mounting bolts to **600 ft-lbs.**

Strut Assembly Installation

Note: Lowering the axle will ease installation of the Strut Assemblies.

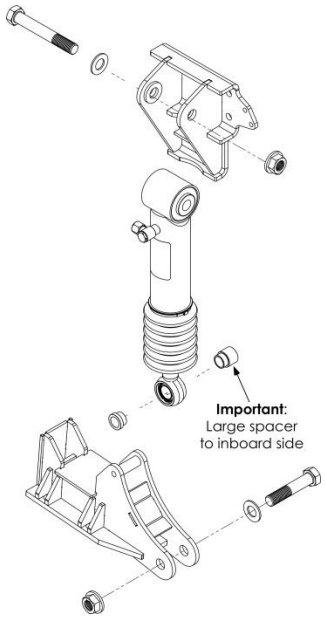


Figure 31. Strut Installation. Left Hand shown.

1. Locate the Left Hand Strut Assembly.
2. Loosely attach the Strut Assembly to the Driver Side Upper Strut Mount using the 1”-8 x 7.00” Hex Bolt, 1” Hardened Flat Washer, and 1”-8 Locking Flange Nut. See Figure 31.
3. Locate the Right Hand Strut Assembly and spacer.
4. Loosely attach the Strut Assembly to the Passenger Side Upper Strut Mount using the 1”-8 x 7.00” Hex Bolt, 1” Hardened Flat Washer, and 1”-8 Locking Flange Nut.
5. Locate (2) large bearing spacers and (2) small bearings spacers.
6. Insert the bearing spacers into each lower strut bearing, with the larger spacer located on the Inboard (towards the frame) side and the smaller spacer on the outboard (towards the tire) side.

   CAUTION: The larger spacer must be placed on the INBOARD side of the lower bearing mount. Failure to properly install the spacers may result in contact between the strut and exhaust system.

7. Raise the axle, or pull on the lower mount eye to extend strut, until the lower strut bearings can be attached to the Axle Cradle lower strut mount using the 1”-8 x 5” Hex Cap Screw, 1” Hardened Flat Washers, and 1”-8 Locking Hex Nut.
8. Repeat for opposite side.
9. Torque the upper strut mount 1”-8 Lock Nuts to **600 ft-lbs.**
10. Torque the lower strut mount 1”-8 Lock Nuts to **250 ft-lbs. Do not over torque.**

11. Release the jack under the axle and let the axle hang by the struts.

Jounce Bumpers

1. Locate (2) Jounce Bumpers, (2) M10 Spring Lock Washers, and (2) M10-1.5 Hex Flange Bolts.
2. Install the bumpers through the bottom of the frame, at the OEM Jounce Bumper location, utilizing the (2) M10-1.5 Hex Flange Bolts and Spring Lock Washers.

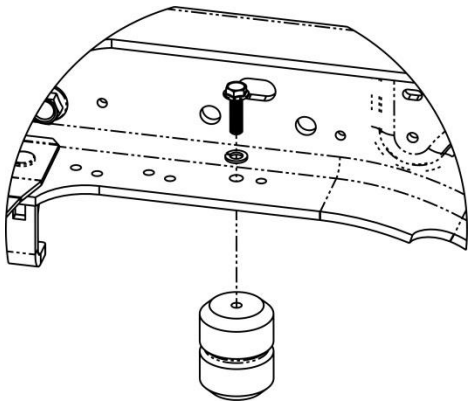


Figure 32. Installation of Left Hand Bumper

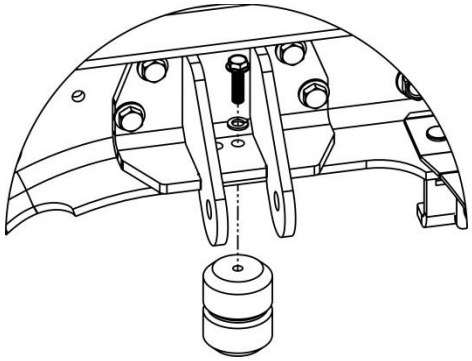


Figure 33. Installation of Right Hand Bumper

3. Torque bolts to **42 ft-lbs.**

Height Sensors

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

1. Locate the Height Sensor, Linkage Assembly, and Ball Stud.
2. Attach the Ball Stud to the Left Hand (Driver Side) Lower Control Arm, orientated with the ball pointing outboard, using the 5/16”-18 Locking Hex Nut. Torque to **14-17 ft-lbs.**

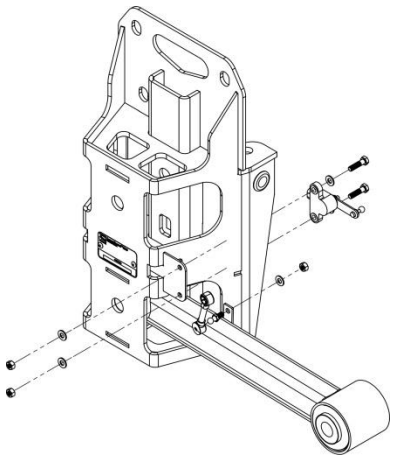


Figure 34. Height Sensor and Linkage installation.

3. Attach the Height Sensor to the Left Hand (Driver Side) Hanger using the 5/16”-18x1.25” Hex Cap Screw, 5/16” Hardened Flat Washer, and 5/16”-18 Locking Hex Nut. Torque to **14-17 ft-lbs.** See Figure 34. **Do not over torque.**
4. Snap the Linkage Assembly to the ball stud attached to the lower control arm and to the ball stud on the Height Sensor arm. **Install rod end locks as shown.**

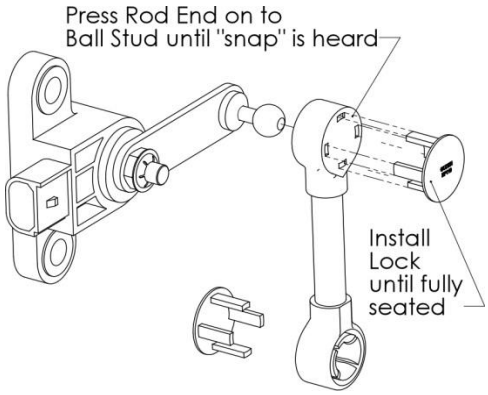


Figure 35. Height Sensor Linkage Installation.

5. Repeat with the Right Hand (Passenger Side).

Secondary Volumes

1. Locate (2) Volume Mount Weldments.
2. Place the mounts against the driver side frame, forward of the front hanger. Figure 34 shows suggested locations. The mounts can be relocated based on frame mounts, etc.

Important: Locate the mounts such that the distance between two mounts as wide as possible.

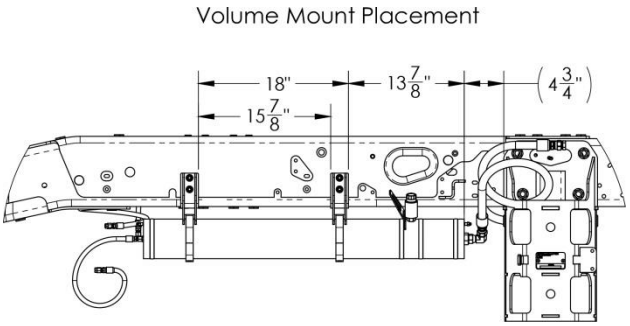


Figure 36. Secondary Volume suggested mount locations

3. Verifying the mounts are held flush to the bottom of the frame and utilizing the mount hole pattern, mark the locations of the mounting holes and drill (2) Ø7/16" holes per mount.
4. Locate (4) 3/8"-16 x 1.50" Hex Cap Screws, (4) 3/8"-16 Lock Nuts, and (8) 3/8" Hardened Flat Washers and attach the two mounts. **Torque to 35-43 ft-lbs**. Note: Orientate nuts outboard.
5. Repeat with (2) more Volume Mount Weldments on the passenger side of the frame.
6. Locate the Left Hand Secondary Volume Assembly, which includes the shorter -4 hydraulic hose attached.

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.

7. Raise the volume assembly until the volume contacts both mounts. Rotate the volume assembly until the rate valve is located to the top and as vertical as possible. Ensure clearance to emergency brake cable past the guard. See Figure 37.
8. Locate (2) T-Bolt Clamps, open the mounts, and place them in the mounts, on top of the two pegs.
9. Secure both clamps around the volume and torque the T-Bolt nut to **240 in-lbs**.

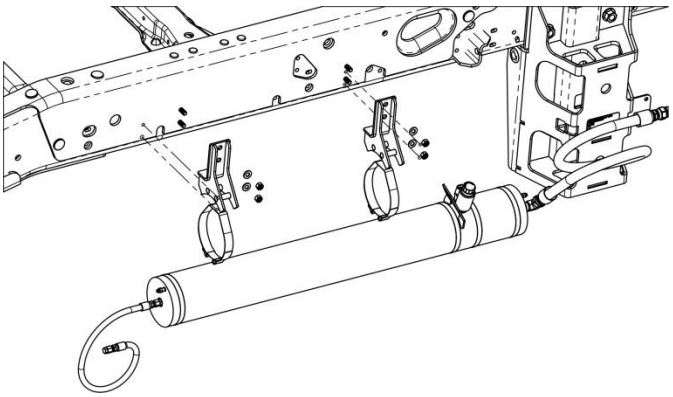


Figure 37. Secondary Volume Assembly mounting location.

10. Repeat for passenger side.

Power Module Installation

1. Locate the Power Module Assembly and Power Module Mounting Kit.
2. Inside the kit, locate the installation drawing and follow instructions for installing the power module brackets to the power module, then install to the vehicle.

Hydraulic Hose Attachment

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

CAUTION: During shipping, the fluid inside of the volume may have heated up causing increased pressure. Always open the bleed screw to relieve pressure prior to removing plugs in the hoses.

1. 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.
2. 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.

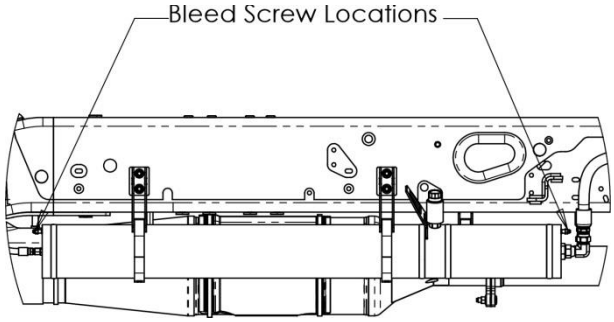


Figure 38. Bleed screw locations.

3. Open the bleed screw slightly to relieve any residual pressure.
4. After pressure is relieved, close the bleed screw and torque to **13-18 ft-lbs.**
5. Remove the cap from the strut port.
6. Raise the end of the -10 (5/8") hose, attached to the volume assembly, above the secondary volume to prevent fluid loss.
7. Route the hose to the strut and secure with hose clamps or stand-offs as shown in Figure 26. Use of hose clamps is recommended to secure the hose from movement or chafing.

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

8. Remove the plug from the end of the hose.
9. Attach the hose end (-10 JIC fitting) to the strut port.
10. Torque to **36-63 ft-lbs.**

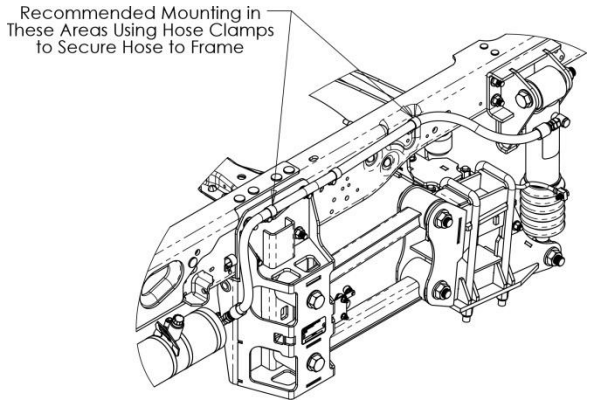


Figure 39. Driver Side -10 Hose attachment.

11. Tighten all emergency brake cable guides to OEM recommendations.
12. Repeat with the opposite side.

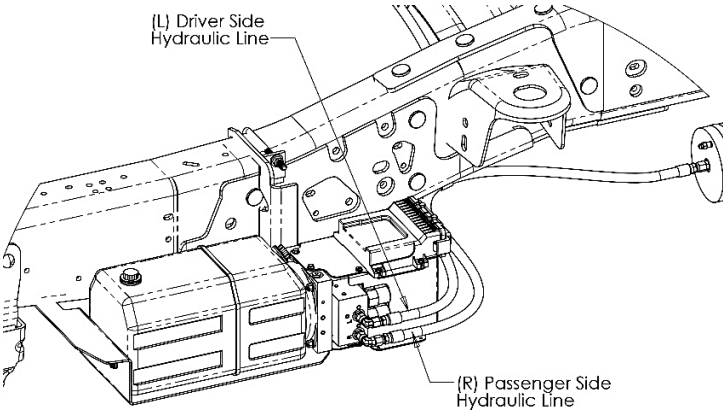


Figure 40. Power Module hose attachment.

13. Route the Left Hand (Driver side) -4 (1/4") hydraulic hose, attached to the volume assembly, to the Power Module. Use of hose clamps is recommended to secure the hose from movement or chafing.

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

14. Remove the cap from the -4 JIC fitting mounted on the side of the power module assembly.
15. Remove the plug from the hose end.
16. Attach the hose end to the side mounted fitting. Torque to **12 ft-lbs. Do not over tighten.**
17. Route the Right Hand (Passenger side) -4 (1/4") hydraulic hose, over the frame, to the power module assembly. Use of hose clamps is recommended to secure the hose from movement or chafing.

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

18. Remove the cap from the bottom mounted -4 JIC fitting on the power module.
19. Remove the plug from the hose end.
20. Attach the hose end to the bottom mounted -4 JIC fitting. **Torque to 12 ft-lbs. Do not over tighten.**
21. Clean up any fluid spillage.
22. Re-install tires and wheels as per OEM instructions.

Parking Brake Cable

1. Loosely reinstall the driver side parking brake cable formed wire brackets.

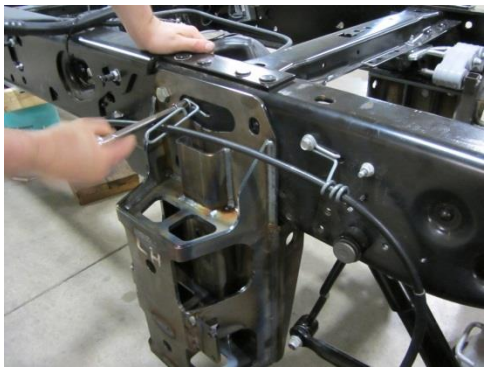


Figure 41. Reinstallation of the formed wire brackets.

2. Remove the two rubber grommets from the Left Hand Hanger.
3. Feed the passenger side parking cable, including the first wire formed bracket, through both access holes in the Left Hand Hanger.

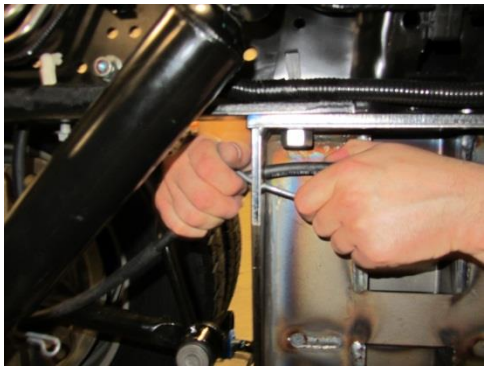


Figure 42. Feeding parking brake cable, and wire formed bracket, through hanger.

4. Cut both grommets as shown in Figure 43.

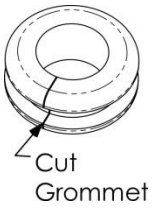


Figure 43. Illustration where to cut grommet.

5. Slip cut grommets over the parking brake cable and reinstall in the hanger.

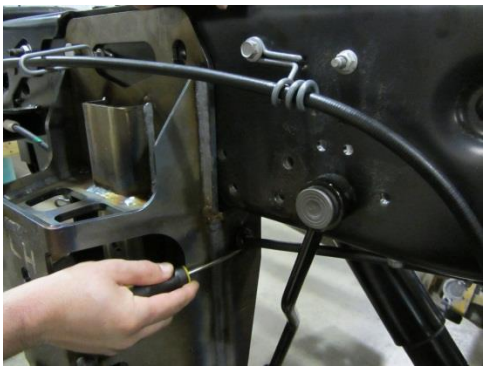


Figure 44. Installation of grommets.

Figure 45. Grommets and parking brake cable after installation through hanger.

6. Hook the end of the parking brake cable into the equalizer.

Figure 46. Reattaching the parking brake cable.

7. Reinstall the parking brake cable to cable connector into the frame bracket.
8. Attach the wire formed bracket in front of the hanger. The bracket may require some minor bending to keep the cable from being pinched or contacting.

Figure 47. Attachment of wire formed bracket.

9. Attach the wire formed bracket under the frame behind the hanger.

Figure 48. Attachment of wire formed bracket under frame.

Figure 49. Complete driver side parking brake cable re-routing.

10. Verify the passenger side parking brake cable does not interfere with the operation of the suspension. If contacting the lower control arm, slide the cable towards the passenger side to provide additional slack.

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, 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.
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 OEM harness on driver side. Use of plastic clips is recommended.
7. Locate the 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 may be applied after ring terminal is secured.
10. Route the remaining trunk (containing blunt wires and steering sensor connector) towards the firewall. Secure to OEM wiring harness.
11. Locate the existing firewall access hole, or drill a Ø1-1/4" hole in the firewall, under the dash, behind the brake pedal and just above the OEM customer access upfitter wiring. Remove the OEM installed plug, if installed. See Figure 50.

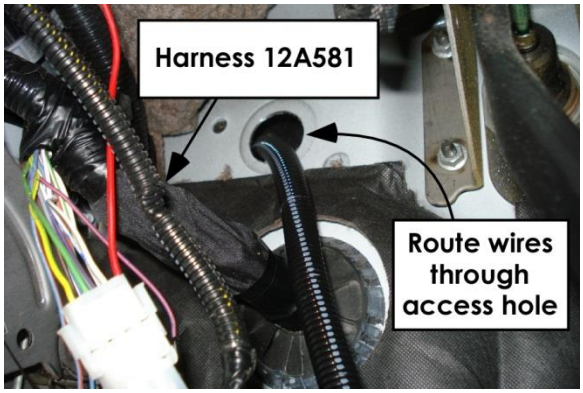


Figure 50. External Harness routing through firewall.

12. Route the wiring harness branch containing the (8) 18ga blunt wires inside the cab through the firewall access hole. Install rubber grommet or sealing putty to seal the hole around the harness.
13. Locate the 8ga battery connection branch.
14. Route branch to the driver side battery positive terminal.
15. Locate the Battery Fuse Lead containing the 80 amp fuse.
16. Crimp the fuse lead to the 8ga battery connection branch blunt end.
17. Melt the heat shrink on the crimped connection to seal the splice.
18. Remove the 80 amp fuse and retain.
19. Connect to the positive terminal post per OEM Upfitter wiring instructions.

Figure 51. OEM Upfitter Driver Side Terminal Connection instruction.

Important: Do not connect to passenger side battery.

Steering Sensor Installation

1. Raise the front end of the vehicle, per OEM instructions.
2. Locate the OEM track rod mounting bracket and pitman arm.

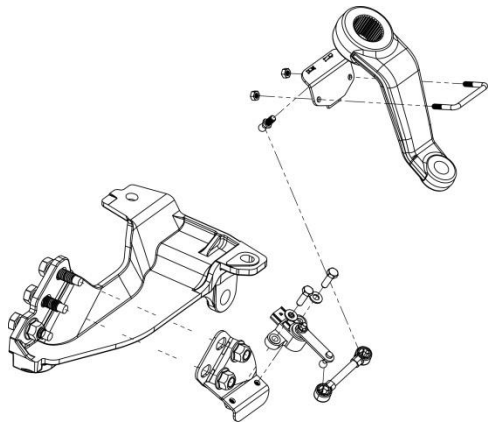


Figure 52. Steering Sensor Installation.

3. Locate the Steering Sensor mounting bracket.
4. Remove and retain upper two of three nuts securing front track rod mount to cross member. See Figure 53.

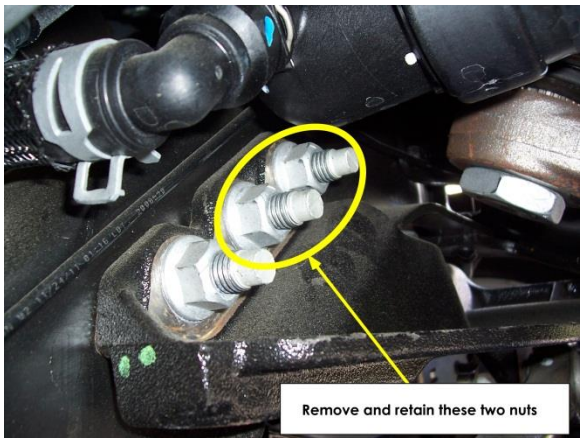


Figure 53. Track rod mount bolts to temporarily remove.

5. Install bracket over two bolts and reinstall nuts. Torque to **120 – 147 ft-lbs [163 – 199 Nm].**
6. Locate the branch containing the J35 steering sensor connector.
7. Route the steering connector branch down to the steering sensor. Route the Steering Sensor Harness along the hose, located near the steering sensor mount area, over the cross member and along the inside Drivers side frame. Secure the wiring harness. **Important: Verify the wiring harness does not contact heat source or moving components.**
8. Connect the electrical connector to the steering sensor prior to installation of the Steering Sensor.
9. Install the Steering Sensor to the Mount Bracket utilizing (2) 5/16”-18 x 1” Hex Cap Screw and (2) 5/16” Hardened Flat Washers.
10. Torque to **14-17 ft-lbs**. **Do not over torque**.
11. Locate the Steering Linkage Mount bracket, Ball Stud, and 1/4”-20 U-bolt.
12. Install the Ball Stud into the weld nut of the bracket. Torque to **14-17 ft-lbs**.
13. Locate the Steering Sensor Linkage Asy.
14. Snap one end onto the ball stud, located on the pitman arm.
15. Slip the Steering Linkage Mount bracket under the OEM pitman arm and attach using the (1) 1/4”-20 U-bolt and (2) 1/4”-20 Lock Nuts. Torque Lock Nuts to **60 – 85 in-lbs.**
16. Snap the remaining linkage end onto the ball stud located on the steering sensor. Install rod end locks.

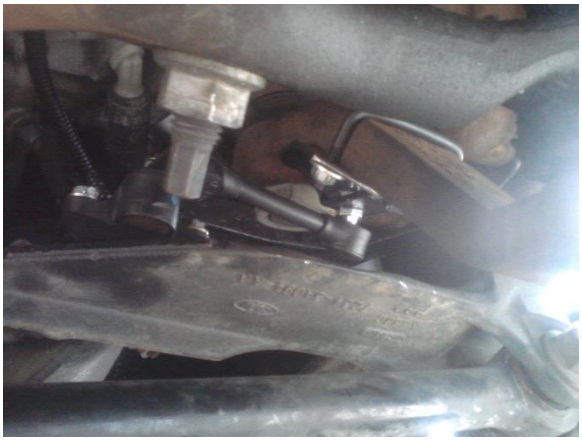


Figure 54. Steering Sensor components installed.

17. Turn steering wheel to full lock in either direction to check for any interference.

Dash Electrical Harness Installation:

1. Locate the dash harness.
2. Locate and identify the following 18ga wires in the external wiring harness branch passed through the firewall:
   Red (Battery Power)
   Yellow (Ignition)
   Black (Ground)
   White (CAN High)
   White/Black (CAN Low)
   Violet/White (Speed)
   Pink/Black (Brake)
3. Connect each wire to the corresponding wire in the dash harness using appropriate butt splices. Match wire colors. Heat shrink sealing is optional.

Figure 55. Accessing inside of side kick panel.

4. Remove plastic sill panel. See Figure 55.
5. Pull weather stripping from front edge and sill of the driver side door opening.
6. Remove outboard side kick panel, from around parking brake.
7. Locate dash harness.
8. Attach ring terminal J32 to ground screw.

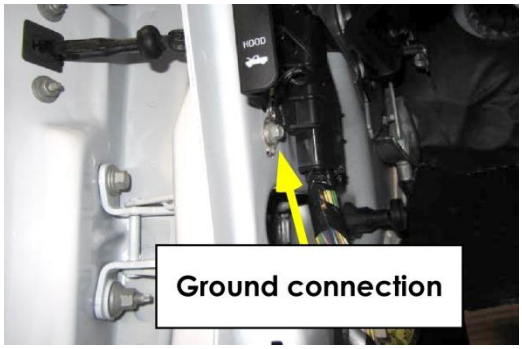


Figure 56. Location of ground connection.

9. Locate the OEM customer access upfitter wiring, under the dash, behind the brake pedal. See Figure 56.

Figure 57. Customer Access wires.

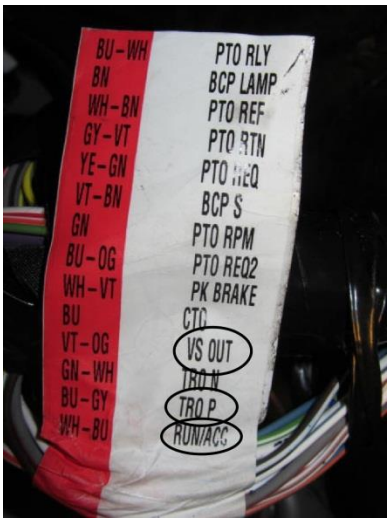


Figure 58. Customer access wires utilized.

10. Remove some of the electrical tape to reveal the blunt-cut wires.
11. In the OEM Upfitter wiring bundle, locate the "VS OUT", Violet/Orange, wire and strip end.
12. Splice the Violet/Orange to the dash harness Violet/White (W55) wire, using the appropriate butt splice and crimp. Reference the Dash Harness Schematic.
13. In the OEM upfitter wiring bundle, locate the "RUN/ACC", White/Blue, wire and strip end.
14. Splice the White/Blue end to the dash harness Yellow only (W58) wire, using the appropriate butt splice, and crimp. Reference the Dash Harness Schematic.
15. In the OEM upfitter wiring bundle, locate the "TRO P", Blue/Grey, wire and strip end.
16. Splice the Blue/Grey end to the dash harness Yellow/Black (W61) wire, using the appropriate butt splice, and crimp. Reference the Dash Harness Schematic.

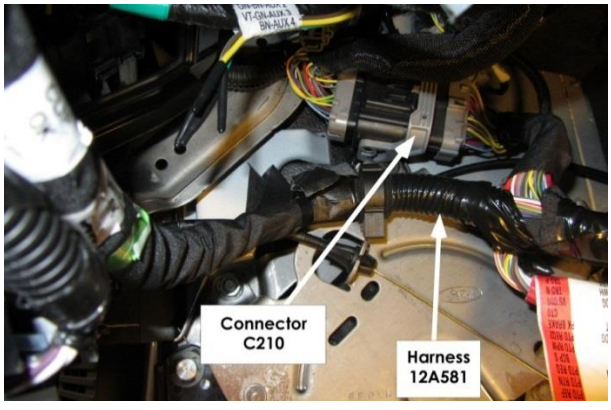


Figure 59. Wiring bundle to access (Diesel shown).

17. Locate the vehicle wire harness 12A581 under steering column. See Figure 59.

18. Remove the electrical tape from harness at Customer Access wire bundle junction. Pull back any sheathing to gain access to the White/Red wire in harness 12A581. See Figure 60.

CAUTION: Do not cut the White/Orange wire in harness 12A581. Do not cut the White/Red wire from connector C210. Do not cut the White/Orange wire from Customer Access bundle.

Figure 61. Passenger side kick panel to remove.

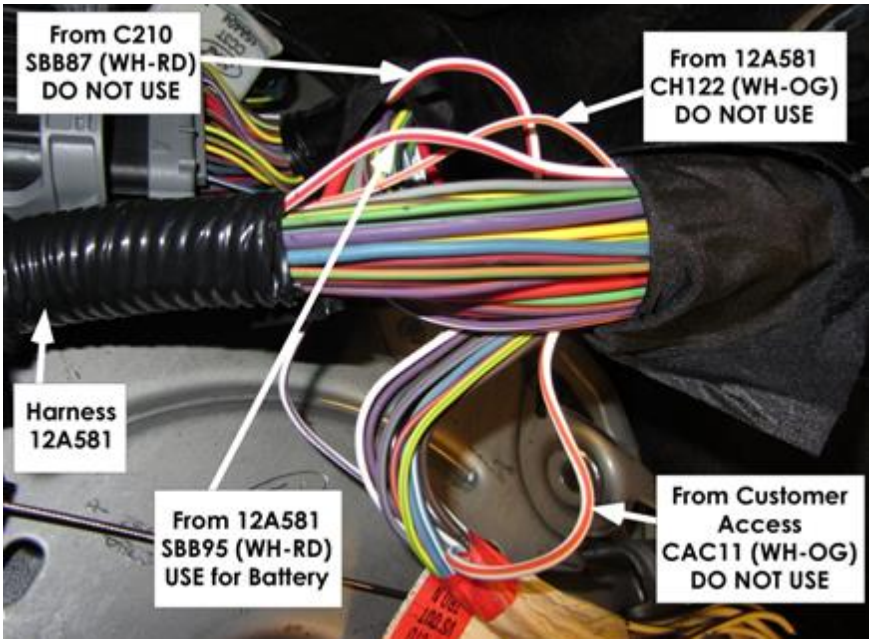


Figure 60. Identification of wire to splice.

19. Cut White/Red wire in harness 12A581 near Customer Access wire junction bundle.

20. Strip one end of the White/Red wire and insert into the heat shrinkable butt splice and crimp.

21. Strip the dash harness Red (W96) wire and the other end of the vehicle White/Red wire and twist together. Insert the twisted pair into the other end of the heat shrinkable butt splice and crimp. Reference the Dash Harness Schematic.

22. Heat the insulation of the butt splice to seal the connection.

23. Re-sheath the vehicle wiring bundle and rewrap with appropriate electrical tape.

24. Locate the Pink/Black wire in the dash harness.

25. Route the Pink/Black wire to the passenger side kick panel area (near the passenger side door). See Figure 61.

26. Remove the outboard passenger side kick panel.

27. Locate connector C2280F (brown colored) on the Body Control Module (BCM). See Figure 62.

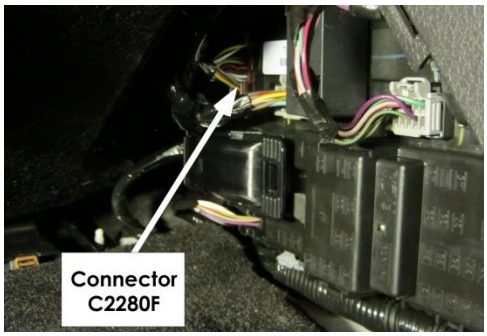


Figure 62. Location of Connector C2280F.

28. Disconnect connector C2280F from the BCM.

29. Remove the electrical tape to gain access to the Brake Signal wire (Blue/Orange) at Pin #19 in Connector C2280F. See Figure 63.

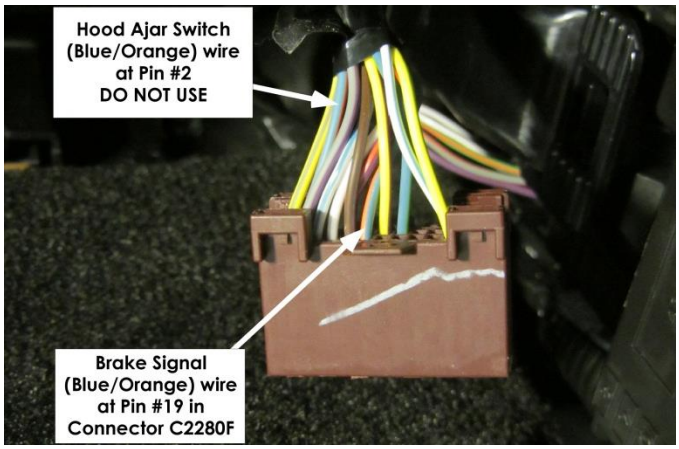


Figure 63. Wire to splice in Connector C2280F.

CAUTION: Do not cut Hood Ajar Switch wire (also Blue/Orange) at Pin #2 in Connector C2280F.

30. Cut the Brake Signal (Blue/Orange) wire at Pin #19 in Connector C2280F approximately 4" from the connector. See Figure 63.
31. Strip one end of the Brake Signal (Blue/Orange) wire and insert it into the heat shrinkable butt splice and crimp.
32. Strip the other end of the Brake Signal (Blue/Orange) wire and the dash harness Pink/Black (W59) wire and twist together. Insert the twisted pair of wires into the other end of the heat shrinkable butt splice and crimp.
33. Heat the insulation of the butt splice to seal the connection.
34. Refit any sheathing and apply appropriate electrical tape.
35. Reconnect connector C2280F to the BCM.

CAUTION: Connector C2280F must be connected to the Body Control Module before starting the vehicle or reconnecting the battery.

36. Replace the passenger side kick panel.
37. Replace the driver side plastic kick panel, weather stripping, and sill plate.

Driver Interface Installation:

1. Locate driver interface.
2. Mount the driver display in appropriate location according to Ford QVM/Body Builder Guidelines or Final Stage Manufacturer requirements. Use supplied Velcro to secure as needed.
3. Route and secure driver interface harness accordingly to connect to dash harness connector J12 underneath dash on driver's side.

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).

System Preparation

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. Locate the container of Silicone Fluid.
6. Remove the breather cap from the Power Module reservoir.
7. Fill the reservoir approximately 2/3 full.
8. 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.

9. Press and release the Red ON/OFF button on the driver display. All LEDs on the driver display should go out.
10. 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.
11. 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.
12. 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.
13. If the suspension system does not begin to rise to a preset ride height after 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
14. After the suspension system stops leveling, check the fluid level in the reservoir. If low, fill to the indicated line.

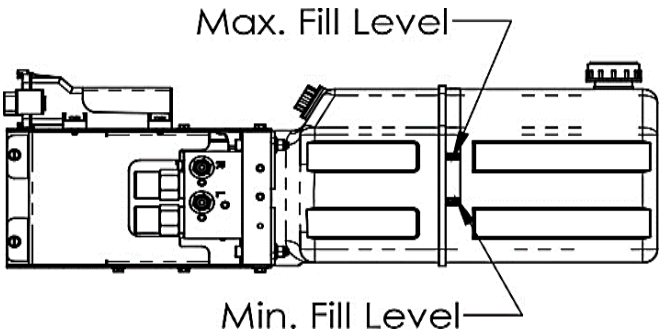


Figure 64. Final fill fluid level.

Bleeding the System

1. 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.
2. 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.

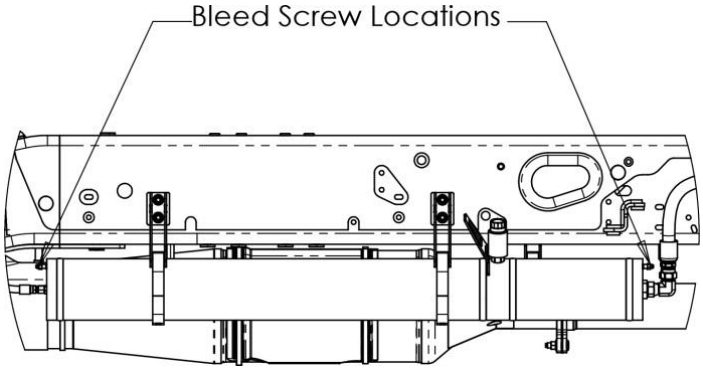


Figure 65. Bleed screw locations.

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

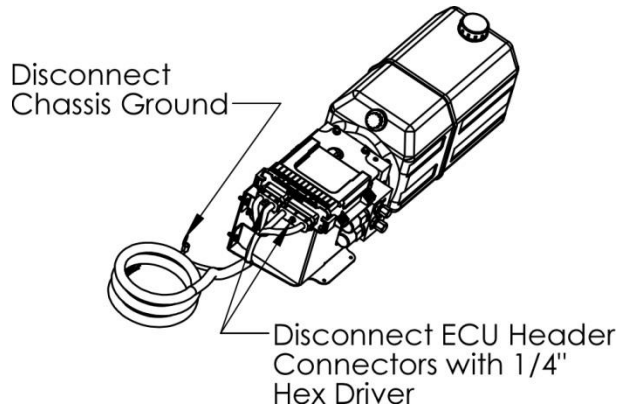
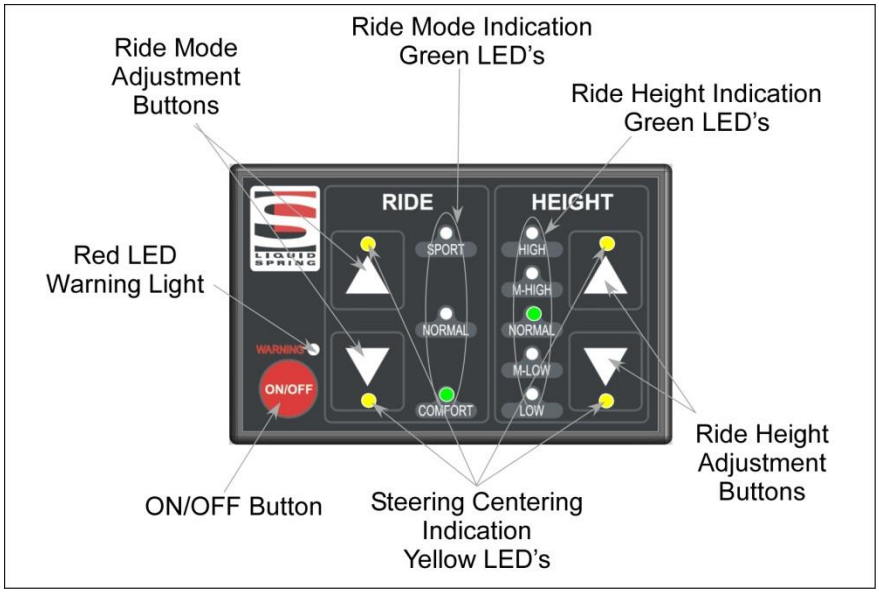


Figure 66. ECU disconnects prior to welding on chassis.

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 27

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.

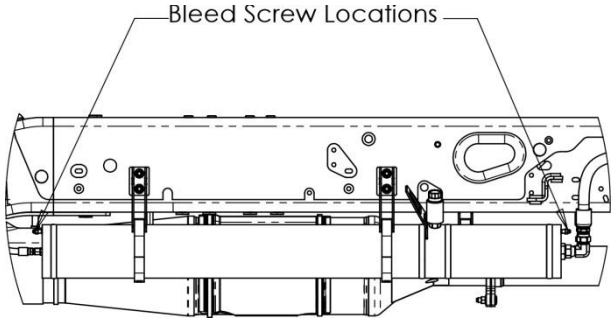


Figure 71. Bleed screw locations.

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.

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 cannot 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

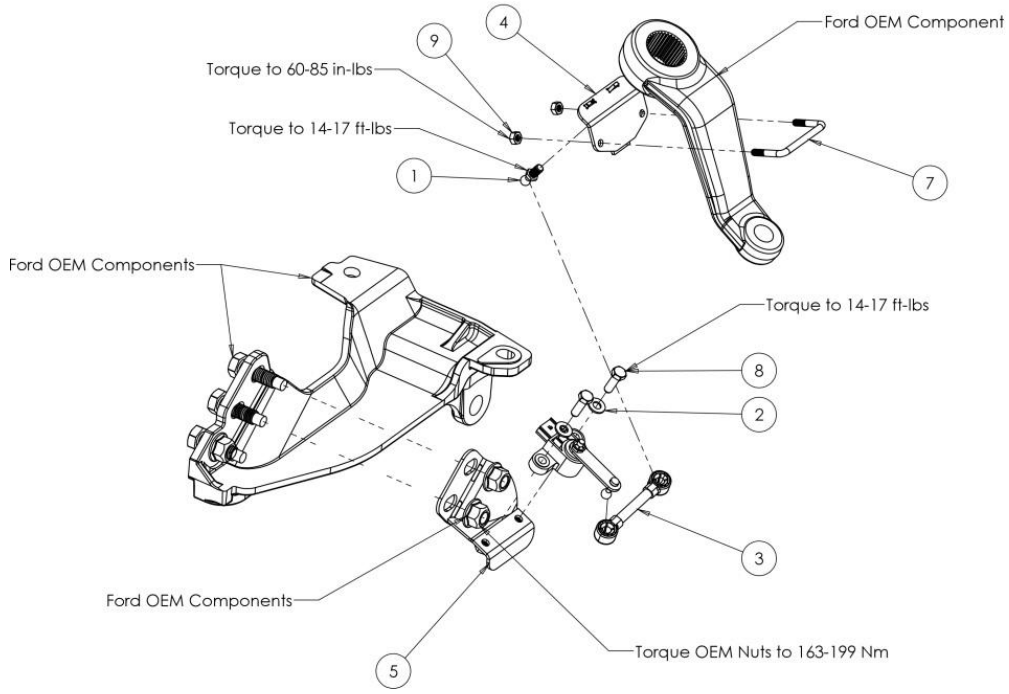
Parts List Information

Abbreviations

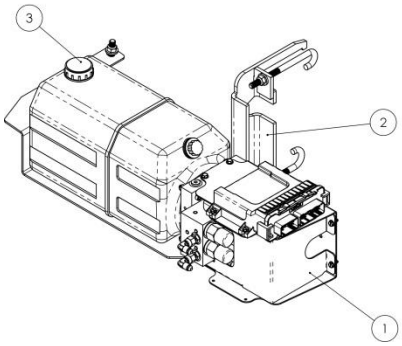
HCS	Hex Cap Screw	HTCN	Hex Thin Castle Nut
HFB	Hex Flange Bolt	HFW	Hardened Flat Washer
SHCS	Socket Head Cap Screw	SLW	Spring Lock Washer
SFHS	Serrated Flange Hex Screw	SAE	SAE O-Ring Fitting
HN	Hex Nut, Non-locking	37°	SAE or JIC 37° Flare Fitting
LHN	Locking Hex Nut	LH	Left Handed Part
LFN	Locking Flange Nut	RH	Right Handed Part
CHN	Castle Hex Nut		

Part Identification

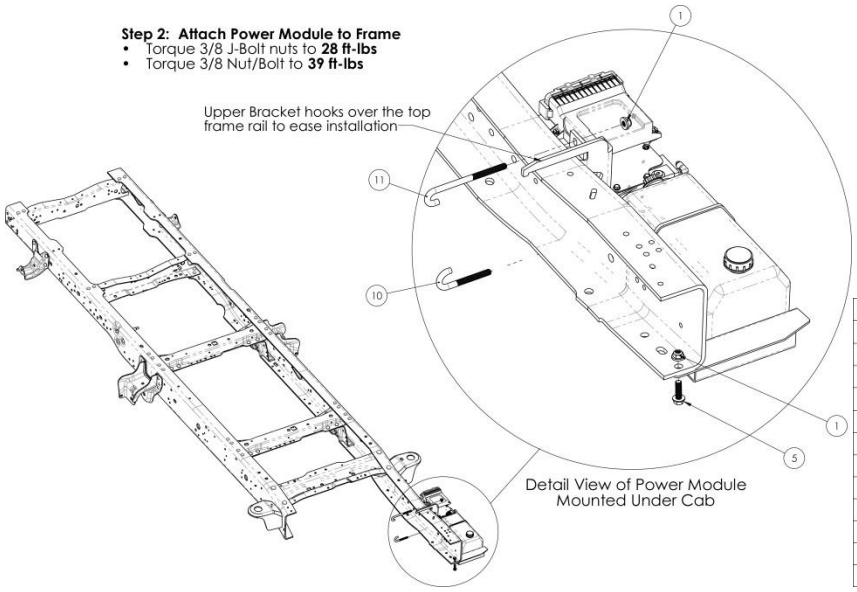
Steering Sensor Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	1	10591-001	Ball Stud, 10mm x 5/16-18
2	2	10006-011	HFW 5/16 .688 x .344 x .065 Z
3	1	10587-002	Asy, Linkage
4	1	10733-001	Wldmnt, Steering Linkage Mount
5	1	10741-001	Wldmnt, Steering Sensor
6	1	10586-002	Asy, Steering Sensor
7	1	10669-002	U-Bolt, 1/4-20 x 2.438 x 1.438 Gr 2 SQ
8	2	10238-002	HCS .313-18x1, Gr. 8, Zinc
9	2	10004-024	LHN 1/4-20, Gr. 2, Z CntrLck



Power Module Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	1	10941-008	Asy, Power Module, DS120F-A
2	1	11111	Kit, Power Module Mounting
3	1	10614-001	Cap, Filler/Breather

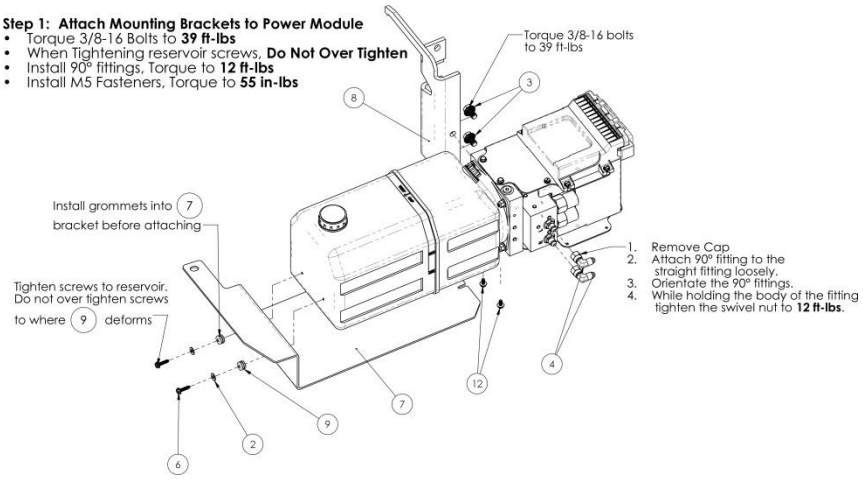


Step 2: Attach Power Module to Frame
- Torque 3/8 J-Bolt nuts to **28 ft-lbs**
- Torque 3/8 Nut/Bolt to **39 ft-lbs**

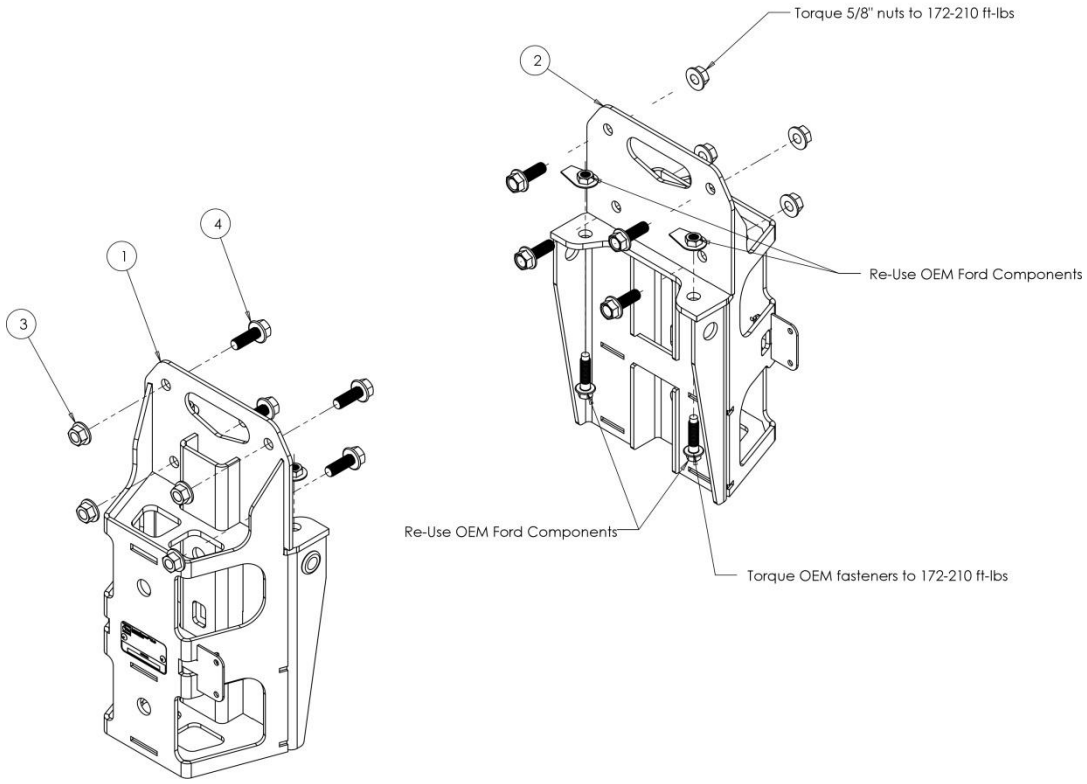


ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	3	10012-011	LFN 3/8-16, Gr. G, Z, Nylon Top
2	2	10088-001	FW #10, Zinc
3	2	10252-003	SFHS 3/8-16 x .625, Gr 8.2, Z
4	2	10322-021	Hyd Fit 90, -4 37 x -4 37 F
5	1	10501-002	HFB 3/8-16 x 1.250, Gr 8, BO
6	2	10510-002	STS #10-16 x .750, Z, Hex Head
7	1	10798-014	Power Module Reservoir Mount
8	1	10799-014	Wldmnt, Power Mod Manifold Mount
9	2	10805-004	Grommet, .19 ID x .56 OD x .375 T
10	1	10865-003	J-Bolt, 3/8-16 x 4"L, Z
11	1	10865-004	J-Bolt, 3/8-16 x 6"L, Z
12	2	11207-001	HFB M5-0.8X10 CL 10.9 BO

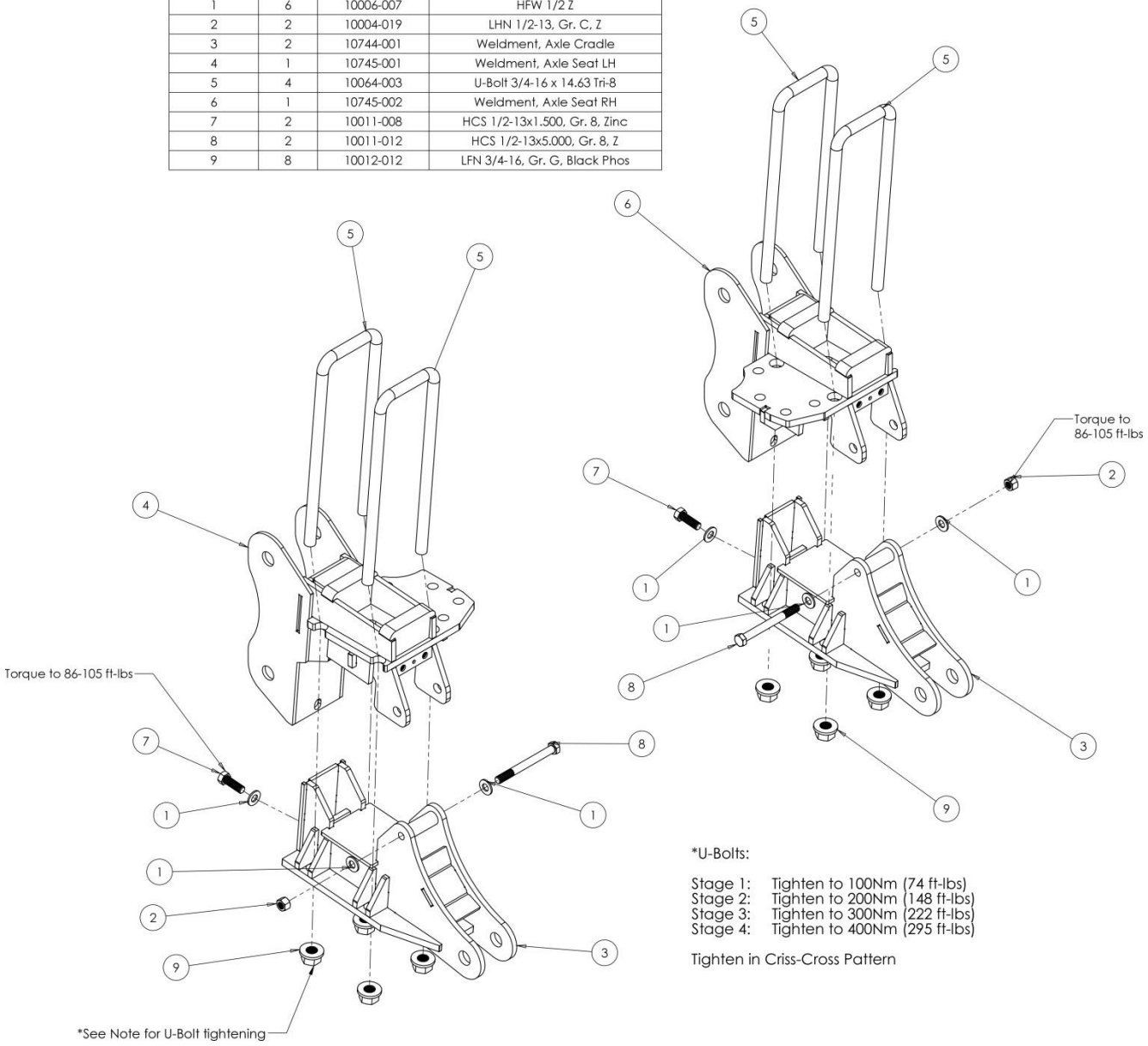
Step 1: Attach Mounting Brackets to Power Module
- Torque 3/8-16 Bolts to **39 ft-lbs**
- When Tightening reservoir screws, **Do Not Over Tighten**
- Install 90° fittings, Torque to **12 ft-lbs**
- Install M5 Fasteners, Torque to **55 in-lbs**



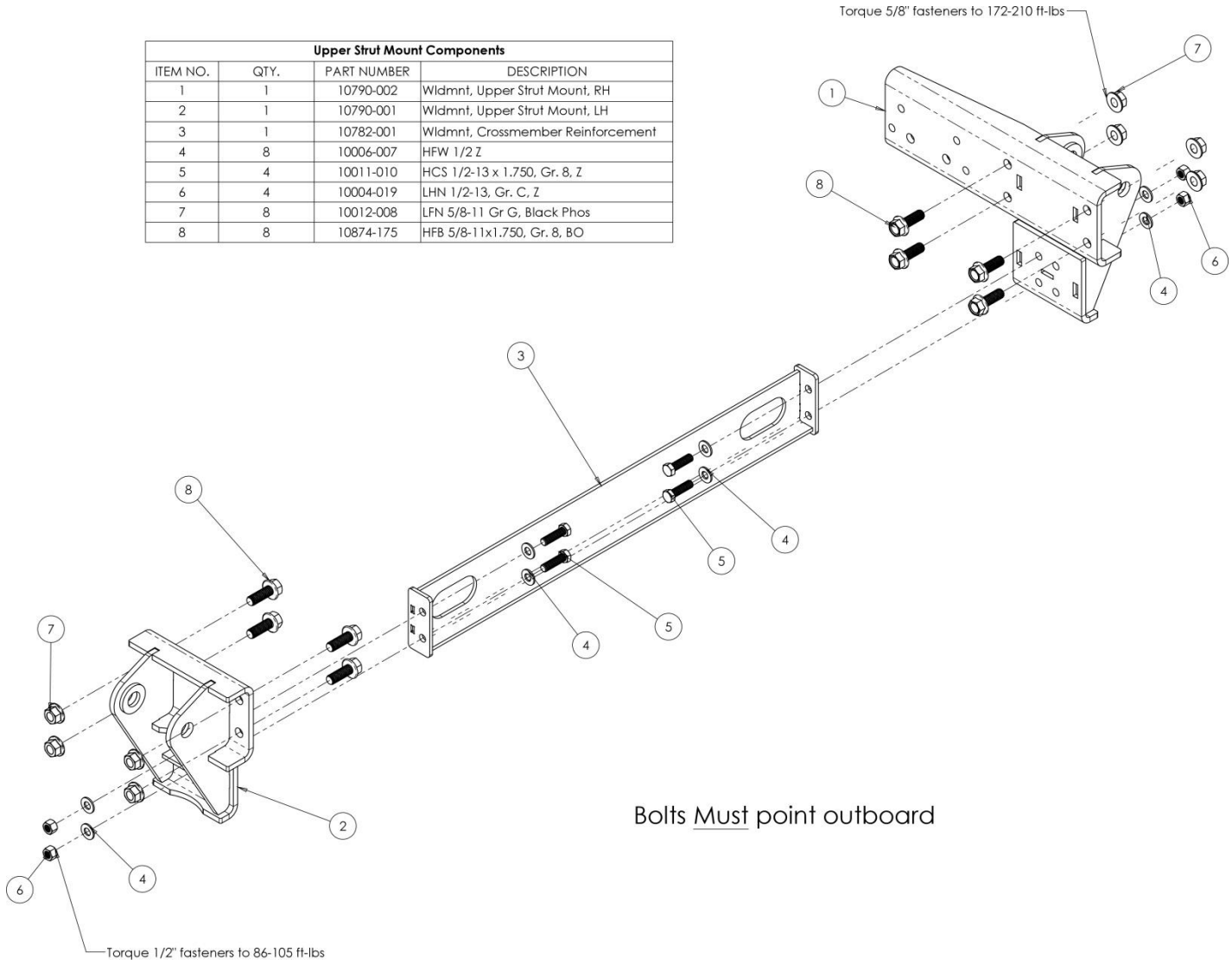
Front Hanger Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	1	10730-001	Asy, Front Hanger, LH
2	1	10729-002	Wldmnt, Front Hanger, RH
3	8	10012-008	LFN 5/8-11 Gr G, Black Phos
4	8	10874-175	HFB 5/8-11x1.750, Gr. 8, BO



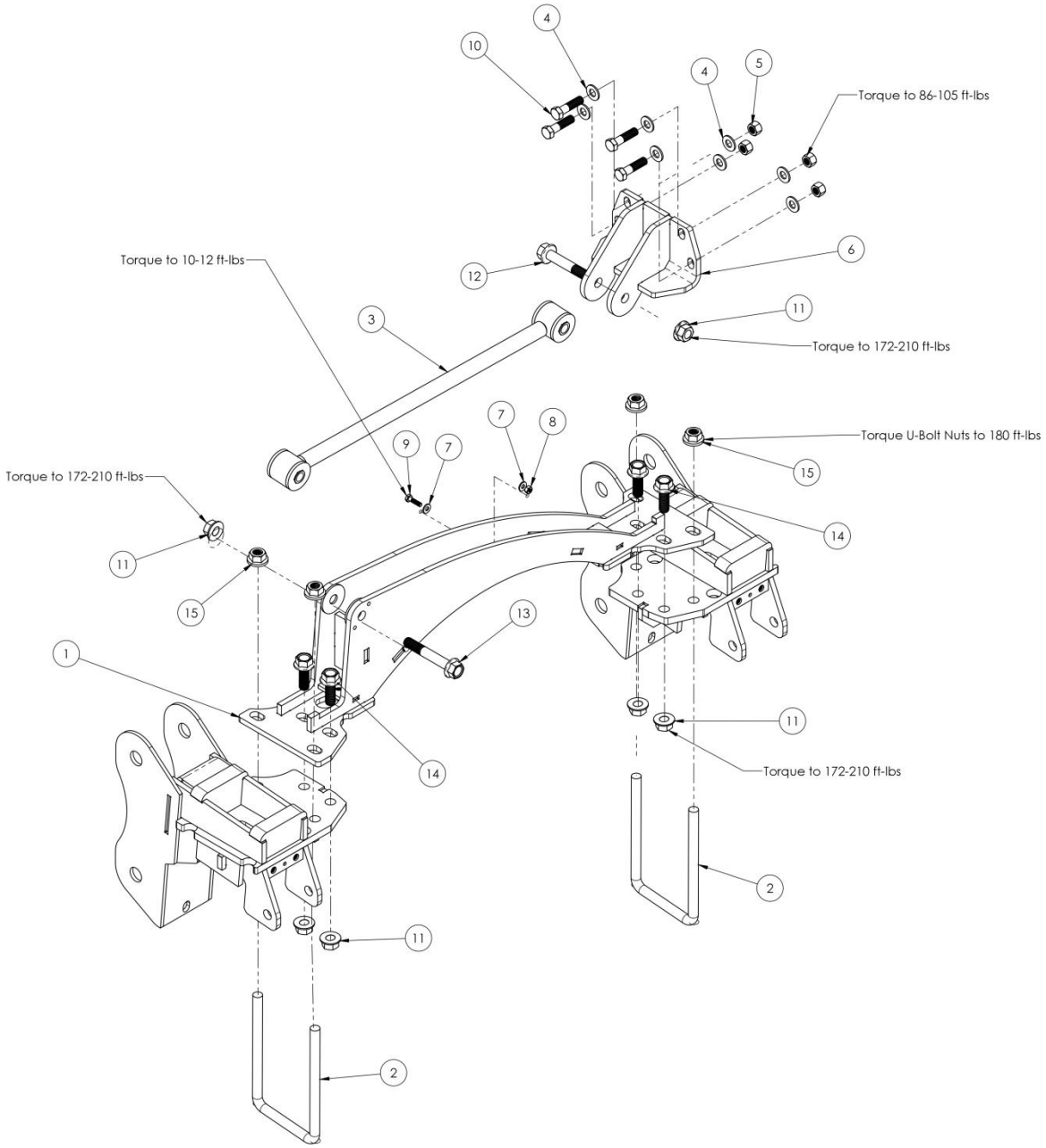
Axle Clamp Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	6	10006-007	HFW 1/2 Z
2	2	10004-019	LHN 1/2-13, Gr. C, Z
3	2	10744-001	Weldment, Axle Cradle
4	1	10745-001	Weldment, Axle Seat LH
5	4	10064-003	U-Bolt 3/4-16 x 14.63 Tri-8
6	1	10745-002	Weldment, Axle Seat RH
7	2	10011-008	HCS 1/2-13x1.500, Gr. 8, Zinc
8	2	10011-012	HCS 1/2-13x5.000, Gr. 8, Z
9	8	10012-012	LFN 3/4-16, Gr. G, Black Phos



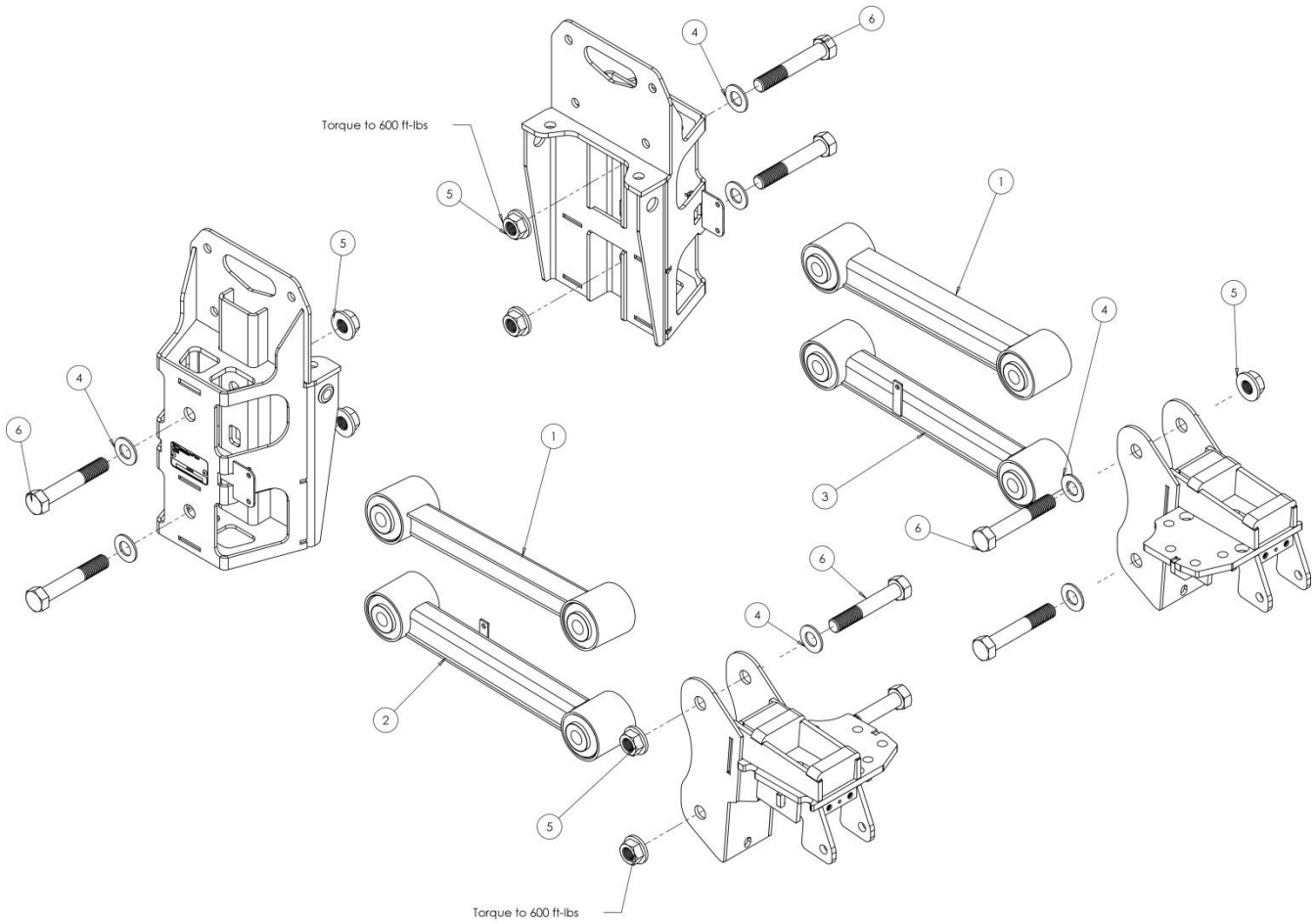
Upper Strut Mount Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	1	10790-002	Wldmnt, Upper Strut Mount, RH
2	1	10790-001	Wldmnt, Upper Strut Mount, LH
3	1	10782-001	Wldmnt, Crossmember Reinforcement
4	8	10006-007	HFW 1/2 Z
5	4	10011-010	HCS 1/2-13 x 1.750, Gr. 8, Z
6	4	10004-019	LHN 1/2-13, Gr. C, Z
7	8	10012-008	LFN 5/8-11 Gr G, Black Phos
8	8	10874-175	HFB 5/8-11x1.750, Gr. 8, BO

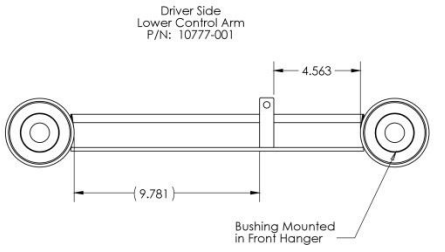


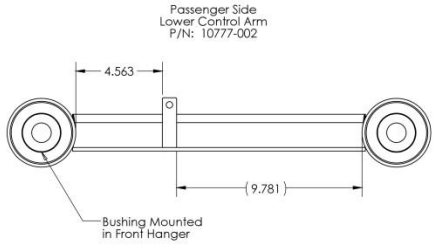
Bridge Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	1	10762-001	Weldment, Bridge
2	2	10064-002	U-Bolt, 5/8-18 x 8.5 x 8.0, Slanted
3	1	10786-001	Asy, Track Rod
4	8	10006-007	HFW 1/2 Z
5	4	10004-019	LHN 1/2-13, Gr. C, Z
6	1	10789-001	Wldmnt, Track Rod Mnt
7	2	10006-009	HFW 1/4, .625x.281x.064, Z
8	1	10004-013	LHN .250-20, Gr. C, Zinc
9	1	10210-004	HCS 1/4-20x1.000 Gr. 8, Z
10	4	10011-013	HCS 1/2-13x2.000, Gr. 8, Z
11	6	10012-008	LFN 5/8-11 Gr G, Black Phos
12	1	10874-375	HFB 5/8-11x3.750, Gr. 8, BO
13	1	10874-400	HFB 5/8-11x4.00, Gr. 8, BO
14	4	10874-175	HFB 5/8-11x1.750, Gr. 8, BO
15	4	10012-013	LFN 5/8-18, Gr. G, Black Phos



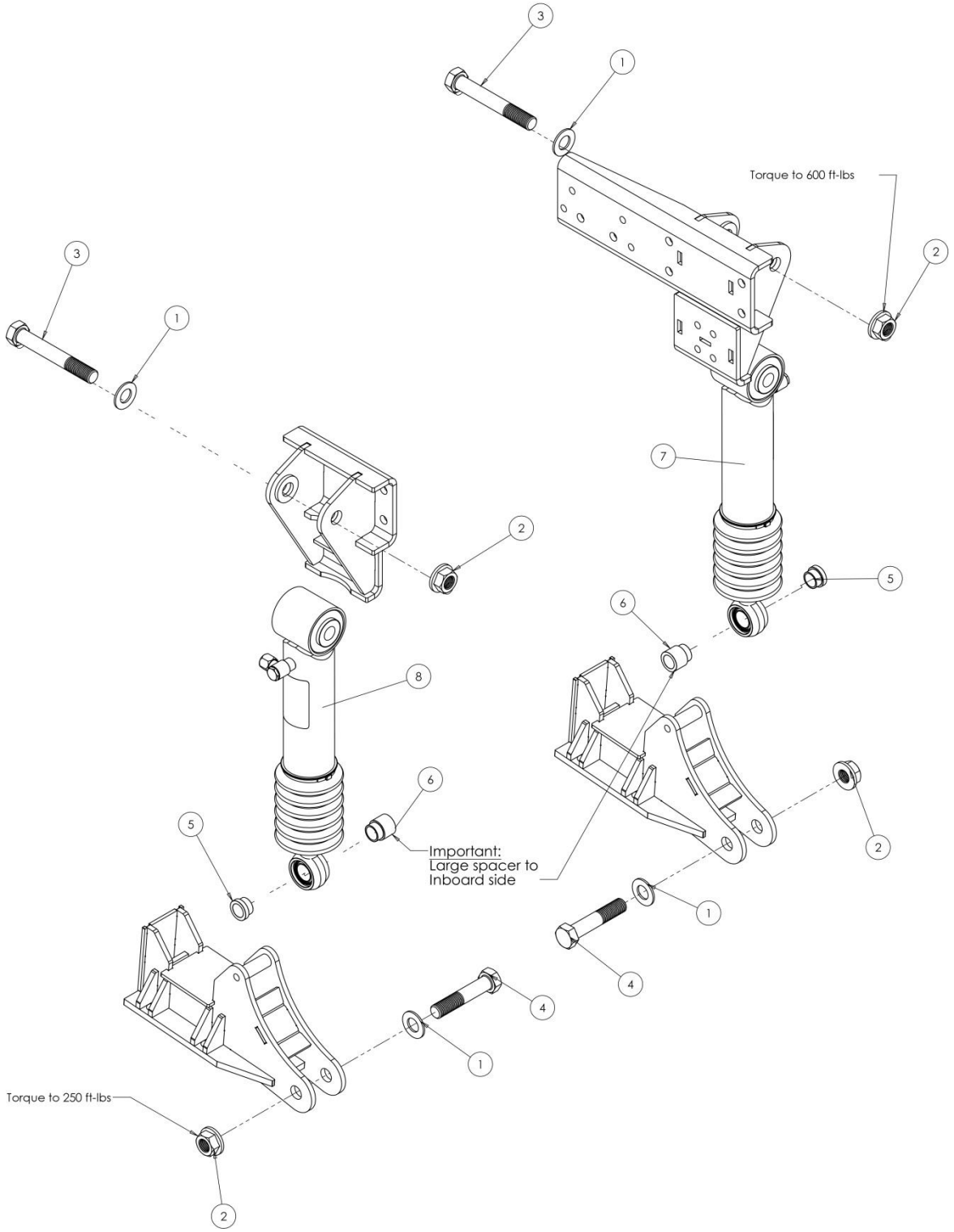
Control Arm Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	2	10777-003	Asy, Control Arm, Upper
2	1	10777-001	Asy, Control Arm, LH, Lower
3	1	10777-002	Asy, Control Arm, RH, Lower
4	8	10006-004	HFW 1.000, Zinc
5	8	10012-003	LFN 1-8, Gr G, Z Top Lock
6	8	10003-003	HB 1.000-8x6.000, Gr. 8, Zinc



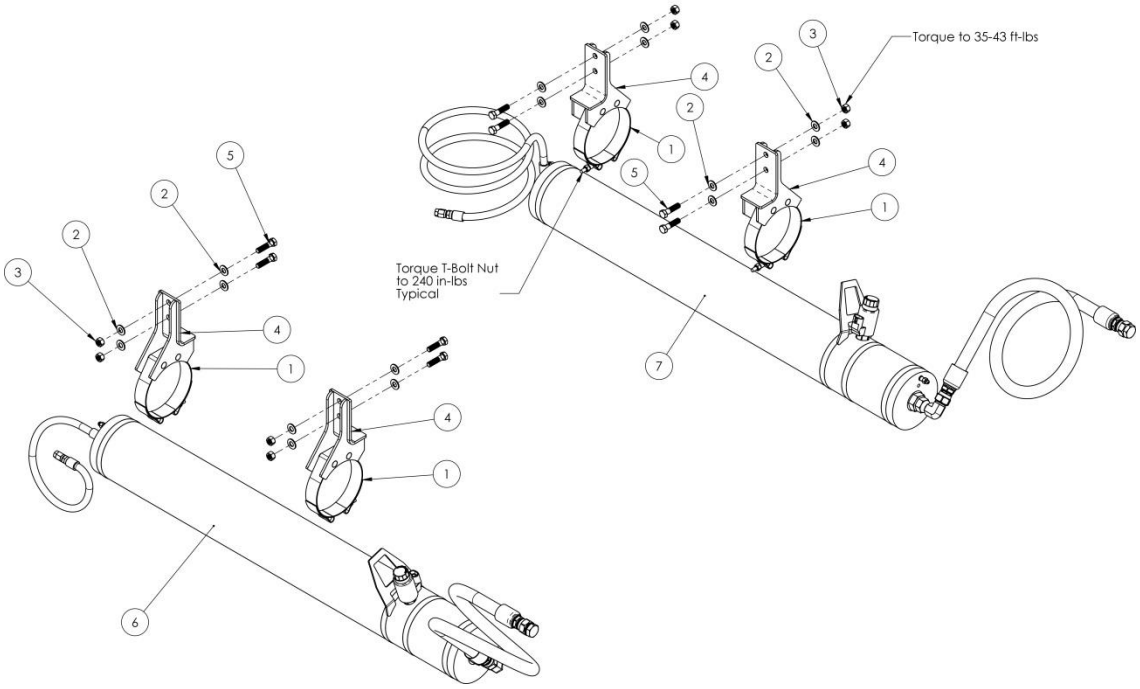




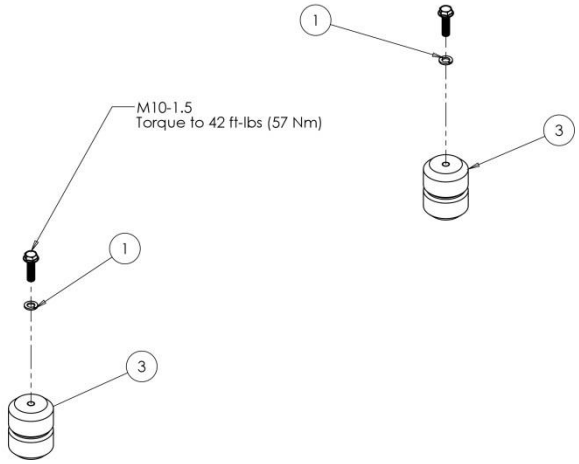
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	4	10006-004	HFW 1.000, Zinc
2	4	10012-003	LFN 1-8, Gr G, Z Top Lock
3	2	10003-006	HCS 1.000-8 x 7.000, Gr. 8, ZY
4	2	10003-008	HCS 1-8 x 5.000, Gr 8, Z
5	2	10640-002	Bearing Spacer, 1.25 x 1.02 x .318
6	2	10640-003	Bearing Spacer, 1.25 x 1.02 x 1.068
7	1	10877-001	Asy Strut 2.75ID x 3.50 OD x 1.375
8	1	10877-002	Asy Strut 2.75ID x 3.50 OD x 1.375



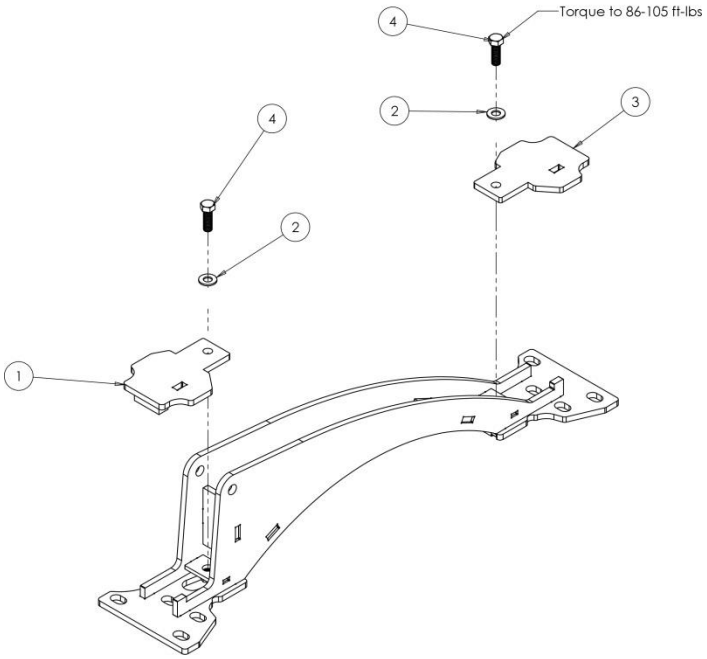
Secondary Volume Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	4	10843-003	T-Bolt Clamp, Range 4.88-5.5
2	16	10006-010	HFW 3/8 .813x.406x.065, Z
3	8	10004-016	LHN 3/8-16, Gr. 8, Z
4	4	10830-013	Wldmnt, Volume Mount, Bolt-on
5	8	10461-005	HCS 3/8-16x1.500, Gr 8, Z
6	1	10597-011	Asy, 2nd Vol 50 x 374, LH
7	1	10597-012	Asy, 2nd Vol 50 x 374, RH



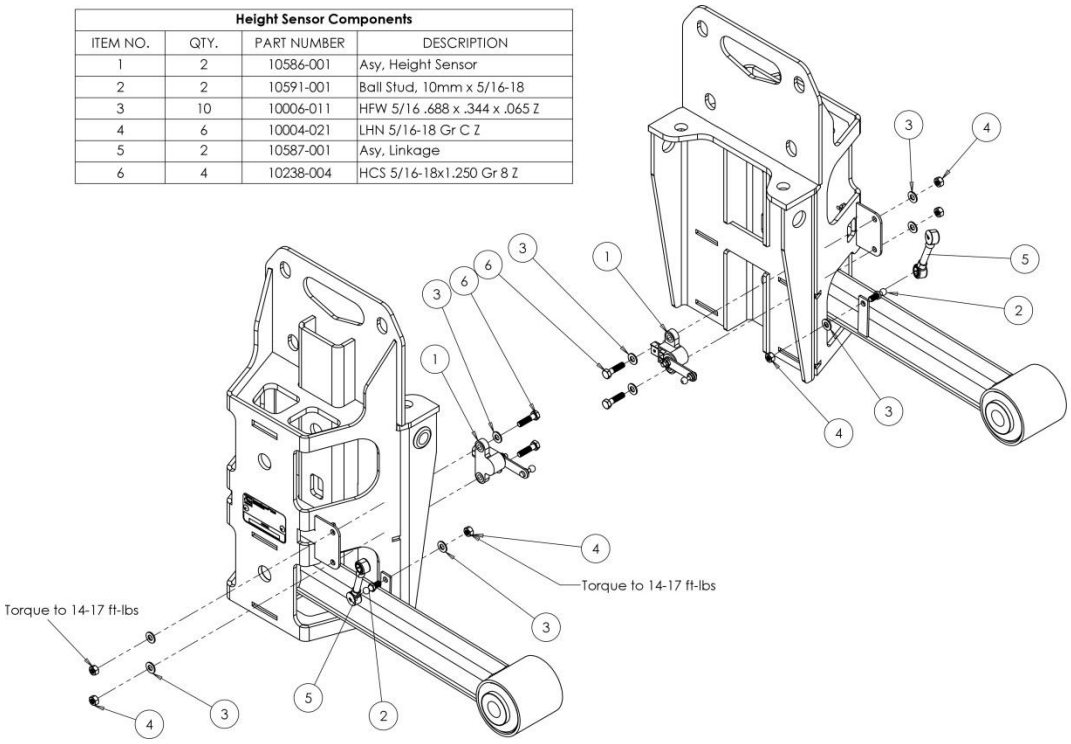
Jounce Bumper Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	2	10871-001	SLW M10, Z
2	2	10502-004	HFB M10-1.5 x 35 CL 10.9 Z
3	2	10867-003	Jounce Bumper, 2.375"Dia x 3.00"T



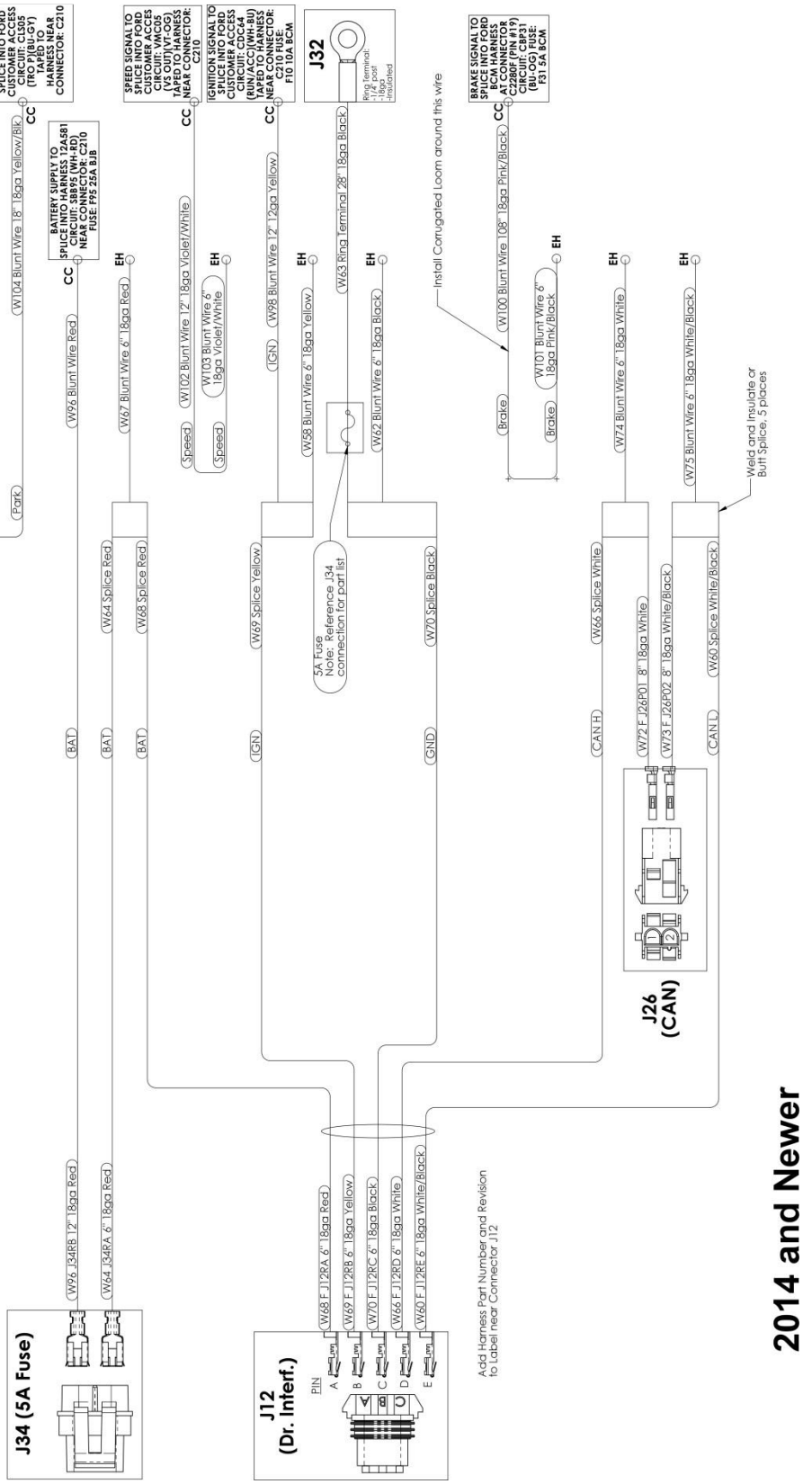
Bumper Pad Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	1	10772-001	Wldmnt, Bumper Pad, LH
2	2	10006-007	HFW 1/2 Z
3	1	10772-002	Wldmnt, Bumper Pad, RH
4	2	10011-008	HCS 1/2-13x1.500, Gr. 8, Zinc

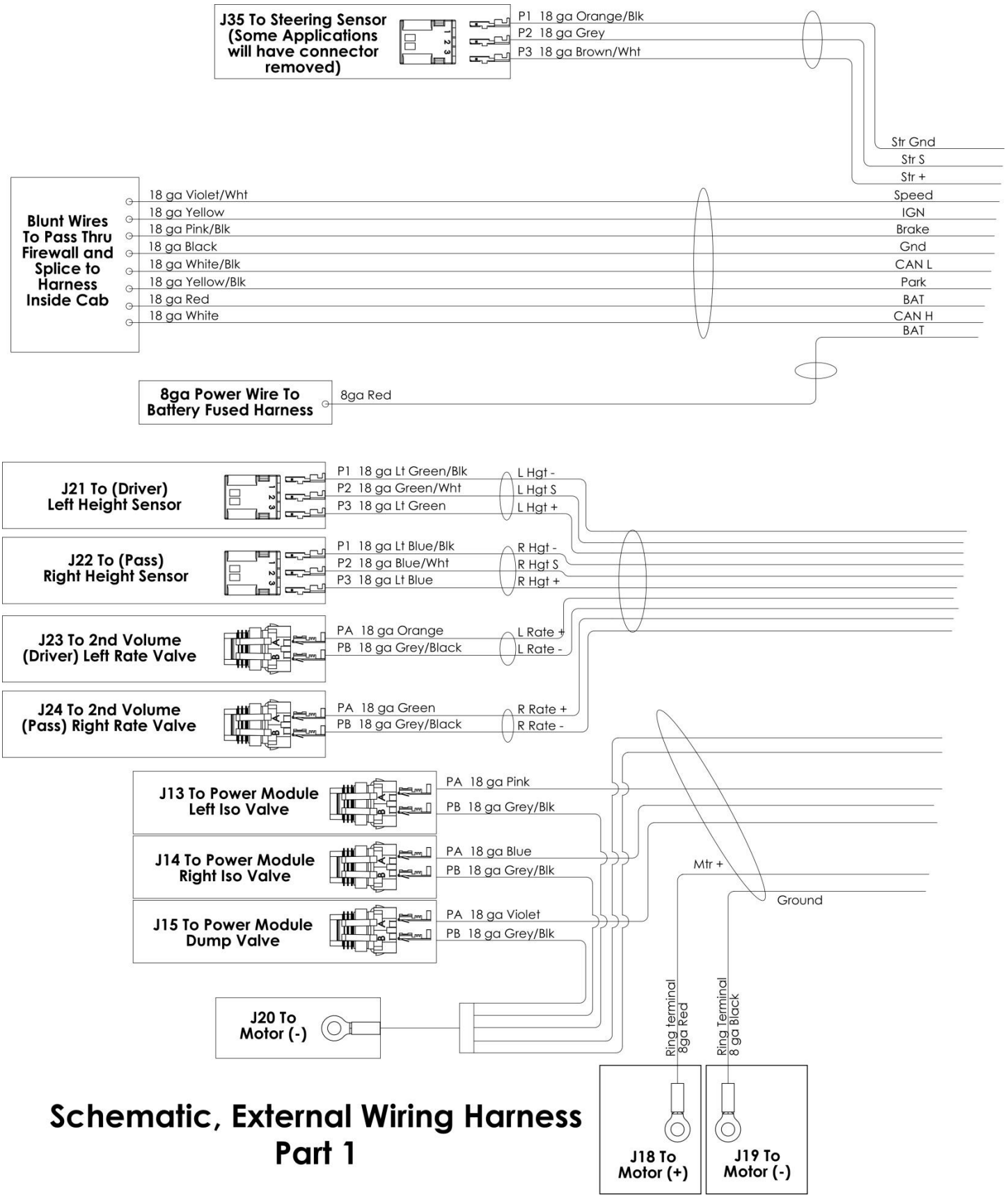


Height Sensor Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	2	10586-001	Asy, Height Sensor
2	2	10591-001	Ball Stud, 10mm x 5/16-18
3	10	10006-011	HFW 5/16 .688 x .344 x .065 Z
4	6	10004-021	LHN 5/16-18 Gr C Z
5	2	10587-001	Asy, Linkage
6	4	10238-004	HCS 5/16-18x1.250 Gr 8 Z

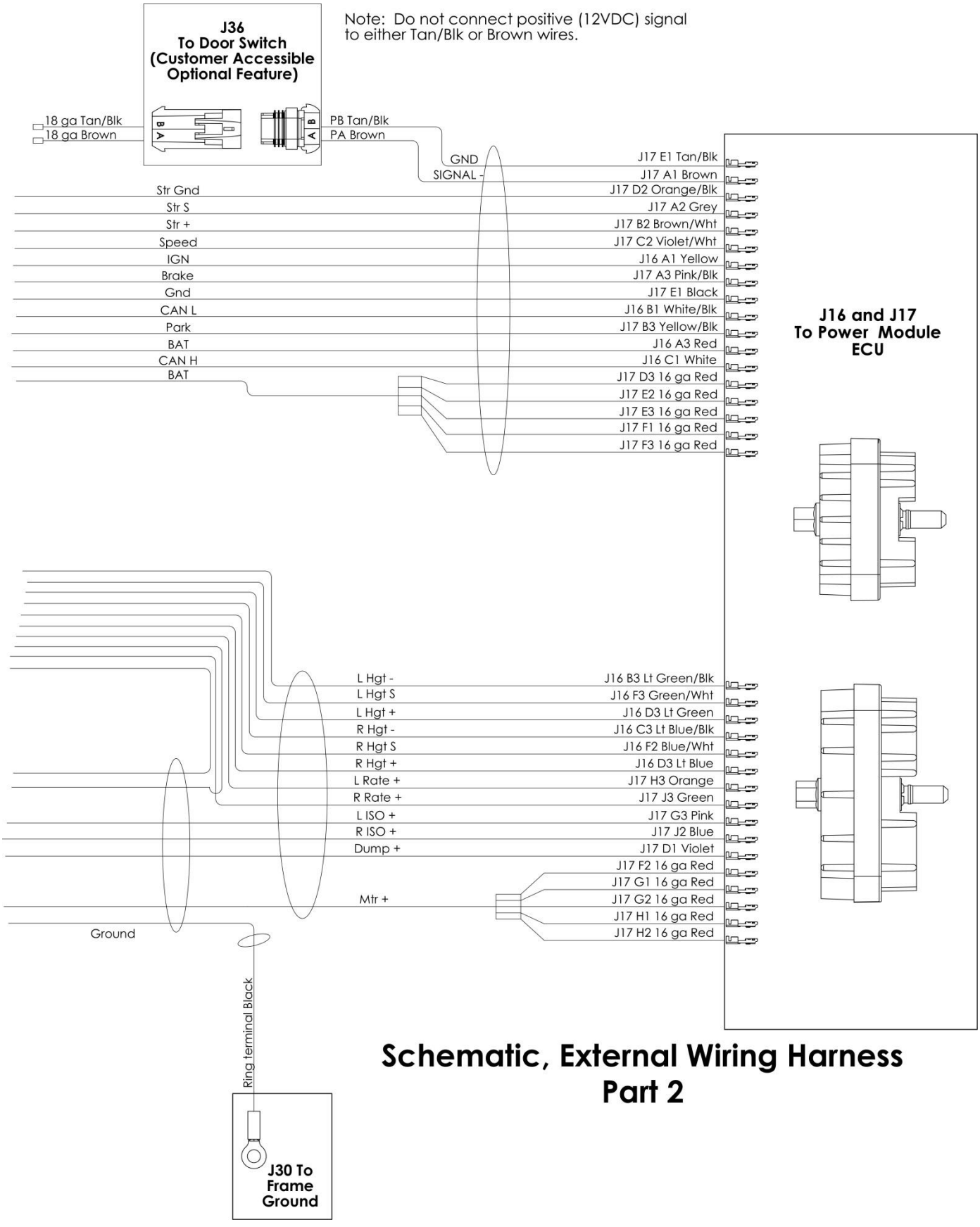


Electrical Schematics





Schematic, External Wiring Harness Part 1



Schematic, External Wiring Harness Part 2

Appendix A: Frame Drilling Locations

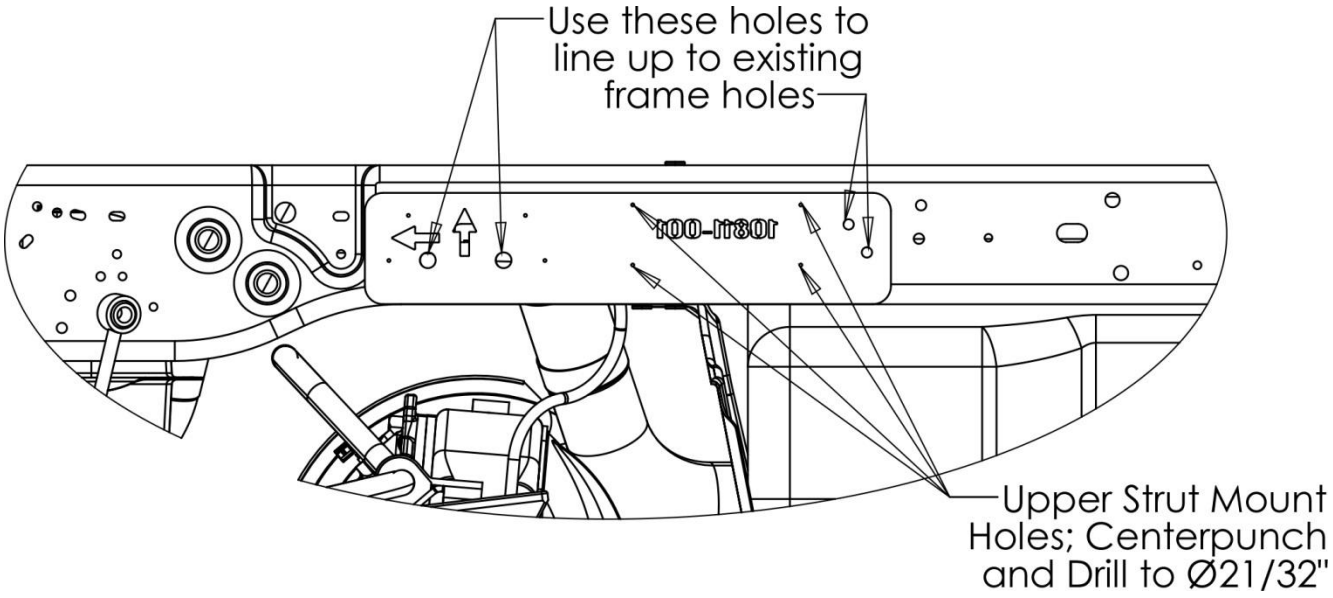


Figure A1: Driver side template location for upper strut mount frame drilling.

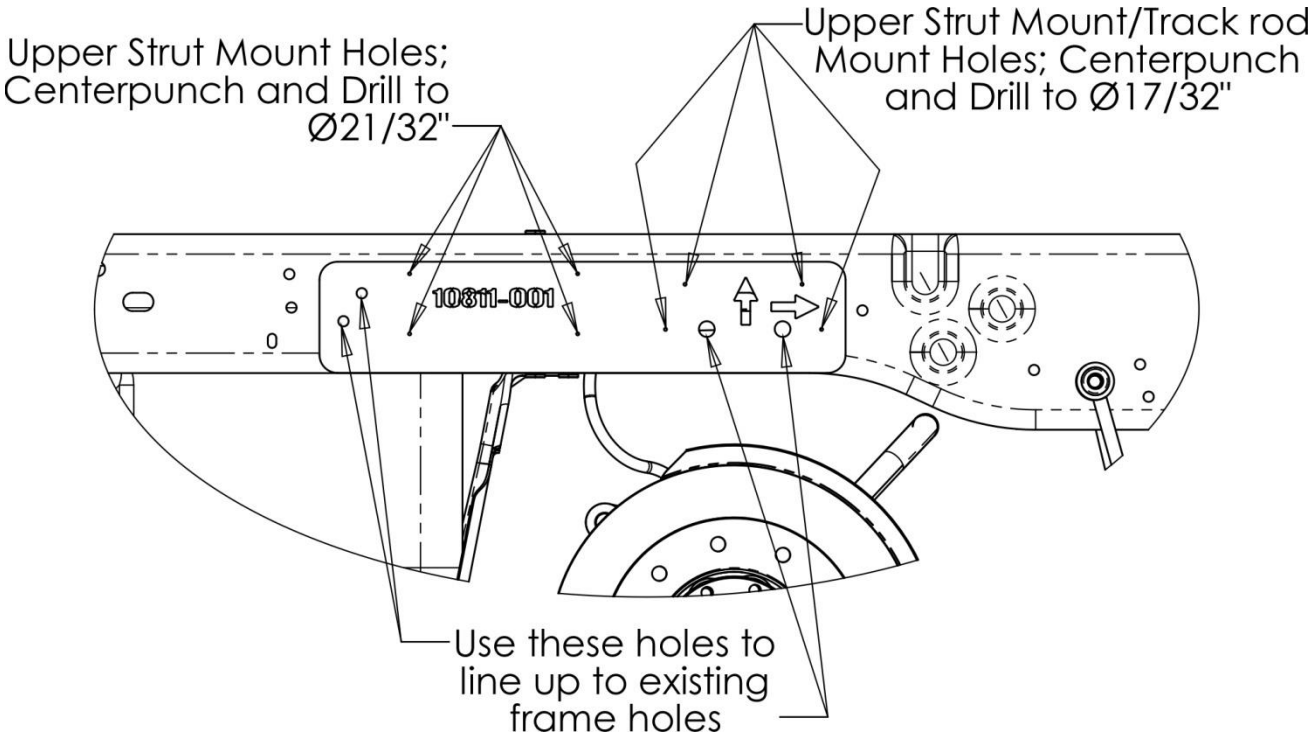


Figure A2: Passenger side template location for upper strut mount and track rod frame mount frame drilling.

LiquidSpring™ LLC
4899 E 400 S
Lafayette, IN 47905

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

Information contained in this publication is subject to change without notice or liability. LiquidSpring LLC reserves the right to revise the information presented or discontinue the production of parts described at any time.