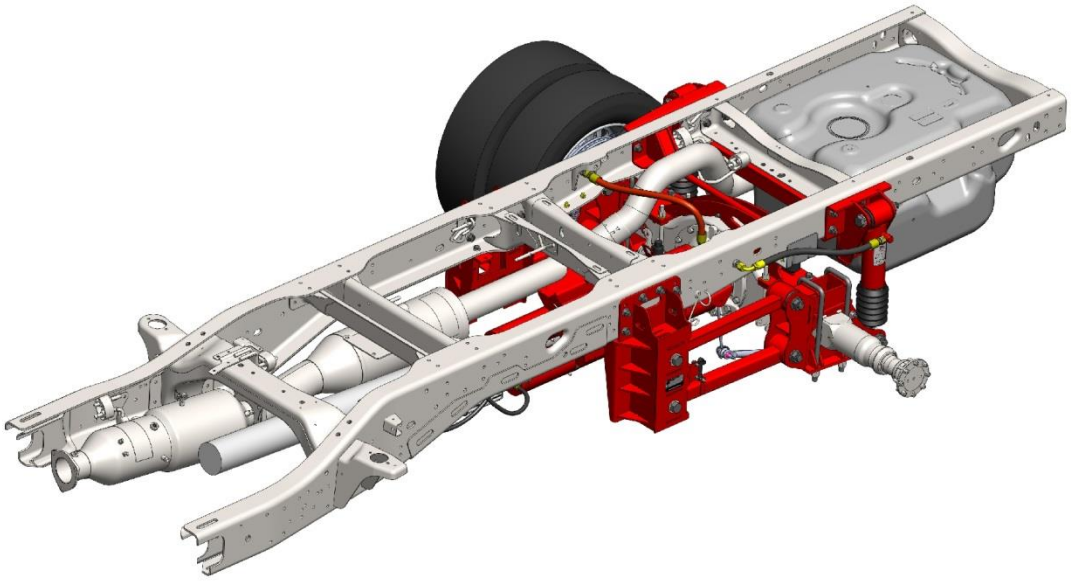
DS120R-DS135R

DS120R
DS135R

Rear Axle Suspension System
for Ram 4500/5500 Cab Chassis
based Ambulance, Transit Bus
and Limo



LIQUIDSPRING™ LLC

Installation / Maintenance Manual

D10906 Rev AK 12/18

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Introduction

This manual provides installation information for the LiquidSpring CLASS® DS120R/DS135R series of rear axle suspension systems for the Ram 4500/5500 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 indicated. 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.

These instructions cover the following models:

Model	Application
DS120R-A	2014 and newer 4500 Cab Chassis
DS120R-A12	2012 and prior 4500 Cab Chassis
DS120R-A13	2013 4500 Cab Chassis
DS120R-AF	2014 and newer 4500 Cab Chassis
DS120R-ALA	2014 and newer 4500 Cab Chassis
DS135R-B	2014 and newer 5500 Cab Chassis
DS135R-B13	2013 5500 Cab Chassis
DS135R-AF	2014 and newer 5500 Cab Chassis

Instructions pertaining to a specific model will be indicated.

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

Model	Suspension Rating
DS120R-A, DS120R-A12, DS120R-AF, DS120R-ALA, DS120R-A13	**12,000 lbs**
DS135R-B, DS135R-B13, DS135R-AF	**13,500 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.

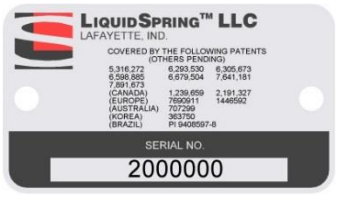


Figure 1. Suspension Identification

Figure 2. Serial Number Tag Location

Vehicle Towing and Jacking Information

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

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.

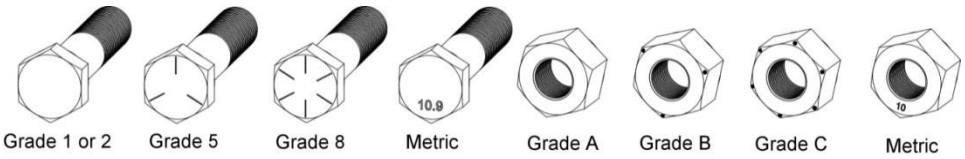


Figure 3. Identification of fastener grades.

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 in-lbs	1-2
Bridge Mount Nuts	5/8-11	C	172-210	233-285
Bridge U-Bolt Flange Nuts	5/8-18	G	180	244
Bridge, Brake Line Securing Nut	5/16-18	C	20-24	27-33
Bulkhead Fitting Jam Nut	7/8-14	N/A	85	115
Control Arm Flange Nuts	1-8	G	600	813
Cross Member Reinforcement Nuts	1/2-13	C	86-105	117-142
Hanger Mount Nuts	1/2-13	G	86-105	117-142
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 in-lbs	4-7
Hose Connections, -4	7/16-20	N/A	12 in-lbs	1
Jounce Bumper to Mount Plate [2013 and newer]	3/8-16	8	35	47
Jounce Stop Bolt	M10-1.5	10.9	42	57
Parking Brake Relocation Bracket Fasteners	5/16-18	C	20-24	27-33
Power Module Manifold Bracket Screws	3/8-16	8	39	53
Power Module Mount Nuts	M10-1.5	10.9	43-53	47-58
Power Module Reservoir Support Screws	#10-16	N/A	Snug Only	
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
Sway Bar Mount to Frame [2012 and prior models]	M10-1.5	10.9	43-53	47-58
Sway Bar to Mount [2012 and prior models]	M12-1.75	10.9	76	103
Track Rod Frame Mount Nuts	5/8-11	C	172-210	233-285
Track Rod Nuts	5/8-11	C	172-210	233-285
Upper Strut Mount Bracket Nuts	5/8-11	C	172-210	233-285
Upper Strut Mount Bracket Nuts	1/2-13	G	86-105	117-142
Upper Strut Mount to Track Rod Mount	3/8-16	G	35-43	47-58
Volume Mount Clamps	5/16-24	N/A	240 in-lbs	27
Volume Mount to Frame Fasteners	M10-1.5	10.9	43-53	47-58
Volume Mount to Hanger Nuts	1/2-13	C	86-105	116-142

Hydraulic Fitting Assembly

SAE O-Ring Adjustable Fittings

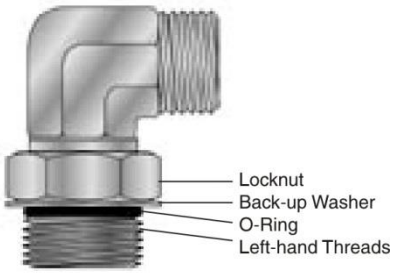


Figure 4. Adjustable SAE fitting

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.

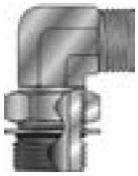


Figure 5. Locknut completely backed off.

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. Remove the OEM Axle Stop Bumpers from under the frame.
8. Lockout the parking brake cable.
9. Loosen the cable adjuster nut (#1 in Figure 6). Marking the location of the nut prior to loosening will aid in later adjustment.

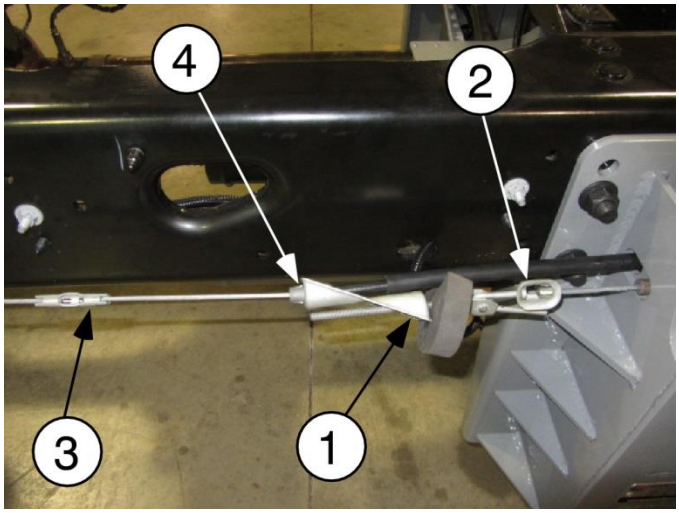


Figure 6. Releasing the parking brake cable tension.

10. Unhook the driver side Parking Brake Cable from the connector (#2 in Figure 6).
11. Compress tabs on the cable end fitting on the park brake cable to the frame mount bracket, then pull the cable through the bracket.
12. Disconnect the passenger side parking brake cable from the intermediate connector (#3 in Figure 6).
13. Compress tabs on the cable end fitting on the park brake cable to the equalizer (#4 in Figure 6), then pull the cable through the equalizer and frame mount bracket.
14. Remove the driver side Parking Brake Cable wire form brackets and position the cable and conduit aside.
15. Remove the passenger side Parking Brake Cable wire form brackets from the driver side frame rail and position the cable and conduit aside.
16. Remove the forward leaf hanger, rear leaf shackle and hanger brackets.

IMPORTANT: Some Ram models, such as the 84" CA chassis, are not equipped with a rear sway bar from the factory.

17. **[2012 and Prior Only].** If equipped, disconnect the upper sway bar link connection to the frame. Retain fasteners.
18. Remove the front and rear overload pads. Note: The overload pad casting on 2012 and prior models includes the upper sway bar linkage mounts.

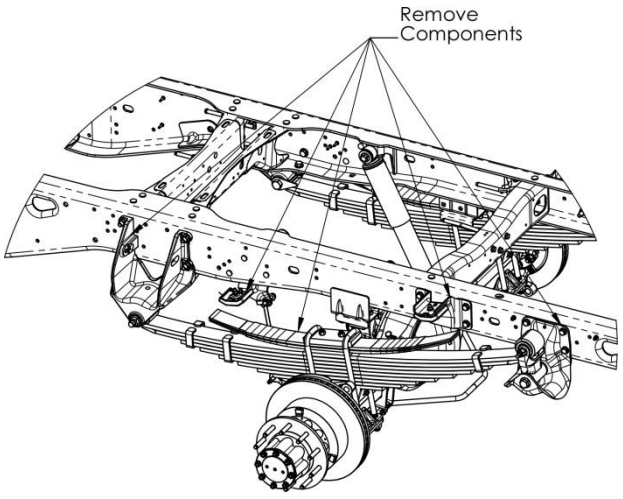


Figure 7. Components to remove.

IMPORTANT: On 2013 and newer models, do not disconnect the sway bar from the frame, if equipped. On both models, do not disconnect the sway bar from the axle, if equipped.

19. Disconnect and remove the plastic hardline retainer, as shown in Figure 8.

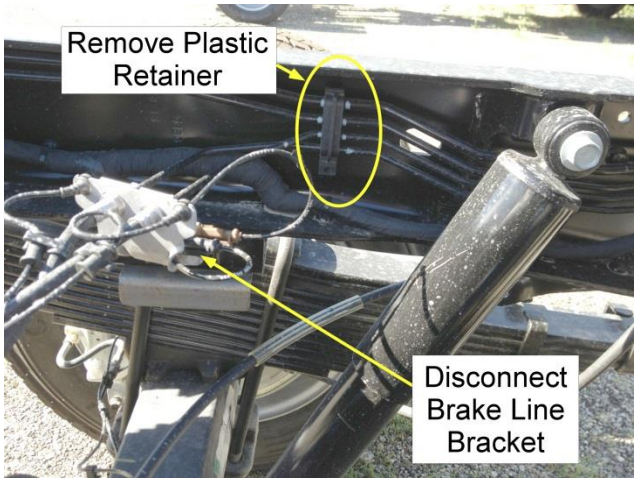


Figure 8. Brake line bracket location.

20. Disconnect the brake line bracket, as shown in Figure 8. Retain mounting hardware.
21. Locate the drilling template and place it along the driver side frame as shown in Figure 9 and Appendix A, Figure A1. Note: Make sure template top is level with top of frame.

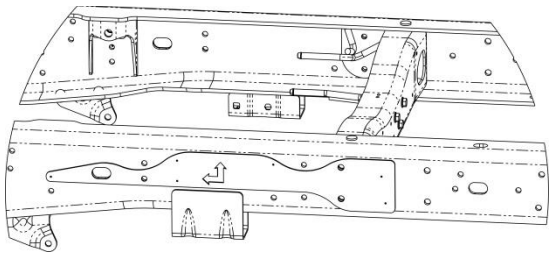


Figure 9. Location of Drilling Template on Driver Side Frame.

22. Center punch or mark the holes indicated in Appendix A, Figure A1.
23. Remove the template and drill the marked holes to Ø21/32”
24. **[2013 and later models only].** Remove passenger side jounce bumper mount by cutting off mounts and grinding welds smooth.

> CAUTION: Do not cut into or grind into frame. Gouging frame rail can result in weaken frame rails.

25. Place the template along the passenger side frame as shown in Figure 10 and Appendix A, Figure A2. [2012 and prior, refer to Appendix A, Figure A3]. Note: Make sure top of template is level with top of frame.

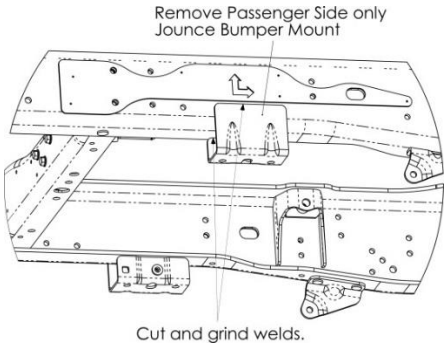


Figure 10. Location of Drilling Template on Passenger Side Frame. [2013 and later models]

26. Mark the indicated holes.
27. Remove the template and drill the rear holes to Ø21/32” and the holes directly over the axle to Ø21/32.
28. Drill the bulkhead fitting holes to Ø7/8”.
29. **[2013 and later models only].** Locate indicated hole in Appendix A, Figure A2 to ream out to Ø17/32”. Ream out hole.
30. Ream out the indicated existing holes to Ø21/32”

Installation

Front Hangers

1. Locate the Front Hangers.
2. Ream out hanger holes in frame to Ø21/32” as necessary.

IMPORTANT: Follow steps 3-4 for DS120R-AF and DS135R-AF kits used on vehicles with Midship Fuel tanks.

3. Cut off the volume mounts from the driver side hanger to provide clearance to the midship fuel tanks, as shown in Figure 11.

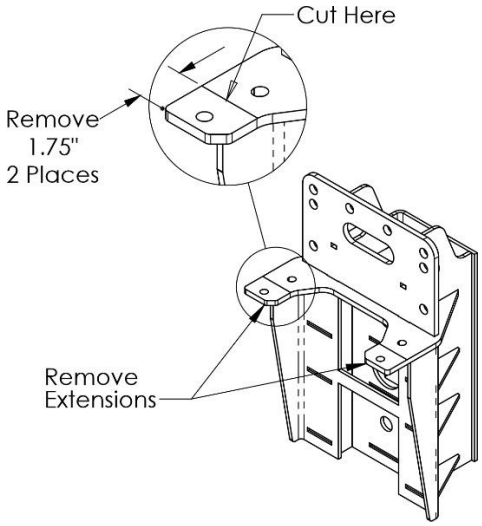


Figure 11: Modify Driver Side Front Hanger on -AF kits

4. Debur and paint exposed metal surfaces to prevent corrosion.

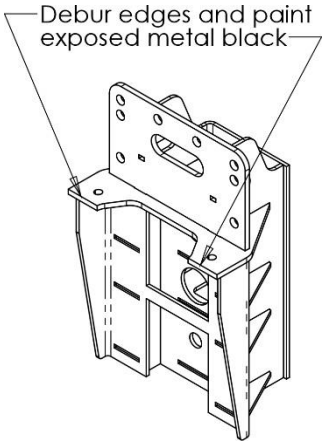


Figure 12: Modified Dr. Side Front Hanger for -AF kits

5. Install the Left Hand Front Hanger (with the serial tag) on to the driver's side of the frame, using the (6) 5/8"-11 x 1.75" Hex Flange Bolts and (6) 5/8"-11 Flange Lock Nuts.

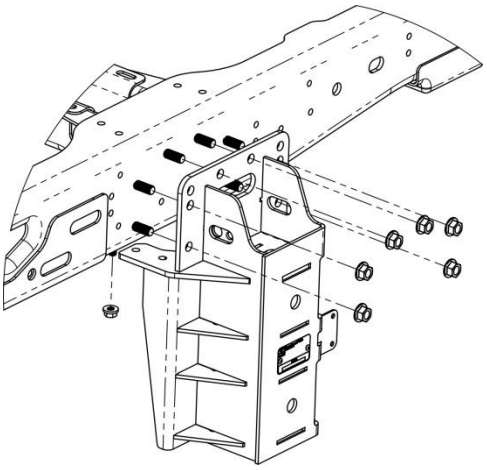


Figure 13. Installation of Front Hanger.

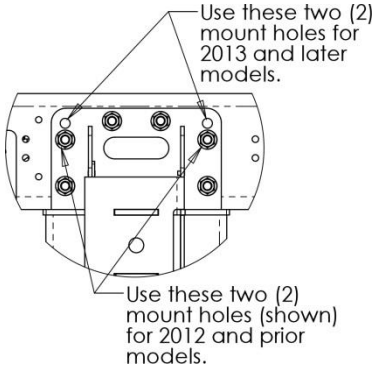


Figure 14. Installation of Front Hanger.

6. Verify that the hanger is flush to the bottom of the frame.
7. Install the (2) 1/2"-13 x 1.50" Hex Flange Bolts and (2) 1/2"-13 Locking Flange Nuts to attach the bottom of the Front Hanger to the lower frame flange. Refer to Figure 13 and Figure 14.
8. Torque 5/8"-11 nuts to **172 -- 210 ft-lbs.**
9. Torque the 1/2"-13 nuts to **86 – 105 ft-lbs.**
10. Repeat for the Right Hand Front Hanger (without the serial tag) on to the passenger side of the frame, using the (6) 5/8"-11 x 1.75" Hex Flange Bolts, (6) 5/8"-11 Flange Lock Nuts, (2) 1/2"-13 x 1.50" Hex Flange Bolts and (2) 1/2"-13 Locking Flange Nuts.
11. Torque 5/8"-11 nuts to **172 -- 210 ft-lbs.**
12. Torque the 1/2"-13 nuts to **86 – 105 ft-lbs.**

Sway Bar Frame Connection [2012 and prior only]

1. Locate the Sway Bar Link Mount, (2) M10-1.5 Locking Flange Nuts, and (2) M10-1.5 x 30 Hex Flange Bolts.
2. Install the mount to the frame where the OEM sway bar mount/overload pad was connected under the frame.
3. Torque to **43-53 ft-lbs**.
4. Reconnect the sway bar linkages reusing the original fasteners and hardware.
5. Torque to **55 ft-lbs**.
6. Repeat with other side.

Upper Strut Mounts

7. Locate the Left Hand Upper Strut Mount, Backing Plate, and Brake Relocation Bracket.
8. Loosely attach the LH Upper Strut Mount to the frame at the six (6) Ø21/32" holes previously drilled and utilizing (6) 5/8"-11 x 2.00" Hex Flange Bolts and (6) 5/8"-11 Flange Lock Nuts. Note: The Backing Plate is to be used in the two (2) rear mount holes.

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

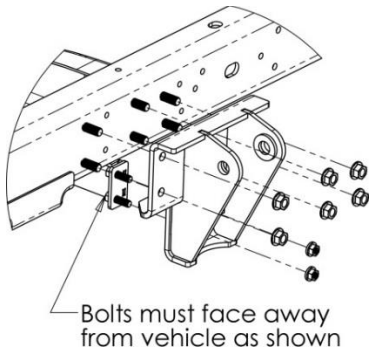


Figure 15. Installation of Left Hand Upper Strut Mount.

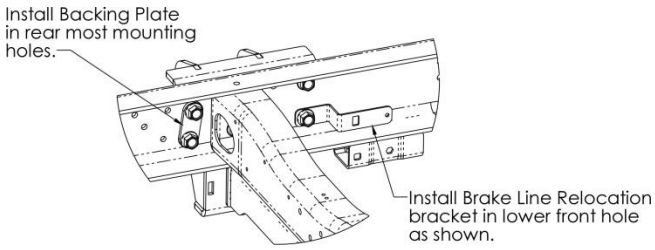


Figure 16. Location of Backing Plate.

9. Locate the Right Hand Upper Strut Mount.
10. Loosely attach the RH Upper Strut Mount to the frame at the Ø21/32" holes previously drilled and utilizing (4) 5/8"-11 x 2.00" Hex Flange Bolts and (4) 5/8"-11 Flange Lock Nuts. Note: The Backing Plate is to be used in the two (2) rear mount holes.

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

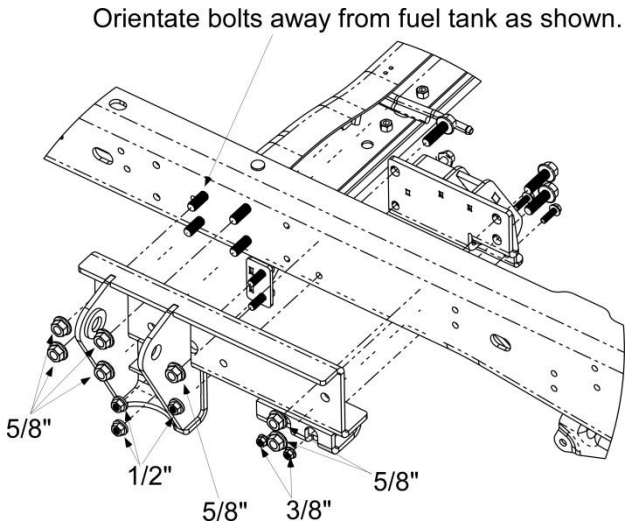


Figure 17. Installation of Right Hand Upper Strut Mount. [2013 and later models only]

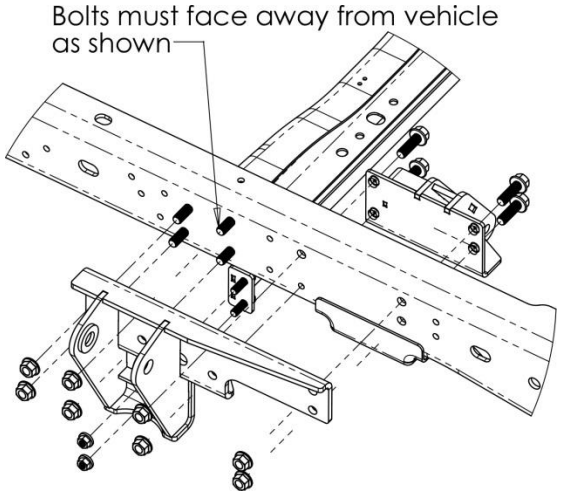


Figure 18. Installation of Right Hand Upper Strut Mount. [2012 and prior models only]

11. Loosen or remove the exhaust hanger bracket on the passenger side.
12. Locate the Upper Track Rod Mount.
13. **[2012 and prior models only]** Loosely attach to the inside of the Passenger Side Frame Rail utilizing (4) 5/8"-11 x 2.00" Hex Flange Bolts and (4) 5/8"-11 Locking Flange Nuts through the Ø21/32" holes previously drilled.
14. **[2013 and later models only]** Loosely attach to the inside of the Passenger Side Frame Rail utilizing (3) 5/8"-11 x 2.00" Hex Flange Bolts and (3) 5/8"-11 Locking Flange Nuts through the Ø21/32" holes previously drilled; and (1) 1/2"-13 x 2.00" Hex Flange Bolt and (1) 1/2"-13 Locking Flange Nut through the Ø17/32" hole previously drilled.
15. **[2013 and later models only]** Loosely attach the upper track rod mount to the upper strut mount, at the jounce bumper mount, utilizing (2) 3/8"-16 x 1.25" Hex Flange Bolts and (2) 1/2"-13 Locking Flange Nuts.
16. After track rod mount is placed in position, reinstall exhaust hanger bracket.

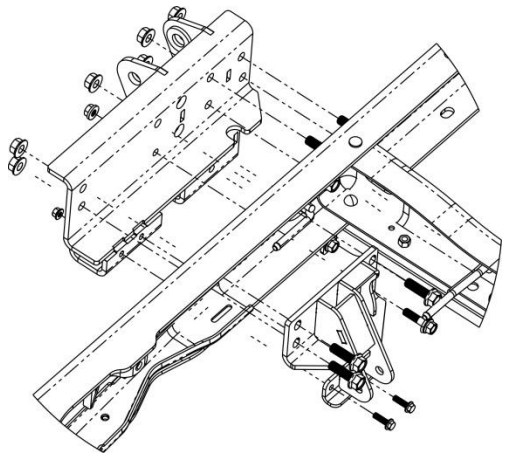


Figure 19. Installation of Upper Track Rod Mount. [2013 and later models shown, others similar]

17. Locate the Cross-member Reinforcement.
18. 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 1.50" 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.

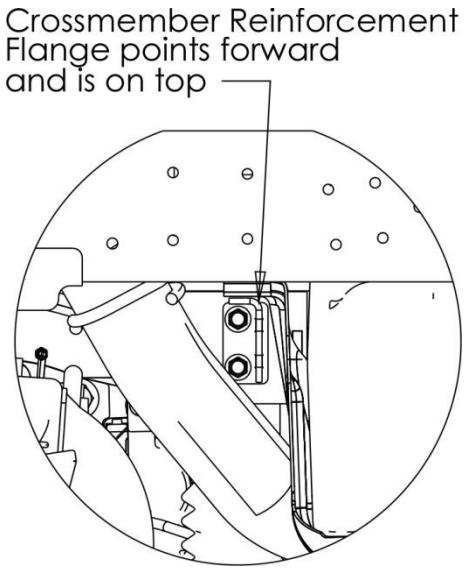


Figure 20. Orientation of Cross-member Reinforcement (passenger side shown).

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

19. Torque all 5/8”-11 nuts to **172-210 ft-lbs**.
20. Torque all 1/2”-13 nuts to **86-105 ft-lbs**.
21. Torque the 3/8”-16 fasteners to **35-43 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.

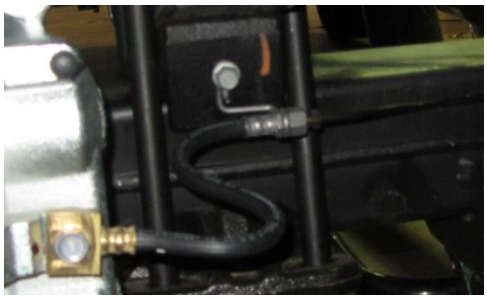


Figure 21. Driver side brake line bracket to detach..

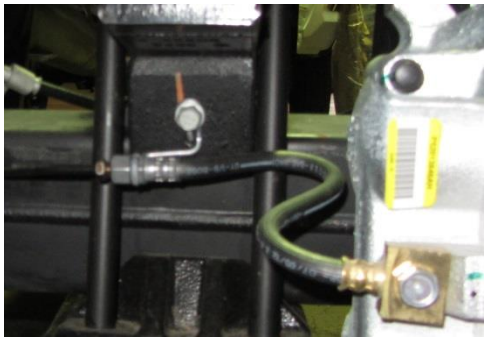


Figure 22. Passenger brake line bracket to remove..

2. Remove axle seat pads from axle, leaving the protruding stud in the axle.

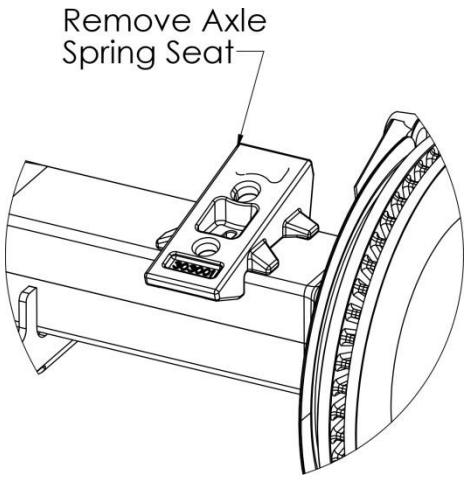


Figure 23. Axle seat pad removal.

3. Locate the Left Hand Axle Seat Weldment, Axle Cradle, and 3/4” U-Bolts.
4. Place the Axle Seat on to the Drivers Side axle spring seat. The Axle Seat should be flush to the top of the axle with the axle stud in in the slot.

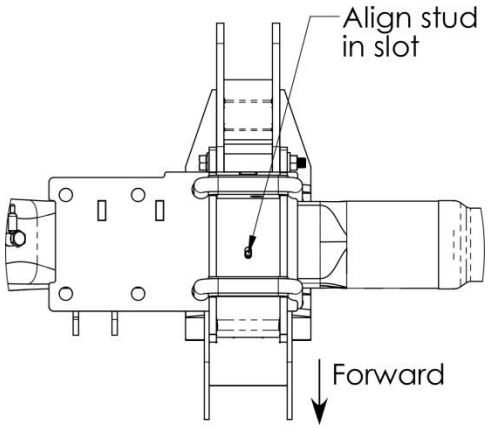


Figure 24. Axle Clamp assembly.

5. 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 Flange Nut at the rear connection point. Use (1) 1/2”-13 x 1.50” Hex Cap Screws and (1) 1/2” Hardened Flat Washers at the front connection point. See Figure 25.

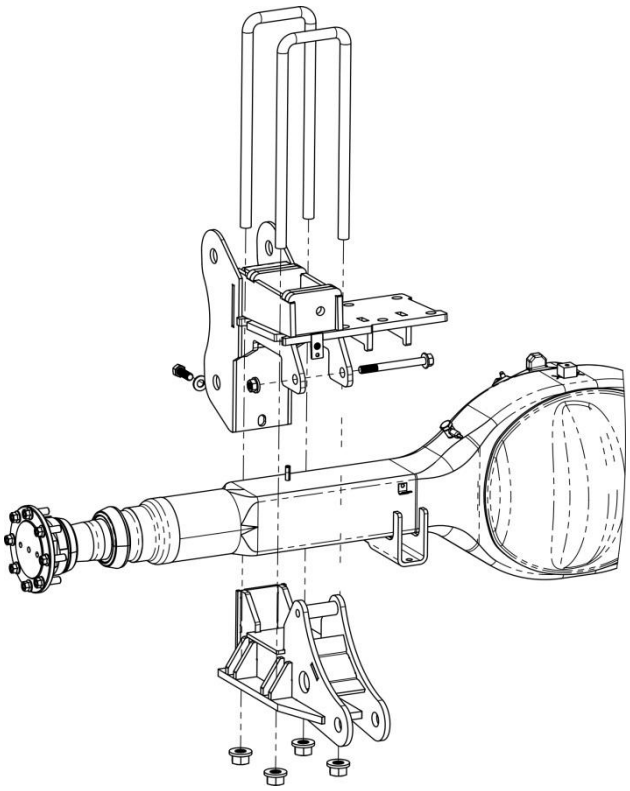


Figure 25. Axle Clamp assembly.

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

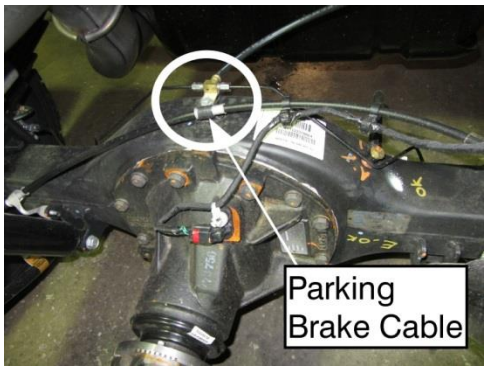


Figure 26. Parking Brake Cable/Hydraulic Brake Line Mounting Bracket Location [2012 and prior].

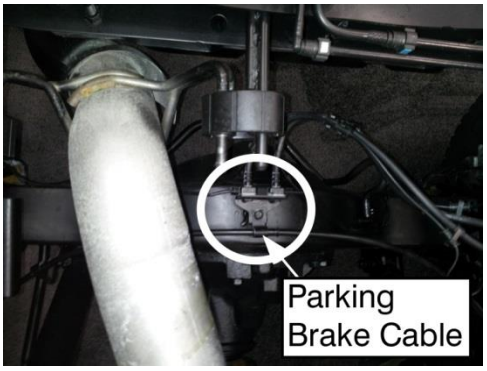


Figure 27. Parking Brake Cable/Hydraulic Brake Line Mounting Bracket Location [2013 and later].

9. Attach brake line bracket to relocation bracket with OEM hardware.

Figure 28. Brake Line Bracket relocation.

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.

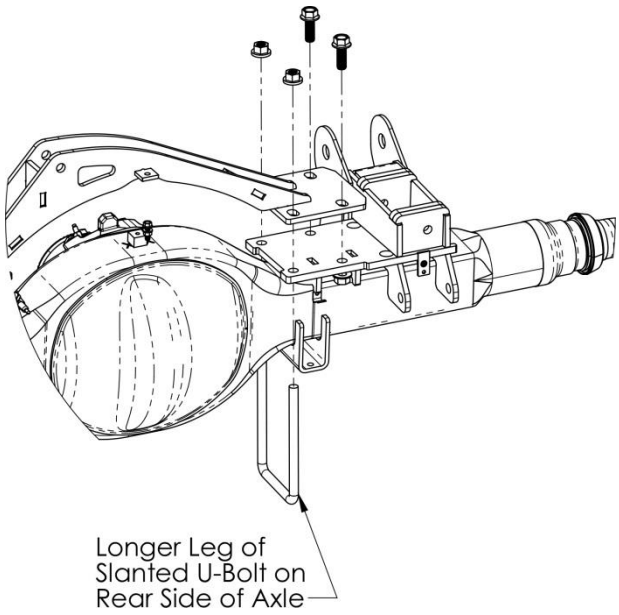


Figure 29. Installing Bridge Weldment.

12. Slip the 5/8” Slanted U-bolts under the axle, as shown in Figure 29, and through the Axle Seat and Bridge on both sides utilizing (4) 5/8”-18 Locking Flange Nuts.

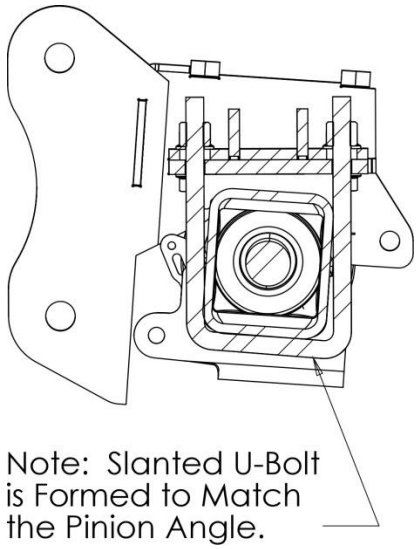


Figure 30. Installing Slanted U-bolts.

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 parking brake cable bracket to the front of the Bridge Weldment utilizing (1) 5/16”-18 x 1.00” Hex Flange Bolt and (1) 5/16”-18 Locking Flange Nut.

Figure 31. Attaching Parking Brake Bracket.

18. Attach brake line bracket, removed from top of axle, to under tab of axle bridge using (1) 5/16”-18 x 1.00” Hex Flange Bolt and (1) 5/16”-18 Locking Flange Nut.

Figure 32. Axle Brake Line reattachment.

19. Torque the 5/16”-18 Lock Nut to **20-24 ft-lbs.**
20. Locate the Parking Brake Standoff bracket.
21. Remove the passenger side parking brake attachment to the original shock absorber lower mount. Retain all hardware.
22. Reusing the OEM fasteners, attach the parking brake standoff bracket to the shock absorber lower mount. Torque to **20-24 ft-lbs.**
23. Reattach the parking brake retainer to the bracket using (1) 5/16”-18 x 1.00” Hex Flange Bolt and (1) 5/16”-18 Locking Flange Nut. Torque to **20-24 ft-lbs.**

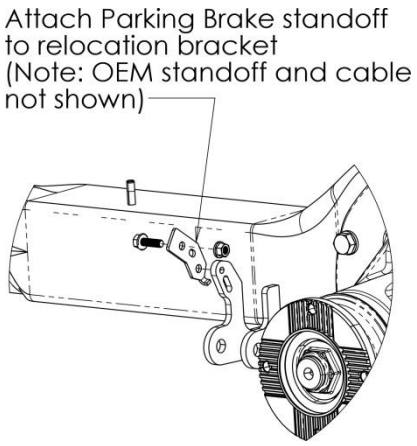


Figure 33. Attachment of passenger side parking brake cable.

Figure 34. Attachment of passenger side parking brake cable.

24. Reinstall the brake flexible line mounting brackets to back of the Axle Seat Weldments.

Figure 35. Attachment brake flexible line. (Passenger side shown, driver side similar).

25. Torque to **18 ft-lbs**.

26. 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.

Control Arms

1. Locate (1) Upper Control Arm Assembly and (1) Left Hand (Driver Side) Lower Control Arm Assembly. See Figure 37 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 36.

   Note: Orientate the lower control arm with the height sensor linkage tab outboard 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.

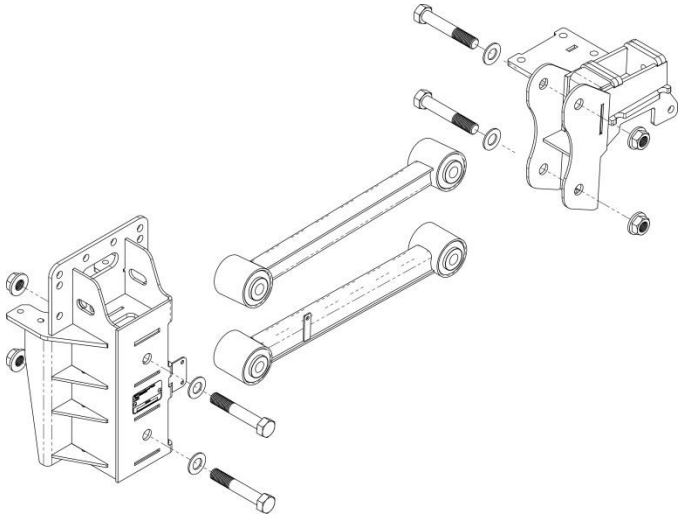


Figure 36. Control Arm installation. Driver side shown.

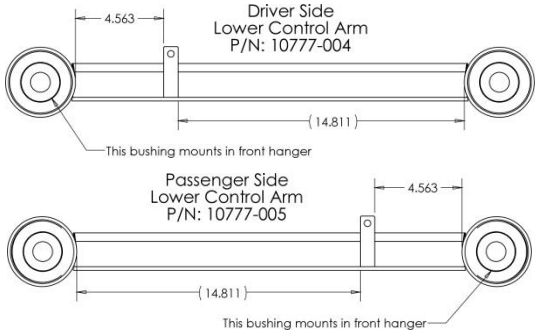


Figure 37. Lower Control Arm identification.

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 outboard and closest to the front hanger.

IMPORTANT: Verify that the passenger side parking brake cable is routed between the upper and lower control arm. Verify the cable does not contact the axle seat weldment or 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.

Track Rod and Mount

1. Locate the Track Bar.
2. Loosely attach the Track Bar to the Track Rod Mount Bridge using (1) 5/8”-11 x 3.75” 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 38

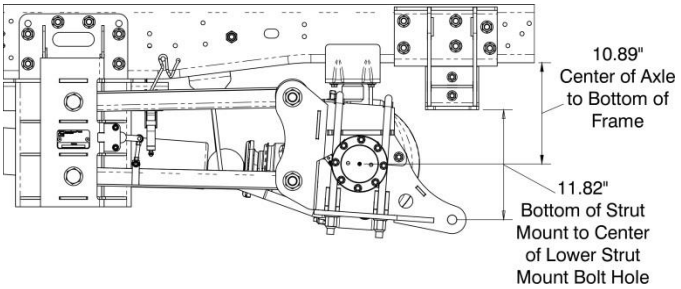


Figure 38. Lift to Design Ride Height.

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.**

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

Strut Assembly Installation

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

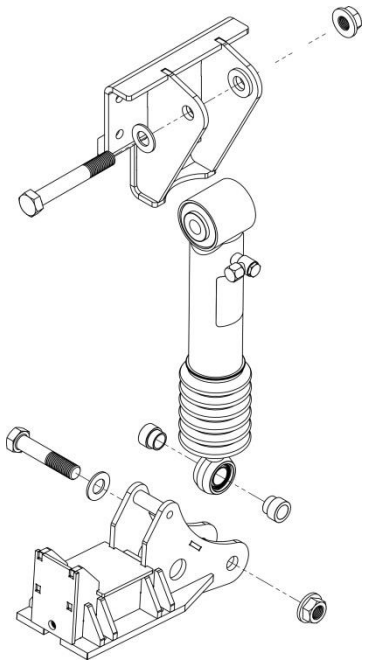


Figure 39. Strut Installation. Left Hand shown.

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 39.
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 (4) bearing spacers.
6. Insert the bearing spacers into each lower strut bearing.
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 5.00” Hex Cap Screw, 1” Hardened Flat Washers, and 1”-8 Locking Flange 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 [2012 and prior models]

1. Remove the OEM jounce bumpers and fasteners.
2. Discard the 1” thick spacer and OEM fasteners.

3. Locate (2) M10-1.5 x 30 Hex Flange Bolts provided in the kit.
4. Install the bumpers through the bottom of the frame, at the OEM Jounce Bumper location, utilizing the (2) M10-1.5 Hex Flange Bolts.

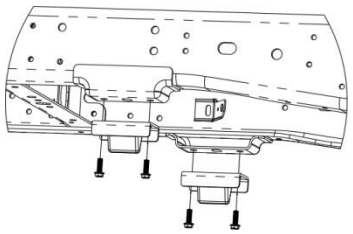


Figure 40. Installation of Left Hand Bumper [2012 and prior models].

5. Torque bolts to **43-53 ft-lbs.**

Jounce Bumpers [2013 and newer models]

1. Remove the OEM jounce bumpers and retain the M10-1.5 fasteners.
2. Locate (2) Jounce Bumpers, (2) Jounce Bumper Adapter Plates, (2) 3/8”-16 Spring Lock Washer, and (2) 3/8”-16 x 7/8” Hex Cap Screw.
3. Attach the jounce bumpers to the adapter plates using the 3/8” fasteners though the center hole. Torque to **35 ft-lbs.**
4. Attach the jounce bumper assembly to the frame, on the driver side, or upper strut mount, on the passenger side, using the retained M10-1.5 Hex Flange Bolts. Torque to **43-53 ft-lbs**.

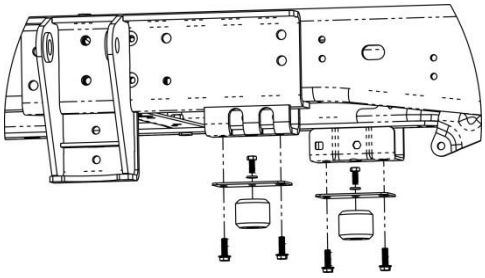


Figure 41. Installation of Left Hand Bumper [2013 and later models].

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 inboard, using the 5/16”-18 Locking Flange Nut. Torque to **14-17 ft-lbs.**

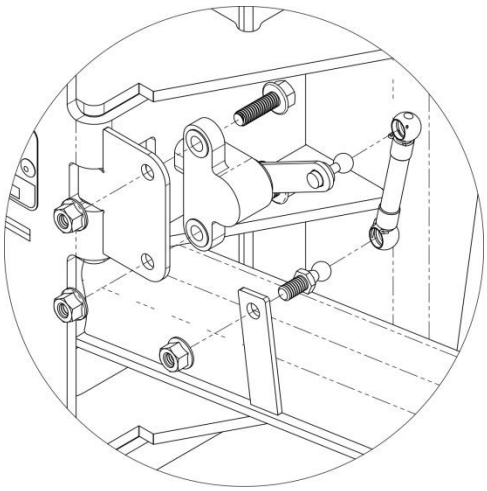


Figure 42. Height Sensor and Linkage installation.

3. Attach the Height Sensor to the Left Hand (Driver Side) Hanger using the 5/16”-18x1.00” Hex Flange Bolt and 5/16”-18 Locking Flange Nut. Torque to **14-17 ft-lbs.** See Figure 42. **Do not over torque.**

   Note: It is recommended to attach the electrical harness to the height sensor prior to installation. See External Electrical Installation Section.
4. Remove Locking Clips from the End Fitting.
5. 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 locking clips as shown.**

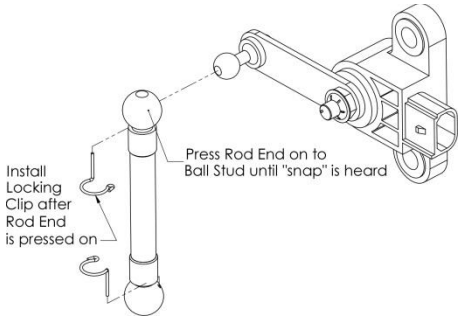


Figure 43. Height Sensor Linkage Installation.

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

Secondary Volumes [DS120R-A, DS120R-A12, DS135R-B]

1. Locate the Volume Mount Weldment, (2) 1/2”-13 x 1.50” Hex Flange Bolts, (2) 1/2”-13 Locking Flange Nuts, (2) M10-1.5 x 30 Hex Flange Bolts, and (1) M10-1.5 Locking Flange Nut.
2. Attach the volume mount to the driver side front hanger using the 1/2” fasteners and to the cross member using the M10 bolt. Attach the M10 bolt to the weld nut located in the cross member. Snug fasteners.
3. Using the weldment as a template, drill a Ø7/16” hole in the cross member and attach the weldment to the

cross member using the remaining M10 bolt and lock nut.

4. Torque the 1/2" fasteners to **86-105 ft-lbs**.
5. Torque the M10 fasteners to **43-53 ft-lbs**.
6. Locate the Right Hand Secondary Volume Assembly, which includes the orange heat protected sleeve wrapped -10 hose.

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 the upper attachment point. Center the tank to the bracket. Rotate the volume assembly until the rate valve is located to the top and as vertical as possible. Ensure clearance to the axle. See Figure 44.
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**.

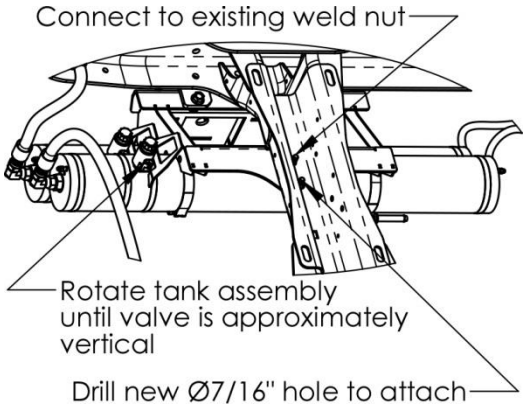


Figure 44. Secondary Volume Assembly mounting.

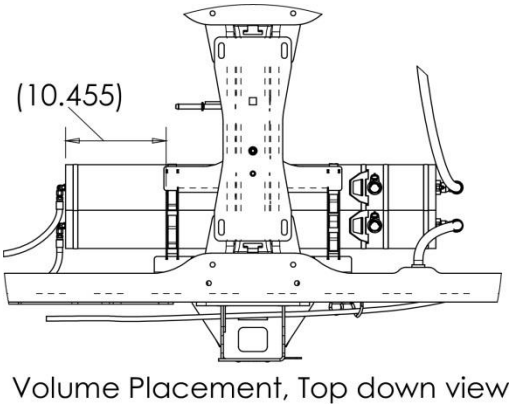


Figure 45. [4500 Chassis] Secondary Volume Assembly mounting location.

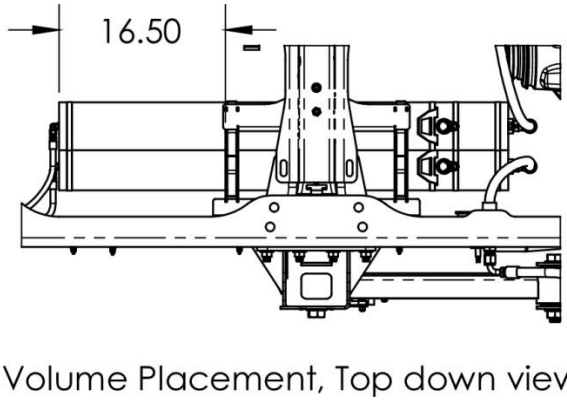


Figure 46. [5500 Chassis] Secondary Volume Assembly mounting location

10. Repeat for driver side in the lower mount area.

Secondary Volumes [DS120R-AF and DS135R-AF]

1. Locate (2) Volume Mount Weldments.
2. Place the mounts against the driver side frame, forward of the front hanger. Figure 47 shows approximate locations when installed on 84"C-A vehicles. Other longer wheelbases widen spread as much as possible, See Figure 48 for 120" C-A vehicle mounting. 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.

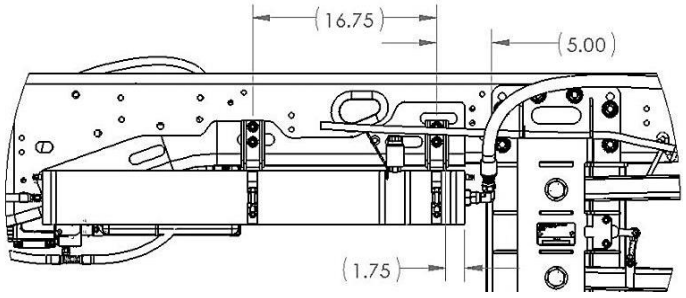


Figure 47. Secondary Volume suggested mount locations for DS120R-AF on 84"C-A.

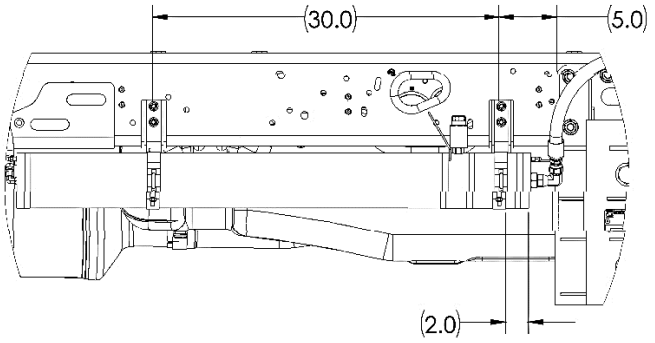


Figure 48: Secondary Volume suggested mount locations for DS135R-AF on 120"C-A

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 1.25" Hex Flange Bolts, (4) 3/8"-16 Locking Flange Nuts 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 49.
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**.

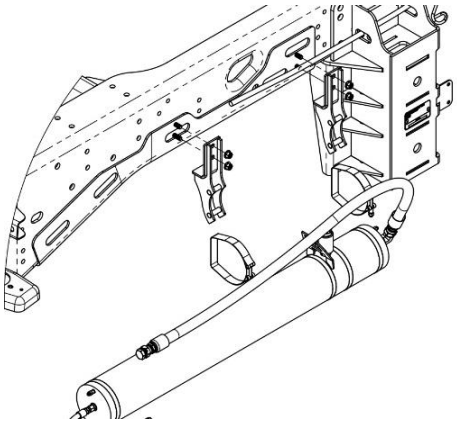


Figure 49. Secondary Volume Assembly mounting location.

10. Repeat for passenger side.

Power Module Installation [DS120R-A, DS120R-A12, DS135R-B, DS120R-ALA]

1. Locate the cross member behind the cab.

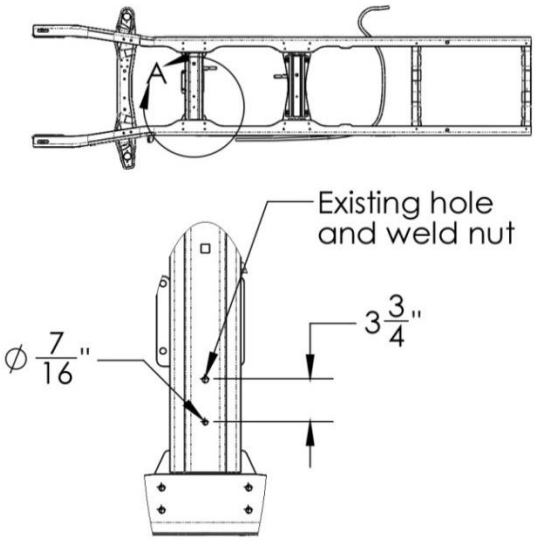


Figure 50. Power Module mounting hole location.

2. Mark and drill Ø7/16" hole as indicated in Figure 50.
3. Locate the Breather Cap. Replace the top plug with the Breather Cap.
4. Locate the Power Module Assembly and Power Module Mounting Kit.
5. Inside the Kit, locate the Manifold Mounting Bracket.

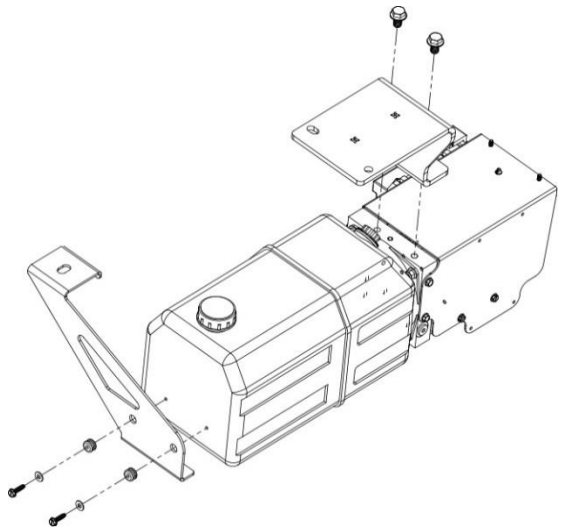


Figure 51. Power Module mounting bracket installation.

6. Install the Manifold Mounting Bracket, see Figure 51, to the Power Module pump head manifold utilizing the (2) 3/8-16 Serrated Flange Hex Screws.
7. Torque to **39 ft-lbs**.

8. Locate the Reservoir Support Bracket, (2) grommets, (2) #10 Flat Washers, and (2) #10 Self Tapping Screws.
9. Install the grommets into the indicated holes in Figure 51.
10. Attach the support bracket to the reservoir using the self-tapping screws. Snug tighten only.

    IMPORTANT: Do not over tighten screws into reservoir. Bushings should not be deformed when attached. Over tightening of screws can damage plastic reservoir.
11. Locate (3) M10-1.5 x 30 Hex Flange Bolts and (2) M10-1.5 Locking Flange Nuts.
12. Attach the power module assembly to the frame using the M10 fasteners. One of the M10 bolts will attach to an existing OEM weld nut located in the cross member.

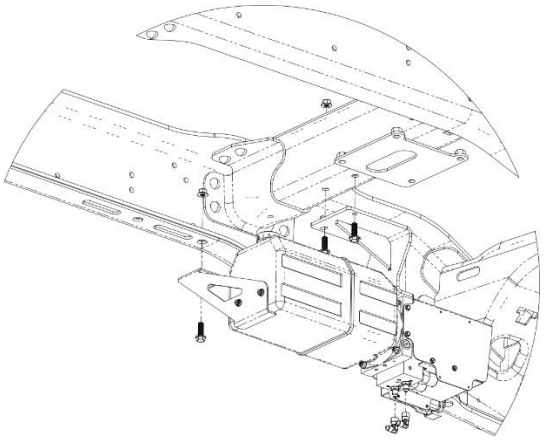


Figure 52. Mounting location of Power Module (located behind driver side of cab).

13. Torque the M10 fasteners to **48 ft-lbs.**

Power Module Installation [DS120R-AF and DS135R-AF]

1. Locate the Power Module Assembly and Power Module Mounting Kit.
2. Follow instructions inside the kit for installing the Powermodule Brackets.

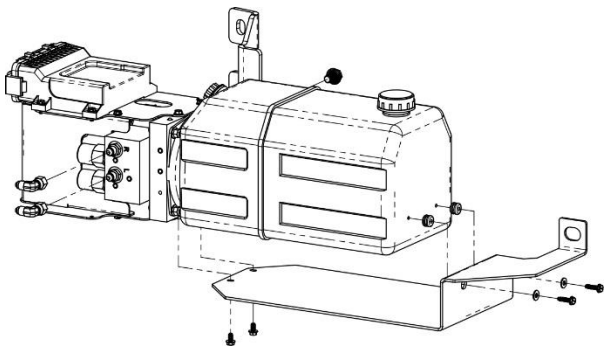


Figure 53. Power Module mounting bracket installation.

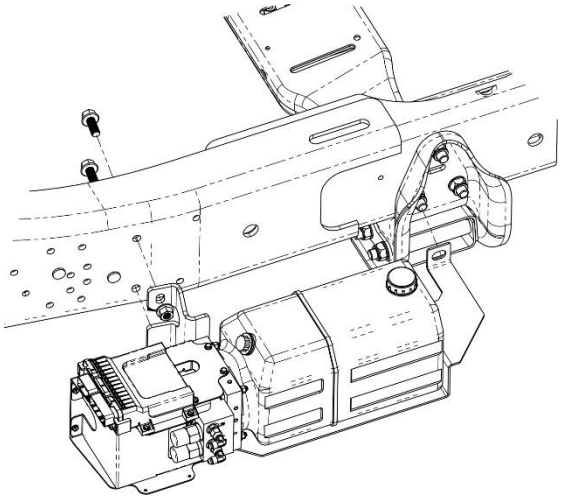


Figure 54. Mounting location of Power Module (located under passenger side of cab).

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.

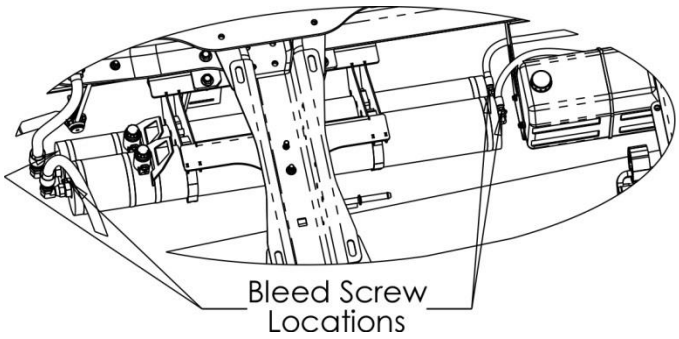


Figure 55. Bleed screw locations.

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.**

-10 Hose Routing for DS120R-A, DS120R-A12, and DS135-B follow steps 5-18

5. Locate the -10 bulk head fitting and -10 bulk head fitting lock nut.
6. Install the fitting into the Ø7/8" hole drilled into the frame.

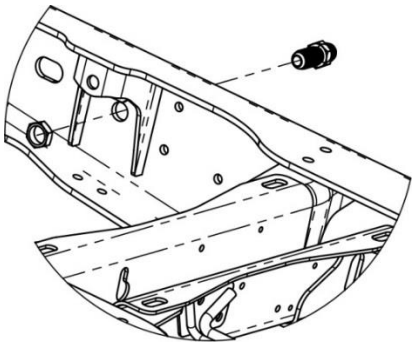


Figure 56. Installation of bulk head fitting.

7. Torque the lock nut to **85-95 ft-lbs**.
8. Locate the -10 hose assembly, with 90° fitting on one end.
9. Remove the cap from the strut port.
10. Attach the straight fitting to the strut port. Hand tighten only at this time.
11. Route the hose to the bulk head fitting and attach hose.

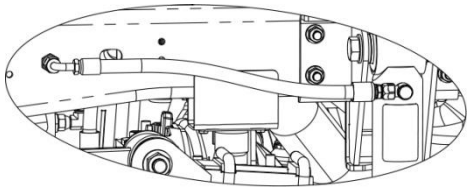


Figure 57. Installation of -10 hose to strut.

12. Torque both ends to **36-63 ft-lbs.**
13. Raise the end of the -10 (5/8") hose, attached to the driver side volume assembly, above the secondary volume to prevent fluid loss.
14. Route the hose to the strut to the bulk head fitting as shown in Figure 58.

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

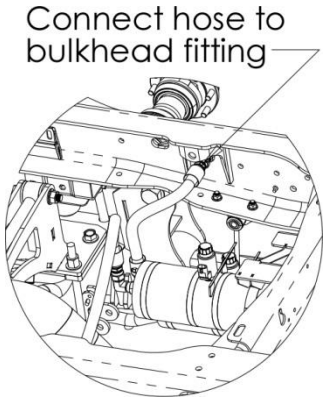


Figure 58. Driver side -10 hose attachment.

15. Remove the plug from the end of the hose.
16. Attach the hose end (-10 JIC fitting) to the bulk head fitting.
17. Torque to **36-63 ft-lbs.**

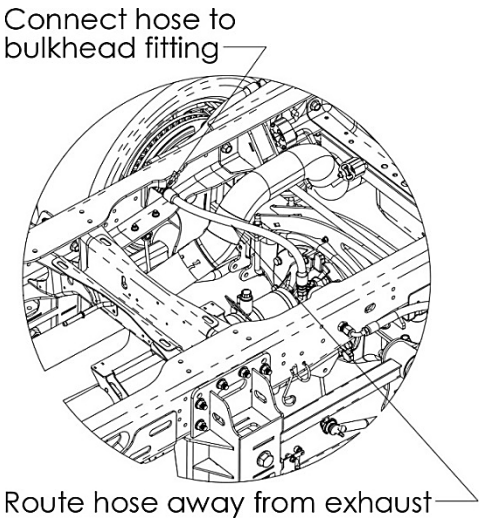


Figure 59. Passenger side -10 hose attachment.

18. Repeat with the opposite side. Verify to route hose away from exhaust.

CAUTION: Make sure the hose adequately clears the exhaust to prevent any contact.

-10 Hose Routing for DS120R-AF and DS135R-AF follow steps 19-25

19. Remove the cap from the strut port.
20. Raise the end of the -10 (5/8") hose, attached to the volume assembly, above the secondary volume to prevent fluid loss.
21. Route the hose to the strut and secure with hose clamps or stand-offs with provided 5/16" hardware as shown in Figure 60. Use of hose clamps is recommended to secure the hose from movement or chafing.

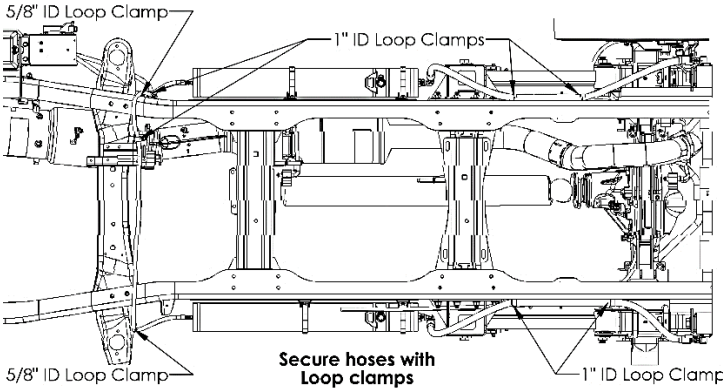


Figure 60, Loop Clamp Installation / Hose routing

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

22. Remove the plug from the end of the hose.
23. Attach the hose end (-10 JIC fitting) to the strut port.
24. Torque to **36-63 ft-lbs.**
25. Repeat with the opposite side.

-4 Hose to Power Module Connection [All Units]

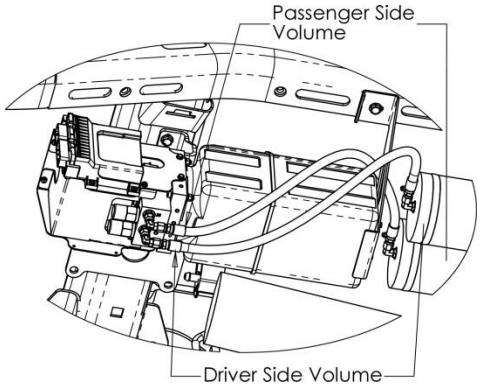


Figure 61. Power Module hose attachment [DS120R-A, DS120R-A12, and DS135R-B shown].

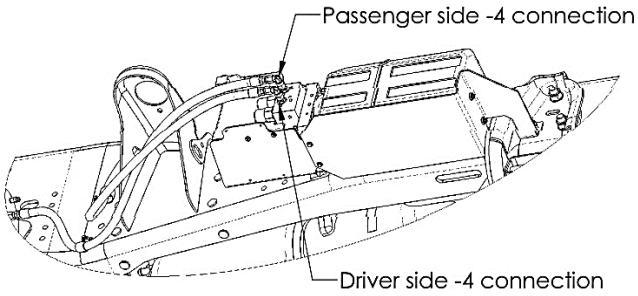


Figure 62. Power Module hose attachment [DS120R-AF and DS135R-AF shown].

26. 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.

27. Remove the cap from the -4 JIC fitting mounted on the bottom of the power module assembly, marked "L".
28. Install 90° -4 Elbow from mount kit.
29. Remove the plug from the hose end.
30. Attach the hose end to the Left Side Elbow. Torque the hose fitting and elbow to **12 ft-lbs. Do not over tighten.**
31. Route the Right Hand (Passenger side) -4 (1/4") hydraulic hose 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.

32. Remove the cap from the bottom mounted -4 JIC fitting on the power module, marked "R".
33. Install 90° -4 Elbow from mount kit.
34. Remove the plug from the hose end.
35. Attach the hose end to the Right Side Elbow. Torque both the hose fitting and elbow to **12 ft-lbs. Do not over tighten.**
36. Clean up any fluid spillage.
37. Verify the -10 hose fittings to the secondary volume assemblies are torqued to **36-63 ft-lbs** on the JIC connections
38. Verify the -12 SAE fitting to the secondary volume assemblies are **75-83 ft-lbs**.
39. Verify the -4 SAE jam nut to the secondary volume assemblies are torqued to **14-16 ft-lbs**.
40. Verify the -4 hose fitting to the 90° fitting at the secondary volume assemblies are **12 ft-lbs**.
41. Re-install tires and wheels as per OEM instructions.

Parking Brake Cable

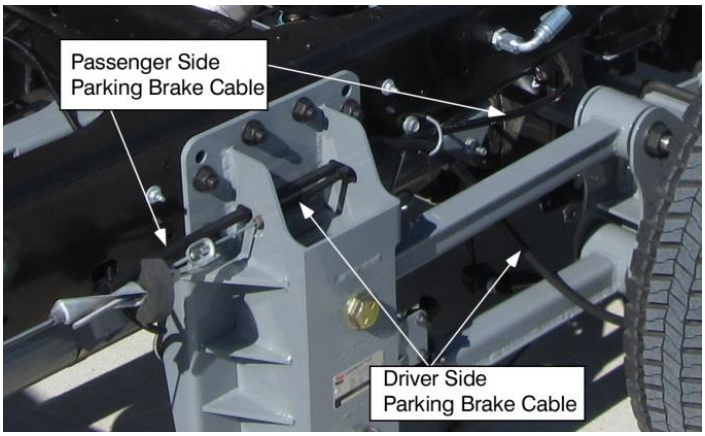


Figure 63. Parking brake cable installation.

1. Route the driver side parking brake cable between the control arms, through the upper loop hook, and through the outside set of holes in the front hanger.

   Alternative routing: Parking Brake Cable can be routed under the lower control arm and through the lower loop hook, as long as the Cable does not rub on the lower control arm throughout travel.

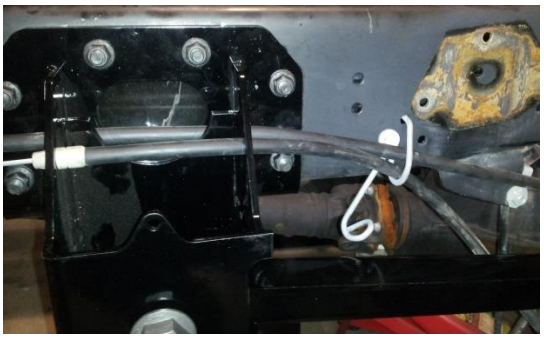


Figure 64: Route Both cables through the upper loop hook

2. Lock the driver side cable end fitting tables into the hanger hole.
3. Insert the cable end into the connector (#2 in Figure 65).

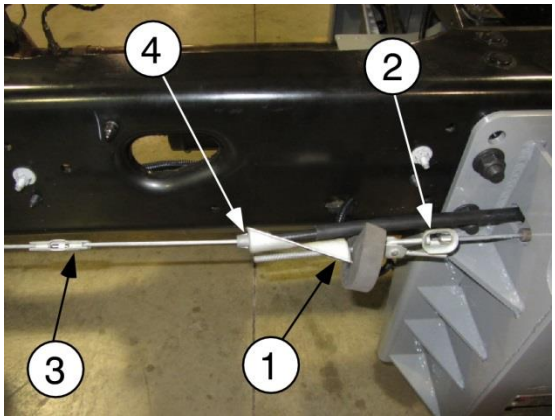


Figure 65. Parking brake connections.

4. Route the passenger side parking brake cable through the upper loop hook and through the inner set of holes in the front hanger.
5. Insert and lock the cable into the equalizer (#4 in Figure 65).
6. Install the cable end into the connector (#3 in Figure 65).
7. Tighten the cable adjuster nut (#1 in Figure 65) to the original location.
8. Perform a parking brake adjustment procedure per OEM service instructions.
9. Reinstall the tires and wheels as per OEM instructions.

Steering Sensor Installation

1. Raise the front end of the vehicle, per OEM instructions.
2. Place jack stands under frame.
3. Locate the OEM engine cross-member and pitman arm.

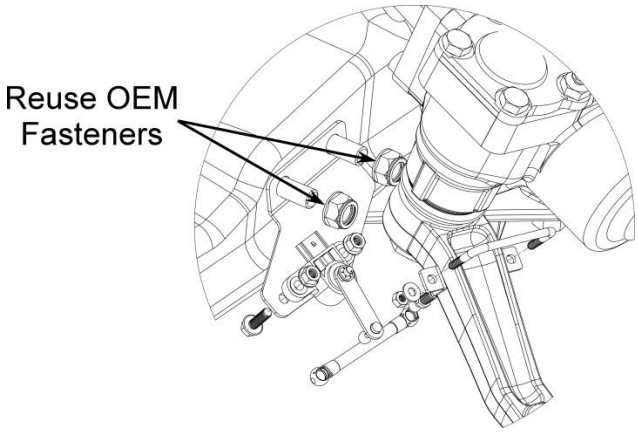


Figure 66. Steering Sensor Installation.

4. Locate the Steering Sensor mounting bracket.
5. Remove and retain the two nuts securing front track rod mount to cross member. See Figure 66.

6. Install bracket over two bolts and reinstall nuts. Torque to **194 – 238 ft-lbs**
7. Locate the Steering Sensor Asy.
8. Install the Steering Sensor to the Mount Bracket utilizing (2) 5/16”-18 x 1” Flange Hex Bolts and (2) 5/16”-18 Locking Flange Nuts.
9. Torque to **14-17 ft-lbs**. **Do not over torque**.

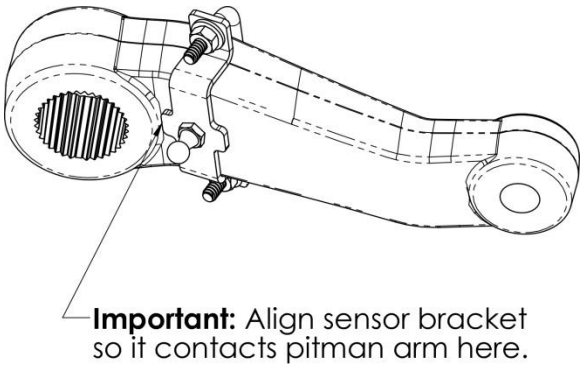


Figure 67. Linkage bracket installation.

10. Locate the Steering Linkage Mount bracket, (1) Ball Stud, (1) 5/16”-18 Locking Flange Nut, (2) 1/4”-20 Lock Nuts, (2) 1/4” Flat Washers, and (1) 1/4”-20 U-bolt.
11. Install the Ball Stud into the Linkage Mount bracket as shown in Figure 67 and secure with the 5/16”-18 Locking Flange Nut. Torque to **14-17 ft-lbs**.
12. 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. Verify the bracket contacts the pitman arm boss as shown in Figure 67. Torque Lock Nuts to **60 – 85 in-lbs.**
13. Locate the Steering Sensor Linkage Asy.
14. Remove Locking Clips from the End Fitting.
15. Snap one end onto the ball stud, located on the pitman arm.
16. Snap the remaining linkage end onto the ball stud located on the steering sensor. Install locking clips.
17. Turn steering wheel to full lock in either direction to check for any interference.

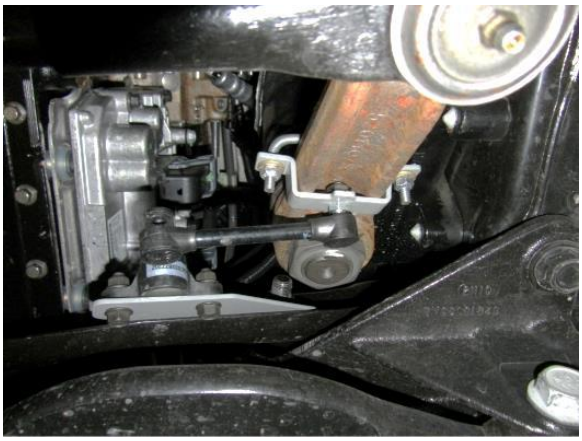


Figure 68. Steering Sensor components installed.

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.

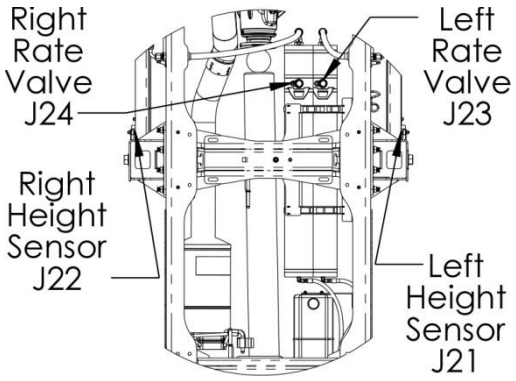


Figure 69. Rate valve and height sensor electrical connections.

Note: Rate valve and height sensor connections for DS120R-A, DS120R-A12, and DS135R-B shown above. Electrical connections for DS120R-AF are similar with perspective tanks on side of frame.

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.

   Note: Torque height sensor fasteners to **14-17 ft-lbs. Do not over torque.**

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. Remove the cover plate. Nuts are located inside the passenger cabin on the firewall, left of the steering column.
12. Drill Ø7/8" hole in approximately the center of the plate.
13. Locate the 5/8" ID x 1-1/8" OD x 3/8" Thick grommet.
14. Install the grommet in the Ø7/8" hole just drilled.

Figure 70. Modified Clutch Linkage Cover Plate.

15. Reinstall the plate.
16. Route the wiring harness branch containing the(8) 18ga blunt wires to the clutch linkage passage cover plate in the firewall.
17. Route branch through the grommet in the cover plate.
18. Locate the branch containing the J35 steering sensor connector.
19. Route the steering connector branch down to the steering sensor. Secure the wiring harness.
    Important: Verify the wiring harness does not contact heat source or moving components.
20. Connect the harness to the steering sensor.
21. Locate the 8ga battery connection branch.
22. Route branch to the driver side battery positive terminal.
23. Locate the Battery Fuse Lead containing the 80 amp fuse.
24. Crimp the fuse lead to the 8ga battery connection branch blunt end.
25. Melt the heat shrink on the crimped connection to seal the splice.
26. Remove the 80 amp fuse and retain.
27. Connect to the positive terminal post per OEM Upfitter wiring instructions.

Figure 71. OEM Upfitter Driver Side Terminal Connection instruction.

Important: Do not connect to passenger side battery.

Dash Harness Installation [2012 and prior models]:

Important: 2012 and prior models require the installation of the DGE Ram Truck Upfitter Module. If the vehicle does not already have a DGE module installed, contact LiquidSpring regarding instructions to obtain a DGE module.

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)
3. Crimp each wire to the corresponding butt splice in the dash harness. Match wire colors. Heat shrink sealing is optional.
4. Locate the Extension Harness.
5. Route the harness from the driver side to passenger side under the dash, between the carpet and heater

conduit, with the butt splices located on the driver side.

6. Locate the following wires on the extension harness (which have butt splices installed):
   Yellow/Black (Park)
   Pink/Black (Brake)
   Violet/White (Speed)
7. Crimp wires to the corresponding colored wires in the external harness.
8. Locate the Yellow wire on the extension harness. Connect to the Pink/Yellow wire on the dash harness.

   Note: The Brown/Light Green and Pink wires in the Dash Harness are not used in 2012 and prior models installations.
9. Locate in the OEM dunnage the Port Upfitter 6-pin grey connector (p/n 7282-3740-40).
10. Cut the red/white wire, which is looped between pins 3 and 4.
11. Locate the red wire on the LiquidSpring Extension harness.
12. Locate the 12 ga red wire in the LiquidSpring Dash harness.
13. Splice the two red wires to the red/white wire on the grey upfitter connector at pin 3. Do not splice to pin 4.
14. Locate the DGE harness with the 26 pin connector and all blue wires.
15. Make the following wiring splices:

LiquidSpring		→	DGE	
Wire Color	Harness	→	Wire Label	Harness
Violet/White (Speed)	Extensions	→	VEH SPD	DGE
Yellow/Black (Park)	Extension	→	PARK	DGE
Yellow (Ignition)	Extension	→	IGN	DGE
Pink/Black (Brake)	Extension	→	BRAPPLED	DGE

16. Locate the DGE harness with multi-colored wires.
17. Locate the red wire in the DGE harness.
18. Splice the red wire to the red wire in the LiquidSpring Extension harness.
19. Install the DGE module per provided instructions. Note: Battery feed wire (red) is already connected to the LiquidSpring Extension harness.
20. Locate the 18ga black wire with ring terminal on the LiquidSpring Dash harness.
21. Route the wire behind the parking brake mechanism and attach to the A pillar as shown in Figure 72.

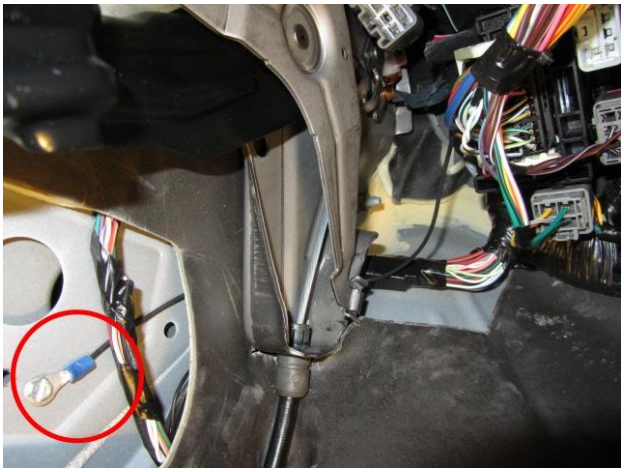


Figure 72. Dash harness ground to vehicle location (circled).

22. Locate the Upfitter Port -2, found near the parking brake mechanism.

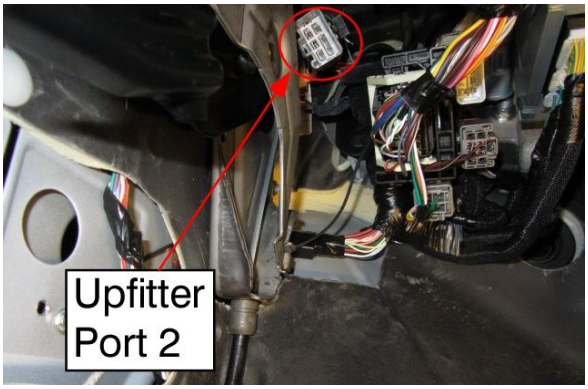


Figure 73. Upfitter Port 2.

23. Connect the Upfitter connector to Port 2.

Dash Harness Installation [2013 and later models]:

24. Locate the dash harness.
25. 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)
    Yellow/Black (Park)

26. Connect each wire to the corresponding wire in the dash harness using appropriate butt splices. Match wire colors. Heat shrink sealing is optional.
27. Locate the OEM V-Sim module, under the driver side dash, left of the steering column, and behind the parking brake mechanism.
28. In the OEM vehicle dunnage, locate the V-Sim harnesses, one containing a grey 24-cavity connector and the other containing a black 16-cavity connector. Refer to the Ram Chassis Cab V-Sim Usage Instructions as needed.
29. Make the following wiring butt splices:

LiquidSpring		→	V-Sim	
Wire Color	Harness		Wire Color	Harness Connector
Violet/White (Speed)	Dash	→	Brown/Yellow (Pin 16)	Black 16 Cavity
Pink/Black (Brake)	Dash	→	Dark Green/Orange (Pin 11)	Black 16 Cavity
Yellow/Black (Park)	Dash	→	Yellow/Dark Blue (Pin 7)	Grey 24 Cavity
Brown/Light Green (Ground)	*Dash	→	Brown/Light Green (Pin 3)	Black 16 Cavity
Pink (Ground)	*Dash	→	Pink (Pin 5)	Black 16 Cavity

***NOTE: Connect Brown/Green and Pink wires on 2013 model year and older. Do NOT connect Brown/Green and Pink wires on 2014 and newer.**

30. Locate in the OEM dunnage the Port Upfitter 6-pin grey connector (p/n 7282-3740-40).
31. Cut the red wire, which is looped between pins 3 and 4.
32. Locate the 10 ga red or 12 ga red/white wire on the LiquidSpring Dash harness.
33. Splice the red/white wire to the red wire connected to pin 3 only. Do not splice to pin 4.
34. Cut the Pink/Yellow (or Pink/Orange) wire, which is looped between pins 1 and 6.
35. Locate the 18ga Yellow or Pink/Yellow wire on the LiquidSpring Dash Harness.
36. Splice the Yellow or Pink/Yellow wire to the Pink/Yellow or Pink/Orange wire connected to pin 1 only. Do not splice to pin 6.
37. Locate the 18ga black wire with ring terminal on the LiquidSpring Dash harness.
38. Route the wire behind the parking brake mechanism and attach to the A pillar as shown in Figure 74.

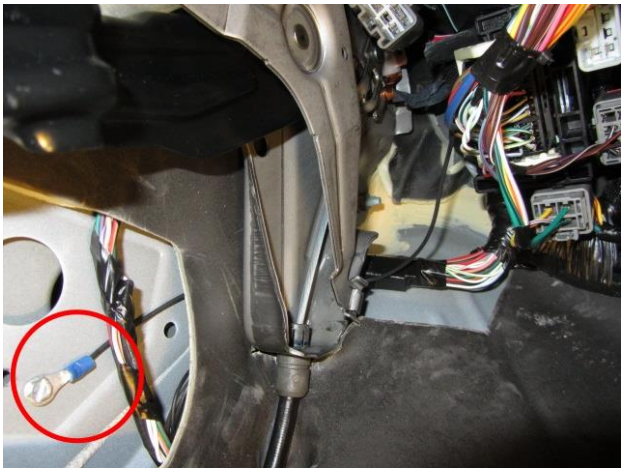


Figure 74. Dash harness ground to vehicle location (circled).

39. Connect the two V-Sim harnesses to the V-Sim.
40. Locate the Upfitter Port -2, found near the parking brake mechanism, left of the V-Sim.

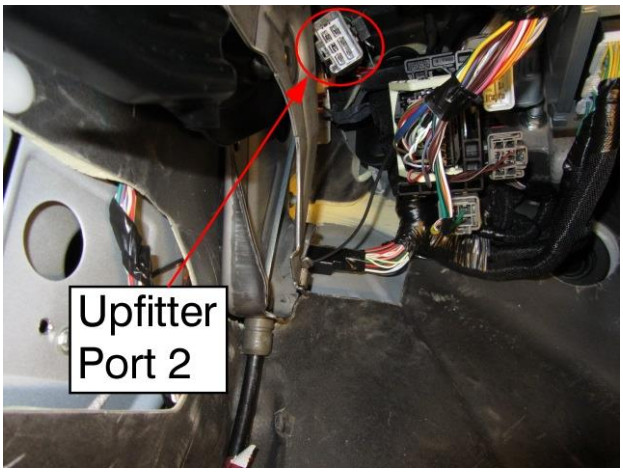


Figure 75. Upfitter Port 2. (2012 Model shown, 2013 in similar location).

41. Connect the Upfitter connector to Port 2.

Driver Interface Installation:

1. Locate the Driver Interface.
2. Mount the Driver Interface to the dash in an appropriate location.
3. Route the Driver Interface harness to the dash harness connector, J26, and connect.
4. Secure all wires under the dash.
5. Replace the 80 amp fuse at the battery.

Optional Door Electrical Harness Installation:

The optional door harness can be used to remotely activate the system "kneeling" feature in which the suspension automatically lowers to a point slightly less

than maximum jounce travel. The door harness can be utilized in two actuation methods.

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

A. Single Wire - Ground Signal From Source

Ground is provided to the door harness Brown (W93) wire from a grounding source (e.g. multiplex signal, switch, etc.). If a remote switch is used, it is recommended to use a normally closed (NC) door switch which remains open when the door is closed (or closed when the door is opened). One side of the switch must be connected to a ground source and the other side routed to the door harness. If multiple switches are used, they should be wired in a parallel arrangement with the door harness. Requires single wire routed from source to door harness.

B: Dual Wire – Ground Signal From System

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

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

Initial System Fill

1. Install the wheels and tires. Torque wheel nuts to OEM specifications.
2. Reconnect the negative cable to the vehicle battery.
3. Verify that the front wheels are steered straight ahead.
4. Lower the vehicle to the ground and remove any jack stands from under the vehicle. The suspension should be in the kneeled position.
5. Locate the container of Compressible 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.

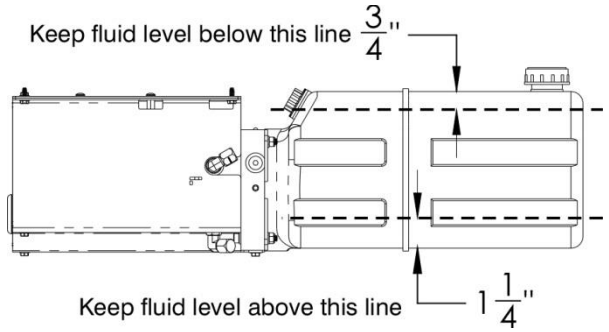


Figure 76. Fluid level while initially filling system.

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.

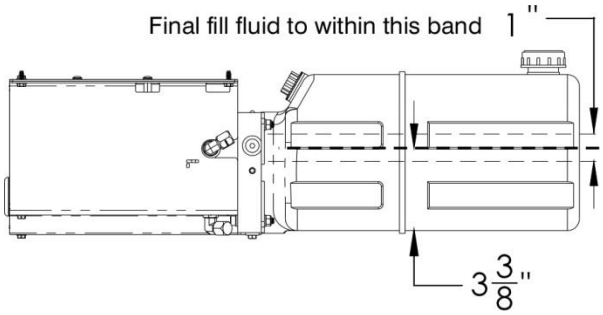


Figure 77. Final fill fluid level.

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.

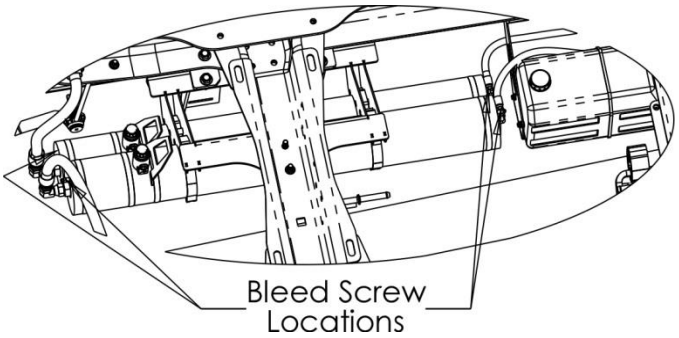


Figure 78. Bleed screw locations.

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.

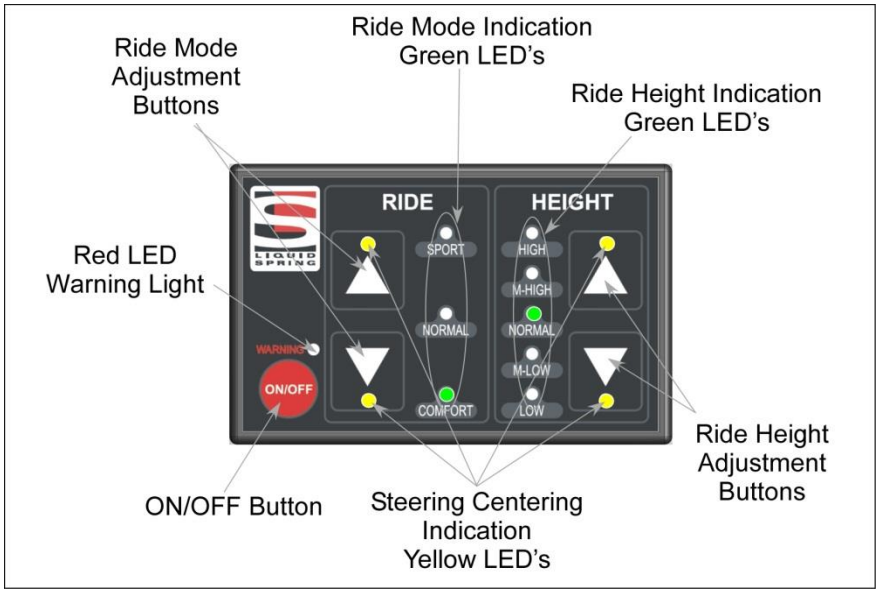
1. Verify that the front wheels are steered straight ahead.
2. Lower the vehicle to the ground and remove any jack stands and any other obstructions from under the vehicle.
3. To begin the calibration, turn the ignition key to "Run" and ensure that the LiquidSpring driver display lights up and that the 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.

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 31.

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).

Note: HIGH Ride Height is not available on model DS120R-ALA

- 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.

2. Press and release the Red ON/OFF button on the driver display. All LEDs on the driver display should go out.
3. Press and release the Red ON/OFF button again. The LEDs on the driver display should all flash and then only the four yellow arrow LEDs, one green ride mode indicator LED, and one green ride height indicator LED should remain lit.
4. Press and release the HEIGHT DOWN arrow button to lower the vehicle to the LOW height.
5. Press and hold the HEIGHT DOWN arrow button for approximately 2 minutes.
6. Release the HEIGHT DOWN arrow button.
7. Press and release the ON/OFF button to disable the system.
8. 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:

9. Locate 3/16" ID PVC Tubing. Note: Alternatively, a bleed kit similar to the Actron 7840 Bleed Kit can be used.
10. 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.

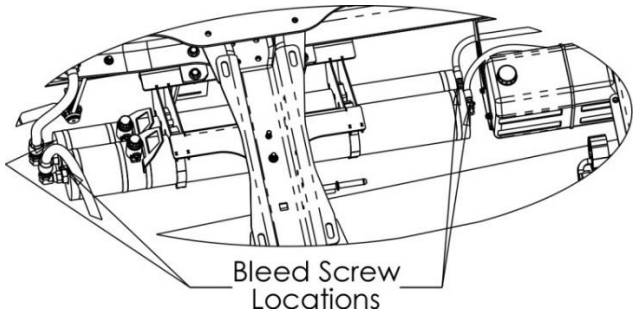


Figure 79. Bleed screw locations.

11. Open the bleed screw slightly to relieve any residual pressure.
12. 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. **Not Available on DS120R-ALA**.

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.

Special Tools

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

Bleed Kit (Actron 7840 shown, others similar).

Gallon Hand Pump (Autotec 57429 shown, other similar)

Troubleshooting

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

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

Issues with Vehicle Raising/Pump

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

Issues with Vehicle Lowering/Dump Valve

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

Issues with One Corner Not Leveling Properly

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

Issues with Height Sensors

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

Issues with Ride/Handling

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

Issues with Steering Sensor

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

Issues with Vehicle Speed Signal

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

Issues with Vehicle Brake Signal

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

Issues with Door Switch

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

Issues with Vehicle Ignition Signal

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

Issues with Vehicle Park Signal

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

Issues with Driver Interface

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

Issues with Power Module

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

Issues with Strut Assembly

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

Issues with Secondary Volume Assembly

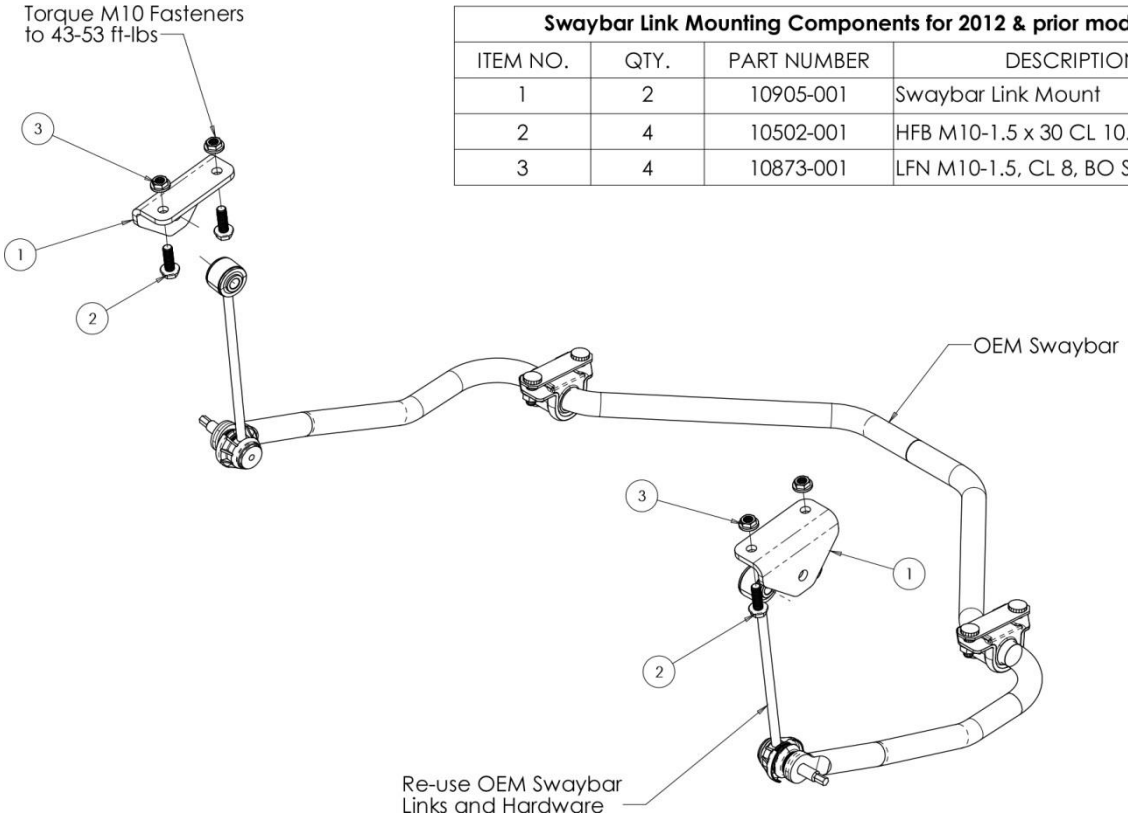
Condition	Cause	Correction
Hydraulic Leak	Weld failure between tube and end	Replace secondary volume welded assembly
	Weld failure between tube and manifold	Replace secondary volume welded assembly
	Cylinder fracture	Replace secondary volume welded assembly
	Bleed screw loose	Tighten bleed screws to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

Parts List Information

Abbreviations

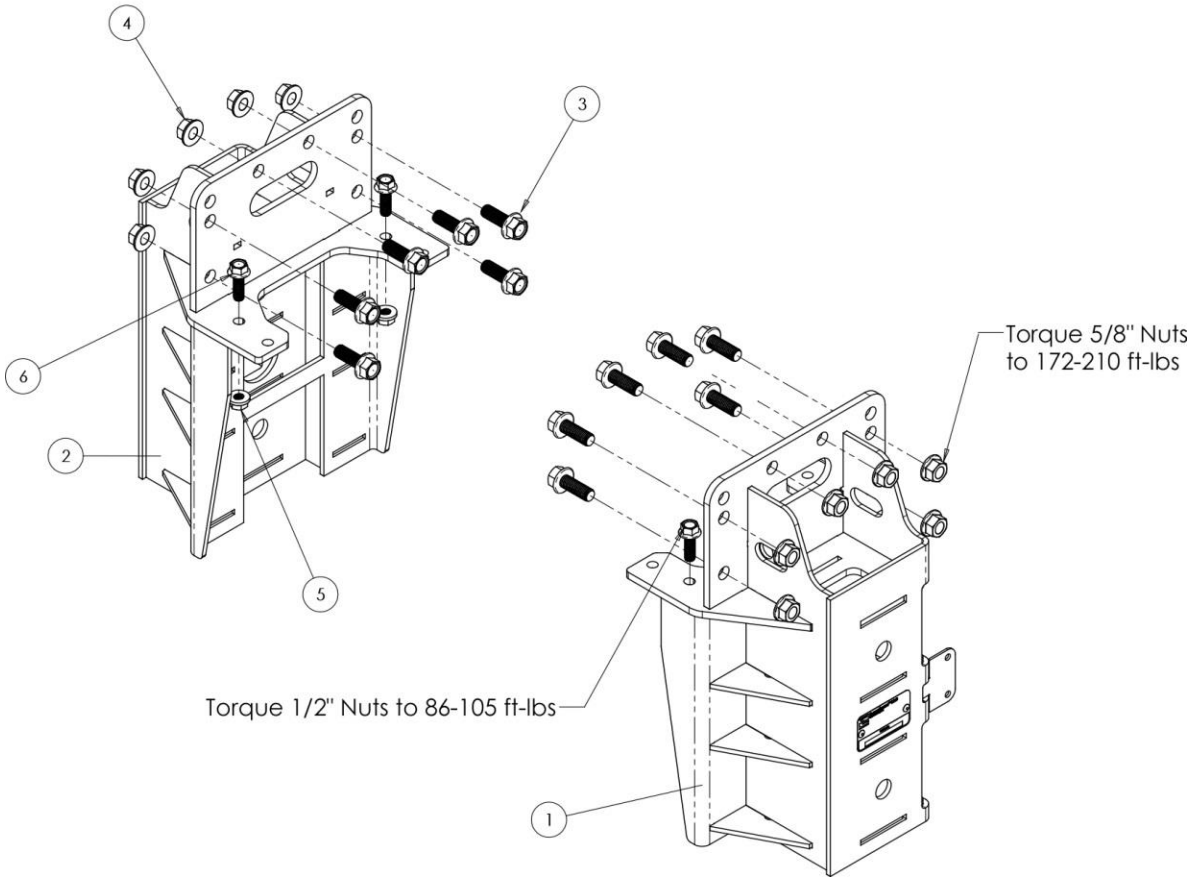
HCS	Hex Cap Screw	HTCN	Hex Thin Castle Nut
HFB	Hex Flange Bolt	HFW	Hardened Flat Washer
SHCS	Socket Head Cap Screw	SLW	Spring Lock Washer
SFHS	Serrated Flange Hex Screw	SAE	SAE O-Ring Fitting
HN	Hex Nut, Non-locking	37°	SAE or JIC 37° Flare Fitting
LHN	Locking Hex Nut	LH	Left Handed Part
LFN	Locking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

Part Identification

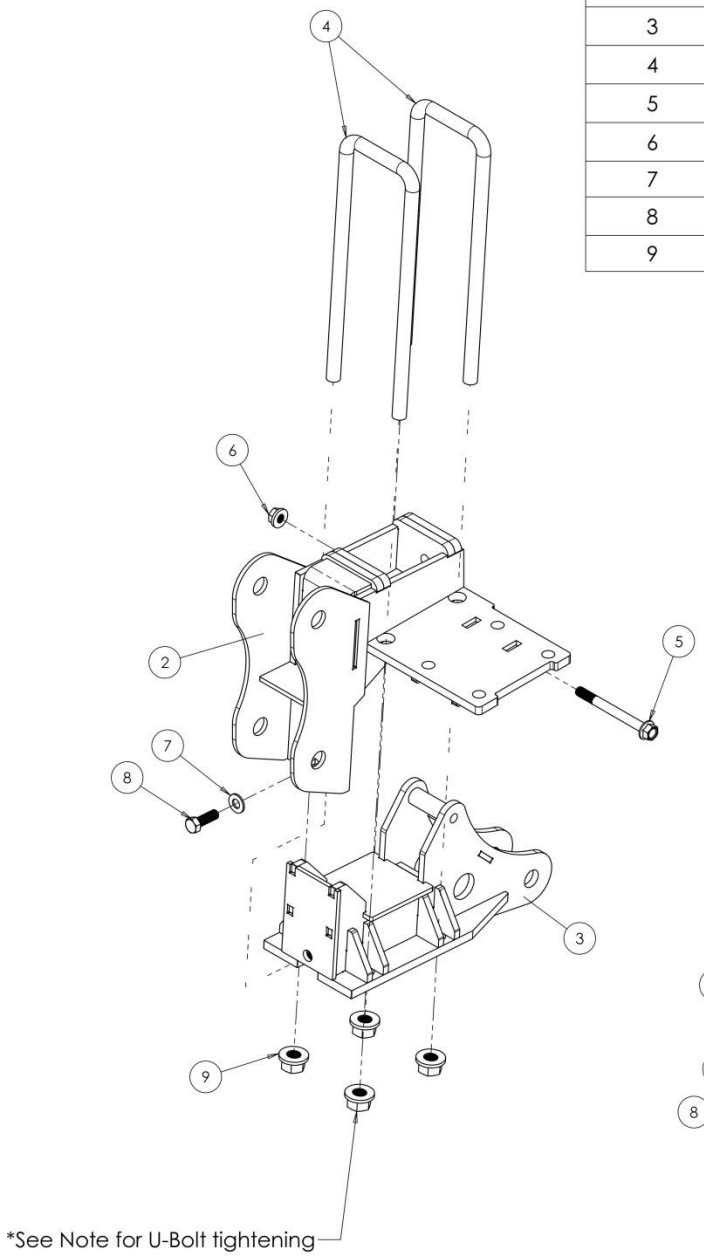


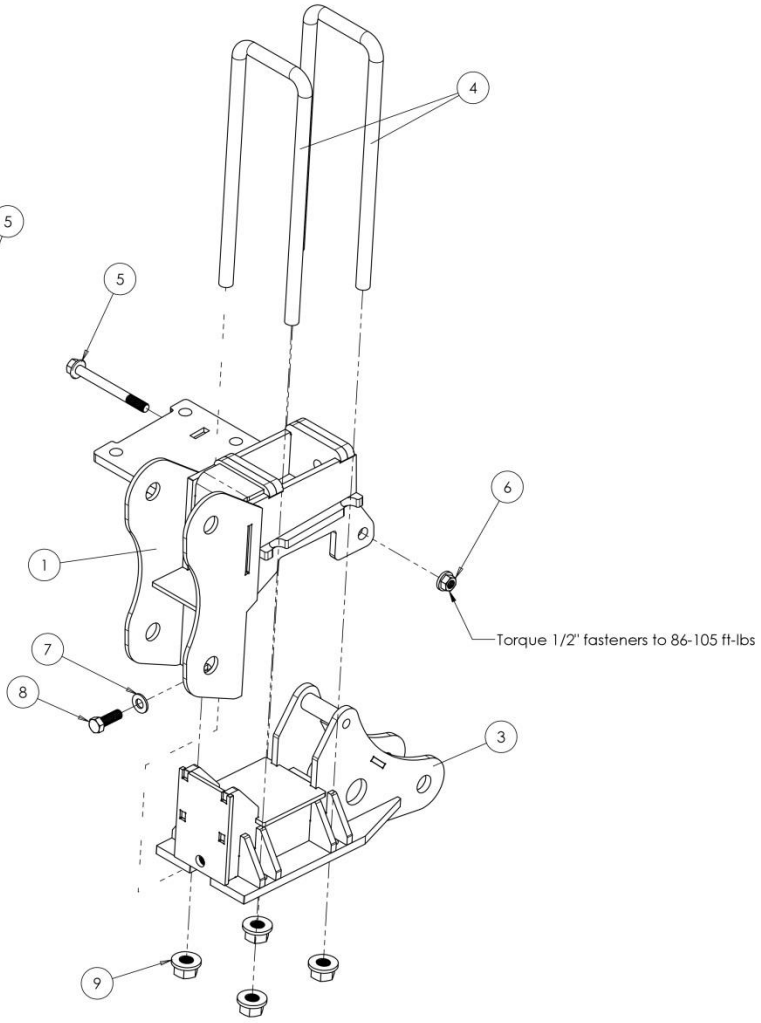
Swaybar Link Mounting Components for 2012 & prior models			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	2	10905-001	Swaybar Link Mount
2	4	10502-001	HFB M10-1.5 x 30 CL 10.9 Z
3	4	10873-001	LFN M10-1.5, CL 8, BO Serrated

Front Hanger Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	1	10730-002	Asy, Front Hanger, LH
2	1	10729-004	Wldmnt, Front Hanger, RH
3	12	10874-175	HFB 5/8-11x1.750, Gr. 8, BO
4	12	10012-008	LFN 5/8-11 Gr G, Black Phos
5	4	10012-007	LFN 1/2-13, Gr. G, Black Phos
6	4	10885-150	HFB 1/2-13x1.500, Gr. 8, BO



Axle Clamp Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	1	10745-003	Weldment, Axle Seat LH
2	1	10745-004	Weldment, Axle Seat RH
3	2	10744-002	Weldment, Axle Cradle
4	4	10064-003	U-Bolt 3/4-16 x 14.63 Tri-8
5	2	10885-500	HFB 1/2-13x5.000, Gr. 8, BO
6	2	10012-007	LFN 1/2-13, Gr. G, Black Phos
7	2	10006-007	HFW 1/2 Z
8	2	10011-008	HCS 1/2-13x1.500, Gr. 8, Zinc
9	8	10012-012	LFN 3/4-16, Gr. G, Black Phos





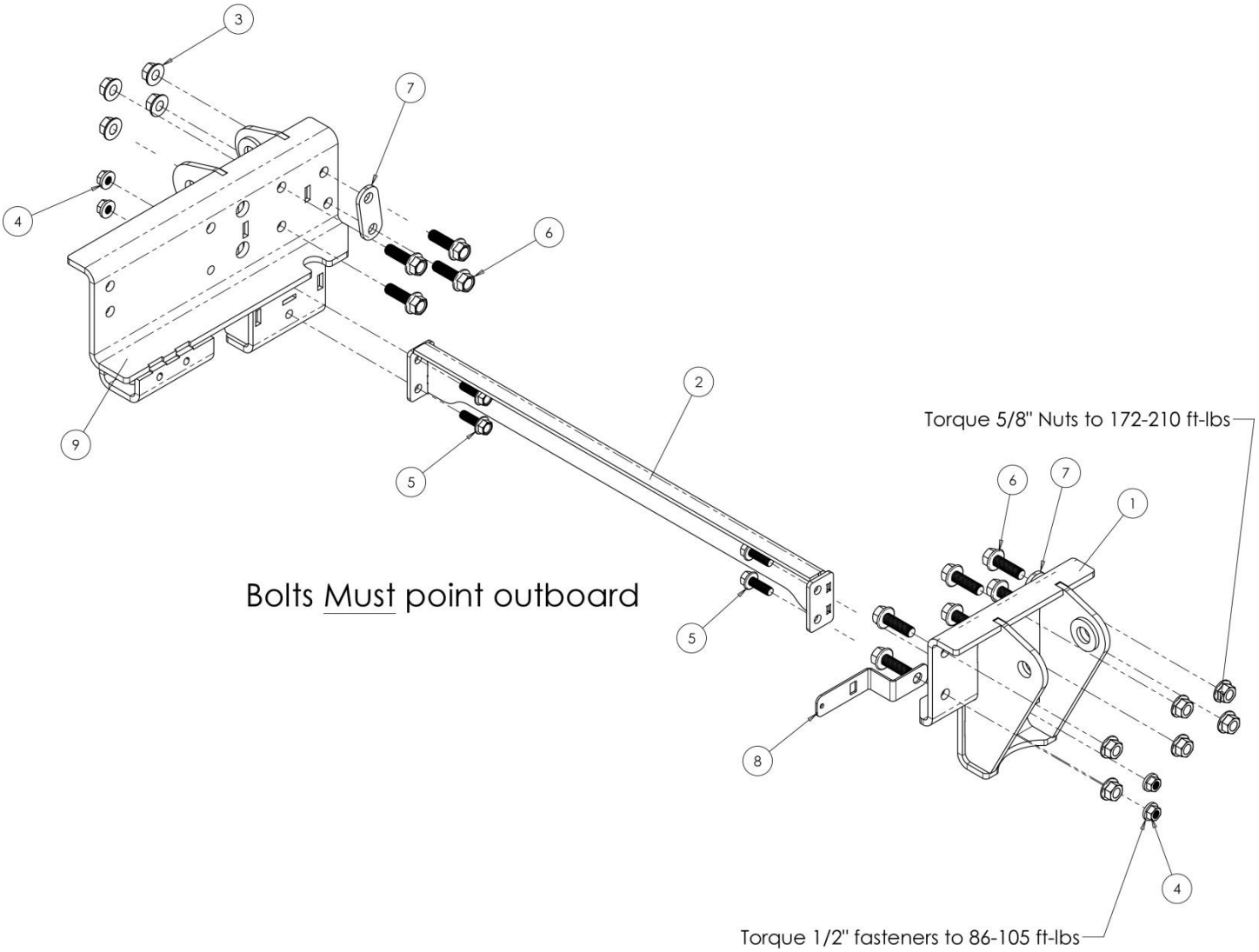
*U-Bolts:

Stage 1: Tighten to 100Nm [74 ft-lbs]
Stage 2: Tighten to 200Nm [148 ft-lbs]
Stage 3: Tighten to 300Nm [222 ft-lbs]
Stage 4: Tighten to 400Nm [295 ft-lbs]

Tighten in Criss-Cross Pattern

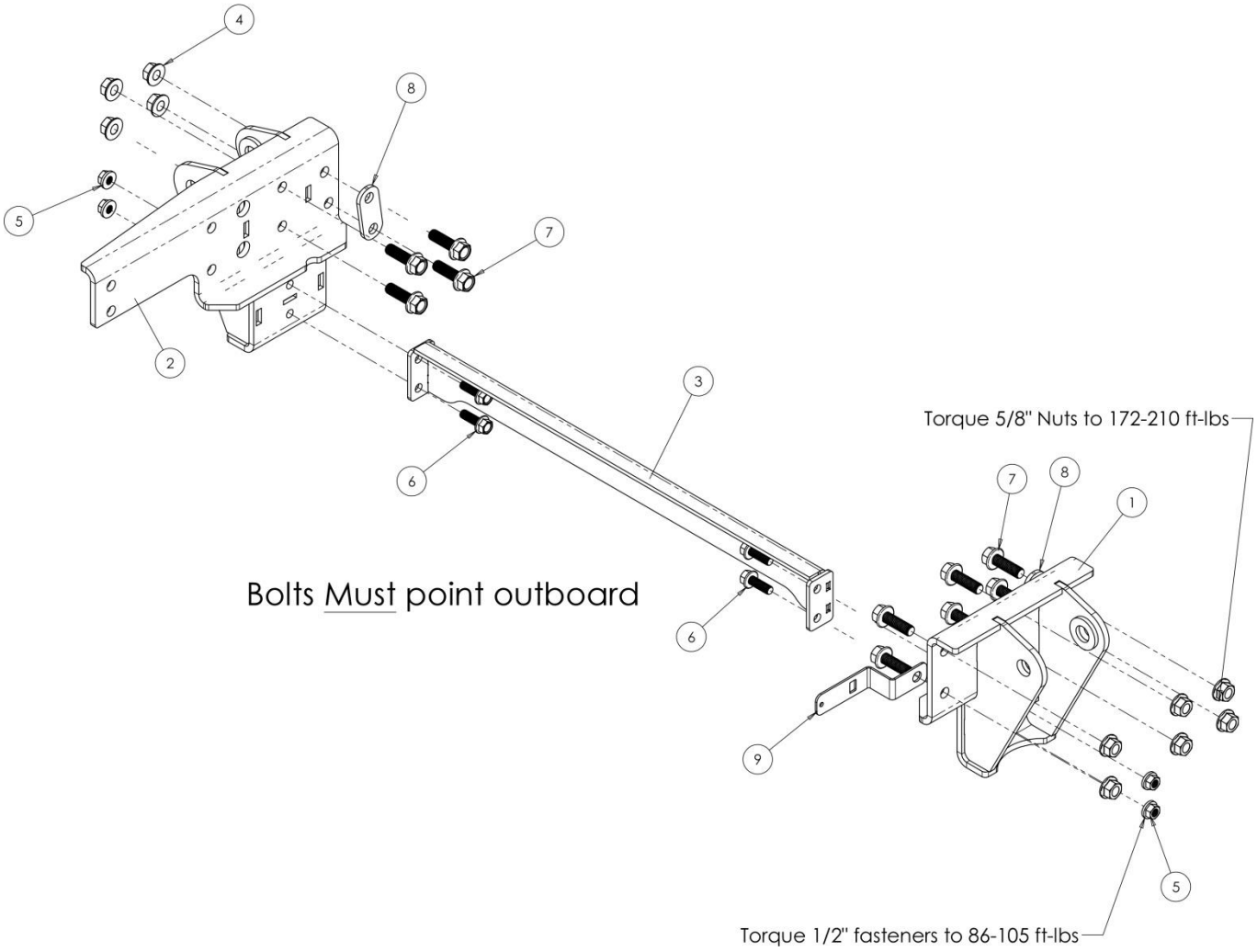
[2013 and later models]

Upper Strut Mount Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	1	10790-003	Wldmnt, Upper Strut Mount, LH
2	1	10782-002	Wldmnt, Crossmember Reinforcement
3	10	10012-008	LFN 5/8-11 Gr G, Black Phos
4	4	10012-007	LFN 1/2-13, Gr. G, Black Phos
5	4	10885-150	HFB 1/2-13x1.500, Gr. 8, BO
6	10	10874-200	HFB 5/8-11x2.000, Gr. 8, BO
7	2	10912-001	Backing Plate
8	1	10919-001	Brake line relocation bracket
9	1	10790-005	Wldmnt, Upper Strut Mount, RH



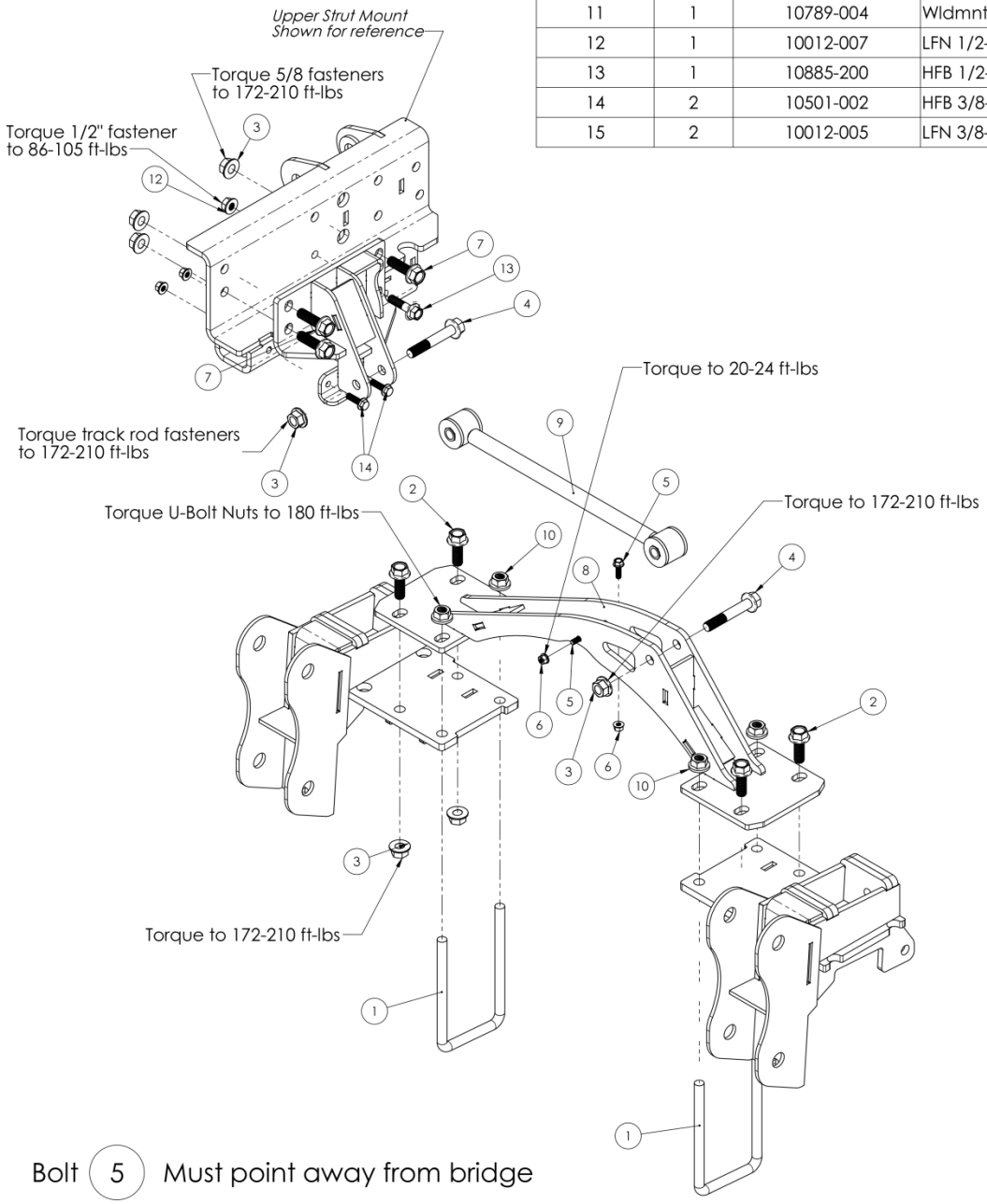
[2012 and prior models]

Upper Strut Mount Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	1	10790-003	Wldmnt, Upper Strut Mount, LH
2	1	10790-004	Wldmnt, Upper Strut Mount, RH
3	1	10782-002	Wldmnt, Crossmember Reinforcement
4	10	10012-008	LFN 5/8-11 Gr G, Black Phos
5	4	10012-007	LFN 1/2-13, Gr. G, Black Phos
6	4	10885-150	HFB 1/2-13x1.500, Gr. 8, BO
7	10	10874-200	HFB 5/8-11x2.000, Gr. 8, BO
8	2	10912-001	Backing Plate
9	1	10919-001	Brake line relocation bracket



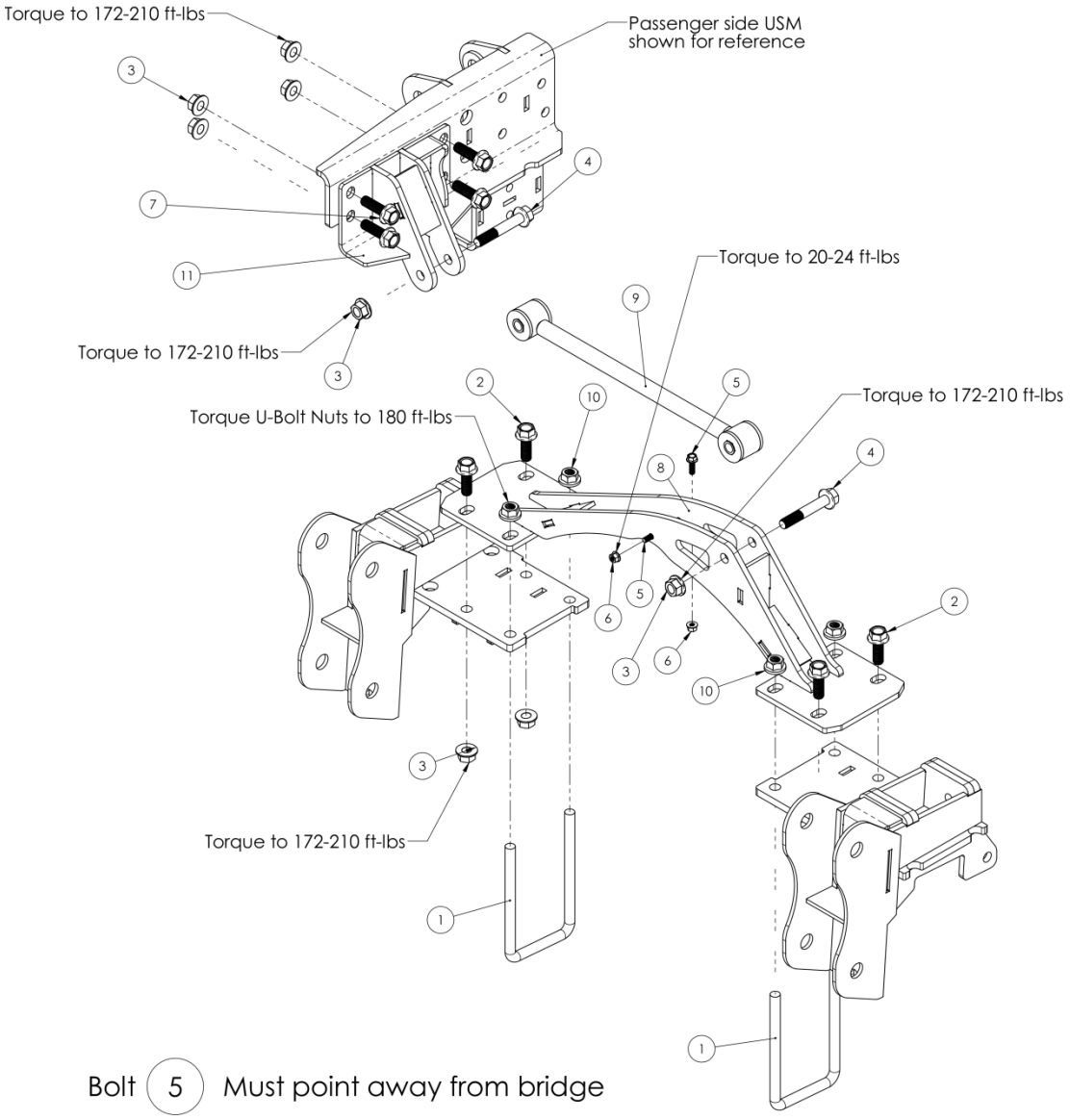
[2013 and later models]

Bridge Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	2	10064-002	U-Bolt, 5/8-18 x 8.5 x 8.0, Slanted
2	4	10874-175	HFB 5/8-11x1.750, Gr. 8, BO
3	9	10012-008	LFN 5/8-11 Gr G, Black Phos
4	2	10874-375	HFB 5/8-11x3.750, Gr. 8, BO
5	2	10886-100	HFB 5/16-18 x 1.000, Gr. 8, BO
6	2	10012-010	LFN 5/16-18, Gr. G, Black Phos
7	3	10874-200	HFB 5/8-11x2.000, Gr. 8, BO
8	1	10762-003	Weldment, Bridge
9	1	10786-002	Asy, Track Rod
10	4	10012-013	LFN 5/8-18, Gr. G, Black Phos
11	1	10789-004	Wldmnt, Track Rod Mnt
12	1	10012-007	LFN 1/2-13, Gr. G, Black Phos
13	1	10885-200	HFB 1/2-13x2.000, Gr. 8, BO
14	2	10501-002	HFB 3/8-16 x 1.250, Gr 8, BO
15	2	10012-005	LFN 3/8-16, Gr G, Z

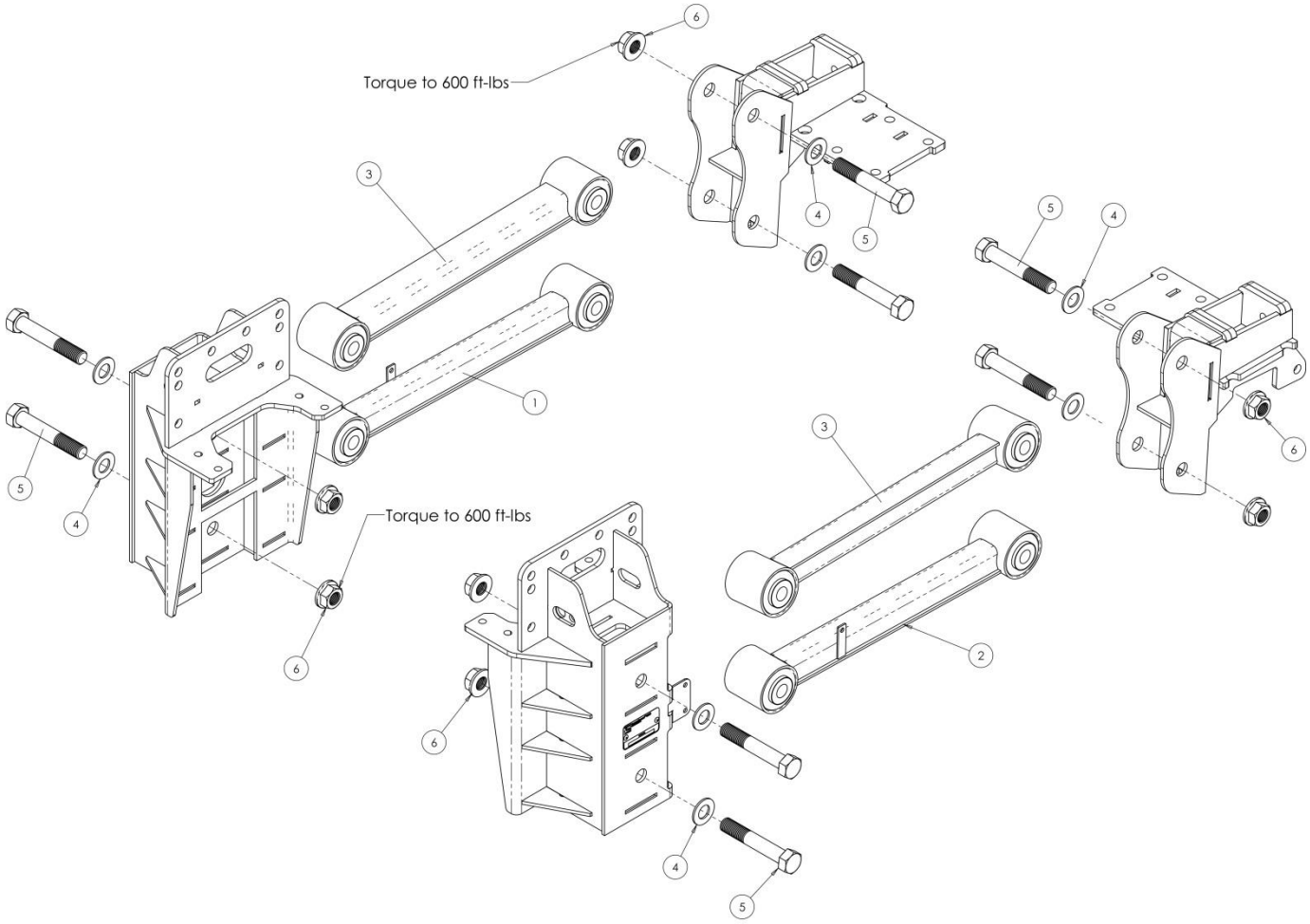


[2012 and prior models]

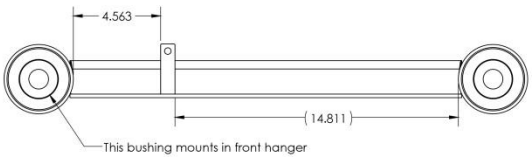
Bridge Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	2	10064-002	U-Bolt, 5/8-18 x 8.5 x 8.0, Slanted
2	4	10874-175	HFB 5/8-11x1.750, Gr. 8, BO
3	10	10012-008	LFN 5/8-11 Gr G, Black Phos
4	2	10874-375	HFB 5/8-11x3.750, Gr. 8, BO
5	2	10886-100	HFB 5/16-18 x 1.000, Gr. 8, BO
6	2	10012-010	LFN 5/16-18, Gr. G, Black Phos
7	4	10874-200	HFB 5/8-11x2.000, Gr. 8, BO
8	1	10762-003	Weldment, Bridge
9	1	10786-002	Asy, Track Rod
10	4	10012-013	LFN 5/8-18, Gr. G, Black Phos
11	1	10789-003	Wldmnt, Track Rod Mnt



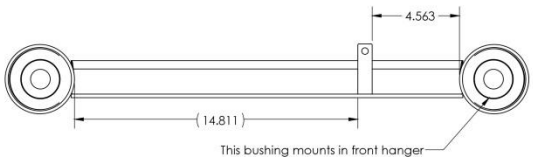
Control Arm Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	1	10777-005	Asy, Control Arm, RH, Lower
2	1	10777-004	Asy, Control Arm, LH, Lower
3	2	10777-006	Asy, Control Arm, Upper
4	8	10006-004	HFW 1.000, Zinc
5	8	10003-003	HB 1.000-8x6.000, Gr. 8, Zinc
6	8	10012-003	LFN 1-8, Gr G, Z Top Lock



Driver Side
Lower Control Arm
P/N: 10777-004

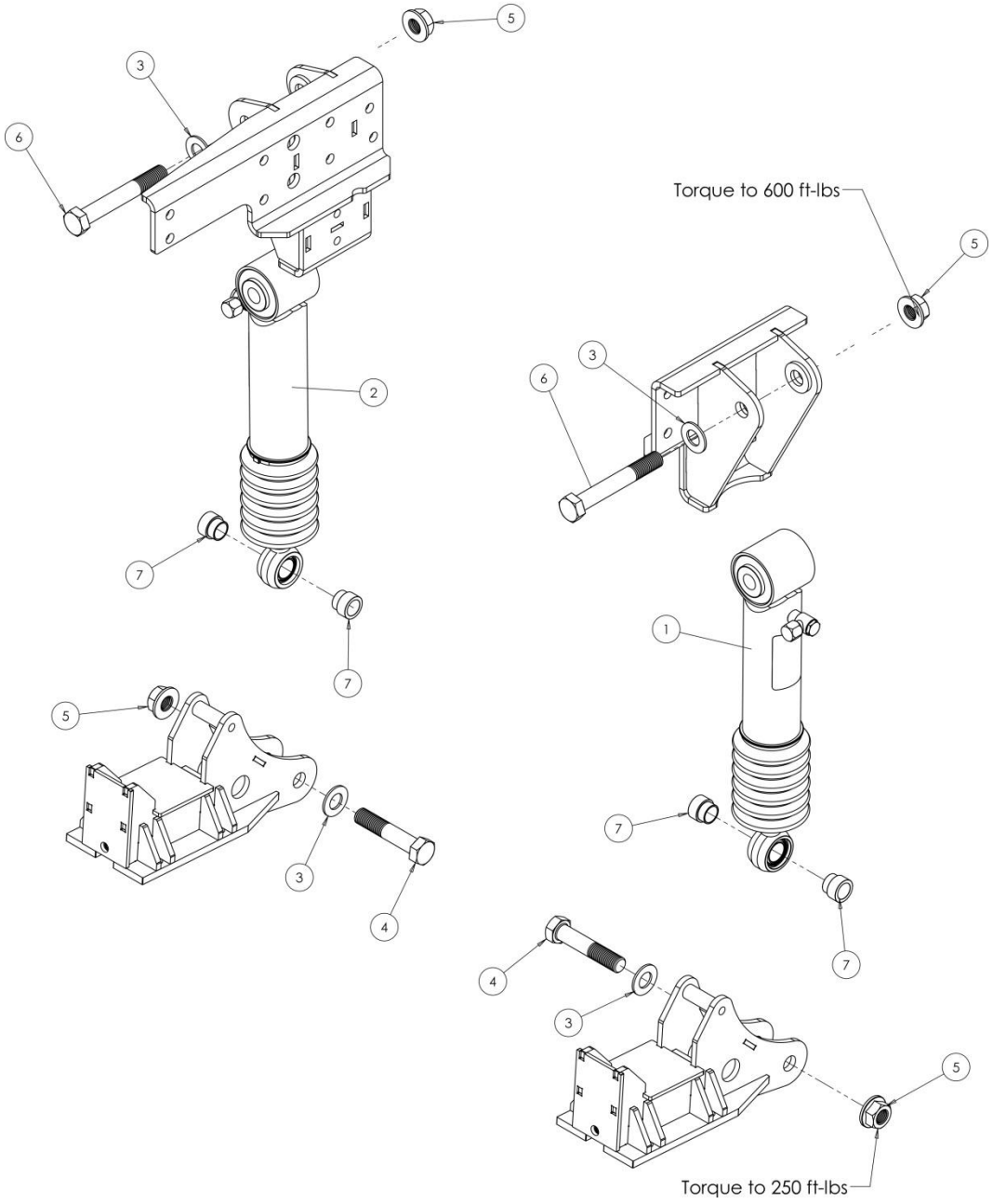


Passenger Side
Lower Control Arm
P/N: 10777-005



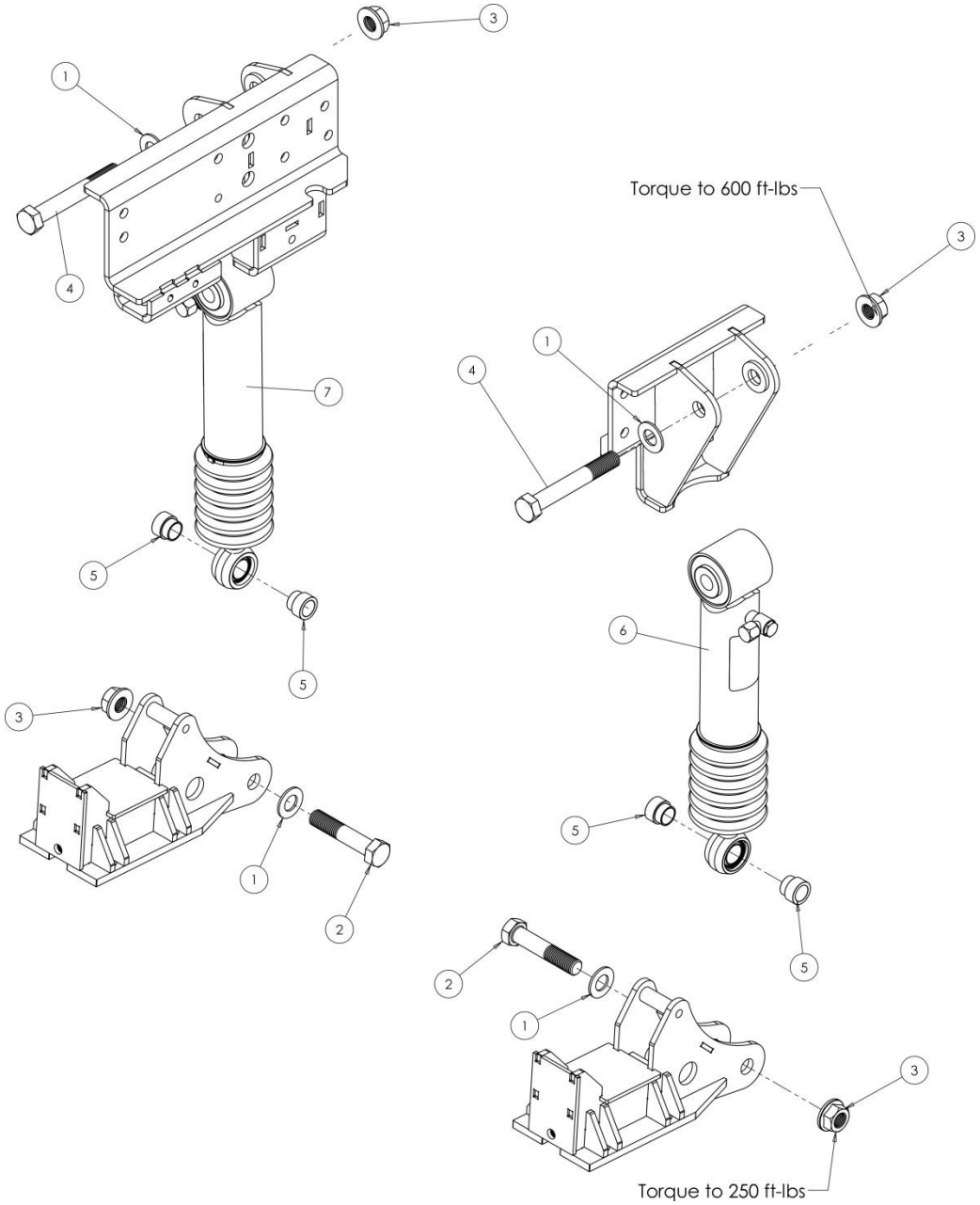
[2012 and prior 4500 Cab Chassis models]

Strut Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	1	10877-002	Asy Strut 2.75ID x 3.50 OD x 1.375
2	1	10877-001	Asy Strut 2.75ID x 3.50 OD x 1.375
3	4	10006-004	HFW 1.000, Zinc
4	2	10003-008	HCS 1-8 x 5.000, Gr 8, Z
5	4	10012-003	LFN 1-8, Gr G, Z Top Lock
6	2	10003-006	HCS 1.000-8 x 7.000, Gr. 8, ZY
7	4	10640-004	Bearing Spacer, 1.24 x 1.06 x .693



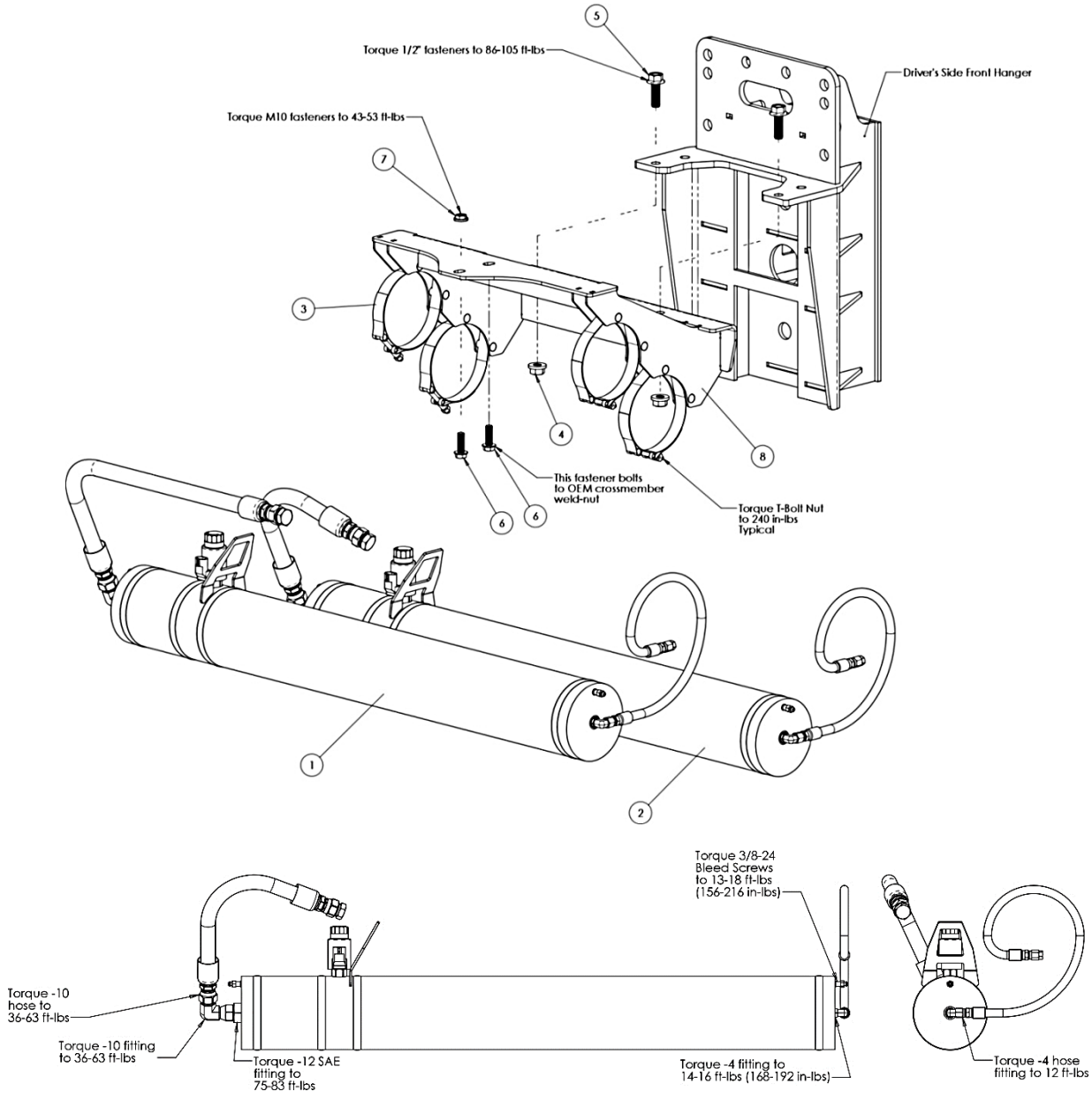
[All 2013 and later 4500 and 5500 Cab Chassis models]

Strut Components				
ITEM NO.	QTY.	PART NUMBER **DS120R 4500**	PART NUMBER **DS135R 5500**	DESCRIPTION
1	4	10006-004		HFW 1.000, Zinc
2	2	10003-008		HCS 1-8 x 5.000, Gr. 8, ZY
3	4	10012-003		LFN 1-8, Gr. G, Z Top Lock
4	2	10003-006		HCS 1-8 x 7.000, Gr. 8, ZY
5	2	10640-004		Bearing Spacer, 1.25 x 1.02 x .693
6	1	10877-002	10838-002	Asy Strut, Port Left
7	1	10877-001	10838-001	Asy, Strut, Port Right



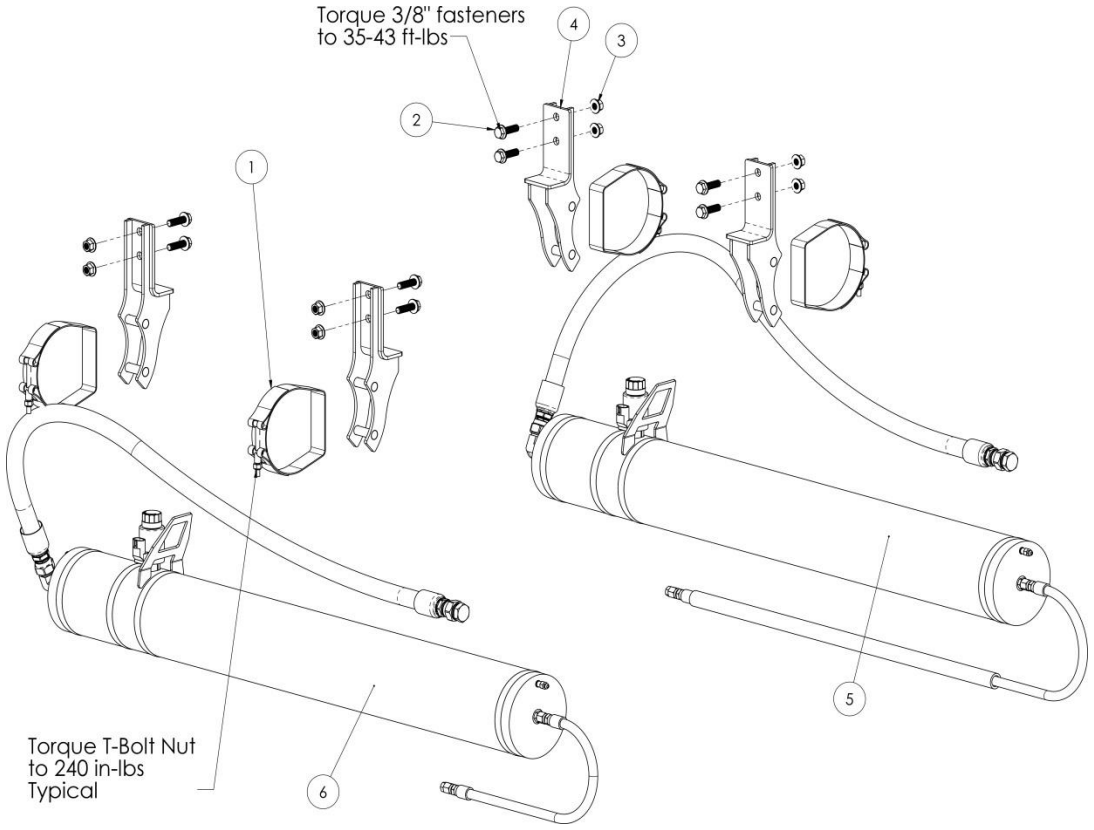
[All Models except for DS120R-AF and DS135R-AF]

Secondary Volume Components				
ITEM NO.	QTY.	PART NUMBER **4500 models**	PART NUMBER **5500 models**	DESCRIPTION
1	1	10597-016	10597-024	Asy, 2nd Volume, Ram, RH
2	1	10597-015	10597-023	Asy, 2nd Volume, Ram, LH
3	4	10843-003		T-Bolt Clamp, Range 4.60-5.22
4	2	10012-007		LFN ½-13, Gr. G, Black Phos
5	2	10885-150		HFB ½-13x1.500, Gr. 8, BO
6	2	10502-001		HFB M10-1.5 x 30 CL 10.9 Z
7	1	10873-002		LFN M10-1.5, CL 10.9 Z
8	1	10830-004		Wldmnt, Volume Mount, Twin

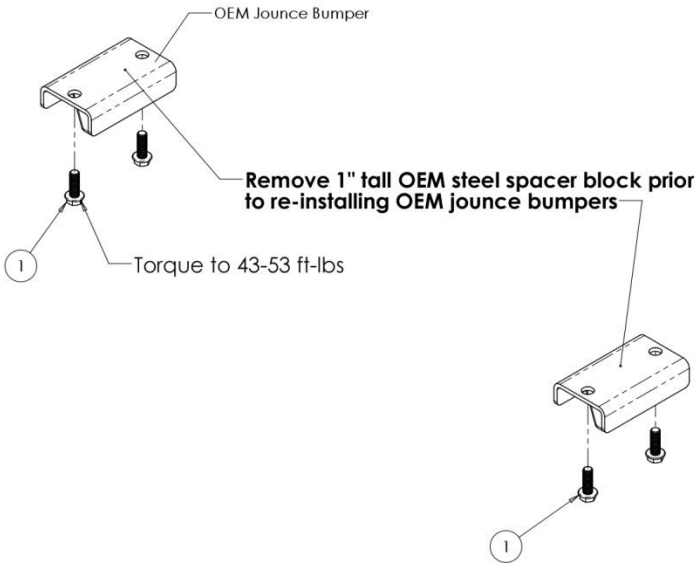


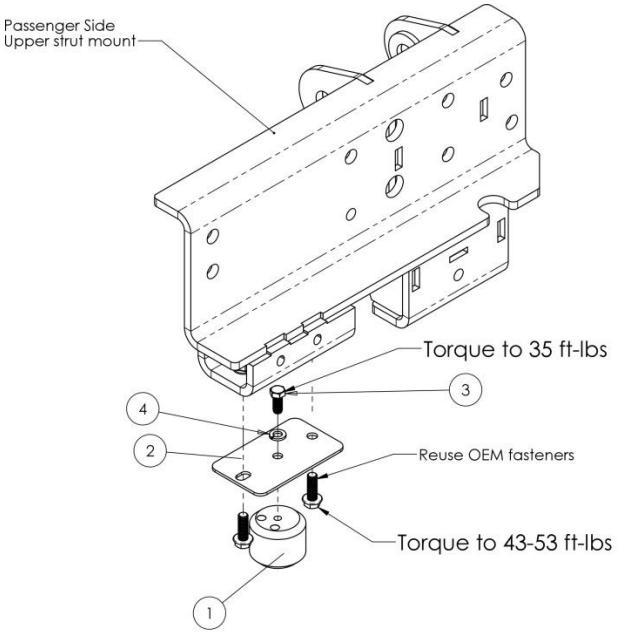
[DS120R-AF and DS135R-AF Model Vehicles only]

Secondary Volume Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	4	10843-003	T-Bolt Clamp, Range 4.60-5.22
2	8	10501-002	HFB 3/8-16 x 1.25, Gr 8, BO
3	8	10012-005	LFN 3/8-16, Gr. G, Z
4	4	10830-015	Volume Mount Weldment
5	1	10597-043 **[DS120R-AF]**	Asy, 2nd Volume 50x374, LH
		10597-053 **[DS135R-AF]**	Asy, 2nd Volume 50x450, LH
6	1	10597-044 **[DS120R-AF]**	Asy, 2nd Volume 50x374, RH
		10597-054 **[DS135R-AF]**	Asy, 2nd Volume 50x450, RH



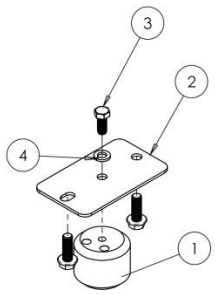
Jounce Bumper Components for 2012 & prior models			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	4	10502-001	HFB M10-1.5 x 30 CL 10.9 Z



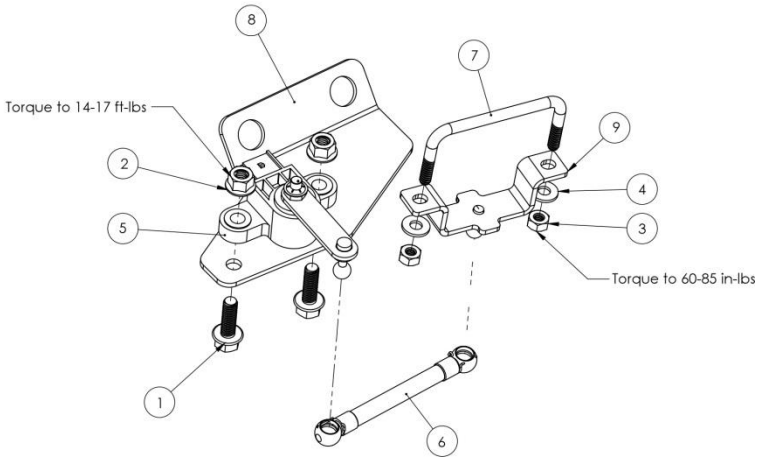


Jounce Bumper Components for 2013 and newer models			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	2	10867-002	Jounce Bumper, 2.313"Dia x 1.875"T
2	2	10889-001	Jounce Bumper Mount Plate
3	2	10461-003	HCS 3/8-16x.875 Gr 8 Z
4	2	10237-003	SLW 3/8, Z
5	2	10873-002	LFN M10-1.6, CL 10.9 Z

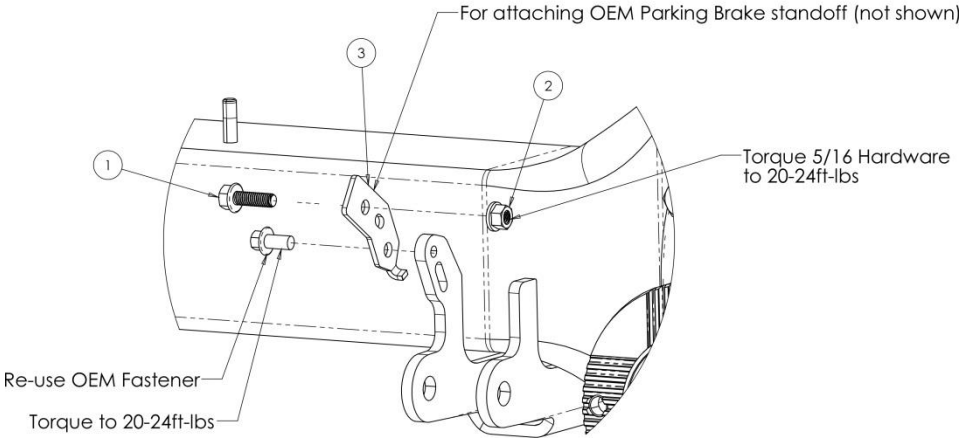
Discard OEM Bumpers and replace with assembly shown



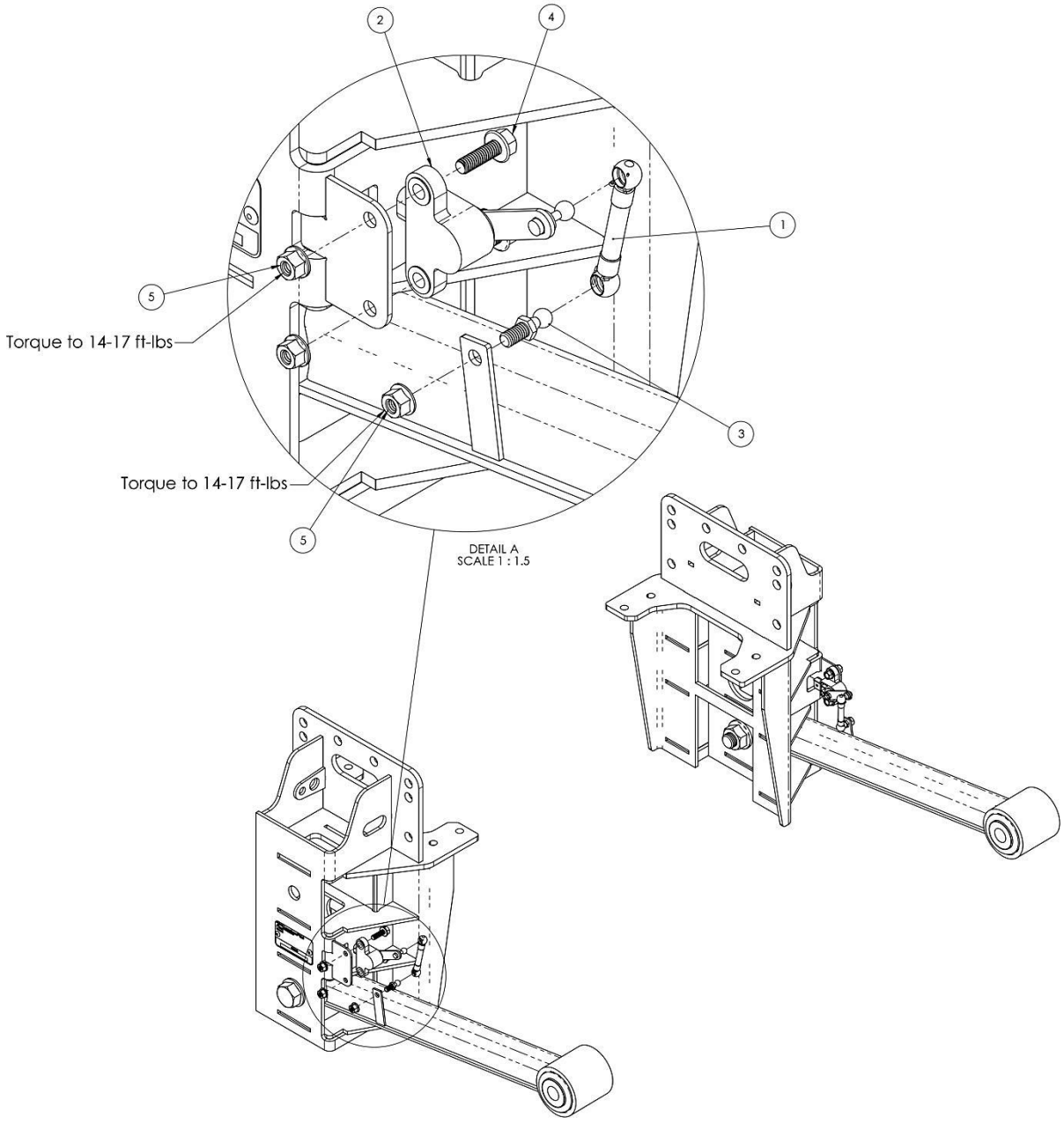
Steering Sensor Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	2	10886-100	HFB 5/16-18 x 1.000, Gr. 8, BO
2	2	10012-010	LFN 5/16-18, Gr. G, Black Phos
3	2	10004-013	LHN .250-20, Gr. C, Zinc
4	2	10006-009	HFW 1/4, .625x.281x.064, Z
5	1	10586-002	Asy, Steering Sensor
6	1	10587-006	Asy, Linkage, 3.938" SS
7	1	10669-005	U-Bolt, 1/4-20 x 3.00 x 1.375 Gr 5 SQ
8	1	10904-001	Steering Sensor Mount Plate
9	1	10733-002	Wldmnt, Steering Ball Stud Mnt

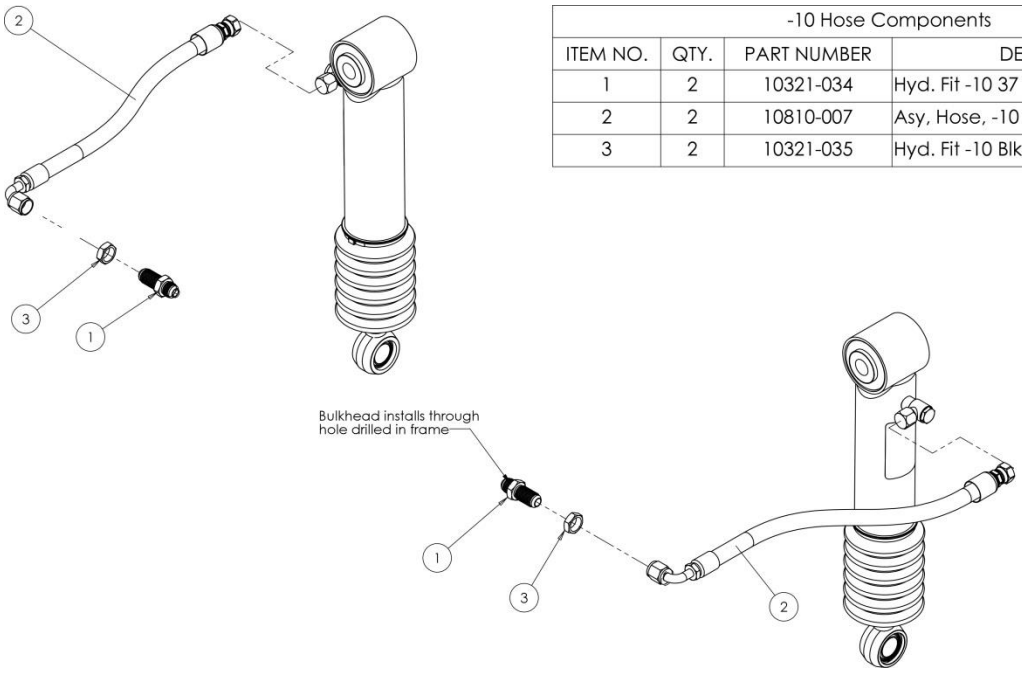


Parking Brake Relocation Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	1	10886-100	HFB 5/16-18 x 1.000, Gr. 8, BO
2	1	10012-010	LFN 5/16-18, Gr. G, Black Phos
3	1	10902-001	Parking Brake Relocating Bracket



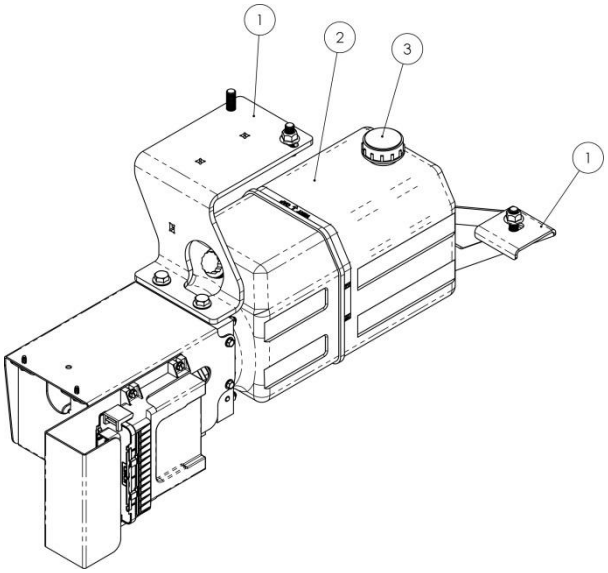
Height Sensor Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	2	10587-005	Asy, Linkage
2	2	10586-001	Asy, Height Sensor
3	2	10591-001	Ball Stud, 10mm x 5/16-18
4	4	10886-100	HFB 5/16-18 x 1.000, Gr. 8, BO
5	6	10012-010	LFN 5/16-18, Gr. G, Black Phos



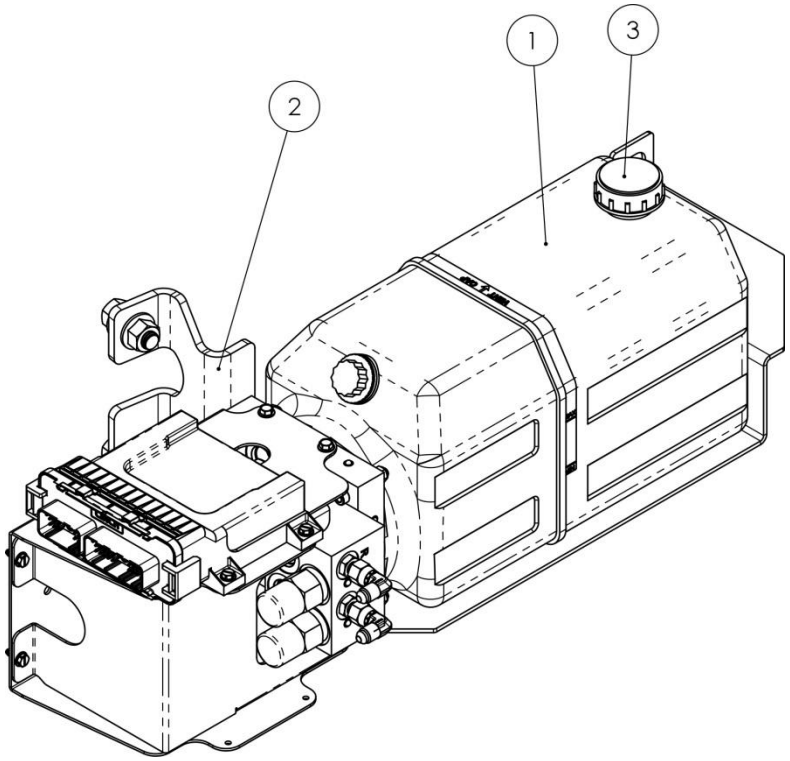


-10 Hose Components			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	2	10321-034	Hyd. Fit -10 37 x -10 37 Blkhd
2	2	10810-007	Asy, Hose, -10 x 25-3/16"
3	2	10321-035	Hyd. Fit -10 Blkhd Locknut

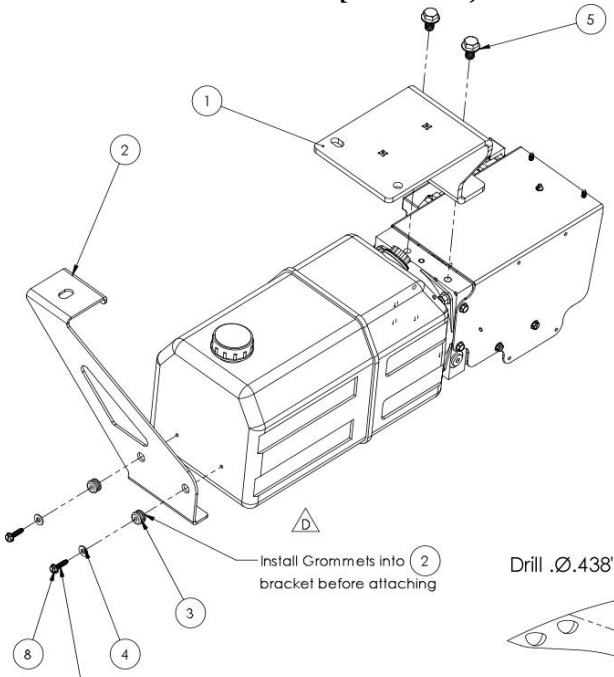
Power Module Mounting [DS120R-A, DS120R-A12, DS120R-A13, DS135R-B, DS135R-B13, DS120R-ALA]			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	1	10887	Kit, Power Module Mounting, Ram
2	1	11023-001	Asy, Power Module, RAM 4500 (2013 and later)
		11023-002	Asy, Power Module, RAM 4500 (2012 and earlier)
		11023-003	Asy, Power Module, RAM 5500
		11023-005	Asy, Power Module, DS120R-ALA
3	1	10614-001	Breather Cap



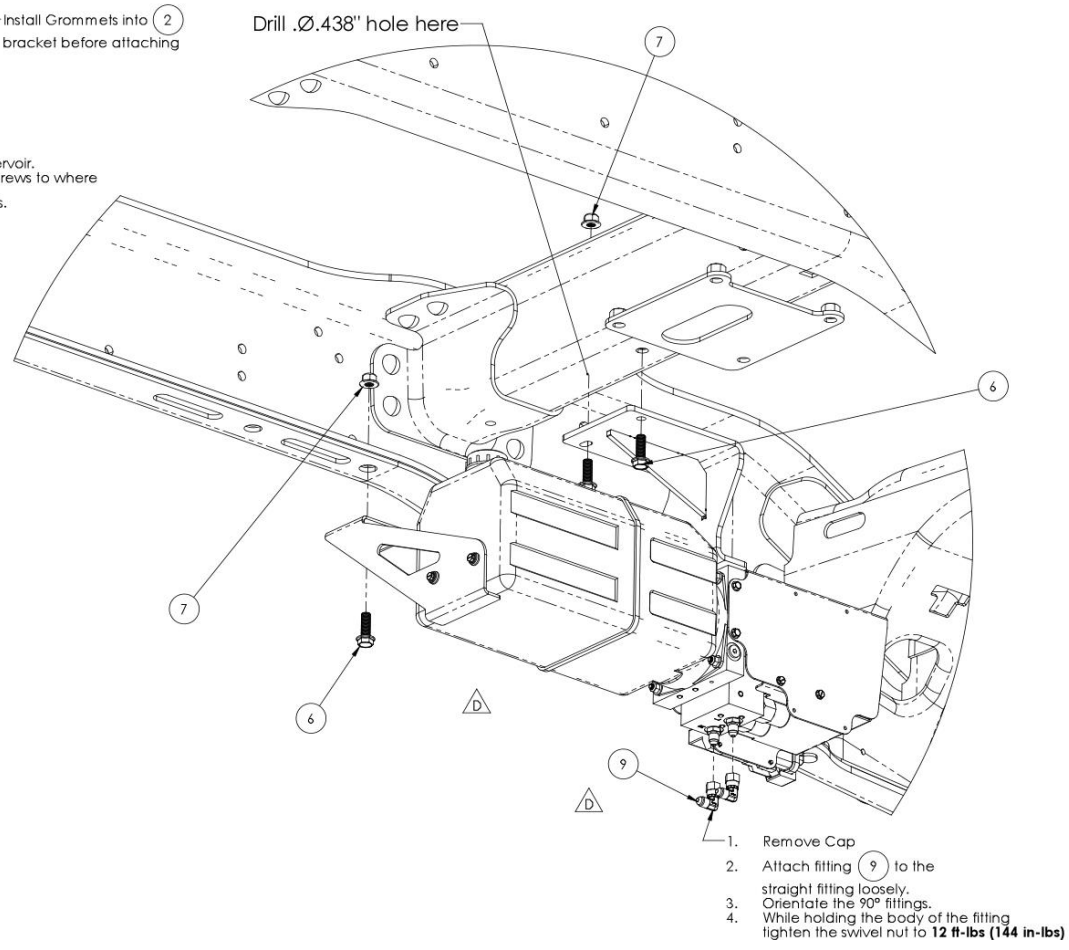
Power Module Mounting [DS120R-AF and DS135R-AF]			
ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	1	11013-003 **[DS120R-AF]**	Asy, Power Module, RAM 4500
		11013-005 **[DS135R-AF]**	Asy, Power Module, RAM 5500
2	1	11094	Kit, Power Module Mounting, RAM-AF
3	1	10614-001	Breather Cap



[DS120R-A, DS120R-A12, DS120R-A13, DS135R-B, DS135R-B13]

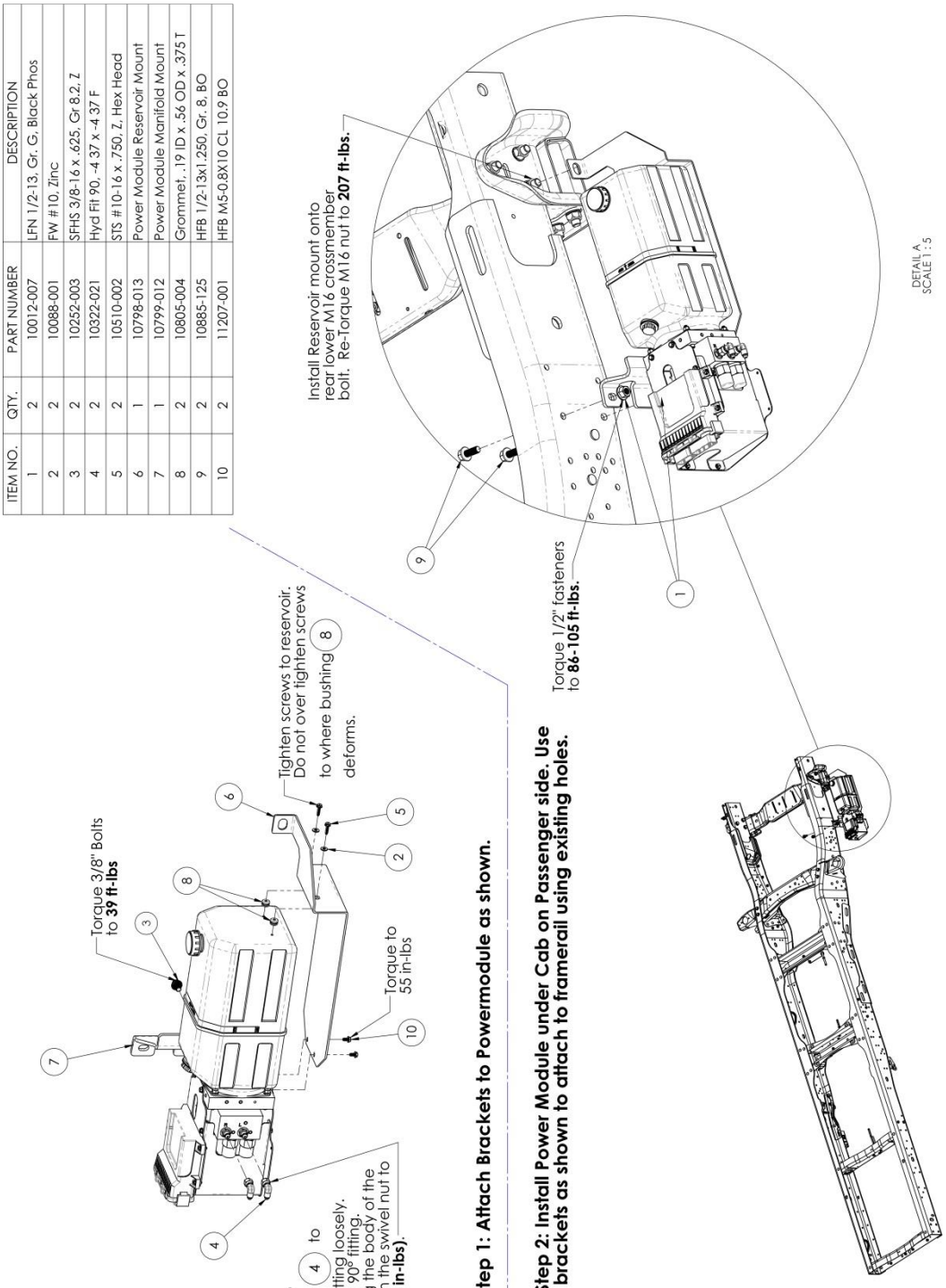


ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	1	10799-008	Wldmnt, Power Mod Manifold Mnt
2	1	10798-005	Power Module Reservoir Mount
3	2	10805-004	Grommet, .19 ID x .56 OD x .375 T
4	2	10088-001	FW #10, Zinc
5	2	10252-003	SFHS 3/8-16 x .625, Gr 8.2, Z
6	3	10502-001	HFB M10-1.5 x 30 CL 10.9 Z
7	2	10873-002	LFN M10-1.5, CL 10.9 Z
8	2	10510-002	STS #10-16 x .750, Z, Hex Head
9	2	10322-021	Hyd Fit 90, -4 37 x -4 37 F
10	1	D10887	Document, Kit, Power Module Mounting, RAM



[DS120R-AF and DS135R-AF]

ITEM NO.	QTY.	PART NUMBER	DESCRIPTION
1	2	10012-007	LFN 1/2-13, Gr. G, Black Phos
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	2	10510-002	STS #10-16 x .750, Z, Hex Head
6	1	10798-013	Power Module Reservoir Mount
7	1	10799-012	Power Module Manifold Mount
8	2	10805-004	Grommet, .19 ID x .56 OD x .375 T
9	2	10885-125	HFB 1/2-13x1.250, Gr. 8, BO
10	2	11207-001	HFB M5-0.8X10 CL 10.9 BO

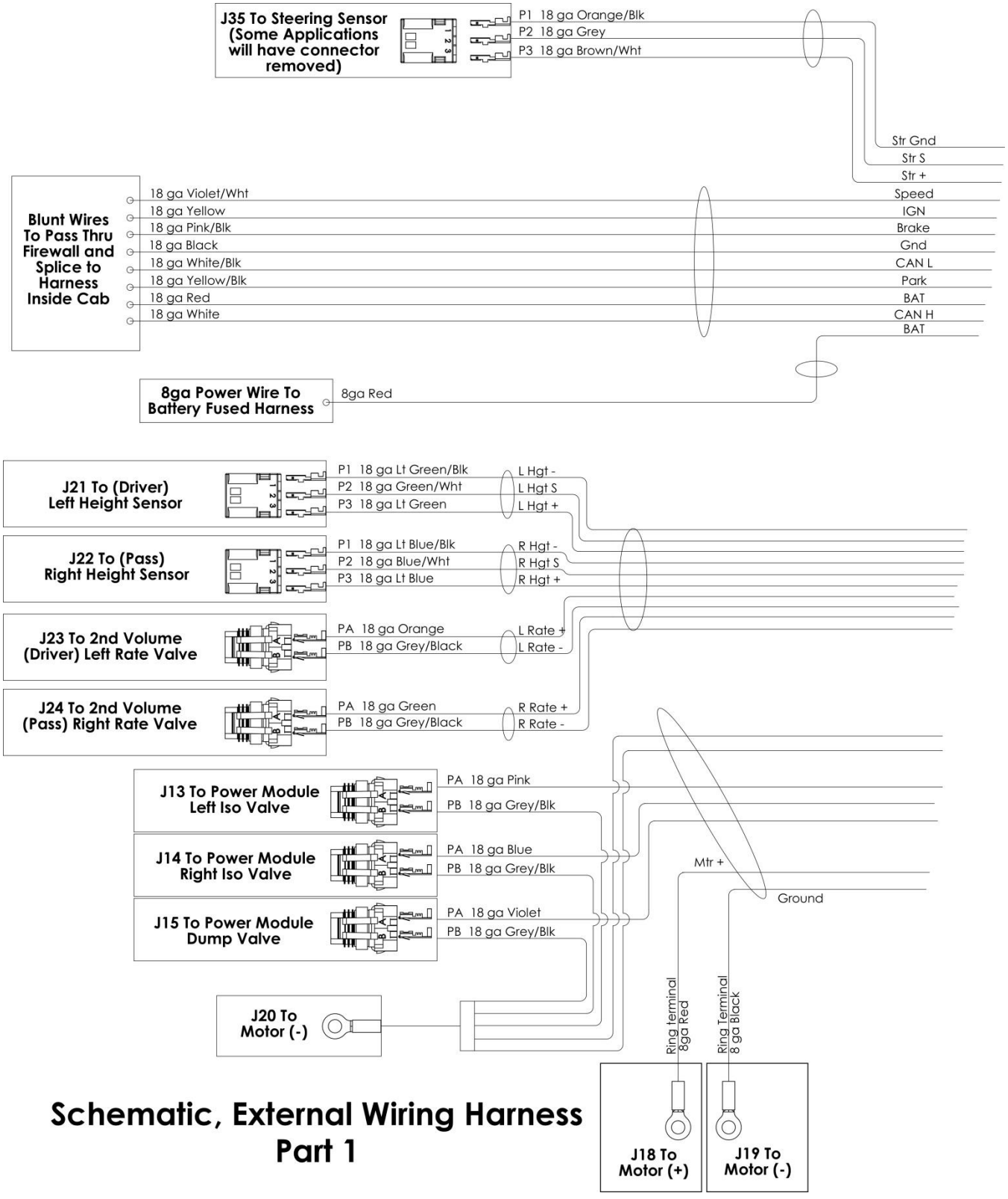


1. Remove Cap
2. Attach fitting (4) to the straight fitting loosely.
3. Orientate the 90° fitting.
4. While Holding the body of the fitting, tighten the swivel nut to **12 ft-lbs (144 in-lbs).**

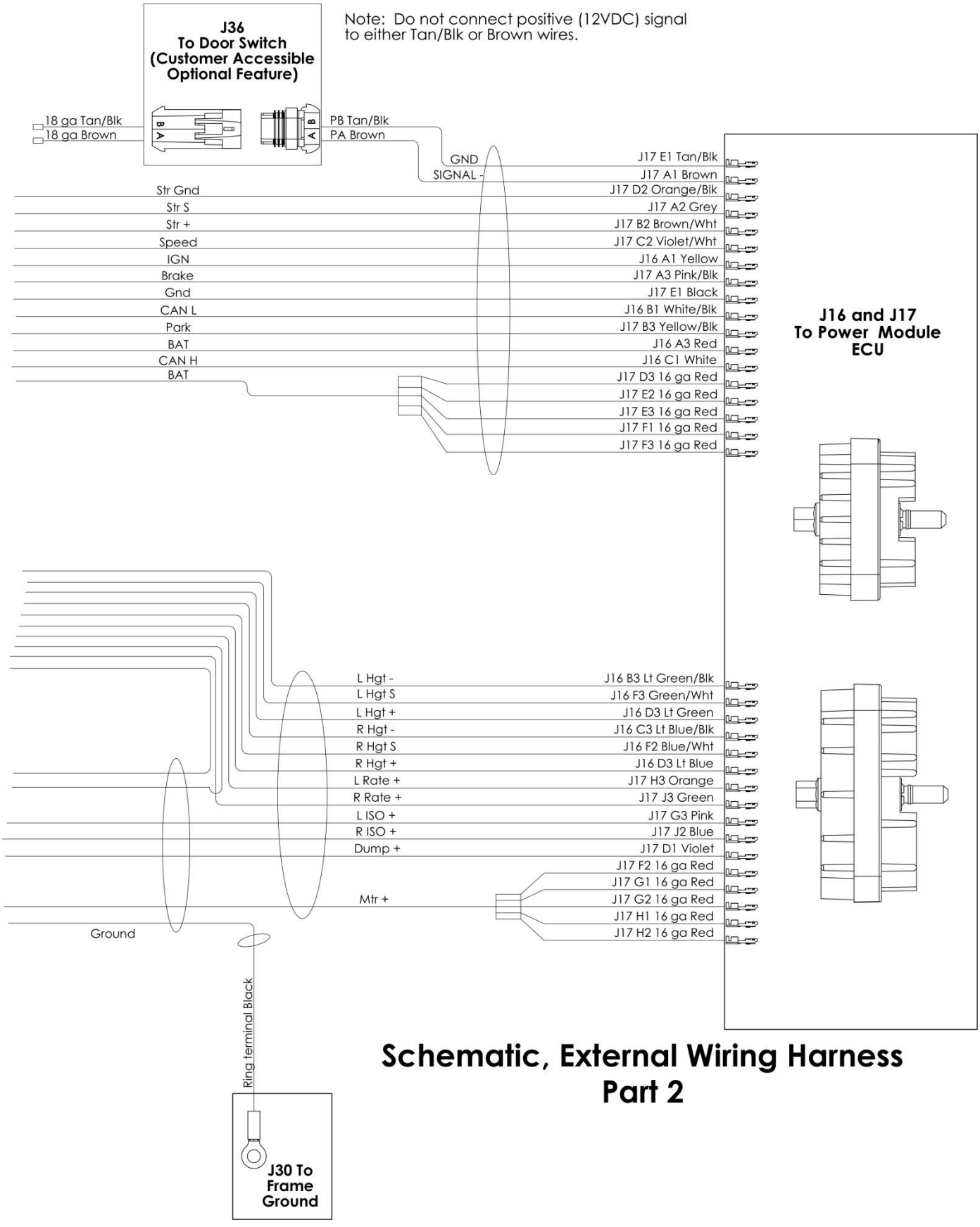
Step 1: Attach Brackets to Powermodule as shown.

Step 2: Install Power Module under Cab on Passenger side. Use brackets as shown to attach to framerail using existing holes.

Electrical Schematics

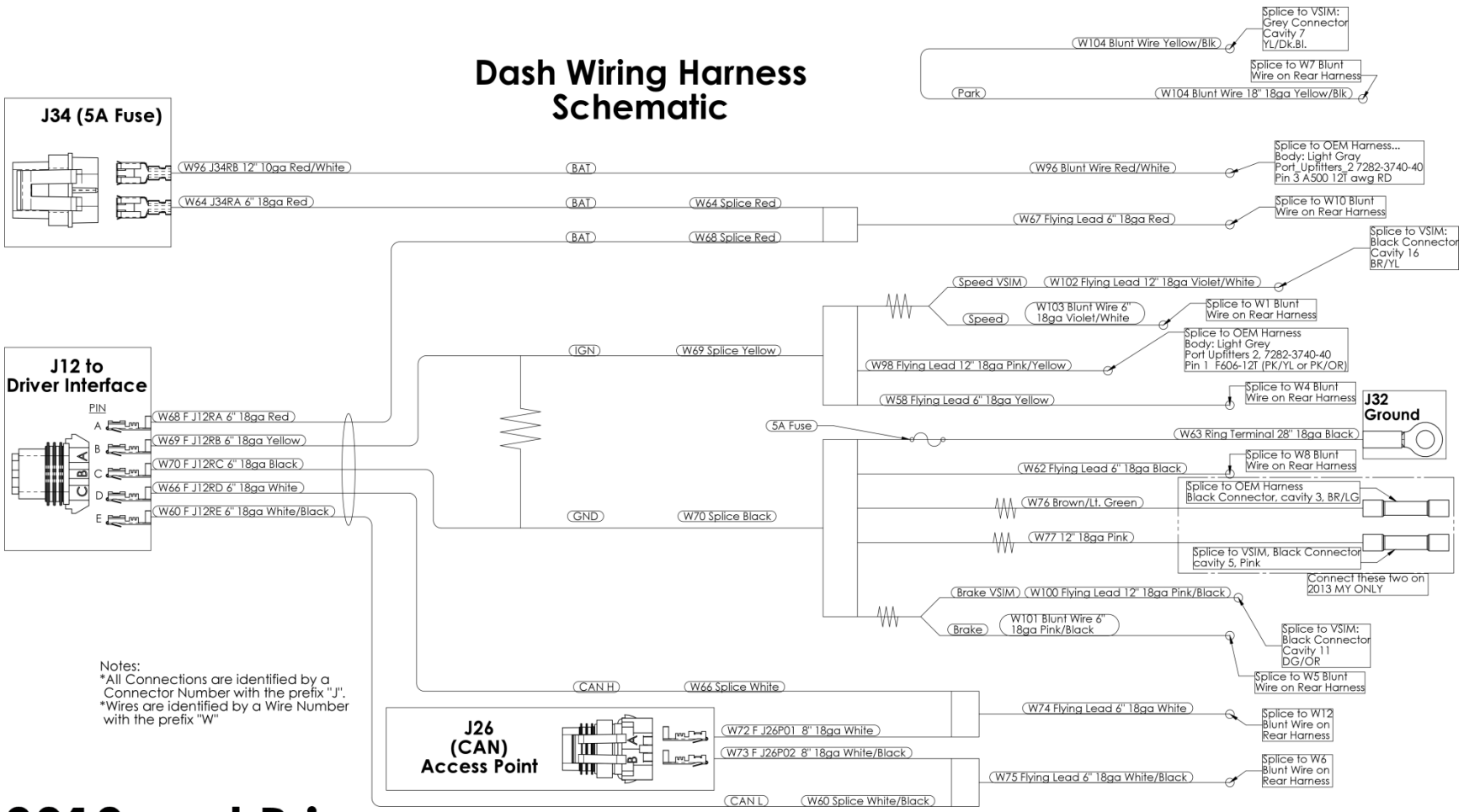


Schematic, External Wiring Harness Part 1



Schematic, External Wiring Harness Part 2

Dash Wiring Harness Schematic

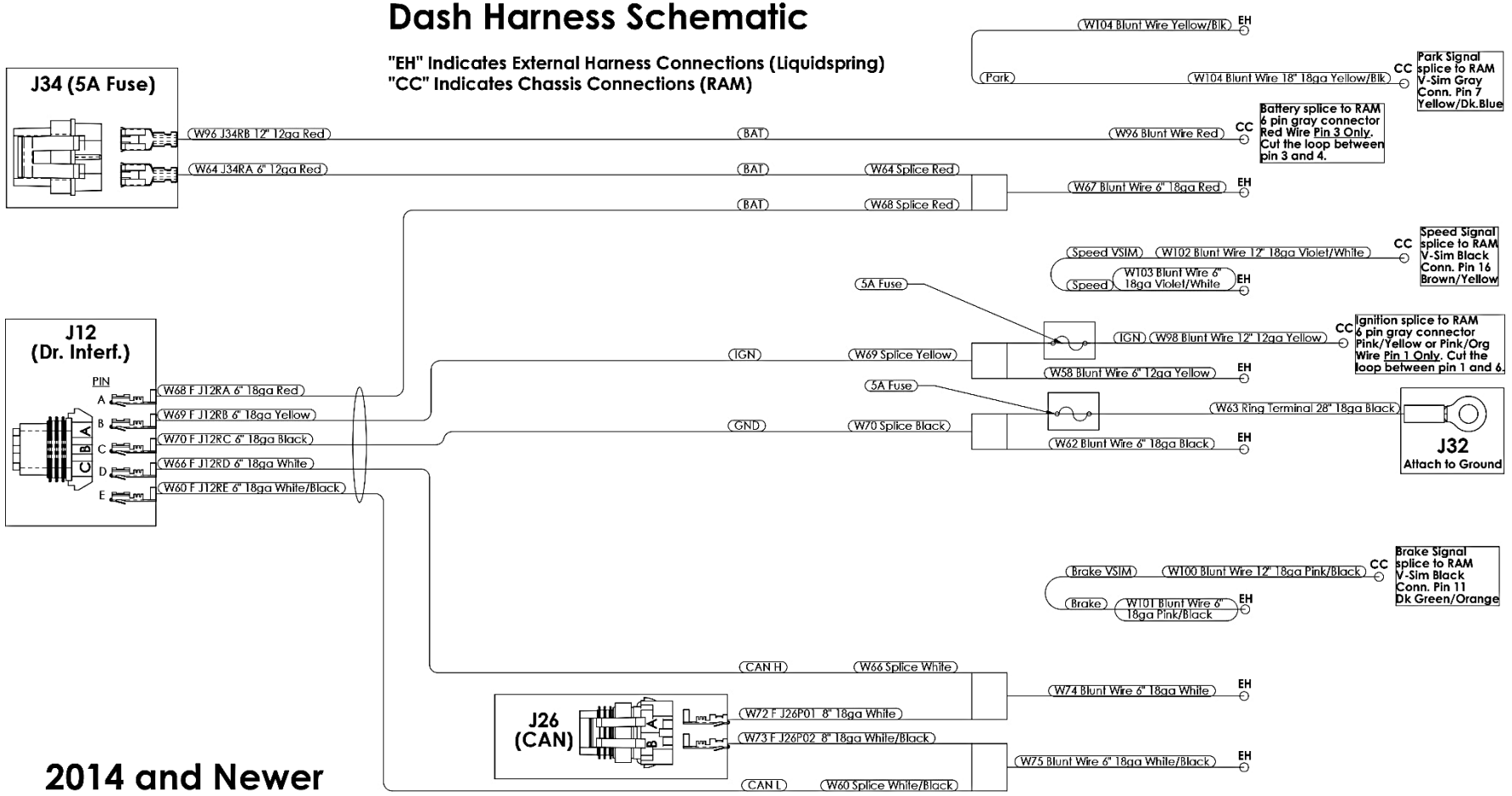


Notes:
*All Connections are identified by a Connector Number with the prefix "J".
*Wires are identified by a Wire Number with the prefix "W"

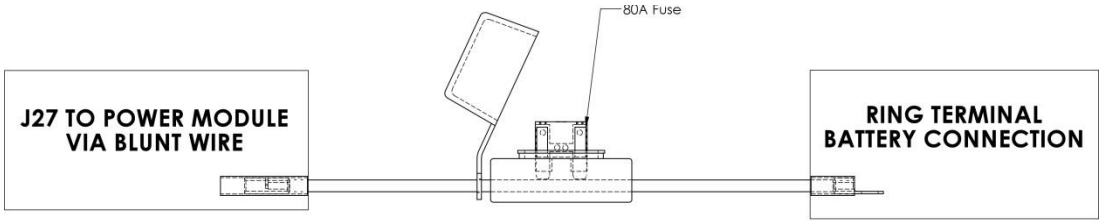
2013 and Prior

Dash Harness Schematic

"EH" Indicates External Harness Connections (Liquidspring)
"CC" Indicates Chassis Connections (RAM)



2014 and Newer



Schematic, Battery Fuse Lead

Appendix A: Frame Drilling Locations

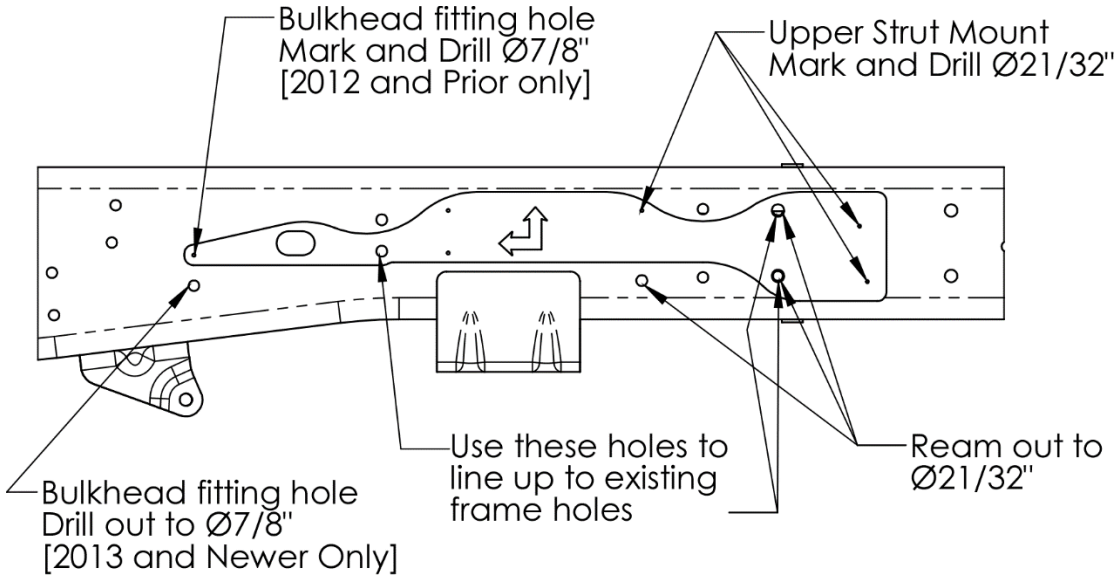


Figure A1: Driver side template location for upper strut mount and bulkhead fitting frame drilling.

Note: DS120R-AF vehicles do not require drilling Ø7/8" hole.

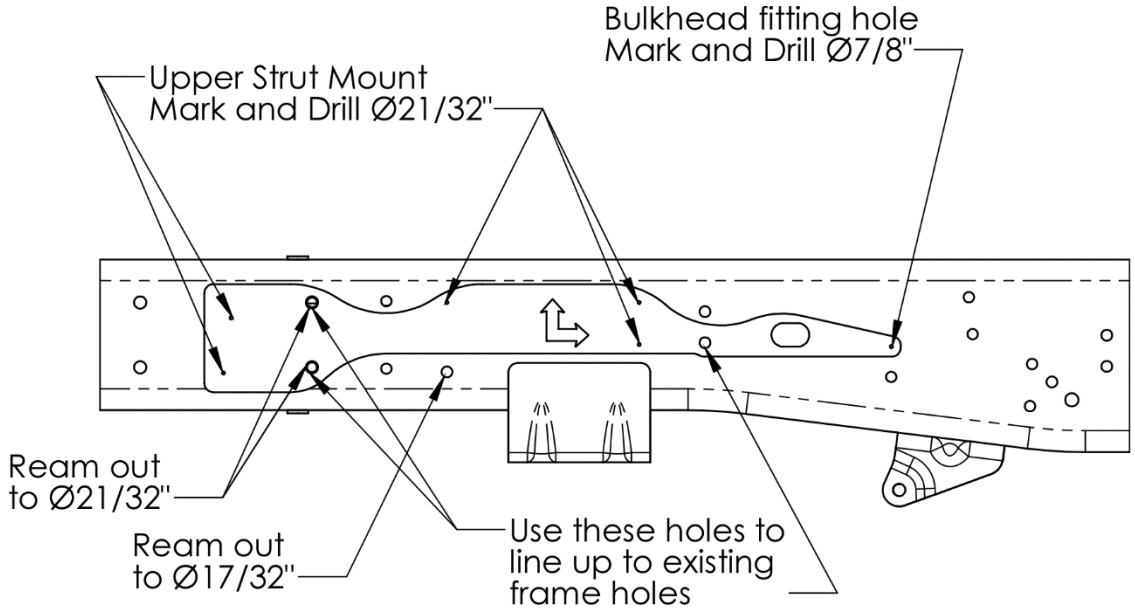


Figure A2: Passenger side template location for upper strut mount, bulkhead fitting, and track rod frame mount frame drilling. [2013 and later models]

Note: DS120R-AF vehicles do not require drilling Ø7/8" hole.

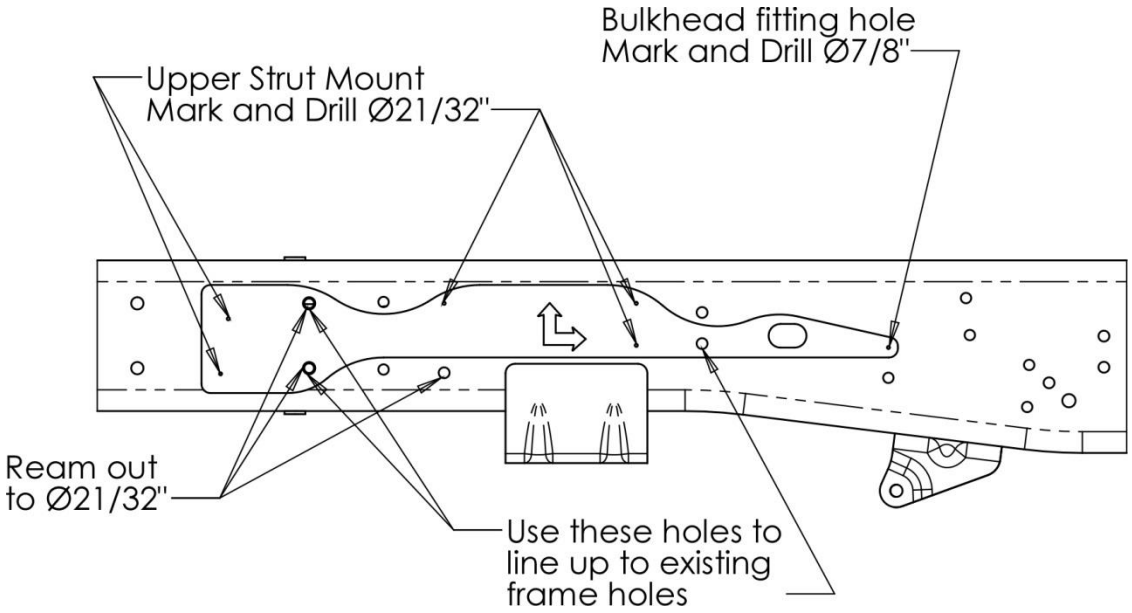


Figure A3: Passenger side template location for upper strut mount, bulkhead fitting, and track rod frame mount frame drilling. [2012 and prior models]

Note: DS120R-AF vehicles do not require drilling Ø7/8" hole.

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