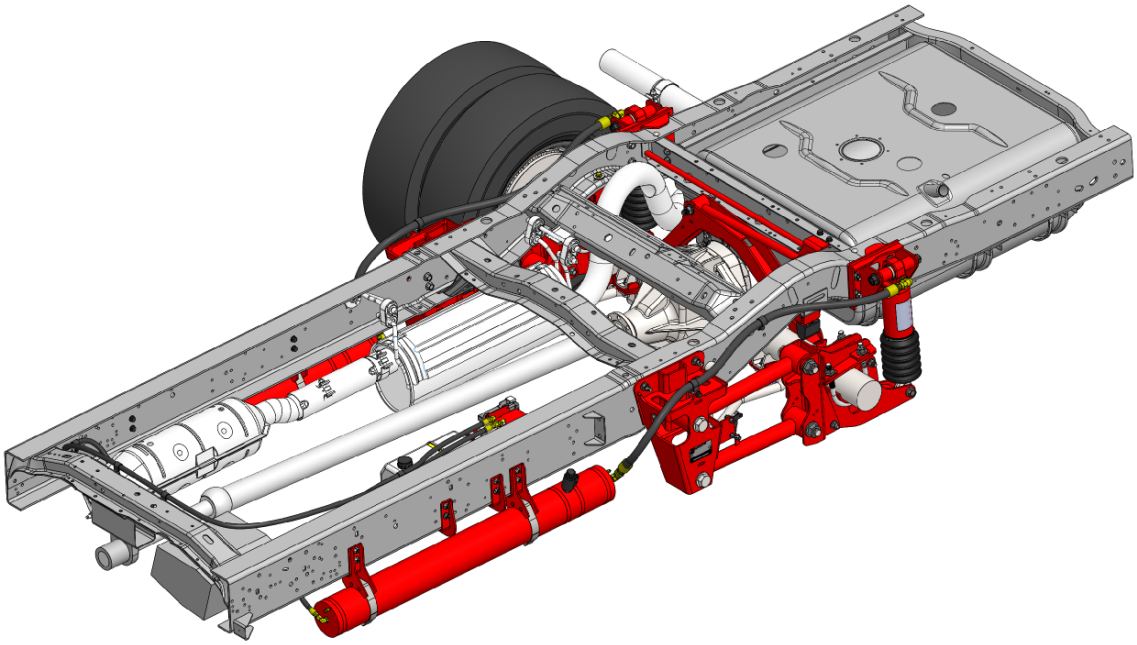
DS85FS2/DS96FS2

DS85FS2
DS96FS2

Drive Axle Rear Suspensions
for E-350 and E-450 Cab Chassis



LIQUIDSPRING™ LLC

Installation / Maintenance Manual

D11303 Rev R 7/19

Contents

Introduction

This manual provides installation information for the LiquidSpring **CLASS**® DS85FS2 and DS96FS2 series of rear axle suspension systems for the Ford E350 and E450 Cutaway Chassis.

Before you begin installation of the suspension system:

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

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

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
DS85FS2	8,500 GAWR E-350 Cutaway
DS85FS2-BA	8,500 GAWR E-350 Cutaway
DS96FS2	9,600 GAWR E-450 Cutaway
DS96FS2-BA	9,600 GAWR E-450 Cutaway

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
DS85FS2 (on E-350 Cutaway)	**8,500 lbs**
DS85FS2-BA (on E-350 Cutaway)	**8,500 lbs**
DS96FS2 (on E-450 Cutaway)	**9,600 lbs**
DS96FS2-BA (on E-450 Cutaway)	**9,600 lbs**

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

Serial Number Tag Information

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

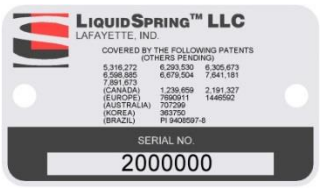


Figure 1. Suspension Identification

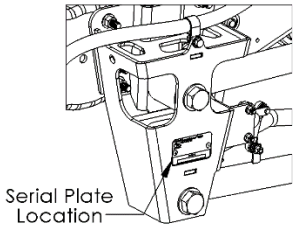


Figure 2. Serial Number Tag Location

Vehicle Towing and Jacking Information

Before attempting any type of towing procedures, the OEM/Coach Builder must be referred to for the recommended towing methods.

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

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

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

Damage to the suspension and/or vehicle,

Loss of vehicle control,

Possible disconnect from the vehicle.

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

Hydraulic Fitting Assembly

SAE O-Ring Adjustable Fittings

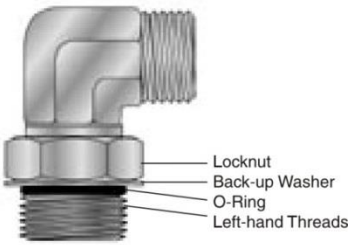


Figure 3. Adjustable SAE fitting

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.

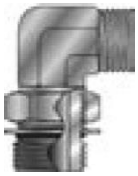


Figure 4. Locknut completely backed off.

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

Abbreviations

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

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. Before you start removing OEM components, check your wheelbase to determine if you need to add a wedge to the axle clamp group. Refer to Driveline Adjustment Instructions on page 17.
2. Chock the front tires.
3. Jack up the rear frame of the vehicle to remove the load from the rear leaf springs.
4. Place jack stands under the frame and block the rear tires from moving.

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

5. Remove the OEM shock absorbers, leaf springs, and rear shackles.
6. Remove the front leaf hanger and rear leaf shackle hanger brackets. The rivets can be removed by grinding, air chiseling, or torching off the heads. Then use a hammer and punch to remove the remainder of the rivet. See Figure 5.

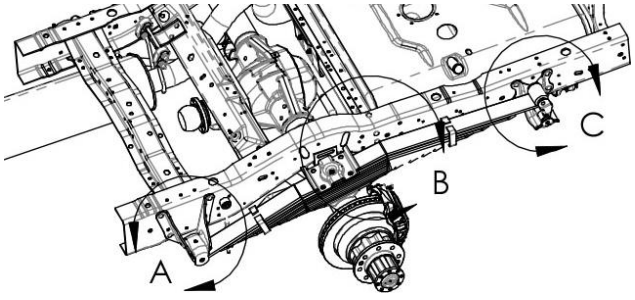


Figure 5. Rivet removal locations. Driver side shown. Remove rivets on passenger side also.

7. Drill out the six (6) front hanger mount holes to Ø.531" (17/32") on each side.

Note: Clamp cross member flange to frame prior to drilling to prevent flange distortion. 2011 and prior model years have (4) holes.

8. Remove the lower outboard rivet from the aft of axle cross-member's lower only location. See Figure 6.

CAUTION: Do not remove the upper side rivet or top flange rivets on the cross-member.

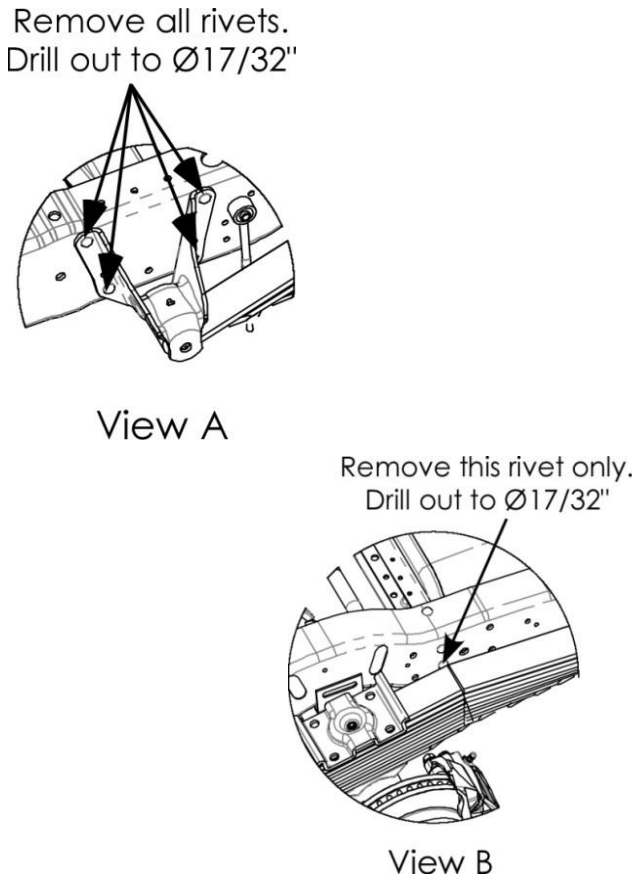


Figure 6. Rivet removal details

9. Drill out the rivet hole to Ø.531" (17/32") if necessary.
10. Drill out the three (3) indicated holes on the top and bottom flanges of the aft of axle cross-member to Ø.406" (13/32"). See Figure 7.
11. Remove the OEM Axle Stop Bumpers from under the frame. Do not discard the bumpers or brackets.

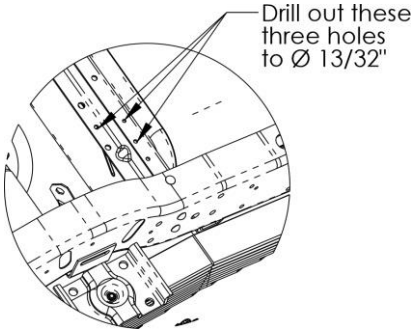
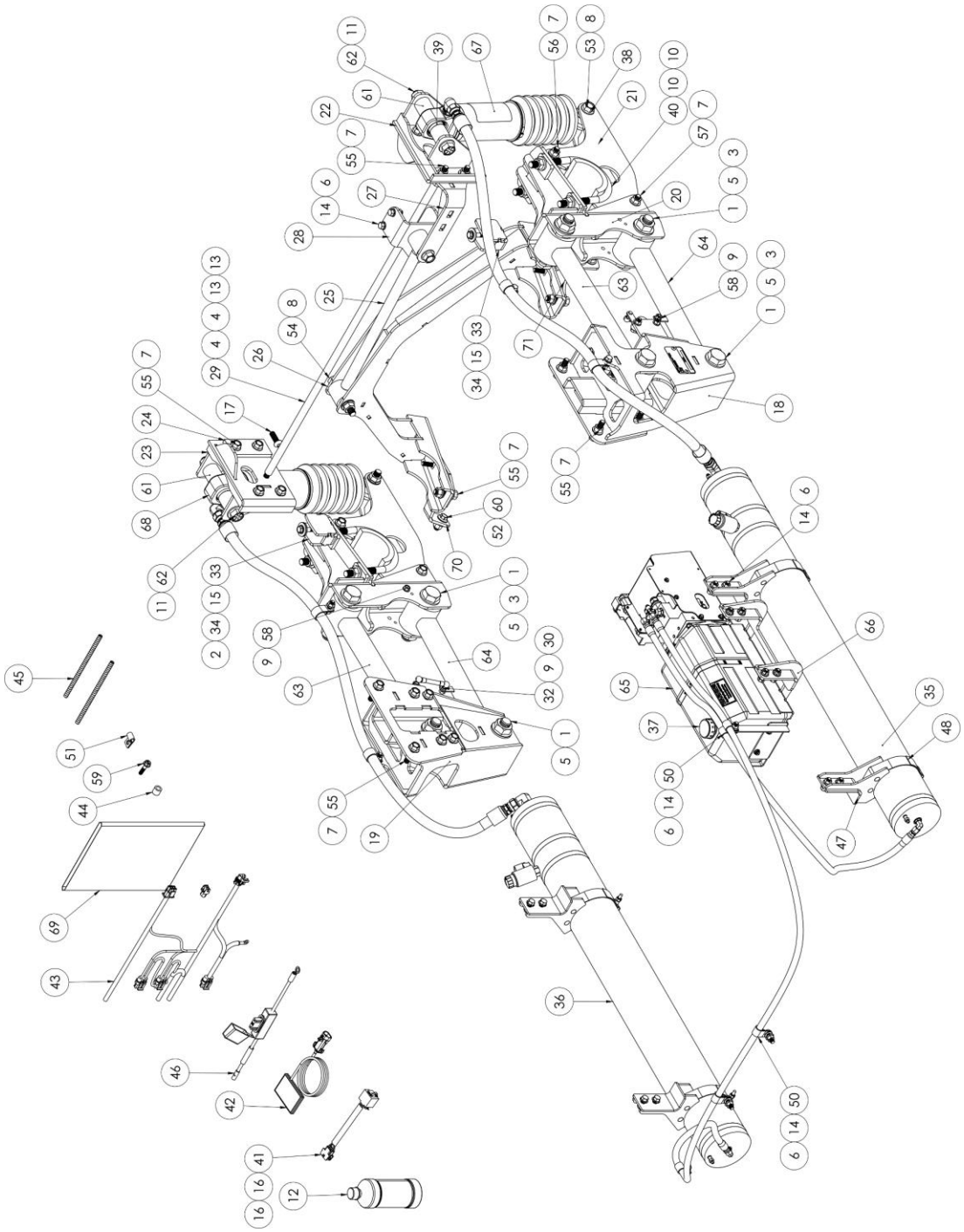


Figure 7. Cross-member drill holes

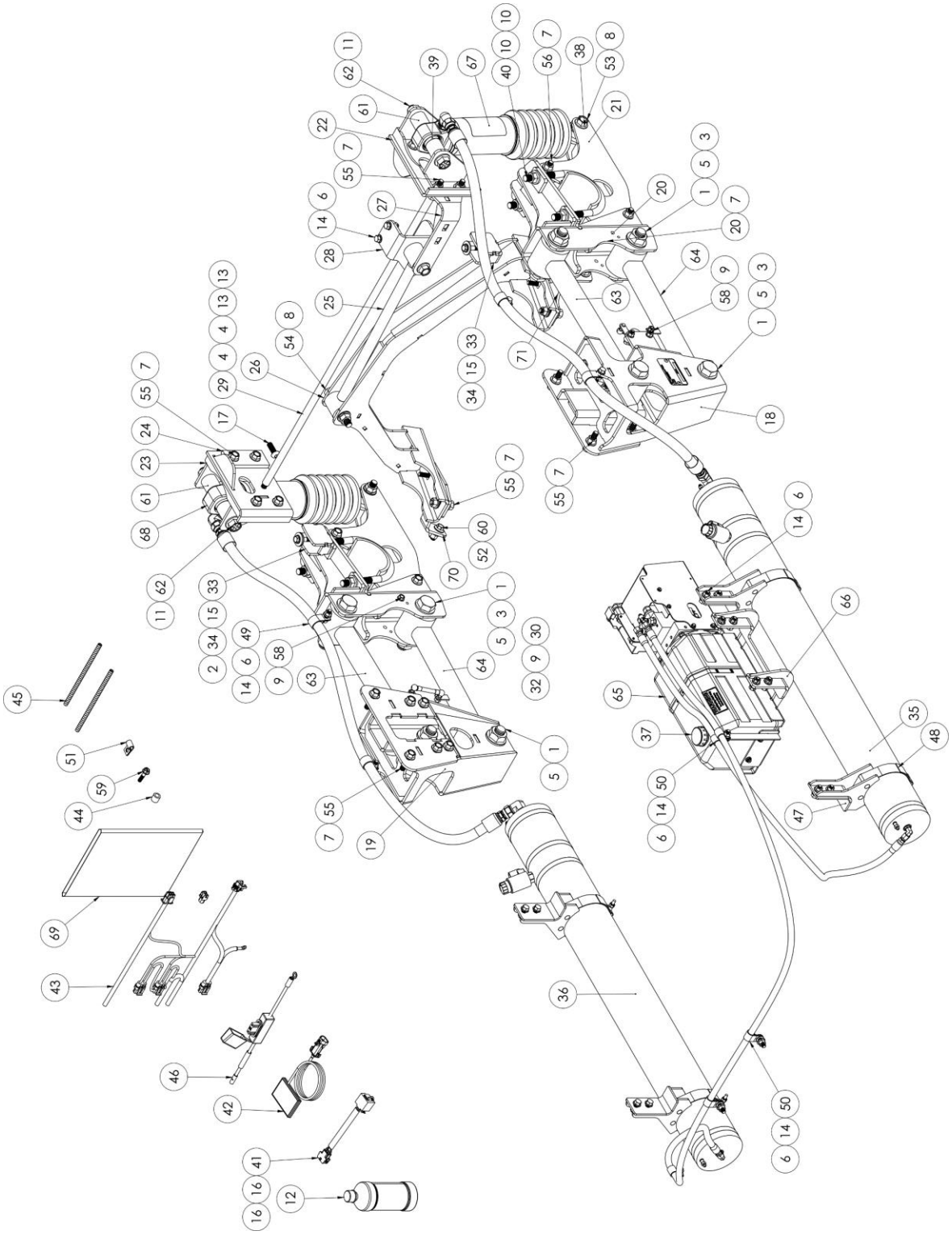
Part Identification:

DS85FS2



DS85FS2							
ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	8	10003-010	HCS 1-8x5.500, Gr. 8	37	1	10614-001	Cap, Filler/Breather
2	8	10006-004	HFW 1”	38	4	10640-001	Bearing Spacer, 3/4 x 5/8 x 1/2
3	2	10011-010	HCS 1/2-13 x 1.750, Gr. 8	39	4	10640-005	Bearing Spacer, 1.24 x .812 x.318
4	8	10012-003	LFN 1-8, Gr G	40	4	10642-001	U-Bolt 5/8-18 x 7.00 Gr. 8
5	20	10012-005	LFN 3/8-16, Gr G	41	1	10649-001	Steering Sensor
6	26	10012-007	LFN 1/2-13, Gr. G	42	1	10680-001	Driver Interface
7	4	10012-008	LFN 5/8-11 Gr G	43	1	10704-002	Wiring Harness, Dash
8	7	10012-010	LFN 5/16-18, Gr. G	44	1	10800-004	Tube
9	8	10012-013	LFN 5/8-18, Gr. G	45	2	10804-002	Spiral Cable Wrap
10	2	10012-014	LFN 3/4-10 Gr G	46	1	10815-001	Wiring Harness, Battery Fuse Lead
11	3	10006-001	HFW 5/8”	47	4	10830-013	Volume Mount
12	1	10474-001	Compressible Fluid, 16 oz. Bottle	48	4	10843-003	T-Bolt Clamp
13	2	10494-002	WLW 1/2, Z	49	4	10855-002	Vinyl-Coated Loop Clamp, 1” ID
14	20	10501-001	HFB 3/8-16 x 1.00, Gr. 8	50	5	10855-003	Vinyl-Coated Loop Clamp, 5/8” ID
15	4	10502-050	HFB M10-1.5 x 50 CL 10.9	51	1	10855-004	Vinyl-Coated Loop Clamp, 3/8” ID
16	2	10510-003	SMS #8-15 x .500	52	2	10873-004	LFN M12-1.75, CL 10.9
17	1	10512-001	BHCS M12-1.75x35 CL 10.9 BO	53	2	10874-350	HFB 5/8-11x3.500, Gr. 8
18	1	10538-005	Front Hanger, LH	54	2	10874-400	HFB 5/8-11x4.00, Gr. 8
19	1	10539-010	Front Hanger, RH	55	22	10885-175	HFB 1/2-13x1.750, Gr. 8
20	2	10546-010	Axle Seat	56	2	10885-325	HFB 1/2-13x3.250, Gr. 8
21	2	10552-008	Axle Cradle	57	2	10885-375	HFB 1/2-13x3.750, Gr. 8
22	1	10564-005	Upper Strut Mount, LH	58	5	10886-125	HFB 5/16-18x1.250, Gr.8
23	1	10564-006	Upper Strut Mount, RH	59	1	11003-035	HFB M8-1.25x35, CL 10.9
24	2	10569-001	Backing Plate	60	2	11012-001	HFB M12-1.75x30, CL 10.9
25	1	10570-003	Track Rod	61	2	11100-004	Spacer
26	1	10574-003	Axle Bridge	62	2	11102-700	HFB 3/4-10x7.000, Gr. 8
27	1	10581-001	Weldment, Track Rod Mount	63	2	11240-004	Control Arm, Upper
28	1	10584-001	Track Rod Mount	64	2	11240-005	Control Arm, Lower
29	1	10585-001	Crossmember Reinforcement	65	1	11293-001	Power Module
30	2	10586-001	Height Sensor	66	1	11295	Power Module Mount
31	2	10587-007	Linkage	67	1	11299-001	Strut Assembly, LH
32	2	10591-001	Ball Stud	68	1	11299-002	Strut Assembly, RH
33	2	10592-003	Bump Stop Spacer	69	1	11305	Document Kit
34	2	10595-001	Coupler, M10-1.5x1.500	70	1	11306-001	Bridge Support Bracket, RH
35	1	10597-081	Volume Assembly, LH	71	1	11306-002	Bridge Support Bracket, LH
36	1	10597-082	Volume Assembly, RH				

DS96FS2



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4	8	10012-003	LFN 1-8, Gr G	40	4	10642-001	U-Bolt 5/8-18 x 7.00 Gr. 8
5	20	10012-005	LFN 3/8-16, Gr G	41	1	10649-001	Steering Sensor
6	26	10012-007	LFN 1/2-13, Gr. G	42	1	10680-001	Driver Interface
7	4	10012-008	LFN 5/8-11 Gr G	43	1	10704-002	Wiring Harness, Dash
8	7	10012-010	LFN 5/16-18, Gr. G	44	1	10800-004	Tube
9	8	10012-013	LFN 5/8-18, Gr. G	45	2	10804-002	Spiral Cable Wrap
10	2	10012-014	LFN 3/4-10 Gr G	46	1	10815-001	Wiring Harness, Battery Fuse Lead
11	3	10006-001	HFW 5/8”	47	4	10830-013	Volume Mount
12	1	10474-001	Compressible Fluid, 16 oz. Bottle	48	4	10843-003	T-Bolt Clamp
13	2	10494-002	WLW 1/2, Z	49	4	10855-002	Vinyl-Coated Loop Clamp, 1” ID
14	20	10501-001	HFB 3/8-16 x 1.00, Gr. 8	50	5	10855-003	Vinyl-Coated Loop Clamp, 5/8” ID
15	4	10502-050	HFB M10-1.5 x 50 CL 10.9	51	1	10855-004	Vinyl-Coated Loop Clamp, 3/8” ID
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32	2	10591-001	Ball Stud	68	1	11299-002	Strut Assembly, RH
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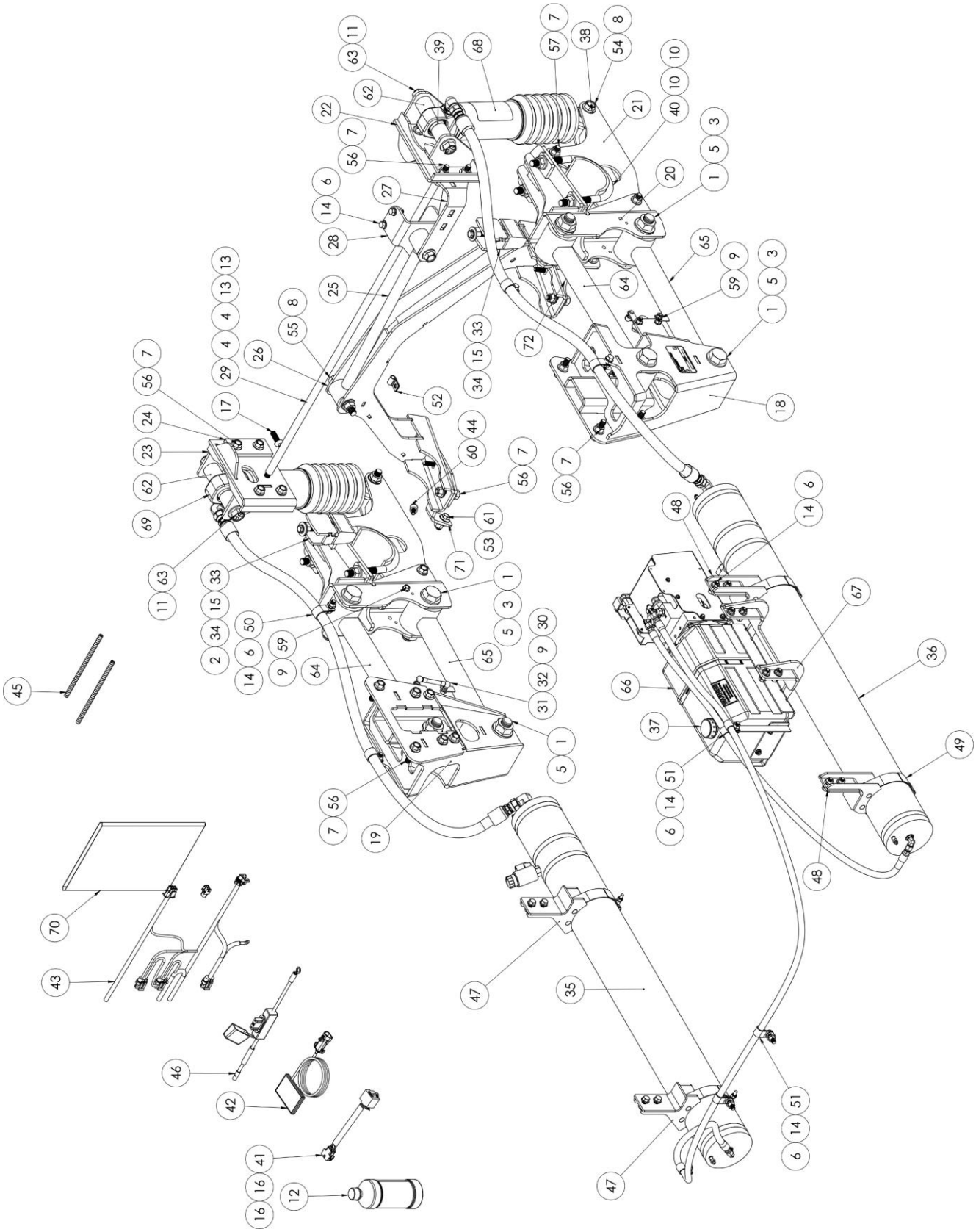
DS85FS2-BA
DS96FS2-BA



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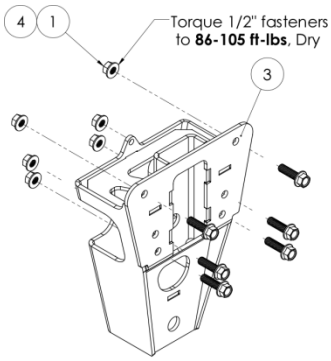
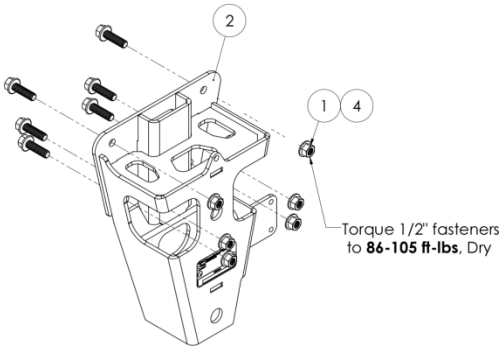
36	1	10597-118	Volume Assembly, LH				

Installation

Front Hangers





ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	12	10012-007	LFN 1/2-13, Gr. G	3	1	10539-010	Weldment, Hanger, RH
2	1	10538-005	Asy, Front Hanger, LH	4	12	10885-175	HFB 1/2-13x1.75, Gr. 8

1. Locate the Front Hangers.
2. Install the Left Hand Front Hanger (with the serial tag) on to the driver's side of the frame, using the (6) 1/2-13 x 1.75 Hex Flange Bolts and (6) 1/2-13 Locking Flange Nuts.

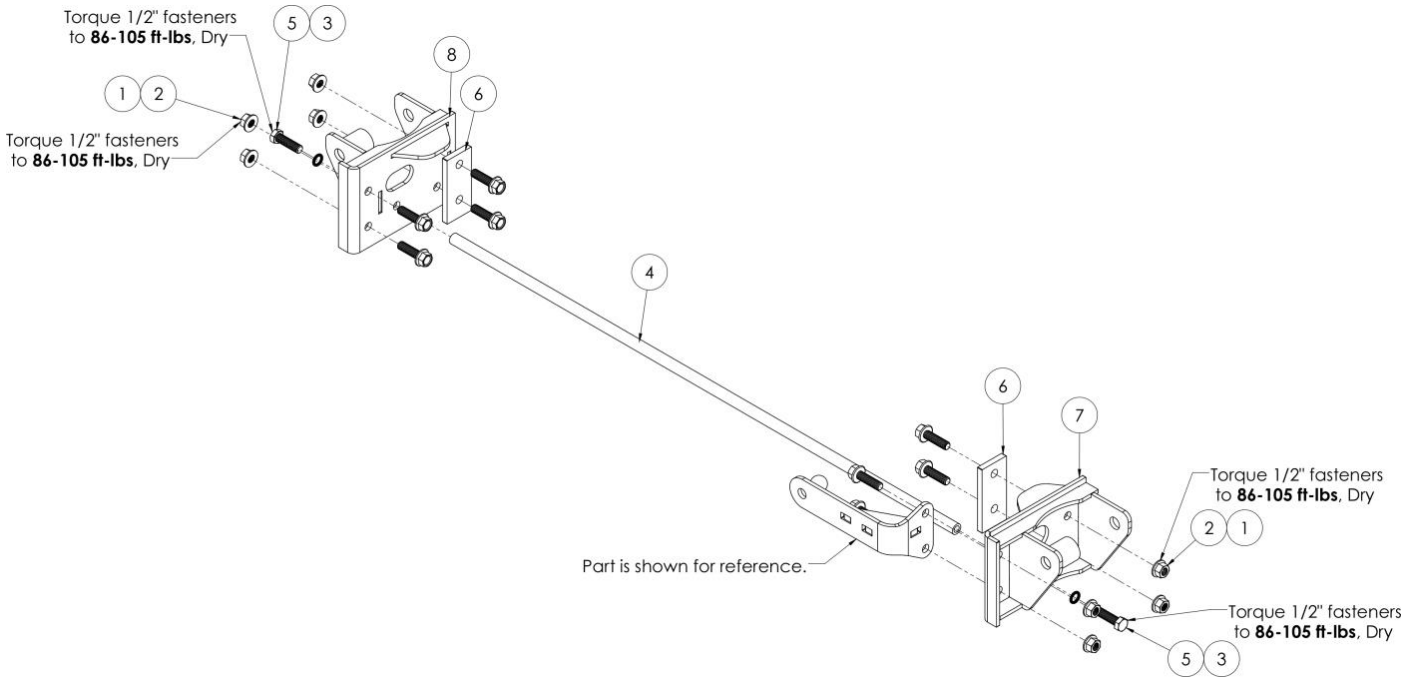
Note: 2011 and previous model year's use only (4) four sets of fasteners.

IMPORTANT: Before tightening fasteners, verify the top of each front hanger is parallel with the top of the frame.

3. Torque nuts to **86-105 ft-lbs.**
4. Repeat with passenger side hanger.
5. Using the Spiral Wrap included in the kit, wrap the driver side E-Brake cable as shown in Figure 8.

Figure 8. Spiral Wrap Around E-Brake Cable

Upper Strut Mount and Crossmember Reinforcement



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	8	10885-175	HFB 1/2-13x1.75, Gr. 8	5	2	10011-010	HCS 1/2-13, Gr. 8
2	8	10012-007	LFN 1/2-13, Gr. G	6	2	10569-001	Backing Plate
3	2	10494-002	WLW 1/2, Z	7	1	10564-005	Upper Strut Mount, LH
4	1	10585-001	Crossmember Reinforement	8	1	10564-006	Upper Strut Mount, RH

1. Remove lower factory cross-member bolt. Replace bolt with Button Head Cap Screw M12-1.75x35. Torque to **75-92 ft-lbs.** See Figure 9.

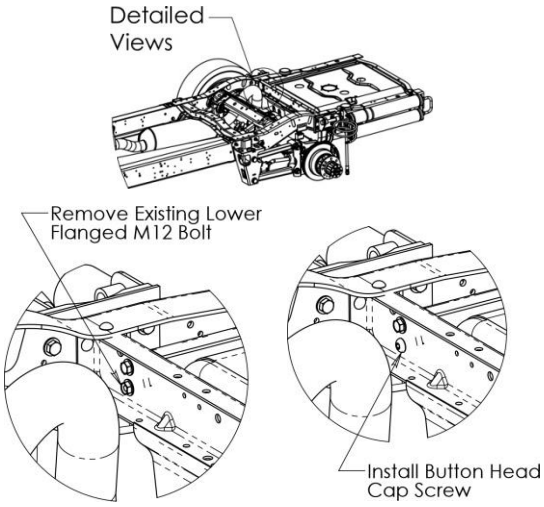


Figure 9. Cross-member bolt replacement

2. Locate the Left-Hand Upper Strut Mount and rest the extruded flange flush with the top of the frame and use a 1/2-13 x 1.75 Hex Flange Bolt to temporarily secure the mount to the frame. See Figure 10

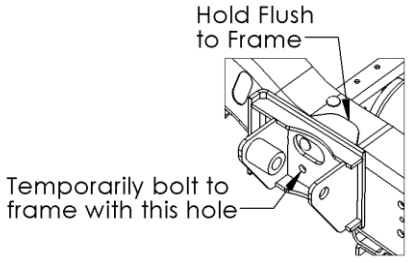


Figure 10. Upper Strut Mount placement for hole drilling

3. Mark and drill the (4) four Upper Strut Mount holes to Ø17/32" into the side of the frame. See Figure 11

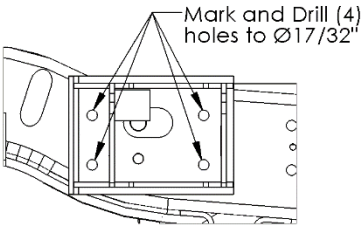


Figure 11. Mark and drill these four holes

4. Locate the Backing Plate and loosely attach the component to the Driver Side of frame.

CAUTION: The end of the Backing Plate with the hole closest is oriented up.

5. Locate (2) 3/8-16 x 1.00 Hex Flange Bolts.
6. Place the bolts in the lower holes of the aft of axle crossmember. At this time, install the Track Rod Mount that sits behind the Upper Strut Mount. See Figure 12

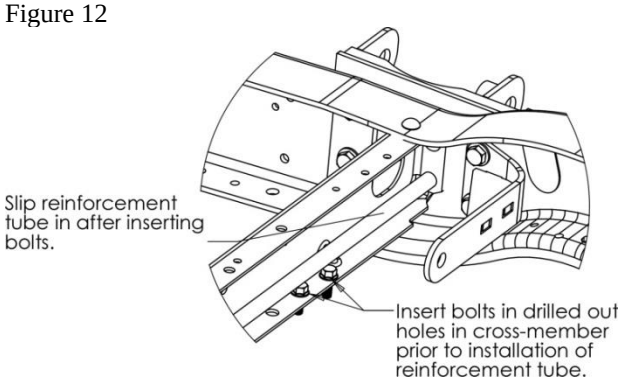
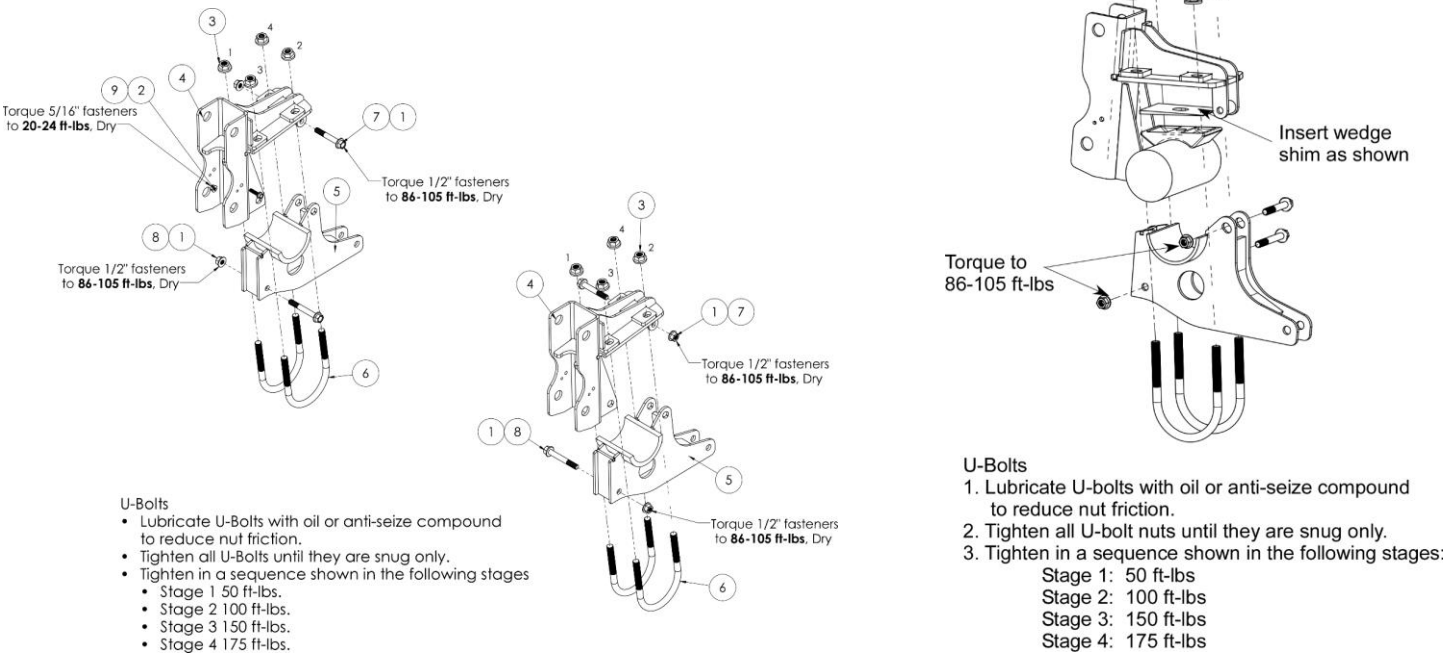


Figure 12. Track bar mount attachment bolts.

7. Attach the (4) 1/2-13 x 1.75 Hex Flange Bolts and (4) 1/2-13 Locking Flange Nuts. Torque to **86-105 ft-lbs.**
8. Loosely install the Crossmember Reinforcement Tube using the 1/2-13 x 1.75 Hex Cap Screw and the Wedge Lock Washer. Torque to **86-105 ft-lbs.**
9. Repeat with Passenger Side.

Axle Clamp - DS85FS2/FS2B; DS96FS2/FS2-BA



DS85FS2 and DS85FS2-BA

ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	4	10012-007	LFN 1/2-13, Gr. G	6	4	10642-001	U-Bolt
2	1	10012-010	LFN 5/16-18, Gr. G	7	2	10885-325	HFB 1/2-13x3.25, Gr. 8
3	8	10012-013	LFN 5/8-18, Gr. G	8	2	10885-375	HFB 1/2-13x3.75, Gr. 8
4	2	10546-010	Axle Seat	9	1	10886-125	HFB 5/16-18x1.25, Gr. 8
5	2	10552-008	Axle Cradle				

DS96FS2 and DS96FS2-BA

ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	4	10012-007	LFN 1/2-13, Gr. G	6	4	10642-001	U-Bolt
2	1	10012-010	LFN 5/16-18, Gr. G	7	2	10885-325	HFB 1/2-13x3.25, Gr. 8
3	8	10012-013	LFN 5/8-18, Gr. G	8	2	10885-375	HFB 1/2-13x3.75, Gr. 8
4	2	10546-009	Axle Seat	9	1	10886-125	HFB 5/16-18x1.25, Gr. 8
5	2	10552-007	Axle Cradle				

1. Locate the Axle Seat Weldment, Axle Cradle, and 5/8" U-Bolts.
2. Place the Axle Seat on to the Drivers Side axle spring seat. The Axle Seat should be flush to the top of the axle spring seat with the locating pin in the center hole.
3. If you already have your wedge, place it between the Axle Seat and the axle spring seat at this time.

Note: The Wedge should be facing with the thick side facing forward as shown in Figure 13.

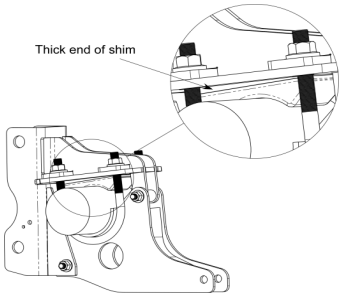


Figure 13. Thick End of Shim Facing Forward

4. Place the Axle Cradle under the axle tube and loosely attach to the Axle Seat using the (1) 1/2 -13 x 3.25 Hex Flange Bolt, (1) 1/2-13 x 3.75 Hex Flange Bolt, and (1) 1/2-13 Locking Flange Nut at the rear and front connection points.

5. Slip the 5/8” U-bolts into position. **Torque, the U-bolt nuts evenly in an X-type pattern in 5 stages:**
   - **Stage 1: Tighten snug only.**
   - **Stage 2: Torque to 50 ft-lbs.**
   - **Stage 3: Torque to 100 ft-lbs.**
   - **Stage 4: Torque to 150 ft-lbs.**
   - **Stage 5: Torque to 175 ft-lbs.**
6. Repeat with passenger side.
7. Remove E-Brake bracket attached to the shock mount and relocate it on the Axle Seat using the 5/16” hardware as shown in Figure 14.

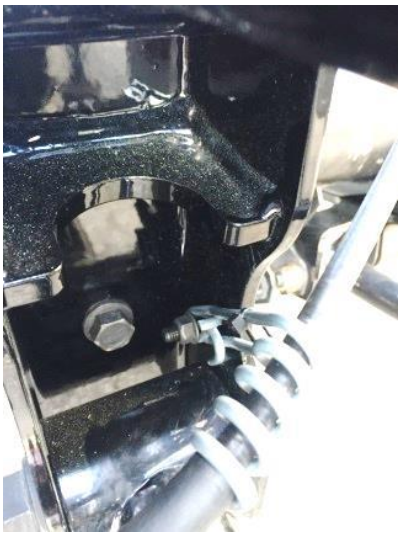


Figure 14. Re-Locate bracket to Axle Seat

8. Remove E-Brake bracket from the top of the axle, retain OEM bolt.
9. Using the 3/8” loop clamp and the OEM bolt from the previous step, re-attach the e-brake to the top of the axle as shown in Figure 15.

Figure 15. Loop Clamp attachment

10. Locate the brake line bracket on the back of the passenger side shock mount.
11. Remove the OEM M8 bolt.
12. Using the spacer tube and M8-1.25x35 HFB supplied with the kit, re-attach the bracket to the shock mount as shown in Figure 16. This will keep the whip hose from making contact with the axle cradle.

Figure 16. Use spacer and M8 bolt to re-attach bracket

13. Using the Spiral Wrap included in the kit, wrap the passenger side whip hose as shown in Figure 17.

Figure 17. Spiral Wrap on Whip Hose

14. Torque the 1/2” Fasteners to **85-105 ft-lbs.**
15. Torque the 5/16” Fasteners to **20-24 ft-lbs.**
16. Torque the M8 Fastener to **22-27 ft-lbs.**

Driveline Adjustment Instructions

To minimize driveline service and drivability concerns on Ford E350 and E450 equipped with LiquidSpring suspension systems, it is recommended to follow the Ford QVM Bulletin Q-14.

Driveline Balance: Balance all drivelines per Bulletin Q-14.

Driveline Angles: Measure all drivelines per Bulletin Q-14.

Based on experience, LiquidSpring recommends adjusting the driveline angles such that any individual joint must be at least 1/2 deg and not to exceed 1-1/2 deg, this is tighter than as described in Q-14.

Depending on the amount of stretch, the rear axle pinion angle may need to be reduced to achieve joint angles as recommended. The following kits are available to reduce the pinion angles:

E350/E450 Final Vehicle Wheelbase	Recommended Pinion Angle Change	LiquidSpring Pinion Angle Adjustment Kit	Wedge Part Number
158”-178”	No Change	N/A	N/A
179”-193”	Down 1°	11537	11536-010
194”-208”	Down 2°	11538	11536-020
209”-223”	Down 2.5°	11539	11536-025

To install the axle shims:

1. Depressurize the system as necessary.
    a. Turn the ignition key to “On” and ensure the LiquidSpring driver display LEDs light up.
    b. Press and release the Red ON/OFF button on the driver display. All LEDs on the driver display should go out.
    c. 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.
    d. Press and release the HEIGHT UP arrow to raise the vehicle to HIGH height.
    e. Place jack stands under the frame rails.
    f. Press and release the HEIGHT DOWN arrow button twice to lower the vehicle to the LOW height and depressurize the system.
    g. The valves will be heard “clicking” as the pressure is released. After 3 minutes, the system will stop dumping pressure and show the read warning light. Press the Red ON/OFF button twice to clear the warning.
    h. Once depressurized, press and release the ON/OFF button to disable the system.
    i. Turn off the vehicle ignition.
2. Loosen U-bolts. Remove each U-bolt one at a time. Insert new U-bolt and loosely tighten the lock nut to prevent the Axle Cradle and Seat from fully separating from the axle. Discard old U-bolts and lock nuts.
3. Loosen and remove the 1/2” fasteners as shown.

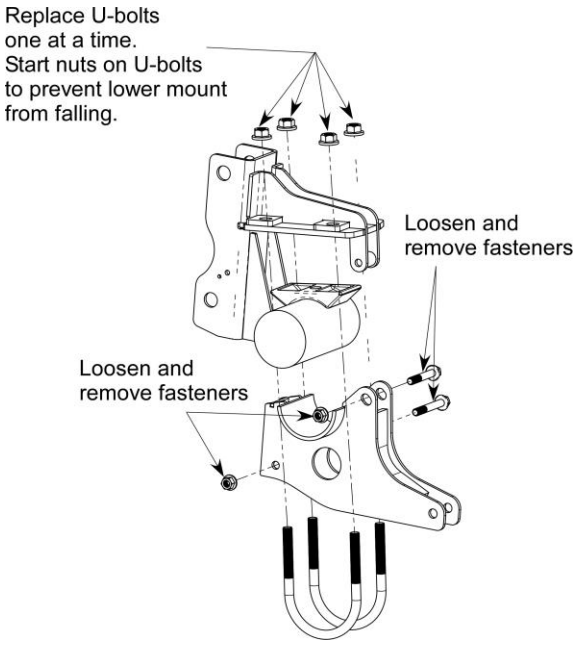


Figure 18. Loosening and removal of fasteners. Axle Cradle shown lowered for clarity.

4. Lift the upper Axle Seat.
5. Insert the appropriate shim, with the thick end orientated forward.

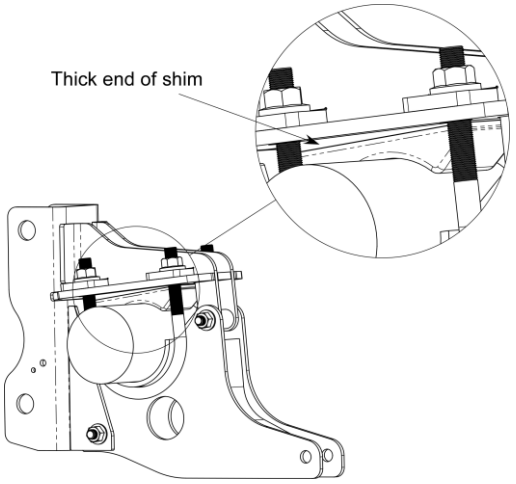
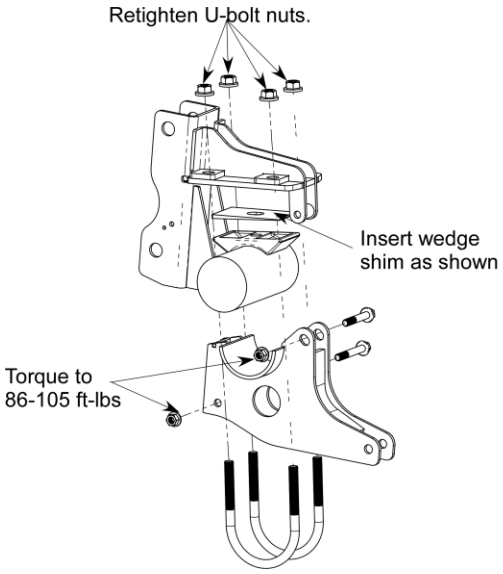


Figure 19. Proper orientation of Wedge Shims.

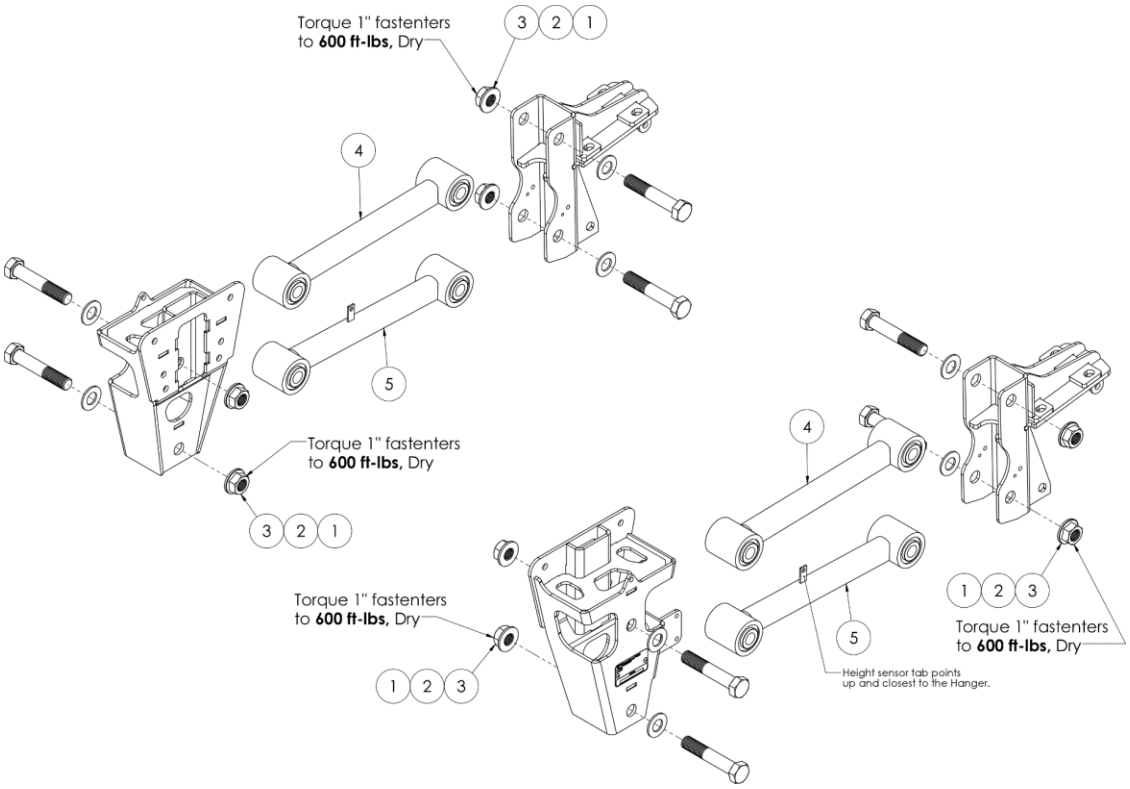
6. Reassemble the axle connection as per Figure 3.
7. Re-pressurize the system
    a. Turn the ignition key to "On".
    b. Press and release the Red ON/OFF button. The LEDs on the driver display should all flash and then only the four yellow arrow LEDs, one green ride mode indicator LED, and one green ride height indicator LED should remain lit.
    c. Press and release the HEIGHT UP arrow, twice, to raise the vehicle to HIGH height.
    d. Remove jack stands.
    e. Press and release the HEIGHT DOWN arrow to lower the vehicle to NORMAL height.
8. Perform a calibration on the LiquidSpring system. Refer to the Owners/Installation Manual.
9. Measure driveshafts per Q-14.
10. Adjust additional driveshaft mounting as necessary to achieve recommended joint angles.



1. Make sure Axle Seat and Cradle are properly seated.
2. Insert 1/2" bolts and loosely install nuts.
3. Lubricate U-bolts with oil or anti-seize compound to reduce nut friction.
4. Tighten all U-bolt nuts until they are snug only.
5. Tighten in a sequence shown in the following stages:
    Stage 1: 50 ft-lbs
    Stage 2: 100 ft-lbs
    Stage 3: 150 ft-lbs
    Stage 4: 175 ft-lbs
6. Torque 1/2" bolts and nuts to 86-105 ft-lbs.

Figure 20. Reassembly of Axle Connection.

Control Arms



ITEM	QTY	PART NUMBER	DESCRIPTION
1	8	10003-010	HCS 1-8x5.500, Gr. 8
2	8	10006-004	HFW 1.000, Z
3	8	10012-003	LFN 1-8, Gr. G

ITEM	QTY	PART NUMBER	DESCRIPTION
4	2	11240-004	Control Arm, Upper
5	2	11240-005	Control Arm, Lower

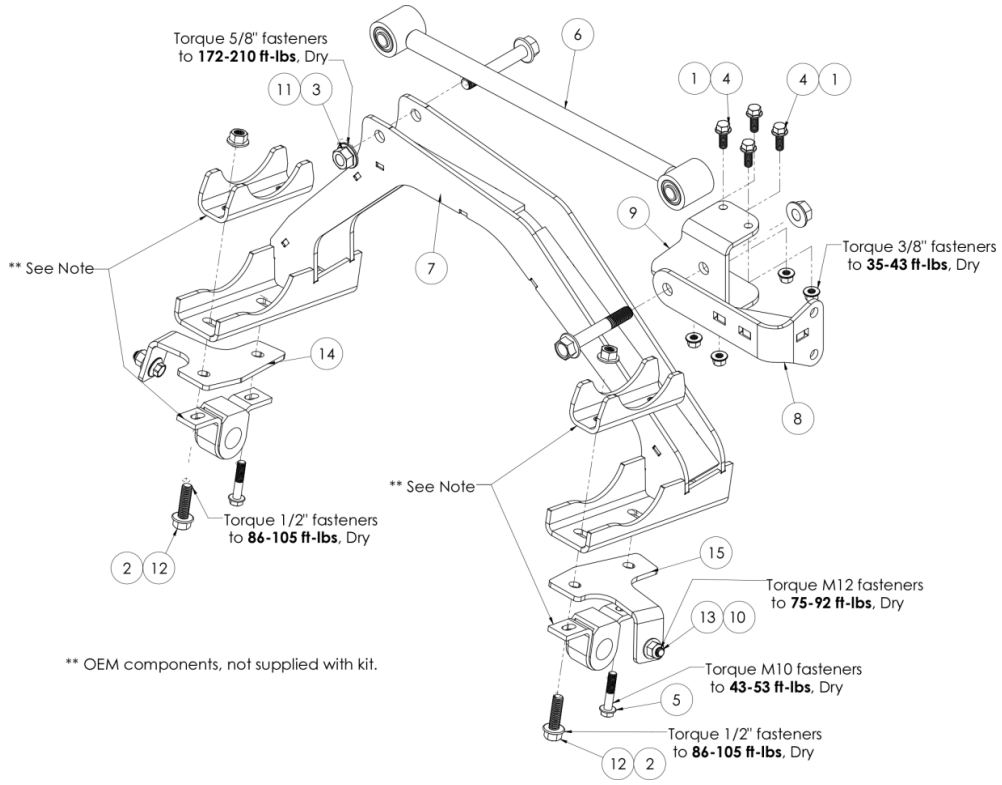
1. Locate control arms and install as shown.

Note: Height sensor tab points upward and is forward on Lower Control Arm.

2. Do **Not** Torque fasteners at this time. Torque after track rod is installed and axle is held at ride height.

   IMPORTANT: Vehicle must be at ride height when tightening control arms, to prevent premature wear of bushings from excess twist in the rubber.

Track Rod and Mount



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	4	10012-005	LFN 3/8-16, Gr. G	9	1	10584-001	Track Rod Mount
2	2	10012-007	LFN 1/2-13, Gr. G	10	2	10873-004	LFN M12-1.75, CL 10.9
3	2	10012-008	LFN 5/8-11, Gr. G	11	2	10874-400	HFB 5/8-11x4.00, Gr. 8
4	4	10501-001	HFB 3/8-16x1.000, Gr. 8	12	2	10885-175	HFB 1/2-13x1.75, Gr. 8
5	2	10502-050	HFB M10-1.5x50 CL 10.9	13	2	11012-001	HFB M12-1.75x30 CL 10.9
6	1	10570-003	Track Rod	14	1	11306-001	Bridge Support Bracket, RH
7	1	10574-003	Axle Bridge	15	1	11306-002	Bridge Support Bracket, LH
8	1	10581-001	Track Rod Mount				

1. Loosen and detach the sway bar and sway bar bushing from the axle. Do not remove bushings from sway bar.
2. Remove the D-Ring and drill out one of the slots so 1/2" bolts can pass through.
3. Remove the front weld nuts from both of the sway bar mounts. See Figure 21

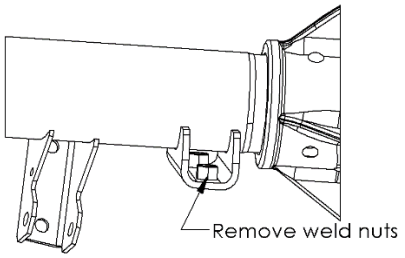


Figure 21. Remove weld nuts

4. Locate the Track Rod Mount Bridge and Track Rod.
5. Loosely attach the track rod to the axle bridge using (1) 5/8”-11 x 4.00 HFB and (1) 5/8”-11 Hex Flange Nut.

NOTE: Track rod must be attached to bridge before bolting to axle, there is not adequate room to install the bolt afterwards.

6. Slip the Track Rod Mount Bridge and Track Rod onto the axle from the rear of the axle.
7. Loosely reattach the sway bar, sway bar bushings, and bridge support brackets to the bottom of the Track Rod Mount Bridge and axle using the (2) M10-1.50 x 50 Hex Flange Bolts, (2) 1/2-13 x 1.25 Hex Flange Bolts, and (2) LHN 1/2-13 Nuts. See Figure 22
8. Use (1) M12-1.75x30 fastener to finish mounting Bridge Support Bracket to the shock mount.

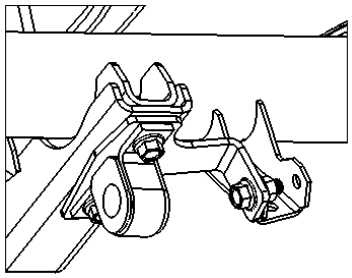


Figure 22. Installed on Axle

9. Locate the Track Rod Mount and loosely attach to the aft of axle cross-member using the (4) 3/8-16 x 1.00 Hex Flange Bolts, two of which are already inserted in the cross-member and (4) 3/8-16 Locking Flange Nuts. See Figure 23

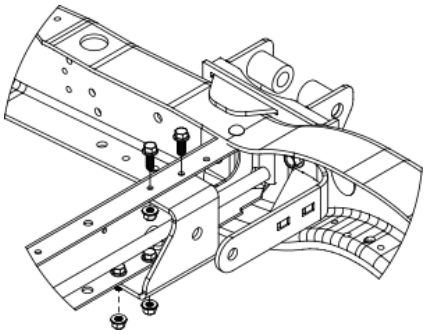


Figure 23. Track rod mount attachment. Some components not shown for clarity.

10. Loosely attach the other end of the Track Rod to the frame using (1) 5/8”-11 x 4.00” Hex Flange Screw and (1) 5/8”-11 Locking Hex Flange Nut.

11. Raise or lower axle until the designed ride height is achieved. Ride height is approximately when the CL of axle to bottom of the Upper Strut Mount is 6 3/4". See Figure 24

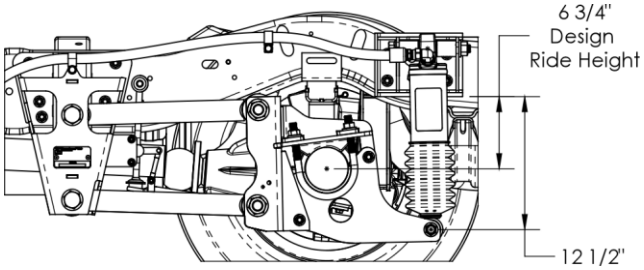
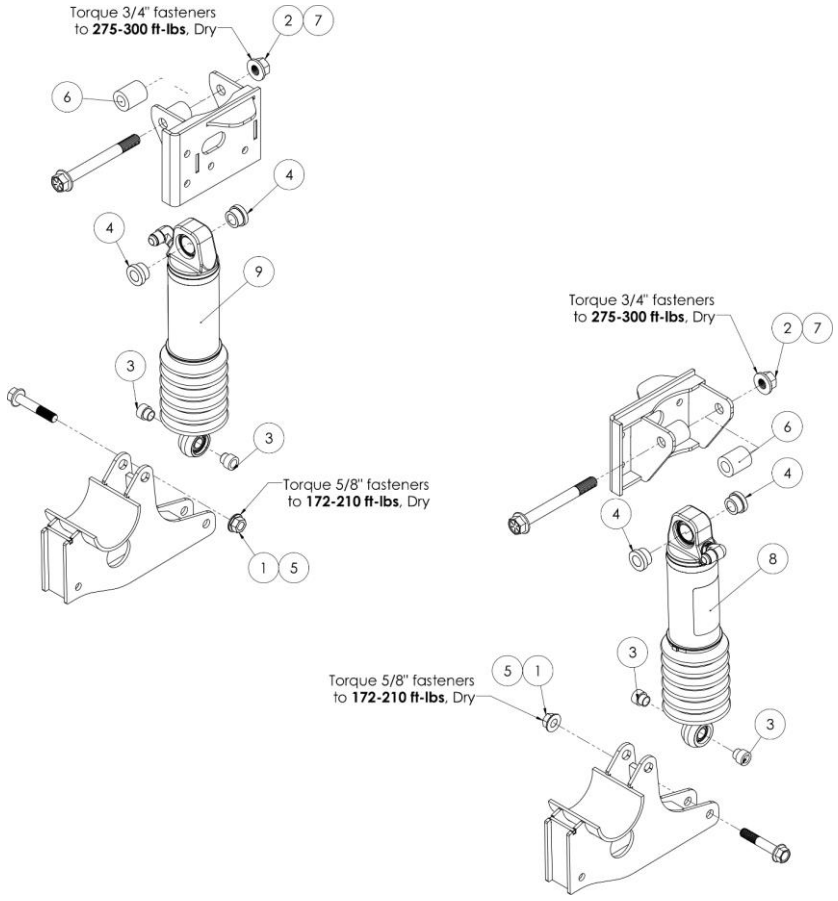


Figure 24. Adjust frame or axle to ride height when tightening control arm fasteners.

12. Torque 3/8” fasteners to **35-43 ft-lbs.**
13. Torque 1/2” fasteners to **86-105 ft-lbs.**
14. Torque 5/8” fasteners to **172-210 ft-lbs.**
15. Torque M10 fasteners to **43-53 ft-lbs.**
16. Torque M12 fasteners to **75-92 ft-lbs.**

Strut Assembly Installation



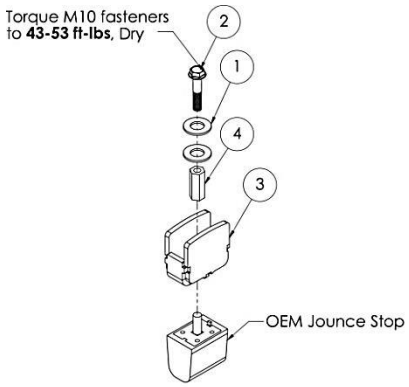
ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	10012-008	LFN 5/8-11, Gr. G	6	2	11100-004	Spacer
2	2	10012-014	LFN 3/4-10, Gr. G	7	2	11102-700	HFB 3/4-10x7.000, Gr. 8
3	4	10640-001	Bearing Spacer	8	1	11299-001	Strut, LH
4	4	10640-005	Bearing Spacer	9	1	11299-002	Strut, RH
5	2	10874-350	HFB 5/8-11x3.500, Gr. 8				

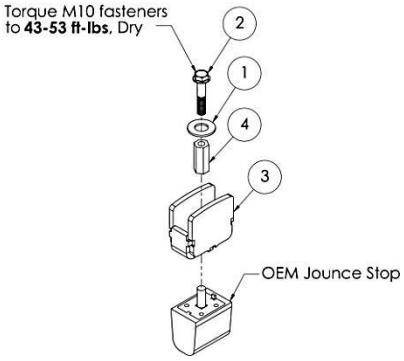
1. Install Struts as shown above with -10 ports pointing forward.

Note: Spacer shipped loosely and must be installed with Struts.

2. Torque 5/8” fasteners to **172-210 ft-lbs.**
3. Torque 3/4” fasteners to **275-300 ft-lbs.**

Jounce Bumpers





ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	3	10006-001	HFW 5/8"	3	2	10592-003	Bump Stop Spacer
2	2	10502-050	HFB M10-1.5x50	4	2	10595-001	Coupler

1. Locate (1) Bump Stop Spacer (1) M10 Coupler, and (1) M10-1.5 x 50mm Hex Flange Bolt.
2. Attach the Driver Side OEM Axle Stop Bumper to the Bump Stop Spacer using the M10 Coupler. Snug tight the coupler to the Bumper.

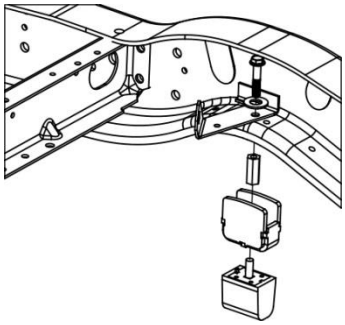


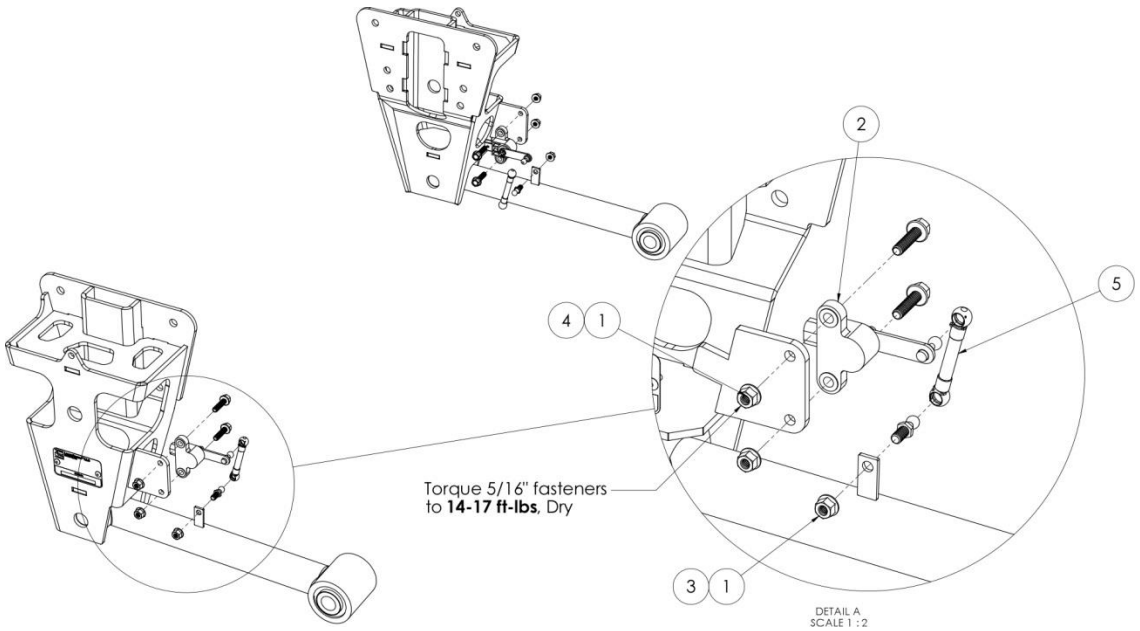
Figure 25. Jounce stop installation.

3. Slip the Spacer and Bumper assembly under the frame and reattach to the Driver Side frame and brake bracket using the M10-1.5 x 50mm Hex Flange Bolt and 5/8" HFW. Torque to **25-30 ft-lbs.** See Figure 25
4. Locate (1) Bump Stop Spacer, (1) M10 Coupler, and (1) M10-1.5 x 50mm Hex Flange Bolt.
5. Attach the Passenger Side OEM Axle Stop Bumper to the Bump Stop Spacer using the M10 Coupler. Snug tight the coupler to the Bumper.

Note: While tightening the M10 bolt, push the OEM brake bracket as far forward as you can. This will keep hoses/lines from making contact to the track rod and track rod mount.

6. Slip the Spacer and Bumper assembly under the frame and reattach to the Passenger Side frame using the M10-1.5 x 50mm Hex Flange Bolt and 5/8" HFW. Torque to **25-30 ft-lbs.**

Height Sensors



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	6	10012-010	LFN 5/16-18, Gr. G	4	4	10886-125	HFB 5/16-18x1.25, Gr. 8
2	2	10586-001	Height Sensor	5	2	10587-007	Linkage
3	2	10591-001	Ball Stud				

IMPORTANT: Strut assemblies must be installed prior to the installation of the height sensors to prevent over-travel of sensors which could damage sensor components.

1. Install Height Sensors as shown above. Refer to **Figure 26 or Figure 27** for detail of linkage.
2. Repeat with the Right Hand (Passenger Side).

Note: When installing linkage, be sure to apply even pressure behind the sensor arm to prevent breaking the arm off the sensor body.

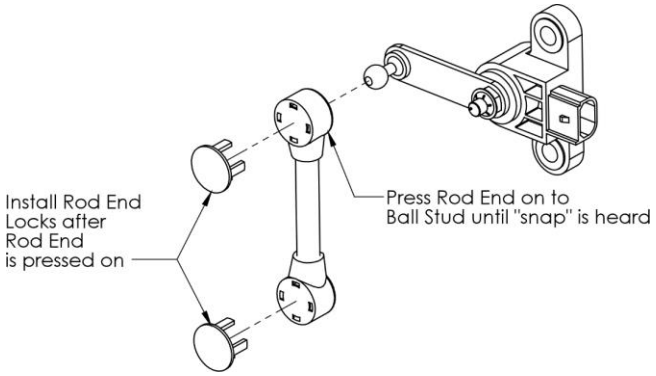


Figure 26. Height Sensor Plastic Linkage End Installation.

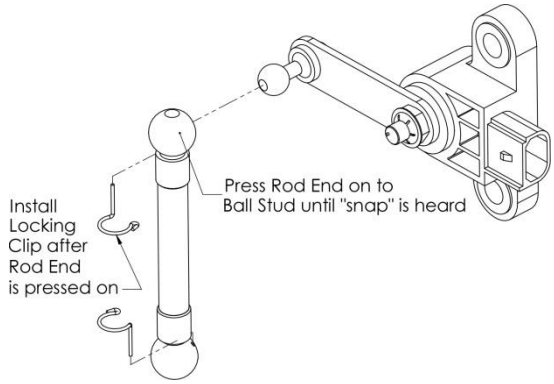
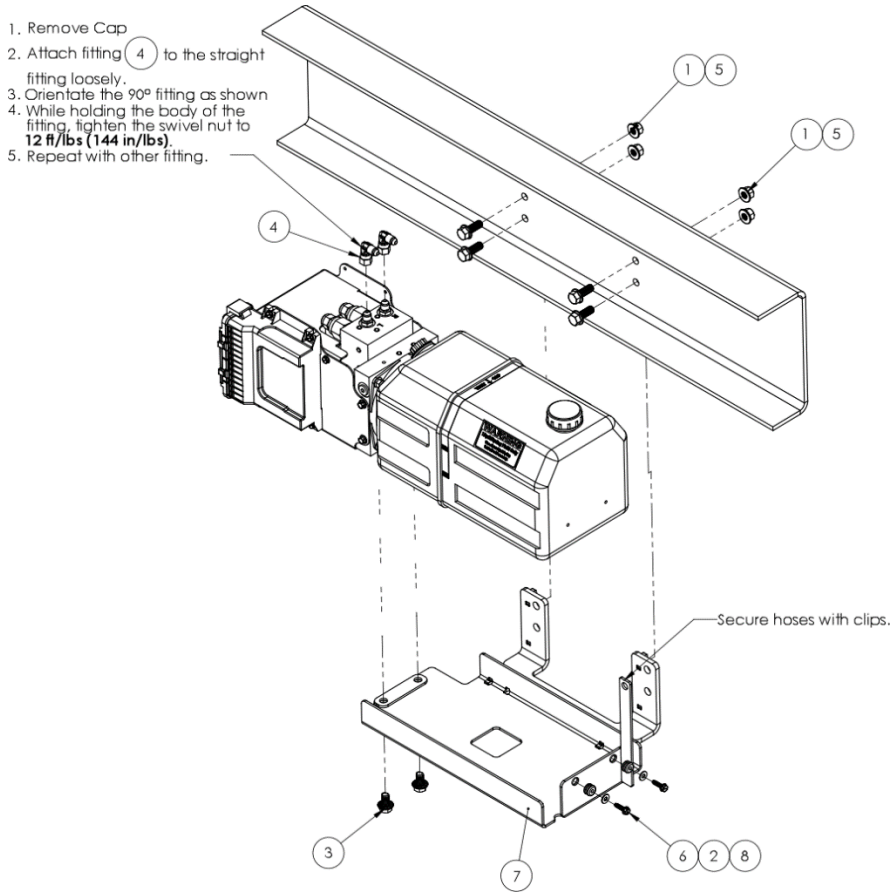


Figure 27. Height Sensor Metal Linkage End Installation.

Power Module Installation



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	4	10012-005	LFN 3/8-16,Gr. G	5	4	10501-001	HFB 3/8-16x1.00, Gr. 8
2	2	10088-001	FW #10, Zinc	6	2	10510-002	STS #10-16x.750
3	2	10252-003	SFHS 3/8-16x.625, Gr. 8	7	1	10798-023	Power Mod Reservoir Mnt
4	2	10322-021	Hyd. Fitting 90°	8	2	10805-004	Grommet

Note: The Power Module Mount uses the same mount hole pattern as the Volume Mounts. Use Volume Mount to locate and mark holes.

1. Using the Volume Mounts, mark and drill holes shown in Figure 28.

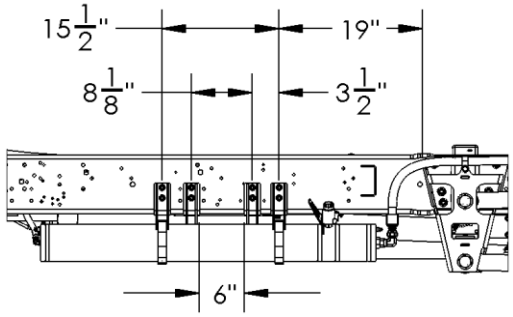
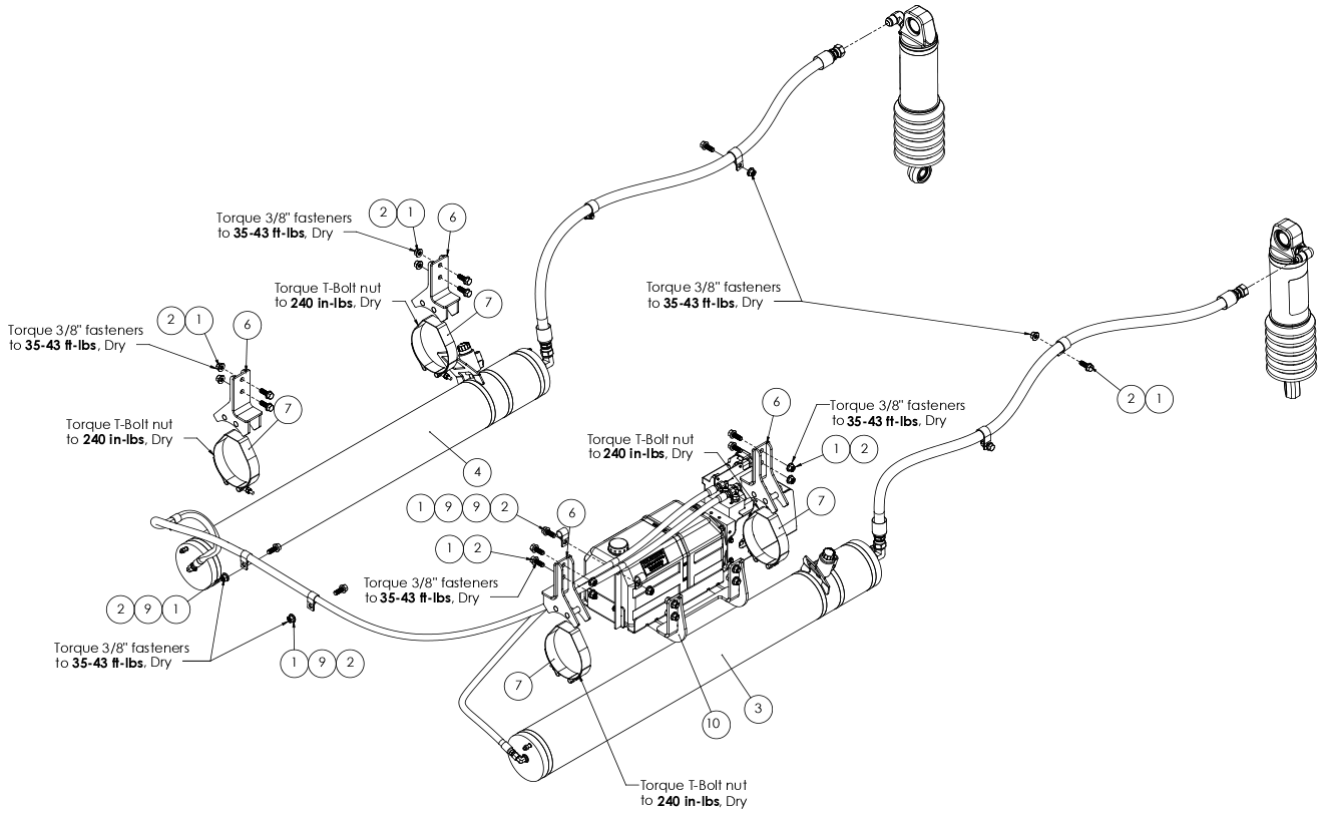


Figure 28. Volume Mount and Power Module Mount Locations

2. Verify that the mount is 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.
3. Install the Power Module Mount using the 3/8" fasteners and Torque to **35-43 ft-lbs.**
4. Follow instructions supplied with the hardware for attaching Power Module to Mount.

Secondary Volumes (DS85FS2 / DS96FS2)

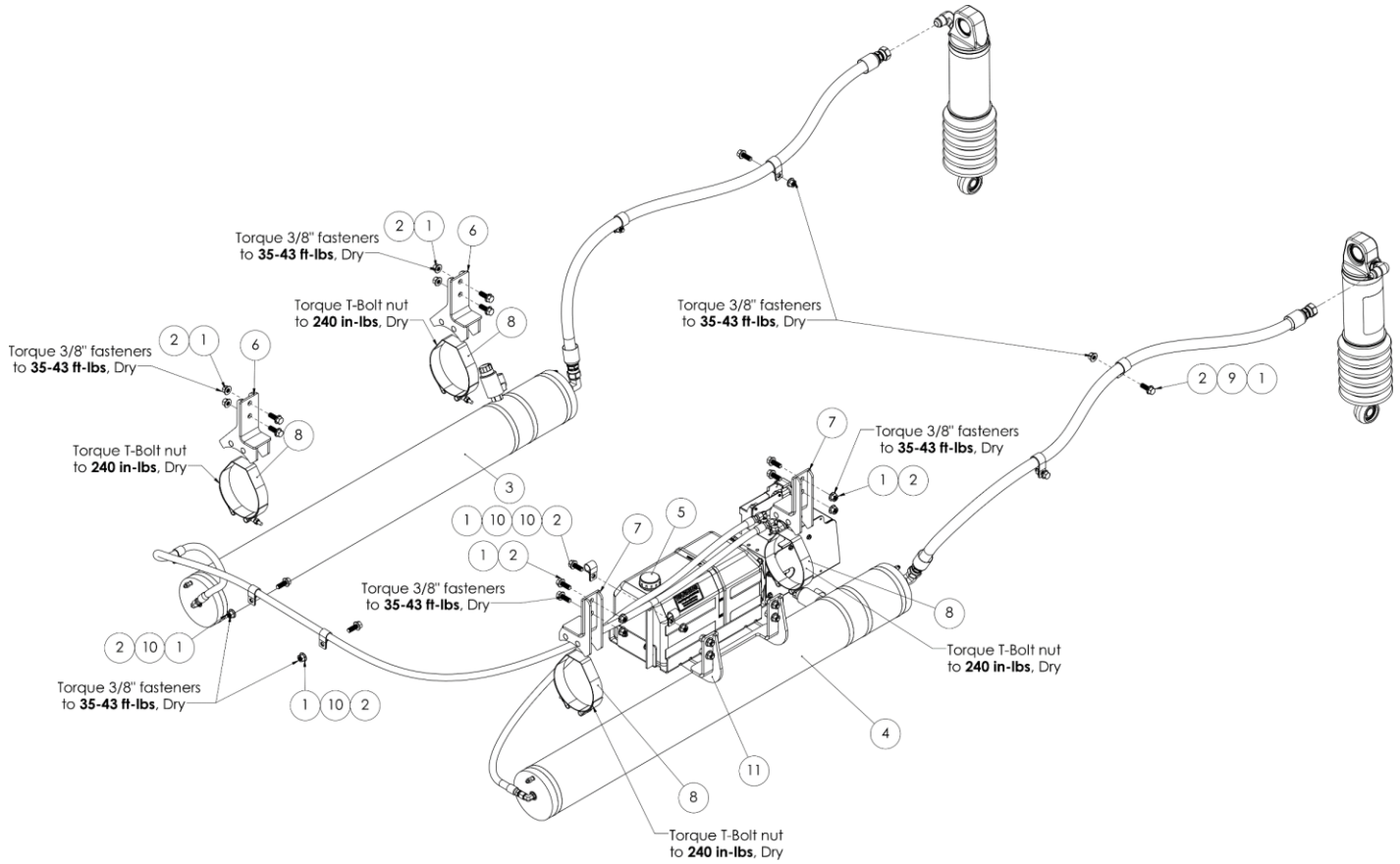


ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	16	10012-005	LFN 3/8-16, Gr. G	6	4	10830-013	Volume Mount
2	16	10501-001	HFB 3/8-16x1.000, Gr. 8	7	4	10843-003	T-Bolt Clamp
3	1	10597-081	2nd Volume, LH	8	4	10855-002	Loop Clamp, 1”
4	1	10597-082	2nd Volume, RH	9	5	10855-003	Loop Clamp, 5/8”
5	1	10614-001	Filler/Breather Cap	10	1	11295	Kit, Power Module, Mount

1. Locate the Volume Mounts and using the holes previously drilled during Power Module Mount installation, bolt Mount to frame using 3/8” fasteners.
2. Torque to **35-43 ft-lbs.**
3. Insert the T-bolt band clamps into the Volume Mounts
4. Raise the volume assemblies until they contact the mount.
5. Secure the tanks with the bleed screws orientated up, with the T-bolt clamps torqued to **240 in-lbs.**
6. Route hoses using loop clamps to secure away from moving parts, shard edges, and/or heat sources.
7. Repeat with passenger side.

Important: Verify that the Rate Valve on the driver side does not contact the Parking Brake Cable.

Secondary Volumes (DS85FS2-BA / DS96FS2-BA)



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	16	10012-005	LFN 3/8-16, Gr. G	7	2	10830-014	Volume Mount
2	16	10501-001	HFB 3/8-16x1.000, Gr. 8	8	4	10843-003	T-Bolt Clamp
3	1	10597-082	2nd Volume, RH	9	4	10855-002	Loop Clamp, 1”
4	1	10597-118	2nd Volume, LH	10	5	10855-003	Loop Clamp, 5/8”
5	1	10614-001	Filler/Breather Cap	11	1	11295	Kit, Power Module, Mount
6	2	10830-013	Volume Mount				

1. Locate the Volume Mounts and using the holes previously drilled during Power Module Mount installation, bolt Mount to frame using 3/8” fasteners.
2. Torque to **35-43 ft-lbs.**
3. Insert the T-bolt band clamps into the Volume Mounts
4. Raise the volume assemblies until they contact the mount.
5. Secure the tanks with the bleed screws orientated up, with the T-bolt clamps torqued to **240 in-lbs.**
6. Route hoses using loop clamps to secure away from moving parts, shard edges, and/or heat sources.

Hydraulic Hose Attachment

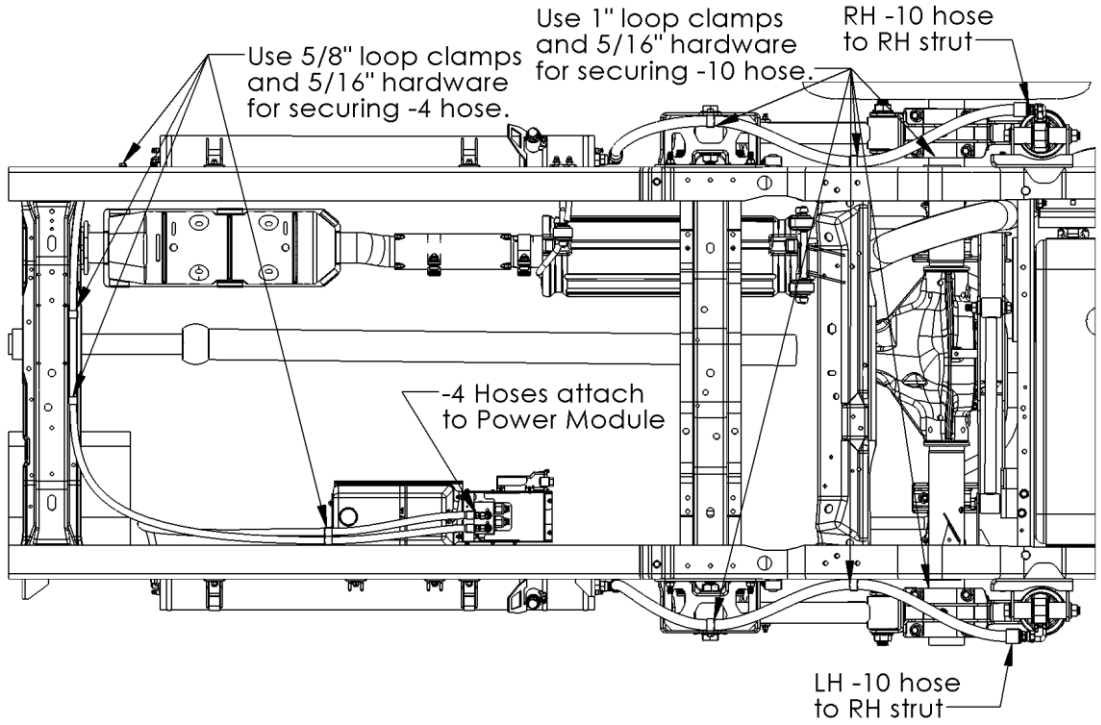


Figure 29. Location of loop clamps and hose routing.

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.

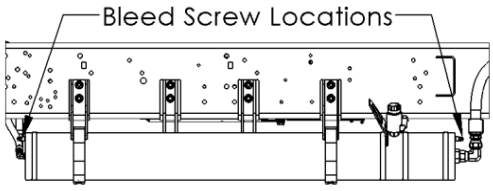


Figure 30. Bleed screw locations.

3. Open the bleed screw slightly to relieve any residual pressure.
4. After pressure is relieved, close the bleed screw and torque to **13-18 ft-lbs.**
5. Remove the cap from the strut port.
6. Raise the end of the -10 (5/8") hose, attached to the volume assembly, above the secondary volume to prevent fluid loss.

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

7. Remove the plug from the end of the hose.
8. Attach the hose end (-10 JIC fitting) to the strut port.
9. Torque to **36-63 ft-lbs.**
10. Repeat with the opposite side.
11. 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.

12. Remove the cap from the LH -4 JIC fitting on the power module assembly.
13. Remove the plug from the hose end.
14. Attach the hose end to the LH fitting. Torque to **12 ft-lbs. Do not over tighten.**
15. 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 within 6" from the exhaust system.

16. Remove the cap from the RH -4 JIC fitting on the power module.
17. Remove the plug from the hose end.
18. Attach the hose end to the RH -4 JIC fitting. **Torque to 12 ft-lbs. Do not over tighten.**
19. Clean up any fluid spillage.

Steering Sensor Installation

Note: Model year 2012 and newer Ford E450 under dash do not require the removal of the cover and brackets to gain access to the steering sensor installation.

1. Remove the Under-Dash Steering Column Cover.

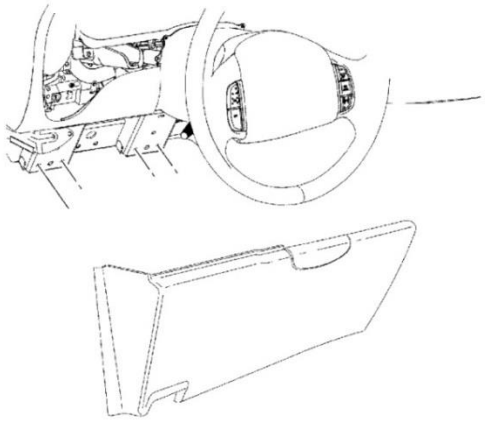


Figure 31. Under Dash Steering Column Cover removal.

2. Locate and remove fasteners that mount the data link connector. Retain hardware for reassembly in later steps.

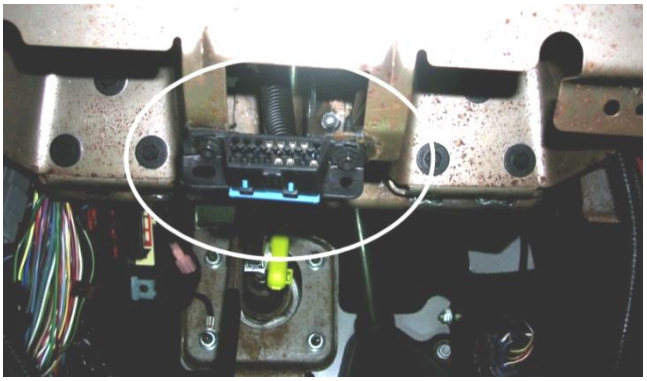


Figure 32. Data Link Connector.

3. Remove the under-dash bolster brace by removing the six (6) bolts. Retain hardware.

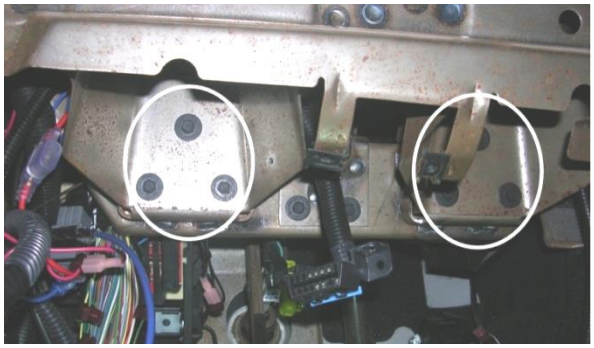


Figure 33. Bolster Brace Bolts.

4. Remove the bracket shown below by removing the two (2) bolts.

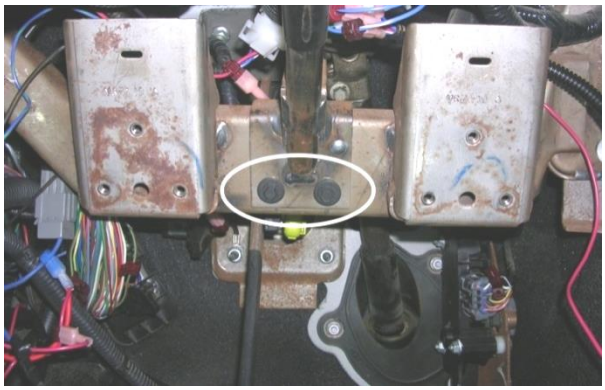


Figure 34. Bracket Bolts.

5. Locate the Steering Sensor and (2) #8 x .50 Pan Head Sheet Metal Screws
6. Install the Sensor as shown in Figure 35 and Figure 36.

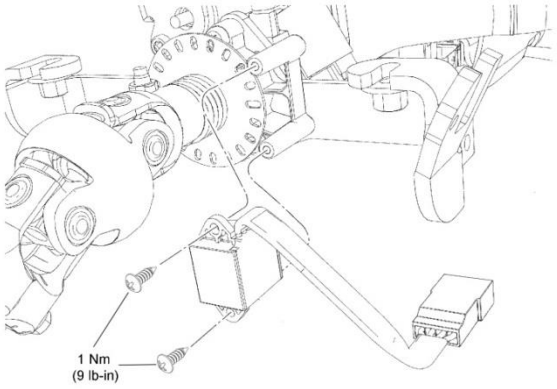


Figure 35. Steering Sensor Installation.

Figure 36. Steering Sensor Location

7. Reinstall the brackets and bolster brackets reusing the bolts removed. Torque to **80 in-lbs (9 Nm).**
8. Reinstall the Data Link
9. Reinstall the under dash steering column cover.

Wiring up the vehicle Pass-thru

1. Looking underneath the vehicle hood, locate the customer access upfitter wiring between the engine air induction tube and the brake master cylinder. Remove some of the plastic wiring harness tape to reveal the blunt-cut wires. Also, locate the Pass-thru wires and connector (C140) near the vehicle cowl. See Figure 37.

   Note: If Pass-thru wires and connector (C140) are already in use by the final stage vehicle manufacturer, please contact LiquidSpring LLC for alternative wiring use.

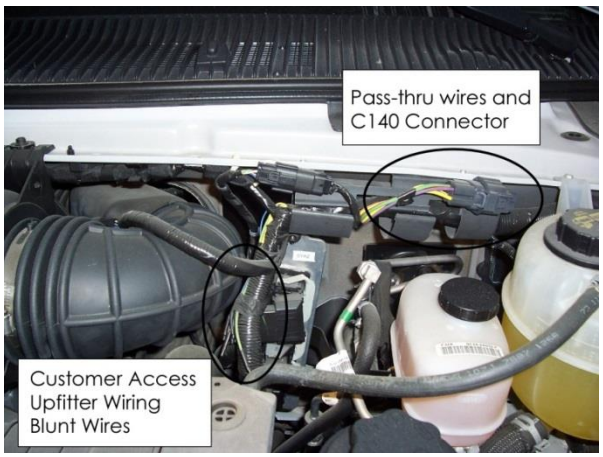


Figure 37. Under hood wiring

2. Cut the 12ga Violet/Grey wire and the 12ga Yellow Grey wire from just behind the Pass-thru wire connector.
   NOTE: Do not cut more than 1" away from C140 connector body.
3. Strip the two wires in preparation for butt splicing.
4. Crimp heat shrink butt-splices onto the ends of the two wires. NOTE: Do not apply heat to shrink the insulator at this time.
5. Locate the Gray/Brown wire labeled "TRO-P" (Park) from the blunt-cut upfitter wiring. Insert this wire into the butt-splice on the Yellow/Grey wire and crimp. Heat the insulator to seal the connection.
6. Locate the Violet/Orange wire labeled "VSOUT" (Speed) from the blunt-cut upfitter wiring. Insert this wire into the butt-splice on the Violet/Grey wire and crimp. Heat the insulator to seal the connection.

External Electrical Harness Installation:

1. Locate the External Electrical Harness attached to the power module.
2. Unroll the wiring harness.
3. Locate the trunks containing the Height Sensor (J21 and J22) and the Rate Valve (J23 and J24) connectors.
4. Route the wires towards the height sensors and rate valves.
5. Connect the following:
   a. J21 to Left Height Sensor (Driver Side)
   b. J22 to Right Height Sensor (Passenger Side)
   c. J23 to Left Rate Valve (Driver Side)
   d. J24 to Right Rate Valve (Passenger Side)

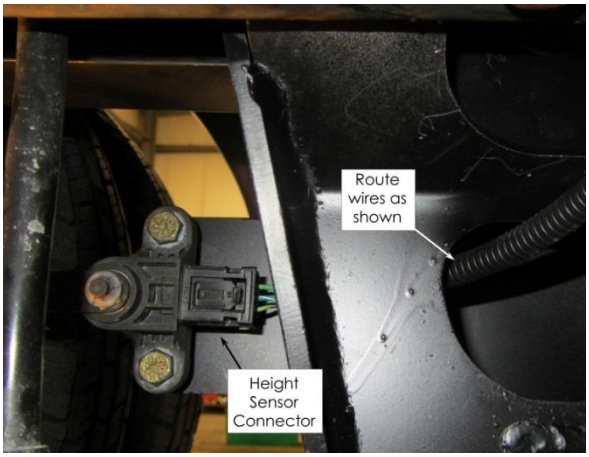


Figure 38. Height Sensor Electrical Connections

Note: Connection after routing the harness and prior to installation of the height sensor may aid in electrical connection.

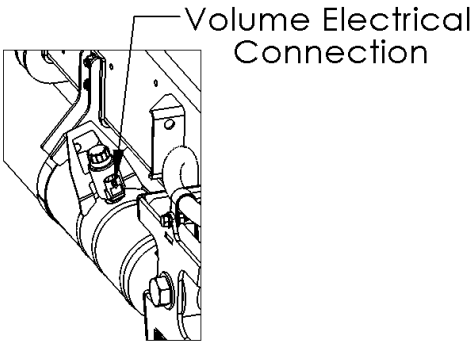


Figure 39. Secondary Volume Electrical Connections

6. Secure the harness.
7. Locate the 8 ga. wire ground ring terminal, J30, branch near the Power Module.
8. Attach the ground ring to the frame. Remove frame coating(s) as needed to ensure metal-to-metal contact between the ring terminal and frame. Sealant may be applied after secured.
9. Route the remaining trunk containing the blunt wires and steering sensor connector towards the cab. Secure the wire harness to OEM harness where appropriate. Do not secure directly to the chassis frame.
10. Route the harness through access hole in cab. See Figure 40.

Figure 40. Location of access hole

11. Route the external harness under the driver side door well cover and kick panel to underneath the dash on drivers side. Secure any excess accordingly to prevent entanglement with driver's feet.
12. Locate the 8 ga. battery connection branch.
13. Route branch to the passenger side auxiliary battery.

    Secure harness to frame, crossmembers, etc. as necessary. Use of the down clips or clamps is recommended. Do not allow harness to droop below frame or attach to fuel lines, brake lines, etc. Route harnesses inside the frame channel or near cross members where appropriate.
14. Locate the Battery Fuse Lead containing the 80 Amp fuse.
15. Crimp the fuse lead to the 8 ga. battery connection branch blunt end.
16. Melt the heat shrink on the crimped connection to seal the splice.
17. Remove the 80 Amp fuse and retain.
18. Connect to the positive terminal post per OEM Upfitter wiring instructions.

Dash Electrical Harness Installation:

1. Locate and identify the following 18 ga. wires in the external harness. These wires should be routed from the Power Module to the inside of the cab.
2. If existing on the dash harness, cut off the two 6-pin connectors labeled J9 and J10.
3. Butt splice the following wires between the dash harness and external harness:

Dash Harness	→	**External Harness**
Red (Battery)	→	Red (Battery)
Yellow (Ignition)	→	Yellow (Ignition)
Black (Ground)	→	Black (Ground)
White (CAN High)	→	White (CAN High)
White/Black (CAN Low)	→	White/Black (CAN Low)
Violet/White (Speed)	→	Violet/White (Speed)
Pink/Black (Brake)	→	Pink/Black (Brake)
Yellow/Black (Park)	→	Yellow/Black (Park)
The following are steering signal wires		
Orange/Black	→	Orange/Black
Brown/White	→	Brown/White
Gray	→	Gray

4. Connect each wire to the corresponding wire in the dash harness using appropriate butt splices. Heat shrink sealing is optional.
5. Attach Ground ring terminal (J32) to firewall stud for grounding. See Figure 41.

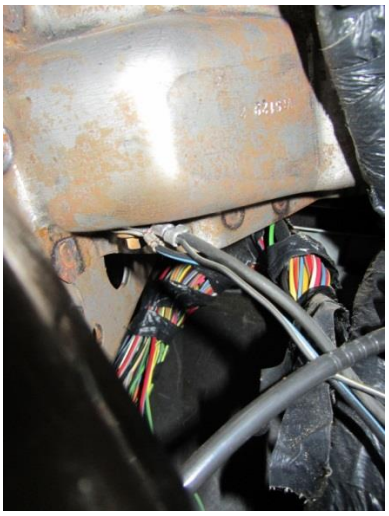


Figure 41. Firewall ground stud—driver side under dash

6. Connect the 6-pin connector (J11 on Dash Harness) to the steering sensor.
7. Locate Ford connector C219 and wire harness 14401 underneath driver side dash. See Figure 42 and Figure 43.

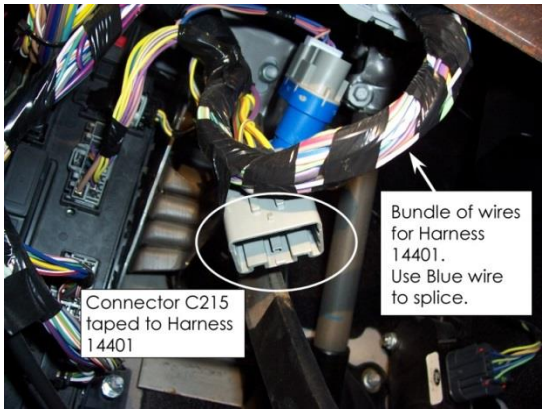


Figure 42. Under dash wiring. Note: Connector J31 not shown connected for clarity.

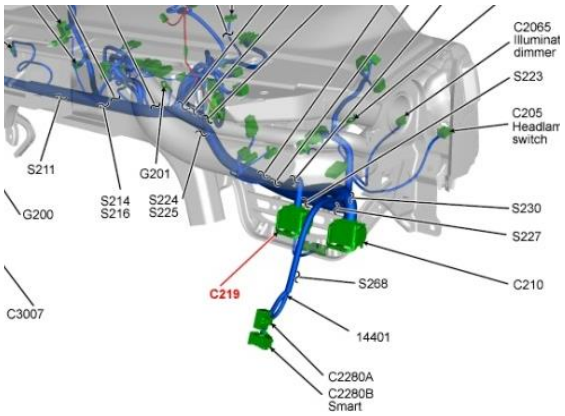


Figure 43. Connector C219 location under dash, driver side.

8. Locate the five (5) wires in the LS Dash Harness labeled “Chassis Connections”.
9. The Pink/Black blunt wire needs to be spliced into the Violet/White wire of harness 14401 at connector C219.
10. Locate the Violet/White 18 ga. wire in pin #37 of connector C219. Unwind the plastic tape to gain access to the Violet/White wire at least 8” from white connector C219 and cut the wire ≈6” from connector C219. See Figure 44.
11. Strip one cut end of the Violet/White wire and insert into one end of a heat shrinkable butt-splice and crimp.
12. Strip the Pink/Black blunt wire and the other cut end of the Violet/White wire and twist together. Insert the twisted pair into the other end of the heat shrinkable butt-splice and crimp.
13. Apply heat to the insulator to seal the connection.

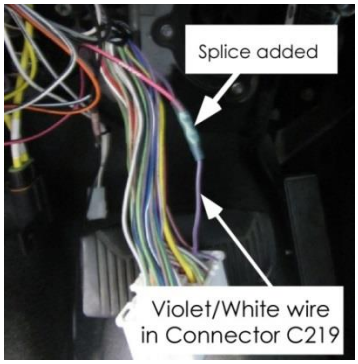


Figure 44. Violet/White wire in Connector C219 shown with splice.

14. Locate the Ford C215 connector under the dash.
15. Locate and splice the following wires to the LiquidSpring Dash Harness blunt wires:

OEM C215 Wires	→	LS Dash Harness Wires
Pin #1 (Violet/Gray) 12ga.	→	Violet/White (Speed)
Pin #2 (Yellow/Gray) 12ga.	→	Yellow/Black (Park)
Pin #3 (Green/Red) 10ga.	→	Red (Battery) 10ga
Pin #4 (Yellow/Orange) 12ga.	→	Yellow (Ignition) 10ga

16. For each connection:
    a. Unwind the plastic tape as necessary.
    b. Cut OEM wire approximately 6” from the connector.
    c. Strip one end of the OEM wire and insert into one end of the heat shrinkable butt-splice and crimp.

d. Strip the other end of the cut OEM wire and the corresponding LiquidSpring Dash Harness blunt wire. Twist together.

e. Insert the twisted pair into the other end of the heat shrinkable butt-splice and crimp.

f. Apply heat to seal the connection.

17. Secure Dash Harness to prevent wires getting entangled in driver's feet.

Driver Interface Installation:

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

Optional Door Electrical Harness Installation:

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

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

A. Single Wire - Ground Signal from Source

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

B: Dual Wire – Ground Signal from System

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

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

Initial System Fill

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

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

6. Press and release the Red ON/OFF button on the driver display. All LEDs on the driver display should go out.
7. Press and release the Red ON/OFF button again. The LEDs on the driver display should all flash and then only the four yellow arrow LEDs, one green ride mode indicator LED, and one green ride height indicator LED should remain lit.
8. The green ride height indicator LED should indicate "Low" and begin flashing as the pump/motor starts. If pump/motor does not start, check Trouble Shooting Electrical Section.
9. Monitor the fluid level in the reservoir. If the level drops below 1/4 of the tank, press and release the Red ON/OFF button to shut off the system, refill the reservoir, and turn the system back on by pressing the Red ON/OFF button.
10. 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

11. After the suspension system stops leveling, check the fluid level in the reservoir. If low, fill to the indicated line. Additional fluid can be purchased from LiquidSpring.

CAUTION: Adding any fluid other than Compressible Fluid from LiqidSpring LLC to the system will result in incorrect operation and will damage critical components of the system. Using unapproved fluid in the LiquidSpring system will void the LiquidSpring Warranty.

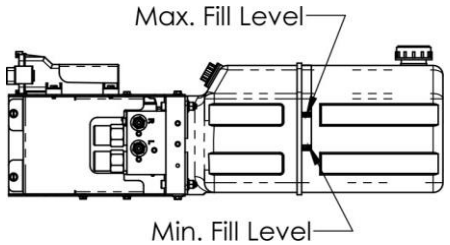


Figure 45. Final fill fluid level.

Bleeding the System

1. Verify system is turned OFF by either pressing the ON/OFF button on the driver interface until the lights are turned off or turning the ignition off.
2. Locate 3/16" ID PVC Tubing (not included with kit). Note: Alternatively, a bleed kit similar to the Actron 7840 Bleed Kit can be used.
3. Attach the PVC tubing to one of the upper bleed screws on the Left-Hand Secondary Volume Assembly and place the other end in a bucket.

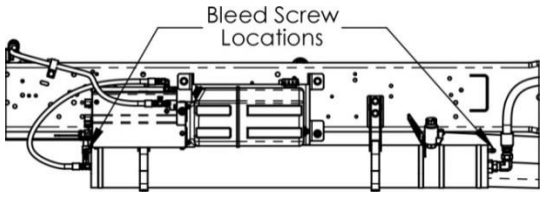


Figure 46. Bleed screw locations.

4. Open the bleed screw slightly.
5. After air bubbles are no longer present, close the bleed screw and torque to **13-18 ft-lbs.**
6. Repeat with remaining bleed screws. Note: the system may need to powered on and allowed to re-pressurize.
7. Repeat with other side.

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.

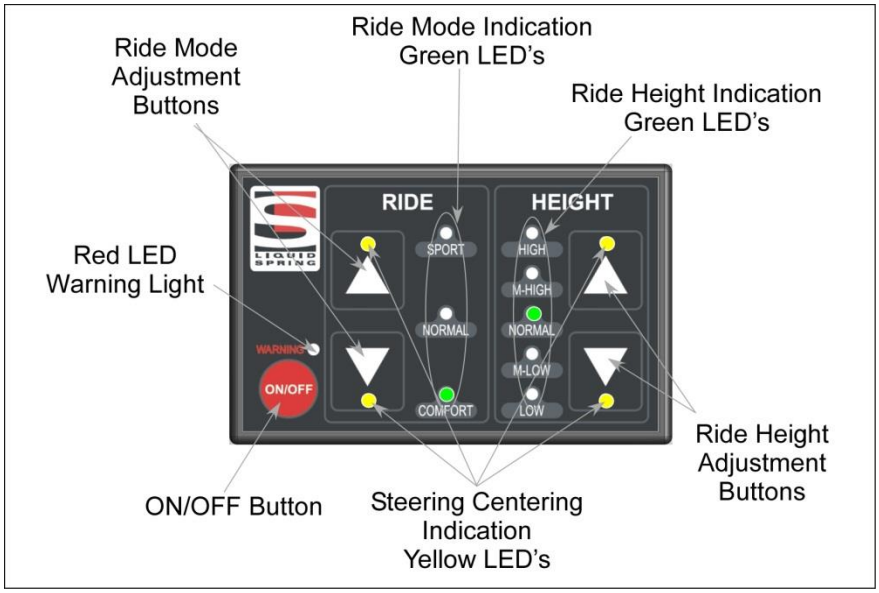
1. Verify that the front wheels are steered straight ahead.
2. Lower the vehicle to the ground and remove any jack stands and any other obstructions from under the vehicle.
3. To begin the calibration, turn the ignition key to "Run" and ensure that the LiquidSpring driver display lights up and that the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

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 lights on the driver display should go out.
5. Press and release the Red ON/OFF button a second time. The lights on the driver display should all flash then only show the four yellow arrow lights, one green ride mode indicator, and one green ride height indicator.
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, then press the Red ON/OFF button twice and verify the suspension system moves to the new and correct ride height.
10. 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**.

Ride Mode Adjustment:

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

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

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

Ride Height Adjustment:

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

- A solid green LED will indicate the selected height. A flashing green LED will indicate the current height and that height adjustment is occurring. When a single solid green LED is lit, the selected height has been achieved.

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

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

Depressurizing the System

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

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

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

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

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

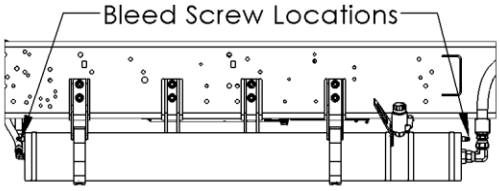


Figure 47. Bleed screw locations.

10. Open the bleed screw slightly to relieve any residual pressure.
11. After pressure is relieved, close the bleed screw and torque to 13-18 ft-lbs.

Notes:

- Jacking up the chassis of a lowered, depressurized chassis will cause a slight vacuum in the system and minimize fluid loss while disconnecting hoses.

- For service of non-hydraulic connected suspension components, the suspension system can be first raised to the HIGH height, appropriate jack stands placed under the chassis, then depressurized as listed above lowering the chassis onto the jack stands.

Calibrating the Steering Sensor Only

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

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

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

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

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

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

Troubleshooting

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

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

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

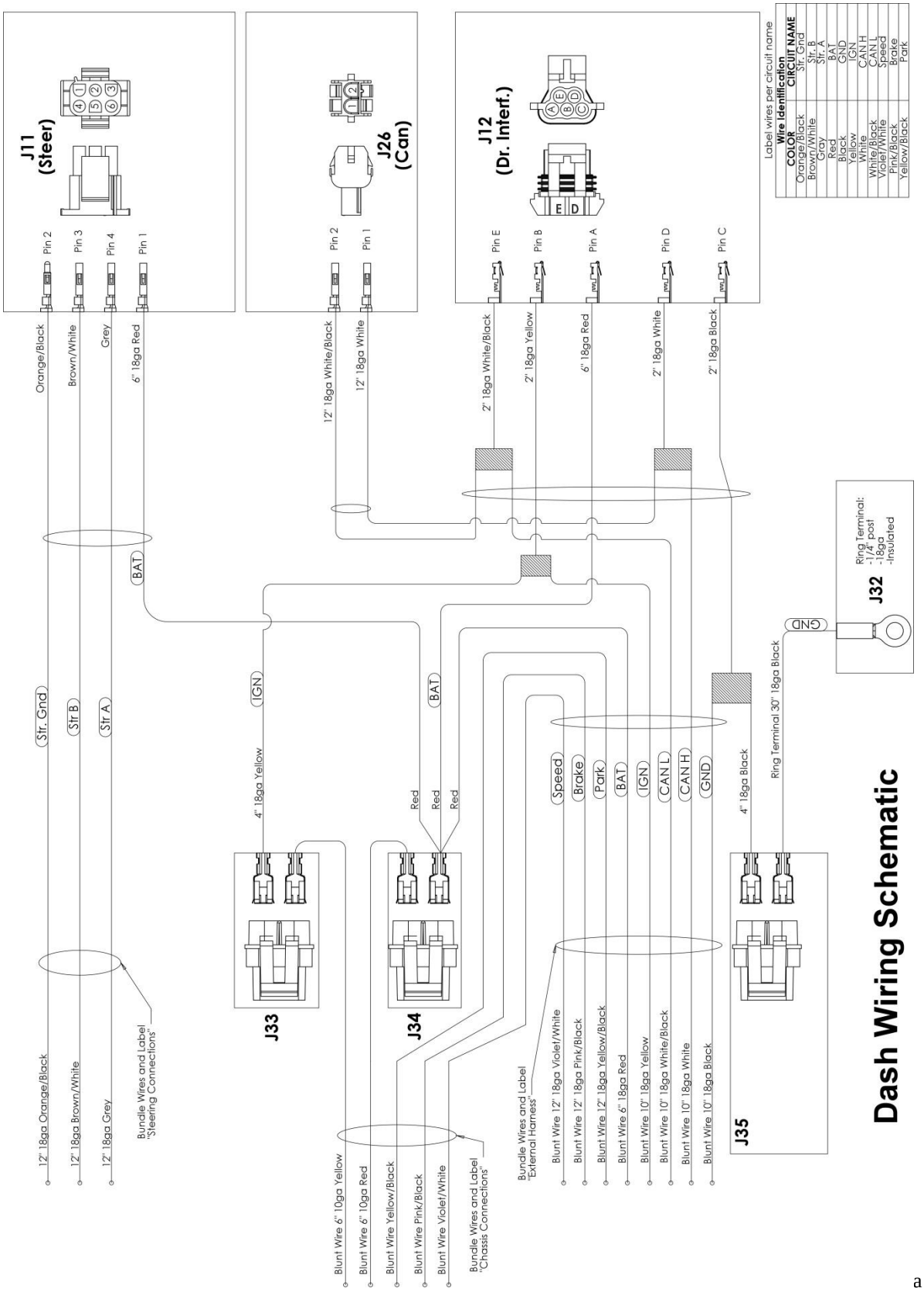
Issues with Strut Assembly

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

Electrical Schematics



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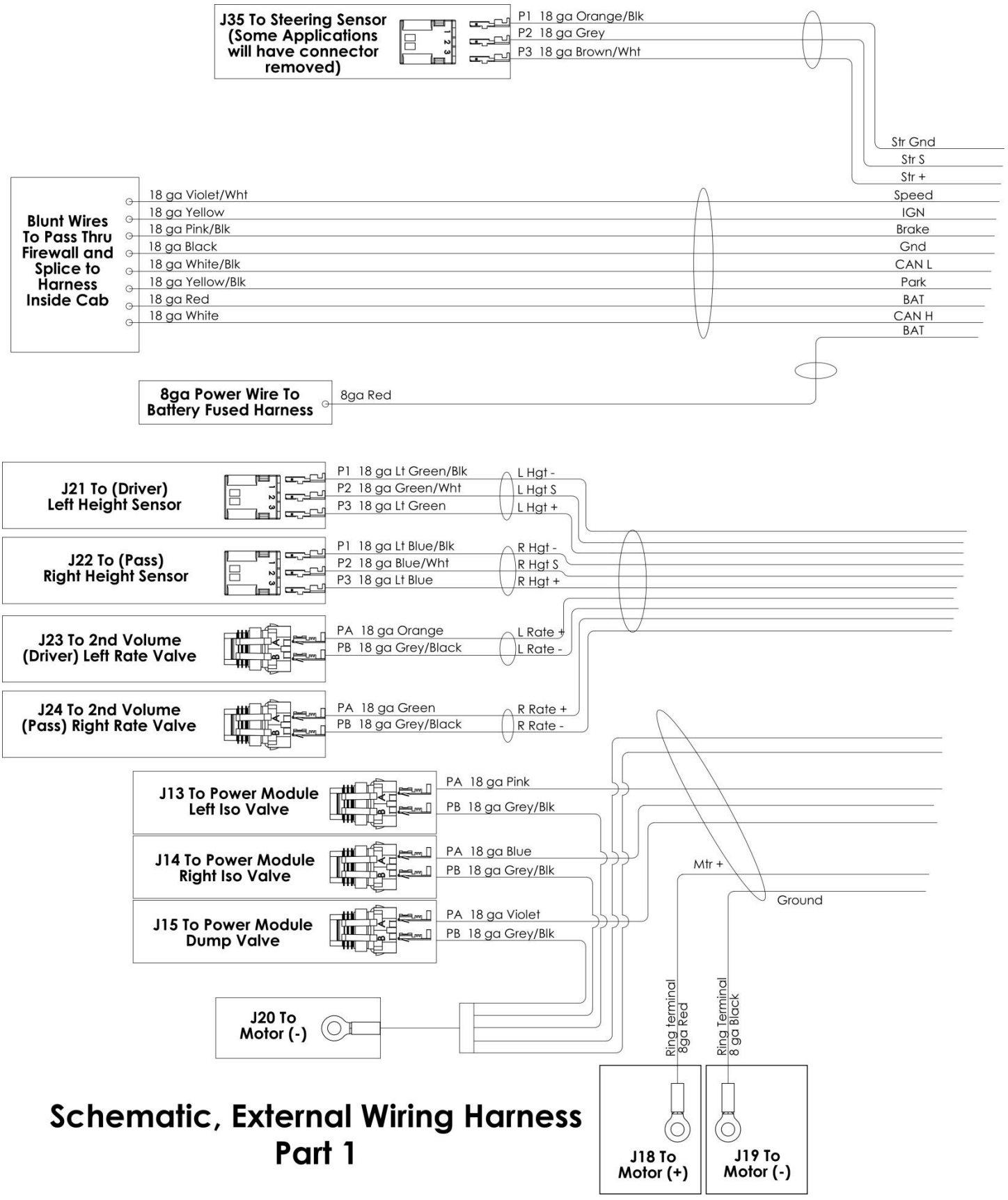
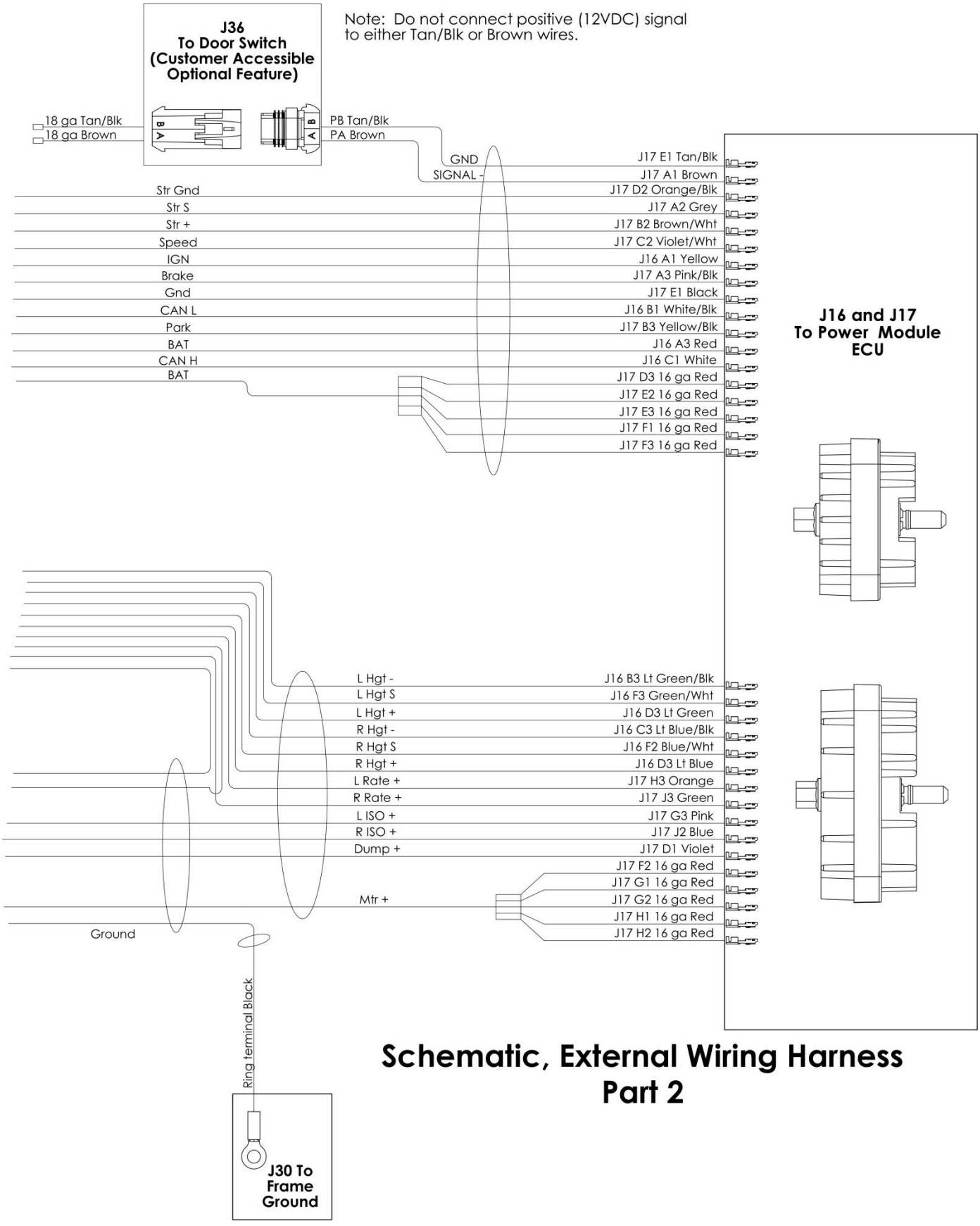
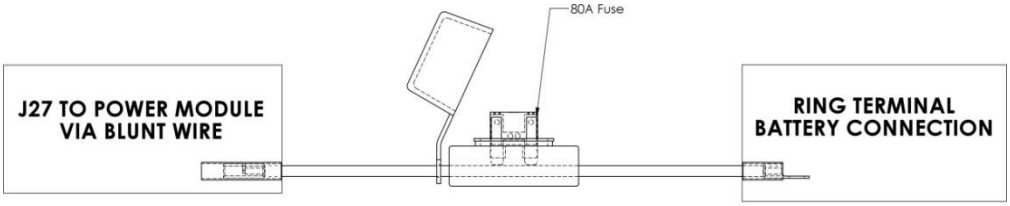


Schematic, External Wiring Harness Part 1



Schematic, External Wiring Harness Part 2



Schematic, Battery Fuse Lead

LiquidSpring™ LLC
4899 E 400 S
Lafayette, IN 47905

Phone: 765-474-7816
Fax: 765-474-7826
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INSTALLATION CHECK LIST

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

FRAME PREPARATION:
☐Battery Disconnected
☐Removed OEM Leaf springs, overload pads, front hangers, shock absorbers, passenger side OEM shock absorber mount, parking brake cables, rear sway bar.
☐Upper Strut Mount, Front Hanger, Power Module Mount, and Secondary Volume Assy holes drilled.

FRONT HANGER INSTALLATION:
☐1/2”-13 Nuts torqued to **86-105 ft-lbs**.
☐Added spiral wrap to passenger side E-Brake.

UPPER STRUT MOUNT/TRACK ROD MOUNT/CROSS MEMBER REINFORCEMENT:
☐Upper Strut Mounts level with frame.
☐Cross member Reinforcement installed.
☐Bolts oriented per Installation Manual Views.
☐1/2”-13 Nuts torqued to **86-105 ft-lbs**.

AXLE CLAMP INSTALLATION:
☐5/8”-18 U-Bolts torqued in stages up to **175 ft-lbs**.
☐1/2”-13 Nuts torqued to **86-105 ft-lbs**.
☐Passenger E-Brake bracket moved to Upper Axle Clamp.
☐Loop Clamp placed on top of Axle.
☐Spacer added to shock mount.
☐Added spiral wrap to passenger side whip hose.
☐Wedge added (if necessary)

CONTROL ARMS INSTALLATION:
☐Control Arms correctly orientated.
☐1”-8 Nuts torqued to **600 ft-lbs.** at ride height.

BRIDGE INSTALLATION:
☐D-Ring holes drilled out to 1/2”
☐Weld Nuts Removed
☐Bridge Support Brackets Installed.
☐1/2”-13 hardware torqued to **86-105 ft-lbs.**
☐M10 hardware torqued to **43-53 ft-lbs.**
☐M12 hardware torqued to **75-92 ft-lbs.**

TRACK ROD INSTALLATION:
☐3/8”-16 Nuts torqued to **35-43 ft-lbs**.
☐1/2”-13 hardware torqued to **86-105 ft-lbs.**
☐5/8”-11 Track rod fasteners torqued to **172-210 ft-lbs.** at ride height.

STRUT INSTALLATION:
☐3/4”-10 Nuts torqued to **275-300 ft-lbs**.

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

JOUNCE BUMBER INSTALLATION:
☐Bump Stop Spacer installed
☐M10 fasteners torqued to **43-53 ft-lbs.**

POWER MODULE/SECONDARY VOLUME INSTALLATION:
☐3/8”-16 Manifold Bolts torqued to **25 ft-lbs**.
☐Reservoir Mount Self Tapping Screws tightened to **snug only**.
☐3/8”-16 Nuts Torqued to **39 ft-lbs**.

HOSE INSTALLATION:
☐-4 Hose fittings torqued to **14 ft-lbs.**
☐-10 Hose fittings torqued to **36-63 ft-lbs.**
☐Bleed screws closed and torqued to **13-18 ft-lbs.**
☐Hoses secured with loop clamps and 5/16”-18 hardware torqued to **14-17 ft-lbs**.

STEERING SENSOR INSTALLATION:
☐Steering Sensor encoder installed.

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

INTIAL FILL/CALIBRATION:
☐Battery connected.
☐Suspension rose to ride height.
☐Reservoir at proper level.
☐Calibration completed.