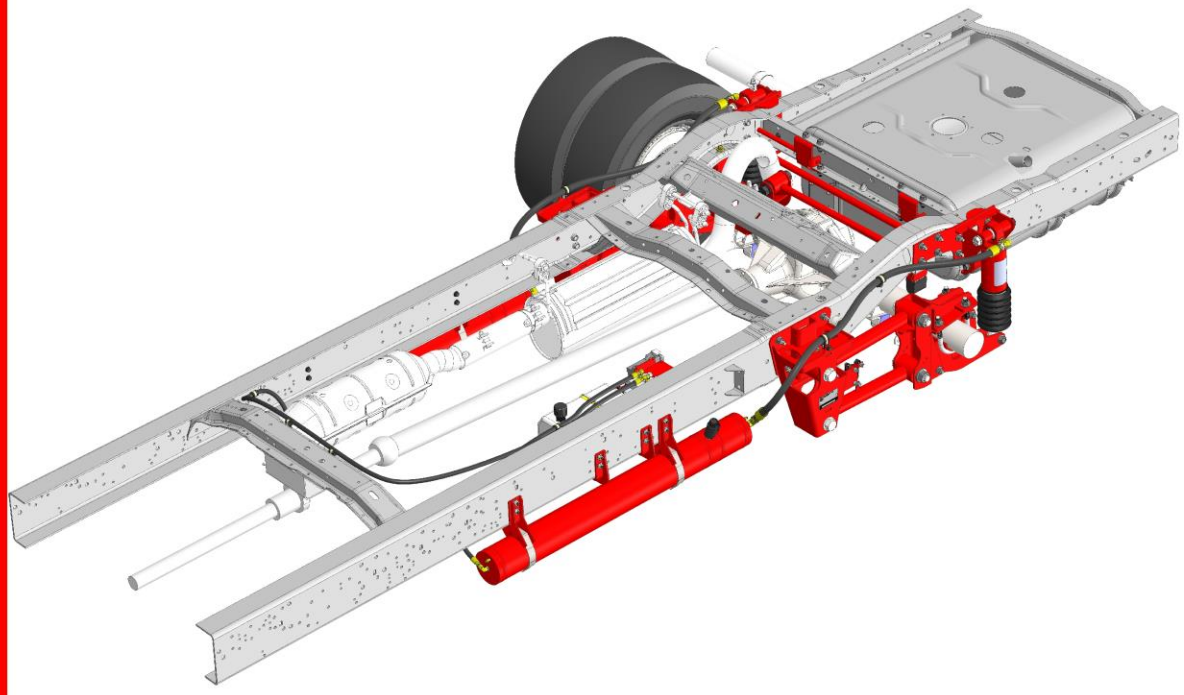
DS85FS3/DS96FS3

DS85FS3
DS96FS3

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



LIQUIDSPRING®
SMART SUSPENSION

Installation / Maintenance Manual

D11862 Rev F 11/20

Contents

Introduction

This manual provides installation information for the LiquidSpring **CLASS**® DS85FS3 and DS96FS3 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
DS85FS3	8,500 GAWR E-350 Cutaway (2021+)
DS85FS3-BA	8,500 GAWR E-350 Cutaway (2021+)
DS85FS3M	8,500 GAWR E-350 Cutaway (2021+)
DS96FS3	9,600 GAWR E-450 Cutaway (2021+)
DS96FS3-BA	9,600 GAWR E-450 Cutaway (2021+)
DS96FS3M	9,600 GAWR E-450 Cutaway (2021+)

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
DS85FS3 (on E-350 Cutaway)	**8,500 lbs**
DS85FS3-BA (on E-350 Cutaway)	**8,500 lbs**
DS85FS3M (on E-350 Cutaway)	**8,500 lbs**
DS96FS3 (on E-450 Cutaway)	**9,600 lbs**
DS96FS3-BA (on E-450 Cutaway)	**9,600 lbs**
DS96FS3M (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.

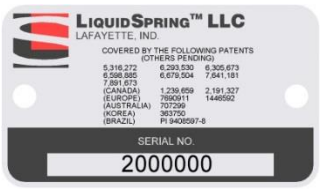


Figure 1. Suspension Identification

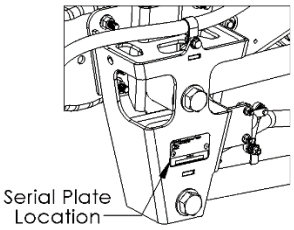


Figure 2. Serial Number Tag Location

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

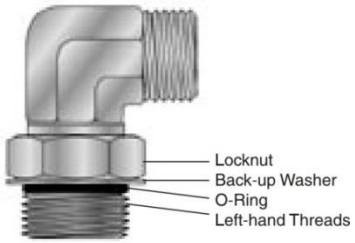


Figure 3. Adjustable SAE fitting

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.

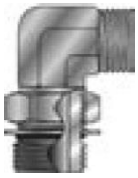


Figure 4. Locknut completely backed off.

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 Nut
HTCN	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 ensure 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 25.
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.

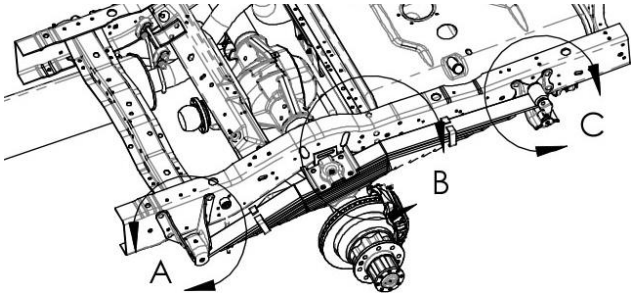


Figure 5. Rivet removal locations. Driver side shown. Remove rivets on passenger side also.

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

NOTE: Clamp crossmember flange to frame prior to drilling to prevent flange distortion.

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

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

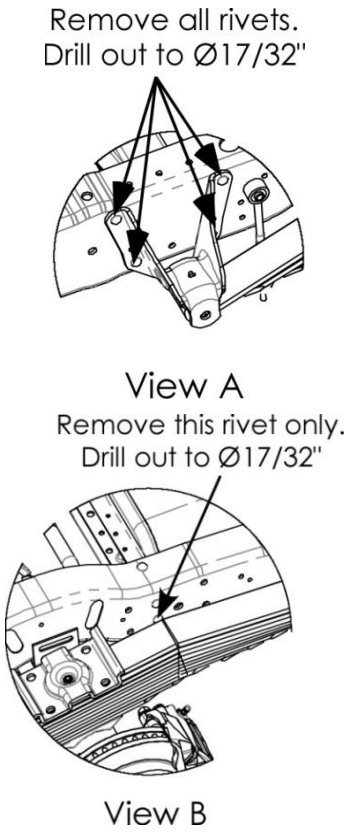


Figure 6. Rivet removal details

9. Drill out the rivet hole to Ø.531" (17/32") if necessary.
10. Drill out the four (4) indicated holes on the top flange of the front fuel tank crossmember to Ø.531" (17/32"). See Figure 7.

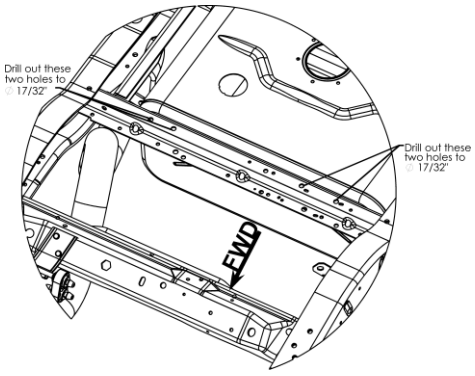
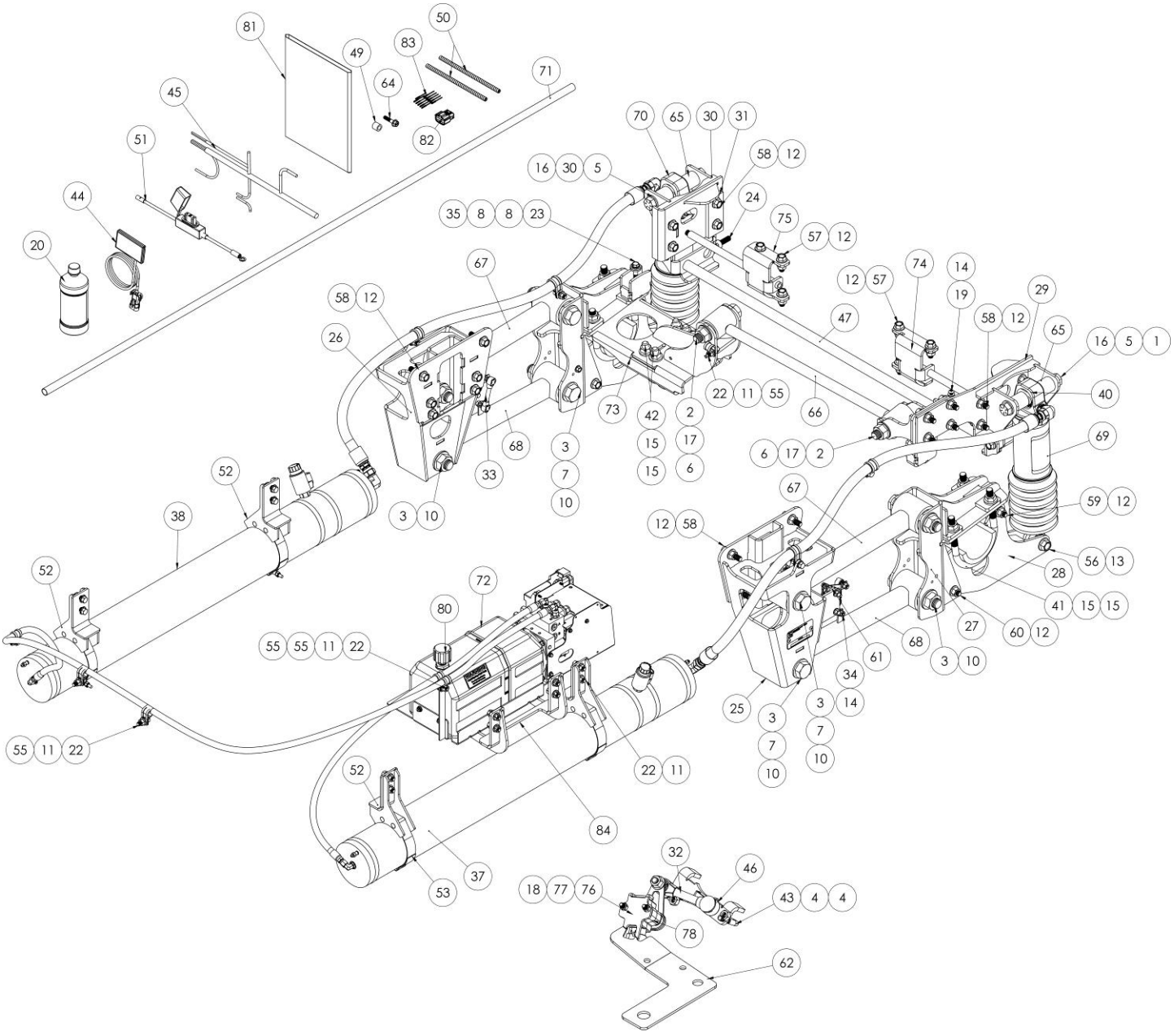


Figure 7. Drill Fuel Tank Crossmember Holes

11. Remove the OEM Axle Stop Bumpers from under the frame. Do not discard the bumpers or brackets.

Part Identification:

DS85FS3



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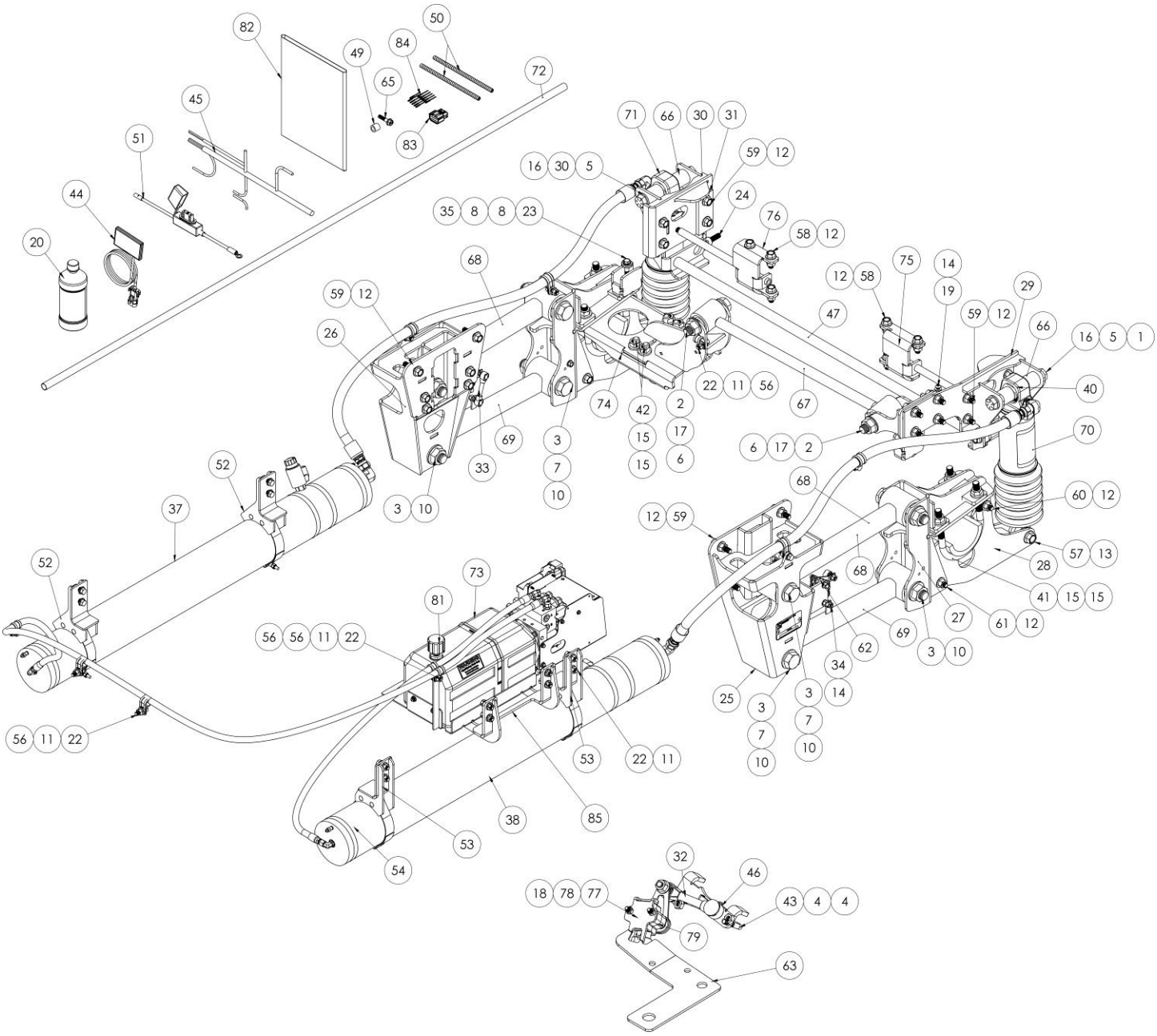
ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	10001-011	HCS 3/4-10 X 7, Gr 8	43	1	10669-005	U-Bolt ¼-20 x 3 x 1.375
2	2	10002-500	HCS 7/8-9 x 5, Gr 8	44	1	10680-001	Driver Interface
3	8	10003-010	HCS 1-8x5.500, Gr 8 Z	45	1	10704-013	Wiring Harness, Dash
4	2	10004-024	LHN ¼-20, Gr 2	46	1	10733-015	Wldmnt, Pitman Arm Brkt
5	2	10006-002	HFW .750"	47	1	10782-025	Wldmnt, Crossmember Reinf.
6	2	10006-003	HFW .875"	48	1	10789-030	Wldmnt, Track Rod Mnt
7	8	10006-004	HFW 1"	49	1	10800-004	Tube, .69 OD x .42 ID x .625L
8	4	10006-007	HFW ½"	50	2	10804-002	Spiral Cable Wrap
9	2	10011-010	HCS 1/2-13 x 1.750, Gr. 8	51	1	10815-001	Wiring Harness, Battery Fuse Lead
10	8	10012-003	LFN 1-8, Gr G	52	4	10830-013	Volume Mount
11	17	10012-005	LFN 3/8-16, Gr G	53	4	10843-003	T-Bolt Clamp
12	38	10012-007	LFN 1/2-13, Gr. G	54	4	10855-002	Vinyl-Coated Loop Clamp, 1" ID
13	2	10012-008	LFN 5/8-11 Gr G	55	6	10855-003	Vinyl-Coated Loop Clamp, 5/8" ID
14	8	10012-010	LFN 5/16-18, Gr. G	56	2	10874-350	HFB 5/8-11x3.500, Gr. 8
15	12	10012-013	LFN 5/8-18, Gr. G	57	10	10885-125	HFB 1/2-13 X 1.25
16	2	10012-014	LFN 3/4-10 Gr G	58	24	10885-175	HFB 1/2-13x1.750, Gr. 8
17	2	10012-017	LFN 7/8-9 Gr 8	59	2	10885-325	HFB 1/2-13x3.250, Gr. 8
18	2	10232-006	LHN M5-0.8	60	2	10885-375	HFB 1/2-13x3.750, Gr. 8
19	1	10421-005	BHCS 5/16-18 x .75	61	5	10886-125	HFB 5/16-18x1.250, Gr.8
20	1	10474-001	Compressible Fluid, 16 oz. Bottle	62	1	10904-058	Bracket, Steering Sensor
21	2	10494-002	WLW 1/2, Z	63	1	10910-012	Spacer Plate
22	17	10501-001	HFB 3/8-16 x 1.00, Gr. 8	64	1	11003-035	HFB M8-1.25 x 35
23	2	10502-050	HFB M10-1.5 x 50 CL 10.9	65	2	11100-004	Spacer
24	1	10512-001	BHCS M12-1.75x35 CL 10.9 BO	66	1	11198-001	Asy, Track Rod
25	1	10538-005	Front Hanger, LH	67	2	11240-004	Control Arm, Upper
26	1	10539-010	Front Hanger, RH	68	2	11240-005	Control Arm, Lower
27	2	10546-014	Axle Seat	69	1	11299-001	Strut Assembly, LH
28	2	10552-008	Axle Cradle	70	1	11299-002	Strut Assembly, RH
29	1	10564-009	Upper Strut Mount, LH	71	1	11333-002	Thermashield, 5/8" ID
30	1	10564-010	Upper Strut Mount, RH	72	1	11508-002	Asy, PM, DS85-96FS3
31	2	10569-001	Backing Plate	73	1	11633-003	Wldmnt, Track Rod Mnt
32	1	10587-004	Linkage	74	1	11635-005	Wldmnt, Crossmember Reinf., LH
33	2	10587-007	Linkage	75	1	11635-006	Wldmnt, Crossmember Reinf., RH
34	2	10591-001	Ball Stud	76	2	11639-040	HCS M5-0.8 x 40
35	2	10592-003	Bump Stop Spacer	77	2	11641-001	FW M5 10 x 5.3 x 1
36	2	10595-001	Coupler, M10-1.5x1.500	78	1	11675-001	Asy, HW Sensor
37	1	10597-081	Volume Assembly, LH	79	2	11752-001	Asy, HW Sensor, Adapter
38	1	10597-082	Volume Assembly, RH	80	1	11793	Kit, Breather Cap
39	4	10640-001	Bearing Spacer, 3/4 x 5/8 x 1/2	81	1	11861	Document Kit
40	4	10640-005	Bearing Spacer, 1.24 x .812 x.318	82	1	11880-001	Connector, MX150 2x6
41	4	10642-001	U-Bolt 5/8-18 x 7.00 Gr. 8	83	11	11881-001	Plug, MX150, 22-14 AWG
42	2	10642-006	U-Bolt 5/8-18 x 5.50 Gr. 8	84	1	11972	Kit, Power Module Mount

DS85FS3-BA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DS85FS3-BA							
ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	10001-011	HCS 3/4-10 X 7, Gr 8	44	1	10680-001	Driver Interface
2	2	10002-500	HCS 7/8-9 x 5, Gr 8	45	1	10704-013	Wiring Harness, Dash
3	8	10003-010	HCS 1-8x5.500, Gr 8 Z	46	1	10733-015	Wldmnt, Pitman Arm Brkt
4	2	10004-024	LHN ¼-20, Gr 2	47	1	10782-025	Wldmnt, Crossmember Reinf.
5	2	10006-002	HFW .750”	48	1	10789-030	Wldmnt, Track Rod Mnt
6	2	10006-003	HFW .875”	49	1	10800-004	Tube, .69 OD x .42 ID x .625L
7	8	10006-004	HFW 1”	50	2	10804-002	Spiral Cable Wrap
8	4	10006-007	HFW ½”	51	1	10815-001	Wiring Harness, Battery Fuse Lead
9	2	10011-010	HCS 1/2-13 x 1.750, Gr. 8	52	2	10830-013	Volume Mount
10	8	10012-003	LFN 1-8, Gr G	53	2	10830-014	Volume Mount
11	17	10012-005	LFN 3/8-16, Gr G	54	4	10843-003	T-Bolt Clamp
12	38	10012-007	LFN 1/2-13, Gr. G	55	4	10855-002	Vinyl-Coated Loop Clamp, 1” ID
13	2	10012-008	LFN 5/8-11 Gr G	56	6	10855-003	Vinyl-Coated Loop Clamp, 5/8” ID
14	8	10012-010	LFN 5/16-18, Gr. G	57	2	10874-350	HFB 5/8-11x3.500, Gr. 8
15	12	10012-013	LFN 5/8-18, Gr. G	58	10	10885-125	HFB 1/2-13 X 1.25
16	2	10012-014	LFN 3/4-10 Gr G	59	24	10885-175	HFB 1/2-13x1.750, Gr. 8
17	2	10012-017	LFN 7/8-9 Gr 8	60	2	10885-325	HFB 1/2-13x3.250, Gr. 8
18	2	10232-006	LHN M5-0.8	61	2	10885-375	HFB 1/2-13x3.750, Gr. 8
19	1	10421-005	BHCS 5/16-18 x .75	62	5	10886-125	HFB 5/16-18x1.250, Gr.8
20	1	10474-001	Compressible Fluid, 16 oz. Bottle	63	1	10904-058	Bracket, Steering Sensor
21	2	10494-002	WLW 1/2, Z	64	1	10910-012	Spacer Plate
22	17	10501-001	HFB 3/8-16 x 1.00, Gr. 8	65	2	11100-004	Spacer
23	2	10502-050	HFB M10-1.5 x 50 CL 10.9	66	1	11003-035	HFB M8-1.25 x 35
24	1	10512-001	BHCS M12-1.75x35 CL 10.9 BO	67	1	11198-001	Asy, Track Rod
25	1	10538-005	Front Hanger, LH	68	2	11240-004	Control Arm, Upper
26	1	10539-010	Front Hanger, RH	69	2	11240-005	Control Arm, Lower
27	2	10546-014	Axle Seat	70	1	11299-001	Strut Assembly, LH
28	2	10552-008	Axle Cradle	71	1	11299-002	Strut Assembly, RH
29	1	10564-009	Upper Strut Mount, LH	72	1	11333-002	Thermashield, 5/8” ID
30	1	10564-010	Upper Strut Mount, RH	73	1	11508-002	Asy, PM, DS85-96FS3
31	2	10569-001	Backing Plate	74	1	11633-003	Wldmnt, Track Rod Mnt
32	1	10587-004	Linkage	75	1	11635-005	Wldmnt, Crossmember Reinf., LH
33	2	10587-007	Linkage	76	1	11635-006	Wldmnt, Crossmember Reinf., RH
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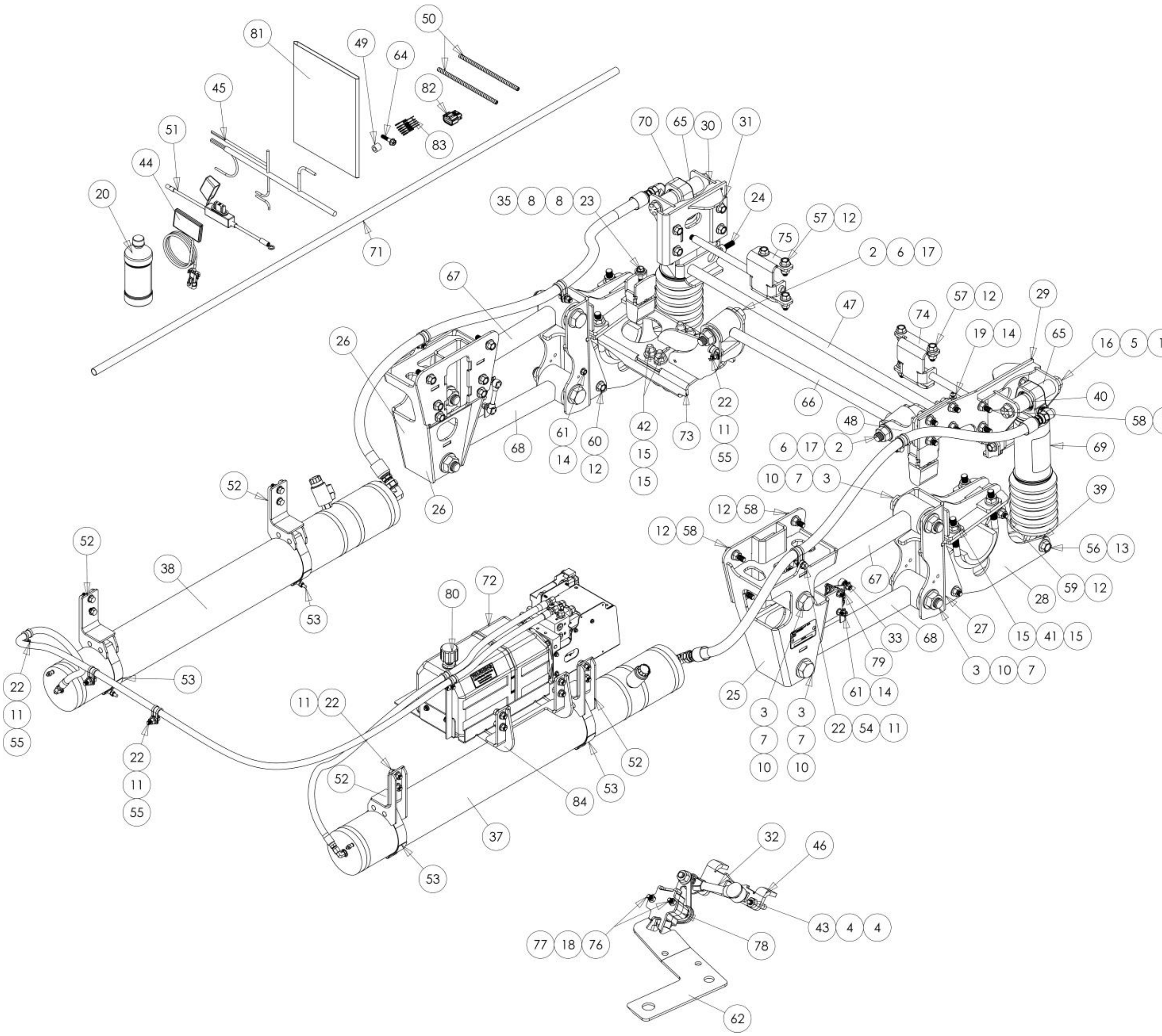
36	2	10595-001	Coupler, M10-1.5x1.500	79	1	11675-001	Asy, HW Sensor
37	1	10597-082	Volume Assembly, LH	80	2	11752-001	Asy, HW Sensor, Adapter
38	1	10597-118	Volume Assembly, RH	81	1	11793	Kit, Breather Cap
39	4	10640-001	Bearing Spacer, 3/4 x 5/8 x 1/2	82	1	11861	Document Kit
40	4	10640-005	Bearing Spacer, 1.24 x .812 x.318	83	1	11880-001	Connector, MX150 2x6
41	4	10642-001	U-Bolt 5/8-18 x 7.00 Gr. 8	84	11	11881-001	Plug, MX150, 22-14 AWG
42	2	10642-006	U-Bolt 5/8-18 x 5.50 Gr. 8	85	1	11972	Kit, Power Module Mount
43	1	10669-005	U-Bolt ¼-20 x 3 x 1.375				

DS85FS3M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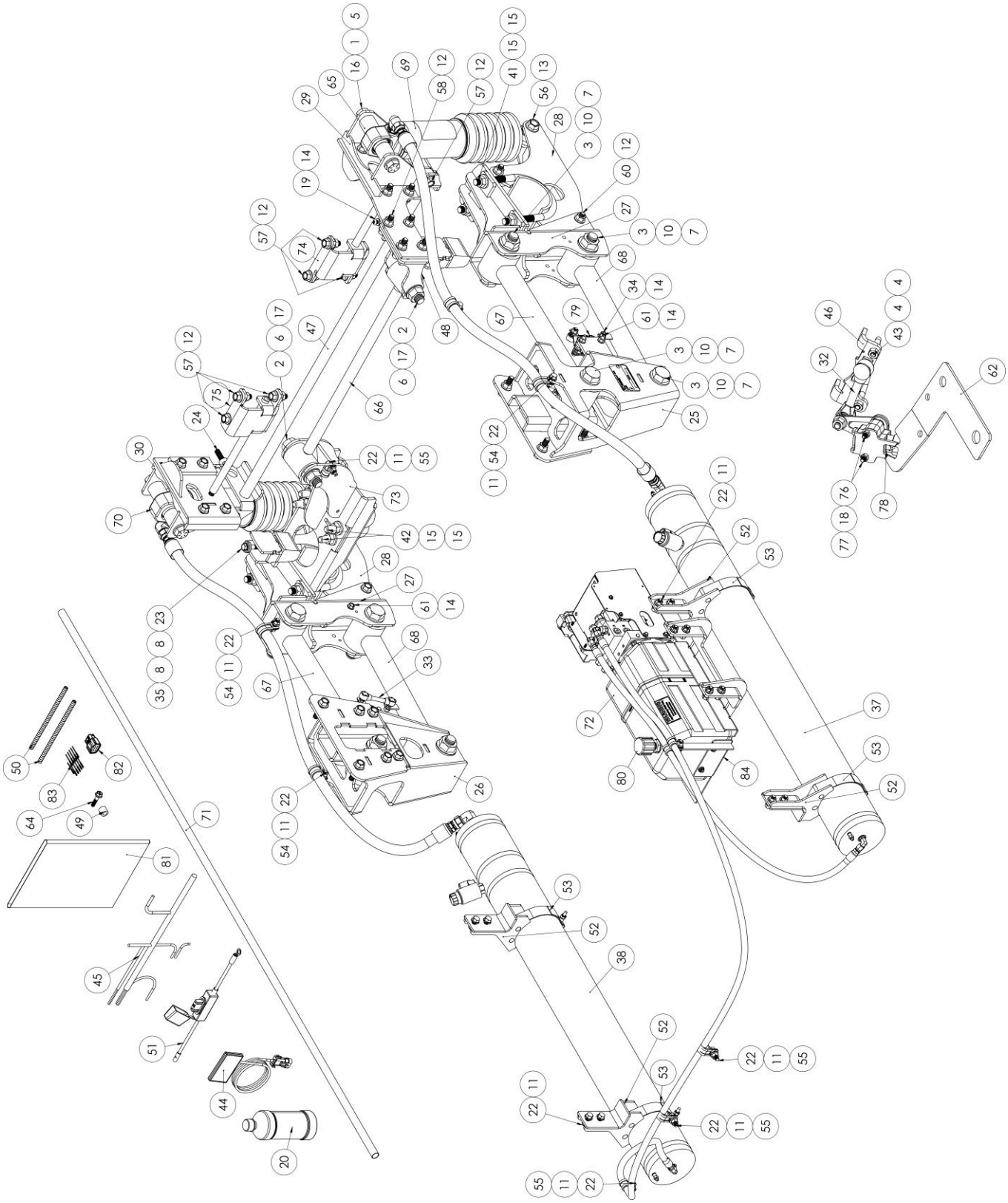
ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	10001-011	HCS 3/4-10 X 7, Gr 8	43	1	10669-005	U-Bolt ¼-20 x 3 x 1.375
2	2	10002-500	HCS 7/8-9 x 5, Gr 8	44	1	10680-001	Driver Interface
3	8	10003-010	HCS 1-8x5.500, Gr 8 Z	45	1	10704-013	Wiring Harness, Dash
4	2	10004-024	LHN ¼-20, Gr 2	46	1	10733-015	Wldmnt, Pitman Arm Brkt
5	2	10006-002	HFW .750"	47	1	10782-025	Wldmnt, Crossmember Reinf.
6	2	10006-003	HFW .875"	48	1	10789-030	Wldmnt, Track Rod Mnt
7	8	10006-004	HFW 1"	49	1	10800-004	Tube, .69 OD x .42 ID x .625L
8	4	10006-007	HFW ½"	50	2	10804-002	Spiral Cable Wrap
9	2	10011-010	HCS 1/2-13 x 1.750, Gr. 8	51	1	10815-001	Wiring Harness, Battery Fuse Lead
10	8	10012-003	LFN 1-8, Gr G	52	2	10830-014	Volume Mount
11	17	10012-005	LFN 3/8-16, Gr G	53	4	10843-003	T-Bolt Clamp
12	38	10012-007	LFN 1/2-13, Gr. G	54	4	10855-002	Vinyl-Coated Loop Clamp, 1" ID
13	2	10012-008	LFN 5/8-11 Gr G	55	6	10855-003	Vinyl-Coated Loop Clamp, 5/8" ID
14	8	10012-010	LFN 5/16-18, Gr. G	56	2	10874-350	HFB 5/8-11x3.500, Gr. 8
15	12	10012-013	LFN 5/8-18, Gr. G	57	10	10885-125	HFB 1/2-13 X 1.25
16	2	10012-014	LFN 3/4-10 Gr G	58	24	10885-175	HFB 1/2-13x1.750, Gr. 8
17	2	10012-017	LFN 7/8-9 Gr 8	59	2	10885-325	HFB 1/2-13x3.250, Gr. 8
18	2	10232-006	LHN M5-0.8	60	2	10885-375	HFB 1/2-13x3.750, Gr. 8
19	1	10421-005	BHCS 5/16-18 x .75	61	5	10886-125	HFB 5/16-18x1.250, Gr.8
20	1	10474-001	Compressible Fluid, 16 oz. Bottle	62	1	10904-058	Bracket, Steering Sensor
21	2	10494-002	WLW 1/2, Z	63	1	10910-012	Spacer Plate
22	17	10501-001	HFB 3/8-16 x 1.00, Gr. 8	64	1	11003-035	HFB M8-1.25 x 35
23	2	10502-050	HFB M10-1.5 x 50 CL 10.9	65	2	11100-004	Spacer
24	1	10512-001	BHCS M12-1.75x35 CL 10.9 BO	66	1	11198-001	Asy, Track Rod
25	1	10538-005	Front Hanger, LH	67	2	11240-004	Control Arm, Upper
26	1	10539-010	Front Hanger, RH	68	2	11240-005	Control Arm, Lower
27	2	10546-014	Axle Seat	69	1	11299-001	Strut Assembly, LH
28	2	10552-008	Axle Cradle	70	1	11299-002	Strut Assembly, RH
29	1	10564-009	Upper Strut Mount, LH	71	1	11333-002	Thermashield, 5/8" ID
30	1	10564-010	Upper Strut Mount, RH	72	1	11508-002	Asy, PM, DS85-96FS3
31	2	10569-001	Backing Plate	73	1	11633-003	Wldmnt, Track Rod Mnt
32	1	10587-004	Linkage	74	1	11635-005	Wldmnt, Crossmember Reinf., LH
33	2	10587-007	Linkage	75	1	11635-006	Wldmnt, Crossmember Reinf., RH
34	2	10591-001	Ball Stud	76	2	11639-040	HCS M5-0.8 x 40
35	2	10592-003	Bump Stop Spacer	77	2	11641-001	FW M5 10 x 5.3 x 1
36	2	10595-001	Coupler, M10-1.5x1.500	78	1	11675-001	Asy, HW Sensor
37	1	10597-081	Volume Assembly, LH	79	2	11752-001	Asy, HW Sensor, Adapter
38	1	10597-082	Volume Assembly, RH	80	1	11793	Kit, Breather Cap
39	4	10640-001	Bearing Spacer, 3/4 x 5/8 x 1/2	81	1	11861	Document Kit
40	4	10640-005	Bearing Spacer, 1.24 x .812 x.318	82	1	11880-001	Connector, MX150 2x6
41	4	10642-001	U-Bolt 5/8-18 x 7.00 Gr. 8	83	11	11881-001	Plug, MX150, 22-14 AWG
42	2	10642-006	U-Bolt 5/8-18 x 5.50 Gr. 8	84	1	11972	Kit, Power Module Mount

DS96FS3



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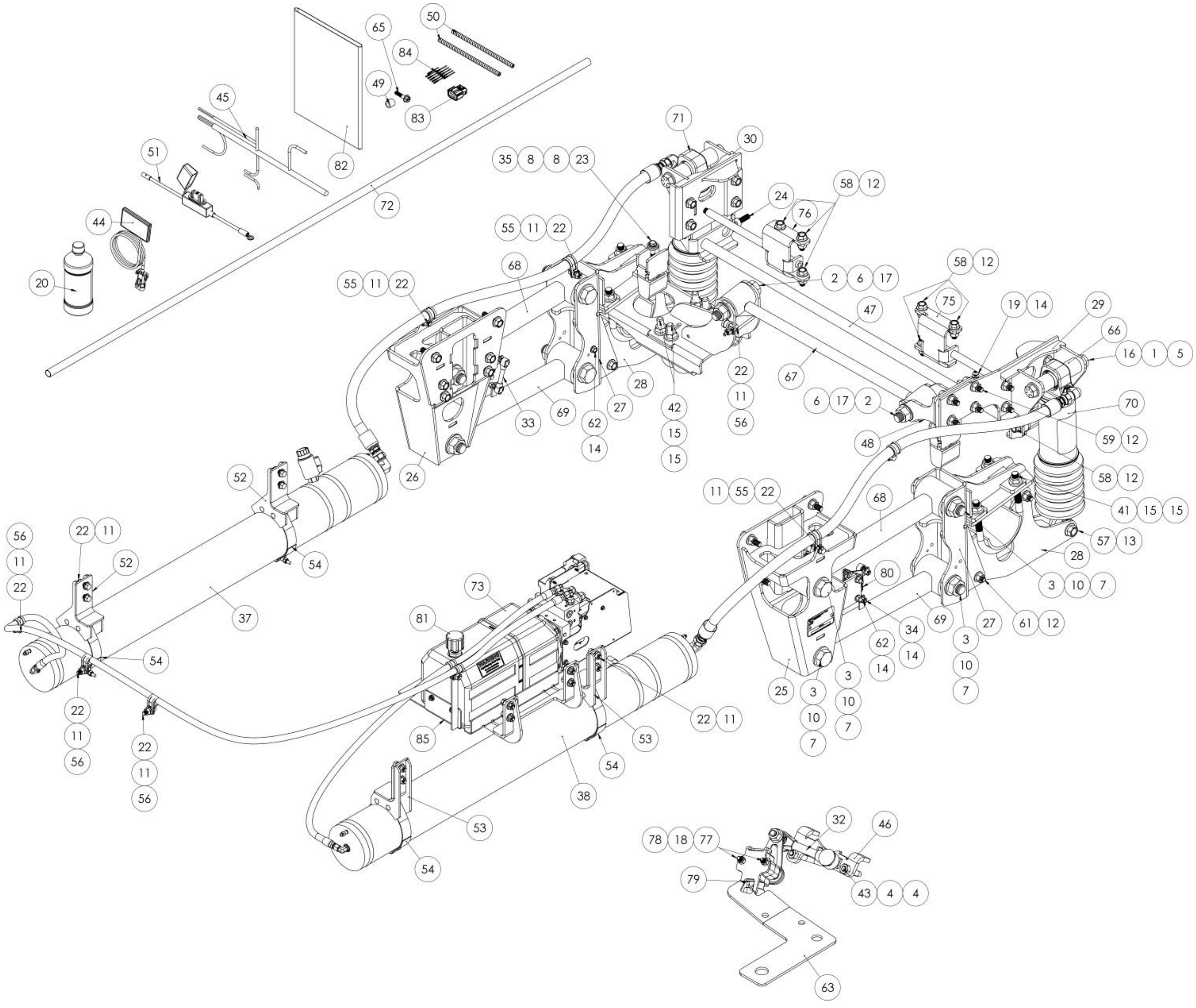
ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	10001-011	HCS 3/4-10 X 7, Gr 8	43	1	10669-005	U-Bolt ¼-20 x 3 x 1.375
2	2	10002-500	HCS 7/8-9 x 5, Gr 8	44	1	10680-001	Driver Interface
3	8	10003-010	HCS 1-8x5.500, Gr 8 Z	45	1	10704-013	Wiring Harness, Dash
4	2	10004-024	LHN ¼-20, Gr 2	46	1	10733-015	Wldmnt, Pitman Arm Brkt
5	2	10006-002	HFW .750”	47	1	10782-025	Wldmnt, Crossmember Reinf.
6	2	10006-003	HFW .875”	48	1	10789-030	Wldmnt, Track Rod Mnt
7	8	10006-004	HFW 1”	49	1	10800-004	Tube, .69 OD x .42 ID x .625L
8	4	10006-007	HFW ½”	50	2	10804-002	Spiral Cable Wrap
9	2	10011-010	HCS 1/2-13 x 1.750, Gr. 8	51	1	10815-001	Wiring Harness, Battery Fuse Lead
10	8	10012-003	LFN 1-8, Gr G	52	4	10830-013	Volume Mount
11	17	10012-005	LFN 3/8-16, Gr G	53	4	10843-003	T-Bolt Clamp
12	38	10012-007	LFN 1/2-13, Gr. G	54	4	10855-002	Vinyl-Coated Loop Clamp, 1” ID
13	2	10012-008	LFN 5/8-11 Gr G	55	6	10855-003	Vinyl-Coated Loop Clamp, 5/8” ID
14	8	10012-010	LFN 5/16-18, Gr. G	56	2	10874-350	HFB 5/8-11x3.500, Gr. 8
15	12	10012-013	LFN 5/8-18, Gr. G	57	10	10885-125	HFB 1/2-13 X 1.25
16	2	10012-014	LFN 3/4-10 Gr G	58	24	10885-175	HFB 1/2-13x1.750, Gr. 8
17	2	10012-017	LFN 7/8-9 Gr 8	59	2	10885-325	HFB 1/2-13x3.250, Gr. 8
18	2	10232-006	LHN M5-0.8	60	2	10885-375	HFB 1/2-13x3.750, Gr. 8
19	1	10421-005	BHCS 5/16-18 x .75	61	5	10886-125	HFB 5/16-18x1.250, Gr.8
20	1	10474-001	Compressible Fluid, 16 oz. Bottle	62	1	10904-058	Bracket, Steering Sensor
21	2	10494-002	WLW 1/2, Z	63	1	10910-012	Spacer Plate
22	17	10501-001	HFB 3/8-16 x 1.00, Gr. 8	64	1	11003-035	HFB M8-1.25 x 35
23	2	10502-050	HFB M10-1.5 x 50 CL 10.9	65	2	11100-004	Spacer
24	1	10512-001	BHCS M12-1.75x35 CL 10.9 BO	66	1	11198-001	Asy, Track Rod
25	1	10538-005	Front Hanger, LH	67	2	11240-004	Control Arm, Upper
26	1	10539-010	Front Hanger, RH	68	2	11240-005	Control Arm, Lower
27	2	10546-013	Axle Seat	69	1	11299-001	Strut Assembly, LH
28	2	10552-007	Axle Cradle	70	1	11299-002	Strut Assembly, RH
29	1	10564-009	Upper Strut Mount, LH	71	1	11333-002	Thermashield, 5/8” ID
30	1	10564-010	Upper Strut Mount, RH	72	1	11508-002	Asy, PM, DS85-96FS3
31	2	10569-001	Backing Plate	73	1	11633-002	Wldmnt, Track Rod Mnt
32	1	10587-004	Linkage	74	1	11635-005	Wldmnt, Crossmember Reinf., LH
33	2	10587-007	Linkage	75	1	11635-006	Wldmnt, Crossmember Reinf., RH
34	2	10591-001	Ball Stud	76	2	11639-040	HCS M5-0.8 x 40
35	2	10592-003	Bump Stop Spacer	77	2	11641-001	FW M5 10 x 5.3 x 1
36	2	10595-001	Coupler, M10-1.5x1.500	78	1	11675-001	Asy, Hw Sensor
37	1	10597-081	Volume Assembly, LH	79	2	11752-001	Asy, HW Sensor, Adapter
38	1	10597-082	Volume Assembly, RH	80	1	11793	Kit, Breather Cap
39	4	10640-001	Bearing Spacer, 3/4 x 5/8 x 1/2	81	1	11861	Document Kit
40	4	10640-005	Bearing Spacer, 1.24 x .812 x.318	82	1	11880-001	Connector, MX150 2x6
41	4	10642-001	U-Bolt 5/8-18 x 7.00 Gr. 8	83	11	11881-001	Plug, MX150, 22-14 AWG
42	2	10642-004	U-Bolt 5/8-18 x 6.50 Gr. 8	84	1	11972	Power Module Mount

DS96FS3-BA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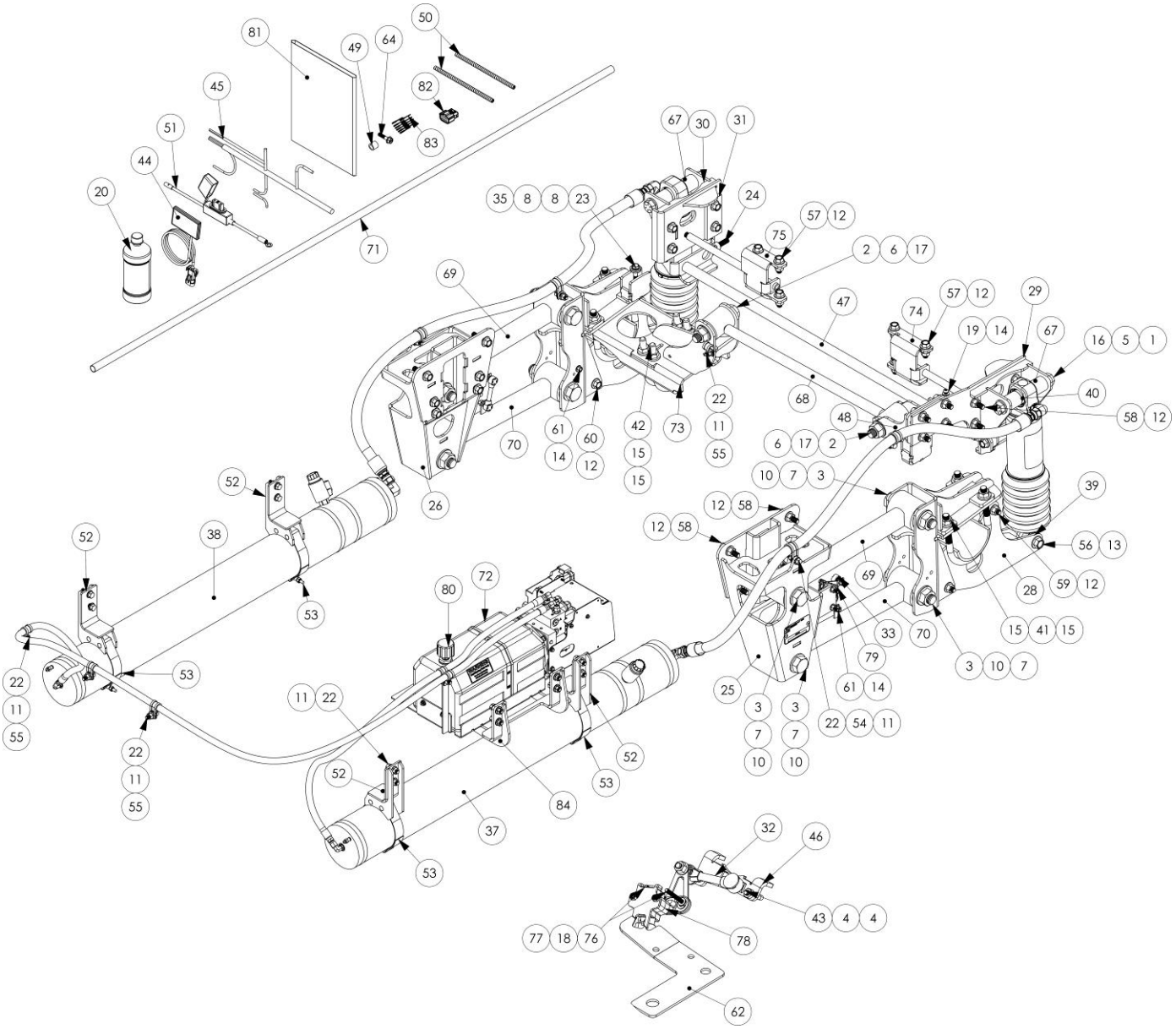
DS96FS3-BA							
ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	10001-011	HCS 3/4-10 X 7, Gr 8	44	1	10680-001	Driver Interface
2	2	10002-500	HCS 7/8-9 x 5, Gr 8	45	1	10704-013	Wiring Harness, Dash
3	8	10003-010	HCS 1-8x5.500, Gr 8 Z	46	1	10733-015	Wldmnt, Pitman Arm Brkt
4	2	10004-024	LHN ¼-20, Gr 2	47	1	10782-025	Wldmnt, Crossmember Reinf.
5	2	10006-002	HFW .750”	48	1	10789-030	Wldmnt, Track Rod Mnt
6	2	10006-003	HFW .875”	49	1	10800-004	Tube, .69 OD x .42 ID x .625L
7	8	10006-004	HFW 1”	50	2	10804-002	Spiral Cable Wrap
8	4	10006-007	HFW ½”	51	1	10815-001	Wiring Harness, Battery Fuse Lead
9	2	10011-010	HCS 1/2-13 x 1.750, Gr. 8	52	2	10830-013	Volume Mount
10	8	10012-003	LFN 1-8, Gr G	53	2	10830-014	Volume Mount
11	17	10012-005	LFN 3/8-16, Gr G	54	4	10843-003	T-Bolt Clamp
12	38	10012-007	LFN 1/2-13, Gr. G	55	4	10855-002	Vinyl-Coated Loop Clamp, 1” ID
13	2	10012-008	LFN 5/8-11 Gr G	56	6	10855-003	Vinyl-Coated Loop Clamp, 5/8” ID
14	8	10012-010	LFN 5/16-18, Gr. G	57	2	10874-350	HFB 5/8-11x3.500, Gr. 8
15	12	10012-013	LFN 5/8-18, Gr. G	58	10	10885-125	HFB 1/2-13 X 1.25
16	2	10012-014	LFN 3/4-10 Gr G	59	24	10885-175	HFB 1/2-13x1.750, Gr. 8
17	2	10012-017	LFN 7/8-9 Gr 8	60	2	10885-325	HFB 1/2-13x3.250, Gr. 8
18	2	10232-006	LHN M5-0.8	61	2	10885-375	HFB 1/2-13x3.750, Gr. 8
19	1	10421-005	BHCS 5/16-18 x .75	62	5	10886-125	HFB 5/16-18x1.250, Gr.8
20	1	10474-001	Compressible Fluid, 16 oz. Bottle	63	1	10904-058	Bracket, Steering Sensor
21	2	10494-002	WLW 1/2, Z	64	1	10910-012	Spacer Plate
22	17	10501-001	HFB 3/8-16 x 1.00, Gr. 8	65	1	11003-035	HFB M8-1.25 x 35
23	2	10502-050	HFB M10-1.5 x 50 CL 10.9	66	2	11100-004	Spacer
24	1	10512-001	BHCS M12-1.75x35 CL 10.9 BO	67	1	11198-001	Asy, Track Rod
25	1	10538-005	Front Hanger, LH	68	2	11240-004	Control Arm, Upper
26	1	10539-010	Front Hanger, RH	69	2	11240-005	Control Arm, Lower
27	2	10546-013	Axle Seat	70	1	11299-001	Strut Assembly, LH
28	2	10552-007	Axle Cradle	71	1	11299-002	Strut Assembly, RH
29	1	10564-009	Upper Strut Mount, LH	72	1	11333-002	Thermashield, 5/8” ID
30	1	10564-010	Upper Strut Mount, RH	73	1	11508-002	Asy, PM, DS85-96FS3
31	2	10569-001	Backing Plate	74	1	11633-002	Wldmnt, Track Rod Mnt
32	1	10587-004	Linkage	75	1	11635-005	Wldmnt, Crossmember Reinf., LH
33	2	10587-007	Linkage	76	1	11635-006	Wldmnt, Crossmember Reinf., RH
34	2	10591-001	Ball Stud	77	2	11639-040	HCS M5-0.8 x 40
35	2	10592-003	Bump Stop Spacer	78	2	11641-001	FW M5 10 x 5.3 x 1
36	2	10595-001	Coupler, M10-1.5x1.500	79	1	11675-001	Asy, Hw Sensor
37	1	10597-082	Volume Assembly, LH	80	2	11752-001	Asy, HW Sensor, Adapter
38	1	10597-118	Volume Assembly, RH	81	1	11793	Kit, Breather Cap
39	4	10640-001	Bearing Spacer, 3/4 x 5/8 x 1/2	82	1	11861	Document Kit
40	4	10640-005	Bearing Spacer, 1.24 x .812 x.318	83	1	11880-001	Connector, MX150 2x6
41	4	10642-001	U-Bolt 5/8-18 x 7.00 Gr. 8	84	11	11881-001	Plug, MX150, 22-14 AWG
42	2	10642-004	U-Bolt 5/8-18 x 6.50 Gr. 8	85	1	11972	Kit, Power Module Mount
43	1	10669-005	U-Bolt ¼-20 x 3 x 1.375				

DS96FS3M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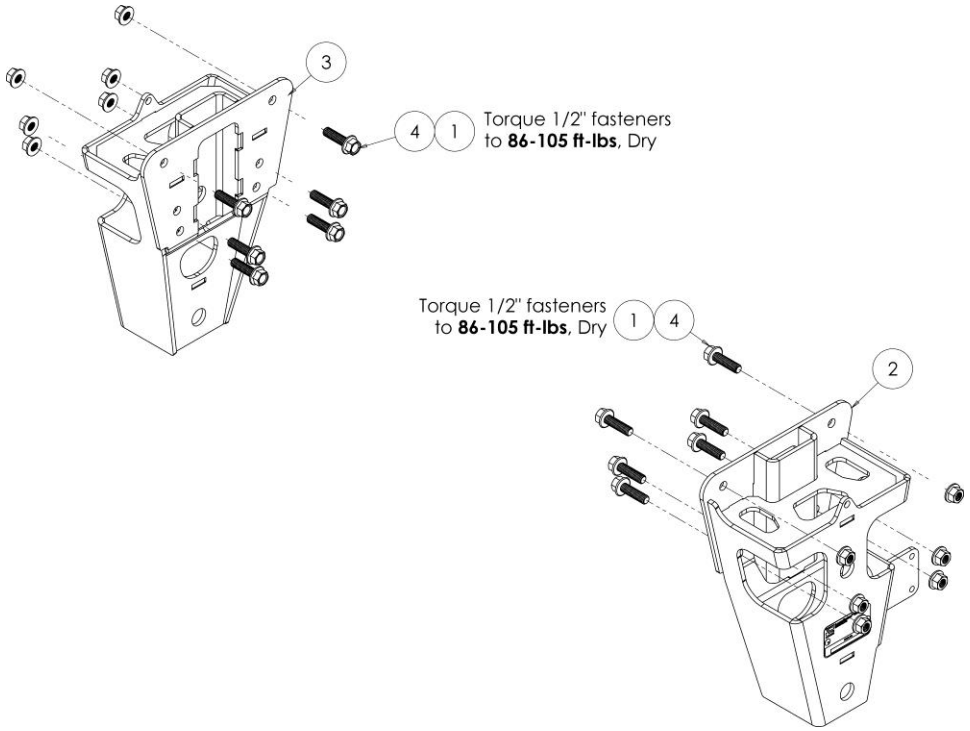
DS96FS3M							
ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	10001-011	HCS 3/4-10 X 7, Gr 8	43	1	10669-005	U-Bolt ¼-20 x 3 x 1.375
2	2	10002-500	HCS 7/8-9 x 5, Gr 8	44	1	10680-001	Driver Interface
3	8	10003-010	HCS 1-8x5.500, Gr 8 Z	45	1	10704-013	Wiring Harness, Dash
4	2	10004-024	LHN ¼-20, Gr 2	46	1	10733-015	Wldmnt, Pitman Arm Brkt
5	2	10006-002	HFW .750"	47	1	10782-025	Wldmnt, Crossmember Reinf.
6	2	10006-003	HFW .875"	48	1	10789-030	Wldmnt, Track Rod Mnt
7	8	10006-004	HFW 1"	49	1	10800-004	Tube, .69 OD x .42 ID x .625L
8	4	10006-007	HFW ½"	50	2	10804-002	Spiral Cable Wrap
9	2	10011-010	HCS 1/2-13 x 1.750, Gr. 8	51	1	10815-001	Wiring Harness, Battery Fuse Lead
10	8	10012-003	LFN 1-8, Gr G	52	4	10830-014	Volume Mount
11	17	10012-005	LFN 3/8-16, Gr G	53	4	10843-003	T-Bolt Clamp
12	38	10012-007	LFN 1/2-13, Gr. G	54	4	10855-002	Vinyl-Coated Loop Clamp, 1" ID
13	2	10012-008	LFN 5/8-11 Gr G	55	6	10855-003	Vinyl-Coated Loop Clamp, 5/8" ID
14	8	10012-010	LFN 5/16-18, Gr. G	56	2	10874-350	HFB 5/8-11x3.500, Gr. 8
15	12	10012-013	LFN 5/8-18, Gr. G	57	10	10885-125	HFB 1/2-13 X 1.25
16	2	10012-014	LFN 3/4-10 Gr G	58	24	10885-175	HFB 1/2-13x1.750, Gr. 8
17	2	10012-017	LFN 7/8-9 Gr 8	59	2	10885-325	HFB 1/2-13x3.250, Gr. 8
18	2	10232-006	LHN M5-0.8	60	2	10885-375	HFB 1/2-13x3.750, Gr. 8
19	1	10421-005	BHCS 5/16-18 x .75	61	5	10886-125	HFB 5/16-18x1.250, Gr.8
20	1	10474-001	Compressible Fluid, 16 oz. Bottle	62	1	10904-058	Bracket, Steering Sensor
21	2	10494-002	WLW 1/2, Z	63	1	10910-012	Spacer Plate
22	17	10501-001	HFB 3/8-16 x 1.00, Gr. 8	64	1	11003-035	HFB M8-1.25 x 35
23	2	10502-050	HFB M10-1.5 x 50 CL 10.9	65	1	11057-031	Asy, Strut
24	1	10512-001	BHCS M12-1.75x35 CL 10.9 BO	66	1	11057-032	Asy, Strut
25	1	10538-005	Front Hanger, LH	67	2	11100-004	Spacer
26	1	10539-010	Front Hanger, RH	68	1	11198-001	Asy, Track Rod
27	2	10546-013	Axle Seat	69	2	11240-004	Control Arm, Upper
28	2	10552-007	Axle Cradle	70	2	11240-005	Control Arm, Lower
29	1	10564-009	Upper Strut Mount, LH	71	1	11333-002	Thermashield, 5/8" ID
30	1	10564-010	Upper Strut Mount, RH	72	1	11508-002	Asy, PM, DS85-96FS3
31	2	10569-001	Backing Plate	73	1	11633-002	Wldmnt, Track Rod Mnt
32	1	10587-004	Linkage	74	1	11635-005	Wldmnt, Crossmember Reinf., LH
33	2	10587-007	Linkage	75	1	11635-006	Wldmnt, Crossmember Reinf., RH
34	2	10591-001	Ball Stud	76	2	11639-040	HCS M5-0.8 x 40
35	2	10592-003	Bump Stop Spacer	77	2	11641-001	FW M5 10 x 5.3 x 1
36	2	10595-001	Coupler, M10-1.5x1.500	78	1	11675-001	Asy, Hw Sensor
37	1	10597-081	Volume Assembly, LH	79	2	11752-001	Asy, HW Sensor, Adapter
38	1	10597-082	Volume Assembly, RH	80	1	11793	Kit, Breather Cap
39	4	10640-001	Bearing Spacer, 3/4 x 5/8 x 1/2	81	1	11861	Document Kit
40	4	10640-005	Bearing Spacer, 1.24 x .812 x.318	82	1	11880-001	Connector, MX150 2x6
41	4	10642-001	U-Bolt 5/8-18 x 7.00 Gr. 8	83	11	11881-001	Plug, MX150, 22-14 AWG
42	2	10642-004	U-Bolt 5/8-18 x 6.50 Gr. 8	84	1	11972	Kit, Power Module Mount

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

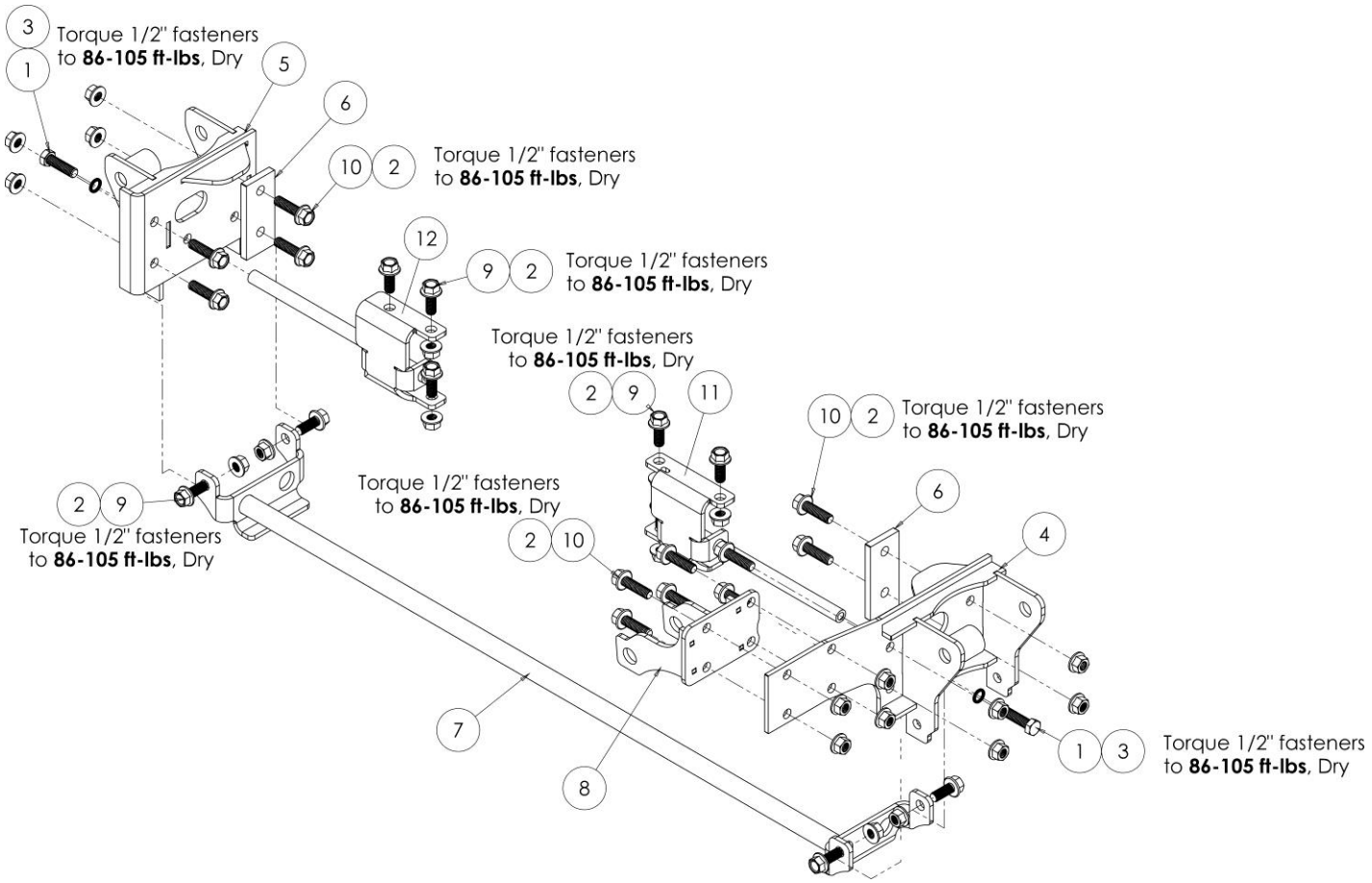
1. Install the Left-Hand Front Hanger (with the serial tag) on to the driver's side of the frame, using the (6) 1/2-13 x 1.75 Hex Flange Bolts and (6) 1/2-13 Locking Flange Nuts.

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

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

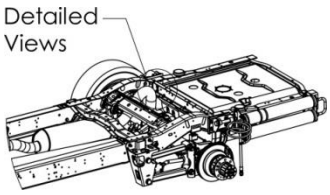
Figure 8. Spiral Wrap Around E-Brake Cable

Upper Strut Mount and Crossmember Reinforcement



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	10011-010	HCS 1/2-13, Gr. 8	7	1	10782-025	Wldmnt, Crossmember Reinf.
2	22	10012-007	LFN 1/2-13, Gr. G	8	1	10789-030	Wldmnt, Track Rod Mnt
3	2	10494-002	WLW 1/2, Z	9	10	10885-125	HFB 1/2-13x1.25, Gr. 8
4	1	10564-009	Upper Strut Mount, LH	10	12	10885-175	HFB 1/2-13x1.75, Gr. 8
5	1	10564-010	Upper Strut Mount, RH	11	1	11635-005	Wldmnt, Crossmember Reinf., LH
6	2	10569-001	Backing Plate	12	1	11635-006	Wldmnt, Crossmember Reinf., RH

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



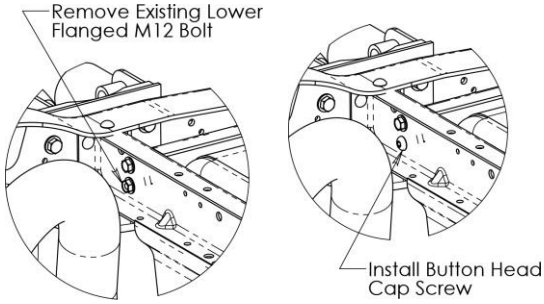


Figure 9. Crossmember bolt replacement

2. Remove the factory brake line bracket bolt and clip nut at the front fuel tank crossmember. See Figure 10.

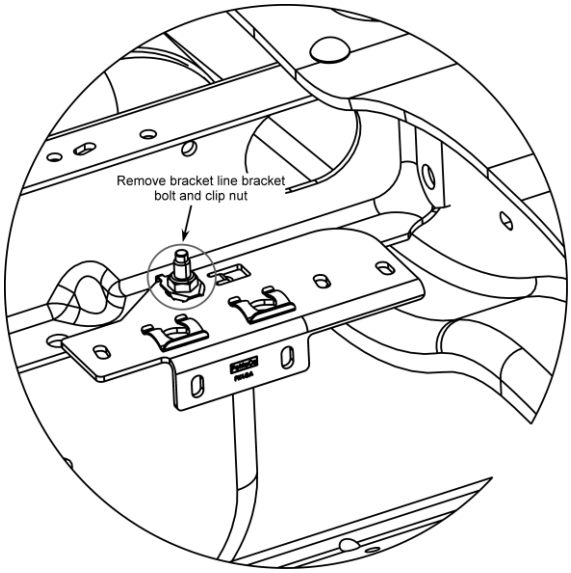


Figure 10. Remove OEM Brake Line Bracket Bolt

3. Replace OEM bolt with Button Head Cap Screw 5/16-18 x 3/4. Torque to **20-25 ft-lbs**. See Figure 11.

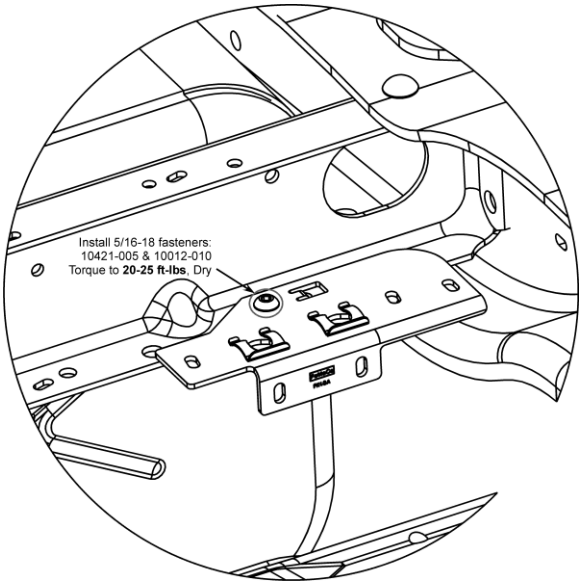


Figure 11. Replace Bolt With BHCS

4. Locate the Left-Hand Upper Strut Mount and rest the extruded flange flush with the top of the frame. Use a 1/2-13 x 1.75 Hex Flange Bolt to temporarily secure the mount to the frame. See Figure 12.

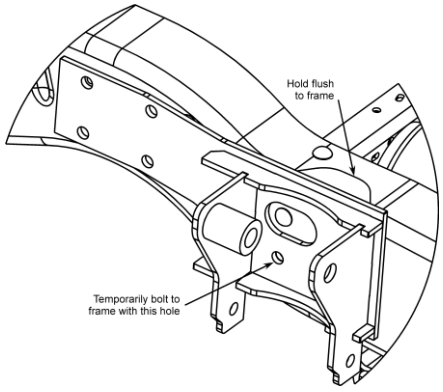


Figure 12. Upper Strut Mount Placement for Hole Drilling

5. Mark and transfer drill the (8) eight Upper Strut Mount holes to Ø 17/32" in the frame. See Figure 13.

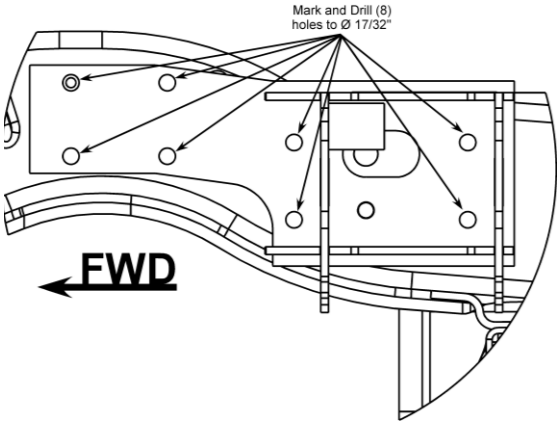


Figure 13. Mark and Drill These (8) Holes

6. 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.

7. Locate and install the Crossmember Reinforcement using the 1/2-13 x 1.75 Hex Cap Screw and the Wedge Lock Washer. Torque to **86-105 ft-lbs.**

IMPORTANT: Install the Hex Cap Screw and Wedge Lock Washer in the threaded rod end before 1/2" fasteners in fuel tank crossmember.

8. Finish installing the Crossmember Reinforcement to the fuel tank crossmember with the 1/2-13 x 1.25" fasteners. Torque to **86-105 ft-lbs**. See Figure 14.

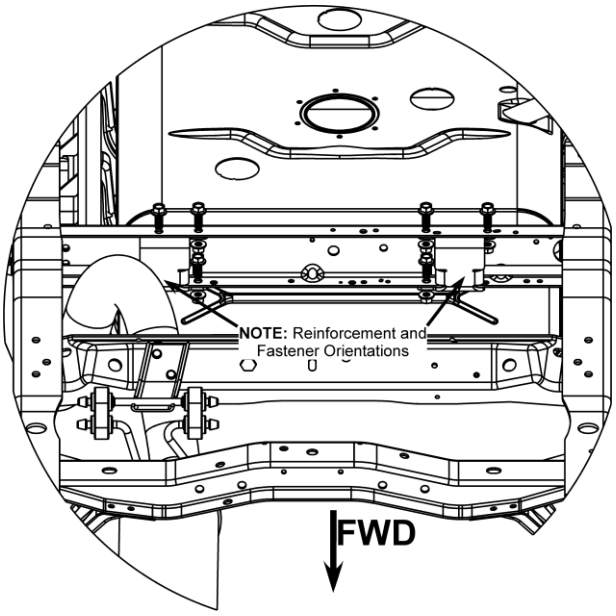


Figure 14. Reinforcement and Fastener Orientations

9. Locate and install the Track Rod Mount that sits behind the Upper Strut Mount. Torque 1/2-13 fasteners to **86-105 ft-lbs**.
10. Install and torque the remaining 1/2-13 x 1.25" Upper Strut Mount fasteners to **86-105 ft-lbs**.
11. Locate the Lower Crossmember Reinforcement to the Upper Strut Mount. See Figure 15.

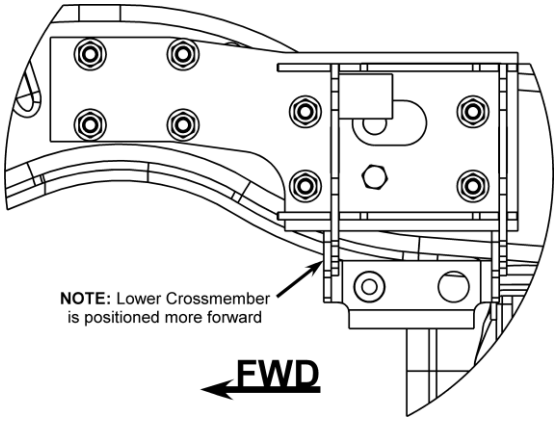
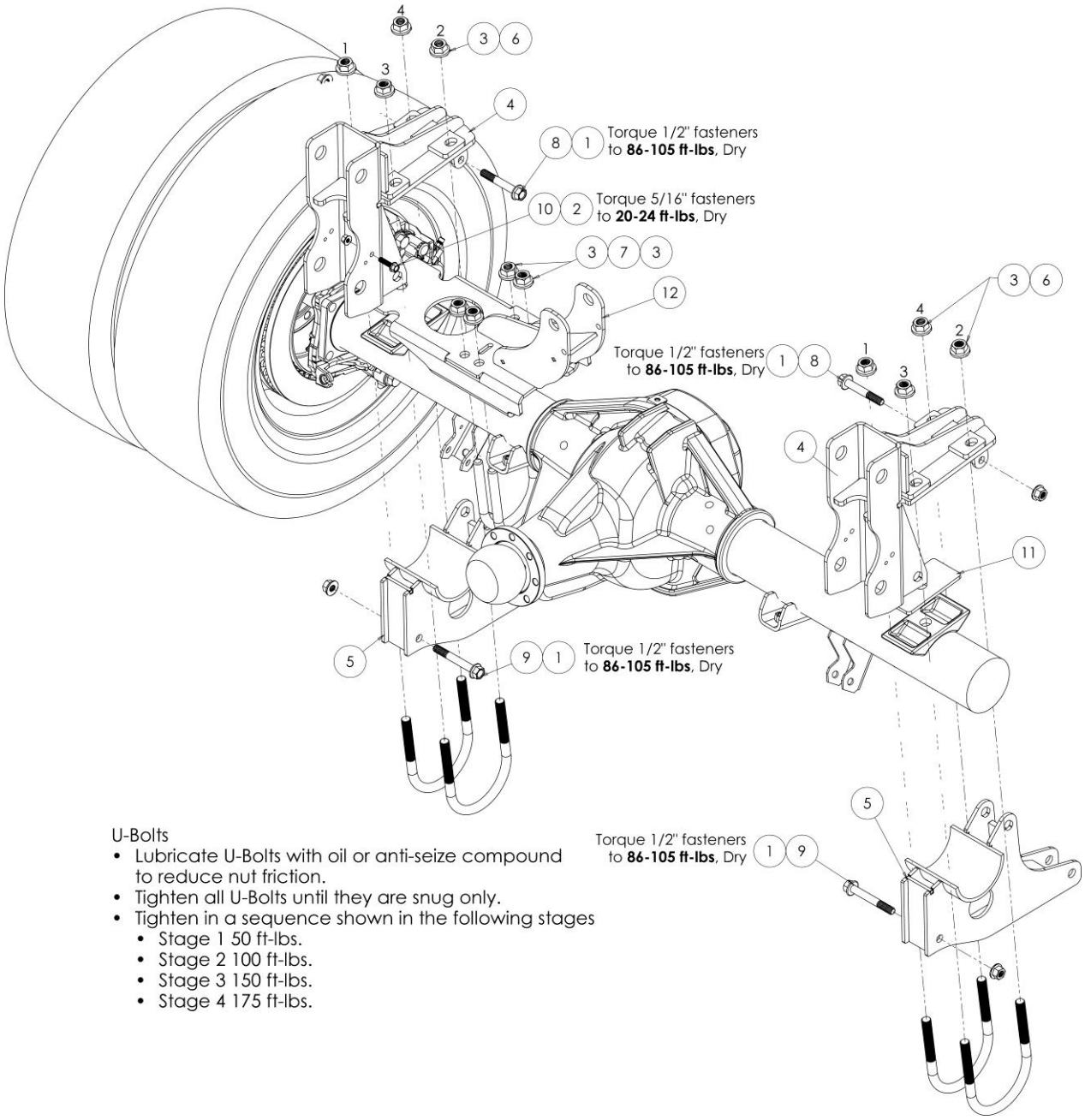


Figure 15. Lower Crossmember Positioning

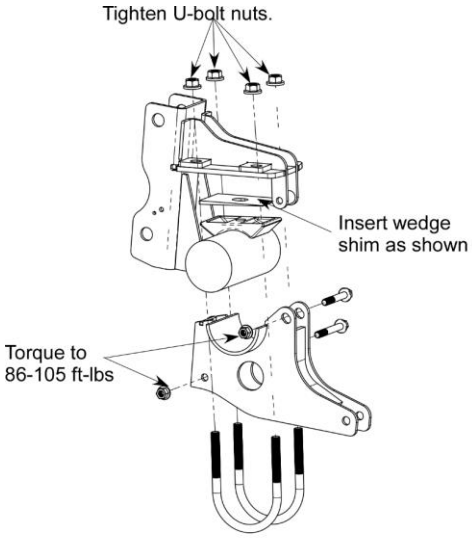
NOTE: Exhaust hanger behind right rear tire may need to be loosened to get Lower Crossmember installed to Upper Strut Mounts.

12. Torque the Lower Crossmember 1/2-13 x 1.25 fasteners to **86-105 ft-lbs**.
13. Repeat with Passenger Side.

Axle Clamp – DS85FS3 & DS96FS3



DS96FS3 & DS85FS3							
ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	4	10012-007	LFN 1/2-13, Gr. G	8	2	10885-325	HFB 1/2-13x3.25, Gr. 8
2	1	10012-010	LFN 5/16-18, Gr. G	9	2	10885-375	HFB 1/2-13x3.75, Gr. 8
3	12	10012-013	LFN 5/8-18, Gr. G	10	1	10886-125	HFB 5/16-18x1.25, Gr. 8
4	2	10546-013	Axle Seat	11	1	10910-012	Spacer Plate
5	2	10552-007	Axle Cradle	12	1	**DS96FS3:** 11633-002	Wldmnt, Track Rod Mount
6	4	10642-001	U-Bolt 5/8-16 x 7			**DS85FS3:** 11633-003	
7	2	**DS96FS3:** 10642-004	U-Bolt 5/8-18 x 6.5 Gr 8				
		DS85FS3: 10642-006	U-Bolt 5/8-18 x 5.5 Gr 8				



U-Bolts
1. Lubricate U-bolts with oil or anti-seize compound to reduce nut friction.
2. Tighten all U-bolt nuts until they are snug only.
3. 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

1. Locate the Axle Seat, Axle Cradle, and 5/8" U-Bolts.
2. Place the Spacer Plate onto the Drivers Side axle spring seat. The Spacer Plate should be flush to the top of the axle spring seat with the locating pin in the center hole.
3. Place the Axle Seat onto the Spacer Plate. The Axle Seat should be flush to the top of the Spacer Plate with the locating pin in the center hole.
4. 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 16.

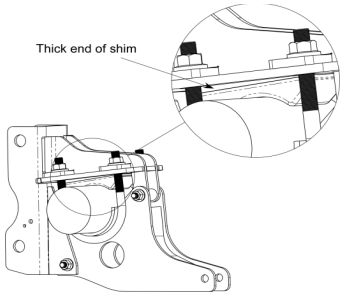


Figure 16. Thick End of Shim Facing Forward

5. 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.
6. Place the 5/8-18 x 7" 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.**
7. Repeat on passenger side with the Axle Track Rod Mount in place of the Spacer Plate.
8. Place the two 5/8-18 x 6.5" U-Bolts through the Axle Track Rod mount. **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.**

NOTE: Stabilizer bar may need to be loosened to install Axle Track Mount U-bolts.

9. Remove E-Brake bracket attached to the shock mount and relocate it on the passenger side Axle Seat using the 5/16" hardware as shown in Figure 17.

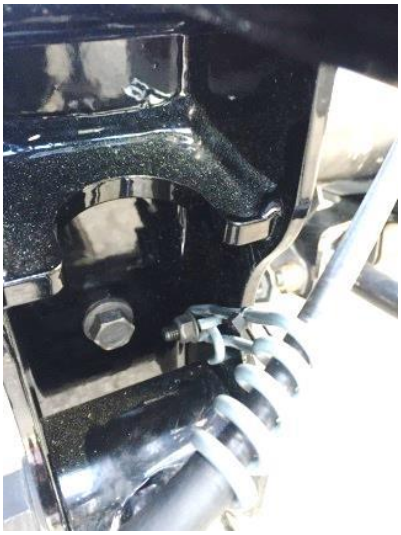


Figure 17. Relocate bracket to Axle Seat

10. Using the Spiral Wrap included in the kit, wrap the passenger side whip hose as shown in Figure 18.

Figure 18. Spiral Wrap on Whip Hose

11. Locate the brake line bracket on the back of the passenger side shock mount.
12. Remove the OEM M8 bolt.
13. 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 19. This will keep the hardline from contacting the U-bolts.

Figure 19: Use Spacer Tube & M8 Bolt to Re-attach Bracket

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.

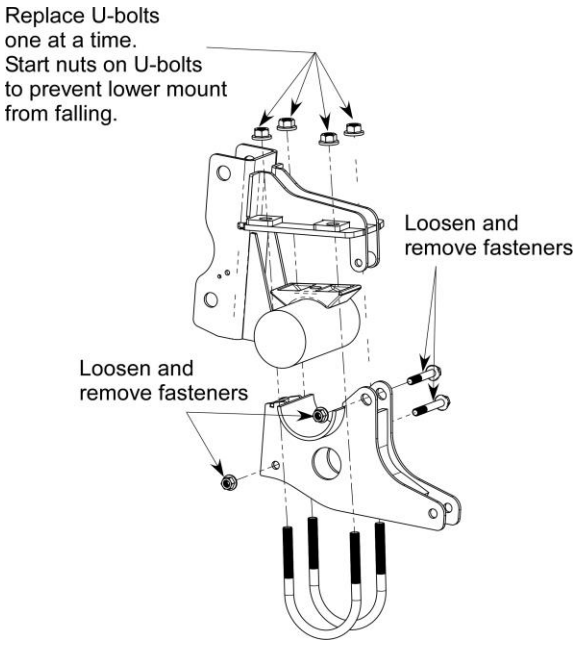


Figure 20. Loosening and removal of fasteners. Axle Cradle shown lowered for clarity.

4. Lift the upper Axle Seat.

5. Insert the appropriate shim, with the thick end orientated forward.

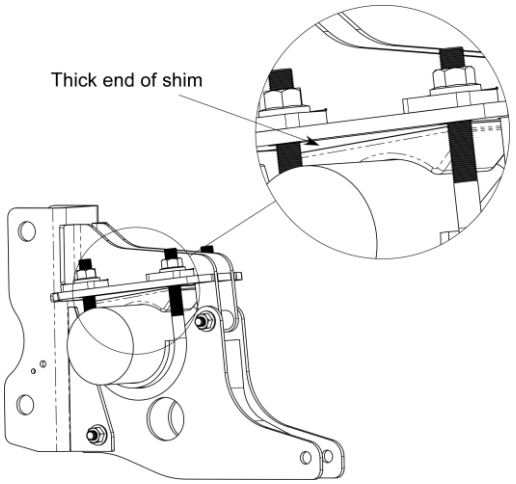
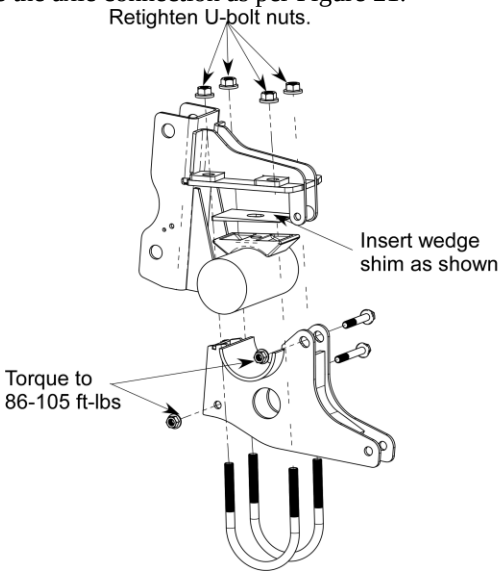


Figure 21. Proper orientation of Wedge Shims.

6. Reassemble the axle connection as per Figure 21.

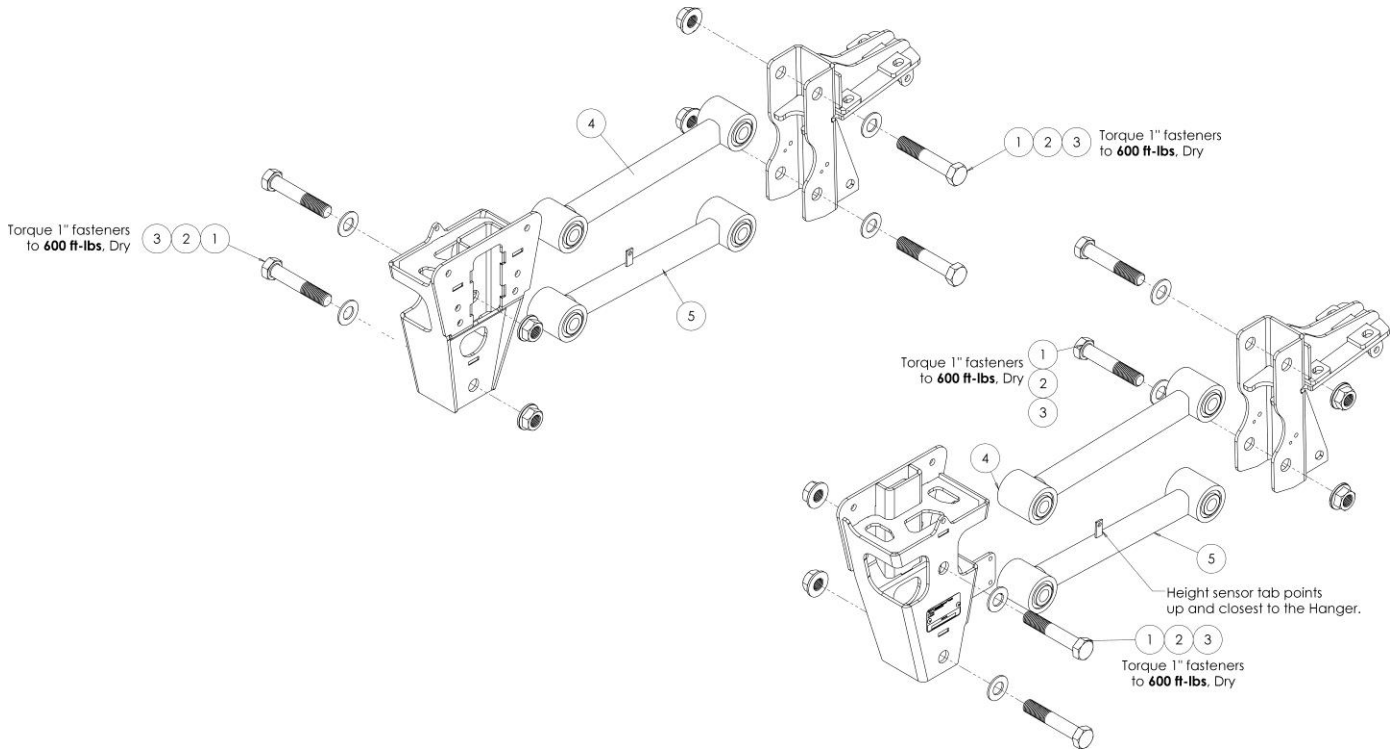


1. Make sure Axle Seat and Cradle are properly seated.
2. Insert 1/2" bolts and loosely install nuts.
3. Lubricate U-bolts with oil or anti-seize compound to reduce nut friction.
4. Tighten all U-bolt nuts until they are snug only.
5. Tighten in a sequence shown in the following stages:
   - Stage 1: 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 22. Reassembly of Axle Connection.

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.

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

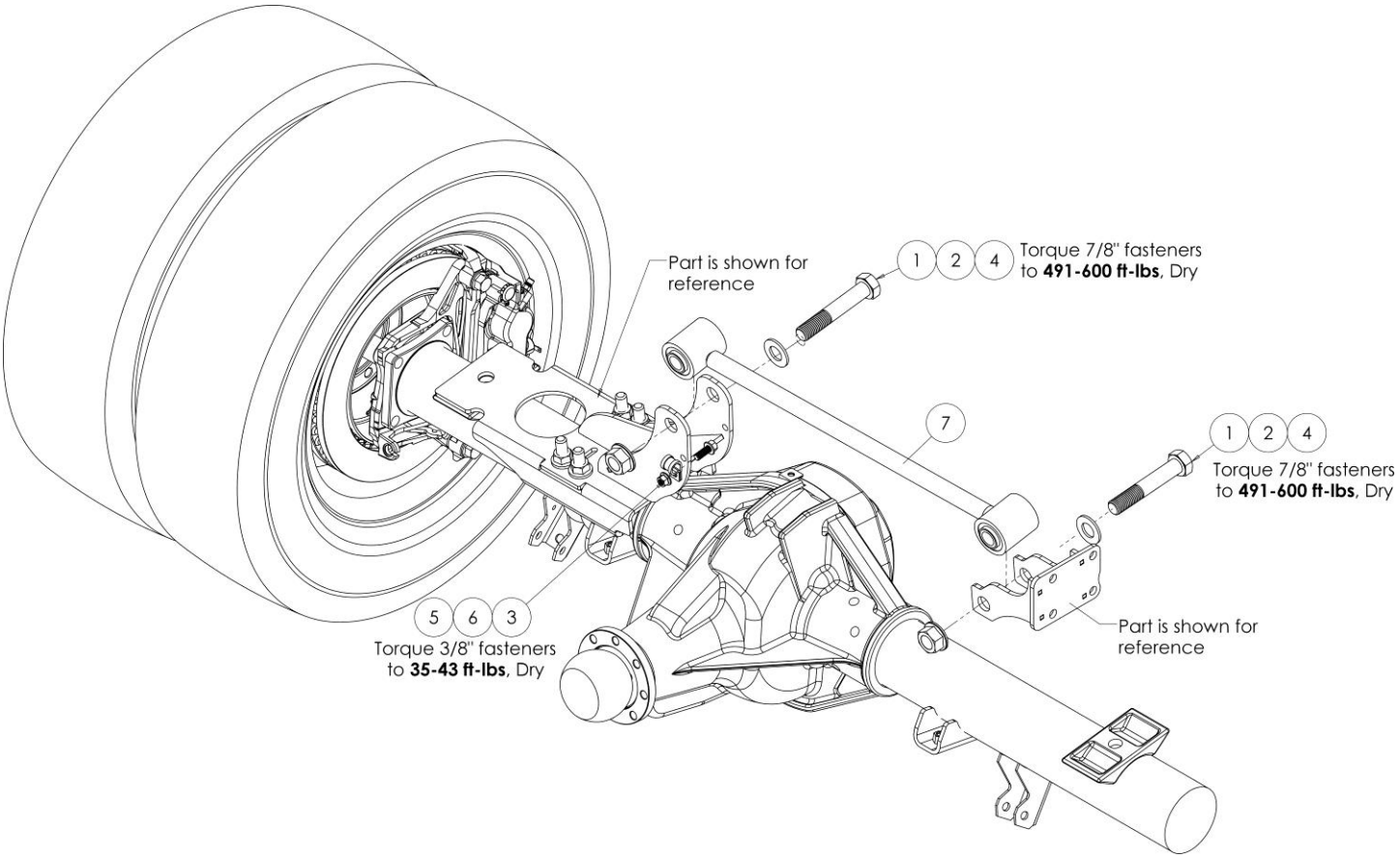
1. Locate Control Arms and install as shown.

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	2	10002-500	HCS 7/8-9 x 5 Gr. 8	5	1	10501-001	HFB 3/8-16 x 1
2	2	10006-003	HFW 7/8"	6	1	10855-003	Loop Clamp, 5/8" ID
3	1	10012-005	LFN 3/8-16	7	1	11198-001	Asy, Track Rod
4	2	10012-017	LFN 7/8-9 Gr. 8				

1. Locate the Track Rod, 7/8" fasteners, and washers.
2. Loosely attach to the Axle Track Rod Mount and Frame Track Rod Mount installed previously.
3. 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 23.

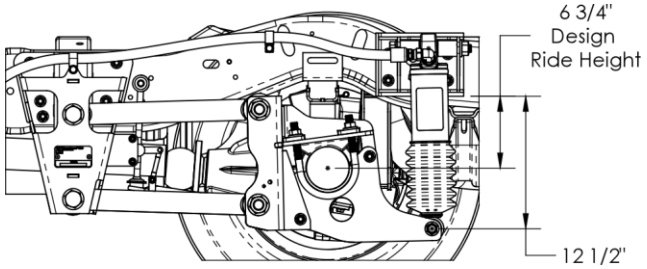


Figure 23. Adjust Frame or Axle to Ride Height

4. Torque 7/8" Track Rod fasteners to **491-600 ft-lbs.**
5. Torque the (8) eight 1" Control Arm fasteners to **600 ft-lbs**.
6. Route the parking brake cable to the Axle Track Rod Mount using the 3/8" fasteners and Loop Clamp as shown below.

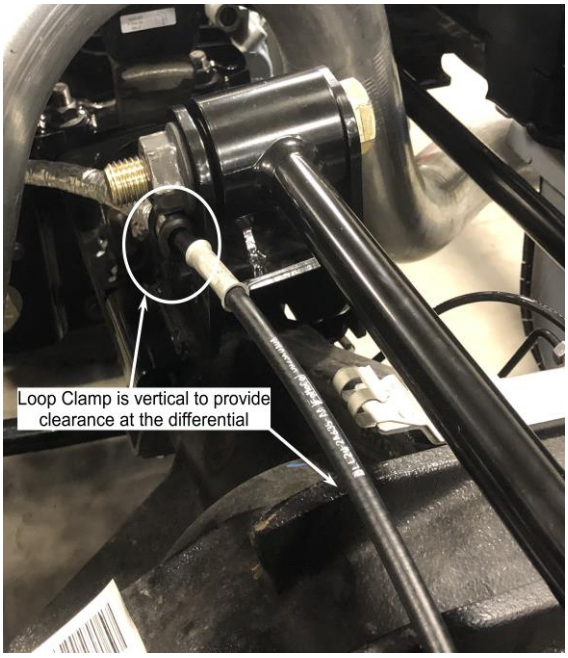
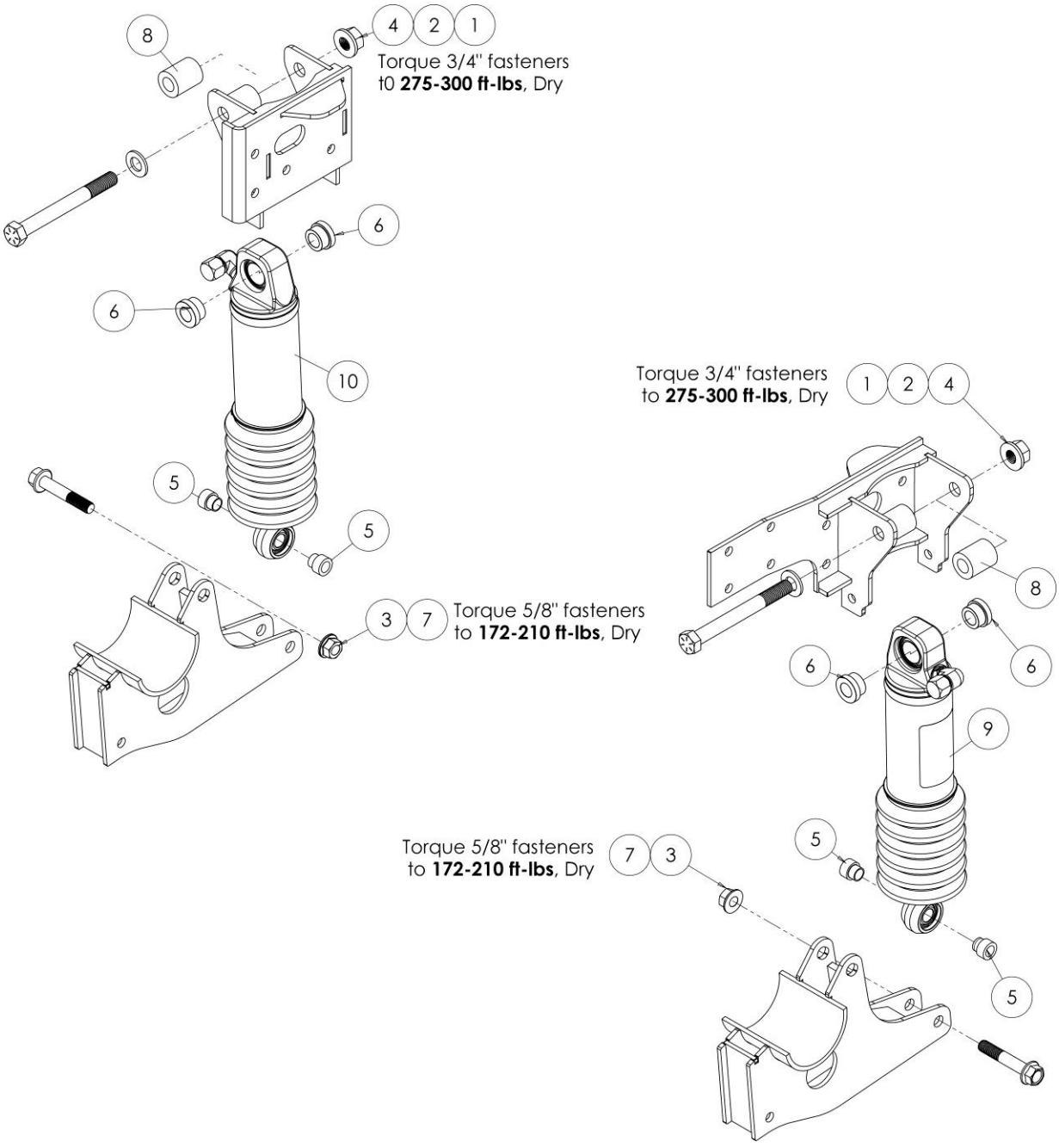


Figure 24. Locate Brake Cable to Track Rod Mount

7. Torque 3/8” fasteners to **35-43 ft-lbs.**

Strut Assembly Installation



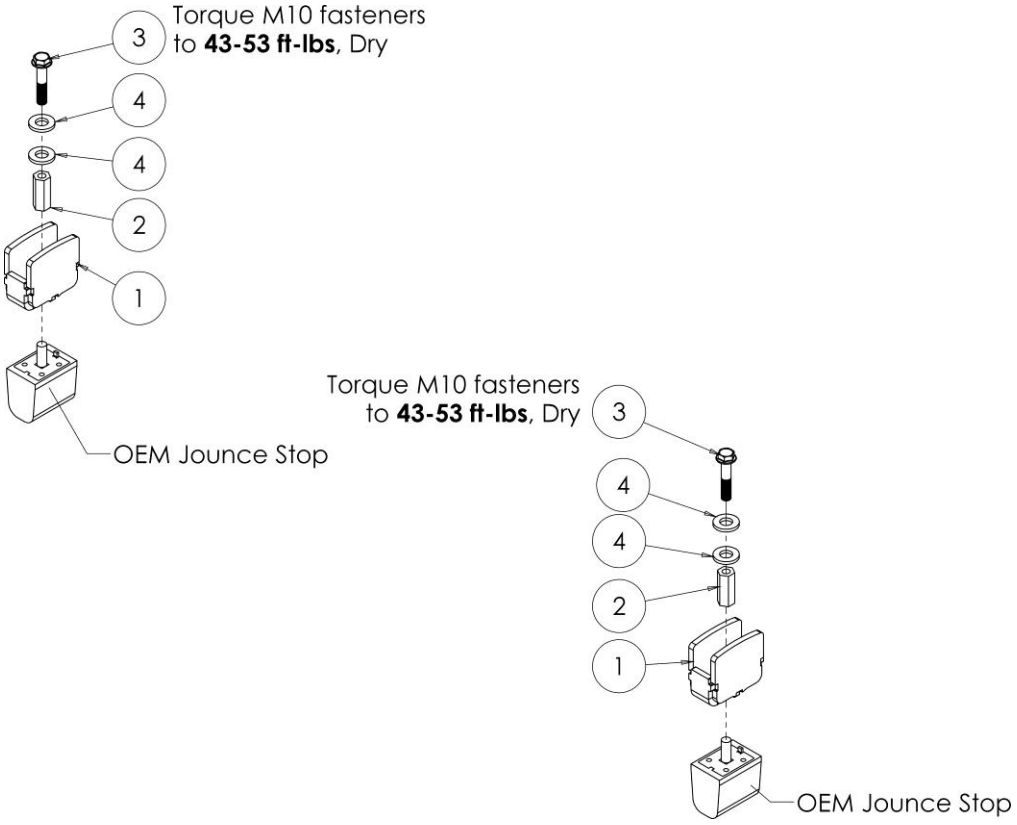
ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	10001-011	HCS 3/4-10 x 7 Gr 8 Z	7	2	10874-350	HFB 5/8-11x3.500, Gr. 8
2	2	10006-002	HFW .750"	8	2	11100-004	Spacer
3	2	10012-008	LFN 5/8-11, Gr. G	9	1	11299-001	**DS85-96FS3/-BA:** Strut, LH
4	2	10012-014	LFN 3/4-10, Gr. G			11057-031	**DS96FS3M:** Strut, LH
5	4	10640-001	Bearing Spacer	10	1	11299-002	**DS85-96FS3/-BA:** Strut, RH
6	4	10640-005	Bearing Spacer			11057-032	**DS96FS3M:** Strut, RH

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	2	10592-003	Wldmnt, Jounce Bumper Spacer	3	2	10502-050	HFB M10-1.5 x 80
2	2	10595-001	Coupler, M10-1.5 x 50	4	4	10006-007	HFW 1/2

1. Locate (1) Bump Stop Spacer (1) M10 Coupler, (2) 1/2" Washers 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.
3. Place the Spacer and Bumper assembly under the frame and reattach to the Driver Side frame using the M10-1.5 x 50mm Hex Flange Bolt and (2) 1/2" HFW. Torque to **43-53 ft-lbs.** See Figure 25.

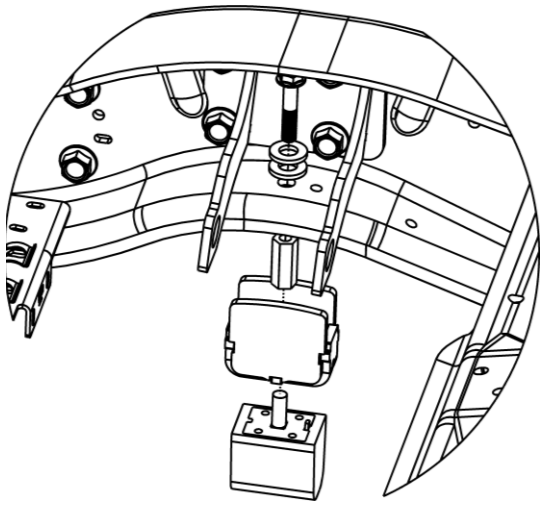
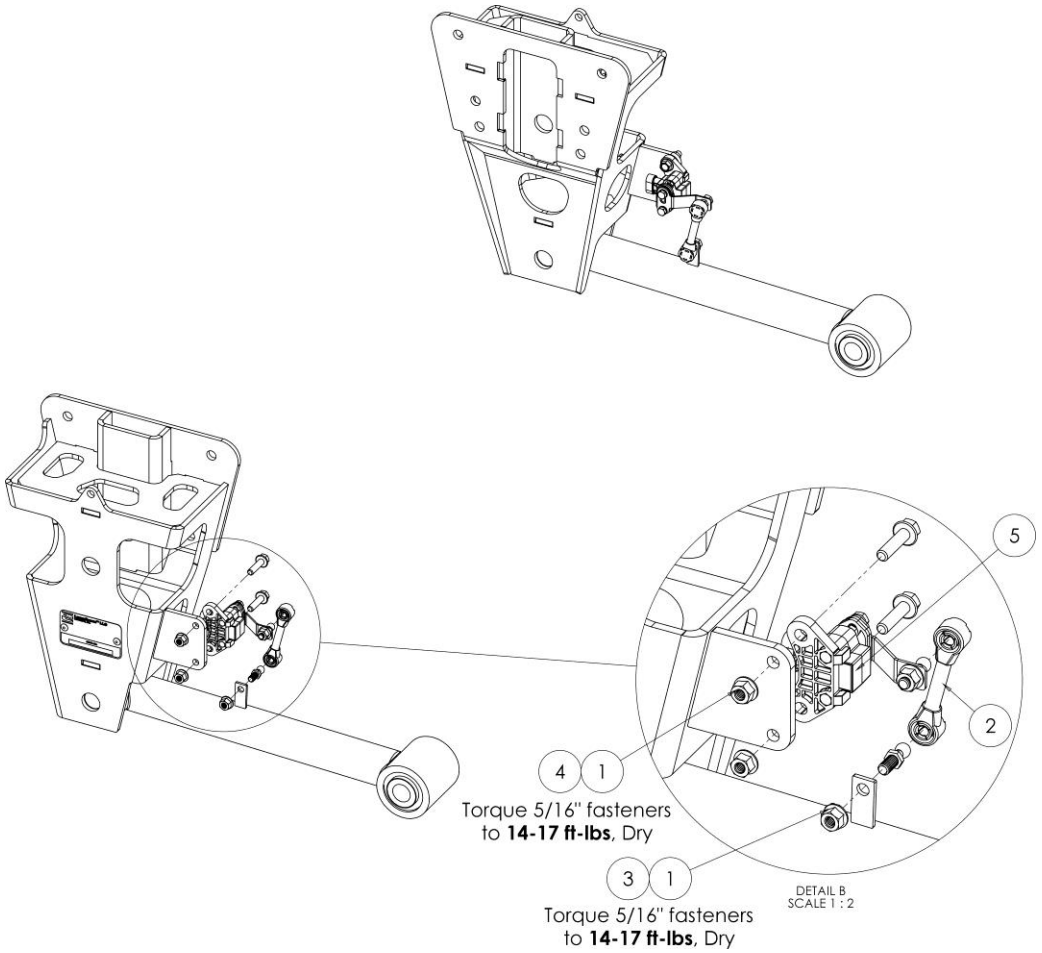


Figure 25. Jounce Bumper Install

4. Repeat on passenger side.

Height Sensors



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	6	10012-010	LFN 5/16-18, Gr. G	4	2	10587-007	Linkage
2	2	10591-001	Ball Stud	5	2	11752-001	Asy, HW Sensor, Adaptor
3	4	10886-125	HFB 5/16-18x1.25, Gr. 8				

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.
2. Torque 5/16” fasteners to **14-17 ft-lbs. DO NOT OVERTIGHTEN.**
3. Install the linkage on the ball studs with the locking clips. Refer to Figure 26 for detail of linkage.
4. 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.

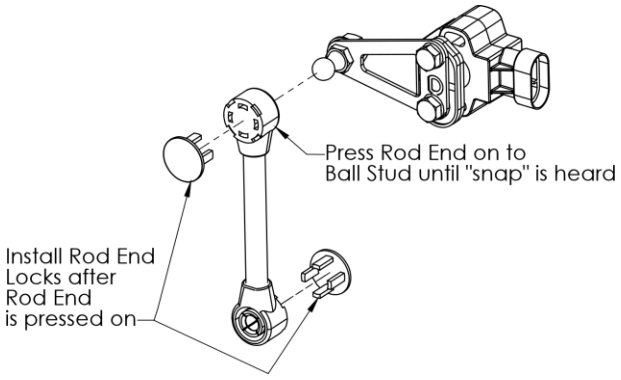
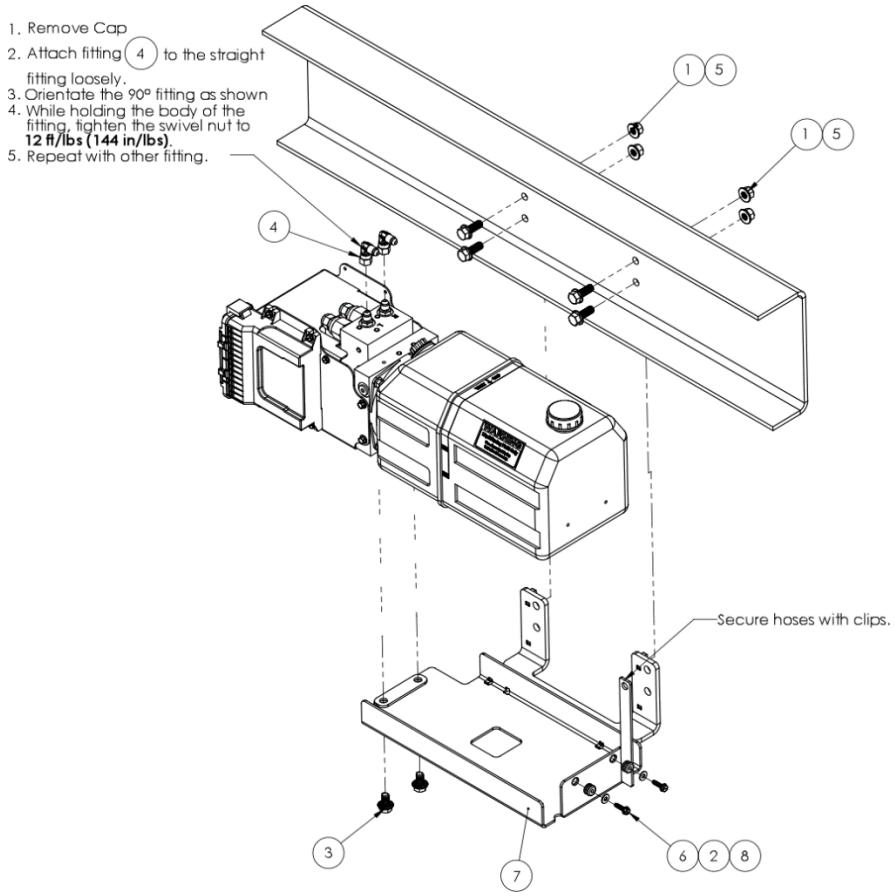


Figure 26. Height Sensor Plastic Linkage End Installation.

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 27.

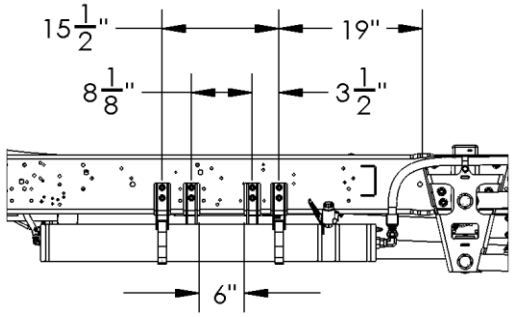
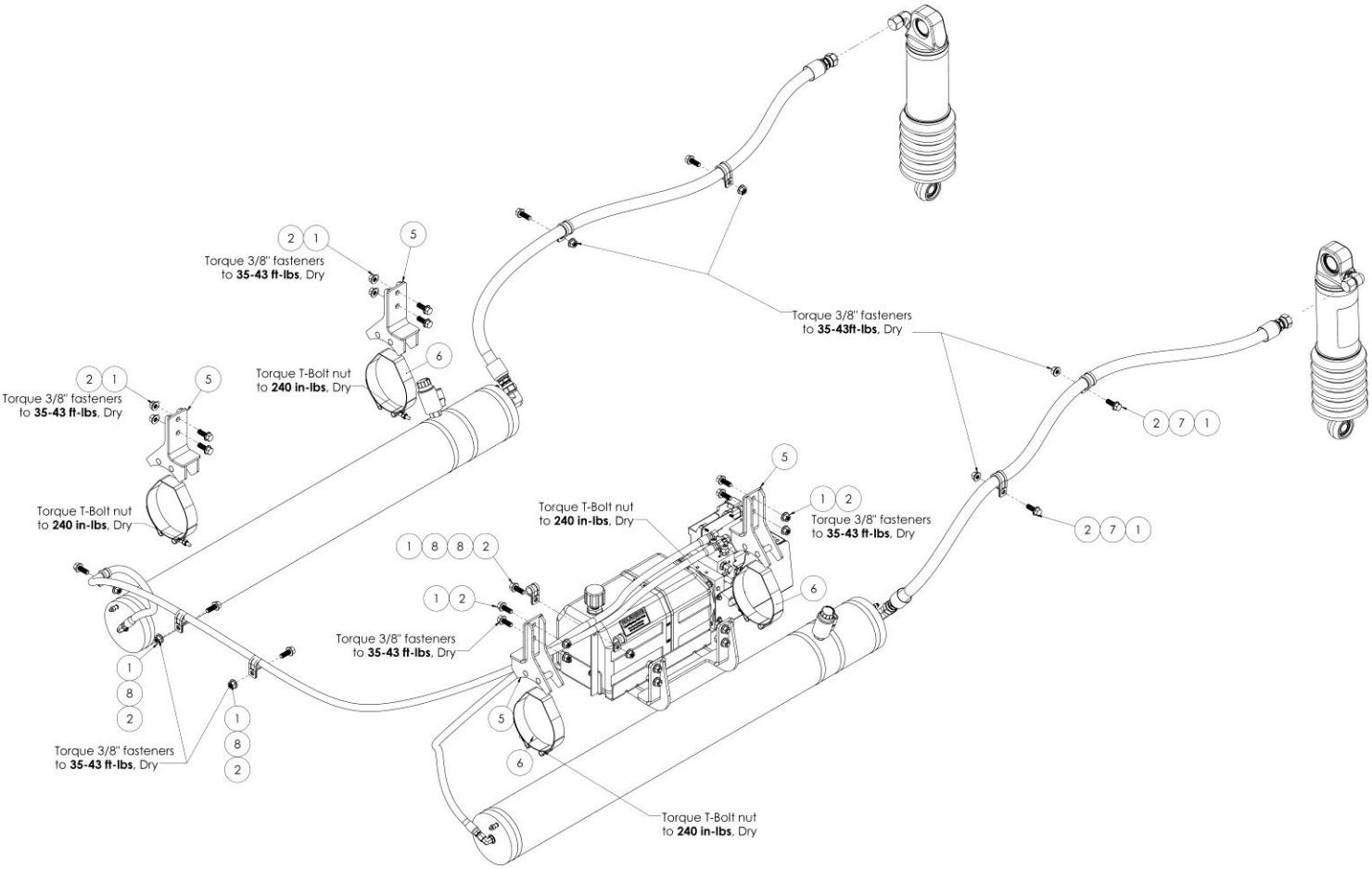


Figure 27. Volume Mount and Power Module Mount Locations

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 (DS85-96FS3 & DS85-96FS3M)

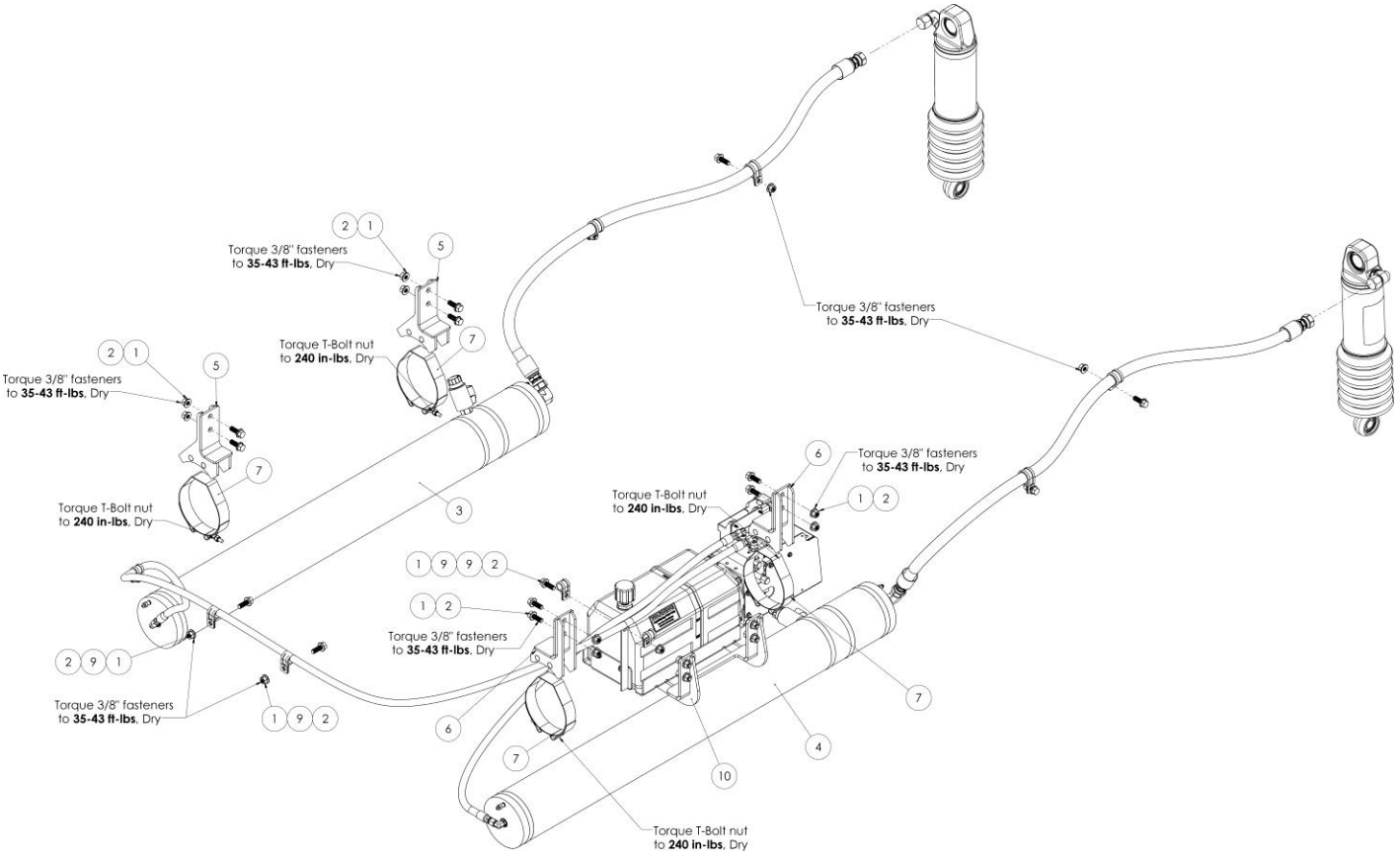


ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	16	10012-005	LFN 3/8-16, Gr. G	6	4	10843-003	T-Bolt Clamp
2	16	10501-001	HFB 3/8-16x1.000, Gr. 8	7	4	10855-002	Loop Clamp, 1”
3	1	10597-081	2nd Volume, LH	8	5	10855-003	Loop Clamp, 5/8”
4	1	10597-082	2nd Volume, RH	9	1	11295	Kit, Power Module, Mount
5	4	10830-013	**DS85-96FS3:** Volume Mount	10	1	11793	Kit, Breather Cap
		10830-014	**DS85-96FS3M:** Volume Mount				

1. Locate the Volume Mounts using the holes previously drilled during Power Module Mount installation, bolt 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 (DS85-96FS3-BA)



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	16	10012-005	LFN 3/8-16, Gr. G	7	4	10843-003	T-Bolt Clamp
2	16	10501-001	HFB 3/8-16x1.000, Gr. 8	8	4	10855-002	Loop Clamp, 1”
3	1	10597-082	2nd Volume, LH	9	5	10855-003	Loop Clamp, 5/8”
4	1	10597-118	2nd Volume, RH	10	1	11295	Kit, Power Module, Mount
5	2	10830-013	Volume Mount	11	1	11793	Kit, Breather Cap
6	2	10830-014	Volume Mount				

1. Locate the Volume Mounts using the holes previously drilled during Power Module Mount installation, bolt 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.

Hydraulic Hose Attachment

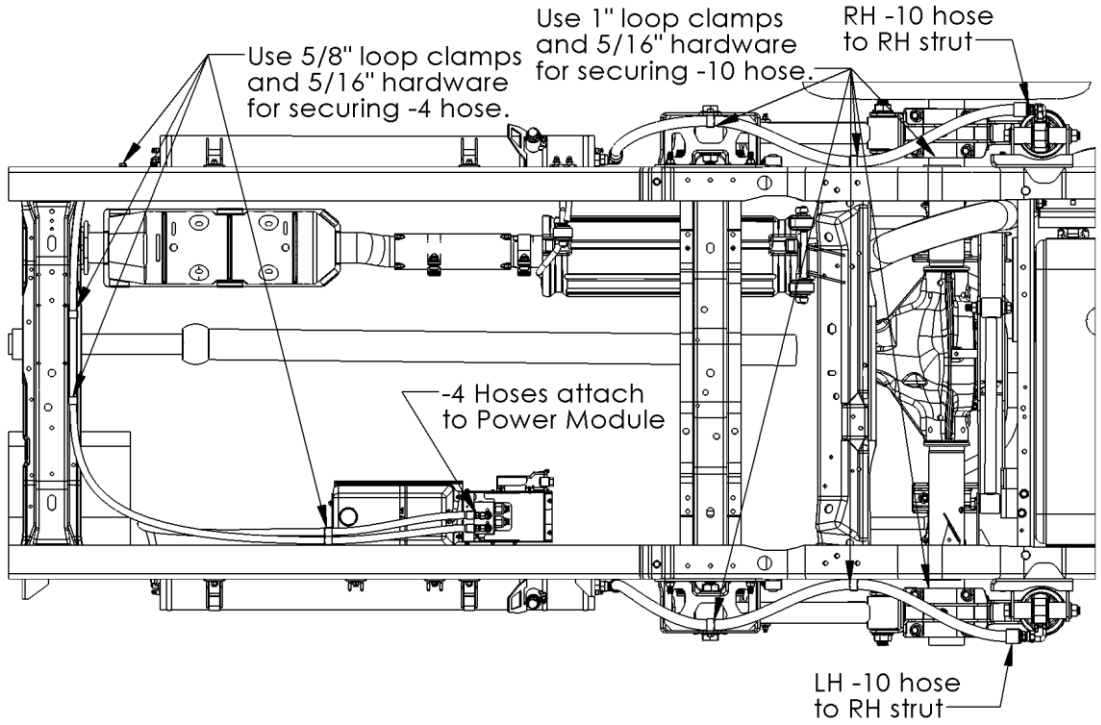


Figure 28. Location of loop clamps and hose routing.

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.

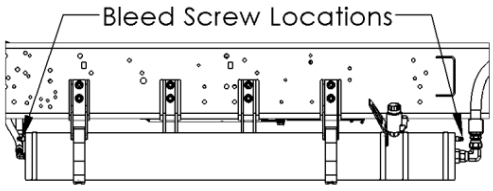


Figure 29. Bleed screw locations.

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.

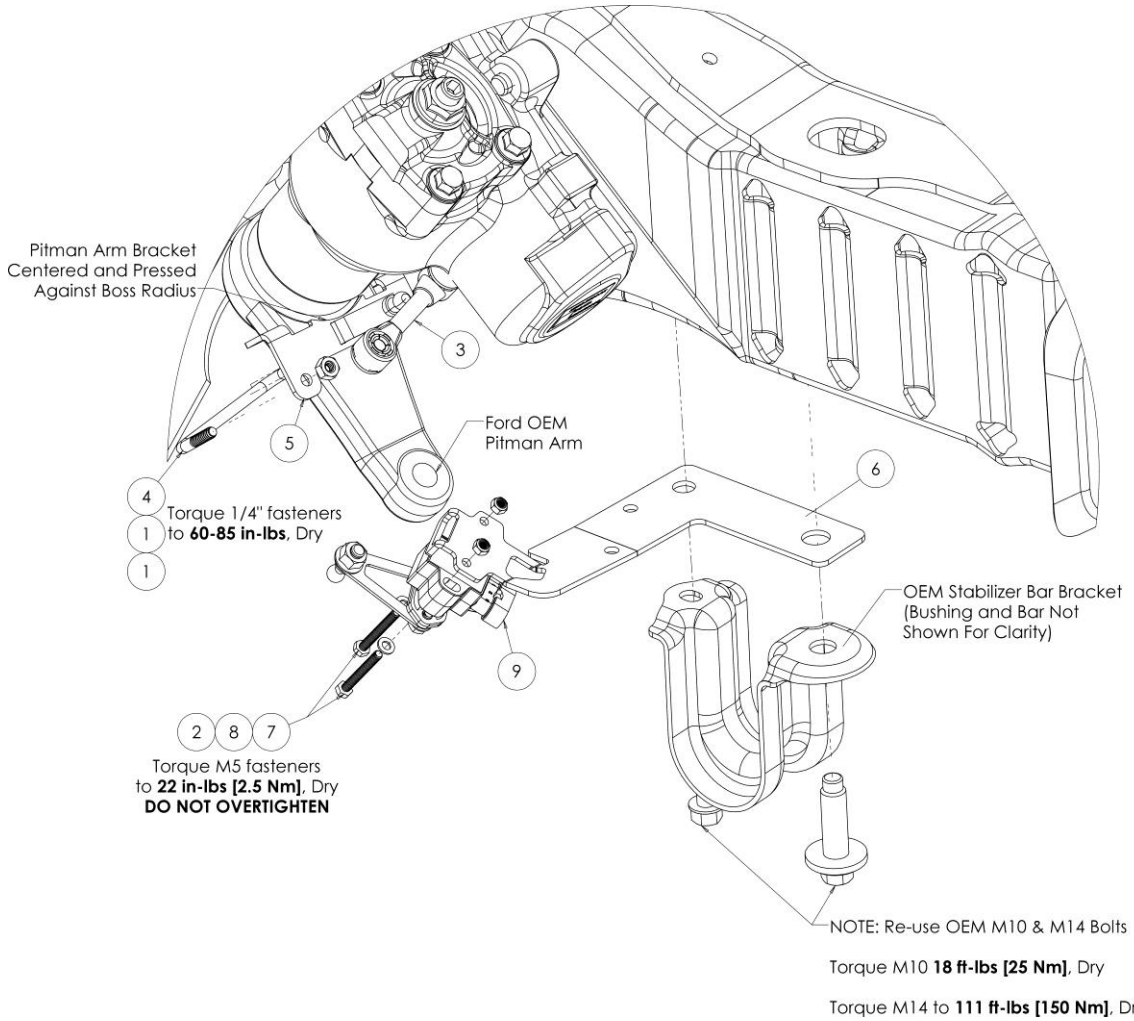
12. Remove the cap from the LH -4 JIC fitting on the power module assembly.
13. Remove the plug from the hose end.
14. Attach the hose end to the LH fitting. Torque to **12 ft-lbs. Do not over tighten.**
15. Route the Right Hand (Passenger side) -4 (1/4") hydraulic hose, to the power module assembly. 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



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	10004-024	LHN 1/4-20	6	1	10904-058	Bracket, Steering Sensor
2	2	10232-006	LHN M5-0.8	7	2	11639-040	HCS M5-0.8
3	1	10587-004	Asy, Linkage	8	2	11641-001	FW M5
4	1	10669-005	U-Bolt 1/4-20 x 3”	9	1	11675-001	Asy, Sensor
5	1	10733-015	Wldmnt, Pitman Arm Brkt				

1. Attach the Sensor to the Sensor Bracket with the M5 washers and fasteners as shown above. Torque to **22 in-lbs. [2.5 Nm]. DO NOT OVERTIGHTEN.**
2. Remove the M10 and M14 bolts on the Driver’s side Stabilizer Bar Bracket.
3. Locate the Steering Sensor Bracket with the Sensor attached from Step 1. Insert the Bracket in-between the frame and OEM Stabilizer Bar Bracket.
4. Torque the OEM bolts as specified below:
    - Torque the OEM M10 bolt to **18 ft-lbs.**
    - Torque the OEM M14 bolt to **111 ft-lbs**.
5. Locate the Pitman Arm Bracket. Center it at the top of the Pitman Arm with the circular cutout pressed up against the Pitman Arm boss Radius as shown above.
6. Fasten the Pitman Arm Bracket to the Pitman Arm using the 1/4” U-bolt and Locking Hex Nuts. Torque **60-85 in-lbs**.

IMPORTANT: Verify that the bracket is still positioned as shown above and described in Step 5.

7. Attach the linkage to ball studs. **DO NOT install locking clips**.

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)
   e. J35 to Steering Sensor

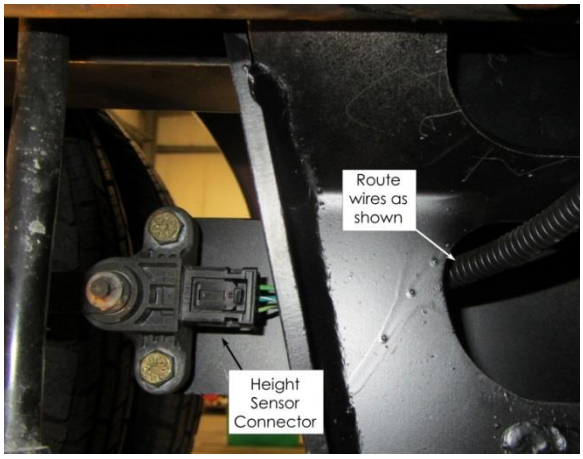


Figure 30. Height Sensor Electrical Connections

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

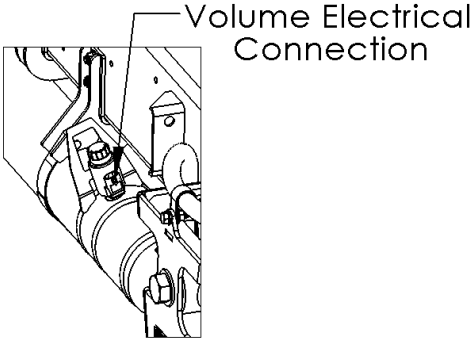


Figure 31. Secondary Volume Electrical Connections

6. Secure the harness.
7. Locate the 8ga 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 32.

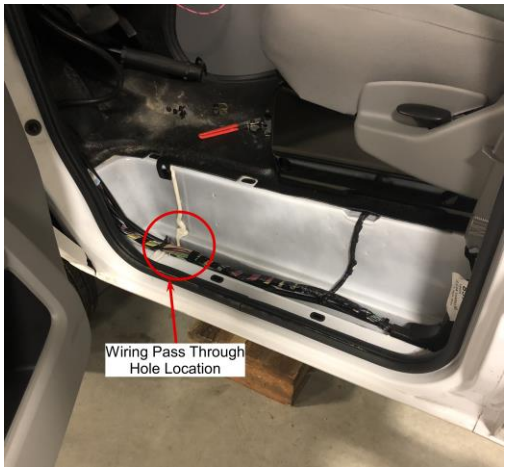


Figure 32. Location of Driver Side Access Hole

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 8ga battery connection branch.
13. Route branch to the passenger side auxiliary battery.

NOTE: Use of the down clips or clamps is recommended. Do not allow harness to hang 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 8ga 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 18ga wires in the external harness. These wires should already be routed from the Power Module to the inside of the cab.

2. Butt splice the following wires between the dash harness and external harness:

LS Dash Harness	→	LS 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)

NOTE: Heat shrink sealing is optional.

3. Attach Ground ring terminal (J32) to firewall stud for grounding.

4. Looking inside the cab, under the dash, behind the pedals, locate the (6) six pin C215 connector as shown below in Figure 33.

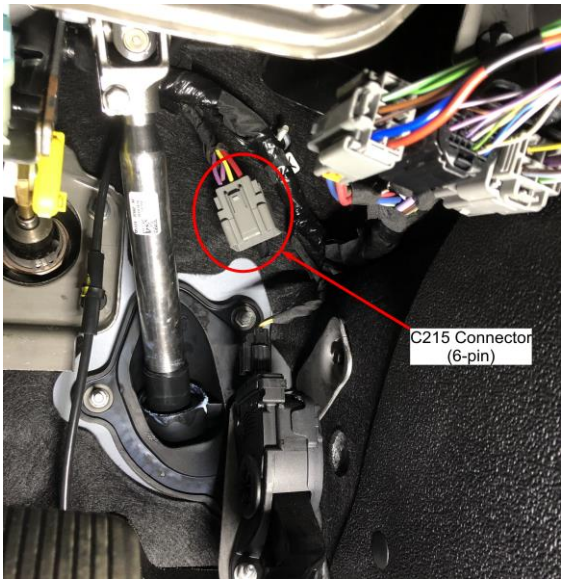


Figure 33. Locate C215 Connector

5. Locate the C215 upfitter connector provided with the vehicle. See Figure 34.

NOTE: If the C215 upfitter connector provided with the vehicle cannot be located, a splice can be made on chassis side of connector shown in Figure 33.

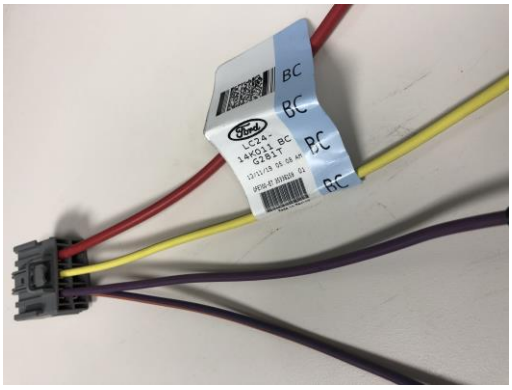


Figure 34. C215 Upfitter Connector

IMPORTANT: Verify that you have the correct 6-pin connector as shown above.

6. Locate the LiquidSpring Dash Harness and prepare to make the following connections with the C215 upfitter connector blunt ends:

LS Dash Harness	→	OEM C215 Upfitter Connector
Red (Battery) 10ga	→	Red (Battery) – Pin 3
Yellow (Ignition) 10ga	→	Violet/Orange (Ignition) – Pin 4

7. Connect the C215 upfitter connector to the chassis side C215 connector. See Figure 33 again for location.

8. Locate the Violet/White wire on the Dash Harness and route out to engine bay above driver side tire. See Figure 35.

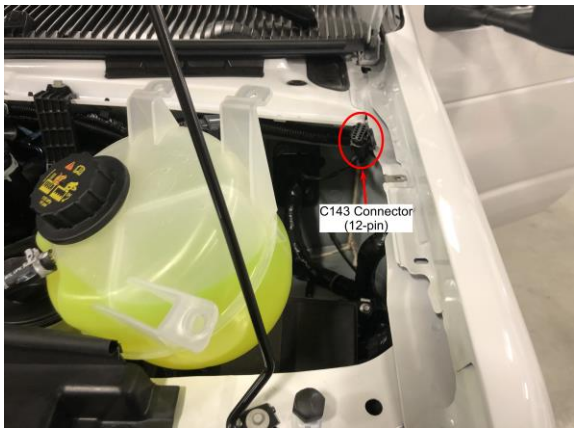


Figure 35. Locate C143 Connector

NOTE: Coolant reservoir can be set aside as shown above to aid in routing wires to the C143 connector in engine bay.

9. Locate the Molex MX150 2x6 (12-pin) connector provided with the suspension.

10. Unlock the Molex MX150 2x6 (C143 connector) by prying up on the point shown below. The white center piece should pop up 5mm. **Do not completely remove the center piece.**

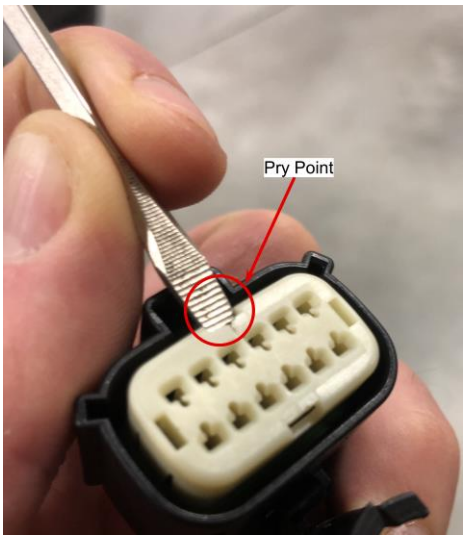


Figure 36. Connector Pry Point

11. Insert the terminal on the Dash Harness into the C143 upfitter connector as shown in the table and Figure 37 below:

LS Dash Harness	→	OEM C143 Upfitter Connector
Violet/White (Speed) 18ga	→	Violet/Orange (Speed) – Pin 12

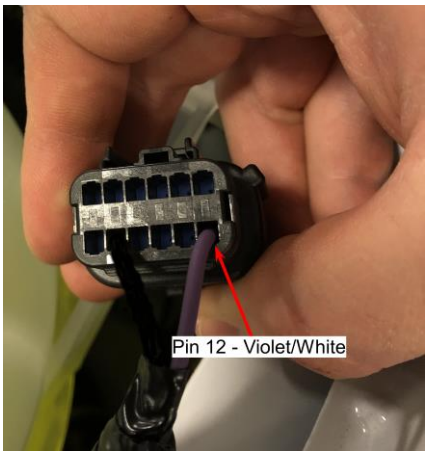


Figure 37. Wire inserted in C143 Upfitter Connector

12. Push wire in until a click is heard, then lock into place by pressing the white center piece back down.

NOTE: Terminal plugs are supplied to seal any unused terminals. Plugs are unserviceable once locked into connector.

13. Connect the provided C143 upfitter connector to the chassis side C143 connector.

NOTE: The MX150 2x6 connector can be replaced with another if the access point needs to be shared.

14. Pull the main dash trim piece loose as shown in Figure 38 to gain access to the C239 connector.

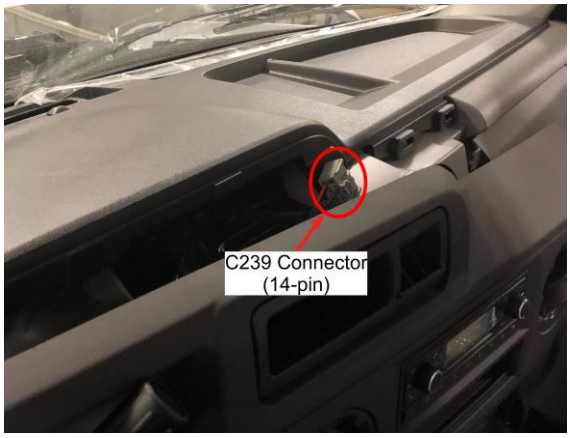


Figure 38. C239 Connector Location

15. Locate the C239 upfitter connector provided with the vehicle. See Figure 39.

NOTE: If the C239 upfitter connector provided with the vehicle cannot be located, a splice can be made on chassis side of connector shown in Figure 38. Refer to the table below for chassis side splicing.

LS Dash Harness	→	C239 Connector Chassis Splicing
Pink/Black (Brake) 18ga	→	Blue/Tan (Brake) – Pin 12

Figure 39. C239 Upfitter Connector

IMPORTANT: Verify that you have the correct 14-pin connector as shown above.

16. Route the Pink/Black 18ga wire from the LS Dash Harness over to the C239 connector as shown above in Figure 38.

17. Make the following connection with the C239 upfitter connector blunt end:

LS Dash Harness	→	OEM C239 Upfitter Connector
Pink/Black (Brake) 18ga	→	Yellow/Blue (Brake) – Pin 12

18. Connect the C239 upfitter connector to the chassis side C239 connector.

19. Tuck the connector and wires into dash and reinstall the dash trim.

20. Secure Dash Harness to prevent wires getting entangled in driver's feet and moving parts.

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.

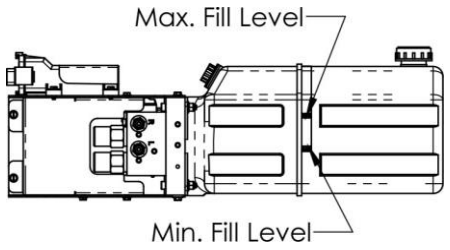


Figure 40. Final fill fluid level.

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.

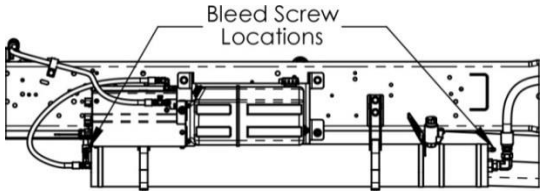


Figure 41. Bleed screw locations.

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 "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.

Disabling/Enabling High Height

NOTE: The suspension has the ability to disable or enable high height functionality.

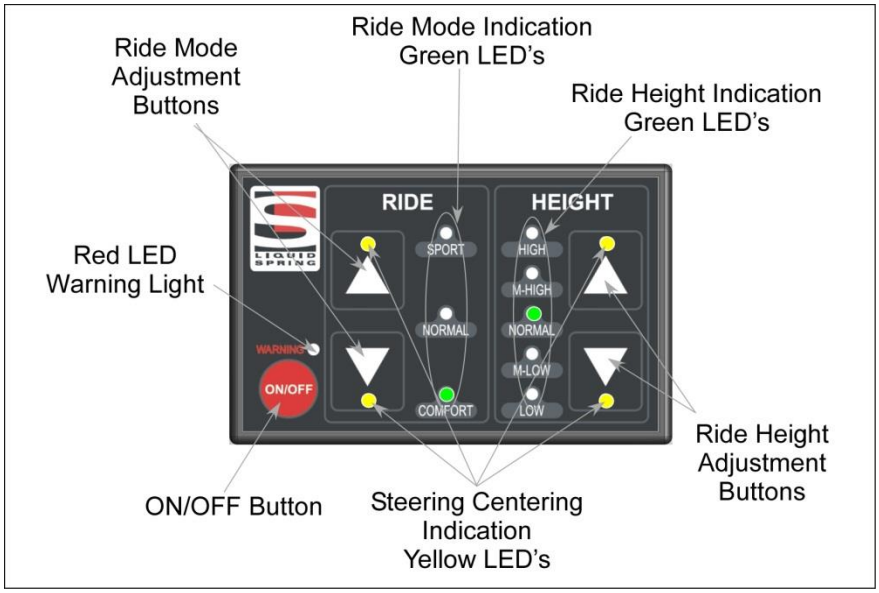
To Disable High Height:

1. While the system is calibrating, refer to step 6 in *calibrating the system*, press ride mode **DOWN** and allow calibration to finish.

To Enable High Height:

1. While the system is calibrating, refer to step 6 in *calibrating the system*, press ride mode **UP** and allow calibration to finish.

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.

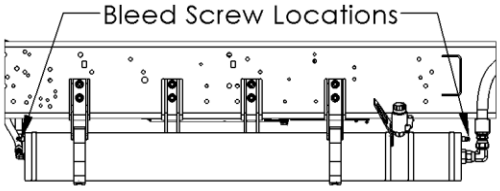


Figure 42. Bleed screw locations.

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

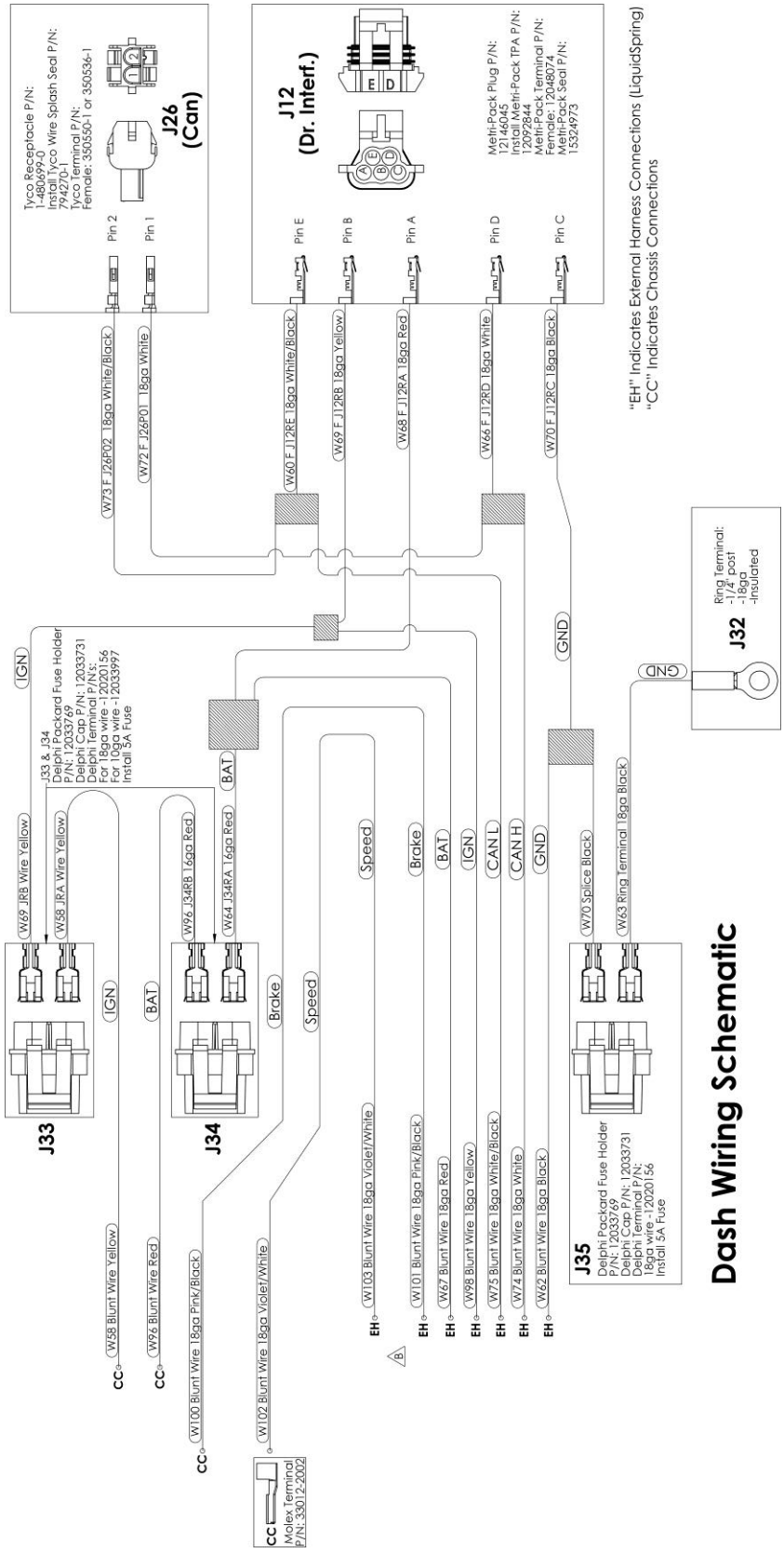
Issues with Strut Assembly

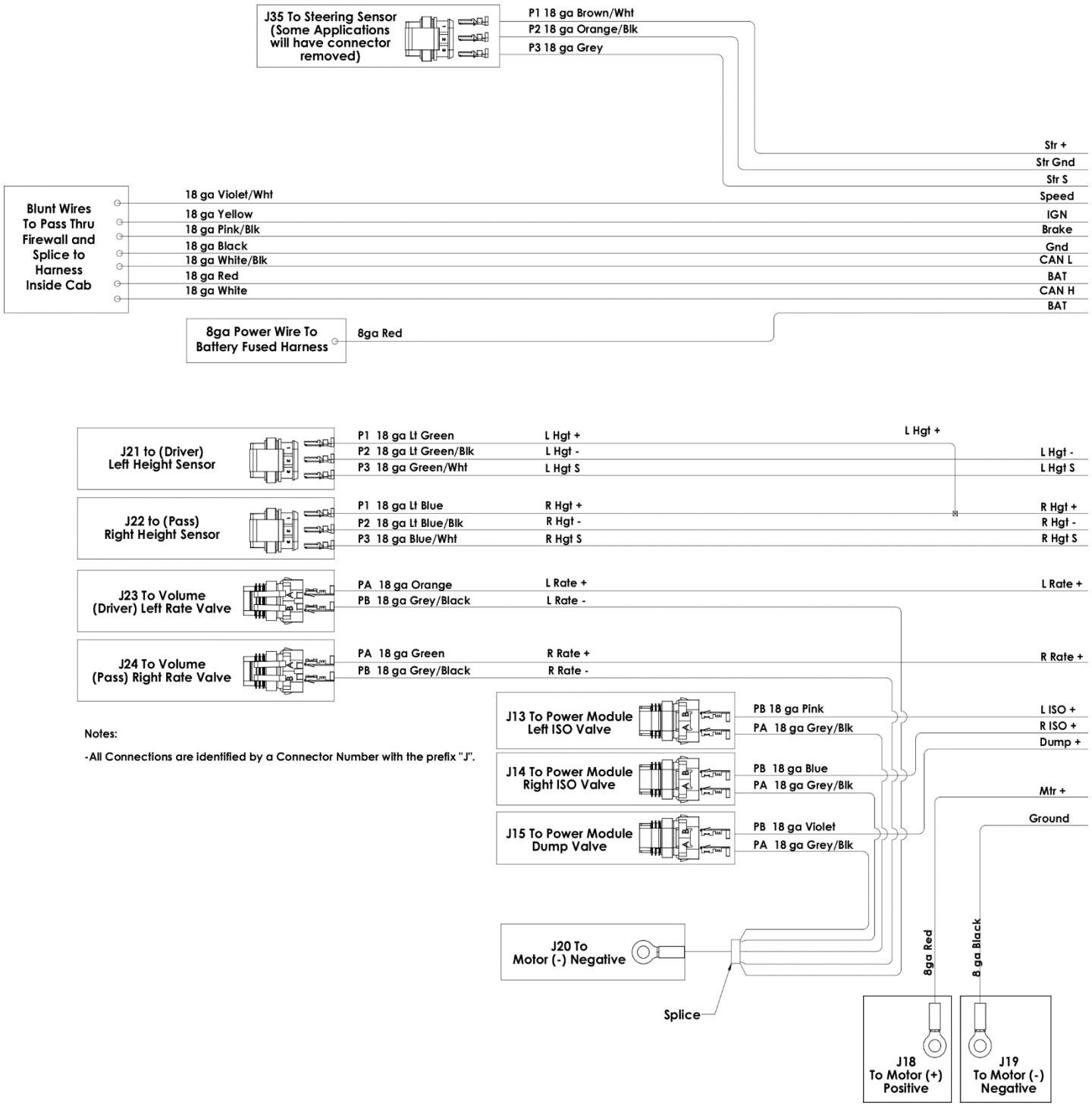
Condition	Cause	Correction
Hydraulic Leak	Weld failure between cylinder and end	Replace strut
	Cylinder fracture	Replace strut
	Threads stripped between cylinder and gland	Replace strut
	Seals worn out	Replace strut
	Rod severely scratched or dented	Replace strut
	Fitting loose	Tighten or replace fittings
	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

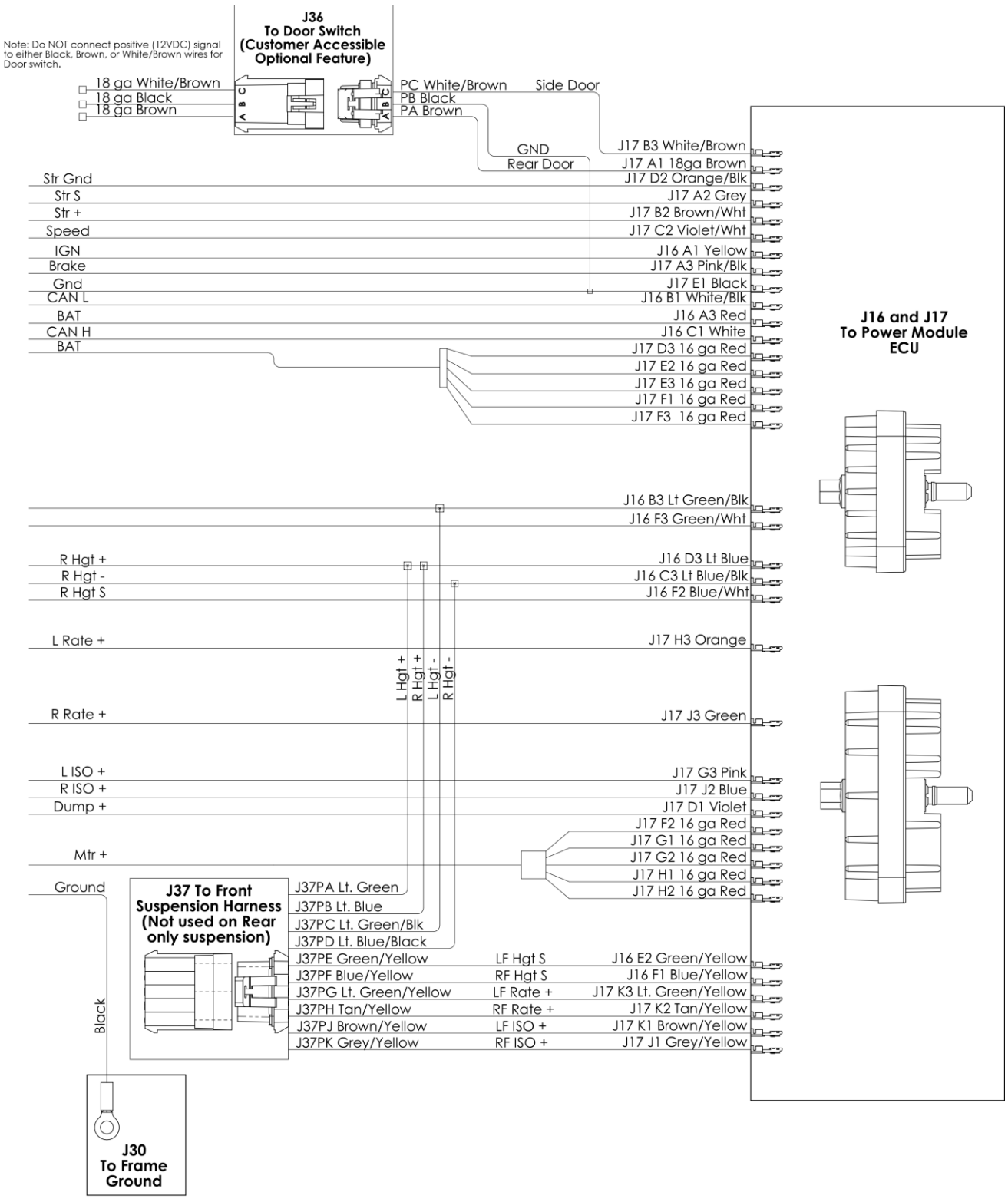
Condition	Cause	Correction
Hydraulic Leak	Weld failure between tube and end	Replace secondary volume welded assembly
	Weld failure between tube and manifold	Replace secondary volume welded assembly
	Cylinder fracture	Replace secondary volume welded assembly
	Bleed screw loose	Tighten bleed screws to 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

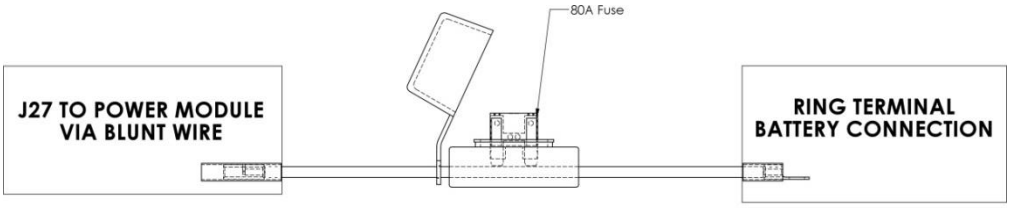




Schematic, External Wiring Harness – Part 1



Schematic, External Wiring Harness – Part 2



Schematic, Battery Fuse Lead

LiquidSpring™ LLC
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Lafayette, IN 47905

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Web: www.liquidspring.com

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, and shock absorbers
☐Removed specified rivets
☐Upper Strut Mount, Front Hanger, Power Module Mount, and Secondary Volume Asy holes drilled.
☐Fuel tank crossmember holes drilled.

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

UPPER STRUT MOUNT/TRACK ROD MOUNT/CROSSMEMBER REINFORCEMENT:
☐Upper Strut Mounts level with frame.
☐Replaced OEM M12 crossmember bolt with M12 Button Head Cap Screw, torqued to **75-92 ft-lbs.**
☐Replaced OEM M10 brake line bracket bolt with 5/16”-18 Button Head Cap Screw, torqued to **20-25 ft-lbs.**
☐Fuel Tank Crossmember Reinforcements installed.
☐Lower Strut Mount Crossmember Reinforcement installed.
☐Frame Track Rod Mount installed to back of driver side Upper Strut Mount.
☐Bolts oriented per Installation Manual views.
☐1/2”-13 Nuts torqued to **86-105 ft-lbs**.

AXLE CLAMP INSTALLATION:
☐Spacer Plate inserted between Upper Axle Seat and axle.
☐Axle Track Rod Bracket inserted between Upper Axle Seat and axle.
☐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.
☐Spacer added to shock mount for brake line bracket.
☐M8 bolt torqued to **22-27 ft-lbs**.
☐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**.

TRACK ROD INSTALLATION:
☐7/8”-9 Track rod fasteners torqued to **491-600 ft-lbs.** at **ride height**.
☐Parking brake cable clamped to Axle Track Rod Mount with Loop Clamp.
☐3/8”-16 fasteners torqued to **35-43 ft-lbs.**

STRUT INSTALLATION:
☐3/4”-10 Nuts torqued to **275-300 ft-lbs**.
☐5/8”-11 Nuts torqued to **172-210 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 with Washers.
☐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:
☐M5 fasteners torqued to **22 in-lbs [2.5 Nm].**
☐1/4”-20 U-bolt nuts torqued to **60-85 in-lbs.**
☐M10 OEM Stabilizer Bar bolt torqued to **18 ft-lbs [25 Nm].**
☐M14 OEM Stabilizer Bar bolt torqued to **111 ft-lbs [150 Nm].**
☐Linkage and locking clips installed.
☐Steering Sensor harness attached and routed.
☐Clearance checked at steer full left and right.

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.