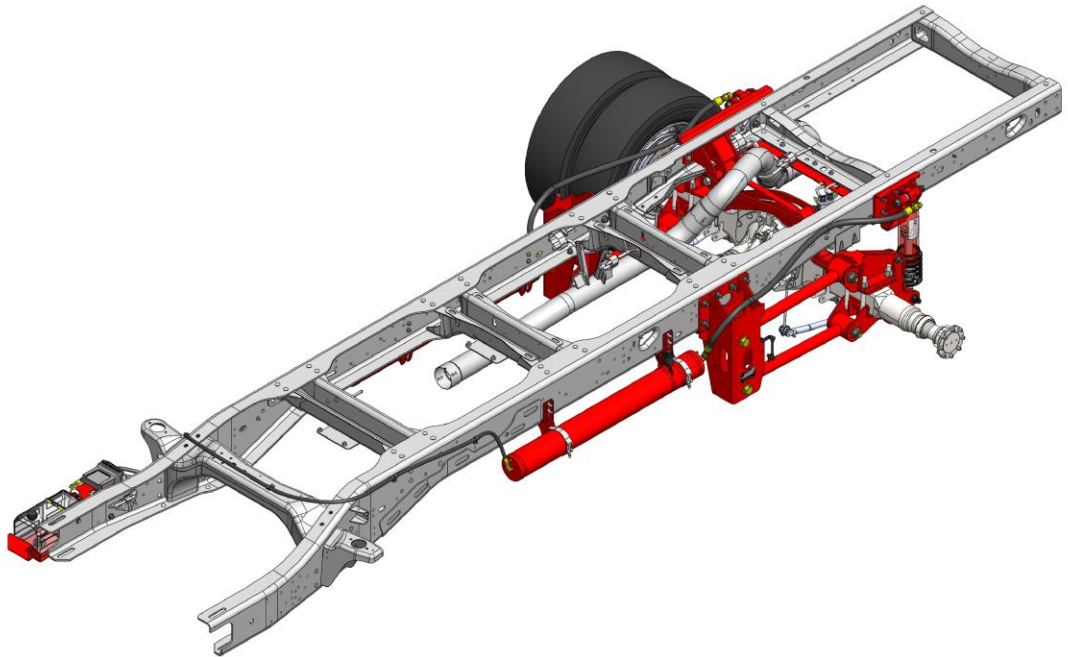


CLAS[®]S

DS 1 35RS3

Drive Axle Rear Suspensions
for Ram 4500/5500 Cab Chassis
MY 2019 and Newer



Installation/Operator Manual

D11687 Rev G 2/2020

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Introduction

This manual provides installation information for the LiquidSpring CLASS® DS135RS3 series of rear axle suspension systems for the RAM 4500/5500 Cab Chassis.

Before you begin installation of the suspension system:

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

Throughout this manual, important product information is indicated. These terms are defined as follows:

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

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

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

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

These instructions cover the following models:

Model	Application
DS135RS3A	4500/5500 (2019 and Newer)
DS135RS3AF	4500/5500 (2019 and Newer)
DS150RS3-DM	4500/5500 (2019 and Newer)

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.

IMPORTANT: If installing on a 22 gallon midship diesel tank, then you'll need to order and install exhaust P/N: 68261138AA

Suspension Rating

Model	4500	5500
DS135RS3A	12,000 lbs	13,500 lbs
DS135RS3AF	12,000 lbs	13,500 lbs
DS135RS3-DM	12,000 lbs	13,500 lbs

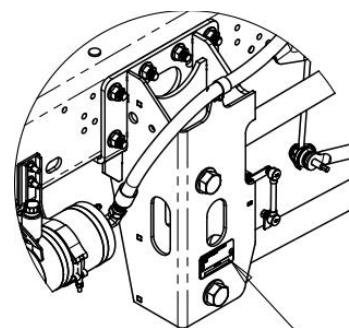
WARNING: Overloading suspension system may result in abnormal handling characteristics and premature wear of components.

Serial Number Tag Information

The suspension model, serial number, and maximum axle capacity are found on an aluminum tag that is riveted to the Left Hand Suspension Hanger as shown in Figure 2. This information will aid you when contacting the chassis manufacturer or LiquidSpring LLC.



Figure 1. Suspension Identification



Serial Plate Location
Figure 2. Serial Number Tag Location

Important Safety Notices

Fluid

The LiquidSpring suspension system requires the use of a specific compressible fluid for proper operation. If additional fluid is needed, the fluid can be purchased directly from LiquidSpring LLC.

RH	Right Handed Part
UCA	Upper Control Arm
LCA	Lower Control Arm
USM	Upper Strut Mount
PM	Power Module

CAUTION: Adding any other fluid not obtained from LiquidSpring LLC to the system will result in incorrect operation of the system, and will likely damage critical components of the system, and will void the LiquidSpring Warranty.

Vehicle Towing and Jacking

Before attempting any type of towing procedures, contact the Chassis OEM or Vehicle Manufacturer for instructions.

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

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

WARNING: Attaching towing equipment to improper locations and failure to utilize Chassis OEM or Vehicle Manufacturer 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. Applying a jack to improper locations can result in damage to the suspension and/or vehicle and severe personal injury

Abbreviations

The following abbreviations will be used throughout the manual.

HCS	Hex Cap Screw (also HB)
HFB	Hex Flange Bolt
SHCS	Socket Head Cap Screw
SFHS	Serrated Flange Hex Screw
STS	Self Tapping Screw
HN	Hex Nut, Non-locking
LHN	Locking Hex Nut
LFN	Locking Flange Nut
HFW	Hardened Flat Washer
SLW	Spring Lock Washer
FW	Flat Washer
SAE	SAE O-Ring Fitting
37°	SAE or JIC 37° Flare Fitting (F – Female)
LH	Left Handed Part

Pre-Installation

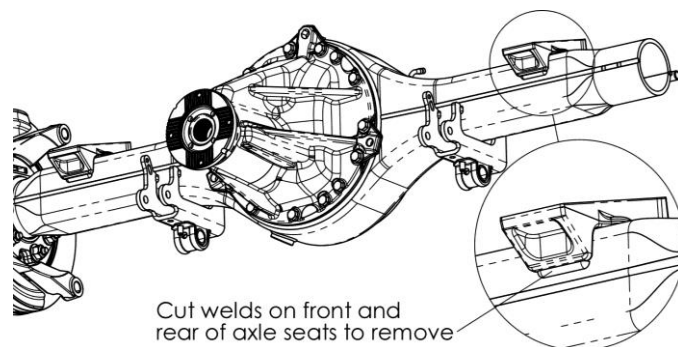
1. Check the vehicle wheel alignment prior to installation to insure pre-existing conditions do not exist.
2. It is suggested, but not required, to remove the attached body to ease installation.
3. A chassis lift can be used in assistance of the installation of the suspension system.
4. Measure and record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

Frame Preparation

1. Chock the front tires.
2. Jack up the rear frame of the vehicle to remove the load from the rear leaf springs.
3. Place jack stands under the frame and block the rear tires from moving.

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

4. Disconnect the negative cable from the vehicle battery.
5. Remove the OEM shock absorbers.
6. Remove the OEM leaf springs and rear shackles.
7. Detach Hydraulic brake lines from both axle spring seats and retain hardware.
8. Remove axle spring seats.



9. If equipped with the midship fuel tank, dropping the tank may ease installation, but not necessary.
10. Remove the OEM Axle Stop Bumpers from under the frame.
11. Remove the driver and passenger side Parking Brake Cables and wire form brackets and position the cable and conduit aside.
12. Remove the Front Hangers.
13. Remove the passenger side welded on jounce bumper mount. Use caution when removing as not to damage the frame.

IMPORTANT: Skip step 14 unless you have a DS135RS3-DM kit. (DO NOT remove driver jounce bumper mount)

14. Remove the driver side welded-on jounce bumper mount. Use caution when removing as not to damage the frame. (DS135RS3-DM ONLY)
15. Remove the leaf spring overload pads.
16. Remove Rear Exhaust bracket and enlarge holes to $\text{Ø}17/32''$ to clear using $\text{Ø}1/2''$ fasteners.
17. Drill required holes into frame rails per Figure 3 and Figure 4.

Note: See secondary volumes, page 24, for additional frame drill requirements.

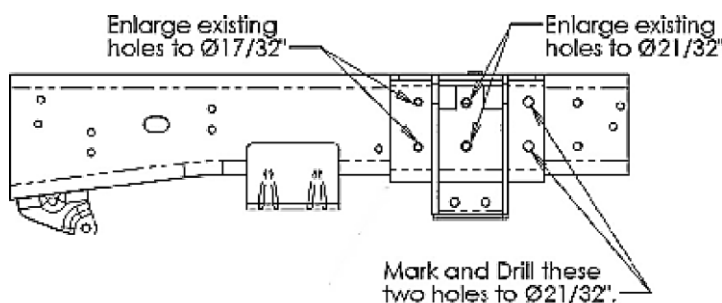


Figure 3. Driver Side Upper Strut Mount Frame Drilling.

Use Mount as a template for marking hole locations.

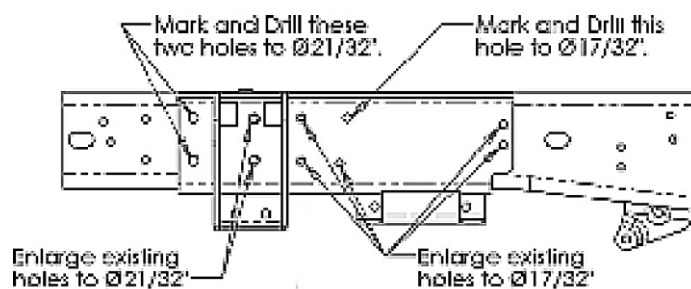
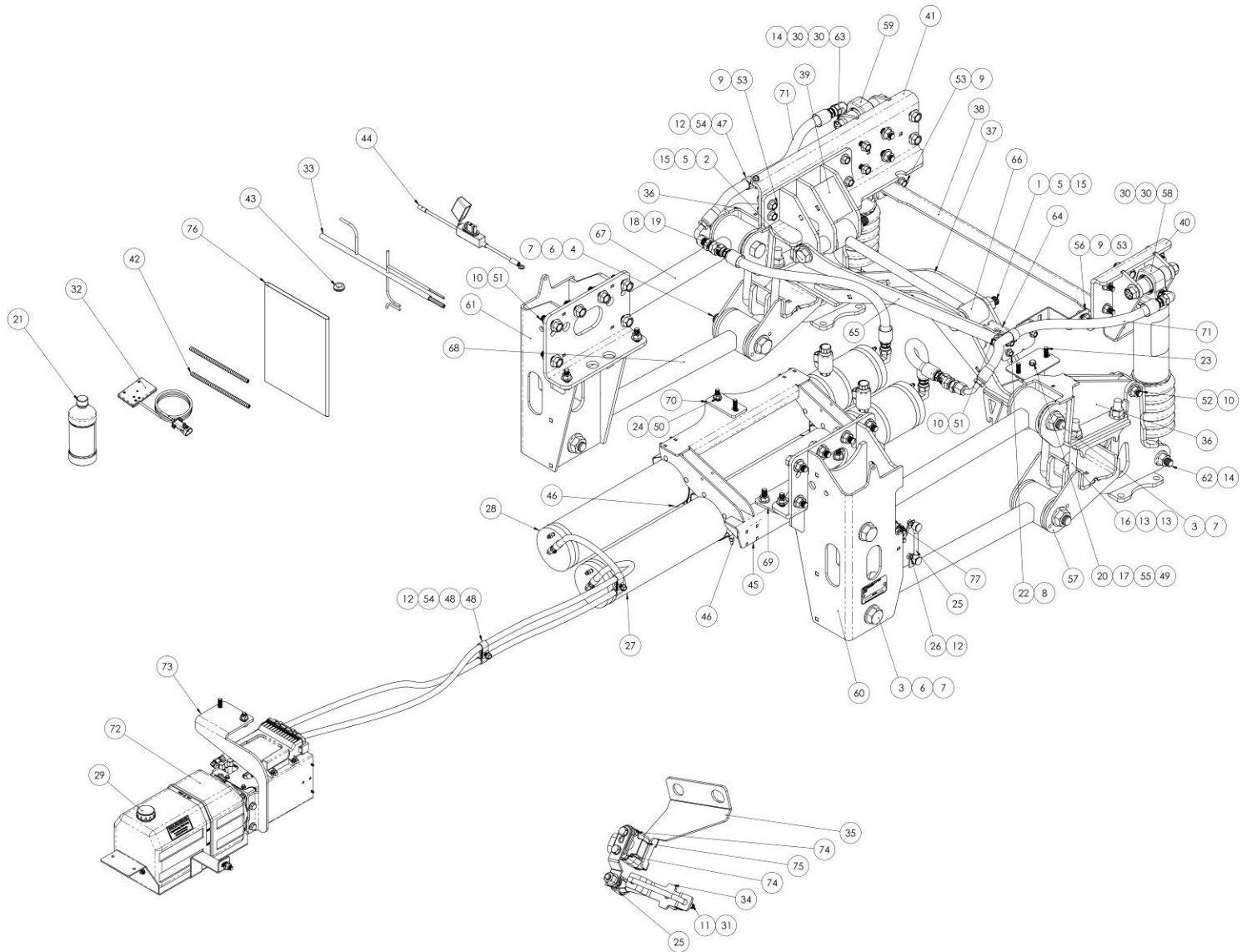


Figure 4. Passenger Side Upper Strut Mount Frame Drilling.

Use Mount as a template for marking hole locations.

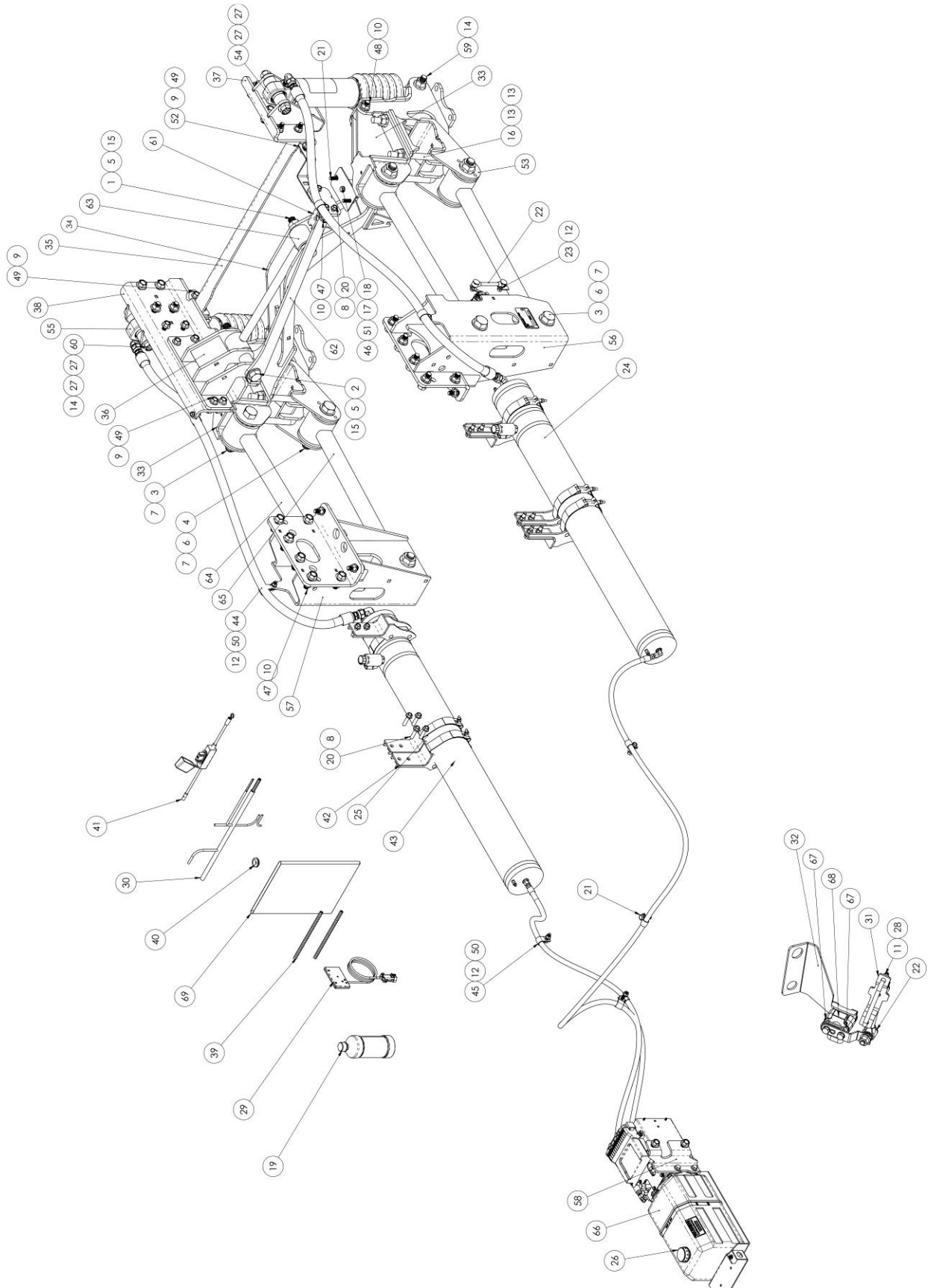
Part Identification:

DS135RS3A



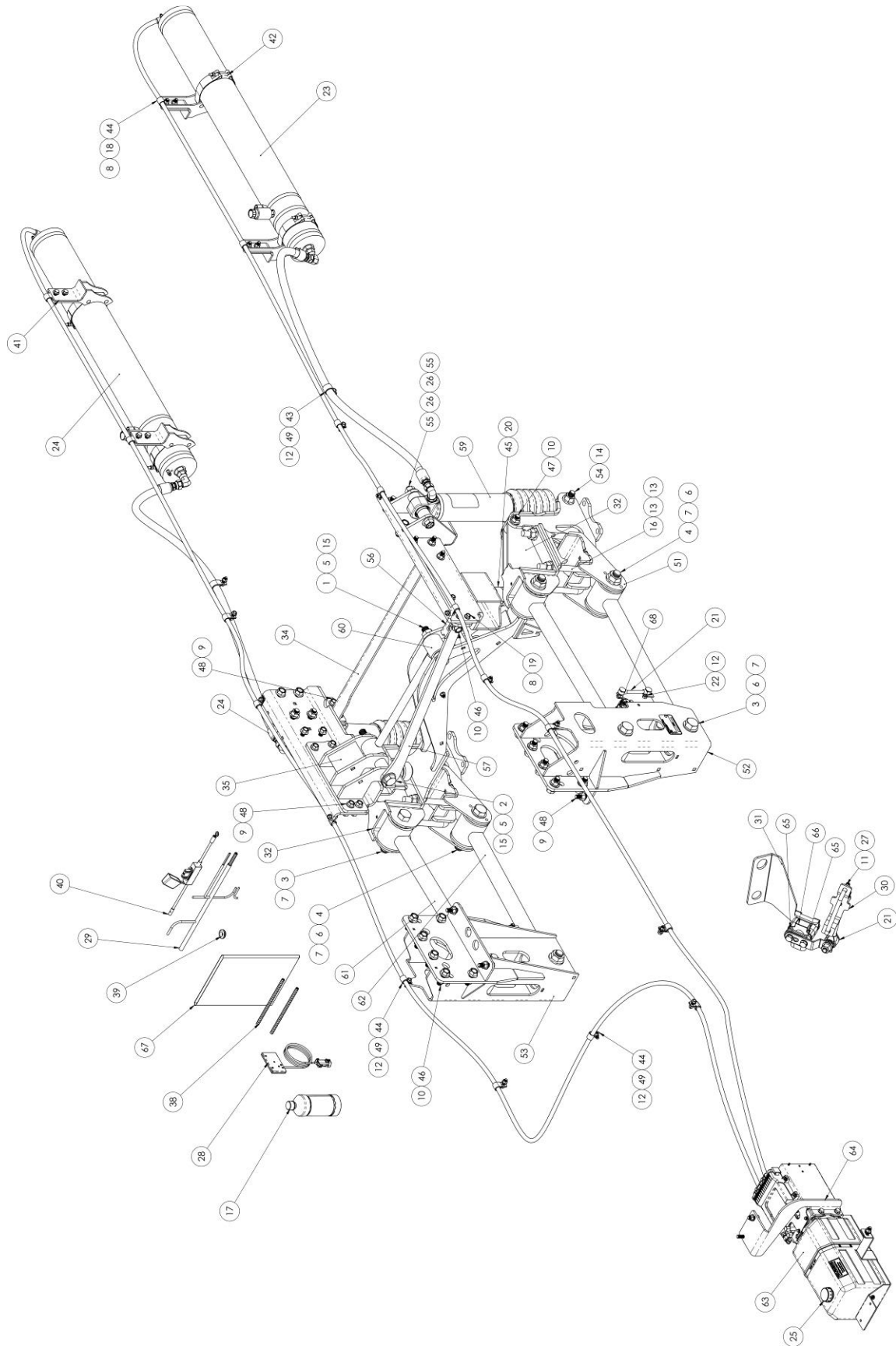
DS135RS3A							
ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	10002-550	HB .875-9x5.500, Gr. 8	40	1	10790-027	USM, LH RAM 4500/5500
2	1	10002-850	HB .875-9x8.500, Gr. 8	41	1	10790-028	USM, RH RAM 4500/5500
3	6	10003-003	HB 1.000-8x6.000, Gr. 8	42	2	10804-002	Spiral Cable Wrap, .375 OD x 8" L
4	2	10003-004	HB 1.000-8x6.500, Gr. 8	43	1	10805-005	Grommet, .63 ID x 1.13 OD x .38 T
5	2	10006-003	HFW .875	44	1	10815-001	Fused Battery Lead
6	6	10006-004	HFW 1.000	45	1	10830-006	Volume Mount
7	8	10012-003	LFN 1-8, Gr G, Top Lock	46	4	10843-003	T-Bolt Clamp, Range 4.88-5.5
8	3	10012-005	LFN 3/8-16, Gr G	47	2	10855-002	Loop Clamp, 1" ID
9	21	10012-007	LFN 1/2-13, Gr. G	48	4	10855-003	Loop Clamp, 5/8" ID
10	23	10012-008	LFN 5/8-11 Gr G	49	2	10867-002	Jounce Bumper, 2.313"Dia x 1.875"T
11	2	10012-009	LFN 1/4-20, Gr. G	50	1	10873-002	LFN M10-1.5, CL 10.9
12	11	10012-010	LFN 5/16-18, Gr. G	51	21	10874-175	HFB 5/8-11x1.750, Gr. 8
13	8	10012-012	LFN 3/4-16, Gr. G	52	2	10874-350	HFB 5/8-11x3.500, Gr 8
14	4	10012-014	LFN 3/4-10 Gr G	53	21	10885-175	HFB 1/2-13 x 1.75, Gr 8
15	2	10012-017	LFN 7/8-9, Gr. G	54	9	10886-100	HFB 5/16-18 x 1.000, Gr. 8
16	4	10064-006	U-Bolt, 3/4-16 x 5.19 x 8.03 SQ	55	1	10889-001	Jounce Bumper Mount Plate
17	2	10237-003	SLW 3/8	56	1	10919-001	Brake line relocation bracket
18	2	10321-034	Hydraulic Fitting, -10 Bulkhead	57	2	10947-019	Lower Axle Clamp
19	2	10321-035	Bulkhead Fitting Locknut	58	1	11057-005	Strut, LH
20	2	10461-003	HCS 3/8-16x.875 Gr 8	59	1	11057-006	Strut, RH
21	1	10474-001	Compressible Fluid, 16 oz. Bottle	60	1	11083-004	Hanger, LH
22	3	10501-150	HFB 3/8-16 x 1.500, Gr. 8	61	1	11084-008	Hanger, RH
23	2	10502-001	HFB M10-1.5 x 30 CL 10.9	62	2	11102-400	HFB 3/4-10 x 4 Gr 8
24	2	10502-002	HFB M10-1.5 x 40 CL 10.9	63	2	11102-600	HFB 3/4-10 x 6 Gr 8
25	3	10587-006	Linkage, 3.938" SS	64	1	11114-004	Tie Plate Mount
26	2	10591-001	Ball Stud, 10mm x 5/16-18	65	1	11115-011	Tie Bar, RAM 4500/5500
27	1	10597-089	2nd Volume, LH	66	1	11198-002	Track Rod
28	1	10597-090	2nd Volume, RH	67	2	11222-002	Upper Control Arm
29	1	10614-001	Cap, Breather	68	2	11222-003	Lower Control Arm
30	8	10640-005	Bearing Spacer, 1.24 x .812 x .318	69	1	11316-001	Volume Mount Adapter
31	1	10669-005	U-Bolt, 1/4-20 x 3.00 x 1.375 Gr 5 SQ	70	1	11316-002	Volume Mount Shim
32	1	10680-001	Driver Interface	71	2	11458-026	Hydraulic Hose, -10 x 26"L
33	1	10704-003	Wiring Harness, Dash	72	1	11506-003	Power Supply, DS135RS3
34	1	10733-002	Steering Ball Stud Mount	73	1	11543	Kit, Power Module Mounting
35	1	10741-007	Steering Sensor Mount	74	2	11639-035	HCS M5-0.8 x 35
36	2	10745-011	Axle Seat	75	1	11675-005	Asy, Sensor
37	1	10762-016	Bridge	76	1	11688	Kit, Document, DS135RS3A
38	1	10782-012	Crossmember Reinforcement	77	2	11752-001	Asy, Sensor
39	1	10789-017	Track Rod Mount				

DS135RS3AF



DS135RS3AF BOM							
ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	10002-550	HB .875-9x5.500, Gr. 8	38	1	10790-028	USM, RH RAM 4500/5500
2	1	10002-850	HB .875-9x8.500, Gr. 8	39	2	10804-002	Spiral Cable Wrap, .375 OD x 8" L
3	6	10003-003	HB 1.000-8x6.000, Gr. 8	40	1	10805-005	Grommet, .63 ID x 1.13 OD x .38 T
4	2	10003-004	HB 1.000-8x6.500, Gr. 8	41	1	10815-001	Fused Battery Lead
5	2	10006-003	HFW .875	42	6	10830-015	Volume Mount
6	6	10006-004	HFW 1.000	43	6	10843-003	T-Bolt Clamp, Range 4.88-5.5
7	8	10012-003	LFN 1-8, Gr G, Top Lock	44	4	10855-002	Loop Clamp, 1" ID
8	15	10012-005	LFN 3/8-16, Gr G	45	6	10855-003	Loop Clamp, 5/8" ID
9	19	10012-007	LFN 1/2-13, Gr. G	46	2	10867-002	Jounce Bumper, 2.313"Dia x 1.875"T
10	23	10012-008	LFN 5/8-11 Gr G	47	21	10874-175	HFB 5/8-11x1.750, Gr. 8
11	2	10012-009	LFN 1/4-20, Gr. G	48	2	10874-350	HFB 5/8-11x3.500, Gr 8
12	15	10012-010	LFN 5/16-18, Gr. G	49	19	10885-175	HFB 1/2-13 x 1.75, Gr 8
13	8	10012-012	LFN 3/4-16, Gr. G	50	13	10886-100	HFB 5/16-18 x 1.000, Gr. 8
14	4	10012-014	LFN 3/4-10 Gr G	51	1	10889-001	Jounce Bumper Mount Plate
15	2	10012-017	LFN 7/8-9, Gr. G	52	1	10919-001	Brake line relocation bracket
16	4	10064-006	U-Bolt, 3/4-16 x 5.19 x 8.03 SQ	53	2	10947-019	Lower Axle Clamp
17	2	10237-003	SLW 3/8	54	1	11057-005	Strut, LH
18	2	10461-003	HCS 3/8-16x.875 Gr 8	55	1	11057-006	Strut, RH
19	1	10474-001	Compressible Fluid, 16 oz. Bottle	56	1	11083-004	Hanger, LH
20	15	10501-150	HFB 3/8-16 x 1.500, Gr. 8	57	1	11084-008	Hanger, RH
21	3	10502-001	HFB M10-1.5 x 30 CL 10.9	58	1	11094	Kit, Power Module Mounting
22	3	10587-006	Linkage, 3.938" SS	59	2	11102-400	HFB 3/4-10 x 4 Gr 8
23	2	10591-001	Ball Stud, 10mm x 5/16-18	60	2	11102-600	HFB 3/4-10 x 6 Gr 8
24	1	10597-053	2nd Volume, LH	61	1	11114-004	Tie Plate Mount
25	1	10597-054	2nd Volume, RH	62	1	11115-011	Tie Bar, RAM 4500/5500
26	1	10614-001	Cap, Breather	63	1	11198-002	Track Rod
27	8	10640-005	Bearing Spacer, 1.24 x .812 x .318	64	2	11222-002	Upper Control Arm
28	1	10669-005	U-Bolt, 1/4-20 x 3.00 x 1.375 Gr 5 SQ	65	2	11222-003	Lower Control Arm
29	1	10680-001	Driver Interface	66	1	11506-003	Power Supply, DS135RS3
30	1	10704-003	Wiring Harness, Dash	67	2	11639-035	HCS M5 x 0.8 x 35
31	1	10733-002	Steering Ball Stud Mount	68	1	11675-005	Asy, Sensor
32	1	10741-007	Steering Sensor Mount	69	1	11688	Kit, Document, DS135RS3
33	2	10745-011	Axle Seat	70	2	11752-001	Asy, Sensor
34	1	10762-016	Bridge				
35	1	10782-012	Crossmember Reinforcement				
36	1	10789-017	Track Rod Mount				
37	1	10790-027	USM, LH RAM 4500/5500				

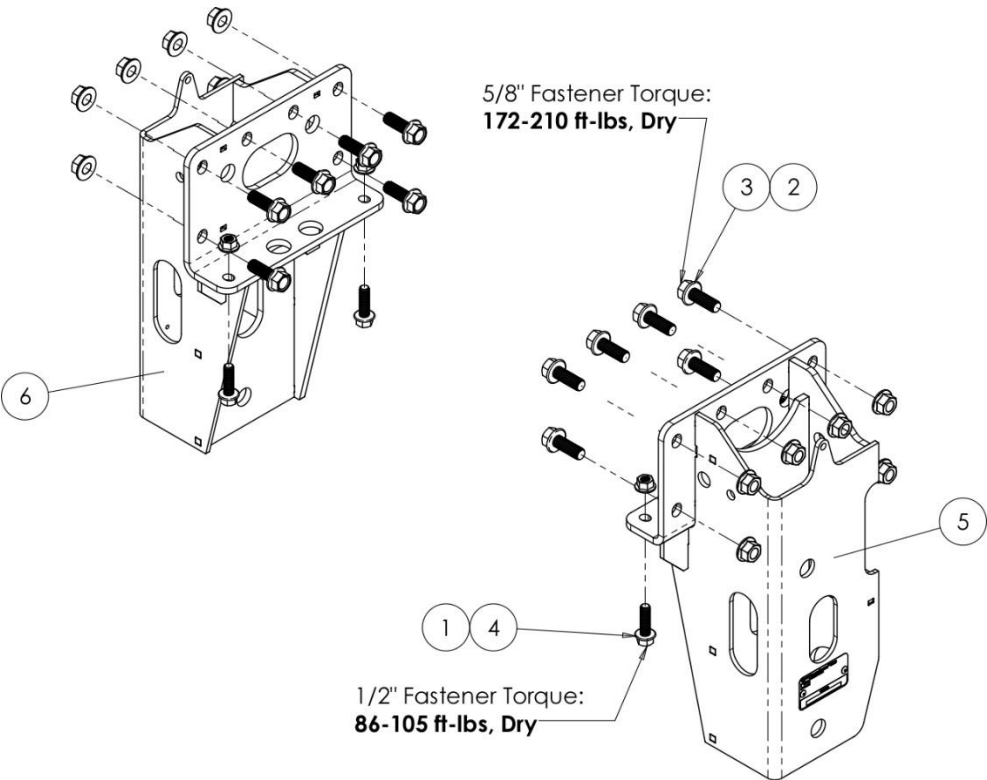
DS135RS3-DM



DS135RS3AF BOM							
ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	10002-550	HB .875-9x5.500, Gr. 8	35	1	10789-017	Track Rod Mount
2	1	10002-850	HB .875-9x8.500, Gr. 8	36	1	10790-067	DM USM, LH
3	6	10003-003	HB 1.000-8x6.000, Gr. 8	37	1	10790-068	DM USM, RH
4	2	10003-004	HB 1.000-8x6.500, Gr. 8	38	2	10804-002	Spiral Cable Wrap, .375 OD x 8" L
5	2	10006-003	HFW .875	39	1	10805-005	Grommet, .63 ID x 1.13 OD x .38 T
6	6	10006-004	HFW 1.000	40	1	10815-001	Fused Battery Lead
7	8	10012-003	LFN 1-8, Gr G, Top Lock	41	4	10830-015	Volume Mount
8	11	10012-005	LFN 3/8-16, Gr G	42	4	10843-003	T-Bolt Clamp, Range 4.88-5.5
9	19	10012-007	LFN 1/2-13, Gr. G	43	2	10855-002	Loop Clamp, 1" ID
10	23	10012-008	LFN 5/8-11 Gr G	44	17	10855-003	Loop Clamp, 5/8" ID
11	2	10012-009	LFN 1/4-20, Gr. G	45	2	10867-003	Jounce Bumper, 2.313"Dia x 1.875"T
12	23	10012-010	LFN 5/16-18, Gr. G	46	21	10874-175	HFB 5/8-11x1.750, Gr. 8
13	8	10012-012	LFN 3/4-16, Gr. G	47	2	10874-350	HFB 5/8-11x3.500, Gr 8
14	4	10012-014	LFN 3/4-10 Gr G	48	19	10885-175	HFB 1/2-13 x 1.75, Gr 8
15	2	10012-017	LFN 7/8-9, Gr. G	49	21	10886-100	HFB 5/16-18 x 1.000, Gr. 8
16	4	10064-006	U-Bolt, 3/4-16 x 5.19 x 8.03 SQ	50	1	10919-001	Brake line relocation bracket
17	1	10474-001	Compressible Fluid, 16 oz. Bottle	51	2	10947-019	Lower Axle Clamp
18	8	10501-002	HFB 3/8-16 x 1.250, Gr. 8	52	1	11083-013	DM Hanger, LH
19	3	10501-150	HFB 3/8-16 x 1.500, Gr. 8	53	1	11084-026	DM Hanger, RH
20	2	10502-001	HFB M10-1.5 x 30 CL 10.9	54	2	11102-400	HFB 3/4-10 x 4 Gr 8
21	3	10587-006	Linkage, 3.938" SS	55	2	11102-600	HFB 3/4-10 x 6 Gr 8
22	2	10591-001	Ball Stud, 10mm x 5/16-18	56	1	11114-004	Tie Plate Mount
23	1	10597-135	2nd Volume, LH	57	1	11115-011	Tie Bar, RAM 4500/5500
24	1	10597-136	2nd Volume, RH	58	1	11185-007	Strut, LH
25	1	10614-001	Cap, Breather	59	1	11185-008	Strut, RH
26	8	10640-005	Bearing Spacer, 1.24 x .812 x .318	60	1	11198-002	Track Rod
27	1	10669-005	U-Bolt, 1/4-20 x 3.00 x 1.375 Gr 5 SQ	61	2	11222-002	Upper Control Arm
28	1	10680-001	Driver Interface	62	2	11222-003	Lower Control Arm
29	1	10704-003	Wiring Harness, Dash	63	1	11506-003	Power Module, DS135RS3
30	1	10733-002	Steering Ball Stud Mount	64	1	11543	Kit, Power Module Mounting
31	1	10741-007	Steering Sensor Mount	65	2	11639-035	HCS M5-0.8 x 35
32	2	10745-011	Axle Seat	66	1	11675-005	Asy, Sensor
33	1	10762-019	DM Bridge	67	1	11688	Kit, Document, DS135RS3
34	1	10782-012	Crossmember Reinforcement	68	2	11752-001	Asy, Sensor

Installation

Front Hangers

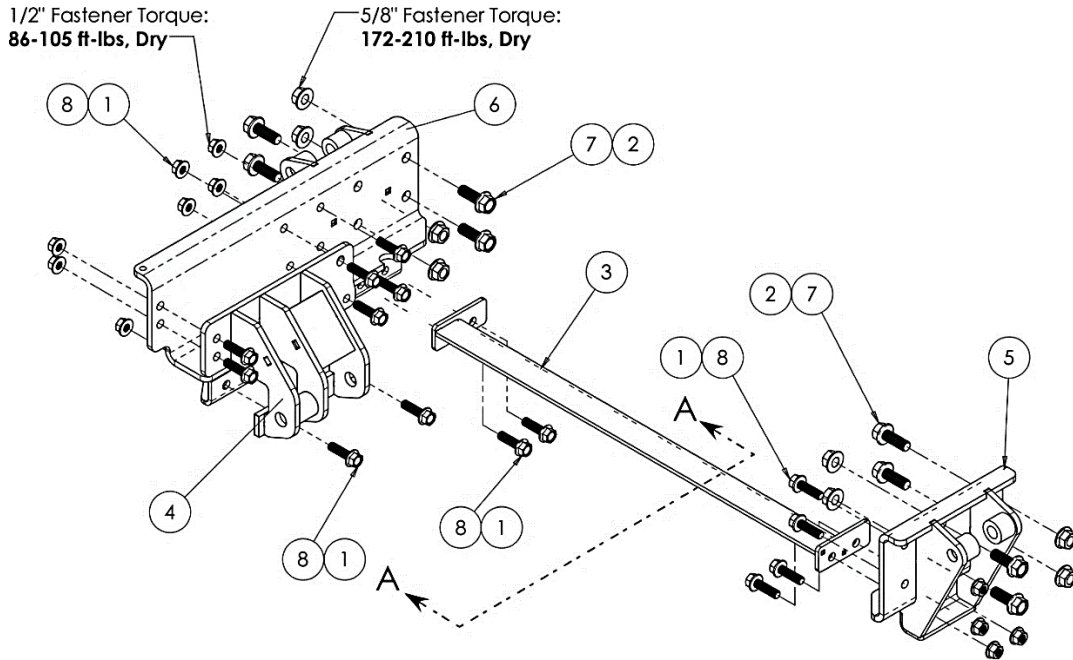


ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	4	10012-007	LFN 1/2-13, Gr. G	5	1	11083-004	LH, Front Hanger
2	12	10012-008	LFN 5/8-11, Gr. G			11083-013	LH, Front Hanger RS3-DM
3	12	10874-175	HFB 5/8-11 x 1.75, Gr. 8	6	1	11084-008	RH, Front Hanger
4	4	10885-175	HFB 1/2-13x1.75, Gr. 8			11084-026	RH, Front Hanger RS3-DM

Note: Enlarge holes in the frame rail to Ø21/32" for installing 5/8" bolts in 12 locations.

1. Install hangers in OEM front hanger locations
2. Loosely tighten 1/2" fasteners on the lower flange to hold hanger up close to the frame.
3. Torque 1/2"-13 nuts to **86-105 ft-lbs.**
4. Torque 5/8"-11 nuts to **172-210 ft-lbs.**

Upper Strut Mounts



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	14	10012-007	LFN 1/2-13, Gr. G	5	1	10790-067	LH, USM RS3-DM
2	8	10012-008	LFN 5/8-11, Gr. G	6	1	10790-028	RH, USM
3	1	10782-012	Crossmember Reinforcement			10790-068	RH, USM RS3-DM
4	1	10789-017	Track Rod Mount	7	8	10874-175	HFB 5/8-11 x 1.75, Gr. 8
5	1	10790-027	LH, USM	8	14	10885-175	HFB 1/2-13 x 1.75, Gr. 8

1. Loosely attach all components through previously drilled holes in frame.

IMPORTANT: Orient fasteners as shown. Make certain the 5/8\"

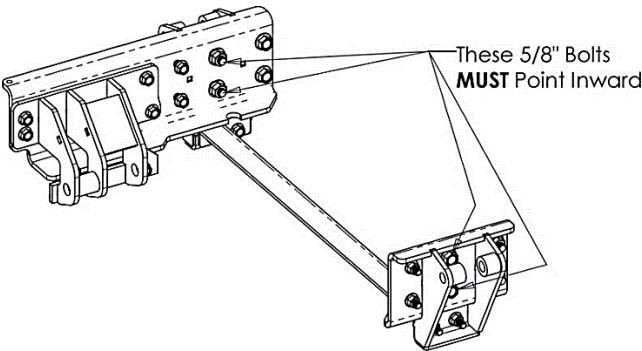
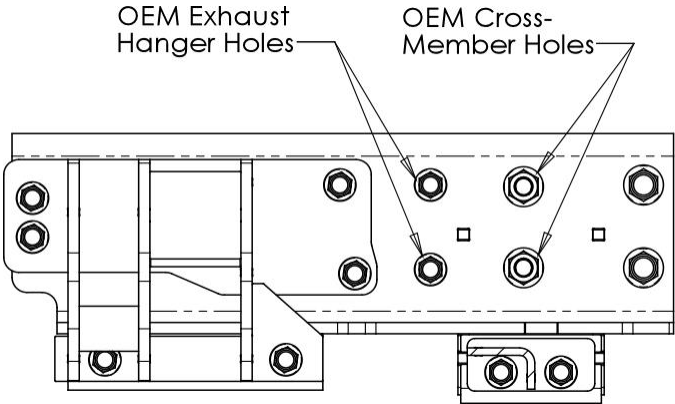


Figure 5: 5/8\"

Note: Exhaust hanger bracket holes will need enlarged to Ø17/32\"



Figure 6: Enlarge holes to Ø17/32\"

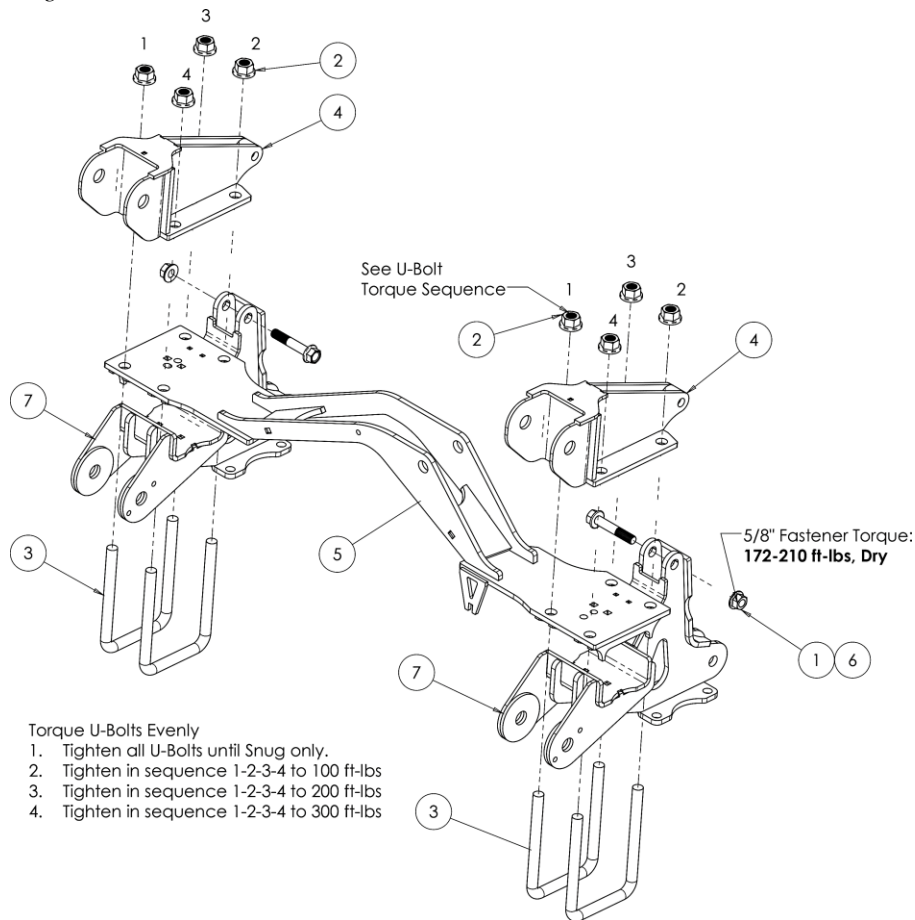


Section A-A: Section View looking at RH Side

Note: Use of a floor jack may be necessary to hold the mounts flush.

2. Tighten and torque all 5/8-11 nuts to **172-210 ft-lbs.**
3. Tighten and torque all 1/2-13 nuts to **86-105 ft-lbs.**

Bridge and Axle Clamp Hangers



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	10012-008	LFN 5/8-11, Gr. G	5	1	10762-019	Bridge RS3-DM
2	8	10012-012	LFN 3/4-16, Gr. G	6	2	10874-350	HFB 5/8-11 x 3.50, Gr. 8
3	4	10064-006	U-Bolt, 3/4-16 x 5.19 x 8.03 SQ	7	2	10947-019	Lower Axle Clamp
4	2	10745-011	Axle Seat	*8	2	10804-002	Spiral Cable Wrap, 3/8"OD x 8" L
5	1	10762-016	Bridge				

*Note: Item 8 is not shown in the above view, reference step 7 for installing.

1. Relocate Passenger parking brake cable mounted in front of axle as shown in Figure 7.

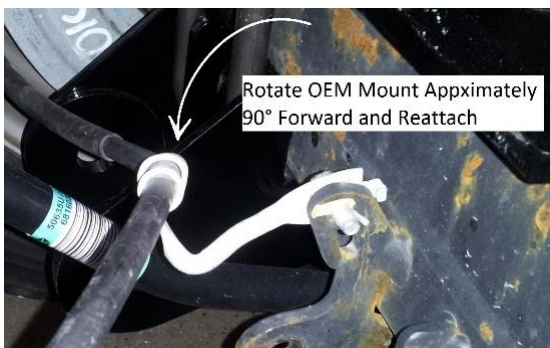


Figure 7: Rotated OEM Pkg Brake Cable Mount

2. Place the Bridge on top of the axle using the shock mount tab for locating. See Figure 8.

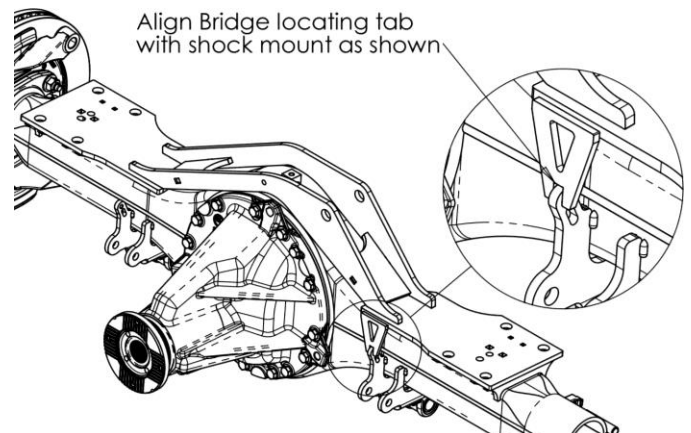


Figure 8: Locate Bridge on Shock Mount

IMPORTANT: Re-Attach OEM flexible brake line brackets using OEM M8 hardware to the back side of the Bridge prior to installing the Lower Axle Cradle. Torque M8 bolts to **17 ft-lbs.** See Figure 9.

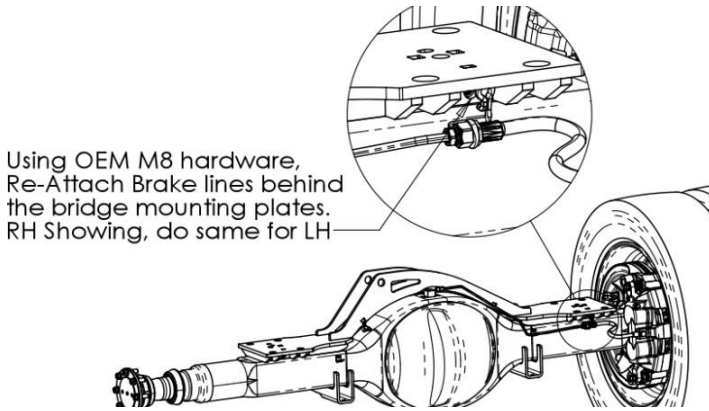


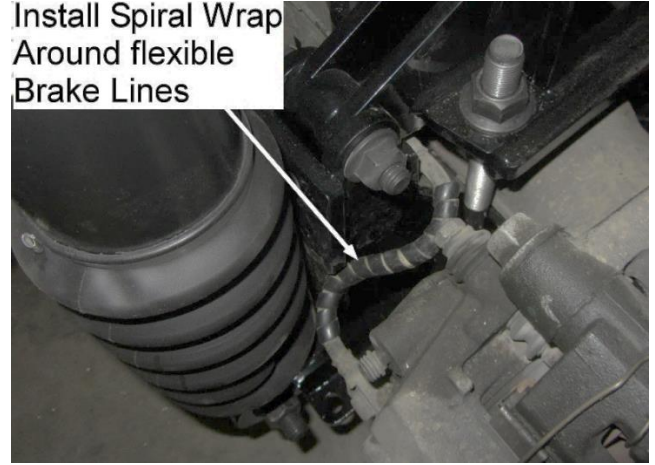
Figure 9: Attach flexible brake lines to bridge

3. Place the Axle Seats on top of the bridge, making sure the tabs align and is sitting flush.
4. Place the LH Axle Cradle under the axle and loosely attach to the Axle Seat using the 5/8" hardware.
5. Slip the 3/4" U-bolts into position. Lightly tighten u-bolts. Repeat installation for RH side.
6. **Torque, the U-bolt nuts evenly in an X-type pattern in 4 stages:**
 - **Stage 1: Tighten snug only.**
 - **Stage 2: Torque to 100 ft-lbs.**
 - **Stage 3: Torque to 200 ft-lbs.**
 - **Stage 4: Torque to 300 ft-lbs].**

Note: U-Bolt Torques for Dry Fasteners. Reduce torques 20% for use with Anti-Seize.

7. Install 3/8" spiral wrap around flexible brake lines where they attach to the brake calipers, both Driver and Passenger side. Make sure the brake lines are routed so they don't contact the struts.
8. Reattach Passenger Parking Brake cable to the bridge over the center of the axle using 5/16" hardware included in the kit. Torque hardware to 14-17 ft-lbs. See additional instructions for Parking Brake Cable, page 32

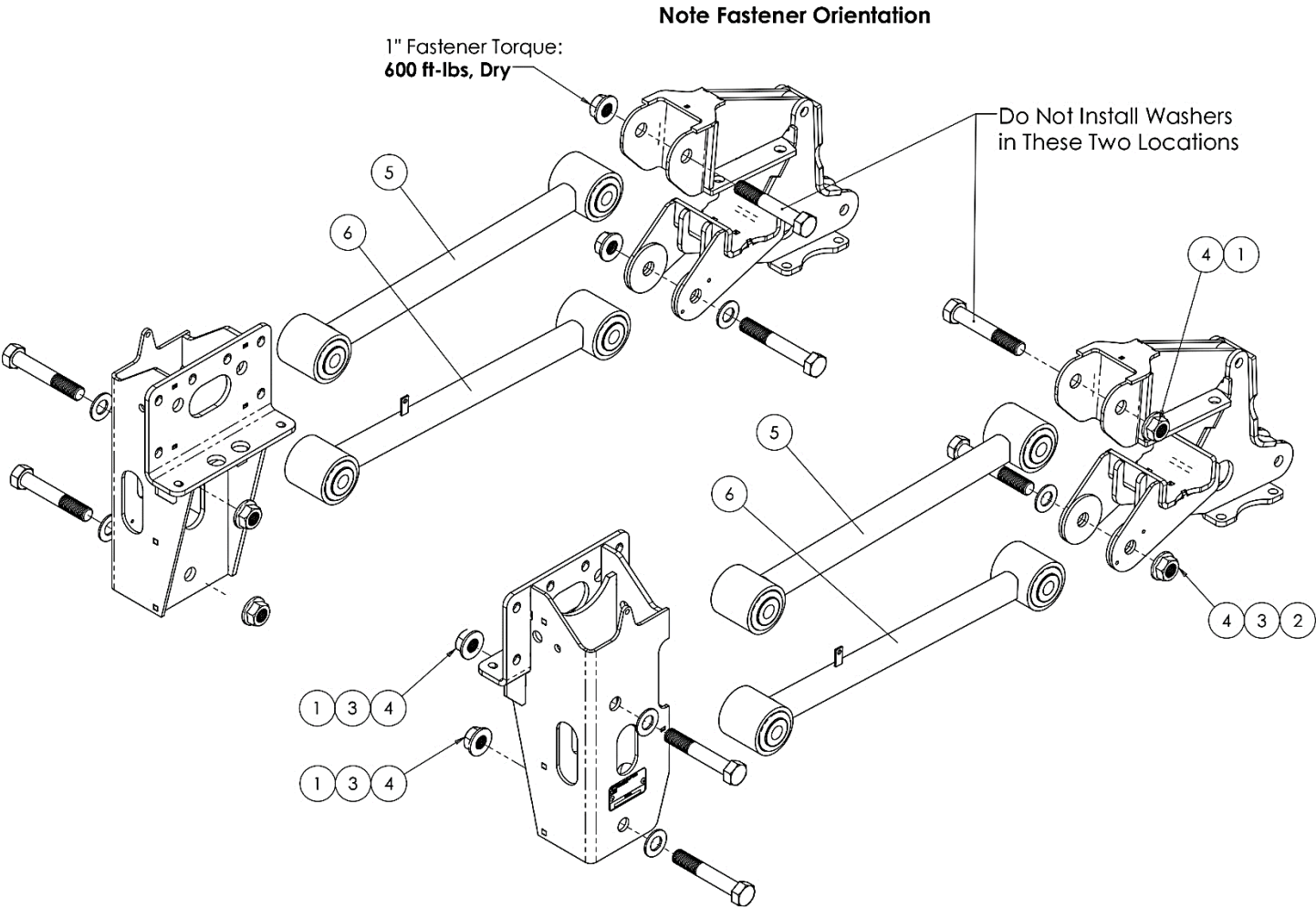
Install Spiral Wrap Around flexible Brake Lines



IMPORTANT: Failure to install protective spiral wrap could allow the rubber brake lines to wear against the strut boots potentially causing brake failure.

Note: Pay close attention to hydraulic brake lines and be sure they do not chafe against sharp edges. In some instances, the OEM brake lines may need adjusted to allow additional clearance where necessary.

Control Arms



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	6	10003-003	HB 1.00-8 x 6.00, Gr. 8	4	8	10012-003	LFN 1-8, Gr G
2	2	10003-004	HB 1.00-8 x 6.50, Gr. 8	5	2	11222-002	Upper Control Arm
3	6	10006-004	HFW 1.00	6	2	11222-003	Lower Control Arm

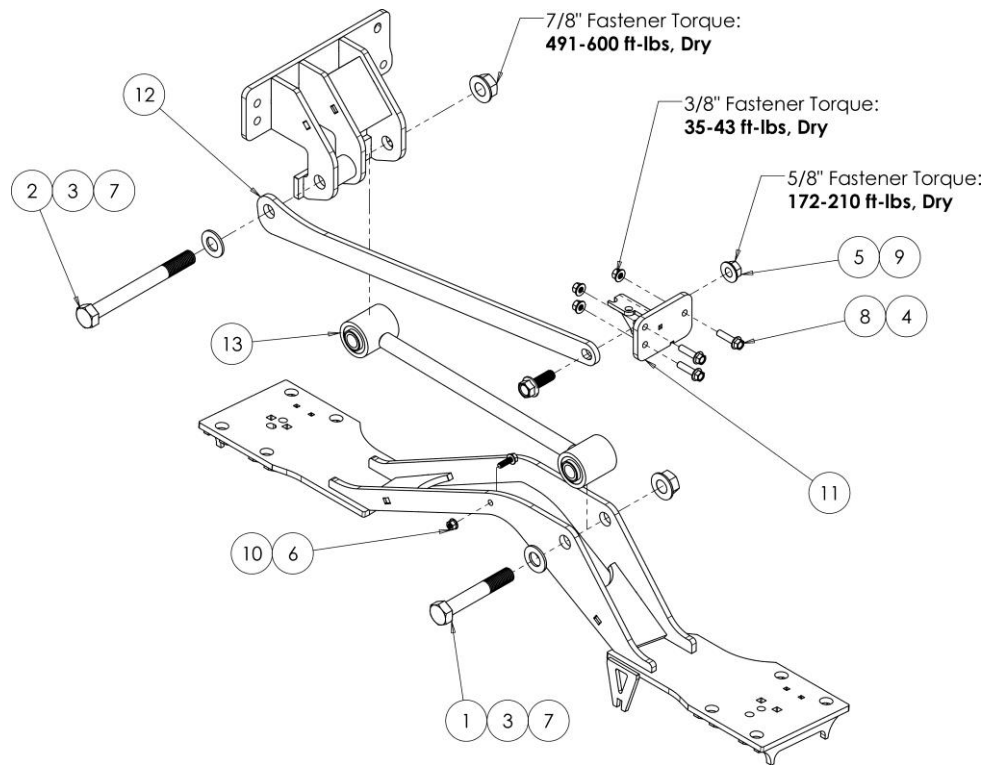
1. Locate control arms and install as shown.

Note: Height sensor tab is pointed up and located forward on Lower Control Arms.

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 Tie Plate



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	10002-550	HB 7/8-9 x 5.50, Gr. 8	8	3	10501-150	HFB 3/8-16 x 1.50, Gr. 8
2	1	10002-850	HB 7/8-9 x 8.50, Gr. 8	9	1	10874-175	HFB 5/8-11 x 1.75, Gr. 8
3	2	10006-003	HFW 7/8-9, Gr. G	10	1	10886-100	HFB 5/16-18 x 1.00, Gr. 8
4	3	10012-005	LFN 3/8-16, Gr. G	11	1	11114-004	Tie Plate Mount
5	1	10012-008	LFN 5/8-11, Gr. G	12	1	11115-011	Tie Bar, RAM 4500/5500
6	1	10012-010	LFN 5/16-18, Gr. G	13	1	11198-002	Track Rod
7	2	10012-017	LFN 7/8-9, Gr. G				

Note: Prior to installing components, one hole will need drilled in the frame.

Caution: Do not drill into fuel or brake lines, when drilling through the frame rail.

- Using the tie plate mount as a template, mark the third mounting hole in the frame and drill to Ø13/32 to allow mounting with 3/8" hardware. See Fig. 12

Mark and drill hole to Ø13/32.

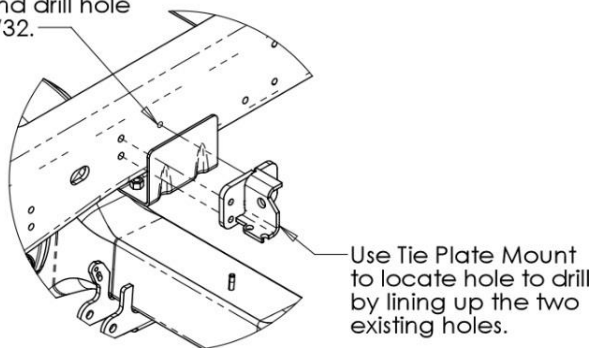


Figure 10: Placing mount upside down - outside the frame, mark hole and drill from the outside.

- Install the Tie Plate Mount inside the frame and attach the OEM fuel and brake lines on top of the bracket.



Figure 11: Tie Plate Bracket installed with fuel and brake lines reattached

3. Re-Attach brake line standoff to included bracket
P/N: 10919-001. See Figure 12

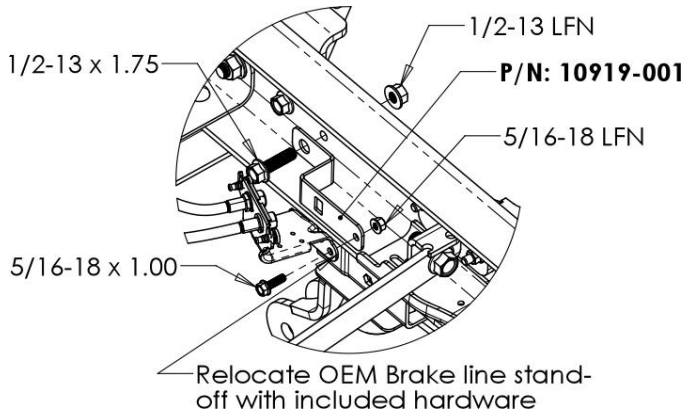


Figure 12: Install Brake line standoff bracket

4. Torque 5/16" fastener to 14-17 ft-lbs, dry.
5. Torque 1/2" fastener to 86-105 ft-lbs, dry.
6. Raise or Lower Axle until Design Ride height is achieved. Ride Height is approximately when the CL of axle to bottom of frame is 10-1/8", See Figure 13.

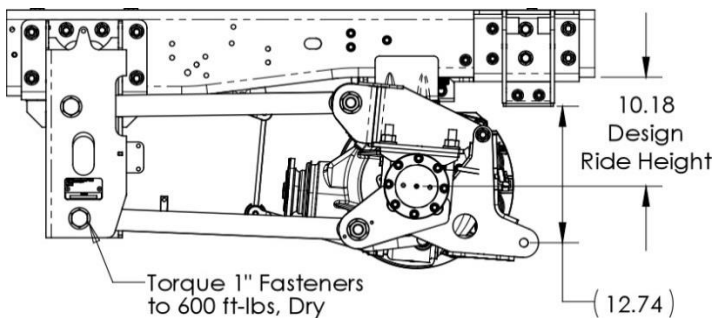
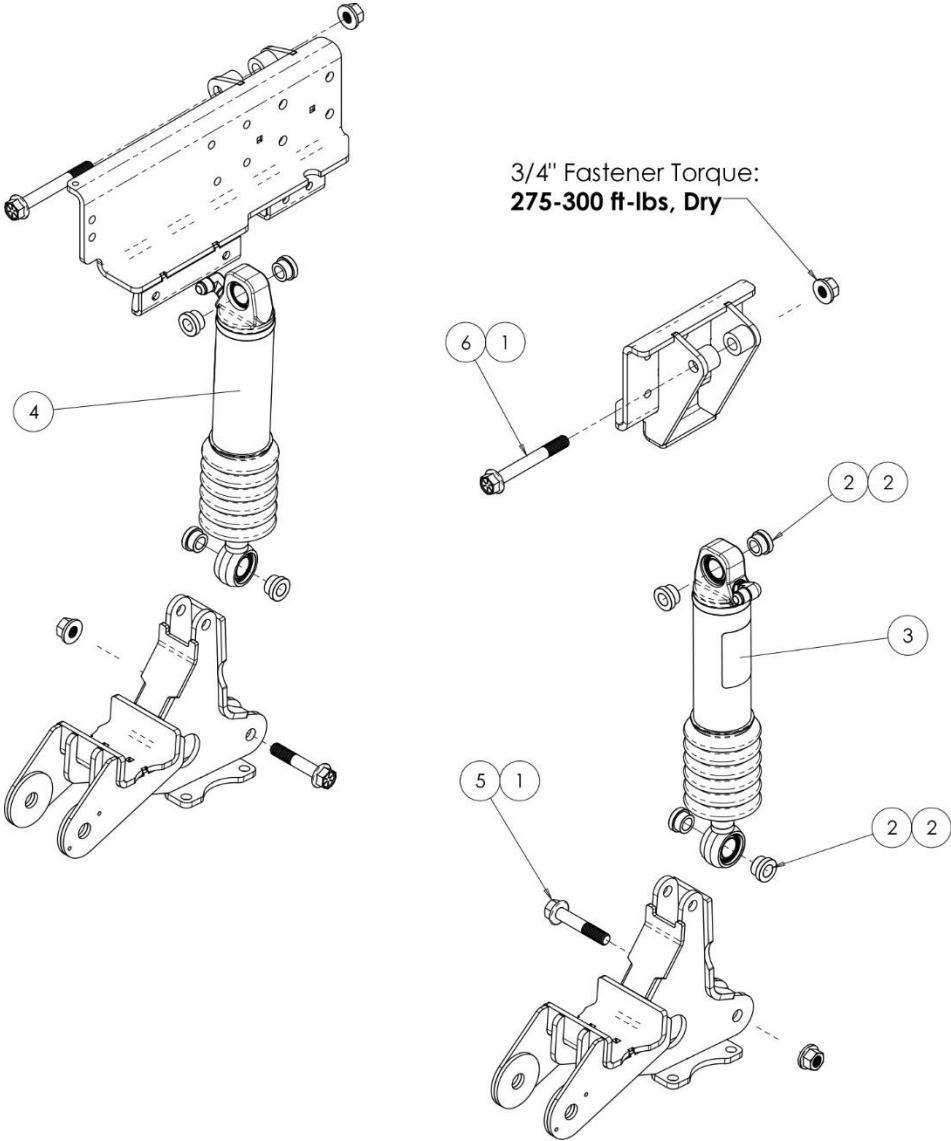


Figure 13: Adjust frame or axle to ride height when tightening control arm fasteners.

7. Tighten and Torque the (3) 3/8" Tie Plate Mount bolts to **35-43 ft-lbs, Dry.**
8. Tighten and Torque the (1) 5/8" Tie Plate fastener to **172-210 ft-lbs, Dry.**
9. **IMPORTANT: Vehicle must be at ride height when tightening control arms and Track Rod, to prevent premature wear of bushings from excess twist in the rubber.**
10. Tighten and Torque the two (2) 7/8" Track Rod mounting bolts to **491-600 ft-lbs, Dry.**
11. Torque the (8) 1" Control Arm Bolts to **600 ft-lbs.**

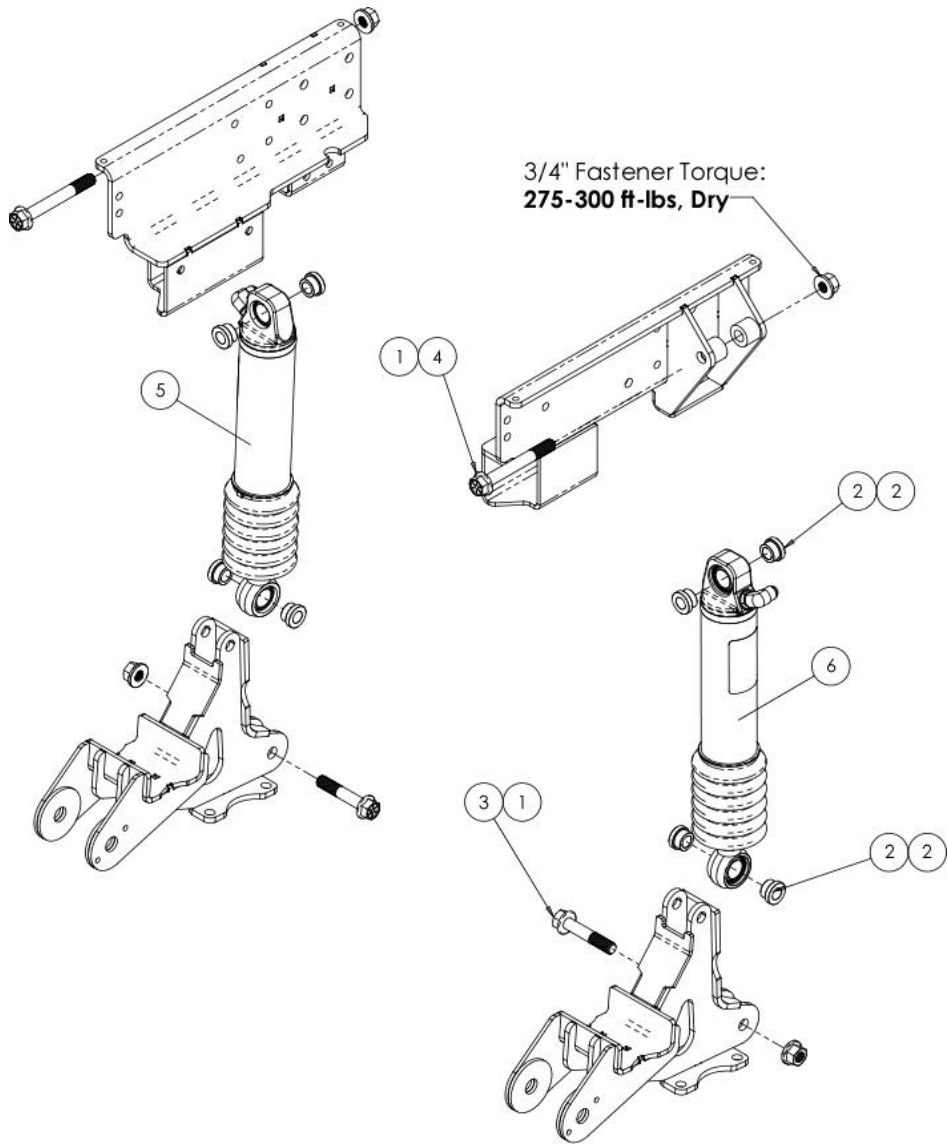
Struts



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	4	10012-014	LFN 3/4-10 Gr. G	4	1	11057-006	RH Strut
2	8	10640-005	Bearing Spacer, 1024 x .812 x .318	5	2	11102-400	HFB 3/4-10 x 4 Gr. 8
3	1	11057-005	LH Strut	6	2	11102-600	HFB 3/4-10 x 6.00 Gr. 8

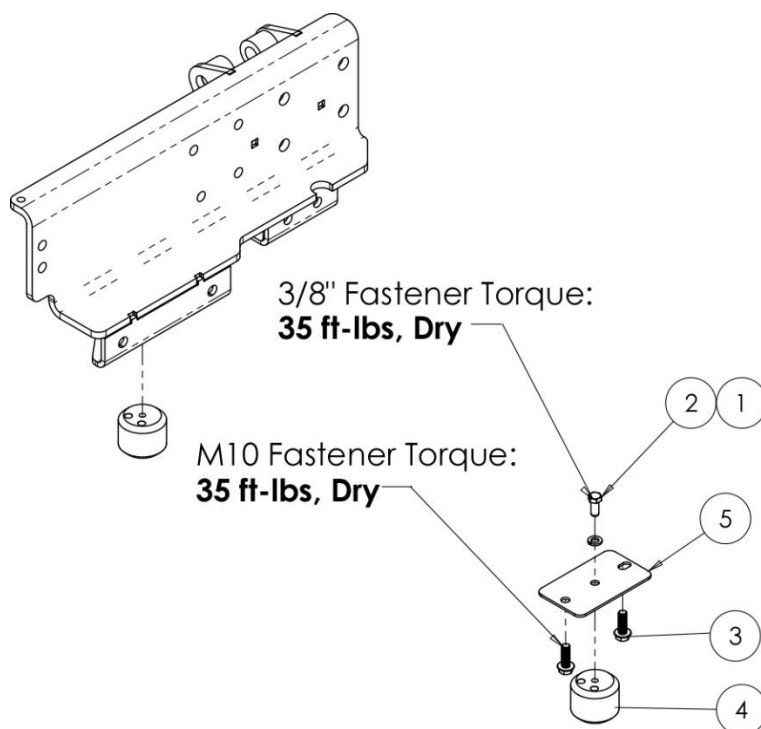
1. Install Struts as shown above with -10 ports pointing forward.
2. Torque 3/4-10 fasteners to **275-300 ft-lbs, Dry**.

Struts (DS135RS3-DM)



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	4	10012-014	LFN 3/4-10 Gr. G	4	2	11102-600	HFB 3/4-10 x 6.00 Gr. 8
2	8	10640-005	Bearing Spacer, 1024 x .812 x .318	5	1	11185-007	RH Strut
3	2	11102-400	HFB 3/4-10 x 4 Gr. 8	6	1	11185-008	LH Strut

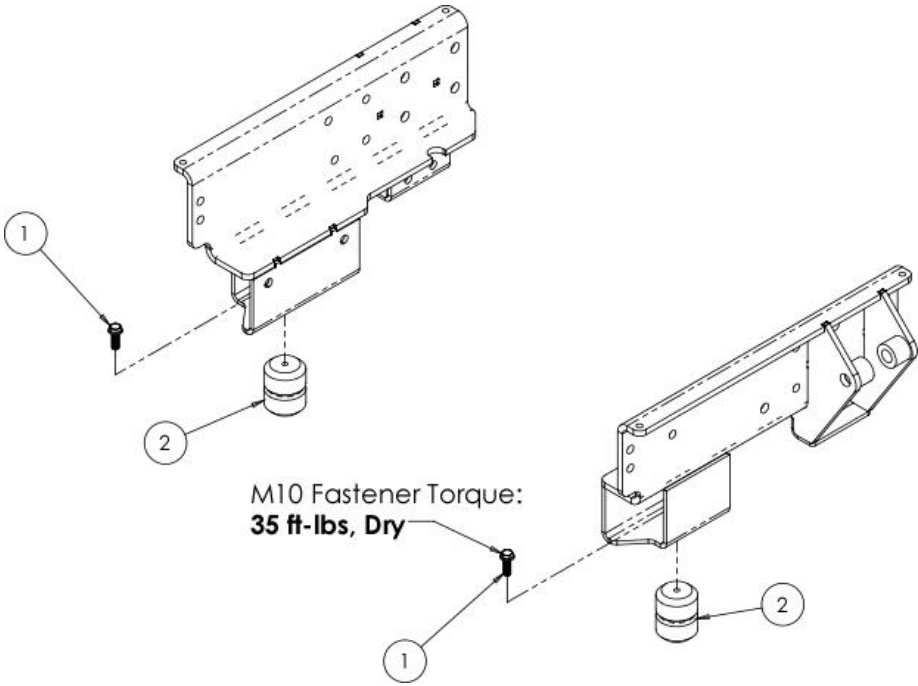
3. Install Struts as shown above with -10 ports pointing forward.
4. Torque 3/4-10 fasteners to **275-300 ft-lbs, Dry**.

Jounce Bumpers

ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	10237-003	SLW 3/8	4	2	10867-002	Jounce Bumper, 2.31" Dia x 1.88 T
2	2	10461-003	HCS 3/8-16x.875, Gr. 8	5	1	10889-001	Jounce Bumper Plate
3	2	10502-001	HFB M10-1.5 x 30 CL 10.9				

1. Locate two jounce bumpers, two 3/8-16 Cap Screws, and two split lock washers from the kit.
2. Install the driver side bumper to the bumper plate and torque bumper to **35 ft-lbs**, then attach with M10 hardware to the original location and torque M10 fasteners to **35 ft-lbs**.
3. Attach the passenger side bumper through the bottom of the passenger upper strut mount and torque bumper to **35 ft-lbs**.

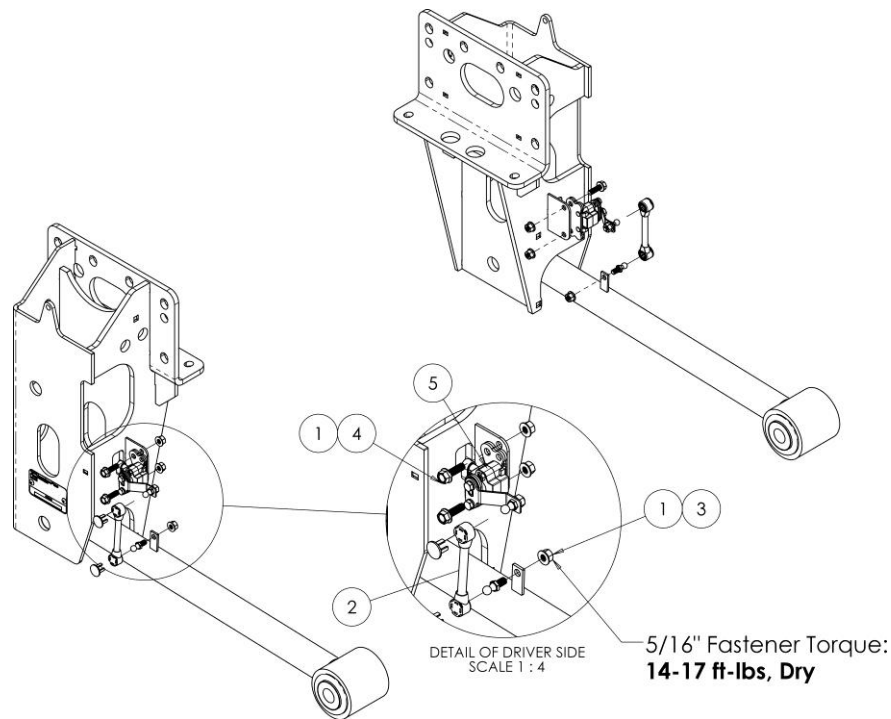
Jounce Bumpers (DS135RS3-DM)



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	10502-001	HFB M10-1.5 x 30	4	2	10867-003	Jounce Bumper

1. Locate and install Jounce Bumpers using M10 bolts.
2. Torque M10 fasteners to **35 ft-lbs**.

Height Sensors



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	6	10012-010	LFN 5/16-18, Gr. G	4	4	10886-100	HFB 5/16-18 x 1.00, Gr. 8
2	2	10587-006	Linkage	5	2	11752-001	Asy, Sensor
3	2	10591-001	Ball Stud, 10mm x 5/16-18				

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

1. Install Height Sensors as shown above. Refer to **Figure 14** or **Figure 15** for detail of linkage.
2. Repeat with the Right Hand (Passenger Side).

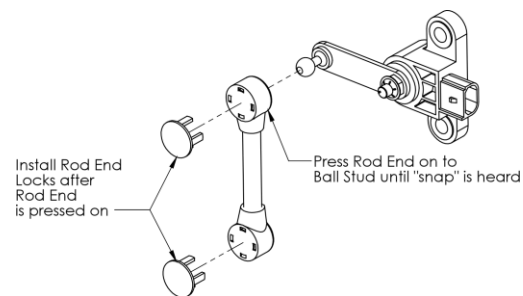


Figure 14. Height Sensor Plastic Linkage End Installation.

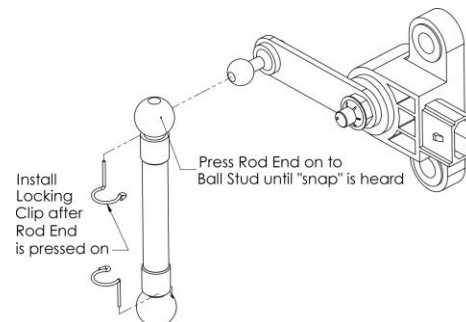
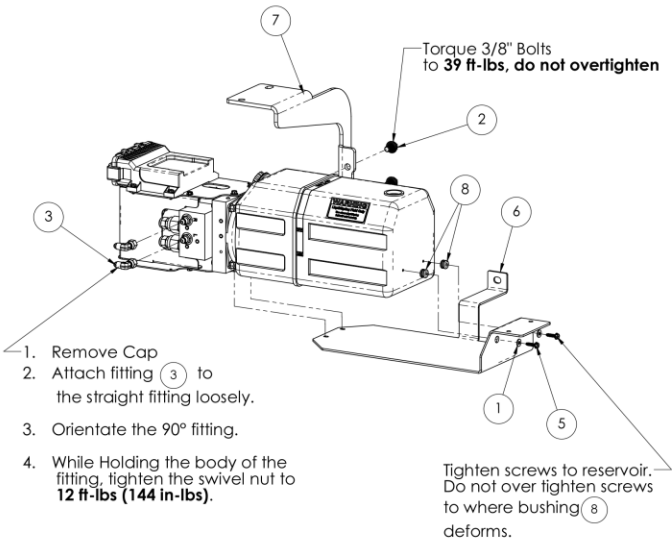
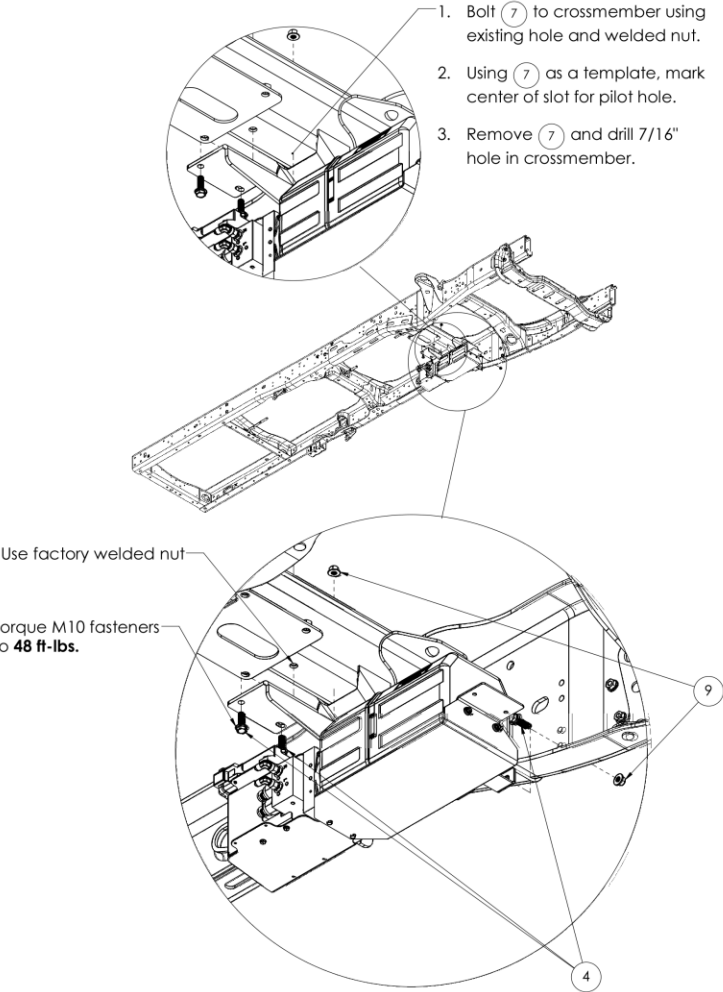


Figure 15. Height Sensor Metal Linkage End Installation.

Power Module Installation (DS135RS3A/RS3-DM)

Step 1: Drill hole in crossmember for Power Module Manifold Mount



Step 2: Attach Brackets to Powermodule as shown.

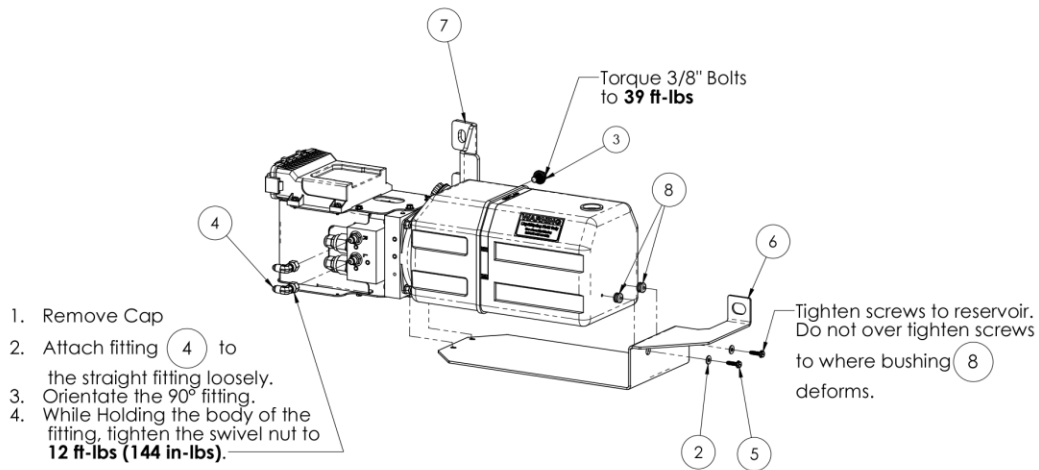
Step 3: Install Power Module on Driver side. Use brackets as shown and M10 bolts to attach using existing hole and drilled hole in crossmember .

ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	10088-001	FW #10	6	1	10798-028	Reservoir Mount
2	2	10252-003	SFHS 3/8-16 x .625, Gr 8	7	1	10799-025	Manifold Mount
3	2	10322-021	Hydraulic Fitting 90, -4 37 x -4 37 F	8	2	10805-004	Grommet, .19 ID x .56 OD x .375 T
4	3	10502-001	HFB M10-1.5 x 30 CL 10.9	9	2	10885-125	LFN M10-1.5, CL 10.9
5	2	10510-002	STS #10-16 x .75, Hex Head	10	1	11506-001	Power Module

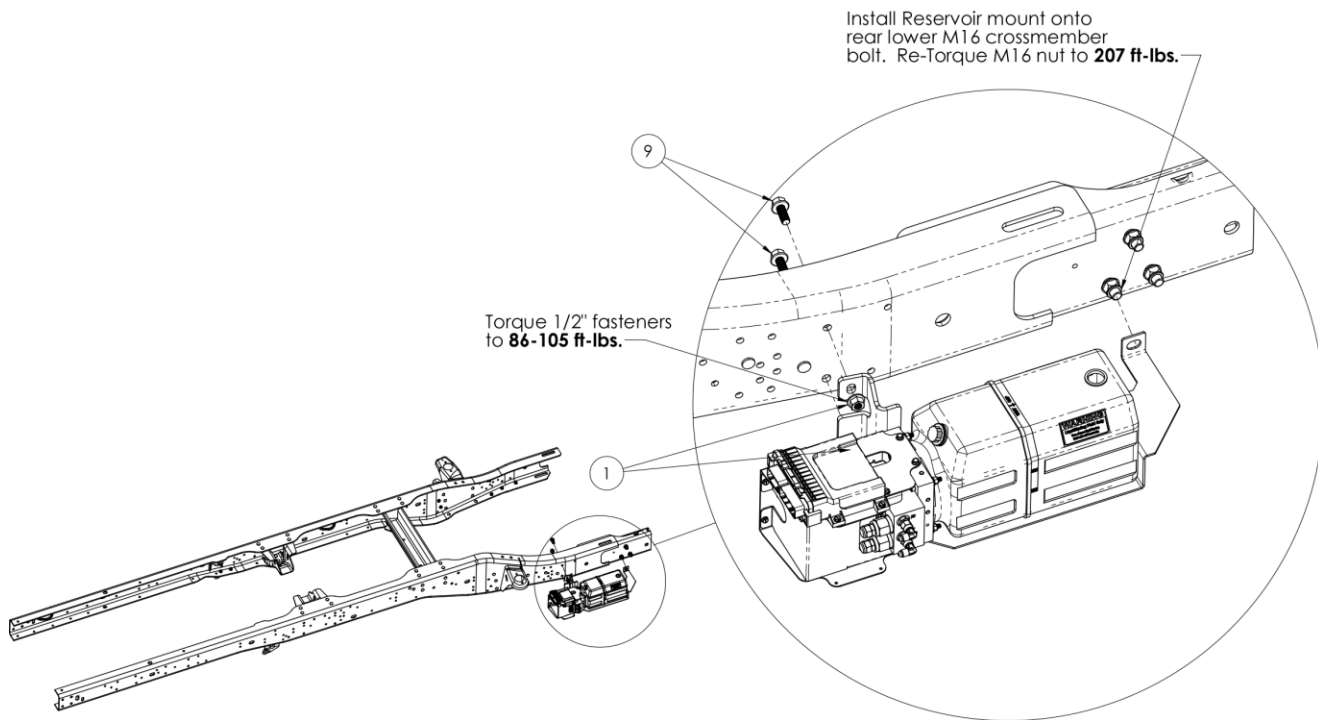
1. Locate the Power Module Assembly and Power Module Mounting Kit.
2. Assemble as shown and mount onto chassis under the crossmember on driver side.

Power Module Installation (DS135RS3AF)

Step 1: Attach Brackets to Powermodule as shown.



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

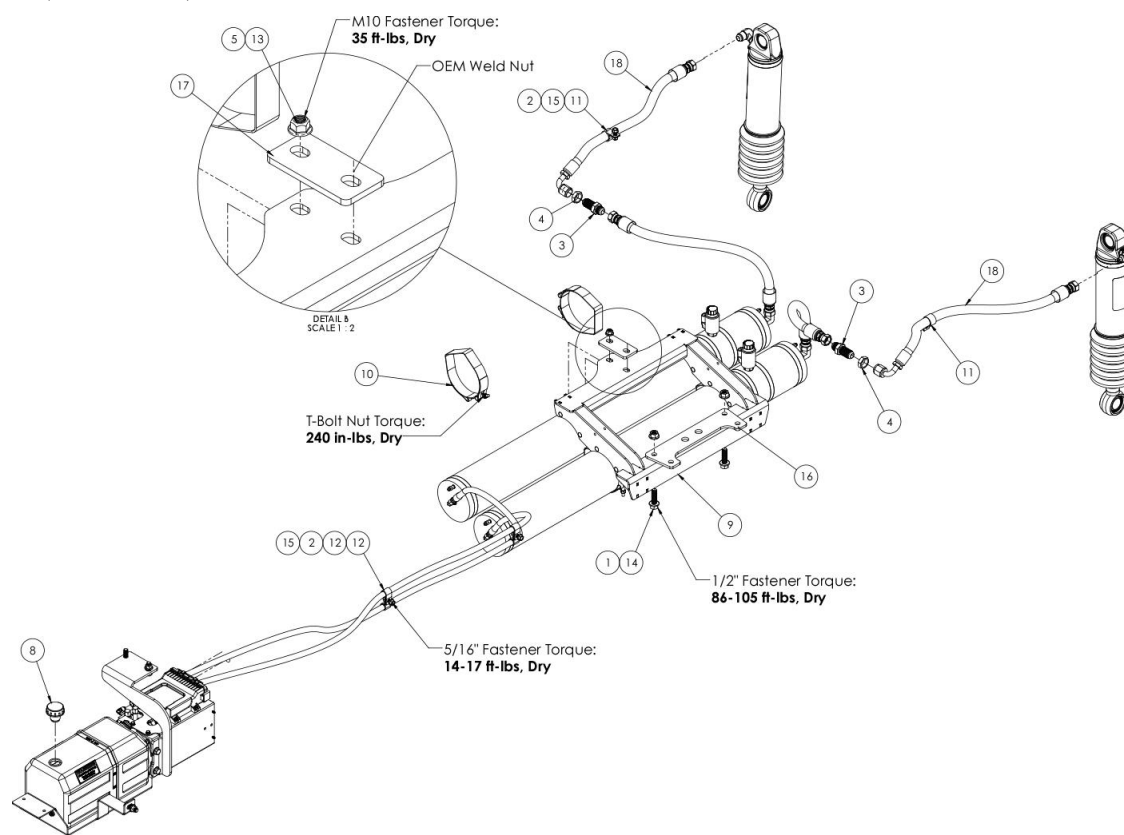


ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	10012-007	LFN 1/2-13, Gr. G	6	1	10798-013	Reservoir Mount
2	2	10088-001	FW #10	7	1	10799-012	Manifold Mount
3	2	10252-003	SFHS 3/8-16 x .625, Gr 8	8	2	10805-004	Grommet, .19 ID x .56 OD x .375 T
4	2	10322-021	Hydraulic Fit 90, -4 37 x -4 37 F	9	2	10885-125	HFB 1/2-13 x 1.25, Gr. 8
5	2	10510-002	STS #10-16 x .75, Hex Head	10	1	11506-001	Power Module

1. Locate the Power Module Assembly and Power Module Mounting Kit.

2. Assemble as shown and mount onto chassis under the cab on passenger side.

Secondary Volumes (DS135RS3A)



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	10012-007	LFN 1/2-13, Gr. G	10	4	10843-003	T-Bolt Clamp, Range 4.88-5.5
2	3	10012-010	LFN 5/16-18, Gr. G	11	2	10855-002	Vinyl Coated Loop Clamp, 1" ID
3	2	10321-034	Hyd. Fitting, -10 x -10 Bulkhead	12	4	10855-003	Vinyl Coated Loop Clamp, 5/8" ID
4	2	10321-035	Hyd. Fitting -10 Bulkhead Locknut	13	1	10873-002	LFN M10-1.5, CL 10.9
5	2	10502-002	HFB M10-1.5x40 CL 10.9	14	2	10885-175	HFB 1/2"-13 x 1.75" Gr 8
6	1	10597-089	2 nd Volume, LH	15	3	10886-100	HFB 5/16"-18 x 1.00" Gr 8
7	1	10597-090	2 nd Volume, RH	16	1	11316-001	Volume Mount Adapter
8	1	10614-001	Breather Cap	17	1	11316-002	Volume Mount Shim
9	1	10830-006	Volume Mount, Twin	18	2	11458-026	Hydraulic Hose, -10 x 26"L

1. Locate the Volume Mount Adapter and attach it to the bottom of the driver side Front Hanger, using the 1/2" fasteners used to attach the front hanger to the bottom of the frame. See Figure 16
2. Locate the Volume Mount Shim, (2) M10-1.5 x 40mm bolts, (1) M10 nut, (2) 1/2-13 Bolts, and (2) 1/2-13 lock nuts.
3. Slip the Shim between the Volume Mount and OEM crossmember, and snug a M10 bolt into the OEM weld nut.
4. Using the weld mount and shim as a template, drill a Ø7/16" hole into the crossmember and attach using the remaining M10 bolt and locknut.

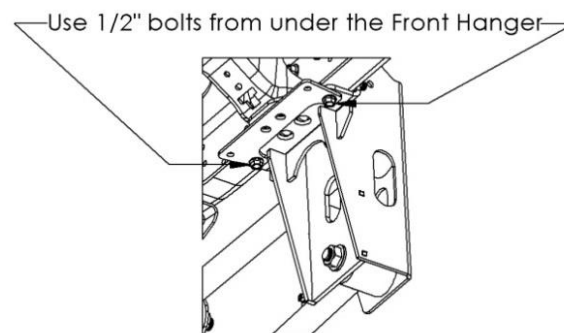


Figure 16. Use 1/2" bolts from under the front hanger

5. Loosely attach the Volume Mount to the adapter, attach to the left side Hanger with 1/2" fasteners.
6. Locate the Right Hand Secondary Volume Assembly.

7. Torque 1/2-13 fasteners to **86-105 ft-lbs.**
8. Torque M10 fasteners to **43-53 ft-lbs.**
9. Raise the Volume Assembly until the volume contacts the upper attachment point. Center the tank to the bracket. Rotate the volume assembly until the rate valve is located to the top and as vertical as possible. Ensure clearance to the axle.
10. Locate (2) T-Bolt Clamps, open the mounts, and place them in the mounts, on top of the two pegs.
11. Secure both clamps around the volume and torque the T-Bolt nut to **240 in-lbs.**
12. Repeat for driver side in the lower mount area.

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

Note: Make sure the other holes remain lined up.

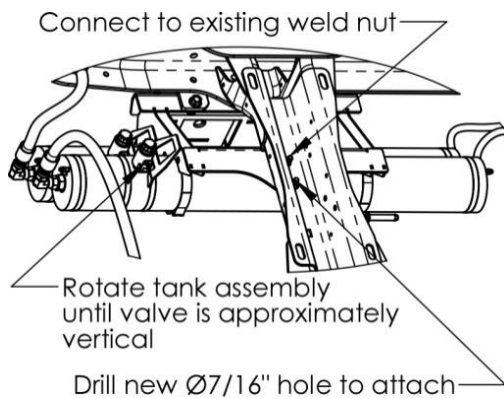


Figure 17. Secondary Volume Assembly Mounting.

Note: Make sure the other holes remain lined up.

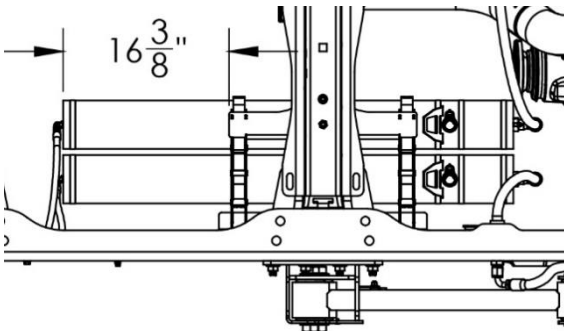


Figure 18. Secondary Volume Assembly Placement.

Bulkhead Hole Drilling (Additional Frame Preparation)

1. Find the (2) existing holes in the frame as shown in Figure 20 on passenger side of vehicle.

2. Ream top hole to $\varnothing 7/8$ " for thru-frame bulkhead fitting. Be sure all hoses and wiring will not be damaged by reamer.
3. Repeat for driver side of vehicle.
4. Refer to Page 26 for additional bulkhead instructions.

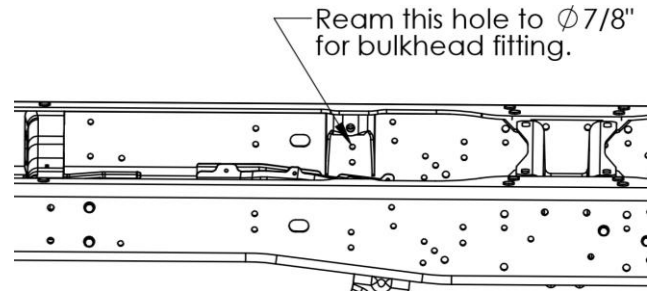
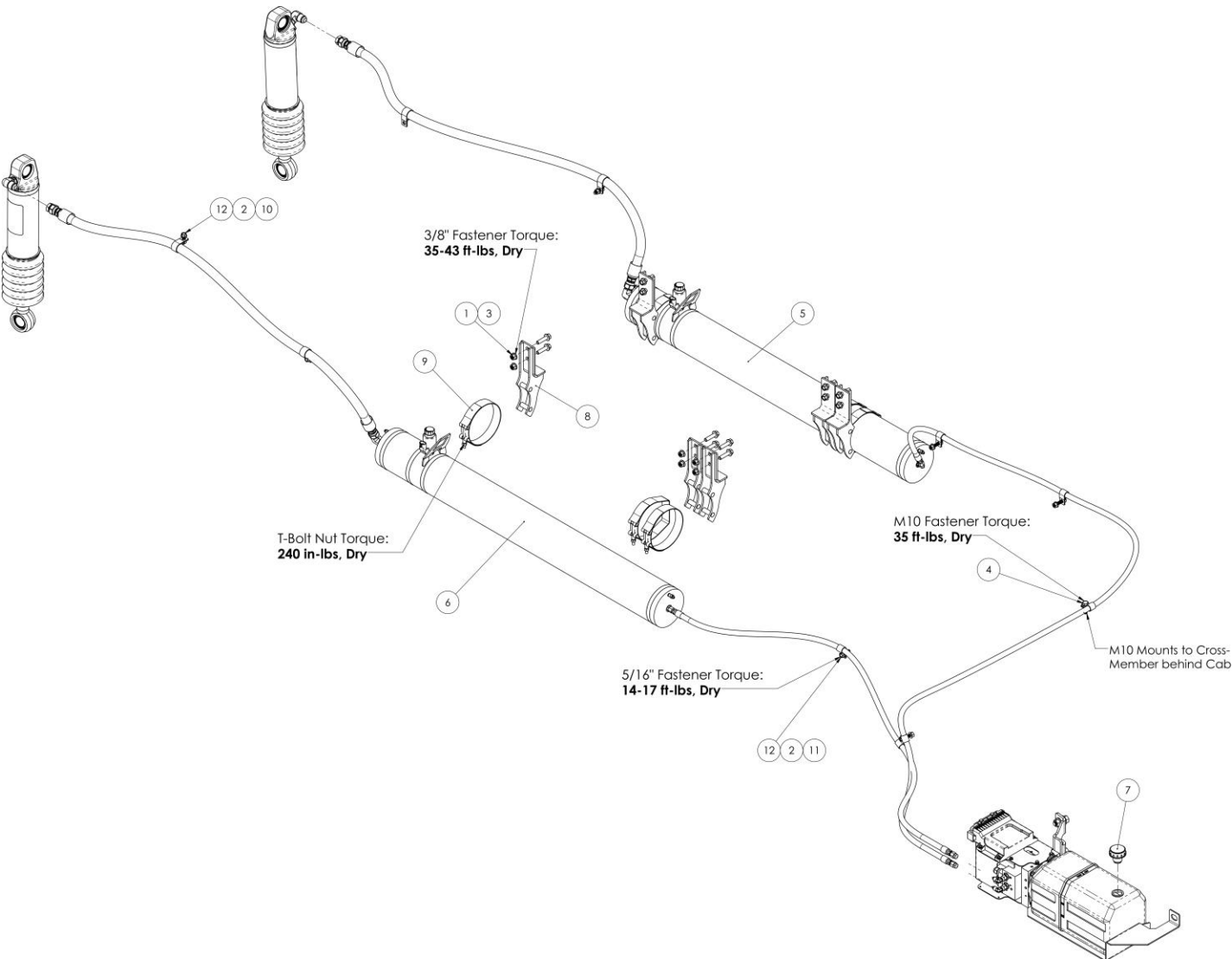


Figure 19. Location of hole for bulkhead fitting.

Secondary Volumes (DS135RS3AF)



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	12	10012-005	LFN 3/8-16, Gr. G	7	1	10614-001	Breather Cap
2	7	11012-010	LFN 5/16-18, Gr. G	8	6	10830-015	Volume Mount
3	12	10501-150	HFB 3/8-16 x 1.50, Gr. 8	9	6	10843-003	T-Bolt Clamp, Range 4.88-5.5
4	1	10502-001	HFB M10-1.5x30 CL 10.9	10	4	10855-002	Vinyl Coated Loop Clamp, 1\" ID
5	1	10579-053	2 nd Volume, LH	11	6	10855-003	Vinyl Coated Loop Clamp, 5/8\" ID
6	1	10579-054	2 nd Volume, RH	12	7	10886-100	HFB 5/16\"-18 x 1.00\" Gr 8

1. Place the mounts against the driver side frame, forward of the front hanger. Refer to Error! Reference source not found. if you have a 120\" CA; if you have a 108\" CA, refer to Error! Reference source not found. ,if you have an 84\" CA refer to Error! Reference source not found..
 2. Verifying the mounts are held flush to the bottom of the frame and utilizing the mount hole pattern, mark

- the locations of the mounting holes and drill (2) Ø7/16\" holes per mount.
 3. Repeat steps 1 and 2 on the passenger side of the frame.
 4. Install volume mounting brackets, and volume assemblies using t-bolt band clamps with bleed ports pointing upward.

5. Route hoses using loop clamps to secure away from moving parts, sharp edges, and/or heat sources. See Hydraulic Hose Attachment, page 33, for hose routing and attaching.

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

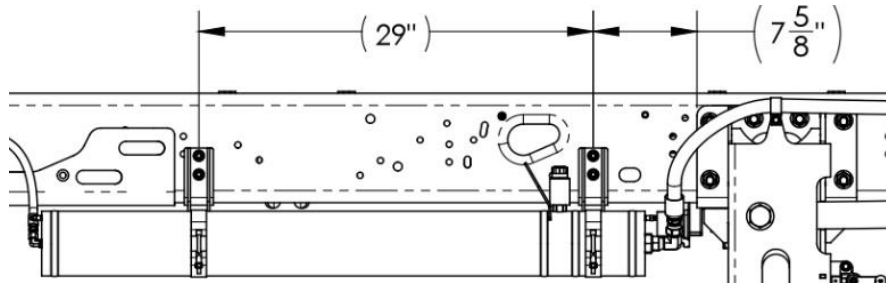


Figure 20: Approximate Locations of Volume Brackets (120" CA)

Note: The above view shows installation on 120" CA chassis DS135RS2AF. Install the mounts as far apart as possible.

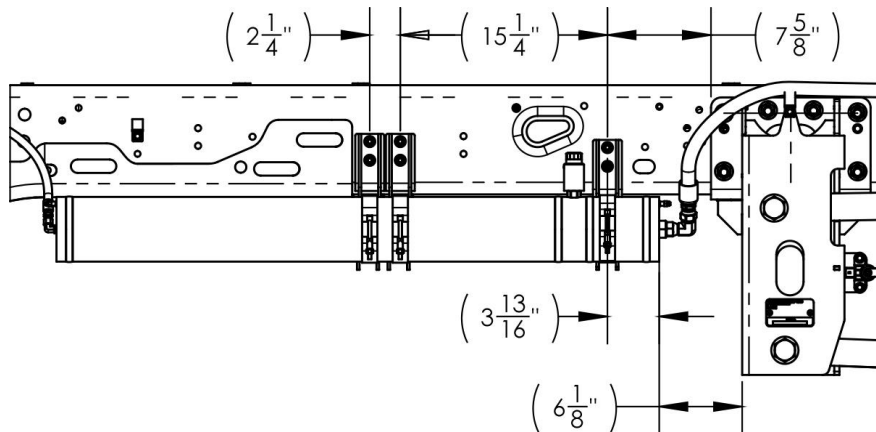


Figure 21: Approximate Locations of Volume Brackets (108" CA)

Note: The above view shows installation on 108" CA chassis of DS135RS2AF. All six volume mounts are utilized.

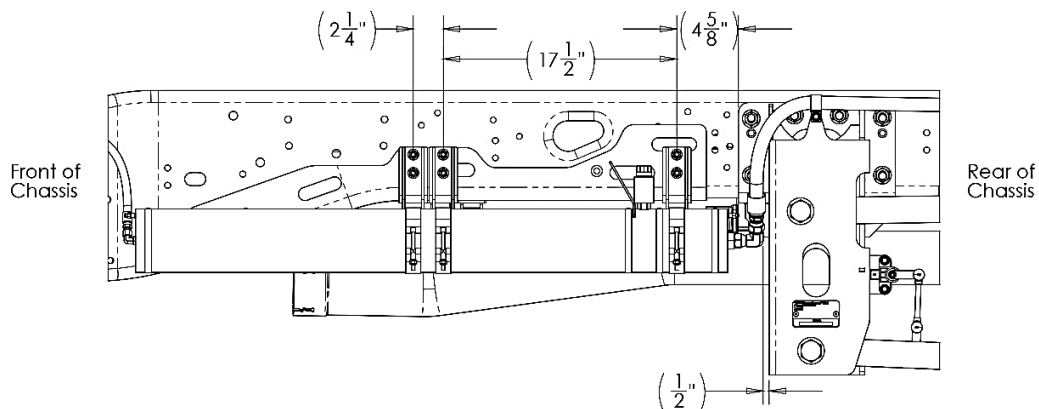
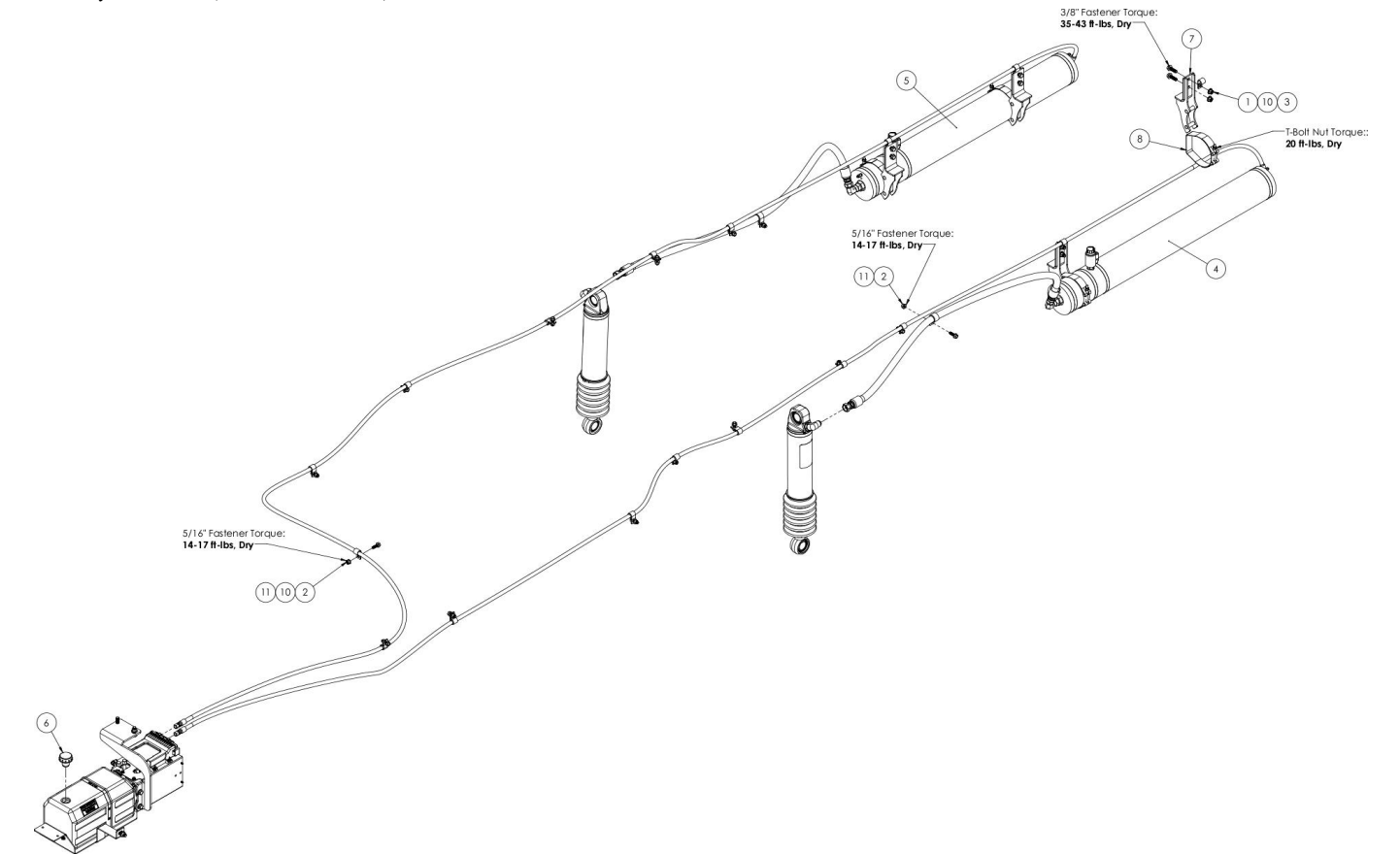


Figure 22: Approximate Locations of Volume Brackets (84" CA)

Note: The above view shows installation on 84" CA chassis of DS135RS2AF. All six volume mounts are utilized.

Secondary Volumes (DS135RS3-DM)



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	8	10012-005	LFN 3/8-16, Gr. G	7	4	10830-015	Volume Mount, Twin
2	15	10012-010	LFN 5/16-18, Gr. G	8	4	10843-003	T-Bolt Clamp, Range 4.88-5.5
3	8	10501-002	HFB 3/8-16 x 1.250, Gr. 8	9	2	10855-002	Vinyl Coated Loop Clamp, 1" ID
4	1	10597-135	Volume, RH	10	17	10855-003	Vinyl Coated Loop Clamp, 5/8" ID
5	1	10597-136	Volume, LH	11	15	10886-100	HFB 5/16"-18 x 1.00" Gr 8
6	1	10614-001	Breather Cap				

- Place the mounts against the driver side frame, rear of the upper strut mount, see **Figure 23**.
- Verifying the mounts are held flush to the bottom of the frame and utilizing the mount hole pattern, mark the locations of the mounting holes and drill (2) Ø7/16" holes per mount.
- Repeat steps 1 and 2 on the passenger side of the frame.
- Install volume mounting brackets, and volume assemblies using t-bolt band clamps with bleed ports pointing upward.
- Route hoses using loop clamps to secure away from moving parts, sharp edges, and/or heat sources. See Hydraulic Hose Attachment, page 36, for hose routing and attaching.

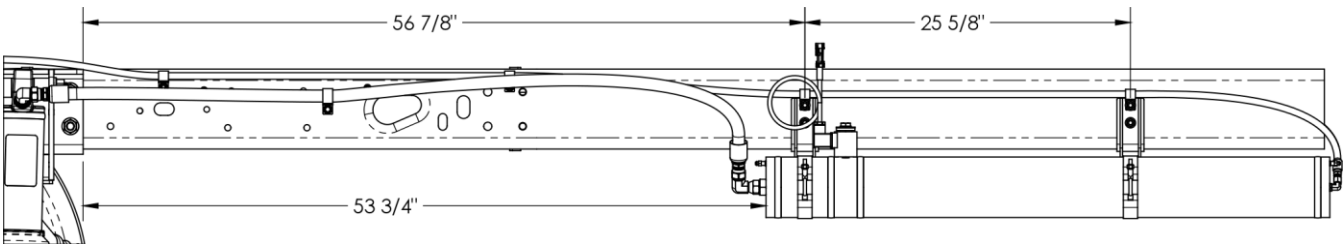
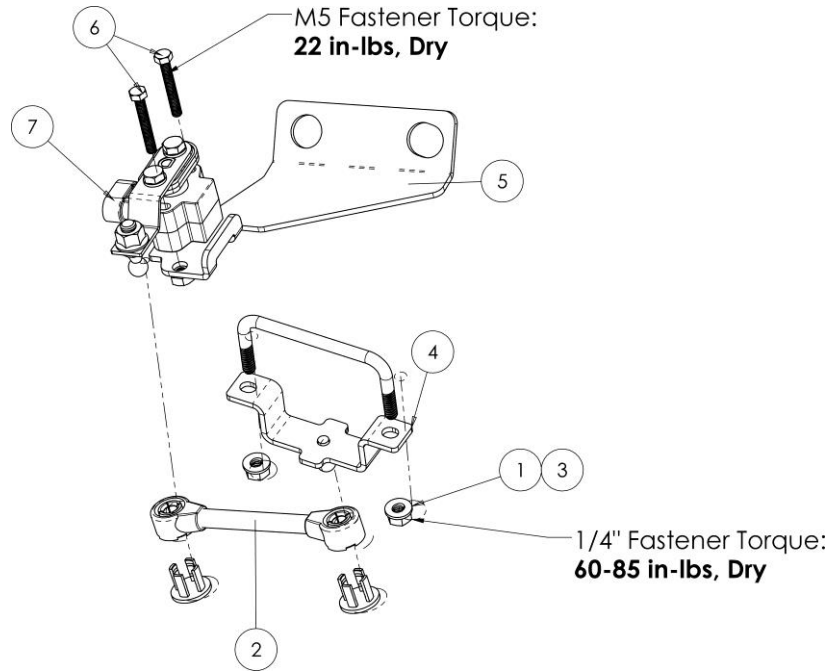


Figure 23. Volume Mount and Drill Hole Location

Steering Sensor Installation



ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	10012-009	LFN 1/4-20, Gr. G	5	1	10741-007	Steering Sensor Bracket
2	1	10587-006	Linkage	6	2	11635-035	HCS M5-0.8 x 35
3	1	10669-005	U-Bolt, 1/4-20, Gr 5	7	1	11675-005	Steering Sensor
4	1	10733-002	Ball Stud Bracket				

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

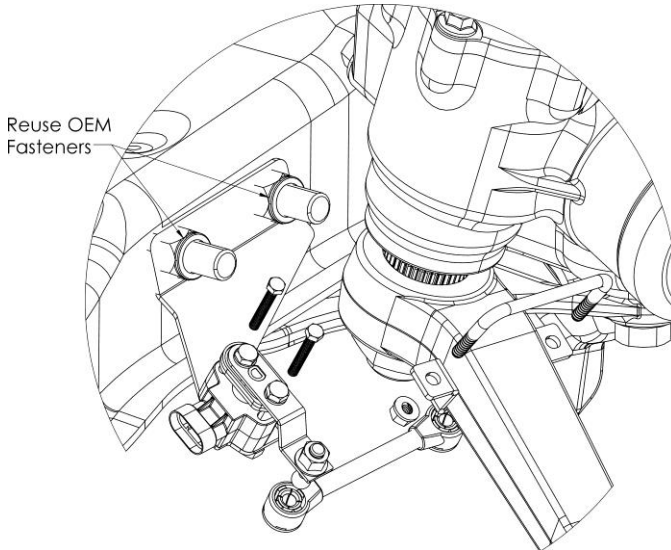


Figure 24: Steering Sensor Installation

3. Remove and retain the two nuts securing front track rod mount to cross member. See Figure 24.

4. Install Sensor Bracket over two bolts and reinstall nuts. Torque to **194 – 238 ft-lbs.**
5. Install the Steering Sensor to the Mount Bracket.
6. Torque to **1.8 ft-lbs [22 in-lbs.] Do not over torque.**
7. Attach the Ball Stud Bracket to the Pitman arm as shown in Figure 25. Torque U-Bolt nuts to **60 – 85 in-lbs.**

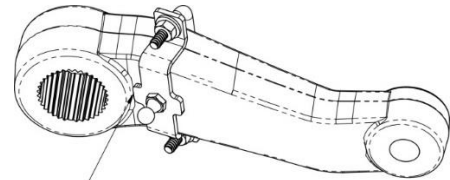


Figure 25: Locating the Ball Stud on Pitman Arm

8. Install the Linkage to both the ball stud on the pitman arm bracket and the steering sensor.

IMPORTANT: When installing the linkage, be sure to apply even pressure behind the sensor arm as not to break the sensor.

9. Install rod end locks.

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

Parking Brake Cable

1. Route both the driver and passenger parking brake cables through the upper loop in the OEM wire formed cable guide.
2. The cables will route between the upper and lower control arms near the attachment at the axle.

IMPORTANT: Routing cables in any other manner may cause binding or chafing of the cables as suspension travels.

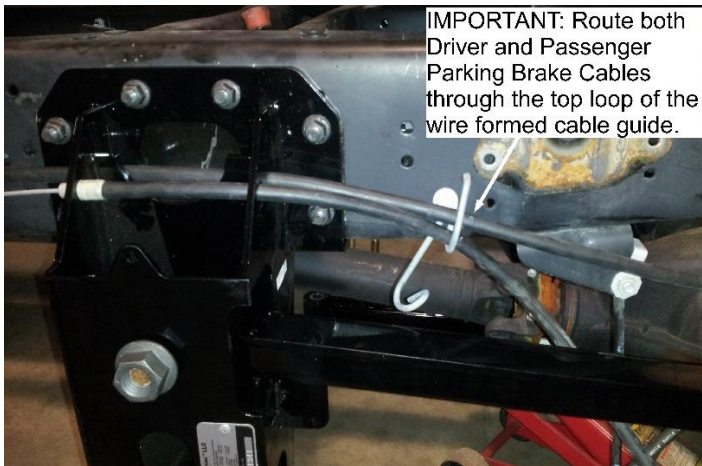


Figure 26. Reinstallation of the formed wire brackets.

3. Reconnect splice along driver side frame rail per OEM guidelines.
4. Make sure Passenger Parking Brake cable is reattached to the bridge over the center of the axle using 5/16" hardware included in the kit.

Hydraulic Hose Attachment (DS135RS3A)

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 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.

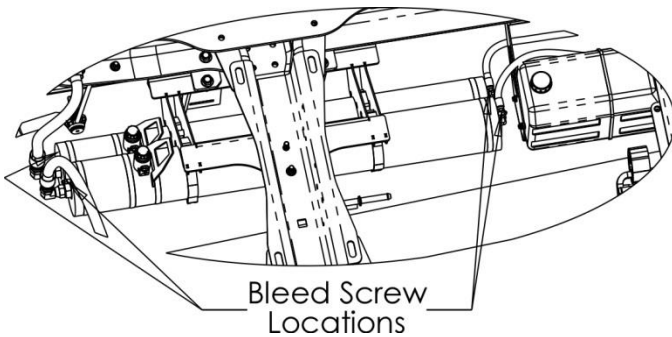


Figure 27. Bleed screw locations DS135RS2A.

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. Locate the -10 bulkhead fitting and -10 bulkhead fitting locknut.
6. Install the fitting into the Ø7/8" hole drilled into the frame.

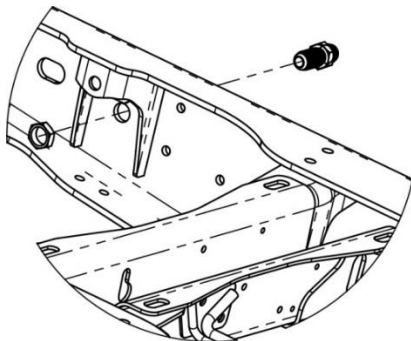


Figure 28. Installation of bulk head fitting.

7. Torque the lock nut to **85-95 ft-lbs.**

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

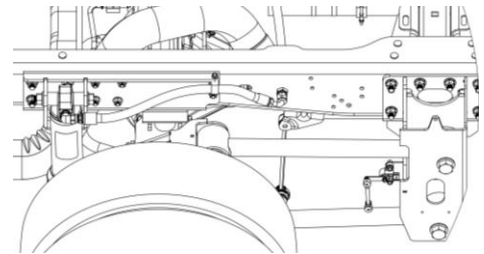


Figure 29. Installation of -10 hose to strut.

12. Torque both ends to **36-63 ft-lbs.**
13. Raise the end of the -10 (5/8") hose, attached to the driver side volume assembly, above the secondary volume to prevent fluid loss.
14. Route the hose to the strut to the bulk head fitting as shown in Figure 30. Use 1" loop clamps to secure -10 hoses as shown in Figure

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

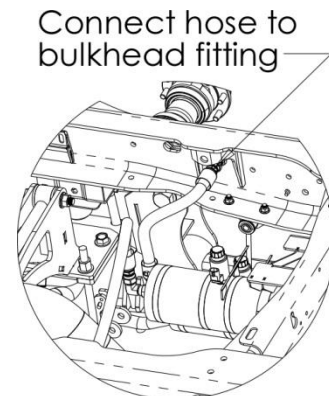
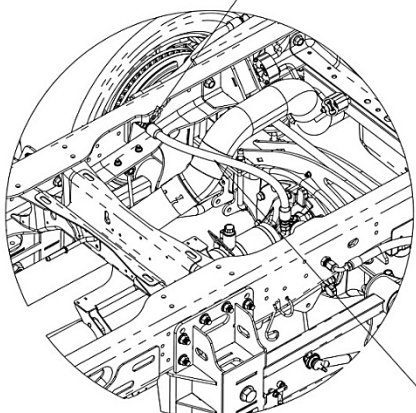


Figure 30. Driver side -10 hose attachment.

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

Connect hose to bulkhead fitting



Route hose away from exhaust

Figure 31. Passenger side -10 hose attachment.

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

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

19. 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.
20. Remove the cap from the -4 JIC fitting mounted on the bottom of the power module assembly, marked "L".
21. Install 90° -4 Elbow from mount kit.

22. Remove the plug from the hose end.
23. Attach the hose end to the Left Side Elbow. Torque the hose fitting and elbow to **12 ft-lbs. Do not over tighten.**
24. Route the Right Hand (Passenger side) -4 (1/4") hydraulic hose to the power module assembly. Use of hose clamps is recommended to secure the hose from movement or chafing.

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

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

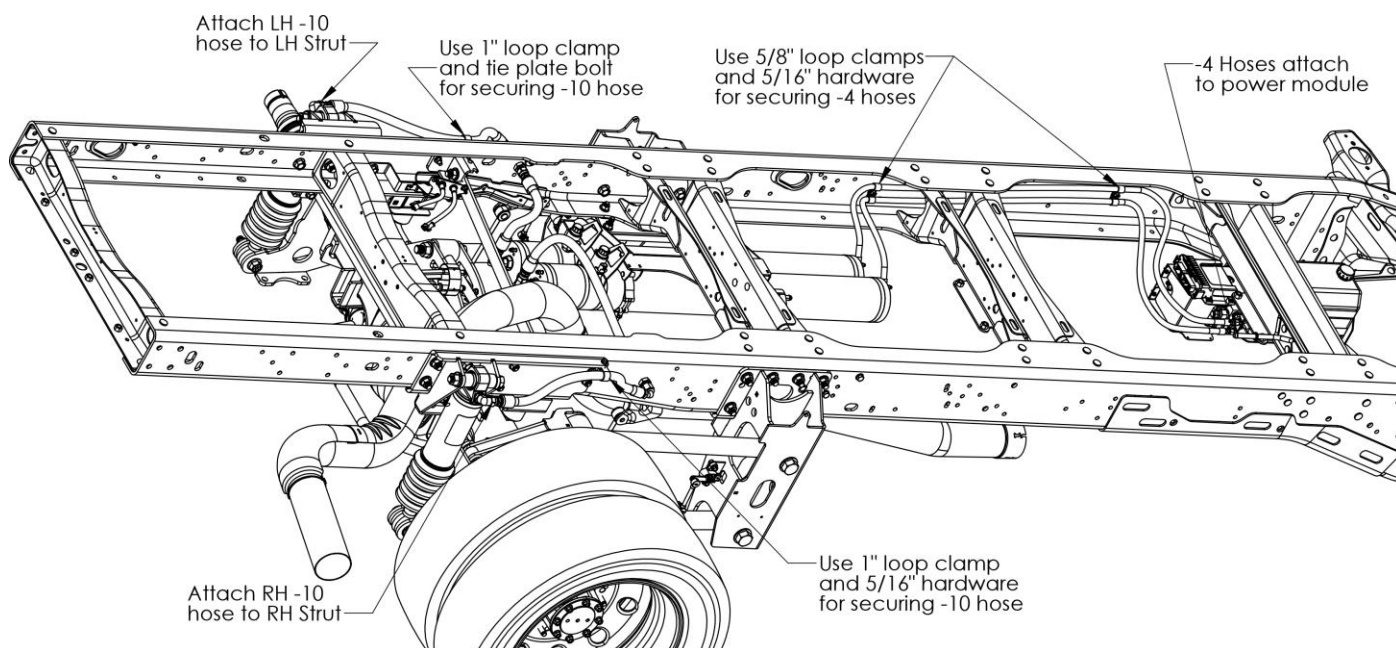


Figure 32. Hydraulic hose routing and loop clamps (DS135RS3A)

Hydraulic Hose Attachment (DS135RS3AF)

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 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.

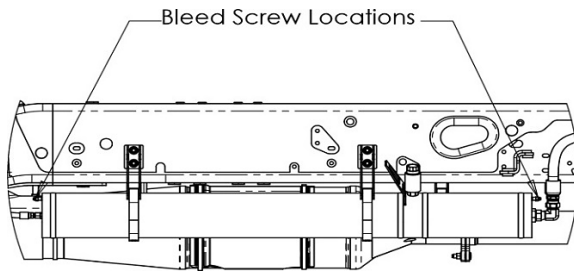


Figure 33. Bleed screw locations DS135RS3AF.

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.

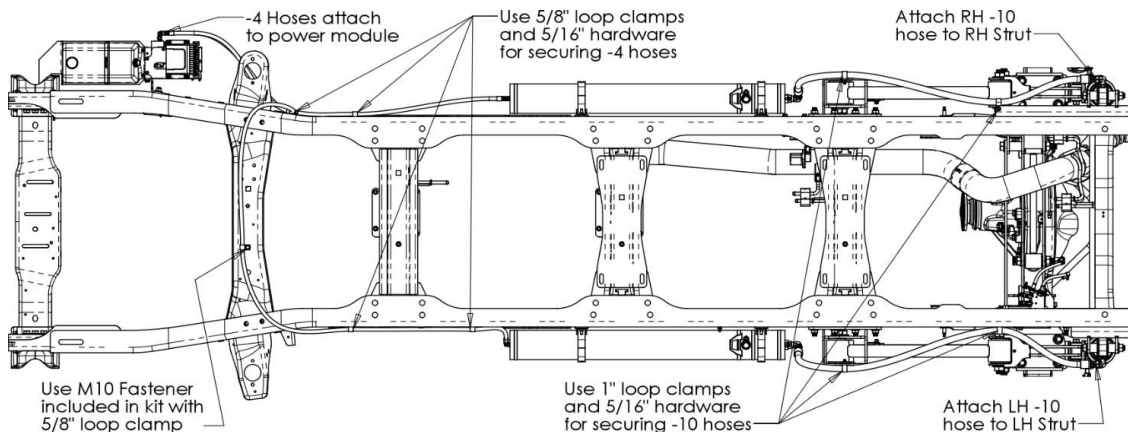


Figure 34: Location of loop clamps and hose routing (DS135RS3AF)

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 mounted on the side of 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, over the frame, to the power module assembly. Use of hose clamps is recommended to secure the hose from movement or chafing.

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

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. Re-install tires and wheels as per OEM instructions.

Hydraulic Hose Attachment (DS135RS3-DM)

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.

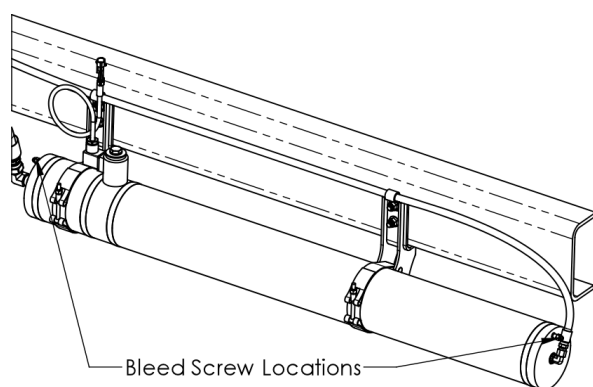


Figure 35. Bleed screw locations DS135RS3-DM.

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. Remove the plug from the -10 hose...
7. Secure the hose using the included hose clamps and fasteners. Refer to Figure 35.
8. Torque to **36-43 ft-lbs**
9. Repeat the -10 hose from the Right-Hand Secondary Volume to the Passenger Side Strut.

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

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

10. 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.

11. Remove the cap from the -4 JIC fitting mounted on the bottom of the power module assembly, marked "L".
12. Install 90° -4 Elbow from mount kit.
13. Remove the plug from the hose end.
14. Attach the hose end to the Left Side Elbow. Torque the hose fitting and elbow 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 with the exhaust system.

16. Remove the cap from the bottom mounted -4 JIC fitting on the power module, marked "R".
17. Install 90° -4 Elbow from mount kit.
18. Remove the plug from the hose end.
19. Attach the hose end to the Right Side Elbow. Torque both the hose fitting and elbow to **12 ft-lbs. Do not over tighten.**
20. Clean up any fluid spillage.
21. Verify the -10 hose fittings to the secondary volume assemblies are torqued to **36-63 ft-lbs** on the JIC connections
22. Verify the -12 SAE fitting to the secondary volume assemblies are **75-83 ft-lbs.**
23. Verify the -4 SAE jam nut to the secondary volume assemblies are torqued to **14-16 ft-lbs.**
24. Verify the -4 hose fitting to the 90° fitting at the secondary volume assemblies are **12 ft-lbs.**
25. Reinstall tires and wheels per OEM instructions.

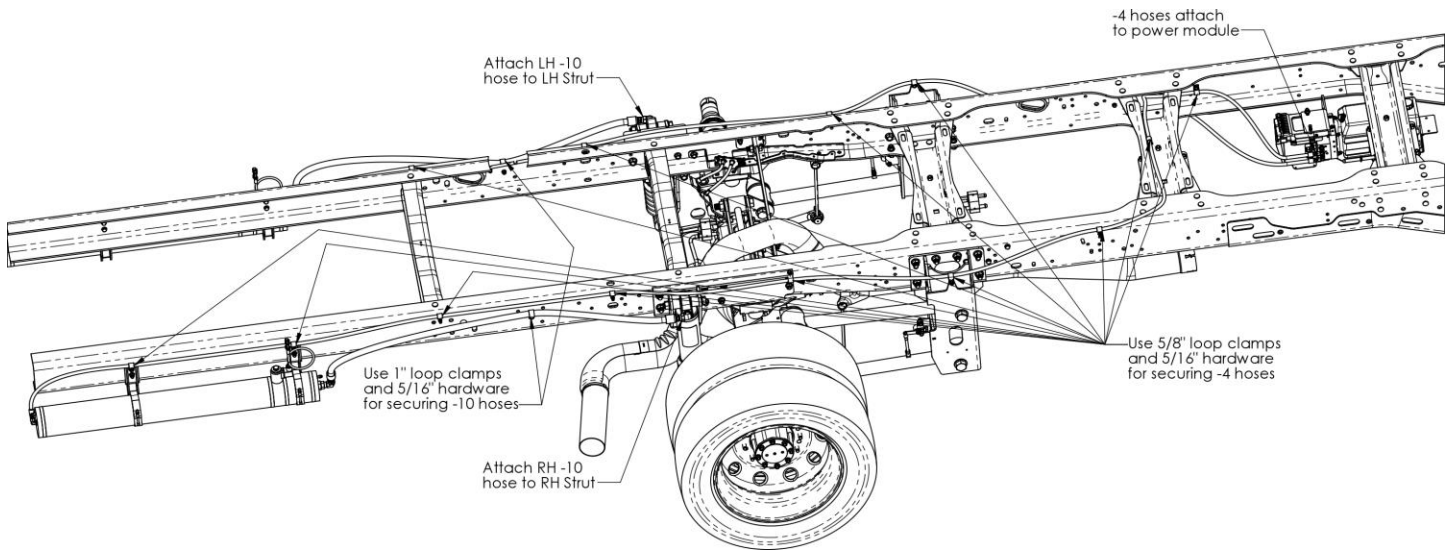


Figure 36: Location of loop clamps and hose routing (DS135RS3-DM)

External Electrical Installation

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

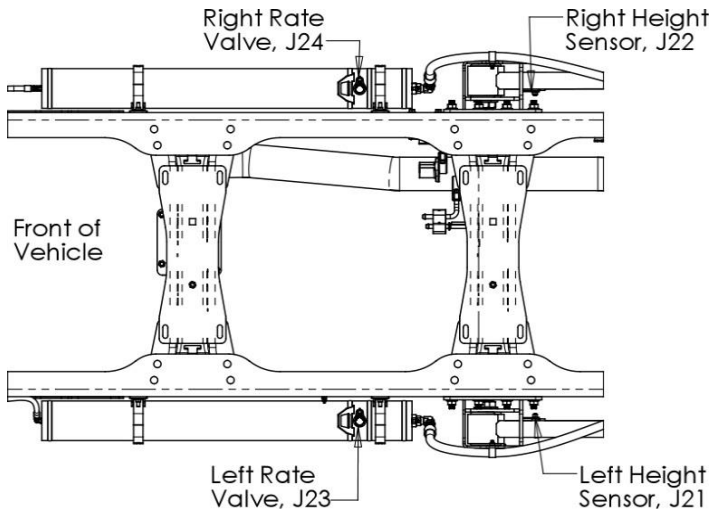


Figure 37. Rate valve and height sensor electrical connections (DS135RS3AF).

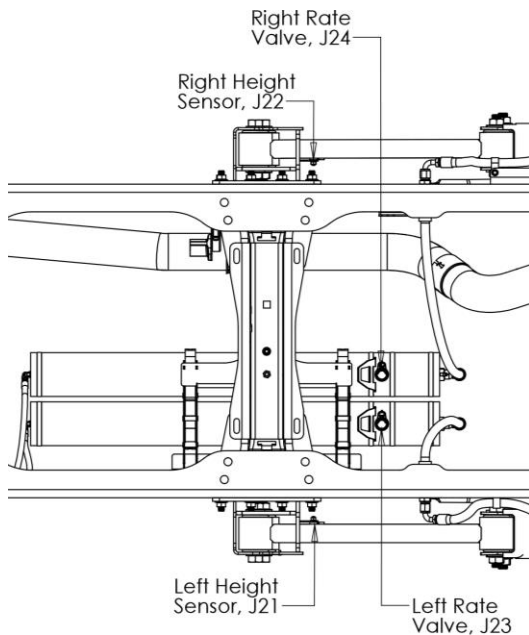


Figure 38. Rate valve and height sensor electrical connections (DS135RS3A).

5. Connect height sensor and rate valve connections.
Note: Connection after routing the harness and prior to installing the height sensor may aid in electrical connection.
6. Route and secure harness to OEM harness on driver side. Use of plastic clips is recommended.
7. Locate the 8ga wire ground ring terminal, J30, branch near the power module.
8. Locate and drill $\varnothing 1/4$ " hole in frame. Remove frame coating(s) as needed to ensure metal-to-metal contact between the ring terminal and frame.
9. Attach the ground ring terminal, J30, to the chassis frame for grounding. Sealant may be applied after ring terminal is secured.
10. Route the remaining trunk (containing blunt wires and steering sensor connector) towards the firewall. Secure to OEM wiring harness.
11. Drill $\varnothing 7/8$ " hole in cover plate shown in Figure 39 and Figure 40. Nuts are located inside the passenger cabin on the firewall, left of the steering column for removing to ease drilling the hole.



Figure 39: Cover plate to route harness through

12. Locate the $5/8$ " ID x $1-1/8$ " OD x $3/8$ " Thick grommet.
13. Install the grommet in the $\varnothing 7/8$ " hole just drilled.



Figure 40. Modified Cover Plate (Removed from vehicle)

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



Figure 41. OEM Upfitter Driver Side Terminal Connection instruction.

Important: Do not connect to passenger side battery.

Dash Harness Installation

1. Locate the dash harness.
2. Locate and identify the following 18ga wires in the external wiring harness branch passed through the firewall:
 - Red (Battery Power)
 - Yellow (Ignition)
 - Black (Ground)
 - White (CAN High)
 - White/Black (CAN Low)
 - Violet/White (Speed)
 - Pink/Black (Brake)

Note: Park Signal is now removed from the main harness, therefore it is not necessary to connect park to the chassis dash harness.

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

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

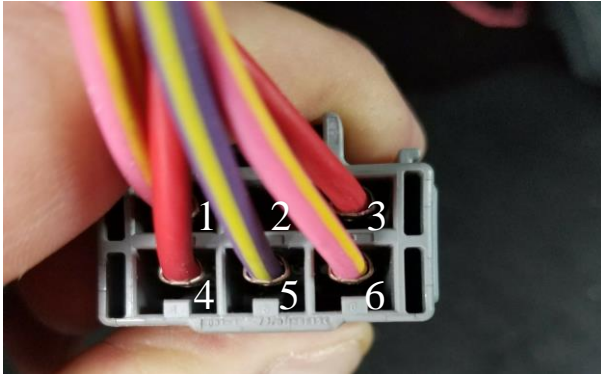
Note: The Pink/Black (Brake) wire in the dash harness might be excessively long and may be shortened accordingly.

7. Locate in the OEM dunnage the Port Upfitter 6-pin grey connector (p/n 7282-3740-40).
8. Cut the red wire, which is looped between pins 3 and 4.
9. Locate the 12 ga red wire on the LiquidSpring Dash harness and splice to the red wire connected to pin 3 only. **Do not** splice to pin 4.
10. Cut the Pink/Yellow (or Pink/Orange) wire, which is looped between pins 1 and 6.

11. Locate the 18ga Yellow wire on the LiquidSpring Dash Harness and splice the Yellow or Pink/Orange wire connected to pin 6 only. **Do not** splice to pin 1.

Note: MY2019 Ram vehicles switched the Ignition feed from Pin 1 to Pin 6. MY2018-prior use pin 1.

12. Locate the 18ga black wire with ring terminal on the LiquidSpring Dash harness and route behind the parking brake mechanism and attach to the A pillar as shown in



13. Connect the black connector V-Sim harness to the V-Sim.
14. Locate the Upfitter Port -2, found near the parking brake mechanism, left of the V-Sim.

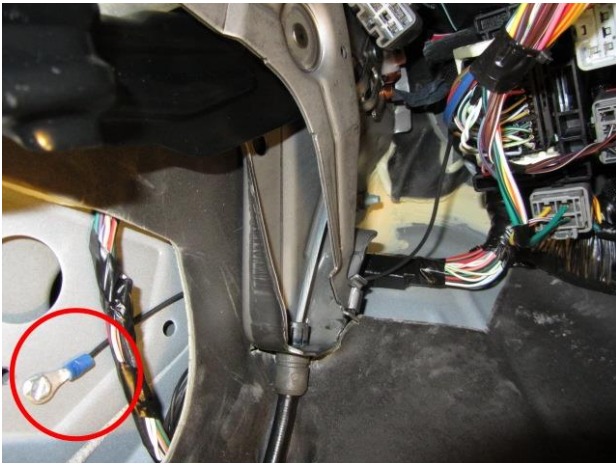


Figure 42. Dash harness ground to vehicle location (circled).

Note: park signal splice has been removed since it is no longer needed.

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

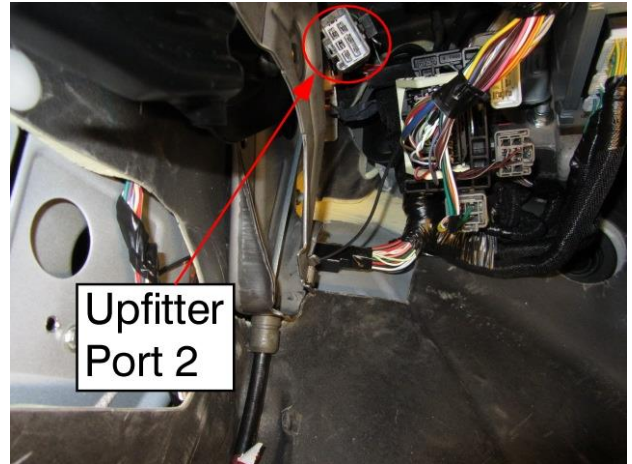


Figure 43. Upfitter Port 2. (2012 Model shown, 2013 in similar location above parking brake mechanism).

15. Connect the Upfitter connector to Port 2.

Driver Interface Installation:

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

Optional Door Electrical Harness Installation:

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

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

A. Single Wire - Ground Signal from Source

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

B: Dual Wire – Ground Signal from System

Ground is provided by the suspension system when the Brown (W93) wire is connected to the Black or 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 Black or Tan/Black (W98) wire. Requires two wires routed from switch to door harness.

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

System Preparation

Initial System Fill

1. Install the wheels and tires. Torque wheel nuts to OEM specifications.
2. Reconnect the negative cable to the vehicle battery.
3. Verify that the front wheels are steered straight ahead.
4. Lower the vehicle to the ground and remove any jack stands from under the vehicle. The suspension should be in the kneeled position.
5. Locate the container of Silicone Fluid.
6. Remove the breather cap from the Power Module reservoir.
7. Fill the reservoir approximately 2/3 full.
8. Turn the ignition key to "Run" and ensure that the LiquidSpring driver display LEDs light up and that the red "Warning" LED is not lit. If the red "Warning" LED is lit, proceed to the Trouble Shooting Section.

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

9. Press and release the Red ON/OFF button on the driver display. All LEDs on the driver display should go out.
10. Press and release the Red ON/OFF button again. The LEDs on the driver display should all flash and then only the four yellow arrow LEDs, one green ride mode indicator LED, and one green ride height indicator LED should remain lit.
11. The green ride height indicator LED should indicate "Low" and begin flashing as the pump/motor starts. If pump/motor does not start, check Trouble Shooting Electrical Section.
12. Monitor the fluid level in the reservoir. If the level drops below 1/4 of the tank, press and release the Red ON/OFF button to shut off the system, refill the reservoir, and turn the system back on by pressing the Red ON/OFF button.
13. If the suspension system does not begin to rise to a preset ride height after 3 minutes, stop the system and check the following first and then repeat this step:
 - a. Check for any fluid leaks.
 - b. Check that the hoses are properly connected.

- c. Completely depressurize the system. See Depressurizing the System section, under System Operation

14. After the suspension system stops leveling, check the fluid level in the reservoir. If low, fill to the indicated line.

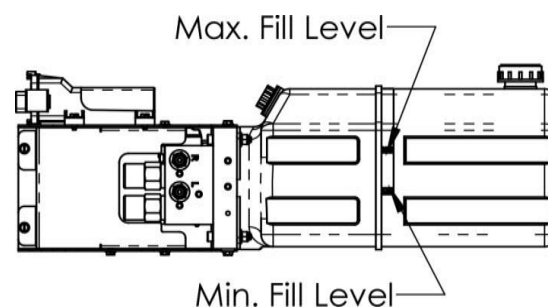


Figure 44. Final fill fluid level.

Bleeding the System

1. Locate 3/16" ID PVC Tubing (not included with kit).
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.

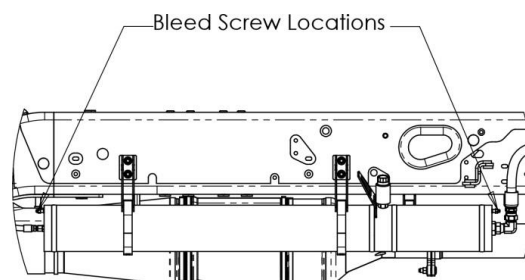


Figure 45. Bleed screw locations DS135RS3AF.

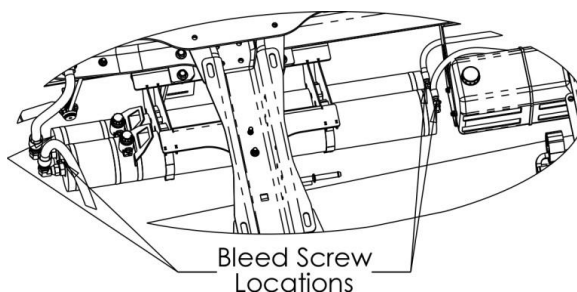


Figure 46. Bleed screw locations DS135RS3A.

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

Calibrating the System

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

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

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

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

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

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

9. Turn the ignition back to Run,

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

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

Post Installation Welding

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

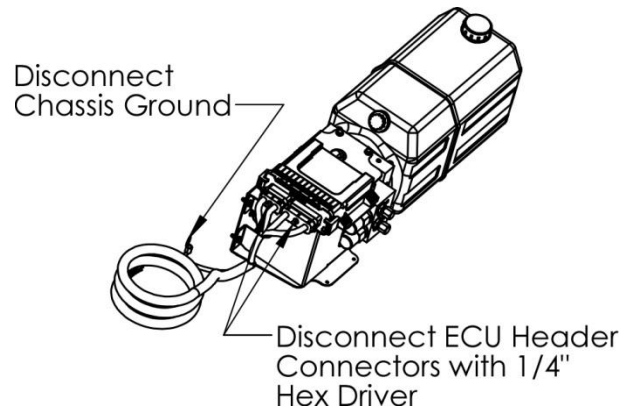
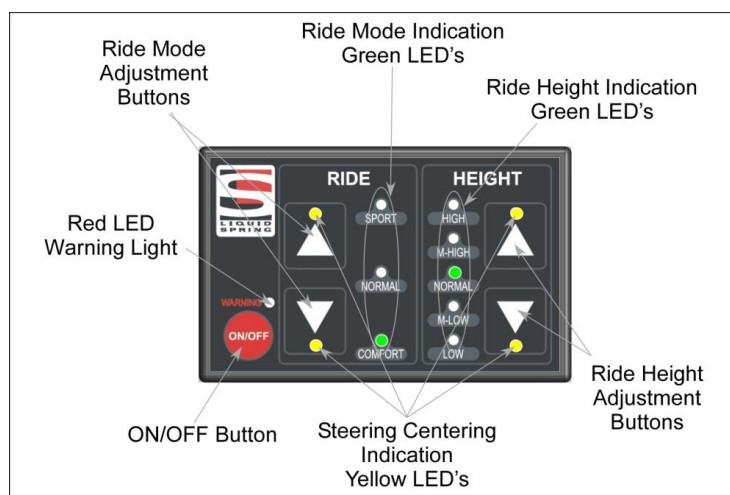


Figure 47. ECU disconnects prior to welding on chassis.

Operation



System Startup

- 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 *Issues with Steering Sensor*
- The yellow lights will go off when the steering wheel is turned approximately 10-20° off center in either direction.

ON/OFF Button

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

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

Warning Light

If the Red LED warning light is continuously illuminated along with one or more of the other indicator lights, please refer to the *Troubleshooting* section on page 51

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.

The following table shows the selection and indication of available ride heights:

NOTE: All-Up and All Down only apply if a LiquidSpring front suspension is installed.

Ride Height Description	Driver Interface Operation	Front Ride Height	Rear Ride Height	Ride Height LED (2 Corner Mode)	Ride Height LED (4 Corner Mode)
All Up (AU)	From RH, P&R UP 2 times. From RU, P&R UP 1 time.	HIGH	HIGH	n/a	<input checked="" type="radio"/> HIGH <input type="radio"/> M. HIGH <input type="radio"/> NORMAL <input type="radio"/> M. LOW <input type="radio"/> LOW
Rear Up (RU)	From RH, P&R UP 1 time	NORMAL	HIGH	<input checked="" type="radio"/> HIGH <input type="radio"/> M. HIGH <input type="radio"/> NORMAL <input type="radio"/> M. LOW <input type="radio"/> LOW	<input type="radio"/> HIGH <input checked="" type="radio"/> M. HIGH <input type="radio"/> NORMAL <input type="radio"/> M. LOW <input type="radio"/> LOW
Ride Height (RH)	From AU, P&R DOWN 1 time. From RU, P&R DOWN 1 time. From RD, P&R UP 1 time From AD, P&R UP 1 time Auto Select, Speed > 15 MPH	NORMAL	NORMAL	<input type="radio"/> HIGH <input type="radio"/> M. HIGH <input checked="" type="radio"/> NORMAL <input type="radio"/> M. LOW <input type="radio"/> LOW	<input type="radio"/> HIGH <input type="radio"/> M. HIGH <input checked="" type="radio"/> NORMAL <input type="radio"/> M. LOW <input type="radio"/> LOW
Rear Down (RD)	From RH, P&R DOWN 1 time Rear Door Trigger	NORMAL	LOW	<input type="radio"/> HIGH <input type="radio"/> M. HIGH <input type="radio"/> NORMAL <input type="radio"/> M. LOW <input checked="" type="radio"/> LOW	<input type="radio"/> HIGH <input type="radio"/> M. HIGH <input type="radio"/> NORMAL <input checked="" type="radio"/> M. LOW <input type="radio"/> LOW
All Down (AD)	From RH, P&R DOWN 2 times. From RD, P&R DOWN 1 time. Side Door Trigger	LOW	LOW	n/a	<input type="radio"/> HIGH <input type="radio"/> M. HIGH <input type="radio"/> NORMAL <input type="radio"/> M. LOW <input checked="" type="radio"/> LOW
Depressurize	(2 Corner Mode): From RD, P&H DOWN (4 Corner Mode): From AD, P&H DOWN	FULL LOW	FULL LOW	<input type="radio"/> HIGH <input type="radio"/> M. HIGH <input type="radio"/> NORMAL <input type="radio"/> M. LOW <input checked="" type="radio"/> LOW	<input type="radio"/> HIGH <input type="radio"/> M. HIGH <input type="radio"/> NORMAL <input type="radio"/> M. LOW <input checked="" type="radio"/> LOW

P&R = Press and Release, P&H = Press and Hold

Depressurizing the System

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

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

2. Press and release the Red ON/OFF button on the driver display. All LEDs on the driver display should go out.
3. Press and release the Red ON/OFF button again. The LEDs on the driver display should all flash and then only the four yellow arrow LEDs, one green ride mode indicator LED, and one green ride height indicator LED should remain lit.
4. From NORMAL Ride Height, press and release the HEIGHT DOWN arrow button to lower the rear to the LOW height. For four corner systems, press and release HEIGHT DOWN arrow button a second time to lower the front.
5. Press and hold the HEIGHT DOWN arrow button for approximately 2 minutes.
6. While holding the HEIGHT DOWN arrow button, press and release the ON/OFF button to disable the system. Release the HEIGHT DOWN arrow button
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:

1. Locate 3/16” ID PVC Tubing. Note: Alternatively, a bleed kit similar to the Actron 7840 Bleed Kit 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.
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.

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.

Repressurizing the System

1. Turn the ignition key to “On” and ensure that the LiquidSpring driver display LEDs light up and that the red “Warning” LED is not lit.
2. Press and release the Red ON/OFF button on the driver display. All LEDs on the driver display should go out.
3. Press and release the Red ON/OFF button again. The LEDs on the driver display should all flash and then only the four yellow arrow LEDs, one green ride mode indicator LED, and one green ride height indicator LED should remain lit.
4. If jack stands were placed under the frame prior to depressurizing, press and release the HEIGHT UP arrow to raise the vehicle to HIGH height.
5. Remove jack stands.
6. Press and release the HEIGHT DOWN arrow to lower the vehicle to NORMAL height.

Temperature Changes

CLASS® utilizes a compressible liquid for its spring and damping, which expands and contracts with temperature changes.

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.

When system is turned on again, it automatically returns the suspension to the selected ride height.

While the suspension system can be used immediately upon start-up, it is recommended to allow the suspension system to automatically adjust the ride height for a brief period (less than 30 seconds) before driving away. Some ride harshness may be noticed until NORMAL ride height is achieved.

The suspension system functions normally within a temperature range of -40°C and +125°C.

Door Switch Trigger

This function is only active if the driver display is set to NORMAL height, the system and ignition are turned ON, and for 1 hour after the vehicle ignition is turned off.

- Opening the rear door will set the suspension to LOW height and the suspension will lower to a kneeled position.
- If the system and ignition are ON and the door is closed before the system achieves the kneeled

position, the system will return to NORMAL height.

- If the system and ignition are OFF and the door is closed before the system achieves the kneeled position, lowering will cease.
- If the system and ignition are ON and the door is re-opened, the suspension will resume lowering to the kneeled position.
- If the system and ignition are OFF and the door is reopened, the suspension will only resume lowering to the kneeled position if the 1 hour time period hasn't elapsed since turning off the ignition.
- The door switch can be over-ridden by the driver display height selections.

Preventative Maintenance

Service Intervals

Once Daily or Before Each Shift

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

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

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

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

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

- Inspect reservoir fluid level.

Checking Fluid Levels

The LiquidSpring suspension system requires the use of a specific compressible fluid for proper operation. If additional fluid is needed, the fluid can be purchased directly from LiquidSpring LLC.

CAUTION: Adding any other fluid not obtained from LiquidSpring LLC to the system will result in incorrect operation of the system, and will likely damage critical components of the system, and will void the LiquidSpring Warranty.

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

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

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

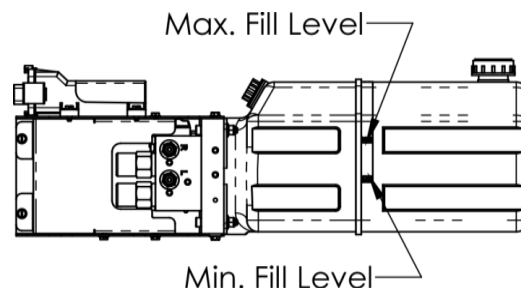


Figure 48. Power Module Fluid Level

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

Checking Fittings for Leaks

WARNING: The system operates under high fluid pressure (up to 4000 psi). Do not attempt to locate leaks by feeling with hands or any part of the body. High pressure fluids can penetrate the skin and cause severe tissue damage.

While system is at ride height and pressurized, visually examine fittings and hose connections for any source of leaks. Do not use hands to search for leak. If the source of the leak is a fitting or other component, depressurize the system and repair or replace as needed.

Tighten hose nuts if the leak is coming from the connection between the hose nut and a fitting. Depressurize the system before tightening anything. Replace hose if the leak is coming from anywhere else on the hose.

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

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

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

Adjustments

Calibration

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.

Steering Centering

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.

- 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.

- Press and release the Red ON/OFF button on the driver display. All LEDs on the driver display should go out.
- 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.
- Press and hold both Ride Height Adjustment Buttons simultaneously until the SPORT, COMFORT, HIGH, and LOW green LED’s begin to flash.
- As soon as the four green LED’s begin to flash, press the ON/OFF button to stop the process.
- Verify that the four yellow arrow LED’s are lit.
- Steering calibration is completed.

Fasteners

Torque Specifications

See Installation

U-Bolts

See Bridge and Axle Clamp Hangers

Hydraulic Connections

SAE O-Ring Adjustable Fittings

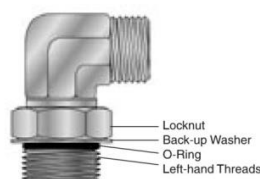


Figure 49. Adjustable SAE Fitting

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

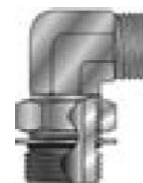


Figure 50. Locknut completely backed off.

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

SAE O-Ring Non-Adjustable Fitting

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

JIC 37° Fitting

- Inspect components to ensure that male and female threads and sealing surfaces are free of burrs, nicks and scratches, or any foreign material. Annular tool marks of 100µin with the thread are permissible.
- Lubricate the threads and the entire surface of the cone with system fluid.
- Align mating components for hand connection and turn flare nut until sealing surfaces make full contact.
- Using two wrenches, hold fitting in desired position and tighten to the proper torque:
- 4 fitting: 9-12 ft-lbs
- 8 fitting: 27-39 ft-lbs
- 10 fitting: 36-63 ft-lbs
- 12 fitting: 65-88 ft-lbs

Component Replacement

Please contact LiquidSpring LLC Customer Service regarding instructions regarding diagnosis and replacement of any component.

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 <i>Issues with Vehicle Raising/Pump Section</i>	See <i>Issues with Vehicle Raising/Pump Section</i>
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 Rear Height Sensor	See <i>Issues with Height Sensors Section</i>	See <i>Issues with Height Sensors Section</i>
Warning + HEIGHT: NORMAL	System kneels in excess of 3 minutes without suspension movement	See <i>Issues with Vehicle Lowering/Dump Valve Section</i>	See <i>Issues with Vehicle Lowering/Dump Valve Section</i>
Warning + HEIGHT: LOW	Issue with Left Rear Height Sensor	See <i>Issues with Height Sensors Section</i>	See <i>Issues with Height Sensors Section</i>
Warning + HEIGHT: FLASHING HIGH	Issue with Right Front Height Sensor	See <i>Issues with Height Sensors Section</i>	See <i>Issues with Height Sensors Section</i>
Warning + HEIGHT: FLASHING LOW	Issue with Left Front Height Sensor	See <i>Issues with Height Sensors Section</i>	See <i>Issues with Height Sensors Section</i>
Warning + HEIGHT: M-HIGH	Issue with Accelerometer	Damaged ECU	Replace ECU
Slow or Fast Blinking Warning Light	Driver Interface cannot communicate with ECU.	See <i>Issues with Driver Interface</i>	See <i>Issues with Driver Interface</i>

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 <i>Issues with Height Sensors</i>
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 <i>Issues with Height Sensors</i>
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 <i>Issues with Height Sensors</i>
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 <i>Issues with Vehicle Speed Signal</i> 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 <i>Calibrating the Steering Sensor Only</i> .
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

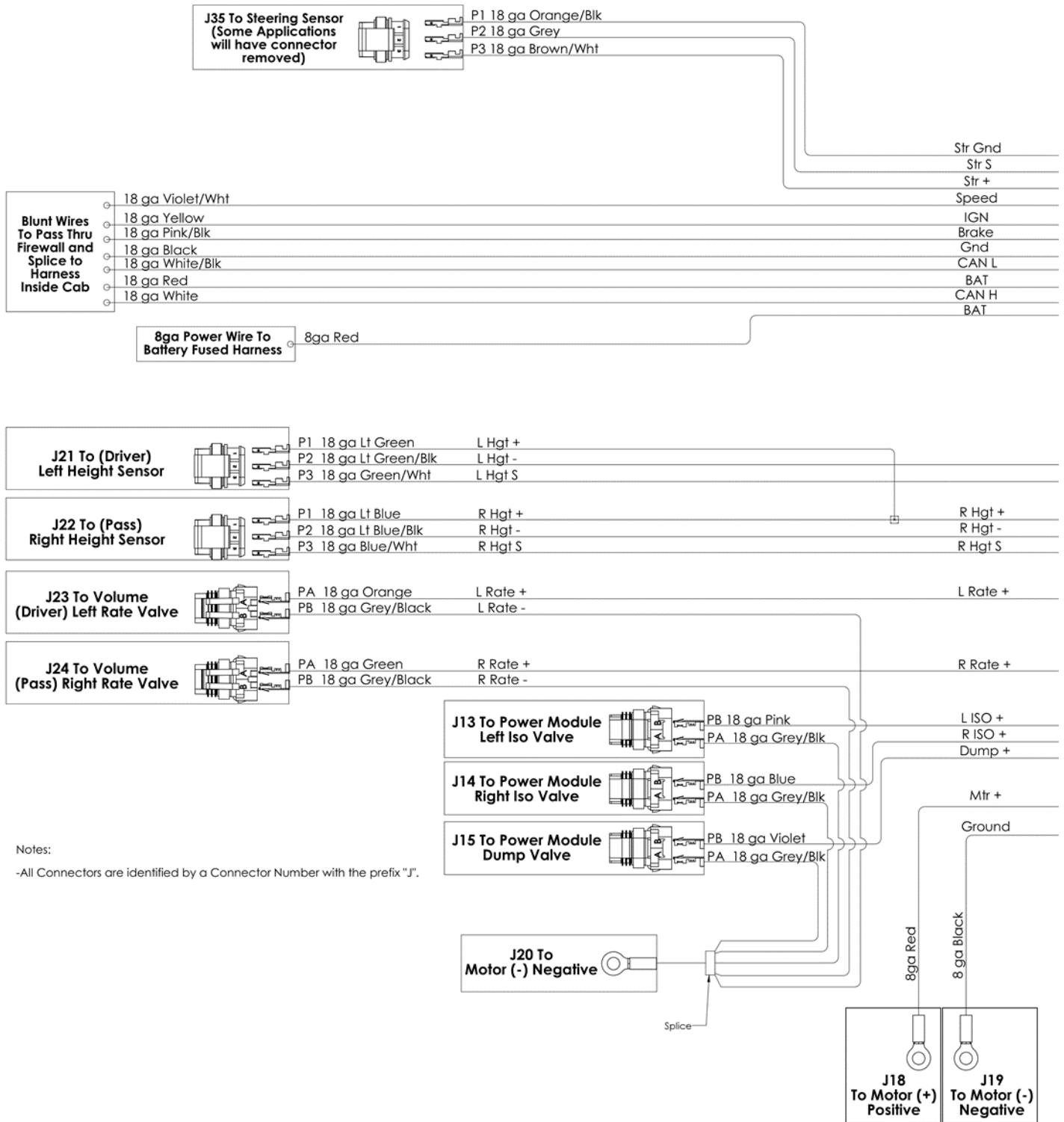
Issues with Strut Assembly

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

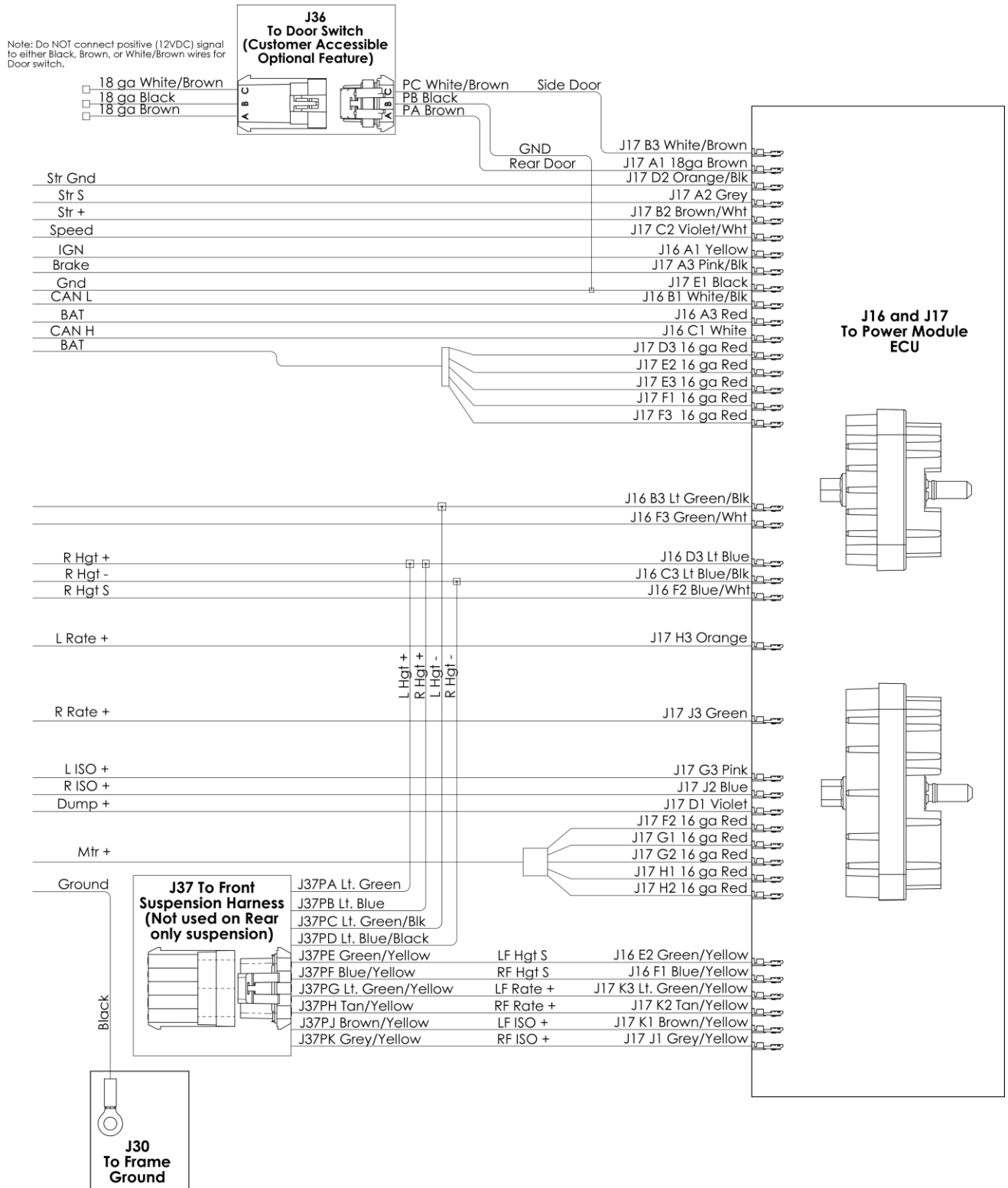
Issues with Secondary Volume Assembly

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



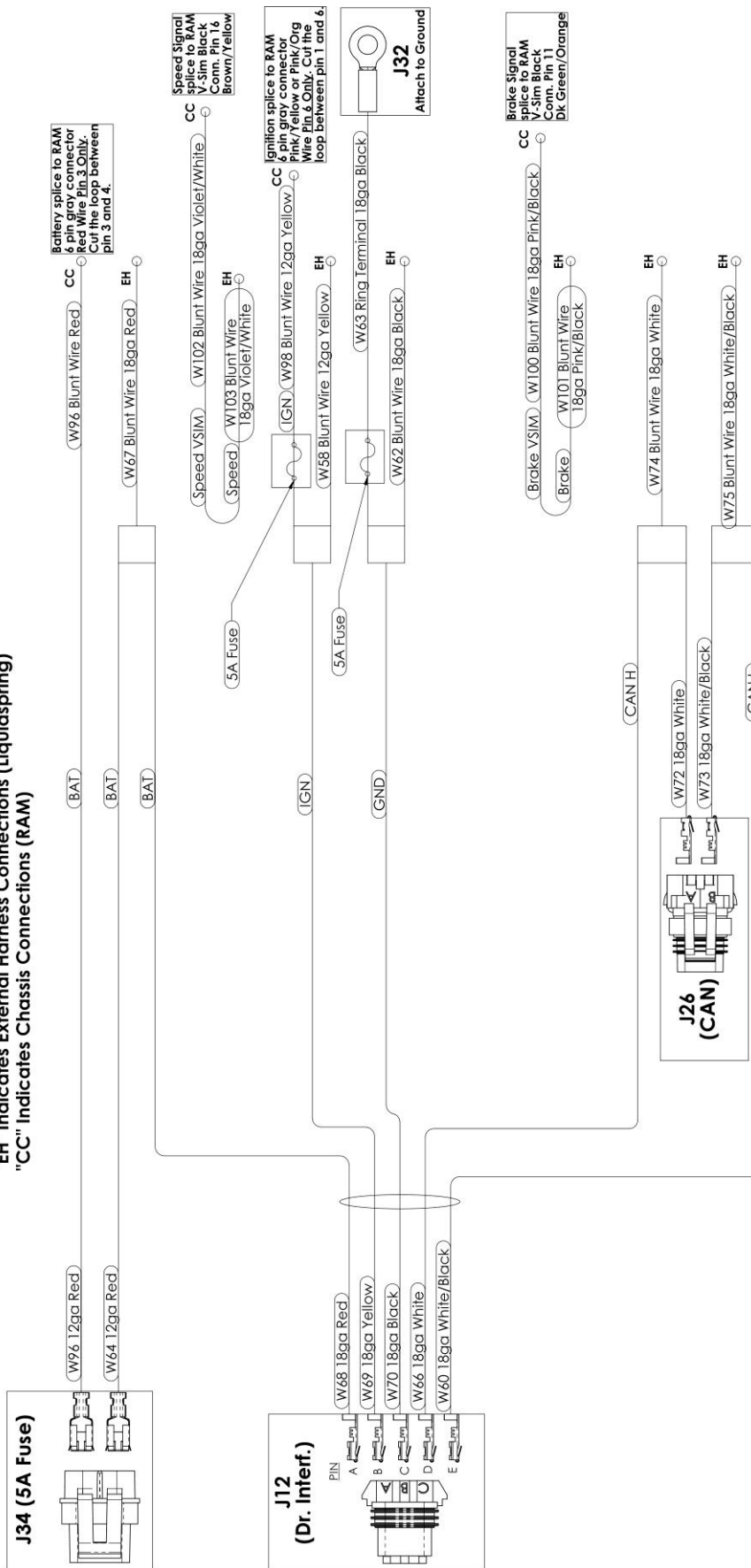
Schematic, External Wiring Harness – Part 1



Schematic, External Wiring Harness – Part 2

bring)

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INSTALLATION CHECK LIST

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

FRAME PREPARATION:

- ☐ Battery Disconnected
- ☐ Removed OEM Leaf springs, overload pads, front hangers, axle spring perches cut off.
- ☐ Remove OEM Jounce Bumpers, and cut off RH jounce pad off frame.
- ☐ Upper Strut Mount, Front Hanger, Tie Plate Mount, and Secondary Volume Mount holes drilled.

FRONT HANGER INSTALLATION:

- ☐ 1/2"-13 Nuts torqued to **86-105 ft-lbs.**
- ☐ 5/8"-11 Nuts torqued to **172-210 ft-lbs.**

UPPER STRUT MOUNT/TRACK ROD MOUNT/CROSS MEMBER REINFORCEMENT:

- ☐ Upper Strut Mounts flush with bottom of frame.
- ☐ Cross member Reinforcement orientated correctly.
- ☐ Bolts oriented per Installation Manual Views.
- ☐ 1/2"-13 Nuts torqued to **86-105 ft-lbs.**
- ☐ 5/8"-11 Nuts torqued to **172-210 ft-lbs**

AXLE CLAMP AND BRIDGE INSTALLATION:

- ☐ 3/4"-16 U-Bolts torqued in stages up to **300 ft-lbs.**
- ☐ 5/8"-11 Nuts torqued to **172-210 ft-lbs.**

BRAKE LINE RELOCATION PLATE INSTALLATION:

- ☐ Installed 3/8 nylon spiral wrap around caliper whip hoses
- ☐ Relocated OEM brake bracket and torqued 1/2"-13 nut to **86-105 ft-lbs.**
- ☐ Driver and Passenger Brake caliper whip hoses attached to bridge with OEM M8 hardware.

CONTROL ARMS INSTALLATION:

- ☐ Control Arms correctly orientated.
- ☐ 1"-8 Nuts torqued to **600 ft-lbs**, at ride height.

TRACK ROD INSTALLATION:

- ☐ 7/8"-9 Nuts torqued to **491-600 ft-lbs** at ride height.

TIE BAR INSTALLATION:

- ☐ 5/8"-11 Nut torqued to **172-210 ft-lbs.**
- ☐ OEM Brake and fuel lines secured to Tie plate mount.
- ☐ 3/8"-16 Nuts torqued to **35-43 ft-lbs.**

STRUT INSTALLATION:

- ☐ 3/4"-10 Nuts torqued to **275-300 ft-lbs.**

JOUNCE BUMPER INSTALLATION:

- ☐ 3/8"-16 Bolts torqued to **35-43 ft-lbs.**
- ☐ M10 Bolts torqued to **35 ft-lbs.**

HEIGHT SENSOR INSTALLATION:

- ☐ 5/16"-18 Nuts torqued to **14-17 ft-lbs.**
- ☐ Locking Clips installed.

PARKING BRAKE CABLE INSTALLATION:

- ☐ Parking brake cable rerouted through and attached to front Driver side hanger.
- ☐ Wire formed brackets reattached
- ☐ Both Driver and Passenger cables route through upper OEM loop behind front hanger
- ☐ Passenger side parking cable relocated to bridge on top of axle.

POWER MODULE/SECONDARY VOLUME INSTALLATION:

- ☐ 3/8"-16 Manifold Bolts torqued to **39 ft-lbs.**
- ☐ 1/2"-13 Nuts torqued to **86-105 ft-lbs.**
- ☐ OEM M16 crossmember bolt torqued to **194-238 ft-lbs.**
- ☐ Reservoir Mount Self Tapping Screws tightened to **snug only.**
- ☐ 5/16"-24 Clamp Fasteners torqued to **240 in-lbs.**
- ☐ 3/8"-16 Nuts Torqued to **35-43 ft-lbs.**
- ☐ M10 Nuts Torqued to **43-53 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.

STEERING SENSOR INSTALLATION:

- ☐ OEM Crossmember/Track Rod Mount fasteners torqued to **194-238 ft-lbs.**
- ☐ M5 fasteners torqued to **22 in-lbs.**
- ☐ 1/4"-20 U-bolt nuts torqued to **60-85 in-lbs.**
- ☐ Locking Clips installed.
- ☐ Steering sensor harness attached and routed.
- ☐ Steering wheel turned full left and full right and checked for clearance around sensor and linkage.

WIRING HARNESS INSTALLATION:

- ☐ Dash harness installed
- ☐ All appropriate wiring splices made.
- ☐ OEM Connector plugged into Upfitter Port 2.
- ☐ 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.

INITIAL FILL/CALIBRATION:

- ☐ Battery connected.
- ☐ Suspension rose to ride height.
- ☐ System bled.
- ☐ Reservoir at proper level.
- ☐ Calibration completed.