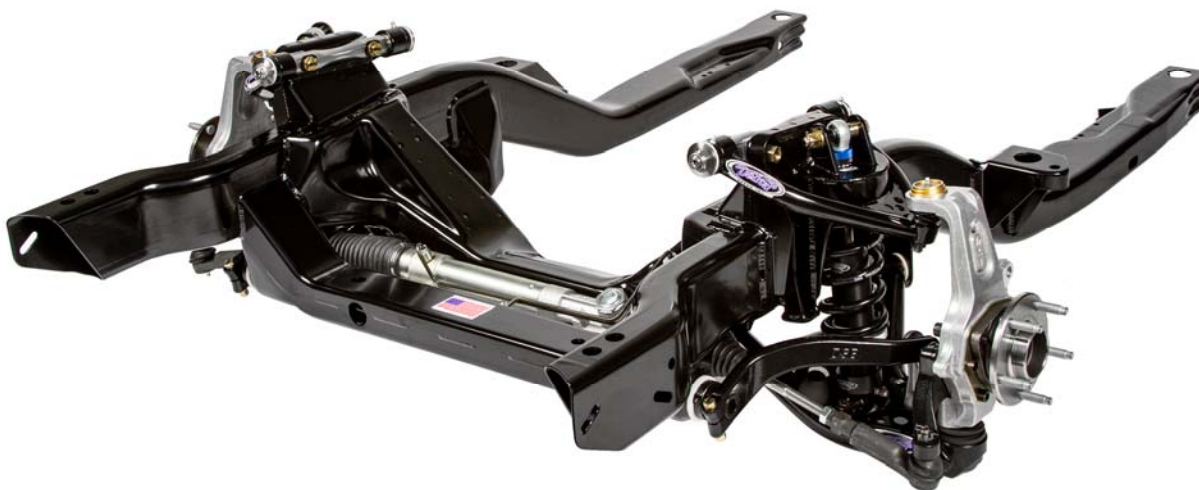




**Detroit Speed, Inc.**  
**Hydroformed Front Subframe**  
**1967-1969 Camaro/Firebird & 1968-1974 Nova**  
**P/N: 032001 through 032005**



**Figure 1**

## **INTRODUCTION**

Congratulations on your purchase of a hydroformed front frame from Detroit Speed, Inc. This all new front frame is a bolt in replacement for the original stock front frame and greatly improves handling and ride quality by utilizing DSE's unique suspension geometry. It is the only front frame in the aftermarket industry with hydroformed frame rails. The hydroformed frame rails feature high strength and stiffness, decreased weight, and precise quality and repeatability. Hydroforming preserves the steel's strength and stiffness because it is performed at low temperature, unlike traditional high temperature processes which decrease material strength.

The DSE front frame has been designed, engineered, and developed for the road and track. This front frame blends the benefits of current OEM technology and aftermarket performance into one product.

The DSE front frame has the following features:

- Hydroformed framersails and stamped crossmembers
- Optimized suspension and steering geometry
- Ability to accommodate small and big block Chevrolet engines as well as LS1, LS2, and LS7 engines
- Fits within stock inner fenders on a 1969 Camaro without modifications. 1967-1968 Camaros may require modifications to the inner fenders.
- Aluminum body coilover shocks with "Detroit Tuned" valving
- Splined Anti-Roll bar
- Power rack and pinion steering

Specifications-DSE Front frame	
Total Suspension Travel	6"
Ride Height*	2.9" ± 1.0"
Static Camber	- 0.5° ± 0.2°
Static Caster	+5.0° ± 0.5°
Static Toe	0.0° ± 0.1°
*Measured from the top of the framerail to the center of the hub	

Engine Fitment-DSE Front frame				
SBC/BBC Engines				
Engine	Mounting	Oil Pans	Headers	Comments
Small Block Chevrolet	Stock type mounts and brackets	Stock Or Aftermarket	Patriot P/N: H8056 (mid-length) P/N: H8047 (full-length) Hooker Headers P/N: 2131 (1 3/4" full-length) Lemon's Headers	
Big Block Chevrolet	Stock type mounts and brackets	GM P/N: 12495360 (one-piece rear main seal)	Patriot P/N: H8012 (mid-length) Doug's Header's P/N: D313R (full-length) Lemons Headers	
LS Engines				
Engine	Engine Mounting Kits/Engine Oil Pan Usage		Headers	Comments
LS1*, LS2* & LS3*	DSE P/N: 060401 (Positions engine in a stock position) Oil Pan: Stock GM 4 <sup>th</sup> Gen F-body P/N: 12558762 or Champ P/N: LS1000 or Mast Motorsports P/N: 401-011 or DSE P/N: 060404 (Moves engine rearward from stock 1") Oil Pan: Stock GM LS1, LS2, or LS3 or Mast Motorsports P/N: 401-011		DSE P/N: 061001 (Requires use of DSE Engine Mount Kit P/N: 060404)	A/C compressor will fit in stock 4 <sup>th</sup> Gen F-body mounting location.
LS7*	DSE P/N: 060401 (Positions engine in a stock position) Oil Pan: Stock GM Oil Pan NOTE: Use GM P/N: 25534412 or Peterson Fluid Systems for dry sump fittings to drain oil pan or DSE P/N: 060404 (Moves engine rearward from stock 1") Stock GM Oil Pan		DSE P/N: 061001 (Requires use of DSE Engine Mount Kit P/N: 060404)	A/C compressor will fit in stock 4 <sup>th</sup> Gen F-body mounting location. Needs to use Camaro style balancer/pulley.

**\* NOTE: For aftermarket LS engines (i.e. Mast Motorsports), refer to manufacturer for specific oil pan usage and use chart above for correct DSE Engine Mounting Kit.**

Accessory Components-DSE Front frame	
Brakes	DSE has Baer brake packages for our front frame. Any C6 Corvette brake application will work with our front frame.
Body Mounts	DSE stock height or half height body mounts or any stock type body mount.
Subframe Connectors	Most connectors available for the stock subframe will fit
Rack & Pinion Fittings	Return (low): 5/8" - 18 - Pressure (high): 9/16" - 18 Fittings to adapt to -6 AN and complete hose kits are available from DSE
Rack & Pinion Input Shaft	3/4"-36, Complete kits available from DSE
Transmission Crossmember	Stock or aftermarket crossmembers designed to fit a stock subframe
Z-Bar Bracket	Bolt-on bracket available for stock clutch linkage. See Page 4.
Parking Brake Cable	Stock routing and mounting

## Wheel and Tire Fitment

1967-68 Camaro/Firebird		
Wheel Size	Wheel Backspacing	Tire Size
17" x 8.0" *	5.125"	245/45ZR17
18" x 8.0"	5.125"	245/40ZR18
18" x 8.5"	5.625"	245/40ZR18
18" x 9.0"	6.125"	255/35ZR18
18" x 9.5"	Not Recommended	
18" x 10.0"	Not Recommended	

1969 Camaro/Firebird		
Wheel Size	Wheel Backspacing	Tire Size
17" x 8.0" *	4.875"	245/45ZR17
18" x 8.0"	4.875"	245/40ZR18
18" x 8.5"	5.125"	245/40ZR18
18" x 9.0"	5.375"	255/35ZR18
18" x 9.5"	5.875"	255/35ZR18
18" x 10.0"	6.125"	275/35ZR18

1968-74 Nova		
Wheel Size	Wheel Backspacing	Tire Size
17" x 8.0" *	5.125"	245/45ZR17
18" x 8.0"	5.125"	245/40ZR18
18" x 8.5"	5.625"	245/40ZR18
18" x 9.0"	6.125"	255/35ZR18
18" x 9.5"	Not Recommended	
18" x 10.0"	Not Recommended	

**\* 17" wheels require a minimum inside wheel diameter of 16.250"**

**Caution:** Some brake applications will not work with 17" wheels. Flush mount valve stems may also be required on wheels with a behind center valve stem location.

Fastener Torque Specifications – DSE Front frame		
Application	Torque (ft-lb)	Threads
Lower Control Arm Mounting Bolts	95	
Rack and Pinion Mounting Bolts	95	Anti-Seize
Anti-Roll Bar Shaft Clamp Screw	14	Blue Loctite 242
Anti-Roll Bar Link Nuts	40 on top nut – 45 on bottom nut	Red Loctite 262
Upper Control Arm Crossshaft Mounting Bolts	75	Red Loctite 262
Upper Coilover Shock Mounting Bolts	70	
Lower Coilover Shock Tie Bar Bolts	35	
Anti-roll Bar Arm Mounting Bolt	25	
Tie Rod End Jam Nut	45	
Upper Control Arm Ball Joint Stud Nut*	40	
Lower Control Arm Ball Joint Stud Nut*	20 then turn an additional 180°	Red Loctite 262
Tie Rod End Stud Nut	35	Anti-Seize
Wheel/Hub Bearing Mounting Bolts	95	Red Loctite 262
Steer Arm Mounting Bolts	60	Red Loctite 262
Body Mount Bolts	90	
Radiator Support Mount Bolts	35	
Front Brake Caliper Mounting Bracket Bolts	125	
Wheel Stud Nuts	100	
*Always tighten slotted nuts to line up with the cotter pin hole.		

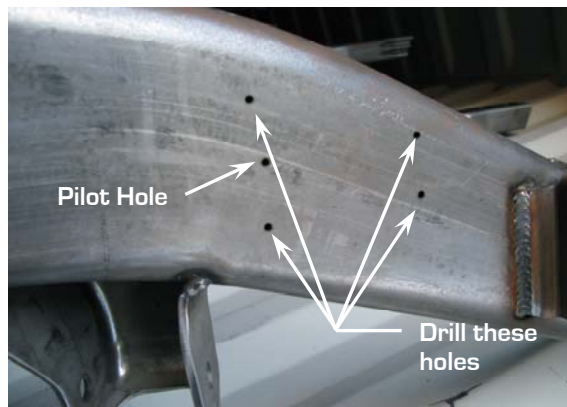
## **IMPORTANT:**

If the lower control arm ball joint stud needs to be serviced after the initial torque setting listed above for a coilover spring change, etc. use the following information to re-assemble the lower control arm and upright:

1. Before you remove the ball joint nut, make a line with a marker from the top of the nut down to the upright and then loosen the ball joint nut.
2. Upon re-assembly, torque the ball joint nut to 20 ft-lbs. and then tighten the nut until the line on the nut goes back to the line on the upright so it is back in the same location as the initial torque setting.

**DSE Bolt-on Z-bar Bracket (P/N: 032101):** If you purchased the Bolt-on Z-bar Bracket, Detroit Speed has a bracket for this application. The Bolt-on Z-bar Bracket provides a simple and effective way of mounting a bracket to the front frame for the factory Z-bar bracket.

1. Pilot holes for the Bolt on Z-bar Bracket are located in the frame rails. The appropriate holes in the front frame must be drilled larger to be tapped. These holes are shown in Figure 2.



**Figure 2 – Locating the holes to be drilled**

2. Drill the holes out using a “J” drill bit. Using the appropriate tools, tap the drilled holes to 5/16” – 24.
3. Before bolting the DSE Bolt-on Z-bar Bracket to the front frame, attach the factory Z-bar support. Use the provided hardware to attach the Z-bar Bracket to the front frame.

**NOTE:** Be sure the frame rails are free of any loose media or particles that may have collected in the rails from paint or powdercoat. Do this with compressed air. Pay particular attention to the front crossmember. Any foreign particles left in the front crossmember could possibly damage the Anti-roll bar end support bushings.

**1. Install lower control arm assemblies.**

- a) Locate the correct lower control arm (driver or passenger side). This is referenced by the bump stop located on the forward leg of the front frame. See Figure 3.



**Figure 3 – Passenger side control arm shown**

- b) Be sure to use the correct bolts to mount the control arms. The short bolt (9/16-18 x 3 1/2") is used in the forward leg of the control arm and the long bolt (9/16-18 x 3 3/4") is used in the rear leg of the control arm. Both bolts must point forward [i.e. bolt head toward the rear] or the bolts and the control arm will not be able to be removed once the front frame is fully assembled.

**2. Install each coilover assembly.**

- a) Before installing each coilover, it is necessary to build each assembly.

For the *base, non-adjustable shocks* please use the following steps to assemble each coilover shock:

- (1) Assemble the coilover shock by removing the snap ring using a set of snap ring pliers to remove the upper spring seat as seen in Figure 4.
- (2) Once the upper spring seat is removed, the coilover adjuster nut must be threaded all the way to the bottom of the threads. Then you can install the Torrington bearing set (See Figure 5) on each shock by installing one thrust washer, followed by the roller bearing and then another thrust washer.



**Figure 4 – Removing the Snap Ring**



**Figure 5 – Torrington Bearing Set**

- (3) With the Torrington bearing set in place you can now install the spring over the end of the shock.
- (4) With the spring in place, install the upper spring seat along with the snap ring as seen in Fig. 6.



**Figure 6 - Snap Ring Installed**

For the *adjustable shocks*, please use the following steps to assemble each coilover shock:

- (1) Remove the upper spring seat from the retaining ring using a rubber hammer and moving it down off the upper shock mount as seen in Figure 7.
- (2) Remove the retaining ring from upper shock mount and pass the upper spring seat over the upper shock mount as seen in Figure 8.
- (3) Thread the spanner nut all the way to the bottom of the coilover shock and install the Torrington bearing set (See Figure 5 above) on each shock by installing one thrust washer, followed by the roller bearing and then another thrust washer.
- (4) Slide the coilover spring over the top of the upper shock mount.
- (5) Install the upper spring seat back over the top of the upper shock mount and re-install the retaining ring back onto the upper shock mount. Press the upper spring seat up onto the retaining ring so it locks in place.

The coilover assembly is now complete and ready to be installed.



**Figure 7 - Removing the Upper Spring Seat**



**Figure 8 - Upper Spring Seat & Retaining Ring**

- b) Make sure the upper mounting hole is clean and free of any paint so the bolt and spacer slide into the mounting tab.
- c) Slide the 1/2" upper bolt with spacer through the eyelet and install the 1/2" Nylock nut and washer from the shock hardware bag provided.
- d) Position the lower coilover mount to the lower control arm. Install the lower shock retaining bolts from the top side of the control arm so that the washer and nut are on the bottom of the LCA. Torque all coilover and LCA hardware. Figure 9 shows a completed and installed coilover spring.





Figure 9 - Installed Coilover View (Passenger Side)

3. **Install the upper control arm assemblies.**

- a) When installing the upper control arms, be sure to install a flat washer on both the head and nut side of the bolt. See Figure 10 for help distinguishing between the driver and passenger side UCAs.
- b) Apply High Strength Loctite 262 to the threads of the bolts before installing nuts.
- c) Once the nuts have been installed loosely, insert two shims on each bolt and torque the bolts.

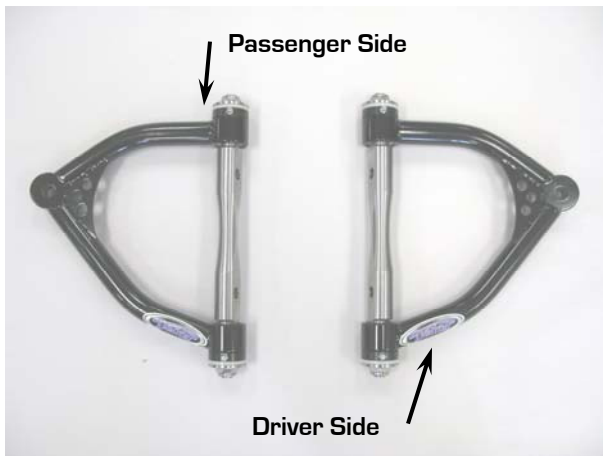


Figure 10a - Driver & Passenger Upper Control Arms

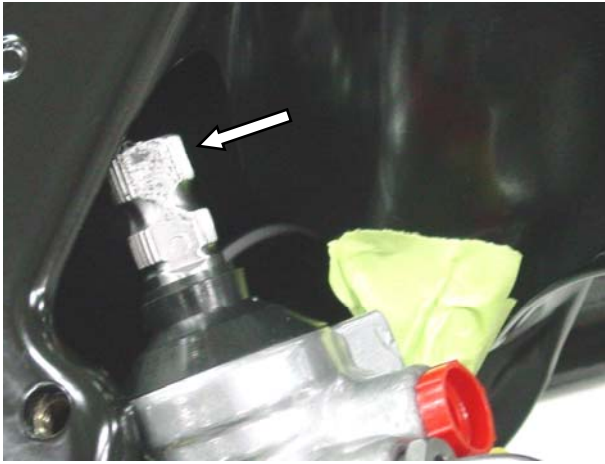


Figure 10b - Installed Upper Control Arm View

4. **Install the bump stops for the upper control arms.**

5. **Install the rack and pinion assembly.**

- a) When installing the rack and pinion, protect the opening in the crossmember to avoid paint chips as it gets very tight in several areas. Install the rack and pinion assembly **from below the crossmember** for better clearance and easier alignment.
- b) The steering output shaft must be positioned with the flat of the shaft pointed upward. Refer to the arrow in Figure 11. With the steering shaft turned correctly so that the flat surface on the splined steering shaft points up and forward, rotate the rack to the rear of the front frame to install in the crossmember. Figure 12 shows the rack installed.



**Figure 11 – Positioning the Steering Shaft**



**Figure 12 – Installed Rack**

- c) Once the rack is in place, slide the aluminum spacers in place between the rack and the forward crossmember and install the bolts. Use anti-seize on the bolts and torque to 95 ft-lbs.

**6. Install the outer tie rod ends.**

- a) Apply anti-seize to the tie rod end threads, then thread the outer tie rod ends onto the rack and pinion.
- b) When installing the tie rod ends, make sure they are equal distance on each side to center the steering. This measurement should be approximately 2 ¼" per side. Measure this from the end of the threads to the outer edge of the nut.
- c) Thread the grease fittings into the tie rod ends.

**7. Install the Anti-Roll bar.**

- a) Lube the outside of the composite bushings with soapy water. Lube the inside of the bushing, and do your best to fill the interior bushing grooves with chassis grease.
- b) Before sliding the Anti-Roll bar in place, clean the outside of the bar thoroughly with lacquer thinner to remove any foreign materials from the bar.
- c) Once the bar is clean, slide the bar in place. After the bar is in place, install the composite bushings. The bushings may not push in completely by hand. Do not be concerned, as they are designed to be a very precise fit. With the bar and both bushings installed, use a large diameter socket and a rubber hammer to seat the bushings on both sides at this time. See Figure 14.



**Figure 13 – Installing the Bushing & Anti-Roll Bar**



**Figure 14 – Fully Installing the Bushings**

- d) After installing the bar and pushing the bushings in all of the way, center the bar in the crossmember. Measure the portion protruding from the bushings on each side as in Figure 15 and adjust accordingly until this measurement is the same on both sides. Make sure to reseat the bushings



against the frame before measuring, as they can shift when you move the bar and throw off your measurements.



**Figure 15 – Measuring the Anti-Roll Bar**

- e) Install the Anti-Roll bar shaft clamp next. Loosen both allen screws in the lock collar. Apply Medium Strength Loctite 242 to the threads and position the clamp onto the Anti-Roll bar. With the heads of the bolts accessible from the bottom, torque the bolts. **NOTE:** Be sure that the groove in the clamp is installed so that it points to the center of the front frame and the size marking is to the outside, and that the two clamps match on either side. See Figure 16.



**Figure 16 – Indexing the Clamp**

8. **Install the Anti-Roll bar arms to the Anti-Roll bar tube.**
- a) Make sure both arms are positioned the same on the splines and are even in relation to one another.
  - b) When both arms are on the same splines, bolt them in place. The bolt will go through the arm and line up with the groove in the end of the Anti-Roll bar tube. Install the bolt from the bottom so that the nut is on top of the bar. The bolt will not be able to be removed after it is fully assembled.
  - c) Torque the Anti-Roll bar arm retaining bolt.

9. **Install the Anti-Roll bar end links to the lower control arm.**

- a) These must be installed on the lower control arms now as tightening the links later can be very difficult.
- b) Use the included Nylock nut and washer. When installing the lower Nylock nut, use High Strength Red Loctite 262 on the threads.
- c) Torque the lower nut to the correct specification.

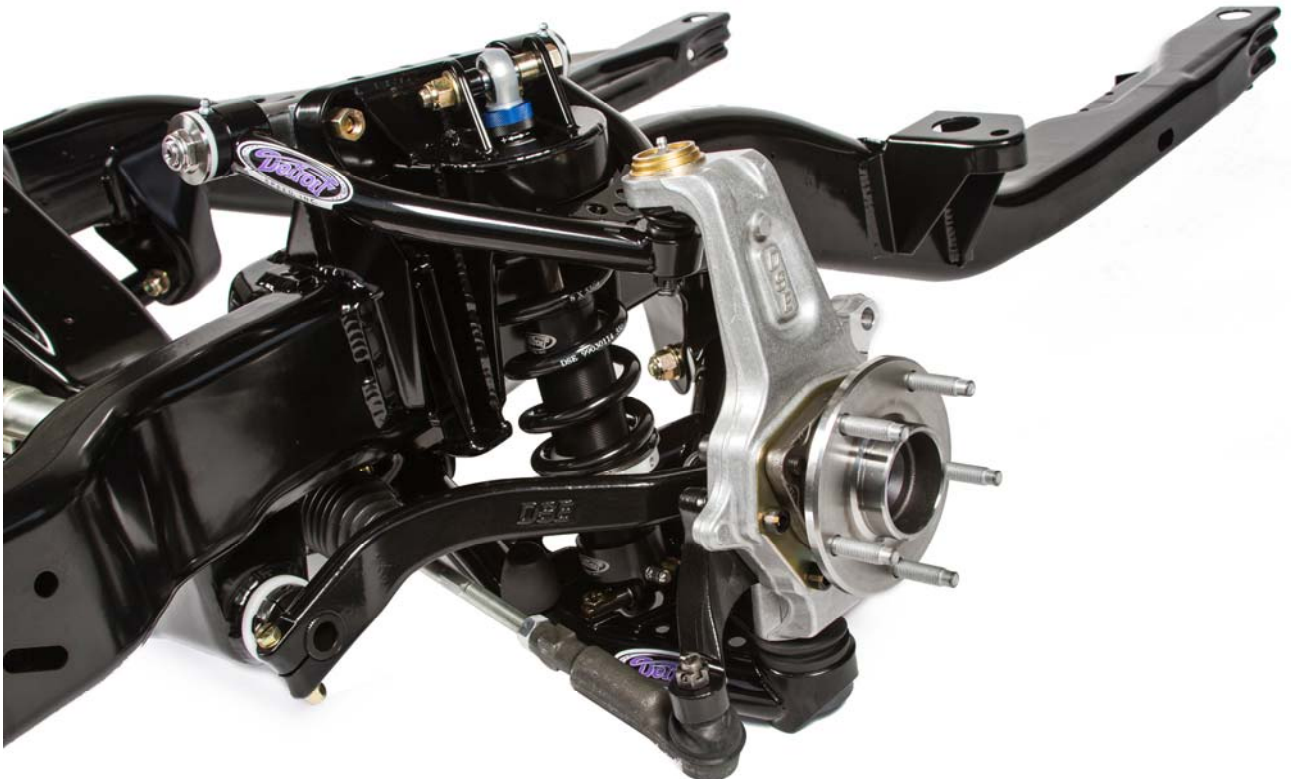
10. **Connect the Anti-Roll bar arm to the end links.**

- a) Connect the Anti-Roll bar arm to the Anti-Roll bar end link on either side. Use High Strength Red Loctite 262 on the threads when installing the jam nuts and washers and torque.
- b) Reposition the lower control arm on the side that is being installed last.
- c) Install the upper Anti-Roll bar end link nut to the Anti-Roll bar arm. Again, use High Strength Red Loctite 262 on the threads and torque.

11. **Install the spindle assembly.**

- a) Clean any grease from the upper and lower ball joint studs and the spindle holes with a clean rag and lacquer thinner.
- b) Install the spindle to the upper control arm first. **NOTE:** Turn and position the stud so the cotter pin locates from front to rear to ease installation.
- c) Tighten the upper ball joint nut to the appropriate torque setting and install the cotter pin.
- d) Place the spindle on the lower ball joint. **NOTE:** Turn and position the stud so the cotter pin locates from front to rear to ease installation.
- e) Tighten the lower ball joint nut to the appropriate torque setting and install the cotter pin. **NOTE: It is critical to follow the torque procedure listed in the table on page 3 and to use High Strength Red Loctite 262 on the lower ball joint threads.**
- f) Insert outer tie rod end into the spindle and torque. Install the cotter pin.

12. The front frame is assembled at this point. Figures 17 and 18 show a completed installation. Double-check to ensure that all installed components are tight and torqued correctly.



**Figure 17 – Fully Assembled View (Driver side, Front)**



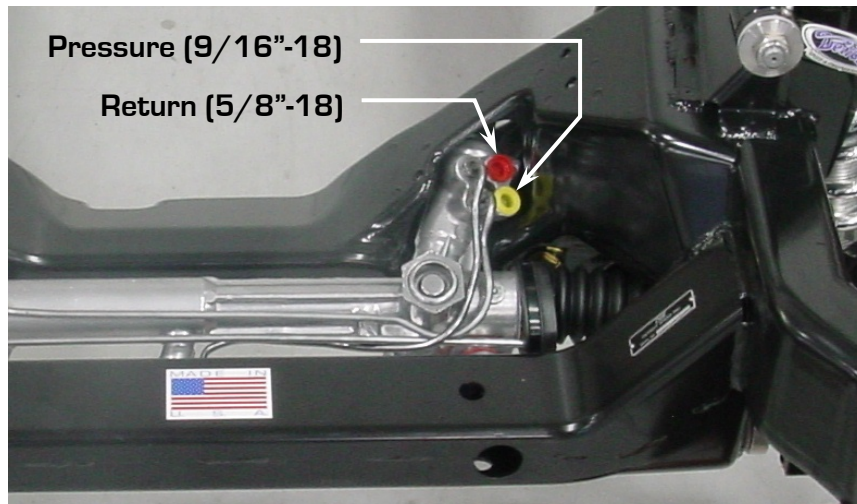
**Figure 18 – Fully Assembled View (Driver side, Rear)**

13. Install the front frame in the vehicle. It is very important that the front frame be centered in the vehicle.
- a) Position the vehicle on level and solid ground. Support the vehicle using jackstands at four corners of the body.
  - b) Locate the lower control arm forward mounting locations and drop a plumb line to the ground and mark the locations.
  - c) On the rear of the car, locate the round flanged hole in the frame rail that is next to the rear spring pockets. Drop a plumb line from this location on both sides and mark the locations.
  - d) Measure diagonally from these locations to see if the front frame is square. The difference between the two measurements should be  $1/16"$  or less. If the front frame is not square, loosen the front frame mounts and reposition.
14. When installing the front frame in 1968-1974 Nova applications, it is necessary to use the factory Body Mount Spacers. The spacers install at the forward body mounts and install between the body mounts and the body. The spacers can be seen in Figure 19.



**Figure 19 – Nova Body Mount Spacers**

15. After the front frame is installed into the vehicle, the power steering hoses can be attached to the steering gear. Follow Figure 20 for the location of the pressure and return ports.



**Figure 20 – Location of Pressure and Return Ports**

16. The front frame is now assembled and installed. **NOTE:** Be sure to lubricate all points on the front frame with quality chassis grease. Detroit Speed offers Driven Extreme Pressure chassis grease available as P/N: 140103 if needed.
17. When installing the engine in the front frame on LS7 applications, the DSE Hydroformed Front frame is designed to accept the stock oil pan and drain plug. However, the design does not allow the drain plug to be functional. To drain the oil from the engine, the hose adapters on the oil pan must be used. The manufacturer and part numbers for the hose adapters are shown in the engine fitment section on page 2. Follow the manufacturer guidelines for the installation of this hose kit.
18. Setting the vehicle ride height.
  - a) With the vehicle assembled with all components installed, adjust the ride height as necessary. Detroit Speed does recommend using a small wipe of anti-seize before adjusting the spanner nut and compressing the coilover spring.
  - b) Detroit Speed does include a Spanner Tool (P/N: 031060) to adjust ride height however if you have the adjustable coilover shocks, Detroit Speed does offer an Adjustment Tool available as P/N: 031061 if needed. A photo can be seen in Figure 21.



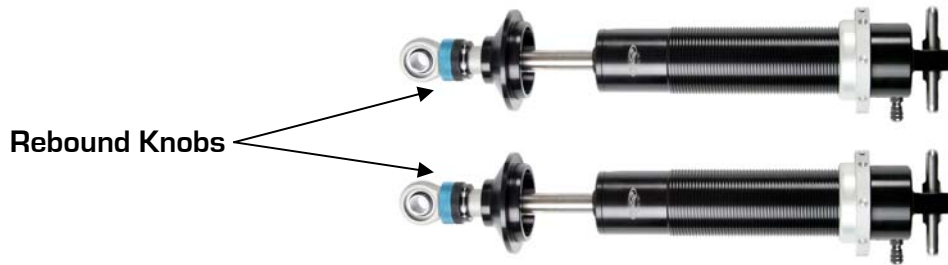
**Figure 21 – Adjustment & Spanner Tool**

19. If the Single Adjustable, Double Adjustable, or the Double Adjustable Remote Canister Coilovers were purchased as an upgrade, refer to the following information for adjustment procedures.



## ***DSE Single Adjustable Shock Applications***

To change from the recommended “Detroit Tuned” valving, adjustments can be made independently to the rebound setting. The rebound is controlled by the knob at the upper shock mount (Shock is mounted body side down). The knob rotates clockwise (+) to increase the damping and counterclockwise (-) to decrease the damping. Refer to Figure 22a below



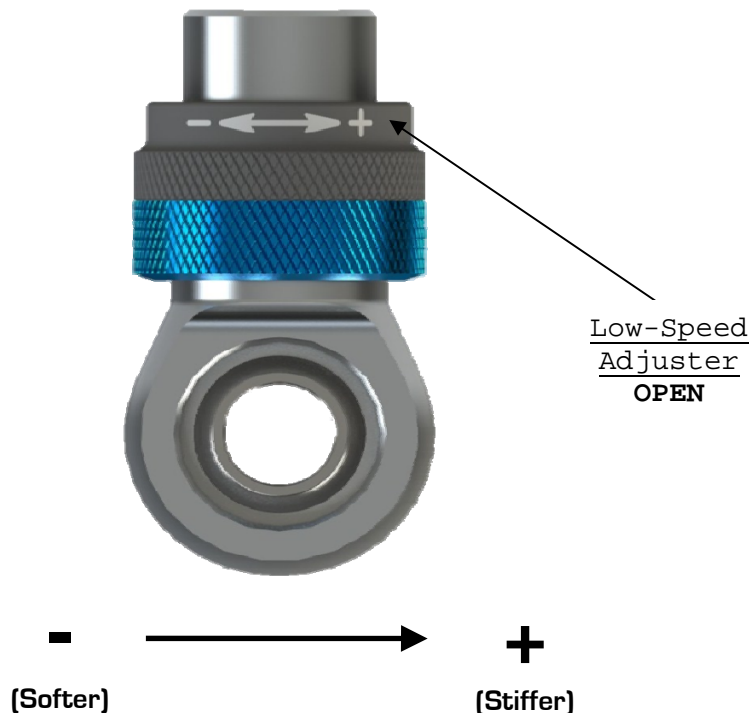
**Figure 22a- DSE Single Adjustable Shock**

To return to the DSE recommended settings, turn the knob clockwise (+) to full damping. Once at full damping, turn counterclockwise (-) to reach the recommended settings. Refer to Figure 22b for the rebound settings.

Rebound (Shaft Knob)..... 15 Open (counterclockwise, -)

**Figure 22b - DSE Recommended Settings**

## **Adjuster Operation**



- **Adjuster (60-64 Clicks)**

The low-speed adjuster is a “clicker” style adjuster meaning that its adjustment is measured by detents located inside the blue adjuster knob. There are 16 clicks per 1 revolution of the knob. It uses a right-hand thread in its operation which means as you increase low-speed, the adjuster will move up on the eyelet. The recommended change for an adjustment is 8 clicks at a time. The low-

speed adjuster's reference position is **full stiff** (closed, or all the way up) and referred to -0 (-0 = full stiff, -64 = full soft).

- **Tuning Notes**

- **Racetrack**

- For more grip, soften the damping.
    - For increased platform control, stiffen the damping.

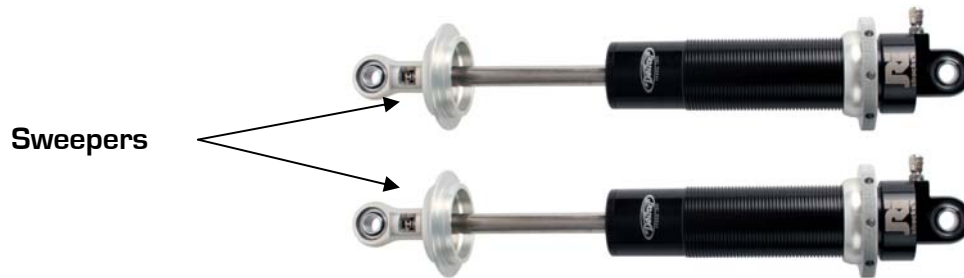
- **Street**

- For a more comfortable ride, soften the damping

**\*DO NOT FORCE KNOB WHEN IT STOPS TURNING, YOU MAY DAMAGE THE ADJUSTER AND INTERNAL HARDWARE**

### ***DSE Double Adjustable Shock Applications***

To change from the recommended "Detroit Tuned" valving, adjustments can be made independently to both the high and low speed settings. The rebound is controlled by the sweepers at the upper shock mount. The sweepers rotate clockwise (+) to increase the damping and counterclockwise (-) to decrease the damping. The sweepers can be seen in Figure 23a.



**Figure 23a - DSE Double Adjustable Shock**

When adjusting the low speed rebound start at full (+) position, when adjusting the high speed rebound start at full (-) position. To return to the DSE recommended settings turn the sweeper clockwise(+) to full damping for the low speed setting, and counterclockwise (-) to full damping for the high speed setting. Once at full damping, turn counterclockwise(-) for the low speed setting, and clockwise(+) for the high speed setting to reach the recommended settings. Refer to Figure 23b for recommended settings.

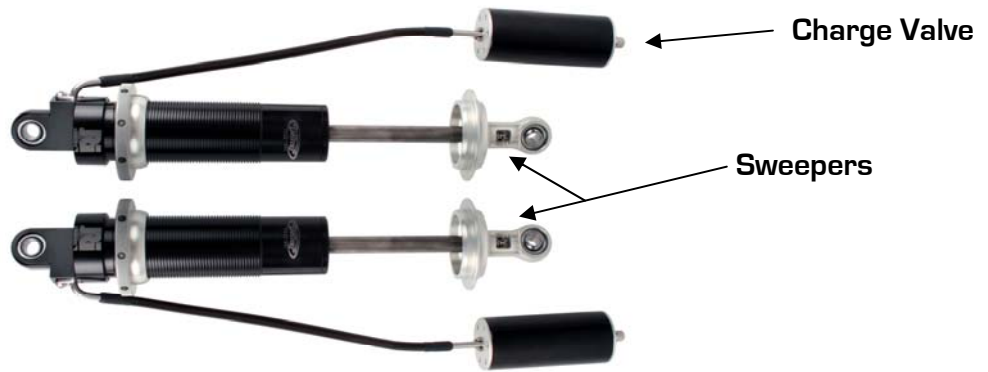
Low Speed Rebound (Sweeper).....	15 sweeps [counterclockwise](-)
High Speed Rebound [Sweeper].....	4 sweeps[clockwise](+)

**Figure 23b - DSE Recommended Settings**

### ***DSE Double Adjustable Shocks w/Remote Canisters***

To change from the recommended "Detroit Tuned" valving, adjustments can be made independently to both the high and low speed settings. The rebound is controlled by the sweepers at the upper shock mount. The sweepers rotate clockwise (+) to increase the damping and counterclockwise (-) to decrease the damping. Refer to Figure 24a.





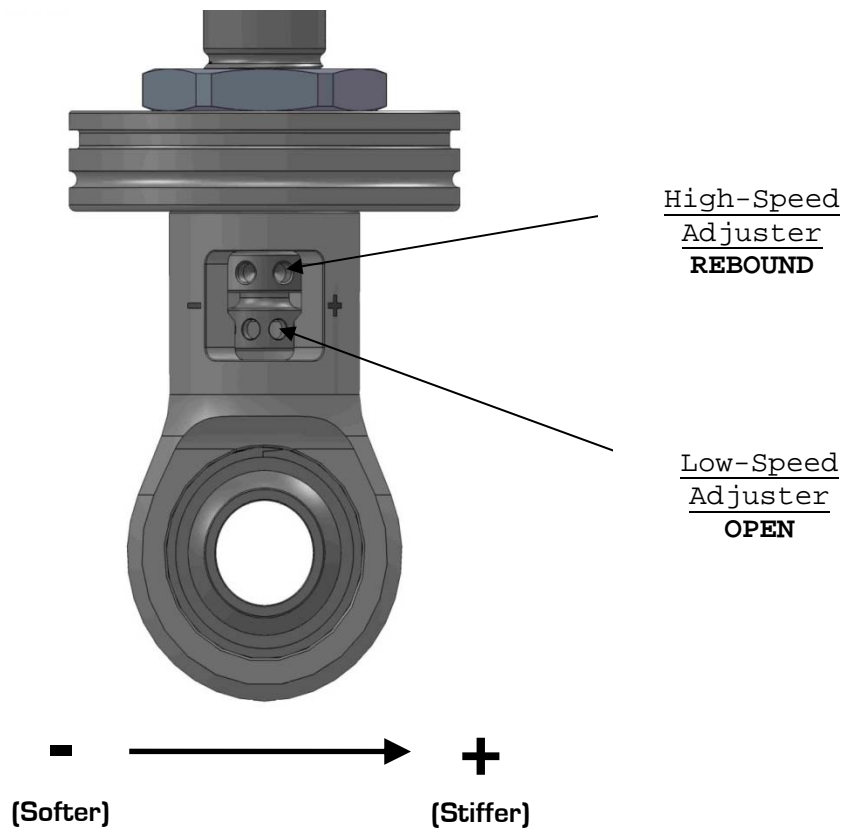
**Figure 24a – DSE Double Adjustable Shock w/Remote Canister**

When adjusting the low speed rebound start at full (+) position, when adjusting the high speed rebound start at full (-) position. To return to the DSE recommended settings turn the sweeper clockwise(+) to full damping for the low speed setting, and counterclockwise (-) to full damping for the high speed setting. Once at full damping, turn counterclockwise (-) for the low speed setting, and clockwise(+) for the high speed setting to reach the recommended settings. Refer to Figure 24b for recommended settings.

Low Speed Rebound [Sweeper].....	15 sweeps [counterclockwise](-)
High Speed Rebound [Sweeper].....	4 sweeps[clockwise](+)

**Figure 24b – DSE Recommended Settings**

### Adjuster Operation



- **High-Speed Adjuster (12 Sweeps)**

The high-speed adjuster is a “sweep” style adjuster meaning that its adjustment is measured by the location of the adjuster in the eyelet window. It uses a left-hand thread in its operation which means; as you increase high-speed, the adjuster will move down in the window\*. The high-speed adjuster's reference position is **full soft** and referred to as +0 (+0 = full soft, +12 = full stiff).

- **Low-Speed Adjuster (25 Clicks)**

The low-speed adjuster is a “clicker” style adjuster meaning that its adjustment is measured by detent grooves located inside the high-speed shaft. It uses a right-hand thread in its operation which means; as you increase low-speed, the adjuster will move up in the window. The low-speed adjuster's reference position is **full stiff** and referred to as -0 (-0 = full stiff, -25 = full soft).

***\*The low-speed adjustment does not change when adjusting the high-speed.***

To aid in the installation of the reservoirs, we also offer a set of Billet Aluminum Remote Canister Mounts. The canister mounts are available exclusively through DSE, P/N: 032102. They are shown in Figure 25.



**Figure 25 – Billet Aluminum Remote Canister Mounts**

20. Have a professional alignment completed following the specifications given in the chart on Page 2.

If you have any questions, please contact Detroit Speed, Inc. at (704) 662-3272.

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