



## Tesla Model 3 Ohlins DFV Coilover Install Guide



**Warning:** Parts of this installation are highly dangerous when performed improperly or with improper tools. This install is intended to be performed by a **certified professional technician**. In addition, due to the nature of the adjustability that is built into the Ohlins suspension, it is possible to adjust the suspension such that the battery-to-ground clearance is compromised. This suspension should be installed by a specialist if adjusting outside of the recommended parameters. Installation of this suspension on a vehicle is done at your own risk, and all liabilities associated with the performance and safety of the vehicle will be assumed by the owner of the vehicle.

**\*Important note about shock assembly, setup, and adjustment:**

All of our suspension kits must be assembled to the recommended free length. The dual-adjustable nature of the Redwood Motorsports Ohlins DFV's allow adjustment of vehicle height via both Free Length and Preload. This allows nearly infinite customization for advanced and or custom setups, however, it is possible to adjust the shocks to the point where battery to ground clearance becomes compromised. As with any lowered car, do so only at your discretion and be mindful of road hazards that would endanger a lowered car. Unlike other cars, the Tesla's battery pack is one of the lowest parts of the car - impacts, damage, or punctures will endanger the battery pack and or entire car itself. Height adjustment is therefore recommended to be done using spring preload only. While we have set our free length recommendations to protect the battery in most circumstances, lowering the car beyond the factory height must be done at the owners risk.

As the Redwood Ohlins DFV shocks have an additional method of adjusting ride height - by adjusting free length of the shock assembly - the installer setting up the car must be mindful of the ramifications of modifying these dimensions. Shortening the shock free length has the effect of lowering the car while preserving compression stroke, however, this will reduce battery-to-ground clearance during compression, and allow the wheel to travel further into the wheel well. For that reason Redwood Motorsports does not recommend reducing shock free length - only do so **at your own risk** for advanced setups - battery to ground clearance will be reduced and risk of battery damage and or potential for battery fire due to impacts will be increased.

Please keep in mind, all Redwood Motorsports adjustable suspension components such as our Camber+Caster FUCA, Rear Adjustable Camber and Toe Control Arms, sway bars, etc. are designed to be used in conjunction with the standard free lengths listed. Any deviation from these dimensions may cause damage or be incompatible with other components.

## **Step 1: Remove frunk and associated covers**

There are 7 bolts that hold in the frunk and two panels held in by plastic snaps.

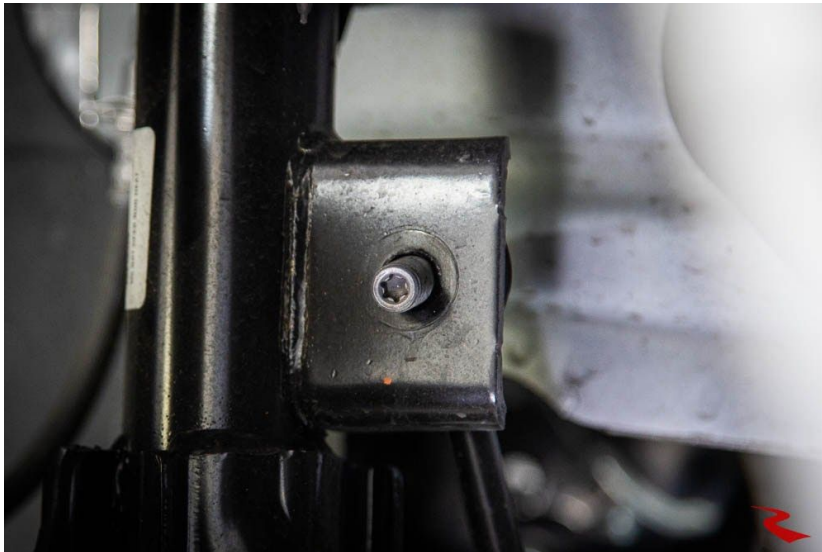
- Remove everything from the frunk.
- Remove the cowl area cover and the intake for the cabin air filter by pulling it up and away from the frunk and the cowl - these are both held in by snaps that will come undone with a bit of a tug.
- Remove the cover around the frunk latch so you can get at the bolts underneath.  
\*Note: There is an electrical connector to the internal frunk release on this panel, unplug that and set aside for now.
- Remove the two bolts near the frunk latch.
- Remove the two bolts on the frunk floor, and then remove the two bolts around the rim of the frunk closest to the passenger side - under the two flip open access points.
- Lastly unbolt the frunk panel from the windshield washer reservoir.
- Starting back by the cowl simply pull up on the frunk to pop loose all the plastic clips still holding it in place. Pick up the frunk and place it out of the way.
- Next, remove the two water guards from on top of the front strut towers. They are rubber pieces on either side that have two plastic rivets holding them in place. Simply pop up the center section of the two plastic rivets and then remove them and the covers will come off.
- With the covers removed, you will see one plastic rivet on either side holding the bottom of the cowl down to the strut tower, both of these must be removed as well.

## Step 2: Lift the vehicle, and remove OEM shocks/springs

### Front:

- Safely lift the vehicle, using factory lifting points, and remove wheels.
- Remove the anti-sway bar end link from both **front** struts.

**\*Note:** The stock sway has bonded bushings so removing the second one can be slightly troublesome, but the weight of an approximately 200lb person leveraging the sway bar is about right to get the hole lined up and the end link removed easily.



- Using a torx bit, undo the pinch bolt attaching the front knuckle to the upper control arm. Remove the bolt and tap up on the control arm to get the upper ball joint out of the socket in the front knuckle.



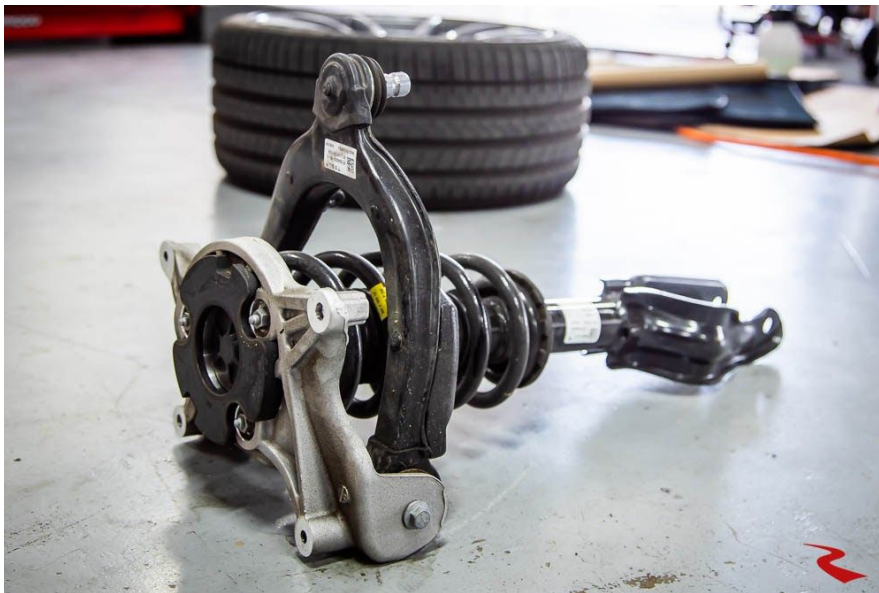
- Once this is loose you have plenty of room to remove the ABS sensor wire from the upper control arm. Disconnect this from the control arm completely as the front upper control arm will be removed with the front strut.
- Now, remove the front lower shock bolt going through the lower control arm.



- With the previous parts removed, we will go back to the top of the front shock tower to prepare to remove the shock, upper control arm, and the carrier as one assembly.

**\*Note:** Before doing so, it is wise to mark the location of a couple of the bolts that secure the assembly to the chassis. The holes have some slop so if you do not mark them now when you reinstall your suspension the front alignment may be slightly off.

- With the bolts marked such that you will be able to reinstall the carrier in the same position later, remove the 4 bolts on each side that hold in the upper control arm/strut carrier. One of these bolts is just a bit under the cowl, and one is a bolt that secures the front strut brace.
- While it is possible to remove the entire shock assembly without removing anything else, we recommend disconnecting the brake line holder from the front knuckle, which leaves you with a bit more room making removal easier.
- You can now remove the strut/carrier/FUCA assembly. Simply push the knuckle as far forward as you can and maneuver the assembly carefully out of the wheel well.
- With the assembly out of the car, remove the three bolts securing the strut top hat to the carrier. Set the carrier aside.





### Step 3: Front top hat removal (skip if you will be using floating top hats)

The following instructions will differ based on the kit version and parts you have. **Grand Touring** and **Performance Sport** kits **without** floating top hats require you to remove and reuse the stock top hats from the OEM Tesla front and rear shocks. If you have elected to use the Redwood Motorsports floating top hats, you can leave the OEM shocks assembled, and move directly to assembly and setup of your new Ohlins DFV shocks.

- Warning: This next step can be EXTREMELY DANGEROUS if improper techniques or tools are used. The stock strut is under approximately 1000lbs of tension because of the preload on the stock spring. Disassembly without the use of a professional level spring compressor is EXTREMELY DANGEROUS! Please exercise caution when removing the stock top hats. Please see our illustration of the massive amount of preload on the stock spring below.



- Place the stock shock in your spring compressor to hold the spring tension. Remove the stock top hat from the assembly. The rest of the stock assembly can be removed from the spring compressor and set aside as this is all you will need.

#### Step 4: Rear Shock Removal

- Remove the aero cover from the bottom of both rear lower control arms



- Support the lower control arm with a jack to take the load off the lower shock bolt. Remove the lower shock bolt.
- With the shock bolt out, loosen and remove the bolt attaching the lower control arm to the knuckle.

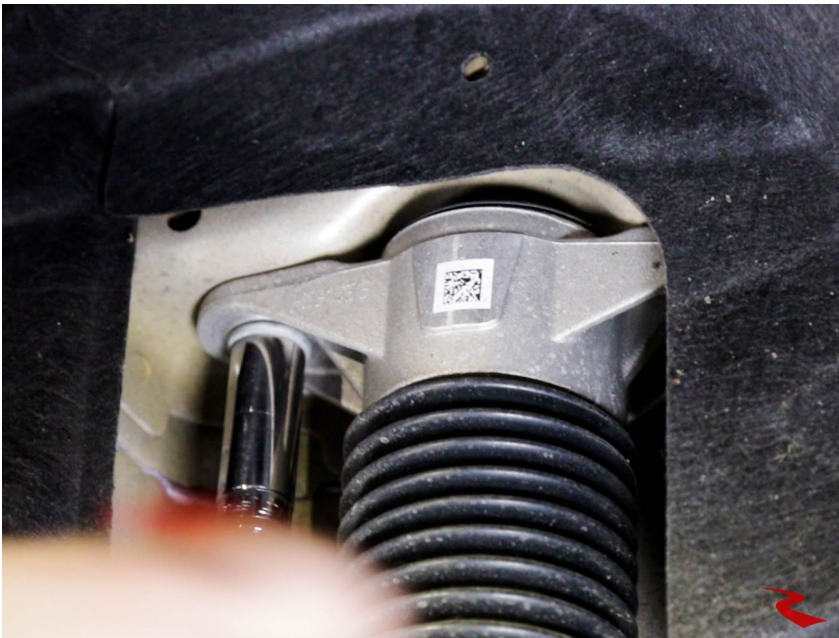




- Carefully lower the jack and move it off to the side.



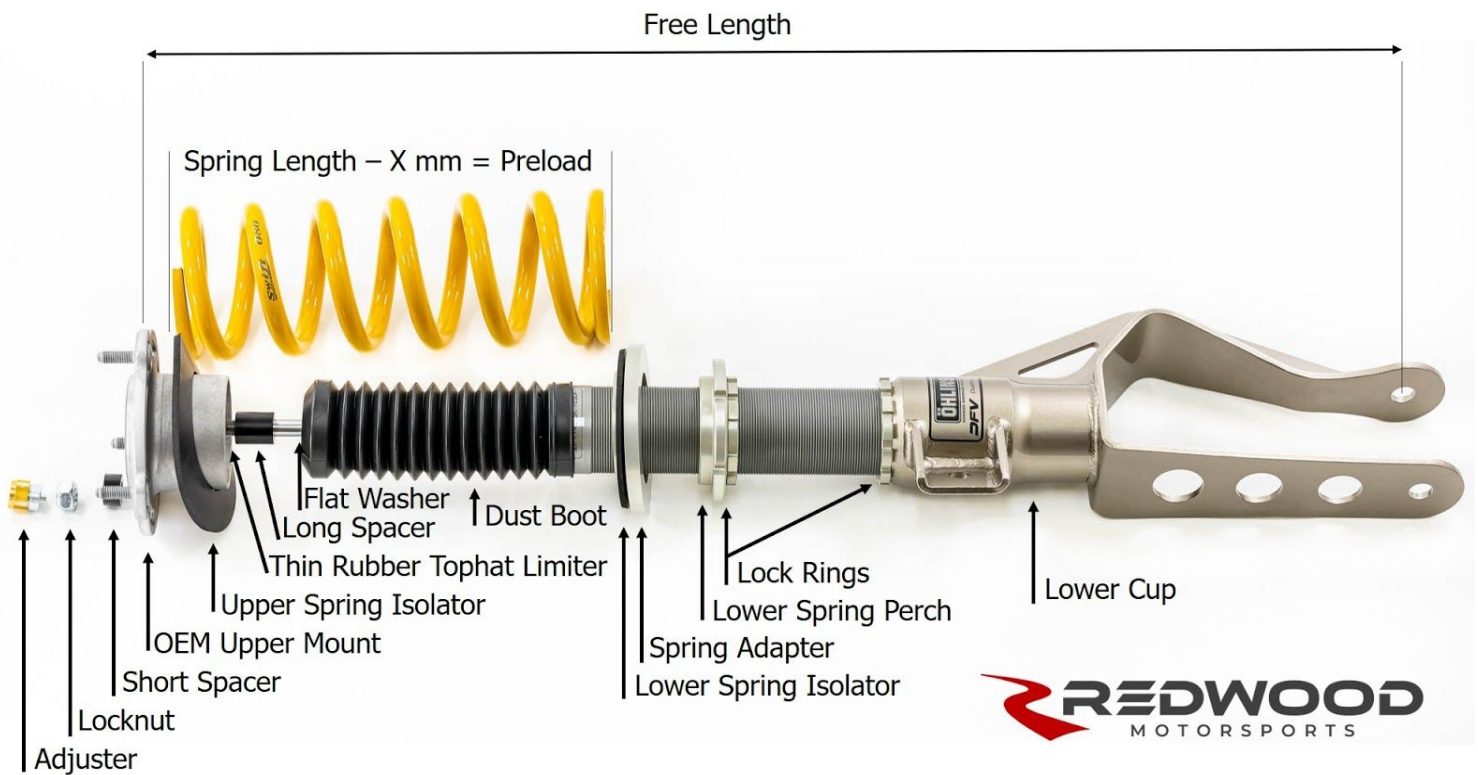
- Remove the two bolts from underneath the top hat that secure the top hat to the car and remove the shock assembly.



- With the shock assembly removed, push down on the lower control arm and pull the stock spring out. The stock spring will not be re-used, but the upper and lower rubber isolators will be re-used, so keep these handy.
- Remove the OEM top hat from the top of the shock.

**\*Note:** If you have purchased our floating rear tophats and they are not already installed, install them according to the directions included with them - you will need to transfer the two upright top hat bolts and retaining plastic washers from the OEM assembly to the new top hat assembly.

### Step 5: Front Shock Assembly and Setup



### Assembly:

- If you have purchased floating top hats they should have come assembled on your shocks. If not please see our floating top hat assembly guide.

- If you are reusing your stock top hats, install the smaller 70mm ID rubber isolator onto the gray circular 65->70mm spring adapter. Install the spring adapter on top of the 65mm lower spring perch.



**\*Note:** For ease of adjustment later, we recommend adding anti-seize to the threads surrounding the lower spring perch to allow for ease of movement while adjusting on-car. Apply anti-seize on the appropriate threads under and above the lower spring perch as needed.

- Install the dust boot and ensure it is seated. Note: Do not remove the black plastic spacer from the front shock shaft - between the bump stop and upper bump stop perch - it is required to protect the internals of the shock.
- Install the large steel washer on top of the dust boot, then the tall black cylindrical spacer on top of the washer.
- Next, we will install the spring onto the shock assembly. Before doing so, spin down the lower-spring-perch so that the spring will be loose once the top mount is installed. We will set preload later. Note: For ease of adjustment later, we recommend adding anti-seize to the threads of the shock shaft within the desired adjustment range.
- Install the OEM top hat with thick rubber spring-isolator between the spring and tophat, and thin 5mm bump limiter between the top hat and the large steel washer. \*OEM top hats please see note below.



- **\*OEM Front Top Hat Pro-Tip:** Due to the tapered nature of the stock front top hat, the front spring must be perfectly centered to avoid the spring rubbing on one side or the other of the downward protrusion. This can be done by simply centering the spring by hand when torquing the upper nut down, but to prevent the possibility of the spring becoming mis-aligned during assembly we recommend wrapping a section of the OEM top hat in electrical tape or similar. Wrap the top hat to take up slack between the ID of the spring and the OD of the OEM top hat, building up enough material to prevent the spring from shifting during assembly.

While the top hats can be installed without this step, you will need to ensure the assembly does not become mis-aligned during assembly. If the spring becomes mis-aligned, a rubbing or “violin” noise on compression is typically a sign that the OEM top hat is not centered, and slightly rubbing the side of the spring. Centering the spring will avoid this from happening, as shown below.



- With the tophat installed, add the short damper shaft spacer in the upper recess on the OEM top hat.



- Install the Nylock M10 Locknut which holds the shock assembly together. Use a  $\frac{3}{8}$ " impact driver to tighten the locknut while holding the shock shaft with two fingers through a gap in the springs. The rubber dust boot will help you grip the shock shaft to prevent it from rotating. Take care impacting the nut on, it is important that it is tight and seated, but do not continue to tighten it after it has seated in order to protect the shock internals. Alternate method: It is also possible to tighten the top nut by using a 5mm allen key inside of the shock shaft, and using a box end wrench to tighten the nylock nut.
- Attach the gold damper adjuster knob by first screwing down the silver base section by hand, finger tight. Then rotate the upper gold knob section clockwise until resistance is felt (fully closed = full stiff). Now, using a 14mm box end or the multi-tool located on the back of the included FPSpec Wrenches, tighten down the lower silver section of the adjuster firmly. Do not overtighten, simply snug down.
- Set your initial front damping values. Full clockwise (closed) is full stiff, and full counter clockwise (open) is full soft. This is roughly 34 clicks but may vary slightly from damper to damper. We measure clicks always from full stiff, counting backwards (counter clockwise) after the first detent from full closed (0) is felt. **We typically start at 10 Clicks from full stiff as a starting point on most chassis.** Track cars will typically perform best in the 5-10 range, performance street 8-15 range, and comfort driving in the 14-25 range. When adjusting damping, we recommend rotating full clockwise, and counting backwards after feeling the first detent.

### Setup:

- First, we need to set free length. Free length is the measurement from the top of the top hat to the center of the lower mounting bolt hole. Use a tape measure and spin the lower cup to the appropriate height. **Set the free length of the shock to 630mm.** Once set, tighten the lock ring for the lower mounting fork.

**\*Safety Note:** The 630mm free length dimension is a critical dimension as it dictates the minimum ground-to-battery-pack clearance under full compression. The Redwood Motorsports recommended-free-length value is designed to protect your battery pack from being damaged under normal circumstances. Damage to the battery pack due to road debris, speed bumps, potholes, etc. can lead to possible battery fire, serious injury,



etc. When lowering the car, Redwood Motorsports recommends using *\*only\** spring-preload to lower the car. This effectively removes compression stroke from the shock and maintains battery to ground clearance under full compression regardless of chassis height. However, the more the car is lowered the less compression stroke is available. While the Redwood Ohlins DFV design does allow adjustability of shock free length, and doing so can maintain compression stroke with a lowered car, it comes at the expense of reduced battery-to-ground clearance. As a result, Redwood Motorsports officially does not condone this method of lowering, though it is available for advanced setups - do so at your own risk.

- Next we will set preload. Preload is defined by the uncompressed length of the spring, minus a particular value in millimeters which will determine your ride height and resulting total compression stroke. The standard method of setting preload is to snug the spring up so that the upper and lower perches just touch the spring (0mm preload). Then using the included spanners, turn the lower spring perch up to increase the preload to the desired amount. One full rotation of the spring perch is equivalent to 1.5mm height change. After preload is set, firmly lock the lower lock ring in place using the smaller lock ring spanner.

**\*Alternate preload method:** To save time, (or when large values of preload are required) it is possible to set preload before shock assembly. To do so you will need to loosely assemble your suspension **without the spring**, but with the rest of the components in the stack-up. Preload is measured by measuring your spring's uncompressed length and then subtracting the desired amount of preload from that value. Then using a measuring tape, and the assembled shock (minus spring) move the lower spring perch to match the desired value. This distance is measured/set between the upper and lower rubber spring isolators (where the spring sits).

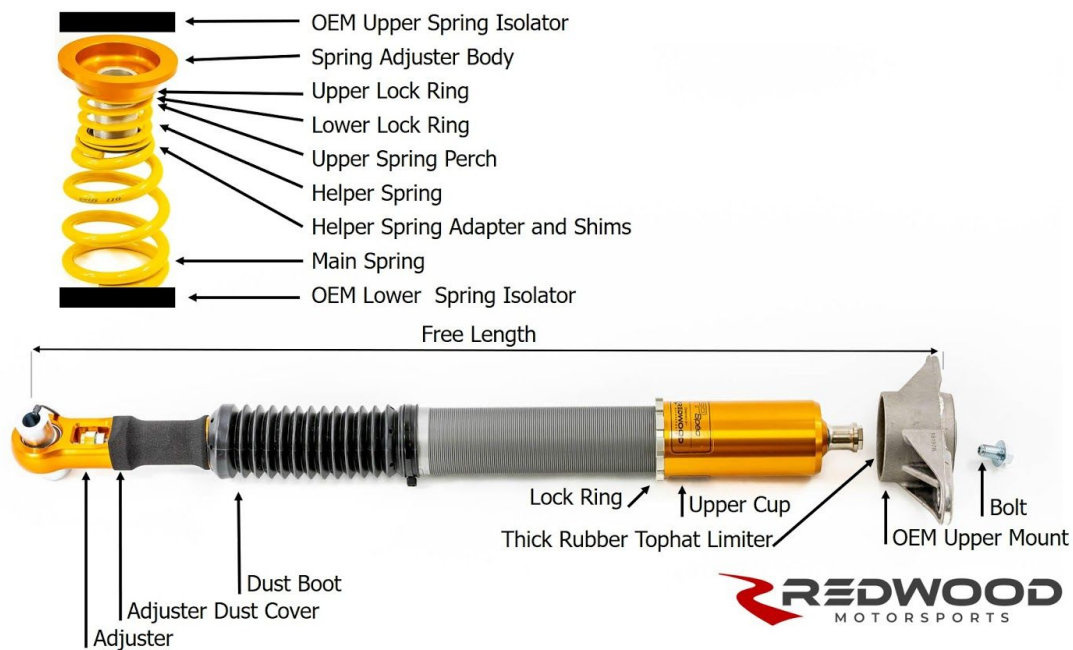
Once your preload value is set (by moving the lower spring perch into place) reassembly the shock stack with the spring, and compress the top hat downwards so the nut can be started on the shock shaft. If the force required is greater than possible by hand (as in the case for the Grand Touring kits) use a spring compressor to alleviate tension from the spring. Using an impact driver (as mentioned above in the assembly section) torque down the top nut which will in turn compress the spring to your desired value.

If adjustments need to be made after the fact to alter the height of the vehicle, we recommend using a compact on-shock spring compressor to remove spring

pressure and allow you to easily move the lock rings into place. As there is quite a bit of force on the spring seats from the spring preload, we suggest the use of a spring compressor when changing preload to prevent galling the threads on the Ohlins DFV damper body. Anti-seize paste on the threads is also helpful as mentioned in previous steps.

8/11kg Performance Sport Kit			
Front	Front Damper Free Length	Preload (mm)	Ride Height (mm)
	630mm	50	410
		43	400
		35	390
		28	380
		20	370
		12	360
Rear	Rear Damper Free Length	Preload (mm) w/ 5kg helper	Ride Height (mm)
	645mm	51	410
		44	400
		38	390
	645mm (630mm w/ reduced ground clearance)	32	380
		25	370
		19	360
	*Rear spring "preload" measured from bottom of gold mount to lower spring perch face (touching spring)		
	**Ride height measured from center of wheel to top of fender		

## Step 6: Rear Shock/Spring Assembly and Setup



### Assembly:

- **\*Floating Top Hats:** If you have purchased floating top hats they should have come assembled on your shocks. If not please see our floating top hat assembly guide. You will need to transfer the bolts and plastic bolt retainers from your OEM top hats to the floating top hats.
- **OEM Top Hats:** Remove the top hat from your OEM shock. Install the 16mm Thick Rubber Top Hat Limiter inside the recess of the OEM top hat. Install the top hat to the upper shock body mount using the included short M10 bolt provided with the shock. Use a dab of blue thread locker to secure it, and tighten to 32ft lbs.



- As the rear suspension setup is a divorced spring, we will be setting free length on the shock body and preload on the spring assembly separately. Please see the chart below for spring preload vs height, and recommended free length.
- Free Length: For OEM height cars, set your free length to 645mm. For lowered cars we have slightly relaxed our free length recommendation to 630mm (though with reduced ground clearance) to improve ride quality and handling by slightly increasing compression stroke for lowered cars. To set free length, loosen the lockring on the shock body. Measure from the top of the tophat to the center of the lower mounting bolt, and re-tighten the lock ring.

**\*Safety Note:** As with the front shock, the rear free length is a critical dimension as it dictates the minimum ground-to-battery-pack clearance under full compression. The Redwood Motorsports recommended-free-length value is designed to protect your battery pack from being damaged under normal circumstances. Damage to the battery pack due to road debris, speed bumps, potholes, etc. can lead to possible battery fire, serious injury, etc. When lowering the car, Redwood Motorsports recommends using *\*only\** spring-preload to lower the car. This effectively removes compression stroke from the shock and maintains battery to ground clearance under full compression regardless of chassis height. However, the more the car is lowered the less compression stroke is available. While the Redwood Ohlins DFV design does allow adjustability of shock free length, and doing so can maintain compression stroke with a lowered car, it comes at the expense of reduced battery-to-ground clearance. As a result, Redwood Motorsports officially does not condone this

method of lowering, though it is available for advanced setups - do so at your own risk.

- Spring Preload: Calculating preload is much trickier in the rear, so instead we will use the distance between the base of the gold spring adapter, and the start of the spring. For those looking for additional adjustment beyond what is available normally, various lock rings can be removed as needed for additional drop. Set preload as desired, measuring from the flat on the gold adapter to the top of the spring contact point on the adjustable upper spring perch.

**\*Note:** As with the front shocks, for ease of adjustment later, we recommend adding anti-seize paste to the threads surrounding the lower spring perch to allow for ease of movement while adjusting height on-car. Apply anti-seize on the appropriate threads under and above the lower spring perch as needed. Depending on the desired rear height of the car you may want to add anti-seize only in the center threads to start, and add to additional threads as you move the adjuster. If you plan on lowering the car further.



\*Please see height / preload table in previous section

## Step 6: Installation of Ohlins DFV suspension into vehicle

### Rear Suspension:

- First install the stock lower rubber spring isolator on to the larger diameter end of the supplied conical spring. Put the assembly in the general correct place on the lower control arm. Note: There are rubber “nubs” on the bottom of the spring isolator that will need to engage in the corresponding locating holes in the rear lower control arm.



- Helper spring installation (if provided): On top of the main spring (smaller diameter end) place the black plastic helper spring adapter, with metal rotational shims on top and bottom of the plastic adapter. Add the helper spring on top.

**\*Note:** To prevent unevenly loading the helper spring isolator, it is important that the open-coil sections of the springs do not overlap. When installing the helper spring, rotate the open section of the main and helper springs 180 degrees from each other.

- Put the OEM rubber upper spring isolator into the top of the gold spring adapter. Push down on the lower control arm as you work all the pieces into place (this can be tricky with one person, you may want one person to help stabilize the spring assembly during installation, as one side of the helper spring will want to compress more than the other - this is normal).

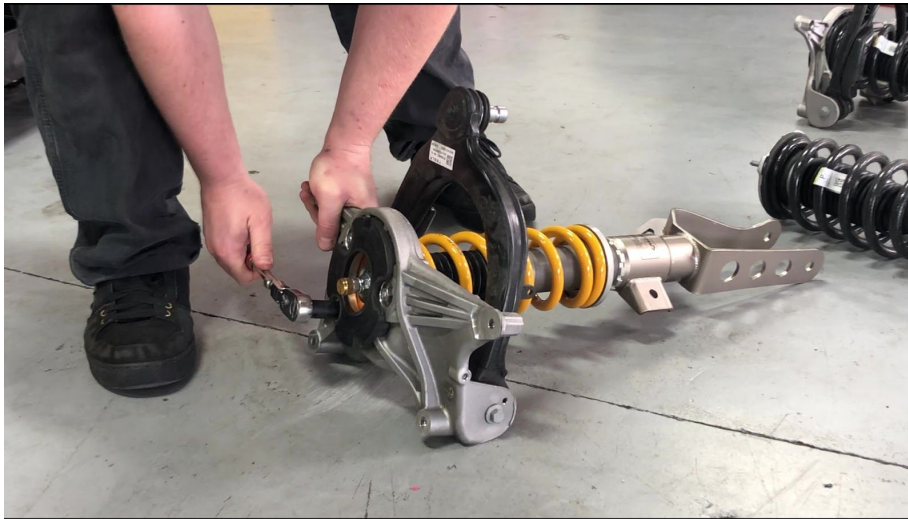


- With the spring(s) in place you will want to grab your rear shock and install the top of the shock into the chassis with the two OEM upper bolts. With the two upper bolts in and tight, place a jack under the lower control arm. Slowly jack up the lower control arm (being careful that your jack point will not interfere with the bottom mount of the new shock) and line up the bottom mount until you can put the lower shock bolt through and tighten it up. Once you have the lower shock

bolt through you can remove the jack and line up the bolt in between the lower control arm and the rear knuckle, insert the bolt and tighten.

#### Front Suspension:

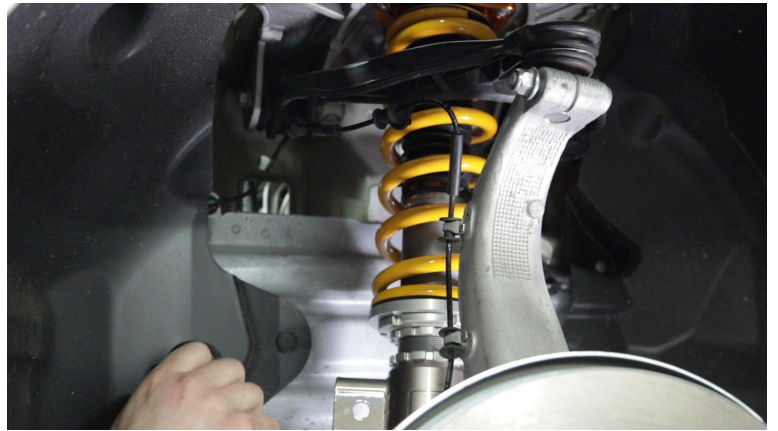
- First install the Left strut into the Left FUCA carrier, and the Right strut into the Right FUCA carrier. Torque the upper tophat bolts.



- Carefully reinstall the assembled shock assembly back into the car the reverse of how it was removed by pushing forward on the knuckle and sliding it in behind.
- With the shock assembly in place, move to the top of the chassis and replace the shock carrier bolts. With them loosely in place, do your best to re-align the assembly so that the bolts line up as close to the OEM location as possible and tighten down (this will help get your alignment specs as close as possible). Note that there is additional slop in these holes which should only be used to even out small differences in camber. If you wish to change front camber significantly you will need an adjustable FUCA such as the Redwood Motorsports Camber+Caster Adjustable front upper control arm assembly or similar).
- Once you have installed the front upper carrier and torqued all four bolts, back in the wheel well install the lower shock bolt. This may require you to pull downwards on the front knuckle **\*Note: Do not tighten this bolt until you have the suspension compressed as this is a rubber bushing - tightening too far from actual ride height can cause it to tear and will change your**

**suspension behavior. Do not forget to re-tighten once the arm is loaded with vehicle weight.**

- Now pull down on the FUCA down to insert the ball joint into the knuckle and re-install the pinch bolt, and torque.
- Pull the sway bar back down, insert the end link through the tab and tighten the nut. Lastly get the suspension to approximate ride height by loading the suspension with vehicle weight, and tighten the lower shock bolt.
- With the suspension finished, you will now want to install any remaining performance suspension components or accessories such as the Redwood Motorsports Remote Adjusters, Adjustable Camber+Caster FUCA (Front Upper Control Arms), Adjustable Camber and Toe Rear Control Arms etc. Reinstall the wheels, torque the lug nuts, reinstall the frunk and associated panels, the reverse of removal. Adjust height as needed, and align the car.



You have now finished installing your Redwood Motorsports Tesla Model 3 Ohlins.  
We're more than sure you'll enjoy the new experience that Ohlins has to offer.  
Be sure to tag us on Social Media!



[facebook.com/RedwoodMotorsports](https://facebook.com/RedwoodMotorsports)



[@RedwoodMotorsports](https://www.instagram.com/RedwoodMotorsports)

