Factory Five Racing, Inc.

Part Number: 80900	*Revision:* A	*Effective Date:* 12/05/2014	*By:* J.Schenck

818R Supplemental instructions

Table of Contents

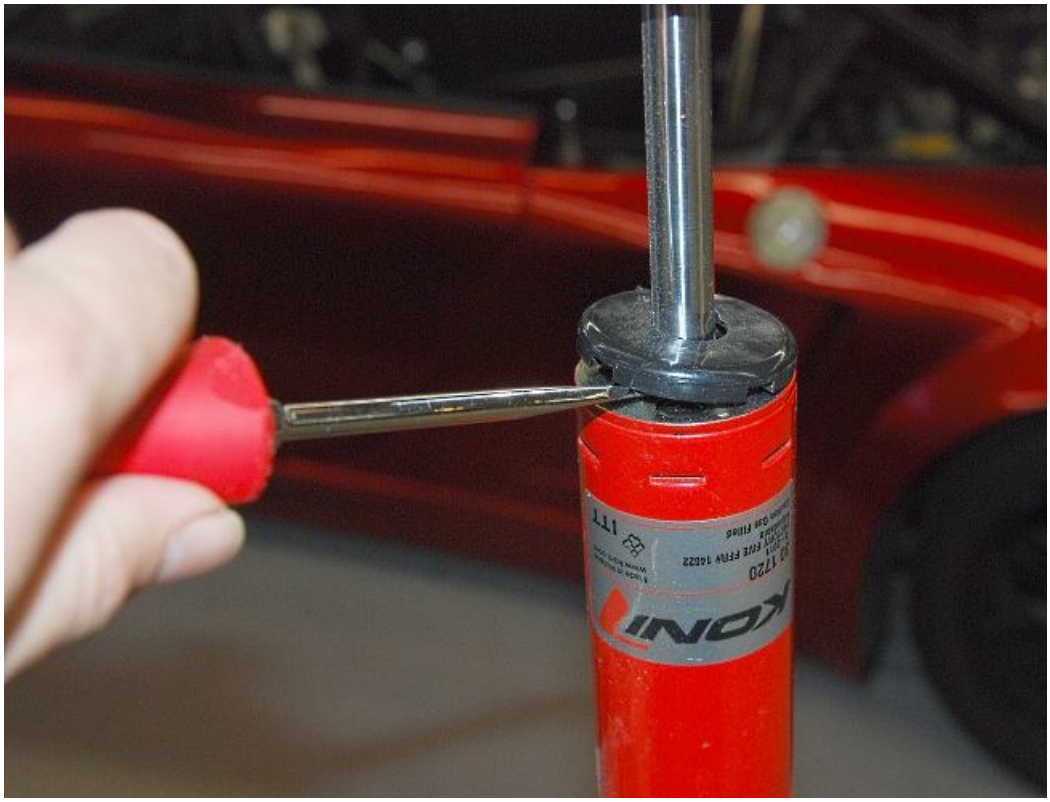
- The 818R assembly is unique in that it can be built for track use, for street use, or for dual purpose. The information in these instructions is provided as a supplement to the standard assembly manual where the R model is different than the S as well as covering information about building a more track specific car. After the assembly section there is also a set-up section to get a good baseline for track use. For street use the settings in the assembly manual are the same for the R or the S models.
- It is highly recommended that you read these instructions in full before beginning your build so that you will know where the assembly procedure is different for the R model from the assembly manual when you get to that step in the build.

Suspension Assembly

Shock adjustment

- The Coil overs that come with the R model are a mono-tube shock and are stiffer than the twin tube shocks that come with the S model. They should be set from the factory on the softest setting out of

the box but we recommend double checking them before installing and leaving them on the base setting until you are comfortable with the car.



To adjust the shocks pry the plastic cap off the main body that surrounds the shock shaft.

The metal button under the collar needs to be pushed in for the shock to adjust.


Holding the button down, twist the shock shaft to adjust the valving. You will feel clicks at each setting and the final setting is where the shaft stops turning. With the body of the shock down (as shown in the vice) turning *Clockwise* will stiffen the valving while turning *Counter-Clockwise* will soften the valving.

Front Coil-Over Shock Assembly

- Snap ring pliers, ¾" wrench, ¾" socket, Ratchet, Torque wrench
- Front shock set, IFS Components, Insulated clip hardware.
- The front shocks are pre-valved at the factory in compression and rebound for good street use. The shocks can be adjusted in rebound as per Koni's instructions if so desired. The front springs are 500lb. Other springs are available for different ride characteristics.
- WARNING! Incorrect assembly and maintenance of this part can cause serious injury or death.
- The front shocks extended measurement is 15.15" center to center. They are 2.50" shorter than the rear shocks

Unpack the front shocks, coil-over's and hardware.

Double check the jam nut under the rod end and bump stop to make sure that it is tight.
Screw the spring seat down on the sleeve so it is closer to the unthreaded end.

Slide the coil sleeve over the body of the damper beginning at the end which has the rubber bump stop. The unthreaded end of the sleeve goes first so that it will sit on the snap ring on the shock body.

The coil-over hats have a snap ring which holds it in place. Remove this snap ring to assemble the coil over shock.

Slide the rubber bumper about two inches down on the shaft.

Put the spring and hat on the shock and rotate the spring seat back up the sleeve so that the spring pushes the hat tight against the end of the shock.

Install the snap ring on the spring hat so that it holds onto the shock end. Make sure that the slot in the snap ring and the slot in the spring hat are not aligned.

Pass the shock assembly (**with the body of the shock up**) through the upper control arm and attach them to the lower control arm using the 0.43" spacers that are supplied in the kit.
Check for shock clearance on brake lines, emergency brake cables, brake calipers, frame and axle parts.
Check to make sure that the spring is seated correctly on the shock.

Assembled Koni coil-over shock.

Sway bar

Due to the heavier spring rates provided with the R chassis we do not generally run the front sway bar. If you are building the car as a street car and switch to the softer spring and shock package of the S model then the sway bar is still recommended.

Ride Height

The R chassis along with the S chassis is designed to run at an approximate 4.5 inch ride height using standard OEM suspension parts. The chassis was also built to easily allow a track only ride height while maintaining the same geometry but this requires some extra parts and will only work with the front control arms from the sedans and not the wagons.

For the standard ride height the suspension install is the same as in the assembly manual.

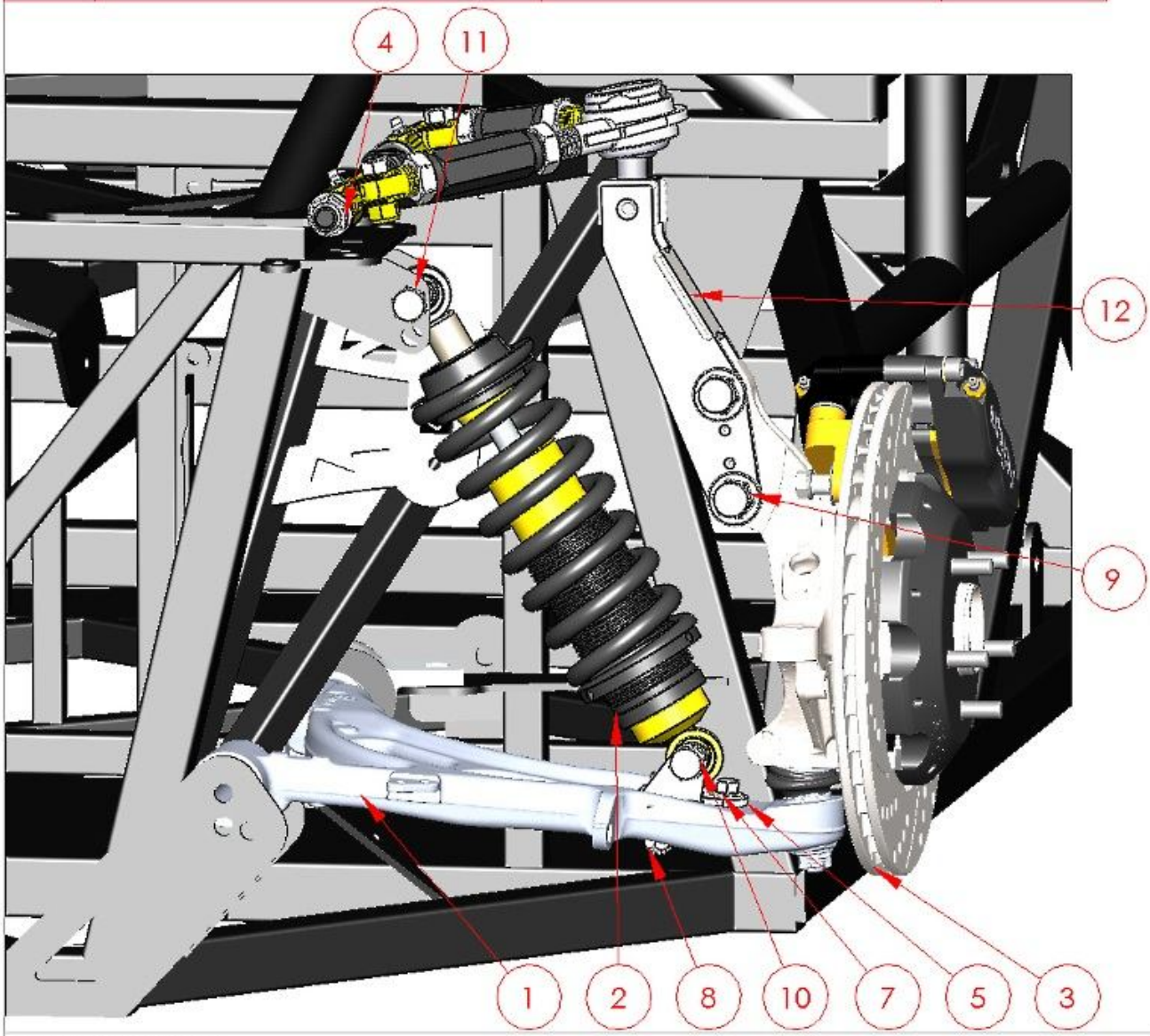
Track only lower ride height - Front

Recommended parts

- 2 Spacers $^{5}/_{8}$ inch inner diameter ¾ in tall (Washer stack is fine)
- 2 Spacers $^{5}/_{8}$ inch inner diameter $^{5}/_{16}$ in. tall (Washer stack is fine)
- Aftermarket Bump Steer Kit for 2002-2007 WRX
- 2 Grade 8 bolts $^{5}/_{8}$ inch x 5½ in. long
- 2 Spacers 2¼ inch $^{5}/_{8}$ Inner diameter (.125 wall min)
- 4 Upper Control arm spacers, ½ in. I.D. x 0.8 in. long (or stack shims or washers)
- 4 Grade 8 bolts ½ inch by 2¾ inches long
- $^{5}/_{8}$ inch Washers

Track Height Front Suspension

ITEM NO.	PART NUMBER	DESCRIPTION	Competition/QTY.
1	Front Lower Control Arm		1
2	818 koni Shock	818 KONI FRONT SHOCK	1
3	Front Spindle		1
4	15501	FRONT UPPER CONTROL ARM	1
5	80267	FRONT LOWER SHOCK MOUNT BRACKET	1
6	B18.2.3.4M - Hex flange screw, M10 x 1.5 x 40 --26N		1
7	B18.2.3.4M - Hex flange screw, M10 x 1.5 x 35 --35N		1
8	AM-M10-N		2
9	B18.2.3.4M - Hex flange screw, M16 x 2.0 x 60 --38N		2
10	HBOLT 0.5000-13x2x1.25-N		1
11	12385	HBOLT 0.5000-13x2.5x1.25-N	1
12	80051	IFS BRACKET ASSEMBLY	1



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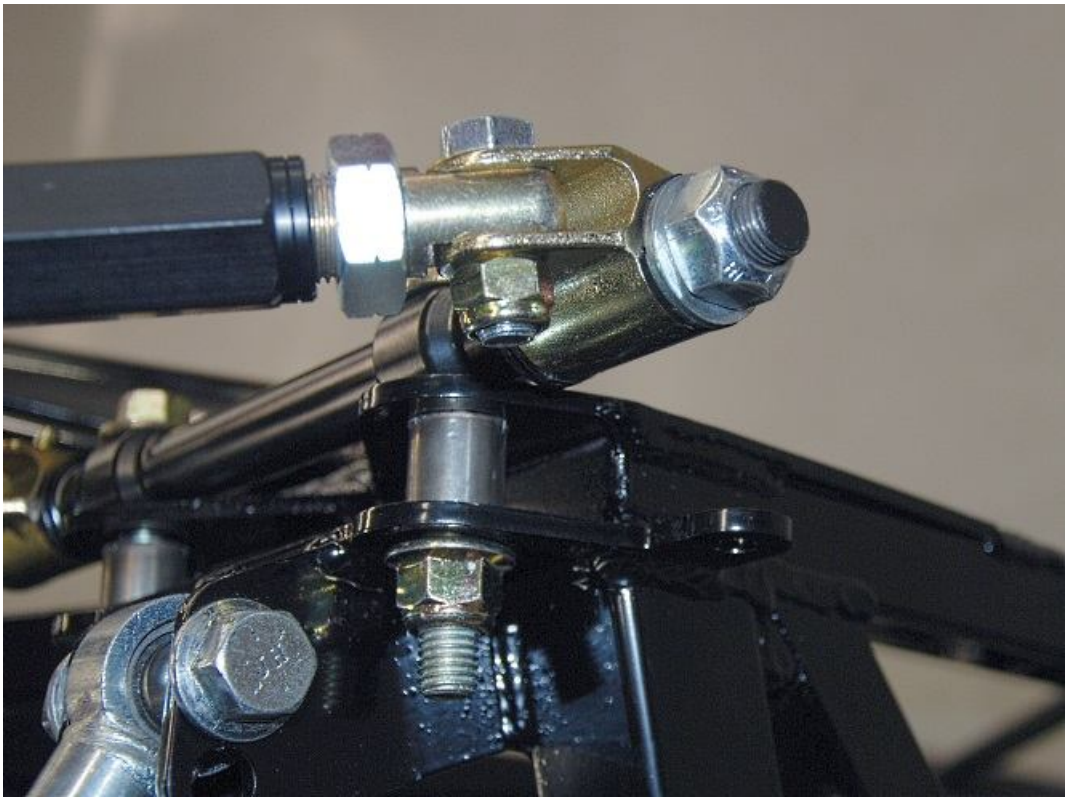
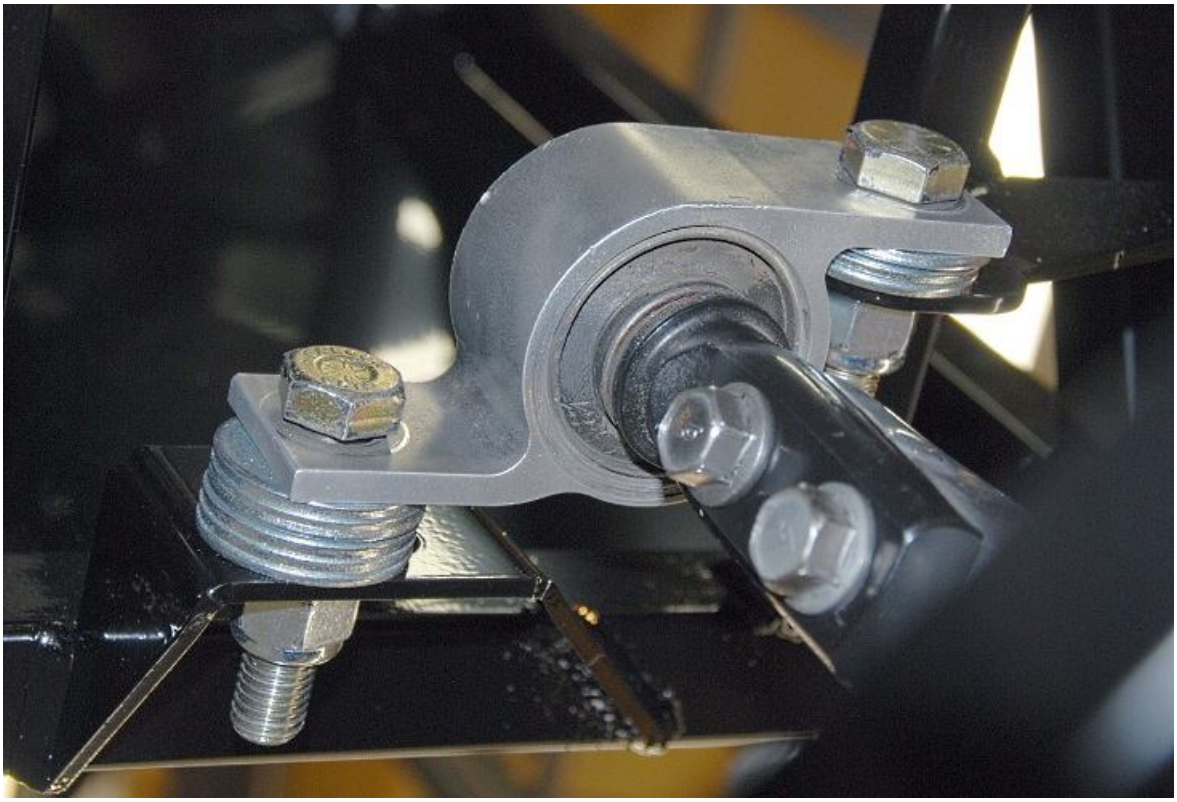
The front upper control arm will now mount on top of the top set of frame tabs. In order to maintain the full strength of the mount use longer bolts that still reach both mounting tabs.



Either with washers or spacers take up the 0.80 inch height between the two mounting tabs so the frame doesn't crush when you tighten the bolts.

On the lower control arm the front mounting bolt moves to the upper hole. The aluminum arms often have a casting bump that can touch the frame in this position; it should be removed with a grinder or file so that the arm pivots freely and does not contact the tube.



The rear mount for the control arm is spaced up using spacers or washers to be even with the front mount. The lower bolt requires ¾ inch of spacing and the upper mount switches to being on top of the frame and needs about a $^{5}/_{16}$ in. spacer. The thickness of these aluminum mounts can vary so the upper bolt spacing may be a little different. If you tighten the lower bolt and measure the distance at the top it will give you the exact distance you need.

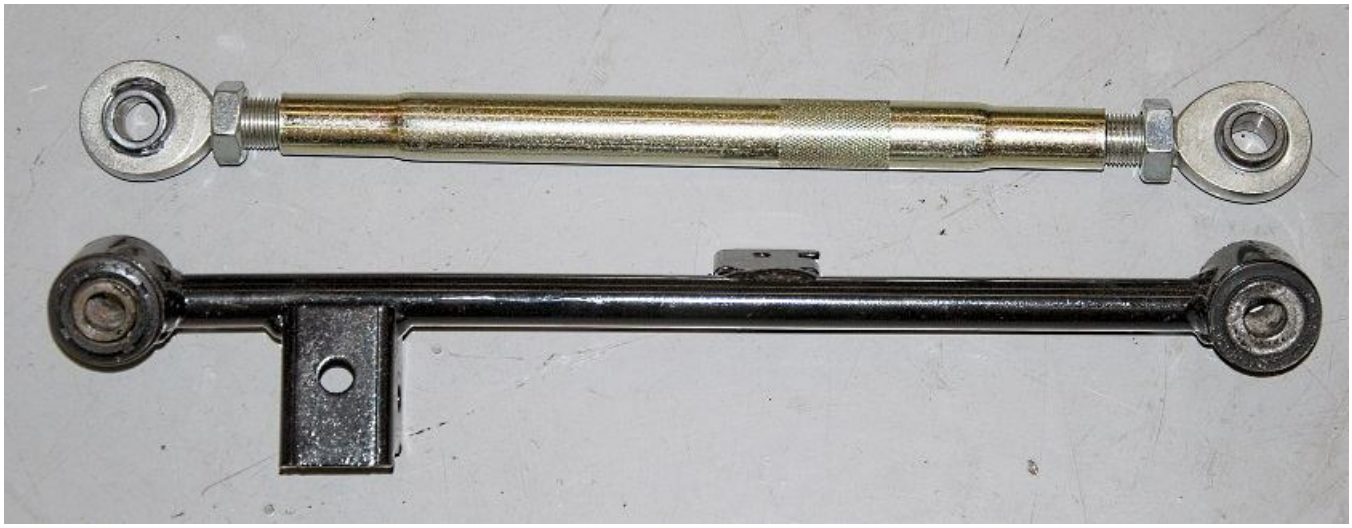
Because the steering rack does not move, a bump steer kit is required. Most of the aftermarket kits will not reach the distance needed so we drill out the spindle and use a $^{5}/_{8}$ inch grade 8 bolt instead of the tapered mount usually provided. A $2^{7}/_{16}$ inch total spacer should get you close to optimum bump steer, but we cut the long spacers a little short to allow for adjustment in both directions.

Track only lower ride height - rear

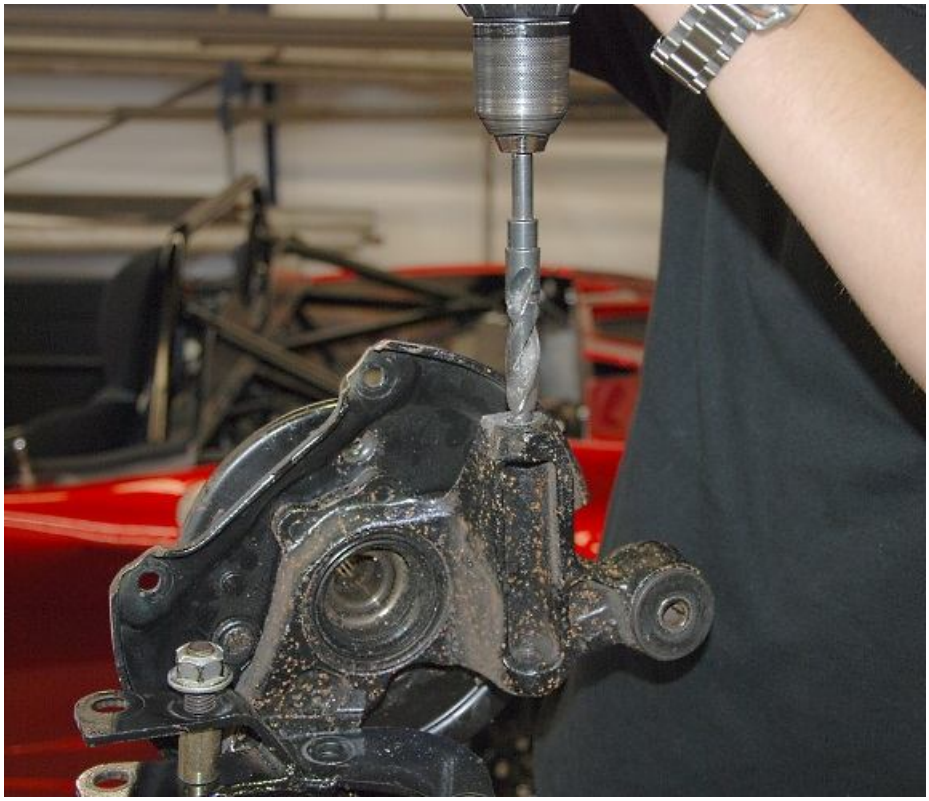
Recommended parts

Heim Joint lateral links consisting of:

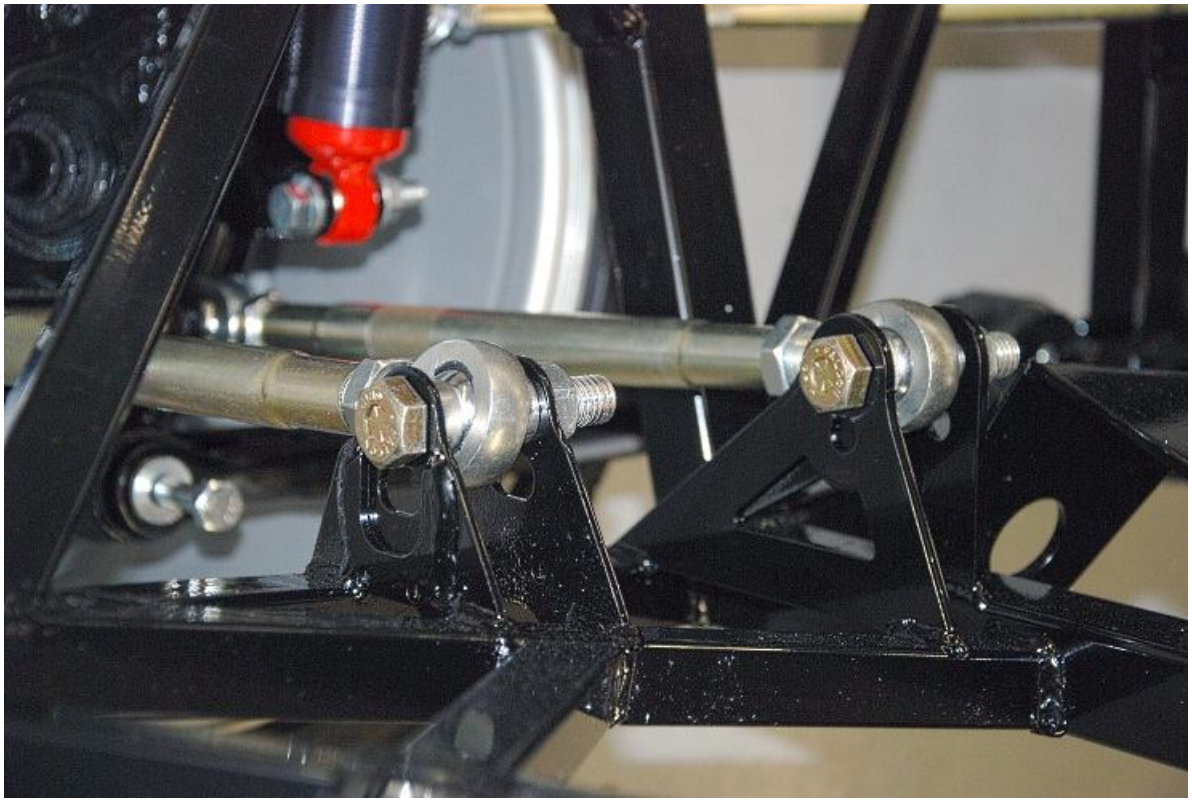
- (4) Swaged link tubes 12 inch long with ¾ fine thread (left hand/right hand)
- (2) 8.5 inch long $^{5}/_{8}$ bolts for attaching rod ends to spindle
- (4) Left hand thread ¾ inch shank $^{5}/_{8}$ inch bore rod ends w/jam nuts
- (4) Right hand thread ¾ inch shank $^{5}/_{8}$ inch bore rod ends w/jam nuts
- (4) 2¾ inch long $^{5}/_{8}$ inch bolts
- (6) $^{5}/_{8}$ inch nuts
- (8) $^{5}/_{8}$ inch inner diameter by $^{3}/_{8}$ inch long spacers for rod ends.
- (2) Longer ½ inch grade 8 bolts for upper shock mounts.
- $^{5}/_{8}$ inch Washers



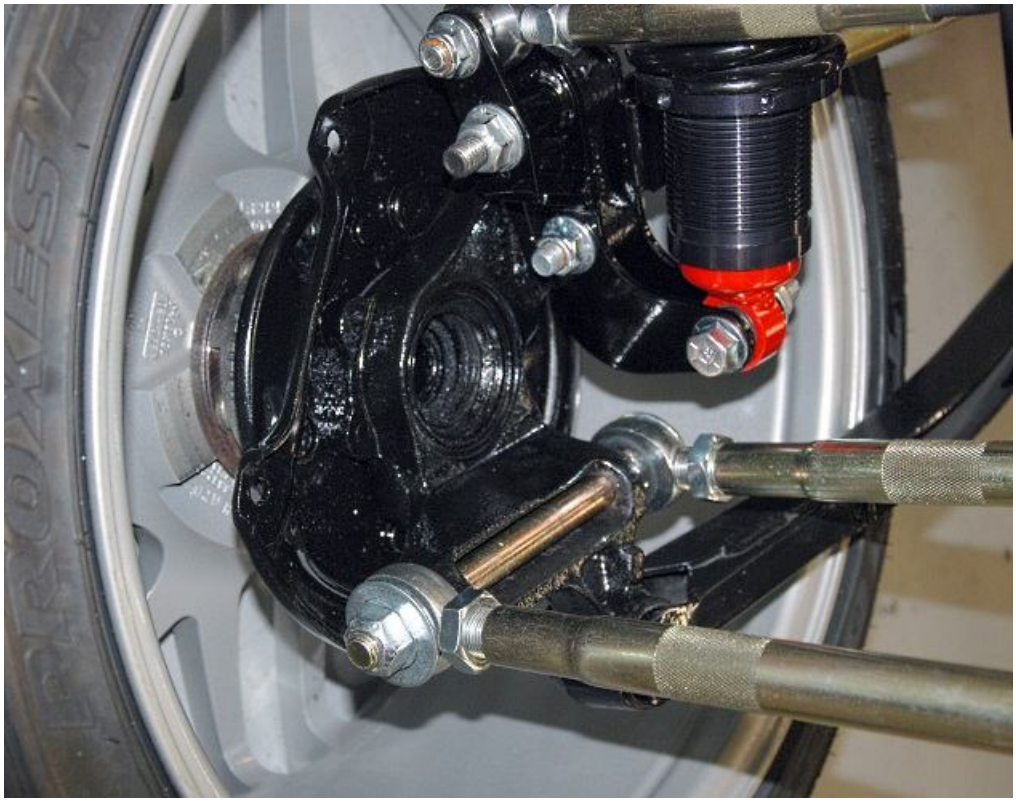
Assemble the lower lateral arms using the factory arms as a guide for length. Double check the arm length with each other to make sure they are the same side to side.



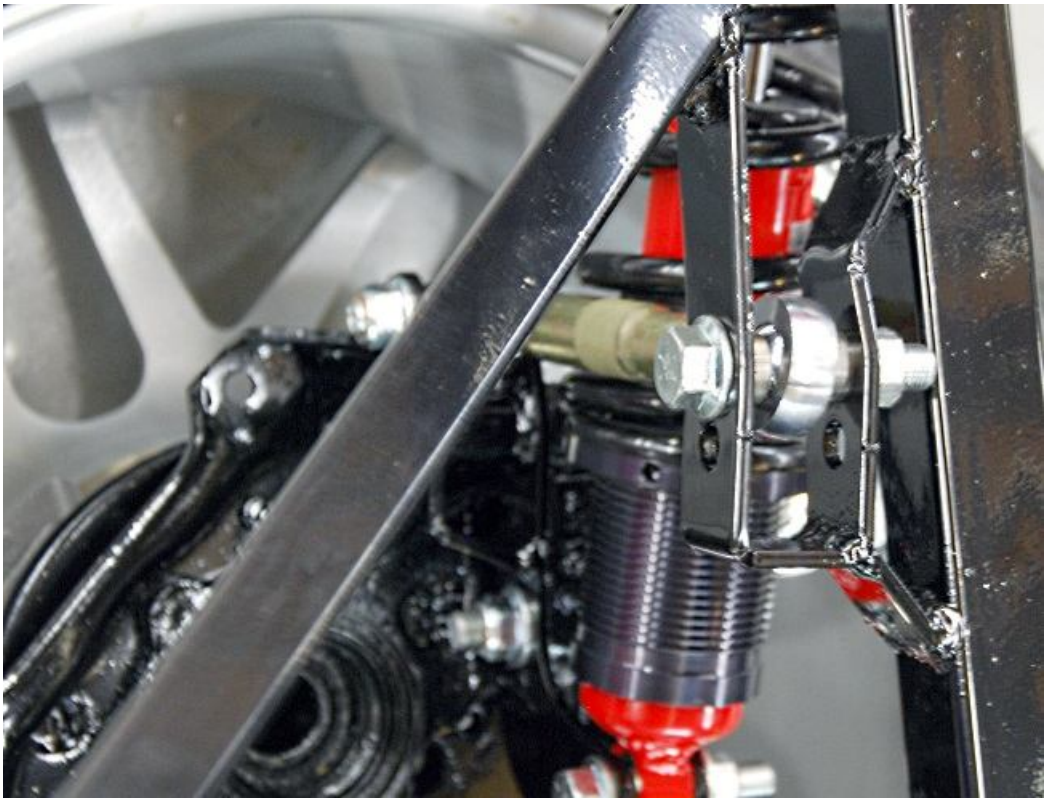
The rear spindles need to be drilled out for the $^{5}/_{8}$ inch bolt that holds the rod ends. Drilling through the cast iron is not hard if you run the drill slow and use some oil or cutting lubricant.



Bolt the lower lateral links to the upper holes on the chassis tabs.

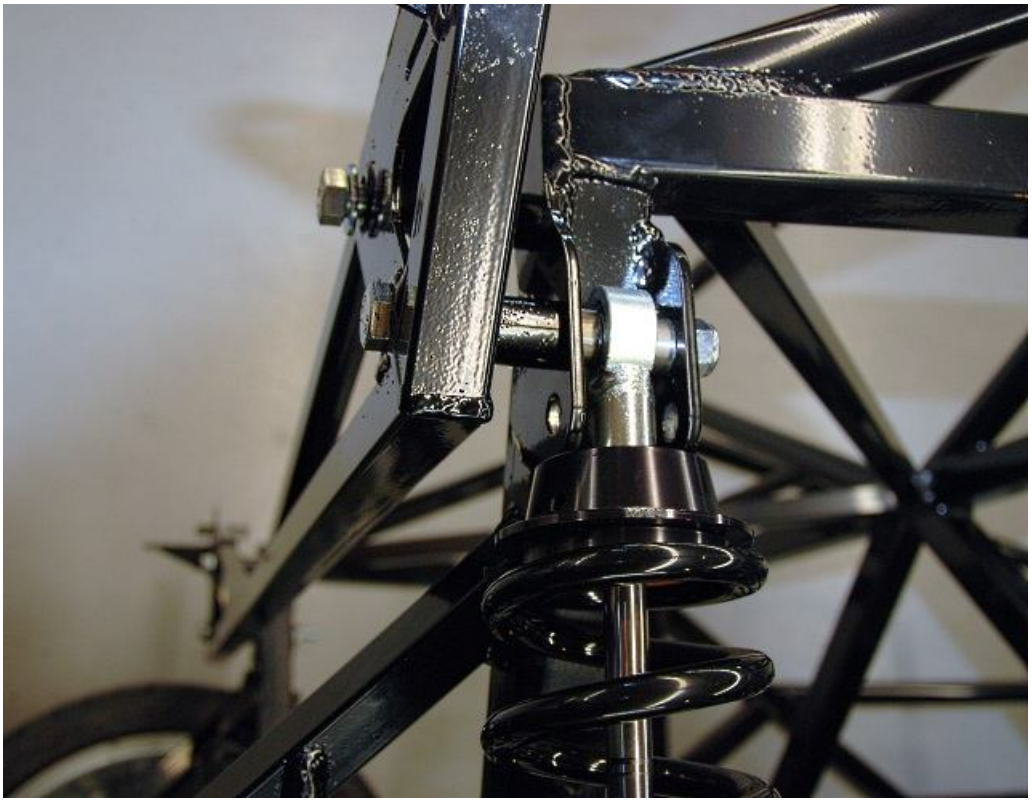


Bolt the outer end of the lower links to the spindle using the long $^{5}/_{8}$ inch bolt. Because these rod ends are mounted on the outside of the spindle use washers that are bigger than the inside roller on the rod end for safety. (In the event of a rod end separating, the arm is still captured)



The upper link mounts to the upper hole in the chassis as well.

Upper and lower trailing arms mount in the upper mounting holes.



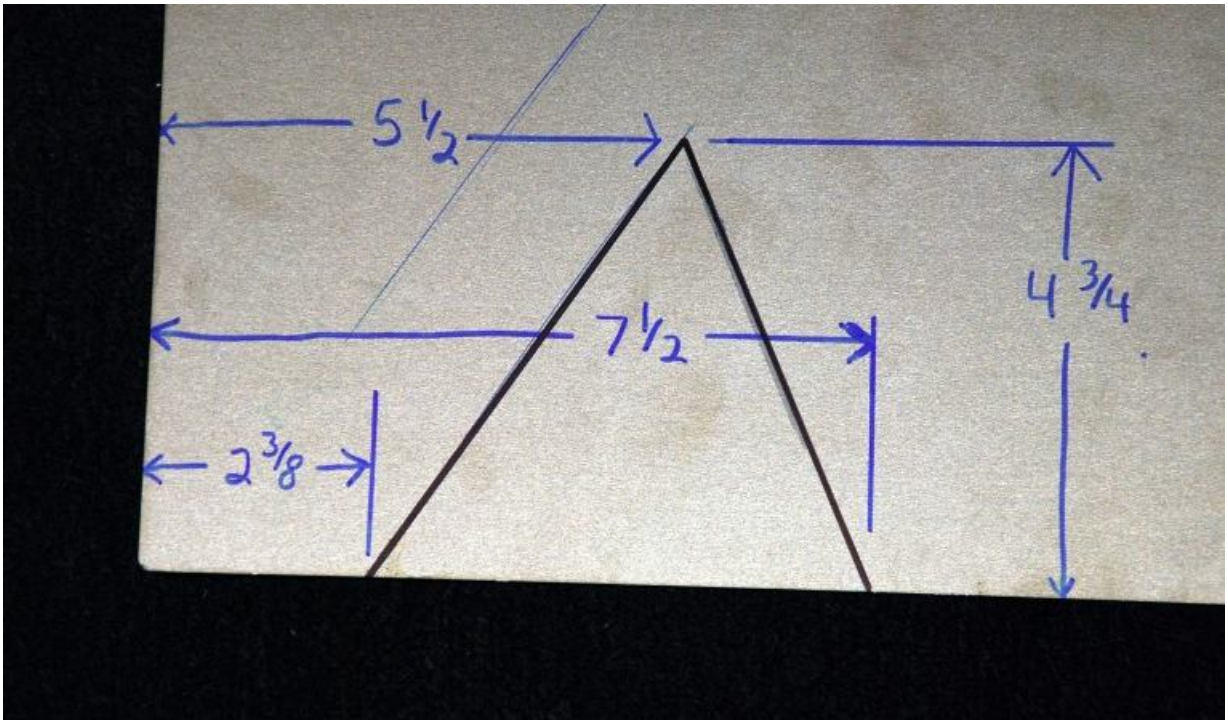
The upper shock bolt now runs through the chassis brace and in the upper set of holes. The shock bolt and chassis brace bolt will need to be replaced with one long ½ inch x 4½ inch long bolt.

Lowered ride height rear suspension completed.

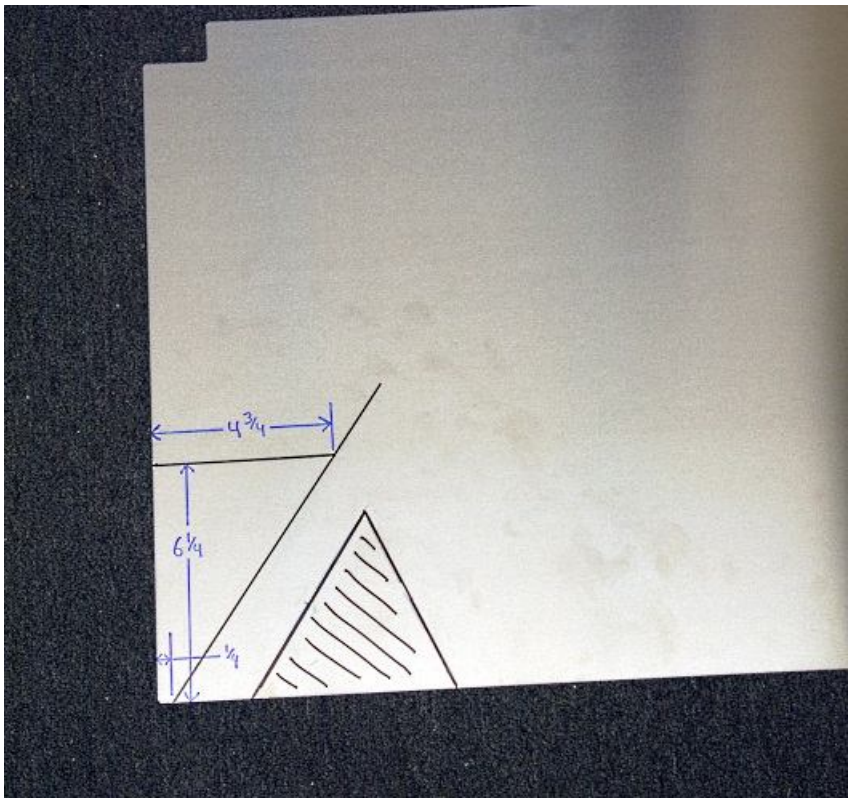
Cockpit Side Aluminum

- For Wheel to Wheel racing it is required by many sanctioning bodies to have anti-intrusion plates on at least the drivers' side. This can be done by either supplementing the aluminum driver side panel or using it as a template to cut an entire panel out of thicker material.

The cockpit side panels mount on the outside of the frame. Hold them up by hand or with a few rivets and trace them from the inside to locate the tubes. The radiator hose pass through is not cut on these panels giving the option of running the hoses one on each side or both down the passenger side.

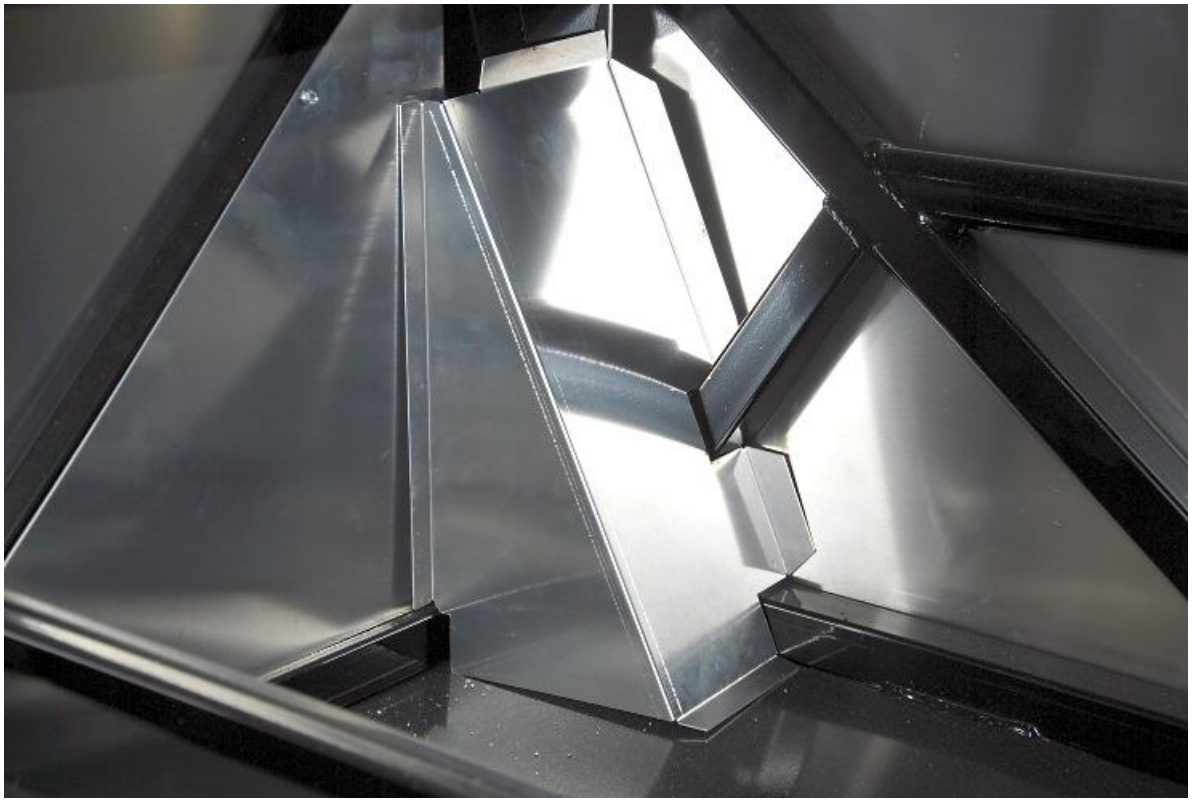


If you plan to run one coolant hose down each side use the template above to cut both side panels in the lower front corner.

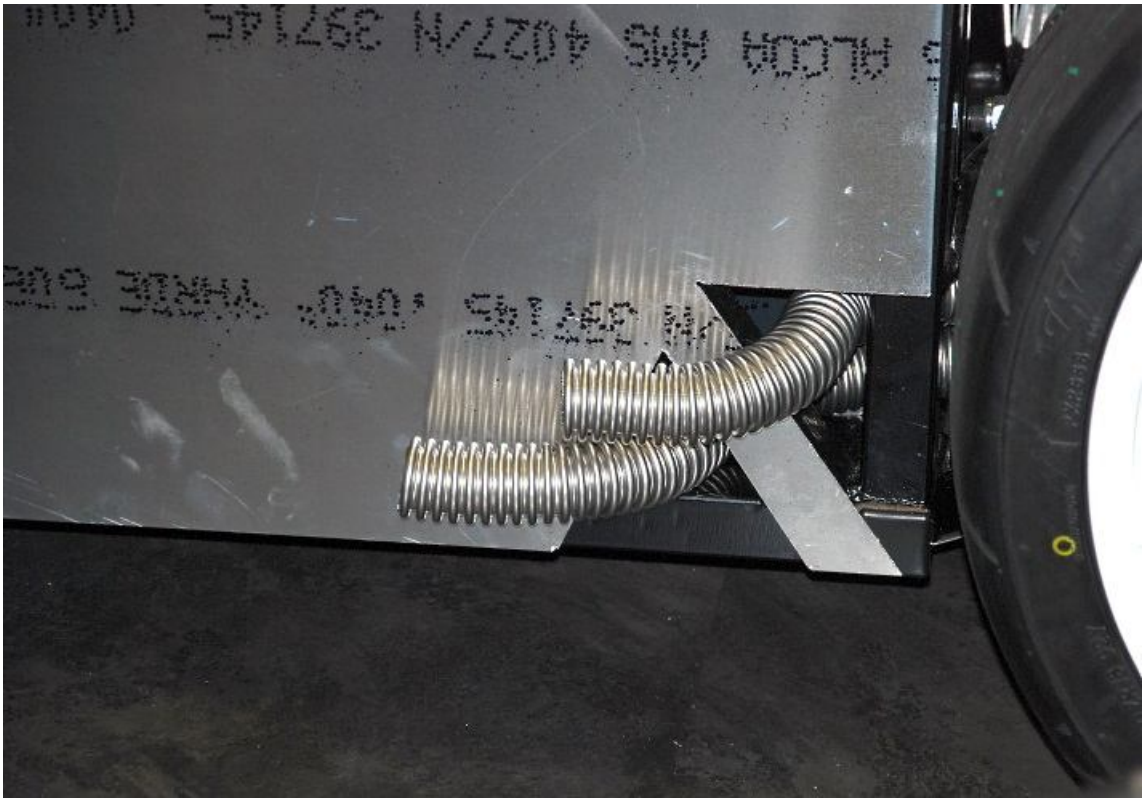


If you plan to run both coolant tubes down the passenger side, (for a car that only has one seat it helps balance out the weight) then cut the passenger side panel out for both tubes. The lower cut from the previous template and the additional cut from the picture above. The driver's side will not be cut at all.

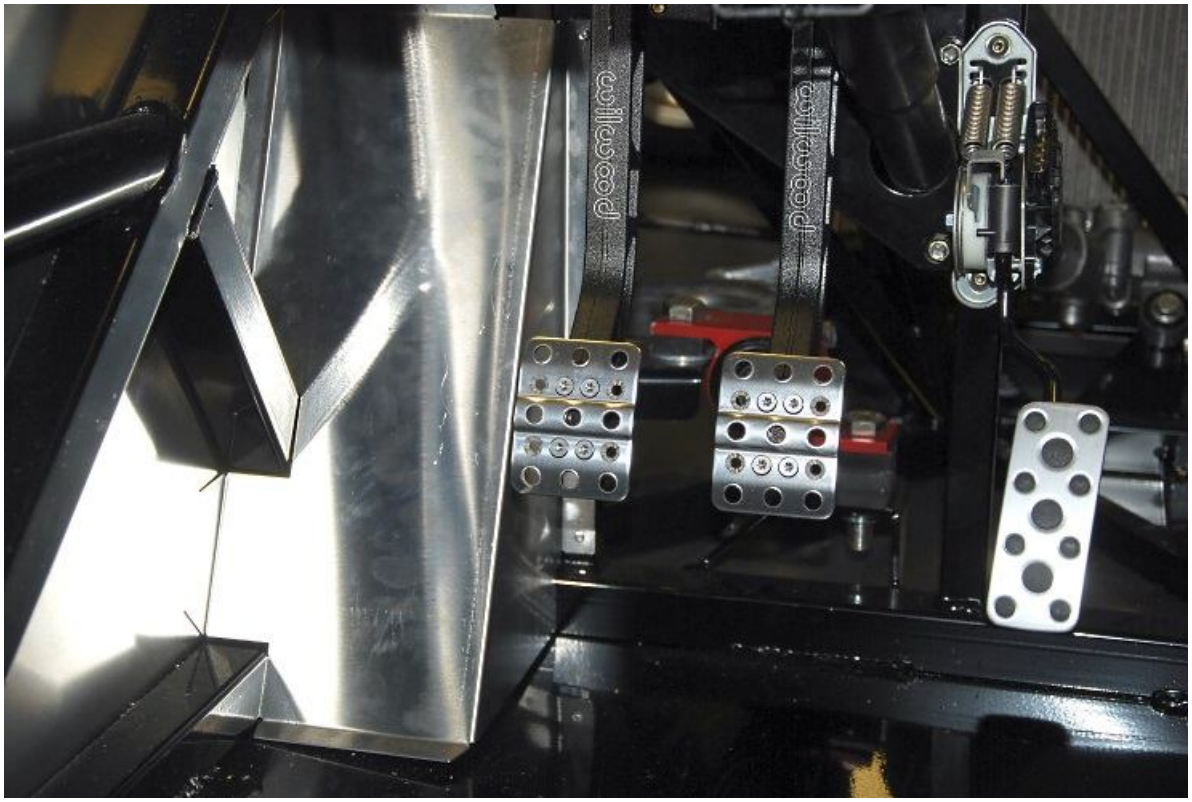
Panel cut for two coolant tubes. (note: Only the lower triangle is needed for single coolant line per side)



Finish rivet the side panel in place and test fit the dead pedal for coolant hose routing.



With the panel in place make sure there is room to route the hoses. Note that the body tunnel is 5¼ inches above the bottom of the frame so you must keep both hoses below this height.

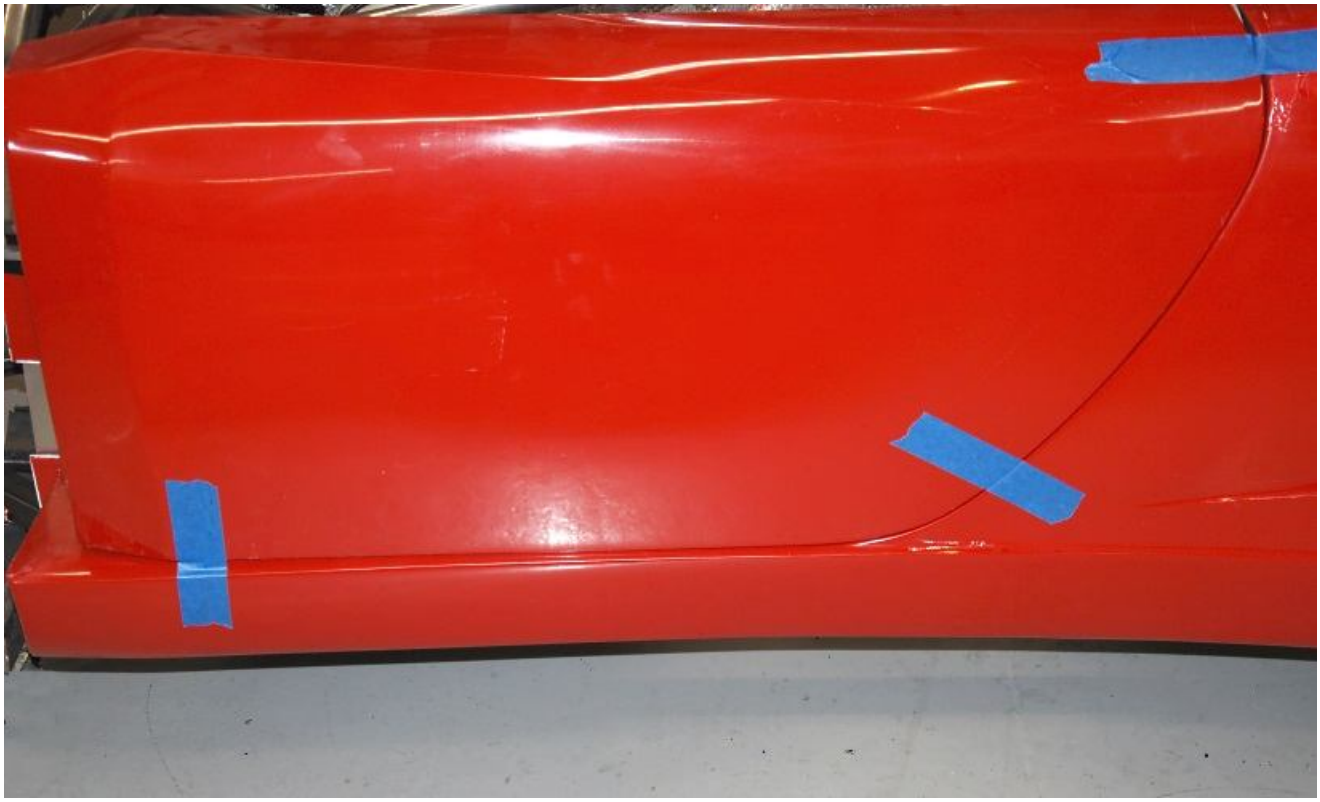


Finish rivet both dead pedals in place. Even if you don't run the coolant tubes the dead pedal panel is still needed to complete the front wall and useful as a footrest. Some rivets or grip-tape on the panel add a nice touch and keep your foot from slipping off.

Door Mounting

- Doors for the R are bolted firmly into position. We generally use riv-nuts because some of the back side areas under the body are tight to access but you can get a nut and bolt to work if you prefer that method of attachment.

In order to get an even gap the door should be spaced up on the bottom. If you are using riv-nuts to attach then use $^{3}/_{8}$ inch ID washers so they can be permanently attached by the riv-nut. Stack the washers until you get the fitment you want on the door.



With the door spaced into position tape it in place using some painters tape or duct tape if the body isn't painted. Keep the rear gap even with the body while taping and use enough so that the door won't move while drilling.

Mark the inside of the door for drilling the mounting holes. We will usually run 3 across the bottom and two up the back side. This can be done with the door still taped in place, the door has just been removed here for a clear view.

With the door taped firmly in place drill out the holes you marked with a ¼ inch bit. After each hole is drilled slide a bolt into it to keep the door from moving. If you start at the front it is easier to keep the bolts in place while you drill.

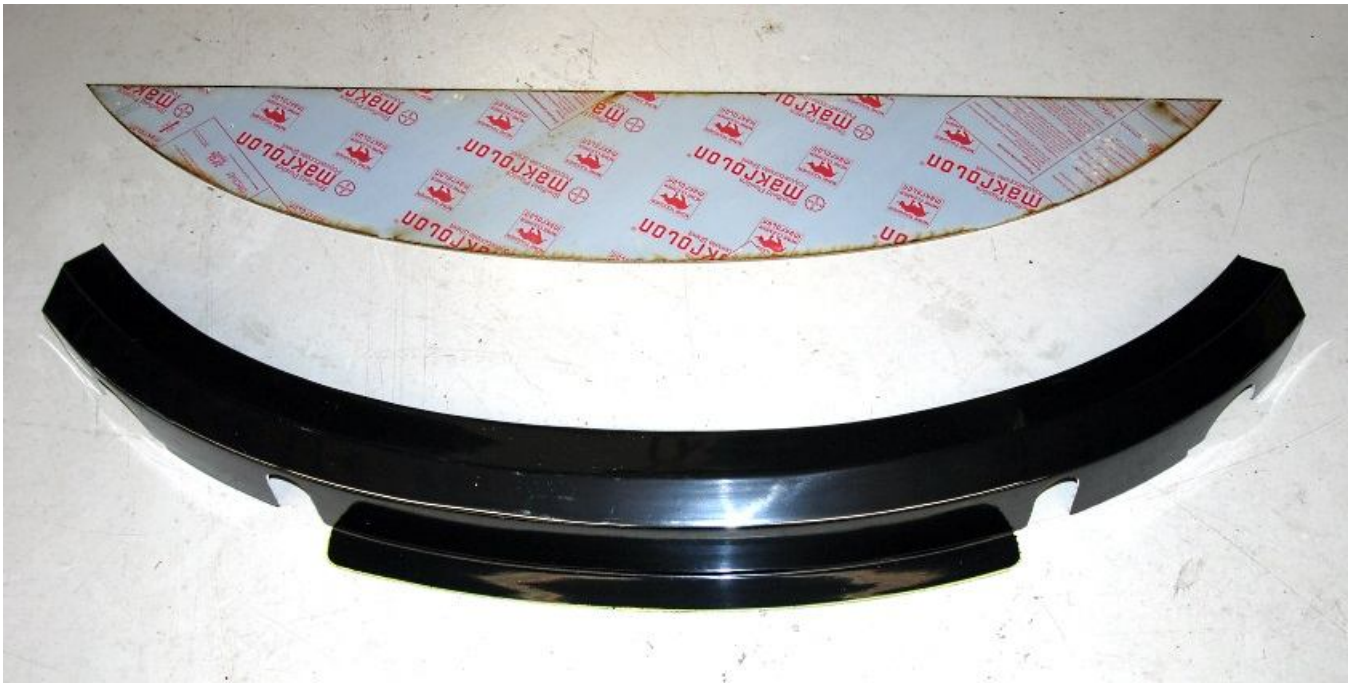
Drill out the holes in just the body to $^{25}/_{64}$ and install riv-nuts. Use the washers you had as spacers under the nuts and they will hold the door at the correct lined up position.

Screw the door into position using button head screws. If needed open the holes in the door up to $^{5}/_{16}$ inch to help line up the screws with the riv-nuts.

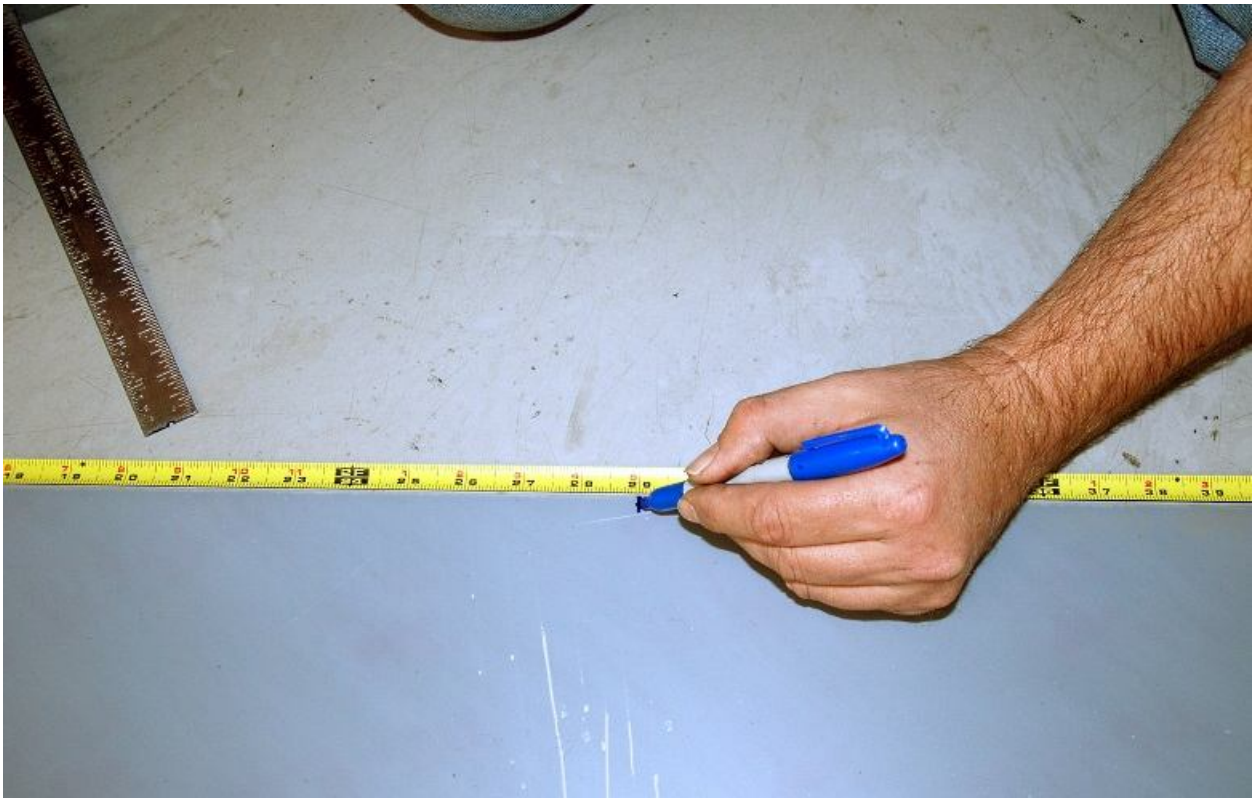
The front of the door is held in place using the angled steel brackets and rivets. If you are running the full windshield then only one of these is used per side. With the race windscreen there will be two.

Clamp the bracket in place on the frame and drill the rivet holes. This bracket should be as low as possible if you are running the full windshield. If running the race windscreen , add the second bracket higher up on the door near the top of the mounting pad.

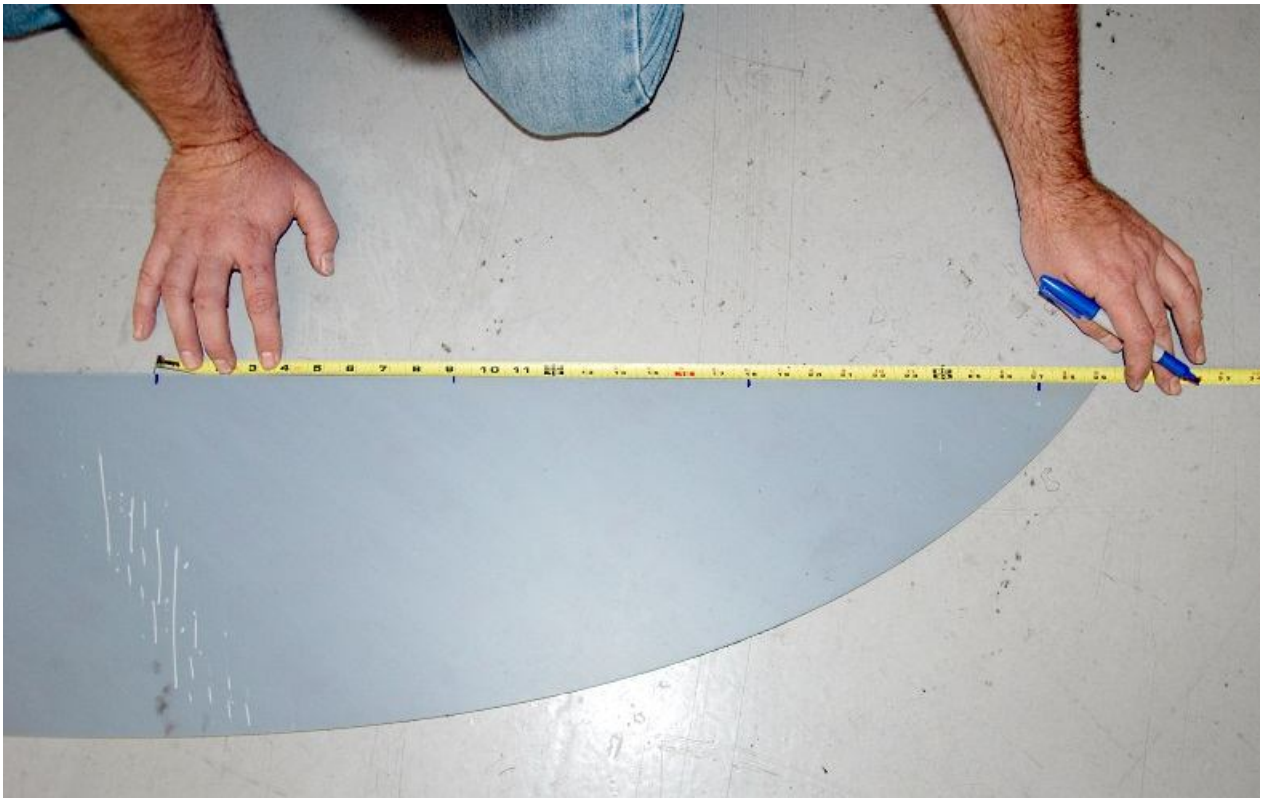
Windscreen



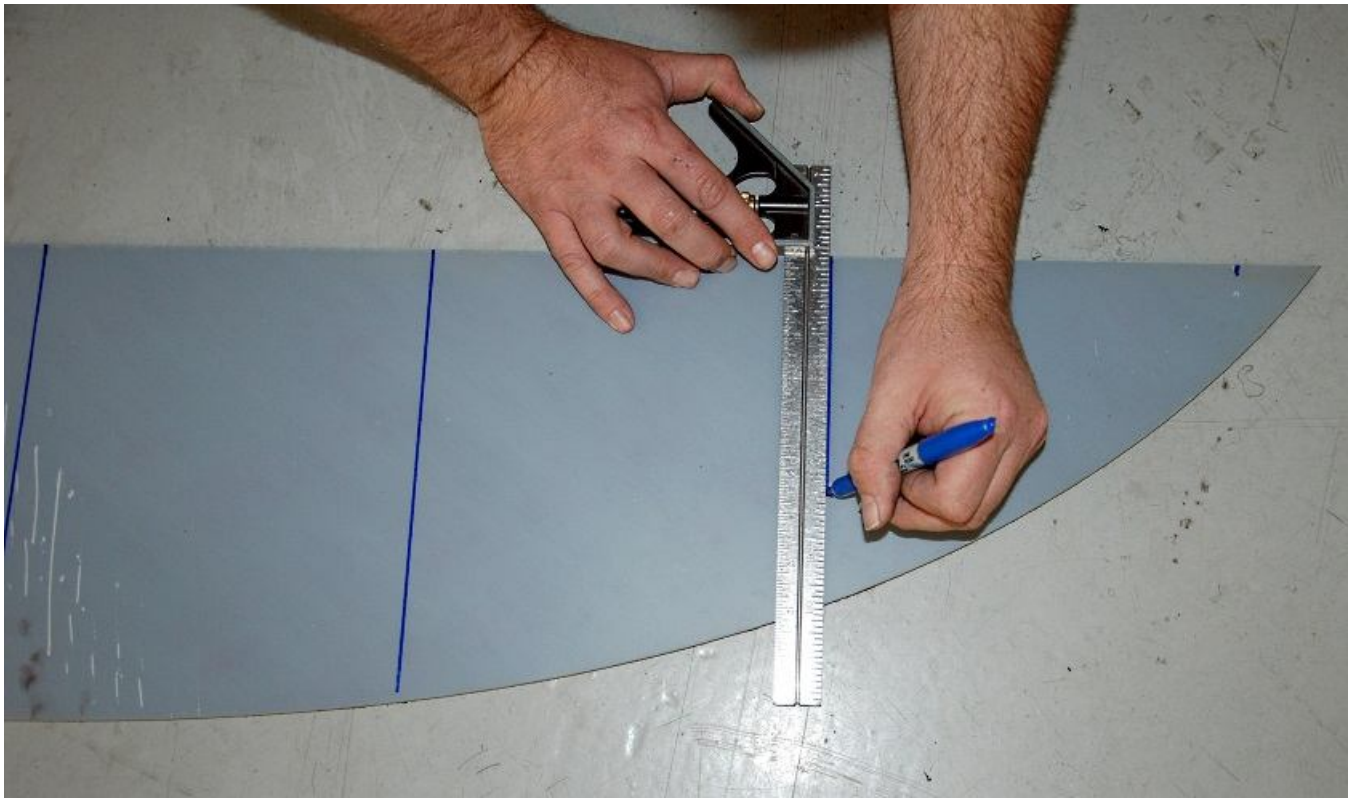
The race windscreen is built from the fiberglass mount and the pre-cut clear plastic. Leave the protective covering in place as long as you can to prevent scratches.



Mark the center of the windscreen using a tape measure along the straight edge.



Starting at the center, mark for the mounting hardware every nine inches.



Using a square draw a line straight down from each mark to the curved edge.

Center the windscreen on the mount and clamp or tape it in place. You want an even edge around the bottom to show below the screen, we usually leave ¼ inch of mount showing but you can raise the windscreen up as high as you want as long as there is enough material for the mounting hardware.

With the windscreen where you want it, drill the mounting holes using a ¼ in. bit. After drilling each hole slip a bolt down into the hole to keep the two pieces from sliding apart and the holes aligned.

Bolt the windscreen down using the hardware provided.

Once you are ready to drive remove the protective covering.

Center Console

- The R model does not come with the center console and the entire tunnel can be removed for extra space. If you do remove the tunnel, you will still need a raised platform to mount the shifter.

Setup Info

- Car set-up can vary a good deal based on the experience and style of the driver. These set-up tips help get a good idea of both a decent baseline setting to start from and to help save some time in the initial trial and testing phase by listing what has worked well for the factory cars and customer cars that have shared their feedback.

Front Suspension

- The key to any good suspension is getting the moving parts to move with as little bind or friction as possible so that the shock and spring combo can do their job and be consistent. Using polyurethane bushings can be a big help in terms of maintaining the geometry under hard loads but any time that style mount is used it should be checked for freedom of movement when tight. Likewise the upper control arms should be well greased and the end nuts set so the arms will fall down to vertical under their own weight. If the arms stay horizontal then the nuts are too tight. Like any race car suspension all the joints need to be greased and inspected regularly, with race tires this means before every event.

Front camber settings can be tire dependant but in general we dial in more and more camber until it starts to take away front grip under braking. Usually this occurs around 3.0° - 3.5° negative camber.

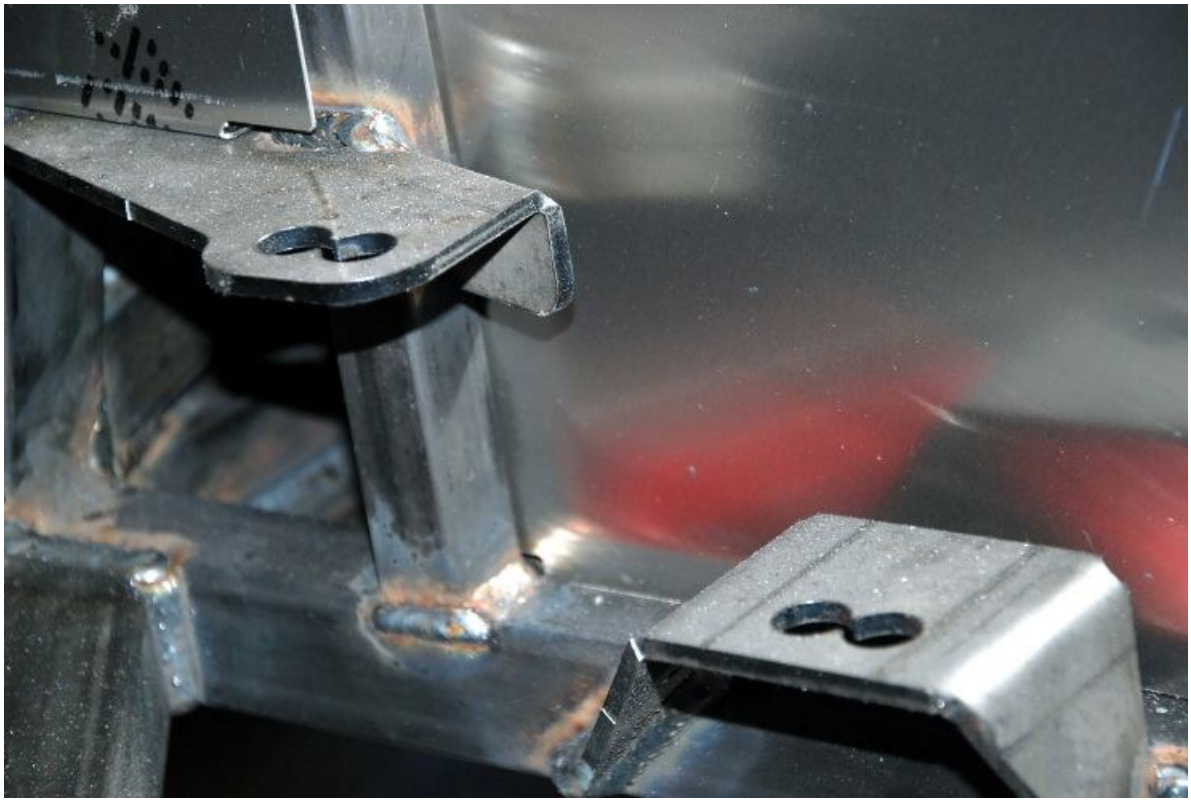
Front caster settings can vary depending on driver size and strength as well as tire size, steering rack ratio, and even steering wheel size. Adding caster can add front grip and stability but eventually the steering becomes heavy and the car can weight jack (the corner weights get thrown off when the wheels are turned). For the standard racks, 3.5° is a good starting point and 3.0° for the later WRX (2006+ and all STI) quicker ratio racks. If you are running power steering then you can raise the caster up to the 5°-7° range and this will help the over-assisted feel from the front end being so light as well.

Front Toe and Bumpsteer should be run to keep good steering feel and prevent the car from darting on initial turn in. We usually run just a little bit of toe in, $^{1}/_{16}$ inch total, in the front and set the bump steer as close as possible to zero. Since you will have a little bit of bump steer you want it to toe the wheels out under compression and our baseline setting for that (on the lower ride height) is to space the rod end $2^{7}/_{16}$ inches down off the spindle. Having the car toe out in bump will stabilize the feel under turn in, but too much will make the car feel unstable under braking. Small increment will also make big changes here, so when experimenting change $^{1}/_{16}$ inch shims and feel the difference in the car. The amount of caster affects the bumpsteer as well by raising or lowering the steering arm, so if your range of caster is far off the baseline then you may want to start with your own measurements for bump steer spacers.

Front Lower control arm length plays a big role in the adjustments you can make to the suspension, both in terms of alignment and also for tire fitment. There are 3 different ways to adjust the track-width to get to the setting you want. The front bushing carriers on the factory arms have offset holes so spinning them 180° from how they are shown in the assembly manual will bring the inner pivot inboard $^{3}/_{8}$ inch when flipped.

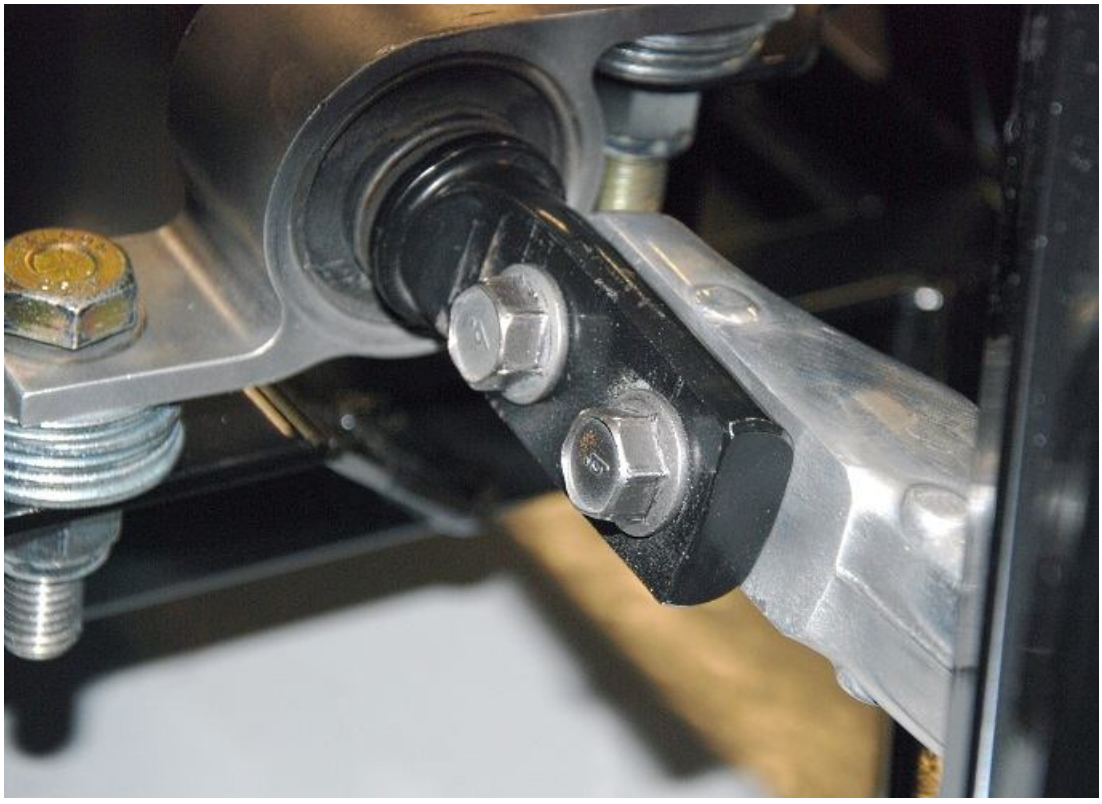
The arms on the bushing carrier look different to make it easy to differentiate which is the long one. The flat side is the shorter side and the indented side is longer.

The chassis also has two sets of holes in the mount for the bushing carrier. Just moving the wider arms to the outer mount would most likely be too large of an adjustment, but pivoting the bushing sleeve as shown above to move the arm back some of the distance gives a good setting.

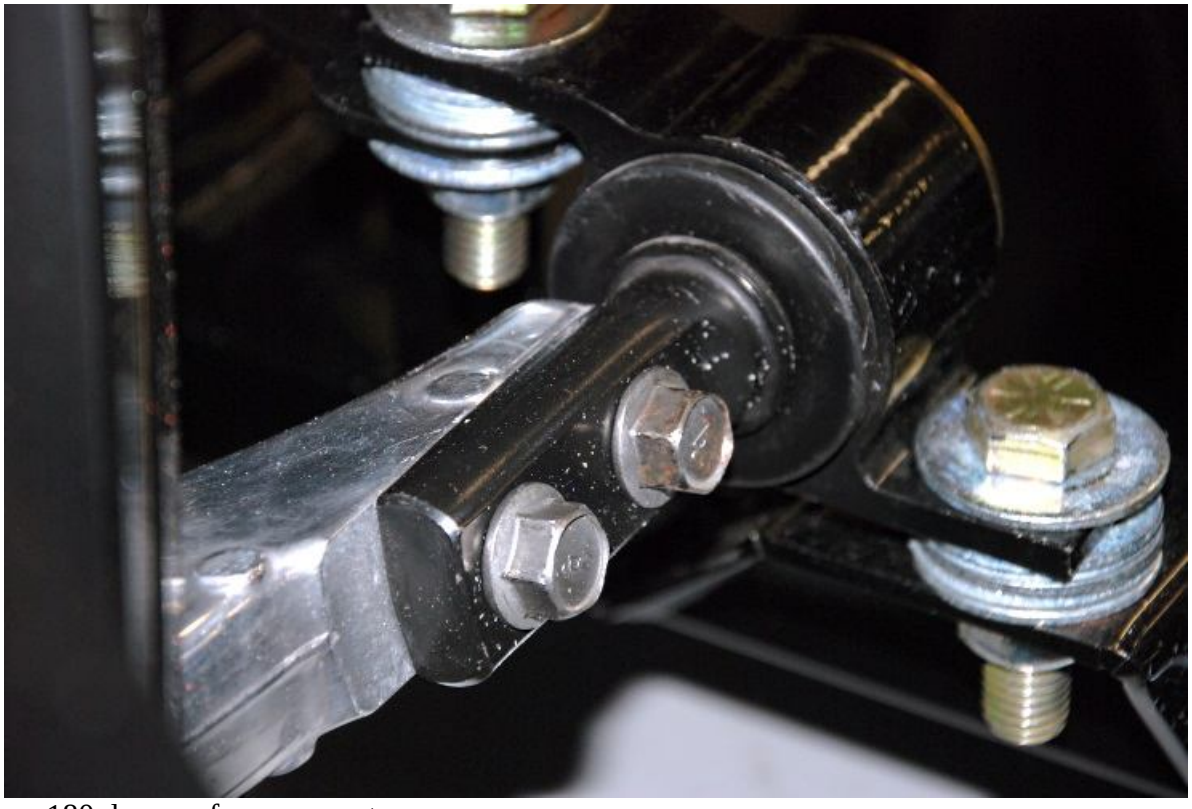


Moving just the rear of the arm to the outer holes works to add more caster if you spin the bushing mounts to avoid going too far.

One more method to add Caster is to unbolt the two bolts that hold the control arm to the pivot stem and flip the stem 180 degrees and bolt it back to the arm. This will put the smaller flat surface against the control arm and the larger flat on the bolt head side.



Standard OEM mounting location



Stem spun 180 degrees for more caster.

Rear Suspension

Rear Toe in is a very critical setting on all of the 818s. Running a good amount of rear toe in will stabilize the car and make it much more fun to drive hard and much more stable exiting corners. Baseline setting for rear toe should be 5/16 in. total toe in. If you want to experiment from there then we recommend going in 1/16 inch increments.

Rear Camber setting should be similar to the front and is also tire dependant. -2.5 degrees is a good starting point and taking tire temperatures and watching tire wear patterns will allow you to adjust from there. On a full racing slick with a slightly softer sidewall start at -3.0

Rear Roll-Steer is adjustable by lengthening or shortening the upper trailing link. Roll steer is equally important to rear toe in as it has the same affect as the suspension rolls through its travel. The baseline setting for rear roll steer is zero which means the lower lateral links are parallel when viewed from the front. In order to adjust the roll-steer park the car at ride height on flat ground and measure from the ground up to both ends of each lateral link. Subtract the difference in height from the inside to the outside on each link to get the total amount the inner pivot is higher than the outer. To adjust to zero rear roll-steer change the length of the upper trailing arm until both lateral links change by the exact same height. Another way to describe this is the long bolt in the bottom of the spindle that attaches both lateral links should be parallel to the flat bottom of the car.

General

Spring rates were set from the factory based on the most aggressive combination for the R model. Since a mid-engined car will tend to understeer at low speeds and then switch to oversteer at higher speeds the spring set-up is very important. The rates that come in the kit are optimized for high downforce and are a compromise in stiffness for a car with little or no aero. If you are not running a rear wing then we highly recommend swapping the springs and running the 500lb coils in the front of the car. This will make the car understeer at low speeds but gives much better drivability at higher speeds on track. If you are doing mostly auto-crossing and the speeds are lower then running the stock 500 rear/300 front is most likely going to be faster as a baseline but further spring tuning is recommended based on your tire sizes and driving style. Also on a low downforce setup where the spring rates are swapped for softer ones then we recommend keeping the front sway bar for tuning as well.

Oiling is a critical area and one that is slightly more complex on the Subaru engines than on most inline or vee configurations. Because this car is capable of very high lateral corning forces you have to pay very close attention to make sure and not starve the engine in the long corners. Using a road race style oil pan is a good start along with a windage tray and pickup, and if you are running sticky tires and full aero then we recommend an Accusump. For full track duty (and to help with underbody aero) a dry sump system is the ultimate form of protection from oil starvation. No matter which system you use monitoring the pressure is the key to a healthy engine. If you don't have any data logging then something as simple as a camera on the oil pressure gage for the first few sessions is a good idea.

Scaling the car is essential to making sure the car is balanced handling wise and under heavy braking. Getting the cross weights even is the most important thing as it is difficult due to the driver position being offset to get the two sides to be equal both front and rear. If you are running the sway-bar then disconnect it to scale. If you don't have scales or any method to set cross-weights then it is worth taking the car to a race shop to get it done. Just be sure your ride height and alignment are set first. If you can't get anywhere to scale the car then measure the spring collars to get them even across the front and even across the back. Then if you have one front wheel that consistently locks up under braking raise that corner by a half turn at a time until they are even.

Aerodynamic balance also can play a big role in how the car handles and ultimately how fast it will go. It is easy to overdo one end of the car and end up with a car that is slower and harder to drive even though it has more total downforce than before. Matching components and having built in adjustment (usually rear wing angle) is the key to finding the perfect set-up. As a starting point these are good baseline combinations we have used.

Tires and tire sizes. With the large percentage of weight on the rear wheels it is best to run staggered sizes front to rear. Front tires are generally limited to 215 widths but if the overall diameter is small enough then some 225s will fit as well. Some of the combinations we have used:

Hoosier A7/R7:
Front 225/40/17
Rear 255/35/18

Toyo R888
Front 215/45/17 (This size requires the front lower arms be mounted for extra caster)
Rear 255/35/18

Yokohama Advan Radial Slicks
Front 210/610/17
Rear 240/640/18