



Dart 2.0 Team Kit Owner's Manual

Thank you for purchasing the McPappy Racing Dart 2.0 Team Kit. This manual will guide you through the assembly process. It is possible to take a kit and throw it together in an hour. But it's wise to take the time and do it right. This owner's manual will provide building instructions but also tips on better methods for building a smoother suspension, removing slop and binding, etc.



Chassis Prep

As a bare minimum, there are you 5 areas that you should Dremel, file, or sand off the sharp edges so that it does create unnecessary resistance by catching or cutting carpet fibers:

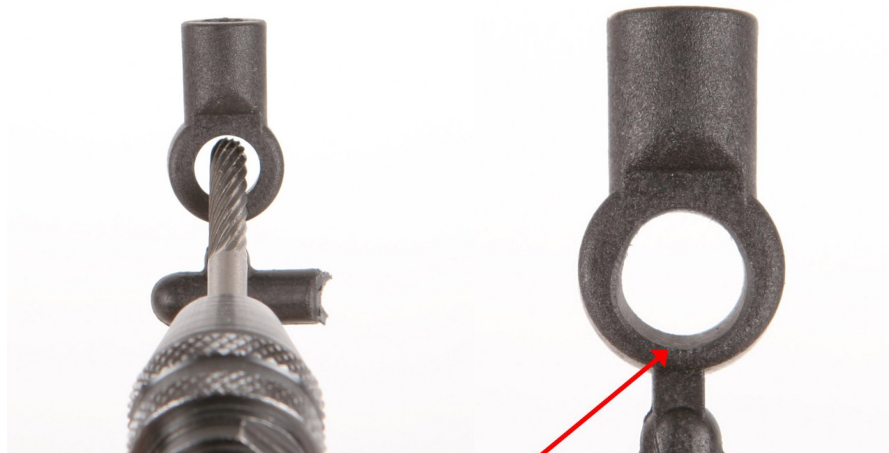
- Front edge of the chassis
- Right edge of the chassis
- Front edge of the bumper
- Nerf wing
- LiPo strap brace
- Where the battery tape connects to the chassis

Taking time to Dremel, file, or sand all of the carbon fiber is worth the effort as well. For a smooth finish, you can finish off the perimeter with 400 – 600 grit sandpaper. Applying superglue (CA) to the edges will make it feel smoother and also helps to keep the carbon fiber layers together during a hard hit. Take thin CA and soak a Q-tip. Shake off the excess CA and slide the Q-tip along the perimeter. It will slide easy on all sanded edges, but you may have to roll the Q-tip along the rougher edges, otherwise it will pull off the Q-tip fibers. For the ultimate glass smooth perimeter finish, you can sand the CA when it dries and repeat the process. It's also recommended to CA the countersunk 8-32 slots in the locators. This will keep the slots in better shape for a long time.

Front End

Attach the bumper to the chassis using 8-32 1/2" flathead screws and 8-32 nylon locknuts.

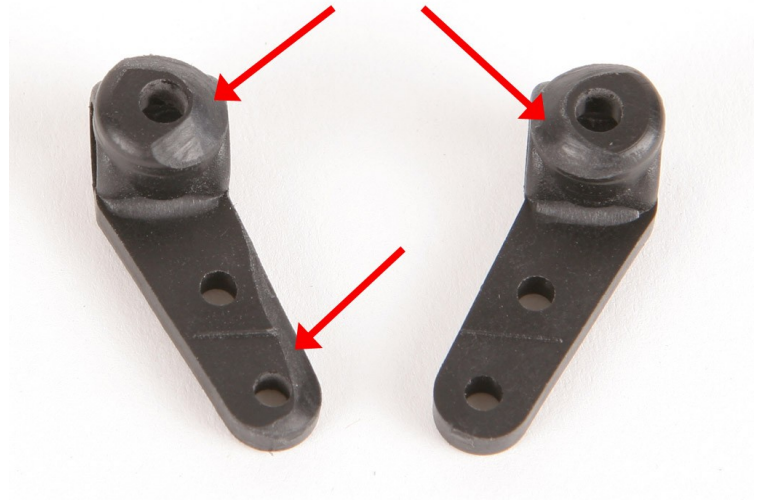
Take a Dremel and remove some material from the outermost edge of the eyelet or install the eyelet upside down. Otherwise, when the suspension is compressed, the spacers at the top of the kingpin will bind against the inside of the eyelet.



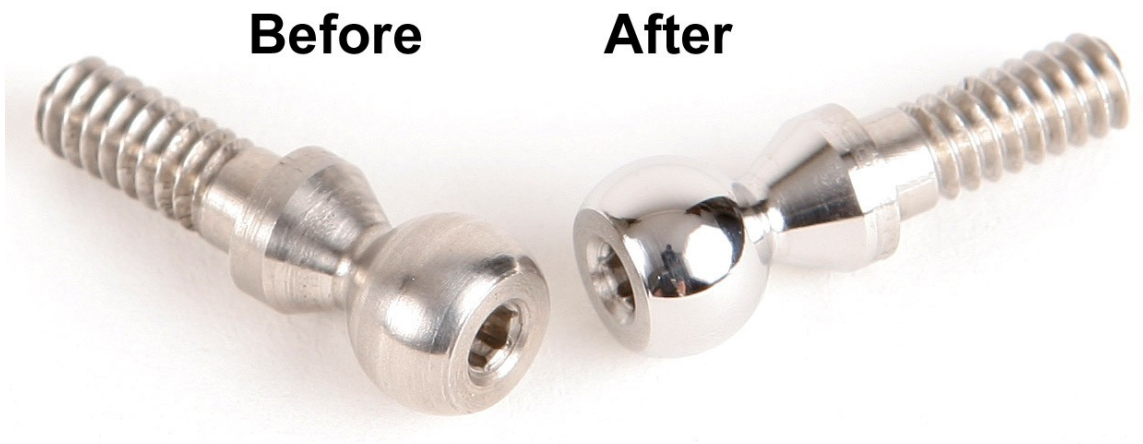
Insert the front suspension pivot balls into the eyelets and lower suspension arms. To allow your suspension to work the smoothest, it's important that these aren't too tight. Generally, a brand new eyelet and lower arm is slightly too tight with brand new pivot balls. The best way to break in the eyelet and lower arm is to use the "pivot ball removal tool" to insert and remove the pivot ball many times. Slowly insert the pivot ball. Let it sit in the tightest location for a while, and also screw it in past the normal point. This will open the eyelet and lower arm. To greatly speed up the process, use a slightly oversized pivot ball like the Hyperdrive Teflon coated aluminum pivot ball. The IRS pivot ball diameter is the largest available and since it's metal, you can save your plastic pivot balls from getting damaged.

Both steering blocks need some material Dremeled off the inside top area, otherwise the eyelet will hit the steering block when the suspension is compressed.

While you are at it, take the left steering block and Dremel off some material as well, otherwise when the left suspension is compressed, the left Dubro will bind against the left steering block.



Ignore the short kingpins that come in the front end bag. Find the 1.5" kingpins, put them in a Dremel and polish them with metal polish (or toothpaste if you don't have any). The ultimate metal polish is Simichrome. Absolutely amazing how fast Simichrome works without taking anything off the diameter! Stop by a Harley dealership or pick some up online (like Amazon.com). Here's an example with the pivot balls:



With single cell racing, we've lost some left side weight percentage, so cars are rolling a little more onto the right front. If you are running 10.5 or faster, it's a nice option to be able to run more than 3 degrees of camber on the right front so that the edge of the tire doesn't dig into the carpet. Generally, the 6-32 turnbuckle will bottom out at about 3 degrees of camber. To increase this, take a little material off the eyelet and upper arm. You don't have to do this for the left side.



Left Side



Insert the 6-32 turnbuckles into the eyelets and upper arms. Now is the best time to decide which direction you want the threads to run. Choose the same on both so adjusting the camber later will be consistent.

Using 5/8" buttonhead screws and brass cone washers, connect the aluminum 10 degree caster block to the left lower arm. The brass cone washers are used to space out the caster block to decrease camber gain. This keeps more left tire contact patch on the ground in the corners when the suspension compresses.

Using 1/2" 4-40 buttonhead screws, connect the 10 degree caster block to the right lower arm. The brass cone washers are not used on the right caster block to increase camber gain. This helps to keep the right tire from coning and from biting too hard on the outer edge in the corners.



Right Side

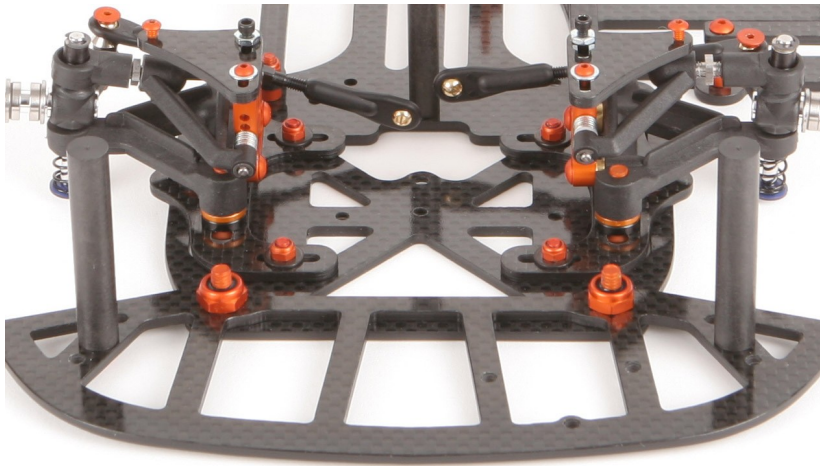
Static caster can be controlled by the amount of spacers between the rear of the caster block and the upper arm. No washers in the rear of the caster block is about 0 degrees. Each washer is approximately 1 additional degree of caster. For the left side, we recommended 1 degree of caster (1 washer to the rear of the caster block). For the right side, we recommended 2 degrees of caster (2 washers to the rear of the caster block, our picture only shows 1).

Insert the self-locking hinge pin into the uppermost holes of the left caster block. Insert the self-locking hinge pin into the lowermost holes of the right caster block. Apply light forward pressure to the hinge pin take away any slop, and gently tighten the 2-56 screw down to hold the hinge pin in place. This also locks the upper arm from moving forward or rearward. When you do it right, the upper arm should have no slop and should also be loose enough to flop down by it's own weight.

Note: The rear upright of the 10 degree caster block is the only upright that allows the long 2-56 screw to go all the way down through to hold the hinge pin. In our testing, only one 2-56 screw was needed to

secure the hinge pin. For added peace of mind, you could fill the front of the hinge pins with extra spacers, but technically aren't needed as long as the 2-56 holds the hinge pin.

Notice the single long 2-56 screw serves 2 purposes. It holds the hinge pin in place and the nut holds the bumpstop in place. Also notice that we added a few spacers under the left bumpstop to give us a little more room for clearance.

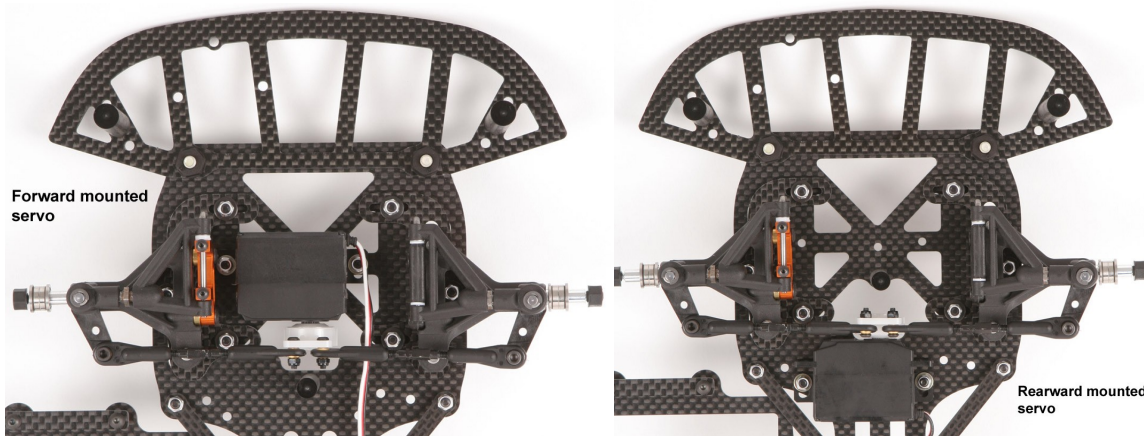


Use 3/8" 4-40 flatheads, #4 washers, and 4-40 locknuts to install the locators. There is a left and a right locator, so look at the picture to use the correct ones. Use 5/8" 8-32 flat heads to install the front ends onto the locators. Of course, you'll probably want to use some spacers under the lower arms to get the ride height correct.

Install the aluminum axles into the steering blocks. Find the upgraded 1.5" kingpins, chuck them in your Dremel or drill and polish them with Simichrome. Make sure to remove any residual Simichrome polish with motor spray or similar before proceeding. Install an e-clip on one end, then a spring bucket, large black front spring, and another spring bucket. From the bottom, install the Kingpin up through the lower arm, steering block, front axle and upper eyelet. Use the black nylon spacers and metal spacers on top of the kingpin to take up the slack. You want just barely enough spacers to take up all of the slop. You don't want to preload the spring too much. Install the e-clip on top of the kingpin.

Servo Mounting

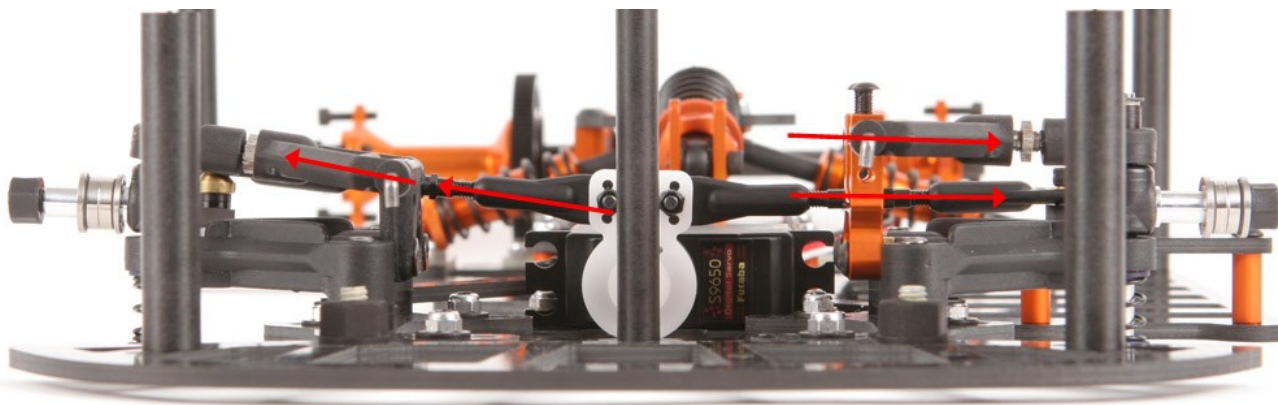
The servo holes in the chassis were drilled for the popular Futaba 9650, 9602, or BLS651 servos. If your servo has both ears intact, you can mount the servo in the forward position or regular position. Using the forward mounting position is beneficial for 2 reasons. It increases the forward weight percentage which has proven to be desirable in 1 cell racing. Secondly, it moves weight more towards the suspension mounting points which keeps the chassis settled/flatter over bumps. If your servo does not have the ears intact, you can recreate them with thick Lexan bent into a 90 angle and epoxied to the servo.



Put one of each type of Dubros (4-40 MCP3580 and 2-56 MCP3581) on each end of 1.25" black turnbuckle. They go on a little tight, so it's good to open up the Dubro plastic a little bit with a 7/64" drill bit and put a little chapstick on the turnbuckle threads before threading them. Being consistent with your choice of turnbuckle thread direction will make it easier on you later when adjusting your toe. Use the 3/8" 2-56 button head screw (button head goes closest to the servo) and 2-56 locknut to attach the Dubros to the servo saver. It's important to use a small servo saver (not the large one that comes in the front end bag) to get the Ackerman and bumpsteer right. (More on that later.)

Mount your small servo saver onto your servo. Use 5/16" 4-40 flatheads, #4 thin washers (found in the front end bag) and 4-40 locknuts to secure the servo flat to the chassis. Mounting the servo in this manner saves weight and lowers the center of gravity. Move the servo so that the turnbuckles are straight across. This will provide the proper amount of Ackerman.

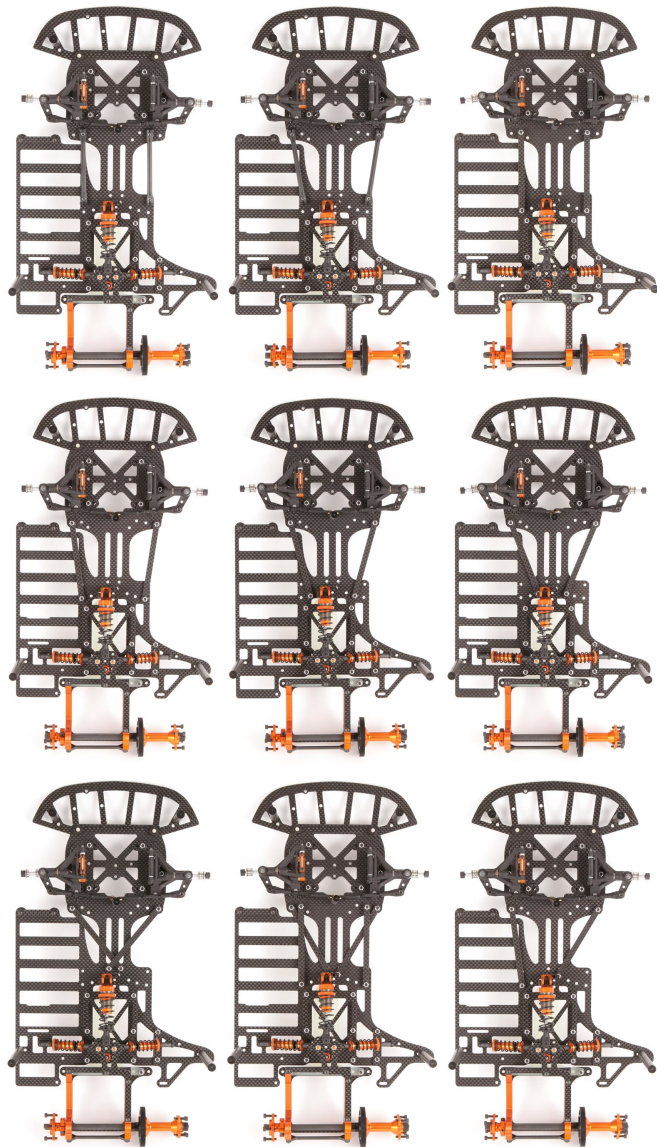
To eliminate bumpsteer, the turnbuckles should be parallel to the upper arms when looking from the front of the car. Using a 7/16 sockethead 4-40 screw and locknut to connect the left Dubro to the left steering block. When the suspension is compressed, it will not bind since you shaved a little angle into the left steering block. Use a 3/4" flathead 4-40 screw, spacers, and an aluminum cone washer to mount the right Dubro to the right steering block. To get the right turnbuckle parallel with the right upper arm, this usually means lots of spacers to the point where the Dubro is almost touching the tire. BSR's provide the most clearance, as their rim diameter is the largest.



Flex Control

This car was designed so you could have complete flex control for any classes, types of tracks, or track conditions. If you prefer a lot of flex, there is no need to cut your chassis with a Dremel. On the other end of the spectrum, the new design also allows you to build a rock solid chassis.

It is important that you run at least two carbon fiber flex braces or clamp links for impact resistance purposes. The 3 chassis “neck” pieces alone probably won’t be enough strength on a hard hit into a wall. The kit comes with two 2.5” clamp links, four 3.1” carbon fiber flex braces, and spacers. They can be used in various combinations or doubled up to get the desired effect. You’ll be able to control both the twist and the bow (belly of the chassis sagging down or arching up). There are literally millions of possible combinations, but don’t worry, it’s actually pretty easy to understand and document on setup sheets.



Rules of Thumb:

- The plastic clamp links provide the most flexible setup overall. They provide impact strength without adding any twist or bow/arch resistance.
- Carbon fiber braces aligned parallel (front to back) will increase the bow/arch strength, but not add much twist resistance.
- Carbon fiber braces angled towards the center in a “V” pattern will significantly add a lot of twist resistance, but not add much bow/arch resistance.
- The higher the carbon fiber brace is off of the chassis (using spacers or standoffs), the more effect it will have.

Use the provided collection of ball studs w/ clamp links, carbon fiber flex braces, flathead screws, locknuts, spacers and washers to design the car for your situation. Be creative. You can bolt the carbon fiber flex braces right down to the chassis, or you can double them up, or raise them up with spacers and standoffs. You can use more than two braces as well. You can also run one set parallel, and one set angled. They do not have to be symmetrical nor do you need to add them in pairs. You could run 2 on one side and one on the other for example. Just make sure you have at least 1 brace or clamp link on

each side of the chassis for impact resistance.

On a side note, if you are running the flex braces in parallel, the right side offers 2 choices. The widest parallel position will have a slight increase in twist strength compared to the narrow parallel position.

Slower classes or wide oval tracks:

Generally, a very flexible chassis is usually desirable these situations. With less G forces, there is less weight transfer to the RF. A flexy chassis encourages more weight to transfer which can give you that quick snap you are looking for when the car first dives into the corner. Secondly, a flexy chassis acts like a very consistent suspension, which is usually better than springs and kingpins.

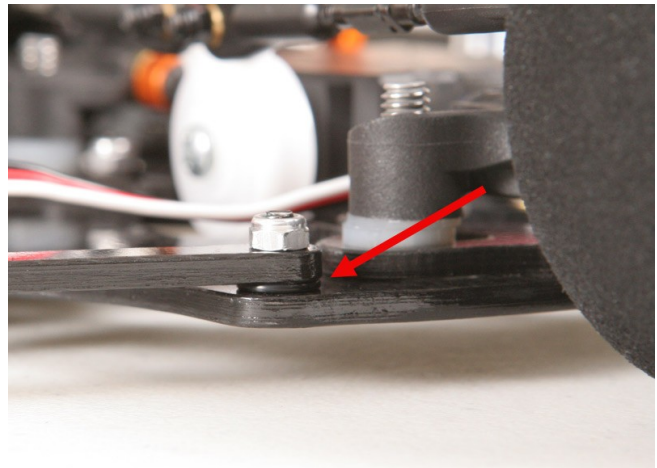
Faster classes or paperclip tracks:

These usually require a more rigid chassis as a lot of weight transfers to the RF which can cause it to bite too hard, providing so much traction that it might traction roll or spin out. A stiffer chassis will keep more weight on the left side in the corners.

This is just a ballpark starting point: 17.5 or 13.5 classes might want to start with the 2.5" clamp links. 10.5 class might start out with the carbon fiber links in the wide parallel position using 1/8" standoffs. 7.5 class would probably want to start angled halfway towards the center using 1/8" standoffs. Mod class would probably start with a "V" pattern and 1/8" standoffs.

Important Note: O-Rings with Flex Braces

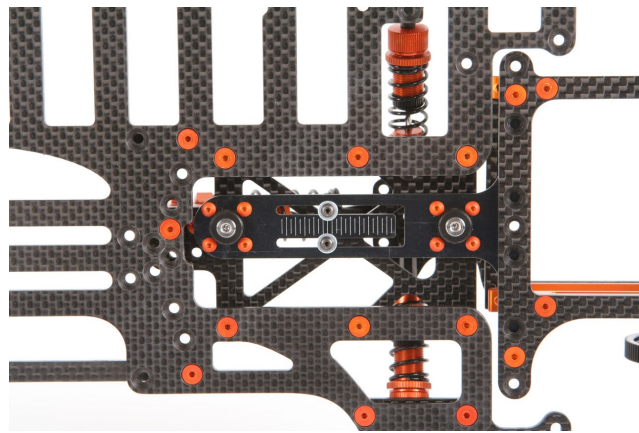
If you are using the carbon fiber flex braces, use the provided rubber O-rings between the flex brace and the chassis. This will prevent the chassis from holding any unwanted tweak. Tighten down the flex brace so that the O-ring is squeezed and to the point where O-ring diameter matches the diameter of the flex brace.



Rear End

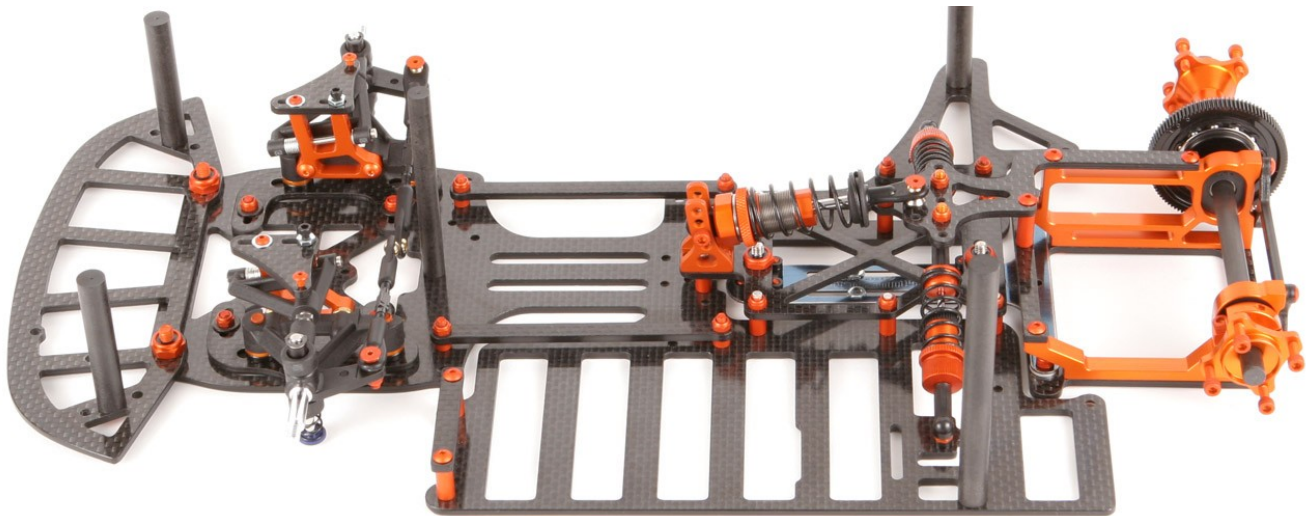
This kit comes with a Muddslide adjustable flex spring steel T-plate. Spring steel returns back to its neutral position better than fiberglass. The T-plate is engineered so that you will only need your hex driver. You can practice, pull it over, adjust the T-plate with one tool (no nut wrench needed), put the car back down and go right back out there!

Chuck your pivot balls into a drill and use Simichrome to polish them. Clean them off well before proceeding. Insert the lower Delrin pivot ball sockets into the T-plate. Insert the pivot balls into them. Put the upper Delrin pivot ball sockets on top and secure everything with 1/4" 2-56 buttonhead screws. You will not need to tighten them down all the way. Try to keep the pivot balls as loose as possible without any slop.



Connect the T-plate to the lower pod plate with 5/16" 4-40 flathead screws, .030" spacers, and 4-40 locknuts. You will use a .030" spacer in between the lower pod plate and the T-plate. We recommend running offset pod (and offset T-plate) so use the center set of holes on the lower pod plate like the picture below. We also recommend running just 2 screws to keep the T-plate more flexible.

Install the center shock mount onto the float bridge left most holes using a single 1/4" 4-40 buttonhead screw. Next, turn the chassis on it's side, insert seven 5/8" 4-40 flathead screws and place the seven 9/32" aluminum spacers on the top side of the chassis. Then install the float bridge. The six float bridge holes were designed to be snug so that there is no play. Thread a little at a time into the float bridge. Finish it off with six 4-40 locknuts. The forward most 5/8" 4-40 flathead screw will screw into the center shock mount.



Insert the pivot balls up through the float bridge. This will also be a snug fit by design. Use your 5/64" driver to turn them as you push up on them. Then secure them with 6-32 low profile aluminum locknuts.

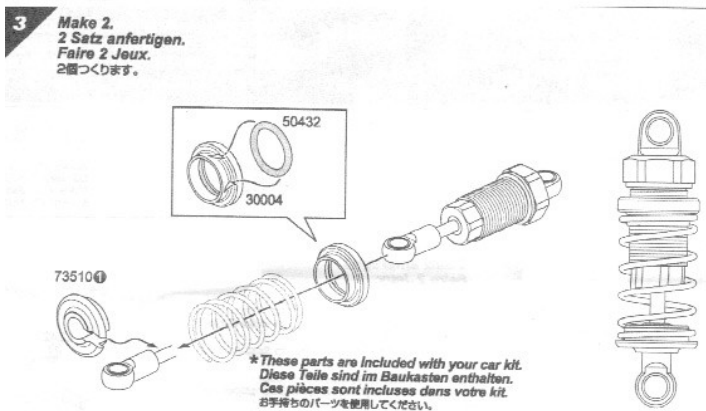
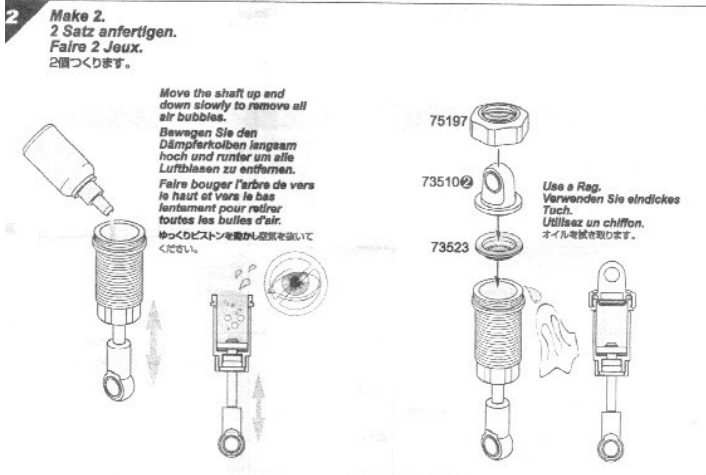
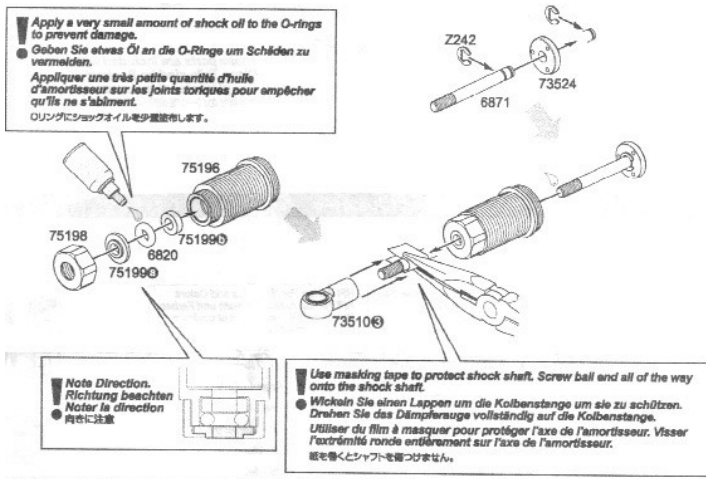
Install the left and right bulkheads onto the bottom plate using 1/4" flathead 4-40 screws. Install the dogbone onto the backside using 1/4" buttonhead 4-40 screws. Install the 1/2" standoff onto the pod support brace using a 1/4" buttonhead 4-40 screw. The standoff will be on top and to the right side. Install the pod support brace onto both bulkheads using 1/4" buttonhead 4-40 screws.

Polish all of you ball studs with Simichrome. If they are anodized, the Simichrome will polish that just fine. No need to take off the anodizing first. Install the short ball studs on the underside of the top plate (second holes in on both sides). Install the top plate onto the right bulkhead using 1/4" buttonhead 4-40 screws. You need to be careful if you use aluminum screws with these 2 particular screws. Over time, they tend to get very tight because of the constant heating and cooling of the bulkhead. Use steel, titanium, or lubricated aluminum screws here.

Center Shock

Polish your shock shafts and inside of the shock body with Simichrome. Assemble the center shock as seen below. We recommend 50 weight oil for the center shock.





For the center shock, take a hobby knife and mark and shorten the 4-40 Dubro by 0.10" so its overall length is approximately 0.88". Open up the Dubro plastic a little bit with a 7/64" drill bit and/or 4-40 tap, and put a little chapstick on the shaft threads before threading on the Dubro. To go the extra mile, turn the brass pivot ball sideways and pop it out of the Dubro. Polish with Simichrome and put it back inside the Dubro.

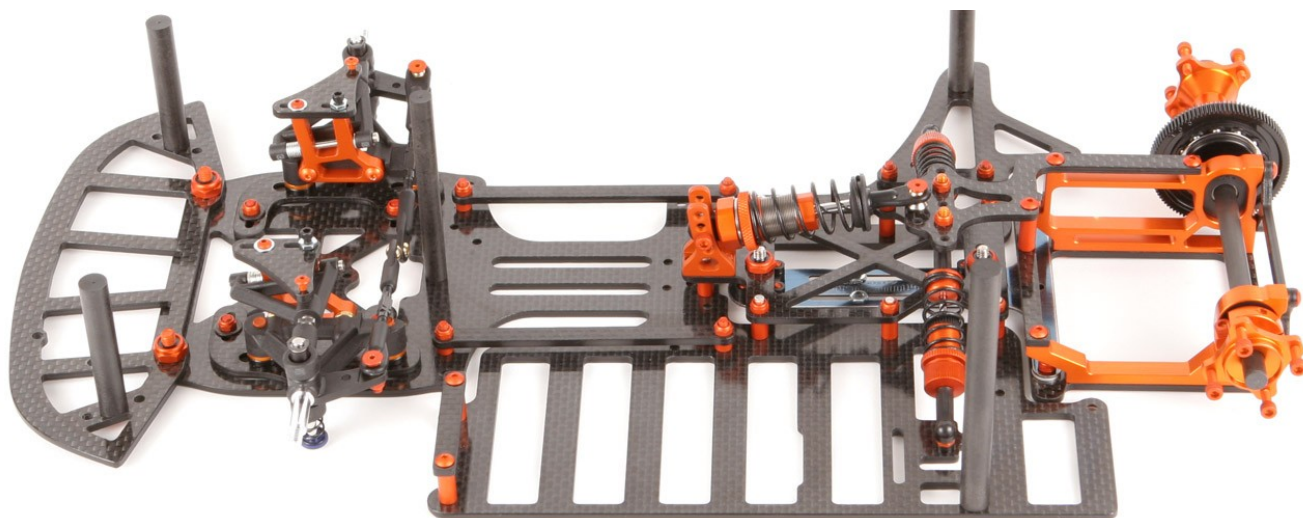
Place the spring and spring retainer onto the shock.





Work the fuel line tubing into the head of the center shock as seen here. Use a hobby knife to shave off all excess fuel line tubing on both sides of the head. This is important, as too much fuel line tubing in between the center shock mount uprights will cause a bind.

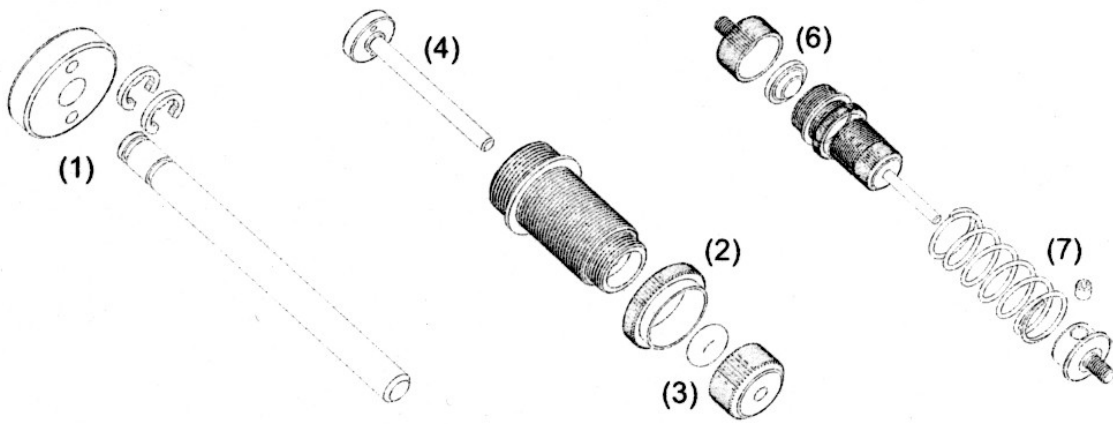
Using a 7/16" 4-40 socket head screw, install the shock into the center shock mount. Using a 1/2" 4-40 flathead screw, aluminum cone washer, and 4-40 locknut, attach the Dubro to the upper pod plate as seen below.



Side Shocks

Polish your shock shafts and inside of the shock body with Simichrome. Assemble the Silva HPS2 side shocks as seen below. We recommend 70 weight oil in the side shocks.





- 1) Attach the piston to the shaft using the 2 e-clips.
- 2) Thread on the shock spring adjustment collar.
- 3) Apply a small amount of oil to the o-ring. Slide the o-ring into the bottom of the shock body. Secure the o-ring with the lower black cap.
- 4) Slide the shock shaft assembly into the shock body
- 5) Fill the shock up with oil. Move the shock shaft up and down to help bleed the air out.

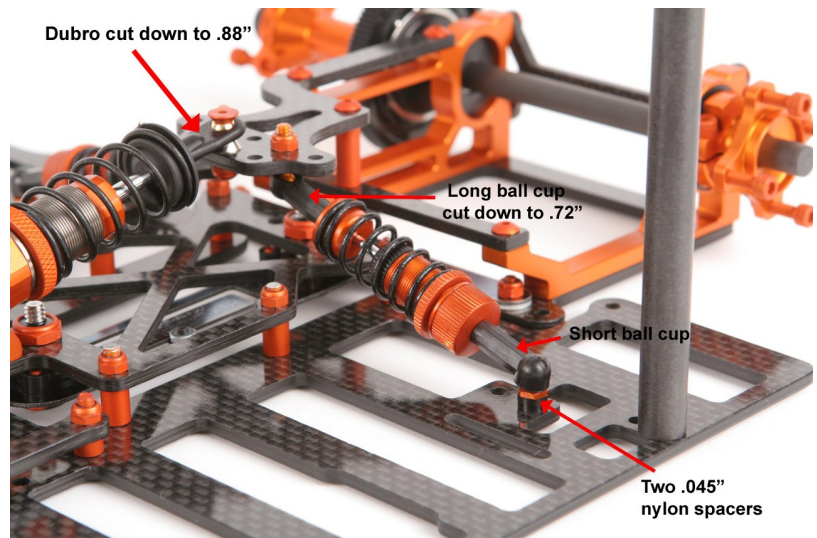
- 6) Place the bladder onto the top of the shock. Oil may squeeze out. Fasten the shock cap onto the shock body half way. Move the shock shaft up to the top of the shock to get the desired pressure. Once you get the desired pressure fully tighten the cap.
- 7) Slide on the desired spring (not included in kit). Attach the shock end with the supplied set screw.

For the perfect length, use a short ball cup on the shock body, and cut down a long ball cup with a hobby knife to 0.72" and install it on the spring retainer. This puts the piston in the center of the oil, and the shocks will travel fully to both sides.



Polish your hollow ball studs with Simichrome. Using a 1/4" 4-40 buttonhead screw, install a hollow ball stud on to the left most hole in the nerf wing. Using a 3/8" 4-40 flathead screw and two .045" black nylon spacers, install a hollow ball stud in the left most hole of the chassis. The two nylon washers on the left ball stud are necessary to get both ball studs to the same height.

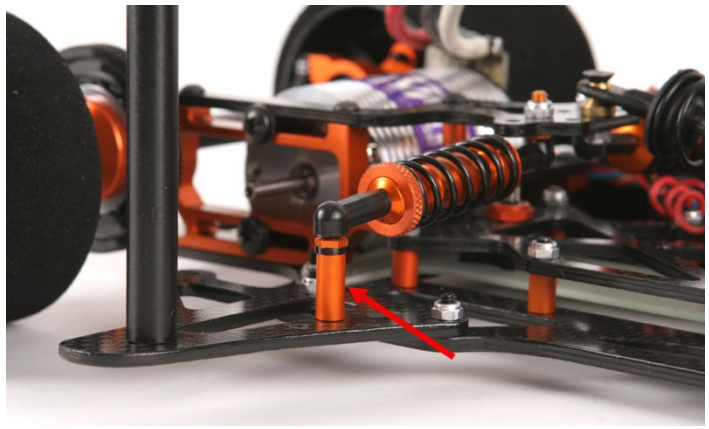
Install the side shocks as shown.



UPDATE: Side Shock Standoffs

We have included two new standoffs and ball studs for you. (Use the shorter standoff on the nerf wing side.)

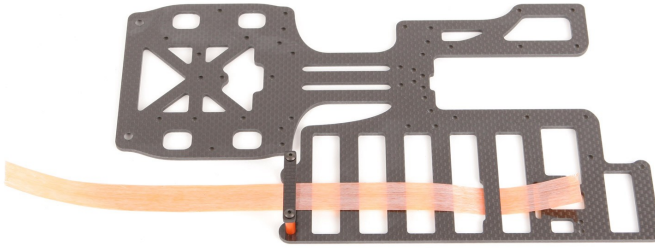
We have found that raising up the side shocks to make them more flat will put less upward pressure on the top plate. This essentially allows the T-plate to provide more pod rise resistance under acceleration or bumps on the track. We've found this to increase rear traction even more and would highly recommend it.



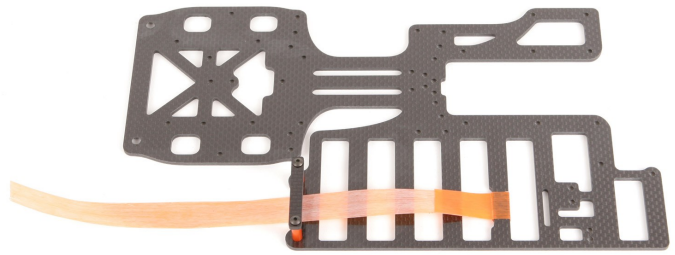
LiPo Mounting

The Dart's LiPo strap mounting is the lightest way to hold a battery in with 2 screws. It also holds the battery fully flush to the left of the chassis for increased left weight percentage. The tape strap is not sticky to the battery, which makes it easy to install or remove the batteries. It's important to note that the tape strap was designed to hold the battery down, while tungsten or lexan strips were designed to lock the battery in from moving side to side. Therefore you should not need the LiPo strap to be over tightened. Let the tungsten or lexan strips provide the main holding power.

Step 1. Cut a piece of tape 12" long



Step 2. Fold it back on top of itself like this



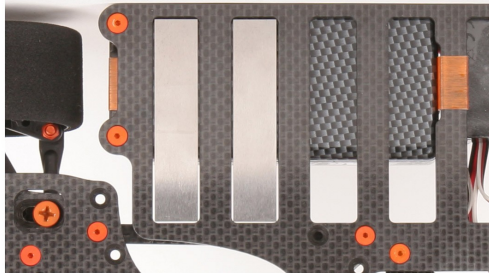
Step 3. Insert the battery underneath the tape.
LiPo strap screws should be only halfway tightened.



Step 4. Fold tape back onto itself again, gently snug.
Tighten LiPo strap screws a little more.



Step 5 Install tungsten and/or lexan with servo tape to lock in the battery.

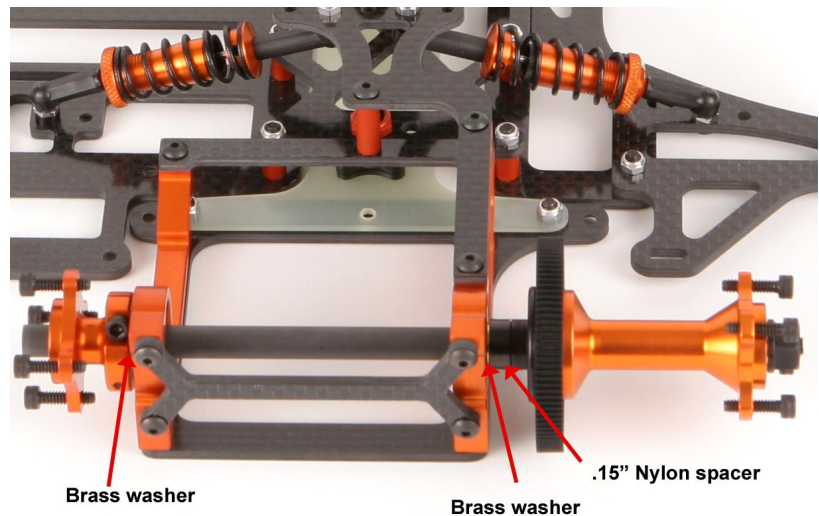


(Underside)

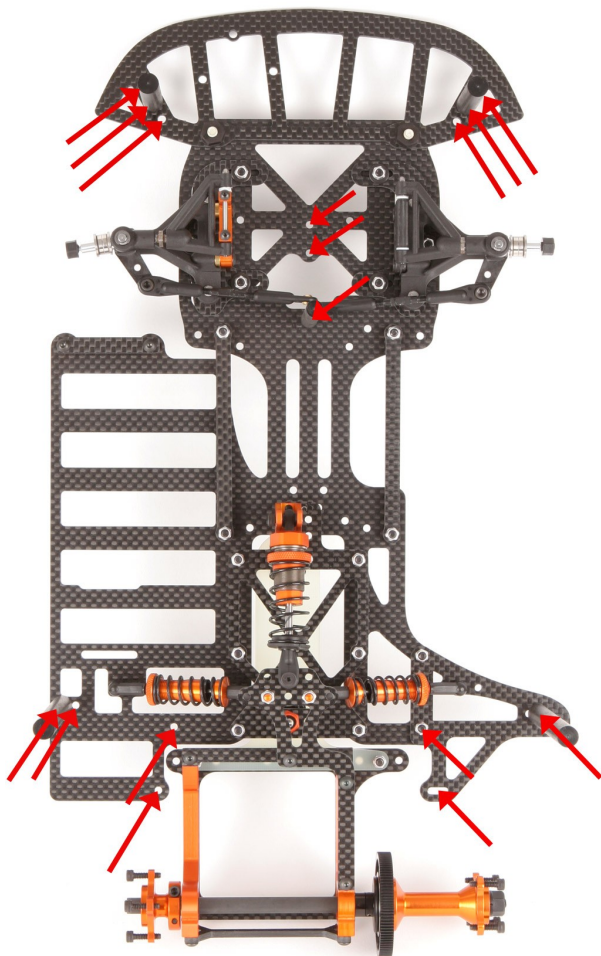
Rear Axle

Place your flanged bearings into your desired ride height locator and insert into the bulkheads. Install the 0.15" nylon axel spacer on to the axle. Install a brass washer on next. Slide the axle into the bearings. Install the left hub onto the axle. Use 7/16" 4-40 socket head screws to tighten it on to the axle.

On the other side, install the diff rings, spur gear (with diff balls and unflanged bearing installed), right hub, diff cone washer and 8-32 nylon locknut.



Body Posts



There are 16 body posts locations for you to choose from! We recommend the choices shown in the pictures, but feel free to use whatever works best for you. Use a Dremel with a cutoff wheel to cut the posts the desired heights and angles. Drill a hole and use a 4-40 tap for best results.


Aftermarket aluminum adjustable body posts are convenient, but are heavier. Taking the time to make all Delrin body posts will benefit you on every lap as they are lighter.


We will be posting some body posts heights on our web site later.

Team Updates and Communication

We have an open policy for providing tips, setups, discussing future improvements, and taking suggestions from all McPappy Racing owners. Please join us on www.McPappyRacing.com in our discussion forum. We also have downloadable setup sheets as well. If you have any questions, feel free to contact us:

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Toll Free (US Only) Sales: 800-596-8727	36 Coventry Dr.
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Fax: 585-352-4593	
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