

# BMI RACING

## DB12 R



"Anything else is just a Toy"

The ultimate in rear suspension. Fully adjustable, and isolated, allows for fine tuning your cars handling without sacrificing steering on bumpy tracks.



BMI designed servo mounts that allow for a flat or angled servo installation. Allows for hassle free adjustable steering geometry



6061 -T6 precision machined rear pod for brushed or brushless use. Add the capability for infinite gear ratios and no motor tab interference for the ultimate in pod design



- Revolutionary BMI rear suspension
- BMI precision low CG brushless/brushed rear pod
- BMI high volume Damper Tubes
- Titanium front axles
- Quasi Isotropic carbon fiber
- BMI combination flat/angled servo mounts
- IRS lower front suspension arms
- IRS nickel teflon coated shock
- IRS ride height adjuster set
- Teflon hardcoat front pivot balls



352-544-0463 / 15373 Flightpath Dr, Brooksville Fl. 34604 / [www.bmiracing.com](http://www.bmiracing.com)



# ESSENTIAL

# MANUAL

# CompetitionX

A WEB SITE FOR THE SERIOUS RACER

## Message from BMI Racing

The DB12R is a revolutionary step forward in 1/12th scale car design. Two years of research and development has culminated in the kit you have before you. The goal of the DB12R project was to take the best features of T-bar cars and Link cars and combine them to make a new type of rear suspension that will set new standards for speed, versatility and ease of use. I call this new suspension system the BMI Flex Link.

What if you could have a t-plate car that was as stiff side to side as with a .075" t-plate but more flexible front to rear than a .063" t-plate with 2 screws in the read pod?

What if you could have a link car that had insane steering with very little front wheel travel, transitions left to right in chicanes like it was hard wired to your brain and was equally at home on carpet and asphalt?

Stop wondering, the DB12R delivers on all of the above.

The DB12R's suspension allows racers to enjoy the rising side to side spring rate inherent in a T-bar rear suspension system with the separation of the front to back versus side to side spring and damping effects as seen in link cars. This allows serious racers to balance forward traction, side traction and steering aggressiveness independently of each other with the ultimate goal in mind. This means **FASTER LAP TIMES!**

Please read through the instruction manual carefully. Even if you are an experienced R/C racer, there are some details about the DB12R that are different. To get the most out of your kit you must have it assembled correctly.

With Regards,

Jason Breiner

BMI Racing

### Items needed to assemble your DB12R

1. .050", 1/16" and 3/32" Allen wrenches
2. A #2 Phillips Screwdriver
3. 3/16" and 11/32" nut drivers
4. A pair of needle nose pliers
5. A pair of slip joint pliers
6. A hobby knife
7. A ruler or calipers
8. A file
9. A soldering iron
10. Diff Grease
11. Electric Motor Cleaner Spray
12. 35wt silicon shock oil (for center shock)
13. 5000wt silicon diff oil (for damper tubes)

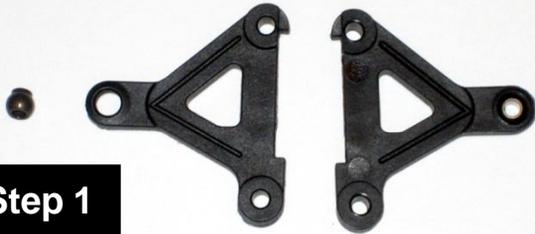
### Items needed to operate your DB12R

1. Two channel surface Radio system
2. A mini servo\*
3. One or more 4 cell battery packs
4. A battery charger
5. An electronic speed control
6. An electric motor
7. A 64 pitch pinion gear
8. A small servo saver.
9. 1/12<sup>th</sup> scale body
10. 1/12<sup>th</sup> scale tires

\* The DB12R was designed for servos with dimensions similar to the Futaba 9602 and 9650. These will fit perfectly with a centered output shaft. Other servos will fit but may require different servo mounts and/or modifications to the lower chassis.

# Front suspension assembly

## Step 1



Locate your lower front suspension arms and the hard anodized alloy pivot balls. Note that the arms are symmetrical. At this time you must pick which one will become the left and right arms as this will determine how you pop the pivot ball into the arms.

Pop the pivot balls into the arms with the shoulder on the ball facing up. Do this by placing the ball on a hard flat surface and placing the arm over the ball. Carefully push the arm down over the pivot ball. Be careful. It will take a lot of force.

### *Special Note:*

The DB12R uses IRS hard anodized alloy pivot balls and the new IRS lower suspension arms. If the balls are tight in the lower arms carefully squeeze them with pliers until the ball just begins to move freely

## Step 2



Locate your upper suspension arm rod ends. Note that the top side of the rod end opening is smaller than the bottom

With a hobby knife, carefully chamfer the top of the rod ends opening. This creates clearance for the king pin shims that will go here later. This will ensure there is no binding in the suspension.

The inset picture shows a finished rod end.

## Step 3



Locate the two remaining hard anodized alloy pivot balls and snap them into the upper arm rod ends with the shoulder on the ball facing down. As with the lower arms, squeeze the rod ends if the balls do not move freely.

## Step 4



Locate the upper suspension arms, the upper arm turnbuckles and assemble as shown above.

We prefer to thread the right hand thread portions of the turnbuckles into the rod ends and the left hand thread into the upper arms.

### *Note:*

The arms have a bottom and a top. They have small circular impressions on the bottoms.

## Step 5



Locate the 10 degree reactive caster upper suspension mounts, upper suspension hinge pin, e-clip and nylon caster spacers.

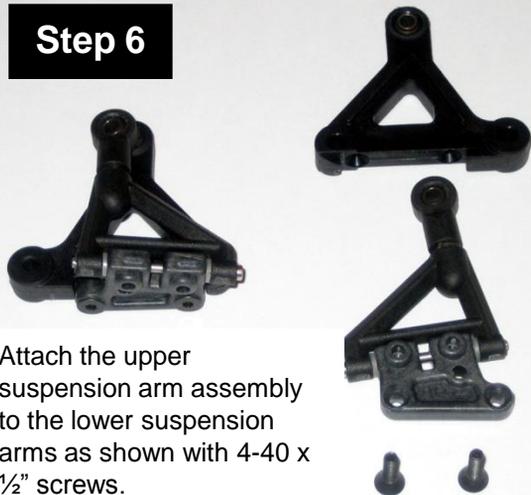
Assemble as shown.

Make sure the upper suspension arms pivots freely. If there is any binding at all, the car may handle poorly. If the upper arms are tight, use the back of a hobby knife to scrape the front and back of the reactive caster blocks and the inside of the upper suspension arms to make more clearance for the caster spacers. Take your time here and get it right!

### *Special Note:*

The DB12R uses IRS upper hinge pins and does not require setscrews in the upper suspension arm mounts.

## Step 6



Attach the upper suspension arm assembly to the lower suspension arms as shown with 4-40 x 1/2" screws.

## Step 7



Locate the left and right steering spindles. Trim the steering arms length to the line molded on the part as shown.

## Step 8



Locate the Ti front axles, four 4-40 alloy lock nuts, and two alloy pivot balls.

Thread the Ti axles into the steering spindles. Note that the threads on the axles that go into the spindles are left hand. After the axles are fully seated tighten an alloy 4-40 lock nut onto the threaded stub coming out the back of the spindle.

Thread the alloy pivot balls into the holes on the steering arms and secure them with alloy 4-40 lock nuts. Remember these are alloy pivot balls so make the nuts snug. They are strong enough to last a few racing seasons; but if you crank them down, you can snap them.

## Step 9



Locate 2 steel 1/8" king pins, 10 1/8" shims, 4 e-clips and 2 .020" springs.

1. Snap an e-clip on to one end of the king pin.
2. Slide 4 shims onto the king pins against the e-clip.
3. Pass this through the pivot ball in the upper suspension arms rod end.
4. Place one more shim on the king pin.
5. Slide the steering spindle onto the king pin.
6. Slide the king pin through the pivot ball in the lower suspension arm.

7. Slide the .020" spring onto the king pin and snap an e-clip on the bottom of the king pin.
8. Repeat for the other side of the front suspension.

### *Special notes:*

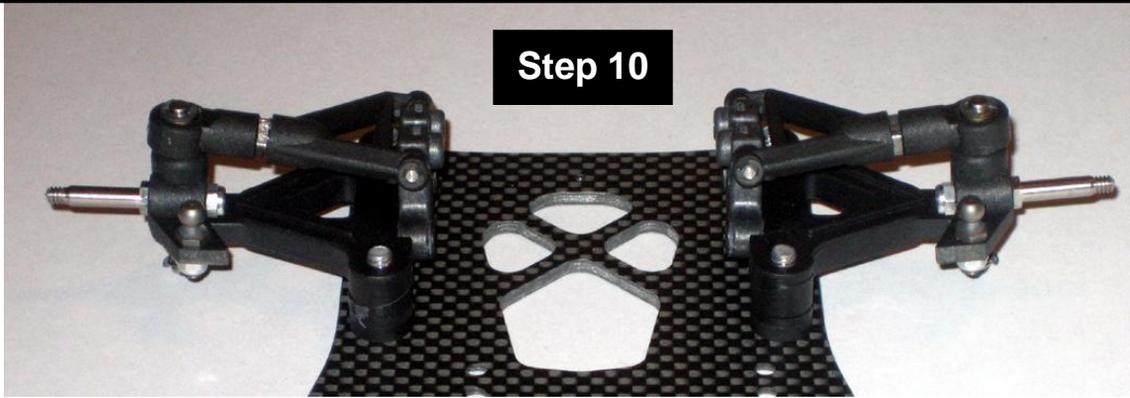
Make sure the steering arms on the spindle are pointing towards the rear of the car as shown in the picture.

The axle is offset in the spindle. Make sure the axle is closest to the lower suspension arm. As shown in the picture to the left

It is important that the king pin slide freely in all of the parts including the steering spindle. When you thread the axle into the spindle, it may swell the king pin bore and make it tight on the spindle. You can try to use a 1/8" drill to open it up but the best solution is to use a 1/8" reamer.

You can order the reamer from:  
[www.mcmaster.com](http://www.mcmaster.com). The part number is [2995A61](http://www.mcmaster.com)

## Step 10



Locate four 8-32 x 5/8" screws and 4 nylon lower suspension arm risers.

Pass a screw through the chassis and slide a nylon riser over the screw. Start threading the screw into the lower suspension arm but do not tighten it. Pass another screw through the chassis and slide a nylon riser over that screw. Start threading the screw into the other hole on the lower suspension arm. Tighten both screws. Repeat on the other side.

### *Special Note:*

In testing, we found we preferred to not use any suspension brace, strap or tube to connect the left and right suspension assemblies. This was true on high traction carpet tracks to low bite asphalt tracks. You can add or remove lower arm spacers to adjust ride height and to compensate for tire wear.

## Rear suspension assembly

## Step 11



Locate two flex plates\*, 2 Nickel Teflon plated Alloy pivot balls, 2 delrin pivot ball housings, 2 delrin housing caps, 2 10-32 set screws\* and 4 2-56 button head screws.

1. Place a pivot ball in a pivot ball housing with the shoulder on the ball facing down.
2. Place a housing cap over the ball.
3. Place the flex plate over this assembly.
4. Pass the 2-56 screws through the pivot ball housing from the bottom up so they thread into the flex plate.
5. Thread 10-32 set screw into the large hole on the flex plate above the housing cap. Just get the 10-32 started into the flex plate for now as we will adjust it later.

The 10-32 set screw is there to adjust tension on the pivot ball so it can move freely but have zero play.

\*Black flex plates and 10-32 set screws were used for photos. The production links are natural G10 in color and the production screws are stainless steel.

## Step 12



Take a minute to prepare all your carbon components for assembly. With a file or sand paper knock off any sharp edges along the perimeter or the carbon parts.

The cell slots in the chassis are designed to fit the cells properly if you just knock off the sharp edges. If you bevel the cell slots the batteries will hang below the bottom of the chassis.

*Special note:*

**Carbon fiber dust is really bad for you.** Always wear a mask and eye protection when sanding or filing carbon fiber.

## Step 13



Locate the delrin center pivot assembly one 4-40 x 1/4" and two 4-40 x 3/8" flat head screws.

Attach the center pivot assembly to the rear most hole in the center of the lower chassis plate with the 1/4" screw. The shoulder on the pivot ball and the two bosses on the center pivot assembly should face down towards the chassis. The pivot ball has a 3/32" hex in the top so you can use a wrench to tighten it firmly.

Attach the rear lower pod plate to the center pivot assembly with two 4-40 x 3/8" flat head screws.

## Step 14



Attach the two flex plate assemblies to the rear lower pod plate with 4-40 x 1-4: flat head screws. Temporarily remove the 10-32 set screws in the flex plates in order to access the 3/32" hex in the top of the pivot ball so you can tighten it down firmly.

Replace the 10-32 set screw and adjust it so there is no play between the pivot ball and the pivot ball housing on the flex plate. However, the flex plate must still move freely. If you lift the front of the flex plate, it should fall under its own weight when you let it go.

## Step 15



Locate 2 gray anodized non-threaded spacers, 2 gray anodized threaded spacers and 2 4-40 x 1/2" flat head screws.

1. Pass a 4-40 x 1/2" flat head screw through the hole in the chassis corresponding to the front hole on the flex plate.
2. Pass a gray non-threaded spacer over the screw.
3. Slide the forward hole on the flex plate over the screw and the spacer.
4. Thread the gray threaded spacer onto the screw and hold it with needle nose pliers as you tighten the screw.
5. Repeat to assemble the other side

## Step 16

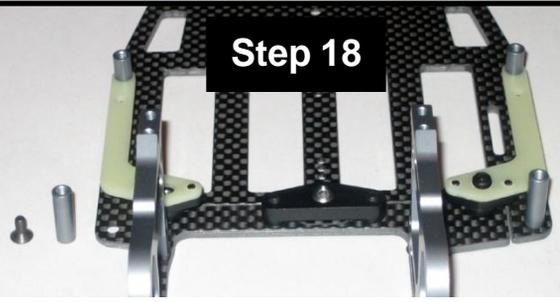


Locate the two alloy rear pod plates, the alloy rear pod plate spacer tube 2 4-40 x 3/8" flat head screws and 4 4-40 x 1/4" flat head screws.

Attach the alloy pod plates to the lower carbon pod plate with the 4 4-40 x 1/4" screws.

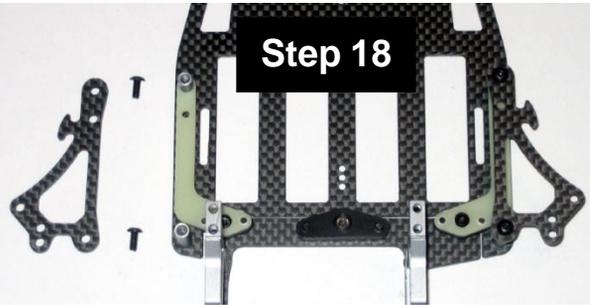
Attach the alloy rear pod plate spacer tube to the alloy rear pods with the 2 4-40 x 3/8" screws.

## Step 18



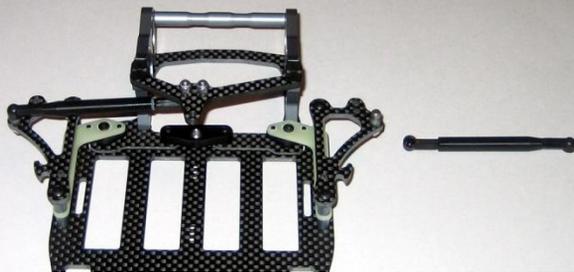
Locate and install the two long gray anodized threaded spacers as shown with 4-40 x 1/4" flat head screws

## Step 18



Locate and install the two carbon damper tube/body mount wings as shown with 4-40 x 1/4" button head screws.

## Step 19



Locate the damper tube parts bag, the rear pod top plate and 4 4-40 x 1/4" flat head screws..

1. Thread a 4-40 x 1/2" set screw into each of the 4 ball cups from the damper parts bag.
2. Thread a ball cup/set screw assembly into the ends of each of the damper tube pistons and damper tubes.

3. Apply 5000wt silicon diff oil to the pistons and insert them into the damper tubes.
4. Attach the alloy pivot balls to the bottom of the pod top plate and the tops of the side wings as shown above. Secure them with alloy lock nuts
5. Attach the carbon pod top plate to the alloy rear pod plates
6. Snap the ball cups of the assembled damper tubes onto the pivot balls on the pod top plate and wings.

### Note:

If you feel play between your ball cups and ball studs, you can place a single layer of plastic bag material between your ball cup and ball stud then snap them together. This will cut and insert a disc of plastic into your ball cup reducing or eliminating the play. If you still feel play, repeat the process. We find you usually need one to two layers to get the proper feel, no play but totally free movement.

## Step 20



1. Install the molded shock mount-antenna mount with 2 4-40 x 3/8" flat head screws
2. Assemble the IRS Nickel-Teflon Pro Shock as per the included instructions with 35wt silicon shock oil.
3. Place the one long black alloy ball stud in the antenna mount and a standard ball stud in the rear pod top plate as shown. Secure the top pod plate ball stud with an alloy lock nut.
4. Install the included gold shock spring onto the shock and snap the shock in place.

Trim the ball cup on the shock that attaches to the antenna mount to .472" (12mm) in length. Thread this short ball cup on so the over all shock length is 2.6" (66mm). This length will give you the standard setting of 1.5mm of rear pod droop. If you thread on the ball cup until it stops, you will have zero pod droop.

## Step 21



Locate the rear axle parts bag. There are a couple of steps that can make your diff last longer that should be done at this time.

Use the right alloy diff hub as a holder and sand both sides of each diff ring on 600 grit sand paper using electric motor cleaner spray as a lubricant. Sand until you see an even scoring pattern across the face of each diff ring. Clean them with motor spray and set them aside.

The diff balls may have a protective oil coating on them. Place them on a clean paper towel and carefully clean them with motor spray. When dry drop them into your cup of diff grease and stir them to coat them with diff grease.

Diff Assembly:

## Step 21 Continued

1. Put a small dab of diff grease on the axle flange so the diff will stick to it. Place a diff ring on the flange so its flat keys onto the flat on the diff flange.
2. Place a flanged 3/8 x 1/4" bearing in the center of the spur gear. Slide the spur gear and bearing unit on to the axle until it stops against the diff ring.
3. With a small flat screw driver remove the diff balls from the diff grease and snap them into the outer row of holes in the spur gear.
4. Place a flanged 3/8 x 1/4" bearing into the inside face of the right side diff hub. Put a small dab of diff grease on the hub flange so the diff will stick to it. Place a diff ring on the flange so its flat keys onto the flat on the hub flange. Slide this unit on to axle.
5. Slide a flanged 3/8 x 1/4" bearing over the axle into the outside face of the right side diff hub. Slide the stepped thrust cone onto the axles so the smaller diameter part is against the right hub bearing.
6. Thread the black nylon lock nut onto the threaded stud on the axles until it makes contact with the thrust cone.
7. Tighten the black lock nut gradually with an 11/32" nut driver until you notice you cannot slip the spur gear when holding the axle and right hub in a fixed position.

Six 4-40 x 1/4" cap head screws are supplied to mount your rear wheels.

### Notes:

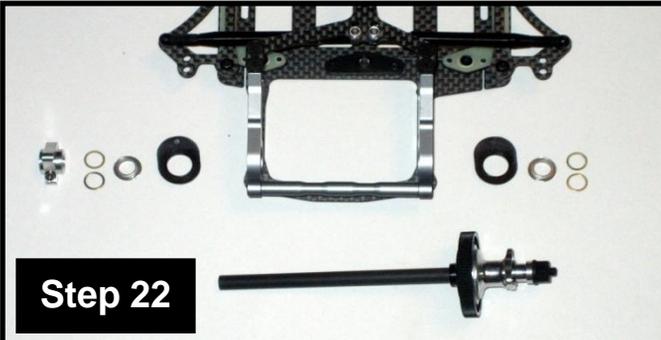
Keep your fingers clean with motor spray. Diff assembly is like surgery. You do not want dirt or oil where it does not belong.

The grease on the diff balls when you pluck them out of the cup of diff grease is all you need.

Smearing diff grease on the rings will make your diff get dirty faster and make a mess.

The ultimate goal in building a diff is one which is extremely free and glass smooth but requires a lot of force to slip the spur gear.

## Step 22



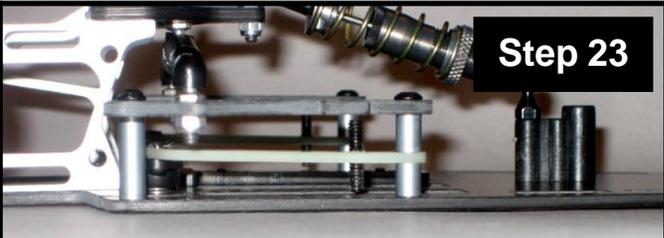
Insert the IRS precision ride height adjuster cams into the rear alloy pod plates. Insert a  $3/8$ " x  $1/4$ " flanged bearing into each ride height adjuster and insert the axle as shown. Note that the left clamping hub has the shallow center boss out towards the wheel. This is necessary to have symmetrical wheel spacing.

Install your favorite wheels and measure the width of the car. Shim as necessary to obtain a centered axle and a 172mm rear track width.

### *Special Note:*

The DB12R is designed to work with IRS precision ride height adjuster cams. We find too much size variation in other cams and cannot guarantee they will fit properly.

## Step 23



Install a 4-40 x  $1/2$ " set screw into each flex plate.

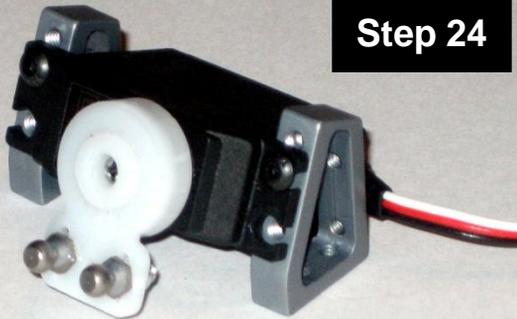
### *Special note:*

While these long set screws were initially designed to be tweak screws in testing we found the nature of the rear suspension system never lets the car get tweaked.

Now, the set screws in the flex plates function as roll stiffeners. If you want less roll in the rear of your car, you can run them down so they just touch the top of the lower chassis.

Under most conditions we run them so they are not touching, or we do not install them at all.

## Step 24



Angled Mounting



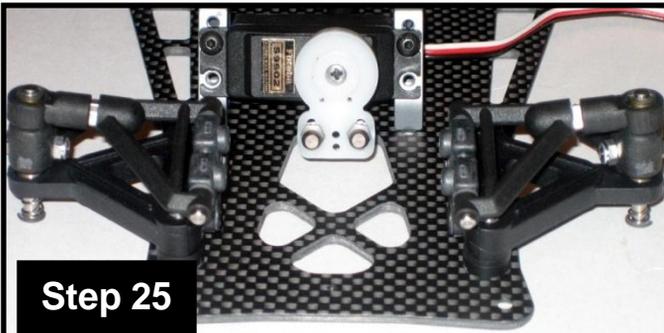
Flat Mounting

You have two servo mounting options with the DB12R, Angled or Flat. The new BMI Servo Mounts have holes to allow either mounting option.

The Reactive Caster front suspension used on the DB12R is designed to function best with angled servo mounting. The hardware supplied with this kit is what you need for angled mounting.

If you wish to mount your servo flat, you will need two long off set ball studs to replace the standard offset ball studs on your steering spindles. These ball studs will correct the steering geometry and eliminate the bump steer present if you did not use them.

The servo is mounted to the servo mounts with two 4-40 x  $1/4$ " button head screws.

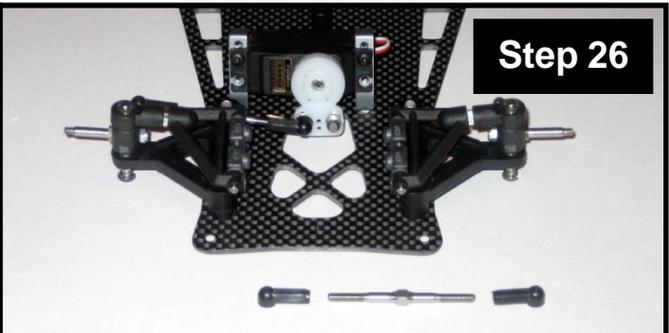


### Step 25

The Servo mounts are attached to the lower chassis with two 4-40 x 1/4" flat head screws.

At this time drill out the center holes on your servo saver (not supplied) for two Nickel Teflon ball studs. Secure them with two 3/16 alloy lock nuts.

You have two sets of servo mounting holes in the chassis. They let you achieve proper linkage geometry whether you run your ball studs in front of the servo saver as shown or behind them. This is a valuable tuning option as the servo's weight has a big effect on chassis weight distribution.

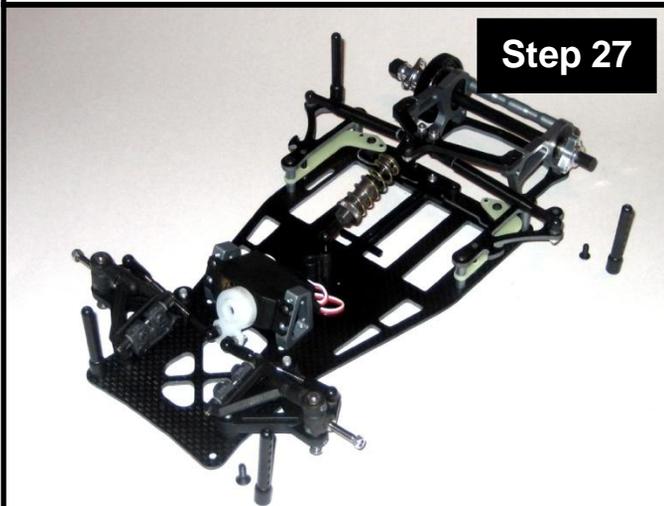


### Step 26

Locate two titanium turnbuckles and four black ball cups. Assemble them as shown and adjust them to an over all length of 2.375" (60.5mm). This is a starting point. You will need to reset their length after setting your camber in order to achieve the desired amount of front toe.

*Note:*

You can use the same plastic bag trick mentioned in Step 19 to remove play in your steering linkage. Remember you want to remove play but still have totally free movement in the links. Any friction at all is unacceptable and will make you car not center properly after steering inputs



### Step 27

Install your body posts with two 4-40 x 3/8" flat head screws in the front and two 4-40 x 1/4" button head screws in the rear..



### Step 28

Install the IRS battery locater with 2 2-56 flat head screws.

You can secure your batteries with the supplied battery o-ring or strapping tape. Both methods work well.

## **Congratulations, your done!**

Go to the starting setup sheet, adjust your car to the base setup and hit the track!