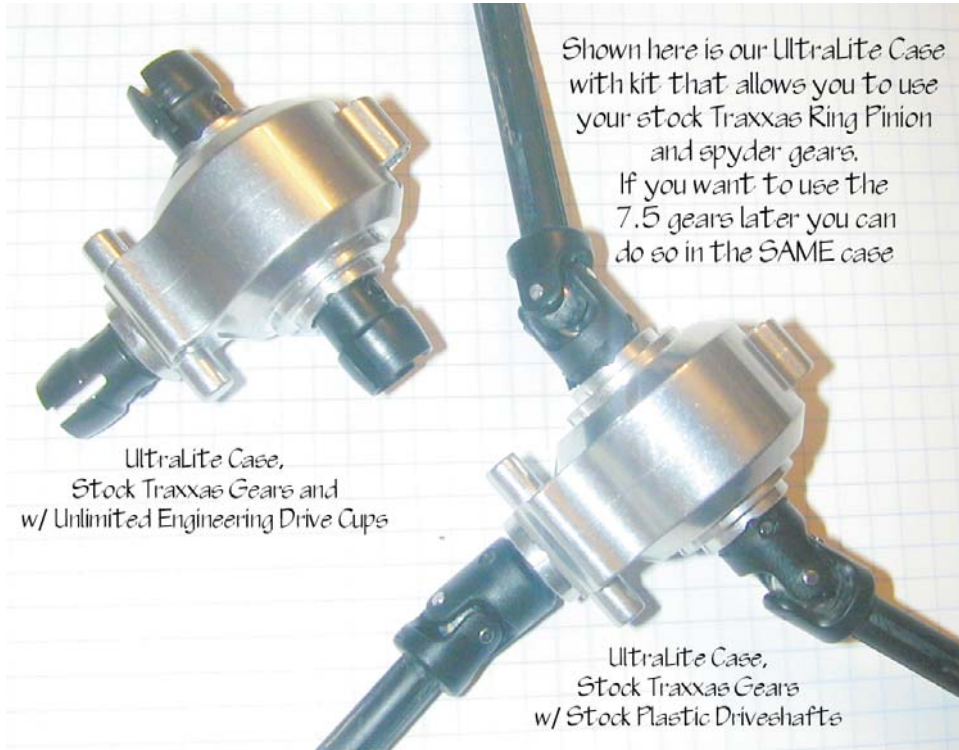




## SuperMaxx UltraLite Differential Housing for Stock TRX Gears



Serial # \_\_\_\_\_ (from the outside of the package)

Warranty: Lifetime for manufacturing defects.

Severe abuse policy: 30% off replacement. So if the replacement part is \$10 you pay \$7

Parts MUST be returned to Unlimited, Inc to be eligible for warranty or severe abuse replacement.

Warranty or severe abuse should be sent directly to Unlimited. Sending through point of purchase will only delay the process.

We make every effort for perfection, but there are always some machining marks in any CNC product. If something is unacceptable to you we will happily replace the part(s). You must return the part(s) new and unused to Unlimited, Inc before replacement is shipped.

If something does not go together please don't force it – find out why. If a screw seems too short or doesn't go in easily, get a longer screw or clean out the threads, don't strip the holes or bust off the screw. If you have a hammer in your RC toolbox, put it back in the garage where it belongs. Please use common sense when assembling these kits. Mangled parts will not be covered under warranty just because I didn't tell you not to do something in the instructions –I do try to be as thorough as possible, but I can't possibly think of every single variable that could happen.

I should note, these instructions are **differential** assembly instructions.

They do not cover basic aspects of E-Maxx, T-Maxx, Transmission, Chassis, Bulkhead, Motor, Electronics, Suspension or Driveshaft instruction.

If you are SCRATCH building a truck you will need to get instruction for the *non-differential* portion from either Traxxas or the manufacturer of that item.

I would appreciate it if you give me the opportunity to correct any problems before broadcasting them to the world. I am a small company and negative publicity can do a lot of harm. I will do all that is possible to make you happy. E-mail me at [MonsterMaxx@att.net](mailto:MonsterMaxx@att.net)

Thank you for choosing Unlimited, Inc and congratulations on purchasing the most robust, finely engineered and highest performing upgrades available for your Maxx.

Robin Oury, Unlimited, Inc, 500 Dunwoody Drive, Simpsonville, SC 29681

Qty	Description
1	SuperMaxx 7.5 UltraLite Differential Housing
3	Spacer, Thick
2	M6x16x5 2RS Bearings
2	M10x16x5 2RS Bearings
5	Shim .004" x 6mm x 11mm (ring and pinion setup)
5	Shim .010" x 6mm x 11mm (ring and pinion setup)
5	Shim .003" x 14mm x 16mm (ring and pinion setup)
5	Shim .010" x 14mm x 16mm (used inside carrier on output shafts)
4	M3x10 Socket Head Flat Head Screws

## 1. Remove Bulkhead Assemblies from your truck

1.1. Remove the shock tower, bumpers, bumper braces (if necessary) and anything else necessary to remove the stock differential. *Shown photo has the bulkheads stripped of the suspension, though this is not required.*

## 2. Fit differential housings to bulkheads

2.1. While this may not be necessary, since the stock support collar floats, the dimensions to the support pin hole in the bulkheads have not been tightly controlled in the past and it may be necessary to fit the new differential housing to the bulkhead. We had to pick a standard to make them to so we choose the Traxxas Aluminum Bulkheads as our standard. This means that in most cases this operation will not be necessary, but it may be. Simply elongate the hole a little bit for the support pin. Do this in the direction parallel to the top of the chassis deck. Easiest to use the end mill type bit in your Dremel for this operation. Work slowly; it's easy to take material off, and impossible to put it back. Do both bulkheads until the housing fits nicely and the bulkheads close as they should.

3. **Building the Diff** – First lay everything out in a staging area to work from. Prepare another surface next to this where you will work. I lay paper towels down for this purpose. Familiarize yourself with the parts.

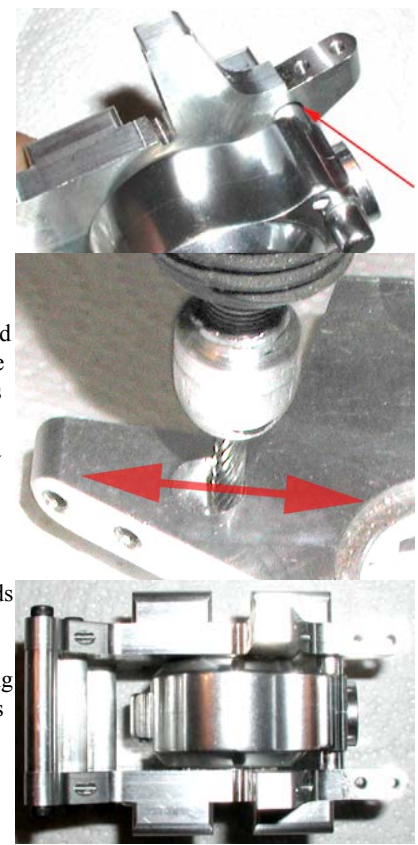
3.1. **Prepare the Cases** – do not mix these up (if you got two of them), they are matched pairs. It might be wise to mark them to prevent this from ever happening.

*NOTE: Setting up a differential means that you may assemble it and disassemble it many times over its life. This can lead to stripped out holes. To ensure this never happens we install Helicoils in the housing threads. These look like small hardened steel wires shaped like a thread. Do not try to pull these out, they are meant to be there. They should give you long life. Ensure you **never** strip out a housing. You do need to make sure you use metric M3x.5 screws that are in good condition. Failure to do so may damage a Helicoil. While they can be replaced, it means either you have to send it in or buy a Helicoil kit.*

3.1.1. Remove the M3x8 SHCS (Socket Head Cap Screws) from the case and set aside.

3.1.2. The cases fit snugly into each other, twist them to remove any burrs left from the manufacturing process.

3.1.3. Now separate them, and wipe off any polishing residue or burrs left over and set aside. You may find that they have such a perfect fit that you have nothing to grab to separate them. You can use your razor knife in the pinion area to start a gap. The polishing materials may leave some blackish staining between the case halves. There is



no way to prevent this, nor will it harm anything.

### 3.2. Prepare the carrier and ring gear

3.2.1. Carefully inspect the mating surfaces of the carrier and the ring gear for burrs or debris. Clean/de-burr as necessary.

3.2.2. If using the optional Kippster diff cups, build those first.

### 3.3. (Optional) Assemble Kippster diff cups (Portions re-printed with permission from Gary Kip)

3.3.1. The first step to building the Kippsters is to disassemble the stock diff. As you disassemble the diff, clean and inspect the ring and pinion gears as well as the internal spider gears for wear. Replace as needed.

3.3.2. If you are modifying your ring gear for 3mm screws, you will need a  $\text{\O} \frac{1}{4}$ " 6 flute carbide counter-sink bit and a 3mm carbide drill bit. Drill the 2mm mounting holes in the ring gear to 3mm using the 3mm carbide drill bit. Follow this step by using the carbide countersink bit to countersink the holes for the larger 3mm flat head screws. **It is imperative that you make sure to drill and countersink straight through the diff cup. You do not want to drill/countersink at an angle.** Doing so may cause improper alignment of the ring gear and diff cup, resulting in improper alignment of ring and pinion. If you have a drill press, use it. Get the ring gear fitting the cup well before continuing on.

3.3.3. Scribe a line on the ring gear which aligns with the spider pin hole in the side of the carrier. You will want to reassemble the diff the same way every time. Failure to do so may throw off the ring and pinion setup in the next steps.

3.3.4. Before you install the output shafts you should make sure that the output shafts are smooth with no burrs on them. If they have any bumps or burrs, remove them with fine sandpaper or a small file. While you're at it, check the diff cups themselves for burrs. Every effort is made to prevent burrs, but there will be the occasional burr.

3.3.5. Install one of the .010" thick 6mm shim on each of the output gear shafts. You can now install one of the output gears into the diff cup. Place the spider gears in the diff cup so they line up with the spider gear pin holes. Insert the spider gear pin and carefully screw it in while checking alignment.

*Note: if you tighten it more during final assembly than now, this will spread the cup slightly and throw off your shimming. Tighten fully now – just be careful that you do not strip it out with repeated installs.*

3.3.6. Install the 2<sup>nd</sup> output shaft through the ring gear, install the 4 screws that hold the ring gear in place, and check for fit and mesh of the spider gears.

3.3.7. Gently rotate the output shafts. The output shafts should rotate easily, with only slight resistance. If the output shafts are difficult to rotate, you will need to remove a shim & replace it with a thinner one. If sloppy, add shims. It may take several tries before you get the right gear mesh. Be patient.

3.3.8. Once you have correct spider gear mesh, add a drop of red loctite to the spider gear pin to hold it in the diff cup. Use the loctite sparingly. You only want loctite on the threads of the pin, not the pin itself. If loctite gets on the pin that the spider gears ride on, it may impair operation once it cures.

3.3.9. Assemble the ring gear to the Kippster cup with the 4 M3x8 SHFH (Socket Head Flat Head Screws). Tighten them evenly in an "X" pattern. This is very important and will insure the ring gear is flat on the diff cup and perpendicular to the axis of the output shafts.

3.3.10. Check to make sure you do in fact have the ring gear on straight, it is possible to get it on cocked, and still have the screws tight – it will be severe and noticeable to the naked eye.

*Pro Tip: I've found that on rare occasions the Kippster pin can come loose, back out and tear up the differential.. I prevent this with a dot of CA around the head of the pin & a layer or two of shrink wrap over the whole cup. Sub C Battery Cell shrink wrap is the perfect size – avail at most local hobby shops.*

3.4. **Set up Ring and Pinion.** Proper setup of the ring and pinion is critical to long life and smooth operation. Ideally you will end up with perfectly smooth operation and very little backlash. This can be time consuming, but the efforts are well worth it. The good news is that you only have to do this once over the entire life of the ring gear. A good setup will ensure a very long life. Setup requires shimming for backlash and pinion depth. This must be done for all gears, whether they are 1:1 or RC or any other type of gear mesh. While we hold very tight control over the case dimensions, variations in gear manufacture, different gear manufacturers (you are not limited to the included differential style) assembly and other factors require setup. We have allowed for this in the case design. It is not possible to have a 'one size fits all' and get a high precision fit. Low precision loose fits are possible in the 'one size fits all' category, but gear life and strength are sacrificed. Take your time with this, the rewards are well worth it.

3.4.1. **Determine the amount of shims required for the Carrier.** The Distance between the bearing seats is greater than the width of the carrier and bearings, so shimming is necessary to take up this slack. You want to end up with neither excessive backlash, nor pressure (pre-load) on the bearings.

3.4.1.1. Insert one thick spacer into each bearing pocket (see picture) in the diff case halves.

3.4.1.2. Install two (2x) .010" x 14mm x 16mm shims on each side of the carrier and a bearing on after. Be very careful to get the bearing straight in the bearing pocket. There is a very small amount of clearance and the bearing cannot go in cocked, forcing it will only damage things. We inspect 100% of these with gauge pins to ensure the bearings will fit.

*Note: We have found that when using RRP's Ring & Pinion it's a little wider than stock – use only one (1x) .010" shim per side.*



3.4.1.3. Set the ring gear down inside one of the case halves. The inside of the cases have been marked with an "N" for 'Nitro' and an "E" for 'Electric.' You will put the ring gear on the side that is correct for your application.

*The reason for this is that by putting the ring gear on one side or the other it will reverse the direction of rotation for the input shaft for the same output direction (forward motion of the truck.) The pinion for Nitro trucks rotate one direction and Electrics rotate the other; therefore it is necessary to install the ring gear on the correct side for your application. If you don't, the truck will go backwards when it should be going forward, or worse, not move at all.*

3.4.1.4. Fit the diff carrier & ring gear assembly into the housing.

3.4.1.5. Gently squeeze the housing together. Don't force it. You will probably see a small gap, as normally .040" of shim (four of the .010") is too much, though it's a good starting point. If there is a gap, go to step 6, if the diff case halves are fully closed go to step 7.



3.4.1.6. If there is a gap (and there probably is) take a guess at how much to take out. Normally this will be  $\sim .010$ ". So replace the two  $.010$ " shims with two of the  $.0025$  shim per side. Repeat step 3.

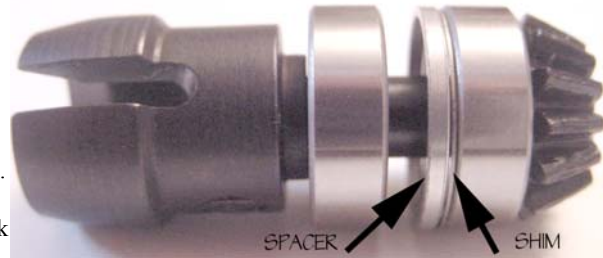
3.4.1.7. If the case closes, turn the housing up so you can see down the pinion hole. Hold the bearings between your fingers and try to push them back and forth, while watching the ring gear down in the pinion hole. If it moves add a shim.

3.4.1.8. Once close, install the case screws and check again. Repeat until you can tighten the case screws and have the proper fit.

*This will be the total amount of shim you need to take up the clearance. This total will not change, though how much is on each side of the carrier may.*

3.4.2. **Ring gear to pinion setup.** You will now setup the ring and pinion. You will do this by moving shims from side to side on the carrier, and by adjusting the amount of shims on the pinion which will adjust the pinion depth.

3.4.2.1. Begin with by installing bearings and shims on the pinion shaft. You will use one  $.010$  shim on the shaft and one thick spacer. Install a bearing, then a  $.010$ " shim, then the thick shim, and the last bearing. Shims should be between the inner pinion bearing & the thick spacer. (see diagram) You do



not want the shim to be against the bearing seat in the case – when closing the case halves, it's possible to catch the thin shim(s) and damage them. When it's between the spacer & bearing there's little risk of damaging the thin shim(s).

3.4.2.2. Set the pinion with it's bearings, spacer & shims down in one half of the case, then attach the pinion drive cup, then attempt to close the case.

*Note: You may find that you will need to remove a slight amount of material from the back side of the drive cup (see picture) before the case will close easily and not have excessive pre-load on the pinion bearings. The reason for this is to prevent excessive preloading of the pinion bearing. As always, remember the rule...it's easier to remove too little material than to remove too much, though if you do take too much off, you can always use one of the  $\text{Ø}6\text{mm}$  shims between the bearing & pinion drive cup.*

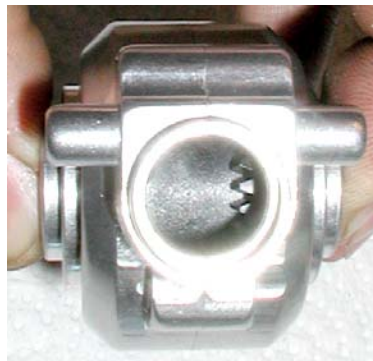


3.4.2.3. Once you have the input drive cup mounted with no pre-load on the bearing, remove the pinion set screw, apply red Loc-tite to it and reinstall into the drive cup. **TIGHTEN**

3.4.2.4. Set the pinion assembly down in the case, put the other case half on and close it up.

Gently squeeze the cases again like you did when setting up the carrier. Close this up evenly, remember these are high precision cases, getting them cocked like in this picture can damage the seating areas. Also if it seems to be catching on the pinion, you may need to back up to the previous step and remove a little material from the drive cup.

3.4.2.5. Spin the pinion. Feel for free, smooth motion.



3.4.2.6. When you re-assemble the diff, hold the carrier in the housing with the pinion perpendicular and look for the pinion teeth mating with the ring gear. Add to or remove the  $.010$ " shim until you have good pinion depth (contact with the ring gear.)



3.4.2.7. Check for free movement. It is normal for *one spot* in the rotation to be slightly tighter than the rest as no ring and pinion, no matter how precise, is perfect. You are shimming for NO tight spots w/o having excessive backlash.



3.4.2.8. Now comes the tricky part, you must decide to take either shims out on the pinion or transfer them from one side to the other on the carrier. Try to do this in balance, neither shifting the carrier too far nor the pinion too far. **In our test set-up w/ the Traxxas Ring & Pinion, we found that in the end we'd have 2 x  $.010$ " and 2 x  $.0025$ " shims on the ring gear side of the diff. On the carrier side we had 1 x  $.010$ " and 2 x  $.0025$ " shims. Our pinion had 1x  $.010$ " shims. (note: the thick spacer must be used in all 3 locations.) Your set-up will likely vary.** Pay attention to what your ears are telling you as you go through this process.



When you get it, even the "sound" of the diff will be nicer, motion will be smooth, and backlash will be minimal.

3.4.2.9. Add and tighten the case screws and check again. The final squeeze down of the screws may affect what you've done so far, in which case you'll need to re-shim the diff.



3.4.2.10. Take apart and grease. A layer of grease on the ring gear teeth is all that is necessary, putting more in does no good and only makes a mess when you need to service the differential.

3.4.2.11. A little blue Loctite on the case screws will ensure they don't back out.

3.4.3. Record the total of the shims for future reference.

Side	Front	Rear
Carrier		
$.0025$ "		
$.010$ "		
Ring Gear		
$.0025$ "		
$.010$ "		

*Some potential mistakes:*

*Not counting correctly when moving or exchanging shims.*

*Not having the bearings fully seated in their pockets*

*Not installing the pinion drive cup consistently.*

Take your time on this step. A good setup only needs be done once as long as you are consistent in the way you assemble the gears.

### **3.5. Attach input and output yokes or drive cups**

**3.5.0.1.** Depending on which type of driveline you use from the diff to the wheel, you may need to break out the Dremel. If you are using steel drive cups on the diff output, you should have no problems.

Just remember to do the same as with the input cup, use red Loc-tite on the pins securing the drive cups.

**3.5.0.2.** If you are using stock Traxxas sliders, you will need to chamfer the output yokes to clear the diff case. As a general guideline, your chamfer should extend down to the yoke's hole for the cross pin, but not extend into it. (see picture)



**4. Install differential in your truck** by reversing the disassembly process.

**5. Go out for a short test run**, bring it back in and check it over carefully before going out and running hard.

And that's about it folks. If I've missed anything e-mail your suggestions to [MonsterMaxx@att.net](mailto:MonsterMaxx@att.net) and I'll add it to the next version of the instructions.

Now check everything over and go have some fun.  
After your first run re-check everything carefully.

Troubleshooting:

Q: I keep blowing up bearings, what's wrong?

A: Improper shimming has your bearings pre-loaded. This results in their rapid demise.

Q: I've installed the ring gear on the 'N' side for my nitro truck, but now it goes backwards, what's wrong?

A: At some time in the past you flipped your diffs and were operating your transmission in reverse. Now it's operating correctly and you just need to reverse the direction of the servo.

Thank you for your support,  
Robin Oury  
President  
Unlimited, Inc  
500 Dunwoody Drive  
Simpsonville, SC 29681  
[www.UnlimitedEngineering.com](http://www.UnlimitedEngineering.com)  
[Sales@UEusa.net](mailto:Sales@UEusa.net)



Unlimited, Inc  
500 Dunwoody Drive  
Simpsonville, SC 29681