

## **Owner's Manual**

Routine Maintenance  
Trouble Shooting and Tips  
Intermediate Shaft Disassembly & Reassembly  
Intermediate Shaft Removal & Bearing Maintenance  
Eccentric / Timing Chain Adjustment  
Spindle Adjustment and Eccentric Maintenance  
Torque Specifications  
S&S Coupling Cleaning & Inspecting  
S&S Coupling Nut Remove & Replace  
Packing Global Tandems (Coupled)

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## **Routine Maintenance (Please read this)**

***A properly maintained bicycle will improve the feel, reliability, safety, and longevity of your investment.***

When the bike is new and for the first couple hundred miles, frequently check and tighten the crank bolts. Cranks have a seating period and many times it takes a while for the tapers on the cranks to properly mate to the spindle. If you ride any bike with loose cranks you can permanently damage the cranks.

Check all other bolts for loosening. i.e. stem, handlebars, seatposts, brakes, brake pads, pedals, and eccentric set screws (under the bottom brackets).

Do not over tighten the derailleur attaching bolts, especially the front derailleur clamp, it only has to be tight enough to prevent movement.

Inspect the brake and derailleur cables for wear and broken strands. If you have a bike equipped with a *Travel Agent* (pulley at the brakes) pay special attention to the cable at the sharp bend and around the smaller diameter pulley. If you see any signs of fatigue, replace the cable. Failure to do so may result in a loss of brakes when you least want it.

Keep your chain clean and lubricated. It is a good idea to carry a small squeeze bottle of your favorite chain lube so you can apply it at the first sign of a squeaky or dry chain. It is better to over lube your chain and wipe off the excess, than skimp and run your chain dry.

Check the timing chains for excess slop. All chains stretch, especially when they are new. (See: Eccentric / Timing Chain Adjustment)

Whenever you remove a part or bolt apply grease to the threads to assure proper tightening and so you can remove it again in the future.

Occasionally remove the seatposts, wipe them off, wipe out the inside of the frame seat tube, and spread grease on the seatpost and inside the seat tube before reinstalling it.

We do not recommend using high pressure water (car washes) to clean your bike unless you are planning to strip it down and re-grease everything on the bike. Do not spray water directly at any bearing.

After cleaning your bike it is important to apply lubricant to all exposed moving parts.

## Trouble Shooting, Tips, & Random Thoughts

*These are a few things we have seen happen, so we'll give you the heads up.*

If you hear a creaking noise when you pedal hard and your cranks are tight, tighten the eccentric set screws.

Creaks that may appear to come from the cranks may come from the seat, seatpost, stem or handlebars. Check that they are all tight.

If the chain wants to wrap around the driving gears "chairings" when you shift the front derailleur, your chain is dry, too dirty or both.

If you get flats and rough roads, increase your tire pressure.

Carefully check the inside of your tires when changing flats. What caused the flat may still be there.

If your saddle bothers you, change the tilt angle. Many times pressure on the front of the saddle is made worse by tilting it forward.

Wider saddles are not always more comfortable. What feels good when you first sit on it may cause excessive rubbing or pressure in several miles.

There are two schools of thought on whether or not to grease the spindle tapers when installing cranks, we do not recommend using grease because it is too easy to over tighten the cranks and stretch the crank tapers causing the cranks to seat too far on the taper.

We do not ship our tandems with reflectors because 90% of the reflectors on high end bicycles end up in landfills. If you plan to ride at night it would be a good idea to put some on. If you request reflectors you will get them. I bet every bike shop in your town has a box of reflectors unless they pitch them.

## Disassemble the Intermediate Shaft & Removing the Timing Chains Without Loosening the Eccentrics

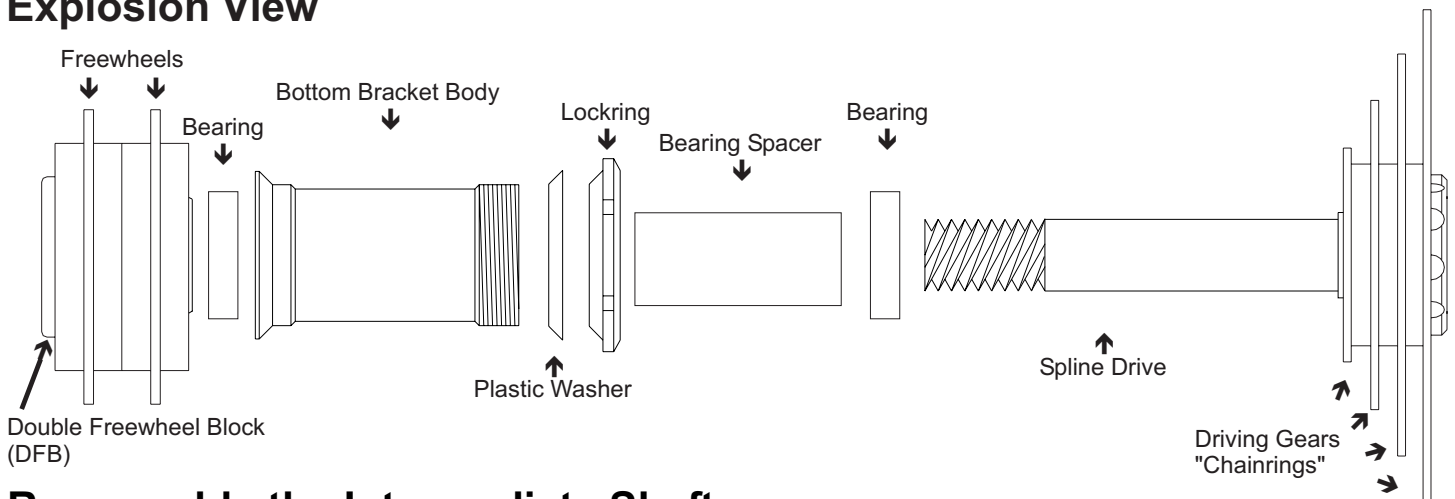
If you do not have da Vinci Tool TL.001, Insert two 5mm allen wrenches all the way into any two opposite holes of the DFB (Double Freewheel Block), use a pry bar or wrench as shown in the photo.

You will also need a chain whip to break the assembly loose. Wrap the chain whip around the second or third chainring on the Spline Drive and rotate the chainrings foreword (clockwise looking from the right side of the bike). Do this while holding the pry bar. This will take a great deal of force to loosen.

As you are unthreading the Spline Drive, the DFB will move to the left (away from the bike). At this point you should no longer need the allen wrenches or pry bar. Continue unthreading by hand. If you are doing this with the timing chains still on the bike you will need to push the assembly to the right to prevent putting a side load on the timing chains. Do this by smacking the outside (left side) of the DFB with your hand, rubber mallet or any soft object. Continue unthreading and smacking until the DFB is loose from the Spline Drive.

Pull the Spline Drive out of the Bottom Bracket Body. Now the timing chains will come off by hand.

### Explosion View



### Reassemble the Intermediate Shaft

Grease the threads and shaft of the Spline Drive, and slide one of the bearings onto the Spline Drive followed by the Bearing Spacer.

Slide the assembly into the Bottom Bracket Body from the right side of the bike.

Press the second bearing onto the Spline Drive and thread the DFB onto the Spline Drive by hand.

Center the bearings in the Bottom Bracket Body and tighten the assembly to seat the bearings, using the tools and techniques covered in "Disassemble of the Intermediate Shaft". Remember the DFB has a left hand thread so you will turn it counterclockwise to tighten. There is no need to tighten the assembly more than what is necessary to seat the bearings.

If you did not loosen the Eccentrics or remove the timing chains you will need to pull the DFB back off, and pull the Spline Drive out until it is only sticking out of the Bottom Bracket Body by about 1/2".

Hang the timing chains from the timing chainrings and maneuver the chains onto the DFB and Freewheels. The front chain goes on the inside (right) freewheel and the rear chain goes on the outside (left) freewheel. This may take a little patience, but once the chains are in place the DFB should hang freely without falling out of the "cradle-of-chains"

Center the DFB on the Spline Drive and tighten the assembly by hand, just as you did to seat the bearings. When you pedal the bicycle the DFB will finish tightening itself.

## Remove and Replace the Bottom Bracket Body

With the Intermediate Shaft out, use a lockring spanner wrench to remove the Lockring. If the Bottom Bracket Body rotates use a pin spanner on the opposite side of the Bottom Bracket Body to keep it from slipping.

Pull the Bottom Bracket Body out of the frame shell and wipe it clean.

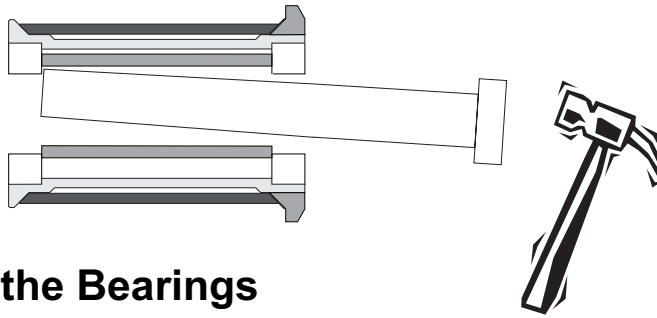
When you replace the Bottom Bracket Body grease the external threads and the inside of the frame shell.

The Bottom Bracket Body slides into the frame shell from the left side of the bike. Do not forget to install the Plastic Washer under the Lockring.

## Removing the Bearings

Pry the bearing spacer off center with a flat punch.

Lightly tap the inner race of the bearing from the inside. You want the bearing to come out as straight as possible, so alternate tapping on the top and bottom of the inner race. It is important to only tap on the inner race or you will damage the bearing seal and possibly destroy the bearing.



## Cleaning and Greasing the Bearings

Insert the tip (less than 1mm) of an X-Acto knife or small jewelers screwdriver between the inner race and rubber seal and very lightly pry the seal off. Be careful not to break the tip of the tool off inside the bearing or bend the seal. Remove both seals on both bearings.

Wipe the seals clean with a lint free cloth. Again, be careful not to bend the seals, they are delicate.

Soak the bearings in solvent, de-greaser, carburetor cleaner, or brake cleaner.

When all the grease is softened or dissolved blow the bearing dry with compressed air. (wear protective eye things) If you do not have compressed air, an aerosol carb or brake cleaner will do nicely, you'll just have to wait a little longer for the bearings to dry completely.

Pack both sides of the bearings with your favorite grease, press the seals back on and wipe off the excess grease.

## Eccentric / Timing Chain Adjustment

As the cross over chains stretch you will need to adjust the eccentrics to tension the chain.

Loosen the set screws under the bottom bracket shell. There are two of them and 1 full turn should be plenty. If you are already confused this would be a good time to visit your bike shop and watch them do it.

The eccentric should be rotated so the spindle is above the bottom bracket shell centerline (see drawing below). You can use either a pin spanner wrench or a 36mm headset wrench to rotate the eccentric.

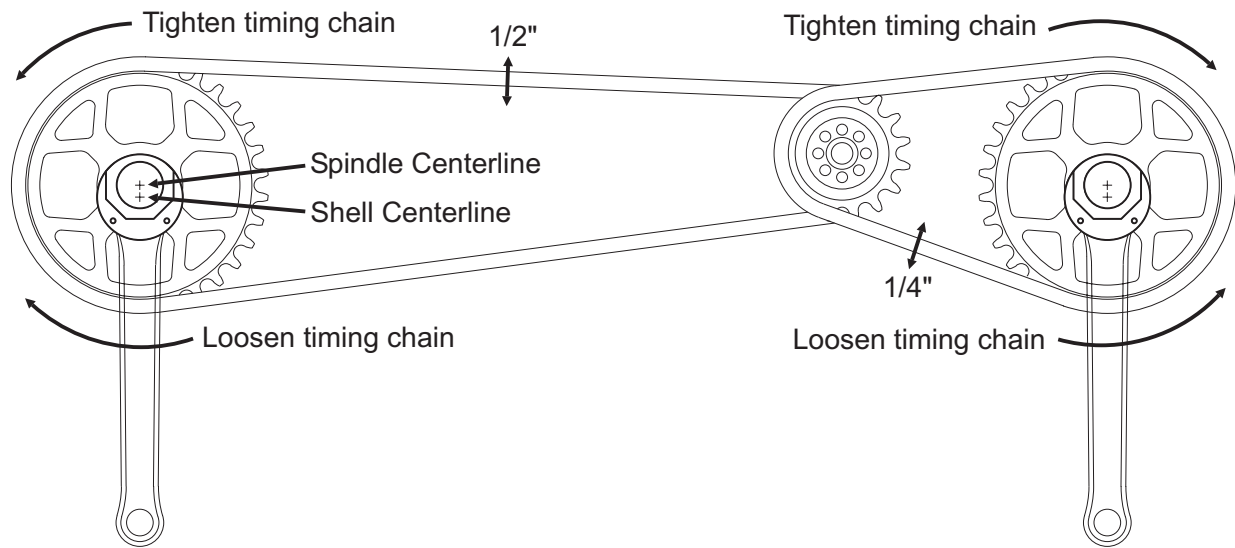
Rotate the eccentric according to the drawing to tighten or loosen the timing chain. The timing chain should be loose enough to prevent binding and tight enough to keep from falling off.

The chain should move about 1/2" for the front and 1/4" for the rear without using force.

When you think the eccentric is adjusted, snug up the set screws (do not tighten yet) and rotate the cranks to see if there is a tight spot.

**CAUTION:** Take care to not catch your fingers between the chain and chainring. IT CAN CUT YOUR FINGER OFF.

If the chain is tight in one spot readjust the eccentric and check again. Once it is adjusted tighten the set screws and check one more time. Adjust again if necessary.



# Spindle Adjustment & Eccentric Maintenance

## Removing the Eccentrics

When servicing the eccentrics it is best to remove them from the bike first. To do this all you have to do is loosen the set screws under the bottom bracket shells. If the eccentrics do not come out by hand after backing the sets screws out by three to four turns then you may have to rotate the eccentric to break it loose. Use a 36mm wrench or pin spanner wrench and work the eccentric back and forth until you can work it out of the shell.

## Removing the Spindles

There are two models of our eccentrics / spindles. The collared model has a shoulderless spindle. The bearings and spindle are held in position by two locating collars. See illustration. The snapping model uses snaprings to hold the bearings in place and a shoulder on the spindle to hold the spindle in place.

### Collared Model

You will need to loosen the three set screws on one of the locating collars. The set screw take a small 2.5mm allen wrench, so take care to stick the allen wrench all the way into the set screw before loosening or tightening. Only back the screws out  $\frac{1}{2}$  to 1 turn. There is only one place on each side of the eccentric to get to the set screws. (See illustration).

You will only need to loosen one of the locating collars in order to remove the bearings and spindle.

Next you will tap the spindle out from the same side you loosened the collar. If the spindle does not come out by hand, use a soft mallet or block of wood to tap it out.

If you remove only one collar and remember which direction the spindle came out you will not need to realign the spindle for proper chainline. The shorter soindle goes in the front.

### Snapping Model

To remove the spindle on the internal snapping model simply remove the snaprings and tap the spindle from one side. Use a soft mallet or block of wood so you do not damage the spindle. One of the bearings will come out with the spindle.

The shoulders are not centered on most of the spindle lengths, so mark the direction the spindle came out and reinstall it the same direction for proper chain alignment. The shorter spindle goes in the front.

## Removing the Bearings

(see "Removing the Bearings" earlier in this manual.)

## Cleaning and Greasing the Bearings

(See "Cleaning and Greasing the Bearings" earlier in this manual.)

## Spindle Adjustment & Eccentric Maintenance (continued)

### Replacing the Bearings

The bearings need to be pressed straight into the eccentrics. If the bearing is pressed into the eccentric crooked it can damage the eccentric. Use the spindle as a guide to make sure the bearings go in straight.

#### Collared Model

#### Snapping Model

The spindle can be slid in and out of the eccentric with the bearings installed.

### Adjusting the Spindle (Chainline Adjustment)

The snapping model has no chainline adjustment.

On the collared model loosen both collars to adjust the spindle side to side.

The front spindle should be centered on the eccentric.

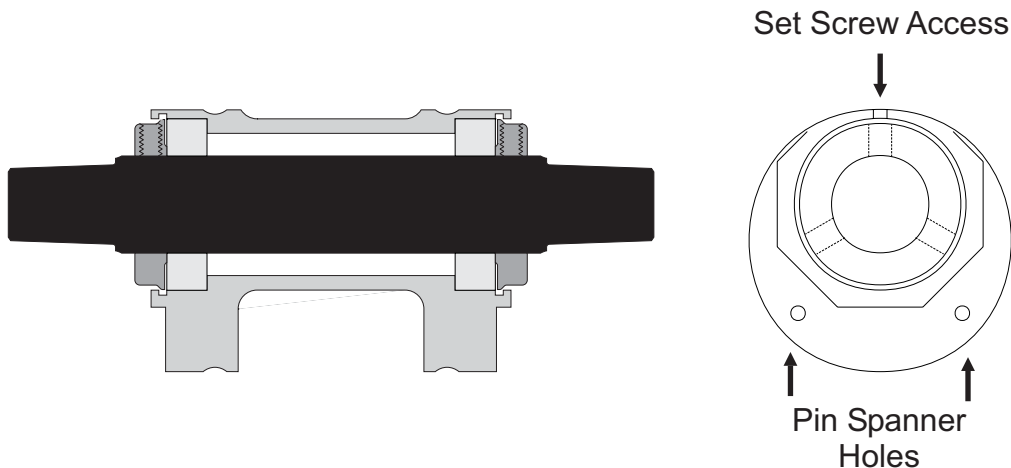
With both collars loose, center the spindle. Slide the collars all the way towards the bearings and tighten the set screws.

If the spindle has side to side play you will need to loosen one of the collars, push it closer to the bearing and re-tighten the set screws.

The rear spindle should be adjusted as follows. Install and tighten the left crank. Align the spindle so that the left crank clears the DFB by 2 to 3mm.

Slide the left collar towards the bearing and tighten the set screws.

Next slide the right collar towards the bearing and tighten it.



# Torque Specifications

	In. Lbs.	Ft. Lbs.	N-M
Stem Top Cap - - - - -	10 - 12	0.8 - 1	1.1 - 1.4
Stem / Bars - - - - -	60 - 70	5 - 5.8	6.8 - 7.9
Stem / Fork - - - - -	75 - 85	6.2 - 7	8.5 - 9.6
Seatpost Clamps - - - - -	65 - 75	5.5 - 6.2	7.4 - 8.5
USE Seatpost / Seat - - - - -	25 - 30	2 - 2.5	2.8 - 3.4
Brake Mounting - - - - -	45 - 55	3.7 - 4.6	5.1 - 6.2
Brake Cable Clamp - - - - -	25 - 30	2.1 - 2.5	2.8 - 3.4
Brake Pads - - - - -	40 - 50	3.3 - 4.1	4.5 - 5.6
Eccentric Set Screw - - - - -	60 - 70	5 - 5.8	6.8 - 7.9
Spindle Locating Collars - - - - -	10 - 12	.8 - 1	1.1 - 1.4
Crank Arm Bolts - - - - -	300 - 360	25 - 30	34 - 41
Spider to Crank - - - - -	45 - 50	3.8 - 4.2	5.1 - 5.7
Rear Derailleur Attach - - - - -	35 - 45	3 - 3.8	4 - 5.1
Rear Derailleur Cable Clamp - -	20 - 25	1.7 - 2.1	2.2 - 2.8
Sachs Front Derailleur Attach - -	12 - 15	1 - 1.2	1.4 - 1.7
Front Derailleur Cable Clamp - -	35 - 45	1.5 - 2	2.3 - 2.8
Intermediate Shaft Lockring - - -	20 - 25	1.7-2.1	2.2 - 3.0
Shimano Hyperglide Lockring - -	240 - 300	20 - 25	27 - 34

# S and S Machine's Bicycle Torque Couplings

## Cleaning and inspecting the couplings during regular use

**ATTENTION:** *If your couplings are stuck, before doing anything, go to the bottom of this page.*

The couplings must be kept clean from all abrasive materials during assembly and use so that wear of their contact surfaces will be minimized and so that they will open and close smoothly without damage to the threads, shoulders, teeth, etc.

Inspect the couplings and the silver brazing joint periodically. Look for hairline cracks between the coupling and the frame, the same as you would with any bicycle frame.

Clean the couplings periodically, especially if you detect debris inside or turning it feels rough. Use a firm plastic brush (tooth brush) on the teeth and threads.

1. Be careful not to push particles into the threads, retaining ring area, behind the retaining rings, or into the frame tubes.
2. Blow out the couplings with air while shaking the nut if necessary. **WEAR EYE PROTECTON!**
3. Do not aim directly into coupling bores as it may send debris into the frame tubes.
4. Make sure there is no foreign material left on the shoulders, rings, or just inside the coupling bore.
5. Total disassembly of the couplings for cleaning also works well for extremely dirty couplings.
6. Only use fluids for cleaning the couplings when absolutely necessary.
7. Fluids should never enter the coupling bores as trapped fluids may cause damage to the frame tubes, bearings, etc.

After a good cleaning we highly recommend placing a small amount of 100% Dupont Teflon Bearing Grease , or the included special oil inside the nut on the retaining ring shoulder and on the threads. These are the best lubricants we have found. Do NOT trust your favorite grease or oil!

## If the threads should ever feel rough when turning

A rough turning nut due to debris or lack of lubrication demands special attention. Of 40 lubricants tested, only two have been found to work well for aiding this problem: Liquid Wrench Super-Lube with Teflon and Permatex Super-Lube with Teflon, both in the aerosol form. Accept no substitutes. Grease or simple oil forms do not work.

1. Spray the fluid into the threads from both ends to be assured of adequate penetration.
2. Work the nut slowly back and forth with the spanner wrench. It should begin to loosen almost immediately. If as the nut is being loosened, it begins to turn with difficulty again, reverse the direction, apply more lubricant and try again.
3. After the coupling is opened, clean thoroughly according to the above instructions.

# S&S Coupling Nut Remove & Replace

## Removing the Two Retaining Rings and the Coupling Nut

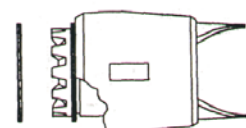
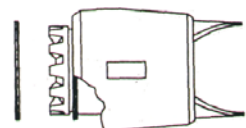
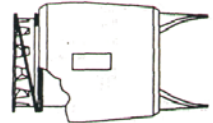
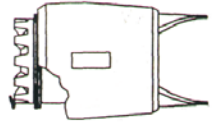
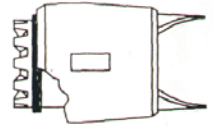
You must remove both retaining rings and the coupling nut to thoroughly clean and inspect a coupling.

**ALWAYS TAKE CARE TO PROTECT THE COUPLING TEETH!**

1. Slide the coupling nut back to expose the first retaining ring.
2. Hook the end of the ring with a small screw driver and gently begin to pry it out of the groove. Use caution not to deform the ring by over-bending it.
3. Work the ring out of the groove and off of the lug, working around the coupling lug. Again, do not over-bend the rings.
4. When the first ring is off pull on the nut to move the second ring toward the teeth, push the nut back and remove this ring the same way as the first..

Note: Be careful not to push the second retaining ring back in the groove as it may get trapped under the coupling nut.

5. It is always good to thoroughly clean the inside of the coupling when you have it disassembled



## Installing the Coupling Nut and the Two Retaining Rings

Only install coupling nuts and both retaining rings after the parts are thoroughly cleaned.

**ALWAYS TAKE CARE TO PROTECT THE COUPLING TEETH!**

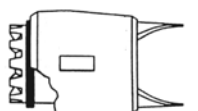
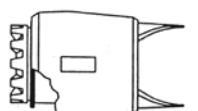
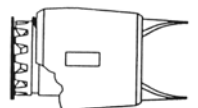
1. Slide the clean nut all the way onto the coupling lug with the threads out so the retaining ring groove is visible just beyond the edge of the coupling nut.
2. Install the first stainless steel retaining ring by carefully spreading one end of the ring from the others and hooking it in the groove.
3. Wrap the rest of the ring into the groove by gently expanding it, coiling it over the teeth and into the groove. Do not bend the ring so far that it is permanently deformed.

Check the seating of the ring by sliding the coupling nut over the ring. If it moves smoothly, the ring is properly seated, If it does not, the ring must be re-seated before use.

Re-seating can be done by sliding the ring back and forth using the nut and a screw driver.

4. If the ring is seated properly, push it to the back edge of the groove to make room for the second ring.
5. Install and check the seating of the second ring following the same procedures as above.

If you kink or severely bend a retaining, order a replacement.



## Packing Global Model da Vinci Designs Tandems

Shown is a size medium packed in a 26" X 26" X 12" S&S case.  
Other sized tandems and cases pack differently.

Start by shifting both the front and rear derailleurs into the smallest sprockets.

Un-thread the Easy-Split cable separators and pull all the cables out of the cable stops (pay attention to which cable goes where).

Pull out both seatposts.

Remove both wheels and pull the quick releases out.

Unbolt the rear derailleur from the frame and put it in an old sock. You can leave the drive chain attached, just be careful to protect the frame and avoid kinking the chain.

Remove the left crank arms. You can leave the right crank arms attached, but it will pack easier if you remove them as well. The timing chains will fall off when the left crank arms are removed.

Remove the front and rear handlebars at the stems.

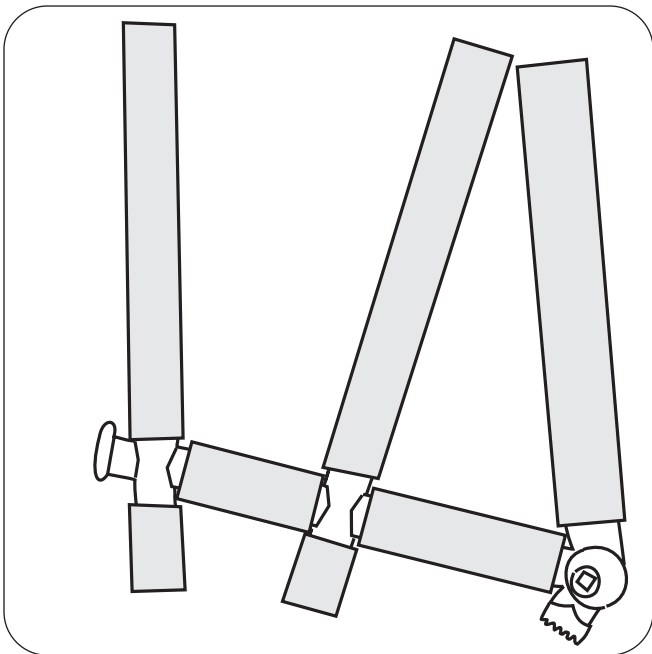
You may have to remove racks and/or water bottle cages.

If you have a disk brake unbolt the rotor and protect it. A bent rotor is a real drag.

You are now ready to loosen the S&S couplings. Looking from the front of the bike, turn the coupling nut CCW with the spanner wrench.

Once the frame is disassembled, cover the tubes with the velcro frame pads and pack as follows.

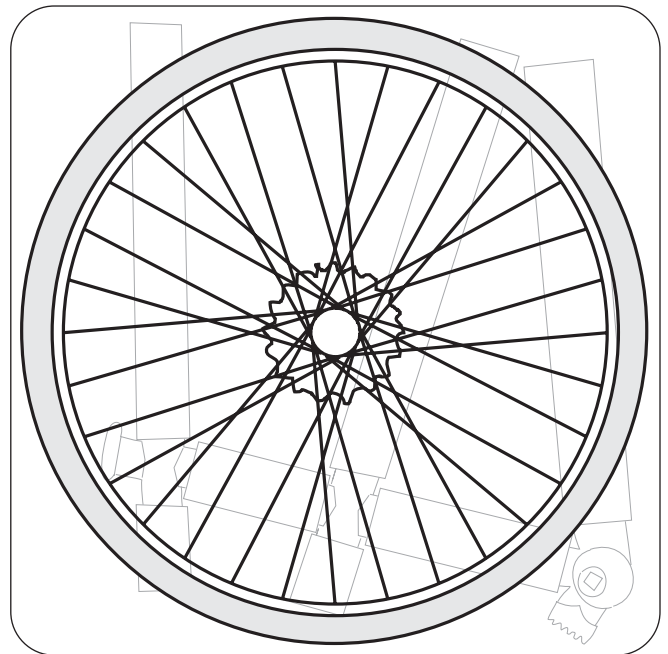
All drawings are shown with the case on the ground and the top opened away from you.



(1) Place the middle section in the case as shown.

Tip: You can take an old tennis ball, cut an "X" in it and push it over any uncovered couplings for extra protection

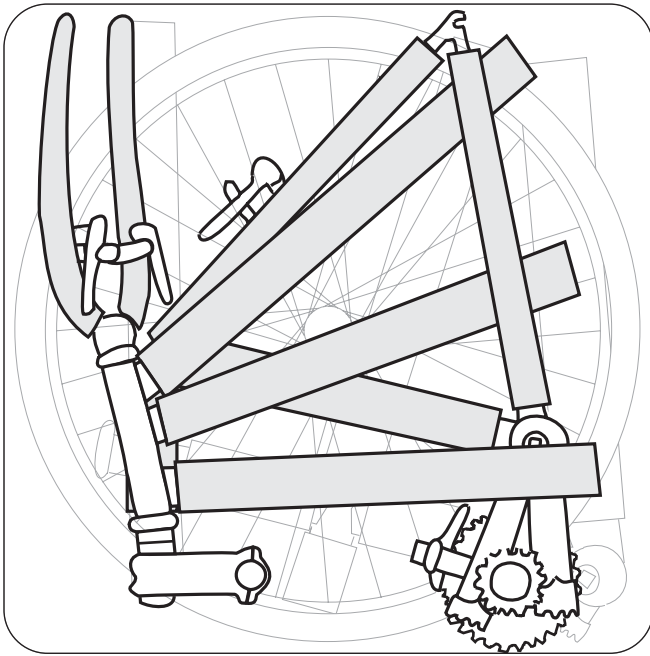
Tip: Toe straps make great re-useable synch straps, to keep frame sections and parts from moving around.



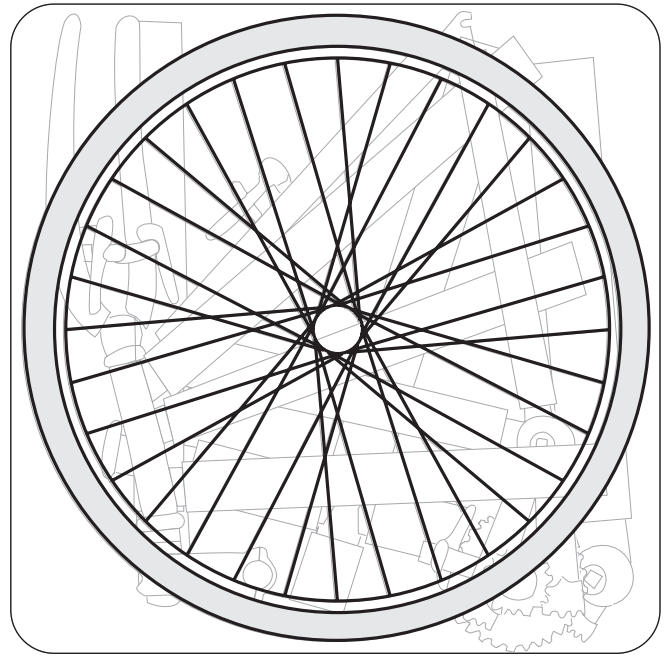
(2) Put the rear wheel in cassette side down. Be sure to add extra protection between the cassette

cogs and the frame. Dense foam, plastic or several layers of cardboard will work.

## Packing Global Model da Vinci Designs Tandems (continued)



(3) Intertwine the front and rear frame section as shown. Be sure to protect all metal-to-metal contact points.



(4) Place the front wheel in and as always, be sure to protect all metal to metal contact points.

All the rest of the parts will fit in the case. Figure out what works best for you and take lots of pictures.

Take care not to kink any cables or allow unprotected parts to rub each other.

Take extra precautions: wrap the cranks in rags, stuff foam between parts, strap loose parts and frame sections together. Etc.

### Re-assembly notes:

It is imperative that you understand where each part belongs and how the cables are routed. If you do not, take notes while you take the bike apart. Take pictures if you need to. Install the timing chains while you re-install the left side cranks. It should not be necessary to readjust your derailleurs, brakes or eccentrics. If you have a bike equipped with a Travel Agent cable accelerator, you may need to rotate the pulley to get proper braking. Look at the position of the pulley before you disconnect the brakes.