

# **2002 – 2003 *Ducati* ST4s**

## **Showa Fork Service Overhaul and Oil Replacement**

**'02-'03 Showa 43mm Forks are Ducati Part Number: 340.2.069.1C and 340.2.070.1C**

*(The technical specifications contained do not apply to 340.2.281.1A or 340.2.282.1A...AS FAR AS I KNOW!)*

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Credits: Ducati Workshop Manual (WSM), 2002 ed. is cited throughout as reference; additionally, member postings on Ducati.ms some are informative, some misinformation; and the Mid Atlantic Ducati post on servicing fork oil to Ducati ST4s Showa Forks which was the inspiration for this document.

I have learned the 2002-2003 ST4s Showa adjustable forks are different that subsequent ST4s and ST3s Showa Forks. Based on comparison measurements of a friend's 2005 ST4s forks, I believe that overall length is one major difference, besides the different Ducati Part Numbers for the forks as cited in the header. The 2002-2003 ST4s Showa Fork Slider (outer/upper tube) is 450mm long and the 2005 ST4s Showa Upper Slider or Outer Tube is 490mm long...I am not sure about the stanchion (inner tube) length.

Note: There are two special tools that are needed to proceed with Fork Service and Overhaul. One is a device to push down the spring spacer tube and the other is a retention plate hold down tool that prevents the spring spacer tube from returning to its original location due to spring load. These can be made or improvised, I got mine from Traxxion Dynamics.

Record the suspension settings of the front forks prior to disassembly.

	Preload (mm)	Rebound (clicks out (cc) from full in)	Compression (clicks out (cc) from full in)	Fork Oil Level (132mm spring out, 110mm spring in, 94mm spring and spacer in)
Left Fork				
Right Fork				

\*\* Settings may change with the disassembly and assembly process.

### ***Removal of the Forks***

#### ***Left Fork Removal***

1. Remove the headlight fairing, front fender, and the side fairings from the motorcycle.
2. Remove the front brake calipers and secure out of the way.
3. Remove front wheel.
4. Loosen the upper triple clamp pinch bolts, on both sides (1 each). Figure 1
5. Start with rider's LH side, remove the handlebars, and then loosen the left fork cap (32mm), just a turn to loosen.
6. Remove the wire snap ring at the left fork rebound adjuster and turn the rebound adjuster to its minimum damping position, (full out – counter-clockwise).
7. Reduce left fork preload adjustment turning counter -clockwise (22mm Nut)

## 2002-2003 Ducati ST4s Showa Fork Service

'02-'03 Showa 43mm Forks Ducati Part Number: 340.2.069.1C and 340.2.070.1C

8. Loosen the two pinch bolts on left side holding the fork legs to the bottom yoke (triple).
9. Slide the left fork leg out, downwards.

### Right Fork Removal

1. On rider's RH side, remove the handlebars, and then loosen the right fork cap (32mm), just a turn to loosen. See Figure 1
2. Remove the wire snap ring at the left fork rebound adjuster and turn the rebound adjuster to its minimum damping position, (full out – counter-clockwise).
3. Reduce right fork preload adjustment turning counter-clockwise (22mm Nut)
4. Loosen the two pinch bolts on right side holding the fork legs to the bottom yoke (triple).
5. Slide the right fork leg out, downwards. Figure 2

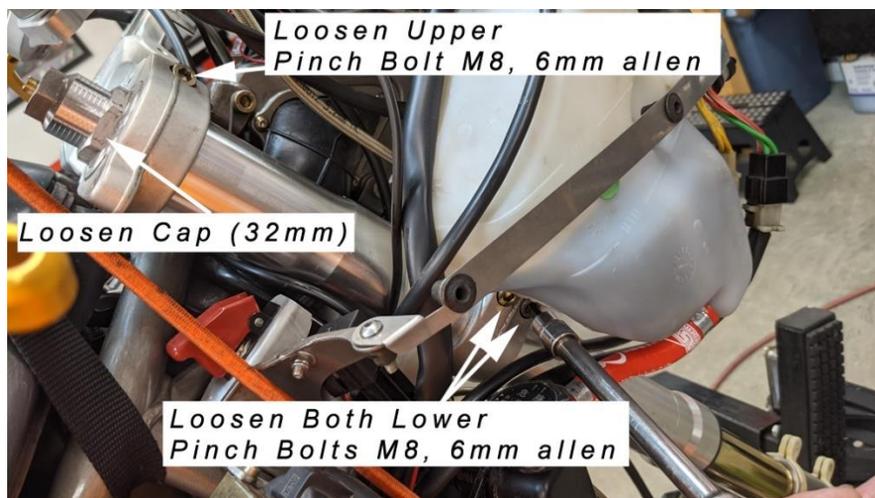


Figure 1 '02 Ducati ST4s Rt Fork - Loosen Cap and Triple Tree Pinch Bolts



Figure 2 Withdraw Right Fork

## 2002-2003 Ducati ST4s Showa Fork Service

'02-'03 Showa 43mm Forks Ducati Part Number: 340.2.069.1C and 340.2.070.1C

### Fork Disassembly and Overhaul

Parts listed are for renewal/overhaul of '02-'03 Showa 43mm Forks Ducati Part Number: 340.2.069.1C and 340.2.070.1C

Item # on Figure 3 (WSM)	Ducati PN	Description	Qty	Aftermarket PN and source
11	349.1.101.1A	Dust seal	2	
17	930.1.005.1A	Seal ring (43x54x11)	2	
14	349.1.103.1A	Bushing (outer)	2	Traxxion (FOB43202)
15	349.1.120.1A	Bushing (inner)	2	Traxxion <span style="background-color: red; color: black;">FIB432015</span> INCORRECT!!!

### Fork Disassembly and Overhaul

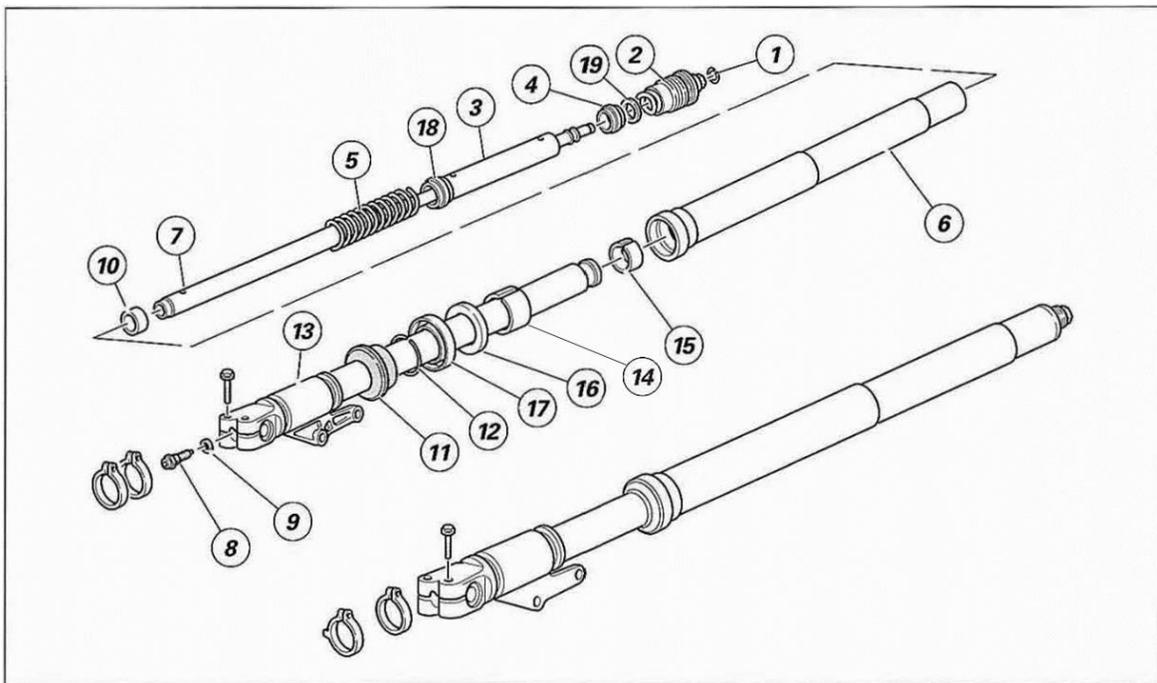


Figure 3 2002-2003 Ducati ST4s Workshop Manual Showa Fork Diagram

These steps that follow are for a complete disassembly of the fork necessary for complete inspection and renewal of bushings and seals. A photo of completed fork disassembly is below, Figure 12 with numbering of the parts IAW 2002 Ducati ST4s WSM (numbering changes in other years WSMs). Ensure that the area you are working in is clean and free from sand, hairs, metal chips, etc.

1. With fork cap still installed, support and secure the fork horizontally, careful not to mar the stanchions or sliders and using a 19mm socket and impact gun, loosen but do not remove the

## 2002-2003 Ducati ST4s Showa Fork Service

'02-'03 Showa 43mm Forks Ducati Part Number: 340.2.069.1C and 340.2.070.1C

compression adjuster in the bottom of the fork. This step is necessary to loosen the compression adjuster (it is like a very fancy bolt with a copper washer). Once loosened, simply snug it back up by hand so that fluid does not excessively leak out of it when you return it to vertical. A little weeping of fluid is fine, just catch it with a rag. Figure 4 Showa Fork Compression Adjuster Loosen / Removal



Figure 4 Showa Fork Compression Adjuster Loosen / Removal

2. Hold fork vertically and using 32mm wrench or socket, loosen the fork cap so that the last thread disengages completely, and the upper stanchion can slide down and expose the spring collar (internal metal tube) with the two holes. Figure 5



Figure 5 Showa Fork Cap Removal

3. Use the fork spring compression tool inserted into the two holes on the spacer to move the spring joint (spacer tube) down and expose the hex nut that fastens the upper plug to the damping rod. Once the hex nut is exposed, place the retention plate hold down tool between the hex nut and the top of the tube. (This may be a two person job and requires some physical exertion. I built a fork holder with a jack to hold the special tool and fork in place and allow it to be done solo.) Figure 6

**2002-2003 Ducati ST4s Showa Fork Service**  
**'02-'03 Showa 43mm Forks Ducati Part Number: 340.2.069.1C and 340.2.070.1C**

Note: oil can spill out from the top of the opened fork tube.

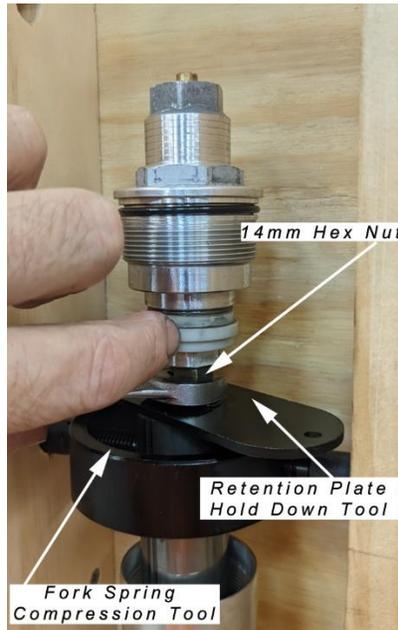


Figure 6 Showa Fork Disassembly Tools

4. Remove the upper fork cap plug by holding the hex nut on the rebound adjuster fitted on cartridge rod (#7 in Ducati WSM Figure 3) in place with a hex wrench (14mm) aka spanner and unscrew the complete upper plug with 32mm socket or by hand. (Be careful, there are small plastic and delicate metal rods in the upper plug that can be easily damaged or lost. Figure 6)
5. Remove the spring collar with the plastic spacer and washer and then the spring, and spring spacer tube.
6. The oil can then be poured out of the fork body. Gently pump the fork leg upside down while over a pan to catch oil. Oil is captured internally and pumping it will ensure that most of the oil has been removed. Oil will squirt out of the small orifice at the top of the damping rod.



Figure 7 Showa Fork Compression Adjuster - Removal

## 2002-2003 Ducati ST4s Showa Fork Service

'02-'03 Showa 43mm Forks Ducati Part Number: 340.2.069.1C and 340.2.070.1C

7. Once again, support and secure the fork horizontally, and withdraw the compression adjuster with a 19mm socket from the bottom of the fork. You may want to use the impact gun to spin the adjuster free of the damper cartridge, or otherwise keep the damper cartridge from also turning while attempting to withdraw the compression adjuster. It has very fine threads and it as well as the damper cartridge can be easily damaged so take care in the process. With the adjuster removed the cartridge / damping rod and the lower centering bushing can be withdrawn. Figure 3, parts #7 and #10

Caution: Do not open the damper cartridge.



Figure 8 Showa Dust Wiper - Removal



Figure 9 Showa Fork Seal Circlip - Removal

8. With the fork supported horizontally (use soft cloth or rags etc. to prevent any marring or scratches) on work surface, using a small screw driver, loosen and remove the dust wiper out of the stanchion. Slide it up the stanchion tube for the time being. Figure 8

## 2002-2003 Ducati ST4s Showa Fork Service

'02-'03 Showa 43mm Forks Ducati Part Number: 340.2.069.1C and 340.2.070.1C

9. Remove the circlip retaining the fork seal next. With a small screwdriver, carefully work the end of the wire clip out of its recess and then remove by hand. Figure 9

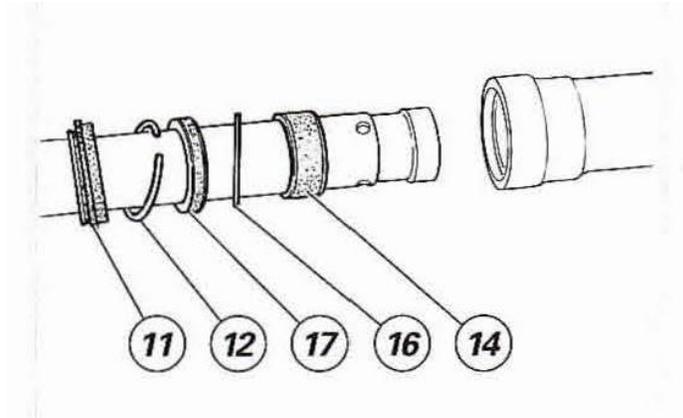


Figure 10 2002 Ducati ST4s WSM Showa Fork Pilot Bushing and Seals

10. With one hand on the slider (the fat silver outer tube - 53mm) and the other hand on the stanchion (gold not as fat inner tube 43mm that slips inside the slider) and pull apart firmly tapping repeatedly to remove the slider from the stanchion tube. Figure 11. Repeated tapping to free the pilot / guide bushing (#14 in the Ducati WSM Figure 10.) that is forced into the slider.



Figure 11 Separate Fork top and bottom

11. Once separated, place the fork halves on a suitable work surface, protecting them with soft rags etc., and supported horizontally then using a screw driver gently pry the bushing open (#15 in the Ducati WSM Figure 3) and remove from the stanchion tube. The pilot or guide bushing (#14), seal (#17), retainer (#16), and dust wiper (#11) can be withdrawn as desired. Figure 10.

## 2002-2003 Ducati ST4s Showa Fork Service

'02-'03 Showa 43mm Forks Ducati Part Number: 340.2.069.1C and 340.2.070.1C

Photo of complete Showa Fork disassembly:



Figure 12 2002 Ducati ST4s Showa Fork Disassembled and Labeled IAW 2002 Ducati ST4s WSM

### Inspection:

1. Measure the spring length, with the spring on a flat surface, measure its free length, it should be 370mm in length. (The Ducati WSM has a typo for ST4s; it shows 270mm spring length which is incorrect!)
2. Examine the outer surface of the two stanchions and the inner surfaces of the two sliders. They should be free of scoring, notches, or signs of forcing.
3. Check that each stanchion slides smoothly inside the sliders and that there is not excessive play.
4. Ensure that the stanchions are perfectly straight. Max. deviation allowed: 0.10 mm
5. Inspection of the bushings may occur here as well, but if you are this far along, you are probably replacing them.
6. Ensure that the bushing retainer (Part #16 in the Ducati WSM Figure 13 below) is not bent. If it is bent, change the retainer...it is like a large washer...the cross section does not look like fig 13 from the Ducati WSM below, if it is bent – replace it.

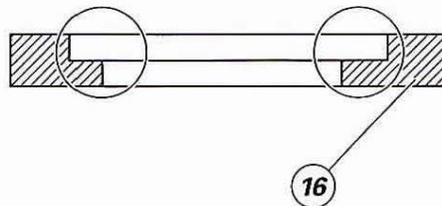


Figure 13 Inspect the indicated area of the bush retainer

## 2002-2003 Ducati ST4s Showa Fork Service

'02-'03 Showa 43mm Forks Ducati Part Number: 340.2.069.1C and 340.2.070.1C

### Assembly:

Caution: Lubricate the sliding edges with fork oil or seal grease before reassembling the oil seal (#17)

1. Wrap fork stanchion top with some adhesive tape or use plastic covering to protect the seal as it slips over the edge of the stanchion and bushing channel. (Figure 14) I used a bit of plastic from a smooth plastic water bottle, cut and then lubed up with fork oil. Slide the seals on the plastic past the channel that the bushings sets in, so as to avoid the sharp metal edges nicking the seals.



Figure 14 Plastic covering to protect the seal

2. Fit the following parts into the stanchion according to the given order:
  - a. Dust wiper (seal) (#11)
  - b. Circlip (#12)
  - c. Oil seal (#17)

Caution: Fit the oil seal with the marked surface facing the dust seal.

3. Fit the following parts into the stanchion according to the given order:
  - a. Retainer (#16)
  - b. Pilot bushing (#14)
  - c. Stanchion bushing (#15)

Caution: Remove any burrs and make sure not to damage the bushing outer coating.

4. To make the next operation easier, tape dust wiper seal and circlip together out of the way.

Note: Lubricate the bush sliding surfaces with fork oil before reassembling.

**2002-2003 Ducati ST4s Showa Fork Service**  
**'02-'03 Showa 43mm Forks Ducati Part Number: 340.2.069.1C and 340.2.070.1C**

5. Push the pilot bushing (#14) and the retainer (#16) into the slider with the seal driver 43mm



*Figure 15 Pilot bushing and retainer*



*Figure 16 43mm seal driver*

**2002-2003 Ducati ST4s Showa Fork Service**

**'02-'03 Showa 43mm Forks Ducati Part Number: 340.2.069.1C and 340.2.070.1C**

6. Push the oil seal (#17) into the slider using the seal driver 43mm
7. Fit the circlip (#12) and the dust wiper seal (#11)



*Figure 17 Fit circlip*



*Figure 18 Fit the dust wiper seal*

## **2002-2003 Ducati ST4s Showa Fork Service**

**'02-'03 Showa 43mm Forks Ducati Part Number: 340.2.069.1C and 340.2.070.1C**

Caution: Ensure that the slider slides smoothly along the stanchion tube. Hold both stanchions and sliders in your hands not to damage oil seals and pilot bushing

8. Support and secure the fork
9. Fit the lower centering bush (#10) into the damper cartridge end (#7) and then fit them into the slider (outer tube) *[I like the fork bleeder tool from Traxxion Dynamics and thread it to the damper rod threaded end to help hold the damper rod in place when fitting the compression adjuster]*



*Figure 19 Traxxion Dynamics fork bleeder tool*

## 2002-2003 Ducati ST4s Showa Fork Service

'02-'03 Showa 43mm Forks Ducati Part Number: 340.2.069.1C and 340.2.070.1C

10. Fit the copper washer seal (#9) and the compression adjuster (#8). Tighten to 30-40 Nm. *[To torque the compression adjuster to the base of the damper cartridge, you may want to temporarily attach the upper plug (#2) to the damper cartridge hand tight and then fit it to the upper stanchion, hand tight in stanchion. Once the compression adjuster is torqued, remove the upper plug from the stanchion and damper cartridge and continue with step 11.]*



## **2002-2003 Ducati ST4s Showa Fork Service**

**'02-'03 Showa 43mm Forks Ducati Part Number: 340.2.069.1C and 340.2.070.1C**

11. Fill each fork leg with half the amount of the specified oil (half of the 492cc)
12. Fill the damper rod from the top hole until oil comes out from the side vent hole
13. Pump the rod and the slider up and down at least 10 times (completing a stroke of a least 150 mm) so that the oil fills the fork leg and cartridge completely...be careful to not spray the fork oil out of the fork  
*[Again, I use the Traxxion Dynamics fork bleeder tool to keep the fork oil from going all over the place and making the bleeding much easier]*

Note: Oil will squirt out of the hole in the top of the damping rod as rod is pulled up. It is possible to insert the spring and spacer and then attach the upper plug (#2) to the damping rod, then compressing the spring joint with the pusher tool, keeping the oil from spraying out of the fork.

14. Move the damper rod and the slider to the end of their stroke.
15. Pour the remaining oil into the stanchion tube and measure the oil level (Fork Oil Level: 132mm spring out, spacer out; 110mm spring in, spacer out; or 94mm spring and spacer in)

Caution: The fork leg must be in a vertical position when measuring the oil level. Ensure that both fork legs have the same oil level.

16. Recommended oil and capacity:
  - a. Shell Advance Fork 7.5w, DONAX TA, Spectro 5W CRT fork
  - b. Standard capacity: 492±2.5 cu.cm
  - c. Standard oil level: (132mm spring out, 110mm spring in, 94mm spring and spacer in)
  - d. The amount of oil in a fork affects the performance of the fork in the compression stroke
  - e. High oil level will increase the compression load; a low oil level will decrease the compression load
17. Wipe any oil from the spring and the spring collar before reassembling
18. Fit the following parts:
  - f. Spring (#5), with the tapered section facing the collar (#3)
  - g. Spring collar (#3) with the ring (#18)
  - h. Slider (#4)
  - i. Upper washer (#8)
19. Fit the compression tool (used for disassembly) into the side hole in the spring spacer tube collar (#3)
20. Push the tool down and slide the holding plate (C) under the lock nut of cartridge (#7)
21. Screw the upper plug (#2) onto the rebound adjuster on cartridge (#7)

## 2002-2003 Ducati ST4s Showa Fork Service

'02-'03 Showa 43mm Forks Ducati Part Number: 340.2.069.1C and 340.2.070.1C

22. Using a hex wrench (spanner) hold the rebound adjuster in place and tighten the upper plug to 30-40 Nm
23. Push the compression tool (A) downwards and slide out the holding plate (C)

Warning: The adjuster (D) of the top cap (#2) must be fully slackened.

24. Screw the upper plug (#2) onto the slider and tighten to 30-40 Nm.
25. Fit the wire snap ring circlip (#1)

### Reinstall forks:

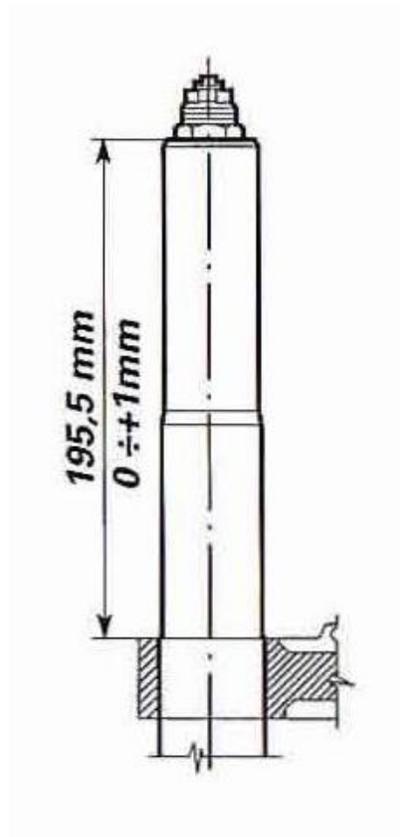


Figure 20 Fork Install Height - Location

1. Insert forks into triple tree through lower clamp and into position in upper clamp, locate the fork in the clamps as depicted in the diagram above Figure 20.
2. Tighten pinch bolts per the work shop manual torque values and sequence.
  - a. Steering Head Bolt 23 Nm (Grease B - Shell Gadus S2 V220 2)
  - b. Bottom Yoke Bolt 20 Nm (Grease B - Shell Gadus S2 V220 2) 1-2-1 Sequence
3. With the pinch bolts tightened, tighten the fork cap to 30 Nm – 40 Nm.
4. Fasten Handle Bars to the Steering Head (M8x1.25) torque 24Nm.

## **2002-2003 Ducati ST4s Showa Fork Service**

**'02-'03 Showa 43mm Forks Ducati Part Number: 340.2.069.1C and 340.2.070.1C**

### **Reinstall the front wheel:**

Ensure that the axle will slide into both RH and LH forks with minimum force. If you must force the axle through to the LH fork, the fork legs are not at the same level. Readjust the fork legs with respect to each other.

Make sure that the speedo drive ring is in the wheel before putting the wheel on the bike. The speedo ring has two tangs that line up with two grooves in the speedo drive unit.

Now place the wheel between the forks and insert the axle from the RH side and also place the speedo drive onto the axle. Rotate the axle to line up the holes in it with the compression adjusters in each fork. Make sure you line up the speedo unit properly so that the tab on the lower LH fender mount fits into the outer groove of the speedo.

Once the axle is in, put on the axle nut hand tight. Put the calipers back on at this point.

Tighten the axle nut with a wrench, but not fully and ensure that the axle is seated against the RH wheel's inner bearing race. Tighten the two RH axle clamp bolts just enough to stop the axle from turning. Fully tighten the axle nut. Fully tighten the LH axle clamp bolts.

Loosen the two RH axle clamp bolts that you previously tightened.

Remove the bike off the front stand. Pump the front brake lever a few times to seat the disc pads. Next, bounce the suspension up and down till you are sure that the RH fork has had a chance to stabilize into position.

Tighten the two RH fork clamp

## **2002-2003 Ducati ST4s Showa Fork Service**

**'02-'03 Showa 43mm Forks Ducati Part Number: 340.2.069.1C and 340.2.070.1C**

### **Table of Figures:**

Figure 1 '02 Ducati ST4s Rt Fork - Loosen Cap and Triple Tree Pinch Bolts.....	2
Figure 2 Withdraw Right Fork.....	2
Figure 3 2002-2003 Ducati ST4s Workshop Manual Showa Fork Diagram .....	3
Figure 4 Showa Fork Compression Adjuster Loosen / Removal.....	4
Figure 5 Showa Fork Cap Removal .....	4
Figure 6 Showa Fork Disassembly Tools .....	5
Figure 7 Showa Fork Compression Adjuster - Removal.....	5
Figure 8 Showa Dust Wiper - Removal .....	6
Figure 9 Showa Fork Seal Circlip - Removal.....	6
Figure 10 2002 Ducati ST4s WSM Showa Fork Pilot Bushing and Seals .....	7
Figure 11 Separate Fork top and bottom .....	7
Figure 12 2002 Ducati ST4s Showa Fork Disassembled and Labeled IAW 2002 Ducati ST4s WSM .....	8
Figure 13 Inspect the indicated area of the bush retainer.....	8
Figure 14 Plastic covering to protect the seal .....	9
Figure 15 Pilot bushing and retainer .....	10
Figure 16 43mm seal driver .....	10
Figure 17 Fit circlip .....	11
Figure 18 Fit the dust wiper seal .....	11
Figure 19 Traxxion Dynamics fork bleeder tool.....	12
Figure 20 Fork Install Height - Location.....	15