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September 18, 2011, 06:36:19 AM



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**Author****Topic: SP Fork Overhaul (Read 837 times)**

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☐ **Malc**

Snr. Member



Posts: 239

**SP Fork Overhaul**

« on: March 13, 2011, 02:51:03 AM »

Quote

**PART ONE - SP FORK STRIPDOWN**

I'll assume you have removed the front wheel and all the necessary components like brake calipers, etc, and skip straight to the good stuff...

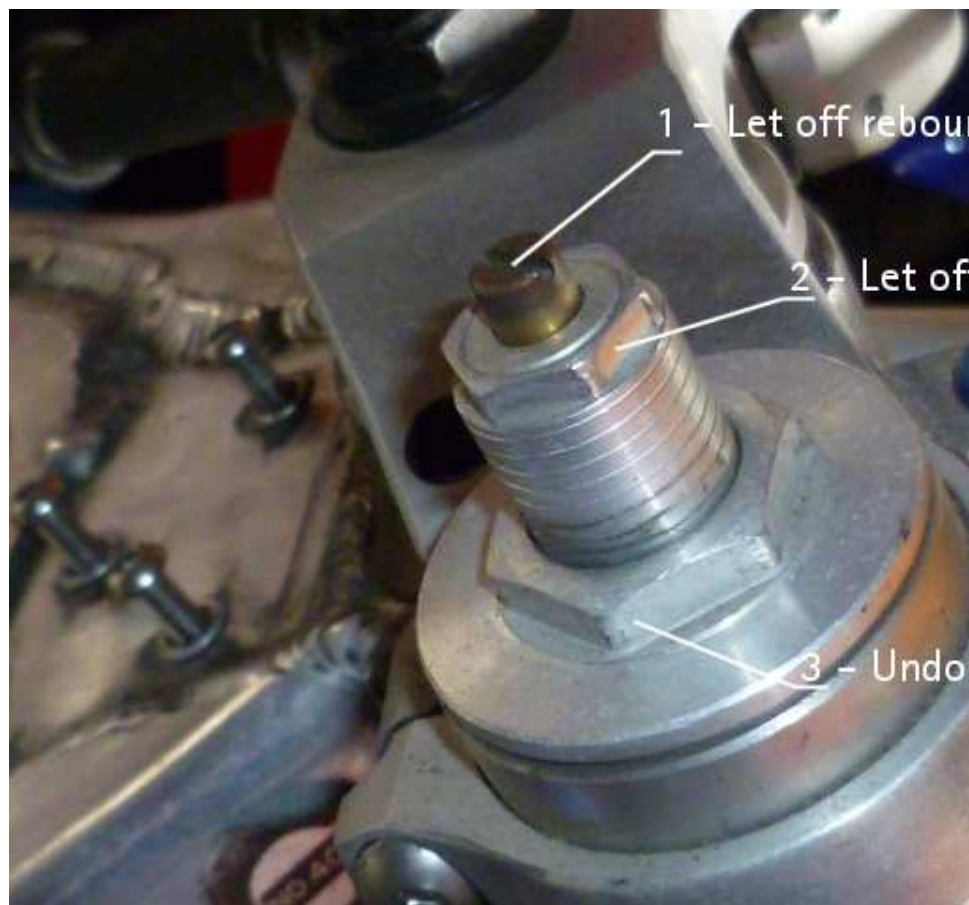
1. Undo the topmost clamp bolt at least two full turns (see image 1).

Image 1:



2. Let off the rebound damping using a flat blade screwdriver, and also fully unwind the fork preload adjuster using a 17mm spanner or socket. While you're here, undo the fork top cap using a 22mm spanner or socket (see image 2).

Image 2:



Note it's important you follow step 1 before doing this cos it will be extremely tight if you don't. You want to undo this top bolt now because it is far easier to undo while the fork is still being held in the triple clamps.

3. Let off the compression damping using the flat blade screwdriver (see image 3).

Image 3:



4. Now you need to remove the fork fully from the triple-clamps. I'll let you work out how to do this on your own.

5. Holding the fork assy upside down in a vice, you now need to slacken the damper rod bolt. You'll need a 10mm Allen key to do this (see image 4).

Image 4:



6. Now you've done all the prep work, hold the fork right way up again in your vice and fully slacken the fork top bolt. Once done, you can slide the fork outer tube down a bit. Now you can drain the oil (see image 5). Don't be shocked at the colour of the old oil... While it's draining, you can help it by pumping the fork a bit, but the best way to do it is just leave the fork assy upside down and let it drain for a good few hours.

Image 5:



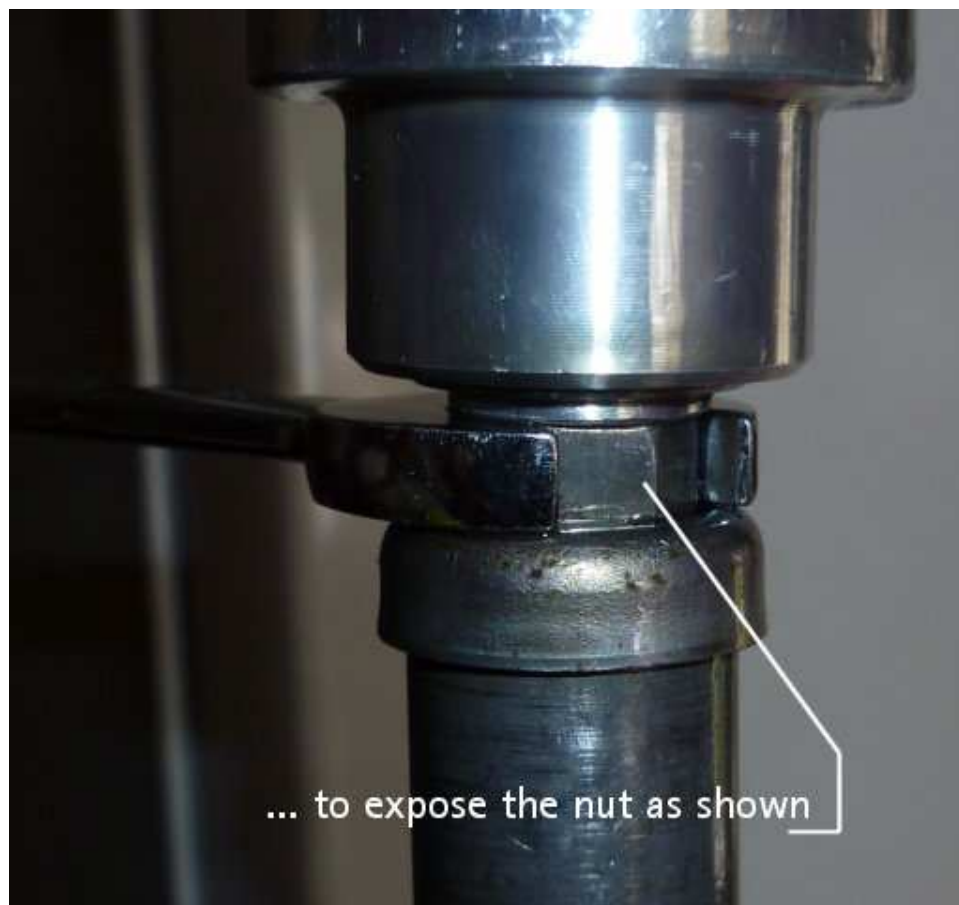


7. Now you've got the old oil out, you can start to strip the forks to component level. First you have to remove the fork top bolt from the damper rod. To do this, you need to compress the spring enough to allow you to get a 14mm spanner on the damper rod nut. Pull down on the spring seat and collar (see image 6) to expose the nut enough to get your spanner in place (see image 7). The manual says you can buy special tools assist in compressing the spring and locking the collar in place, but this is Malc's garage and not MotoGP, so we'll do it the "other" way. When pulling down on the seat, you can offset the collar and rest it against the bottom edge of the nut. This relieves you of the need for a third hand to let you get the spanner in place.

Image 6:



Image 7:



8. Once the 14mm spanner is in place, using a 17mm spanner or socket, unscrew the fork top cap see image 🤪. It's tight, but once its slackened you should be able to unscrew it using your hand only. Bear in mind that once you fully unscrew it, you'll be letting the spring pressure release too, so be careful when doing so.

Image 8:





9. Now you can pull out the spring and the spring seat and collar. Set them aside for cleaning and closer examination later.

10. Next, lay the fork flat and undo fully the damper rod bolt using a 10mm Allen key, then extract the damper rod assy, laying it aside for cleaning later. Recover the damper rod bolt and its sealing washer.

11. Clamp the fork assy upright in your vice again, and using a thin flat bladed screwdriver, carefully prise up the dust seal (see image 9). Push it up the fork out of the way.

Image 9:



12. Using the same screwdriver, carefully remove the oil seal retaining clip from its groove (see image 10) and set it aside for cleaning and examination later.

Image 10:



13. Now you can separate the fork outer tube from the fork slider. To do this we need to displace the bottom bush. The top bush will not pass through the bottom bush. Pull the two fork parts apart until the bushes touch, then sharply pull them again a few times. Do not be alarmed at the clunking noise made. After a few sharp pulls the two tubes will separate.

14. Now you have two tubes separated, all that remains is to remove the dust seal, retaining clip, oil seal, seating washer, and bottom bush. The manual says "do not remove the top bush unless it's to be replaced" but in I have never been able to remove (and more important fit new) parts without removing the top bush first! So, just for once, I'm gonna say "Up Yours Mr Yamaha" and tell you to remove the bush.

To do this, you need to prise the bush apart very gently (see image 11). It has very little springy pressure behind it so you should be able to do this with your fingernails! Open the bush only as much as you need to to remove it. Once its removed, you can slide off all the other parts as required.

Image 11:



At this point, you need to clean and examine closely for damage or wear all parts accordingly. The oil seals, dust seals, and damper rod bolt sealing washers are going to be replaced no matter what so you can throw these parts in the bin, but everything else you should hopefully be re-using. You might want to replace the bushes, but 99 times out of 100 they are good enough to re-use. Yamaha recommend replacing them no matter what, I'll let you decide.

## **PART TWO - REBUILD**

Before starting work on reassembling the forks, take time to clean thoroughly and check for any wear or damage on all parts of the forks. Pay particular attention to any corrosion on the chrome of the forks - small pits and/or high-spots can usually be buffed out using some fine wet or dry, but anything other than pin-pricks could and probably will lead to your new seals getting damaged quickly, rendering all this work worthless. If they are really bad, consider getting them rechromed (about £150 currently) or replace them altogether (about £6million probably...)

15. First thing to do is assemble the new seals and bushes on the fork. To prevent damage to the new seals, wrap a single wrap of insulating tape around the sharp edges on the end of the fork. Liberally grease the lips of the new seals, then install the dust seal, oil seal, seating washer, then the bottom bush. Make sure the dust seal lip is pointing towards the bottom of the fork (the end with the castings) and the small lettering on the oil seal points the same way (see image 12).

Image 12:



Don't worry about the seal spring, it can pass over the fork at any time. After you've got the parts on in the correct order, remove the insulating tape and prise apart gently the top bush and put it back in its groove (see image 13). In the picture you'll also see an o-ring - this is for later on when measuring sags, etc. It's a pose to use an o-ring rather than a cable tie...

Image 13:



16. We are now ready to put the fork back into its slider. I find the best way to do this is suspend the fork from the ceiling of the garage using a bungee cord, with the slider upright on a workmate or similar, but you'll work out what's best for you.

Lubricate the inside of the slider with a light smear of general purpose grease. This helps when pushing home the bush and seals. Use a small bit of insulating tape and hold all the parts as far up the fork out of the way as possible, leaving only the bush loose. Insert the fork into the slider and allow the bush to fall into position (see image 14).

Image 14:





The bush now has to be driven into position. There are tools available for specifically doing just this, but I have just as much success with a soft-faced mallet and punch, gently tapping the bush home by constantly working my way round the circumference of the bush. If you are careful this is every bit as successful, and continue until the bush is fully home (see image 15).

Image 15:



17. Next, let the washer fall into position, then pull the oil seal into position also. You should be able to press the oil seal home using finger pressure alone, but at the very worst a few very light taps with the punch will see it home (see images 16 and 17).

Image 16:



Image 17:



18. When the oil seal is fully in place, you will be able to see the spring clip groove is exposed, and the spring clip will clip into position easily (see image 18). Looking at the image, you can see the clip in position, probably better illustrated by looking at the reflection on the fork.

Image 18:



19. Finally, press the dust seal into position too.

20. Measure the exposed thread on the top of the damper rod assembly, and if necessary adjust it so the nut is 10.5mm down the thread (see image 19).

Image 19:



21. Insert the damper rod assy into the fork, and hold it in place using the damper rod banjo bolt and a new sealing washer as required. The bolt goes in from the bottom of the slider, through the casting (see image 20). Tighten the bolt to 40Nm torque! If you find you cannot get the full torque without the damper assy spinning, leave it 'til later and try again when the fork assy is fully rebuilt. You can use the spring force to help prevent the damper assy from spinning.

Image 20:





In this instance the manual says 393cc, so I'll pour 400 give or take.

Image 21:





23. Hold the fork assy vertical in your vice, trying to get it as level as possible. It doesn't have to be spot on but the closer the better! Push the slider all the way down on the fork.

Pour in **ROUGHLY HALF** your amount of all (see image 22). **DO NOT** pour it all in cos quite simply you will not have the volume in the fork leg to hold it all.

Image 22:



24. Now you must pump the damper rod assy at least ten times, but the more the better (see image 23), until you get a good bit of consistent resistance to your pushing and pulling on the rod. You'll know its ready when you feel it.

Image 23:



In doing this, you'll fill the damper assy with oil also, thus dropping the level in the fork significantly. Now you can pour in the rest of your oil. Pump the damper assy some more for good luck, and similar give the slider one or two shortish (about 100mm) pumps too. This bit doesn't actually do anything, but it does give the good wife something to laugh at. Simple things...

25. Now we need to add more/take away oil to get the level correct. By far and away the easiest way to do this is by using a syringe and length of tube cut to the required length. Again, you can buy tools which do a similar job, but they are extortionately expensive for all they are so I'll do it home workshop style.

I attach a length of tubing to the syringe, then cut it to the required length (see image 24). Now I must confess at this point I am not overly worried about being *too* accurate here. 135mm is my goal so I cut it there or thereabouts, trying to be as close as possible but not getting anal about it, if you see what I mean.

Image 24:



Making sure the slider is pushed fully all the way down the fork, now I simply insert the syringe/tubing into the fork and extract any excess oil as required. Bearing in mind the manual says 393cc, and I poured in 400cc (as near as I could anyway), all things being equal I need to extract 7cc of oil for everything to be perfect. I actually pulled about 50cc out. Go figure!

Image 25:



26. Anyway, what we do now is actually check the level of the oil. I take a steel rule and lower it into the fork to a depth of 140mm and pull it out again. I am looking to see how far in the rule went. In this instance I am measuring about 4mm, so  $140 \text{ minus } 4 = 136\text{mm}$ , which is as near as makes no odds to my target of 135mm. Job's a good 'un, as they say!!

Image 26:



Image 27:





I could be fussy here and try to add a smidge more oil but I really doubt it would make much difference at all. Usually when changing oil levels for tuning purposes, we are working in 10mm chunks, so 1mm isn't going to hurt.

Now would be a good idea to ask the wife and small children to leave the garage, cos now the fun really begins...

27. Insert the spring into the fork, with the smaller diameter springs upwards. You'll notice straight away its now very difficult to actually pull the damper rod assy out again. There is a factory tool available to do this, but (...) so we need to find a way of doing it. I found a pair of needle nose pliers worked pretty well. Basically, pull the damper rod out as far as it will go, then quickly drop the spring into the fork. Due to the damping effect of the oil, the rod will drop nice and slow, enough for you to grab it through the top of the spring with the needle nosed pliers. I'd like to have been able to photograph this bit, but no joy. Anyway, you'll manage however you find is the best way to do it but ultimately you need the spring in place and the damper rod nut out the top of the spring.

28. Before going any further, make sure the damper rod inner pipe and the fork top cap are easily to hand as you need to work quickly here.

We need to get the spring seat and its collar installed. This again is very difficult to achieve without the factory tool to keep hold of the damper rod, but at least this time I was able to use one pair of needle nose pliers to hold the rod through the spring coil, while I used a second pair to again grab the damper rod at its top after putting the seat and collar in position.

Now, holding the damper rod at the top with the second set of pliers, pull down on the spring seat and collar until the collar is lower than the nut. Now, offset the seat and collar to one side and rest the collar against the bottom of the nut (see image 28). Whilst holding the collar and seat to the side, drop the damper rod inner pipe into position, then screw the fork top cap into position also.

Image 28:



29. Put into position a 14mm spanner on the nut (see image 29) then let off the collar from under the nut into its proper position. Torque down the top cap to 15Nm. You're home and dry!

Image 29:



30. All that remains is to pull up the slider and screw it into position with the top cap. This needs to be torqued down to 23Nm, but is easier done once the fork is installed in position on the bike.

Image 30:



« Last Edit: March 16, 2011, 04:41:44 AM by Malc »

[Report to moderator](#)

☐ **wullie3XV9**

Snr. Member



Posts: 745

Meet the money pit !



**Re: SP Fork Overhaul**

« **Reply #1** on: March 13, 2011, 03:18:56 AM »

[Quote](#)

Good stuff, Malc. 😊 I don't know if this makes much difference, but I managed to strip & rebuild my fully adjustable RS forks *without* removing the damper rod & bolt.

I didn't experience any problems during / afterwards doing it that way.

Apart from that, everything else was done as per downloaded 3XV9 workshop manual supplement.

« Last Edit: March 13, 2011, 03:20:45 AM by wullie3XV9 »

[Report to moderator](#)

Happiness is a pair of frazzled BT 090's. ( Other sticky tyres are available ).

☐ **Malc**

Snr. Member



**Re: SP Fork Overhaul**

« **Reply #2** on: March 13, 2011, 03:29:14 AM »

[Quote](#)

Posts: 239

**Warwick**Global Moderator  
Snr. Member

Posts: 1649

Hoiking it up... and crashing  
it back down again!**wullie3XV9**

Snr. Member



Posts: 745

Meet the money pit !

**ash33**TZR250.COM  
Administrator  
Snr. Member**Quote from: wullie3XV9 on March 13, 2011, 03:18:56 AM**

Good stuff, Malc. 😊 I don't know if this makes much difference, but **I managed to strip & rebuild my fully adjustable RS forks without removing the damper rod & bolt.**

I didn't experience any problems during / afterwards doing it that way. Apart from that, everything else was done as per downloaded 3XV9 workshop manual supplement.

Hi Wullie,

Nah, yer probably right, but I like to disassemble them totally so I can examine all the parts closely for anything untoward. If I knew the bike well and was just changing oil, they very likely wouldn't come out. If nothing else, it would save on new sealing washers.

And being Scottish, I have a reputation to maintain! 😊

[Report to moderator](#)**Re: SP Fork Overhaul**« **Reply #3 on:** March 13, 2011,  
04:23:04 AM »[Quote](#)*Excellent* post, Malc![Report to moderator](#)

Still smoking...

**Re: SP Fork Overhaul**« **Reply #4 on:** March 13, 2011,  
06:46:49 AM »[Quote](#)

Malc, I forgot to say that I took them apart to replace the "guide" and "slide" bushes in each leg, as well as both oil & dust seals, to "zero mile" them. All OEM parts / prices too !! 😊

[Report to moderator](#)

Happiness is a pair of frazzled BT 090's. ( Other sticky tyres are available ).

**Re: SP Fork Overhaul**« **Reply #5 on:** March 13, 2011,  
07:35:54 AM »[Quote](#)

Very nice Malc, I'll be adding this one to the How To article page 😊

[Report to moderator](#)



Posts: 1094


☐ **wullie3XV9**

Snr. Member



Posts: 745

Meet the money pit !

**Re: SP Fork Overhaul**« **Reply #6 on:** March 14, 2011,

04:20:04 AM »

[Quote](#)

To help folks in the U.K. contemplating a full 3XV fork overhaul, here's some prices, ( as of Feb 2009 ), as a ( very ) rough guide, as OEM spares prices have been hiked up *several* times since!! ( All prices stated below with a 10% discount, courtesy of WEBBS YAMAHA of LINCOLN, as I'm a registered TZR forum member ).

I would have added the Part No's., but there's differences between models because of the different slider diameters, i.e. 39 mm for R's & 41 for the RS & SP's.

X 2 "Guide" bushes, ( at bottom of stanchions ) = £46.58

X 2 "Slide" bushes, ( at top of sliding tubes ) = £24.54

X 2 oil seals = £15.64

X 2 dust seals = £28.07

And a 1 litre bottle of SILKOLENE 10wt. fork fluid = £8.90. ( Bought elsewhere ).

Total = £124.73.

It'll probably cost *at least* £150 quid now! ( I hope this doesn't put anyone off, but forewarned is forearmed etc etc ).

« Last Edit: March 15, 2011, 01:59:49 AM by wullie3XV9 »

[Report to moderator](#)

Happiness is a pair of frazzled BT 090's. ( Other sticky tyres are available ).

☐ **Malc**

Snr. Member



Posts: 239

**Re: SP Fork Overhaul**« **Reply #7 on:** March 15, 2011,

01:04:38 AM »

[Quote](#)

Yeah, oil seals 9.19 and the dust seals about 12.00 each, can't remember the exact amount. Cost of spares are getting silly...

[Report to moderator](#)
☐ **turbo\_d202**

Member



Posts: 6

**Re: SP Fork Overhaul**« **Reply #8 on:** April 11, 2011,

05:27:02 AM »

[Quote](#)

Hi Malc





Brilliant guide, wondering if you could help with a couple of points.

Do you know the torque settings for the yoke clamp bolts onto the ones that clamp the woke to the forks.

Cheers Jeff

[Report to moderator](#)

☐ **Malc**

Snr. Member



Posts: 239



**Re: SP Fork Overhaul**

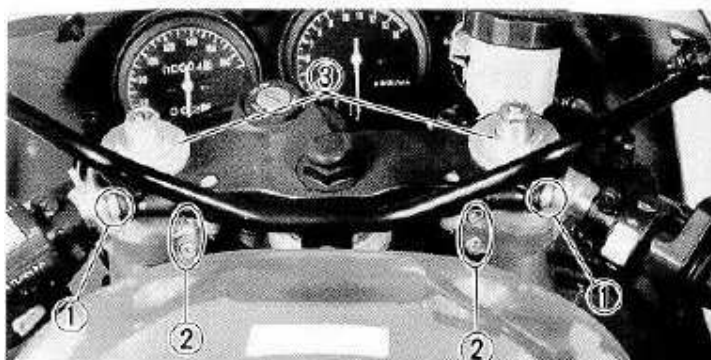
« **Reply #9 on:** April 11, 2011,  
06:24:31 AM »

[Quote](#)

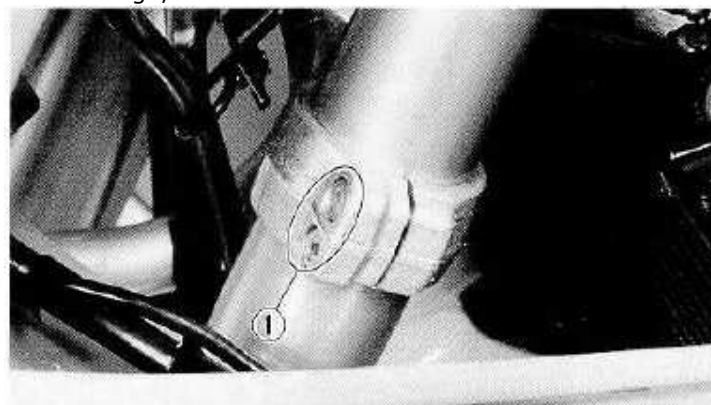
Hi Jeff,

The torques are 23Nm for both the top (1 off each side) and bottom (2 off each side) yokes, and 13Nm for the clip-on clamps (2 off each side).

In this image, #1 is 23Nm, #2 is 13Nm



In this image, #1 is 23Nm



Hope this helps?

« Last Edit: April 11, 2011, 06:38:03 AM by Malc »

[Report to moderator](#)

☐ **Warwick**

Global Moderator

Snr. Member



**Re: SP Fork Overhaul**

« **Reply #10 on:** April 11, 2011,  
06:58:53 AM »

[Quote](#)

Brilliant, Malc. I've often thought this kind of stuff for forks and the other stuff that many find a bit daunting would be really useful but I've always just been too disorganised/lazy/ashamed of my, ahem, 'special methods' to do it



Posts: 1649

Hoiking it up... and crashing it back down again!



**enduras\_wr200**

Snr. Member



Posts: 22



myself. I'll sticky this one for posterity though as it's absolutely brilliant!

Thanks for taking the time and making the effort. Inspirational stuff! 😊

« Last Edit: April 11, 2011, 07:01:03 AM by Warwick »

[Report to moderator](#)

Still smoking...



**Re: SP Fork Overhaul**

« Reply #11 on: April 11, 2011,

08:20:13 PM »

[Quote](#)

Wow, thanks Malc. I rebuild my forks myself, but I really appreciate the time you took offering this to us. Should definitely be on the DoItYourself, HowTos section. Excellent guide. Now do another on 3MA engine full rebuild.. 😊

Thanks alot, Fanis

[Report to moderator](#)

Under A Pale Grey (and Blue) Sky, We (2stokers) Shall Arise!

**turbo\_d202**

Member



Posts: 6



**Re: SP Fork Overhaul**

« Reply #12 on: June 14, 2011,

05:44:33 AM »

[Quote](#)

Hi Malc

Just going to put the forks back into the bike are the yoke torque settings the same for a 93 rs with 41mm forks?

Got the oil measurements from another thread in the TZR suspension for the 93rs as they're slightly different.

Jeff

[Report to moderator](#)

**Malc**

Snr. Member



Posts: 239



**Re: SP Fork Overhaul**

« Reply #13 on: June 14, 2011,

04:45:47 PM »

[Quote](#)

**Quote from: turbo\_d202 on June 14, 2011, 05:44:33 AM**

Hi Malc

Just going to put the forks back into the bike are the yoke torque settings the same for a 93 rs with 41mm forks?

Got the oil measurements from another thread in the TZR suspension for the 93rs as they're slightly different.

Jeff

Yep, torque settings are the same for the 3XV6 and 9 as they are for the earlier models. Oil levels will differ from year to year and model to model due to differences in springs, shims stacks, etc. so its not surprising there is no consistency in this respect.

[Report to moderator](#)**younggrasshopper**

Member



Posts: 11

**Re: SP Fork Overhaul**« **Reply #14** on: August 12, 2011,

07:47:52 AM »

[Quote](#)

Brilliant illustration...thank you!

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