



# Technical Bulletin

## KTM AMERICA, INC.

East 1906 Broadway, Lorain, Ohio 44052

West 435 "B" W. Bradley, El Cajon, California 92020

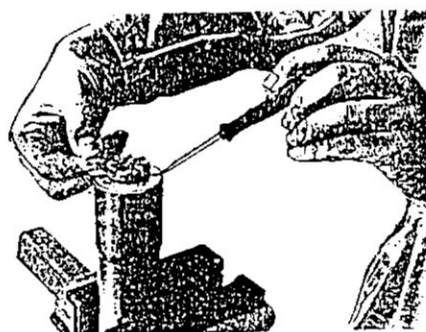
Date 4-7-89

No. 89/18-T

Subject: OIL CHANGE & LEVEL SETTING PROCEDURE

Reference: 89 KTM/WP 4054 MULTI ADJUSTER FORKS

### TO CHANGE FORK OIL



1. Remove forks from triple clamp.
2. Clamp fork in vise with soft jaws.
3. Turn top red rebound adjuster to "fast" position. (Full counter-clockwise)
4. Place flat blade screwdriver under rebound adjuster knob (at "fast or slow" position) pry up, and remove knob.
5. Unscrew top fork cap with 22mm box end wrench or socket.
6. Remove fork from vise.
7. Allow outer (upper) tube to fall and compress fully.
8. Insert small rod, no larger than 4mm or .157 inch into hole of the black plastic bottoming tube inside of the spring.
9. Turn spring counterclockwise like a screw until preload tension is removed, then remove spring clips.
10. Turn fork upside down over a drain pan and remove spring.
11. Stroke cartridge assembly rod up and down until all oil has been pumped out.
12. Stroke outer tube and remove oil from tube overlap area.

Check the condition of the oil, if the oil is extremely dirty, the condition of the fork seals should be inspected and a complete disassembly and service should be considered. See your KTM Dealer for details.

### TO FILL WITH OIL AND BLEED AIR, (STANDARD OIL VISCOSITY SAE 10)

- 1A. Extend upper tube completely and fill fork with approximately 550cc/ml of SAE 10 wt. White Power cartridge fork oil.
- 2A. Push the upper tube slowly downwards while holding the palm of your hand over the end of the tube to create air pressure. This air pressure will help to force oil between the inner and outer tubes which is very important for setting oil levels correctly. Occasionally, raise the palm of your hand slowly to relieve some excess pressure. DO THIS JUST ONCE AND DO NOT RAISE OUTER TUBE AGAIN.



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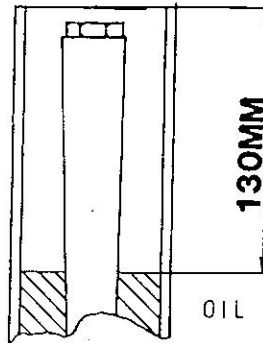
**"VERY IMPORTANT"**

After the outer fork tube has been compressed just once using the method described (2A). **DO NOT MOVE THE OUTER TUBE FROM THE BOTTOMED POSITION!** Oil can only be forced between the inner and outer tubes when the oil level is above the inner chrome tube or when a minimum of 550cc to 650cc of oil is initially added and the fork is compressed quickly and only ONCE using procedure described in 2A.

**NOTE:** If the outer fork tube is raised after the initial compression, the overlap oil will be forced out from in between the inner and outer tubes and a false oil level will result. REMEMBER, it is only possible to properly bleed the air from the overlap area when first filling the fork or by overfilling the fork with oil and compressing the upper tube only once as described.

3. With the outer tube completely compressed to the axle carrier, stroke the cartridge assembly rod up and down until a continuous flow of oil comes out of the two holes of the black plastic bottoming cone. **NOTE:** Oil must only flow out of the two holes on the upward stroke and stop flowing immediately when compressed. If this is not the case, the one way valve is not functioning properly and the fork must be disassembled and repaired. See your KTM Dealer for details.

**STD. OIL LEVEL - 130MM**



- Fork compressed!
- Spindle down!
- No air in oil!
- Before mounting spring!

**TO SET OIL LEVEL:**

1. Once the cartridge and the fork have been properly bled, completely compress the outer tube and the cartridge assembly.
2. With a siphon device which has a small pick-up tube or hose with an outside diameter of approx. 6mm or 1/4 inch. Mark off a distance of 120mm to 160mm and siphon off the desired oil level.



The oil level is measured from the top of the outer tube to the oil, with the fork and cartridge completely compressed and spring removed.

THE STANDARD 1989 KTM/WP MULTI-ADJUSTER OIL LEVEL = 130MM  
THE STANDARD 1989 KTM/WP MULTI-ADJUSTER OIL VISCOSITY = SAE 10

FOR SETTING SPRING PRELOAD, SEE TECHNICAL BULLETIN #89/17-T

If no further work is necessary, reassemble fork.

TECHNICAL SERVICES DEPT.  
KTM AMERICA, INC.



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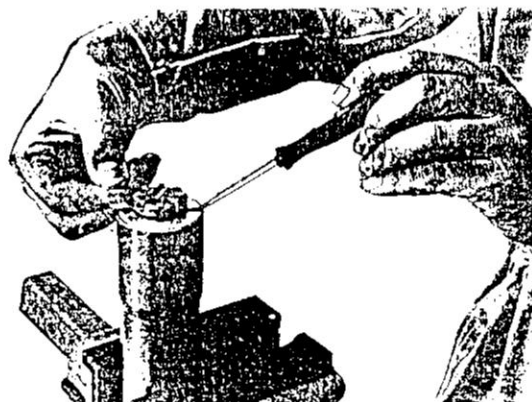
Date 3-27-89

No. 89/17-T

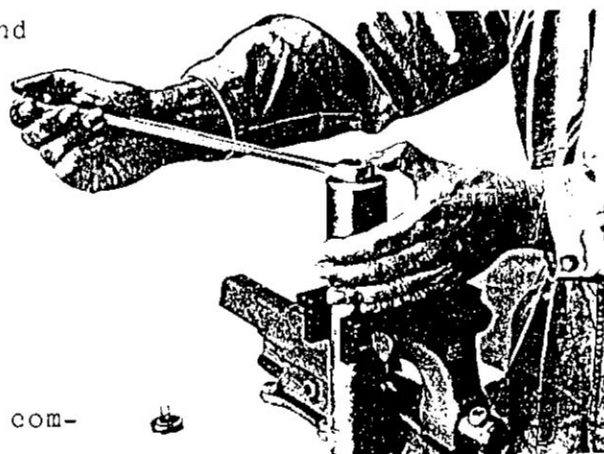
Subject: ADJUSTING FORK SPRING PRELOAD

Reference: 1989 KTM/WP 4054 MULTI ADJUSTER FORKS

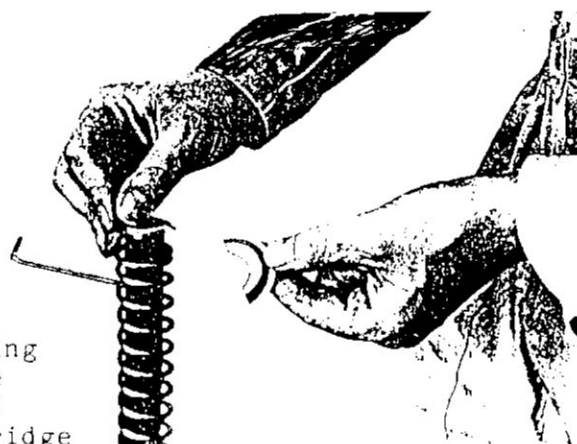
1. Remove forks from triple clamp.
2. Clamp fork in vise with soft jaws.
3. Turn top red rebound adjuster to "fast" position. (Full counterclockwise)
4. Place flat blade screwdriver under rebound adjuster knob (at "fast or slow" position) and pry up and remove knob.



5. Unscrew top fork cap with 22mm box end wrench or socket.



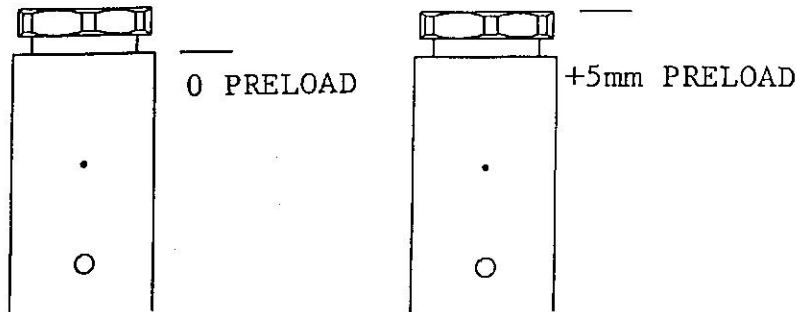
6. Remove fork from vise.
7. Allow outer (upper) tube to fall and compress fully.
8. Insert small rod (no larger than 4mm or .157 inch) into hole of the black plastic bottoming tube inside of the spring.
9. Turn spring counterclockwise like a screw until preload tension is removed then remove spring clips.
10. Carefully hold upward pressure on the inserted 4mm pin so the cartridge assembly will stay fully extended while you slowly "unscrew" (clockwise) the spring pressure from the 4mm pin.
11. Closely watch the contact point of the 4mm pin and the spring and stop turning the spring immediately at the point of no contact. The preload of the fork spring can be determined at this point. (\*Remember to keep the cartridge fully extended.)



(Continued next page)

The fork spring preload is determined by the distance from the spring clip groove of the fully extended cartridge to the end of the (free standing) fork spring.

STANDARD SPRING PRELOAD = 7 - 12MM  
MAXIMUM SPRING PRELOAD = 20MM



Note that the clip groove is 5mm below the end of the cartridge assembly, so you will have 5mm of preload if the free standing spring is parallel with the cartridge end. Zero preload is with the free standing spring parallel to the base of the clip groove. (See Illustration)

Preload spacers are available in various thicknesses and an assortment has been included with the motorcycles tool kit. Additional spacers are available through your KTM Dealer under these part numbers:

P/N #564.01.022.200	2.5mm
#564.01.022.000	5.0mm
#564.01.022.100	10.0mm

White Power fork spring dimensions (rate) are determined by:

- 1.. Wire diameter.
2. Number of coils.
3. Overall length.

**KEY NOTES:**

Standard overall length of all White Power 4054 Multi-Adjuster fork springs is 534mm + 3mm.

Fork springs which are 525mm or less in overall length are considered sacked and should be replaced. See your KTM Dealer for replacement spring details.

**SPRING RATES WILL:**

INCREASE WITH INCREASE OF WIRE DIAMETER  
INCREASE WITH DECREASE OF NUMBER OF COILS  
DECREASE WITH DECREASE OF WIRE DIAMETER  
DECREASE WITH INCREASE OF NUMBER OF COILS  
WITH ALL POINTS ABOVE OVERALL LENGTH REMAINS THE SAME (534MM ± 3MM).

After adjusting preload, reassemble fork if no further work is necessary.

REFER TO BULLETIN #89/18-T FOR "OIL CHANGE & LEVEL SETTING PROCEDURE"

## DETERMINING WHETHER YOU HAVE THE CORRECT FORK SPRING

Thanks to the possibility of carrying out external compression damping adjustments and spring preload adjustments, and of varying the oil level height, the standard fork springs fitted to your White Power fork will cover a wide range of rider weights and terrain conditions.

The standard setting for the external rebound and compression adjuster is position no. 3. If, after correctly adjusting the preload, you experience hard bottoming at many points around the race track, which is not corrected when you increase the compression damping, then the air chamber length must be decreased by raising the oil level. Altering the length of the air chamber greatly influences the force in the last third of the fork stroke, as illustrated in Fig. 8.

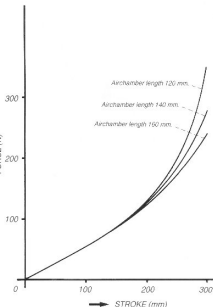


Fig. 8 influence of the air chamber length

When altering the air chamber length, be sure that the oil level **between** inner- and outer leg is up to the four holes on the top of the inner leg. See chapter changing oil level.

The air chamber length should not be less than 120 mm, or greater than 160 mm with the fork fully compressed. Reducing the air chamber length to less than 120 mm will cause too high pressures in the fork. If the air chamber length is increased to more than 160 mm, there will be a loss of damping control near full extension.

If, after reducing the air chamber length to its minimum size of 120 mm, the fork still bottoms, then the spring rate needs to be increased by one step.

If there is a feeling of harshness and a general stiffness and the fork rarely bottoms, which cannot be corrected by decreasing the compression damping, then the air chamber length should be increased to a maximum of 160 mm. If the forks are still too hard, then the next softer fork spring rate, should be installed.

When changing springs, they should be installed at the identical preload as the standard spring specification, the air chamber length should be reset to its original value and the compression and rebound damping adjuster should be reset to position no. 3.

## CHANGING PRELOAD, FORK SPRINGS, OIL LEVEL OR OIL

### A) Dismantling the front fork.

- Clamp the outer fork tube in a bench vice which is fitted with aluminium jaws or shop towel in order to protect the fork.
- Set the adjustment of the red rebound adjustment knob to position 1. (Turn anti-clockwise towards position marked FAST.)
- Remove the rebound adjustment knob with a small screwdriver (see Fig. 9).

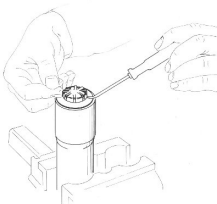


Fig. 9 removing the rebound adjustment knob

- Unscrew the screw cover with a 22 mm box end wrench (see Fig. 10).

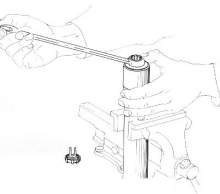


Fig. 10 removing the screw cover

- Remove the fork leg from the vice and push the outer fork tube fully downwards.
- Remove the two steel spring retainers and plastic preload spacers, if fitted (see Fig. 11).

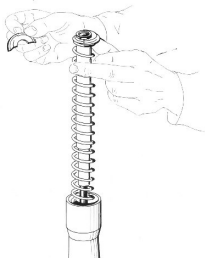


Fig. 11 removing the spring retainers

- Remove the spring.
- Invert the fork leg over an oil-catching tray and move the piston rod up and down, so that the oil is pumped out of the cartridge (see Fig. 12).
- Allow the fork leg to drip for a time to ensure that no old oil remains in the fork.

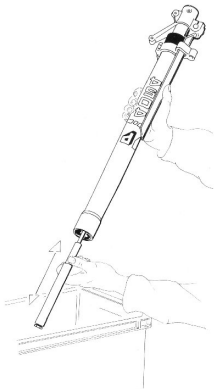


Fig. 12 pumping the oil out of the fork

### B) Renewing the oil and adjustment of air chamber-length.

- Fill the **fully compressed** fork leg with special White Power Cartridge Oil SAE 10 to approximately 10 mm above the red plastic locking ring. Continue to fill until no more air bubbles appear in the oil. (See Fig. 13).

#### NOTE:

White Power strongly recommends that the special White Power Cartridge Oil be used for your front fork. This fade-free front fork oil has been specially developed for front forks fitted with a cartridge damping system, and reduces foam formation, friction and wear to a minimum, and has optimum damping characteristics.

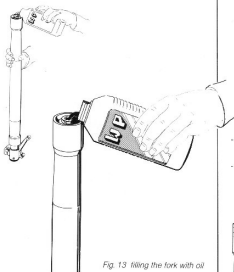


Fig. 13 filling the fork with oil

- Place the axle clamp on the ground and pull the outer fork tube upwards as far as possible.
- With the palm of your hand gently push the outer fork tube downwards, to the axle clamp. Allow the air to escape slowly from the fork by occasionally raising the palm of your hand slightly. Air pressure will force the oil between the inner and outer fork tubes, which is very important in determining correct oil levels. Do this only one time.
- Add more oil if necessary, filling to approx. 5 mm above the red plastic locking ring, when fully compressed.
- Move the piston rod **gently** up and down, until no further air bubbles escape from the two small holes on the side of the black plastic sleeve when fully stroked (see Fig. 14). Attention! Oil should only come out of these two small holes when the piston rod is moved upwards. If oil also comes out when the piston rod is pushed downwards, the one-way internal valve system is not functioning properly, consult your White Power dealer.

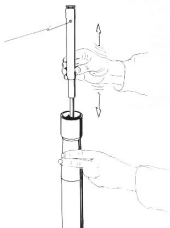


Fig. 14 bleeding the air out

- After bleeding all of the air from the fork, fully compress the outer fork leg and piston rod to the axle clamp.
- Set the correct air chamber length by removing excess oil with a syphon, or if necessary by adding extra oil. The standard air chamber length is 130 mm (see Fig. 15).

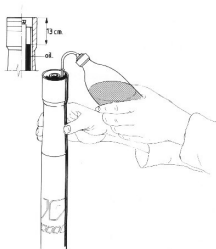


Fig. 15 adjusting the oil level

### C) Fitting the fork spring and adjustment of spring preload.

- Pull the cartridge piston rod upwards.
- Slide the correct spring over the spindle; Hold the black plastic sleeve with your fingers between the spring coils, to prevent the sleeve slipping down. Push a steel pin with a maximum diameter of 5 mm into one of the two small holes on the side of the black sleeve. Turn the spring so that the piston rod rises. Continue turning until the piston rod is at the highest position and there is no more preload on the spring.
- If the upper end of the spring is level with the upper end of the cartridge piston rod, then the spring will have a preload of 5 mm after fitting the two half spring retainers.
- Measure the distance by which the spring protrudes, using a vernier caliper (see Fig. 16).



Fig. 16 measuring the preload

- If the spring protrudes 4 mm above the piston rod, then the preload is  $5 + 4 = 9$  mm. Set the correct preload by adding plastic preload spacers. These spacers are available in thicknesses of 2.5, 5 and 10 mm.
- Continue to screw the spring downwards.
- Fit the two half spring retainers, with the outer edge facing downwards, into the groove in the cartridge piston rod (see Fig. 17).

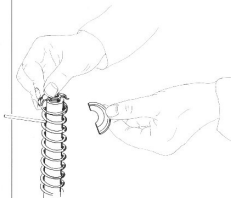


Fig. 17 mounting the spring retainers

- Remove the steel pin from the hole in the sleeve.
- Pull the outer fork tube upwards until the spring retainers are in their seatings.
- Clamp the outer fork tube in the bench vice.
- Check that the rubber ring on the inside of the screw cover is correctly positioned in its groove and is not damaged.
- Fit the screw cover using a 22 mm box end wrench (30-35 Nm torque).
- Remove excess oil from the hole in the screw cover with compressed air or a contact cleaner.
- Clean the red rebound adjustment knob and the O-ring and press the adjustment knob into the screw cover.
- Check the position of the rebound adjustment knob and the compression set screw and adjust to the correct setting (standard position for both adjustment knob and set screw is position no. 3).
- Degrease the outer fork leg before mounting in the triple clamps.

#### IMPORTANT:

Fit the M8 bolts of the lowest triple clamps, tightening to a maximum torque of 15 Nm, and the upper triple clamp bolts to a maximum torque of 25 Nm. Caution: If the lower triple clamp bolts are overtightened, the fork will bind, stick or feel very harsh.



## SHOCK AND FORK COMPRESSION AND REBOUND DAMPING

A feature of White Power components is that both the compression and rebound damping are externally adjustable. What do the terms compression and rebound damping actually mean? The compression damping is the damping force which arises on the inward stroke of the shock absorber or front fork. The compression damping serves to support the spring in every speed range and enables the shocks or forks to absorb impact. By "speed range" we mean the speed at which the shock absorber or the front fork is compressed and rebounds, not the speed at which the motorcycle is traveling. This compression damping is very important. It ensures that the suspension responds flexibly, but without bottoming. The rebound damping is the damping force arising on the outward stroke of the shock absorber or front fork. Without this rebound damping, the bike would simply continue rocking when the suspension was compressed. This rocking would eventually stop due to the friction of the link system. By damping the outward stroke, this rocking can be reduced to a minimum.

Since the compression and rebound damping can be easily adjusted by turning a knob, the damping can be altered to suit every circuit optimally, and fine tuned to personal requirements. The standard setting for the White Power shock is compression position no. 3 on a scale of 7 (knob on shock reservoir), and rebound position no. 4 on a scale of 11 (knob at bottom of shock). The standard setting for the Upside-Down fork is compression no. 3 on a scale of 8 (screw on side of each axle clamp) and rebound position no. 3 on a scale of 7 (knob at top of each fork leg). See also Fig. 3.

## ADJUSTING THE COMPRESSION AND REBOUND DAMPING

Prior to making any adjustments to the suspension damping, you will need to lay out a test track. This should not be too long (max. 2-3 km / 1.5-2 miles). Ensure that the test track is rough, and similar to the most demanding conditions you will experience in your racing or riding. The damping characteristics of the White Power shocks and front forks are selected by a team of very experienced test riders, so that the standard settings should be near perfect for the majority of riders. However, tracks and riders are not all the same. We have therefore compiled the following adjustment guide to help you adjust the shock absorber and front fork to suit your personal requirements.

Begin by setting the shock rebound damping. Once you have become thoroughly familiar with the circuit, ride for approximately 15 minutes at the standard setting. You can then begin adjusting the suspension. Set the rebound knob to position no. 1 (quickest return). Take note of the action of the rear shock, and concentrate on what the bike is doing and how it handles - it is not necessary to break the lap record straight away. After several laps, turn the rebound knob to position no. 11 (slowest return). By adjusting to the extremes of the shock rebound damping range, you should be able to note the difference in the handling of the machine. The possible results of incorrect adjustment are given in the adjusting guide. Now fine-tune the rebound damping to the setting which feels best for you. After the shock rebound has been correctly adjusted, you can adjust the shock compression damping in the same way. Begin with the knob on position no. 3. If you recognise the symptoms noted in the adjusting guide as being the result of too little compression damping, then adjust to a higher number. Adjust in large steps rather than small ones (3 or 4 numbers at a time) so that you can feel the difference. Following this, fine-tune to the best setting for you. Most endurance and off-road riders will prefer a softer compression adjustment position, whereas motocross riders, racing on very rough tracks with large jumps and G-force bumps, may prefer a harder position.

### NOTE:

Position no. 1 gives softest compression damping force and position no. 7 gives hardest compression damping. Begin adjusting the front fork in the same way, starting with the compression damping, and setting this initially at position no. 3. This number is then increased if the fork is too soft, or decreased if the fork is too harsh (see adjusting guide).

### NOTE:

Position no. 1 gives softest compression damping and position no. 8 gives hardest compression damping. When in doubt, most riders will prefer a fork compression damping setting at the soft end of the damping range. Once you have found the optimum fork compression damping, adjust the rebound damping (see adjusting guide). Turning the rebound knob anti-clockwise will decrease the rebound damping (faster out) with the lightest setting being position no. 1. Turning the rebound knob clockwise towards position no. 7 will increase the rebound damping (slower out).

Bear in mind that a properly adjusted suspension system may bottom very slightly at least once per lap at full racing speed. This is normal and acceptable.

## Rebound damping

### Too little:

Fork extends too quickly and wheel springs up from the ground after landing from a large jump. Difficulty in maintaining a straight path through rocks; Front-end attempts to climb the verge while cornering; High ride height; Difficult turning in.

### Too much:

Harsh feeling; Fails to rebound after landing from a large jump or on brake bumps; Low ride height; Easy turning in; Bottoming sometimes occurs even though compression damping, spring rate and oil level are all correct.

## SUSPENSION ADJUSTMENTS RELATED TO SPECIFIC TRACK CONDITIONS

The following recommendations are a guide to front and rear suspension adjustments that will benefit the rider by giving improved handling for specific track conditions. Prior to make any of the adjustments recommended, the rider should carry out the Suspension Tuning Procedures recommended earlier in this manual. This will familiarise the rider with the effects that the fork, shock damping and ride height have on the handling of this machine.

For supercross (stadium), sand tracks, soft or muddy ground you need more compression damping front and rear. On hard ground/hard terrain and especially on rocks, you need less compression damping front and rear.

On hard ground/hard terrain you need a little less rebound damping front and rear, and for supercross, a little less rebound on the rear. Sand tracks and soft terrain require slightly more rebound damping on the rear because the distance between the bumps is longer, so the shock has more time to extend before the next bump. On rocks you need more rebound damping both front and rear.

In a muddy race, you need stiffer springs at the front and, especially, at the rear because your bike becomes much heavier with the accumulation of mud. If you don't compensate for the additional weight of the mud that collects during the race, the suspension will be compressed too far most of the time and the bike won't handle very well. The spring rate requirements probably won't change much between a hard track and a sand track.

On sand tracks/soft terrain, you can lower the rear of the bike by adjusting the Rear Rider Height Sag to improve straight line stability although the rear wheel traction will be a little worse. On tight tracks/supercross you can decrease the Rear Ride Height Sag to improve turning ability.

## FRONT FORK HEIGHT

The position of the fork legs in the triple clamps is adjustable. On long, fast tracks, where there are few turns, consider an alternative position with the top of each fork leg flush with the top of the upper triple clamp. This will increase fork rake and trail and straight line stability will therefore be improved (see Fig. 18).

On tight tracks with many turns, you can lower the front of the bike by pushing the fork legs through the triple clamps in 5 mm increments. The fork rake and trail will be decreased and turning ability will be improved.

**NOTE:** - Never position the top surface of the fork leg more than 15 mm above the upper triple clamp (see Fig. 19).

- Max. tightening torque upper clamp bolts = 25 Nm
- Max. tightening torque lower clamp bolts = 15 Nm.



Fig. 18 fork height

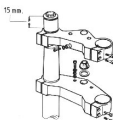


Fig. 19 max. fork height