



*The Science of Winning*

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## RACE TECH HIGH PERFORMANCE FORK SPRINGS - STREET

<f\_spring\_s.doc> FRSP Sxxxxxx 8-28-02 © P Thede

3 pgs

INCLUDES: (2) Springs, (4) Preload Washers, Spacer material (if required), Instructions - **Cutting Preload Spacers is required on some models.**

Thank you for choosing Race Tech High-Performance Fork Springs. These Straight Rate Springs are manufactured from "suspension" quality chrome silicon wire, shot peened, heat treated and 100% tested. They are the finest available.

**Please read the instructions completely before proceeding. If you have questions please call Race Tech 909-279-6655. If you are unfamiliar with this process, stop and have a qualified mechanic assist you.**

### GENERAL INSTALLATION INSTRUCTIONS

**STEP 1 - Remove the fork cap.** Before you remove the cap make a note of your rebound adjustment if you have one. Use caution as some springs are preloaded heavily and the cap can be released with a lot of force. Remove the spring and spacer. It is helpful to use a Race Tech Spring Compressor (p/n TFSC 01) on some cartridge style forks. If you do not have a spring compressor you may need to take your forks or bike to a local motorcycle shop.

**STEP 2 - Identify your fork type. (Refer to the next page for assistance)**

Type 1 - Upside-down

Type 2 - Conventional (right-side up) damping rod

Type 3 - Conventional Cartridge Forks. **With this type you must also determine if you have EXTERNAL Top-Out or INTERNAL Top-Out Springs. (Refer to the next page for assistance)**

**STEP 3 - Determine the Preload you're going to use. (Refer to the next page for assistance.)** If you have fork caps with adjustable Preload, set the minimum preload to 15 to 20 mm. Identify the type of fork cap you have to assist you in measuring Preload. **Calculate the required Spacer Length and cut the spacer. Remember to include spring washer and Emulator thickness if used.**

**STEP 4 - Install the springs, spacers (if required) and washers.** If you use spacers, you must have washers on both ends of the spacer. **Never let the spring ride directly on the aluminum cap or the spacer. A steel washer should always be between any aluminum cap and the spring.**

**STEP 5 - Install the cap.** If you have cartridge forks, use Loctite on the damping rod threads at the cap and torque it to manufacturers specs. Most models require careful positioning of the rod in the cap so the proper number of rebound clicks are available for adjustment. For this type, if the rod is threaded too far into the cap there will not be the full number of clicks. If the cap is not threaded on far enough, it will not touch the adjuster and it could come off the shaft.

Consult your owners manual for the proper procedure. Following is an overview. Start with the cap off. **On most KYB's,** screw the adjuster in all the way until it stops, then back it out 2 clicks. **On most Showa's,** there's no stop when you screw the adjuster in, so the procedure is a little different. Screw the adjuster out all the way, then screw it in 3 to 4 turns (or 16 to 20 clicks).

Then for either type, install the cap onto the rod until it starts to feel tight (the adjuster needle is bottomed out). Hold the position of the cap in relation to the rod, back out the adjuster 1 turn (so the needle isn't damaged when the jam nut is tightened) and torque the jam nut to proper specs (consult manual). Check to see you have the proper number of clicks. Set your rebound adjusters.

**STEP 6 - Install the forks** on the bike and **measure the Static (Race) Sag** (refer to Measuring Static Sag Instructions) and adjust the Preload accordingly. Typical Static Sag is 25 to 35 mm for street applications and 20 to 30 mm for racing. More Preload means less Static Sag.

**STEP 7 - Enjoy!**

**Note for the perfectionists:** Different springs and spacers take up different volumes. This affects the required oil level. Regardless of the spring rate, physically heavy springs (ones that weigh a lot), take up more volume than physically light springs. This means that springs that weigh more require a lower oil level than springs that weigh less because oil level is measured with the spring out.

## DETAILS FOR STEPS 2 and 3

### STEP 2 DETAILS - IDENTIFY YOUR FORK TYPE

There are three types of forks each with slightly different instructions:

- 1 **Upside-down cartridge forks** – Most of these springs are designed to fit “as is”. Preload should be in the proper range with your adjusters. All have INTERNAL Top-Out Springs. Follow the instructions for **INTERNAL**. It is helpful to use a Race Tech Fork Spring Compressor (p/n TFSC 01).
- 2 **Conventional (right-side up) damping rod forks** - A preload spacer must be cut for proper preload. These all have **EXTERNAL** Top-Out Springs. Follow the instructions for **EXTERNAL**.
- 3 **Conventional (right-side up) cartridge forks** - A spacer must be cut for proper preload. These forks could have either **EXTERNAL** or **INTERNAL** Top-Out Springs.

Identify the forks as either EXTERNAL or INTERNAL Top-Out. To determine where the Top-Out Spring is located, hold the chrome inner fork tube, with the spring out and the cap off, and extend the fork all the way until it stops. **EXTERNAL TYPE** forks have the Top-Out Spring on the outside of the cartridge tube and will stay the same length as when fully assembled. **INTERNAL TYPE** forks have the Top-Out Spring on the inside of the cartridge tube and therefore will extend longer. Once you have determined which type you have, choose the corresponding instructions.

### RECOMMENDED PRELOAD

*TYPICAL PRELOAD RANGE for STREET FORKS - 15 to 30 mm (5/8 to 1 1/4")*

*STANDARD PRELOAD - 20 mm (0.8")* (using RT recommended rate) If your model has Preload Adjustment and you are making spacers, cut spacers to set the minimum adjustment to 15 mm (5/8").

*PRELOAD EXTREMES - 5 to 35 mm (1/4 to 1 1/2")* More Preload for heavy bikes or when using softer springs.

**NOTES ON PRELOAD:** The amount of preload required depends on the sprung weight of bike and rider, the rate of the spring, the front to rear weight bias, the fork angle and personal preference. **There is no magic Preload number.** *If you like the feel of the bike with less or more Preload than these guidelines, great. More Preload means less Static Sag (the front end sits higher). This will make the bike turn slower. Less Preload means more Static Sag (the front end sits lower). This will make it turn quicker and it will feel softer and bottom easier (though Spring Rate has a bigger effect on bottoming than Preload does). Higher oil level does not affect Static Sag but does increase bottoming resistance.*

### STEP 3 DETAILS - DETERMINING THE PRELOAD SPACER LENGTH

**EXTERNAL TOP-OUT** - Assemble the forks without the springs and spacers. Install the Emulator (if used). Extend the fork all the way. Drop the spring and spring washer into the fork tube. Use a tape measure to record the distance from the top of the fork tube down to the top of the spring washer. Set the Preload Adjuster to minimum (if available). Measure the Fork Cap Height from the bottom of the sealing lip (the point that touches the top of the tube when the cap is tightened) to the point on the bottom of the cap where the spring touches (this point might be on a special spacer or washer). Subtract this distance from the first measurement (down to the top of the spring washer). This would be the required length of the spacer for zero preload. Add the amount of preload required to determine the length of your spacers. Be sure to put spring washers on both ends of the preload spacer during final assembly and include them in your calculations.

**INTERNAL TOP-OUT** - This type requires you to measure the Set Length of the fork. The Set Length is the installed length of the spring and spacer with the fork fully extended. First, set the Preload Adjustment to minimum (if available).

Measuring the Set Length is best accomplished with the cartridge out of the fork, however, it can be done with the fork spring out and cap unscrewed from the outer tube but still attached to the damping rod. Collapse the fork tube. The Set Length is measured from the point the spring touches on the top of the cartridge to the point the spring touches on the cap with the rod fully extended. (Sometimes the point the spring touches on the cap is actually a special washer or spacer.) A tape measure can be put down the fork tube with the spring removed, if you are careful to make sure the tape is resting on the flange when measuring.

Once the Set Length is recorded, measure the Length of the Spring and subtract. This would be the required length of the spacer for zero preload. Add the amount of preload required to determine the length of your spacers. Be sure to include spring washer thickness as they are required on both ends of the preload spacer.

### STEP 6 DETAILS - MEASURING STATIC SAG

- 1 Static Sag is the amount the bike settles, from fully extended, with the rider on board in riding position. First, extend the forks completely (bike off the ground). Measure from the wiper to the bottom of the triple clamp on conventional forks or from the wiper to a point on the axle clamp on inverted forks. This is L1.
- 2 Take the bike off the stand and put the rider on board in riding position (Street - sitting or Road race - full tuck). Get an assistant to balance the bike or have the rider hold onto something. Push down on the front end and let it extend **very slowly**. Where it stops, measure the distance between the wiper and the bottom of the triple clamp again. **Do not bounce**. This is L2. (If there were no drag, the bike would come up a little further.)
- 3 Next, lift up on the front end and let it drop **very slowly**. Where it stops, measure again. **Do not bounce**. This is L3. The reason L2 and L3 are different is due to stiction or drag in the seals and bushings. (If there were no drag, the bike would drop a little further.)
- 4 Half way between L2 and L3 is where the Sag would be with no drag or stiction. L2 and L3 must be averaged to find the midpoint and subtracted from L1 to calculate true Static Sag.  
$$\text{Static Sag} = L1 - (L2 + L3) / 2$$
- 5 To adjust Static Sag use the preload adjusters, if available, or make longer or shorter preload spacers. **Recommended Static Sag for street applications is 25 to 35 mm, racing from 20 to 30 mm.**

## TERMS

**Spring Rate** - The spring stiffness measured in kg/mm or lbs/in.

**Spring Free Length** - The length of the spring when it is not installed.

**Spring Set Length** - The installed length of the spring with the shock or forks fully extended.

**Spring Preload Length** - Amount the spring is compressed from it's Free Length to install it. It is not the length of the spacer.

**Spring Spacer Length** - Spacer length.

**Static (Race) Sag** - The amount the bike compresses from fully extended with the rider on board at full riding weight in riding position.

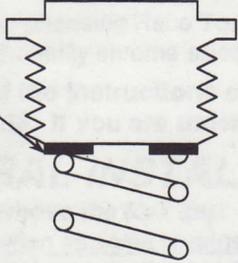
## FORK CAP TYPES

This information is provided to assist you in measuring your Set Length. Identify the type of cap you have and note the specific measurement point. There are variations of the types listed below. Be sure to take "special" washer thickness into consideration.

**Type A**

The Set Length is measured from this point.

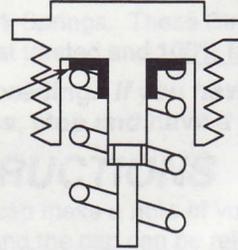
Non-adjustable



**Type B**

The Set Length is measured from this point.

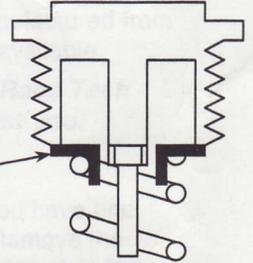
Non-adjustable



**Type C**

**Models with flanged washers.**  
The Set Length is measured from this point.

Non-adjustable

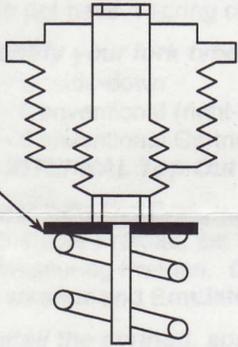


**Type D**

The Set Length is measured from this point.

This washer could also be a special washer.

Adjustable

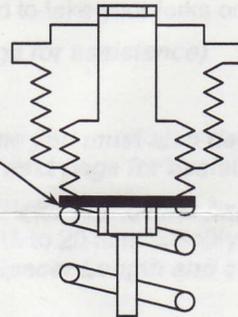


**Type E**

The Set Length is measured from this point.

This washer could also be a special washer.

Adjustable

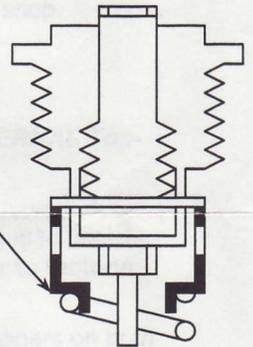


**Type F**

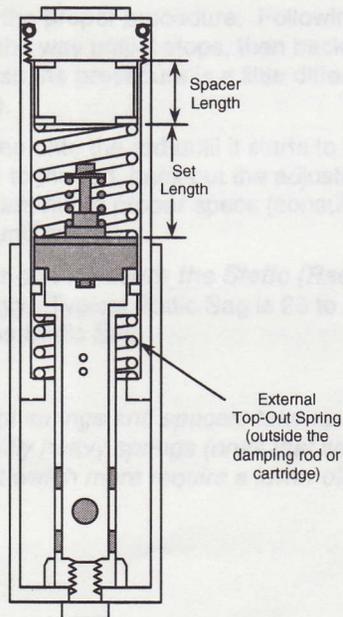
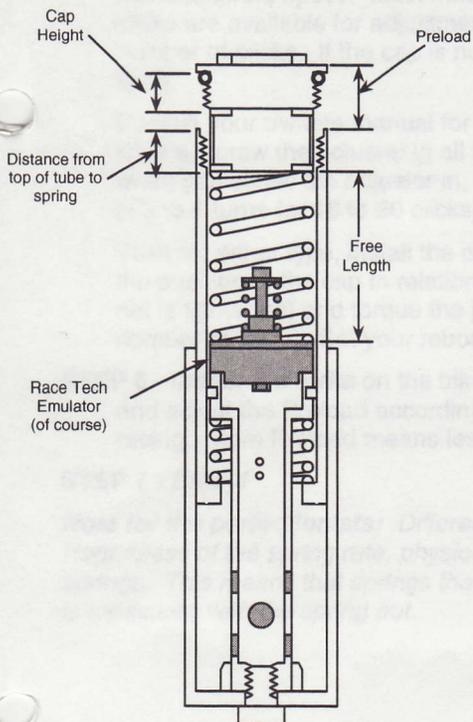
The Set Length is measured from this point.

Special spacer.

Adjustable



## EXTERNAL TOP-OUT



## INTERNAL TOP-OUT

