SPORTBIKE BASIC SUSPENSION SETUP SEMINAR (1)

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PREPARED & PRESENTED BY: GARY JAEHNE (AFM #996)

For any additional questions or comments on this presentation: EMAIL address: GSJCB1@AOL.COM

SUSPENSION SEMINAR COURSE OUTLINE

I: Student Welcome

II: Instructor Introduction

III: Review of Class Schedule

IV: Pre-Setup Inspection

V: Suspension Terminology Review

VI: Suspension "SAG" Set-Up Procedure (Lecture)

VII: Suspension "SAG" Set-Up Procedrue (Hands-on Demonstration)

VIII: Damping adjustments: Basic overview only

IX: Open Questions/Answer Wrapup

"PRE-CHECK": VERIFICATION LIST:

- ☐ Chain tension correct (min. 1" freeplay at mid-length, unlaiden)
- ☐ Tire pressures correct (approx. 32-38 PSI, load dependent)
- ☐ Tire wear condition not excessive
- ☐ Rear wheel lateral alignment (chain adjuster position)
- ☐ Leaky fork seal(s) / fork oil level – check for pits on tube
- ☐ Steering head bearing adjustment /lubrication - if loose, you'll feel a "clunk" when forst breaking
- ☐ Rear suspension linkage freedom of movement / lubrication

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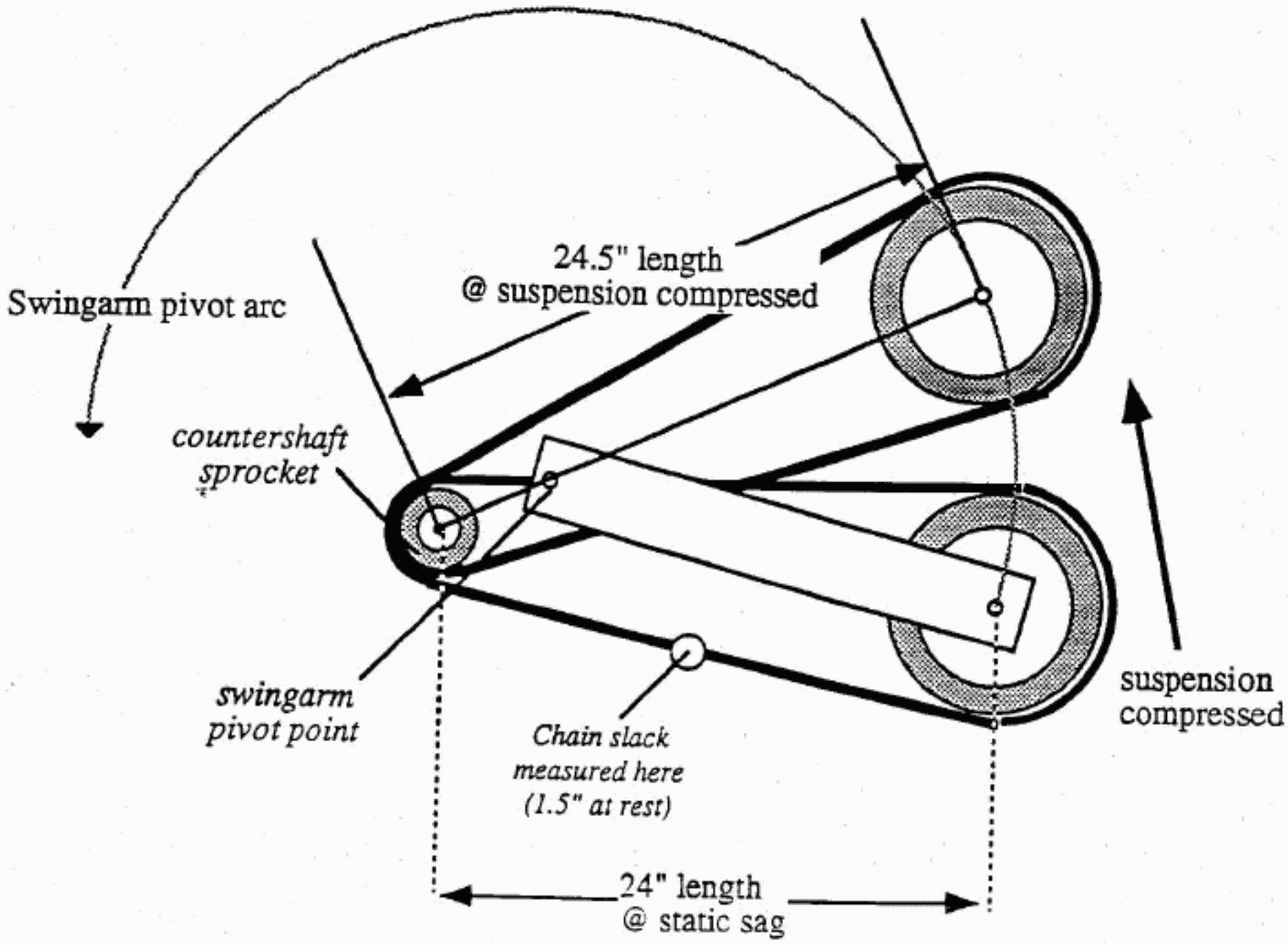
CHAIN TENSION EFFECT DIAGRAM



NOTE: Amount of change in actually chain length is EXAGGERATED for illustration purposes only, actual change will be less.

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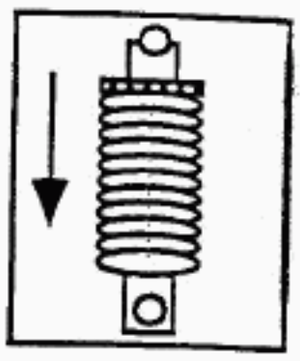
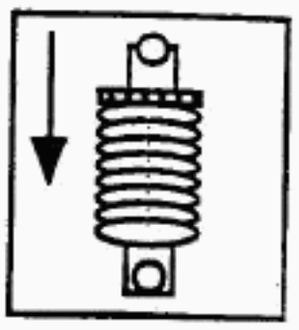
SUSPENSION TERMINOLOGY REFERENCE SHEET

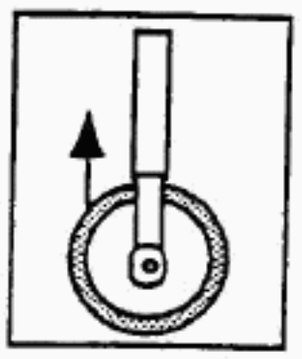
STATIC SAG — The linear distance that the center of the axle travels (in reference to a specific fixed point on the chassis) from it's fully extended position, with only the bikes own weight applied. (NOTE: Most modern lightweight sportbikes, when properly setup, exhibit little to NO static sag).



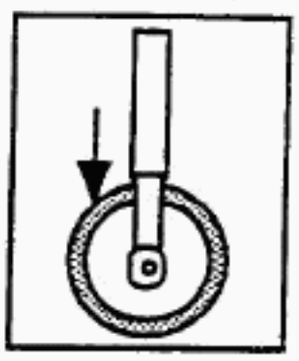
RIDER SAG — The linear distance that the center of the axle travels (in reference to a specific fixed point on the chassis) from it's fully extended position, from the weight of the bike AND rider (in full gear).



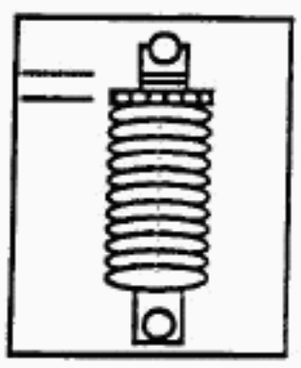
COMPRESSION DAMPING — The amount of hydraulic resistance provided within the shock or forks, when the wheel is moving upwards towards the chassis (bumps). *("SPRING HELPER")*



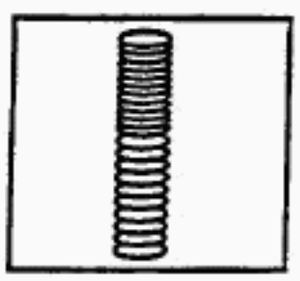
REBOUND DAMPING — The amount of hydraulic resistance to the unloading of the stored energy in the spring(s), provided within the shock or forks, when the wheel is moving away from the chassis (dips). *("ENERGY ABSORBER")*



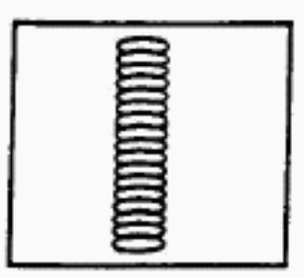
PRELOAD — The linear distance that the spring is compressed, from it's fully extended length, by the adjustable spring support collar (controls "SAG").



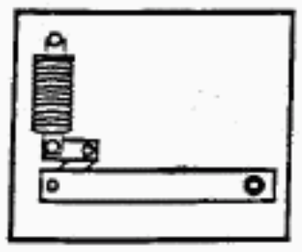
PROGRESSIVE SPRING — A fork spring that is constructed with unequally spaced windings, and/or varying wire diameter, to provide increasing levels of resistance to movement, as it is compressed through it's range of travel.



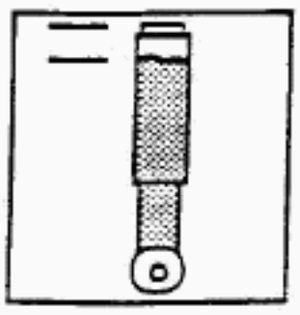
STRAIGHTRATE SPRING — A spring that is constructed with equally spaced windings, and/or constant wire diameter, to provide a uniform level of resistance to movement, as it is compressed through it's range of travel.



PROGRESSIVE LINKAGE — A leverage mechanism, built into the rear suspension system of many sportbikes, that effectively causes an increase in the amount of force required to compress the shock spring a specific distance, as it is compressed through it's range of travel. Produces the effect of a "progressive spring".



AIR SPRING — A secondary level of resistance, to the front forks compression (most notable during the final 1" of suspension travel), caused by the compacting effect on the volume of residual air remaining in the enclosed fork tube, as determined by the volume of fork oil installed.



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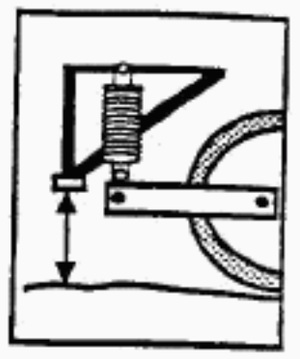
SUSPENSION TERMINOLOGY REFERENCE SHEET

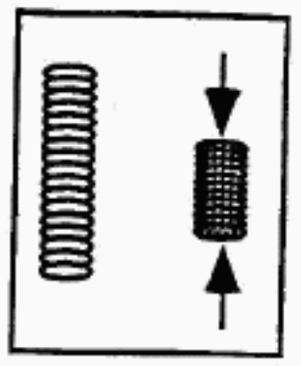
RIDE HEIGHT

Distance from the ground, that a fixed point on the chassis (i.e. footpeg) resides, when the bike is laiden with the weight of the rider (normally not DIRECTLY adjustable at the rear, except on aftermarket shocks).



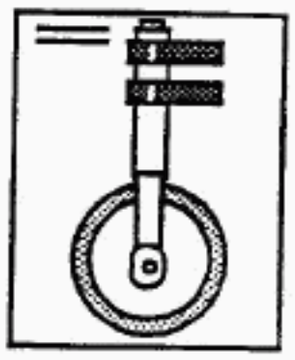
COIL BIND

A malfunction condition that can occur (if improper suspension parts are intalled) when the spring(s) are compressed, by the suspension's upward travel, to a point where it attempts to exceed it's MINIMUM overall length, and becomes effectually a solid pipe.



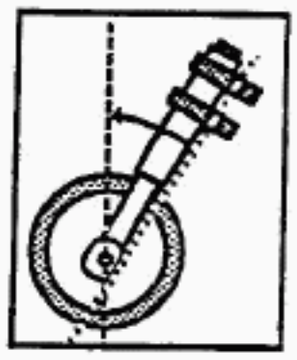
FORK TUBE HEIGHT

The linear distance that the top of the fork tube extends about the upper surface of the top triple clamp (adjustable to change bike's handling characteristics, via effective "rake" and "trail" change).



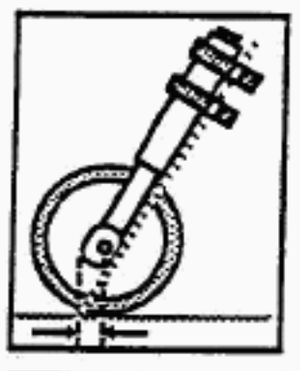
RAKE

The relative angle from the center of a line drawn through the steering head of the frame, in relation to a vertical line drawn through the center of the axle, (lower # = quicker steering/less stabiliity).



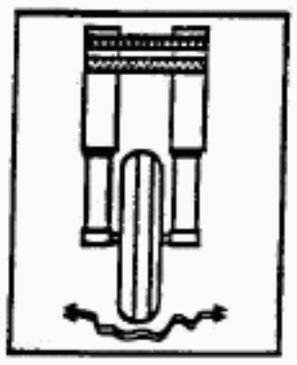
TRAIL

The distance from a line drawn through the center of the steering head of the frame, and a verticle line drawn through the center of the front axle, where the two intersect the ground, (smaller # = faster steering/less straightline stability).



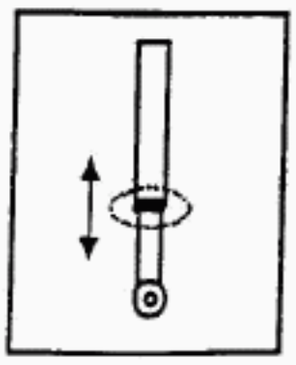
HEADSHAKE

A rapid side-to-side oscillation of the front wheel, typically occuring upon encountering bumpy pavement surfaces, while the bike is under hard acceleration, (often minimized by the addition of a steering damper).



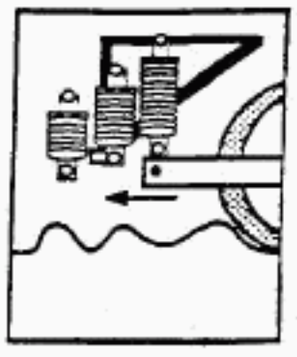
STICTION

A mechanical resistance to movement, typically in the forks, as a result of the frictional drag created by the rubber fork seals and internal metal bushings.



PACKING EFFECT

A situation where the forks or shock, become captive at a compressed range of their travel, due to excessively slow Rebound damping, and it's effect as the bike travels over a series of contiguous bumps on the road surface.



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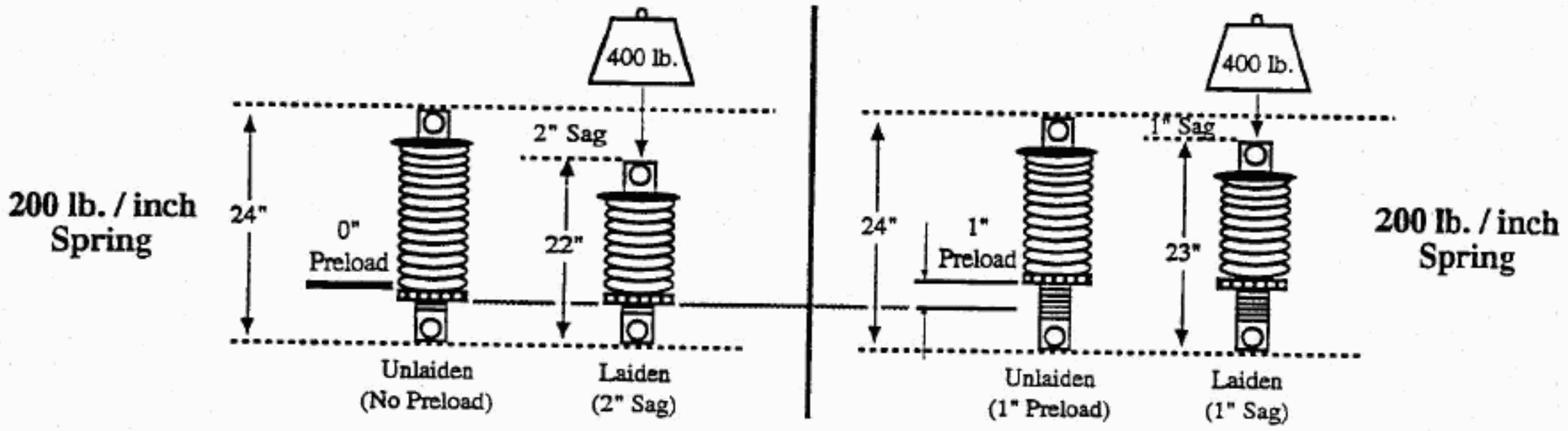
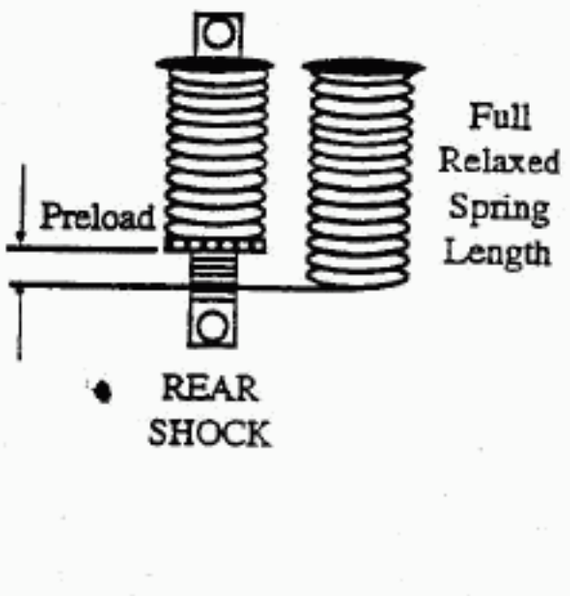
PRELOAD CONCEPT DIAGARM

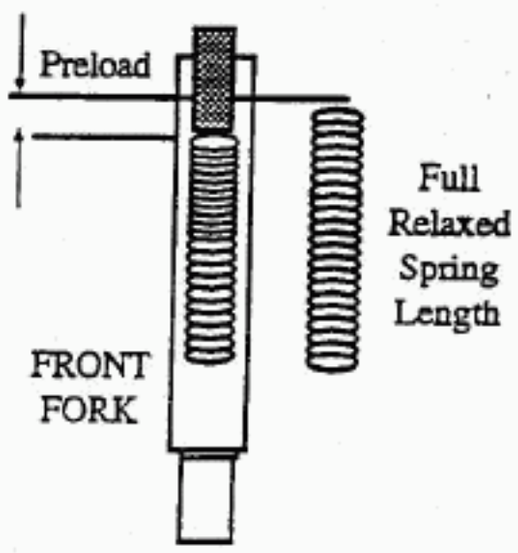


"SPRING RATE": TUNING & TROUBLESHOOTING

1) Actual **rear shock** spring "pre-load" measured amount, required to achieve proper "Sag":

- 0 - 1/8": Spring rate **TOO STIFF** for rider/bike combined weight
- 1/4 - 3/4": Spring rate **CORRECT** for rider/bike combined weight
- >1": Spring rate **TOO SOFT** for rider/bike combined weight





2) Actual **front fork** spring "pre-load" measured amount, required to achieve proper "Sag":

- 0 - 3/8": Spring rate **TOO STIFF** for rider/bike combined weight
- 1/2 - 1": Spring rate **CORRECT** for rider/bike combined weight
- >1 1/4": Spring rate **TOO SOFT** for rider/bike combined weight

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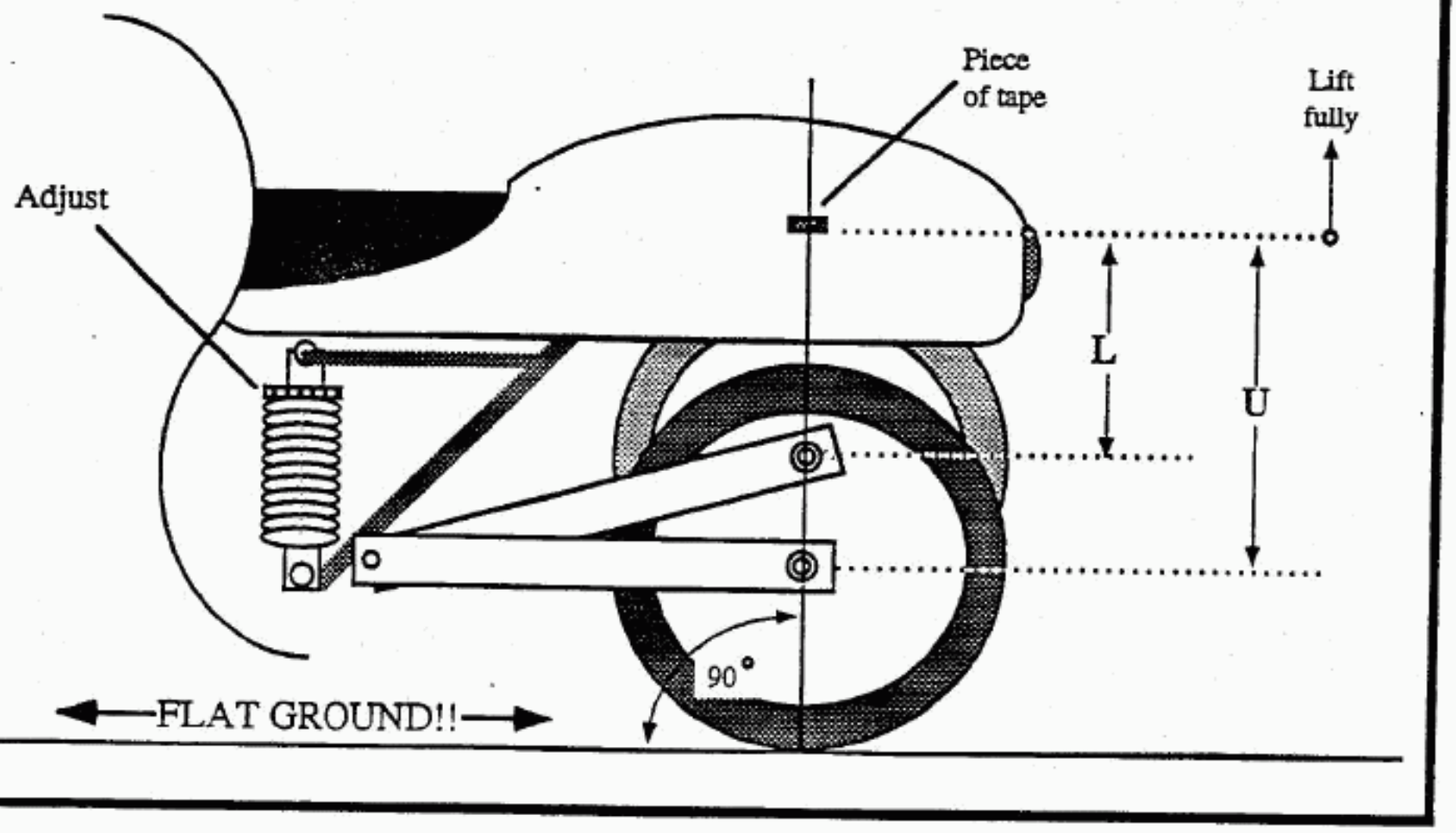
MOTORCYCLE SUSPENSION SETUP WORKSHEET

REAR SUSPENSION:



REAR SUSPENSION:

• **Unloaded distance measurement:** **U =** _____ mm

• **Loaded distance measurement:** **L =** _____ mm

• **Actual sag distance:** **A =** _____ mm **(U - L)**

• **Desired sag distance:** **D =** 26 - 32 mm
- *26 (Track)*
- *32 (Street)*

• Correction amount required: **C =** _____ mm **(A - D)**

• IF C = Positive number: *(too much "sag")*
Turn adjuster "clockwise": ..... (increase preload number) on stock shock 4-> 5, etc...

• IF C = Negative number: *(too little "sag")*
Turn adjuster "counter-clockwise": (decrease preload number) on stock shock 3->2, etc...

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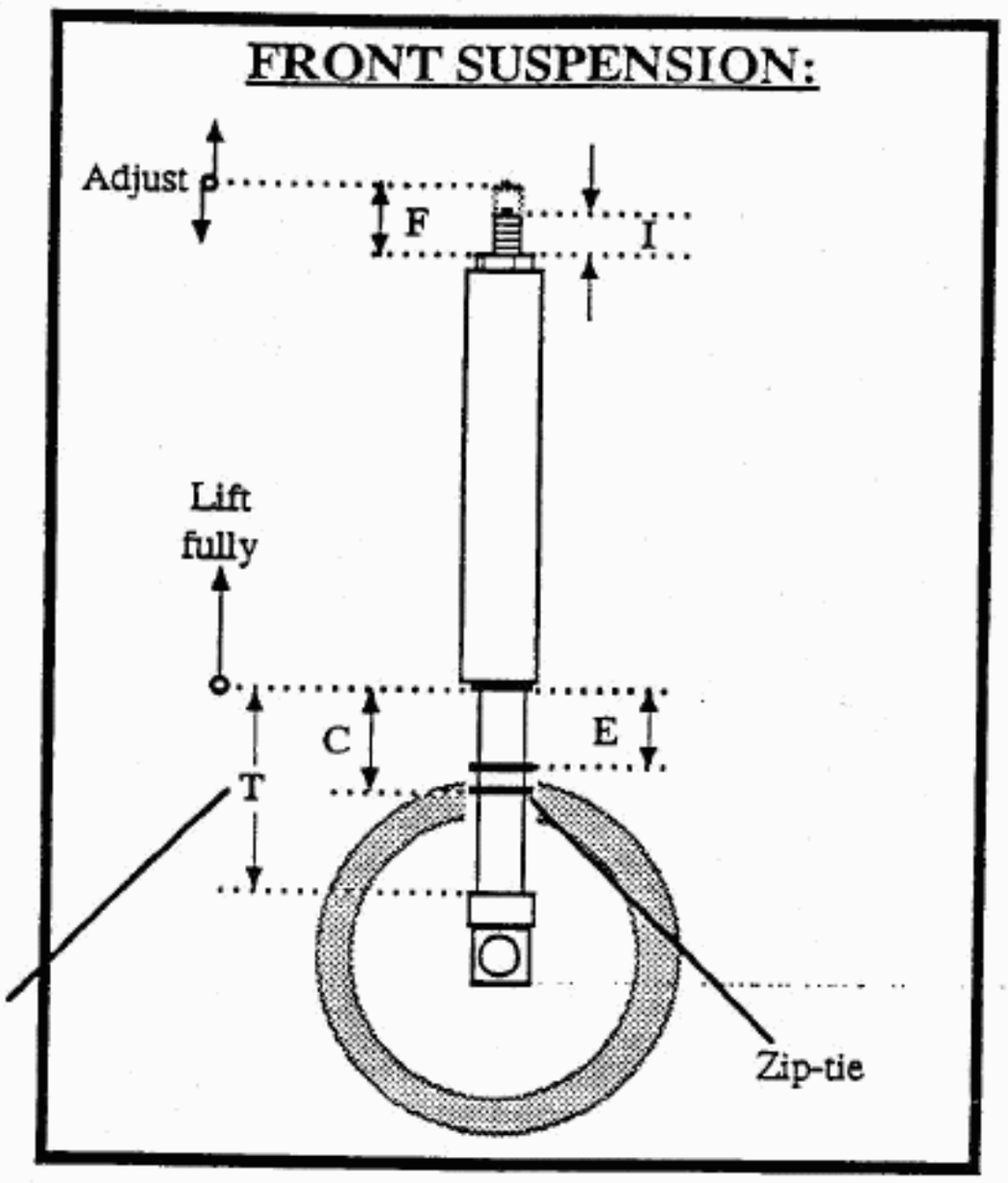
MOTORCYCLE SUSPENSION SETUP WORKSHEET



NOTE:
This static measurement for total travel is possible with "Upside Down" forks ONLY!

FRONT SUSPENSION:

- Travel distance: **T** = _____ mm
- Goal "sag" distance: **G** = _____ mm $\left(\frac{T}{3}\right)$ *"Upside Down" forks ONLY!*

- Goal "sag" distance: **G** = 38 mm *(STREET)*
  ("Conventional" forks) 34 mm *(TRACK)* } *Generic target "Sag" distances:*

- Compression stroke "sag" distance: **C** = _____ mm
- Extension stroke "sag" distance: **E** = _____ mm
- Stiction effect range: **S** = _____ mm (C - E)
- Offset correction for stiction: **O** = _____ mm $\left(\frac{S}{2}\right)$
- Actual sag distance: **A** = _____ mm (E + O)
- Difference in "sag" needed: **D** = _____ mm (A - G)

- Inital preload adjuster distance: **I** = _____ mm
- Final preload adjuster distance: **F** = _____ mm (I - D)

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"COMPRESSION & REBOUND": ADJUSTMENT PROCESS:

FRONT FORKS:

NOTE: Despite the fact that the adjuster screws may have numerous turns available (mechanically), many suspension's only offer any actual change in damping over a very small range (typically the first turn or so out from maximum CLOCKWISE). On such bikes, 1/4 turn increments offer SIGNIFICANT changes in damping!

• COMPRESSION:

1) Turn "REBOUND" adjuster to MINIMUM (all the way "counter-clockwise")

2) Turn "COMPRESSION" adjuster to MINIMUM (all the way "counter-clockwise")

3) Bounce the front end up and down a few times, by standing the motorcycle upright off it's stand, and holding the front brake on, while pressing on the handlebars, to feel settings.

4) Turn "COMPRESSION" adjuster to MAXIMUM (all the way "clockwise", until LIGHTLY seated)

5) Bounce the front end up and down a few times, using the same process, to feel the difference in this setting.

6) Turn "COMPRESSION" adjuster out in HALF TURN increments (keeping track of how many turns have been applied), and repeat the testing process at each step, until you feel the desired "firmness" provided.

7) Write down on a piece of paper this COMPRESSION setting.

• REBOUND:

1) Turn "COMPRESSION" adjuster back to MINIMUM (all the way "counter-clockwise")

2) Bounce the front end up and down a few times, by holding the front brake on, and pressing on the handlebars, to feel the settings.

3) Turn "REBOUND" adjuster to MAXIMUM (all the way "clockwise", until LIGHTLY seated)

4) Bounce the front end up and down a few times, using the same process, to feel the difference in this setting.

5) Turn "REBOUND" adjuster out in HALF TURN increments (keeping track of how many turns have been applied), and repeat the testing process at each step, until you feel the desired "slowness" in rise of the forks provided.

6) Write down on a piece of paper this REBOUND setting.

7) Turn "COMPRESSION" adjuster BACK to the setting established in the previous steps.

8) Bounce the front end up and down a few times, using the same process, to feel if the combined settings are still in the desired range. (Note there is some interactivity between the two settings, and may require some fine tuning of each)

REAR SHOCK:

NOTE: Despite the fact that the adjuster screws may have numerous turns available (mechanically), many suspension's only offer any actual change in damping over a very small range (typically the first turn or so out from maximum CLOCKWISE). On such bikes, 1/4 turn increments offer SIGNIFICANT changes in damping!

• COMPRESSION:

1) Turn "REBOUND" adjuster to MINIMUM (all the way "counter-clockwise")

2) Turn "COMPRESSION" adjuster to MINIMUM (all the way "counter-clockwise")

3) Straighten the motorcycle up off it's stand, and while having someone hold the bike stable from the front, push on the back of the bike to bounce the rear suspension up and down a few times, to feel for the settings.

4) Turn "COMPRESSION" adjuster to MAXIMUM (all the way "clockwise", until LIGHTLY seated)

5) Bounce the rear of the bike a few times, using the same process, to feel the difference in this setting.

6) Turn "COMPRESSION" adjuster out in HALF TURN increments (keeping track of how many turns have been applied), and repeat the testing process at each step, until you feel the desired "firmness" provided.

7) Write down on a piece of paper this COMPRESSION setting.

• REBOUND:

1) Turn "COMPRESSION" adjuster back to MINIMUM (all the way "counter-clockwise")

2) Push on the back of the bike to bounce the rear suspension up and down a few times, to feel for the minimum settings again.

3) Turn "REBOUND" adjuster to MAXIMUM (all the way "clockwise", until LIGHTLY seated)

4) Bounce the back end up and down a few times, using the same process, to feel the difference in this setting.

5) Turn "REBOUND" adjuster out in HALF TURN increments (keeping track of how many turns have been applied), and repeat the testing process at each step, until you feel the desired "slowness" in rise of the forks provided.

6) Write down on a piece of paper this REBOUND setting.

7) Turn "COMPRESSION" adjuster BACK to the setting established in the previous steps.

8) Bounce the back end up and down a few times, using the same process, to feel if the combined settings are still in the desired range. (Note there is some interactivity between the two settings, and may require some fine tuning of each)

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• FINAL VERIFICATION:

1) Straighten the motorcycle up off it's stand, and while having someone hold the bike stable from the front, sit on the bike with both your feet on the footpegs.

2) Stand upright on the pegs, and push downward firmly several times, while observing the rate of compression (front vs. rear) of the bike's suspension travel.

3) The ideal balance between front and rear suspension setup (compression, springrate, and weight bias) is achieved when the bike's attitude remains parallel with the ground, during this testing process.

4) IF one end of the motorcycle appears to lag behind the other in it's compressing travel, the compression or spring settings for the forks or shock will need to be changed (either softer or firmer, depending on the desired result) to compensate.

• WET WEATHER RIDING MODIFICATIONS:

The amount of grip available for the tires, when riding in wet weather conditions, is significantly reduced. This reduction in grip, and the resultant decresase in overall speed, reduces the amount of actual suspension "loading" that is tranferred to the forks and rear shock of the bike.

Therefore to optimize the bikes performance (and safety) in these conditions, ALL of the settings that directly effect the "COMPRESSING" side of the suspension's travel, should be "SOFTENED". This softening process consists of the following:

- DECREASING the amount of "COMPRESSION" damping on the forks
- DECREASING the amount of "COMPRESSION" damping for the rear shock
- DECREASING the amount of "PRELOAD" on the fork springs (INCREASING "SAG")

  . INCREASE "SAG" by approximately 6 mm)

- DECREASING the amount of "PRELOAD" on the rear shock spring (INCREASING "SAG")

  . INCREASE "SAG" by approximately 5 mm)