

RACE TECH

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GOLD VALVE CARTRIDGE EMULATOR INSTRUCTIONS STREET / ROAD RACE

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4 pgs

TOOLS REQUIRED - Long Allen Socket (typically 6, 8 or 10 mm), Air Impact, 5/16" (8 mm) or 1/4" (6mm) Drill and Drill Motor, Tape Measure (metric/inch), Tubing Cutter, Fork Fluid (see DVS)

IMPORTANT NOTE: Most models require different fork springs. Consult www.racetech.com or call Race Tech.

NOTE: If you have aftermarket (non-stock) damping rods fitted in your motorcycle or most vintage KYB & European forks you must use an FPEV ADxx adapter not supplied in this kit. Please call Race Tech Technical Support for details.

NOTE - BEFORE ASSEMBLY CHECK FOR PROPER FIT (SEE STEPS 2 and 6).

1 **Remove the damping rods.** Take the forks off the bike and disassemble them. An air impact and a long Allen socket helps a lot. For stubborn Damping Rod Allen bolts use a drift and beat on the head of the damping rod bolt to jar the threads loose. Unless you are doing a complete overhaul, on most models, you don't have to remove the seals. Simply take the fork spring and the damping rod bolt out, turn the fork upside down and the damping rod will fall out. Some models have washers or circlips on the damping rod that require complete disassembly.

2 **Check the fit of the Gold Valve Emulator** by placing it on top of the damping rod. The step on the Emulator must sit into the large hole in the top of the damping rod and must completely cover it so there is no blow-by (figure 1).

NOTES:

- Some Emulators (FEGV S4301 and S4101) come with sizing circlips. This allows proper fit for more than one ID damping rod. Check to determine if you need to use the sizing circlips by installing the circlip and checking to see if it will fit into the top of the damping rod. The circlip is for location only so there is no blow-by, it does not seal.
- Check the inner diameter of the fork spring. It must be at least 4 mm (0.160") larger than the Emulator Valve Plate OD itself for proper flow (figure 1).
- Non-standard style damping rods include Flat-top and Protruding-top (vintage KYB & Euro models) styles. These require special instructions, special FREV ADxx adaptors. See pg. 3 & Vintage insert
- Models with adjustable rebound: (ZX11 all, 84-93 FJ 1100/1200 all, 88-98 GSX 600F/750 Katana, 96-98 TRX 850, 86-87 VFR 700) Please see the **Special Instructions for Adjustable Rebound Models**.
- Models that have valves that sit where the Emulator goes: (86-87 ZX 1000, 85-87 ZX600) Remove them.

3 **Drill the existing compression holes in the damping rod to 5/16 inch (8 mm) and add additional 5/16" holes so you end up with six holes (3 sets of 2 holes) (figure 1).** When drilling new holes, space them axially (lengthwise) at 10 mm (7/16") increments. Each set of two holes must be perpendicular to the last set so as not to weaken the rod (figure 1). After drilling, chamfer and deburr the compression holes, inside and out. Do not add or enlarge the rebound holes and leave their edges sharp if any exist. Smaller Damping rods found in **31-35mm Vintage forks can use 1/4" (6mm) holes due to their small size.**

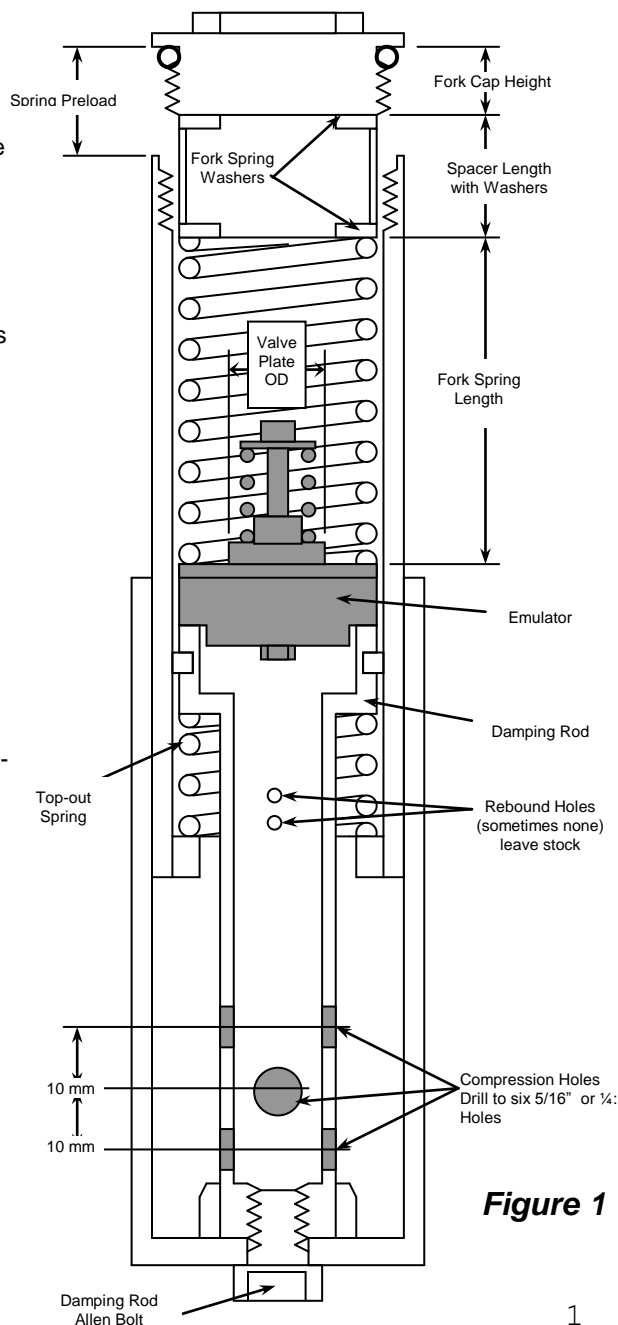


Figure 1

NOTE: If the bike is equipped with an Anti-Dive Mechanism or an External Compression Adjuster, the new holes should be drilled starting just above the Bottom-out Cones (or washers on models with washers). This will bypass the effect of the Anti-Dive but will result in a vastly improved ride. You do not have to disconnect the external Anti-Dive mechanism; it will be disabled with this modification.

- 4 **Check the Emulator Valving.** The standard valving that is pre-installed is a 40 lb/in (blue) or 64 lb/in (yellow) Emulator Valve Spring with 2-3 turns of Valve Spring Preload. (Typically use 2 turns of preload for street, 4 turns of preload for racing) Check the tightness of the jam nut on the Emulator. See Tuning notes for details
 - 5 **Begin reassembling** the forks according to your manual. Remember to install the top-out spring and bottom-out cone if you have chosen complete disassembly. Consult manufacturers specs for damping rod bolt torque.
 - 6 **Set the fork spring preload by making the correct length spacers.** This is done before installing the fork fluid. (See the Custom Valving Setup at www.racetech.com)
 - a. Drop the Emulator down the tube. It sits on top of the damping rod with the Emulator Valve Spring facing up and is held in place with the main fork spring. Refer to figure 1. Visually check to make sure the Emulator is sitting squarely on top of the damping rod or the adapter. If you have flat-top or protruding style damping rods it requires the FPEV AD series adapters (figure 2) and they should be installed first, before the Emulator.
 - b. Extend the fork tube all the way. Insert the fork springs into the fork tube on top of the Emulator. Install a fork spring spacer washer. Place the fork spring spacer tube in next, then another washer.
 - c. Set the fork cap on the washer and determine the preload by measuring from the top of the fork tube to the sealing lip on the fork cap (see figure 1). This is a direct measurement of fork spring preload. Shorten the spring spacer tube to achieve the proper preload; 10-25mm based on sag and rider preference.
- NOTE: If you use the same spring and there is no preload spacer in the forks, it will have more preload and the front end will ride higher. This is not correct.
- NOTE: If one end of the spring has a smaller diameter than the other, the large diameter end should go down against the Emulator.
- NOTE: You must have washers on both ends of the spacer. The spacer must not rest directly on the spring or the cap.
- 7 **Install the fork fluid.** First remove the fork spring and use the oil viscosity recommended in racetech.com. Bleed the fork by pumping them. Install the Emulator and then set the oil level with the forks completely bottomed and the springs out.
 - 8 **Finish reassembly** by installing the spring and spacer. Before you install the cap, re-check the spring preload. This will indicate whether the Emulator is seated properly. Install the fork caps and, with the forks off the bike, push on them, checking for any unusual drag or bind that would indicate an improperly seated Emulator. Install the forks back on the bike. Align the forks on the axle for minimum bind.
- We strongly recommend a quality fork brace for racing applications. Be careful to set the brace width for minimum bind. Torque all the bolts including the brake calipers, pump up the brakes and enjoy!

TUNING NOTES

To adjust the Gold Valve Emulator you must remove it from the fork. When you remove the fork springs use a twisting motion to avoid oil drips. To remove the Emulator, use a parts grabber. Adjust the Emulator Valve Spring Preload a half turn at a time. More Valve Spring Preload will make the forks stiffer. Before installation, be sure the jam nut on the Emulator is tight using a socket.

TUNING VARIABLES - TABLE 1

VARIABLE	STANDARD	OPTIONAL	PRIMARY EFFECT
Valve Spring Preload*	2 Turns (Street use)	0 to 7 Turns	Overall firmness, controlling a mushy feel and the speed the front end dives under braking
Oil Viscosity	US-3 (15wt)	US-1 (5wt) to 30wt 15 or 20wt typical	Use oil viscosity to set rebound, this affects traction and stability. Heavier oil equals slower rebound, lighter oil equals quicker rebound.
Valve Spring Rate	64 lbs/in or 40lbs/in	26, 40, 64 or 101 lbs/in	Overall firmness and the ride on square shaped bumps. Note that most 33-35mm forks work better with the 40lb/in spring starting at 3 turns

* Measured from zero preload (no tension) on the Valve Spring. To find zero preload back off on the adjuster bolt until the spring is loose then tighten it until the spring just touches. More Preload gives more compression damping and a firmer ride. **4 turns of Valve Spring Preload for Racing or for heavy riders.**

Use oil viscosity to set the amount of rebound damping, then adjust the compression with the Emulator settings. The Emulator does not affect rebound, however oil viscosity does. The primary compression adjustment is the amount of Emulator Valve Spring Preload. Increasing Valve Spring Preload makes the fork stiffer. The effect of all the variables will overlap providing extreme tuning flexibility.

SPECIAL INSTRUCTIONS for ADJUSTABLE REBOUND MODELS

Forks with external rebound adjusters require special treatment which involves disabling the external adjustment. *After this procedure you will no longer have external rebound adjustment.* There are two styles: STYLE 1) ZX11's that do not require brazing and STYLE 2) Other models that require brazing. **If you are not experienced with this work STOP!!! DO NOT PROCEED. SEEK OUT A QUALIFIED SUSPENSION TECHNICIAN.**

STYLE 1 – KAWASAKI ZX 11 (all) (does not require brazing)

- 1 This is a very simple modification. **Remove the cap.** The "D" shaped adjustment rod that is attached to the cap must be removed with a hacksaw. **Cut the rod off** within 25 mm (1 in) from the cap.
- 2 Remove the damping rod from the forks. There is an adjuster in the center of the damping rod. Simply **position the adjuster so the damping hole is closed.**
- 3 **Use 5w fork fluid at 160 mm oil level.**
- 4 **Follow the standard installation instructions.** This includes drilling the additional compression holes (located at the bottom of the damping rod).

STYLE 2 – OTHER MODELS THAT REQUIRE BRAZING

- 1 **Remove the damping rods** from the fork tubes.
- 2 **Disassemble the adjustable rebound mechanism** in the top of the damping rod. This is usually operated with a "D" shaped rod connected to the fork cap and operated with a screwdriver. The rebound mechanism is usually held into the top of the damping rod with a wire clip or a standard circlip.
- 3 The "D" shaped adjustment rod that is attached to the cap must be removed with a hacksaw. **Cut the rod off** within 25 mm (1 in) from the cap. The exact length is not critical.
- 4 The damping rod has extra holes originally used for detent purposes. **These must be brazed shut. Once they are brazed they must be filed smooth. The rebound feed hole must also be brazed shut and smoothed down.**
- 5 You may want to **drill a new rebound hole** in the small diameter portion of the damping rod below the head. This is determined by the setting you normally use. For example: if you use the #2 setting, check what size hole is being used when the adjuster is in that position. Use a set of numbered drills and find the corresponding size drill for the rebound hole in the #2 position. Drill a new rebound hole the size you just determined. Locate it 20 mm below the head and lightly de-burr the opening.
NOTE: If you like the rebound damping best when it is set at another setting, like 1,3 or 4, then drill your new rebound hole to the corresponding size for that adjustment.
- 6 **Follow the standard installation instructions.** This includes drilling the additional compression holes (located at the bottom of the damping rod).

MEASURING STATIC SAG - FORKS

Static Sag is the amount the bike compresses from fully extended, with the rider on board.

- 1 Extend the forks completely and measure from the wiper to the bottom of the triple clamp. This is L1.
- 2 Take the bike off the stand, put the rider on board in riding position. 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 friction in the seals 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 friction in the seals the bike would drop a little further.)
- 4 Half way between L1 and L2 is where it would be with no friction. Therefore L2 and L3 must be averaged and subtracted from L1 to calculate true Static Sag.
$$\text{Static Sag} = L1 - (L3 + L2)/2$$
- 5 To adjust Static Sag make longer or shorter preload spacers or use the preload adjusters, if available.

NON-STANDARD INSTALLATIONS

FLAT-TOP or PROTRUDING-TOP DAMPING RODS (CUSTOM ADAPTER REQUIRED)

Before installation, check the fit of the Emulator

by placing it on the top of the damping rod. There are three basic types of damping rods. One that is cupped on the top of the damping rod, second, one that is flat on the top, and third where the damping rod protrudes on top.

On the cupped style, the step on the Emulator must sit into the top of the damping rod. This is the most common style. No adapter is required.

The flat-top style requires an adapter. The adapter sits on top of the damping rod and the Emulator sits on top of the adapter. These adapters are often custom however some of the more common types are available.

The protruding-top style is just like the flat-top style but the adapter must be slightly taller to insure proper flow to the Emulator. **NOTE:** Most vintage 70's Suzuki & Yamaha models with KYB forks require some sort of adaptor, many require damping rod machining, example; Yamaha RD400 Models should have the domed shaped top portion of the damping rod machined away to expose the center flow area of the damping rod, making it a flat-top style & must use FPEV AD3004 Emulator Spacer. RD250/350 damping rod does not require special machining, however the roll pin locating damper piston should be cut down for maxim oil flow. Reinstall portions of roll pin at each side of piston to locate & secure it! Use FPEV AD3003 Emulator Spacer. Many European models will also require similar modifications for proper Emulator fitment.

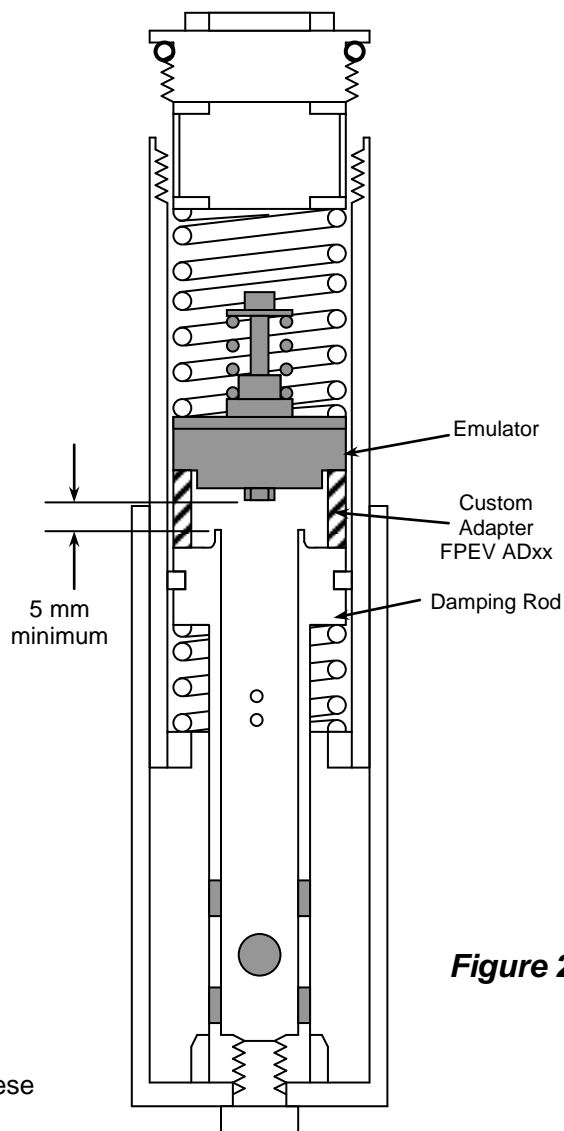


Figure 2

CUSTOM ADAPTER BASIC DESIGN

Since there are many configurations of the top of the damping rod these guidelines will not apply to all applications. Please call the Technical Support Hotline 951.279.6655 for assistance. You may also visit www.racetech.com product search for your model; see the Fork Comments at the top of the page for details on your model.

Select the proper Emulator (fits into the tube and clears by 0.5 mm (0.020") minimum).

Material - Aluminum

Adapter Outer Diameter – Same as the Emulator Outer Diameter

Adapter Inner Diameter - 0.5 mm (0.020") larger than the Step Diameter of the Emulator

Adapter Height – The adapter must be tall enough to allow 5 mm (0.200") clearance between the top of the hole in the damping rod and the bottom of the jam nut on the Emulator. (Figure 2) Pre-made Emulator Spacers are available: FPEV AD 3003 standard style, FPEV AD3004 custom style center