ROCK SHOX®

JUDY®

CARTRIDGE SYSTEM

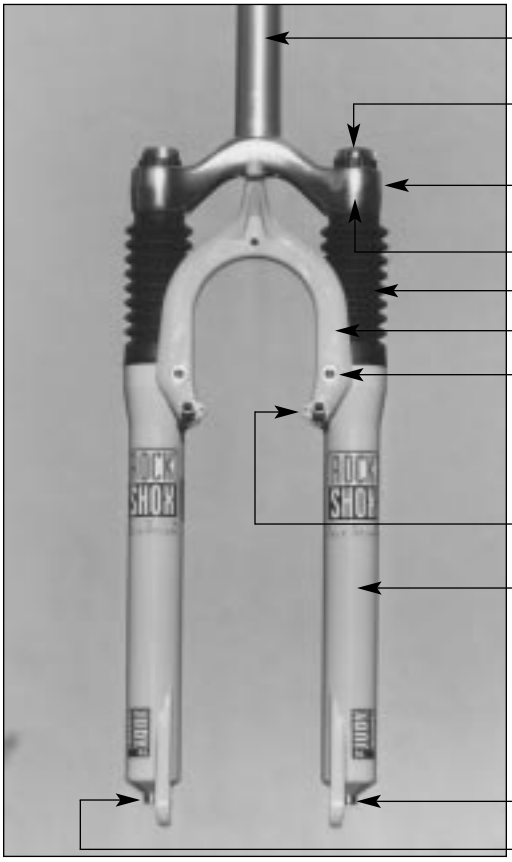
SERVICE MANUAL
1996

For Judy XC, SL, DH and FSX Forks

RockShox, Inc. 1.800.677.7177

INTRODUCTION

ROCK SHOX JUDYS– The Judys are designed as a modular system. The multicellular urathane (MCU) springs and damper cartridge are easy to tune, remove and replace. With the adjustment available almost any ride quality can be achieved.



REQUIRED TOOLS

COMMON HAND TOOLS:

- 2, 4 & 5mm hex keys
- Snap ring pliers
- Small straight blade screwdriver
- Soft face mallet
- Safety glasses

SPECIAL ROCK SHOX TOOLS:

- Bushing installer tool
- Bushing remover tool
- Judy bushing puller adapter ring
- Mag seal puller tool
- Cartridge Service Tool Kit
- Shaft Guide Tool

MISCELLANEOUS:

- High quality bearing grease (Judy Butter or Non-Lithium)
- Fishing line or Mag 21 Seal O-ring
- RockShox Fork Oil (8 or 5 wt.)

REGULAR MAINTENANCE

1. Routine maintenance of Judy forks consists of keeping the forks clean externally. After every ride, wipe down the outside of the fork.

2. Approximately once a month and/or every 40 hours of riding, inspect the fork for damage (crown, brace, upper tubes, lower tubes.)

3. Also check the torque of the crown bolts, lower tube bolts, brace bolts and brake posts.

4. The aluminum upper tubes, the MCU spring stacks, and the bushings in the lower tubes should be lubed at this interval.

REMOVING MCU STACKS

Figure 2A

1. To lube MCU spring assembly, first loosen the 5 or 6mm crown bolts using a 4 or 5mm allen wrench respectively, then unscrew top cap assembly counter-clockwise and pull top cap and MCU spring stack out (fig. 2A and 2B).

2. Unsnap the MCU springs and/or spacers from the Judy Jax and clean off old grease with a rag and degreaser such as Pedro's (fig. 2C).

3. Now reassemble the stack and, using a rag or your fingers, apply a coating of grease to the entire MCU spring stack. Reassemble by screwing top cap assembly back into upper tube and tighten crown bolts to 60 in/lbs of torque (very snug but not super tight).

Figure 2B

Figure 2C

REMOVING AND GREASING LOWER TUBES

Figure 2D

1. To lube upper tubes and bushings the lower tube/brace assembly must be removed. First, disconnect front brake cable and remove front wheel.

2. Using a 5mm hex wrench, remove 6mm bolt at bottom of each lower tube. See fig. 2D. It may be necessary to add preload to the spring stack in order to break the 6mm bolt loose. Add preload by turning the adjuster knobs clockwise and/or compress the fork.

Figure 2E

3. After removing both 6mm bolts, pull lower tube/brace assembly free of upper tubes. See fig. 2E.

4. Use a clean, lint-free rag and degreaser to clean the aluminum upper tubes. Clean bushing surfaces inside magnesium lower tube with a clean, lint-free rag. Be certain to reach lower bushings (cont. next page)

REMOVING AND GREASING LOWER TUBES (Cont.)

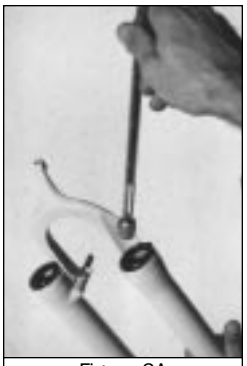


Figure 3A

located 7" inside lower tube (a long 3/8" drive extension or screwdriver works well for this).

5. Apply a light coating of grease such as Judy Butter to the clean bushings (again, a long 3/8" extension without the rag this time works well for lower bushings). See fig. 3A.

NOTE: DO NOT USE LITHIUM-BASED GREASE.

6. Next, apply a light coating of grease to upper tubes (Fig. 3B) and internal lip of dust wiper located on top of each lower tube (Fig. 3C). The primary cause for a sticky Judy is a dry and/or dirty dust seal rubbing on a dry and/or dirty upper tube.


Figure 3B


Figure 3C

REINSTALLING THE LOWER TUBES


Figure 3D

1. Slide lower tube/brace assembly gently over upper tubes, taking care not to damage dust wiper or lower bushing. (Fig. 3D)

2. Apply medium threadlock such as blue Loctite 242 to threads of 6mm bolts and, using a 5mm allen key, reinstall them through the lower tubes, engaging threads in cartridge and/or neutral shafts.

3. Torque to 60in/lbs. If bolts do not thread into cartridge and/or neutral shafts, check to see if upper tubes have engaged lower bushings. It may be necessary to spread lower tube/brace assembly apart slightly or gently rock assembly side to side while getting lower bushings to mate with upper tubes. **DO NOT FORCE.** Be sure to push protective boots into their retaining grooves on the lower tubes.

TUNING VARIABLES

Judy forks can be tuned to your particular weight, riding style and terrain. Start by tuning the spring stack to achieve the correct ride height. (Please refer to the illustration in the back as a reference for the parts used in the following descriptions.)

RIDE HEIGHT ADJUSTMENT

Judys are designed to compress (droop or sag) when you are sitting with your weight on the bike. Sag allows the front wheel to stay in contact with the ground when braking and cornering over rough and uneven terrain. Adjust preload and/or change spring stack to maintain correct ride height. For example, set preload adjusters to zero (full counter-clockwise) and sit on the bike. If fork compresses 15mm (too much sag), turn preload adjusters clockwise, one click on each side at a time, until desired ride height is achieved. The nominal sag dimensions are: 7-10mm for 75 and 80mm travel; 5-8mm for 60mm travel; 2-5mm for 50mm travel.

SPRING TUNING

To tune the MCU spring, unscrew the top cap assembly (see exploded view in Small Parts Catalog or Owner's Manual) Remove spring stack. By using different combinations of the soft (red), the firm (blue) springs, and the solid spacer, almost any spring rate you desire is possible. Simply separate the standard springs from the JUDY JAX™, then reassemble the new combination of firm and soft springs you would like to try.

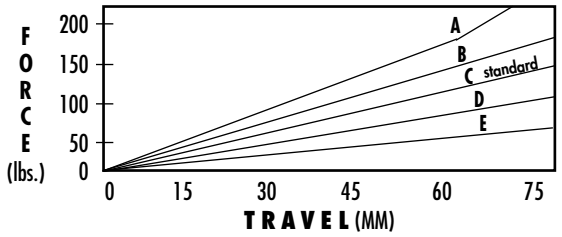


figure 4A

A = 5 firm/1 solid
B = 6 firm
C = 5 firm/1soft
D = 4 firm/2 soft
E = 3 firm/3 soft

SPRING PRELOAD

The preload adjuster knobs control the amount of fork sag (preload on the spring stack).
Turn the adjuster knob clockwise to increase the preload on the microcellular spring and reduce sag.
Turn the adjuster knob counter-clockwise to reduce the preload on the spring and increase sag.

COMPRESSION DAMPER TUNING

A single cartridge in the left leg provides the damping for the entire fork(except the DH.) Kits with different travel options (2"/50mm adjustable, 2.5"/60mm adjustable, and 3"/75mm adjustable are available for XC and SL models only). The DH is available in 80mm adjustable only. The damper unit has a wide range of adjustment. Insert the enclosed 2mm hex key through the hollow shaft bolt in the bottom of the left leg (see exploded view at end of English section.) Turn the hex key clockwise to increase the compression damping. Turning the hex key counterclockwise will decrease the compression damping. There are two full turns of adjustment available from full clockwise. **DO NOT TURN ADJUSTER MORE THAN TWO FULL TURNS COUNTER-CLOCKWISE.**

REBOUND DAMPER TUNING (DH only)

A cartridge in the right leg provides the rebound damping for the DH fork. The damper unit has a wide range of adjustment. Insert the enclosed 2mm hex key through the hollow shaft bolt in the bottom of the right leg (see exploded view at end of English section.) Turn the hex key clockwise to increase the rebound damping (slow the return stroke.) Turning the hex key counterclockwise will decrease the rebound damping (speed the return stroke.) There are four full turns of adjustment available from full clockwise.

BUSHING REMOVAL


Figure 5A

The high quality Garlock DU bushings are designed to outlast many months of hard riding. The protective boots, a clean fork and timely greasing are keys to long bushing life. However, like all moving parts, bushings will eventually wear and need replacement. Increased fore and aft movement of upper tubes in lower tubes (similar to a loose headset) and slow action, even after a fresh greasing, signals the need to remove and replace bushings.


Figure 5C

1. First, remove lower tube/brace assembly as detailed in previous section, REMOVING LOWER TUBES.


Figure 5B

2. Remove brakes as per manufacturer's instructions.

3. Next, remove fork brace by unscrewing 6mm fork brace bolts with an appropriate hex wrench and unscrew 8mm brake boss bolts with an open end wrench. Remove the dust seal with a small, flat-blade screwdriver.

4. Slide Judy bushing puller adapter tool over aluminum end of a Mag seal puller tool. Insert bushing puller tool inside lower tube and engage lower edge of upper bushing with lever of tool. See figure 5A.

5. Slide seal puller tool over handle of the bushing puller until it sits on lower tube. See figure 5b.

6. Invert the entire assembly with tool engaged with bushing and clamp puller tool handle in vise. Now, unscrew seal puller tool by hand or by using 32 and 36mm headset wrenches until the upper bushing has pulled free. See figure 5C.

7. Repeat this procedure for lower bushing.

8. Repeat this entire procedure for other lower tube. Clean the inside of each lower tube to remove dirt and old grease.

BUSHING REPLACEMENT


Figure 5D

1. Looking at your replacement bushings, determine which bushings have the large outer diameter. These are upper bushings, set them aside.

2. Take one smaller outer diameter (lower) bushing and lube interior and exterior surfaces with Judy Butter or other non-lithium high quality bearing grease. Place bushing over end of bushing installer post with sleeve and spacer in place. See figure 5D and illustration 5E.

3. Place lower tube without dust wiper over this assembly and insert mallet drift into counter-bore of lower tube.

4. Using a soft mallet, gently tap drift until lower tube bottoms on bushing installer tool base. See figure 6A.

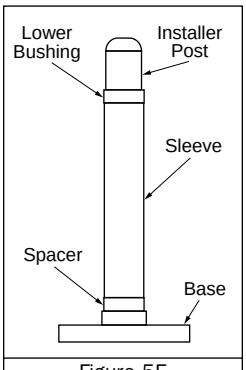


Figure 5E

BUSHING REPLACEMENT (Cont.)


Figure 6A

5. Remove lower tube and slide sleeve and spacer off of the end of the installer tool. Slide a new, greased upper bushing (with the larger O.D.) onto the installer tool. (See figure 6B.)

6. Use a soft mallet to gently tap upper bushing into lower tube until lower tube bottoms on bushing installer tool base.

7. Repeat this entire procedure for other lower tube.

8. See the previous section *REINSTALLING THE LOWER TUBES* for details on reinstalling the lower tubes.


Figure 6B

9. After installing lower tubes, reassemble fork brace being sure to use medium strength threadlock (blue 242 Loc-tite) on fork brace bolt and brake post threads.

CAUTION: USE ANTI-SEIZE ON ALL TITANIUM FASTENERS! ⚠

10. Torque all bolts to 60 in/lbs. Remember to check torque every month or every 40 hours of riding. Reinstall brakes per manufacturer's instructions.

CHANGING TRAVEL


Figure 6C

Judy XC, SL and FSX models are capable of having any of three travels that are available: 2" (50mm), 2.5" (60mm), or 3" (75mm). The list below gives part numbers for different cartridge kits available: (cartridge kit=cartridge and neutral shaft)

2.0" (50mm) adj. cartridge kit 59053
2.5" (60mm) adj. cartridge kit 59054
3.0" (75mm) adj. cartridge kit 59055

The standard MCU spring stack may need to be adjusted when travel is changed. MCU spring kit part number 59043 includes 2 solid, 4 blue, 4 red springs. See previous ***REMOVING MCU STACKS*** section for details on changing MCU spring stack.


Figure 6D

1. To change damper cartridge and neutral shaft, start by removing lower tube/brace assembly (see previous section, REMOVING LOWER TUBES for details). With lower tubes removed, use internal snap ring pliers to remove snap ring on end of each upper tube. See figure 6C.

CAUTION: MAKE SURE THE FORK HAS BEEN AT REST FOR A MINIMUM OF 15 MINUTES BEFORE REMOVING SNAP RING. ⚠

2. Next, grab end of each shaft and gently pull cartridge and neutral shaft assembly free of each upper tube, one at a time.

3. Prior to installing new damping cartridge into left upper tube, make certain that cone-shaped shaft end plate is installed on shaft end that is NOT threaded to accept a 6mm bolt.

4. Install a plastic cartridge washer onto other end.

CAUTION: BE SURE TO PROPERLY INSTALL CARTRIDGE WASHER BETWEEN THE CARTRIDGE AND RETAINING CLIP. ⚠

CHANGING TRAVEL (Cont.)


Figure 7A

5. Slide cartridge into upper tube with end plate side first.

NOTE: On '96 SL forks, make sure the cartridge stop clip is properly seated in its groove within the upper tube.

6. Reinstall snap ring, sharp outside edge facing out. Make certain cartridge washer is in place, snap ring is oriented correctly and fully engaged in groove of upper tube.

CAUTION: IT IS VERY IMPORTANT THAT THE SNAP RING IS CORRECTLY INSTALLED AND FULLY ENGAGED IN THE UPPER TUBE. IF THE SNAP RING WORKS ITSELF LOOSE, THERE WILL BE A SEAL FAILURE IN THE CARTRIDGE AND THE HYDRAULIC FLUID WILL LEAK OUT.

7. Repeat this entire procedure to install neutral shaft assembly of matching travel length in right upper tube. See figure 7A for the correct sequence of neutral shaft assembly parts.

8. After installing cartridge and matching neutral shaft assembly, reinstall lower tubes. See *REINSTALLING LOWER TUBES.*

CARTRIDGE SERVICE SECTION

INTRODUCTION

ROCK SHOX JUDY CARTRIDGE– The Judy damper cartridge is designed to be fully servicable and tuneable. Use the proper tools and procedures to keep Judy cartridges operating properly. The best performing cartridges have the least amount of air inside. Keep this in mind when servicing your cartridge.

CARTRIDGE DISASSEMBLY AND OIL CHANGE


Figure 7B

1. Remove the cartridge from the fork. See previous section, ***Changing Travel***, for details on removal.

2. Slide off the plastic cartridge washer. Hold the cartridge over an oil recepticle with the exposed seal end down and tap the damper shaft with a mallet, firmly holding the cartridge body, to press the seal out of the cartridge body. (Fig. 7B) Once the seal is exposed, drain the oil from the cartridge into the oil container.

3. Pull the damper shaft free of the cartridge body. Inspect the damper shaft for nicks or scratches that may cause oil leakage. Replace assembly as needed.

4. Inspect the inside bore of the cartridge body for scoring or scratches that may cause oil leakage. Replace cartridge body as needed.

Continued on next page

CARTRIDGE DISASSEMBLY (CONT.)


Figure 8A

5. For adjustable compression cartridges unscrew the adjuster rod completely with a 2mm hex and remove from the damper shaft. (Fig. 8A)

CAUTION: REMOVE THE ADJUSTER ROD GENTLY TO AVOID DAMAGING THE ADJUSTER ROD O-RING ON THE THREADS OF THE SHAFT WHEN REMOVING. ⚠

Note: The adjuster rod in the DH rebound cartridge is not removable.

6. Clean the following parts with a clean, lint-free rag: damper shaft, seal, cartridge body.

7. Press upper seal out of cartridge body by using a 2mm hex key, alternating through the four access holes in cartridge body. Finish seal removal using a flat-blade screwdriver through the shaft hole.

WARNING: USE EXTREME CARE NOT TO DAMAGE THE CARTRIDGE BORE. ⚠

8. For DH cartridges, remove top retaining clip and plastic shaft guide washer to allow seal to be pressed out through top of cartridge using upper seal installation tool.

Note: Some 50mm and 60mm cartridges use a plastic spacer located inside or outside upper seal.

9. Identify whether piston has an O-ring or a piston glide ring (pistons with three ports have an O-ring, pistons with four ports have a glide ring). For pistons with an O-ring, remove and replace the O-ring and inspect rebound plate (white plastic washer) for freedom of movement. If plate is not free, replace assembly. For pistons with a glide ring, inspect ring for nicks and scratches and that it shuttles freely on the piston. Replace as needed.

Note: The piston shaft is available in assembly form only. Do not disassemble.

10. Remove and replace adjuster rod O-ring. Grease liberally prior to installation onto adjuster rod.

11. For 50 and 60mm cartridge assemblies, determine which cartridge body you have.

50mm 4.59" body (PN43101) and 1" spacer (PN42265) or 3.59" body (PN43105)
60mm 4.59" body (PN43101) and 1/2" spacer (PN42266) or 4.09" body (PN43104)
This will help you determine which cartridge body you may need to order.

CARTRIDGE ASSEMBLY


Figure 8B

1. Lightly coat inside of cartridge body with RockShox oil. If a spacer was used, reinstall it into the cartridge. Apply grease to a new upper cartridge seal inside and out. Slide seal, pocket-side down, onto upper seal installation tool. Press the seal into seal bore of cartridge until fully seated (Fig. 8B). Remove upper seal installation tool.

2. For DH cartridges, reinstall retaining ring, sharp side out, and make sure it is fully seated into its groove. Next, reinstall plastic shaft guide and then press upper seal into cartridge bore, as previously described. Make sure seal is fully seated, as plastic shaft guide should not be loose in the cartridge.

Continued on next page

CARTRIDGE REASSEMBLY (CONT.)


Figure 9A

3. Insert shaft guide tool into cartridge body and seal. (Fig. 9A) Place assembly into cartridge body fixture. (Fig. 9B) Fill cartridge 1/2 full with RockShox oil. Apply oil to piston O-ring or glide ring and insert piston shaft assembly into cartridge, mating shaft with shaft guide tool. Then push piston/shaft assembly through the upper seal forcing shaft guide tool out. (Fig 9C)

4. Lift entire cartridge body fixture and remove shaft guide tool from bottom side, taking care not to lose any oil from the cartridge. (Fig. 9D)


Figure 9B


Figure 9C

5. Push piston/shaft assembly into cartridge body until it stops. Add more oil until it's about 2/3 full, using care not to pull shaft back through the seal and the piston out of the oil. Cycle piston/shaft assembly several times until no air bubbles are seen in the oil. (Fig. 9D)

6. Push piston/shaft assembly fully into cartridge body until it stops.

7. Install top-out O-ring and seal washer onto shaft.

8. Fill cartridge body fully with RockShox oil.


Figure 9D


Figure 9E

9. Apply grease to new seal, inside and out, fully filling pocket of seal with grease.

10. Using your fishing line or cut main seal O-ring (PN 51104), place in I.D. of seal. (Fig. 9E)

11. Carefully install this seal assembly, pocket-side down, over shaft, being careful not to damage sealing lips on the flats of shaft and maintaining orientation of fishing line between seal and shaft. (Fig. 9F)

Note: Make sure fishing line does not get caught between cartridge body and seal O.D.


Figure 9F


Figure 9G

12. Place seal installation tool over exposed shaft and press seal into cartridge body, leaving 1mm of seal exposed above cartridge body lip. (Fig. 9G)

CAUTION: HOLD A RAG AROUND LOWER SEAL INSTALLATION TOOL AS OIL WILL BE FORCED OUT THROUGH THE VENT HOLES OF THE TOOL.

Note: The lower seal can be pressed in too far. Leave 1mm exposed.

13. Remove fishing line from seal.

Continued on next page


Figure 10A

14. Adjustable cartridges only: Fill exposed adjuster rod shaft full with oil. (Fig 10A)

15. Using a 2mm hex key, install adjuster rod with new O-ring that is liberally greased. Thread into exposed shaft until rod bottoms out.

CAUTION: USE CARE WHILE INSTALLING ADJUSTER ROD TO PREVENT DAMAGE TO O-RING THREADS IN SHAFT.

Hint: Spin adjuster rod as O-ring contacts shaft, effectively threading O-ring through the 6mm threads.

16. See ***Changing Travel*** for reinstalling cartridge into upper tube.

Note: Be sure to properly install a cartridge washer between cartridge and retaining clip.

Warranty

RockShox, Inc. warrants its forks for a period of one year from original date of purchase to be free from defects in materials or workmanship. Any RockShox fork that is returned to the factory and is found by RockShox to be defective in materials or workmanship will be repaired or replaced at the option of RockShox, Inc. This warranty is the sole and exclusive remedy. RockShox shall not be held liable for any indirect, special or consequential damages.

The warranty does not apply to forks which have not been properly installed and adjusted according to RockShox installation instructions. The warranty does not cover any fork that has been subject to misuse or whose serial number has been altered, defaced or removed. This warranty does not cover paint damage or modifications to forks. Proof of purchase is required.

WARRANTY REPAIR

If for any reason it should be necessary to have warranty work done, return the fork to the place of purchase. In the USA, Dealers should call for a Return Authorization (RA#) prior to returning product. Products returned for inspection must be sent freight prepaid to:

RockShox, Inc.
401 Charcot Ave.
San Jose, CA 95131
408.435.7469
FAX 408.435.7468

Customers in countries other than the USA should contact their dealer or local distributor.