Notes for

Bike Basics for Safe and Comfortable Spring Riding

by Tim Potter, Manager, MSU Bikes Service Center

for MSU Evening College

Spring 2012

These notes are online at the following address with active links:

www.bikes.msu.edu/index.cfm/safety-and-education/bike-classes/

Introduction:

- Bike work history (EL Bike Co-op., started own shop in parent's basement with 100 bikes from MSU Salvage auction; bought out Weathervane's bike parts/ tools; Gene's Raleigh, Island Schwinn, Denny's Schwinn EL; volunteer work with MSU Bike Project; current manager of MSU Bikes).
- Family connections to bicycling (brothers & father; father & brother-in-law in Japan [retired pro cyclists]).
- Webmaster and board member, Ride of Silence, Dallas, TX (www.rideofsilence.org)
- Co-founder of Campus Bike Programmers Network (www.universitybikeprograms.org)
- Chair of bike & pedestrian safety sub-committee on All University Traffic and Transportation Committee, advisory committee to Dr. Fred Poston, VP of Finance and Operations, MSU.

Tim pictured here with his in-laws in Japan in the early '80s.

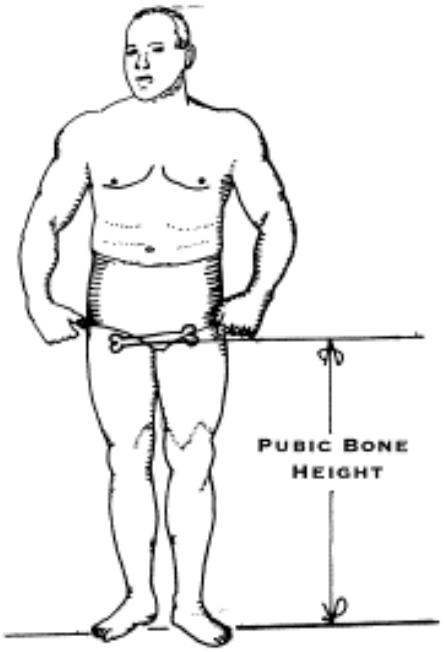
Easy Ways to Improve Your Bike's Performance & Reliability

1. Check Your Bike For Proper Sizing & Fit - If it's Uncomfortable, Modify It!

A. **Saddle height:**

Seat to pedal is most important, not seat to ground. 90% of your time is spent pedaling your bike, not sitting in the saddle with your feet on the ground, right? Proper extension of the leg allows for maximum leg muscle utilization/ output. Seat too low will result in premature tiring, slower speeds, sore or injured knees. Seat too high will result in sore rear-end/ excessive chaffing, uncomfortable ride, premature tiring & sore knees (different area

B. **Stand-over height**: When you stand over your bike's frame (assuming it's a traditional level top-tube design frame), ideally you should have only about 1 inch of clearance between the bike frame and your pubic bone.[1]



C. **Seat angle**: If the nose of your seat is too low, too much of your weight will be pushed onto your arms/ wrists resulting in numbness in hands, premature tiring of your arms, sore neck, etc. Nose of seat too high will result in possible loss of circulation to privates for men & women as well[2], general rear-end pain. You want the saddle at least parallel to the ground; tilt it back slightly as you age to relieve forearm weight and help keep your body more upright.

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[1] Rivendell's article: "about bike sizing *i*n general"
http://www.rivbike.com/how_to_pick_your_bike/choosing_a_frame_size

[2] "Gulp! 63xc.com looks at the 2003 Bicycle Saddle Report" http://www.63xc.com/willm/bike_sexhealth.htm
"Impotence warning hits Bike Week" http://news.bbc.co.uk/1/hi/health/2991088.stm

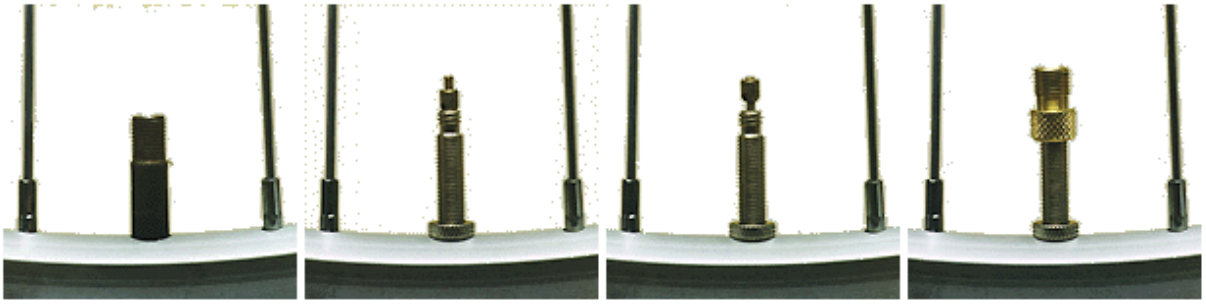
D. **Stem/ bar height/ distance from seat**:

Great example of a bike setup for comfortable riding; a lovely Rivendell Atlantis.

The distance from your seat to the handlebars and the height of your handlebars is a very important measurement for assuring maximum upper body comfort, and an enjoyable ride. Too far out and you'll be mistaken for a bike racer (great for maximum speed by reducing wind resistance, but requires a great deal of upper body strength/ stamina to maintain); too close to the seat and you won't be able to breathe as well, nor can you ride up hill as well when you're out of the saddle climbing. In general, having the handlebars at least as high as your seat or higher will give you a comfortable ride. As Grant Peterson of Rivendell says "Handlebars too low cause 90 percent of the discomfort people suffer." No need to buy a new bike if you have an older road-racing style bike with drop bars; plenty of options for different size/length stems and bars are available to convert it to a comfy touring/ city/ commuter bike for very little expense. There are even a good variety of stems and seatposts available which have some suspension built in to make your ride even smoother if you find your hands or rear-end getting sore/ numb while riding.

2. **Keep Your Tires Properly Inflated**

This is the cheapest (FREE!) way to speed things up on any bike (sorry, I like to go fast!) or to make it easier for you to ride longer with less effort. Every tire has the optimum tire pressure imprinted on its sidewall; this is the best pressure for dry pavement (run your tires considerably softer in the winter for better traction). Bike tires naturally lose air rather quickly; check them often. You'll also reduce the chances for serious damage to your rims/ rim-pinch flats from hitting potholes, etc. Some valve types are also prone to more air leakage than others especially if they're not used correctly. Here's the various types in use:



Schrader valve | Presta valve closed | Presta valve open | Presta valve with adaptor

3. Use the Right Tires for the Conditions/ Purpose

If you're finding your bike ride jarring and harsh try larger/ fatter tires at lower pressures to soften the ride and improve your comfort without sacrificing a lot of money for suspension forks, etc. or performance (new research has shown that larger, lower pressure tires are actually faster on rough pavement – see Bicycle Quarterly's 2 excellent blogs for more detailed info on this topic: Dangers of Narrow Tires & Downsides of Wider Tires). It's best to have your bike checked out at a bike shop for their recommendation on how large/ fat a tire size your bike will take as every bike has different limitations to the maximum tire size. While you're at it, consider getting tires with Kevlar belting to virtually eliminate flats which is great esp. if you're a commuter (not to be confused with Kevlar beaded tires which allow you to fold tires and makes them lighter, but doesn't do anything to protect from flats).

If you find that you're riding a mountain bike mostly on road or smooth trails then get rid of the knobby tires and

install some slick or semi-slick tires (see photo below) to greatly improve your speed, efficiency and fun.

If you're riding in bad weather (snow/ ice) definitely get tires with knobbies (see photos below; you can get them in narrow 700c or 27" sizes too); you can even get carbon-steel studded tires to keep you upright and in control in the worst conditions. It only takes 20-30 min. to change tires (with some practice) when the seasons change; you'll be glad you did!

Every tire manufacturer has their recommended inflation range printed on the sidewalls. These are generally the best air pressure rates for warm-dry weather riding on pavement; when riding in the winter on ice/ snow or going off-road in soft trail conditions dropping these pressures to 2/3 or even 1/2 the recommended pressure on the sidewall will give you much better traction.

4. **Keep Your Drivetrain Properly Lubricated**

   A properly oiled chain is essential to cycling joy. Nothing ruins a ride quite like listening to your chain squeaking constantly (or at least ruining your partner's ride!). Use a Teflon-based oil, preferably one recommended or bought at your local bike shop (TriFlow brand oils are great). WD-40 is NOT for chains or anything else on your bike, except for loosening up rusted-on parts. Motor oil for your car will work in a pinch, but will end up attracting more dirt/ dust to your chain and making a complete mess of your bike. Always wipe off excess after you've applied any oil to your chain for the same aforementioned reason. Be sure you don't get any oil on your rims or you'll find you have no brakes (for this reason, best to use a drip-style oil instead of aerosols which produce a lot of overspray). If you've possibly got ANY oil on your rims you should use a clean towel/ rag and some brake-cleaning fluid or degreaser (or even dish-soap if you don't have any of the above) and wipe down your rims before riding or testing your brakes.

5. **Replace Your Chain Every Season (if you're riding a lot) or Two**

   Chains wear out more quickly than you'd think over time and start to wear your gears out prematurely which cost a lot more money to replace than chains. Keeping your chain as clean as possible will extend the life of your chains and gearing. So, be sure to wipe off excess oil from the outside of your chain after lubing it with correct lube.

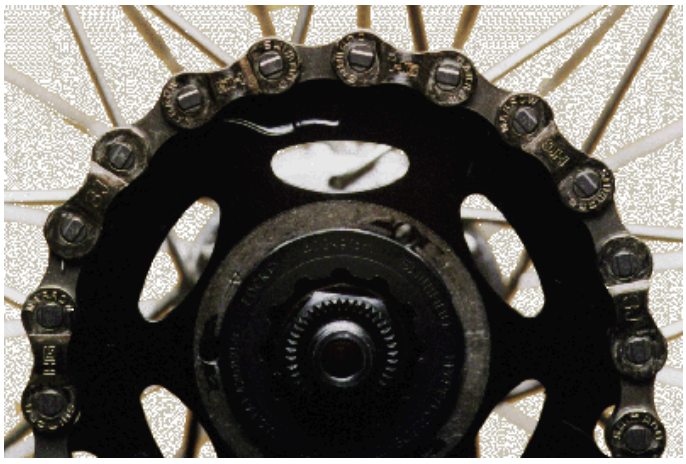
   If you can lift your chain off your large chainwheel then your chain is worn-out and needing replacement. If your chain skips under load (when you're taking off from a light or pedaling up a hill) especially in the smaller freewheel cogs, then you need a new chain and generally a new freewheel/ cassette. The more often you change your relatively cheap chain the longer your freewheel/ cassette will last. On more expensive freewheels/ cassettes the individual cogs can be replaced for a considerable savings over replacing the whole unit. Flip your chain over to give your chain essentially double the life in some cases. After some years of heavy riding chainwheels will also start to get hooked and need replacement. You'll start to know when your chainwheels need replacement when "chain suck" starts to occur when shifting between chainwheels. Read more detailed info. on "chain suck" and how to prevent it in this article: http://fagan.co.za/Bikes/Csuck/

   The Best Chain Lube(s)?

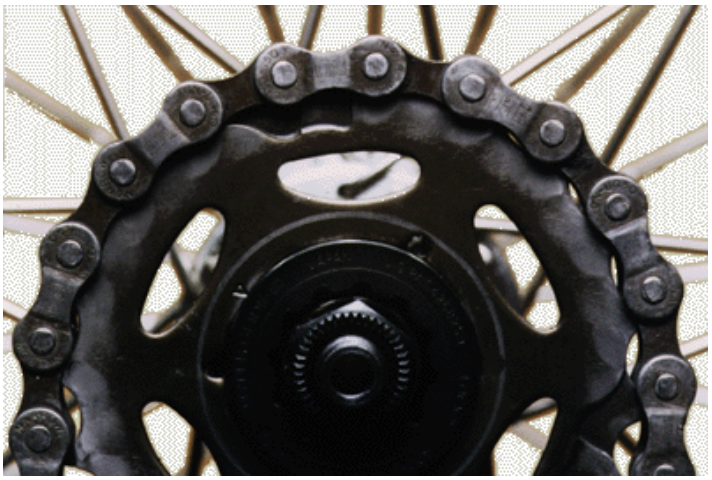
   There's really no one best chain lube for everything. Most shops (like MSU Bikes) use Tri-Flow's Superior Lubricant (contains Teflon); it's best to use a drip-style bottle on the side of the chain that comes into contact with the cogs/ then wipe off all excess oil. Aerosol spray cans should be avoided as you'll often get overspray onto parts (like your rims) that will cause serious problems, not to mention attract more dirt/ grime to those parts that are coated in oil. For cold-weather riding use a thicker lube (we use Pedro's Syn Lube in our Center; Pedro's also makes some of the only environmentally friendly lubes on the market, like their Go! and ChainJ lubes) which won't wash off as easily from road salt/ slush, etc. Before riding or testing brakes ALWAYS wipe down your rear wheel rim with a degreaser (we use brake cleaner fluid) for any oil that might have accidentally dripped on it which could cause use to lose your brakes! **Note:** Tri-Flow also works great for lubing other areas of your bike that require regular lubing (derailer pivots, etc.).

Some excellent illustrations from Sheldon Brown's article on chains: http://www.sheldonbrown.com/chains.html

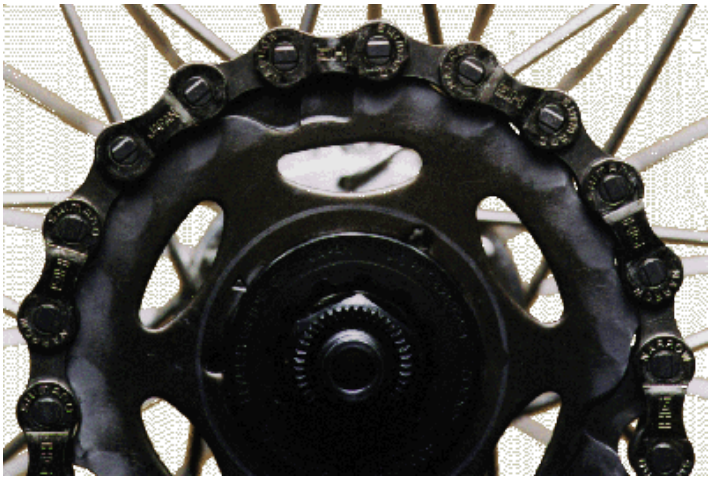
The illustration above shows two formerly identical sprockets, viewed from the right side. The one closest to us is badly worn. On a new sprocket tooth, the surface that the roller presses against is perpendicular to the pull of the chain. The worn teeth have become ramps, causing the chain to ride up under load.



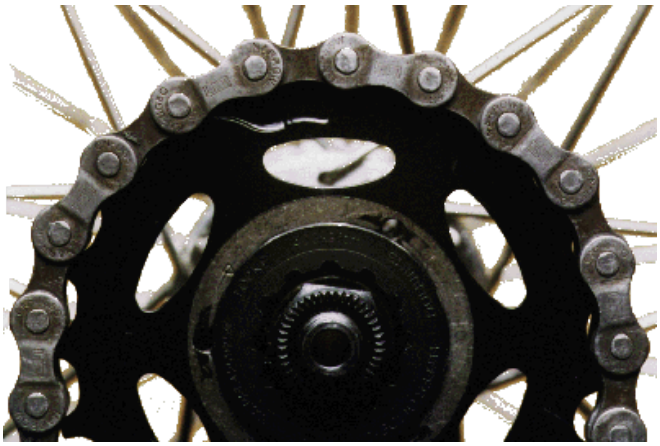
New chain, new sprocket; everything fits lovely.



Worn chain and sprocket; still fitting together OK but starting to see daylight under some of the chain links.



New chain on a worn sprocket; links are settling into the valleys between the sprocket teeth. Due to the pitch mismatch, the chain will not reliably mesh with the sprocket under load, and will tend to jump forward, skipping over the teeth.



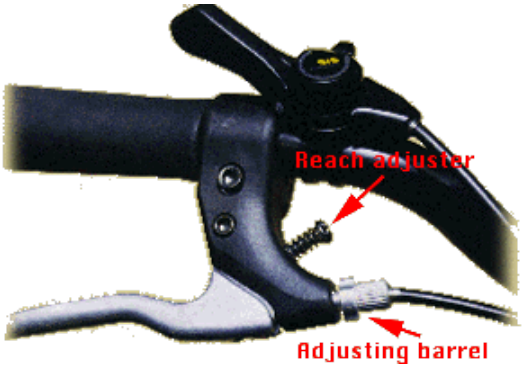
A worn chain on a new sprocket. Due to the pitch mismatch, the load is only carried by the teeth/rollers on our right, the chain hangs slack on our left. The new sprocket will wear rapidly to match the pitch of the worn-out chain.

6. Keep Your Brakes Properly Tuned/ Adjusted

Your brakes are the most important components on your bike in terms of safety, so this is the longest section and one that you should not ignore. Top level note: your front brakes should provide 75% of your braking power.

The Simple Stuff:

The most common problem we see in the shop with poor brakes is cable stretch. All cables stretch considerably from new. Bikes bought in most bike shops will have their cables pre-stretched and then readjusted. Other bikes will have cables that will need to be adjusted for stretch regularly. Simply use the barrel adjuster on the brake levers to effectively take up the slack in the cable to return your brakes to proper adjustment. (illustration courtesy of Sheldon Brown: http://sheldonbrown.com/canti-trad.html)



Keep Your Rims Clean:

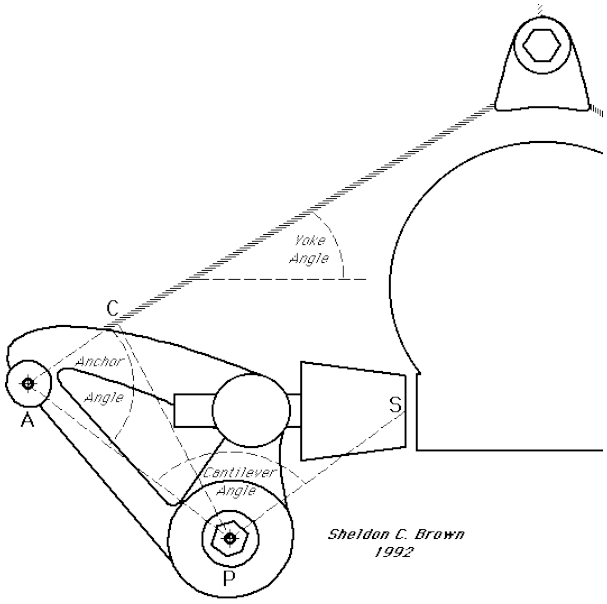
Regular riding in good or bad weather will mean that your brakes are getting dirty and worn down. Keeping your rims clean will keep your brake pads from wearing prematurely (the sand/ dirt on your rims will not only wear your brake pads out quicker but they'll cause more damage to your rims to the point where your rims will also wear out and need replacement). A quick wipe-down of your rims (the flat part where the brake pads hit) before or after your rides with an old clean towel (or old t-shirt or orphaned sock) and some dish soap is sufficient.

Squealing Brakes?

Brakes already squealing like stuck pigs? Time to examine your brake pads more closely. Chances are the pads have developed a glazed/ shiny surface that just needs to be roughed up with light sand-paper or a metal file. If you find that your pads have worn to extreme angles, or worn past the wear indicator grooves. All pads have grooves cut about 2/3 of the way into the surfaces to help you know when to replace your pads; if you don't see any you know it's time to replace your pads, although sometimes the grooves are just packed full of road grime/ brake dust and just need cleaning out with a screwdriver blade.

All Worn Out?

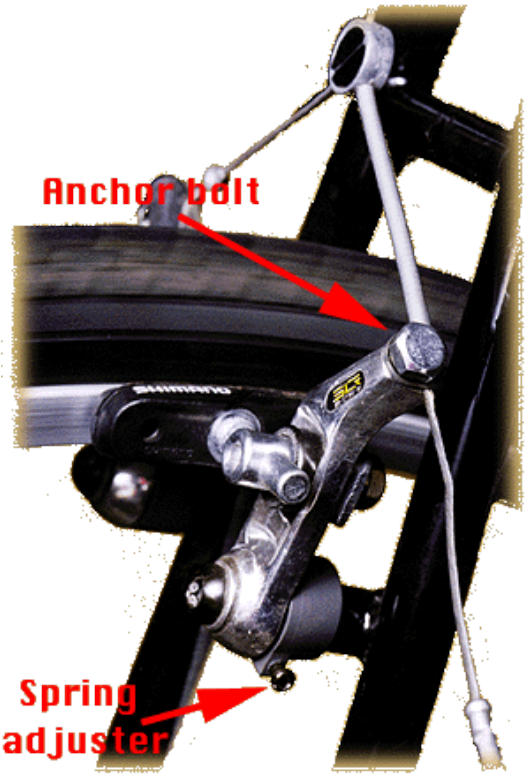
If you've never changed your brake shoes in many years, just go ahead and replace them; it's a cheap way to improve braking immediately (the rubber hardens with the years, so even if you haven't ridden much they'll need to be replaced every few years or so). As noted above, the rim surfaces should be cleaned regularly; they should also be checked for deep grooves or concaveness (if you find severe grooving or concaveness this is a sign that your rims (wheels) might be needing replacement).



Alignment Tips

When you're sure your pads are clean or replaced and your rims are in good, clean shape, make sure that your pads are aligned properly for maximum stopping power. The pads should hit the rim with the trailing edge first; this allows the forces to pull the rest of the pad into contact with the rim; if you've got the leading edge hitting first you'll get a chattering sound, or if the pads hit the rim flat they'll tend to squeal. The pad should also be hitting the rim surface at the top of their arc in the braking motion, not on the downside or your brake pads can slip right off the rim surface and into your spokes under heavy braking or wet conditions. Spin your wheels all the way around and check that the brake pads aren't coming into contact with your tires nor adjusted so that they'll go into the tires after wearing out. If you find one side of your brakes hitting before the other use the adjustment screws on the brake arm to tension or detention the spring to balance out the brake arm travel.

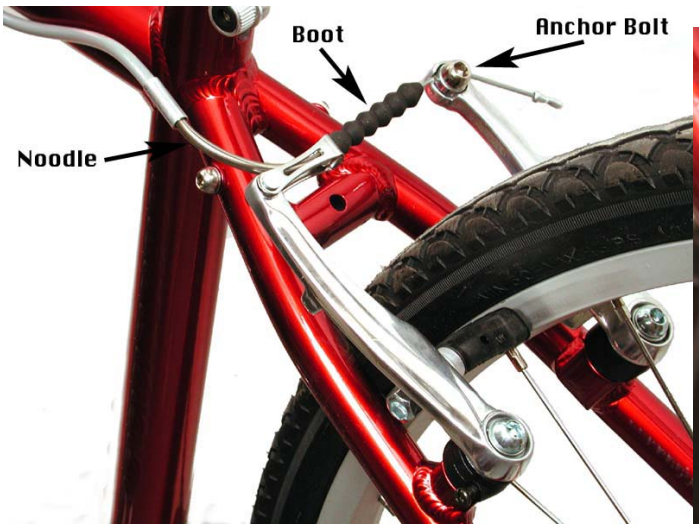
Illustrations courtesy of Sheldon Brown. See his articles on adjusting brakes: Cantilevers – www.sheldonbrown.com/cantilever-adjustment.html
Direct-pull V-brakes: www.sheldonbrown.com/canti-direct.html
His article on "The Geometry of Cantilever Brakes" is excellent:
http://sheldonbrown.com/cantilever-geometry.html

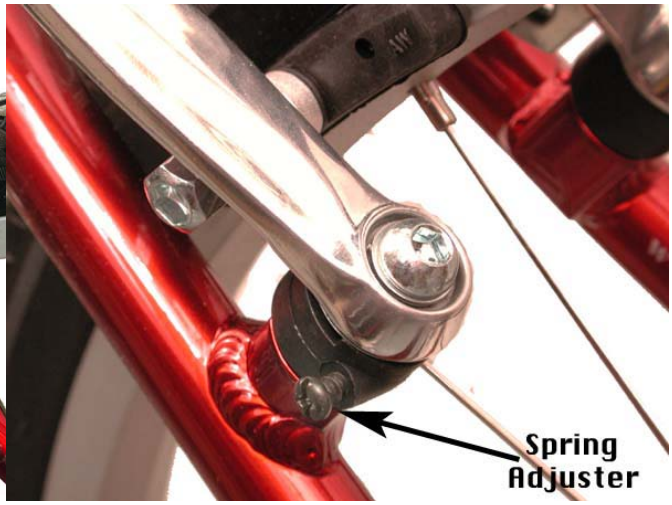


Cabling

Next, check your brake cable action/ feel thru the handles. The brakes should start to engage when your handles are pulled in about 1/4 way to the handle bar. All brake cables will stretch with use, so you'll need to adjust them to take up the resulting slack or your braking power will gradually disappear. Most every braking system has an adjustment barrel mechanism at one or both ends of the cable; simply rotate the adjuster so that it tightens the cabling.

If your adjuster is all the way out, then it's time to get out your tools; dial-in your adjuster(s) almost all the way in, then have a friend (or use a C-clamp) hold your brakes in to the rim while you loosen up the cable anchor bolt and then pull the extra cable length thru and retighten. Let go of the brakes (remove clamp) and test them; if they're too tight use the adjuster to let a little cable out (or repeat the step above until you get the cable length right).
If your rim is hitting your brake pads now and then you'll need to true your wheels (or get them trued).





Above illustrations show a very common brake these days: direct-pull cantilever brakes AKA "V-brakes"

Another very important point tip to solid, responsive brakes: be sure your cable housings are in good shape, routed properly and cut/ finished correctly. Any cuts thru the protective plastic can allow water in and start to rust the cables making them less and less responsive/ smooth acting. Many cables/ housing routings are designed in such a way as to invite water to drain right down into the housing creating a constant rusting problem; they need to be checked and re-lubed more often.

Check your cable routing; often times bikes are taken apart to transport in a car and reassembled with the cables incorrect which can cause brakes/ derailleurs to not function correctly or at all. Cables should be routed so that there's no sharp angles, only smooth lines throughout the length of the cable.

See the following cable routing examples:

This cable is too long:

This cable is correct:

This cable is too short:

Photos courtesy: Sheldon Brown

7. Healthy Wheels

Keeping your tires properly inflated (for the conditions) is by far the easiest and cheapest way to keep your bike performing at it's best. Bike tires will often lose air much faster than car tires without actually having a puncture (their tubes are just more porous), so you should get in the practice of checking the pressure at least weekly. Every tire manufacturer has their recommended inflation range printed on the sidewalls. These are generally the best air pressure rates for warm-dry weather riding on pavement; when riding in the winter on ice/ snow or going off-road in soft trail conditions dropping these pressures to 2/3 the recommended pressure on the sidewall will give you better traction.

Every spoked wheel will eventually get out of true (wobbly) and need truing, that is, adjusting the tension of the spokes to get the rim back into true. While truing wheels can be a very tricky skill, basic truing on the bike isn't rocket science. Basically, you'll need the correct spoke wrench (any bike shop will sell these often built into a road emergency repair tool set which is a good thing to have in your seat bag for any extensive riding) which fits the spoke nipple that you'll be turning to adjust the tension.

Get your bike in a position that will allow you to freely spin the wheels without the rest of the bike moving (if you don"t have a bike repair stand simply flip your bike upside down so the wheels are up in the air taking care not to damage your bike computer/ light/ mirrors or brake handles; if you need to loosen your handlebar and rotate your bars slightly to make your bike more stable when upside down). By tightening a spoke that anchors on one side of a hub you'll move the rim in that direction, or by loosening a spoke the rim will move in the opposite direction. To more easily know when you're tightening vs. loosening it helps me to visualize the spoke as just a long bolt with the nipple being a nut on the end; then it's just "righty tighty, lefty loosey"!

8. Derailers (Deraileurs/ Gear shifters)

Many of the problems we see in the shop related to derailers/ gear shifting is related to a few simple things: cables getting rusty and causing them to seize up or make shifting more and more difficult until the shifters (especially "grip shift" style shifters) break, cable stretch which reduces available gears, alignment of the rear derailer (bikes fall over, they bend and start making noise while riding or won't go into gears correctly), or limit set screws are out of whack.

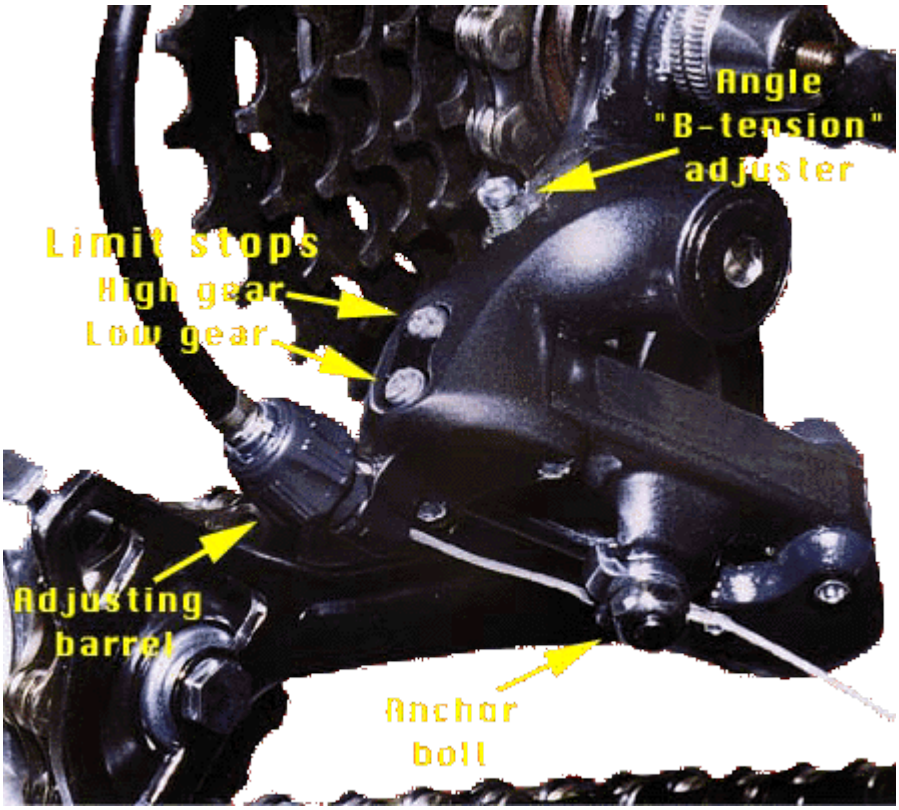


Photo courtesy: Sheldon Brown

Another very easy maintenance item is to keep the cable guides under the bottom bracket well lubricated (heavy grease, but wipe off excess that might attract more grit).

9. The Bike's Frame

This is the easier side of bike maintenance, much like keeping your car clean. A regular bath of soap and water with soft sponges or towels will help keep your frame looking good. Finish up your clean-up with a wax or polish like Bike Lust (Pedros) to protect it from road dirt/ grime. Using a garden hose to hose off a very dirty mountain bike is OK, just don't aim the water stream into hubs or your crank area. Spraying from the eye level down should be OK.

For steel frame bikes it's recommended that you pull the seatpost out entirely at the end of your riding season and turn upside down to drain any moisture that might have accumulated during your rides, then leave the bike upright with the seatpost out for a couple days to air out. You don't want your bottom bracket/ chain stays rusting from the inside out. Some people even suggest spraying some Tri-Flow or other similar lube into the frame tubes; be sure you have a sealed cartridge bottom-bracket before doing this.

Essential Gear for Your Bike's Tool Bag

- Tube (for your first flat, repair punctures at home)
- Patch kit (for your second, third, and fourth flats)
- Tire levers
- A decent pump (a decent pump shouldn't cost an arm and a leg) or C02 cartridge
- A multitool, with integrated chain breaker and spoke wrench

- Zip ties
- Duct tape
- ID
- Some cash incl some $1 bills (emergency tire boot)

Optional equipment

- Small pack of energy food (Goo, etc.) for longer rides
- Cell phone
- Lightweight shell jacket
- Work gloves or small rag
- Flashlight & matches
- Small first aid kit with tensor bandage, scissors, gauze, and band aids

Armed with this gear and assuming you know the basics about bicycle maintenance, you should be able to make basic repairs to your bike while on the trail. And, speaking from experience, it's a whole lot better being able to ride your bike (even if it's partially hobbled) out of the bush than walking it out on a cold or rainy day.

Online Resources

Videos

- **How to do an emergency tire boot using a dollar bill** (Expert Village video)
  http://www.expertvillage.com/videos/bike-tire-boot.htm
- **Changing a tube** (Expert Village video)
  http://www.expertvillage.com/videos/bike-tire-change.htm
- **Understanding different types of flat tires** (Expert Village video)
  http://www.expertvillage.com/videos/bike-tire-flats-types.htm
- **Patching an inner-tube** (Expert Village video)
  http://www.expertvillage.com/videos/bike-tire-patch.htm
- **Proper tire inflation tips** (Expert Village video)
  http://www.expertvillage.com/videos/bike-tire-pressure.htm
- **Mountain biking equipment, riding technique, safety tips** (Expert Village video)
  http://sports.expertvillage.com/interviews/mountain-biking.htm

Illustrated - Text

- **Bicycle Repair Guide** (thorough, great illustrations, simple explanations)
  http://www.bikewebsite.com/repair-bike-index.htm
- **Test your Bike repair knowledge!** (fun and very educational tutorials for wrong answers)
  http://www.bikewebsite.com/biketest.htm

Text-Heavy

- **Bicycle Quarterly Blog:** http://janheine.wordpress.com/
- **Rivendell's Fit, Sizing, Position article w/ links to other great articles:**
  http://www.rivbike.com/Articles.asp?ID=247
- **Sheldon Brown's articles about bicycle repair**
  http://www.sheldonbrown.com/repair/index.html
- **Sheldon Brown's "Tool Tips" articles from Bicycling & Bike World in the 70's- 80's**
  (great for owners of older bikes)
  http://www.sheldonbrown.com/tooltips/index.html
- **Sheldon Brown's World Famous Bicycle Glossary (**everything you ever wanted to know about bikes)
  http://www.sheldonbrown.com/glossary.html