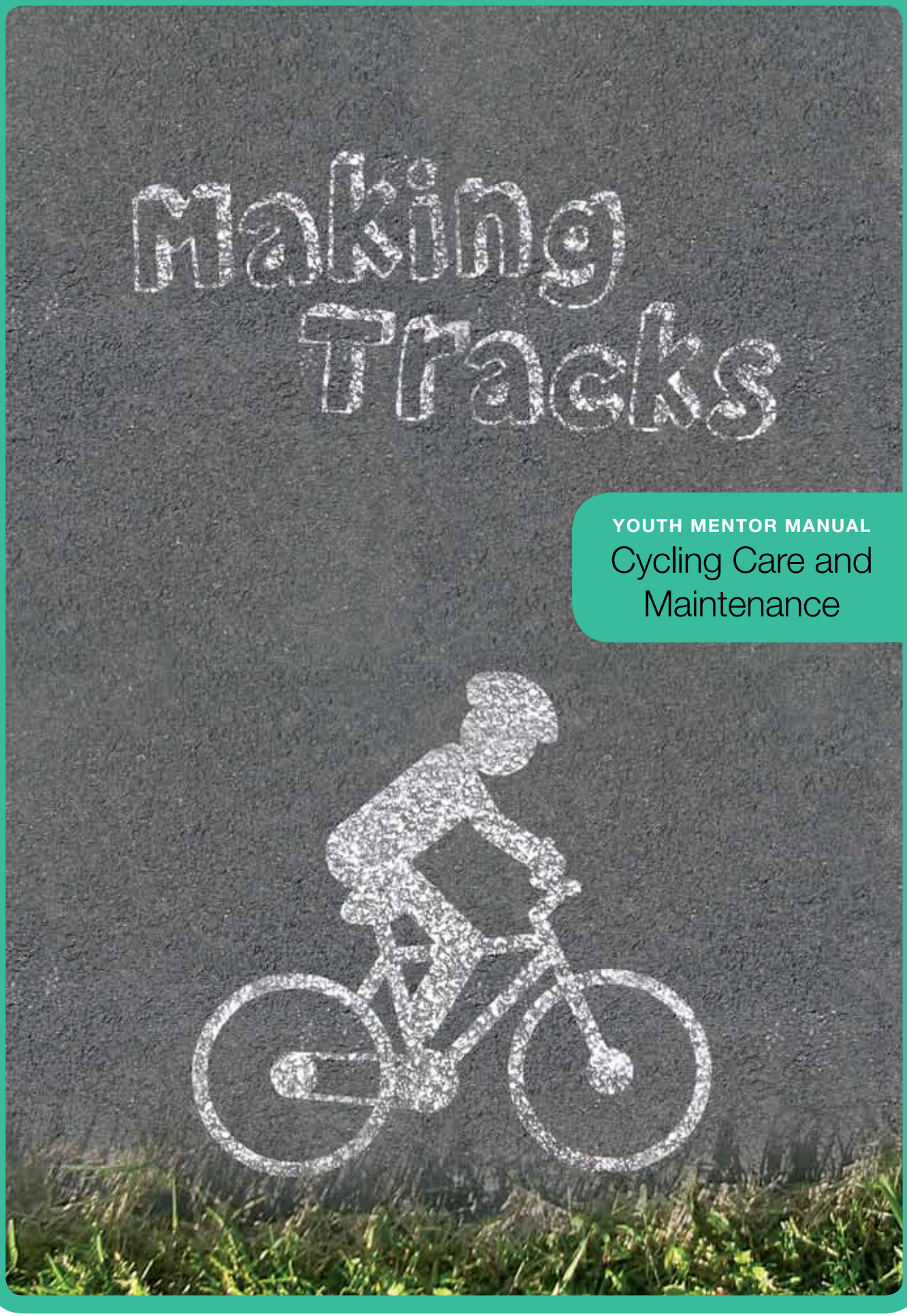


YOUTH MENTOR MANUAL

Cycling Care and Maintenance

About Making Tracks: Active Transportation Safety Education for Children and Youth

Active transportation means any non-motorized form of transportation such as walking, bicycling, in-line skating and skateboarding. Active transportation safety is a basic life skill; everyone is a pedestrian, most children have bicycles, and active transportation is increasingly promoted across Nova Scotia. Data collected through an environmental scan in 2007 pointed to a need for more and better active transportation safety education across the province.

Making Tracks is about making active transportation safe for children and youth in Nova Scotia by giving them the skills they need to do it safely. Making Tracks is a project of the Ecology Action Centre's Active & Safe Routes to School program (ASRTS) with support from the Nova Scotia Department of Transportation and Infrastructure Renewal, St. FX University, and the Bicycle Trade Association of Canada.

Making Tracks teaches safety skills for each of four active transportation modes:

- Walking
- Bicycling
- In-line Skating
- Skateboarding

Using a train-the-trainer model, the program enlists the help of adults and youth in teaching safety skills to other youth and children. Making Tracks focuses on skill-based, experiential workshops.

The goals of Making Tracks are to increase the use of active transportation, to increase safety skills of active transportation users, and ultimately to make it safer for children and youth to walk or wheel on our travel ways.

Active & Safe Routes to School

Making Tracks is an initiative of Active & Safe Routes to School (ASRTS), which encourages more children, youth and their families to use active transportation – such as walking and cycling – for the environment, physical activity and traffic safety. ASRTS is coordinated in Nova Scotia by the Ecology Action Centre in partnership with the Nova Scotia Department of Health Promotion and Protection as part of the Active Kids Healthy Kids initiative. For more information on ASRTS, see www.saferoutesns.ca

Active & Safe Routes to School
Ecology Action Centre
2705 Fern Lane, Halifax,
NS B3K 4L3
asrts@ecologyaction.ca
www.saferoutesns.ca
Tel: (902) 442-5055
Fax: (902) 405-3716

2nd edition, Fall 2009

Making Tracks Partners

Written by: Joe Quercia; Photos and some text courtesy of www.sheldonbrown.com

Edited by: Cheyenne Dickinson, Andrew Foran

Table of Contents

Tube and Tire Maintenance

Equipment List

- Tire Levers
- Tire levers
- Spoke wrenches
- Cone wrenches
- 14 mm, 15 mm wrenches
- Patch kits
- Environmentally-friendly hand cleaner (such as WORX)
- Bike tube with hole for patching
- Large bowl of water
- Bike pump

Materials

N/A

Safety Points

Small chance of minor cuts or scrapes to fingers and hands. Be sure to have a first aid kit on hand.

Replacing Inner Tubes

Materials – new inner tube, 14mm and 15mm wrenches, tire levers, pump

Undo the brake cable.

For wheels with Quick Release axles, open the quick release lever and remove the wheel from the bicycle.

For wheels with bolt on axles, use the 14mm or 15mm wrench to loosen the wheel bolts and remove the wheel from the bicycle.

For rear wheels, be sure to change the gears to the smallest gear so the wheel comes off easily.

Remove the valve cap and using the hooked end of the tire lever, push the valve pin up to remove any air left in the inner tube.

Using the spooned end of one tire lever, reach in between the tire and the rim, pry the tire up over the rim and hook the tire lever to a spoke. Repeat this step with the other two tire levers.

When using the third tire lever, the first two tire levers will become loose. Remove them from the wheel. While holding the final tire lever, rotate it around the wheel until one side of the tire is completely off the rim.

Remove the inner tube.

Pump a small amount of air into the new tube to give it the round shape needed.

Put the new tube into the tire and pull the valve stem through the valve hole in the rim.

Using your thumbs, push the tire back onto the rim until the whole tire is back on. You may need to use the spooned end of a tire lever to pry the final section of tire back onto the rim.

Ensure that the valve stem is straight and not on an angle, if the valve stem is on an angle, pull the tire in the direction needed to straighten the valve stem.

Pump air into the tire until the tire is at the desired air pressure. Be sure not to over inflate the tire. Maximum air pressure will be inscribed on the side of the tire.

Place the wheel back onto the bicycle, for front wheels; ensure they are in the correct rotation direction (check the side of the tire for rotation direction arrows).

Using the 14mm or 15mm wrench, tighten the axle bolts.

Close Quick Release levers, ensuring the lever is flat with the frame or fork leg.

Reconnect the brake.

Patching Tubes

Materials – tube with hole, bowl of water, patch kit, pump

Follow instructions for replacing a tube to remove the tube from the tire.

Pump air into the tube.

Place the tube into the bowl of water and rotate it slowly until you can see bubbles coming up from the tube. The bubbles will indicate where the hole in the tube is.

Once the hole has been located, take the tube out of the water and let it dry.

Choose the appropriate size patch from the patch kit to cover the hole.

Using the sand paper or scraper from the patch kit, rough up the area around the hole, do this to the size of the patch.

Using the glue from the patch kit spread the glue around the roughed area.

Allow the glue to dry until it becomes tacky.

Peel off the foil side of the patch and place onto the area with the glue.

Using your fingers, place pressure on the patch while smoothing it out until the sides of the patch are completely stuck to the tube.

If the patch does not stick, repeat the process.

Once the patch is firmly on, pump air into the tube to ensure that the patch has worked and sealed the hole.

Follow instructions for replacing a tube to put the tube back into the tire.

IMPORTANT:

Before putting a new tube or the patched tube into the tire, remove the tire from the wheel and check it for the cause of the flat tire. This can been done by rotating the tire using your fingers on the interior to feel for sharp objects while watching for things sticking out of the outside of the tire. This should be done slowly and cautiously as to not cut or scratch your fingers. When putting the tire back onto the wheel, be sure to check the sides of the tire for any rotation direction arrows and put the tire on so it spins in the correct direction for proper traction.

Tightening Cones

Follow instructions to remove the wheel from the bicycle.

Cones are the small nuts that hold the axles in the hubs of the wheels.

Using the cone wrenches, find the two wrenches that fit onto the cones.

Loosen the outside locknut slightly.

Tighten the inside cone slowly, be sure not to over tighten the cone. The wheel needs to be able to spin freely without the axle moving side to side within the hub.

Once you have the inside cone tight, hold the cone with the cone wrench and slowly tighten the outside lock nut until neither nut can move. Do this very slowly and carefully to ensure the axle spins freely within the hub without any side to side movement.

Follow instructions to place the wheel back onto the bicycle.

IMPORTANT:

When tightening cones, only work on one side of the axle to ensure that the axle stays centered within the hub.

Truing Wheels

Materials – Spoke keys

With the wheel on the bicycle, spin the wheel in one direction to determine where the rim touches against the brake pad.

Work on one side of the wheel at a time.

Using the correct size spoke key, tighten the spokes, one quarter turn at a time, on the opposite side of the rim that touches the brake pad. This pulls the rim away from the brake pad.

Be sure to tighten all spokes that affect the area of the rim.

Once you have completed, repeat the above steps to the other side of the rim.

IMPORTANT:

Hub cones must be tight before beginning to true wheels.

IMPORTANT:

For wheels with disc brakes, a truing stand is required in order to properly true the wheel.

Brake and Gear Maintenance

Equipment List

- Chain breaker
- 2mm, 3mm, 4mm, 5mm, 6mm hex keys
- 8mm, 9mm, 10mm wrenches
- Small Phillips screwdrivers
- Environmentally-friendly hand cleaner (such as WORX)
- Cable cutters

Materials

Brake pads

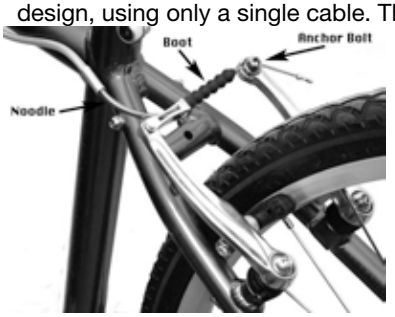
Safety Points

Small chance of minor cuts or scrapes to fingers and hands. Be sure to have a first aid kit on hand.

Direct-pull vs. Traditional Cantilever Brakes

Traditional cantilever brakes used two cables, a main cable running down the centerline of the bike, and a second, "transverse" cable connecting the cantilever units on each side of the wheel. The main cable would pull upward on the middle of the transverse cable, causing the cantilever units to rotate inward.

The "direct pull" cantilever, also commonly known under its Shimano trademark name "V-Brake" is a simpler design, using only a single cable. The cable housing



connects to one arm, the inner cable runs across the top of the tire to the opposite arm. When the brake is applied, the housing pushes /one/ cantilever while the inner cable pulls the other.

Since the cable runs straight across the top of the tire, direct pull cantilevers need longer arms to get the cable high enough to clear the tire. This increases the mechanical advantage of the system, requiring the use of special matching brake levers.

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Quick Release

Normal Position

Boot Pulled Away

Noodle Unhooked

For wheel removal, the noodle may be unhooked from the arm link. This will allow the brake shoes to open up wide enough to clear even a fat tire. First, pull the boot away from the end of the noodle. Then squeeze the brake arms together with one hand while unhooking the lower end of the noodle from the keyhole-shaped slot in the arm link.

IMPORTANT:

Make sure to hook the brake back up immediately after you re-install the wheel!

Replacing and Adjusting Brake Pads

Shoe Adjustment

Brake shoes can be adjusted in 5 different directions:

Height

This is the most critical adjustment. The shoe should contact the rim fully, but not overlap it. If the shoe is set too high, it will rub on the tire, destroying it very quickly.

If the shoe is set too low, it can "dive" under the rim and get caught in the spokes, leading to dangerous wheel lockup.

On mountain bikes with narrow rims and big bulgy tires, it may be quite difficult to get a good vertical adjustment—the shoe may clear the tire when the brake is engaged, but it may rub on the sidewall of the tire in its rest position.

As the brake shoe material wears down, the shoe hits lower and lower on the rim, increasing the risk of "diving" into the spokes, so periodic checking is in order.

Roll angle

The roll angle should be set so that the shoe hits the rim squarely; both the top and bottom of the shoe should meet the rim. If this is not set perfectly, normal pad wear will eventually even it out, but braking will be less effective until the shoe has worn in.

Pitch angle

The pitch angle should be set so that the shoe follows the curvature of the rim as closely as possible.

Yaw angle ("toe in")

The shoe can be set so that the front edge of the shoe contacts the rim slightly before the rear edge. This is commonly called "toe in." If this is not set perfectly, normal pad wear will eventually even it out, but braking will be less effective, and the brakes may squeal until the shoe has worn in.

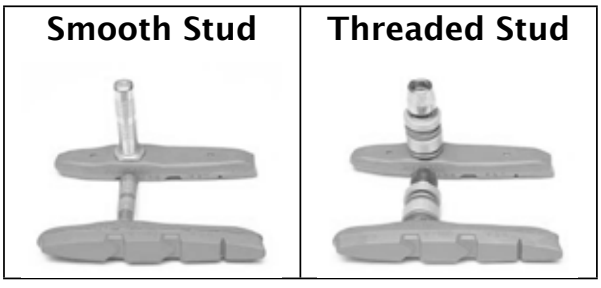
Most direct-pull cantilevers, however, use asymmetrical shoes (longer end faces the rear) that are designed to be set with no toe in.

Extension

Extension is the adjustment of the distance from the pad braking surface to the cantilever arm. Direct pull cantilevers aren't very critical about this, as long as there's a reasonable distance between the tops of the arms.

Shoe Attachment Hardware

There are two different ways of attaching brake shoes to the cantilever arms, threaded studs or smooth studs with eye bolts.



Threaded stud brake shoes with plain washers generally offer height and pitch angle adjustability but little else. For this reason, they are not suitable for direct-pull brakes.

Most direct-pull cantilevers use threaded-stud brake shoes with spherical (domed) washers that allow for all angle adjustments. There are two convex washers, which go inside and outside the arm, and two matching concave washers that mate with the convex ones.

Usually, the concave washers are two different thicknesses, so you can select two different "extensions" depending on whether you put the thick or thin concave washer on the inside.

Smooth stud brake shoes are the type most often used on traditional center-pull cantilevers, though a few direct-pull units do use them.

Sometimes it is difficult to get all 5 adjustments set at once, and to get the bolt tight enough without twisting it out of position. It helps if you remove the nut from the bolt and lubricate the threads.

Squealing/Squeaking

Squealing brakes is a common problem, and there's no one simple solution to it.

It's caused by the friction of the brakes against the rim flexing the brake arms, which then slip back, grab, slip back, grab, etc. This process happens at such high speed that it often causes an audible vibration.

All brakes do this, but with luck the pitch (frequency) is too high for human hearing.

This is generally annoying, but not a safety issue. Unlike automotive brakes, bicycle brakes that squeal are usually in good functional condition.

Here are some things to try if your brakes squeal:

"Toe in" the brake shoes, so that the front edge of the shoe hits the rim slightly before the rear edge.

Clean the rims with a good, oil-free solvent (citrus, alcohol, etc.)

If the pivots of your brakes are adjustable, make sure that you've eliminated as much play as possible without causing them to bind.

Different brake shoes may help.

A “brake booster” may help. This is a horseshoe-shaped arch that connects the two cantilever bolts together, making the whole system more rigid.

If your brakes use the Parallel-Push linkage, the pivots may need servicing. There are special kits for this.

Centering Brakes

Centering Adjustment

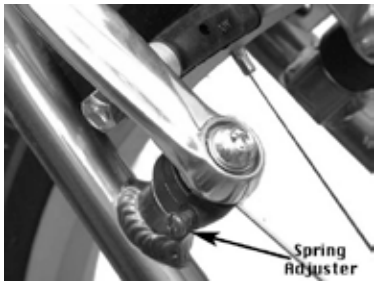
When the brake is released, the brake shoes retract away from the rim. Ideally, the shoes on both sides should back off by the same amount. If they don’t, the brake is not properly centered. In extreme cases, one of the shoes may not retract, and may rub on the rim even when the brake is not being applied.

If a brake appears off-center, check first that the wheel is installed straight in the frame/fork. If the wheel is crooked, and you misadjust the brake to compensate, you are creating two problems where there was only one before.

Spring Adjustment

If your wheels are centered, and your brakes are not, and, if the pivots are properly lubricated and free-moving, the brake shoes should be centered. If they are not, you probably need to adjust the spring tension on one or both of the cantilevers.

Most direct-pull cantilevers have adjustable spring tension. The adjustment will be a small screw with the head facing outward to the side of the bike. The screws are generally located near the bottom of the cantilever, below the pivot point. Sometimes they work with a Phillips screwdriver, other times a small Allen wrench may be needed.



Tightening this screw tightens the spring, so you want to tighten the spring of whichever arm is too close to the rim. This will make it spring back farther.

Adjusting Brake Levers

Reach Adjustment

Many brakes intended for upright handlebars feature a reach adjustment, usually a screw or cam. This sets the rest position, and is mainly used to bring the brake lever in closer to the handlebar for easier operation by a rider with short fingers. This adjustment should be as loose as allows convenient gripping of the lever, because if you bring the rest position of the lever in too close to the handlebar, you increase the risk of having the lever bottom out against the bar.

If you change the reach adjustment, you should expect to have to change the cable adjustment as well.

Adjusting Brake and Derailleur Cables

The most basic brake and derailleur cable adjustment is the cable length adjustment. This is done by loosening the bolt on either the brakes or the derailleur and pulling the cable tight then tightening the bolt.

On properly equipped bicycles, fine adjustments may be made without any tools, by turning and adjusting the barrel at the end of a length of cable housing.

The adjusting barrel for brakes are located at the brake levers.

The adjusting barrel for derailleurs is located at either the shifters or the derailleur.

To tighten the cable using the barrel adjust, turn the barrel clockwise until you reach the desired amount of tension.

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Changing Brake and Derailleur Cables

When changing brake and derailleur cables you must be sure to use the correct cables and housing. In order to do this, replace one cable at a time and use the old cable and housing to compare to the new cable and housing.

Insert end of cable into brake lever or shifter.

Place ferrule (small metal cap, which you may have to very carefully remove from the old housing) onto each end of housing, only on one end of the housing that goes to the brake cantilevers.

Insert opposite end of cable into housing.

Place cable into cable stops on the frame.

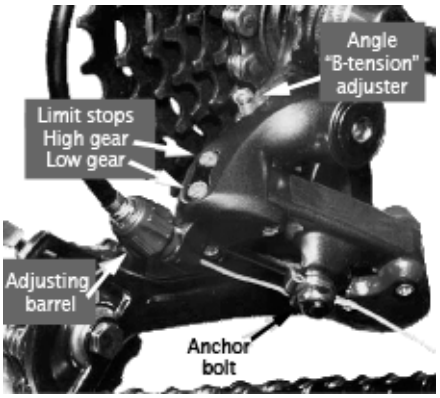
Run cable through cable guide on bottom of frame.

Place cable through bolt on brakes or derailleur and pull tight, tighten bolt.

Once you have replaced the cable, follow the cable adjustment guidelines to ensure that the cables are set properly.

Derailleur Adjustments

The four rear derailleur adjustments, in order of importance:



1. Low-gear limit stop. The low gear limit stop (usually marked by the letter “L”) stops the derailleur from shifting past the largest sprocket and throwing the chain into the spokes. If it is too loose, the derailleur can overshift into the spokes, with disastrous results. If it is too tight, it will be difficult or impossible to shift down to the largest rear sprocket.

2. High-gear limit stop

The high gear limit stop (usually marked by the letter “H”) stops the derailleur from shifting past the smallest sprocket and wedging the chain between the smallest sprocket and the dropout. If it is too loose, it really doesn’t make much difference on a bike with indexed shifting, because the cable will not let the derailleur overshift past the smallest sprocket. If it is too tight, you it will be difficult or impossible to shift up to the smallest rear sprocket.

Difficulty in upshifting to the smallest rear sprocket is rarely caused by misadjustment of the high-gear limit screw. More often it results from the derailleur being bent, or from excess friction in the cable.

3. Indexing adjustment

The indexing adjustment is the most frequently needed derailleur adjustment. The detents (click-stops) that provide indexing are in the shifters, and the index adjustment sets the length of the cable so that the derailleur is in the correct place to correspond with each click stop.

If a derailleur is correctly adjusted when it is installed, this is the only adjustment that should have to be tweaked later on, to accommodate cable stretch, or when cables are replaced.

The indexing adjustment is an adjusting barrel located at one end of a length of cable housing. Many rear derailleur’s have more than one index adjuster. All indexed derailleur’s have an adjuster where the final loop of cable housing ends at the derailleur itself. Many bicycles also have another adjusting barrel located so that it can be adjusted while you are riding. On mountain-bike-type shifters, this will be located at the shifter itself, just where the cable exits. On road bikes with handlebar-mounted shifters, there will usually be an adjusting barrel at the cable stop where the upper length of housing ends on the upper end of the down tube.

It doesn’t matter which of these adjustments you use, use whichever is more convenient.

Before you try adjusting the indexing, shift to the highest gear (smallest sprocket.) Make sure that the shifter is in the position that allows the cable to be as loose as it can get.

Click the shifter to the first click after the fully loose position, then turn the pedals forward. The chain should shift to the second smallest sprocket. If it doesn't, it means the cable is too loose. Turn an adjusting barrel counter-clockwise to tighten the cable. Start with half a turn, then check again. It is very common for beginners to over-correct by turning the adjuster too far. Sometimes this will result in moving the indexing so far off that it sort-of works, except that the clicks are one notch off, so one of the extreme gears doesn't work properly, but the others appear to be OK. This is why it is important to check that the shift from the smallest to the second-smallest sprocket occurs in the right place on the shifter.

Fine adjustments are accomplished according to the following principles:

Shifting to larger sprockets is accomplished by tightening the cable;

if such shifts are slow, the cable is not tight enough--

turn the barrel counter-clockwise to tighten it.

Shifting to smaller sprockets is accomplished by loosening the cable;

if such shifts are too slow, the cable is not loose enough--

turn the barrel clockwise to loosen it.

4. Angle adjustment ("B-tension")

Modern derailleurs have two spring-loaded pivots. The lower pivot, sometimes called the "a pivot" winds the cage up to take up slack as you go to smaller sprockets. The upper "b pivot" adds additional slack take-up ability by pushing the derailleur's parallelogram backwards.

The tension of the two springs needs to be balanced for best shifting.

Most derailleurs have an angle adjustment screw (Shimano calls it "B-tension adjustment"). This adjusts the tension of the upper ("b") spring of the parallelogram, and thus the height of the jockey pulley. The looser this screw is, the closer the jockey pulley will be to the cluster.

The angle adjustment will need to be set according to the size of the largest rear sprocket. If you change to a cluster with a larger or smaller low-gear sprocket, you will need to re-adjust this setting. You will also need to adjust this if you change the length of your chain.

If the angle adjuster is set too loose, however, the jockey pulley will bump into the largest sprocket when the bicycle is in the lowest gear (large rear, small front). This is the gear you should check the adjustment in.

Since a derailleur shift is caused by forcing the chain to run at an angle, the greater the angle, the sooner it will shift. The closer the jockey pulley is to the cluster, the sharper the angle will be for a given amount of sideways motion of the derailleur. Thus, the looser the angle adjuster screw is, the better the shifting will be.

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The Three Front Derailleur Adjustments

1. Clamp Position

The most critical adjustment of a front derailleur is its attachment to the bicycle frame. ***This must be set correctly before you attempt to adjust the limit stops.*** There are two variables, angle and height.

Angle of the front derailleur is judged by looking down on the cage from above. In general, the centerline of the cage should be parallel to the centerline of the frame. Rotating the derailleur so that the back of the cage is farther out will sometimes improve shifting to the small ring of a triple by preventing overshifting, but may cause increased need for trimming on the larger rings. It may also cause the crank to strike the cage.

Height of the front derailleur is a principal factor in how well it will shift. Manufacturers commonly recommend 2mm clearance between the bottom of the outer cage plate and the teeth of the large chain ring. This is a bit of an oversimplification. Best performance will result from the very lowest position that still just barely keeps the cage from hitting the chain ring teeth.

The lower you can get it, the better it will shift, and the less you will need to trim the front derailleur.

2. Low-gear limit stop.
The low-gear limit stop stops the derailleur from shifting past the smallest chain ring and throwing the chain onto the bottom bracket shell. If it is too loose, the chain will fall off when you try to downshift to the small chain ring. If it is too tight, you it will be difficult or impossible to shift down to the low chain ring.

On older front derailleur s, the low-gear stop is the one closer to the frame. Many newer designs reverse this position for reasons relating to the mechanism used.

The basic adjustment for the low-gear stop is to set it so that the chain just barely clears the inner plate of the cage when the lowest gear (small front, large rear) is selected.

For triple ring cranks, it will sometimes be necessary to adjust the low-gear stop a bit looser, so that the outer plate of the derailleur can travel far enough to knock the chain off of the middle ring.

3. High-gear limit stop
The high-gear limit stop is pretty straight forward. It should be set so that the chain almost rubs on the outside plate of the front derailleur cage when the bicycle is in its highest gear (large front/small rear). This will reduce the need for trimming as you shift the rear derailleur.

If the shift to the large chain ring is slow, make sure that you aren't pedaling too hard, front up-shifting requires being ready to have the cranks slow down when the shift takes place. If the shift is unreliable even when you are pedaling lightly, you may be able to improve it by loosening the high-gear stop a bit. If you do so, check to make sure that the derailleur cage is not moving so far out that it can be struck by the crank as it goes by.

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Fixing a Bicycle Chain

Materials – Chain breaker

Use the chain breaker and insert both ends of the chain into the chain breaker.

Be sure to place the chain pin against the chain breaker pin.

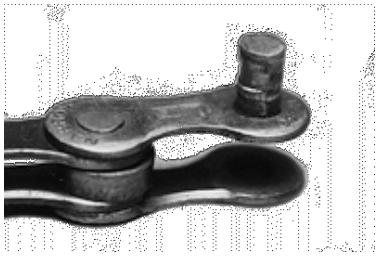
Tighten the chain breaker, push the pin into the chain, until the pin appears to be even on both sides of the chain link.

Remove the chain breaker.

If the repaired link remains stiff, use your hands and lightly twist the chain from side to side. This will set the pin and loosen the stiff link.

When creating the chain sections, be careful to not push the pin out of the chain link. If this occurs, you must remove the link as it is difficult to put the pin back into the chain link.

Chain with pin partially removed



Chain with pin completely removed (avoid this)