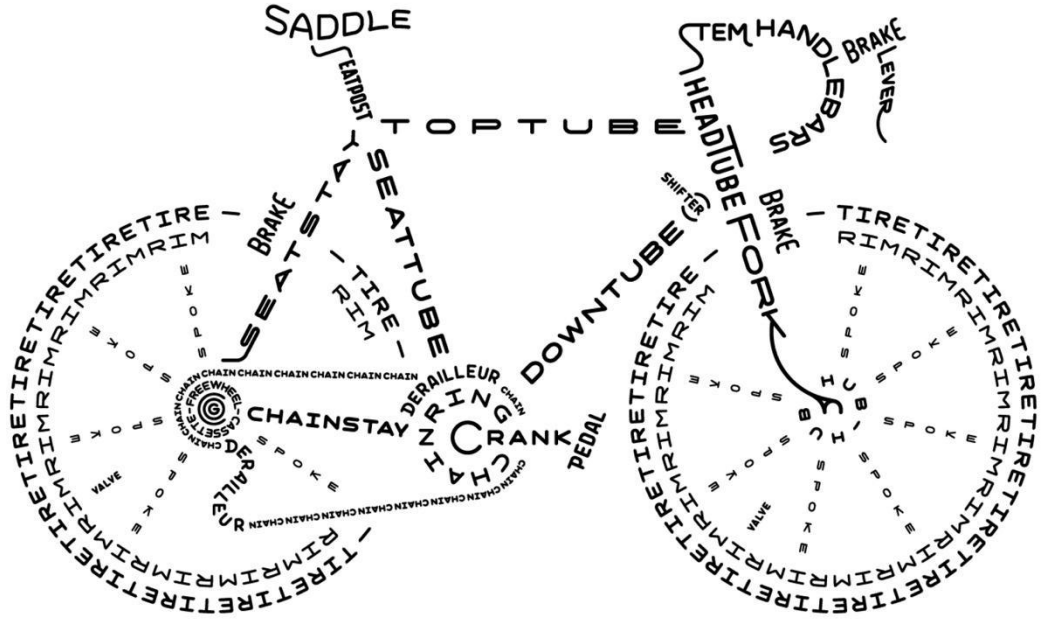
BIKE SHOP MANUAL

A GUIDE FOR BASIC REPAIRS
2021-2022

UCSB Associated Students



SANTA·BARBARA·CA

Introduction

Welcome to UCSB's A.S. Bike Shop! You probably have lots of questions, which you are more than welcome to ask your fellow team members; however, this manual should address the everyday inner workings of the A.S. Bike Shop and also serve as a guide and basic reference for shop repairs.

A.S. Bike Repair Curriculum & Other Knowledge

UCSB has a prominent cycling culture and the A.S. Bike Shop services thousands of bicycles each year. This curriculum is a guide to the types of repairs that are commonly done at the shop. Studying this curriculum after performing a specific repair is an effective way of solidifying your understanding of the repair.

Table of Contents

1. Tube Replacement:

- **Objective:** Identify the cause of a flat. Replace tube with proper measurement and valve. Have the tire tread in the proper direction. Inflate the tube to the correct PSI. Wheel properly and safely back onto frame or fork.
- **Approximate completion time: 5-10 min**

1. Firstly, remove the wheel from the bike by loosening the axle nuts. Most axel nuts can be removed with a **15mm wrench**. If the wheel has a **quick release** then open the lever and loosen the nut on the other side. If the rear wheel has a **coaster brake** (common on beach cruisers) then you also have to disengage the bolt holding the coaster brake arm on the frame.
2. With the wheel off; release the remaining air from the tube through the valve (Schrader or Presta). This makes it easier to remove the tire.
3. In order to get the tire off, you will need one of the colorful(PEDROS) **tire levers**. Insert the tire lever between the bead of the tire and the rim of the wheel then move the lever around the circumference of the wheel to get the entire tire bead off the rim.
4. At this point, you can remove the entire tire from the rim or the just the tube. *Removing the tube and leaving one bead of the tire on the rim is quicker but it ultimately depends on which technique you are more comfortable with*.
5. Inflate the old tube with the **air compressor** to see if the puncture in the tube is apparent.
6. Inspect the **rim strip** on the wheel. If the wheel has a double-walled rim it will need a thick plastic rim strip or a cloth rim strip.
7. Also inspect the inside of the tire to identify if there is anything that may have caused the flat. Afterward, dispose of the old tube in the cardboard "tube boxes."
8. Partially pump the new tube up with the air compressor to give it some shape. Work this tube into the tire with the valve where the tube measurement is. *If you left one bead of the tire on the rim then insert the valve into the valve hole on the rim and work the tube into the tire*.
9. Afterward, get one bead of the tire onto the rim (this can usually be done by hand). For rear wheels, make sure the **tire tread** is in the proper direction. (If the wheel has a flip-flop hub make sure

you know whether the customer was riding fixed gear or freewheel).

10. Next work the other bead of the tire onto the rim; releasing air from the tube if needed. You may need to use a tire lever to get the last portion of the tire bead onto the rim. Do this carefully as you can potentially pinch the tube with the tire lever.
11. Now that the tire is back on the rim, inflate the tube either with the air compressor or a hand pump. The **recommended PSI** can be found on the tire.
12. Once the tube is fully inflated screw the black **valve cap** onto the valve
13. Finally, put the wheel back on the bike and make sure the axle nuts/quick release is tight enough. For rear wheels with coaster brakes make sure that you secure the coaster brake arm to the frame with the bolt that you removed earlier, before tightening the axle nuts. Congratulations! You have just changed a tube.

Chain Tensioning

Most of the tube replacements happen on a rear wheel, therefore a mechanic should develop a good understanding on how to tension a chain. The chain tension on a single speed bike is crucial to get right so the chain doesn't drop frequently or wear out prematurely.

1. Place the axle into the rear dropout, make sure the nuts and washers are in the correct order. Loosen the brake arm if working on a coaster brake bike.
2. Hold the 15mm wrench in the right hand, and use the left hand to pull the rear wheel back near the bottom bracket.
3. While pulling the rear wheel, also pull the wheel a bit towards the left chainstay, then tighten only the left nut.
4. Push the wheel towards the center of the two chainstays; while holding the wheel, tighten the right nut.
5. Pedal the bike on the stand and feel the tension of the chain. There should be minimum slack in the chain while also not being too tight. *there may be a tight spot in the drivetrain, try to have the chain loose enough to eliminate it without excessive slack.
6. If the chain is too tight, repeat from step 3 but pull the wheel to the left less; if it's too loose, pull the wheel towards left more while repeating step 3. *The chain tension for a coaster brake wheel should not be set as tight as a single speed/fixed gear due to the extra tension exerted by braking action.
7. Retighten the brake arm if the wheel has one.
8. Really make sure the axle lock nuts are tight!!!

2. Tire Replacement:

- **Objective:** Identify any damage or wear in the tire, as this can be a factor in causing a flat tube. Replace the old tire with a new tire of the same measurement. Ensure the tire tread is facing the proper direction for optimal tire performance. Wheel properly and safely installed back onto frame or fork. *Keep in mind a tube replacement is often needed with a tire replacement. However, a damaged tire can still contain a tube that holds air. It is up to the mechanic to determine if the tire should be replaced in that circumstance.*
- **Approximate completion time: 5-10 min**
  1. Inspect the outside of the tire for any **tears or holes**. If the hole is large enough so that **tire casing fibers** are visible then the tire should be replaced. The presence of smaller holes or cuts (a few mm in diameter) does not require that the tire be replaced but should be brought to the customers' attention.
  2. If no obvious damage is apparent then inspect the tire for wear. A worn tire will usually appear to have cracks around the circumference of the tire in the area above the rim of the wheel.
  3. To inspect the inside of the tire; remove the tire as stated in **Tube Replacement Tutorial**. The fibers of the tire casing in a worn tire can start to give the inside of the tire a "stringy" appearance.
  4. If the tire shows significant wear, let the customer know that promptly replacing the tire is in their best interest, as they are more susceptible to tube failure.
  5. If it is determined that a tire is to be replaced then select a tire with a corresponding or approximate measurement
  6. to the old tire (If you're not sure which measurement to use please ask a fellow mechanic). Place the tire, with the tube, onto the rim of the wheel paying attention to the tread direction.
  7. Put the wheel back on the bike properly and securely.
  8. Old tires are placed on the poles outside, in between the bike racks, for recycling to pick up.

3. Single Speed Chain Replacement (1/2 x 1/8):

- **Objective:** Identify chains that need link repair and or total replacement. Remove the old chain from the bicycle using the chain breaker tool. *If you know you are going to replace the entire chain then you can use the large red chain cutters to cut the chain*. Ensure that the new chain is the correct length. Proper installation of a new chain onto the chainring and sprocket.
- **Approximate completion time: 5-10 min**
    1. Inspect the old chain for **rust, broken, twisted or bent links**. An overly rusted chain that cannot bend needs to be replaced. Place a chain link into the **outermost cradle** of the chain breaker. Drive the chain breaker pin until it contacts the **chain rivet**. *Be careful not to drive the pin out of the link!* Back out the chain breaker pin and separate the chain by grabbing either side of the selected link and pushing toward the protruding rivet. Pull the chain off the bike from the rivet end of the chain.
    2. Next, you will need to grab a **1/2 x 1/8 single speed chain**. These are the **Z410** chains in the back.
    3. New chains usually will have excess links that need to be removed to match the size of the old chain. Lay the new and old chain next to each other and align each link(old chains tend to stretch) to identify the link where the new chain must be broken. Remove the link with the same technique used to originally remove the chain from the bike. Again be careful not to push the rivet out of the link!
    4. Now with the correctly sized new chain feed the chain onto the chainring and sprocket. Do this with the **protruding** rivet facing towards you. This will make it easier for you to push the rivet back in.
    5. Connect the two ends of the chain and push the rivet back through the link with the chain breaker in the same outermost cradle.
    6. The link that you worked on may be "tight" and need to be loosened up. To loosen the link you need to physically flex the chain laterally back in forth. Continue doing this until the link feels as loose as the other links. Be careful not to apply too much force so that you do not deform the chain. Another technique that can be used when the previous method does not work is placing the tight link into the

inner cradle of the chain breaker. Lightly drive the rivet so that a microscopic gap appears in the tight link, allowing the link to turn much easier. Try to only push the longer side of the rivet

7. Once the chain is connected make sure it is properly tensioned.
8. **Some single speed bikes use 1/2 x 3/32 but this is an infrequent circumstance.*

4. Multi-Speed Chain Replacement:

- **Objective:** Identify chains that need a link repair/total replacement. Ensure that the new chain is the proper length and width to accommodate all of the gear ratios. The **Z50** chain is used for 5-7 speed bikes. The **Z72** chain is used for 8-speed bikes. The **X9** and **X10** chains are for 9 and 10-speed bikes respectively. *Be aware of chains that use master links as that is the optimal place of connection to break a bicycle chain*.
- **Approximate completion time: 5-10 min**
  1. Inspect the chain for **rust, broken, twisted or bent links**. An overly rusted chain that cannot bend needs to be replaced. A chain with "play" in its links is indicative of wear and the chain may need to be replaced. Use the **chain checker** tool to measure the amount of play in a suspect multi-speed chain. (Ask a fellow mechanic how to use this tool). Use the chain breaker tool to break the chain as stated in the **Single Speed Chain Replacement Tutorial.** **Do not push the pin all the way out***.*
  2. Next, get the correct size chain that corresponds with the number of speeds on the rear wheel of the bike.
  3. Again, new chains will likely have excess chains that need to be removed to match the size of the old chain. Lay the new and old chain next to each other and align each link to identify the link where the new chain must be broken. Remove the link with the same technique used to originally remove the chain from the bike. Again be careful not to push the rivet out of the link! *If someone brings a bike in without a chain or you cannot determine the length of the old chain for any reason then you*

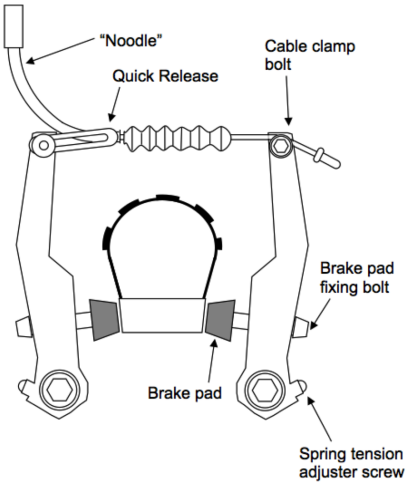
can measure how much of the new chain you need by shifting onto the biggest chainring in the front and the largest sprocket on the rear. Mark the chain at this taut position and add one full link. This is now the correct chain length. It's best to remember this technique as "Big to Big, add One".

4. Once you have the correct length chain, feed the chain through the front derailleur onto the chainring. Then continue feeding the chain onto the rear sprocket and through the derailleur jockey wheels. When you have the chain routed correctly through the drivetrain system then you can reconnect the links with the same technique used for a single speed chain.
5. 9, 10, and 11-speed chains should never use a re-used or "Pushed" pin. Instead, use a replacement pin or a master link.
6. Just as in the single-speed chain the link you worked on may be "tight" so you will have to work that link to loosen it up.
7. Once the chain is fully on shift through all the gears to make sure the chain is running through the drivetrain smoothly.

5. Brake Pad/Caliper/Lever Adjustments

- **Objective:** Identify problems with the braking system; including brake pads, calipers, and levers. Know the differences between **linear-pull/v-brakes, cantilever brakes, dual-pivot brakes, side-pull brakes, and disc brakes** and how to adjust each specific system. *Proper brake adjustments cannot be made at the corresponding wheel is not **true**. If a customer comes in for a brake adjustment with an untrue wheel, consult them about a wheel true. If brake pads appear properly oriented but seem "sticky" when you pull the brake lever, oil the brake cable and housing to reduce friction between the two. This may be sufficient to reduce friction and allow the brakes to function properly. If brakes are screeching when they contact the rim, apply rubbing alcohol to a rag and wipe down the rim and the brake pads. Use sandpaper to sand the pads if brakes are still screeching.*
- **Approximate completion time: 1-5 min**

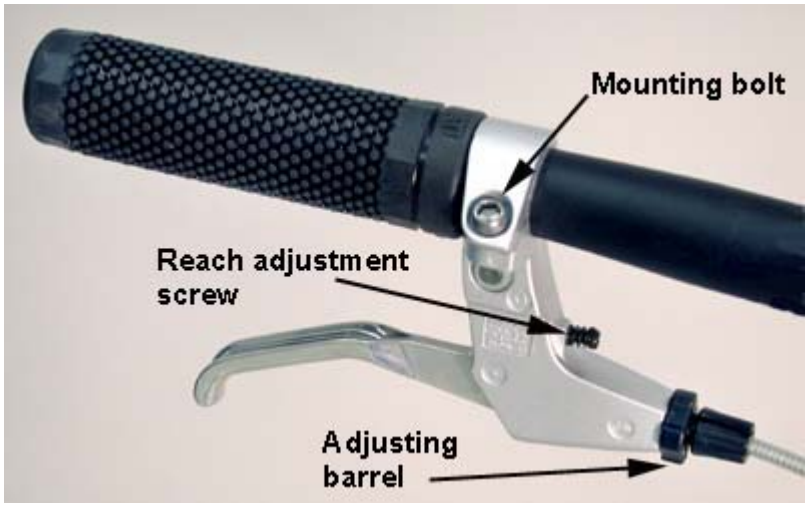
Linear-Pull/V-brakes:



1. Inspect orientation of the brake pads relative to the rim-braking surface. Sometimes just the brake pads need adjustment for proper brake functioning.
2. To adjust brake pads, loosen the **brake pad-fixing bolt** (do not completely remove the hardware; loosening is sufficient) and move the pad so that it is the correct height and parallel to the rim. Tighten the bolt. *Keep in mind that linear-pull calipers will bring the brake pads down as they move towards the rim.*
3. If the pads are in the correct position but the caliper is pulling only one pad towards the rim you will need to adjust the caliper spring tension, which can be done by adjusting the **set screws** on the side of the caliper arms. Tightening the setscrew will bring the caliper arm on that same side away from the rim. Loosening the setscrew will move the arm on that side towards the rim. Continue adjustments of these screws until the brake pads appear center to the rim. *If the caliper is not responding to set screw adjustment then you may need to disengage the **spring** of the caliper and bend it so that it allows the caliper arm to move towards/away from the rim. You can break the spring if you pull hard enough, be careful. Also, make sure the spring is engaged in the middle **tension hole** on the frame if nothing seems to be helping.*
4. To adjust the travel of the brake lever loosen the **pinch bolt** on the caliper and adjust the amount of **cable length** that the caliper can pull and tighten the pinch bolt at this point. To check is the cable pull is appropriate, spin the wheel and

squeeze the brake lever. The brake pads should engage the rim at the same time and effectively stop its rotation.

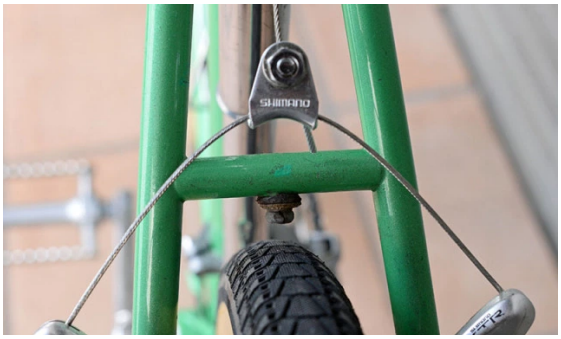
5. For even finer adjustment, you can use the **barrel adjuster**, located on the brake lever. Turning the barrel adjuster counter-clockwise will increase the brake-cable tension, drawing the pads closer to the rim. Turning it clockwise will decrease the brake-cable tension, setting the pads further away from the rim.
6. Sometimes the brake levers will need adjustment. **Brake levers** should be in a position where they are easy and comfortable to reach. Adjust the position of the levers by loosening the mounting bolt and placing them at around a **45º angle** to the ground and then tighten the bolt. Be aware that linear-pull/v-brakes use an **upright brake lever** to pull the brake cable. Upright levers commonly have **set (reach adjustment) screws** to adjust the position(reach) of the lever. Tightening the setscrew will bring the lever closer to the grips. Springs in the lever can wear and/or brake causing the braking system to work improperly. If this is the case then you will have to replace the brake lever. *V-brake/linear-pull levers are specific to V/linear-pull brakes. PICK THE RIGHT REPLACEMENT.*



Cantilever Brakes:

Brake pads on cantilever systems are held in place by a **pad-fixing bolt**. Loosening this bolt allows you to move the pads further or closer to the rim without adjusting the calipers. Adjust the pads so that they are at the appropriate height and parallel to the rim. *Cantilever brakes bring the brake pads down as they approach the rim.*

Identify whether the calipers use a **straddle wire carrier** or a **straddle wire link unit**. The straddle wire carrier sits center above the rim and uses a pinch bolt to secure the cable from the brake lever. The wire link unit sits at a set distance above the tire. Knowing this difference is important if you need to replace cables for these calipers.



Straddle wire carrier^

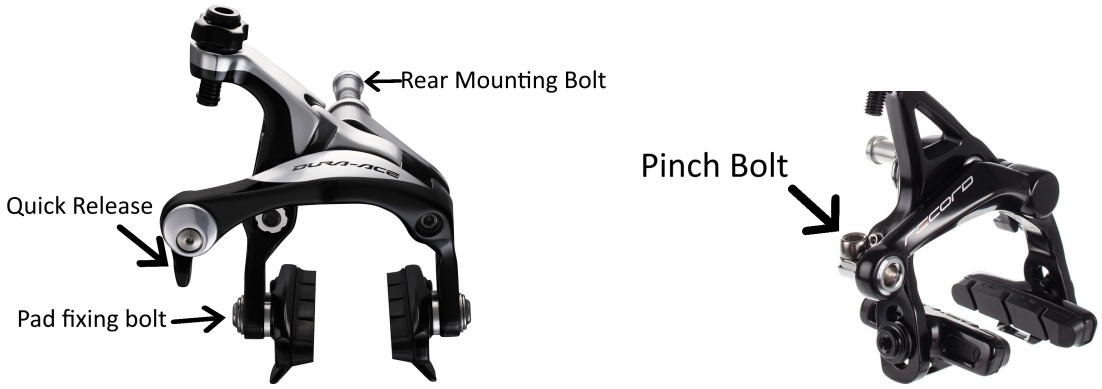
Straddle wire link unit^

If the caliper has **set screws** then you can adjust the calipers with them. Again, tightening the setscrew will bring the caliper arm on that same side away from the rim. Loosening the setscrew will bring the arm on the same side toward the rim.

As for linear-pull brakes, adjustments can also be made for cantilever calipers by adjusting the amount of cable through the **caliper pinch**

bolt and by loosening the **barrel adjuster**, to increase cable tension, or tightening it, to lower cable tension.
Brake levers should be in a position where they are easy and comfortable to reach. Adjust levers by loosening the mounting bolt and placing them at around a **45º angle** to the ground and then tighten the bolt. Be aware that cantilever brakes also use an **upright brake lever** to pull the brake cable. Upright levers commonly have **set(reach adjustment) screws** to adjust the position of the lever. Tightening the setscrew will bring the lever closer to the grips. Springs in the lever can wear and/or brake causing the braking system to work improperly. If this is the case then you will have to replace the brake lever. *Canti levers are specific to canti brakes. PICK THE RIGHT REPLACEMENT.*

Dual Pivot /Side Pull Brakes



1. Dual pivot and side pull calipers are common on road bikes and secure to mounting holes on the frame and fork. If the caliper is loose, tighten the **rear-mounting bolt** while holding the caliper center to the rim.
2. *Dual pivot and side pull calipers also bring the brake pads downwards toward the rim.* If brake pads need adjustment then loosen the **pad-fixing bolts** and adjust the brakes so that they are at the proper height and parallel to the rim.
3. Some calipers are fitted with a **wrench flat** in the **center bolt**. If the calipers are not centered for a caliper with this feature you can use a **14mm wrench** on to adjust the wrench flat while holding **the rear-mount bolt** to center the pads to the rim.
4. For fine-tune adjustment loosen the **pinch bolt** and squeeze calipers so that the brake pads contact the rim. Pull the brake cable tight and slowly release the caliper away from the rim.

Once the pads are at an appropriate distance from the rim, secure the cable with the pinch bolt. *Be aware that these calipers have a **quick release**. Disengaging the quick release will bring the caliper away from the rim and vice versa.*

5. For dual-pivot brakes, the **barrel adjuster** is located at the top of the caliper. Turning the barrel adjuster counter-clockwise will increase cable tension and bring calipers closer to the rim. Turning the barrel clockwise will lower cable tension and bring the calipers away from the rim.
6. There is a **setscrew** on dual-pivot calipers for fine-tune adjustment. If the left pad appears closer to the rim, tighten the setscrew. If the right pad appears closer, loosen setscrew. Side pull calipers may have setscrew similar to linear-pull brakes. Tightening the setscrew will bring the caliper arm on that same side away from the rim. Loosening the setscrew will move the arm on that side towards the rim.

Mechanical Disc Brakes

***Mechanical disc brakes can be distinguished from hydraulic ones by a visible cable**

1. Disc brake calipers are located near the hub of the wheel and house the brake pads, which contact the **disc rotor** in order to stop the wheel rotation.
2. If the pads are rubbing on the rotor then the caliper may be out of alignment or the rotor is out of "true."
3. If the disc is out of true then use the **disc-truing tool** to gently bend the disc rotor in the area that is out of alignment.
4. loosen the pinch bolts, make sure that the arm of the brake sits in a relaxed position, turn the barrel adjusters on both the caliper and the brake lever all the way in.
5. Tighten the pinch bolt, be sure not to move the arm in the process.
6. Loosen both of the mounting bolts
7. To adjust pad spacing, turn the inner pad adjuster. Proper spacing is achieved when the brake fully engages, the brake lever is halfway into the full travel.
8. To align the caliper, turn the pad adjuster half a turn in, hold down the lever so that the caliper engages and aligns itself to the rotor, then tighten both of the mounting bolts bit by bit in an alternating fashion.
9. Back the pad adjuster off by half a turn.
10. Fine tune adjustments can be made with the **barrel adjuster**. *The barrel adjuster for disc brakes may be located at the lever or integrated onto the cable.* Turn the barrel adjuster counter-clockwise to increase cable tension and clockwise to decrease cable tension.

6. Wheel Truing

- **Objective:** Be able to identify when a wheel is out of true and or bent. Being able to identify when a wheel is beyond repair is necessary, as the cost of a new wheel is much larger than the cost of a re-true. Furthermore attempting to true a wheel that is bent is a waste of time for an inexperienced mechanic. If in doubt about the integrity of a wheel please ask an experienced mechanic. *If a customer comes in for a brake adjustment and their wheel is out of true, let them know that brake adjustments cannot be made unless the wheel is true*.
- **Approximate completion time: 10-15 min**

Horizontal Truing

1. When a wheel is out of lateral true, the rim will appear to wobble side-to-side as the wheel rotates. This is due to an uneven tension of the spokes at a certain point on the rim. The side-to-side movement usually causes the rim to rub against the brake pads. *Squeeze each pair of spokes around the wheel to check for broken, loose, and/or tight spokes. A broken spoke means a new spoke needs to be installed which is another repair at a higher price point.*
2. If the lateral movement of the rim is causing the brake pads to rub then the wheel should be trued. The wheel may be out of true but not to the point that the rim contacts the brake pads. An out of true wheel will become worse over time if the spoke tension is not corrected. *If you notice that a wheel is out of true but does not need immediate truing then let the customer know to keep an eye on their wheel and that an out of true wheel will get worse over time resulting in eventual failure.*
3. To true the wheel, remove the wheel from the bike and place it, by its axle, in a **wheel-truing stand**. *Make sure the wheel is **centered** in the stand before you start truing otherwise you run the risk of causing the wheel out of true.* Oil all of the **spoke nipples** with chain lube(tri-flow) before you begin truing! Secure the wheel in the stand and raise the stand caliper up so that it is level with the rim of the wheel. Move the **caliper indicators** close to the rim.
4. To determine the point of largest lateral deviation, spin the wheel and move the indicators in until one of them touches the rim. This is the area of the rim that you will address first. Wheel truing is an incremental process.
5. Use a **spoke key** to adjust the tension of the spokes in the immediate area of deviation. Make sure you use the correct size on the spoke key when adjusting the nipples or you may break or strip the spoke nipples. To bring the rim away from the indicator tighten the spoke on the *opposite* side (if the left of the rim is touching, tighten right-side spoke). To tighten the spoke, turn the nipple *counter-clockwise* (this is because you are working from the bottom of the nipple and not the top). Tighten spokes 1/2 turn at a time.
6. Continue locating side-to-side deviations and move the caliper indicators inward as corrections are made. Tighten the spokes

opposite of any deviations in the same manner until the rim spinning with less than **1mm** of deviation.

7. When the true is complete install the wheel securely back onto the bike.
8. Be aware that damaged wheels can make truing difficult. *For example, if the wheel is running right even though the right side spokes are loose and left side spokes appear tight, the rim is bent.* At this point refer the wheel to an experienced mechanic. They may try to bash the wheel on the ground to correct the rim in the problem areas so that the spokes can be adjusted. If this doesn't work then the wheel likely needs to be replaced.

Radial Truing

***Note: Radial truing a well-used wheel is a witchcraft. The practice should only be attempted with utter confidence.**

1. When a wheel is out of radial true, the rim will appear to move up and down, or "hop", as the wheel revolves. Sections of the rim moving away from the hub are called **high spots** and sections moving toward the hub are called **low spots**.
2. Remove the tire/tube from the wheel and place the wheel in a wheel-truing stand. Remember to oil all of the spoke nipples before any adjustments are made. Adjust the truing-stand caliper indicators so that they are directly under the rim and rotate the wheel to find where the high or low spot is. *A high spot will contact the caliper indicators while a low spot will move away from the indicators*.
3. To correct a high spot find the center of the deviation and tighten (turn counter-clockwise) *both left and right spokes* of this location 1/2 a turn at a time. This will bring the rim closer to the hub. Rotate the wheel and check for any other high spots and correct by tightening the spokes at those locations.
4. After three radial adjustments check the **lateral true** of the wheel and correct for any lateral deviations before continuing with more radial corrections.
5. After making several high spot corrections the rim may show areas of low spots that need to be corrected. To correct low spots move the truing-stand caliper indicators so they are

directly above the inside of the rim and focus on spots that deviate inward to rub the indicators.

6. Find the center of the deviation and loosen (turn clockwise) both the right and left side spokes at that location 1/2 turn at a time. This will bring the rim away from the hub. Rotate the wheel and check for any other high spots and correct by loosening the spokes at those locations.
1. Again check the lateral true when you are done correcting the radial true. If no other truing is needed then put the tire and tube back onto the wheel and put the wheel back onto the bike. Make sure the brake pads are centered to the trued rim.

7. Wheel Respoke

- **Objective:** Identify broken spokes and be able to replace broken spokes with spokes of the correct length. True the wheel after replacing the broken spoke. If a wheel is very out of true with a history of an impact it is likely that a spoke is broken. *Squeeze each pair of spokes around the wheel to check for broken, loose, and/or tight spokes. A broken spoke means a new spoke needs to be installed which is another repair at a higher price point. If a wheel has 5 or more broken spokes then the wheel should be replaced.*
- **Approximate completion time: 15-20 min**
  1. Remove the wheel with broken spokes from the bike. Remove the tire, tube, and rim strip.
  2. If it is a rear wheel, remove the freewheel or cassette with the freewheel or cassette removing tools. It may also help to remove the rotor if it's a disc brake system.
  3. Remove the broken spoke and measure it as accurately as possible with the **spoke-measuring tool**. If the spoke is absent, measure an adjacent spoke from the hole on the hub to where the spoke terminates approximately somewhere within the nipple and rim Find a spoke with the same measurement and feed that spoke through the hub so that the spoke head is facing the correct direction (either inward or outward). *Be sure to follow the pattern of the other spokes as you move the spoke towards its nipple hole*.
  4. Bend the spoke towards its nipple hole (in the rim) without putting a kink in it.
  1. Place a new nipple in the nipple hole and tighten it onto the spoke. Watch out for double-walled rims as nipples tend to get lost

between the walls and are hard to get out. Thread the nipple onto a spare spoke backward to place it into the nipple hole without losing it.
2. With the new spoke/spokes installed, true the wheel as explained in the wheel-truing tutorial.
3. Put the freewheel/cassette (rear wheels), rotor, rim strip, tube, and tire back onto the wheel and securely install the wheel back onto the bike.
4. Adjust brake pads so they are centered to the trued wheel.

8. Pedal Removal / Installation

- **Objective:** Be able to remove and install pedals and know the different thread pitches of the pedals so that you do not strip the crank arm threads during installation. Also know the thread direction for drive and non-drive side pedal. *Be aware that we only sell pedals in pairs but we might have a used pedal/pedals that can be installed for just the labor charge *consult with either the shop or student coordinator before proceeding*. Also if you are having trouble remembering if pedal threads are right or left here is a quote from our fearless leader, "Right is RIGHT and left is WRONG." (right(drive) side is right hand(normal) threaded)*
- **Approximate completion time: 5-10 min**
  1. Grab a **pedal wrench** for this job. The pedals will have **wrench flats** that the pedal wrench fits to. Some pedals may not have the notches for a pedal wrench, use and 8mm hex key on the back instead. Rethink the turning direction when you work on the pedal from the backside.
  2. The drive side pedal has **right-handed threads**. To remove the drive side pedal, turn the pedal left (counter-clockwise) with the pedal wrench. Make sure you have proper leverage when doing this. Ask another mechanic to hold the other crank if necessary.
  3. The non-drive side pedal has **left-handed threads**. To remove the non-drive side pedal, turn the pedal right (clockwise) with the pedal wrench. Again make sure you have proper leverage when doing this. *If the pedals are difficult to remove, spray some WD-40 into the area where the pedal threads into the crank. Wait a few minutes and try again.*

4. Next check the **thread pitch** of the removed pedal. It will either be **1/2** or **9/16**. The threading of a 9/16 pedal will appear larger than a pedal with 1/2 threading. *9/16th is typically matched with 3 -piece (mtb, road) crank-set and 1/2" is typically matched with single-piece (cruiser) crank-sets.*
5. Pedals are designated right or left and an **"R"** or **"L"** is usually indicated on the pedal. Make sure you are installing the correct side so you do not strip the crank threads!!!
6. Before threading the pedal into the crank, grease the pedal threads and the crank threads. This will help prevent seizing when they need to be removed.
7. Thread the drive side pedal into the drive side crank (clockwise) and tighten it snugly into the crank with the pedal wrench. *Be wary not to over tighten the pedals as this will make it harder to remove the pedal in the future.*
8. Thread the non-drive side pedal into the non-drive side crank (counter-clockwise) and tighten with the pedal wrench.

9. Rear Sprocket Removal

- **Objective:** Be able to identify the different types of rear sprockets and know how to remove them if they are damaged or worn. Know how to identify if the rear sprocket is damaged or worn.
- **Approximate completion time: 5 min**

Freewheels are self-contained units that thread on and off rear hubs. Freewheels can be either multi-speed or single speed. Freewheels need to be removed to do rear hub overhauls and wheel re-spokes. To check the integrity of the freewheel, pedal the bike in the stand then stop and let the wheel coast. If the chain sags while the wheel coasts, the freewheel is damaged and should be replaced or flushed. The entire unit-sprockets and ratcheting mechanism come off when the freewheel is removed. *Be aware of multispeed wear patterns for freewheels. This occurs when the customer ride on a single gear without changing it. This causes wear patterns on the chain and the sprocket that the chain runs on. This causes the chain to "slip" and*

make a clunking sound while running over that sprocket. The teeth on that sprocket will also look sharper than other teeth. If this is happening, the chain should be replaced along with the freewheel.

Multi-speed Freewheel

1. Remove the wheel from the bike.
2. Remove the quick-release skewer or the axle nut.
3. Inspect the freewheel to determine which **freewheel removal tool** is needed to remove the freewheel. To determine this, look at the pattern of recessed notches or splines inside the freewheel body.
4. Place the freewheel tool in the **vice** and tighten the vice to firmly secure it. Place the freewheel onto the freewheel tool and turn the wheel counterclockwise. This will unthread the freewheel from the hub. Continue loosening the freewheel until it is off the wheel.
5. Take note of how many speeds the old freewheel has. Replace it with a corresponding freewheel.
6. Grease the freewheel threads on the hub. Thread the freewheel on clockwise by hand until it is fully threaded. Tighten the freewheel a little bit past this point. It does not need to be extremely tight. (it self-tightens)
7. Reinstall the axle nut or the skewer onto the axle. Install the wheel back onto the bike and check for smooth shifting.

Single Speed Freewheel

<The bad ones 

<Good ones

*Single speed freewheels typically use a freewheel tool or key. However, single speed / fixed gear bikes from big-box retailers (Walmart) usually have cheap freewheels that do not accept freewheel keys. Theses freewheels may have to be clamped in the vice to be removed. Usually, these freewheels must be broken to be removed. Be aware of this when dealing with single speed freewheels. *If encountering a job that involves the freewheel being removed, notify the customer that they may need a new freewheel as well.*

1. Remove the wheel from the bike.
2. (For typical freewheels) Get the appropriate **freewheel removal tool** and clamp it in the vice. Line the spline of the freewheel tool up with the notches in the freewheel.
3. Turn the wheel counterclockwise to unthread the freewheel and loosen it until it is removed.
4. (For cheap freewheels) Clamp the freewheel itself tightly in the vice. Clamp the edge right next to the teeth, but not the teeth themselves.
5. With the freewheel clamped, turn the wheel counterclockwise to unthread the freewheel. Tighten the vice clamps more if the freewheel is still not unthreading. *You may have to tighten to the point that the freewheel breaks in order to remove it from the wheel.*
6. Replace the freewheel with one of the single-speed freewheels in the back. Do this by threading it on clockwise until it is tight and secure.

Cassette Removal

Bikes that use cassettes have a **freehub body**. This is the ratchet system that is mounted onto the hub of the wheel. The cassette sprockets slide individually over the splines on the freehub body. A lockring threads into the freehub body and holds the sprockets. *Be aware of multispeed wear patterns for cassettes. This occurs when the customer ride on a single gear without changing it. This causes wear patterns on the chain and the sprocket that the chain runs on. This causes the chain to "slip" and make a clunking sound while running over that sprocket. The teeth on that sprocket will also look sharper than other teeth. If this is happening, the chain should be replaced along with the cassette.*

1. Remove the rear wheel from the bike and remove the quick release skewer or solid axle nut.
2. Grab a 1/2 x 3/32 **chain whip tool** and a **cassette wrench**. Hold the sprockets of the cassette in the clockwise direction with the chain whip tool. Engage the cassette wrench into the splines of the cassette lockring and turn the cassette wrench counter clockwise while holding the sprockets in place with the chain whip tool. *Bikes with a cassette that use solid axles are uncommon. In this case, you will need to use a **cassette remover tool** and an adjustable wrench to remove the lockring from the freehub body.*

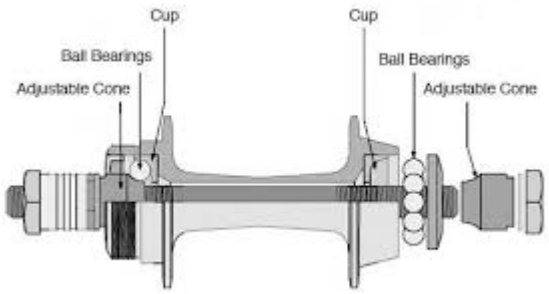
3. Hold sprockets in place until the lockring is unthreaded from the freehub body.
4. Remove lockring and sprockets and take note of the orientation and order of any **spacers** behind the sprockets. Spacers need to be replaced in the same order they are removed.
5. To reinstall the cassette look for a wide space between the splines of the freehub body. Inspect internal splines of the sprockets and look for a wide space to mate with the space on the freehub body.
6. Align the splines and engage all the sprockets and install all of the spacers in their appropriate positions.
7. Grease the threads of the lockring and thread it into the freehub body.
8. Insert the cassette wrench and tighten the lockring (clockwise) until it is fully tight.

Fixed Gear Removal

A fixed gear is a single speed sprocket that is locked to the hub shell. Fixed gear cogs are right hand threaded and meant for hubs designed for a lockring. The lockring is slightly smaller than the cog and is **left hand threaded** because it would be self-tightening should the rear cog start to loosen.

1. Remove the wheel from the bike.
2. Remove the lockring with a **lockring removal tool**. Hold the wheel while turning the tool clockwise to do this.
3. With the lockring off, use a 1/2 x 1/8 **chain whip tool** to remove the fixed cog. Hold the wheel while turning the tool counter clockwise.
4. Reinstall the fixed cog by tightening it onto the fixed cog threads (clockwise).
5. Then tighten the lockring onto the lockring threads (counter-clockwise). Lockrings only need to be snug. Do not overtighten!

10. Hubs



Hubs are the center of the wheels, which allow the rim, spokes, and tire to rotate around the axle. **Ball bearings** in between the **cone races** and the **cup races** of the hub allow for smooth rotation of the wheel. Bearings and race surfaces can be worn down so that "play" develops in the hub. *Cup races can be damaged to the point that the entire wheel needs to be replaced. It is uncommon but some hubs use sealed bearings. Sealed bearings are not adjustable so they need to be replaced if they*

become damaged. If unsure about the integrity of sealed bearings, ask an experienced mechanic.

Objective: Be able to identify a hub that needs adjustment or overhaul. Be able to properly adjust hubs and replace internal components if there is thorough damage present.

Hub Adjustments

The goal of hub adjustments is to remove as much of the play as possible. Properly adjusted hubs are important to maintain the integrity of the cup and cone races and ball bearings. Hubs with "play" will wear down these components at a faster rate. *For rear wheels, the non-drive side cone and lock nut should be adjusted when the hub has play. To check if a locknut is loose grab both of them on either end of the axle and attempt to loosen by hand. *If the drive side locknut is loose then you will have to remove the sprockets to access the drive side cone. For wheels with freewheels, simply remove the freewheel to access the drive side cone. For freehub bodies, remove the cassette and loosen the non-drive side conn so that you can push the axle through the freehub body enough to access the drive side cone.*

Approximate completion time: 5-10 min

1. Remove the wheel from the bike.
2. Typically you will need a **15mm cone wrench** and a **17mm box wrench to adjust the rear hub** and a **13mm cone wrench** and a **17mm box wrench** to adjust the front hub.
3. Remove the quick-release skewer, rubber cone coverings, or axle locknuts on the side that is to be adjusted (*non-drive side for rear wheels*).
4. Place the wheel on a bench so that the side to be adjusted is facing you.
5. Hold the cone with the cone wrench with your right hand. While holding the cone still, place the circular end of the 17mm wrench onto the locknut and turn counterclockwise to loosen it.

6. With the locknut loose, tighten the cone while holding the axle on the opposite side. You can clamp the opposite end of the axle in the vice if you find this an easier way to hold the axle.
7. Check the rotation of the axle by spinning it. If the rotation feels rough then the cone is too tight. Loosen the cone until the rotation is smooth and there is minimal play in the hub. *The point is to create minimal play so that when the locknut is tightened down, there is a smooth rotation with no play.*
8. With the cone adjusted to the desired point (minimal play) hold the cone again with the cone wrench. Place the circular end of the 17mm wrench onto the locknut and tighten it while keeping the cone still.
9. Check the rotation and play of the hub. Ideally, there should be no play and smooth rotation! A properly adjusted hub will not grind or have play. If you feel like you need a third hand to keep the axle from moving when tightening the lock nut, try putting the other side of the axle lock nut in the vice. *Older hubs with some wear may be hard to adjust. Keep this in mind so that you do not waste time trying to get the hub perfectly adjusted!*
10. With the hub adjusted, reinstall any components previously removed from the axle (quick release, rubber caps, axle locknuts).
11. Reinstall the wheel properly and securely onto the bike.

<u>Hub Overhauls</u>

Overhauls should be performed when the hub of a wheel has an excessive amount of play causing the wheel to rock back and forth prominently. This usually means that the ball bearings are worn or the **bearing retainers** are broken. If the rocking of the wheel seems excessive then it is likely that the axle is broken as well. *In this case, damage to the hub is often thorough and the whole wheel should be replaced. A broken axle cannot be confirmed until the hub has been disassembled so it is important to let the customer know that a new wheel may be needed if you discover a broken axle has damaged the interior of the hub beyond repair during the overhaul process*.

Approximate completion time: 15-20 minutes

*The following procedure is for a rear hub. It applies to front hubs as well you just don't have to deal with the sprockets.

1. Remove the wheel from the bike and remove the quick release skewer, rubber cone coverings, or axle locknuts (from the non-drive side for rear wheels).
2. Clamp the wheel in the vice by its axle (clamp on the drive side for rear wheels).
3. On the opposite side of the wheel use the **15mm cone wrench** to hold the cone while using the circular end of the **17mm wrench** to loosen the locknut (counterclockwise).
4. Completely remove the locknut and the cone from the axle.
5. Lift the wheel from the vice. The axle will remain in the vice. Be aware that ball bearings will fall out while you lift the wheel up. Please ensure you do not lose bearings.
6. With the axle out of the wheel, remove the **dust caps** (if they can easily be removed) to access the cup races and bearings.
7. Once the interior of the hub is accessed, wipe old grease and dirt away from the bearings and cup races. Inspect the **cup races** for damage. *If there is sufficient pitting or deformation of the cup race surface this means the wheel needs to be replaced.*

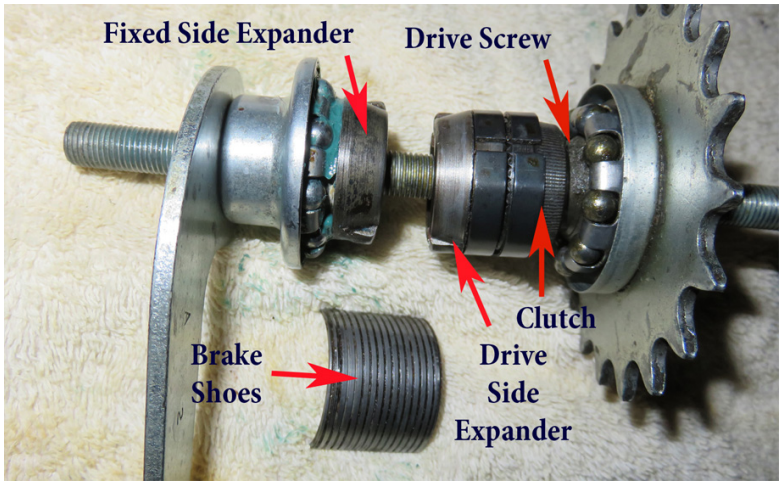
<pitted cone

8. Inspect the ball bearings or bearing retainers. If ball bearings show significant damage then replace them with the correct size ball bearings. If the bearing retainer is broken then replace it with the appropriate size retainer.
9. If all the components are intact or you have the replacement parts ready for installation then clean the cup races, cone races, and bearings with a rag and a solvent (degreaser or

simple green). This is to remove any dirt and grime that may affect the contact between the surfaces.

10. Next, apply a generous amount of grease to the cup races and ball bearings/bearing retainers. *This will reduce the friction between the surfaces and extend the life of the components.*
11. Carefully place the bearing balls back onto the grease. The grease would help hold the balls in place, even upside down.
12. Place the wheel back onto the axle on the appropriate side.
13. Reinstall the dust cap, cone, and locknut that were removed earlier, back onto the axle.
14. With the cone adjusted to the desired point (minimal play) hold the cone again with the cone wrench. Place the circular end of the 17mm wrench onto the locknut and tighten it while keeping the cone still.
15. Check the rotation and play of the hub. Ideally, there should be no play and smooth rotation!
16. With the hub adjusted, reinstall any components previously removed from the axle (quick release, rubber caps, axle locknuts).
17. Reinstall the wheel properly and securely onto the bike.

Coaster Brake Overhaul



Coaster brakes are a common braking mechanism on beach cruiser bicycles. Coaster brakes allow the cranks to remain stationary as the wheel coasts. The braking mechanism engages when pedaling

backwards. The components in a coaster brake can wear and cause the hub to become loose. It is important for the coaster brake hub to be properly adjusted so that the components do not wear as fast.

- **Objective:** Be able to identify coaster brake hubs that need an overhaul. Be able to overhaul the coaster brake hub and reinstall it on the bike properly.

Approximate completion time: 15 min

1. Begin by loosening brake arm stop screw to free arm from frame.
2. Remove the wheel from the bike and remove axle nuts and washers from the axle.
3. Remove the sprocket. Use a narrow tipped straight blade screwdriver to remove a **snap ring** holding the sprocket. Note the orientation of the sprocket, as incorrect orientation can negatively affect the chain line.
4. Hold cone with a cone wrench. Loosen and remove locknut. It will be useful to lay the parts out in orientation and order as they come off the axle and out of the hub.
5. Remove the cone and turn driver counter-clockwise to remove it from the shell.
6. Liftoff the wheel from axle assembly. Use care, as the **brake shoe** or other parts may fall out.
7. Remove **spring** from inside **clutch** for better cleaning.
8. Use a solvent (degreaser/simple green) and a rag to thoroughly clean any grease/dirt off the components.
9. Notice studs on the cone of the axle assembly. These will go between the two brake shoes. The spring end will engage inside the cone. Place assembly through hub shell. Rotate until cone seats into the hub shell.
10. Grease all other bearings and then place bearing into the hub shell and install the driver.
11. Install bearing inside driver and thread on cone and locknut.
12. Adjust bearings. Turn cone down until it just touches the bearings, then turn back counter-clockwise 45-degrees. Hold cone and secure locknut. Grab rim and pull to check for play. Make adjustments in small increments until the play is gone. Note these are generally lower precision parts, and a “smooth”

adjustment may not be possible. A slight amount of play may be necessary.

13. Install sprocket, noting orientation if offset. Use a thin-bladed screwdriver to engage the snap ring into the driver.
14. Install wheel into the bike and adjust chain tension. The chain tension for a coaster brake wheel should not be set as tight as a single speed/fixed gear due to the extra tension exerted by braking action.

11. Cranks

Cranks are levers that connect the pedals to the bottom bracket spindle. The cranks are fitted with toothed sprockets called chainrings that drive the chain. Crank arm removal is needed when the crank/chainring needs to be replaced and in order to service bottom brackets. There are several types of crankset/bottom bracket systems including square tapered, cottered, octalink, ISIS, and two-piece. *The type we deal with most in the shop is the **square tapered** setup for three-piece bottom or cartridge brackets. Square tapered cranks appear to have a square spindle-engaging surface when the crank is viewed vertically (Be aware that diamond tapered cranks appear as squares rotated 45º when viewed vertically). We also see many cranksets for one-piece bottom bracket, most commonly found on beach cruisers.*

- **Objective:** Be able to identify crank arms that are loose or worn. Be able to tighten crank arm and know when to replace the crank arm if it significantly worn.

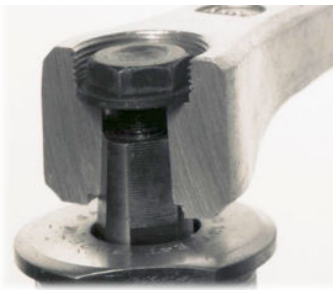
Crank Arm Tightening

The bolts that secure the crank arms to the **bottom bracket spindle** can become loose over time if not properly tightened. This causes the crank arm to become loose on the bottom bracket spindle.

Approximate completion time: <5 min

1. Tighten the **crank arm bolt** (clockwise) with either the **14mm socket** or the **8mm hex** of the **crank arm wrench.**
2. Generously tighten the bolt as this will remove any play and allow for the crank arm to remain secure to the spindle over time.

Crank Removal/Installation (Square Taper/Octalink/ISIS)



< Square taper crank system

^ Various crank-BB interface systems

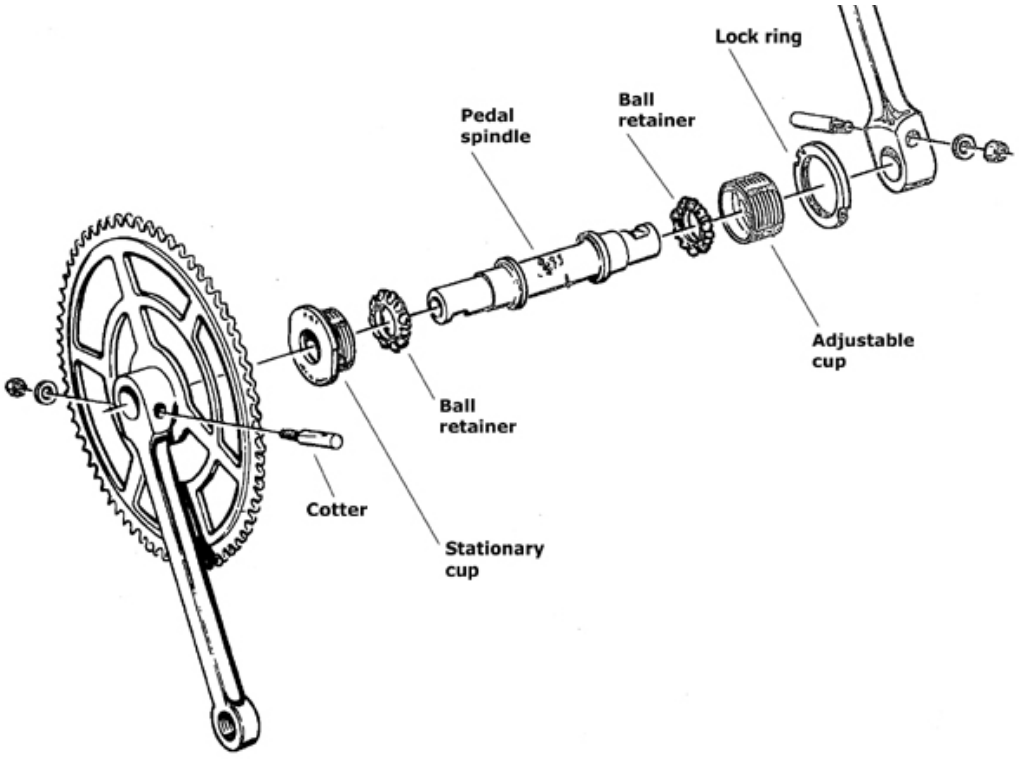
1. *If working with the drive side crank, remove the chain from the chainring and let the chain rest to the inside of the chainring on the bottom bracket shell.
2. If you can't see a bolt securing the cranks, remove the dust cap at the center of the cranks. Some of them can be pried out, some of them unthread.
3. Begin by removing the crank arm bolt from the crank arm with a crank arm wrench. Loosen the bolt (counterclockwise) until it is completely removed. For some spindles, you will just have to remove a nut that threads onto the spindle itself. *The crank arm wrench has a **14mm** socket and an **8mm** hex to remove the axle bolt/nut.*

4. Next, you will need a **crank arm removal tool**. Thread this tool completely into the threads on the crank arm. Octalink and ISIS require a puller with a larger pushing tip. *Be careful not to cross-thread or you can strip the threads on the crank arm! If the threads are not properly engaging then contact an experienced mechanic before proceeding.* ***If you strip the threads in a crank arm you have fucked up....royally. So don't do it.***
5. With the crank arm removal tool fully engaged, rotate the arm of the tool clockwise. *This will cause the tool to push against the bottom bracket spindle in order to disengage the crank arm from the spindle.* As the crank arm is removed more resistance will be encountered but continue to turn the tool arm clockwise until the crank is completely removed.
6. Inspect the spindle surface and the spindle-contacting surface of the crank arm. If the surface on the crank arm is significantly rounded out then replacement of the crank is necessary to allow a tight fit between the spindle and crank arm. Lightly grease the spindle.
7. To reinstall the crank arm place it onto the bottom bracket spindle. Make sure that it is in the opposite direction of the other crank to ensure proper pedaling.
8. With the crank on the spindle, reinstall the crank arm bolt.
9. Generously tighten the bolt as this will remove any play and allow for the crank arm to remain secure to the spindle over time.
10. *Put the chain back onto the chainring if working on the drive side.
11. Test ride the bike to test the security of the cranks as they rotate.

<u>Other Crank Systems</u>

There are also other crank-BB interfacing systems on bicycles. They are encountered far less common in the shop, therefore only their identification process is discussed in this manual.

Cottered Cranks:



Cottered cranks are only found on older bikes typically around early 1970s. They are obsolete due to their difficulty to work on and mechanical disadvantage. A cotter pin is inserted into a hole in the cranks to secure the cranks. The cotter pin has a side that is ground into a wedge, and it contacts a flat face on the spindle. The tip of one side of the cotter pin is threaded, and a nut is threaded onto it to secure the pin when the crank is installed.

More information on Cottered cranks can be found on Sheldon Brown's website: Cottered Cranks (Google: Sheldon Brown Cottered Cranks).

_____Two-Piece Crankset

Two-piece cranksets are commonly found on higher end bikes. One side of the crank is permanently attached to the spindle, and the other side of the spindle is slotted to mate with the other crank. The spindle sits on the bottom bracket bearing directly. These types of cranks have a compression cap on the crank that is removed. Shimano Hollowtech also have two pinch bolts on that crank. On the crank that is attached with the spindle, there is usually a giant hole, or nothing at all. The BB system that come with these cranks are either threaded external cup or pressed in.

The installation and removal process for these cranks vary from manufacturer, so identify the brand, model, and look up the official manual.

12. Bottom Brackets

The bottom bracket system supports a spindle that attaches to a set of crank arms. The bearings in bottom brackets see a lot of load from riding. The bottom bracket shell on the bike frame supports bottom

bracket bearings. During rotation, the bearings roll on the bottom bracket cup surfaces. Over time, the bottom bracket system can become loose and this can accelerate the wear on the bearings and cup surfaces. It is important to properly maintain bottom bracket components to extend their lifetime. *Typically, in the shop we* ***see press-fitted one-piece bottom brackets*** *(common on beach cruisers****),*** ***English threaded three-piece bottom brackets****, and* ***English threaded cartridge bottom brackets****.*

One-Piece Bottom Brackets

In one-piece bottom brackets, one S-shaped piece of steel forms the crank arms and goes from the pedal, through the bottom bracket, to the other pedal. This crank also acts as the bottom bracket bearing axle. The crank arm is threaded in the middle and acts as the bottom bracket's spindle. The crank drive side threading is right-hand threaded, and the non-drive side (left side) is left-hand threaded. It is necessary to first remove the left side pedal in order to remove the crank.

One-Piece Overhaul

If an one-piece bottom bracket is extremely loose then it is likely that the bearings inside are damaged and/or the cup races are drastically worn. In this situation, a bottom bracket overhaul is needed to readjust or replace any problem components.

- **Objective:** Be able to diagnose when a one-piece bottom bracket needs an overhaul, be able to replace any damaged parts and be able to properly and securely reinstall the components onto the bike.

Approximate Completion Time: 15-20 min

1. Remove the chain from the chainring and rest it on the bottom bracket shell so that it is out of the way.

2. Remove the non-drive side pedal by turning it clockwise.
3. Remove the lockring on the non-drive side by using a **36mm wrench**. With the wrench turn the lockring clockwise to loosen it. Remove the lockring fully.
4. Remove the **toothed washer** from the crank. *This washer prevents rotation of the cup when you tighten the locknut back on.*
5. Next, loosen the cone with a **spanner**. Turn clockwise to loosen the cone. Remove the cone fully.
6. Remove the bearings from the non-drive side.
7. With all the non-drive side components removed, remove the crankset from the bottom bracket shell.
8. Inspect the bearing retainers, cup races, and cone races. If any components are significantly worn or damaged they should be replaced. *Usually, the bearings are the damaged components and need to be replaced*.
9. Clean all of the components with a solvent (simple green/degreaser).
10. Generously grease the bearings, cup and cone races. Place the bearing retainers, facing one another, back into the bottom bracket cups. Grease will extend the lifetime of the components by reducing friction between component surfaces.
11. Place the crankset back in the bottom bracket shell making sure the drive side components are installed.
12. Reinstall the non-drive side components. Tighten the non-drive side cone (counterclockwise) until it contacts the bearings and then loosen 1/4 turn.
13. Place the toothed washer back onto the crankset before reinstalling the lockring.
14. Tighten down the lockring (counterclockwise). Check the rotation of the bottom bracket. It should have smooth rotation and also no play. Adjust cone/lockring tightness as necessary. *Please be patient. A proper adjustment should have zero play but also not bind.*
15. Reinstall the non-drive side pedal.
16. Place the chain back onto the chainring.
17. Test ride the bike to check the integrity of the repair.

One-Piece Adjustment

If a one-piece bottom bracket is just slightly loose, then just a small adjustment of the non-drive side cone is needed to remove the play.

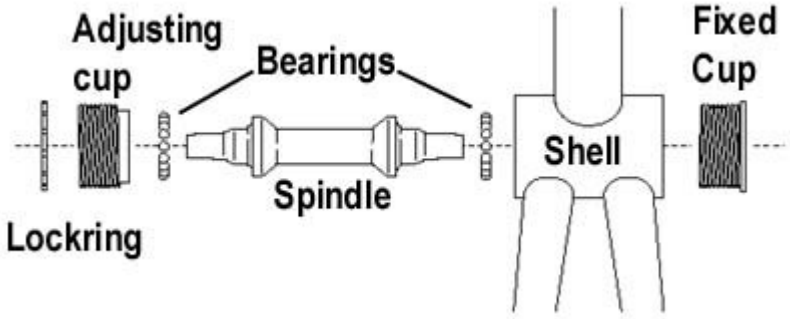
Approximate completion time: <5 min

1. Remove the chain from the chainring and rest it on top of the bottom bracket shell.
2. Loosen the lockring on the non-drive side by using a **36mm wrench**. With the wrench turn the lockring clockwise to loosen it.
3. Next, use a spanner to tighten the non-drive side cone (counterclockwise). Tighten just enough to remove the play.
4. Re-tighten the lockring.
5. Check the rotation of the crankset. Rotation should be smooth, with no binding. There should be no play in the bottom bracket as well.
6. Place the chain back onto to chainring.

Three-Piece Bottom Brackets

3-piece bottom brackets include square-spindle bottom brackets. These bottom brackets can be dismantled and cleaned once the cranks are removed. Bearings rotate between the surfaces of the cone shape race on the spindle and the cup race. If the 3-piece system is too tight or too loose, the components will wear down at a faster rate. Therefore it is crucial that the components are properly adjusted. *Typically we deal with English threaded bottom brackets, however, we do see other thread types. Ask an experienced mechanic is you are unsure of the thread type.*

Three-Piece Overhaul



Over time bottom bracket components will become worn. This may cause the bottom bracket to become loose, make noises during rotation, or become hard to pedal/rotate.

In these cases, the bottom bracket should be overhauled and parts should be cleaned and/or replaced if damaged.

- **Objective:** Be able to identify when a bottom bracket needs an overhaul. Be able to properly disassemble and reassemble bottom bracket components and replace components if needed.
- **Approximate completion time: 25-30 min**
  1. *(These first 4 steps are the same as in the crank removal tutorial.) Remove the chain from the chainring and let the chain rest to the inside of the chainring on the bottom bracket shell.
  2. Begin by removing the crank arm bolt from the crank arm with a crank arm wrench. Loosen the bolt (counterclockwise) until it is completely removed. For some spindles, you will just have to remove a nut that threads onto the spindle itself. *The crank arm wrench has a **14mm** socket and an **8mm** hex to remove the axle bolt/nut.*
  3. Next, you will need a **crank arm removal tool**. Thread this tool completely into the threads on the crank arm. *Be careful not to cross-thread or you can strip the threads on the crank arm! If the threads are not properly engaging then contact an experienced mechanic before proceeding.* ***If you strip the threads in a crank arm you have fucked up....royally. So don't do it.***
  4. With the crank arm removal tool fully engaged, rotate the arm of the tool clockwise. *This will cause the tool to push against the*

bottom bracket spindle in order to disengage the crank arm from the spindle. As the crank arm is removed more resistance will be encountered but continue to turn the tool arm clockwise until the crank is completely removed. *Repeat this procedure for the opposite crank arm.

5. With the cranks off, remove the non-drive side lockring with a **lockring spanner** by turning it counterclockwise.
6. Remove the non-drive side cup with an appropriate tool. Turn the cup counterclockwise to do so.
7. Remove the bearings and spindle and take note of which side of the spindle is the drive side.
8. Remove the drive side cup by turning it clockwise.
9. Clean all the components (cups, bearings, spindle) with solvent and dry them.
10. If the bearings, cups, or the spindle are significantly worn, then they should be replaced.
11. Grease the bottom bracket shell threads, cup threads, cup races, and bearings before reinstallation.
12. Thread drive side cup in completely and tighten.
13. Place bearings on the drive side of the spindle and install spindle through the shell and into the fixed cup.
14. Install second bearing cage into the adjustable cup (non drive side) and thread cup into place.
15. Tighten the adjustable cup until you feel it contact the bearings.
16. Install the lockring on the non-drive side cup and tighten it completely.
17. Check the rotation of the spindle. The rotation should be smooth and there should be no play. Loosen/tighten the cup and lock ring as needed until spindle feels properly adjusted.
18. Reinstall the crank arms onto the bottom bracket spindle. Make sure they are in the opposite direction of each other to ensure proper pedaling.
19. With the cranks on the spindle, reinstall the crank arm bolts.
20. Put the chain back onto the chainring.
21. Test ride the bike to feel the bottom bracket.

Three-Piece Adjustment

If a three-piece bottom bracket is slightly loose, then a small adjustment of the non-drive side cup may be sufficient to eliminate the play.

Approximate completion time: <5 min

1. Remove the chain from the chainring and let the chain rest to the inside of the chainring on the bottom bracket shell.
2. Loosen lockring on non-drive side cup.
3. Tighten the cup until you feel it contact the bearings. This may require you to remove the non-drive side crank.
4. Check the rotation of the spindle. The rotation should be smooth and there should be no play. Loosen/tighten as needed until spindle feels properly adjusted.
5. Tighten lockring on the non-drive side cup completely.
6. Put the chain back onto the chainring.
7. Test ride the bike to feel the bottom bracket.

Cartridge Bottom Brackets

Generally, for cartridge bottom brackets, the bearings are used until they are worn out, and then they are replaced. For most cartridge bottom brackets, the entire bottom bracket unit is replaced, including the spindle. *Again, typically we deal with English threaded bottom*

brackets, however, we do see other thread types. Ask an experienced mechanic is you are unsure of the thread type.

Cartridge Replacement

To determine if the bottom bracket is worn or has developed play, drop the chain off the chainring to the inside.

Objective: Be able to identify a cartridge bottom bracket and when it needs to be replaced. Be able to properly disassemble old cartridge bottom bracket and install a new bottom bracket.
Approximate completion time: 25-30 min

1. *(These first 4 steps are the same as in the crank removal tutorial.) This Removes the chain from the chainring and let the chain rest to the inside of the chainring on the bottom bracket shell.
2. Begin by removing the crank arm bolt from the crank arm with a crank arm wrench. Loosen the bolt (counterclockwise) until it is completely removed. For some spindles you will just have to remove a nut that threads onto the spindle itself. *The crank arm wrench has a **14mm** socket and an **8mm** hex to remove the axle bolt/nut.*
3. Next, you will need a **crank arm removal tool**. Thread this tool completely into the threads on the crank arm. *Be careful not to cross-thread or you can strip the threads on the crank arm! If the threads are not properly engaging then contact an experienced mechanic before proceeding.* ***If you strip the threads in a crank arm you have fucked up....royally. So don't do it.***
4. With the crank arm removal tool fully engaged, rotate the arm of the tool clockwise. *This will cause the tool to push against the bottom bracket spindle in order to disengage the crank arm from the spindle.* As the crank arm is removed more resistance will be encountered but continue to turn the tool arm clockwise until the crank is completely removed. *Repeat this procedure for the opposite crank arm.
5. Insert a **bottom bracket cartridge** tool fully into the fittings of the non-drive side cup. Turn the tool <u>counterclockwise</u> to loosen the cup and remove it completely.
6. Insert the tool fully into the drive side cup and turn <u>clockwise</u> to loosen it and remove it completely.

7. The new bottom bracket should have similar spindle length and bottom bracket shell width dimensions as the old one. The spindle length should be measured with a digital caliper, and if we don't have a new bottom bracket with the exact measure, always round up.
8. Grease the bottom bracket shell threads and the cup threads.
9. Thread the drive side into the shell first by hand, turning counterclockwise. Once threads are aligned, thread the body fully into the shell with the bottom bracket tool.
10. Install the non drive side cup and tighten it down completely by turning clockwise.
11. Reinstall the crank arms onto the bottom bracket spindle. Make sure they are in the opposite direction of each other to ensure proper pedaling.
12. With the cranks on the spindle, reinstall the crank arm bolts.
13. Put the chain back onto the chainring.
14. Test ride the bike to feel the bottom bracket.

13. Derailleurs

Derailleur bicycles have several sprockets on the rear hub and may have multiple chainrings on the front cranks. The front derailleur pushes or "derails" the chain to move it from one chainring to another while the rear derailleur pushes the chain from one sprocket to another. The connection between the shift lever and the derailleur is the cable system. Derailleur cable systems use inner cable and the outer housing (usually 4mm in diameter). The motion of the derailleur cable causes the derailleur to move. Dirty, rusty, or worn derailleur cables and housing will not consistently and effectively transfer the shift lever motion to the derailleur. It is important to keep the cables and housing maintained to ensure proper shifting. Two methods of shifting include *friction* and *index*. **Friction shifting** is shifting without the "notches" or "clicks." The rider must gauge the distance the shifter will move while shifting. Small corrections may need to be made to the lever in order to reach the desired derailleur position. **Index shifting** is a system where

the shifter has discrete stops. Index shifting allows the rider to shift gears without having to make adjustments each time.

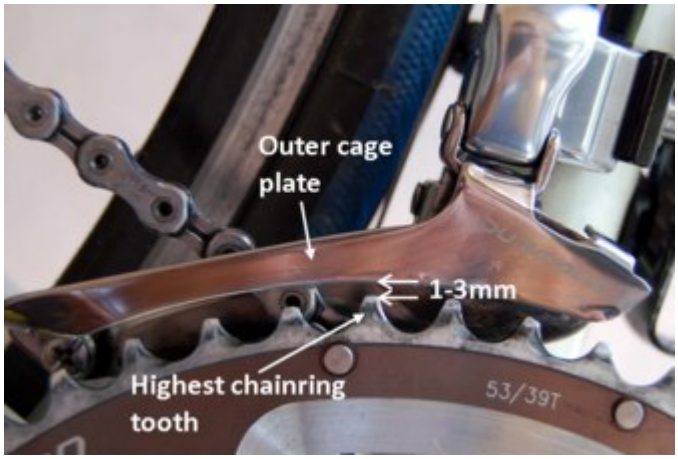
Front Derailleur(FD)

The front derailleur shoves the chain off one chainring and onto another with a cage that surrounds the chain. The derailleur should be adjusted to the proper height and rotation. If the shifter is still functioning but the shifting is inefficient, then the cable and housing should be replaced.

FD Height adjustment

Proper front derailleur height is necessary for efficient shifting. Front derailleur height can be set without attaching the derailleur cable.

1. Shift chain onto the innermost chainring.
2. Pull the **front derailleur cage** over the outer chainring teeth. The gap between the teeth of the outer chainring and the outer cage plate should be 1-3mm in height. (the thickness of a penny is a good gauge)



3. If the derailleur height needs adjustment, loosen the **derailleur clamp bolt**, and adjust cage height.
4. Move derailleur cage over outer chainring teeth to check the height.
5. Continue adjustments until the desired height is reached and tighten the clamp bolt.

FD Rotational Adjustment

The front derailleur cage should be parallel to the chain. The proper rotational positioning of the chain is crucial for efficient shifting.

1. Release the cable tension by shifting the chain to the innermost chainring, undo the cable pinch bolt if necessary. If the FD is a top pull, then the cable tension can pull the FD from the correct orientation while the FD is loose.
2. Loosen the front derailleur clamp bolt and rotate derailleur cage to the appropriate position. The outer cage plate should be parallel with the chainrings.
3. Tighten clamp bolt and check the shifting onto the outer chainring.
4. Continue adjusting until proper derailleur position is attained, then tighten the derailleur clamp bolt.

FD Limit Screw Adjustment

Limit screws stop the inward and outward travel by striking pieces of the moving linkage system. Limit screws are marked "L" and "H." The

L-limit screw will stop the inward motion of the derailleur toward the smallest chainring "low" front gear, and the **H-limit screw** will stop the outward motion of the derailleur toward the largest chainring. The L-limit screw also keeps the chain from falling off the smallest ring onto the bottom bracket. Similarly, the H-limit screw keeps the chain from falling off the outside of the largest chainring.

FD L-Limit Screw Adjustment

1. Shift chain to the innermost rear sprocket and innermost front chainring. Inspect derailleur for mark indicating "L" screw. *The "L" screw may not be marked, at which point you will have to try out the screws to determine which screw is which*. *The L limit is the natural resting position of the front derailleur (where the derailleur would sit with no cable tension).*
2. Derailleur cable tension should be fairly loose at this time. If derailleur cable is taut, turn the barrel adjuster into the lever. If barrel adjuster is already fully turned into the housing, loosen the **derailleur cable pinch bolt**, slacken the derailleur cable and retighten the bolt.
3. There should be a small gap, 1mm, between the chain and the **inner cage plate**.
4. Pedal bike slowly and continue to sight the gap.
5. If there is no gap and chain is rubbing cage, loosen L-limit screw counterclockwise until slight gap appears.
6. If the gap appears larger than 1mm, tighten the L-limit screw in small increments until the gap is appropriate.
7. Test the shift by shifting to the next chainring. Then shift into the innermost chainring. If the chain shifts quickly into the smallest ring, the limit screw is set adequately. *The shift outward away from the smallest ring is determined by the H-screw, which can be adjusted after.*
8. If the shift to the smallest chainring is slow, turn L-screw counterclockwise 1/8 turn and repeat the shift. Repeat this procedure until shifting is adequate.

FD H-Limit Screw Adjustment

1. Shift to the outermost sprocket and outermost chainring. Inspect derailleur for marking indicating "H" screw.
2. Pull derailleur cable by hand to ensure derailleur is against H-limit screw.
3. Check the gap between the chain and outer cage plate. There should be a 1mm gap. If the chain is rubbing cage, loosen H-limit screw 1/8 turn.
4. If the chain is not rubbing, tighten H-limit screw until chain does rub and loosen 1/8 of turn to create a small gap.
5. Test shift into the largest chainring. If shifting is slow, loosen H-limit screw and repeat the test. If the chain shifts off the outer chainring, the screw is too loose. Tighten the H-screw and test again.

FD index adjustment

When the shifting between the chainrings is slow or hesitant, the cable tension needs to be adjusted. This is called indexing. The indexing of the chainrings is adjusted by changing derailleur cable tension. For conventional derailleurs, increasing derailleur cable tension moves the front derailleur outward away from the bike. Decreasing derailleur cable tension allows the derailleur to move inward. *The derailleur cable tension will not stop the derailleur at its extreme limits.*

1. Set limit screws, if not already done.
2. Shift to innermost chainring and a gear in the middle of the cassette/freewheel.
3. Make sure the shifter is on the smallest front gear.
4. Pedal the bike at a normal cadence and shift the front derailleur one click up on the lever. If the derailleur fails to shift one chainring up then the cable may be too slack. To tighten cable tension, loosen the barrel adjuster(counterclockwise) on the shifter. If the chain fails to shift down from a bigger chainring when shifted one click down, the cable is too tight.
5. Turn the barrel adjuster clockwise to loosen the cable, and counter clockwise to tighten the cable.
6. Cycle through all the rings, make sure the chain shifts correctly for all the rings, continue to make fine adjustments to the barrel

adjuster as needed. Beware that cross-chaining can affect shifting, so shift the rear gear accordingly as well to avoid cross-chaining.

Rear Derailleur

Rear derailleurs push the chain from one rear sprocket to another. The rear derailleur attaches to the frame at a fitting called the **derailleur hanger**. The derailleur cable attaches to the rear derailleur at the pinch bolt mechanism. If the shifter is still functioning but the shifting is inefficient, then the cable and housing should be replaced. As with the front derailleur, the rear derailleur has limit screws that limit how far the derailleur can travel. There is also a barrel adjuster on the rear derailleur that allows for gears to be properly indexed. A bent derailleur hanger can also affect rear derailleur functioning.

RD Limit Screw Adjustment

Derailleur pulleys are limited in both inward and outward motions by using the derailleur limit screws. Limit screws are usually labeled "H" or "L." If they are not labeled then you will have to inspect to determine which is which. Tightening the screws limits the travel of the pulleys

and loosening the screw allows more travel. The "L" screw limits the derailleur movement as it travels onto the largest/innermost sprocket. The "H" screw limits the derailleur movement as it travels onto the outermost/smallest sprocket. L limit too tight, the low gear becomes inaccessible, too loose the chain gets caught between the spokes and the lowest sprocket; H limit too tight, highest cog becomes inaccessible, too loose will throw the chain onto the axle.

RD H-Limit Screw Adjustment

1. Shift the chain to the outermost (largest) chainring and the outermost (smallest) rear sprocket. *The H limit is the natural resting position*
2. Eliminate any derailleur cable tension by turning the barrel adjuster clockwise all the way in.
3. Adjust the H limit screw so that the upper pulley is directly below the smallest sprocket. Make sure the chain is on the smallest sprocket as well.
4. While pedaling, tighten the H limit until the chain rubs on the second smallest sprocket and is making noise.
5. Back out the H limit a quarter turn at a time until the noise disappears. Visually inspect that the upper pulley is still sitting under the smallest sprocket. H limit is now set.

RD L-Limit Screw Adjustment

1. Shift bike to middle chainring of three chainring bikes or the smallest chainring of double chainring bikes. Also shift to the second largest rear sprocket.
2. Pedal bike and pull rear derailleur cable by hand to shift derailleur into the innermost sprocket.
3. If shift seems adequate, tighten L-limit screw 1/4 turn and repeat shift. Continue to tighten L-screw until the shift becomes slow or hesitant towards the innermost sprocket. Again, *The goal is to find the point at which the L-limit screw is too tight and to back it off until it is just right.*

4. When symptoms of a too tight limit screw appear, loosen the L-limit screw 1/4 turn and check shift again. Repeat 1/4-turn increments. When too tight symptoms disappear and the chain shifts onto the largest sprocket successfully, the L-limit is at the tightest acceptable setting and the adjustment is done.

Rear Index Adjustment

When the shifting between the rear sprockets is slow or hesitant, the cable tension needs to be adjusted. This is called indexing. The indexing of the rear sprockets is adjusted by changing derailleur cable tension. For conventional derailleurs, increasing derailleur cable tension moves the rear derailleur inward towards the spokes. Decreasing derailleur cable tension allows the derailleur to move outward. *The derailleur cable tension will not stop the derailleur at its extreme limits.*

7. Set limit screws, if not already done.
8. Shift to outermost chainring and outermost rear sprocket.
9. Make sure the sifter is on the highest gear.
10. Pedal the bike at a normal cadence and shift the rear derailleur one click up on the lever. If the derailleur fails to shift one sprocket then the cable may be too slack. To tighten cable tension, loosen the barrel adjuster (counterclockwise). If the chain fails to shift down from a bigger sprocket when the shifted one click down on the index, the cable is too tight.
11. Turn the barrel adjuster clockwise to loosen the cable, and counter clockwise to tighten the cable.
12. Cycle through all the gears, make sure the chain shifts correctly for all the gears, make continue to make fine adjustments to the barrel adjuster as needed. Beware that cross-chaining can affect shifting, so shift the front gear accordingly as well to avoid cross-chaining.

Derailleur Hanger Adjustment

The rear derailleur is mounted to the bike by the derailleur hanger. The hanger should be aligned parallel to the sprockets. A bent or misaligned hanger will result in poor shifting performance. The derailleur hanger

can become bent when hit with force. To repair the derailleur hanger you will need to use the **derailleur hanger alignment gauge**. * You can break derailleur hangers with this tool. Although this failure is not your fault please use caution. *If the derailleur hanger is integrated into the frame be careful because if the hanger is broken the frame loses its function.*

1. Remove rear derailleur from hanger. Derailleur may hang from housing.
2. Install derailleur hanger alignment gauge (DAG) into hanger and tighten the handle.
3. Rotate the arm toward the left side of the rim at the **nine o'clock** position. *Use the valve as a reference point when checking the rim.*
4. Loosen the **sliding gauge knob** and move the **sliding gauge knob** to contact the rim, and then secure the knob.
5. Push **gauge bracket** toward hub before rotating arm.
6. Rotate DAG and rim valve 180 degrees to the three o'clock position. Slide the **indicator** toward the rim to the same point near the valve.
7. The indicator may sit <u>too far in</u> or <u>too far out</u> relative to the rim.
8. Bend the derailleur a small amount in the necessary direction and recheck the position on both sides (9 o'clock & 3 o' clock). Repeating bending until the gap between the indicator and rim is less than 4mm.
9. When the horizontal positions are aligned, move on to check the 6 and 12 o'clock positions. *Start with 6 and move to 12.* Adjust in the same manner as the 9 and 3 positions.
10. When the 9, 6, and 12 o' clock positions are all within 4mm of the rim then the derailleur hanger is properly adjusted.
11. Remove the DAG and reinstall the derailleur.
12. Check settings on both limit screws and the index settings.

<u>Cable Replacement</u>

If shifting remains inefficient after adjustments are made and the shifter is not broken, then there is likely friction between the cable and the cable housing. In this scenario, the cable and housing should be replaced to allow for proper shifting.

- **Objective:** Be able to diagnose when a derailleur cable needs to be replaced. Properly install new cable and housing and adjust the derailleur so that shifting is adequate.
- **Approximate completion time: 10-15 min**
  1. Shift chain onto the smallest chainring/cog. Turn barrel adjuster fully in.
  2. Loosen the derailleur cable pinch bolt and remove the cable.
  3. Remove the cable housing from the cable and save them for reference.
  4. Remove the cable from the shifter while the shifter in the LOW position(when the shifter gives the most cable) and discard it. This may require you to open the cover of the shifter. Sometimes the cable is accessed under a plastic screw on the bottom side of the shifter.
  5. Cut new gear housing (4mm) to the same length as the old cable housing. Use a **pokey tool** to open up the housing. Fit the housing ends with the appropriate ferrules.
  6. Install new cable into the shifter. Reinstall the cover or plastic screw.
  7. Install the new housing onto the cable at appropriate positions along the frame. For down tube routed frames where cable is exposed, sometimes the cable may be designed to cross each other to minimize friction. Reference the how the bike is routed before and pictures online if there are any doubts.
  8. Thread the cable through **cable guide** under the bottom bracket or the appropriate cable guide on the top tube.
  9. Thread the cable under the cable pinch bolt on the derailleur and pull the cable taut. With the cable taut, tighten the pinch bolt to secure the cable.
  10. Test the shifting between the chainrings/cogs. If needed make the appropriate adjustments to the limit screws as discussed earlier.
  11. Double-check that the cable is routed correctly and the shifting, cut the cable leaving an excess length of around 40mm.

12. Use the cutter on a needle-nose pliers to crimp on a crimp end. Do not cut through the crimp end.

14. Handlebars

Handlebars support the riders' hands and are a part of the steering system. The two main types of handlebars are **upright bars** and **drop style bars**.

Upright Bars

Upright bars are common on mountain bikes, hybrid bikes, bmx bikes, and cruisers. Generally, these bars should be aligned to point straight back with the bar bend level to the ground. *If the bar is incorrectly rotated, it will affect the reach for the brakes and the shift levers. Handlebars have clamp diameters that match specific stems. The bar diameter must match the stem clamp diameter for the system to be secure. The clamp diameter of BMX is 22.2mm. Older and cheap MTB and Road use 25.4mm clamp diameters. New MTB and Road use 31.8mm clamp diameters. Metal shims can be used to reduce the larger 31.8mm stems for the 25.4mm bar.*

Grips

Upright bar grips can become worn, excessively sticky, or damaged and customers will usually ask to replace them in these situations. *Bar grips*

vary in shape, size, compounds, but all are designed to fit the 22.2mm bar diameter.

1. To remove a grip, use the air compressor to blow air between the grip and the handlebar. Use your hand or a flathead screwdriver to create space for the air to travel.
2. Wiggle the grip while using the air until it falls off. (This may take some effort depending on the state of the grip.
3. Use the air compressor to install the new grips. If the process is too difficult, water or hair-spray can be use to help slide the grips onto the bar. Adhesive spray is another alternative.

Drop Style Bars

Drop style bars curve downward and form hooks for the hands. Drop style bars can be rotated at the stem for comfort. However, there are rotational limits. Bars that are too far up or down can sacrifice performance and safety. Drop bars experience significant stress at the stem clamp, and it is important that they are fully secure. *The clamp diameter for old/cheap handlebars is 25.4mm. Italian made bars/headsets use clamp diameters of 26.0. Modern bars/stems use clamp diameters of 31.8mm.*

15. Stems

Stems connect the handlebars to the fork tube. Bikes with threaded fork tubes use **quill stems and threaded headsets** while bikes with threadless fork tubes use **threadless stems and headsets**. A stem binds the bars using either a **faceplate** or a **one-piece pinch clamp**. The faceplate of the stem presses against the bar center when the binder bolts are tightened. Make sure that the bolts are turned into the stem the same amount and that the top and bottom gaps between the faceplate and the stem body are the same. If threaded unevenly, the head of the bolt will be stressed and or strip during tightening.

Quill Stems

In a quill stem, the bolt draws up a wedge or cone to jam the stem tight into the column. The stem should be aligned parallel to the front wheel. The height of the stem can be adjusted as necessary. To adjust the height of the stem:

1. Loosen the stem binder bolt at the top of the quill. The bolt does not need to be removed to make the adjustment.
2. Attempt to move the stem by twisting after loosening the binder bolt.

3. If it doesn't move, use a hammer to free the wedge by hitting the top of the stem.
4. Raise the stem. Do not raise it above the **"max height"** line.
5. Retighten the binder bolt with the stem aligned with the front wheel.

Threadless Stems

Threadless stems clamp around the outside of the fork tube.

If the threadless stem needs to be replaced or straightened then:

1. Loosen the **stem binder bolts**. *Loosen each bolt alternatively and incrementally, as this will minimize the stress on the bolts.*
2. Once the stem binder bolts are loose, loosen and remove/loosen the **top cap bolt** and remove/straighten of the stem.
3. Install/tighten the top cap, do so with appropriate torque, not tight enough will result in play and over tightening will wear down the headset.
4. Tighten the stem binder bolts *alternatively and incrementally* while making sure the bar is perpendicular to the wheel.
5. Lock the front brake and rock the bike front and back to feel any play coming from the headset. Lift the front of the bike to feel the smoothness of the steering. Adjust the headset by loosening the stem binder bolts, adjusting the top cap bolt, and retightening the stem.

If the stem height needs to be adjusted:

1. Loosen the binder bolts and top cap.
2. Look for any spacers above the stem.
3. Move these to below the stem. *Changes in the stem height may require longer housing and cables. Simply adding spacers beneath*

the stem may compromise the stem/steering column engagement and make the bike unsafe.

4. The **fork tube** should be slightly recessed below the stem top.
5. Tighten the top cap bolt
6. Tighten the stem binder bolts *alternatively and incrementally* while making sure the bar is aligned with the wheel. **Use caution when tightening the stem on a carbon bike. Over tightening can crack the steering column.*

16. Saddles

Bicycle saddles have rails mounted beneath the seat mold. The rails are secured to the seat post by the **saddle rail binder clamps**. Saddles can be replaced or adjusted.

To adjust the saddle:

1. Loosen the **saddle rail clamp bolts**. This is usually done with a **14mm wrench**.
2. Remove the saddle from the clamps. *If replacing the binder clamps, then remove them from the seat post as well.*
3. Install the clamps onto the seat post and place the saddle in the clamps. Make sure the interfacing knurl match up on all parts when working on a binder clamp. If they cross, the clamp may be

permanently damaged and tend to move when torque is applied. Tighten the clamp bolts so that the saddle is still fairly loose.

4. Adjust the saddle so that it is parallel to the ground.
5. Once the saddle is in the correct position, tighten the bolts down with the 14mm wrench.

**If adjusting the saddle then just loosen the clamp bolts and adjust the saddle to the appropriate position and tighten them*.

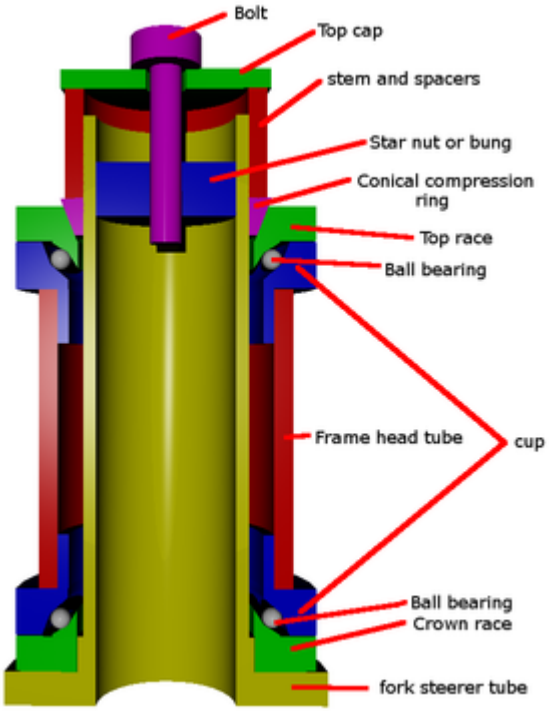
17. Seat Posts

The seat post connects the saddle to the frame. A seat post binder bolt pinches the seat post tight. The binder bolt only need be tightened enough so that it does not move when moved with one hand. Seat posts are usually marked with a "minimum insertion" line. **DO NOT** move the post past this point or the post/frame may break.

18. Headsets

The headset is the bearing system that connects the bicycle fork to the frame and allows the front wheel to steer smoothly while riding. If the headset is worn or damaged, the steering will not be smooth and the handling will suffer. There are two different types of headsets, **threadless and threaded**.

Threadless Headset Service



If the headset is not steering smoothly, or there is play present, then the headset should be adjusted or disassembled for an overhaul.

- **Objective:** Be able to identify when a threadless headset needs to be serviced. Be able to replace and reassemble headset components do the headset functions properly.
- **Approximate completion time: 15-20 min**
  1. Remove the front wheel from the fork and set it aside.
  2. Loosen stem bolts and remove the stem from the steering column. Remove spacers from the steering column and *note the order they are in*.
  3. Remove fork from the bike. Use a mallet if necessary, to tap the fork out of the steering column.
  4. Note the orientation and order of the bearings, cartridge or retainer, as they sit in the headset.
  5. Clean and inspect components. Check races for damage by using a ballpoint pen. Any worn parts should be replaced.
  6. If ball bearings are mis-colored or damaged they should be replaced.
  7. Grease the replacement bearing retainers and the cup races.
  8. Install bearings into upper and lower cup races.

9. Install the fork steering column through the head tube. *Mind the cockpit cable routing.*
10. Install race centering cone into steering column and press centering cone into adjusting race to help hold the fork.
11. Reinstall spacers as appropriate.
12. Install stem, tighten top cap bolt, and snug stem bolts. There should be adequate clearance is 2-3mm for aluminum and steel columns.
13. Reinstall front wheel into fork and test ride the bike.

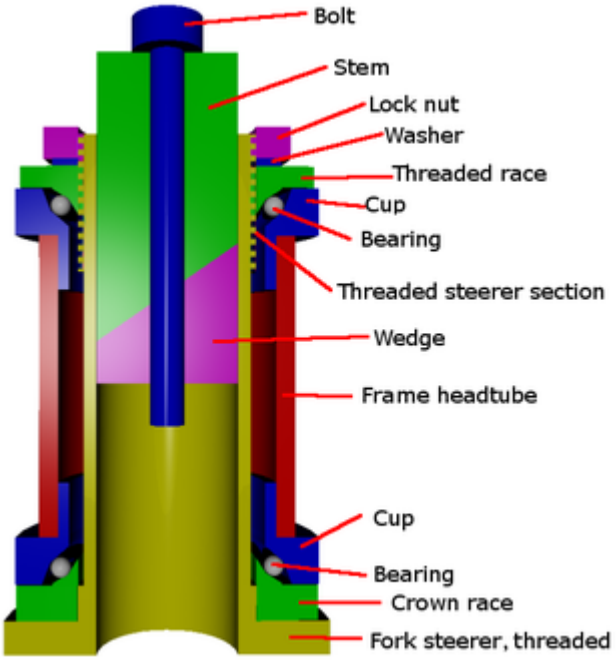
Threadless Headset Adjustment

The cap and bolt at the top of threadless systems are used for bearing adjustment only. The cap bolt threads into the plug in the steering column and pulls on the fork against the headset bearing surfaces, which act to tighten the adjustment. These caps do not secure the stem onto the steering column. The stem binder bolts secure the stem to the steering column so that it does not move. Do not tighten the stem binder bolts before tightening the top cap bolt. This will prevent the top cap from properly adjusting the bearings.

1. Remove the top cap bolt fully and reinstall the cap and bolt gently. Do not tighten cap bolt.
2. Loosen the stem binder bolts that secure the steering column.
3. Wiggle stem to ensure that it is loose. If the stem is jammed or frozen to the steering column, then no adjustment can be made.
4. Align stem straight to wheel and gently secure the top cap bolt until resistance is felt.
5. Tighten stem binder bolts and check for play by pulling back and forth on the fork. *There may be play at this point. If there is play, then continue the adjustment.*
6. To adjust bearings, loosen stem binder bolts and check for play again.
7. Tighten the stem cap bolt 1/8 turn clockwise, secure stem bolts and check for play again.
8. Repeat these adjustments until play disappears. *Remember to loosen the stem bolts before tightening the top cap bolt.*

9. *Another way to test headset play is to place the bike on the ground and rock the bike with the front brake engaged.*
10. Once adjustment is completed, check alignment of stem and tighten stem binder bolts fully.

Threaded Headset Service



1. Remove the wheel first and set it aside.
2. Loosen stem binder bolt. Attempt to move the stem by twisting. If stem will not move, strike the top of the stem binder bolt with a hammer to free the wedge. Attempt to twist the stem again.
3. Pull stem and handlebars from fork.
4. Hold the lower **threaded** race with a thin headset wrench. Loosen and remove top **locknut** with second wrench. Remove the wheel and any spacers under the locknut.
5. Unthread and remove the threaded race and pull the fork from the bike. *Note orientation of the upper and lower bearings*.
6. Inspect and clean the bearings and races. If races are worn, they should be replaced. Also, damaged bearings should be replaced.
7. Grease the bearing retainers, the bearing race cups, and the threads of the steering column. Install the bearings into the upper and lower cup races.

8. Install the fork steering column through the head tube and thread on top race until it contacts the ball bearings then turn the race back 1/4 turn. Hold threaded race with a wrench and tighten locknut fully. *At this point there should be a small amount of play*.
9. Check for play by turning the handlebars and pulling on the fork.
10. Loosen the locknut and tighten the threaded race slightly clockwise.
11. Hold threaded race securely and tighten the locknut fully.
12. Check for play again and repeat steps 9-11 if there is still play. *Adjustment is completed when there is no play, the fork rotates, and the locknut is fully secure*.
13. Reinstall front wheel onto fork and test ride the bike.

Headset Removal

Worn headset cups should be replaced to ensure smooth rotation of the handlebars and fork while riding.

1. Before removing the headset, remove the wheel, handlebars, and fork.
2. To remove the pressed races, use the **pronged headset removal tool**.
3. Install smaller end of the tool through the headset cup. A clicking sound will be heard when the prongs engage head tube cup.
4. Use a hammer to tap the tool until the cup comes out of the head tube. Repeat this process for the other cup.
5. The fork crown race must also be removed. **The crown race tool** can be used or a hammer and punch can be used.
6. If using the crown race tool, place it under the crown race and use a hammer to hit the tool and push the race off.
7. If using the hammer, tap the race alternately first on one side, then the other side, driving the race off the crown seat.

Pressed Headset Installation

Conventional headset bearing races or cups require a press fit into the frame. This press fit occurs when parts are held together when the

internal and external surfaces are forced together. It is best to use a **bearing press tool** to install the head tube races.

1. Place upper headset cup on the top of the head tube.
2. Install the second cup onto sliding press plate and slowly turn the tool handle clockwise to press the cups into the head tube. *Inspect alignment of the cups as they enter the head tube. A gap between the frame and the cup indicates incomplete pressing.*
3. Once cup are properly engaged, remove the bearing press tool.
4. To reinstall the fork crown race, use the **crown race setter tool**. Place the fork crown race back onto the fork and place the tool over the steering column onto the crown race.
5. Use a hammer to strike the top of the tool until the race fully seats.
6. Inspect side of race for full seating against the fork.
7. Once all the headset components are installed, test the headset by the method stated in the headset adjustment section.

Bike Knowledge

Biking Around UCSB

1. Traffic Laws

When you are riding a bicycle, one thing you must realize is that although the laws are slightly different than driving a car, many of the same laws still apply. According to California state law, when you a riding a bicycle, you are considered the operator of a “device” which basically means that many of the same laws you must abide to when driving a car apply.

The most important thing to do when riding is to ride predictably. The people around you are going to be constantly analyzing what you are doing to try and keep themselves safe, if you suddenly stop in the middle of the bike path because you see a friend or cute puppy, they are not going to be expecting that and this is when a lot of crashes happen. Bike paths can be rather terrifying at first due to the sheer number of cyclists at any given time, but if you follow the rules of the road you can make it out unscathed. Treat the bike path just like you would any road you would drive a car on. Would you cross a double yellow line into oncoming traffic to pass a motorist driving a little slower than you? Would you stop in the middle of the road for no apparent reason? Would you change lanes or turn without looking behind you? Would you drive recklessly, erratically, or on the wrong side of the road? Hopefully the answer to all these questions is ‘no.’ Ride your bike just like you would safely drive a car and be aware of your surroundings.

One thing you need to remember, is that it is illegal to ride your bike through the crosswalk of an intersection. There are many accidents that have occurred because of this, and it is something easily avoidable. When you are at an intersection, you must obey the traffic lights that a normal vehicle would look at, not pedestrian crossing lights. A way to get around this is to hop off your bicycle and walk. You are then considered a pedestrian and can walk through crosswalks.

When you are using the roundabouts, you treat them exactly the same as you would if you were driving a car. Anyone currently in the roundabout has the right-of-way, so if you are entering the roundabout, you must yield to them. Once you enter the roundabout, it is always a good idea to be aware of who is around you, and signal when you want to exit so that people in the roundabout with you are able to predict what you are going to do. One of the worst things you can do in a roundabout is to stop in the middle of said roundabout, and let other people in. This might seem like the nice thing to do, but it causes everyone else behind you to have to stop and almost always will end in a crash.

2. Security

When at UCSB, one of the things you will find yourself doing multiple times a day is locking and unlocking your bike. Now this might seem like a very trivial task, but many people actually do this wrong. First off, you will want a U-Lock. Regardless of what other people might tell you, cable locks are nowhere near as safe as a U-Lock is. With simple cable cutters, you can cut many cable locks. If you want to be extra cautious, U-Locks with an additional cable to secure the wheels are even better.

Now onto how to actually lock your bike. To understand this, you must realize there are three main parts to your bike, the bicycle frame, and the two wheels. Contrary to popular belief, it is actually quite easy to remove the wheels from the frame, and because of this you will want to do your best to lock as many parts as possible. If you have a U-Lock, it is recommended that you lock your bike in a way that the frame and also one of the wheels is locked to the rack. I cannot count the number of times that I have seen bikes locked to racks by just the frame sitting with missing wheels.

Also another important thing to bike security is the more your bike stands out, the more likely it is to get stolen. Although that shiny pink and chrome fixie might look cool to your friends, it will also look cool to possible thieves looking for a new bike.

3. Planning your day

When you are planning out your day, it is always good to give yourself plenty of time to bike to class, especially at the beginning of the year. It is very likely that at the beginning of the year you will end up lost on the bike paths at least once, and you don't want this to happen 2 minutes before your next class starts. Also, when you are late the class, if you are flying down the bike path you are more likely to get injured, as you and others around you will have less time to react.

4. Mechanical Stuff

Owning a bike is like a car, there are many moving parts which means that from time to time things might go wrong and then they will need some service. One of the most common things that can happen to you is a flat tire. If this happens to you, it is important that you get it fixed as soon as possible. Most of the time, the issue is the tube inside of the tire, not the tire itself, which makes it a cheap and easy fix. $10 and a trip to AS Bike shop can usually fix it. Riding a flat tire is never a good idea, you lost traction and you are very likely to damage the bike wheel, which becomes a very costly repair.

Another issue that happens again is the chain will fall off of the gears, or get jammed. Usually this is not bad, and you can pull the chain out and put it in the right spot. Be warned, when you do this your hands are likely to get dirty. It is important that if your chain comes off or jams, do not try to just push harder on the pedals. This can cause damage to the bike itself.

5. Purchase Power

When you are looking for a bike to get around campus, you have many options. Do you want a rugged mountain bike? Do you want a stylish fixed gear bike? Do you want a relaxing beach cruiser?

With so many options, you will see a variety of different bikes riding around UCSB. One thing to keep in mind, is less moving parts means less things that can go wrong. Getting a fixed year or a beach cruiser that only has one gear will reduce your chances of having issues.

Another thing you must think of is speed. Fixed gears/road bikes are usually faster than mountain bikes. Everything is faster than a beach cruiser. Make your decision wisely, but remember, you don't want to ride around on your dream bike through campus, it will most likely get dinged and scratched from all the other bikes.

Advice from UCSB Cyclist

Garrison:

Whenever you are riding a bike, you are considered a driver of a device (in California) on the road, not a pedestrian (in California and most other states). This is very important to remember, as all traffic laws that would govern you if you were driving a car, still apply as you are riding around on your bike.

One thing you need to remember, is that it is illegal to ride your bike through the crosswalk of an intersection. There are many accidents that have occurred because of this, and it is something easily avoidable. When you are at an intersection, you must obey the traffic lights that a normal vehicle would look at, not pedestrian crossing lights. A way to get around this is to hop off your bicycle and walk. You are then considered a pedestrian and can walk through crosswalks.

Chandler:

"If you take the blue pill, you will go back into the matrix. If you take the red pill, you can save the human race." This same concept applies, though very loosely, to riding on bike paths. If you do not yield at roundabouts while traffic is congested, you are likely to crash. If you

yield, you save all the humans around you from harm. Along the same lines lies the concept of hand signals. Using hand signals while turning off the bike path also saves the humans around you from harm.

When riding on the bike path, take the red pill and save everyone around you.

Lisa:

A little mechanical knowledge goes a long way. While having problems with your bike can be intimidating, many can be solved quickly and easily. Familiarizing yourself with how to reposition a dropped chain and how to fix a flat tire can help you avoid missing a meeting or walking 15 minutes to your 8 AM. Properly maintaining your bike is also important, especially in the twice-yearly Santa Barbara rain.

Roundabouts are there to help you not crash into people. Though it can be tedious at times, if you use some common-sense etiquette like yielding, signaling, and going in the correct direction, your riding will be more predictable and safer.

Ali:

Bike paths can be rather terrifying at first due to the sheer number of cyclists at any given time, but if you follow the rules of the road you can make it out unscathed. Treat the bike path just like you would any road you would drive a car on. Would you cross a double yellow line into oncoming traffic to pass a motorist driving a little slower than you? Would you stop in the middle of the road for no apparent reason? Would you change lanes or turn without looking behind you? Would you drive recklessly, erratically, or on the wrong

side of the road? Hopefully the answer to all these questions is 'no.' Ride your bike just like you would safely drive a car and be aware of your surroundings. Join UCSB cycling!

Alex:

Most bike wrecks around UCSB occur because of the many roundabouts that are placed throughout the campus bike paths. To keep yourself and others around you safe, it is inevitable that you learn to navigate these. Because of a roundabout's structure, it is sometimes quicker to go backwards through it (clockwise) as long as no one's coming (right?). Do not do this. Even if there is no one in sight, don't do this. You save at most 2 seconds of your time, and people can appear out of nowhere. This is a huge collision risk. Always go around in a counterclockwise direction. Also, learn how to properly yield. These bike path roundabouts function the same way as roundabouts in the street. However, as you'll come to observe, It's quite evident that many students at UCSB grow up in cities that may not have roundabouts. As you approach an entry into a roundabout, yield to anyone that is currently inside of the roundabout. You don't ride straight into the roundabout without looking. At busy hours of the day (in between classes) the roundabouts can be absolutely chaotic. Don't be scared to slow down and roll through slow, especially if you're a freshman. But don't roll into the roundabout and slam on your brakes to a screeching halt. Really, it comes down to common sense. After a few trips through roundabouts at peak traffic hours, you'll get the hang of it.

Will:

UCSB has an incredibly bike friendly campus that makes getting to and around campus on two wheels a no brainer. Bike paths cross the entire school and it is often faster to ride your bike between classes than it is to walk between them. Always use your turn signals (the ones

you probably don't remember from driver's ed) because they keep other people from crashing into you. Yield to others at roundabouts by slowing enough before entering to make sure you won't hit anyone else already in the roundabout. When it comes to buying a bike for school, employ urban camouflage! This is the art of making your bike seem beat up while actually being perfectly functioning so that potential thieves will not even notice it. Tactics include loosely put on handlebar tape and painting over logos. Generally, if you would be sad to see your bike stolen, don't use it to commute to class. Learn how to properly lock your bike (frame and front wheel) and, if you can, park your bike next to someone who has not done so as this makes your bike less likely to be stolen.

Abel:

Unfortunately, bike theft is all too familiar to UCSB students. Some students even think it's unusual to make it through a full 4 years at UCSB without having at least one bike stolen. Whether it's for an hour or a few minutes, leaving your bike unattended and unlocked is risking theft and the only solution is locking it up. A good strong U-lock is the best defense against thieves. Remember to make sure your front wheel is locked to the frame, and the bike rack; locking the bike to itself may stop someone from riding off on your bike, but not from walking off with it.

Jake:

The first time someone rides to class on the bike paths can be very frightening. There are so many bikes all flowing in one direction and people turning off the and on the bike paths at different points. The best way to become comfortable on the bike paths is to make sure you know how to ride a bike. This may seem like a pretty basic thing to be able to do but it still amazes me the amount of people I see riding on the

bike paths unsure how to break or properly turn a bike. Before the first day of classes make sure you can brake, turn, and speed up safely. Once you know how to ride a bike then learn about the hand signals and proper ways of entering and exiting a roundabout. If you ever get caught in a roundabout and get scared, just keep going around in circles until you can exit safely. The bike paths can be scary but if you use some common sense and ride cautiously you should be just fine.

Carina:

One of the busiest times on the bike path seems to be around lunch time, so if you're planning on hurrying to your 1pm class with 5 minutes to spare, you should be betting on crazy traffic. To keep yourself safe, please remember that you can go as slowly as you want as long as you stick to the right side of the bike path, you can also go around the roundabout more than once if you miss your exit, and you can always pull over to the side and get off your bike if you're feeling stressed out or wobbly (just signal so people behind you know what you're doing). Better to be safe and a little late than scraped up and a lot late!

Additionally, no matter how cute you think they are, beach cruisers are probably not a good idea for the UCSB bike paths. Their wide handlebars make them difficult to maneuver, and because they are so heavy, some people find them exhausting to pedal and inconvenient to transport. That being said, a bike that you're familiar with is the best thing (so if that's a beach cruiser, then so be it. Just be ready to find your handlebars entangled with other bikes at the bike rack.)

Dom:

As is the California State law, a bike is considered a vehicle on the bike path and therefore must follow all traffic laws. One of the most common areas for crashes are the roundabouts in which people blindly

ride through the yield signs potentially causing a hazardous situation for surrounding riders. When riding both in roundabouts or anytime you are making a turn, don't assume the people riding behind you know which direction you are going to go. Similarly to a vehicle, use turn signals to let people know where you are turning or at least look over your shoulder before cutting someone off or causing an accident. Simply put, be aware of others around you as you ride and give enough information to let them know where you are going.

Chris:

Some of the larger bike parking areas at Campbell hall, the UCen, and the Library often have hundreds of bikes locked up at the same time. Everyone eventually finds themselves in the situation where they forget exactly where they parked, and walk up and down the endless rows of bikes looking for their own. This problem is only made worse if you own one of the more popular colors of bikes that seem to always overpopulate campus. One way to protect against this is to make your bike slightly unique from the others around it. Wrap colorful tape around the handlebars or frame that can easily be identified from a distance. Attach a fender for your rear tire that can be noticed sticking out into the aisles between bike racks. Another way is to park in a bike rack next to a large, easy to identify landmark. There are many trees and lamp posts in the bike parking areas that will make it easy to remember where your bike is.

One more tip is to always park your bike in a bike rack, even if that means going to another bike parking area if the area you are at is full. UCPD will ticket and sometimes impound your bike if you lock directly to a tree, fence post, or lamp post. Save the trouble and headache by simply walking a minute or two to the next bike parking area. There are always many close by!

Shop Culture and Events

Being part of the A.S. bike team gives us the opportunity to explore and become involved in a community of bike enthusiasts. There are many extra opportunities that the A.S. bike shop has participated and been a part of. Be it volunteering as mechanics in a ***Century 100-mile race*** or simply answering bike related questions for a screening of ***Ovarian Cycles***, a film about women cyclist in LA.

The A.S. Bike Shop strives to be a part of cycling community in UCSB and surrounding area. The team members have volunteered their time in events like UCSB's annual **Bike to Work day** where they stayed ready for tune up's and repairs at the crack at dawn! The A.S. Bike shop team also takes opportunities to educate the local community through **workshops** that offer basic bike knowledge and repair know-how.

Most recently, the Shop has participated in UCSB's first annual **Bike Fair**! Serving as leaders and team members to educate the student body on bike safety, maintenance, and culture.

Contacts

Have questions? Reach out to our student contacts! We'll be happy to guide you through any questions on repairs.

Student Contacts *as of Aug. 25, 2021*

- Gianna Pineda | *giannapineda@ucsb.edu*
- Ben Jantz | *bjantz@ucsb.edu* |