STUFF TO LEARN ABOUT BIKES

- Choosing A Bike
- Headsets
- Bottom Brackets & Cranksets
- Hubs & Gears
- Brakes & Cables
- Derailleurs & Shifting
- Wheel Truing
- Tubes & Tires

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CHOOSING A BIKE

Terms to Know
Road
Mountain
City/Hybrid
Cruiser
Fork
Head tube
Top tube
Down tube
Seat tube
Chain stays
Seat stays
Dropouts

Things to Know
- Choosing a bike is an important first step to a smooth build. By asking the right questions and looking for issues early you can prevent problems later.
- Often people come in asking for a certain type of bike, but may be better suited to another type. It all depends on their needs.
- Different types of bikes are distinguished by geometry.
- A road racing bike has steep angles and puts the rider in a lower stretched out position. This is more efficient but may be less comfortable. The fit is also more critical.
- A mountain bike or cruiser bike has slack angles but for different reasons: A cruiser is built for comfort and to put the rider in an upright position. A mountain bike is built for stability and handling over rough terrain. Fit is less critical for a cruiser, they may come in only one size.
- A city bike or hybrid bike is built for every day use and commuting. The angles on the hybrid will be neither slack nor steep, and the riding position will be neutral. Fit here is also less critical but becomes more important if the person is planning on riding longer distances.
- Tires are also an important issue. Thin, high pressure tires on a road bike make the road bike faster, but the tradeoff is durability. Fatter tires may sacrifice some speed, but add comfort and stability.
- For riding on pavement smooth tires are better than the heavy knobs of an off-road tire. The slick tire will give more traction on pavement since it has more surface in contact with the ground.
- Wheel size is important: changing sizes may be problematic due to brake reach. 27” wheels are the largest, followed by 700c, then 26” fractional, then 26” decimal.

Choosing a Bike
- Talk to the person, try to get an idea of what they know and their experience level with bikes.
  - Identify what kind of riding they want to do, and find out if they have a bike already.
  - Talk to them about the pros and cons of different types of bikes and riding.
  - Guess approximately what size bike they might ride.
  - Identify what we have on hand that can fit their needs, and is about the right size.
  - Have them stand over the bike to make sure they have a safe clearance over the top tube.
- Check for special parts that might get in the way of the build. Certain wheel sizes, three speed hubs, coaster brakes, special brakes, derailleurs, or cranksets are all possibilities.
  - Note any parts that are missing from the bike. Try to determine the wheel size that the frame was built for.
When talking to customers, if we don't have anything that meets their need or fits, encourage them to look for a bike elsewhere, armed with new information, or tell them to check back in coming weeks.

Checking for Damage

Check the bike over to make sure it is in fixable condition. Look for obvious rust and bent frame tubes. Make sure the stem is not seized in the head tube; many of the old cruisers are rusted solid. Check the brake bosses and dropouts to make sure they aren't bent or broken.

Steel bikes can take some damage and still be safely rideable. Small dents in the tubing and scratching are acceptable. However, if there are any major dents or twisted tubing the bike may not be safe and should be scrapped. Aluminum bikes with any major dents are a hazard and should be scrapped. If you see any damage or cracking on a carbon bike, it is unsafe and needs to be scrapped.

Look for cracked or wavy paint. Often a crimp in the tube will cause the paint to move. If the frame has crimped tubing it should be scrapped.

Fitting

Fitting is a complicated subject and could be a class in itself. A good road fit is fairly precise, while on a cruiser if you can reach the pedals and turn the handlebar you can ride it.

Bikes are traditionally sized by measuring from the center of the bottom bracket to the top of the seat tube. On a road bike the top tube length is also important.

For a basic fit make sure the person can stand over the top tube in front of the saddle. There should be one to two inches of clearance, smaller for a road bike, larger for mountain. Make sure they can reach the handlebars comfortably when in riding position. Also make sure they are not cramped by a too small bike with too short a top tube or seat tube.

Especially on a road bike, you want the rider to be balanced and in an efficient position.

Seat height needs to be correct so that the rider is able to get a full range of motion without rocking their hips while pedaling. Many riders have their saddles too low, which can lead to knee problems.

Balance comes from the relationship between the pedals and the saddle, and is independent of reach or top tube length. Move the saddle forward or back to get the rider balanced on the bike.

Reach is set by adjusting the stem length. If the stem needs to be extremely long or short to get the correct reach this means the frame size is too big or small or the top tube length doesn't work for that rider.

There are some rules of thumb to help with these adjustments. These can be good starting points but they are not absolute:

- The seat height should be set so that the riders knee is fully extended when their heel is on the pedal at the bottom of the pedals rotation, lined up with the seat tube.
- When seated on the bike with the pedals in the 3 o'clock and 9 o'clock position, a plumb line dropped from below the knee cap should intersect the pedal spindle.
- With the hands in the forward part of the drops, the riders arm should be at a 90 degree angle.
HEADSETS

Terms to Know
- Headtube
- Headset
- Fork Crown Race
- Fork
- Stem
- Threaded
- Quill Stem
- Wedge
- Wedge Bolt
- Top Cap/Locknut
- Toothed Washer
- Threadless
- Star nut
- Top cap
- Centering sleeve

Things to Know
- The fork crown race is part of the headset, not the fork. If you change forks or headsets keep the crown race with the headset.
- Open headset bearings can be balls-in or balls out. Make sure you know what type you have. Make sure that the retainer won’t hit the cup or cone.
- In a threaded headset the steerer tube length needs to closely match the headtube length and the bearing stack height.
- In a threadless system the steerer tube can be cut and/or spacers can be added to get the stem in the correct location.
- Many threadless headsets use sealed cartridge bearings rather than open bearings.

Open Bearing Procedure:
1. Make sure the fixed side is fixed. Tighten it to be sure.
2. Hand tighten the adjustable side to the point where it just hits the bearing and lock the adjustment in place with the locknut.
3. Make a mark or find a reference point on the part so you know where you are starting.
4. With the locknut locked, check for play. At this point the bearing should be fairly tight.
5. Unlock the locknut, back the adjustable cup/cone off a set amount, and re-lock the locknut. Check for play again.
6. Repeat the unlock, loosen, re-lock, check steps until you find play in the bearings.
7. Unlock the locknut one more time, tighten the adjustable cup/cone slightly, and re-lock the locknut. At this point the play should be done. Now the bearing is as loose as possible but with no play.

In summary; know your starting point and how far you are moving each time. Move the adjustable side with the locknut loose, and lock it before checking for play. Repeat until you find play then go slightly tighter. Using this method anyone can find the correct adjustment without relying on the subjective feel of the bearing.
Figure 4-10. Common threaded headset parts schematic.
**Threaded Headsets**

- Following the open bearing procedure is easier if the front wheel is installed. It gives you a reference point and something to hold while you turn the wrenches.
- The steerer tube must be the correct height for the head tube. If it's too short there won't be enough thread to install the headset. If it's too long the steerer won't have enough threads to install the upper cup or cone.
- In a threaded headset make sure the top cap is tall enough to lock down on the adjustable cup/cone, if not you can get another top cap or install some spacers.

**Removing a quill stem:**
1. Loosen the stem bolt a few turns but don't remove it.
2. Tap the stem bolt with a hammer if it's stuck.
3. Remove the stem.

**Threadless Headsets**

1. Thread top cap bolt into the star nut
2. Preload the bearings by tightening the top cap
3. Align the stem and tighten the stem bolts to clamp the stem to the steerer.
4. Make sure there is some space between the top of the steerer and the top cap, otherwise you won't be able to properly tension the bearings. If there isn't a space, add some spacers under the stem.
Terms to Know
- Square taper
- Cotter Pin
- Single piece / Ashtabula Open Bearing
- Cartridge Bearing
- Splined - ex: ISIS, Octalink
- External Bearing
- Bottom bracket shell
- Fixed cup / drive side cup
- Adjustable cup / Non-drive side cup Bearings
- Spindle/cones
- Crank arms
- Crank Puller
- Lockring Wrench

Things to Know
- All open bearings have a fixed side, an adjustable side, and a lock nut that locks the adjustable side in place.
- Bearings should be just tight enough so that the play is gone, and no tighter.
- Bearing play can only be checked after the lockring is tight, since tightening the lockring affects the adjustment.
- English threaded bottom brackets are threaded so that both cups loosen toward the front of the bike when the bike is upright.
- Italian and French threaded bottom bracket cups are threaded conventionally, that is the cups both loosen counterclockwise.
- A spindle length and a crank are matched to get a certain chainline, if your chainline is bad or the crank hits the frame you may need a different combination.

Open Bearing Procedure
1. Make sure the fixed side is fixed. Tighten it to be sure.
2. Hand tighten the adjustable side to the point where it just hits the bearing and lock the adjustment in place with the locknut.
3. Make a mark or find a reference point on the part so you know where you are starting.
4. With the locknut locked, check for play. At this point the bearing should be fairly tight.
5. Unlock the locknut, back the adjustable cup/cone off a set amount, and re-lock the locknut. Check for play again.
6. Repeat the unlock, loosen, re-lock, check steps until you find play in the bearings.
7. Unlock the locknut one more time, tighten the adjustable cup/cone slightly, and re-lock the locknut. At this point the play should be gone. Now the bearing is as loose as possible but with no play.

In summary; know your starting point and how far you are moving each time. Move the adjustable side with the locknut loose, and lock it before checking for play. Repeat until you find play then go slightly tighter. Using this method anyone can find the correct adjustment without relying on the subjective feel of the bearing.
Crank Puller
1. Grease the crank puller threads
2. Thread the outer nut into the crank arm. The threads are very fine and are easily cross threaded. Don't force the tool into the threads, it should go in by hand. Don't use a wrench.
3. Make sure the tool is threaded all the way in. If you try to pull a crank with only a few threads engaged you'll rip out the threads. Here you can use a wrench to make sure the tool is bottomed out in the crank arm.
4. Once the threaded nut is all the way in, turn the crank puller handle.
5. You'll feel resistance at first then it will get easy as the crank pulls off the spindle.

Open bearing bottom bracket
Removal Tips:
- Use a lockring wrench on the lockring, some have a single hook, others have three teeth.
- You don't need to remove the drive side cup unless you are replacing the entire bottom bracket. If you are just cleaning, clean it in place.
- If you do need to remove the drive side cup, remember that in an english threaded bottom bracket both cups loosen towards the front of the bike. The drive side cup loosens clockwise.
Installation Tips:
- Clean all old grease out of the bearings and races. Pack new grease into the retainer and into each cup.
- Make sure retainer bearings are oriented correctly. Make sure the retainer will not touch the cone or the cup. Most bottom bracket bearings are balls out.
- If you are installing the drive side, remember that english threaded bottom brackets are reverse threaded and the drive side cup tightens counter-clockwise. Otherwise just make sure the drive side cup is tight in the frame.
- Follow the open bearing procedure, marking the cup and spindle with a sharpie helps you keep track of where you are in the adjustment.

Cartridge bearing bottom bracket
Removal Tips:
- If one side is plastic, remove the metal side first. Remember, for english threaded bottom brackets both sides loosen toward the front of the bike when the bike is upright. This means the drive side loosens clockwise.
- When removing the bottom bracket be careful not to let the tool slip, it could damage the splines. If you use the right cartridge bearing tool you can bolt it into the bottom bracket spindle.
Installation Tips:
- Clean and lightly grease the bottom bracket shell threads before installing the bottom bracket. If the threads are damaged, or you can't thread the bottom bracket in by hand, the threads should be chased with the bottom bracket tap.
- Make sure you know which side is left and which is right, and that the removable ring is correct for that bottom bracket.
- Be careful not to cross thread, both sides should go in by hand, don't try to force it in with the wrench, check your sides and directions again to make sure they're right.
- Thread the removable ring part way into the appropriate side to help guide the bearing assembly. Don't thread it in too far, you'll tighten it later.
- Thread the bearing assembly into the bottom bracket shell until the flange is tight against the shell.
Tighten the removable ring until it’s snug, don’t strip the splines, some threads will be showing when it is tight.

Figure 4-2. Common cartridge type bottom brackets are held in place by threaded cups.

**Single Piece Crankset**

**Removal Tips:**
- You need to remove the pedals first so you can remove the cranset later. Remember both pedals loosen towards the back of the bike.
- There is only one set of threads on a single piece crank and they are reverse threaded, so loosen clockwise.

**Installation Tips:**
- Remember the reverse threads, tighten counter-clockwise
- Adjust using the open bearing procedure. You'll notice that the parts are the same as in a threaded headset.

**Cotter Crankset**

**Removal tips:**
- Use the cotter pin press to press out the pin. Try not to bend the pin. Back off and reset the tool as much as necessary.
- You can use a ball bearing under the press screw if you still need to push the pin once it's inside the crank arm.

**Installation tips:**
- Make sure you have the correct size cotter pin.
- Install cotter pins in opposite directions to keep the crank straight.
- Tighten the nut to pull the pin into place. If you can't see the threads, tap it in or use the press.
- If the nut bottoms out, your pin is too small for that crank, get the next size up.
Terms to Know:
  - Cassette
  - Free Hub
  - Freewheel
  - Fixed Gear
  - Coaster Brake
  - Hub Shell
  - Hub Flange
  - Axle
  - Quick Release
  - Solid Axle

Things to Know:

- All open bearings have a fixed side, an adjustable side, and a lock nut that locks the adjustable side in place.
- Bearings should be just tight enough so that the play is gone, and no tighter.
- Bearing play can only be checked after the lockring is tight, since tightening the lockring affects the adjustment.
- On a hub the drive side cone and locknut should be locked together, this is the fixed side. Adjust from the non-drive side.
- Quick release hubs need to have a little play when the quick release is open. When the quick release is closed it compresses the bearings.
- Make sure the axle is centered between the dropouts.
- For quick release wheels, the axle can't protrude past the dropout. If it does, the quick release will not hold the wheel in the frame.

1. Make sure the fixed side is fixed. Tighten it to be sure.
2. Hand tighten the adjustable side to the point where it just hits the bearing and lock the adjustment in place with the locknut.
3. Make a mark or find a reference point on the part so you know where you are starting.
4. With the locknut locked, check for play. At this point the bearing should be fairly tight.
5. Unlock the locknut, back the adjustable cup/cone off a set amount, and re-lock the locknut. Check for play again.
6. Repeat the unlock, loosen, re-lock, check steps until you find play in the bearings.
7. Unlock the locknut one more time, tighten the adjustable cup/cone slightly, and re-lock the locknut. At this point the play should be gone. Now the bearing is as loose as possible but with no play.

In summary; know your starting point and how far you are moving each time. Move the adjustable side with the locknut loose, and lock it before checking for play. Repeat until
you find play then go slightly tighter. Using this method anyone can find the correct adjustment without relying on the subjective feel of the bearing.

Open Bearing Hub Tips:
- Check the spindle (cones) and cups for pitting.
- Check that the drive side cone and locknut are locked together before you put the axle in the hub. If it comes loose later you will have to pull the axle again to tighten it.
- When adjusting the non-drive side cone, use the distance between two spokes as a measurement.
- Bearings on a quick release hub should be adjusted so that there is a very slight amount of play when the quick release is open.
- The perfect adjustment occurs when there is play with the quick release half open (45 degrees) but no play with it closed.
- If the hub can't be adjusted well, its better to leave a little play than to have it too tight.

Freewheel Removal Tips:
- When removing a freewheel put the tool in the vice facing up, and place the wheel on top.
- Turn the wheel counterclockwise from your perspective.
- If the tool slips you can sometimes use the axle bolt or quick release to hold it on.

Freewheel Installation Tips:
- Grease the freewheel threads before installing the freewheel.
- The hub has fine threads, be careful not to cross thread. Tighten the freewheel by hand, tools are not needed since it will tighten as you pedal

Cassette Removal Tips:
- Insert the lockring removal tool into the splines on the lockring.
- Use a chain whip to keep the cassette and freehub body from turning.
- Turn the lockring counter-clockwise, it usually makes a grating noise as the teeth disengage.
- Once you remove the lock ring you can lift the cassette off the freehub body.

Cassette Installation Tips:
- The cassette has one spline that is narrower than the others. This means the cassette can only go on one way.
- Typically, your last few cogs will be separate from the rest of the cogs. Pay attention to any spacers that go between cogs.
- Check for side to side play in the cassette. If any exists, it's possible you missed a spacer.
The major rotating parts on a bicycle almost always use ball bearings. Sometimes the bearings are cartridge bearings that contain the cup, cone, and balls in one unit. More often the cup, cone, and balls are separate and can be replaced and adjusted as they wear. Different bearings vary in the arrangement of the parts and in exactly how they are adjusted but all work in basically the same way.

The balls roll between the cup and the cone (the races). By rolling direct sliding friction is eliminated. Clearance is set so that the balls are in contact with the cup and cone all the way around with no gaps (no "play") but not so tight that they bind.

To adjust a hub, turn the cone on the threaded axle to adjust clearance for the balls. When it's right set it with the lock nut. Use a special thin wrench (cone wrench) to grip flat parts on the cone.

Wheel bearing showing the parts of an adjustable "cup and cone" bearing. The bearing balls may or may not be held in a cage or retainer.

For any bearing clean out old grease and inspect the parts. Pitted balls are easy and cheap to replace, rear hubs usually use 1/4", front usually use 3/16", bottom brackets also usually use 1/4", and headsets vary from 3/32" to 5/32". Pitted races may or may not be replaceable.
BRAKES & CABLES

Terms to Know
- Side pull
- Center pull
- Dual pull
- Cantilever
- V-brake
- Disc brake
- Barrel Adjuster
- Third hand tool
- Fourth hand tool

![Diagram of good and poor tangent]

Figure 6-10. The pads should be level with the rim.

Things to Know
- When adjusting brakes, you care about the pad orientation when they are touching the rim. Otherwise you just want them out of the way. Therefore all pad adjustments should be done with the pad touching the rim. You can use the barrel adjuster to hold the pads against the rim. This also makes adjusting brake distance and feel easier later.
- The barrel adjuster makes the cable housing longer or shorter. This increases or decreases the cable tension since both the housing and cable are fixed at both ends.
- Turn the barrel adjuster out (counter clockwise) to increase the cable tension. Turn it in (clockwise) to decrease the cable tension.
- The fourth hand tool allows you to pull the cable a precise amount, use it to pull the cable through the brake before tightening the cable fixing nut.
- Caliper brakes are split into two halves; everything in front of the spring, and everything behind the spring. The front nut adjusts the play and tightness in the arms. It has no effect on centering. The rear nut is only for centering, it changes the pivot point of the spring. The offset brake wrenches are used to hold the spring in place while you tighten the rear nut.
- Single pivot brakes can sometimes be quickly centered by loosening the nut on the back of the frame or fork and holding the brake lever while re-tightening the nut.

![Diagram of good vertical alignment and poor vertical alignment]

Brake Procedure
1. Turn the barrel adjuster almost all the way out until a thread or two is left.
2. Hold the pads against the rim, use a friend or the third hand tool.
3. Use the forth hand tool to pull the cable so that the pads are snug against the rim. Don’t go too crazy, you don’t want to stretch the cable or compress the housing.
4. Hold the fixing bolt and tighten the nut. Don’t turn the bolt and don’t over tighten the nut or you may damage the cable.
5. Once the pads are touching the rim and the cable nut is tight, make all of your pad adjustments. You want the pads to be centered on the rim vertically, the front and back tips should be the same distance from the edge, and the pad should be flat on the rim along its entire length.
6. Now turn the barrel adjuster in (clockwise), this will cause the pads to open up.
7. As you do this squeeze the brake lever and test the brake feel. This is personal preference, in general the brakes should hit firmly but still have some modulation.
Centering: Side Pull/Center pull (single pivot bolt)
- To center brakes that have a single pivot bolt you need to change the pivot point of the spring.
- Loosen the single nut opposite the brake on the back of the frame or fork.
- Use an offset brake wrench on the flats behind the brake caliper to hold the brake centered. If the brake doesn’t have flats, use the brake spring wrench or a screwdriver in the springs to hold the brake in place.
- Tighten the bolt while holding the brakes centered.
- When you tighten the nut the brake will want to rotate, it may take a few tries to get the brakes centered just right.

Centering: Cantilever & V-Brake
- If the straddle wire length is adjustable, adjust it so the cable hanger pulls the center of the wire at the height of the fork crown or brake bridge. If the cable hanger is too high or too low the brake power will suffer.
- Cantilever brakes often have a spring tension adjustment for centering. Tightening this screw increases the spring tension on that side, which pulls the pad away from the rim, loosening it has the opposite effect. Since both sides are linked you only don’t need to turn it as much as you think.
- Use an allen wrench in the bolt perpendicular to the pad post to adjust the pad angles. Loosen the nut on the back, use the allen wrench to move the pads, then hold it in place while you tighten the nut.
- Cantilever break toe-in or out is often adjusted by a curved washer under the brake pad arm. This adjustment needs to be made when the pads are free to move.
- A V-brake is a linear pull cantilever. The spring is a wire behind each brake arm. If the centering screw doesn’t adjust the brake far enough the spring can be bent by hand to increase or decrease its tension.

Centering: Dual Pivot
- These brakes have a nut on the back of the fork or frame so they can be centered similarly to single bolt brakes.
- There is also usually a single screw on the side of the brake caliper, this can be used to fine-tune the brake centering. Turn it clockwise to increase the pad distance on that side, loosen it to get the opposite effect.
DERAILLEURS & SHIFTERS

Terms to Know
- Front Derailleur
- Rear derailleur
- Chainring
- Cog
- High
- Low
- Short or Long
- Cage
- Downtube shifter
- Bar end
- Brifter
- Trigger/Rapid Fire
- Grip shift

Things to Know
- Gears are referred to by ratios, the highest gear on a bike is the large chainring and the smallest cog. The lowest gear is the small chainring and the largest cog.
- A derailleur has two stops, a high gear stop and a low gear stop. These keep the chain from jumping off the ends of the gear cluster and have nothing to do with the gears in between.
- Adjust the rear high gear stop, and the front low gear stop, with the cable fixing bolt loose and the cable un-attached.
- In an index system the barrel adjuster increases or decreases cable tension and centers the chain on all gears simultaneously.
- Friction shifters allow the rider to put the derailleur anywhere they want. The advantage is that they are simple, allow you to use a wide variety of derailleur/shifter combinations, and are easy to set up and maintain. The tradeoff is that you have to center the chain on each gear as you shift while riding.
- Index shifters have a click for each gear, and have to be adjusted so that the click positions line up with the cogs. The advantage is convenience. When riding you just have to hit the shifter and it will line up with the gear. The tradeoff is that they take a few extra steps to adjust, and you will have to re-adjust every once in a while. You will also have to change the shifters if you want to change the number of cogs on the bike.
- If an index shifter has problems shifting one direction, and when you fix it, it has problems shifting the other direction, it is because the cable and housing (often), or shifter (less often) is hanging up. Clean and/or replace parts until everything moves smoothly.
- Longer cage derailleurs have more capacity and can shift a wider range of gears, shorter cage derailleurs are designed for narrow range gearing and save weight.
- Derailleurs don't care how many gears they are shifting as long as they have enough capacity to take up and release all the chain slack. If you change the number of cogs, you don't necessarily have to change the derailleur.
- When setting up a bike with index shifting, keep shifter/derailleur brands together. This is because each type of shifter pulls a different amount of cable per click.
- If a front derailleur cage is too short the chain may hit the cage in the small chainring.
- Cables stretch over time, and this will affect an index shifting system. Once you've got it set up, shifting quality will degrade slightly until the cables finish stretching. It's important to adjust the derailleur to take up the added slack. Remove the extra cable slack using the barrel adjuster when this happens.
Derailleur procedure

Do these steps separately for each derailleur. Adjust the rear derailleur completely first, then the front derailleur.

1. Make sure the shifter isn't pulling any cable. Shift to the smallest cog or chainring.
2. Disconnect the cable and adjust the stop screw (high stop when working on the rear, low stop on the front). For the rear, the pulley should line up with the cog. For the front, the chain should not rub on the cage, but it should not be too tight or the downshift won't work.
3. For index, turn the barrel adjuster(s) all the way in, then out a turn or two. This resets them so you have some adjustment range later.
4. Verify again that your shifter isn't pulling any cable, then attach the cable to the derailleur with the cable fixing bolt.
5. Shift between the current gear and the next one to make sure the chain shifts smoothly. In an index system use the barrel adjuster to increase cable tension until the shift is made.
6. Move the chain to the other end of the range (low gear when working on a rear derailleur, high gear when working on a front).
7. Tighten the stop screw to prevent the chain from moving into the last gear, then back it off until it shifts smoothly. This guarantees that the chain won't jump off the rear cogs into the spokes or off the large front chainring.
8. If you have an index system, use the barrel adjuster to increase or decrease cable tension to center the chain on the gears.

Rear Derailleur Tips

In a friction system you only need to set the stop screws, chain centering is done by the rider as they shift.
In an index system you set the stop screws the same way and then line up the clicks and gears using the barrel adjuster.
Adjust the high stop screw so the upper derailleur pulley is lined up with the highest gear or slightly outside on narrow 9 or 10 gear setups.
Before you attach the cable you can push the derailleur with your hand and release it to make sure the chain is shifting cleanly to the high cog.
In an index system: If the chain won't move toward lower (larger) gears turn the barrel adjuster counter-clockwise to increase the cable tension. If the chain won't move toward higher (smaller) gears turn the barrel adjuster clockwise to decrease the cable tension.

Front Derailleur Tips

In a friction system you only need to set the stop screws, chain centering is done by the rider as they shift.
In an index system you set the stop screws the same way and then line up the click positions and gears using the barrel adjuster.
If you have brifters you will also have intermediate/trim clicks that will need to be adjusted.
Make sure that the derailleur is properly clamped to the frame. The derailleur should be high enough that it clears the large chainring by a few mm. The derailleur cage should also be lined up with the large chainring.
When adjusting the low stop screw in the front, shift the rear derailleur to the lowest gear (largest cog).
When adjusting the high stop screw in the front, shift the rear derailleur to the lowest gear (largest cog).
If the chain will not go to the small chainring cleanly, release the cable, readjust the low stop screw, and re-tension the cable.
**Terms to Know:**
- Spoke
- Spoke nipple
- Rim
- Hub
- Hub flange
- True
- Lateral
- Round
- Radial
- Spoke wrench
- Truing stand

**Things to Know**
- Your goal is to make the wheel true and round by adjusting the spoke tension.
- The spokes on the right hub flange pull the rim to the right, the spokes on the left flange pull the rim to the left.
- The spokes are threaded normally and the spoke nipple is a nut, therefore they tighten clockwise when you are looking at the end of the spoke inside the rim.
- When you are tightening a spoke with the spoke wrench, you are turning the spoke nipple clockwise, but you are looking at it from the back, so the wrench is turning counterclockwise.
- Always find the highest spot on either side of the rim, back the indicators off if they are rubbing along a large section or indicating multiple points. Your goal is to identify which spoke is causing the problem.
- Tightening spokes on one side while loosening spokes on the other helps keep the wheel round.

**Lateral truing**
1. Position the truing stand indicators on either side of the rim and close enough that it rubs in only one spot.
2. Find the spoke closest to the high spot. If the spoke pulls away from the high spot, tighten that spoke 1/4 turn. If the spoke pulls toward the high spot loosen that spoke 1/4 turn.
3. Loosen or tighten the two adjacent spokes 1/8 turn, opposite the direction from the previous step. This helps keep the wheel round.
4. Repeat, finding the highest spot each time and correcting it.

*Figure 5-2. Tighten spoke tension by turning the nipple clockwise, as seen from the point of view of the nipple.*

*Figure 5-3. Side to side wobble is called lateral error.*
Radial truing:
1. Position the calipers so that they are below the edges of the rim and close enough that it rubs in only one spot.
2. Find the pair of spokes closest to the high spot, tighten them both 1/2 turn as equally as possible.
3. Repeat, finding the highest spot each time and correcting it.
4. Position the calipers so that they are touching the rim all the way around, but far enough away that the rim stops touching in one spot.
5. Find the pair of spokes closest to the low spot, loosen them both 1/2 turn as equally as possible.
6. Repeat, finding the lowest spot each time and correcting it.
Things to Know

- When you ride a bike, you’re riding on air. Proper air pressure will protect your wheels, give you better traction, and make your ride more comfortable.
- The writing’s on the wall – the sidewall. Check the tire for minimum and maximum air pressure (as well as tube/tire size)

CHANGING A TIRE
1. Remove the wheel from the bike.
2. Completely deflate the tire.
3. Slide the rounded end of one of the tire tools between the tire and the rim. Working slowly and taking care not to pinch the tube, pry the tire away from the rim and press down to keep the tire off the rim.
4. Slide a tire tool between the tire and rim. Work this tool around the rim until the tire pops free.
5. Remove the tire and inner tube from the rim. Patch or replace the inner tube.
6. Take the tire and slip one edge of it all the way around the rim. It should be possible to do this by hand, although you can use one of the tire tools if necessary.
7. Place the inner tube completely inside the new tire, taking care to line up the inner tube valve with the valve hole in the rim (see B). Push the tube as far into the tire as possible. It might help to inflate the tube very slightly.
8. Using your hands, push as much of the second edge of the tire onto the rim as possible. Continue pushing the tube into the tire as needed.
9. Gently finish rolling the second edge of the tire into place over the rim edge. Work slowly and avoid snapping the tire into place as this tends to pinch the tube and cause air leaks.
10. Inflate the tire to the recommended pressure written on the side of the tire, and replace the wheel on the bike.