

THE QUICK 'n DIRTY ON

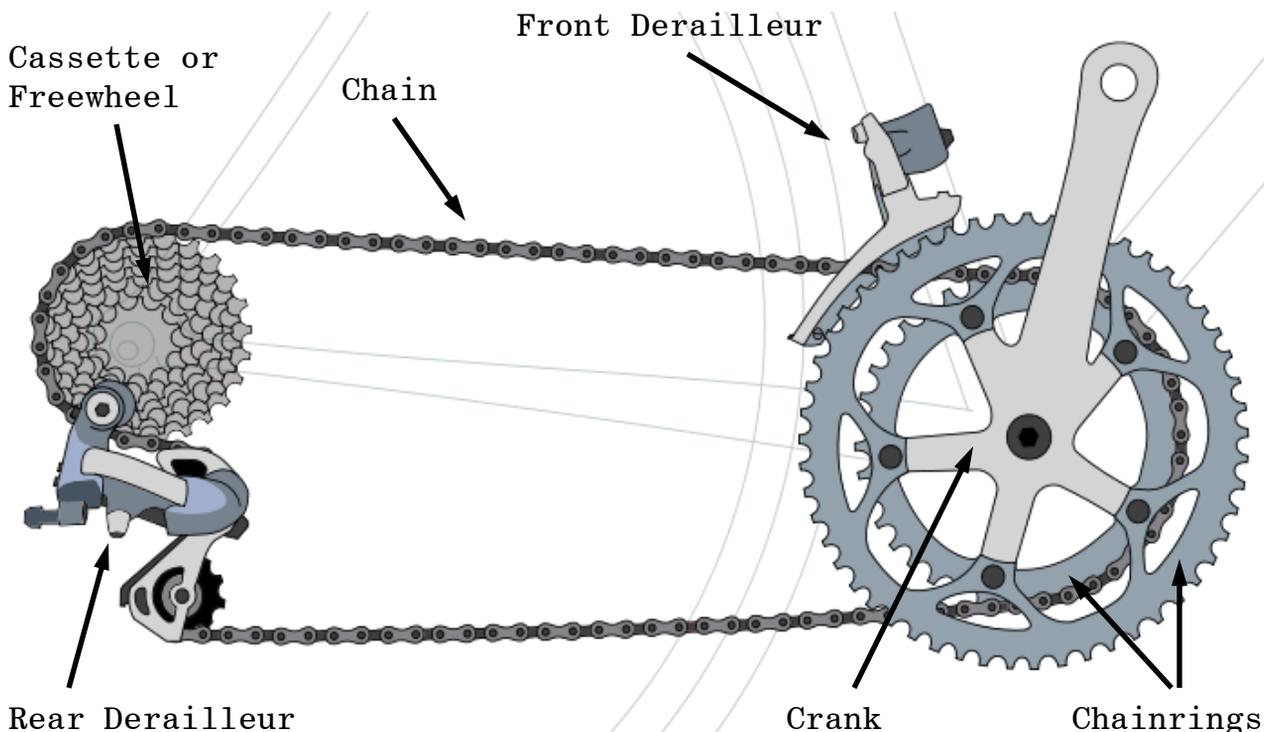
DRIVETRAIN II



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The drivetrain consists of the cranks, chainring(s), chain, and cog(s). On multispeed bikes, derailleurs, which move the chain to change gears, are also considered part of the drivetrain.

ANATOMY of the drivetrain



COMPATIBILITY Shifters and derailleurs work together!

Indexed shifting: is when the shifter has distinct “clicks” for each gear, in contrast to friction shifting which has a continuous pull.

**Why is indexed shifting a big deal?**

You can't mix and match *shifters*, *derailleurs*, and *cassettes* of different brands*, because Shimano, SRAM, Campagnolo, and SunTour engineer their shifters to have different cable pull per click, their derailleurs to have different movement per cable pull, and their cassettes to have different spacing. These three factors and chain width (which we discussed during the last class) control shifting.

***NOTE:** There are some mix-match combinations that do work well. For example the spacing of Shimano and SRAM cassettes and the width of their chains are close enough to be interchangeable.

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The shifter is the BRAIN of the drivetrain! There are a lot of shifter styles. Let's get the terminology straight.

SHIFTER STYLES

Down tube shifters

Down tube shifters are common on vintage road bikes. They either attach directly to braze-ons or by means of an integrated mild steel clamp.



Stem shifters

Also common on vintage road bikes, stem shifters mount either in the headset stack or by clamping directly to the quill stem.



Grip shifters

Also known as "grip shifters", are common on MTB and commuters. Most are made of plastic and prone to breaking.

Thumb shifters

Common on vintage MTB or department store bikes. Can be indexed or friction.



Bar end shifters

Most common on road or touring bikes. These are a much cheaper option than integrated road shifters. Can be indexed or friction.



Trigger shifters and Integrated MTB

Found on modern MTB and flat bar hybrid commuters. Always indexed. Two paddles independently control up- and down-shifts. Considered easier to operate than thumb shifters.



Integrated Road

Found on modern road and cyclocross bikes. Always indexed. Main advantage is not needing to remove hands from brakes to shift. Watch out! These are expensive!



The front derailleur moves the chain between the chainrings. There are too many styles to cover them all!

FRONT DERAILLEURS

1) How is the cable routed?

If it routes along the top tube, then down the seat tube, and pulls up it is a **top pull**. If it routes along the down tube, under the bottom bracket shell, and pulls down it is a **bottom pull**. There are **dual-pull** derailleurs that can work with either style of cable routing.

2) What is the diameter of the seat tube? E-type? Braze-on?

The front derailleur clamps to the seat tube. The three common diameters are **28.6**, **31.8**, and **34.9 mm**. Alternatively, the front derailleur can mount as a spacer behind the drive side cup of the bottom bracket, referred to as **E-type**. **Braze-on** refers to a style that mounts to a slotted tab that is permanently attached to the seat tube.

3) How does the derailleur swing?

The front derailleur can be either A) **Top swing**: where the cage is above the clamp, or B) **Bottom swing**: where the cage is below the clamp.

4) How big are the chainrings?

Front derailleurs have different capacities. **Capacity** refers to the difference in size between the largest and smallest chainring. For example, a derailleur with a 16 tooth capacity can handle shifting between 34 and 48 tooth chainrings ($48-34=14$), but not between 34 and 52 tooth chainrings ($52-34=18$). Derailleurs are also rated by **maximum chainring size** – the curve in a mountain derailleur is sharper (for smaller rings) than the curve in a road derailleur (larger rings).

5) How many chainrings?

The **shape of the cage** is tailored to work with either a **double** (2 rings) or **triple** (3 rings) crankset. On double derailleurs the inside plate of the cage is similar in shape and position to the outside plate. On triple derailleurs the inside plate extends far below the outside plate and has a ramped shape.

6) What if I want to use only one chainring?

First of all, you must be highly evolved. This is a popular choice for mountain biking and commuting. You can go *sans* front derailleur, but you need something to keep the chain from falling off the chainring, typically a bash guard on the outside + a chain catcher on the inside.

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Just so you get the picture, this is what all the different styles of front derailleurs look like.

FRONT DERAILLEURS

Bottom Pull

Cable pulls like this



More common on road bikes

Top Pull

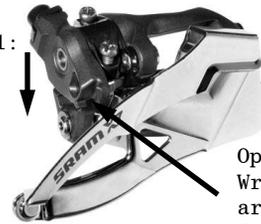
Cable pulls like this



More common on mountain bikes

Dual Pull

Option 1:
Pulls down



Option 2:
Wraps around from top

More common on mountain bikes

Bottom Swing



Also called "traditional."

Top Swing



Gives better tire clearance, but can't handle tight chainlines.

Braze-on



Tab on frame

Bolts into the tab



E-type

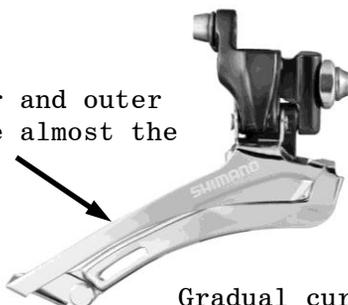


Mounts behind bottom bracket

Common on full suspension MTB or unconventional frames

Double Cage

Inner and outer plate almost the same

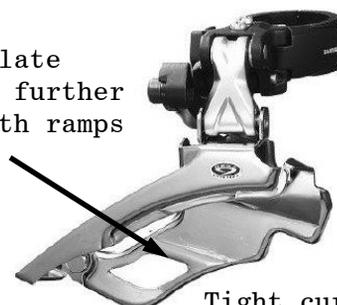


Gradual curve to fit road chainring sizes

For Large Chainrings

Triple Cage

Inner plate extends further down with ramps



Tight curve to fit MTB chainring sizes

For Small Chainrings



The rear derailleur moves the chain between the cogs of a cassette or freewheel. Compared to front derailleurs, rear derailleurs are less variable and easier to work with.

REAR DERAILLEURS

1) What shifter is the rear derailleur paired with?

The number one thing to consider with rear derailleurs is shifter compatibility. Indexed shifters and rear derailleurs of different brands do not play well together. The actuation ratio of Shimano shifters is 2:1 (2 units of cable pull give one unit of derailleur movement) versus 1:1 for SRAM. The configuration and size of the rear derailleur's parallelogram is what translates the shifter's pull on the cable into lateral movement of the chain. Mismatching brands will result in strange translations.

2) What is the gear range?

The rear derailleur, in addition to moving the chain between cogs, also is responsible for tensioning the chain. Shorter derailleur cages are stiffer and therefore lead to more accurate shifting, but short cages cannot take up as much chain slack as longer ones. The wider the gear range, the longer the cage you need. The ability of the derailleur to take up chain slack is described by the **chain wrap capacity (in teeth)**. To see if a derailleur will work with a specific drivetrain take the range of the front gears (ex $52-30=22$ teeth) and the range of the rear gears (ex $28-11=17$ teeth) and add them together ($22+17=39$ teeth). This is the chain slack (in teeth) associated with the loosest gear combination. The derailleur chain wrap capacity must be greater than this figure.

In general, road derailleurs accommodate narrower gear ranges than mountain derailleurs. The most common figure reported by manufacturers is the **largest compatible cog size (in teeth)**. Many road derailleurs will not work with cassettes containing cogs larger than 30 or 32 teeth, while most mountain derailleurs will accommodate 34 or 36 tooth cogs. An assumption used in these ratings is that the crankset is a standard sized double or triple. If a single chainring, or smaller than normal chainrings are used in the front, then the rear derailleur may be able to exceed the formal rating.

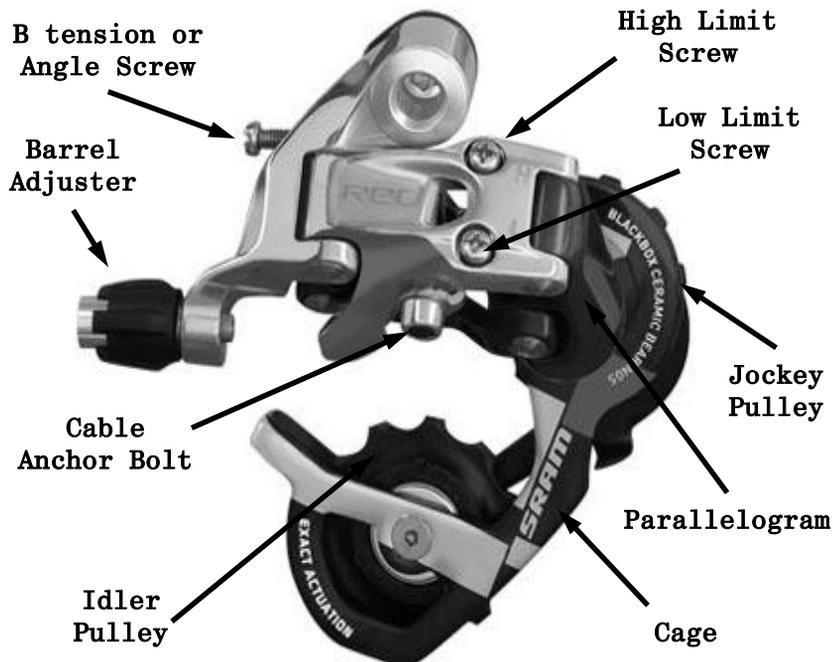
3) Does the speed of the rear derailleur matter?

Not usually. You can mix and match within brands without much ill effect. I've used 7-speed derailleurs with 9-speed drivetrains and 9-speed derailleurs with 7-speed drivetrains. Both worked just fine.



Rear derailleurs are much less variable than front derailleurs. They also function very well because their job is easier – the spacing and size difference between cogs is very small compared to chainrings.

REAR DERAILLEUR ANATOMY



ADJUSTING DERAILLEURS

Modified from the man himself, Sheldon Brown.

- 1) **Set the low limit**
Tighten the limit screw so that it is impossible to shift off the inside of the cassette or chainrings. Loosen the limit if it prevents reaching the full range of gears.
- 2) **Set the high limit**
Tighten the limit screw so that it is impossible to shift off the outside of the cassette or chainrings. Loosen the limit if it prevents reaching the full range of gears.
- 3) **Cable tension**
Start with the derailleur in it's neutral position (let the spring do it's job). Shift all the way down. Pull cable taught and fix in anchor bolt. Hit the shifter to change from the highest to the 2nd highest gear. If nothing happens, add tension until it shifts. Check down shifting. If too slow, release cable tension. Use barrel adjusters for fine tuning.
- 4) **B-tension (rear only)**
Adjust angle to accommodate the largest cog in the cassette or freewheel.