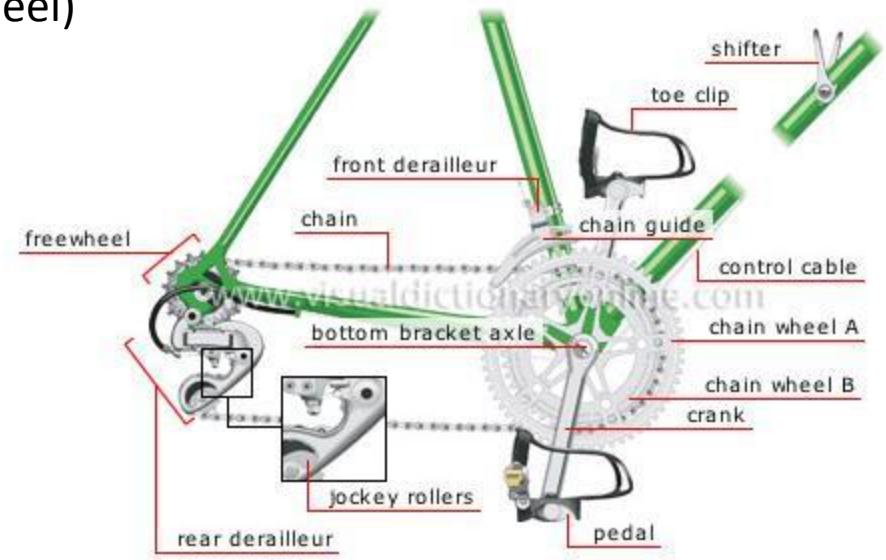
What is the Drivetrain?

The Drivetrain is a system that transmits power from rider to rear wheel, consisting of:

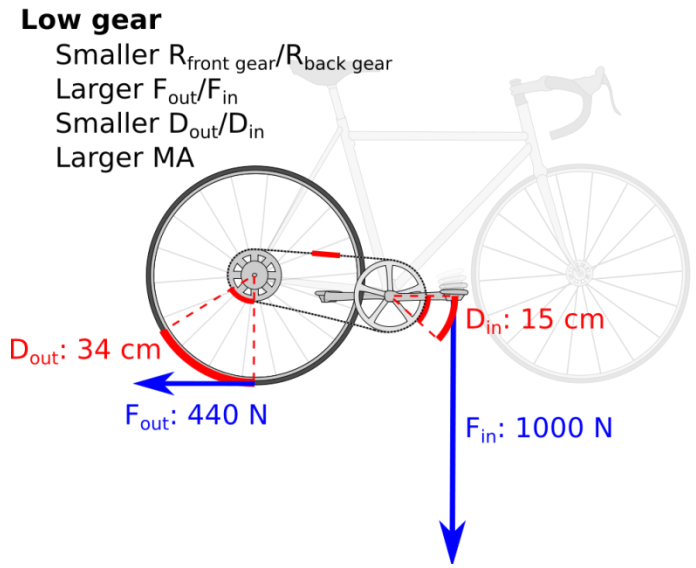
- Pedals
- Cranks
- Chainrings (aka chain wheels)
- Chain
- Cogs on cassette freehub (or freewheel)
- Equipment related to gear selection
  - Shifters
  - Cables and housing
  - Derailleur
  - Barrel adjusters

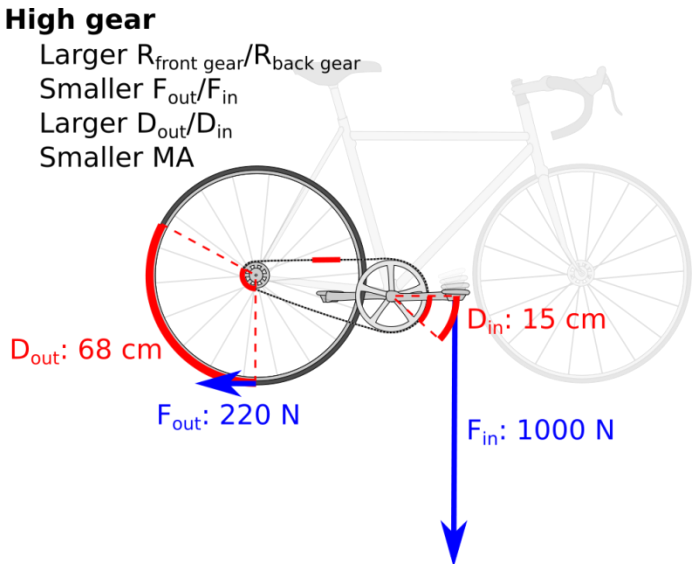


Rider uses pedal/crank assembly to rotate chainring, chain translates chainring rotation into rear cog rotation and hence rear wheel rotation

What is Gearing, and How Does it Relate to Drivetrain?

- The Gear determines the relation between the rider's pedal cadence and the rate at which the rear wheel turns.
- The Gear is determined by the selected chainring and selected cog
- Not all combinations should be used, cross-chaining is bad



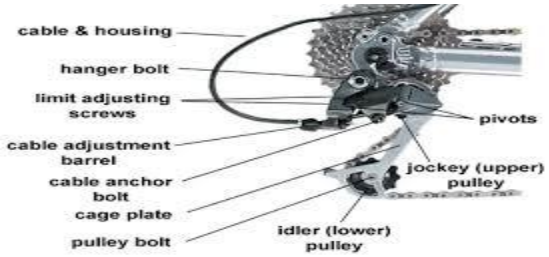


- Low gears make accelerating and climbing easier because they deliver more force to rear wheel
- High gears make high speed easier because they deliver higher RPM to the rear wheel
- The gearing determines the tradeoff between ability to accelerate or maintain high speed at a given rider effort

What is a Derailleur and How Does it Work?

- Shifter controls gear selection through a cable and housing connection to the derailleur
- Proper cable tension is important for correct derailleur function
  - Cable tension is adjusted with Barrel Adjusters
- Proper derailleur adjustment is important for correct derailleur function
  - Derailleur adjustments are made with control screws and default cable tension
- The derailleur "derails" the chain from one cog or chainring to the next
  - Like a train on a track, each click moves the chain to the next track
- Front derailleur

  - When cable tension increased, derailleur pushes chain "up" from smaller to larger chainrings
  - When cable tension reduced, derailleur spring pulls chain "down" from larger to smaller chainrings (i.e. easier gears)
- Rear derailleur

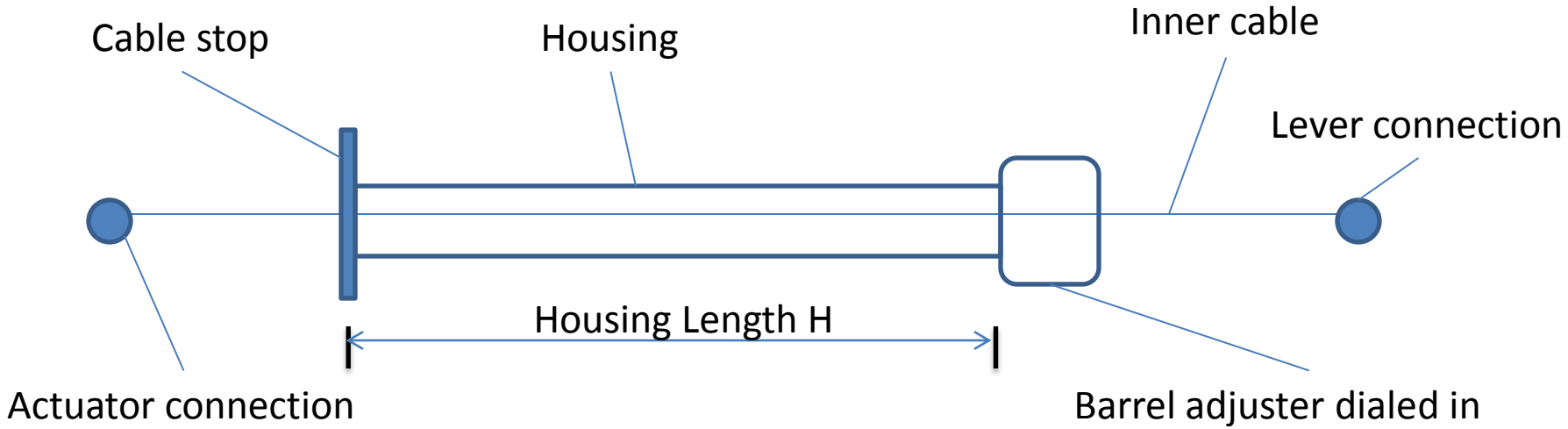


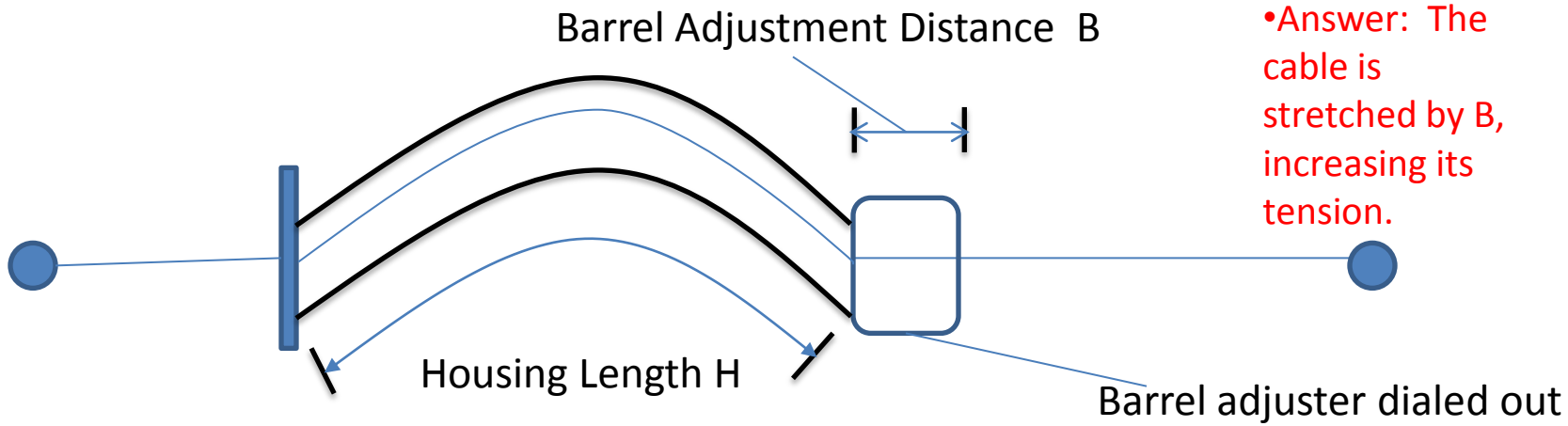
  - When cable tension increased, derailleur pushes chain "up" from smaller to larger cogs
  - When cable tension reduced, derailleur spring pulls chain "down" from larger to smaller chainrings (i.e. harder or higher gears)
  - Pulleys take up chain slack as chain goes to smaller cogs
- Derailleurs only function when the chain is moving forward; always pedal when attempting to change gears

- More cable tension makes derailleur "push" chain "up" from smaller to larger cogs/rings
- Less cable tension lets the derailleur "pull" the chain "down" from larger to smaller cogs/rings

What is a Barrel Adjuster and How Does it Work?

•What happens to cable tension when dialing adjuster "out" a distance "B"?





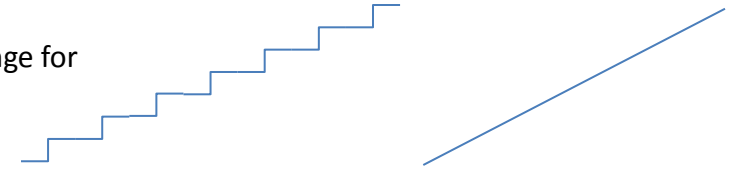
•Answer: The cable is stretched by B, increasing its tension.

- Barrel adjustment depends on housing incompressibility
- Under compression, housing length does not change. This means (bottom graphic)
  - The inner cable is stretched an additional length B, increasing its tension

What is the Deal with Indexed and Friction Shifting?

•Consider the analogy of discrete (indexed) vs. continuous (friction) variables or phenomena

Indexed:
Step function tension change for each shifter click



Friction:
Continuous tension change as shifter lever is moved, no clicks

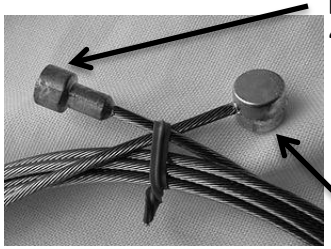
•Regardless of type, ALL shifters increase or decrease cable tension
•Friction Shifter
    •Uses continuous shifter movement
    •Rider judges how far to move lever to achieve desired gear change
    •Simpler to adjust and maintain
    •Especially popular for front since number of gears is limited, i.e. 2-3
    •Friction shifter works with ANY derailleur
•Indexed Shifter
    •Uses discrete steps with a “click” for user feedback
    •For each click, shifter releases (captures) required amount of cable to achieve desired gear change
    •Each click moves the chain up or down one sprocket
    •Parts must be matched: Index shift steps must be matched to derailleur response and cassette sprocket spacing
•Some shifters support either indexed or friction

•Rider is guided by tactile and audible feedback as friction shifter is moved to select gear change
•Index shifter “clicks” automatically release or take up the tension required to effect gear change

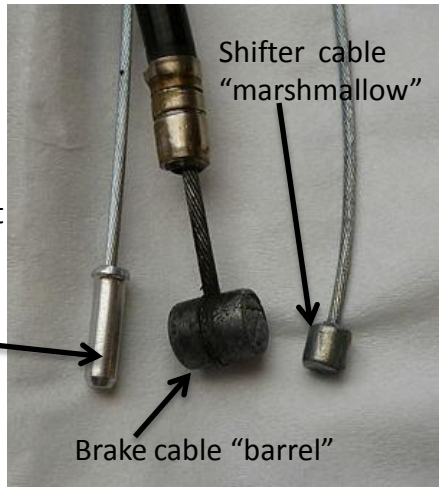
What is the Deal with Cables and Housing ?

- Shift Cable
  - Thinner than brake cable allowing the cable to stretch under tension
    - NEVER USE FOR BRAKES!
  - Terminated at the lever end with small “marshmallow” shaped anchor
  - Contrast with much larger “barrel” or “pear” shaped anchors used for brakes
  - Cable cap stop ends from fraying

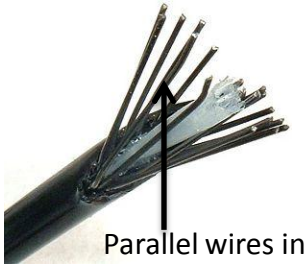
Universal Brake Cable showing “barrel” (straight handle bars) and “pear” (dropped handlebars) options. The end that is not needed is cut off.

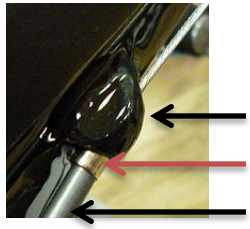


Three cable ends. From left to right, a cable cap (un-crimped), a brake cable anchor, and a shift cable anchor



- Shift Housing
  - Parallel wires like bundle dry spaghetti
    - Not as tough as brake housing
  - Ferrules protect housing ends to keep from splitting
  - Length should allow ends to enter stops in a straight line (not an angle)
    - Too short (kinks) or too long (extended travel) add unnecessary friction





- Shift cable and brake cable are NOT interchangeable
- Shift housing and brake housing are NOT interchangeable

What is the Deal with Chains ?

- Replace a worn chain before it damages chainrings and cogs
- Chains width must match the number of cogs in the cassette
  - Cassette with larger number of cogs (e.g 9-11) spaces them closer together, necessitating a narrower chain
- Troubleshooting
  - Rust
  - Broken or tight links
  - Wear (“chain stretch”)
    - The chain-checker tool measures % elongation, replace if measure > 0.75
    - Or measure 12 links pin-to-pin on a rule, replace if 12.125” or longer
    - Chains don’t actually “stretch”; metal wears away around pins and rollers
  - Clean with Simple Green and rag or brush (or special chain scrubber tool)
  - Lubricate by putting drop of oil on each roller individually
    - Turn cranks for a minute or two to work oil into links
    - Turn cranks again while holding a rag around chain to remove excess oil
    - Excess oil attracts dirt and decorates your pants/leg

- Can’t just throw any old chain on your bike…it must match the cassette size
- Chain wear is manifested by increasing pin-to-pin distance ; worn chains must be replaced
- Chains must be cleaned and lubricated regularly