Colchester Bike Kitchen

Bearings Primer: Make sure everything that should spin, does!

Welcome to the Bike Kitchen Bearings Primer! This booklet is not intended to be a workshop manual or a how-to guide. It does however provide an overview of where key bicycle bearings are, how they work, what they do and things to watch out for when you are maintaining them. For help on the specifics speak to a Bike Kitchen Volunteer mechanic or check of the resources at the end of this guide.

Where are the bearings on a bike?

Bearings on a bike are found in the following locations

- Hubs and Freewheels (helping your wheel spin freely)
- Headsets (Making your handlebars turn smoothly)
- Bottom Brackets (ensuring you cranks turn easily)
- Pedals (making them spin nicely)

What do bearings do and how do they work?

On a bike (and anywhere else for that matter) bearings have one job - to reduce friction. Friction is the enemy of anything that should move freely (like wheels and pedals), so bearings are used to reduce friction as much as possible.

In their most basic form a bearing is a ball or round shape that stops surfaces rubbing together. On a bike they are usually steel balls of various sizes held in a specific position. By placing a rotating load (like a wheel) on smooth, round, slippery surface the friction is reduced as much as possible.

To work well bearings should be:

- Clean and in good condition
- Free of moisture
- Lubricated
- Correctly adjusted

If you can keep the bearings on you bike clean, dry, lubricated and adjusted riding it will be pleasure! As soon as bearings stop working, riding it becomes hard and you should think about some maintenance.

Tools you might need

Basic Essential Tools

- Rags
- Grease
- Degreaser
- Allen Keys
- Selection of standard spanners

Specific Essential Tools

- Cone Spanners
- Headset Spanners
- Pin or lock ring spanners
- Cartridge Bottom Bracket Tools
- Freewheel Remover

Types of Bearings

There are two main types of bearing that you will come across on a bike:

- Loose (or adjustable) bearings
- Sealed (or cartridge) bearings

The key difference is that loose bearings are maintainable (we can take them apart and rebuild them) whilst sealed bearings for the most part are disposable (when they wear out they are replaced).

Loose Bearings

Loose bearings or Ball bearings are found in all applications on bikes and are standard on basic to mid range bikes. That's not to say they are a cheap option, some very high end parts are made with serviceable ball bearings . However loose bearings are the most inexpensive option when manufacturers are making new bikes so they are the most common type.

Loose ball bearings

‘Loose’ bearings in a retainer

Sealed Bearings

Sealed bearings are also found in all applications of bikes, most commonly in Bottom Brackets. They are often referred to as cartridge bearings and in most cases are a disposable items (there are some types that allow new grease to be added). Once they wear out they are removed and new ones are ‘pressed’ in.

Mr. PIM [CC BY-SA 3.0 or GFDL from Wikimedia Commons]

You need special tools to remove and replace sealed bearings. We have most of them in the Bike Kitchen. Just ask!

Key Bearings

Headsets

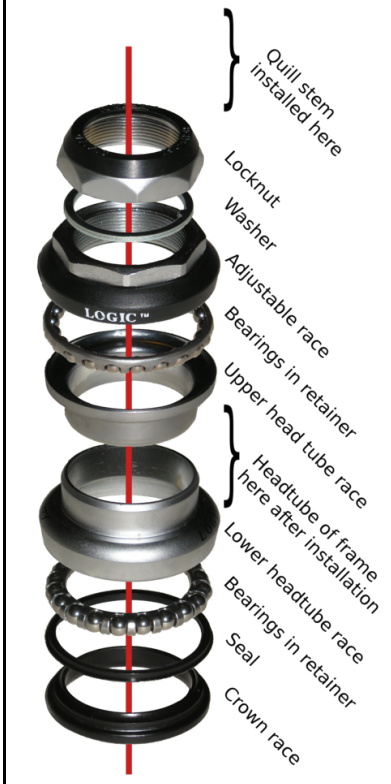
The headset allows the fork to turn in the the head tube of the bicycle frame. Having it set up correctly is essential for smooth steering. A typical headset consists of two cups that are pressed into the top and bottom of the headtube. Inside the two cups are bearings which provide a low friction contact between the bearing cup and the steerer.

They come in a huge range of sizes but the two most common ones are 1” (1 Inch) and 1.125” (1 ⅛ inch). Bike manufacturers have created loads more headsets ‘standards’ with bigger sizes and bigger bearings in the bottom than the top but they all work in pretty much the same away

The are two common arrangements: Threaded and Threadless (sometimes call A-Head set). Threaded headsets, often found on older bikes need 2 correctly sized spanners. You can adjust a threadless headset, which is modern arrangement with just Allen Keys.

If you need to totally remove or fit a new headsets there are some special tools required. We have them for you to use in the Bike Kitchen. Ask us for an overview!

Threaded Headset



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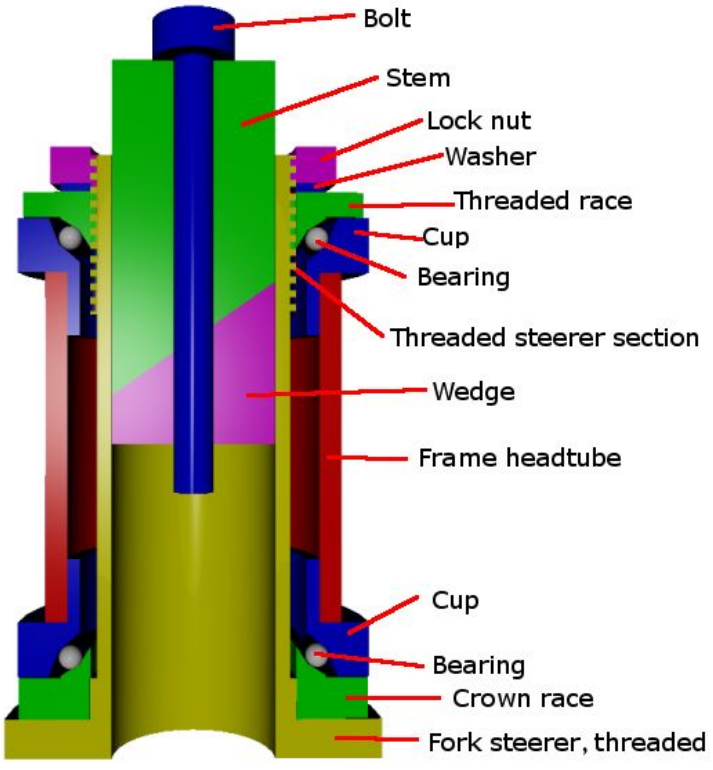

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Threadless Headset

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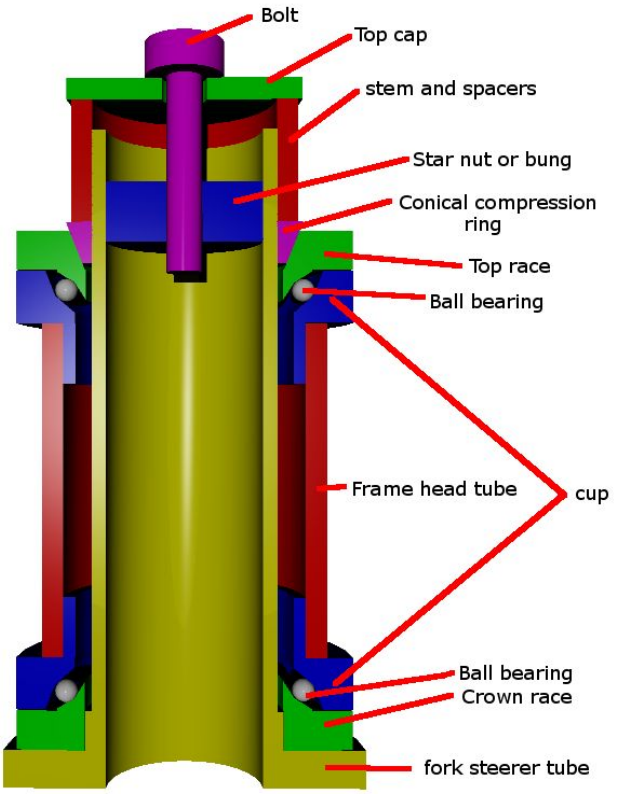


By Thewinch at en.wikibooks [GFDL or CCBY-SA-3.0], from Wikimedia Commons

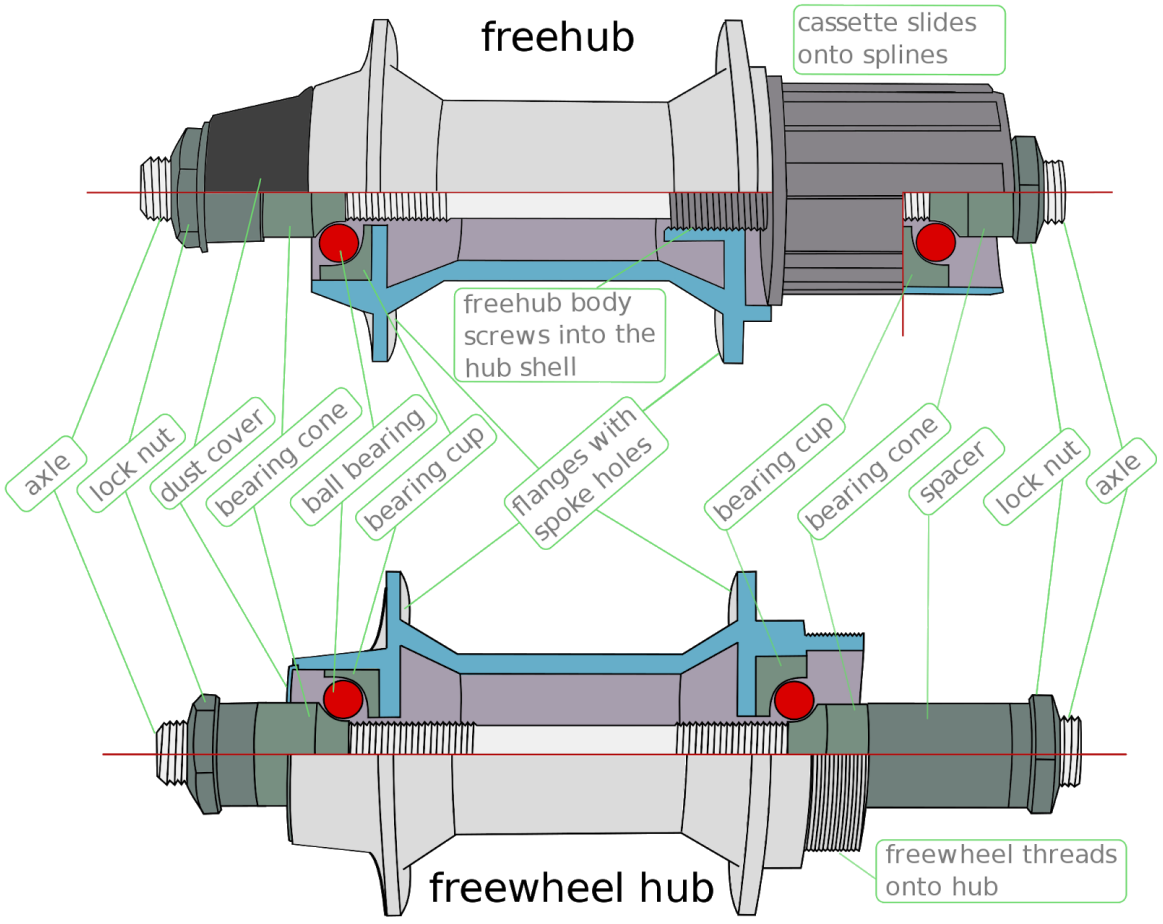
In both designs the lower race (crown race) is susceptible to dirt and water from the front wheel, especially if you don't have mudguards, so from time-to-time it's worth cleaning and greasing the headset. **Annual Servicing as a minimum is recommended.**

Check your bars turn well and don't stick. If they do the bearings are to tight or need servicing. To check for a loose headset, turn the front wheel 90 degrees, apply the front brake and rock the bars back and forth. If there is movement, a click or a clunk then the headset is loose.

Hubs

The hub is the centre part of a bicycle wheel. It consists of an axle, bearings and a hub shell.

Hub shells can be one-piece with press-in cartridge bearings (sometimes called ‘Sealed bearing hubs’) or they may have bearing races and loose bearings - these are usually called ‘Cup and Cone’ hubs. You can check that the wheels is free spinning but also check for side-to-side play by grabbing the wheel at the rim and giving it a ‘waggle’.



By Keithonearth (Bicycle Hub Comparison.svg) [CC BY-SA 3.0 or GFDL], via Wikimedia Commons

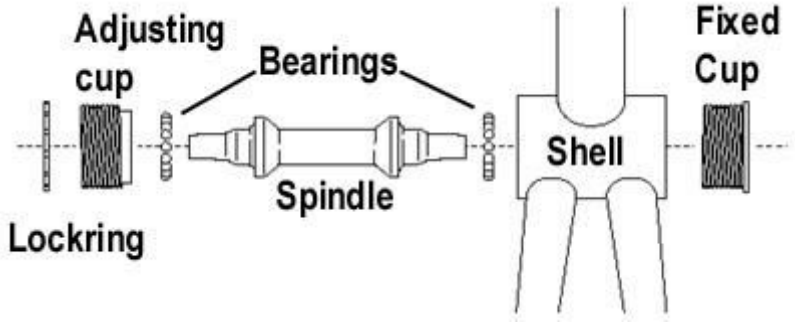
The diagram shows the typical arrangement of a rear cup and cone hub. **Cup and Cone Hubs need at least annual servicing.** You’ll normally need cone spanners in addition to your standard tools to do this. For a rear hub you may need special tools to remove the freewheel or cassette. Front hubs are more-or-less the same but without the gears to contend with they are typically easier to maintain.

Bottom Brackets

Bottom brackets support the cranks. They are in perhaps the filthiest part of your bike, getting hit by all the mud and water from your front wheel, so it is worth keeping an eye on them. The best way to check is to remove the chain and see how they spin. You can also check for side-to-side play by grabbing and ‘waggling’ the crank arms. As well as making sure they spin well, they also need to be well adjusted to ensure you gears work - when they start to come loose shifting your front derailleur will become unpredictable.

Adjustable

Three-piece cranks consist of a spindle with bearing cones, a fixed cup on the drive side, an adjustable cup on the non-drive side, and loose bearings. They all thread into the Bottom bracket shell. Maintaining them requires removing at least one cup, cleaning or replacing the bearings, reinstalling the spindle, and adjusting the cups. **Adjustable Bottom Brackets need at least annual maintenance.**



Cartridge

Today nearly all bottom brackets are some form of cartridge. They can’t be adjusted and once they wear out they are cheaply replaced. The good news is that cartridge bottom brackets are well sealed against the elements and wear out very slowly. You need a special tool to remove these but we have all the types in the Bike Kitchen for you to use.

Other Types

Bottom brackets are another part of bike design where there seem to be many variations on a theme and there are a lots of Press Fit standards too innumerable to mention in this guide. If you want help identifying them try the Park Tool web site or ask in the Bike Kitchen.

IMPORTANT NOTE: Most modern bikes use an ISO thread standard for the bottom bracket. The left side thread is a right-hand direction thread, which tightens clockwise and removes counter-clockwise. **This is a normal thread and what you would expect.** The right side (drive side) thread is a left-hand thread, which tightens counter-clockwise and remove clockwise. **This is a reverse thread and the opposite of what you would expect.**

Pedals

Pedals usually consist of a spindle that threads into the end of the crank and a body, on which the foot rests or is attached, that is free to rotate on bearings with respect to the spindle.

Again there are loads of types. At the basic end of pedal design the pedals are totally unserviceable - once they stop working a new pair can be purchased for very little money. There are pedals with cartridge bearings but these are actually fairly unusual and most mid-range to high-end pedals can be rebuilt and adjusted. The technique is usually specific to the pedal so check the manufacturers guides if in doubt.

IMPORTANT NOTE: The right side thread (drive side) is a right-hand direction thread, which tightens clockwise and removes counter-clockwise. **This is a normal thread and what you would expect.** The left side thread is a left-hand thread, tightens counter-clockwise and removes clockwise. **This is a reverse thread and the opposite of what you would expect.** *If in doubt, pedals always undo by pushing the spanner toward the BACK WHEEL of the bike (and do up by pushing toward the FRONT WHEEL).*

Resources

Threaded Headsets

https://www.parktool.com/blog/repair-help/threaded-headset-service

Threadless Headsets

https://www.parktool.com/blog/repair-help/threadless-headset-service

Bottom Brackets

https://www.parktool.com/blog/repair-help/bottom-bracket-service-adjustable-type

Hubs

https://www.parktool.com/blog/repair-help/hub-overhaul-and-adjustment

Common Terms

Axle - The centre of a hub. Axles have adjustable bearing surfaces
Cone - An adjustable bearing surface
Cup - A concave surface that hold bearings
Lock Nut - A nut that fixes an adjusted bearing. Normally on the outside of a hub
Race - Another surface a bearing runs on. Normally in Headsets.
Spindle - The centre of a Bottom Bracket or pedal. Spindles have fixed bearing surfaces