

# So, You Wanna Build a Ebike?

(j.Arcos)



# Choices

- Mid-drive or hub motor?
  - Mid-drive:
    - Replaceable parts
    - More powerful motors
    - Multiple speeds
    - Lower cg
  - Hub motor
    - Much easier install
    - Easier replacement
  - Went with a mid-drive (fun factor)
- Derailleur gears or integrated hub?
  - Main driver: ability to shift whenever
  - Possibly less maintenance with integrated hub.
  - Main pain: changing the rear tire (got tires with Kevlar belt...Schwalbe Big Apple HS338 26x2.00 Kevlar)

# Sources

- Mid-drive and associated parts (got the optional twist throttle):
  - <https://lunacycle.com/bafang-bbs02-mid-drive-kit/>
- Battery (smallest 52V, 6 AH battery, good for 12-15 miles)
  - <https://lunacycle.com/batteries/packs/52v/52v-mighty-mini-cube-samsung-ebike-battery-pack-30q-6ah-3-pounds/>
- Extra stuff
  - Mid-drive specific wrench
    - <https://lunacycle.com/parts/bafang-parts/bbshd-parts/copy-of-luna-wrench-bbshd-and-bbs02-mid-drive-installation-tool/>
  - Stabilizer bar
    - <https://lunacycle.com/bsbf-1-stabilizer-bar-for-bbs02-and-bbshd/>



# Sources

- Chainstay kickstand (the drive cabling goes through the hole the normal kickstand securing bolt uses)
  - [https://www.purecycles.com/products/chainstay-kickstand?variant=41406684618&gclid=Cj0KCQjw7Z3VBRC-ARIsAEQifZR\\_0dDSK4CZfNgiGKYK16rqlR8jOTm7eW-cVXV11-rqs8BFMG-PU7waArQSEALw\\_wcB](https://www.purecycles.com/products/chainstay-kickstand?variant=41406684618&gclid=Cj0KCQjw7Z3VBRC-ARIsAEQifZR_0dDSK4CZfNgiGKYK16rqlR8jOTm7eW-cVXV11-rqs8BFMG-PU7waArQSEALw_wcB)
- Integrated hub (\$200 complete with a wheelset)
  - [http://www.americasbikecompany.com/Shimano-Nexus-7-Speed-Wheel-Set-p/x-wheel-shimano7setsilver.htm?gclid=Cj0KCQjw7Z3VBRC-ARIsAEQifZRQrbjL-RChTnHFKYzab2B8LdpZEzU1drgOxr9APwl2qWJQnYGj9zkaApijEALw\\_wcB](http://www.americasbikecompany.com/Shimano-Nexus-7-Speed-Wheel-Set-p/x-wheel-shimano7setsilver.htm?gclid=Cj0KCQjw7Z3VBRC-ARIsAEQifZRQrbjL-RChTnHFKYzab2B8LdpZEzU1drgOxr9APwl2qWJQnYGj9zkaApijEALw_wcB)

# Where to start?

- Find a nice old mountain bike.
  - Stronger frame
  - Fixie if you can find one (more later)
  - Fatter tires
  - You'll wind up around 50lb for the complete bike.
  - Not had a problem with caliper brakes, discs could be better.
  - Bottom bracket ~68mm width. Significant departure from this and you should check with the mid-drive vendor.
- **STRONGLY** recommend suspension fork. You'll be cruising at 20mph or better. Hitting a bump and losing your grip on the handlebars could be bad. (Just check that the fork is ok...older RockShox had a recall).



# Put it together (1)

- Worst thing was adding the integrated hub / wheel.
  - The Shimano stuff works but, for a first timer, is a real PIA.
  - The gear change gizmo (the cassette joint) on the hub is held on with a VERY strong split ring. The bike shop, luckily, had one after the original flew across the yard. Just pry the thing on, OR, go to a bike shop. Worth the hassle.
  - Fun video: <https://www.youtube.com/watch?v=JbHFvNU8i60>
- Conversion to single sprocket (integrated hub) from multiple sprockets/derailleur arrangement...basically creating a fixie (fixed gear single speed).
  - So you have a bunch of slack chain left over 'cause the single sprocket is kinda small.
    - Can leave the derailleur in place....but it felt wrong.
  - To the rescue! The fixie chain tensioner..takes up the slack and lets you adjust the chain line.
    - [http://www.jensonusa.com/Shimano-Alfine-CT-S500-Chain-Tensioner-Black-20T-Max-Single-Speed?pt\\_source=googleads&pt\\_medium=cpc&pt\\_campaign=shipping\\_us&pt\\_keyword=&gclid=Cj0KCQjw7Z3VBRC-ARIsAEQifZTt9XVWPpGCqedFoCwFi8MTYcQ9Sx-xDou3CRpBgHwyOr6TyfUSXbcaAiy\\_EALw\\_wB](http://www.jensonusa.com/Shimano-Alfine-CT-S500-Chain-Tensioner-Black-20T-Max-Single-Speed?pt_source=googleads&pt_medium=cpc&pt_campaign=shipping_us&pt_keyword=&gclid=Cj0KCQjw7Z3VBRC-ARIsAEQifZTt9XVWPpGCqedFoCwFi8MTYcQ9Sx-xDou3CRpBgHwyOr6TyfUSXbcaAiy_EALw_wB)



# The mid-drive kit



# Put it together (2)

- Start installing the mid-drive
  - Take off the pedals, crank and bottom bracket.
  - Slide in the mid-drive.
  - On the non-drive side of the bottom bracket slide the triangular support plate on.
  - You may need longer screws and a bunch of washers to make the plate fit flush with the bottom bracket and the mid-drive mounting holes. Make sure the teeth on the plate are towards the frame.
  - And now screw the toothed ring onto the mid-drive threads. Use the handy mid-drive specific wrench to seriously tighten the ring. After a couple of miles it will probably loosen but we have a solution and the support plate will do for now.
  - The trim ring is supposed to screw over the toothed ring. Probably won't have enough exposed threads with a 68mm bottom bracket. Not to worry, have email from Luna saying, "cosmetics only".





# Put it together (3)

- Speed sensor
  - Tells the mid-drive controller how fast you are going. Controller won't work without it.
  - Mounted the sensor on the rear chainstay
  - And then a magnet on one of the rear wheel spokes...just like a speedometer.
- Hook up all the wires.
  - Lots of wires. Everything is keyed and color coded. Look at each connector carefully, line up the pins and they just go together. (Only bent one, slightly, and had to straighten it).
    - Front and rear brakes...to kill the motor when you hit the brakes
    - throttle
    - Power
    - Speedometer/controller thing
    - Speed sensor

Speed sensor in the box

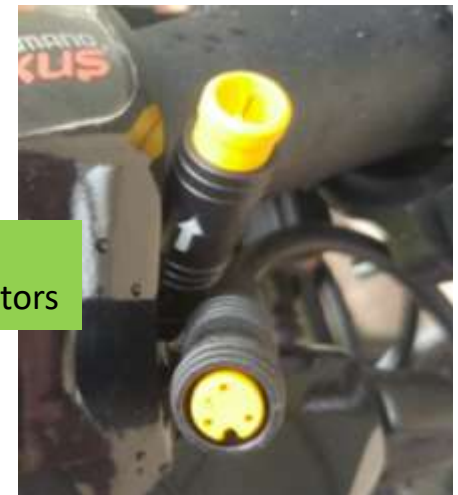


sensor

magnet



Typical connectors



## Put it together (4)

- Try to put all that stuff onto the handle bars in a pleasing ergonomic fashion that won't kill you when you try to shift gears.



# Put it together (5)

- Battery mount...use the bottle holder. Keeps the weight relatively low. Uses existing bolt holes in the frame.
- But needs a better enclosure (see item#1, "Remaining")



# What's gonna go wrong? (1)

- That little toothed ring is gonna loosen and the triangular support plate is gonna start shifting and digging little metal flakes out of your bottom bracket.
- Hence the stabilizer bar. Replaces the triangular support plate and attaches, somehow to the frame. I wrapped everything in innertube and used 2" hose clamps. Very solid and saves drilling holes in the frame.



# What's gonna go wrong? (2)

- You can't get it all onto the handlebars.
  - Changed twist shift to trigger shift.  
(<https://www.ebay.com/item/191892413439>)



# Remaining

- The battery readout is completely wrong. Unit designed for lower voltage so you have no real indication of battery status. Other units reportedly are wildly inaccurate.
- So, get a real ammeter/voltmeter like the one at right. Comes with shunt for hooking up the ammeter. Can read out voltage and amps. (\$16.99)
- Make some sort of battery box (1) to protect the battery, (2) keep it from being stolen, (3) mount the voltmeter/ammeter.



[https://www.amazon.com/gp/product/B01JOUZELG/ref=oh\\_aui\\_detailpage\\_o05\\_s00?ie=UTF8&psc=1](https://www.amazon.com/gp/product/B01JOUZELG/ref=oh_aui_detailpage_o05_s00?ie=UTF8&psc=1)

# Life in the fast lane

- Tops out around 28 mph.
- Can climb any hill in first gear.
- Range: about 12 miles before I am worried. The voltmeter/ammeter will help with this. So figure 25 miles with normal-size 12 AH battery pack. Still just fine for errands around the neighborhood.
- Really heavy. Especially with groceries. But not a problem. Weight is down low and its got POWER.