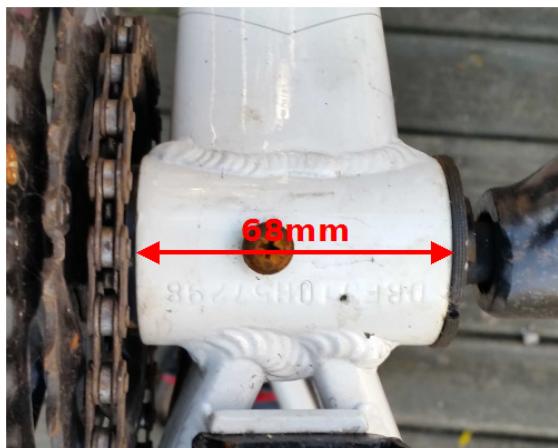


MID-MOTOR EBIKE KITS: INFORMATION FOR INSTALLERS

Tips for evaluating bikes for conversion

- Consider the age, condition and value of the bike. Is it worthwhile using it as a donor? For reference, a good quality new donor bike can be had for around \$750
- Will the brakes give you sufficient stopping power? “Vee” brakes with high performance pads are OK, disc brakes are better. For bikes with side-pull or coaster brakes we recommend limiting the top speed of the bike.
- Check the bottom bracket width. If the tube in the frame is 68mm our motor kits will fit out of the box, if it is 72mm you may need to do a bit of extra work to get them to fit and if it is wider than 72mm you will probably need a “fat bike” kit.



Bottom bracket width measurement

- Check how much room there is inside the frame. If there isn't room for a bottle-mount battery you may need to fit a rack-type battery.

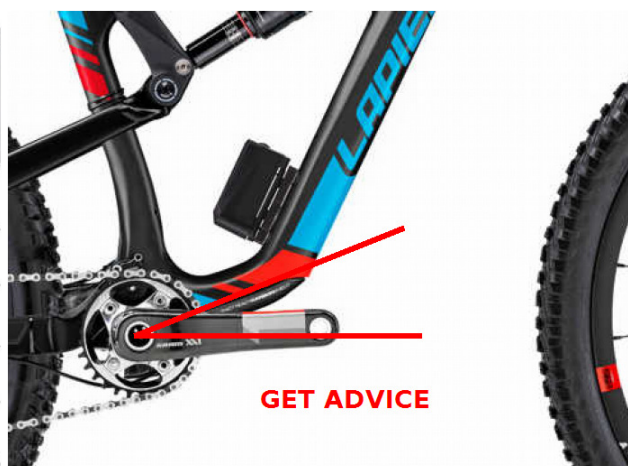


Rack-mount battery



Bottle mount battery

- On bikes where the down tube attaches to the bottom bracket at a shallow angle installation can be tricky and you may need an experienced installer to check it out. This is usually only an issue on a few cruiser style bikes and aggressive off-road bikes.



BBS01 Features and benefits



- The BBS01 uses “standard” pedal assist, which means it comes up to the user’s set power level when the cranks start turning
- It features a throttle so it is possible to use the bike without turning the cranks at all
- A wide range of settings can be modified using the programming software
- Slightly more torque and higher top speed than the TBDZ2
- Different size chain rings are available but standard ones can’t be used without an adaptor
- Wiring harness is slightly bulkier and harder to keep tidy than the TBDZ2

TBDZ2 Features and benefits



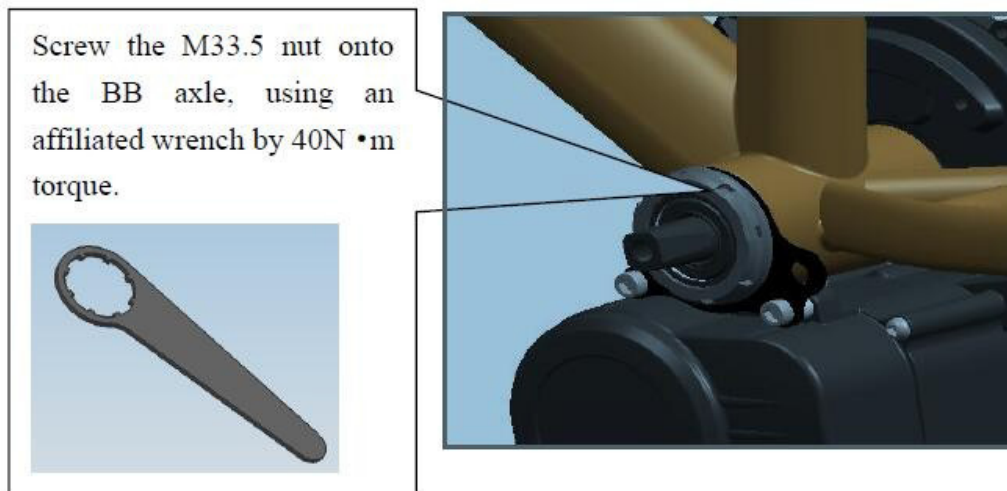
- The TBDZ2 uses torque-sensing pedal assist, which means the system output power is proportional to how much force the user is putting into the cranks. The user can set the system to deliver 30% - 300% of their output.
- Ride feel is very natural and extremely responsive. Great for trail riding
- No throttle option is available at this stage
- Standard 110mm BCD chain rings can be fitted
- Install is generally tidier than the BBS01

Preparing the bike for conversion

- Remove the pedals. You'll need to put them back on after the motor is fitted and they are easiest to remove now. Remember the left hand pedal is reverse thread!
- "Break" the chain and remove it. Some chains have a removable link, but if your chain doesn't you'll need a chain breaker tool.
- Remove the crank arms. A "crank puller" tool is required for this
- Remove the bottom bracket. Different bottom bracket types require different tools, check what type you need. Remember the right hand side of the BB is reverse thread!
- OPTIONAL: Remove the front derailleur as it is not required for the single chain ring on the kits
- Remove the grips from the handle bars. This can be quite difficult if the grips are not "lock on" type. One trick is to get some water in under the grip using an ice block stick or similar. Another option is to just cut them off and fit new ones after the install.
- OPTIONAL: Discard the front shifter as it is no longer required.

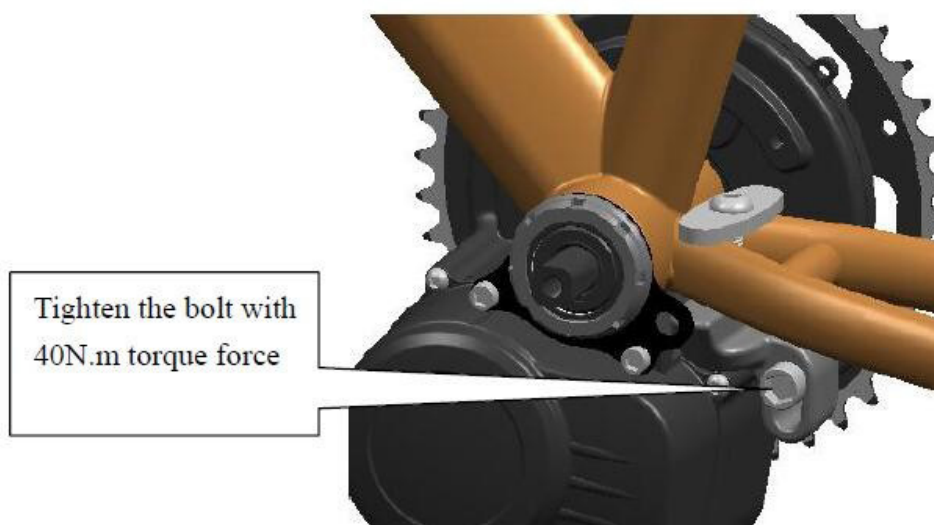
Fitting the motor

- If you are changing the main power connector now is the time to do it. It's much easier to do this on the bench than in the bike.
- Slide the motor into the bottom bracket tube and fit the bracket and locking bolt loosely



Fit the motor, BB bracket, bracket securing bolts and main locknut

- Consider how you will rout your cables. If you are going to feed any through between the motor and the bike frame now is the time to put them in place. Make sure they won't get pinched between the frame and the motor when the install is complete!
- For the BBS01 rotate the motor forward till it is touching the down tube, for the TBDZ2 fit the torque arm assembly.

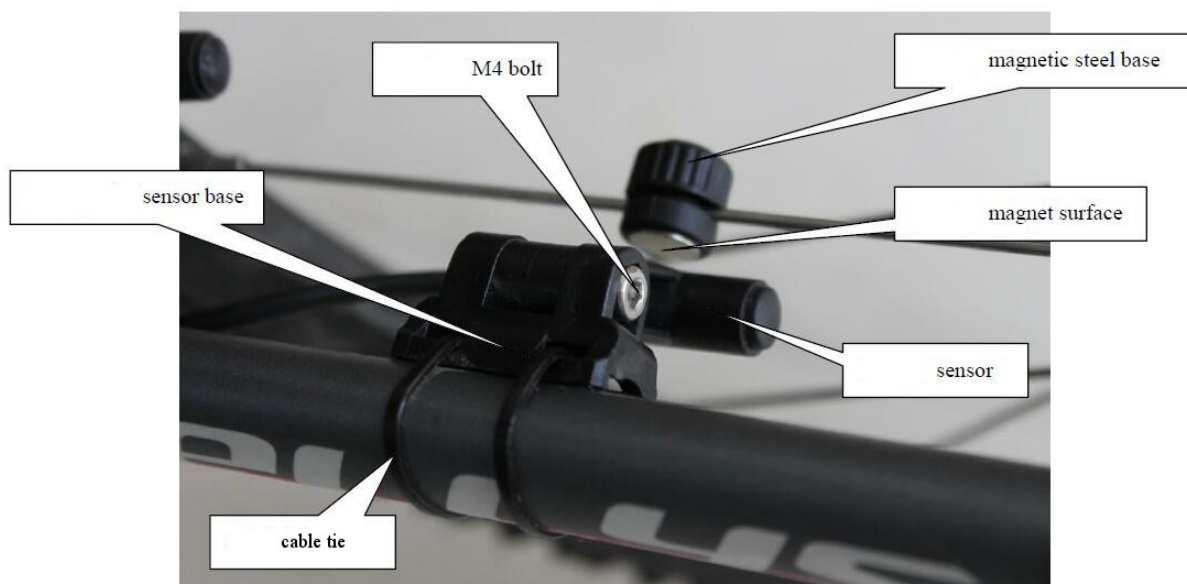


Fit the torque arm, leave tightening these bolts till the end of the install

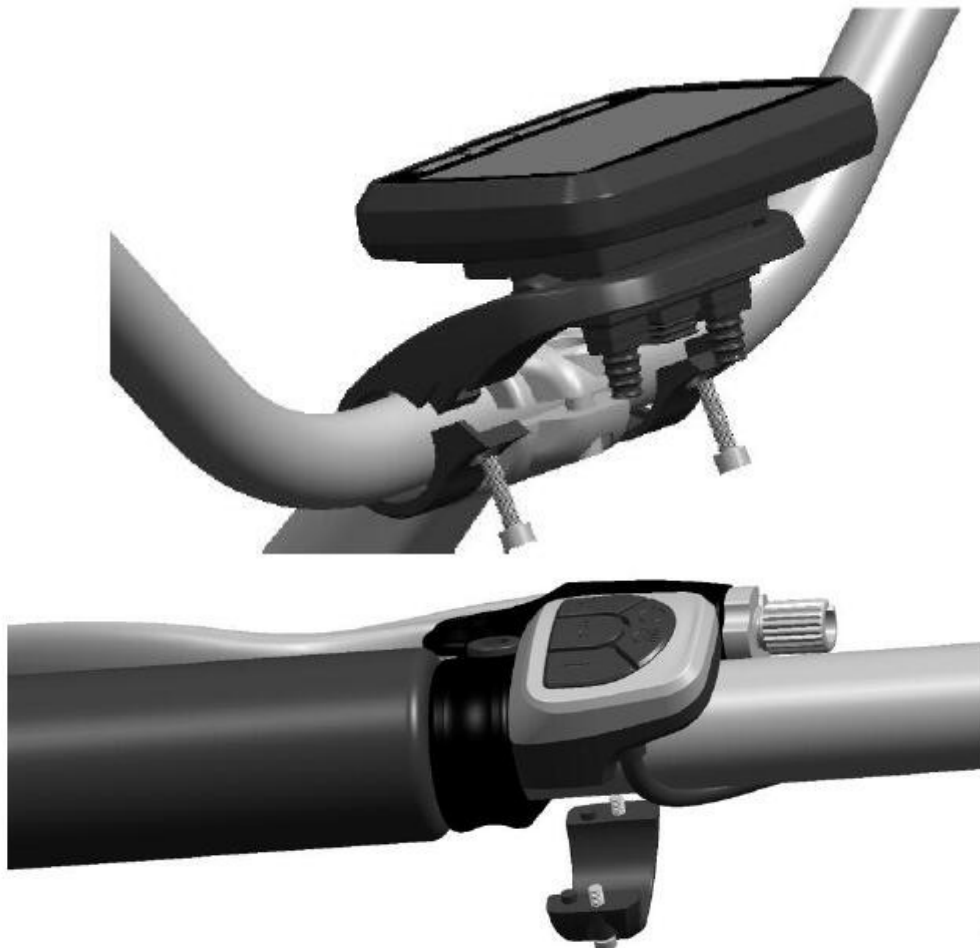
- NOTE: It's best to wait till you've powered the system on and confirmed everything is working before completing the mechanical install

Completing the electrical installation

- Change/fit the main power connector if required.
- Secure the battery cradle to the bike. The method will depend on what battery type you are using. Don't fit the battery until you've almost finished the install as you don't want to be working on live cabling
- Fit the speed sensor to one of the chain stays. Usually it would be fitted on the left to avoid the chain.
- Fit the speed sensor magnet to one of the spokes and position it so that it passes by the sensor.



- Fit the LCD and keypad to the handlebars



- Fit the throttle and/or brake sensors if you are using them. The fitting method for the brake sensors will depend on what type you are using.
- Now the cables can be secured into place. Normally you would follow the existing brake and shift cables. Excess cable can usually be coiled up or wrapped around the frame. Make sure you don't put any sharp bends in the cables and ensure they aren't going to be pinched or stretched (HINT: you should be able to rotate the handlebars so they are almost facing backwards without yanking any of the cables)
- OPTIONAL: To improve the look of the install you can use spiral wrap or conduit to bind bunched cables together.

Complete the mechanical install

- On the TBDZ2, tighten up the torque arm mounting bolts. We recommend using loc-tite or similar on these bolts. If the torque arm is not in contact with the motor body pack it out with washers so there is something for the torque arm to be clamped up against.
- Tighten the main bottom bracket locknut. This needs to be done up VERY tight (40Nm for the TBDZ2, 60Nm for the BBS01)
- Fit the crank arms
- Fit the pedals

Configuring the motor controller

- Once the install is complete fit the battery and power the system up
- The controller can now be configured. The method differs depending on what system you are using so consult the instructions. The key things you will want to set are the wheel diameter (so your speedometer gives the correct reading) and the speed limit.

Advanced configuration options for the BBS01

- Many of the advanced settings of the BBS01 can be accessed using the "Controllertest" software and programming cable.

Basic		Pedal Assist	Throttle Handle
Low Battery Protect(V):	41		
Limited Current(A):	25		
	Limit Current(%)		Limit Spd(%)
Assist0:	1		1
Assist1:	52		44
Assist2:	58		51
Assist3:	64		58
Assist4:	70		65
Assist5:	76		72
Assist6:	82		79
Assist7:	88		86
Assist8:	94		93
Assist9:	100		100
Wheel Diameter(Inch):	18		
Speed Meter Model:	External, Wheel Meter		
SpdMeter Signal:	1		

First screen of the BBSxx programming software

- A full seminar would be required to cover all the programming options, but common things users request are: Removing the speed limit from individual assist levels, changing the amount of assist each level delivers, setting the throttle to deliver full power regardless of what the assist setting is and slowing down the rate at which the motor power ramps up.

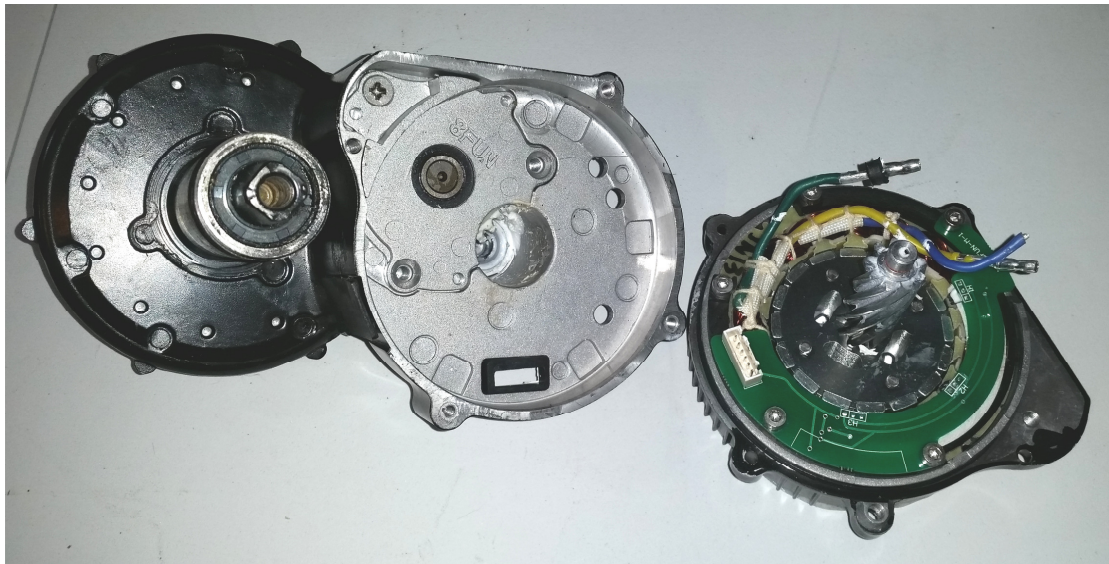
How to service the motors

- At about 3000km (or about when the chain needs replacing) we recommend you re-pack the motor gearbox with grease
- Both the BBS01 and TBDZ2 motors have an inner and outer gearbox. Generally it is only the outer/low speed section that needs the grease replaced but best practice is to do the inner/high speed section too, it just takes a bit more work.
- To access the low speed gears remove the motor from the bike, remove the chain ring and then remove the gearbox cover.



BBS01 with the low speed gearbox cover removed

- Clear as much of the old grease as possible. If water has entered the gearbox the grease will appear lighter in colour than normal. In this case leave the cover off the gearbox in a warm dry place overnight or longer to allow as much of the water to evaporate off as possible. This really only happens if the motor has been cleaned with a high pressure hose or immersed in water so gently remind you customer that, while the motors are weatherproof, they are not ~totally~ waterproof.
- Re-grease the low speed gears with either a wash-out proof carbon grease or marine grease. Put heaps of grease around the O-ring to help prevent moisture getting in.
- If you have accessed the high speed gears repeat the above procedure but use lithium grease.



BBS01 with the motor section removed, giving access to the high speed gears

- After about 10000km, or if water has gotten into the motor, some of the bearing may need replacing. To check remove the shaft from the bearing and rotate the bearing with your finger. It should feel totally smooth. If it feels rough at all replace it
- Some bearings can be easily knocked out by placing a suitable size socket on one side and tapping them with a hammer. The bearings that are fitted to blind holes will need to be removed using a bearing puller.
- Most of the bearings in the motor and gearbox are standard and can be sourced from normal bearing suppliers. The thrust bearings in the crank assembly of the BBS01 are non-standard, but we can supply replacements.

How to diagnose and fix common issues

- The speedo doesn't work / I see error 21 on the BBS01
 - Most likely the wheel magnet and/or speed sensor have been knocked out of place check their position and fit them more securely if necessary.
 - The speed sensor cable or plug may have been damaged. Check these carefully if aligning the sensor and magnet doesn't work
- I see error 06 on the TBDZ2
 - This means the torque sensor hasn't calibrated properly. It is almost always because the user has powered the system on while riding or started pedalling before the system has started up properly. They just need to wait 5 seconds before putting their feet on the pedals.
- The motor makes a banging sound when it starts up / I see error 30 on the BBS01
 - This is usually because the motor has come loose from the frame, and is generally only an issue on home installs. It seems to happen more on the BBS01 as the TBDZ2's torque arm takes the rotational force off the main locknut. Just tighten the motor back up. Make sure the cables are OK as the sometimes get squashed if the motor moves around.
- The LCD turns on but there is no power from the motor
 - This is usually because one of the brake sensors is on. To test this un-plug the brake sensors and see if this fixes the issue. If it does check that the brake sensors are installed properly. You can track down which one is causing the issue by plugging them in one at a time to see which one stops the system working.
 - Sometimes this is a comms error. On the BBS01 you should see error 30 come up, and on the TBDZ2 you may see error 03. Unplug and re-connect all the plugs in the system and check all the cables for damage. Make sure none of the cables are being pinched.
- The system doesn't power up at all
 - This generally indicates a power problem. Assuming the battery is charged and inserted in the cradle properly it's probably an issue with the main power connector or cable (usually only an issue with home installs). First try powering the system up from a bench power supply to see if the battery is the issue. Next you can use a multi-meter to check and see where the issue is. If it's not a battery issue and we didn't fit the system we usually just fit a new power connector as this is where 80% of the issues are.

Most common installation issues that cause problems

- The main locknut on the crank isn't done up tight enough
 - The main locknut has to be done up REALLY tight. 40Nm for the TBDZ2 and 60Nm for the BBS01. We always use loc-tite medium strength thread locker on these nuts and also leave them for 10 minutes then re-tighten them.
- A cable has been crushed between the motor and bike frame
 - This is just a matter of routing the cables carefully. Make sure you don't crush any when you are tightening the motor mounting bolts up, and for the BBS01 especially don't run cables over the rubber bump-stop. If the bump-stop isn't hard up against the down tube fit some rubber packers between the frame and bump-stop. The system is designed to be fitted hard up against the bike frame to stop it rotating when the motor powers up.
- There isn't enough cable length going up to the handle bars
 - This means that when the handlebars are turned too far the connectors get yanked and disconnect. The worst situation is where they become partially disconnected but the plug doesn't actually come apart, so it's difficult to spot. As a rule you should be able to turn the handlebars backwards in both directions without putting tension on any of the cables. If you attach the electrical cables to a brake or shift cable you'll almost always get it right first time.
- The battery connector isn't fitted properly
 - The battery connector is the only one that isn't pre-fitted, so human error comes into play here. With crimped-on connectors you can avoid issues by applying hot glue around the cable where it exits from the connector. If you use solder connectors make sure to tin the cable first and make sure that the solder has flowed properly onto the cable and connector pins. Use some hot glue on soldered connectors too as it provides some strain relief for the solder joint
- The LCD mount has been done up too tight and broken
 - We've changed our LCDs to reduce this problem, but if you do the bolts that secure the LCD to the handlebars up too tight it is possible to break the mounting bracket. Do them up just tight enough that the LCD doesn't move easily.