Bicycle Gear Computer

Installation Guide

Firmware V1.0



1. Technical Specifications

Specification	Value
Microcontroller	ESP32-C3 (240 MHz, WiFi 802.11 b/g/n)
Display	SH1107 OLED 128 × 64 pixels
Speed Sensor	Hall effect sensor + wheel magnet
Motor	Servo motor 0 – 180°
Gears Supported	2 – 10
Speed Range	0 – 99 km/h (or mph)
Battery	LiPo with USB-C charging
Auto Power-Off	15 minutes of inactivity
Firmware Updates	OTA over WiFi
Screen Brightness	3 levels: Dim / Medium / Bright
Menu Language	English
Operating Voltage	3.3 V – 5 V

2. Package Contents

- Gear computer unit × 1

- Speed sensor magnet × 1
- Mounting foam strip × 1
- Large zip tie × 1
- Small zip ties × 4
- USB-C charging cable × 1
- Quick-start card × 1

3. Required Tools

Tool	Purpose
Allen key set (2 mm – 6 mm)	Grip bolt, derailleur cable clamp
Open-end spanner / wrench	Gear shifter removal
Cable cutter	Trim steel cable and housing
Scissors or knife	Cut foam strip to length
Smartphone or computer	WiFi firmware updates (optional)

4. Installation

1 Removing the Existing Shifter and Cable

Begin with the bike on a stand with the wheel clear of the ground.

1. Use an Allen key to loosen the grip-lock bolt and slide the handlebar grip off. Set it aside — you will refit it in Step 8.
2. Use an open-end spanner to unscrew and remove the gear shifter from the handlebar.
3. Pull the grip and cable housing out as a unit.
4. At the rear derailleur, use an Allen key to release the cable clamp bolt. Pull the steel cable and housing completely out and remove them from the frame.

TIP Photograph the cable routing before removing anything. This is a useful reference when reinstalling.

2 Positioning the Unit on the Frame

Mount the unit on the chain stay or seat stay on the derailleur side of the frame.

5. Choose the side of the frame closest to the rear derailleur (usually the drive side — right).
6. The unit can be mounted upright or inverted — both are mechanically equivalent. Choose whichever clears the tire and chain stay best.
7. Position the system tip parallel to the wheel rim. In case of displacement, the unit should contact the rim rather than the spokes..



Normal riding screen

NOTE If the rear dropout is too wide and the magnet catches the chain during wheel rotation, swap the unit to the non-drive side (left).

8. Wrap the foam strip around the frame tube at the chosen position. This increases friction and protects the paintwork.
9. Place the unit over the foam and thread one large zip tie through the center mounting point. Tighten firmly but do not crush the foam.

3 Installing the Magnet on the Wheel

The magnet triggers the hall-effect sensor once per wheel revolution to measure speed. Correct alignment is essential for reliable readings.

10. Select a spoke near the hub on the same side as the unit.
11. Open the magnet bracket and slide it onto the spoke so the two bolts straddle the spoke groove.
12. Rotate the magnet around the spoke until it points as close to 90° toward the sensor face as possible.
13. Slide the magnet along the spoke to align it with the height of the sensor window on the unit.
14. Tighten the clamp bolt. If the bolt protrudes beyond the nut, cut it flush with a cable cutter.

TIP Spin the wheel slowly. A small red indicator light on the side of the unit flashes each time the magnet passes the sensor. Use this to confirm alignment before fully tightening the bracket.

TIP Aim for 1 – 3 mm clearance between the magnet face and the sensor. Too close risks contact; too far causes missed pulses and inaccurate speed readings.

4 Cable Preparation

15. Route the cable housing from the servo lever on the unit to the handlebar area, following the frame lines.
16. Measure the housing: it should follow a smooth arc with no kinks. Add 20 mm for end-cap seating.
17. Cut the housing to length with a cable cutter. File or de-burr the cut end.
18. Thread the steel cable through the housing and leave the free end unconnected — you will attach it to the lever during angle calibration in Step 6.

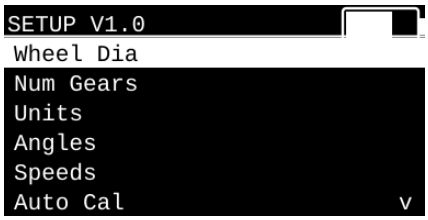
IMPORTANT Do NOT connect the cable to the servo lever yet. The servo must be at its zero position (highest gear) before the cable is tensioned.

5 Initial Device Configuration

Power on the device by pressing the Mode button, then enter the setup menu:

5.1 Enter Setup

19. Press the Setup button to open the main menu.
20. Use Up / Down to scroll through the menu items.
21. Press OK to select a menu item.
22. Press Setup to go back one level at any time.



Main menu — SETUP V1.0

5.2 Wheel Diameter

Select Wheel Dia from the main menu.

23. Press Up / Down to set the diameter of your wheel in inches.
24. Press OK to save.



Wheel Dia editor

Wheel size	
700c — road	
29" — mountain	
27.5" — mountain	
26" — mountain	

5.3 Number of Gears

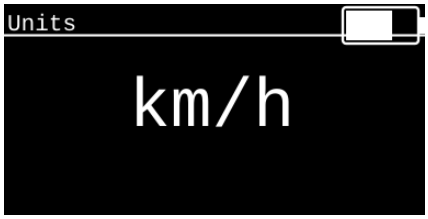
Select Num Gears. Press Up / Down to match the number of sprockets on your cassette (2 – 10). Press OK to save.



Num Gears editor

5.4 Speed Units

Select Units. Press Up or Down to toggle between km/h and mph. Press OK to save.



Units editor

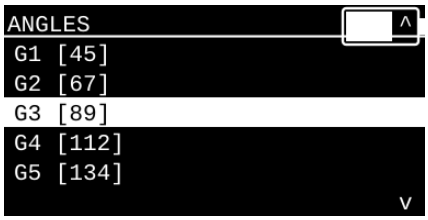
6 Angle Calibration

Angle calibration tells the unit exactly how far to move the servo for each gear. Work from the highest gear (hardest sprocket) down to gear 1.

IMPORTANT Keep the bike on a stand so you can turn the pedals and observe the chain. The cable must NOT be connected to the servo lever until sub-step 6.2.

6.1 Open the Angles Menu

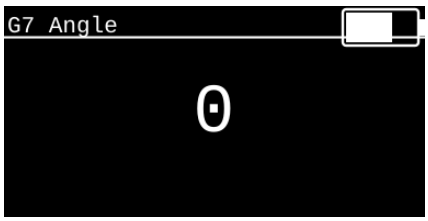
25. In the main menu select Angles and press OK.
26. The gear list shows all gears with their current angle values.
27. Scroll to the highest gear number and press OK.



Angles gear list

6.2 Set Zero for the Highest Gear

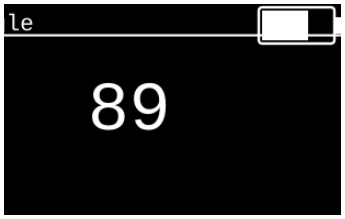
28. With the highest gear selected, use Up / Down to set the angle to 0.
29. The servo moves to its rest position.
30. Now connect the steel cable to the servo lever. Pull it just tight enough to remove slack, then clamp it at the derailleur.
31. Press OK to save and move to the next gear.



G7 — zero angle (connect cable here)

6.3 Calibrate Each Remaining Gear

32. Select the next gear down in the list.
33. Press Up to increase the angle (cable pulls derailleur) or Down to decrease it.
34. Slowly turn the pedals and listen for the chain to settle cleanly on the sprocket.
35. Press OK to save.
36. Repeat for every gear down to gear 1 (smallest sprocket).



G3 — angle edit in progress

TIP Each button press moves the servo 3°.
Hold the button for faster movement.
Press Setup (not OK) to cancel an edit and restore the previous angle.

7 Speed Calibration

Speed calibration sets the thresholds at which automatic mode shifts gear. Choose Method A (manual entry) or Method B (auto-calibration).

Method A — Manual Entry

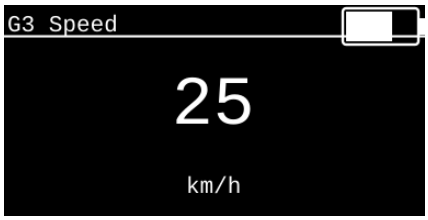
Select Speeds from the main menu. For each gear, set the minimum speed at which the system should engage that gear.



Speeds gear list

TIP Set G1 = 0. Each threshold should be higher than the one before.
A common starting
point for a 7-speed bike: 0, 10, 18, 26, 34, 42, 50 km/h.

Select a gear from the list. Use Up / Down to set the value. Press OK to save.



G3 speed threshold editor

Method B — Auto-Calibration (Recommended)

The device observes your riding for 10 seconds and calculates all thresholds automatically.

37. Select Auto Cal from the main menu and press OK.
38. The screen shows Start Cycling (flashing). Begin pedalling — the countdown starts the moment the device detects movement.
39. Ride at a comfortable pace. Use Up / Down to change gears as you normally would.



Auto Cal — waiting for movement

40. A 10-second countdown is displayed along with your current gear and speed.
41. Try to ride in at least two different gears during the window for the most accurate result.



Auto Cal — 7-second countdown

42. At the end, Done! appears and all speed thresholds are saved automatically.
43. Press OK to return to the menu.



Auto Cal — complete

TIP You can repeat Auto Cal any time by re-entering the menu.

8 Final Assembly

44. Slide the handlebar grip back onto the bar and tighten the lock bolt with an Allen key.
45. Mount the display unit on the handlebar — left or right side, whichever is most comfortable for you.
46. Route all cables neatly along the frame and secure them with small zip ties at 100 – 150 mm intervals.
47. Trim all zip tie tails close to the locking head with a cutter.
48. Spin the rear wheel through its full rotation and confirm the magnet does not contact the chain or any frame part.
49. Test the brakes and steer the handlebar from lock to lock — no cable should snag.

TIP To adjust screen brightness at any time: hold the OK button for 2 seconds on the normal riding screen. The display cycles through Dim / Medium / Bright.

5. Display Screen Reference

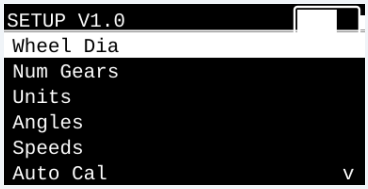
The following screens appear during normal use and setup. Use this section as a quick visual reference when operating the device in the field.



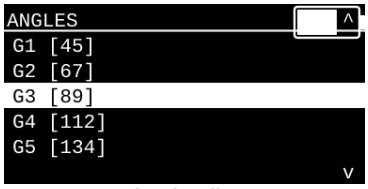
Manual riding



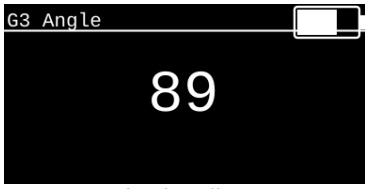
Automatic riding



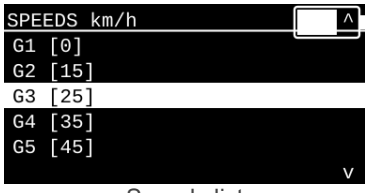
Main menu



Angles list



Angle editor



Speeds list



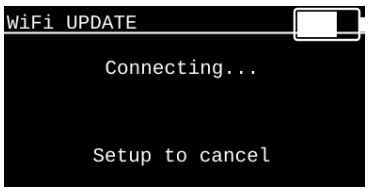
Auto Cal waiting



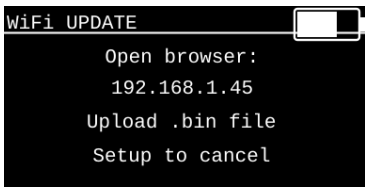
Countdown



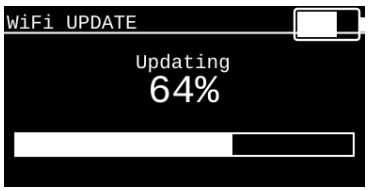
Calibration done



WiFi connecting



WiFi ready



Uploading 64%

6. Troubleshooting

Symptom	Solution
Chain skips or misses in a gear	Re-calibrate the angle for that gear (Setup → Angles). Adjust in 3° steps until the chain runs cleanly.
No speed reading while riding	Check the red indicator light on the unit side: it should flash once per wheel revolution. Re-align the magnet or reduce the gap between magnet and sensor.
Speed reading is exactly double or half actual speed	The wheel diameter is set incorrectly. Update Wheel Dia in the setup menu.
Auto mode shifts too early or too late	Adjust the speed threshold for that gear (Setup → Speeds) or run Auto-Calibration again with more gears used.
Unit does not respond to button presses	Check the battery level (icon top-right of screen). Charge via USB-C if low.

WiFi Update fails immediately	Check that the correct partition scheme is selected in Arduino IDE: Tools → Partition Scheme → Minimal SPIFFS (1.9 MB APP with OTA).
Cannot connect to WiFi for update	Verify the SSID and password in Setup → WiFi Setup. Ensure the phone and device are on the same network.
Screen too dim outdoors	Hold the OK button for 2 seconds on the riding screen to cycle to Bright mode.
Magnet contacts the chain during rotation	Move the unit to the non-drive side (left chainstay) and re-install the magnet on the corresponding spoke.
Servo moves but chain does not shift	The cable is not correctly tensioned. Re-connect the cable with the servo at zero angle (highest gear) and remove cable slack before clamping.

7. Installation Checklist

✓ Done	Step
	Unit positioned and secured with foam + zip tie
	Magnet installed — indicator light confirmed
	Cable housing cut to length
	Wheel diameter, gear count and units configured
	All gear angles calibrated
	Speed thresholds set (manual or Auto Cal)
	Grip and display unit reinstalled
	All cables secured with zip ties
	Wheel rotation and steering checked — no obstructions