DIGITAL FUEL AND SPEED CONTROLLER

version 1.3

FASTROAD

Table of Contents

IMPORTANT DISCLAIMER I am **not a professional electrical engineer**, I'm an automotive engineer who enjoys tinkering with electrical parts as a hobby.

This module is for people who want to upgrade their classic car to have a digital dash and would like to keep their stock fuel level sender and stock vehicle speed sensor, or for people whose original digital fuel level sender or speed signal converter is broken, unavailable, or too expensive to replace.

Use at your own risk. Always double-check connections, verify voltages, and test in a safe environment. If you're unsure about any electrical work, consult a qualified auto electrician.

If you plan to reprogram/customize the output range yourself (via the web application interface), **take the fuel level sender out of the tank** to make the job easier and more accurate. This lets you manually move the float arm to the exact 0%, 50%, and 100% positions. Tank levels can vary slightly due to age, sender wear, rust, so don't rely solely on published values. Making a custom range gives the best results for your specific car.

For the speed function, calibration should be done on the road against a GPS reference.

This module was developed and tested primarily with a **Toyota AE86/KE70** fuel level meter and vehicle speed sensor in a digital dash setup, but the stock sender resistance range and VSS pulse signal are quite similar across any 80’s Toyotas.

1. Introduction & Product Overview

Thank you for purchasing the Fastroad Controller!

Why this exists: Original JDM digital fuel level meters (and compatible senders for the rare AE86 digital instrument clusters) are no longer in production by Toyota. The few remaining NOS or aftermarket replacements are extremely hard to find and very expensive. This makes full digital dash upgrades prohibitively costly for many enthusiasts.

This compact, affordable converter solves that problem by letting you keep your stock fuel sender and vehicle speed sensor while making them work perfectly with modern/aftermarket digital dashboards that expect different input signals.

The stock Toyota AE86/KE70 fuel level sender (in-tank float unit) uses a resistance range of approximately:

- **Full tank** → ~3 Ω (ohms)
- **Empty tank** → ~110 Ω

Many aftermarket digital dashes expect a voltage signal of 0-5V, so this module acts as an intelligent bridge: it reads the original sender resistance and outputs a programmable/converted signal that your digital dash can understand correctly.

On variants that include the **Fuel + Speed variant**, the module also intercepts the vehicle speed sensor (VSS) signal. It lets you correct for non-stock tyre sizes, swap between km/h and mph, and fine-tune the reading against a GPS reference.

2. Features

- Fully programmable output range via web application
- Compatible with any digital cluster that uses 0-5V input
- Tiny form factor – fits easily behind the dash
- Simple plug-and-play wiring (4 wires for fuel-only, 6 wires for the fuel + speed variant)
- Upload/Export custom presets
- Optional VSS interception with tyre-size compensation (Fuel + Speed variant)
- km/h ↔ mph output toggle
- Fine-tune speed reading against GPS reference (±%)

3. What's Included

- 1 × Fastroad Controller PCB (Fuel-only or Fuel + Speed variant)
- Pre-soldered connector with wires
- Protection box
- This manual (digital/PDF version recommended)

4. Installation & Wiring

Safety first: Disconnect the battery before working on any electrical components.

This module was designed to be used behind the cluster, since the factory wires make hookup much easier that way.

If you're connecting this to a **Toyota Corolla AE86** that already has the wiring done, do the following:

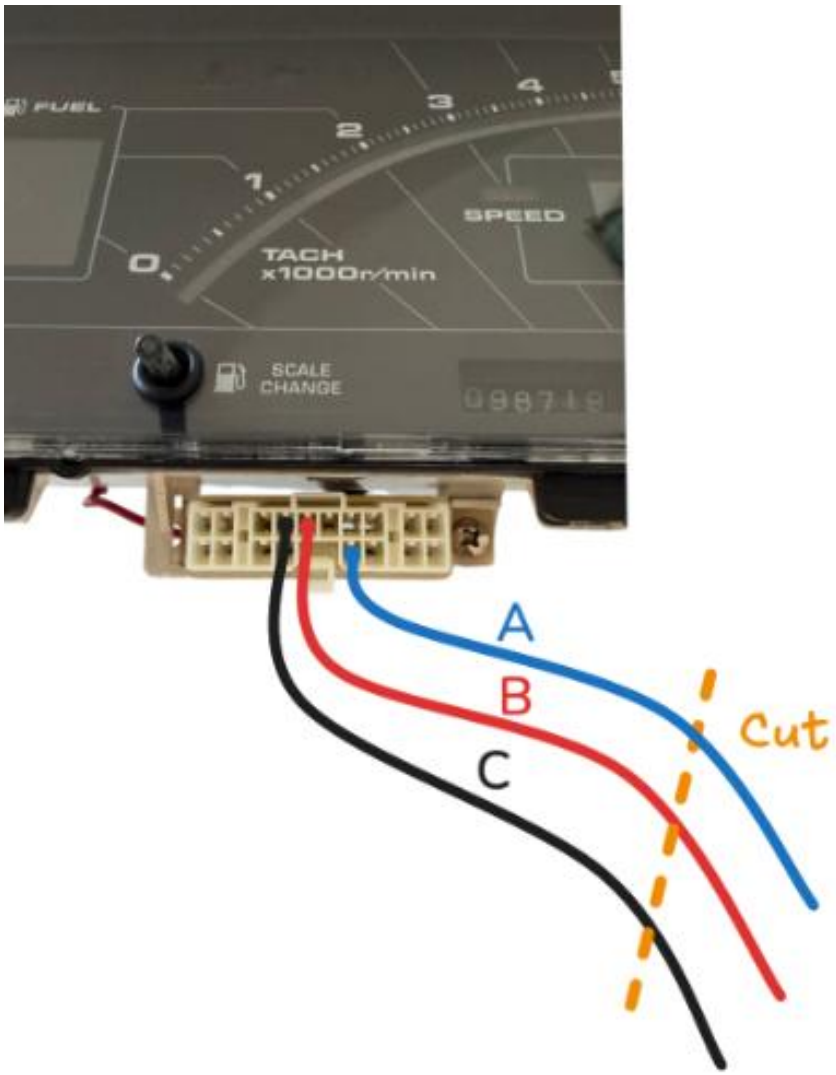


Figure 1 – AE86 cluster wires identified (A, B, C) and cut location

- **A** → Fuel level input
- **B** → 5V power to controller
- **C**→ Fuel level ground

After cutting the wires, please connect them as shown in the picture below:

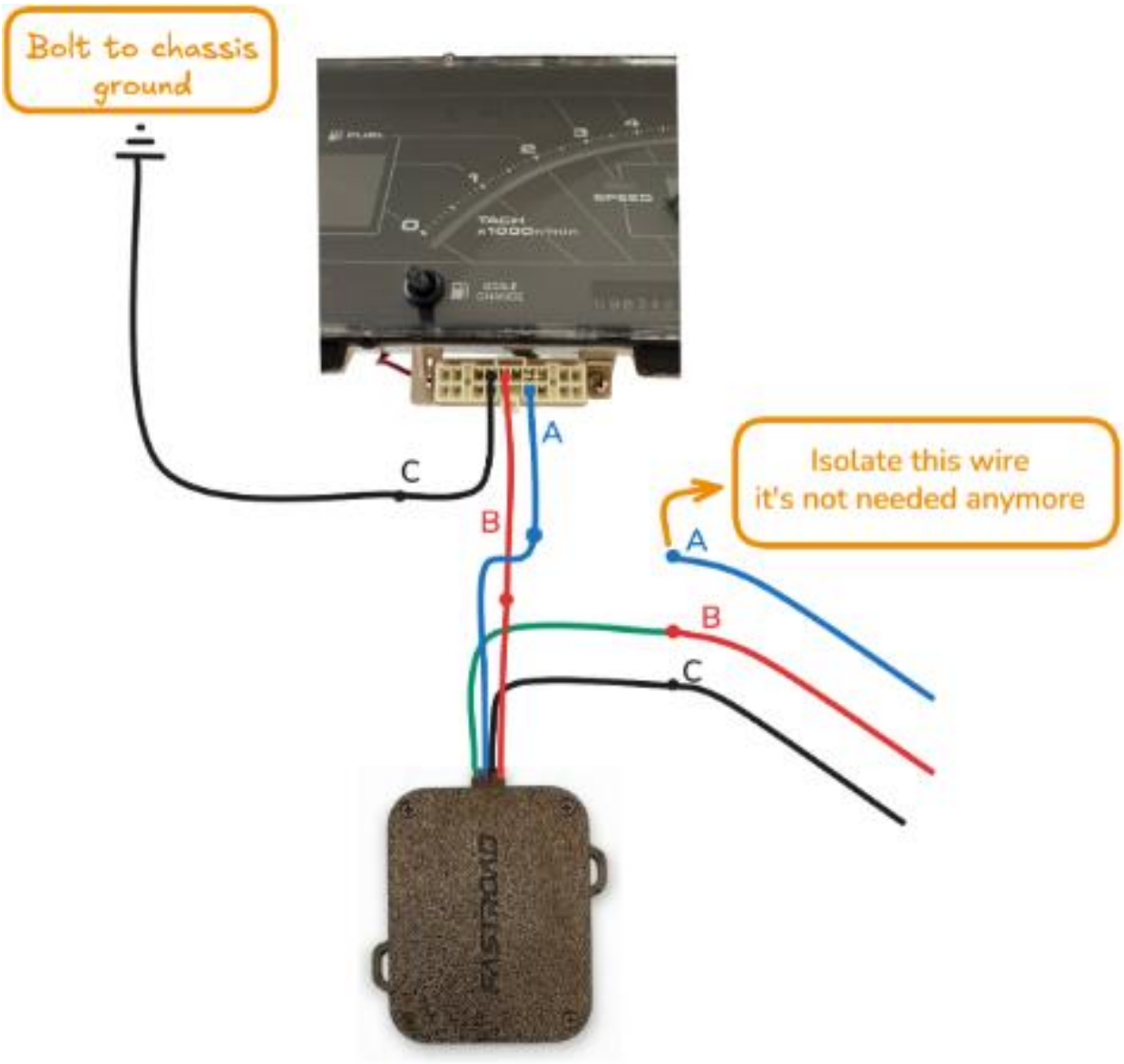


Figure 2 – AE86 wiring connected to the Fastroad Controller

- **A (Cluster side)** → Connect to blue wire in the controller
- **A (Wire harness side)** → Isolate the wire, it's not needed anymore
- **B (Cluster side)** → Connect to red wire in the controller
- **B (Wire Harness side)** → Connect to green wire in the controller
- **C (Cluster side)** → Connect to chassis ground (any bolt with direct connection to chassis should work)
- **C (Wire Harness side)** → Connect to black wire in the controller

If you’re adapting this cluster to **any other car** connect the controller as shown below:

- **5V** → to a switched 5V source (from digital cluster, check image below)
- **GND from controller** → to fuel level meter ground (if unsure check fuel level pins for continuity with car ground)
- **GND from plug**→ to any place, near the cluster (chassis ground)
- **FUEL IN** → to the wire coming from the stock sender (signal wire – if unsure measure continuity or check the car’s manual)
- **FUEL OUT** → to the fuel input pin on your digital dash

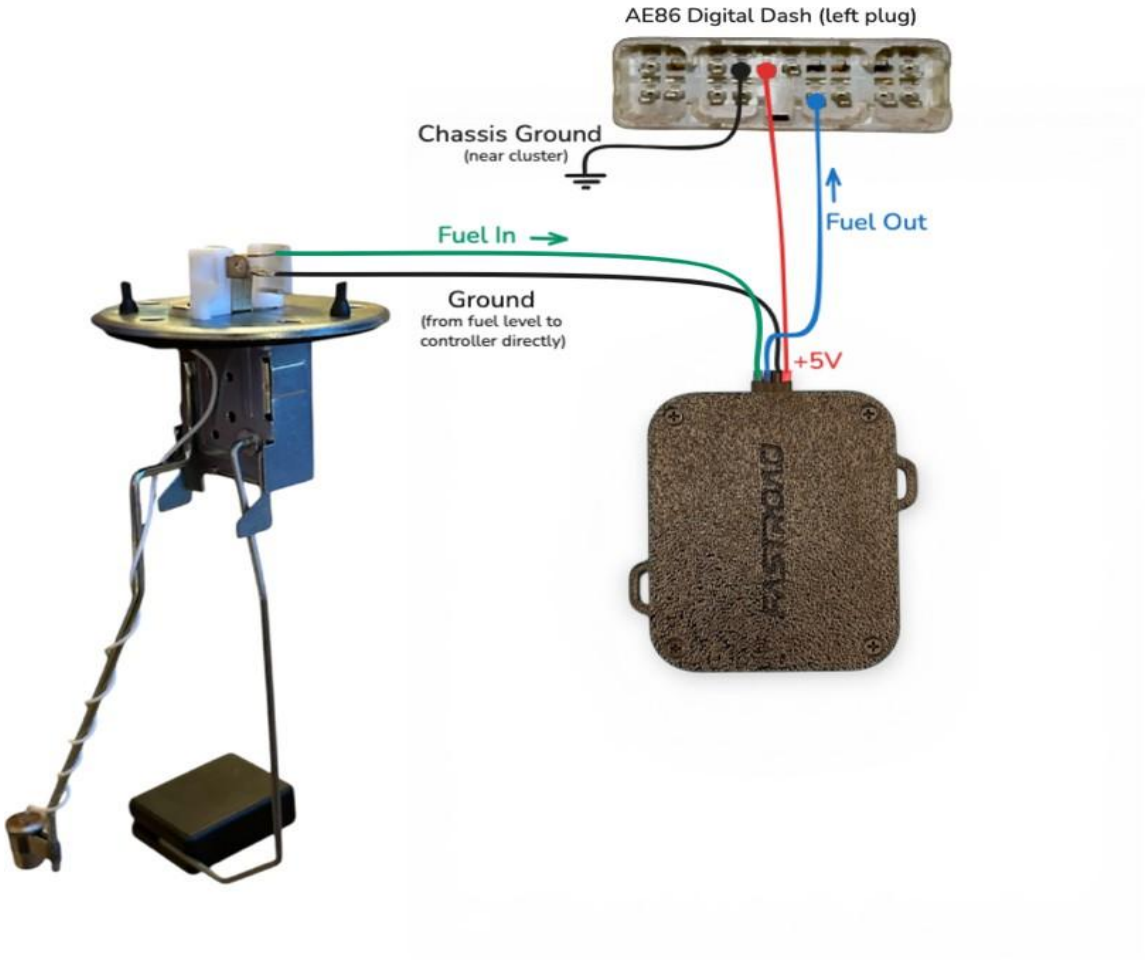


Figure 3 – Wiring diagram for generic installations (non-AE86)

(Optional for custom values)

1. Locate the stock fuel sender connector (usually near the fuel tank or under the rear seat on AE86/KE70).
2. Disconnect the original 3-pin sender plug.
3. Remove the fuel level sender from the tank to freely adjust the float between 0%, 50%, and 100% positions and use the app to calibrate the values.

5. Speed Wiring (Fuel + Speed variant only)

If you have the **Fuel + Speed** variant of the module, two extra wires are used: **SPEED IN** and **SPEED OUT.**

To be sure about the color of the wires, open the controller to check. In most cases **Speed Output** is a **Grey** wire, and the **Speed Input** is a **Brown** wire.

Figure 4 – Fastroad Controller board with wire labels

At the back of the cluster, locate the **speed signal wires**, these contain a yellow wire which is the VSS signal running from the speed sensor to the cluster.

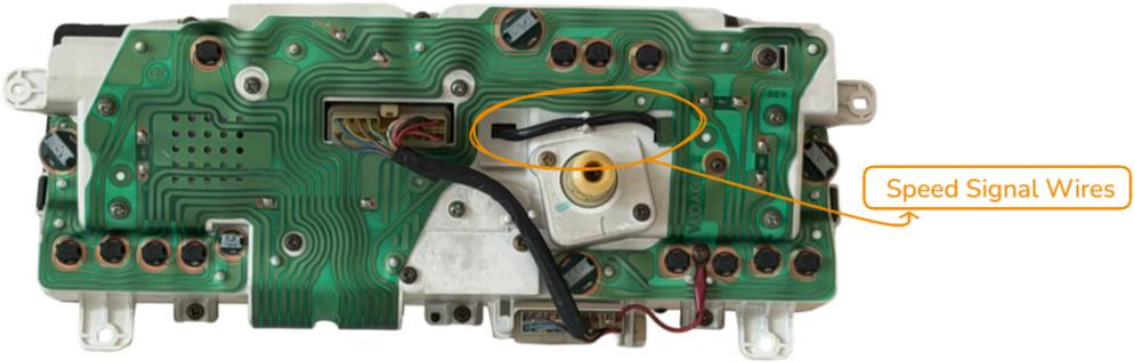


Figure 5 – Speed signal wires at the back of the cluster

Carefully disconnect the plug (on the left part of the wires), and cut half of the plastic protection. Underneath this plastic protection, you will find 3 wires: a blue, a yellow, and a red one. The yellow one is the speed signal which you have to cut.

NOTE: These wires are quite thin, so be careful while cutting the black protection plastic.

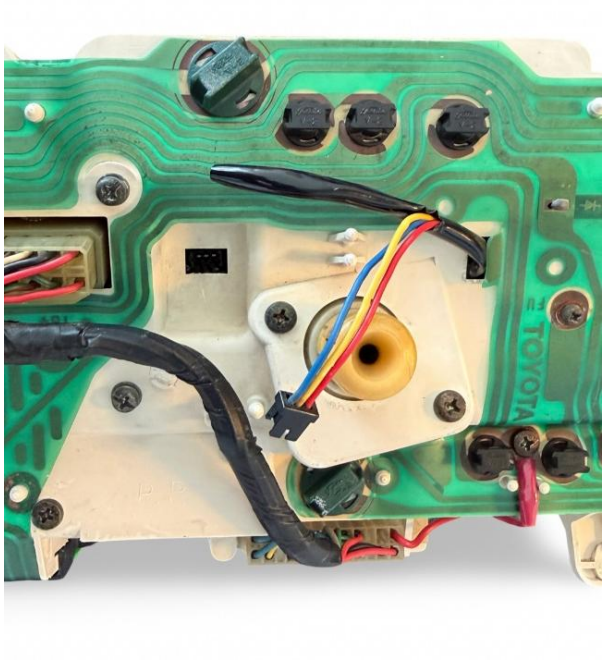


Figure 6 – Inner wires after removing the black plastic protection (blue, yellow, red)

Connect each side to the module as follows:

- **SPEED IN** → to the cut end of the yellow wire coming **from the speed sensor** (raw VSS signal in)
- **SPEED OUT** → to the cut end of the yellow wire going **into the cluster** (converted signal out)

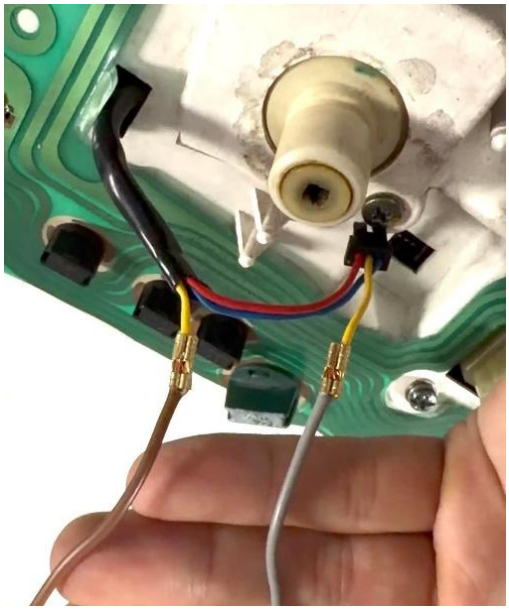


Figure 7 – Speed wires connected to the cluster (Grey = SPEED OUT, Brown = SPEED IN)

Tip: use crimp connectors and connect the wires into a 2 wire terminal, this makes the wire loom removable in the future.

6. First Power-Up and App Access (After Wiring)

Once you have connected all wires correctly and powered everything on, the module will start up and create its own WiFi access point for configuration (a blue led in the module will indicate the wifi is on)

Accessing the Web Application for calibration:

1. On your smartphone (or any WiFi-capable device), look for a new WiFi network named: **Fuel-Gauge-Controller** or **Fuel-Speed-Controller (depending on the variant you use)**
2. Connect to it using the password: **gOr2tyMH1nHM**

(Tip: Scan the QR code below with your phone's camera to connect)

*Figure 8 - **Fuel Only** Variant*

*Figure 9 - **Fuel & Speed** Variant*

Note: Your phone will lose internet access while connected to this access point — that's normal. It doesn't need the internet to configure the module.

3. Once connected to the **WiFi** network, open a web browser on your phone or computer and go to this address: **http://192.168.4.1/**

4. (Again, you can scan the QR code below to open the page instantly.)

Note: You may need to toggle Wi-Fi off and back on (or disable mobile data) on your current device. Some phones automatically disconnect after a while since this network has no internet access.

Figure 10 – QR code to open the controller's web app

You should now see the module's configuration web app load. It looks like a simple dashboard with tabs for Dashboard, Speed (Fuel + Speed variant only), Calibration, WiFi, and Settings.

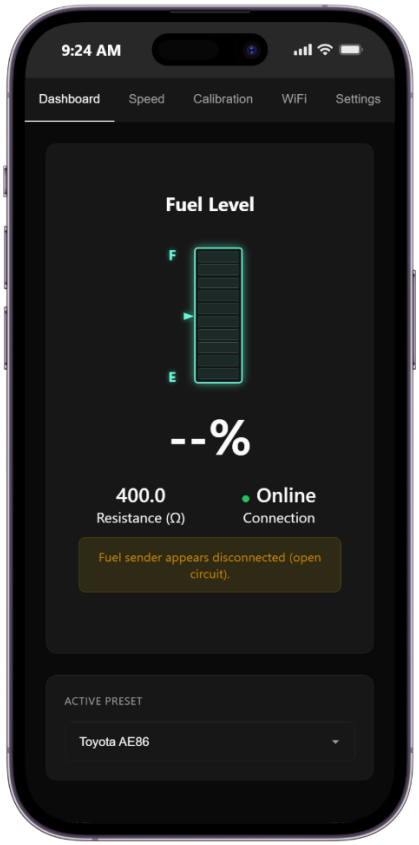


Figure 11 – Dashboard tab on first power-up

5. **Default preset** By default, the module comes pre-programmed with the **AE86/KE70 preset**, this means it is already set up to read the stock Toyota sender (~3 Ω full → ~110 Ω empty) and output a signal compatible with most digital dashes expecting that range. If you're using it in a classic AE86/KE70 digital dash setup, you can often skip custom programming and go straight to testing.

7. Fuel Calibration: Custom Preset

Before you start, make sure to do all initial configuration and calibration **with the car stationary** and in a well-ventilated area. Also, make sure the lights, or any load, is turned off during the calibration since it can affect the readings.

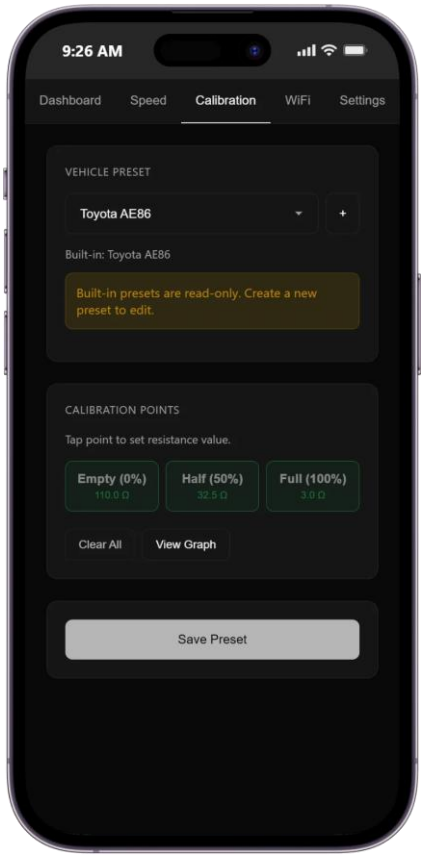


Figure 12 – Built-in AE86 preset (read-only)

1. In the app go to **Calibration** tab
2. Tap the **+** icon to create a new preset, give it a name and start calibration

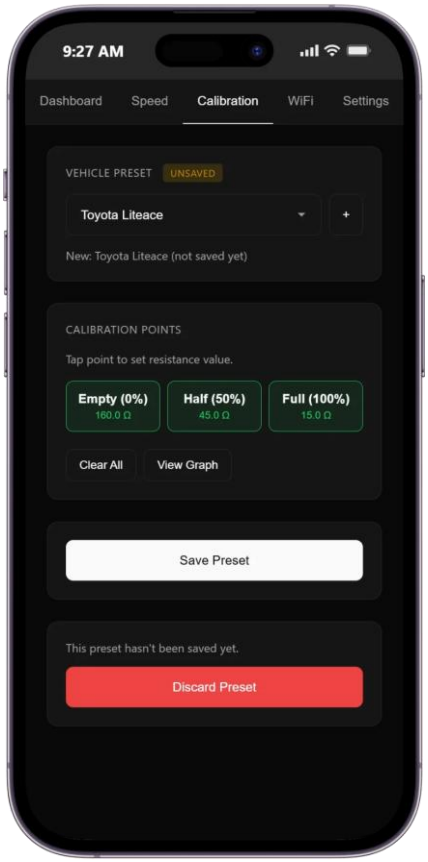


Figure 13 – Editing a custom preset: tap each calibration point to enter its resistance

3. **0% (Empty)**
    - Move float arm to empty position
    - Set the shown resistance for 0% in the app and save point
4. **50% (Half)**
    - Move float arm to halfway
    - Set the shown resistance for 50% and save point
5. **100% (Full)**
    - Move float arm to full position
    - Set the shown resistance for 100% and save point
6. **Save** the preset → go back to main screen
7. **Test**
    - Move the float arm and check if % changes in the app
    - Turn cluster off and on (in the case of AE86 digital cluster), the gauge should now show correct level (E → ½ → F)
    - Do a final test with the fuel level meter in the fuel tank, it should show the correct level of fuel.

IMPORTANT NOTE: In the AE86 digital cluster can take up to 5 minutes to update the fuel level after a change.

Quick fix: Turn the cluster **off and on** (ignition or power cycle) to instantly show the updated value. (If the app disconnects during the power cycle, it will reconnect automatically in a few seconds.)

8. Speed Calibration (Fuel + Speed variant only)

The module comes with a **Stock** preset already configured for the factory AE86 setup. If your car is stock, you may only need to verify the reading against GPS. If your tyre size or final drive has changed, follow the steps below to fine-tune the output.

Safety first: speed calibration is done while the car is moving, so do it on a quiet, straight, flat road with no traffic. Have a passenger handle the phone and GPS reading, **never operate the app while driving**. A GPS-based speedometer app on a smartphone with good signal is enough for reference.

1. In the app, open the **Speed** tab.
2. Under **SPEED PRESET**, select the preset you want to use. Tap the **+** icon next to the dropdown to create a custom preset — just give it a name (for example, “14-inch wheels” or “5-speed swap”) and save.
3. Under **CONFIGURATION**, set **Output unit** to **km/h** or **mph** depending on your cluster scale. If you choose **mph** and want to turn on the light in the cluster, please check this video: https://www.youtube.com/watch?v=38lmQRdpN6g
4. With a passenger watching GPS, drive at a steady speed on a flat, straight road (about 50 km/h or 30 mph is a good starting point). Compare the cluster reading against the GPS reading.
5. Use the **− / +** buttons next to **Speed calibration** to apply a percentage offset until the cluster matches GPS.
6. Verify at higher speeds (for example 80 and 100 km/h) to make sure the correction holds across the range.

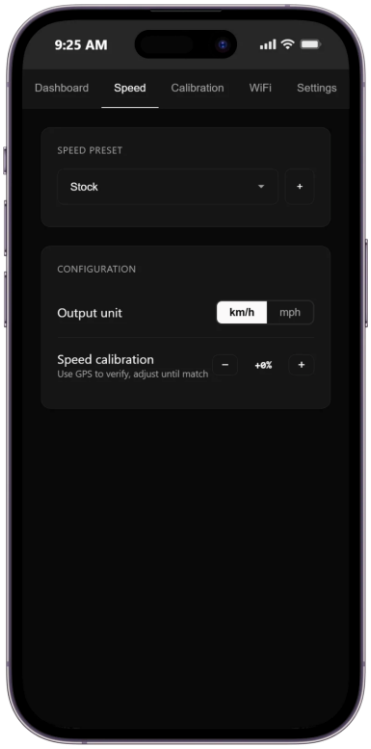


Figure 14 – Speed tab in the app

9. Disable WiFi (Optional)

Turning off WiFi prevents unauthorized access to the controller and protects your presets. **This is intended as a permanent change for when you no longer need remote access.**

To disable WiFi go to the WiFi tab in the application and click the red button “Disable WiFi”.

IMPORTANT NOTE: This action is Irreversible via software: Once disabled, the web interface is no longer accessible wirelessly. WiFi can only be re-enabled by holding the BOOT button on the board for 6 seconds.

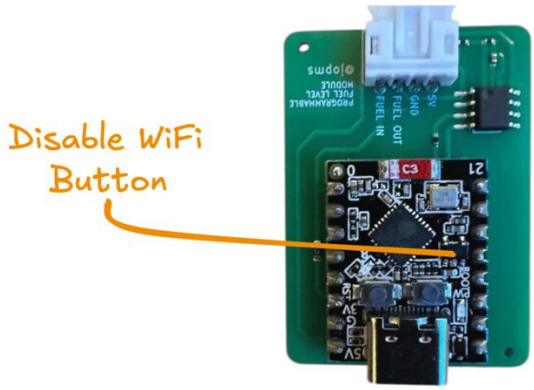


Figure 15 - Controller with BOOT (WiFi reset) button highlighted

10. Troubleshooting & Support

- Wifi not showing → Check blue led in the board, if not present check section 9 to enable WiFi again
- Dashboard says “Connecting” → Check if device is connected to the correct network
- Fuel reads backwards → Swap calibration points or reprogram output range
- No reading → Check power (5V present?), ground, and connections
- Erratic reading → Ensure good ground is being supplied; check that the sender float arm moves freely and is in good condition.
- Dash shows full/empty only → Recalibrate or verify output range matches dash expectation.
- Speedometer reads zero → Check the yellow wire splices on SPEED IN and SPEED OUT.
- Speedometer reads too high or too low → Apply a percentage offset in the Speed tab against a GPS reference until the reading matches.
- Speedometer jumps or flickers → Check the splice quality on the yellow wire (loose joints cause noise); verify chassis ground.
- Speed reading is half / double of GPS → You likely have the wrong preset selected, or the unit toggle is set to the opposite (km/h vs mph). Change it in the Speed tab.

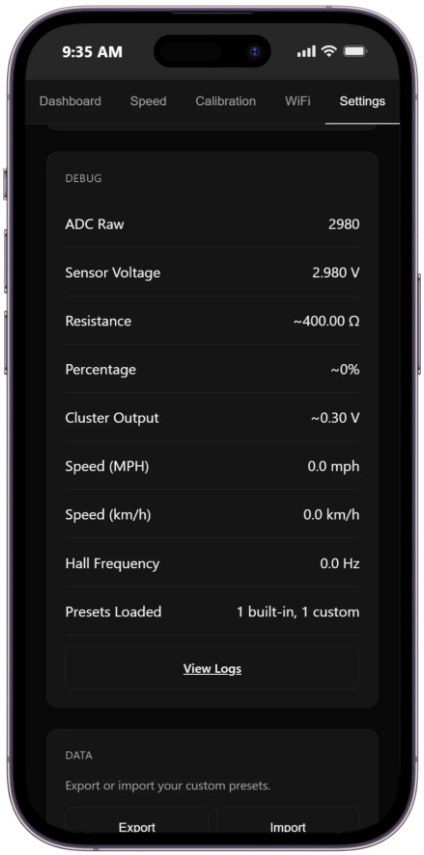


Figure 16 – Debug values in the Settings tab – useful when reporting an issue

For any other problems please reach out at info@fastroad-shop.com.

11. Firmware Updates

Updates are done through the app. **Automatic way:**

1. Go to **WiFi** section in the app.
2. Connect the module to your home WiFi.

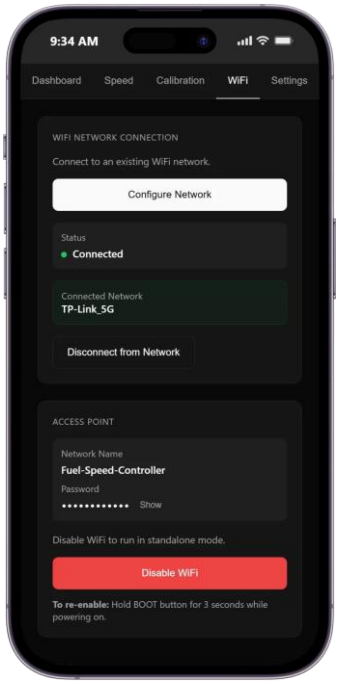


Figure 17 – WiFi tab – connect to your network to enable automatic firmware updates

3. Go to **Settings**.
4. Check for updates and install if available.

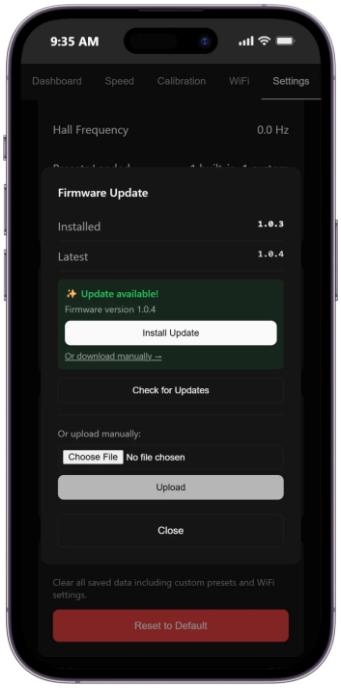


Figure 18 – Firmware Update dialog showing an available update

Manual way:

- Download the file. For the **Fuel-only** variant: https://raw.githubusercontent.com/jopms/fuel-gauge-releases/main/firmware.bin
- For the **Fuel + Speed** variant, use a different firmware binary: https://raw.githubusercontent.com/jopms/fuel-speed-releases/main/firmware.bin
- In the app → Settings → Upload the file → install.

After update, the module restarts and you might lose WiFi connection. Check calibration if needed.

Enjoy, and Safe driving!

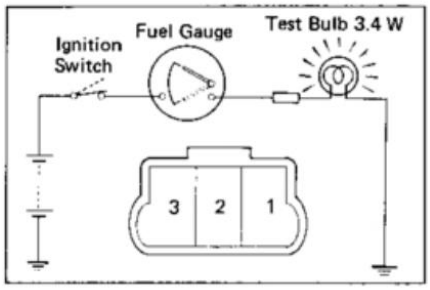
12. Appendix

Fuel Gauge

INSPECTION OF FUEL GAUGE

1. INSPECT RECEIVER GAUGE OPERATION

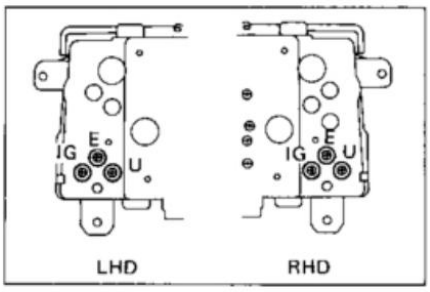
(a) Disconnect the connector from the fuel sender gauge. Turn the ignition switch on and check that the receiver gauge needle moves to empty position.



(b) Connect the 3.4W test bulb between terminal 1 and body ground. Check that the bulb light and the receiver gauge needle operates.

NOTE: Because of the silicon oil in the gauge, it will take about 90 seconds for the needle to stabilize.

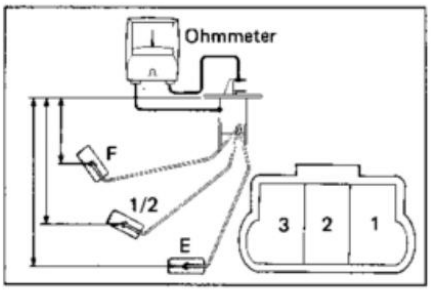
If indications are not correct, remove and test the receiver gauge.



2. MEASURE RECEIVER GAUGE RESISTANCE BETWEEN TERMINALS

Between terminals	Resistance (Ω)
IG – U	Approx. 102
U – E	Approx. 101
IG – E	Approx. 203

If each resistance value is not as shown in the table above, replace the receiver gauge.



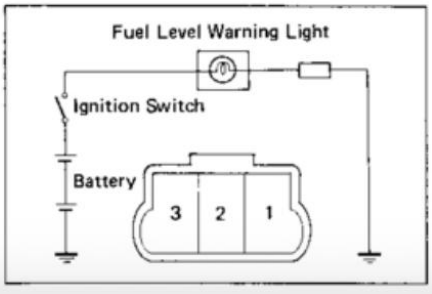
3. MEASURE RESISTANCE OF SENDER GAUGE

(a) Check that resistance changes as the float is moved from the top to bottom position.

(b) Measure the resistance between terminal 1 and the sender gauge body for each float position.

	Float position mm (in.)	Resistance (Ω)
F	64.7 – 70.7 (2.547 – 2.783)	3 ± 2.1
½	153 (6.024)	32.5 ± 4.8
E	205.5 – 211.5 (8.091 – 8.327)	110 ± 7.7

If each resistance value is not as shown in the table above, replace the sender gauge.



Fuel Level Warning

INSPECTION OF FUEL LEVEL WARNING

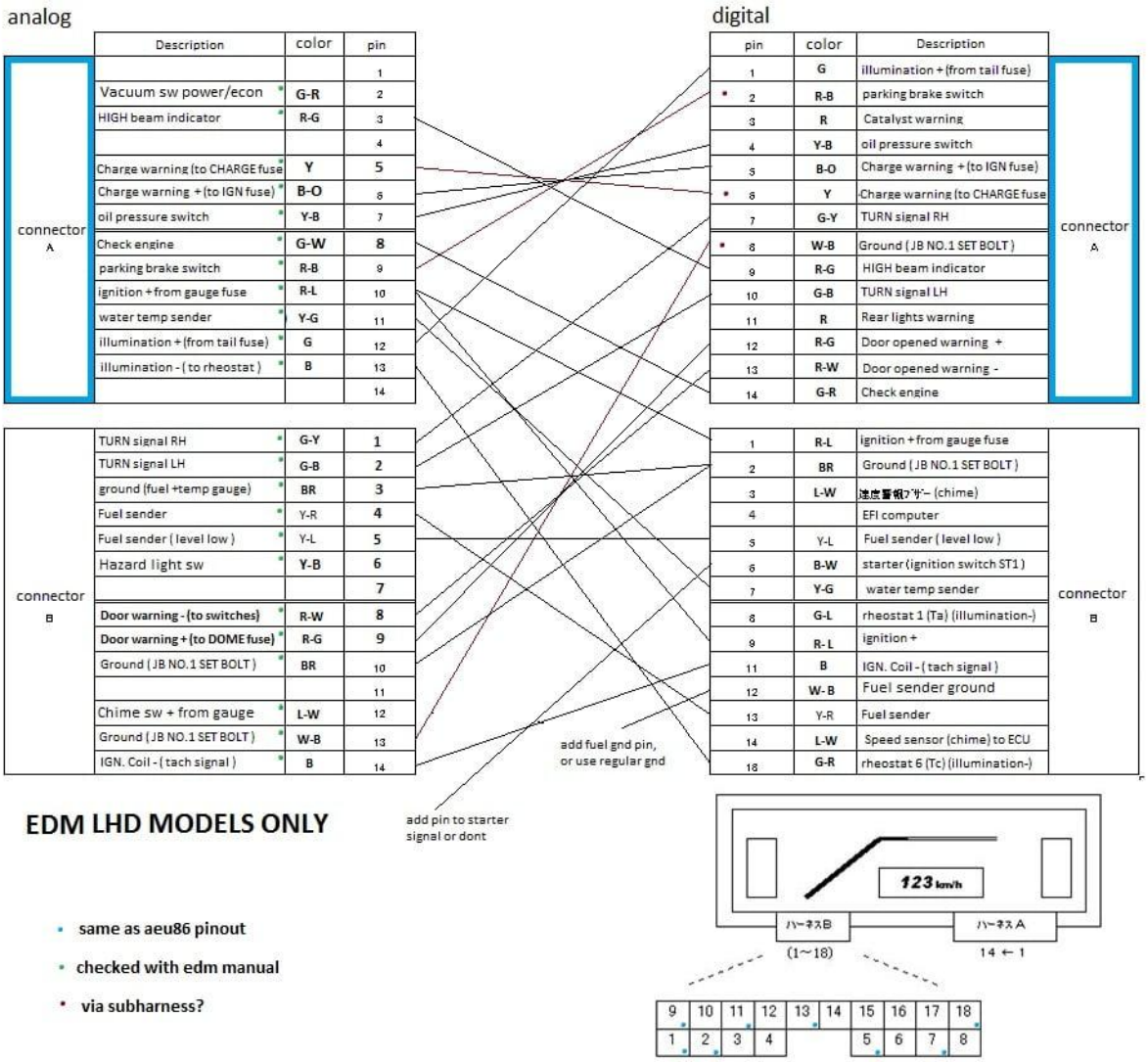
1. INSPECT WARNING LIGHT OPERATION

(a) Disconnect the connector from the switch. Connect the switch terminal 1 and body ground.

(b) Turn the ignition switch on. Check that the bulb lights.

If operation is not correct, remove and test the bulb.

Figure 19 - Picture from Toyota AE86 Manual



analog connector A	Description	color	pin
			1
	Vacuum sw power/econ *	G-R	2
	HIGH beam indicator *	R-G	3
			4
	Charge warning (to CHARGE fuse *	Y	5
	Charge warning + (to IGN fuse) *	B-O	6
	oil pressure switch *	Y-B	7
	Check engine *	G-W	8
	parking brake switch *	R-B	9
	ignition + from gauge fuse *	R-L	10
	water temp sender *	Y-G	11
	illumination + (from tail fuse) *	G	12
	illumination - (to rheostat) *	B	13
			14

digital connector A	pin	color	Description
	1	G	illumination + (from tail fuse)
	* 2	R-B	parking brake switch
	3	R	Catalyst warning
	4	Y-B	oil pressure switch
	5	B-O	Charge warning + (to IGN fuse)
	* 6	Y	Charge warning (to CHARGE fuse
	7	G-Y	TURN signal RH
	* 8	W-B	Ground (JB NO.1 SET BOLT)
	9	R-G	HIGH beam indicator
	10	G-B	TURN signal LH
	11	R	Rear lights warning
	12	R-G	Door opened warning +
	13	R-W	Door opened warning -
	14	G-R	Check engine

connector B			
	TURN signal RH *	G-Y	1
	TURN signal LH *	G-B	2
	ground (fuel +temp gauge) *	BR	3
	Fuel sender *	Y-R	4
	Fuel sender (level low) *	Y-L	5
	Hazard light sw *	Y-B	6
			7
	Door warning - (to switches) *	R-W	8
	Door warning + (to DOME fuse) *	R-G	9
	Ground (JB NO.1 SET BOLT) *	BR	10
			11
	Chime sw + from gauge *	L-W	12
	Ground (JB NO.1 SET BOLT) *	W-B	13
	IGN. Coil - (tach signal) *	B	14

connector B			
	1	R-L	ignition + from gauge fuse
	2	BR	Ground (JB NO.1 SET BOLT)
	3	L-W	速度警報ブザー (chime)
	4		EFI computer
	5	Y-L	Fuel sender (level low)
	6	B-W	starter (ignition switch ST1)
	7	Y-G	water temp sender
	8	G-L	rheostat 1 (Ta) (illumination-)
	9	R-L	ignition +
	11	B	IGN. Coil - (tach signal)
	12	W-B	Fuel sender ground
	13	Y-R	Fuel sender
	14	L-W	Speed sensor (chime) to ECU
	18	G-R	rheostat 6 (Tc) (illumination-)

9	10	11	12	13	14	15	16	17	18
1	2	3	4			5	6	7	8

Figure 20 - Schematic to convert analog to digital cluster for Toyota AE86

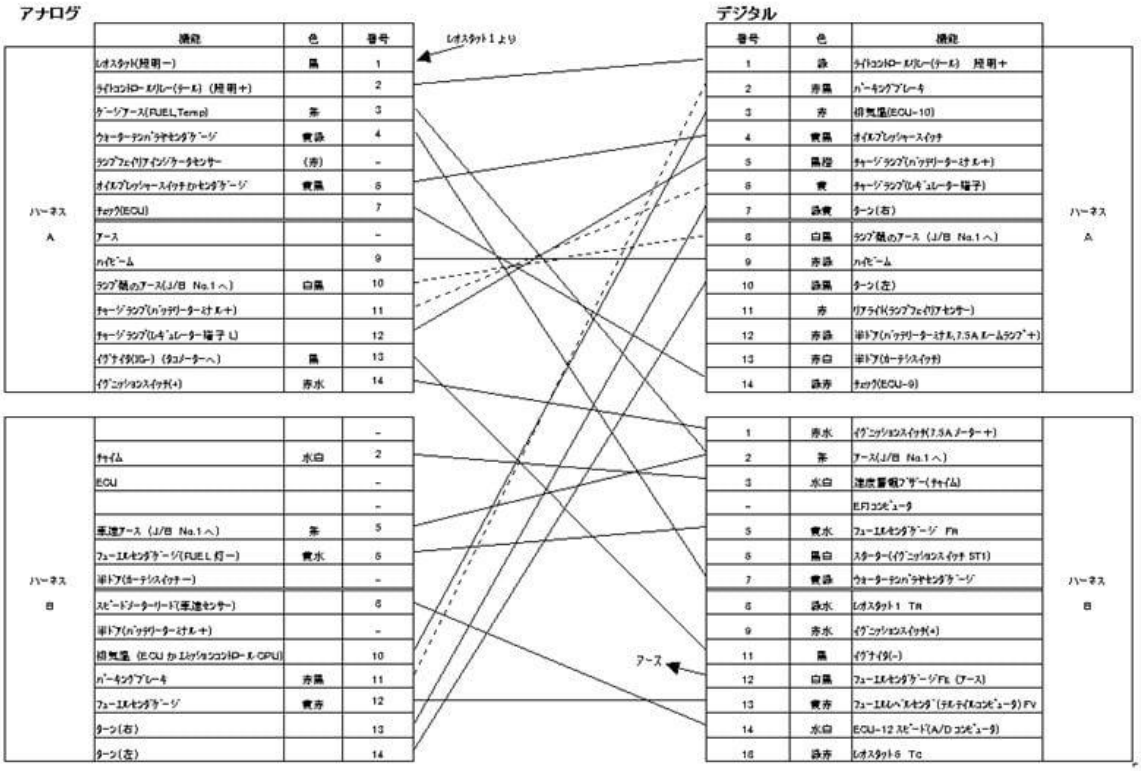


Figure 21 - Schematic to convert analog to digital cluster for Toyota AE86 (Japanese version)