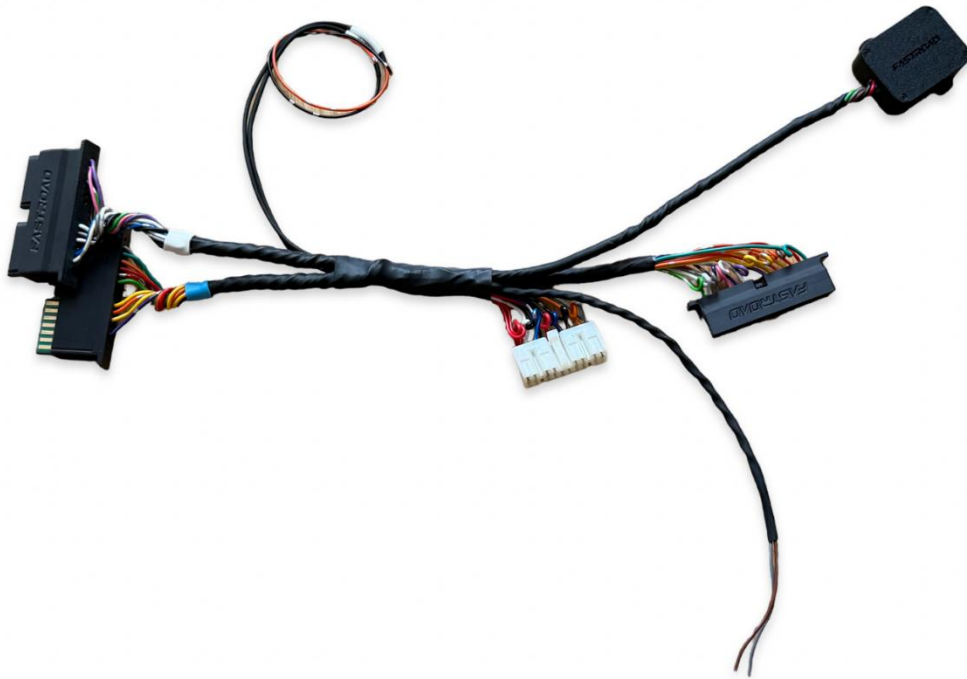


ANALOG TO DIGITAL HARNESS



version 1.0

FASTROAD

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

This harness is for people who want to install or replace their digital dash cleanly, without cutting or modifying the original wiring.

Use at your own risk. Always double-check connections and verify voltages before powering up. If you're unsure about any electrical work, **consult a qualified auto electrician**.

I am also available for any questions via email – see **Section 11**.

1. Introduction & Product Overview

Thank you for purchasing the **Fastroad Harness**!

The Fastroad Harness is a fully plug-and-play wiring adapter that lets you upgrade your car to use a digital cluster **without cutting or modifying any of your stock wiring**. It includes a built-in Fastroad Controller pre-wired into the harness and ready to go.

Why this exists: Original JDM digital fuel level meters 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 harness brings a clean, reversible digital-dash upgrade within reach of any enthusiast.

The stock Toyota AE86/KE70 fuel level sender uses a resistance range of approximately $\sim 3\ \Omega$ when full and $\sim 110\ \Omega$ when empty. Most aftermarket digital dashes expect a 0–5V input. The embedded Fastroad Controller handles this conversion automatically.

On the **Fuel + Speed variant**, the harness also intercepts the vehicle speed sensor (VSS) signal so you can correct for non-stock tyre sizes, swap between km/h and mph, and fine-tune the reading against GPS.

This guide shows the AE86-specific harness. The Fastroad Harness is also produced for other classic Toyota models, the principle is the same across variants, but the OEM connector shapes differ to match each car's stock wiring.

2. Features

- Fully plug-and-play installation (if you don't opt to connect the optional wires)
- Embedded Fastroad Controller, pre-wired and tested before shipping
- Custom-designed connectors (AE86 and other classic Toyota fitments available)
- Start wire (included with every harness) that automatically turns off the cluster lights during cranking
- Optional Exhaust wire - repurpose the exhaust light for any custom indicator
- Upload / export custom presets
- (Fuel + Speed variant) Optional VSS interception with tyre-size compensation and km/h $\leftrightarrow$ mph output toggle
- Fine-tune speed reading against GPS reference ($\pm\%$)

3. What's Included

- 1 $\times$ Fastroad Harness with embedded Fastroad Controller (Fuel-only or Fuel + Speed variant)
- Start wire (black, labeled "Start") — included with every harness
- Exhaust wire (orange, labeled "Exhaust") — **only if selected at purchase**
- (Fuel + Speed variant) Grey **SPEED OUT** and brown **SPEED IN** wires for splicing to the VSS signal
- This manual

4. Speed Wiring (Fuel + Speed variant only)

NOTE: You can skip this step if you don't have the speed variant.

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 1 – 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.

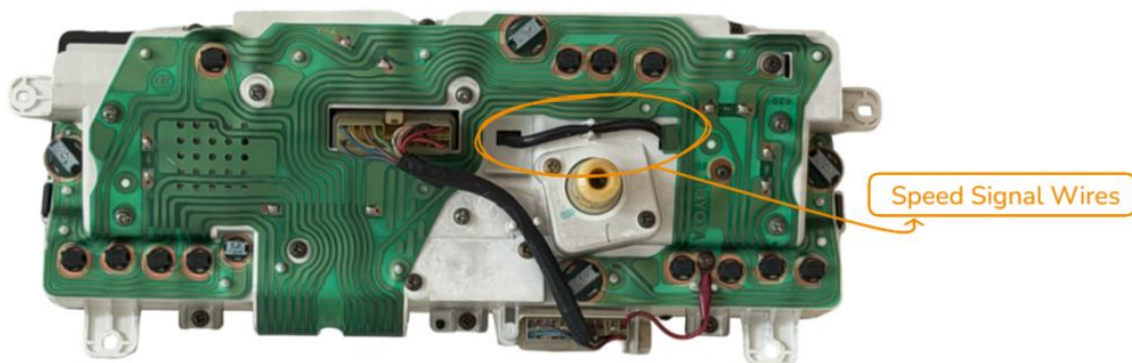


Figure 2 – Speed signal wires at the back of the cluster

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.

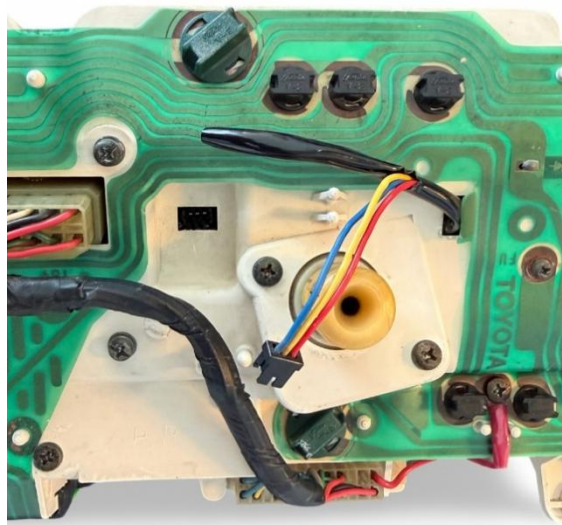


Figure 3 – Inner wires after removing the black plastic protection (blue, yellow, red)

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)

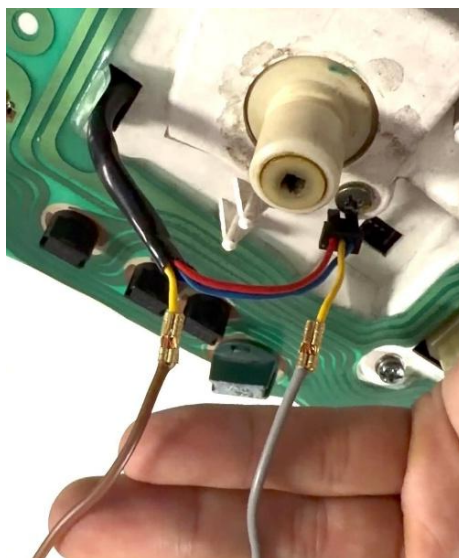


Figure 4 – Speed wires connected to the cluster (Grey = SPEED OUT, Brown = SPEED IN)

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

5. Installation & Wiring

This guide will just cover the installation of the harness itself, for the full guide on how to install a digital cluster there's some tutorials online and even youtube videos.

Installation steps:

1. **Disconnect the battery** to avoid any short circuits while wiring.
2. **Remove your stock analog cluster** following your vehicle's service procedure, and unplug the two original plugs that are connected to the back of the cluster.
3. **Install the digital cluster in place.**
4. **Connect the car side of the harness:** locate the two FASTROAD labeled connectors that are paired together. Plug them into the two original car-side plugs that previously connected to the analog cluster.



Figure 5 – FASTROAD plugs connected to the car's harness

5. **Connect the cluster side of the harness:** plug the remaining FASTROAD-labeled connector and the white OEM-style plug into your new digital cluster. The black plug is a tight fit, so make sure you press down on the middle clip to make it easier to connect.
6. **(Optional)** Connect the Start wire, and the Exhaust wire if your harness includes it. See **Section 6 – Optional Wires**.
7. **(Fuel + Speed variant only)** - See **Section 4**.
8. Reconnect the battery and proceed to **Section 7**.

Note: This guide shows the AE86-specific harness. Harnesses for other Toyota models follow the same plug-and-play principle.

6. Optional Wires: Start & Exhaust

NOTE: The colors from the wires might differ, please follow the labels from your wires.

In addition to the main connectors, the harness includes one or two optional wires depending on the variant you ordered:

- **Start wire** (usually black, labeled “Start”) — **included with every harness**
- **Exhaust wire** (usually orange, labeled “Exhaust”) — included **only if you selected the exhaust option at purchase**



Figure 6 – Optional Start (black) and Exhaust (orange) wires

Start Wire (Optional)

The Start wire shuts off the cluster lights while the engine is cranking. This mimics the OEM behavior of the analog cluster and reduces battery load during start.

The Start wire expects a **12V signal that is only active during cranking**.

- On the **Toyota AE86**, this is the **Black/White (B/W)** wire at the ignition switch — the “ST1” / starter signal. It is 12V only when the key is turned to the START position, and 0V at all other times.
- On other cars, find your ignition switch’s starter signal (sometimes called **ST**, **ST1**, or **Crank**). Any 12V source that is only live during cranking will work.
- To verify you’ve found the right wire, use a multimeter: the wire should read 0V at rest, 0V with the key in the ON position, and ~12V only when turning the key to START.

Tip: if you do not want to use this feature, simply isolate the end of the Start wire and tuck it away, it does not affect any other function.

Exhaust Wire (Optional)

If your harness includes the Exhaust wire, you can use it to trigger the **exhaust warning light** on the digital cluster. This is useful for repurposing the light for any function you’d like, such as a custom warning indicator, a status light for an aftermarket system, or a pure aesthetic light.

The exhaust light turns **ON when the wire is connected to ground**, and OFF when left disconnected.

- Connect the Exhaust wire to the ground side of whatever you want to trigger it with (e.g., the output of a switch or sensor that grounds when active).
- If you don't want to use the Exhaust wire, isolate the end and tuck it away.

7. 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 7 - Fuel Only Variant



Figure 8 - 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 9 – 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.

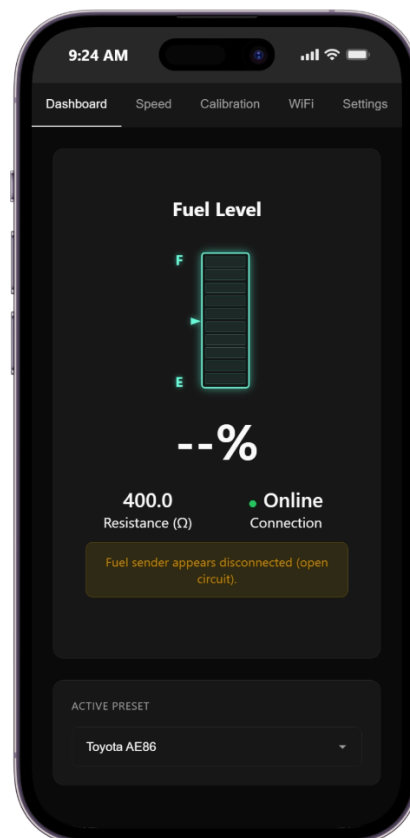


Figure 10 – Dashboard tab on first power-up

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 ($\sim 3\ \Omega$ full $\rightarrow \sim 110\ \Omega$ 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.

8. 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.

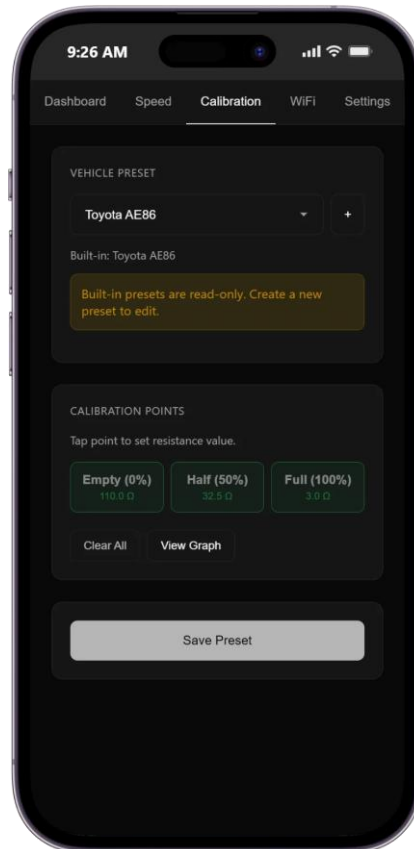


Figure 11 – Built-in AE86 preset (read-only)

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

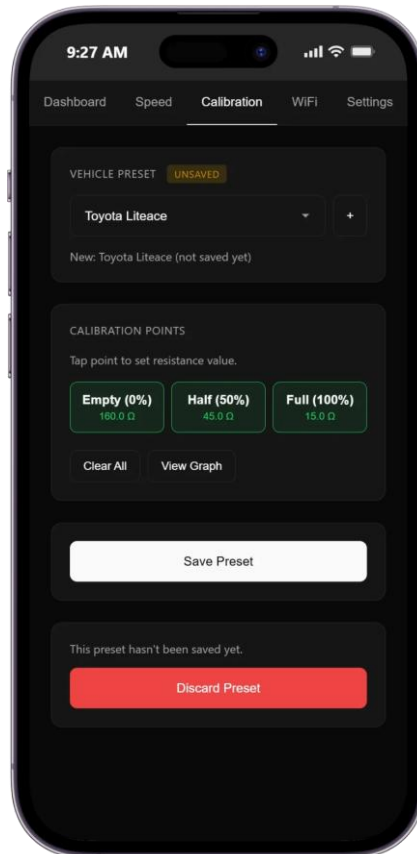


Figure 12 – Editing a custom preset: tap each calibration point to enter its resistance

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.)

9. 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.

9. In the app, open the **Speed** tab.
10. 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.
11. 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>
12. 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.
13. Use the **- / +** buttons next to **Speed calibration** to apply a percentage offset until the cluster matches GPS.
14. Verify at higher speeds (for example 80 and 100 km/h) to make sure the correction holds across the range.

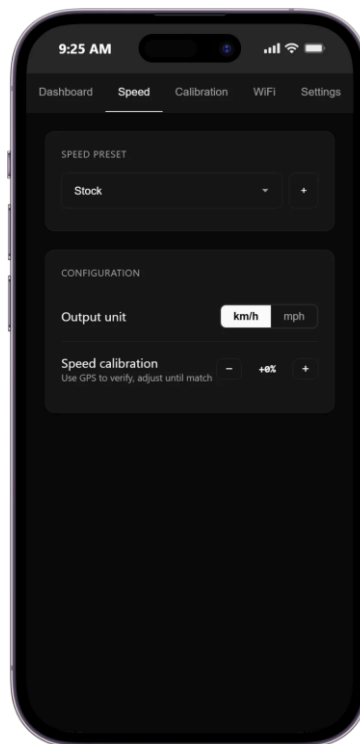


Figure 13 – Speed tab in the app

10. 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.

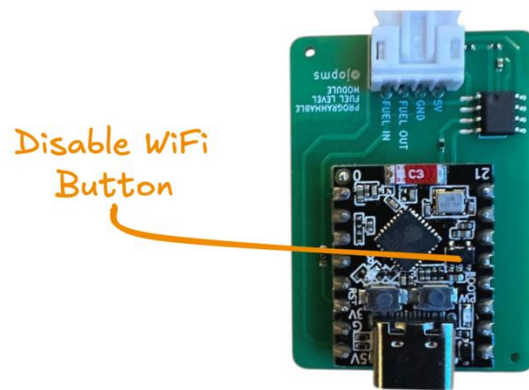


Figure 14 - Controller with BOOT (WiFi reset) button highlighted

11. Troubleshooting & Support

- Wifi not showing → Check blue led in the board, if not present check section 10 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.
- Cluster lights stay on while cranking → The Start wire is not connected, or it is connected to the wrong wire. Verify it sees ~12V only during cranking (multimeter on the wire end against ground).
- Exhaust light always on / never on → Check the Exhaust wire. The light turns on when the wire is grounded; if always on, the wire is shorted to ground somewhere. If never on, the ground connection is not being made.

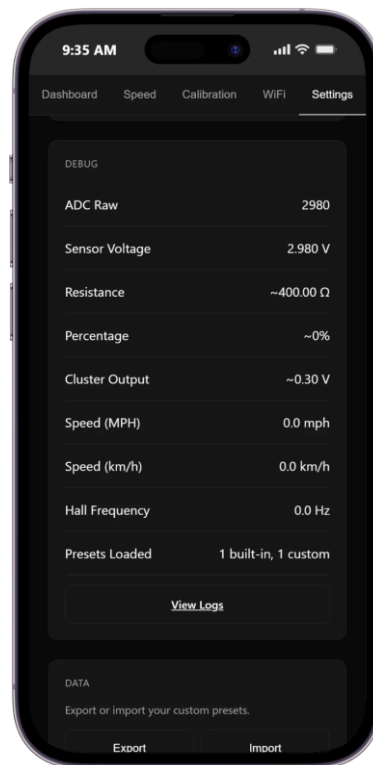


Figure 15 – Debug values in the Settings tab – useful when reporting an issue

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

12. 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.

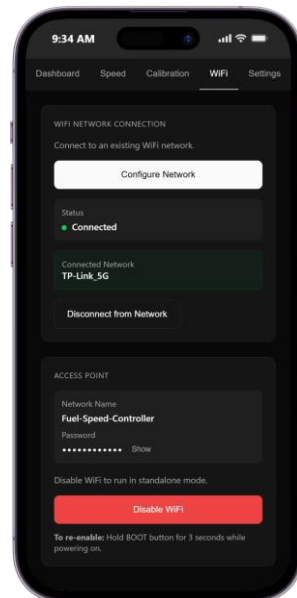


Figure 16 – WiFi tab – connect to your network to enable automatic firmware updates

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

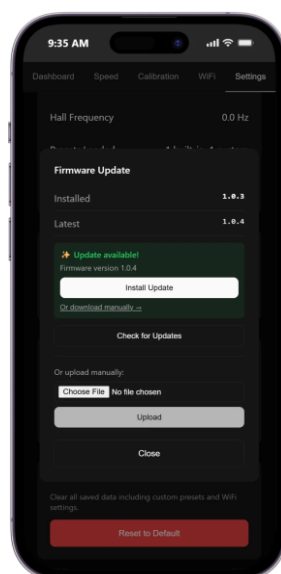


Figure 17 – Firmware Update dialog showing an available update

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!

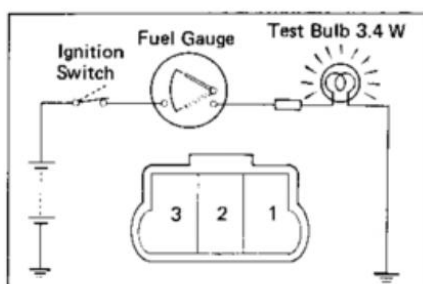
13. Appendix

Fuel Gauge

INSPECTION OF FUEL GAUGE

1. INSPECT RECEIVER GAUGE OPERATION

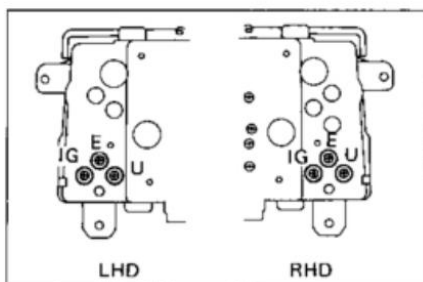
- Disconnect the connector from the fuel sender gauge. Turn the ignition switch on and check that the receiver gauge needle moves to empty position.



- 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.



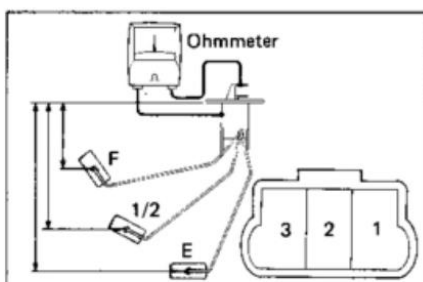
2. MEASURE RECEIVER GAUGE RESISTANCE BETWEEN TERMINALS

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.

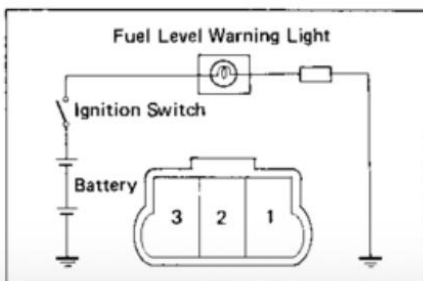
3. MEASURE RESISTANCE OF SENDER GAUGE

- Check that resistance changes as the float is moved from the top to bottom position.
- 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
1/2	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

- Disconnect the connector from the switch. Connect the switch terminal 1 and body ground.
- Turn the ignition switch on. Check that the bulb lights.

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

Figure 18 - Picture from Toyota AE86 Manual

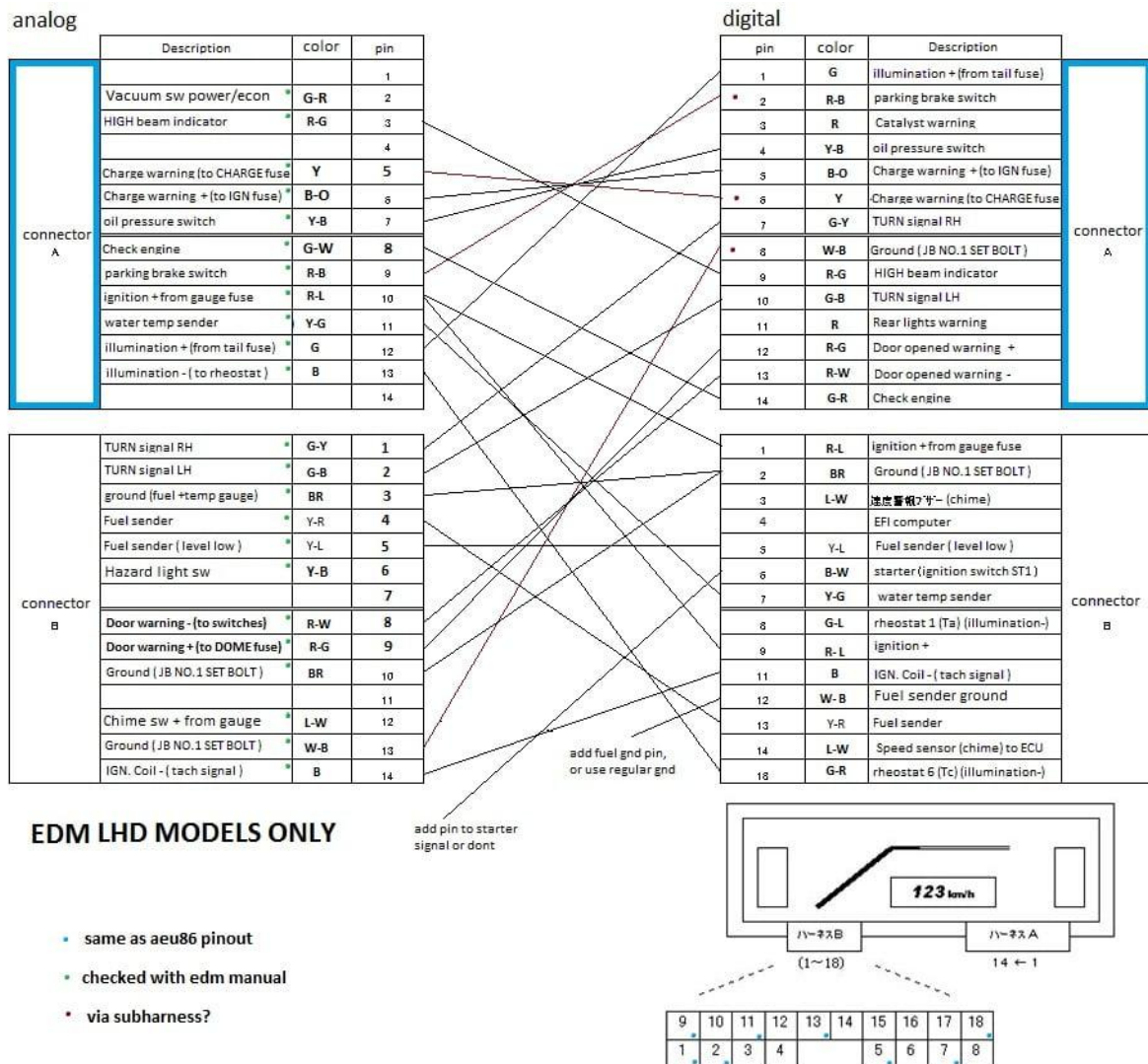


Figure 19 - Schematic to convert analog to digital cluster for Toyota AE86

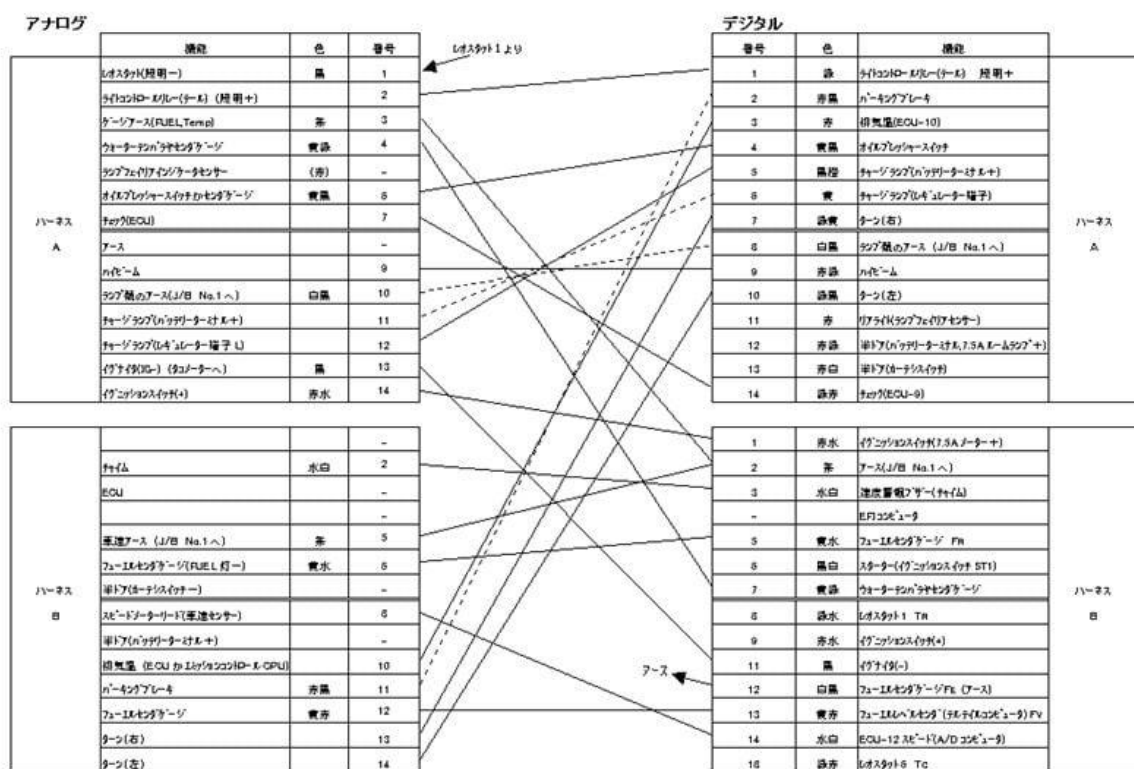


Figure 20 - Schematic to convert analog to digital cluster for Toyota AE86 (Japanese version)