



— COMPLETE DOCUMENTATION

Owner's Manual

Installation, wiring and pinouts, technical specifications, troubleshooting and the complete app manual in one document.



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— HARDWARE GUIDE

1

Installation guide

From box to first drive: where to mount the controller, how to power it, how to plumb the boost line, and how to land sensors and loads on the three pre-terminated harnesses.

Reading time ≈ 25 min Install time ≈ 2–4 h depending on sensors and outputs Applies to FD Design LS / Rev A-LS hardware

**WARNING — READ BEFORE YOU START**

FusionDrive switches real current to real loads and can control boost, water/methanol injection and nitrous. Incorrect wiring can damage the controller, the vehicle or the engine, and can start a fire. If you are not confident working on 12 V vehicle electrics, have the installation done by a qualified auto electrician or performance workshop. Disconnect the battery negative terminal before connecting the dedicated power feed.

**NOTE**

Read the whole guide once before touching the car. Most installs go in one of two ways: **OBD-powered monitoring** (controller, supported vehicle data and compatible sensors) or **dedicated feed** (add a fused battery feed before using OUT1–4). AUX1–2 are low-side switches for compatible, separately supplied loads or ground-trigger inputs. Decide which one you are doing in section 6 before you pick a mounting spot.

1.1 What's in the box



Everything in the box, laid out: the lid and base, the tray panel, the controller in its printed sleeve, the quick start card, and the three harnesses, each coiled in a band marked with its letter.

Item	What it is	Length
FusionDrive controller	The unit itself: black enclosure on a steel base plate with four mounting slots. All connections are on one face: the service port, the OBD port, the sensor port, the power & outputs port and the boost hose barb.	—
Harness A — OBD-II 4 WIRES	Plugs into the OBD port on the controller. The other end is a low-profile OBD-II plug for the vehicle's diagnostic socket. Carries vehicle power, ground and the vehicle CAN bus.	1.5 m
Harness B — Power & outputs 12 LEADS	Plugs into the power & outputs port. Twelve labelled flying leads: battery feed, two grounds, ignition sense, CAN 2, OUT1-OUT4 and AUX1-AUX2.	0.5 m
Harness C — Sensor inputs 8 LEADS	Plugs into the sensor port. Eight labelled flying leads: IN1-IN6, a 5 V sensor supply and sensor ground.	0.5 m
Quick start card	Six steps to first power-up on the front; on the back, every lead on harnesses A, B and C with its label and wire colour. Keep it in the glovebox.	—



Under the controller: the harness tray. A, B and C each have their own bay and a band printed with the letter.

Unpacking

Lift the lid and the controller is on top, in a paper sleeve printed with the connector legend, with the quick start card resting on it. Lift the controller out by its steel base plate, not by the cover. The panel under it lifts away to show the harness tray.

Leave each harness in its band until you need it: the letter on the band is the same A, B or C used on the quick start card, in this guide and in the wiring reference.

Not included: mounting bolts, the boost hose and T-piece, ring terminals for the battery feed, and fuses for individual loads. See the next section.

1.2 Tools and materials

Tools

- Drill and 6.5–7 mm bit (if not using existing holes)
- 10 mm socket or spanner for M6 mounting bolts
- Wire strippers and a ratchet crimper for insulated terminals
- Heat gun for adhesive-lined heat shrink
- Multimeter
- Side cutters, cable ties, trim tools
- Hose cutter or sharp blade for the boost line

Materials

- 4 × M6 (or ¼ in) bolts, washers and nuts or rivnuts
- 2 mm (5/64 in) bore silicone vacuum hose for the boost barb, plus a T-piece or reducer to join it to the vehicle's boost line (see section 8)
- Manufacturer-compatible inductive suppression for each load you switch (see section 11)
- Ring terminal for the battery positive post (12 AWG / 3.3 mm² wire)
- Inline fuse holder for the battery end of the dedicated feed; protect the selected cable and load within the 30 A fused-path limit
- Individual load fuse holders and fuses selected for the actual cable, load and validated output capability
- Automotive-grade wire to extend leads: match or exceed the lead gauge in the wiring reference
- Adhesive-lined heat shrink, split loom or braid, cable ties



CAUTION

Use crimped, heat-shrunk joints or proper splice connectors. Do not use twist-and-tape joints or "vampire" taps anywhere on the harnesses. The harness wire is rated for engine-bay temperatures; anything you add should be too.

1.3 Choosing a mounting location

The controller is designed to live in the vehicle permanently. Pick the location with the harness lengths in mind: the OBD harness reaches **1.5 m** from the controller, the power & outputs and sensor harnesses reach **0.5 m** before their flying leads start, and extensions must account for voltage drop, current, signal integrity and the installation environment.

Good locations

- Under the dash or behind the kick panel, near the OBD socket
- Behind the glovebox or under a seat
- In a dry, ventilated corner of the engine bay away from the exhaust, turbo and radiator fan, bolted to a steel panel or bracket
- Anywhere the steel base plate can bolt flat to the body: the plate carries heat away from the controller

Avoid

- Directly on or next to exhaust components, the turbocharger or the radiator
- Anywhere water pools or sprays: wheel arches, under the scuttle drain, floor pans that get wet
- Loose, hanging from the harness, or cable-tied to a moving part
- Inside a sealed box with no airflow around the controller when driving high-current loads
- Wrapped in insulation or foam

Think about the connector face too. All plugs and the boost barb are on one edge, and the plugs need about **60 mm of clear space** in front of that edge so the cables can leave without a sharp bend. The boost hose exits from the same edge, on the right when you look at the face.

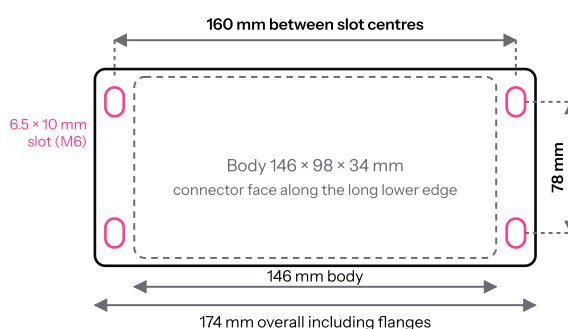
BLUETOOTH RANGE

The controller talks to your iPhone over Bluetooth. A cabin location gives the strongest, most reliable connection. An engine-bay location works, but a steel firewall between the controller and the phone reduces range. If you mount in the engine bay, check the app stays connected from the driver's seat before finalising the position.

1.4 Mounting



The steel base plate. Four slots along the two short ends take M6 bolts.



Mounting pattern. Slots are 6.5 mm wide × 10 mm long, on 160 mm centres across and 78 mm centres front to back. The slots' long axis runs front to back, giving ±2.5 mm adjustment.

1 Mark the holes.

Hold the controller in place with the connector face toward the space you have reserved for cables, and mark the four slot centres: 160 mm apart across the unit, 78 mm apart front to back. Use the controller itself as the template.

2 Drill or reuse holes.

Drill 6.5–7 mm holes, or line up with existing threaded studs. Check what is behind the panel before drilling: wiring, fuel and brake lines, the fuel tank.

3 Bolt it down.

Use four M6 bolts with flat washers under the head. Nuts with spring washers or nyloc nuts on the back, or rivnuts in sheet metal. Tighten to about **8 N·m (6 lb·ft)** for M6 into a nut or steel bracket; for rivnuts in thin sheet stop at about 5 N·m or the rivnut will spin. There is no need to crush the plate. If the surface is not flat, use a bracket rather than bending the plate.

4 Orientation.

Any orientation works. Connector face down or sideways is best in the engine bay so water cannot sit on the plugs. Leave the 60 mm clear zone in front of the connector face.

5 Do not open the enclosure.

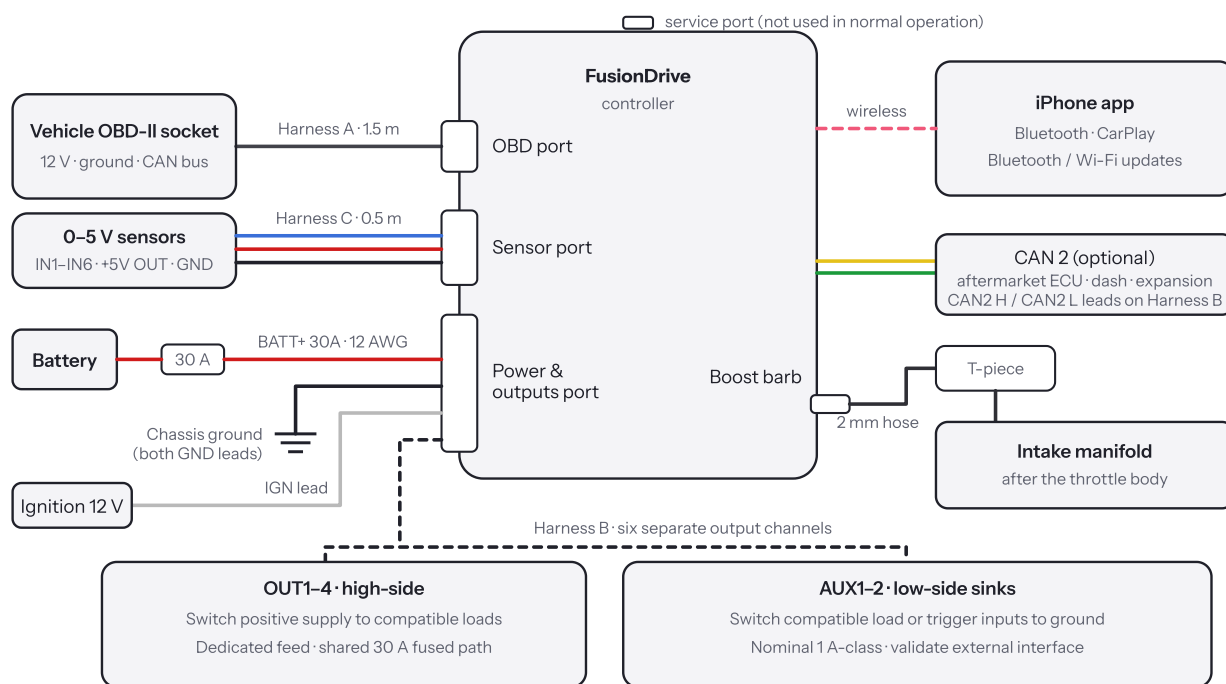
There is nothing to set inside. The 30 A fuse for the dedicated feed lives inside the controller and is only replaced in the unlikely event of a fault; see troubleshooting.

**WHY BOLT IT TO METAL?**

The base plate is the controller's heatsink. Bolted to a body panel or bracket, the car itself carries heat away from the power outputs. Mounting on plastic or carpet still works for OBD-only installs, but if you drive pumps and fans continuously, mount to metal.

1.5 Wiring overview

Everything connects through the three ports on the connector face. This is a connection overview. Use the channel-specific diagrams below and in the wiring reference for actual load polarity; an OBD-only monitoring install uses just the vehicle-data connection.



Wiring overview. Harness A handles the vehicle side; Harness B handles power, ignition, CAN 2 and the six outputs; Harness C handles sensors. The boost line is a hose, not a wire.

1.6 Connecting power

Harness A can power the controller for monitoring. Harness B provides the dedicated load feed, ground and ignition sense. You can use both harnesses together. OUT1-4 source the positive side of a load; AUX1-2 switch its negative side to ground.

	OBD-powered monitoring	Dedicated fused feed
Connection	Harness A to a compatible vehicle OBD-II socket.	J6 pin 1 BATT+ to fused battery positive; both J6 GND leads (pins 4 and 7) to a sound return; J6 pin 3 IGN to verified ignition-switched 12 V.
Purpose	Controller, Bluetooth, supported CAN/OBD data and compatible sensors. Available vehicle parameters depend on the ECU.	Required supply for OUT1-4 and the controller. The four heavy outputs share the 30 A fused path; actual continuous capability must be validated.
Protection	The board has 2 A self-resetting protection on the OBD supply. Do not use the diagnostic connector as a pump or fan supply.	Internal 30 A path fuse plus an external fuse near the battery sized for the cable and installation, no larger than the supported path limit. Fuse individual loads too.
AUX1-2	Nominal 1 A-class low-side sinks, not powered 12 V outputs. A compatible load connects from its fused +12 V supply to AUX; the supply and FusionDrive share ground. Confirm current, suppression and power sequencing.	

	OBD-powered monitoring	Dedicated fused feed
Ignition	CAN traffic can affect wake and sleep when no IGN wire is fitted.	IGN is sense/wake only, not a hardware load-power disconnect. Configure and test ignition-off behaviour for every assigned output/controller.

**LS REV A — DEDICATED FEED REQUIRED FOR OUT1-4**

On the LS Rev A assembly, an unplugged dedicated feed can backfeed the load rail and produce a false feed indication or an unstable heavy-output supply. Fit the dedicated fused feed before using OUT1-4. Verify it at J6 pin 1 with a meter; the app or LED alone is not proof. Software cannot correct this power-path issue.

OBD-powered install**1 Find the OBD-II socket.**

It is within about a metre of the steering wheel on every car built for OBD-II, usually under the dash on the driver's side, sometimes behind a small cover.

2 Route Harness A.

Run the harness from the controller to the socket, following existing looms and away from pedals, steering column moving parts and the driver's feet. Secure with cable ties every 200–300 mm.

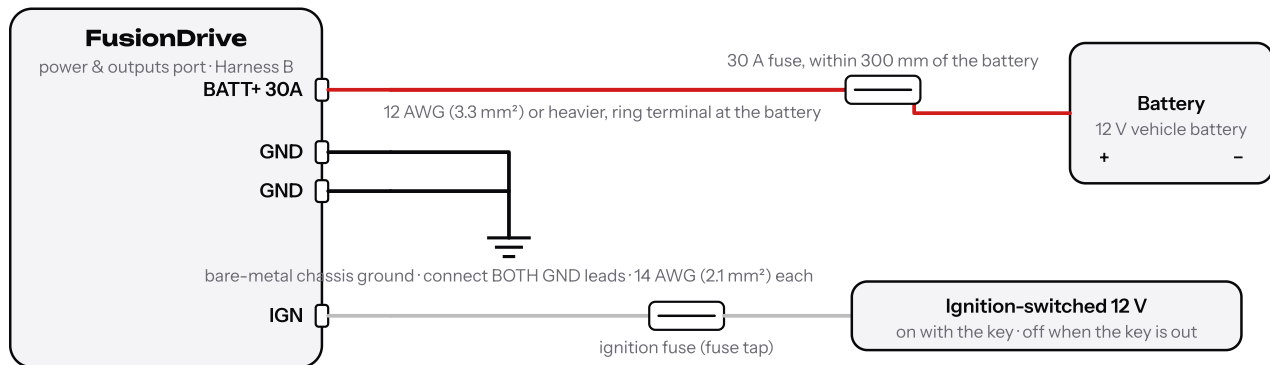
3 Plug in.

Push the low-profile plug fully home. It sits about 18 mm proud of the socket so it stays clear of your knees. Check parked-current draw and sleep/wake behaviour before leaving it connected long term.

**ALWAYS-ON POWER AND SLEEP**

Many OBD sockets remain powered with the key off. Sleep and wake depend on configuration, ignition sense and actual CAN activity; some vehicles keep sending traffic after locking. Check the sleep settings, verify the installed vehicle's parked-current draw and test reconnection. Do not assume a fixed one-minute delay or instant phone reconnection.

Dedicated fused feed



The controller has its own 30 A fuse inside; the fuse at the battery protects the harness. Never connect always-on 12 V to IGN.

Dedicated feed example. The battery-end fuse protects the feed cable; the internal 30 A fuse limits the shared power path. Fuse sizing does not establish a continuous-current rating for the assembled controller.

- 1 Disconnect the battery negative terminal**
before you start.
- 2 Ground first.**
Crimp both **GND** leads from Harness B (14 AWG each) to ring terminals and bolt them to a clean, bare-metal chassis ground point close to the controller. Scrape paint under the terminal, use a star washer, and re-protect the joint with grease or paint afterwards. **Connect both GND leads.** Do not assume the current divides equally; validate the complete return path and its voltage drop under load.
- 3 Route the positive feed.**
Run 12 AWG (3.3 mm²) or heavier wire from the battery positive post to the controller. Extend the **BATT+ 30A** lead with the same gauge, crimped and heat-shrunk. Route away from the exhaust, sharp edges and moving parts, through grommets where it passes through panels. Add a rubber grommet or split loom anywhere it passes through metal.
- 4 Fuse at the battery.**
Fit a suitable automotive fuse within 300 mm of the battery positive terminal. Size it to protect the actual cable and load, no larger than the 30 A path limit. The diagram shows the path limit, not a continuous-load qualification. The wire between the battery and this fuse is unprotected: keep it short and well insulated.
- 5 Battery terminal.**
Crimp a ring terminal sized to the battery post bolt and connect it last, after everything else is finished and checked.
- 6 Do not use the cigarette lighter, radio or accessory circuits**
as the high-current feed. They cannot carry the load and their fuses will blow.

**WARNING — POLARITY AND VOLTAGE**

FusionDrive is for 12 V vehicle electrical systems only. Do not connect it to 24 V systems. Double-check polarity before reconnecting the battery: **BATT+ 30A** to positive, both **GND** leads to ground. Reversed connections can damage the controller and are not covered by warranty.

Grounding

OUT1–4 carry the positive side of their loads, so those loads return to a suitable chassis/ground point. AUX1–2 carry the switched negative side: the load's negative terminal goes to AUX and current returns through FusionDrive's power ground. All connected supplies need the correct common reference.

- Connect both Harness B GND leads, J6 pins 4 and 7, to a clean, secure power ground with adequate cable and termination capacity.
- Check voltage drop under the actual load. A painted surface, rubber-mounted bracket or loose joint is not a reliable return.
- Harness C sensor GND is a measurement reference, not a return for pumps, relay coils or other loads.

1.7 Ignition sense

Connect Harness B **IGN** (J6 pin 3) to verified ignition-switched 12 V. This is a low-current sense/wake input. It tells configured logic about the key state; it does not physically disconnect the load supply.

- Choose a suitable fused circuit after checking the vehicle wiring diagram and its behaviour during cranking, accessory mode and key-off. Do not tap critical safety or ECU-control wiring without an approved interface.
- Never connect permanent battery positive to IGN. A permanently asserted input can prevent the intended sleep/ignition behaviour.
- Generic output ignition-off settings, controller gates and automation conditions must be configured and tested for the application. Outputs are turned off for deep sleep, but a key-off awake period may remain.
- Use an independent, appropriately rated power cut-off where the installation requires a physical interlock. An app setting is not electrical isolation.

With no IGN wire, CAN traffic may provide wake/activity information, but it is not proof that the engine is running. Verify shutdown and parked-current draw on the actual vehicle.

1.8 Connecting the boost hose



The boost barb is on the connector face, to the right of the power & outputs port.

FusionDrive has a boost sensor built in. One hose from the intake manifold to the barb gives you true gauge boost (relative to the air around the car) with no dependence on the factory sensor. The onboard sensor measures gauge boost and vacuum; see specifications.

1 Choose a source.

Use a suitable manifold pressure port *after* the throttle body where applicable. A dedicated port is preferable. Retain existing gauges and sensors; share a reference line only after checking that the added hose cannot disturb its function. Do not alter a fuel-pressure regulator, brake or other critical reference line without qualified assessment.

2 Fit a T-piece.

If the selected reference line is suitable for sharing, fit a correctly sized, leak-free T-piece. The third leg feeds FusionDrive. If the manifold has an unused port, use a plug-in barb fitting instead and skip the T.

3 Run the hose.

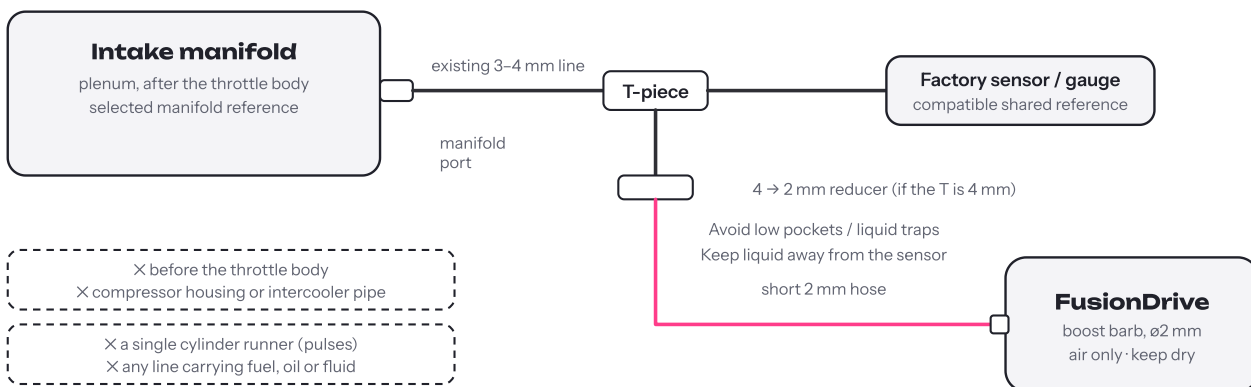
The controller's barb is small: about **2 mm** across. Use 2 mm (5/64 in) bore silicone vacuum hose on the barb; it stretches on firmly. Most vehicle boost lines are 3–4 mm, so use a T-piece with a 2 mm leg, or a short 4 → 2 mm reducer at the T. Keep the run as short as practical, route it away from exhaust heat and sharp edges, and avoid low loops where fuel or water could collect.

4 Push it on.

Push the hose fully over the barb on the controller. A small spring clip or cable tie is a good idea on the manifold end; on the controller end a snug hose is enough.

5 Check for leaks.

Compare the selected onboard pressure reading with the expected engine condition or a reference gauge. Many throttled petrol engines show idle vacuum; this is not universal. Investigate unexpected readings before enabling boost control.



Connection diagram only; choose a mounting position and hose route that keep liquid out of the sensor.

Boost hose route. T into a post-throttle manifold line, step down to 2 mm hose, keep it short with no liquid-trapping low loops, and secure it onto the barb.



CAUTION

Do not connect the barb to anything that can push liquid into it: fuel, oil, coolant or water/methanol lines. The sensor is for air only. Route and position the sensor so liquid cannot collect in the hose or enter the barb; a low loop is not a guaranteed drain or separator.

1.9 Plugging in the three harnesses



Connector face, left to right: service port, OBD port (4-way), sensor port (8-way), power & outputs port (12-way), boost barb.



All three plugs latched. Each plug only fits its own port.

Each plug is a different size and is keyed, so it cannot go into the wrong port or in upside down. Each has a latch on one side that clicks when fully home.

1 Harness C — Sensor inputs

into the 8-way sensor port (second from the left). Wire your sensors first (section 10), then plug in.

2 Harness B — Power & outputs

into the 12-way power & outputs port (the wide one). Wire the power feed, ignition and loads first (sections 6, 7 and 11), then plug in *with the battery still disconnected*.

3 Harness A — OBD-II

into the 4-way OBD port (next to the service port). Plug this in last: it is what powers the controller up on most vehicles.

4 Listen for the click

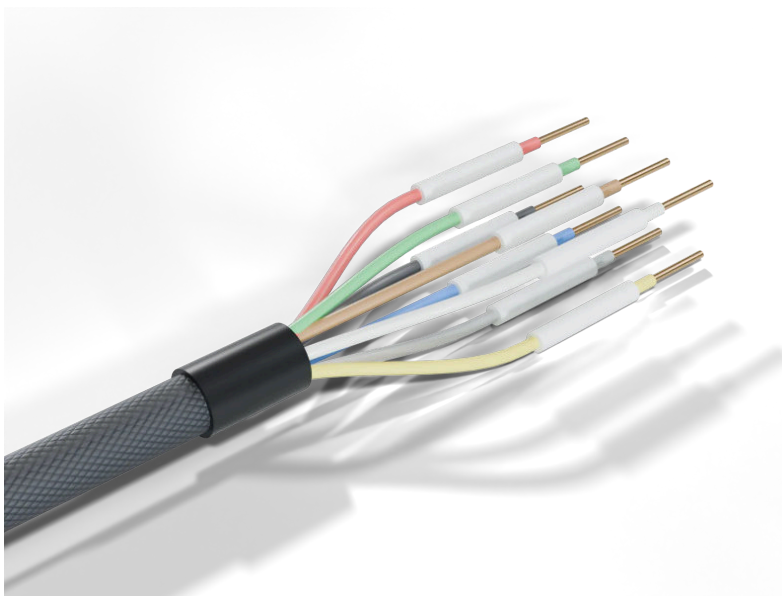
on each plug and give the cable a gentle tug. To remove a plug, press the latch tab and pull the plug body, never the wires.

5 Support the cables.

Cable-tie the harnesses within 100–150 mm of the controller so the plugs do not carry the weight of the loom, then secure along their route.

**SERVICE PORT**

The small port at the far left is a service port used by workshops and support. It is not needed for installation, pairing or firmware updates, which all happen wirelessly. Leave it uncovered but do not connect anything to it unless support asks you to.

1.10 Sensor wiring

Harness C leads. Every lead is labelled 20 mm from its end.

Harness C has IN1–IN6 conditioned 0–5 V inputs, +5V OUT and sensor GND. Configure each input for its actual analog sensor or level/switch function. See the pin map.

How the inputs behave

- **Voltage compatibility:** inputs accept conditioned 0–5 V signals. Never connect 12 V, a coil/ignition signal or a negative-going signal directly. Input clamps are not permission to miswire; an overvoltage or transient can damage the controller or the connected sensor.

- **Zero is a reading, not a diagnosis:** an open input tends toward 0 V, but 0 V may also be a valid sensor value. A zero reading, freshness flag or app label does not prove a wire is intact. Check the sensor's documented failure voltages and test the chosen fault response.
- **Calibration:** analog inputs use the voltage/value calibration you set. Presets are starting points; enter the correct units, range and calibration from the actual sensor or conditioner.
- **Level/switch mode:** the default threshold is 2.5 V. Threshold, hysteresis and reverse logic are configurable. Verify both states and the disconnected-wire state before using a switch as an arm or safety input.
- **Sensor supply:** J8 pin 4 supplies 5 V for compatible sensors and shares the board's 5 V rail. Keep the combined external sensor draw below the hardware guide's approximately 500 mA allowance, with margin. It is not a pump, lamp, relay or wideband-heater supply.
- **Sensor reference:** use J8 pin 8 sensor GND as the signal reference. Do not use it as a load return. Before sharing an existing sensor signal, verify its output type, voltage, grounding and permitted additional loading with the device maker.
- **Pulse and specialised sensors:** these multiplexed analog inputs are not dedicated frequency counters. Frequency-output flex-fuel or flow sensors, crank/cam signals and raw thermocouples need a compatible conditioner or a supported, defined CAN signal. Selecting a preset does not add the missing interface.
- **Freshness:** input conversion, CAN/OBD acquisition and phone display rates differ. Use the actual source age and configured stale limits; a faster display or recording setting does not make the sensor update faster.

Three-wire 0–5 V sensors (pressure, conditioned ethanol, external boost)

- 1 Power:**
use +5V OUT only for a sensor rated for a 5 V supply and within the combined supply allowance. Other devices need their maker's specified supply.
- 2 Ground:**
connect the compatible sensor signal reference to Harness C GND. Check any separately powered controller's grounding requirements.
- 3 Signal:**
connect its documented 0–5 V output to a free IN1–IN6. Do not connect an unverified wire from an existing gauge or ECU.
- 4 Configure:**
select the input, give it a useful name and units, and set its calibration. Verify at known values rather than assuming a preset matches.

A wideband controller's compatible analog or CAN output can provide measured mixture; the raw oxygen sensor cannot connect directly. A frequency-output ethanol sensor needs conversion before an analog input can read it.

Two-wire temperature senders

A resistive sender needs a correctly selected pull-up or signal conditioner. The resistor example produces a voltage, but most temperature senders are nonlinear: a two-point linear calibration is only an approximation over a checked range. Prefer a compatible conditioned output where accurate temperature limits are needed. Do not connect a raw thermocouple directly.

Level switches and arm switches

A dry switch may connect +5V OUT to an input as shown in the switch diagram. Select the threshold, hysteresis and polarity to match the actual switch. An open switch and broken wire can produce the same voltage. Test full/empty or armed/disarmed states and the disconnected state; then explicitly configure the corresponding controller gate or automation.

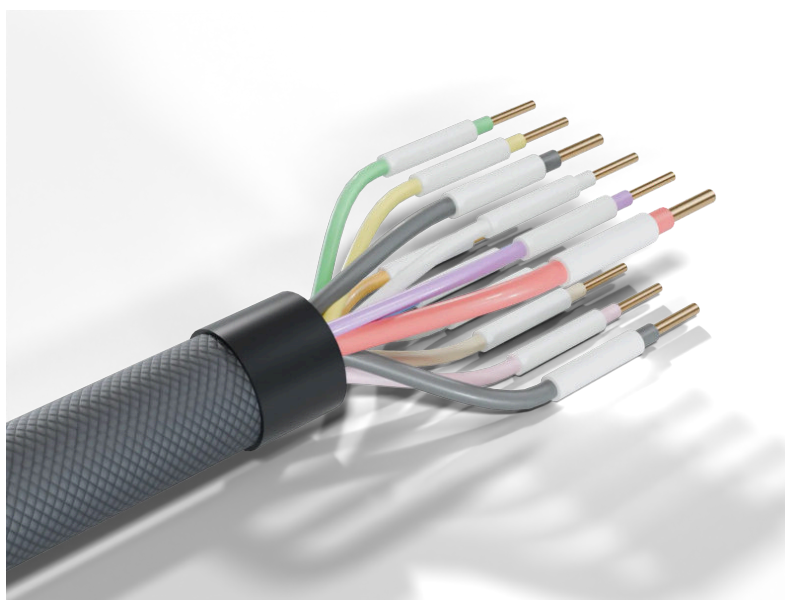
Routing sensor wiring

- Keep sensor wiring away from ignition components, alternator cables and switched load wiring. Cross those runs at right angles where practical.
- Use suitable twisted or shielded wiring for noisy runs, following the sensor maker's grounding guidance. Never carry load current through a signal shield.
- Use properly supported, sealed joints and 20 AWG or heavier extensions, accounting for voltage drop and signal loading.

Choosing existing vehicle or accessory data

You can select supported OBD parameters, defined CAN1/CAN2 signals or calibrated analog inputs instead of adding duplicate sensors. CAN1 is normally the vehicle/OBD bus; CAN2 can connect compatible accessories. Start CAN2 in listen-only mode with the correct bitrate and termination. Give decoded signals the correct bus, standard/extended ID, bit layout, scaling and units; enable polling or custom transmission only when the receiving device's protocol is known. This does not automatically decode every vehicle or accessory.

1.11 Output wiring



Harness B leads. Check the LS lead function and connector pin as well as the nominal lead marking.

Four high-side outputs and two low-side AUX outputs: OUT1-4 switch the positive supply to a compatible load; AUX1-2 switch a compatible load's negative side to ground. All six support on/off or PWM control when their electrical interface and assigned function support it.

Output	J6 pin	Connection	Electrical boundary
OUT1	12	OUT → load positive; load negative → power ground	Four high-side outputs designed for 10 A each, sharing the dedicated 30 A fused path. Match the load and validate the installed assembly.
OUT2	11	Same high-side wiring	
OUT3	10	Same high-side wiring	
OUT4	9	Same high-side wiring	
AUX1	2	Fused +12 V → compatible load → AUX1	Nominal 1 A-class low-side sinks. Common ground required; not isolated contacts or 12 V outputs.
AUX2	8	Fused +12 V → compatible load → AUX2	



VALIDATE THE ACTUAL LOAD AND PROTECT ITS WIRING

OUT1–4 have built-in high-side PWM power drivers designed for 10 A each, sharing a 30 A fused power path. Compatible loads connect directly; no extra driver is needed within their electrical requirements. Check running and start/stall current, wiring, connectors, fuse protection, cooling and enclosure temperature for the actual installation; reduce the load or use a suitable external driver where needed. Do not plan four 10 A loads at once.

Rules for outputs

- **Dedicated feed:** use the correct fused J6 feed for OUT1–4 and observe the LS Rev A limitation in section 6.
- **Shared output budget:** controllers and automations share six physical channels. A boost solenoid uses one, a WMI pump or external permit uses one, each dry nitrous stage uses one and each wet stage uses two. Retard requests and EBC trigger wires consume channels too. Three wet stages consume all six, including the two small AUX sinks; that is not six heavy-load drivers.
- **Individual fuses:** select protection for the actual wire, load and driver. Fuse numbers in diagrams are illustrative or path limits; they do not qualify continuous operation. Never parallel outputs to increase capacity.
- **External drivers:** use an appropriately rated relay/driver for loads beyond a channel's validated capability. Mechanical relays are on/off only. A solid-state driver must explicitly support the load, control polarity and intended PWM frequency.
- **High-side suppression:** for a compatible coil between OUT and ground, a flyback diode's stripe/cathode goes to OUT (load positive), and its anode to load ground.
- **Low-side suppression:** for a compatible coil between fused +12 V and AUX, the stripe/cathode goes to +12 V and the anode to AUX (coil negative). Do not copy the high-side wiring onto AUX.
- **Suppression compatibility:** follow the load maker's polarity, release-time and suppression requirements. Check existing integral diodes and select adequate transient ratings. An arbitrary diode is not a universal solution for a motor with electronics, a fast valve or an external controller.
- **Power sequencing:** AUX is referenced to FusionDrive ground and its clamp rail. Verify the external supply, common ground and on/off sequence; do not assume isolation when FusionDrive is unpowered.
- **Ignition and temperature:** configure and test key-off behaviour. Mount for heat transfer and validate sustained temperature and voltage drop. The app reports commanded duty, not measured output current,

voltage or delivered flow.

Common load examples

Boost solenoid	Use a compatible OUT channel as in the high-side example, or a validated small LS-compatible solenoid wired from fused +12 V to AUX. Match frequency, duty limits and plumbing to the actual valve. A preset is a starting point.
Water/methanol	Directly control a compatible pump through a suitable output/driver, or retain an external controller and use supported monitoring or a compatible binary permit interface. Add real flow, pressure or level measurements where protection requires them; pump duty does not prove injection.
Fans and fuel pumps	Check start/stall current and PWM compatibility. A minimum duty does not guarantee flow, starting, cooling or safe fuel pressure. Use a suitable external driver and independent safeguards where required.
Nitrous	Assign dry/wet stage outputs and independent fuel curves within the shared channel budget. Install and configure required arm, RPM, throttle, pressure or mixture sources. A selected gate is useful only with a valid, correctly calibrated signal.
Relay or external EBC	AUX may sink a compatible coil or documented ground-trigger input. Follow the LS relay diagram or external EBC example; do not inject AUX power into another controller.

FusionDrive can retain compatible existing sensors, gauges and controllers, or directly control compatible loads. It is not an ECU reflash tool, a universal proprietary-controller interface or a replacement for every external controller.

1.12 First power-up and pairing

- 1 Final visual check.**

Every crimp heat-shrunk, no bare copper, every plug latched, harnesses supported, boost hose on, fuses fitted in each load, battery feed fused.
- 2 Reconnect the battery negative terminal.**
- 3 Turn the ignition on**

(engine off). If Harness A is plugged in the controller already has power; ignition wakes it either way.
- 4 Install the supported FusionDrive iPhone app.**

An account is optional for local setup and control. Choose local use or sign in for the online features you want; demo data is separate from the connected device.
- 5 Pair.**

In the app, go to *Connection* and tap your controller when it appears. Each controller advertises under its serial number, which is printed on the unit. Keep the phone within a couple of metres for the first connection.
- 6 Verify the supply and ignition.**

Check J6 pin 1 with a meter where OUT1–4 will be used, including voltage drop under a safe test load. Verify IGN changes with the key. On LS Rev A, a feed indicator can be falsely asserted without the dedicated feed; never use it as the only check.

7 Check the vehicle voltage.

Measure the actual supply against the controller and vehicle specifications. A displayed OBD voltage is a vehicle-reported value, not a measurement at every output or proof of wiring quality.

8 Check for updates.

Follow the app's supported Bluetooth or Wi-Fi update workflow. Keep power stable, keep loads in a safe state and wait for the final completion/restart. Do not interrupt an update or start one while driving.

1.13 Verifying inputs and outputs

Commission stationary, initially with hazardous loads isolated and the engine off. Use a safe test load where practical before connecting fuel, boost or nitrous equipment.

Vehicle data

- Select supported OBD parameters and confirm the ECU actually replies. Compare RPM and other values with a reference; unavailable parameters are not zero readings.
- For accessories, verify bus, bitrate, termination, frame identity, decoding, units and acquisition age. Keep transmission disabled until the receiving protocol is confirmed.

Boost sensor

- Verify the selected feedback source. The onboard gauge sensor should be near zero with its pressure port at atmosphere.
- Compare running pressure with a reference appropriate to the engine; idle vacuum is not universal. Check hose integrity before enabling control.

Sensors

- Check each configured input's raw voltage, units, calibration and known values. Test both switch states and a disconnected input; zero alone is not proof of sensor failure.
- Verify the configured stale/fault response by removing or stopping the selected source safely. Restore the source and confirm the intended recovery behaviour.

Outputs

- Confirm OUT versus AUX polarity before energising. Use the app's manual controls only within the load maker's safe operating conditions and confirm the correct physical device responds.
- Do not run a pump dry or open a nitrous bottle for an electrical test. Isolate hazardous delivery and verify interlocks before any live commissioning.
- Measure supply/ground voltage drop and load current with suitable equipment. App duty, an LED or a connected phone does not prove electrical delivery or thermal safety. See troubleshooting for unexpected operation.

Sleep and wake

- Test key-off output behaviour while awake as well as eventual sleep. Check the actual sleep settings, CAN activity and parked-current draw.
- Test ignition/CAN wake and reconnection on the installed vehicle without relying on a fixed delay.

Operation without the phone

Wait for each configuration save acknowledgement, then disconnect the phone and power-cycle the controller with loads made safe. Verify the saved configuration and intended local operation. ESP configuration runs locally; a phone connection is needed to collect phone logs. Manual duty and WMI prime do not resume as an unattended demand, and nitrous boots disabled; any configured local re-enable/arm path must be explicitly reviewed and tested.

1.14 Final checklist

- ☐ Controller secured for cooling and environmental protection; connector clearance and strain relief checked
- ☐ OBD connection and supported vehicle protocol checked; harness away from pedals
- ☐ Dedicated fused J6 pin 1 feed verified for OUT1–4, with LS Rev A feed-indicator limitation understood
- ☐ Both J6 ground leads connected; IGN on a verified switched circuit and configured key-off behaviour tested
- ☐ OUT positive-side versus AUX negative-side wiring verified; individual fuses and compatible suppression fitted
- ☐ Actual running/start current, cable voltage drop, thermal conditions and shared output allocation checked
- ☐ Sensor supply compatibility, combined 5 V draw, signal reference and calibrated 0–5 V range checked
- ☐ No raw 12 V, frequency or ignition signals on analog inputs; required conditioners installed
- ☐ Boost reference suitable, existing critical lines undisturbed, hose secure with no liquid traps
- ☐ All plugs latched and supported; unused leads insulated
- ☐ App paired in real-device mode; all intended configuration saves acknowledged
- ☐ Physical output response, switch polarity, source loss and fault recovery tested safely
- ☐ Sleep/wake, parked draw and saved phone-disconnected operation checked
- ☐ Boost, water/meth and nitrous limits and independent safeguards reviewed before live operation

Next: set up your sensors, outputs, boost profiles and automations in the app manual.

1.15 Ignition and OBD vehicle activity

A dedicated ignition wire is optional when fresh running-engine OBD data supplies the required activity evidence. You can use dedicated IGN, OBD, or both. A connected cable alone is not running evidence; verify the vehicle supplies fresh supported data and that shutdown behavior matches your installation. Dedicated output power feeds and grounds remain required for the loads they supply.

2

— REFERENCE

Wiring & pinouts

Every pin, wire colour and lead label on the three FusionDrive harnesses, how the plugs are numbered, and typical wiring diagrams for the loads and sensors people fit most often.

FD Design LS · Rev A-LS harness reference For installation steps see the installation guide

**WARNING**

Work with the battery disconnected. Fuse every load. Never apply 12 V to a sensor input, never connect always-on power to the IGN lead, and validate the actual load, cable, fuse and thermal capability. Nominal lead markings are not continuous-current qualification. Values not listed here are in the specifications.

2.1 The connector face



Left to right: service port · OBD port (Harness A) · sensor port (Harness C) · power & outputs port (Harness B) · boost barb.

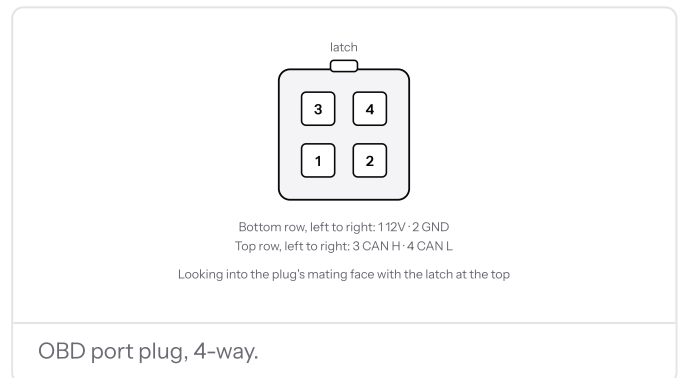
Port	Ways	Harness	Carries
Service port	—	none	Workshop and support use only. Not needed for installation or updates.
OBD port	4	Harness A (1.5 m)	Vehicle 12 V, ground, vehicle CAN bus (CAN 1)
Sensor port	8	Harness C (0.5 m)	Six 0–5 V inputs, 5 V sensor supply, sensor ground
Power & outputs port	12	Harness B (0.5 m)	Battery feed, two grounds, ignition sense, CAN 2, OUT 1–4, AUX 1–2

Port	Ways	Harness	Carries
Boost barb	—	2 mm hose	Manifold pressure to the built-in boost/vacuum sensor (to 60 psi). Barb is about 2 mm across; use 2 mm bore silicone hose.

2.2 Conventions used on this page

- Pin numbers** are the positions in the harness plug as shown in each connector diagram, looking into the plug's mating face with the latch at the top: the bottom row is numbered left to right first, then the top row.
- Lead labels** are printed on a heat-shrink sleeve 20 mm from the end of every flying lead. Check the label against the connector position and the LS pin map before connecting it. Stop and resolve any colour or label mismatch; do not use a current marking as proof of continuous load capability.
- Wire gauges** are given in AWG with the cross-section in mm². When extending a lead, use the same gauge or heavier.
- All harness wire is thin-wall automotive grade rated to 125 °C.

2.3 Harness A — OBD-II 1.5 M

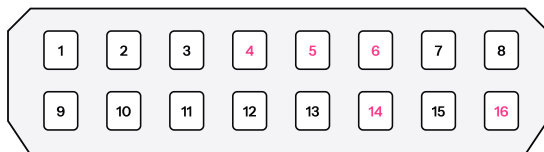


Pin	Function	Colour	Gauge	Vehicle OBD-II socket pin	Notes
1	Vehicle 12 V	red	18 AWG (0.8 mm ²)	16	Battery power from the OBD socket. Protected by a 2 A self-resetting device in the controller.
2	Ground	black	18 AWG (0.8 mm ²)	4 (and 5)	Chassis and signal ground are linked inside the plug.
3	CAN high	yellow	20 AWG (0.5 mm ²)	6	Twisted pair with pin 4.
4	CAN low	green	20 AWG (0.5 mm ²)	14	Twisted pair with pin 3.

Harness A is fully terminated at both ends; there is nothing to wire. If your vehicle's OBD socket is not powered with the key off, the controller will only be awake with the ignition on unless you also fit the dedicated feed. Vehicles whose diagnostic socket does not use CAN on pins 6 and 14 will power the controller but will not provide vehicle data; use the **IGN** lead for a verified ignition state. Ignition on does not prove that the engine is running.

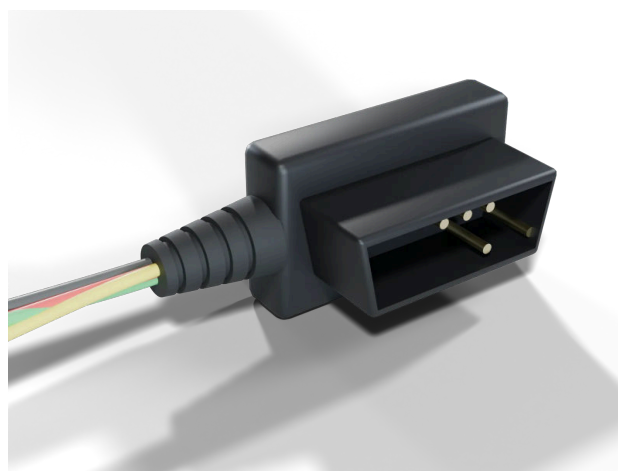
The vehicle's OBD-II socket

Looking into the vehicle's socket, wide edge at the top



16 battery + · 4 chassis ground · 5 signal ground · 6 CAN high · 14 CAN low
All other pins are unused by FusionDrive

The vehicle's OBD-II socket. FusionDrive uses the five pins highlighted; the plug on Harness A has no contacts in the other positions.

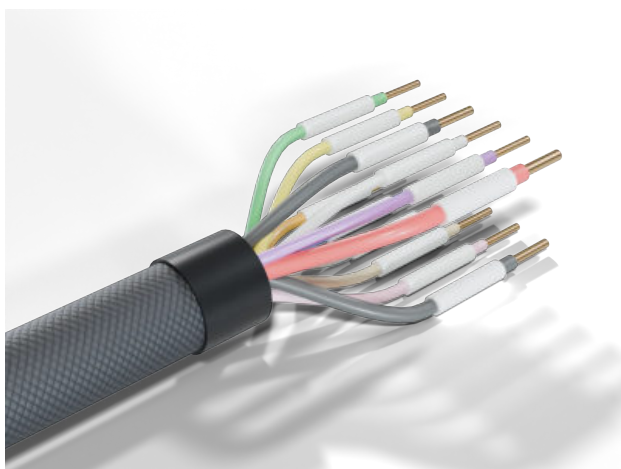


The OBD-II plug on Harness A. Only the five positions FusionDrive needs carry a contact.

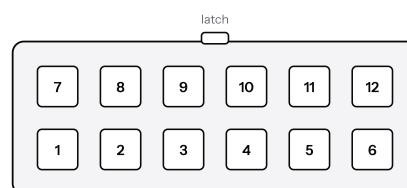
Socket pin	Vehicle signal	Harness A wire	What FusionDrive does with it
16	Battery positive, usually always on	 red	Powers the controller (2 A self-resetting protection). Most vehicles fuse this pin at 7.5–15 A together with the cigarette lighter or radio.
4	Chassis ground	 black	Controller ground. Pins 4 and 5 are linked inside the plug, so either one grounds the controller.
5	Signal ground		
6	CAN high	 yellow	Supported vehicle data and fault-code services, with wake-on-traffic where configured. Available parameters depend on the vehicle ECU.
14	CAN low	 green	

2.4 Harness B — Power & outputs

0.5 M



Twelve labelled leads. Check LS output type and pin number as well as the nominal lead marking.



Bottom row, left to right: 1 BATT+ · 2 AUX1 · 3 IGN · 4 GND · 5 CAN2 H · 6 CAN2 L
Top row, left to right: 7 GND · 8 AUX2 · 9 OUT4 · 10 OUT3 · 11 OUT2 · 12 OUT1

Looking into the plug's mating face with the latch at the top

Power & outputs port plug, 12-way.

Pin	Lead label	Function	Colour	Gauge	Rating / range	Notes
1	BATT+ 30A	Dedicated battery feed	 red	12 AWG (3.3 mm ²)	12 V feed; 30 A fused path	Dedicated battery positive through a correctly sized battery-end fuse, no larger than the 30 A path limit. Required for OUT1–4. LS Rev A can falsely indicate feed presence when unplugged; verify the actual supply.
2	AUX1 LS 1A	Low-side auxiliary output 1	 violet	16 AWG (1.3 mm ²)	Ground-switching sink, nominal 1 A-class, PWM	Connect a compatible load between its fused +12 V supply and AUX1. Requires common ground, correct suppression and validated power sequencing. Does not supply 12 V.
3	IGN	Ignition sense	 white	16 AWG (1.3 mm ²)	12 V in, sense only	Ignition-switched 12 V sense/wake input. Configure and verify ignition-dependent logic. Not a physical OUT1–4 supply interlock; never wire permanent battery positive here.
4	GND	Ground	 black	14 AWG (2.1 mm ²)	Power ground / return	Chassis ground. Connect both GND leads (pins 4 and 7).
5	CAN2 H	CAN 2 high	 yellow	16 AWG (1.3 mm ²)	CAN bus	Separate CAN2 interface for compatible accessories; not internally bridged to CAN1 and not a claim of galvanic isolation. Start listen-only; verify bitrate, termination and signal definitions. Twisted pair with pin 6.
6	CAN2 L	CAN 2 low	 green	16 AWG (1.3 mm ²)	CAN bus	Twisted pair with pin 5.
7	GND	Ground	 black	14 AWG (2.1 mm ²)	Power ground / return	Chassis ground. Second return path; must be connected.
8	AUX2 LS 1A	Low-side auxiliary output 2	 pink	16 AWG (1.3 mm ²)	Ground-switching sink, nominal 1 A-class, PWM	As AUX1.
9	OUT4 10A	Output 4	 tan	16 AWG (1.3 mm ²)	High-side 12 V PWM; designed for 10 A	Positive-side output from the dedicated feed. Shares the 30 A fused path; actual load and thermal capability require validation.
10	OUT3 10A	Output 3	 grey	16 AWG (1.3 mm ²)	High-side 12 V PWM; designed for 10 A	Positive-side output from the dedicated feed. Shares the 30 A fused path; actual load and thermal capability require validation.
11	OUT2 10A	Output 2	 blue	16 AWG (1.3 mm ²)	High-side 12 V PWM; designed for 10 A	Positive-side output from the dedicated feed. Shares the 30 A fused path; actual load and thermal capability require validation.

Pin	Lead label	Function	Colour	Gauge	Rating / range	Notes
12	OUT1 10A	Output 1	orange	16 AWG (1.3 mm ²)	High-side 12 V PWM; designed for 10 A	Positive-side output from the dedicated feed. Shares the 30 A fused path; actual load and thermal capability require validation.



OUTPUT CURRENT

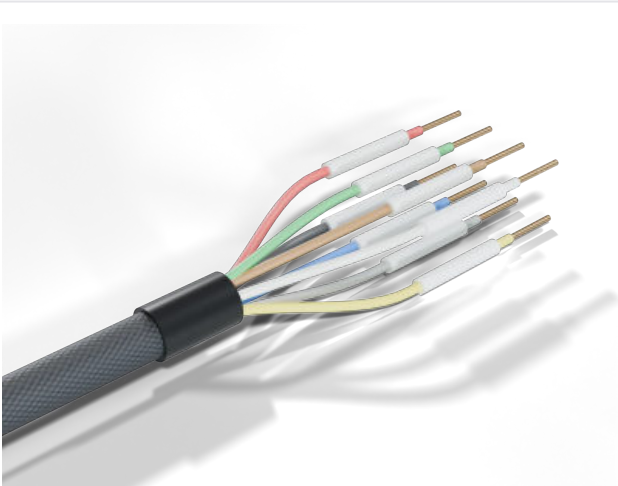
OUT1–4 have built-in high-side PWM power drivers designed for 10 A each, sharing a 30 A fused power path. Compatible loads connect directly; no extra driver is needed within their electrical requirements. Check running and start/stall current, wiring, connectors, fuse protection, cooling and enclosure temperature for the actual installation; reduce the load or use a suitable external driver where needed. Do not plan four 10 A loads at once. AUX1–2 are nominal 1 A-class low-side sinks. The load connects from fused +12 V to AUX, with a common power ground. OUT1–4 instead connect to load positive; load negative returns to ground. Neither output type is an isolated contact.

On the LS Rev A assembly, an unplugged dedicated feed can backfeed the load rail and produce a false feed indication or an unstable heavy-output supply. Fit the dedicated fused feed before using OUT1–4. Verify it at J6 pin 1 with a meter; the app or LED alone is not proof. Software cannot correct this power-path issue.

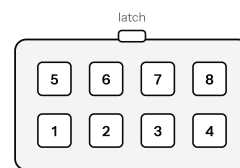
IGN is a sense/wake input, not a physical load–power interlock. Configure and test key-off output behaviour. Choose compatible inductive suppression using the separate high-side and low-side examples below.

The supplied wire gauges do not establish the current capability of the board, connector or installed assembly. Validate the complete path, including start/stall current and heat. Controllers, EBC triggers and automations share six channels: there are four heavy outputs and two small AUX sinks, not six interchangeable power drivers.

2.5 Harness C — Sensor inputs 0.5 M



Eight labelled leads, all 20 AWG.



Bottom row, left to right: 1 IN1-2 IN2-3 IN3-4 +5V OUT
Top row, left to right: 5 IN4-6 IN5-7 IN6-8 GND
Looking into the plug's mating face with the latch at the top

Sensor port plug, 8-way.

Pin	Lead label	Function	Colour	Gauge	Range	Notes
1	IN1	Input 1	 white	20 AWG (0.5 mm ²)	0–5 V	Analog or level/switch. App name: IN1.
2	IN2	Input 2	 brown	20 AWG (0.5 mm ²)	0–5 V	App name: IN2.
3	IN3	Input 3	 green	20 AWG (0.5 mm ²)	0–5 V	App name: IN3.
4	+5V OUT	Sensor supply	 red	20 AWG (0.5 mm ²)	5 V out; keep combined sensor draw below $\approx$ 500 mA	For compatible 5 V sensors; shares the board rail. Allow margin. Not for pumps, lamps, relays or wideband heaters.
5	IN4	Input 4	 yellow	20 AWG (0.5 mm ²)	0–5 V	App name: IN4.
6	IN5	Input 5	 grey	20 AWG (0.5 mm ²)	0–5 V	App name: IN5.
7	IN6	Input 6	 blue	20 AWG (0.5 mm ²)	0–5 V	App name: IN6.
8	GND	Sensor ground	 black	20 AWG (0.5 mm ²)	—	Reference for all sensors. Do not use as a load return.

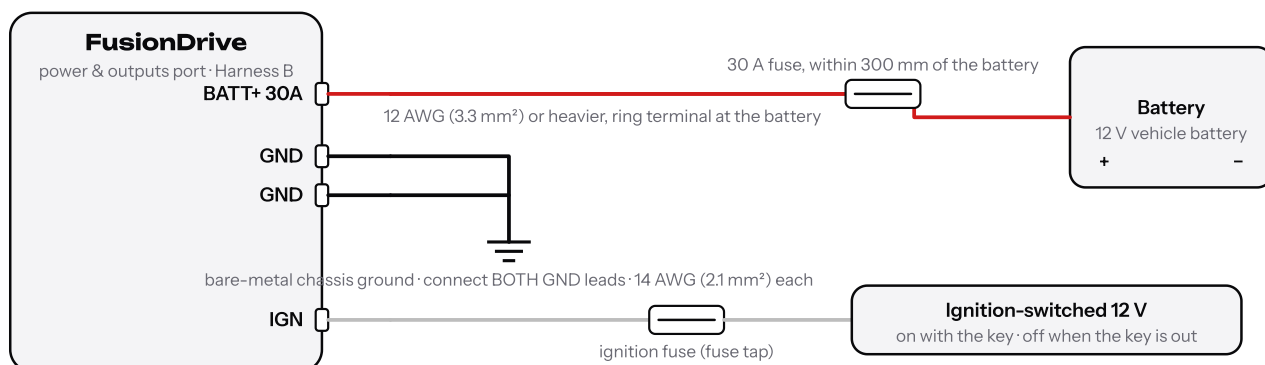
Input behaviour

- **Voltage compatibility:** inputs accept conditioned 0–5 V signals. Never connect 12 V, a coil/ignition signal or a negative-going signal directly. Input clamps are not permission to miswire; an overvoltage or transient can damage the controller or the connected sensor.
- **Zero is a reading, not a diagnosis:** an open input tends toward 0 V, but 0 V may also be a valid sensor value. A zero reading, freshness flag or app label does not prove a wire is intact. Check the sensor's documented failure voltages and test the chosen fault response.
- **Calibration:** analog inputs use the voltage/value calibration you set. Presets are starting points; enter the correct units, range and calibration from the actual sensor or conditioner.
- **Level/switch mode:** the default threshold is 2.5 V. Threshold, hysteresis and reverse logic are configurable. Verify both states and the disconnected-wire state before using a switch as an arm or safety input.
- **Sensor supply:** J8 pin 4 supplies 5 V for compatible sensors and shares the board's 5 V rail. Keep the combined external sensor draw below the hardware guide's approximately 500 mA allowance, with margin. It is not a pump, lamp, relay or wideband-heater supply.
- **Sensor reference:** use J8 pin 8 sensor GND as the signal reference. Do not use it as a load return. Before sharing an existing sensor signal, verify its output type, voltage, grounding and permitted additional loading with the device maker.
- **Pulse and specialised sensors:** these multiplexed analog inputs are not dedicated frequency counters. Frequency-output flex-fuel or flow sensors, crank/cam signals and raw thermocouples need a compatible conditioner or a supported, defined CAN signal. Selecting a preset does not add the missing interface.
- **Freshness:** input conversion, CAN/OBD acquisition and phone display rates differ. Use the actual source age and configured stale limits; a faster display or recording setting does not make the sensor update faster.

2.6 Typical wiring diagrams

These LS wiring examples show connection polarity; they do not qualify every pump, valve, controller or relay. Fuse values are illustrative or shared-path limits, not continuous-current ratings. Verify the actual load, start/stall current, wiring, driver, suppression and heat before connecting it. OUT1–4 require the dedicated feed; all connected supplies need the correct common reference.

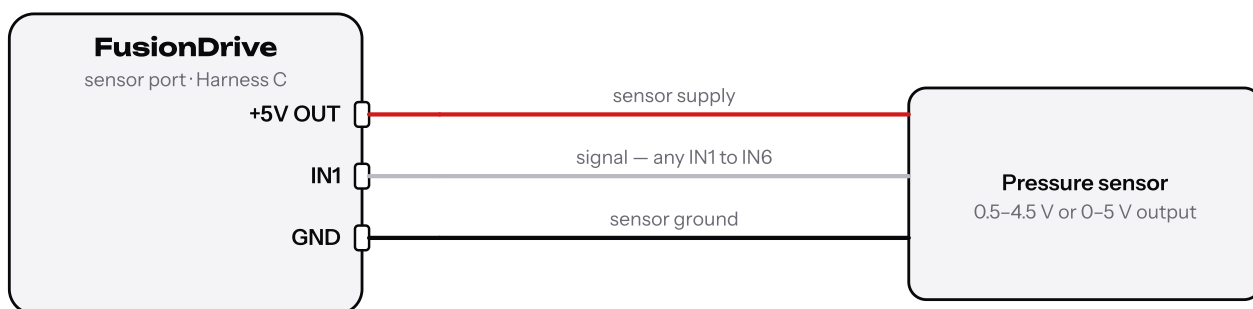
Dedicated power feed and ignition sense



The controller has its own 30 A fuse inside; the fuse at the battery protects the harness. Never connect always-on 12 V to IGN.

Battery positive through an appropriately sized fuse (30 A maximum path limit) to J6 pin 1 **BATT+ 30A**; both **GND** leads, pins 4 and 7, to power ground; **IGN**, pin 3, to a verified ignition-switched circuit. The pictured fuse does not establish continuous load capacity. Verify the real feed, not only its indicator.

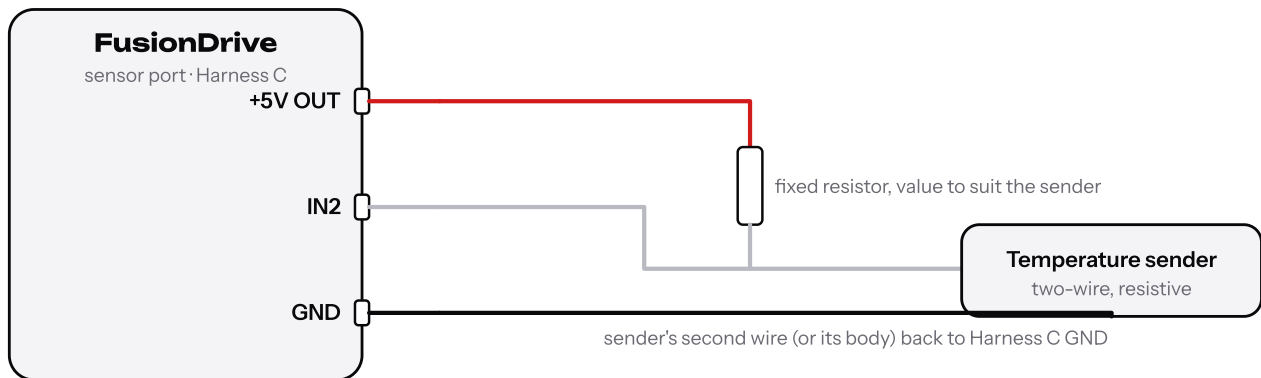
Three-wire 0–5 V pressure sensor



Configure the actual sensor's input, units and voltage/value calibration. Presets do not establish electrical compatibility.

Example for a sensor rated for a 5 V supply with a documented 0–5 V analog output. Other supply voltages need the correct external supply and compatible reference. Frequency-output ethanol/flow sensors and raw thermocouples do not connect this way without conditioning.

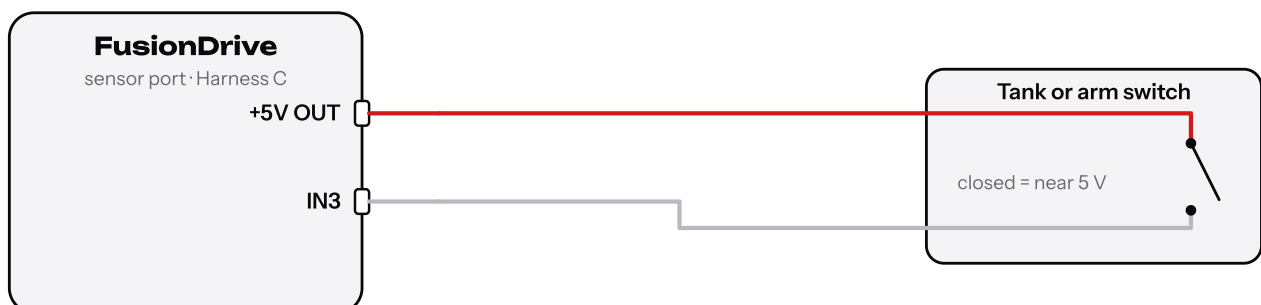
Two-wire temperature sender



A linear calibration is only an approximation for a nonlinear sender. Check the useful range at known temperatures. Use a compatible conditioner when accurate temperature limits are needed; never connect a raw thermocouple directly.

A compatible resistive sender and correctly selected pull-up produce a voltage. The sender is generally nonlinear: a two-point linear calibration is an approximation that must be checked over the useful range. Use a conditioner where accuracy is needed; this is not a raw thermocouple input.

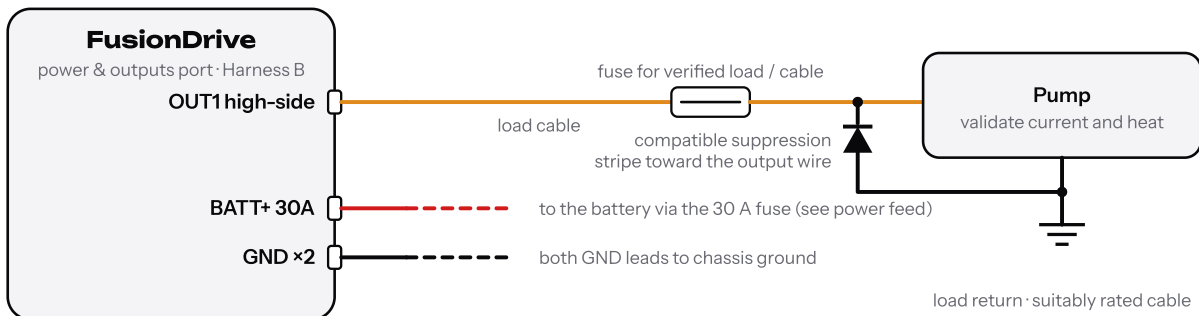
Level switch, float switch or arm switch



Level / Switch: set threshold (default 2.5 V), hysteresis and polarity; verify both states and the disconnected-wire state. Never wire a switch between an input and 12 V. Any of IN1 to IN6 can be a switch input.

Compatible dry switch between **+5V OUT** and an input. Closed is near 5 V; the displayed meaning depends on configured polarity and threshold. An open switch and broken wire can look the same. Configure and test any arm or protection logic separately.

High-current pump on an output



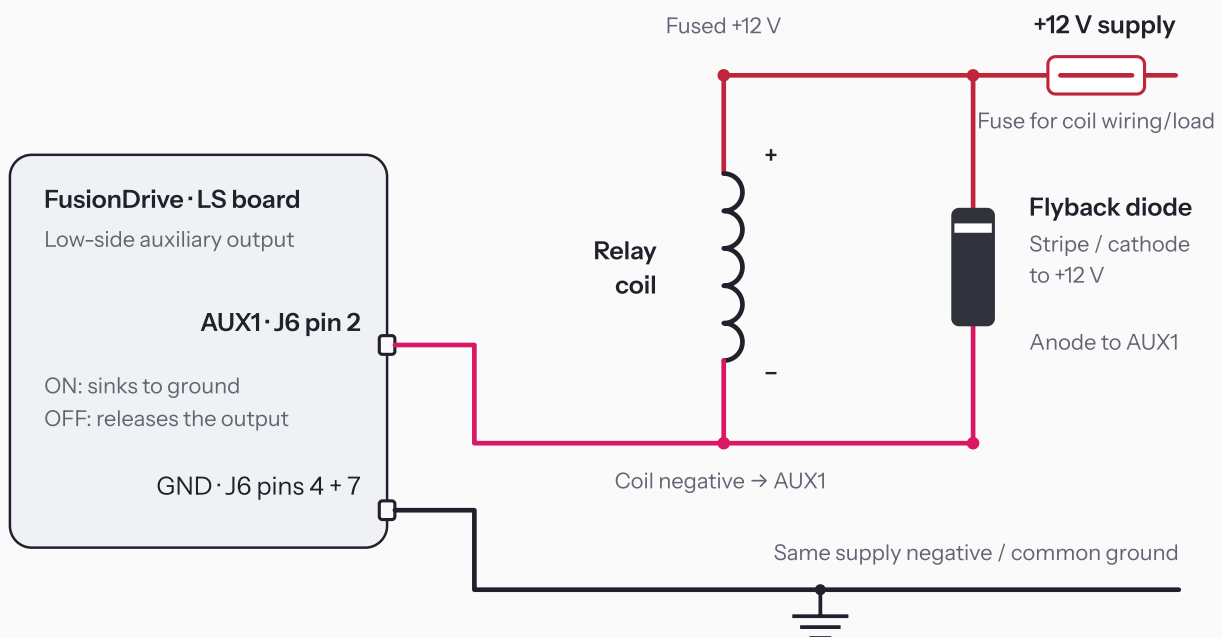
OUT1-4 are high-side outputs. Use the dedicated fused feed; verify the load, wiring and shared path capacity.

High-side example: OUT1 supplies load positive and load negative returns to power ground. Protect the cable/load with a suitable fuse and follow the pump maker's suppression and PWM requirements. For a compatible diode-suppressed load, stripe/cathode connects to OUT and anode to ground. Verify running/start current and heat; use an external driver if needed.

Relay on an auxiliary output

Relay coil on LS AUX1

AUX switches the coil to ground. The relay contacts switch a separate load.

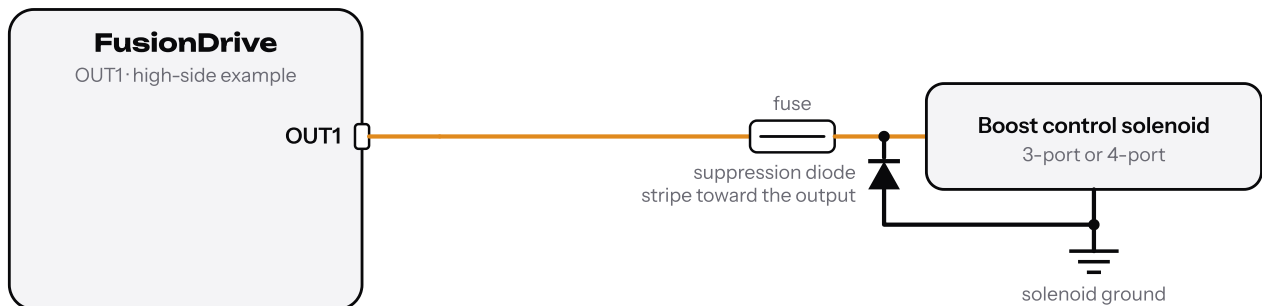


AUX: nominal 1 A-class sink — verify coil current and suppression.

Follow relay polarity if suppression is built in. Contacts/load wiring and FD power feeds are not shown.

LS AUX relay coil: fused +12 V to coil positive; coil negative to AUX1 (J6 pin 2). The flyback stripe/cathode faces +12 V; its anode faces AUX1. Use common power ground. Relay contacts and their separately fused load are not shown; select their ratings for the actual load. A mechanical relay is on/off only.

Boost control solenoid

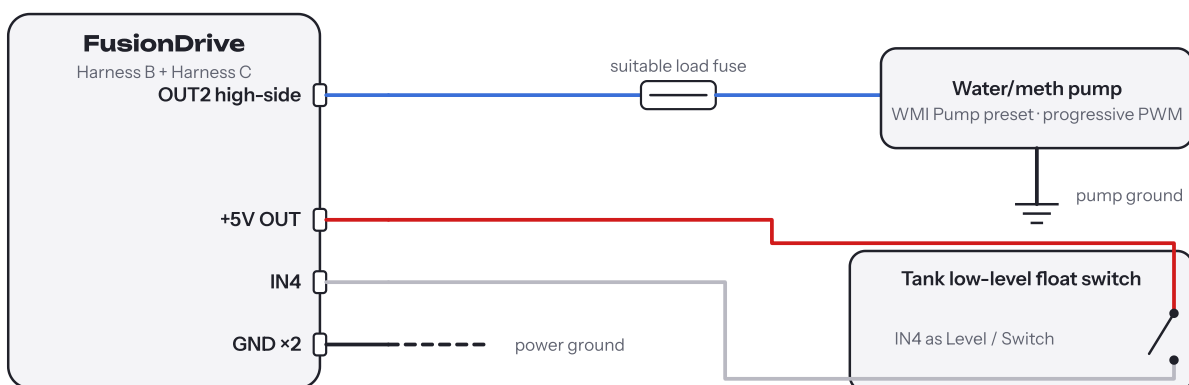


High-side example: OUT1 to coil positive, coil negative to ground; stripe/cathode to OUT1, anode to ground. Use the dedicated fused feed. Follow the valve maker's plumbing, PWM and suppression requirements.

High-side OUT1 example for a compatible solenoid; the dedicated feed is required. Match polarity, current, frequency, suppression and pneumatic plumbing to the actual valve. A preset name is not a compatibility guarantee.

Low-side alternative: a compatible small solenoid may instead connect from fused +12 V to AUX1 or AUX2, with its negative terminal on AUX. Use the LS diode orientation shown in the relay example: stripe/cathode to +12 V, anode to AUX. Stay within the nominal 1 A-class interface and validate the actual load and power sequencing.

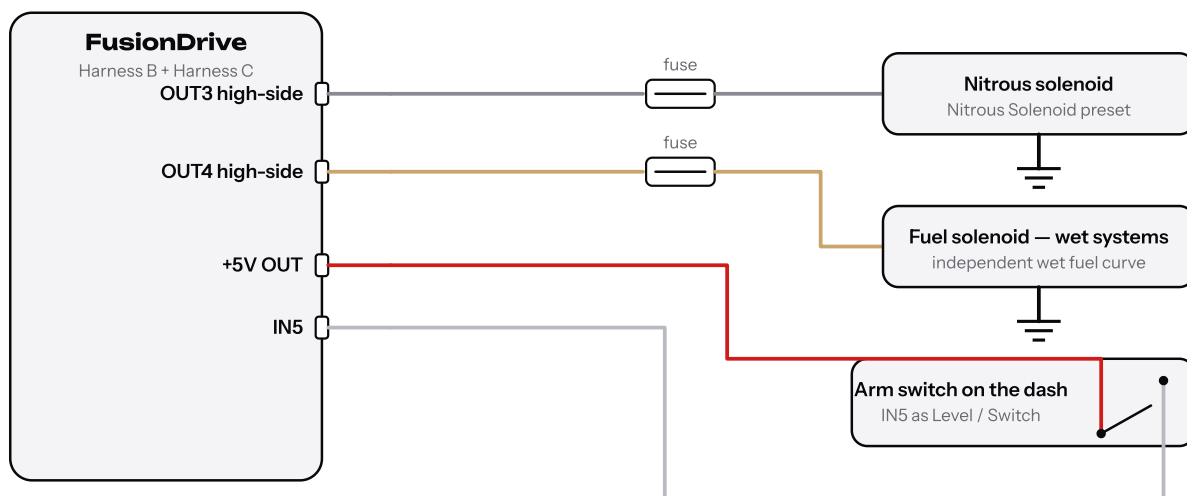
Water/methanol pump with a tank level switch



Select and test the level source and fault response; a switch connection alone does not configure protection. IN4 open tends low through internal pull-down bias; an open switch and a broken wire can look the same.

Compatible pump on high-side OUT2, with a separately configured level/switch input. Select and test the WMI or automation gate and any linked boost cut; the wire alone does not establish protection. Pump duty is not measured flow. Required feed wiring and manufacturer-compatible suppression are omitted for clarity. An existing WMI controller can remain in control when using compatible monitoring or binary permit wiring instead.

Nitrous solenoid with an arm switch



Configure and test the arm input, stage limits and required source gates; confirm physical operation safely.

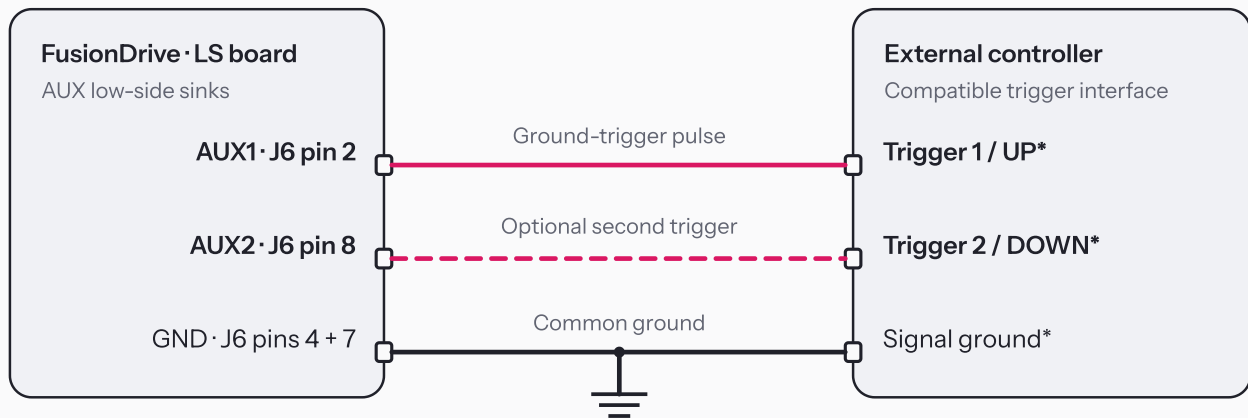
One compatible wet stage: nitrous on OUT3, fuel on OUT4 with its independently configured curve, and a selected/tested arm switch on IN5. Add the dedicated feed, individual fuses and required suppression. Dry stages use no fuel output. Up to three configured stages share the same six-channel budget; three wet stages leave no spare channels and still include only four heavy outputs. Nitrous boots disabled; review any explicitly configured local re-enable path. A retard output is only a compatible binary request, not direct ignition timing control.

Keeping an external boost controller

FusionDrive can use AUX1 (J6 pin 2), and AUX2 (J6 pin 8) where required, to operate **documented ground-trigger selection inputs** on a compatible external EBC. The EBC retains its own sensor, control algorithm and solenoid wiring. Choose the matching pulse/group behaviour only after checking the exact controller manual.

Keep a compatible external boost controller

Connect only to inputs documented for a momentary pull to ground.



No +12 V is injected into these trigger inputs.

*Use the controller manual: names, polarity, pulse timing and electrical limits vary.

AUX is nominal 1 A-class, not an isolated contact. Controller power and solenoid wiring are not shown.

AUX sinks a documented trigger input to the shared ground. The optional second wire is only for a controller that requires it. Do not inject +12 V into the input or treat AUX as an isolated pushbutton contact.

Check trigger voltage, sink current, polarity, pull-ups, pulse width, group count and power-on behaviour. Analog, resistor-ladder, isolated-contact or proprietary interfaces need a suitable interface; a brand/preset listing is not universal electrical compatibility. If group restoration is enabled, FusionDrive assumes the external EBC starts at Group 1. Verify that reset synchronisation on the actual device before relying on restored selections. These two AUX channels cannot simultaneously serve other output assignments.

2.7 Extending the leads

Lead	Harness gauge	Minimum extension gauge	Notes
BATT+ 30A	12 AWG (3.3 mm ²)	12 AWG (3.3 mm ²)	Heavier for runs over 2 m. Fuse at the battery.
GND (Harness B)	14 AWG (2.1 mm ²)	14 AWG (2.1 mm ²)	Keep short; ground close to the controller.
OUT1-OUT4	16 AWG (1.3 mm ²)	16 AWG (1.3 mm ²)	Select for actual load current, voltage drop, temperature and installation length.
AUX1, AUX2, IGN	16 AWG (1.3 mm ²)	16 AWG (1.3 mm ²)	Match or exceed the supplied gauge; AUX load current returns through its lead.
CAN2 H / L	16 AWG (1.3 mm ²)	18-20 AWG twisted pair	Keep the pair twisted to within 25 mm of each end.
IN1-IN6, +5V OUT, GND (Harness C)	20 AWG (0.5 mm ²)	20 AWG (0.5 mm ²)	Twisted or shielded for long or noisy runs; shield to Harness C GND at the controller end only.

- Use crimped butt splices or heat-shrink splice sleeves, then adhesive-lined heat shrink over the joint.
- Use automotive thin-wall wire rated to at least 105 °C; 125 °C in the engine bay.
- Keep sensor wiring away from output wiring and ignition components.

2.8 Optional ignition sense with OBD

J6 pin 3 remains the dedicated IGN sense input. It is optional for software vehicle-activity detection when fresh running-engine OBD data is available; either or both sources may be used. IGN is not a load-power feed. Preserve all documented output, ground and CAN pin assignments.

3

— REFERENCE

Technical specifications

Ratings, ranges and limits for the FusionDrive controller, its harnesses and the app. Where a figure is still being finalised for production it is marked as such rather than guessed.

FD Design LS · Rev A-LS LS wiring reference Figures are typical unless stated



FusionDrive controller. All connections on one face; steel base plate with four mounting slots.

3.1 At a glance

6 sensor inputs

0–5 V analog or level/switch, with a 5 V sensor supply.

6 PWM outputs

4 high-side OUT + 2 low-side AUX (nominal 1 A-class). All PWM-capable.

Vacuum to 60 psi

Built-in gauge boost/vacuum sensor with a 2 mm hose barb.

OBD-II + CAN 2

Vehicle bus over the OBD-II socket plus a private second CAN bus.

Bluetooth + Wi-Fi

Bluetooth to the iPhone app and CarPlay; Wi-Fi for firmware updates.

12 V, 30 A

OBD-powered (2 A) or a dedicated 30 A fused feed.

3.2 Electrical & power

Supply voltage	12 V nominal vehicle system. Use within the validated assembly and accessory supply limits. Not for 24 V vehicles; automotive transient and environmental qualification remains part of beta hardware testing.
Power sources	Harness A provides vehicle supply for logic, sensing and communication. OUT1–4 require the dedicated fused feed on J6 pin 1. AUX1/2 are ground-switching outputs: they do not source power to a load. On Rev A-LS, the dedicated-feed indication can be affected by a documented backfeed path; verify the actual feed electrically.
OBD feed protection	2 A self-resetting protection inside the controller Recovers by itself once the overload is removed.
Dedicated feed protection	30 A mini blade fuse inside the controller Plus the 30 A fuse the installer fits at the battery, which protects the harness.
Shared output supply	OUT1–4 are designed for 10 A each and share a 30 A fused supply path. Compatible loads use the built-in drivers directly. Design ratings still require validation of continuous current for the complete board, connectors, enclosure or simultaneous PWM loads. Validate the installation and each load.
Ignition sense input	/IGN lead, 12 V ignition-switched, sense only (about 0.2 mA) High = key on. Used by configured wake and control logic. It is not a physical power interlock for OUT1–4. Wire and test it according to the installation guide.
Sleep behaviour	Configured activity, ignition and sleep policy determine entry and wake. Test wake timing and current on the delivered board; the software's timers are not a measured vehicle response guarantee.
Sleep current	About 1–2 mA at 12 V (design figure) Roughly 0.03–0.05 Ah per day; two weeks parked costs under 1 Ah. Final production figure to be confirmed after validation.
Power-up state	Saved configuration is restored. Manual duty resets to zero, prime is transient and nitrous starts disarmed. Review saved local rules and controller startup behavior before connecting loads.
Grounding	Two 14 AWG ground leads on Harness B (both must be connected); separate sensor ground on Harness C

3.3 Sensor inputs

Number of inputs	6 (IN1–IN6), on Harness C
Input range	0–5 V conditioned analog input. Keep the signal within this range and use the correct common reference. Do not apply 12 V, negative voltage or an unconditioned ignition/crank signal.
Sensor types	Documented 0–5 V outputs, appropriately conditioned resistive/temperature sensors and correctly biased slow switches. Pulse/frequency flow or flex-fuel sensors need a suitable converter or CAN accessory. Sharing an existing sensor requires checking loading, grounding and the original equipment's requirements.
Level / switch threshold	Configure digital mode, inversion, thresholds and debounce for the actual switch circuit. Verify both open and closed values; do not assume an open circuit means zero.

Unconnected input	An unconnected or zero-volt input is not a universal absence detector. Set expected range, validity and stale behavior and verify the signal before using it as a protection or automation condition.
Resolution	Better than 1 mV at the input (about 0.2 mV)
Input load	The input conditioning loads and filters the source. Confirm the sensor/controller can drive it without changing the reading seen by existing equipment; compatibility is not established by the voltage range alone.
Protection	Conditioning and clamps do not authorize overvoltage or reversed wiring. A wiring mistake may damage the sensor, FD or connected equipment.
Update rate	Six channels share multiplexed ADC conversion. Filtering, channel count and firmware service cadence affect freshness. A requested 50 Hz log can contain repeated source values; inspect source ages and acquisition gaps.
Sensor supply	J8 pin 4 provides a 5 V sensor supply, with sensor ground on pin 8. Confirm the combined sensor current and wiring against the delivered hardware specification. Do not join it to another device's 5 V regulator.
Built-in presets	External Boost / MAP, Oil Pressure, Fuel Pressure, Ethanol Content, EGT, 0–5 V Generic, Level / Switch Any input can also be scaled manually with two voltage/value points.

3.4 Outputs

Number of outputs	6 — OUT 1, OUT 2, OUT 3, OUT 4, AUX 1, AUX 2 — on Harness B
Type	OUT1–4 are high-side 12 V outputs: OUT → load positive, load negative → common ground. AUX1/2 are low-side sinks: fused compatible supply → load positive, load negative → AUX. AUX is neither an analog voltage output nor an isolated relay contact.
OUT 1–4 load capability	Four outputs on a shared 30 A fused path, requiring a correctly fused dedicated feed. Individual/simultaneous continuous load, inrush, PWM and thermal capability must be validated on the assembly; component or lead labels are not that validation.
AUX 1–2 load capability	Nominal 1 A-class low-side circuits on J6 pins 2 and 8. Use documented compatible ground-trigger inputs or suitably rated loads. Common ground, load supply and power sequencing must suit the circuit.
PWM frequency	1 Hz – 40 kHz, set per output Presets: Boost Solenoid 30 Hz · Nitrous Solenoid 100 Hz · Fuel Pump 250 Hz · WMI Pump 500 Hz · Generic 1 kHz · Cooling Fan 25 kHz (inaudible)
Duty range	0–100 % in 1 % steps, with per-output minimum and maximum limits and ramp rates Fuel Pump preset enforces a 30 % minimum duty.
Load types	Compatible pumps, fans, solenoids, relay coils or external control inputs within the selected channel's capability. Match inductive suppression to the load: diode cathode/stripe goes toward load positive. That is OUT for a high-side circuit, but the fused positive supply for low-side AUX.
Protection	Fuse the supply and each load to protect its wiring and validated current limit. The board does not measure per-output current, voltage, pump rotation or fluid flow. A commanded duty or logical fault state is not proof of electrical load health.

Arbitration	Controller assignments share six physical channels. Conflicting assignments are rejected. Output commands, automation actions and configured protective cuts follow firmware arbitration; installation-specific physical protection remains necessary.
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3.5 Built-in boost sensor

Type	Gauge pressure, referenced to the air around the controller Reads boost and vacuum directly; no barometric correction needed.
Range	Full vacuum to +60 psi (414 kPa) boost Sensor span is -60 to +60 psi; readings below atmospheric show as negative (vacuum).
Resolution	About 0.03 psi (0.2 kPa)
Accuracy	Use the exact fitted sensor's specification and calibrate the assembled installation. Bench/vehicle measurement is required before relying on it for a protective threshold.
Update rate	Read continuously; used by the boost controller 50 times a second
Port	Barbed hose fitting on the connector face, about 2 mm across Suits 2 mm (5/64 in) bore silicone vacuum hose; use a T-piece with a 2 mm leg or a 4 → 2 mm reducer to join the vehicle's 3–4 mm line. Air only: the sensor tolerates humidity and fuel vapour but never connect liquids.
Fallback	AUTO retains the supported onboard/OBD policy. Explicit feedback selection uses the chosen calibrated input and does not silently substitute another source. An unplugged pressure hose may still produce plausible pressure and cannot be assumed detectable.

3.6 CAN & OBD-II

CAN 1 — vehicle bus	Via the OBD-II socket (pins 6 and 14) on Harness A
Protocol	Supported OBD-II over classical CAN, with configurable bus speed and standard/extended identifiers. Match the vehicle or accessory definition. The MCP2518FD hardware does not mean the current firmware implements full CAN FD data-phase operation.
Vehicles	Compatible 12 V vehicles with supported CAN-based OBD diagnostics. An OBD-II socket alone does not guarantee coverage; non-CAN diagnostic protocols are not provided through these CAN channels.
Live data	Discovery lists supported responses exposed by the vehicle and understood by FD. Availability and rate depend on the ECU, session and decoder. Proprietary signals need correct custom definitions; listening to bytes does not reveal their meaning automatically.
Fault codes	Read stored, pending and permanent fault codes with descriptions; clear codes
Operating modes	Auto (listen first, then request), Active (request), Passive (listen only, for aftermarket ECUs that broadcast, such as Haltech)

Decoding	Up to 70 configured decode rules, saved on FD so decoding and eligible local control continue without the phone. Full drive recording still requires the iPhone. DBC import supports the app's implemented subset; review imported definitions and units.
Transmit	Up to 8 custom frames broadcasting FusionDrive sensor values onto the bus (raw, or OBD-style responses) at 1-100 Hz
CAN 2 — private bus	A separate accessory bus on Harness B CAN2 H/L. Configure bus speed, listen-only/transmit permission and supported signal definitions for the accessory. General accessory-specific polling is not implemented; only supported configured transmissions may be sent. Saved decoded signals can feed eligible controllers, rules and selected log channels. Future FD add-ons require their own compatible definitions.

3.7 Connectivity

Phone connection	Bluetooth LE to the iPhone app. Actual update rate and reliability depend on channel selection, source rates, negotiated transport and radio conditions; no fixed rate is guaranteed for every signal.
Identification	Each controller advertises under its serial number, printed on the unit
CarPlay	Dashboard, boost, outputs, OBD and automations on the vehicle's screen through the paired iPhone
Wi-Fi	2.4 GHz Wi-Fi, used only for firmware updates from the FusionDrive update server. Enter network details in the app; the controller connects, downloads, verifies and reboots. Not required for normal operation.
Cloud	Optional FusionDrive account for drive logs, remote configuration and Intelligence briefs, via the app
Service port	Wired service connection for workshops and support; not used in normal operation
Security	Per-device claim code links a controller to an account. A PIN protects the separate connected configuration-snapshot tool, not general control access.

3.8 Control features

Boost control	Manual duty, open-loop tables or closed-loop PID; profiles, RPM targets, gear-by-RPM grids, speed/elapsed-load-time curves, source bindings and configured gates/protections.
Water/methanol	Progressive pump control, external monitoring or compatible binary interlock. Duty tables, priming, flow/pressure/level bindings and thresholds, grace/debounce/recovery and optional linked boost cut. Installed measurements are required for measured-delivery protection.
Nitrous	Up to three wet/dry stages and three profiles, with independent nitrous/fuel progression, time/RPM curves, gates, delays and limits. Selected fuel/bottle pressure and measured AFR/lambda protection require valid signals. Optional binary retard request needs a compatible external interface.

Automations	Up to 10 local rules, 8 conditions and 8 actions per rule, nested logic, hysteresis, delays, timed holds and bounded links between rules. Cycles are rejected and controller output ownership is respected.
External boost controller	One or two AUX channels can pulse documented compatible ground-trigger inputs. Model names are pulse presets, not proof of electrical compatibility. FD's assumed group is not a readback of the external controller's actual group.
Configuration storage	Operating settings, sensor calibration, bus/decoder definitions, controllers and automations are saved on FD after acknowledgement. Phone and web hold views/drafts; Cloud changes require review through the connected app and FD readback. Drive logs live on the phone and optional Cloud.

3.9 Environmental

Mounting environment	Cabin, or a dry, ventilated engine-bay location away from exhaust heat
Operating temperature	Final assembly temperature and load limits follow physical validation. Keep the beta unit away from exhaust heat, liquids and unsupported load conditions; a component temperature rating is not a complete enclosure rating.
Ingress	Splash-resistant only; not rated for submersion or direct spray (no IP rating claimed for the beta build) Mount with the connector face down or sideways where water could reach it. Plugs are latching but not sealed.
Cooling	Passive. The steel base plate conducts heat from the outputs into whatever it is bolted to; no fan, no vents.
Vibration	Solid mounting with four M6 bolts; harnesses supported within 150 mm of the controller

3.10 Mechanical



Base plate and mounting slots.

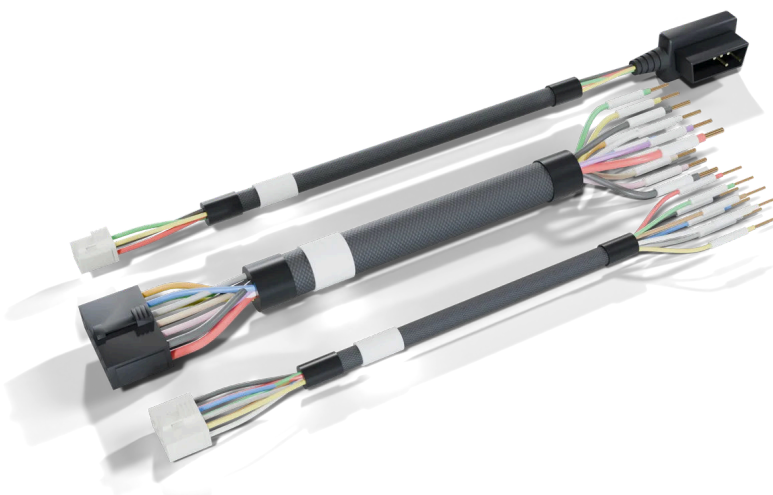


Rear view. The mounting flanges extend 14 mm beyond the body on each short side.

Body dimensions	146 × 98 × 34 mm (L × W × H) excluding plugs and barb
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Overall width including mounting flanges	174 mm
Mounting	4 slots, 6.5 mm × 10 mm, on 160 mm × 78 mm centres, for M6 (or ¼ in) bolts Slot long axis runs front to back, giving ±2.5 mm adjustment.
Clearance	Allow 60 mm in front of the connector face for plugs and cable bend
Enclosure	Black high-temperature polymer cover, 2.5 mm walls; 3 mm steel base plate with raised heat-transfer pads under the output stage
Weight	Approximately 550 g, controller only (estimate for the beta build from the plate and cover dimensions; final figure to be confirmed)
Connections	4-way OBD port · 8-way sensor port · 12-way power & outputs port · boost barb · service port. All plugs latching and keyed.

3.11 Harnesses



Harness A (OBD-II), Harness B (power & outputs), Harness C (sensor inputs).

Harness	Port	Length	Far end	Wire
A — OBD-II	OBD port, 4-way	1500 mm (+10 / -0)	Low-profile side-exit OBD-II plug, ≤18 mm proud of the socket	18 AWG power/ground, 20 AWG twisted CAN pair
B — Power & outputs	Power & outputs port, 12-way	500 mm (+10 / -0)	12 labelled flying leads, stripped and tinned; 400 mm sleeved, 100 mm free	12 AWG feed, 14 AWG grounds, 16 AWG outputs/signals
C — Sensor inputs	Sensor port, 8-way	500 mm (+10 / -0)	8 labelled flying leads, stripped and tinned	20 AWG throughout

Lengths are measured from the plug face to the far end. All wire is thin-wall automotive grade rated to 125 °C, sleeved in braided loom with printed heat-shrink labels rated for engine fluids and temperatures. Full pinouts are in the wiring reference. A 2.0 m OBD harness is available on request.

3.12 App requirements

Platform	iPhone running iOS 18 or later
CarPlay	A compatible wired/wireless CarPlay head unit and supported app distribution, via the paired iPhone
Connection	Bluetooth (always) · Internet for cloud sync, Intelligence and update checks (optional)
Account	Free FusionDrive account for cloud features; the controller works fully without one
Firmware updates	Delivered over Wi-Fi from the FusionDrive update server; the app notifies you when one is available

3.13 Warranty & regulatory



BETA QUALIFICATION STATUS

Warranty terms, regulatory approvals (radio, EMC) and conformity markings for production units will be published here before general release. Early-build units are supplied for evaluation and are supported directly by FusionDrive.

- **Intended use:** aftermarket performance and monitoring on 12 V vehicles. The installer is responsible for compliance with local vehicle regulations, including emissions and road-use rules for boost, water/methanol and nitrous systems.
- **Not covered:** damage from reversed polarity, connection to 24 V systems, unfused loads, liquid in the boost port, or physical modification of the controller or harnesses.
- **Support:** use *Report an Issue* in the app (More → Settings → Device & firmware → Report an Issue) to send diagnostics with your request. See troubleshooting.

3.14 Source availability

Software vehicle activity accepts dedicated IGN or fresh running-engine OBD evidence. Physical output ratings and wiring do not change with the selected activity source. Selecting OBD pressure is required when the onboard hose is intentionally unused; a valid atmospheric reading does not detect that installation choice.

4

— SUPPORT

Troubleshooting

Hardware and connectivity problems, organised by what you see. Each section lists the likely causes in the order they are worth checking, then the fix.

Covers the controller, harnesses and phone connection For app features see the app manual

4.1 Before anything else

Nine out of ten installation problems are one of these. Check them first, whatever the symptom.

- ☐ Both **GND** leads on Harness B are on bare metal, and the controller's base plate is bolted down
- ☐ All three plugs are latched: press each one home until it clicks
- ☐ The 30 A fuse at the battery is intact and the **BATT+ 30A** ring terminal is tight
- ☐ The vehicle's OBD socket fuse is intact (it often shares a fuse with the cigarette lighter or the radio)
- ☐ The phone has Bluetooth on and the FusionDrive app has Bluetooth permission (iPhone Settings → FusionDrive)
- ☐ The app and firmware are current



WHERE TO LOOK IN THE APP

The controller has no external lights: its status is shown in the app. *Connection* shows whether the controller is found and connected. *More → Outputs* shows whether the dedicated 12 V feed is present. *More → Diagnostics* shows the controller's own log, sleep history and sensor health. Most of the checks below refer to those three screens.

4.2 No power / controller never appears

Likely cause	How to check	Fix
OBD socket not powered	Measure between OBD socket pin 16 and pin 4 with a multimeter: expect battery voltage. Try another OBD device.	Replace the vehicle fuse that feeds the diagnostic socket. On vehicles where the socket is only live with the key on, fit the dedicated feed or the IGN lead.
Harness A not fully seated	The OBD plug should be pushed fully into the socket; the 4-way plug should have clicked into the controller.	Re-seat both ends.
Controller is asleep	With the key off and no bus traffic the controller sleeps after about a minute and is invisible to the app.	Turn the ignition on. It wakes instantly on CAN traffic or the IGN lead.

Likely cause	How to check	Fix
Dedicated feed only, no ground	If the controller is powered only from BATT+ (no OBD), a missing ground means no power at all.	Connect both GND leads to bare metal. Check the 30 A fuse at the battery.
Reversed BATT+ / GND	Check polarity at the leads with a meter.	Correct the wiring. If the controller then still does not power up, contact support: reversed power can damage it.
Internal 30 A fuse open	Dedicated 12 V shows as <i>not present</i> in the app even though there is 12 V on the BATT+ lead and grounds are good.	Something drew more than 30 A through the outputs, usually a shorted load. Find and fix the short and fuse the load, then contact support for fuse replacement. Do not open the enclosure yourself while under warranty.

4.3 Won't pair / not found in the app

- 1 Confirm the controller is awake.**
Ignition on, or engine running. A sleeping controller does not advertise.
- 2 Check the phone.**
Bluetooth on, FusionDrive allowed to use Bluetooth in iPhone Settings, and no other phone currently connected to the controller. Only one phone connects at a time.
- 3 Get closer.**
For the first connection sit in the car within a couple of metres of the controller.
- 4 Identify it.**
The controller appears under its serial number (printed on the unit) until you give it a name in the app. If there are several FusionDrive units nearby, match the serial.
- 5 Do not pair in iPhone Settings.**
FusionDrive connects from inside the app. If you previously added it in iPhone Settings → Bluetooth, tap the ⓘ and *Forget This Device*, then connect from the app.
- 6 Restart both ends.**
Close and reopen the app; switch the ignition off, wait two minutes for the controller to sleep, switch on again.

4.4 Drops connection

Likely cause	How to check	Fix
Drops when a pump or fan starts	Watch the connection while you run the load at 100 % from <i>Controls</i> .	Supply or ground problem. Add or improve the chassis ground for the controller and the load; make sure both GND leads are connected; check the battery feed terminals. Check the load is on the dedicated feed, not the OBD supply.

Likely cause	How to check	Fix
Range	Drops when the phone is in a bag or the controller is in the engine bay behind the firewall.	Move the phone; consider relocating the controller to the cabin.
Controller going to sleep	Drops happen about a minute after the engine is switched off, or on a vehicle whose bus goes quiet while running.	Expected at key-off. If it happens while driving, wire the IGN lead (see sleeps unexpectedly).
Phone power saving	Drops when the phone screen locks for a long time.	Allow FusionDrive background activity; keep CarPlay connected.
Interference from unshielded ignition components	Drops only at high RPM.	Move the controller and its harnesses away from coils and plug leads.

4.5 OBD not detected / no vehicle data

1 Ignition on, engine running.

Many ECUs answer nothing with the engine off. Give the controller 30 seconds after start-up.

2 Is your vehicle CAN-based?

FusionDrive reads OBD-II over CAN (see specifications). Vehicles built before CAN became standard receive power from the socket but do not supply data. The controller still works for sensors, outputs and boost; wire the IGN lead so it knows when the engine is running.

3 Check the mode.

In *CAN & OBD* settings, *Auto* listens first and then requests. If the vehicle only answers requests, switch to *Active*. Aftermarket ECUs that broadcast (for example Haltech) need *Passive* plus decode rules.

4 Another device on the socket?

Dongles or splitters on the OBD socket can disrupt the bus. Remove them and try again.

5 Check the plug.

The OBD plug must be fully home. Check the socket for bent or pushed-back pins at positions 6 and 14.

6 Reset CAN.

In *CAN & OBD*, clear the registry and let discovery run again with the engine running.

4.6 No PIDs, or a value you expect is missing

Symptom	Likely cause	Fix
RPM, coolant, throttle appear, but not boost or AFR	Your ECU does not answer those standard parameters. Very common.	Use the built-in boost sensor for boost; add a wideband with a 0–5 V output on a sensor input for AFR; or decode a documented compatible CAN broadcast. The custom sensor-transmit editor does not add proprietary OBD polling.

Symptom	Likely cause	Fix
Nothing at all after discovery	Engine was off during discovery, or the vehicle only answers active requests.	Run discovery with the engine running; set the mode to <i>Active</i> .
Values update slowly	Many parameters enabled on a slow ECU.	Disable parameters you do not use; the ones you keep update faster.
Values from an aftermarket ECU are wrong	Decode rule uses the wrong byte order, scale or offset.	Check the ECU's CAN documentation; import the DBC file if available; adjust the rule and compare against the ECU's own display.
Fault codes won't read or clear	Engine running, or the ECU does not support clearing over the bus.	Read and clear with the engine off, ignition on.

4.7 Sensor reads wrong or shows "No signal"

Symptom	Likely cause	Fix
<i>No signal</i>	The signal failed its configured validity/freshness checks. Possible causes include wiring, power/reference, calibration, source selection or stale data; zero volts alone is not a universal fault.	Check the signal wire lands on the input you configured; check 5 V at the sensor between +5V OUT and GND; set validity, calibration and digital thresholds to the actual sensor specification rather than bypassing a fault with a different preset.
Reads full scale all the time	Signal wire touching 12 V or the sensor supply, or the sensor is a 12 V type.	Only 0–5 V sensors are supported. Never connect 12 V to an input; check for chafed wiring.
Reads zero with a healthy sensor	Sensor grounded to the engine rather than Harness C GND, or the range is set wrongly (for example minimum voltage above what the sensor produces).	Ground the sensor to Harness C GND; check the preset's voltage range against the sensor data sheet.
Reading is noisy or jumps	Wiring runs alongside ignition or output wiring; poor ground; sensor supply overloaded.	Re-route away from noise sources, use twisted or shielded wire, check the total load on +5V OUT.
Level switch always on or always off	The switch circuit's bias, threshold or inversion does not match the configured full/empty states.	Measure both switch states and confirm suitable bias and 0–5 V levels. Set threshold, hysteresis, debounce and inversion to the actual circuit; see the wiring example.
Temperature is way off	Two-wire sender configured without the external resistor, or scaled with the wrong points.	Fit the resistor from +5V OUT (see wiring); scale from two known temperatures.
Reading offset by a constant amount	Sensor's true range differs from the preset (for example a 0–100 psi sensor with a 0–150 psi preset).	Edit the sensor and enter the correct minimum and maximum values.

4.8 Output won't switch

1 Check the app first.

In *Controls*, is the output enabled and in *Manual* mode? An output assigned to the boost controller, water/meth or an automation is controlled by that feature, and a failsafe can hold it off. The output's duty and controlling source are shown on its card.

2 Dedicated 12 V present?

OUT 1–4 need the dedicated feed. If *More* → *Outputs* says it is not connected, check the 30 A fuse at the battery, the BATT+ terminal, and both GND leads. AUX1/2 switch a compatible external supply/load to ground; they do not supply 12 V. On Rev A-LS, verify the dedicated feed electrically because the app indication can be affected by backfeed.

3 Ignition seen?

Check each output/controller's configured ignition-off policy. IGN is a firmware sense input, not a physical OUT interlock. If the app shows ignition off with the key on, the IGN lead is unwired, on an accessory circuit, or on a blown fuse. Measure it: expect battery voltage with the key on.

4 Measure at the lead.

With a suitable test load and 100 % duty, an active OUT1–4 lead should approach its supply voltage relative to power ground. An active AUX1/2 lead instead approaches ground, with voltage across the load from its fused positive supply. Verify supply, return and load current; an unloaded pin reading is not proof of delivery.

5 Check the load's fuse.

A fuse that blows immediately means a short or a load that draws more than expected at start-up. Do not fit a bigger fuse than the output rating.

6 Check the output type.

OUT1–4 supply load positive, with load negative to common ground. AUX1/2 connect load negative to ground when active; load positive goes to a compatible fused supply. Use the LS diagram and test with a suitable dummy load. An unloaded AUX voltage alone does not establish correct switching.

7 PWM and relays.

A mechanical relay driven with a PWM duty below 100 % chatters or does not pull in. Set the output to on/off (100 %) for relays.

4.9 Output or controller gets hot

Likely cause	How to check	Fix
Load draws more than the output rating	Measure the load's current with a clamp meter at 100 %; check the load's specifications, especially start-up and stall current for pumps and fans.	Stop and validate the load, inrush, PWM, wiring and thermal conditions. OUT1–4 share a 30 A fused path; AUX is nominal 1 A-class. These do not establish safe continuous assembly limits. Use a correctly rated external driver where required.

Likely cause	How to check	Fix
Solenoid, relay or motor without a suppression diode	Inductive loads switched with PWM and no diode across them stress the output every cycle.	Follow the load maker's suppression requirements. For a compatible diode, cathode/stripe goes to load positive: OUT for a high-side circuit, fused +12 V for an AUX low-side circuit. Select current, transient and release-time ratings for the load; see the separate wiring examples.
Controller not heat-sunk	Mounted on plastic, carpet, or hanging from the harness.	Bolt the base plate flat to a metal panel or bracket. The plate is the heatsink.
Poor airflow or hot location	Mounted near exhaust, turbo or radiator, or wrapped in insulation.	Relocate.
Several high loads at once	Total current over 30 A trips the fuse; sustained totals near 30 A run hot.	Spread loads, use relays, or stagger them with automations.
Wrong PWM frequency for the load	A motor run at very low frequency draws high peak currents; a solenoid run at very high frequency may not switch cleanly.	Select the load role, then explicitly set and verify Frequency and Duty Limits against the load maker's requirements before saving.

Warm is normal at sustained high current. Too hot to touch for more than a moment, or a smell, is not: switch the loads off and investigate.

4.10 Boost reads negative, flat or wrong

Symptom	Likely cause	Fix
Negative at idle	That is vacuum: correct behaviour with the engine idling.	Nothing to fix. Boost goes positive under load.
Negative or nonsense with the engine off	Hose blocked with liquid, or sensor fault.	Disconnect the hose at the controller and let it read open air: expect close to 0 psi. Clear or replace the hose. If it still reads wrong, contact support.
Flat at zero, never moves	Hose off, kinked, split, or tapped before the throttle body; a hose too large for the 2 mm barb that leaks at the joint; or boost source set to OBD MAP with no MAP data.	Check the hose end to end; use 2 mm bore hose at the barb; move the tap to a post-throttle manifold source; in <i>Boost</i> set the source to the built-in sensor.
Reads lower than the ECU or a gauge	Long hose with a small leak, or a restricted T-piece.	Shorten the hose, replace the T-piece, check every joint.
Reads higher than the ECU	ECU shows absolute pressure (MAP) rather than gauge boost, or the tap is before the throttle.	Compare with a gauge, not the ECU's MAP; move the tap.

Symptom	Likely cause	Fix
Spikes or oscillates	Hose picking up pulsation from a single cylinder port, or PID gains too aggressive.	Tap a plenum or common manifold source; lower the response level or gains in <i>Boost</i> .
Over 60 psi shown	Beyond the sensor's range.	The built-in sensor reads to 60 psi. Use an external 0–5 V sensor on an input for higher pressures.

4.11 Controller sleeps unexpectedly

The controller sleeps about 60 seconds after the vehicle CAN bus has been quiet for 30 seconds *and* the IGN lead is not at 12 V. A connected phone does not keep it awake.

Situation	Why it sleeps	Fix
Non-CAN or aftermarket-ECU vehicle	No bus traffic to keep it awake.	Wire the IGN lead to an ignition-switched circuit.
Vehicle goes quiet on the bus while the engine runs	Some vehicles stop broadcasting when no diagnostic tool is talking.	Wire the IGN lead; or set CAN mode to <i>Active</i> so the controller keeps the bus busy with requests.
IGN lead wired but no effect	Connected to an accessory circuit that is off, or to a circuit that is not 12 V.	Measure the IGN lead: expect battery voltage with the key on. Move it to a proper ignition-switched fuse.
Sleeps during a phone-only session in the garage	Engine off and bus quiet.	Turn the ignition on while you configure, or wire the IGN lead to a switched circuit you can leave on.
Never sleeps, battery goes flat	IGN lead on always-on power, or a vehicle that keeps its bus awake.	Move IGN to an ignition-switched circuit. If the vehicle bus never sleeps, contact support.

More → *Diagnostics* shows the controller's sleep and wake history and the reason for each wake, which tells you exactly which of these is happening.

4.12 Firmware update fails

1 Wi-Fi details.

The controller needs a 2.4 GHz network and the exact network name and password. 5 GHz-only networks and captive-portal networks (hotel or café logins) do not work. A phone hotspot set to 2.4 GHz is a reliable fallback; on iPhone turn on *Maximise Compatibility*.

2 Signal.

The controller must be within range of the network from where the car is parked. A steel garage door between the car and the router is a common cause. Park closer or use a hotspot placed in the cabin.

3 Keep it awake.

Leave the ignition on for the whole update. If the controller sleeps mid-download, the update is abandoned and retried next time.

4 Read the status.

The update screen shows the stage: connecting, checking, downloading with a percentage, complete. *Wi-Fi is not configured* means the details were not saved; *Connecting...* that never progresses means wrong password or no signal.

5 Interrupted download.

Safe: the controller verifies the whole file before installing it and keeps running the old firmware if verification fails. Simply start the update again.

6 Still failing.

Send a support report (below). Include the network type and where the car was parked.

4.13 Sending a support report from the app

A support report bundles the controller's own log, a snapshot of its configuration and state, its sleep and wake history, and the app's recent activity. It is the fastest way to get help because it shows us what the controller saw.

1 Reproduce the problem

if you can, with the phone connected to the controller, so the log contains it.

2 Open

More → *Settings* → *Device & firmware* and scroll to *Support & Actions*.

3 Tap

Report an Issue.

4 Describe

what you expected, what happened, and when. Add your email if you want a reply.

5 Submit.

The app collects diagnostics from the controller (a few seconds) and uploads the report. You will see a confirmation.

If the phone cannot connect to the controller at all, you can still send a report: it will contain the app's side of the story, which is often enough to point at the cause. Every report is emailed to hello@fusiondrive.io. You can also write there directly or use the contact form.

4.14 Configured output missing or not responding

Configured outputs should remain visible even when disabled or following saved rules. If device sync is interrupted, reconnect and wait for a fresh configuration before assuming a save succeeded. For a generic output, live On first enables manual control after device acknowledgement; a rejected setup does not proceed

to the duty command. Use the assigned controller's live actions for controller-owned channels; raw output duty does not bypass its protection or paired fuel logic. If an interrupted-save warning remains, complete recovery and wait for the device to confirm the cleared status.

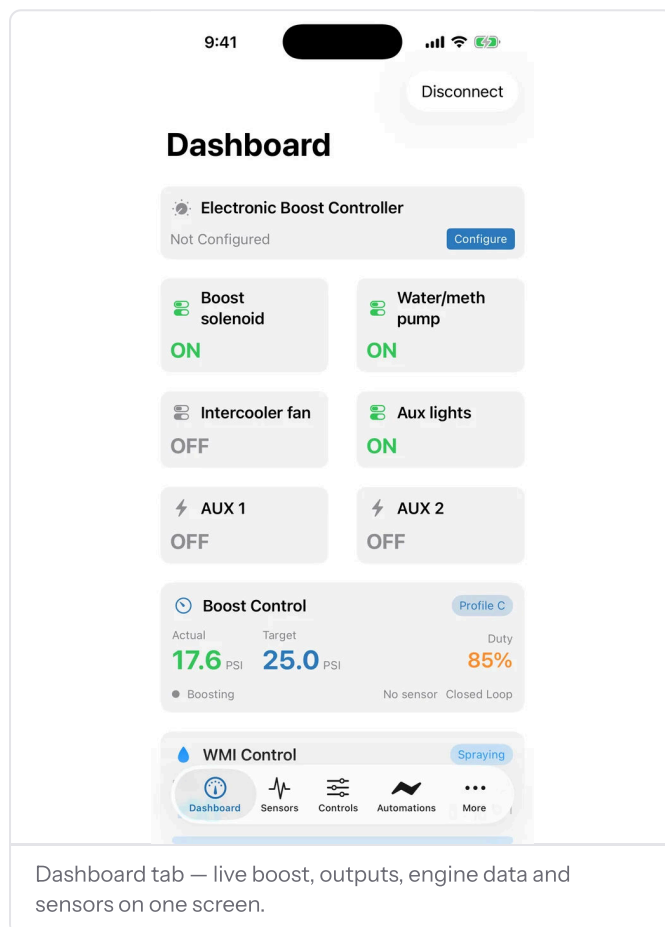
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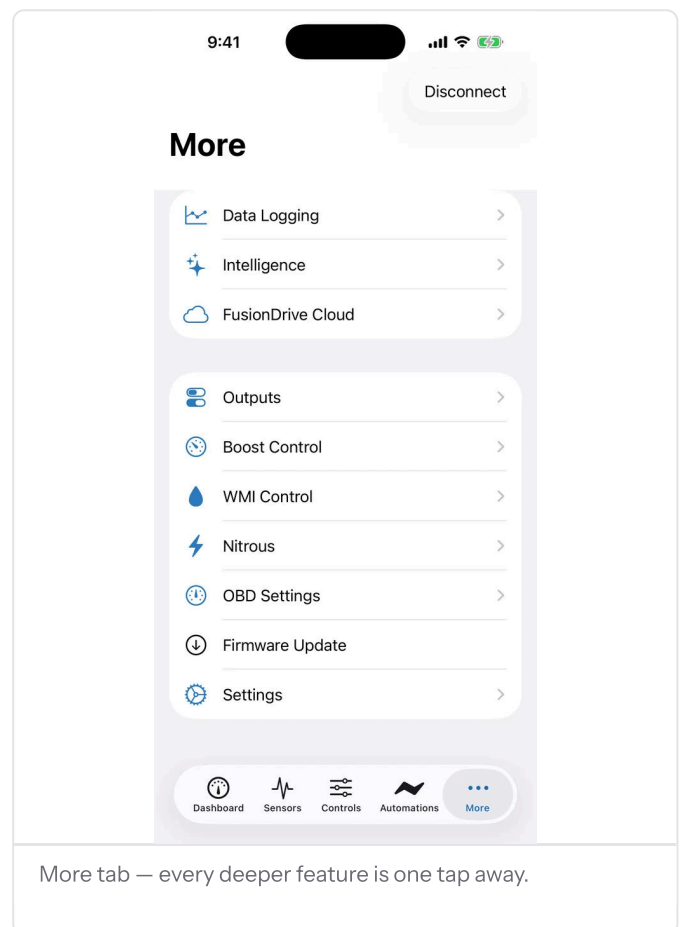
FusionDrive app — getting started

FusionDrive is a boost, output and data controller that lives under your dash. The iPhone app is how you set it up, watch it, and tune it. CarPlay puts the essentials on the car's screen. This manual covers every screen and every setting.

Applies to the current FusionDrive iPhone app and device firmware Reading time ≈ 10 min



Dashboard tab — live boost, outputs, engine data and sensors on one screen.



More tab — every deeper feature is one tap away.

5.1 Install the app

1 Install the current FusionDrive beta

The current app is distributed through an invited internal TestFlight group. Public App Store availability and wider beta access will be announced separately. Use the build supplied by FusionDrive; Android remains an exploration project.

2 Power the device

Plug the FusionDrive into the car's OBD port (and the dedicated 12 V feed if you are using high-current outputs). The device wakes when it sees CAN traffic or ignition-switched power. See Installation.

3 Open the app and connect

New users first see the welcome screen: create an account, sign in, choose **Use without an account**, or explore Demo. Previously signed-in/paired users and completed local-use choices skip automatic welcome. Continue to the connection screen to scan for your FD.

5.2 Permissions the app asks for

Permission	Why it is needed	If you decline
Bluetooth	The app talks to the FusionDrive over Bluetooth Low Energy. Live data, settings and update commands/progress use this link. The device downloads firmware over its own Wi-Fi connection.	The app cannot find or connect to the device.
Notifications	Lock-screen alerts (overboost, faults, disconnects, firmware update finished). Requested the first time you turn on <i>Lock-screen notifications</i> in Alerts, or open Firmware Update.	Alerts still show as in-app banners; nothing appears on the lock screen.
Local network / Wi-Fi (device side)	Only the device joins Wi-Fi, and only to download firmware. Your phone never needs to change networks.	Firmware updates are not possible until a garage Wi-Fi network is saved on the device.

1 NO LOCATION, NO ACCOUNT REQUIRED

The app does not use your location. A FusionDrive Cloud account is optional and only needed for cloud backup, the web viewer and Intelligence add-ons. Local control and phone recording work without an account; saved FD controllers and rules continue when the phone disconnects.

5.3 Pairing and first connection

FusionDrive uses Bluetooth Low Energy, so there is no pairing step in iOS Settings. The app scans, lists nearby FusionDrive devices by name, and connects when you tap one.

1 Turn the ignition on

The device sleeps when the car has been off for about a minute. Ignition (or any CAN traffic) wakes it instantly.

2 Open the app

The connection screen lists discovered devices. Each shows its name (the serial number until you rename it in Settings).

3 Tap your device

Connection takes a second or two. The app then loads the full configuration — outputs, sensors, automations, boost, water/meth, nitrous, OBD — and lands on the Dashboard.

4 Check the status bar

The top of every tab shows the connection state. A *Disconnect* button appears while connected. If the link drops, the app keeps scanning and reconnects automatically when the device is back in range.



ONE PHONE AT A TIME

Only one phone can be connected to a FusionDrive at a time. If a second phone cannot see the device, disconnect the first one (Settings → Disconnect Device) or move it out of range.

If the device was factory reset since you last connected, a **Device Factory Reset** notice appears on the connection screen so you know the configuration you are about to see is the defaults.

5.4 How live data works

When you see **LIVE** next to a value, it is being streamed from the device over Bluetooth several times a second. What that means in practice:

- **Dashboard values refresh continuously.** Boost, duty cycles, OBD parameters and analog inputs update as fast as the link allows — typically 5–10 times a second, faster on the Boost Control screen where the app requests a high-rate stream.
- **Settings are read once, then written when you change them.** Sliders and toggles send their new value to the device and wait for confirmation. If the device rejects a change, the control snaps back and an error message explains why.
- **Everything runs on the device.** The phone is a remote control and a display. Boost control, automations, water/meth and nitrous all execute on the FusionDrive itself at a fixed control rate, whether or not the phone is connected.
- **"No signal" means exactly that.** A sensor card that says *No signal* is reporting that its input voltage is outside the range that indicates a connected sensor. It is not a Bluetooth problem.

5.5 The five tabs

Tab	What it is for	Guide
Dashboard	Live overview: boost controller, water/meth status, output quick controls, key engine parameters, active sensors, pending web changes.	Dashboard & Sensors
Sensors	Configure the six analog inputs (IN1–IN6): presets, calibration, level switches, dashboard visibility. Shows the onboard boost sensor.	Sensors tab
Controls	Hands-on control: boost group up/down for an external boost controller, and one card per output (OUT 1–4, AUX 1–2) with duty presets and a slider.	Controls & Outputs

Tab	What it is for	Guide
Automations	Rules that run on the device: if a condition is true, do something. Toggle rules on and off, add new ones, edit existing ones.	Automations
More	Data Logging, Intelligence, FusionDrive Cloud, Outputs, Boost Control, WMI Control, Nitrous, OBD Settings, Firmware Update and Settings.	See below

5.6 The More tab

The More tab is two groups of links. The first group is about your data; the second is about the hardware.

Item	What you will find	Guide
Data Logging	Record drives and manual sessions, view charts, export, upload. A badge shows when recording.	Data Logging
Intelligence	Health scores, insights, drive sessions, car profile, Assist guard rails. Badge shows the overall health score.	Intelligence
FusionDrive Cloud	Sign in, claim devices, sync, licences, pending web changes, restore logs. Badge shows sync state.	FusionDrive Cloud
Outputs	Advanced configuration of all six outputs: mode, preset, frequency, duty limits, naming.	Outputs
Boost Control	The built-in electronic boost controller: profiles, target, control mode, safety limits.	Boost Control
WMI Control	Water/methanol injection: trigger pressures, duty mapping, priming, pump output.	Water/meth & Nitrous
Nitrous	Nitrous controller: arming, RPM/throttle window, ramp, safety timers.	Nitrous
OBD Settings	CAN operation mode, discovered parameters, fault codes, custom CAN transmit, decode rules.	CAN & OBD
Firmware Update	Check for and install device firmware over the device's Wi-Fi connection.	Firmware Update
Settings	Feature configuration links, display/app preferences, account, device information, maintenance and support.	Settings

5.7 Navigation conventions

- **Cards** group related live values and controls. Tapping a card title or a chevron (>) opens the detailed screen for that feature.
- **Sliders write when you let go.** Dragging shows the new value; releasing sends it to the device. Steppers (– / +) send each tap.
- **Toggles are immediate.** If the device cannot accept the change (for example enabling boost before an output is assigned) the toggle reverts and a message explains.

- **Long-press or swipe** a list row for delete, favourite and other secondary actions (logs, automations, custom alerts).
- **Pull down to refresh** on list screens that talk to the cloud (Cloud account, web changes).
- **Units follow your preference.** Temperature (°C/°F), pressure (psi/bar) and speed (km/h/mph) are set once in Settings → Unit Preferences and apply everywhere, including automation thresholds and CarPlay.
- **Light and dark** follow the iPhone's system appearance. There is no separate theme setting in the app.
- **Keep Screen Awake** (Settings → App Settings) stops the phone locking while the app is open — useful on a dyno or when the phone is in a cradle.

5.8 Demo mode

No device needed: tap *Demo mode* on the welcome or connection screen. Browse the app with simulated data, then leave Demo when ready to connect to hardware. Demo controls do not command a real vehicle.

For an existing connected device, Settings also contains a PIN-protected configuration snapshot tool. That is a separate workflow: commands can affect connected hardware, and restoration covers only its documented saved fields. See Demo Mode & PIN before using it.

5.9 CarPlay overview

When the phone is plugged into (or wirelessly connected to) a CarPlay head unit, FusionDrive appears as a CarPlay app with five tabs: **Dash**, **Outputs**, **Boost**, **OBD** and **Rules**. Wide screens may show a sixth **Sensors** tab. CarPlay is designed for glances and single taps: you can switch boost profiles or groups, nudge the boost target, toggle outputs and water/meth, and enable or disable rules. Everything else — calibration, wiring, editing rules — stays on the phone.



CarPlay Dash — two-column live values with profile buttons across the bottom.

Full details: CarPlay guide.

5.10 What happens when the phone is not connected

The FusionDrive is a standalone controller. When you walk away with your phone:

- Outputs keep the state they were in. Outputs set to *Auto* continue to be driven by boost control, water/meth, nitrous or automations.
- Automations keep evaluating and firing on the device.
- Boost control, water/meth and nitrous keep running with their safety checks.
- Nothing is logged to the phone (data logging is a phone feature), though the device keeps its own drive statistics for Intelligence.
- When the car is switched off, the device waits about a minute for CAN traffic or ignition to return, then forces every output off and goes to sleep. It wakes the moment the bus is active or ignition returns.

Bluetooth activity does *not* keep the device awake — only the car does. This is deliberate so the device never drains a battery.

5.11 Manual contents

Dashboard & Sensors

Every dashboard card, live indicators, sensor slots IN1–IN6, presets, calibration, level switches.

Controls & Outputs

OUT 1–4 and AUX 1–2, on/off vs PWM, duty presets, frequency, min/max duty, output presets, safety.

Boost Control

Up to eight saved profiles, target, ceiling, control modes, response, learning, sensor source, status states.

Water/meth & Nitrous

Trigger pressures, duty mapping, priming, arming, RPM/throttle windows, lockouts and safety.

CAN & OBD

Operation modes, parameter discovery, fault codes, custom CAN transmit, decode rules and DBC import.

Automations

Conditions, operators, AND/OR, actions, reverse-when-false, recipes, and how rules run without the phone.

Data Logging

Channels, rates, auto-start, markers, the log list, log detail, export, storage and cloud upload.

Intelligence

Watch, Advise and Assist tiers, health categories, insights, guard rails, car profile, drive sessions, Cloud Intelligence.

FusionDrive Cloud

Account, claiming devices, licences, auto-sync, pending web changes, web viewer, sharing, privacy.

Settings & Firmware

Feature settings overview, device and firmware actions, display/app preferences, account and support.

CarPlay

Dash, Outputs, Boost, OBD and Rules tabs — what you can change while driving.

Troubleshooting

Connection, sensor, CAN and output problems and how to fix them.

5.12 Create and fine-tune a sensor together

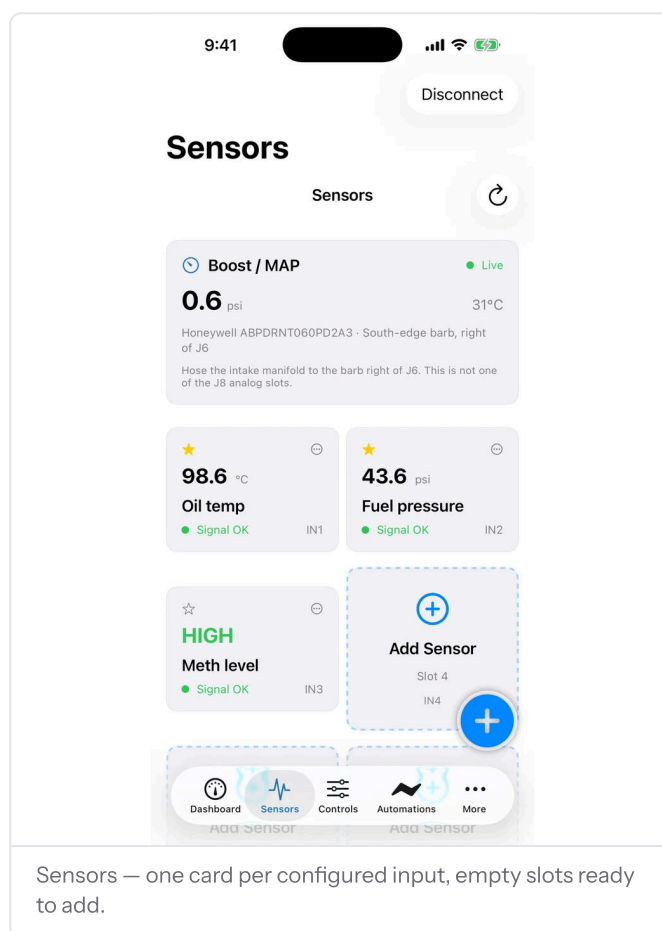
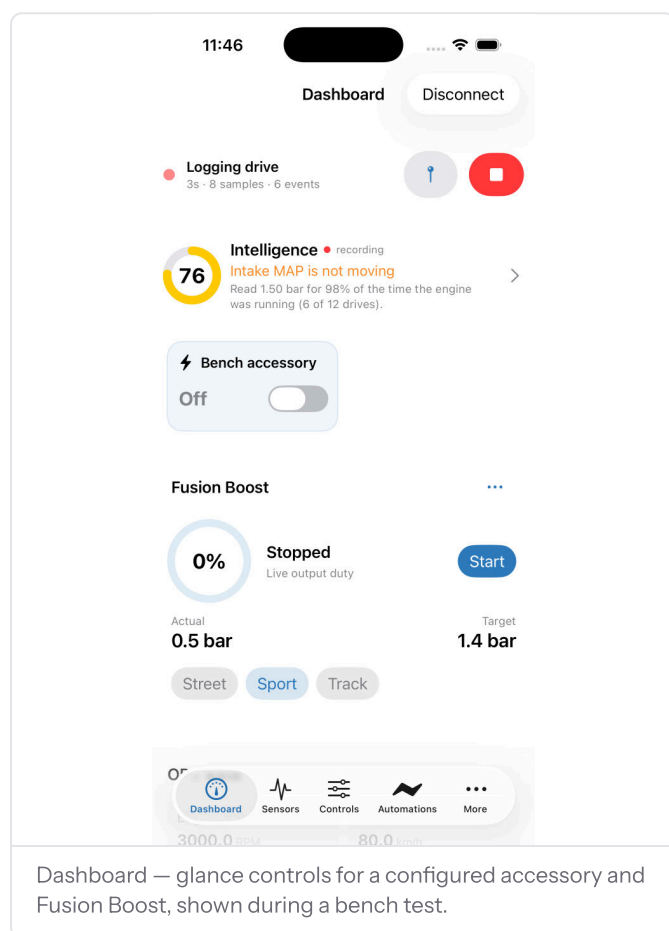
When adding a sensor, select a starting preset and edit its calibration before Create. Analog setup includes low/high voltage and engineering readings, voltage scale and display range. Digital/level setup includes threshold, hysteresis and reverse logic. Invalid ranges must be corrected before saving. Display-unit preferences convert what you see; they do not silently change the source-unit calibration saved on FusionDrive.

6

— APP MANUAL · DASHBOARD & SENSORS

Dashboard and Sensors tabs

The Dashboard is your live view of everything the FusionDrive is doing. The Sensors tab is where you tell it what is wired to its six analog inputs. This page walks through every card, every value, and every field in the sensor setup.



6.1 Dashboard tab

The Dashboard is a scrolling stack of cards. Each card shows live values and, where it makes sense, a one-tap control. Tapping a card's title opens the full screen for that feature. Values refresh many times a second while connected; if the device disconnects, the last values stay on screen greyed out until the link returns.

6.2 Banners at the top

Banner	When it appears	What to do
Active alerts	One or more alerts are currently firing (overboost, fault, disconnect, custom threshold...). Shows the alert title and time.	Tap to see details or dismiss. Configure which alerts exist in Alerts & Notifications.
Pending web changes	Someone edited this device's configuration in the FusionDrive web viewer and the change has not been applied yet.	Tap to review the change, then <i>Apply</i> or <i>Reject</i> . See Pending changes.
Recording card	Always present. Shows whether a data log is recording, its duration and sample count, with a <i>Start/Stop</i> button and a <i>Marker</i> button.	Tap <i>Start</i> to begin a manual log without leaving the Dashboard. See Data Logging.
Intelligence card	Always present. Shows the overall health score, the current tier, and the most important open insight.	Tap to open Intelligence. See Intelligence.

6.3 Every dashboard card

Electronic Boost Controller (external controller)

Shown only when *Show on Dashboard* is on in Boost Control → Third-party EBC → Controller setup. This card is for an **external** aftermarket boost controller that FusionDrive steps through groups using documented ground-trigger pulses on AUX1 or AUX1+AUX2 — not for the built-in boost controller.

- **Title** — the controller model you selected in Settings, or your custom name. Reads *Not Configured* with a *Configure* button until you pick one.
- **Value** — the current group, shown as *Group 1...* or the custom group name you gave it (for example *Street, Track*).
- **Previous / Next** buttons — step the external controller down or up one group. Each press sends one pulse (2-wire controllers) or cycles through (1-wire). The device wraps around at the last group.

Setup for this card is described under Boost Controller Configuration.

Output quick cards

One small card for every output with *Show on Dashboard* turned on, two per row.

- **Title** — the output name (defaults: *Output 1...Output 6*; hardware labels OUT 1–4, AUX 1–2) and its icon.
- **Value** — *ON* (green) when the output is enabled and driving any duty above 0 %; *OFF* when enabled at 0 %; *Off* in grey when the output is disabled in settings.
- **Tap** — toggles the output between 0 % and 100 % duty. Disabled outputs ignore taps.



TAPS GO STRAIGHT TO THE HARDWARE

Tapping an output card switches a real load — a pump, fan or solenoid — immediately. If an output is assigned to boost control, water/meth or nitrous, leave it in *Auto* mode and control it from that feature instead.

Boost Control card

The built-in electronic boost controller. Always shown once the device has reported boost data.

Field	Meaning
Boost profile	The active saved profile name. New supported firmware starts with three and allows up to eight; older firmware can remain limited to three.
Actual	Boost pressure right now, in your pressure unit, from the selected boost sensor source.
Target	The boost the controller is aiming for in the active profile.
Duty	How hard the boost solenoid is being driven, 0–100 %.
Status dot + state	Green when the controller is actively controlling; grey otherwise. The state text (Idle, Spooling, On Boost, Overboost Recovery, Cooldown, Disabled) is explained in Boost status states.
Sensor source	Which sensor is providing "Actual": the onboard boost sensor, an analog input, or the car's own MAP reading over OBD.
Open Loop / Closed Loop	The control mode in use.

Tap the card to open Boost Control.

WMI Control card

Water/methanol injection status. Always shown once the device has reported water/meth data.

- **State badge** — Disabled, Armed, Injecting, Priming or Fault. Blue when active.
- **Duty** — current pump duty, 0–100 %, with a progress bar.
- **Activation** — the start and full-injection pressures (default 8 – 16 PSI).
- **Priming...** — shown with a spinner while a prime/test is running.

Tap to open WMI Control.

Output slider cards

Outputs that are enabled, shown on the dashboard *and* set to *Manual* mode get a second, larger card with the live duty percentage, quick buttons and a duty slider. This lets you run a fan or pump at a partial speed straight from the Dashboard. Controls are identical to the Controls tab — see Output quick controls.

6.4 Key engine values

When the device is receiving data from the car, a grid of engine parameters appears. Which parameters are shown is up to you:

- Common default selections, when supported, include: **Engine RPM**, **Coolant Temperature**, **Intake Manifold Pressure**, **Vehicle Speed**, **Control Module Voltage** and **Throttle Position**.
- Any other parameter you have pinned in OBD Settings → Discovered OBD-II PIDs is added.
- Values are converted to your unit preferences: temperatures to °F if selected, pressures to psi/bar, speed to mph.

- Manifold pressure is shown as *boost* relative to atmosphere — the device subtracts the barometric reading (or the *Baro Fallback* value from Settings if the car does not report one), so idle reads as vacuum and positive numbers mean boost.

Data comes in as fast as the car provides it; most parameters update several times a second in Active mode.

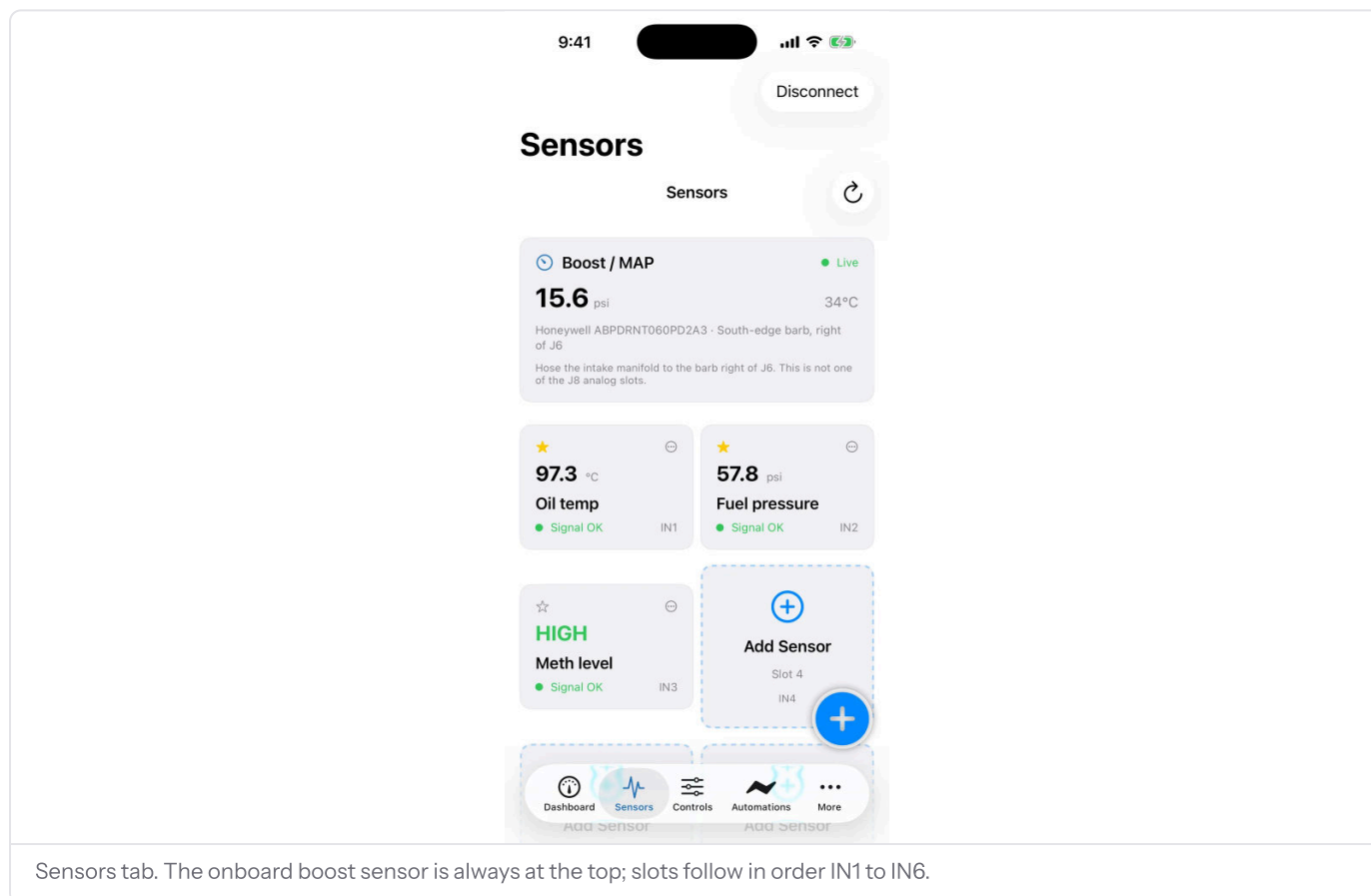
6.5 Active sensors

Every analog sensor with *Show on Dashboard* enabled appears here with its name, live value and unit. Two special cases:

- Level / switch inputs** show *ON* or *OFF* (or the equivalent for a fluid level switch) rather than a number.
- No signal** replaces the value in red when the input voltage is outside the range that indicates a connected sensor. Check the wiring and the sensor's power feed.

6.6 Sensors tab

The Sensors tab manages the six analog inputs. Each input accepts a 0–5 V signal and appears as a "slot". A slot is either empty (an *Add Sensor* tile) or holds a configured sensor card. When not connected, the tab shows *Not Connected* — *Connect to your device to manage sensors*.



Sensors tab. The onboard boost sensor is always at the top; slots follow in order IN1 to IN6.

6.7 Onboard boost sensor

The first card is the sensor built into the FusionDrive itself. It is not one of the six slots and cannot be deleted or re-calibrated.

Item	Detail
Name	Boost / MAP
Range	Vacuum to +60 psi gauge; pressure below atmosphere is negative
Connection	A vacuum hose from the intake manifold to the boost port on the edge of the device (see Installation). No wiring needed.
Live value	Pressure in your unit, plus a status dot. Reads about 0 with the engine off.
Used by	Boost Control (sensor source <i>Onboard</i>), water/meth triggering, Intelligence, data logging.

6.8 Slots IN1-IN6

All six inputs are identical: 0–5 V analog, with sensor power and ground available on the input harness. The card for each slot shows:

Slot	Input label	Typical use
1	IN1	Any 0–5 V sensor: oil pressure, fuel pressure, external boost/MAP, ethanol content, exhaust gas temperature (through a 0–5 V amplifier), a tank level switch, a nitrous arm switch, or a generic voltage.
2	IN2	
3	IN3	
4	IN4	
5	IN5	
6	IN6	

Each configured sensor card shows the sensor name, slot label, live value with unit (or ON/OFF for level inputs), a green *Signal OK* or red *No Signal* indicator, and *Edit/Delete* buttons. Wiring pin-outs for the input connector are in Wiring.

6.9 Add a sensor

1 Tap an empty slot

Choose the slot the sensor is physically wired to. The header of the form confirms the input label, connector pin and 0–5 V.

2 Pick a Sensor type

The preset fills in the unit and calibration for common sensors (table below). The creation form includes the preset voltage/reading endpoints and Fine tuning & display. Adjust them to the sender specification before Create.

3 Name it

Sensor Name is required — *Create* stays greyed out until you type one. Use the name you want to see on the Dashboard, in automations and in logs (for example "Oil Pressure").

4 Choose Type

Analog for anything that reports a value; *Digital (On/Off)* for switches and float sensors. The preset sets this for you.

5 Choose Unit

(analog only)

Options: psi, bar, °C, °F, %, V, A, kPa, MPa. Pressure and temperature units are converted for display according to your Unit Preferences.

6 Show on Dashboard

Choose whether to pin it. Sensors used only for rules or logging do not need a Dashboard card.

7 Tap Create

The device stores the sensor and starts reading it immediately. If the device rejects it (for example the slot is already in use), an error message explains why.

6.10 Sensor presets

Every preset is an editable starting point. Adjust calibration and fine tuning before Create, or reopen Edit later.

Preset	Unit	Type	Voltage range	Value range	Notes
External Boost / MAP	psi	Analog	0.5 – 4.5 V	0 – 30 psi	For a separate boost sensor mounted near the throttle body. Selectable as a boost control sensor source.
Oil Pressure	psi	Analog	0.5 – 4.5 V	0 – 150 psi	Typical 3-wire 150 psi sender.
Fuel Pressure	psi	Analog	0.5 – 4.5 V	0 – 100 psi	Typical 3-wire 100 psi sender.
Ethanol Content	%	Analog	0.5 – 4.5 V	0 – 100 %	For flex-fuel sensors that output 0–5 V through a converter.
EGT	°C	Analog	0.0 – 5.0 V	0 – 1100 °C	Exhaust gas temperature via a thermocouple amplifier with 0–5 V output.
0–5 V Generic	V	Analog	0.0 – 5.0 V	0 – 5 V	Reads the raw voltage. Use with custom calibration for anything not listed.

Preset	Unit	Type	Voltage range	Value range	Notes
Level / Switch	—	Digital (On/Off)	0 – 5 V	0 – 1	Anything that is either on or off: water/meth tank float, nitrous arm switch, clutch switch. Configure the threshold and debounce for the switch circuit.

If you do not pick a preset when creating an analog sensor manually, the default calibration is 0.5 V → 0 and 4.5 V → 100 in the chosen unit; for a level sensor it is 0 V → 0 and 5 V → 1.

6.11 Custom calibration

Set calibration, units, display range and fine tuning during Add Sensor or in its later *Edit* screen. Choose the supported calibration form for the sensor, enter its transfer values, and compare the live result with a known reference. Review signal validity and, for level inputs, threshold and hysteresis before using it as a controller or rule source.

Setting	What it does	Range / options	Default
Sensor Name	Display name used everywhere in the app, CarPlay and logs.	Free text; cannot be empty	From preset
Unit	Unit label and the basis for automatic conversion (psi↔bar↔kPa, °C↔°F).	psi, bar, °C, °F, %, V, A, kPa, MPa	From preset
Show on Dashboard	Whether the sensor appears in the Dashboard's Active sensors section and on CarPlay.	On / Off	On
Voltage Range — Min V	The sensor output voltage at the low calibration point.	0.0 – 5.0 V, one decimal	0.5 V (preset dependent)
Voltage Range — Max V	The sensor output voltage at the high calibration point.	0.0 – 5.0 V, one decimal	4.5 V (preset dependent)
Value Range — Min	The physical value that corresponds to Min V.	Any number, one decimal, in the sensor unit	0
Value Range — Max	The physical value that corresponds to Max V.	Any number, one decimal	Preset full scale (e.g. 150 psi)
Display Range — Min / Max	The span of the gauge shown in the app. Does not affect the measured value — only how bars and gauges are scaled.	Any numbers	Same as value range

Below the fields, *Current Value* shows the live reading with your new calibration applied, and *Signal Status* shows OK / No Signal. Use these to check a calibration before saving: with the engine off, an oil pressure sender should read close to 0.

**CALIBRATION IS ENTERED IN THE SENSOR'S OWN UNIT**

Read the unit shown beside each calibration field: engineering readings follow your display preference and are converted back into the sensor's source unit before saving. Voltage fields stay in volts. Changing the display preference does not change the physical calibration.

Sensor datasheets almost always state the calibration as "0.5 V = 0 psi, 4.5 V = 150 psi" or similar. Enter those four numbers directly. If the sheet gives a transfer function instead (for example "12.5 mV per psi with 0.5 V offset"), compute the value at 4.5 V: $(4.5 - 0.5) / 0.0125 = 320$ psi.

6.12 Level / switch inputs

A *Digital (On/Off)* sensor converts the measured voltage into a state using its configured threshold, hysteresis/debounce and inversion. Verify both switch positions and the open-circuit behavior. Use a properly biased 0–5 V circuit for:

- **Water/meth tank level switch** — wire a float switch so it reads OFF when empty, then add an automation that lights a warning output and a custom alert that notifies your phone. See Level switch interlock.
- **Nitrous arm switch** — select the slot as the *Arm input* in Nitrous settings. The system will not arm unless this input is ON.
- **Any dash switch** — a condition in automations ("Dash Switch = HIGH → Output 3 ON") turns any output or profile into a physical button.

Use the actual threshold and debounce settings shown by the app. A generic 0 V value does not prove a disconnected sensor or an empty tank; configure the circuit and meaning of each state.

6.13 Edit and delete

- **Edit** opens the same form as Add with the Calibration section expanded. Changes are sent when you tap *Save*.
- **Delete** asks for confirmation: "Are you sure you want to delete '*name*'? This will completely remove the sensor configuration." The slot returns to an empty *Add Sensor* tile. Automations or alerts that referred to the sensor will no longer match anything — review them afterwards.
- The app briefly blocks rapid repeated changes so the device is never asked to save faster than it can. If you see "please wait", pause a second and try again.

6.14 Signal status

Indicator	Meaning	Check
SIGNAL OK green	The input voltage is within the range expected of a connected sensor.	—
NO SIGNAL red	The configured validity/freshness check failed. This is a status to investigate, not a diagnosis of the wiring fault.	Sensor power (5 V) and ground on the harness; signal wire continuity; that the sensor is on the slot you configured.

Indicator	Meaning	Check
Value pinned at the maximum	Signal wire shorted to sensor power, or Max V set lower than the sensor's real output.	Compare the raw voltage using the 0–5 V <i>Generic</i> preset.
Value negative or below minimum	Min V is set higher than the sensor's real idle voltage.	Read the datasheet offset (usually 0.5 V) and enter it as Min V.

6.15 Your dashboard, your controls

Health / Intelligence and logging are shown by default; hide them in their respective settings if you prefer. A new device offers six default vehicle PID cards and a boost setup entry. Missing vehicle data is shown as unavailable, never as a fabricated reading. Add or remove dashboard items as your setup grows. Configured boost appears as one controller card; pinned outputs provide glance controls, while Controls opens deeper live actions.

6.16 Related

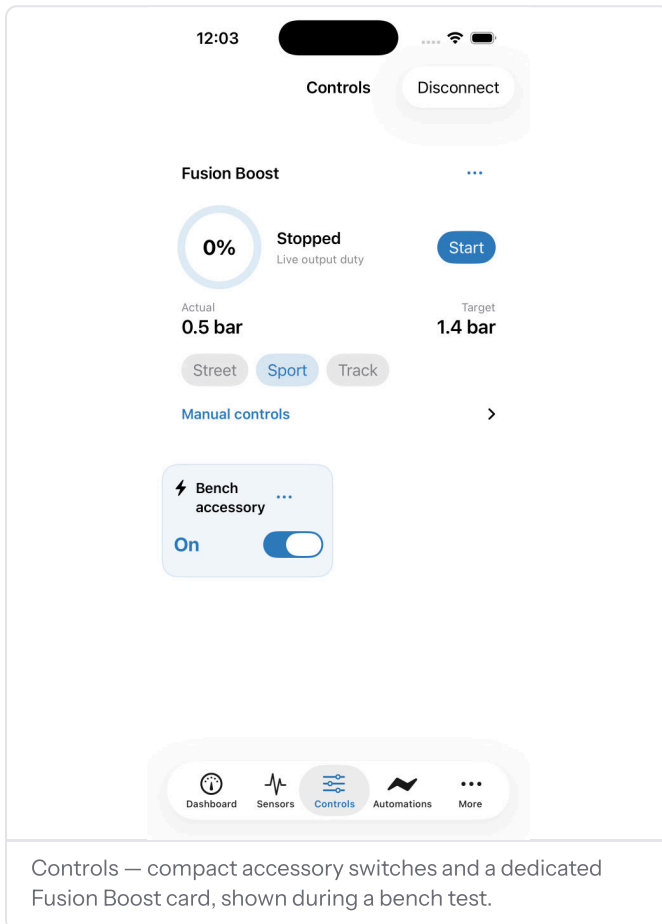
- Wiring — input connector pin-out, sensor power and ground.
- Boost Control → Sensor source — using an external boost sensor for control.
- Automations — using sensor values and switches as conditions.
- Intelligence → Sensors health — automatic detection of noisy or stuck sensors.
- Troubleshooting — sensor reads wrong or no signal.

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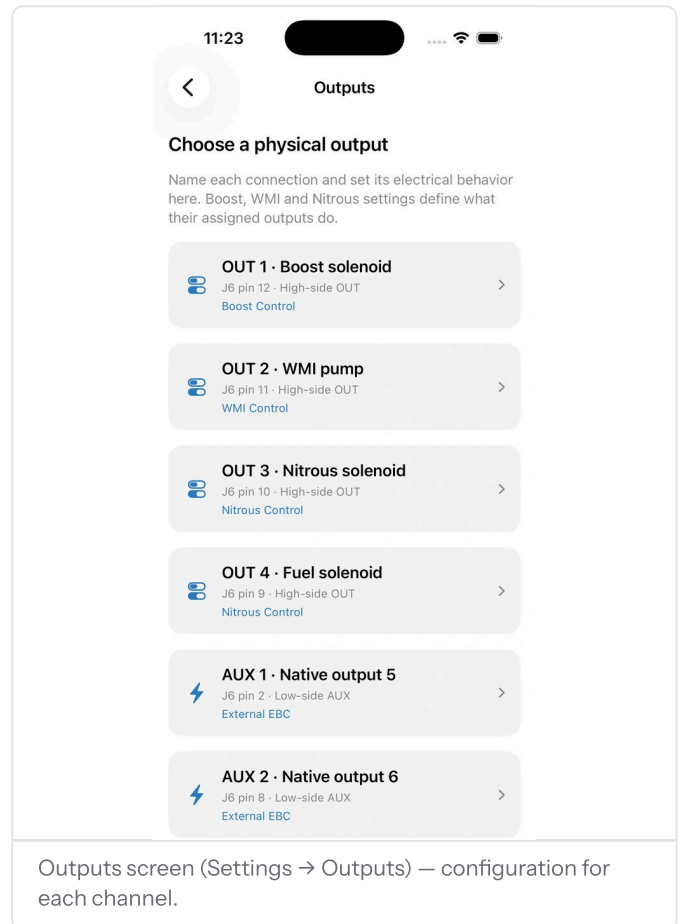
— APP MANUAL · CONTROLS & OUTPUTS

Controls tab and Outputs

FD Design LS has six PWM control channels: **OUT1–4 supply 12 V on the high side; AUX1/2 switch compatible loads or control inputs to ground.** Use suitable sensors and external interfaces to keep existing equipment, or assign compatible loads directly to FD. The same six channels are shared by boost, WMI, nitrous, external EBC and rules.



Controls — compact accessory switches and a dedicated Fusion Boost card, shown during a bench test.



Outputs screen (Settings → Outputs) — configuration for each channel.

7.1 The six outputs

Output	Default name	Class	Harness B lead	Good for
OUT 1	Output 1	High-side; validate load	 orange. OUT1 10A	Compatible boost solenoid, pump or fan
OUT 2	Output 2	High-side; validate load	 blue. OUT2 10A	Compatible pump, fan or solenoid
OUT 3	Output 3	High-side; validate load	 grey. OUT3 10A	Water/meth pump, cooling fan, fuel pump

Output	Default name	Class	Harness B lead	Good for
OUT 4	Output 4	High-side; validate load	 tan. OUT4 10A	Nitrous solenoid, intercooler spray, lights
AUX 1	Output 5	Low-side sink, nominal 1 A-class	 violet. AUX1 1A	Compatible ground-trigger control input or low-current load
AUX 2	Output 6	Low-side sink, nominal 1 A-class	 pink. AUX2 1A	Compatible ground-trigger control input or low-current load

OUT wiring: output → load positive; load negative → common ground. **AUX wiring:** fused compatible positive supply → load positive; load negative → AUX. AUX is not a source of 12 V or an isolated contact. Follow LS wiring and load limits; OUT1–4 need a dedicated feed. Lead labels such as “10A” do not establish tested continuous assembly capability.

7.2 Controls tab

Controls is your live control panel. Configured accessories appear here, including those following saved rules. Compact output cards show their name, current state and an On/Off switch. Dedicated boost, WMI and nitrous cards provide their own live actions; expand Manual controls when needed. Open its three-dot menu to edit setup; connector details, wiring and electrical settings stay in Settings.

Third-party boost groups

The configured controller shows your named groups and Previous / Next controls. Available directions and wrap-around follow its saved one-wire or two-wire configuration. The displayed group is FD's tracked command state, not independent feedback from the controller. Model selection, pulse timing, wiring, group names and ignition-cycle behavior are configured in Boost Control.

Output controls and saved rules

For a generic output, use its On/Off switch. Open its additional controls when you need to adjust duty. A manual command takes control from saved output rules; the card explains when you are controlling it yourself. Choose Resume automation when you want the configured automation logic to take over again. A configured but disabled generic output remains visible. A live On command first prepares it for manual use, waits for the device to accept that setup, then sends the requested duty.

Controller-owned outputs use that controller's actions: boost uses its profiles and manual-duty controls; WMI uses its supported timed prime/test and stop actions; nitrous uses arm/disarm and configured progression. Arming does not bypass activation conditions. Fuel and nitrous stages stay coordinated, and sensor, output and protection gates still apply. A successful tap is confirmed by the device; an interrupted connection does not mean a command was applied.

One place to configure

Use Settings for setup. Use Controls for deeper live actions and the Dashboard for glance controls. Names and saved configurations stay on FusionDrive. Generic PWM live demands start off after restart. Saved Fusion Boost manual mode and its duty setting can resume when enabled and its gates permit; nitrous starts disarmed.

7.3 Outputs screen (Settings → Outputs)

Open **Settings → Outputs** (also linked from Settings). The six rows identify each physical OUT/AUX channel, connector pin and assigned function. Tap a row to configure its name, operation and electrical response. Use **Save Output Setup**, wait for acknowledgement, then **Reload saved values** to confirm the ESP configuration. The icon is a separate preference stored on this phone.

Setting	What it does	Range / options	Default
Enabled	Master switch for the channel. A disabled output stays visible when configured. Live On can prepare a generic output for manual use before commanding it; controller-owned channels use their controller actions.	On / Off	Review in setup
Show on Dashboard	Adds the output's quick card to the Dashboard and to CarPlay's Outputs tab.	On / Off	Review in setup
Turn off on ignition off	Stops the output when neither a valid dedicated ignition signal nor fresh running-engine OBD evidence keeps vehicle activity on. OBD-only installations do not require the dedicated IGN wire for this software gate; stale or stopped-engine data is not running evidence.	On / Off	Off
Load type	Selects the load role for an unassigned channel. Review and set the displayed frequency and limits before saving — see Output presets.	Custom accessory · six PWM starting presets · eight on/off accessory presets	Generic
Switching frequency	The PWM switching frequency in hertz — see Frequency.	1-40,000 Hz	1000 Hz (preset dependent)
Minimum duty	Lowest duty the output will ever be driven at when it is on. Requests below this are raised to the minimum.	0 – 100 %, step 1	0 % (preset dependent)
Maximum duty	Highest duty the output will be driven at. Requests above this are capped.	0 – 100 %, step 1	100 %
Name	Display name (set in Settings → Outputs). Appears on cards, in automations, CarPlay and logs.	Free text	Output 1 ... Output 6
Icon	Symbol shown on the card; saved on this phone.	Choice of icons	By channel

7.4 Who controls the output?

Enable an output and configure the rules that should operate it. Enabled rules automatically act on their assigned enabled outputs when their conditions are met. There is no separate Disabled, Direct or Automatic mode to select.

Use Off, On or the duty control whenever you want to take over. Your manual command holds the generic output until you choose **Resume automation**. This action appears when a saved enabled rule can control that output and a manual override is active. It releases your override so the saved rule conditions determine the output again; it does not force the output on.

Electrical limits, calibration, ramps and ignition-off policy remain in Settings. Assigned boost, WMI and nitrous outputs use their controller-specific actions so paired stages and protections remain coordinated.

Live Stop takes precedence over matching saved controller actions until you explicitly resume/start that controller. It does not remove its saved profiles or protections. Global recovery and safety shutdowns still stop outputs.

7.5 Output presets

Selecting a preset fills its starting frequency and duty limits. You can change these before saving. The values are starting points, not a claim that every pump, fan or valve accepts the same electrical drive; match the connected equipment specification. Selecting a load preset does not assign or enable a Fusion controller.

Preset	Frequency	Min duty	Max duty	Why these values
Generic	1000 Hz	0 %	100 %	Starting values only. Verify the load interface first; use mechanical relays strictly on/off.
Boost Solenoid	30 Hz	0 %	100 %	Typical 3-port boost solenoids are designed for 30–50 Hz. Select this on the channel you assign in Boost Control.
WMI Pump	500 Hz	0 %	100 %	A starting duty floor for a compatible pump. Actual flow, current, start-up and minimum operating duty must be verified.
Cooling Fan	25 000 Hz	0 %	100 %	Use only with fans/drivers that support this supply-switching frequency; integrated fan electronics may require a separate control interface.
Fuel Pump	250 Hz	30 %	100 %	A starting duty floor only. It cannot establish adequate fuel delivery; validate pressure, flow and demand.
Nitrous Solenoid	100 Hz	0 %	100 %	Fast switching for progressive nitrous ramps. Select on the nitrous and fuel solenoid channels.
Relay, Auxiliary lights, Water pump, Intercooler spray pump, Purge valve, Heater, Accessory enable, Solenoid valve (on/off)	1000 Hz stored; no switching at steady Off/On	100 % for nonzero requests	100 %	Switched-load starting presets: zero is Off, any nonzero demand is full On. Use only compatible supply/control inputs; keep mechanical relays on/off.

**RELAYS AND SOLENOIDS DO NOT LIKE PWM**

A mechanical relay or a plain on/off solenoid driven at 50 % duty will chatter and overheat. Use the matching on/off preset: zero remains Off and nonzero demand is full On. Do not change a relay to progressive PWM. If you want a relay to switch a big fan, put the relay on an AUX output and switch it on/off; the fan then runs at full speed.

7.6 Frequency

Frequency is how many times per second the output switches when it is between 0 and 100 %. Frequency affects valve motion, motor operation, losses and heating. Match it to the actual load or external driver; duty alone does not establish delivered power or flow.

- **Low (30–100 Hz)** — boost solenoids, water/meth and nitrous solenoids. Their valves are designed to follow pulses at this rate.
- **Medium (200–1000 Hz)** — fuel pumps, general loads.
- **High (10 000–25 000 Hz)** — fans and motors where audible whine matters.

The software range is 1–40,000 Hz. At 100 % duty the frequency has no effect, so it is irrelevant for pure on/off loads.

7.7 Duty limits

Min and Max duty are guard rails the device applies to *every* source — manual, automation, Boost Control, WMI or Nitrous. If Boost Control asks for 100 % on a channel with Max 80 %, the solenoid gets 80 %. If a rule asks for 5 % on a pump with Min 30 %, it gets 30 %. Zero is always allowed: OFF means off regardless of Min.

PWM still applies supply-voltage pulses at reduced duty. A duty limit is not a voltage regulator. Validate minimum operating duty and maximum current/temperature against the actual load; use a proper interface for a different supply voltage.

7.8 Per-output settings in Settings → Outputs

Each output has one setup page. **Name & appearance** holds its name and phone icon. **Output setup** holds Enabled, visibility, ignition-off policy and Switching frequency. **Electrical limits & response** holds minimum/maximum duty and **Ramp rates & calibration**. A controller-owned output links back to that controller for assignment, targets and progression. EBC-reserved AUX device settings are read-only; its phone icon remains editable. Independent nitrous stages and retard requests use immediate, uncalibrated response configured by Nitrous.

7.9 "Dedicated 12 V rail not connected" warning

OUT1–4 require the correctly fused dedicated feed on Harness B, J6 pin 1. Check both grounds and ignition wiring. The Rev A-LS backfeed path can make the app's dedicated-feed indication unreliable when that feed is absent; verify the real supply electrically before enabling a load.

Saving a preset cannot supply missing power. AUX switches an externally supplied compatible load to ground; it does not power a pump from OBD. Use the LS wiring reference and test with actuators disconnected before enabling control.

7.10 What happens on disconnect, ignition off and sleep

Event	Output behaviour
Phone disconnects (Bluetooth lost, app closed)	No change. Outputs keep their duty; Auto outputs keep being driven by their controller; automations keep running.
Ignition switched off	Vehicle activity uses dedicated IGN, fresh running-engine OBD evidence, or both. A live dedicated IGN signal can keep activity on even with zero RPM. Loss of both sources applies the configured shutdown policy. This is software control, not a physical load disconnect.
About one minute with no ignition and no CAN traffic	The device forces every output off, saves its settings, and goes to sleep. Nothing can switch an output on while asleep.
Ignition on / CAN traffic returns	After wake, generic live PWM duty starts off. Saved controller and rule configurations, including Fusion Boost manual settings, resume evaluation against fresh inputs and configured gates. Nitrous starts disarmed; test actual wake timing on the installed vehicle.
Firmware update / reboot	Generic PWM live demand starts off. Saved Fusion Boost manual settings and other configured controllers/rules can command outputs when their gates allow; nitrous starts disarmed.



SAVED CONFIGURATION IS SEPARATE FROM A LIVE COMMAND

Generic PWM live demand is not restored after restart. Saved Fusion Boost manual mode/duty and local rules can resume when their configured conditions permit; nitrous starts disarmed. Configure ignition-off behaviour and test boot, wake, sensor loss and phone disconnection for each installed load.

7.11 Related

- Wiring — connector pin-out, fuse sizes, dedicated 12 V feed.
- Boost Control → Output channel.
- Water/meth & Nitrous — pump and solenoid outputs.
- Automations → Actions — switching outputs from rules.
- CarPlay → Outputs.

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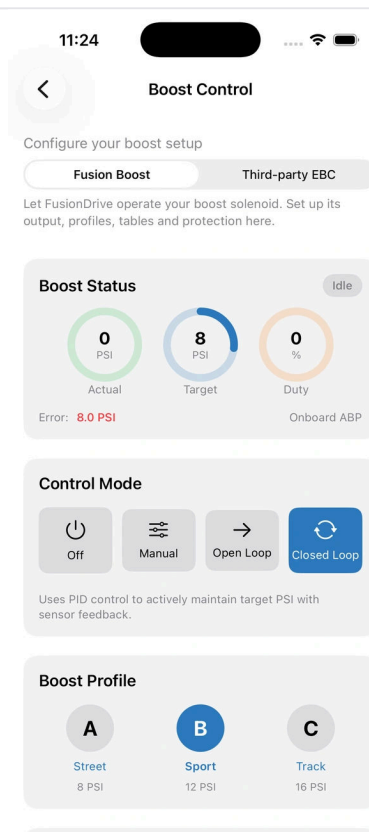
— APP MANUAL · BOOST CONTROL

Boost Control

Configure FusionDrive's built-in boost controller with manual duty, open-loop feed-forward or closed-loop PID, then choose the pressure and load signals your installation uses. Profiles, tables and protections are saved on the device. Open **More → Boost Control** or the Dashboard's Boost Control card. Choose Fusion Boost for internal control or Third-party EBC for a compatible retained-controller setup. This view selection does not enable a controller or reassign outputs.

**VERIFY THE INSTALLATION BEFORE ENABLING**

Use engine-specific limits and correctly matched wiring, plumbing and sensors. FusionDrive can command a protective cut, but it cannot guarantee that a valve moves or pressure falls. Establish a safe installation and controlled test procedure before applying load.



Boost Control — status, control mode, profiles and target, followed by Configure Fusion Boost. Choose Fusion Boost or Third-party EBC to view its setup. Configure Fusion Boost opens the internal controller settings.

8.1 Third-party EBC setup

Open **More** → **Boost Control**, choose **Third-party EBC**, then **Controller setup**. Model, wiring, pulse duration, dashboard visibility and ignition restore are edited as one draft. Tap *Save EBC setup* and wait for completed device readback before testing. *Configure Boost Group Names* becomes available after the controller draft is saved; edit the names and tap *Save Names*. Use *Reload saved setup* to discard the draft and read FD again. *Saved trigger connections* shows acknowledged device settings, not the unsaved draft. An error requires reviewing the actual saved state before proceeding. Choosing which setup to view does not activate it, change wiring or transfer output ownership.

A compatible external EBC can keep its own controller/display while FD requests group changes through **AUX1** or **AUX1+AUX2**. These are low-side ground triggers, not OUT1/2 power outputs. Check the controller's documented input circuit, timing and startup state; named models are pulse presets, not an electrical compatibility guarantee. **Fusion Boost** is the separate internal control setup below.

11:31

< Third-party EBC

Configure your boost setup

Fusion Boost Third-party EBC

Keep your controller. Configure its trigger inputs, groups and pulse timing here.

Controller setup

Controller model Turbosmart eBoost2

Active Groups: 6

Uses two trigger wires. Match the active group count to your eBoost setup.

Keep the external controller's power, solenoid and safety wiring in place. Selecting a model here does not change the device until you save.

Pulse & ignition behaviour

Pulse duration 50 ms

Restore EBC state on Ignition On

Show on Dashboard

Choose 1–5000 ms to suit the controller's switch input. These settings save together with the controller setup on FusionDrive.

Save EBC setup

Reload saved setup

Third-party EBC — configure the retained controller and save the complete draft. The illustrated eBoost2 values are an example setup; match your actual controller and trigger wiring.

Setting	What it does	Range / Options	Default
EBC Model	Choose a starting pulse preset, then verify the actual controller interface, group count and wiring before applying it.	Not Configured · Turbosmart eBoost3 · Turbosmart eBoost2 · GReddy Profec · HKS EVC-S · AEM Electronics Tru Boost · AEM Electronics Tru Boost X · AMS-500 · GFB G-Force III · GFB D-Force · Apexi AVC-R · Custom EBC	Not Configured

Setting	What it does	Range / Options	Default
Active Groups (eBoost2/3 only)	How many of the controller's groups you actually use.	2–6	as model
Custom Name (Custom EBC)	Label for an unlisted controller.	Text	Custom EBC
Trigger Wires (Custom EBC)	1 Wire: one pulse line steps up through groups. 2 Wires: separate compatible ground-trigger lines on AUX1 and AUX2.	1 Wire / 2 Wires	2 Wires
Total Groups (Custom EBC)	Number of presets the controller has.	2–10	Set for the controller
Enable Looping (Custom EBC, 1-wire)	Stepping past the last group wraps to the first. "Looping cannot be enabled in 2-wire mode."	On / Off	On
Configure Boost Group Names	Name each group (e.g. "Low", "Street", "Race"). Save the controller/group draft first, then use <i>Save Names</i> . Names appear on the Controls tab, Dashboard, CarPlay and in automations.	Text per group	Group 1, Group 2...
Show on Dashboard	Shows the group selector card on the Dashboard.	On / Off	On

Review the acknowledged group names after changing a model; do not assume this synchronizes the physical controller. FD cannot read a manual group change or confirm every pulse. Switching groups is described in Controls → External boost controller groups.

Pulse timing and ignition behaviour

Setting	What it does	Range	Default
EBC Pulse Duration	How long each step pulse holds the controller's wire. Too short and the controller misses steps; too long and it may double-step.	1–5000 ms, step 1	100 ms
Restore EBC state on Ignition On	When the ignition comes back, the device sends steps based on the assumed startup group. Verify the EBC starts in the expected group; this is not group readback.	On / Off	Off

8.2 What Boost Control does

FusionDrive commands the duty of a compatible boost-control solenoid. Open-loop mode derives that duty from your base table; closed-loop PID adds feedback correction. Manual mode uses the duty you set. The resulting boost depends on the valve, plumbing, wastegate, turbo and engine—not just a percentage on the screen.

Once acknowledged and saved, controller settings run on the ESP without a phone. The phone supplies configuration, live views and recording. FusionDrive does not reflash the ECU or modify its engine maps.

8.3 Before you enable it

1 Check the valve and wiring

Match the solenoid's voltage, current, PWM frequency and plumbing to its manufacturer's specification. V1 LS has four high-side OUT channels and two low-side AUX sinks with different electrical capabilities. See Wiring.

2 Configure the measurement

Plumb the onboard pressure sensor, or configure a suitable analog, OBD or decoded CAN pressure source. Check its units, gauge/absolute reference, range and freshness before enabling feedback.

3 Prepare and assign an output

Open *More* → *Outputs*, select the physical output and set its name, load type and switching frequency. Select *Solenoid output* under *Configure Fusion Boost* → *Connection*. The channel must be available for Boost and set to Auto. A preset does not establish electrical compatibility.

4 Set the limits and load inputs

Review Max Boost Limit, overboost margin, sensor timeout, invalid-feedback behaviour, warm-up gating and activation/release thresholds. Use limits established for this engine and installation.

5 Review the mode, profiles and tables

Begin with a controlled installation check. Save with *Save Fusion Boost settings*, wait for the device acknowledgement and check the returned settings before enabling.

8.4 Boost Status card

- **Actual:** the selected pressure reading, expressed as boost. Check the source and validity indication alongside it.
- **Target:** the effective target after the selected profile, scheduling strategy and applicable limits.
- **Duty:** the commanded solenoid duty. The board does not measure solenoid current or prove wastegate movement.
- **Error:** target minus measured pressure. Use the log to examine changes over a pull.
- **State and source:** current controller state and feedback identity/availability. A missing or stale signal needs investigation; the response depends on the saved strategy and protection settings.

Live updates depend on the source and Bluetooth delivery. Opening this screen requests faster telemetry; an active recording also manages its own telemetry request.

8.5 Saved boost profiles

New compatible firmware starts with three profiles and supports up to eight. Each profile has its own saved name, target and output-enable flag; PID, duty tables and target scheduling are shared controller settings, not separate tunes per profile. Select a profile in Boost Control or the supported Dashboard/CarPlay controls. A profile selection is a real control command; viewing or editing a profile is separate. Profile targets can be set from zero up to Max Boost Limit; a disabled profile does not command positive output.

Use **Add profile** or **Remove last profile** under **Configure Fusion Boost → Profiles**, then use **Save Fusion Boost settings** and read back. New profiles start with zero target and output permission off. The app honours the connected firmware's advertised profile limit; older three-profile firmware remains limited to three. Removal is blocked for the active profile or one used by an automation. Test the chosen profile after restart, including Dashboard and CarPlay selection.

For gear, speed and time schedules, the active profile target is a ceiling. The legacy closed-loop RPM target curve instead replaces the profile target while it is selected, with Max Boost Limit still applied. Review which strategy is active before comparing a stored profile value with the live target.

8.6 Target Boost

The main slider changes the active profile target from zero to Max Boost Limit in 0.5 psi steps. Quick target buttons above the configured limit are unavailable. The controller works in psi internally; the app can display the selected pressure unit.

Configure Fusion Boost → Tables → Target strategy offers four strategies:

- **Profile / existing RPM curve:** use the profile target, or enable the legacy 11-point RPM target curve for closed-loop mode only.
- **Gear × RPM grid:** eight gears, each with 11 points from 0–10,000 RPM. A fresh whole gear number from 1–8 is required; neutral, reverse or unavailable gear does not authorize output.
- **Vehicle speed curve:** 11 points at 25 km/h intervals from 0–250 km/h. The final point is held above the curve's range.
- **Time after load request:** 11 points over a configured 100–60,000 ms duration. The timer starts when fresh RPM and throttle meet the activation thresholds; release or missing required data resets it.

Gear, speed and time strategies operate in open- and closed-loop modes and require fresh selected inputs. Their targets are capped by the active profile and Max Boost Limit. Manual duty ignores target scheduling. A configured rise limit smooths target increases; reductions and protective cuts remain immediate.

8.7 Control Mode

Mode	Operation
Off	Disables Boost's output command. Whether de-energizing the valve gives spring pressure depends on correct plumbing and functioning hardware.
Manual	Uses the selected fixed duty when runtime eligibility permits it. No target regulation. Protection and output ownership still apply.
Open Loop	Uses the target-to-duty base table, response setting and allowed learned correction. Pressure is not used for continuous PID correction.
Closed Loop	Uses the base duty plus bounded PID correction from valid pressure feedback. PID is the closed-loop mode, not a separate fourth controller.

Enabling a mode cannot make an unavailable output or invalid configuration ready. Check the device's response and returned state.

8.8 Manual duty

The Manual Duty slider sets 0–100% duty. This is a command for controlled valve/plumbing testing, not a guaranteed boost level. Zero de-energizes the assigned valve; 100% fully commands it and can produce unsafe boost depending on the installation.

Manual ignores the target schedule but remains subject to runtime gates, configured feedback behaviour, linked WMI protection and critical overboost cut. Establish safe behaviour with the installation unloaded before any engine-load testing.

8.9 Configure Fusion Boost

From **More** → **Boost Control** → **Fusion Boost**, open **Configure Fusion Boost**. Choose a topic: **Connection**, **Profiles**, **Tables**, **PID**, **Protection** or **Learning**. Tables and Learning are shown for Open Loop and Closed Loop; PID is shown only for Closed Loop. Hidden settings remain stored and shared; selecting a topic does not command the valve.

Save Fusion Boost settings sends the complete advanced draft for validation and storage. A failed save leaves a draft to correct; do not assume the device adopted it.

Group	Current settings
PID Tuning	P, I and D (0–100), correction limit (0–100%), derivative filter (0–1). Zero correction limit disables PID duty correction.
Safety	Max Boost Limit (1–50 psi), Mild/Normal/Aggressive response, overboost margin (0–20 psi), sensor timeout (100–5,000 ms) and invalid-feedback policy.
Warm-up	Optional warm-coolant requirement and minimum temperature (–40–150 °C). Enabling it requires a valid selected temperature source.
Duty Learning	Enable, overshoot tolerance (0.2–5 psi), learning step (0–10%) and maximum learned offset (0–100%).
Base Duty by Boost Target	11 duty points at 5 psi intervals from 0–50 psi. Open loop uses this table; closed loop adds PID correction.
Targets and inputs	Legacy RPM curve; gear/RPM, speed or time scheduling; pressure/load/temperature bindings; activation/release thresholds and target-rise limit.
Connection and profiles	<i>Solenoid output</i> selects the channel. Profiles stores up to eight names, targets and output-enable flags; the active row opens first. <i>Add profile</i> opens a new row.

The UI ranges are configuration bounds, not recommended operating values for an engine.

8.10 How aggressively it corrects (P, I, D in plain words)

- **P:** responds to the current difference between target and actual boost.
- **I:** accumulates persistent error over time.
- **D:** responds to the rate of change of error; filtering reduces sensitivity to noise.

Correction is bounded by the configured limit. A poor base duty table, slow or noisy feedback, a mechanical fault or unsuitable plumbing cannot be fixed simply by increasing gains. Change one setting at a time in a controlled test and compare target, measured boost and duty in the log. Intelligence findings are prompts to inspect evidence, not an automatic diagnosis.

8.11 Safety: Max Boost Limit and the overboost cut

Max Boost Limit bounds configured targets. Runtime overboost recovery reduces duty when measured boost exceeds the limit; measured pressure above **Max Boost Limit + the configured overboost margin** commands zero duty. The margin is configurable, not always 3 psi.

Missing feedback: an explicit pressure selection cuts output if it is invalid; it never silently substitutes another source. Gear, speed and time strategies also cut when required schedule/load data is unavailable. Positive fallback policies—reduced open-loop duty or hold-last duty—apply only to AUTO pressure with the Profile / existing RPM strategy and the runtime's eligibility checks. *Cut output* is the default invalid-feedback policy.

Warm-up and load gates: configured coolant, RPM and throttle sources must satisfy their relevant gates. Release thresholds provide hysteresis and must not exceed activation thresholds. Linked WMI protection can reduce the target or cut duty without rewriting the saved profile/table.

A software cut commands a de-energized output. It cannot prove pressure fell, a valve moved or wiring remained intact. Investigate repeated cuts and measurement loss instead of increasing the limit to hide them.

8.12 Response Level

Mild, Normal and Aggressive scale the calculated base-duty response (approximately 0.8×, 1.0× and 1.2× before limiting). They do not promise a particular spool time or percentage improvement. Compare the resulting duty and measured boost, alongside the PID and learning settings, before deciding whether the response suits the installation.

8.13 Output channel

V1 LS has **OUT1–OUT4 high-side 12 V outputs** and **AUX1/AUX2 low-side sinks**. Select a channel whose electrical characteristics suit the solenoid. AUX is nominally 1 A-class and is not an analog-voltage source or isolated contact. The heavy outputs require the documented dedicated fused feed and share the board's supply/thermal limits.

An external ground-triggered EBC uses **AUX1 or AUX1+AUX2** for its compatible pulse interface—not OUT1/OUT2. Those channels cannot simultaneously belong to the internal boost controller. WMI, nitrous, retard requests and other controller functions draw from the same six-channel budget; overlapping controller assignments are rejected.

8.14 Sensor source

In *Configure Fusion Boost* → *Connection* → *Shared boost pressure*, choose *Boost pressure* and tap *Save shared pressure source*. *Reload saved source* reads it back. This dedicated save changes only the shared pressure selection on FD; WMI uses it too, even while Fusion Boost is off. Choose RPM, throttle and coolant inputs under *Connection* → *Feedback & load inputs*. Compatible options come from onboard pressure, configured analog inputs, supported OBD values and decoded CAN signals. A selectable name does not by itself establish correct wiring, calibration or freshness.

- **AUTO pressure:** retains onboard/OBD arbitration. OBD absolute manifold pressure needs the correct barometric reference; the configured fallback reference may be used when the ECU does not provide one.
- **Explicit pressure:** binds to that source and validates its identity, quantity, units and age. Configure gauge/absolute reference correctly. Losing that source does not switch control to a different sensor.
- **RPM, throttle, gear, speed and warm-up temperature:** select valid measurements appropriate to the active strategy. Unknown or stale values are not equivalent to zero or permission to run.

Check actual response rate and sensor range for the feedback source. An OBD PID can be slower than the control loop or clip at its sensor's range. Commanded ECU values are not substitutes for measured feedback.

8.15 Learning and overshoot tolerance

Open *Configure Fusion Boost* → *Learning* in Open Loop or Closed Loop mode. Enable or disable corrections, set overshoot tolerance, choose the learning step and bound the maximum learned offset. A zero maximum offset removes learned correction.

Learning adjusts the base-duty correction within those bounds; it does not tune the ECU or remove the need to validate the base table. Learned corrections are retained on the device with coalesced storage writes. Review these settings in Boost Control or queue a web configuration change for approval through the connected phone. Current Intelligence findings provide read-only analysis; the controller's on-device learning is a separate function.

8.16 Boost status states and what to do

- **Disabled:** controller/profile output is disabled, a required assignment/configuration is not ready, or a linked cut prevents operation.
- **Idle:** enabled but current eligibility is not met. Inspect source validity and gates if output is unexpectedly absent.
- **Spooling:** an eligible load request is active and the controller is approaching the target.
- **On Boost:** measured boost has reached the controller's near-target threshold; duty continues to follow the selected mode.
- **Overboost Recovery:** measured pressure exceeded the limit. Duty is reduced or cut according to severity.
- **Cooldown:** the load request has released and the state machine is settling back to idle.

A state label describes controller logic, not proof of actuator movement. Review measured pressure, commanded duty, source age and recorded transitions together.

8.17 A safe tuning procedure

1 Verify the installation with control off

Confirm power, polarity, plumbing, sensor calibration and the actual result of de-energizing the valve.

2 Review a conservative configuration

Use engine-specific limits and an appropriate base table. Confirm source-loss, warm-up and linked protection settings with the installer/tuner.

3 Save and read back

Check that the ESP acknowledged the settings and owns the intended output.

4 Record controlled tests

Choose target, actual pressure, duty, RPM/throttle and relevant fuel/temperature channels. Check acquisition gaps as well as the curve.

5 Change one variable, then repeat

Inspect the measured result before increasing load. Stop and investigate unexpected pressure, stale measurements or repeated protection activity.

8.18 Simple setup, full advanced control

Choose your third-party controller or Fusion Boost first. Third-party setup presents only supported group/trigger behavior and the associated wiring. Fusion Boost offers editable starting settings, profiles and manual/open-loop/closed-loop operation; PID is closed-loop control. Advanced setup contains source selection, schedules, tables, learning and protections. Use named profile controls on Controls or Dashboard. Fusion Boost saves its control mode, manual-duty setting and enabled configuration; these may resume after restart when its configured gates permit. Use Stop or disable the controller before leaving a setup that must stay inactive. If the onboard pressure hose is not connected, select the OBD pressure source in setup: a working sensor at atmospheric pressure cannot detect a missing hose. OBD pressure uses MAP minus the available barometric reference; freshness and compatibility still matter.

8.19 Related

- Wiring — V1 LS output polarity and power.
- Outputs — presets and assignments.
- CAN & OBD — configured measurements.
- Data Logging — compare targets, measurements and events.
- Water/meth & Nitrous — shared outputs and protection.

9

— APP MANUAL · WATER/METH & NITROUS

Water/Methanol Injection and Nitrous

Control a compatible water/meth pump, monitor an existing WMI controller, or build progressive nitrous control around your installed sensors. Set the outputs, measurements, curves and protections in the app; FusionDrive saves the configuration and runs it in the car without a connected phone.

**START WITH THE INSTALLATION**

Configure with injection disabled and test with instrumented dummy loads before using fluid or nitrous. The controller can act on installed, calibrated measurements; it cannot measure an empty tank, blocked nozzle, fuel pressure or mixture without the relevant signal. Match each pump, solenoid or external control input to the output's polarity, current and PWM requirements. See Wiring before connecting a load.

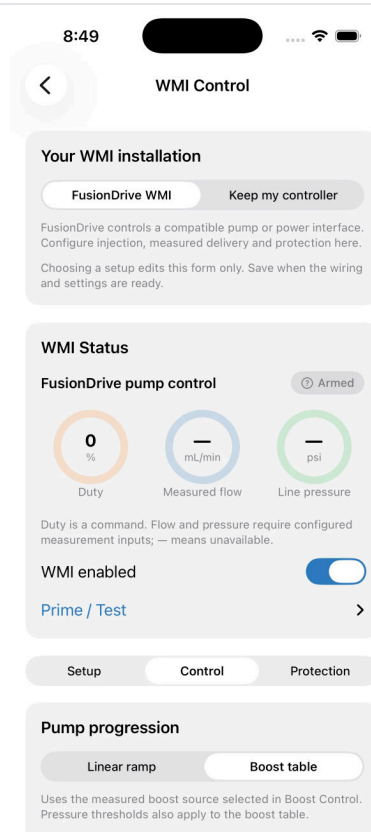
9.1

Water/methanol injection (WMI)

Open **More** → **WMI Control**. Under **Your WMI installation**, choose **FusionDrive WMI** or **Keep my controller**. For a retained controller, choose **Monitor only** or **Enable interlock**. This edits the form; it changes the device only when saved.

Controller role	What FusionDrive does	What you connect
FusionDrive WMI	Commands pump duty using a linear boost ramp or an editable boost/duty table.	A compatible pump output, plus the measurements you want to use for protection.
Keep my controller → Monitor only	Reads external demand and measurements. Owns no output; configured linked boost protection can still act.	The existing controller's supported demand signal and any installed flow, pressure or level measurements.
Keep my controller → Enable interlock	Monitors the external system and operates a binary permit output: 100% permits operation; 0% removes permission.	A compatible enable/interlock input on the external controller. This output is not the external pump's PWM signal.

External-controller modes require a fresh demand source. They do not change a third-party controller's own maps or implement its proprietary communications. Pulse-output flow meters need a compatible voltage conditioner or CAN interface; IN1–IN6 do not count high-frequency pulses.



WMI Control separates the installation choice, live device state and Setup, Control and Protection settings. Control appears only for FusionDrive pump control.

9.2 WMI setup

- 1 **Configure the measurements first**
Add and calibrate sensors under **Sensors**, or define the required vehicle/accessory CAN signals. Check actual values, units, switch polarity and what happens when a signal disappears.
- 2 **Choose the controller role**
Use pump control for a pump FusionDrive drives, monitor only to observe an existing controller, or enable interlock for a documented external permit interface.
- 3 **Allocate the output**
Pump and interlock modes need an available output set to Auto. Monitor-only mode needs no output. OUT1-4 are high-side outputs; AUX1/2 are low-side sinks. Use a compatible load or interface, not an arbitrary spare pin.
- 4 **Set demand and protection**
For pump control, set the boost ramp or table. Bind flow, pressure and tank level where fitted; select external demand in external-controller modes. Set thresholds, input age, grace and recovery timing.

5 Save and read back

Tap **Save WMI Settings**, wait for the device response, then use **Reload saved values** to inspect the stored configuration. Save includes all WMI sections. Monitor-only saves release the WMI output and disable WMI; enable monitoring when ready. If the device configuration changed while you were editing, reload and review before saving again.

6 Test, then enable

Check output operation, simulated low/stale measurements, fault recovery and linked boost response before enabling injection. Test pump priming with fluid safely diverted away from the engine.

9.3 WMI Status

WMI Status shows the saved controller role and state, matching ring gauges for commanded duty or external demand, measured flow and line pressure, and the WMI enabled switch. Unconfigured measurements display a dash rather than zero. Fault reasons and Clear WMI Fault appear when needed. In **Protection → Measured delivery & protection**, inspect flow, line pressure, tank level, external demand where applicable, active grace and recovery readiness.

Measured flow within configured limits means the configured flow signal passes its checks. **Delivery unverified** means that evidence is unavailable or not established. Neither pump duty nor a pressure or level reading alone proves fluid reached the nozzle.

9.4 WMI enabled

WMI enabled controls the saved setup and enables the selected role. Pump control can inject when its demand and protection conditions are met. External modes monitor their configured demand; interlock mode also controls the permit output. Switching the system off stops FusionDrive pump/permit commands and cancels priming.

If enable is rejected, read the message and check the assigned output, Auto mode, source availability and active faults. Do not treat a rejected toggle as an applied setting.

9.5 Prime / Test

Prime is available for the saved, enabled **FusionDrive pump control** setup. Expand **WMI Status → Prime / Test**, choose a duration from 500 to 30,000 ms in 500 ms steps and a duty from 0 to 100%, then tap **Start Prime**. While priming, use **Stop Prime**. Saved defaults are in **Control → Response & prime defaults**.

Priming is a temporary command, not a saved instruction to prime on every reboot. Measurement protections still apply. Prime grace delays minimum flow/pressure checks only; missing signals, tank-level and upper-limit checks remain active. Divert fluid safely during setup and verify actual delivery.

9.6 Control: pump progression

WMI pump progression uses the configured shared boost-pressure source, even when Fusion Boost actuation is disabled. Open **WMI Control** → **Setup** → **Shared boost pressure**. Select the intended onboard, analog, OBD or decoded CAN pressure source supported by the app, verify gauge-pressure units and freshness against a reference, then use *Save shared pressure source* and *Reload saved source*. This changes only the shared measurement selection; it does not enable either controller or prepare an output. Flow, line pressure, tank level and external-demand bindings in WMI Protection serve different roles; they do not choose pump boost demand. Prove missing or stale pressure prevents injection before tuning the curve.

In pump control, **Start Injection** sets the start pressure and **Full Injection** sets the pressure for maximum duty in Linear ramp mode. Pressure sliders and numeric fields use your preferred pressure unit; the linear-ramp preview shows the draft curve. Changes are saved with **Save WMI Settings**. In Control, **Off Below** sets the lower stop threshold so injection does not chatter at the start pressure.

Linear ramp interpolates from minimum to maximum duty between Start and Full. **Boost table** uses **Pump Duty by Boost**: eleven editable points from 0 to 50 psi at 5 psi intervals. Values between points are interpolated; start/off thresholds still determine when injection runs. External modes use the external demand input instead of this pump-demand curve.

9.7 WMI configuration sections

Use **Setup** for the named pump or permit output, **Control** for internal pump progression and prime defaults, and **Protection** for installed measurements, timing/recovery and the boost fault link. Save WMI Settings applies the complete reviewed form; opening a section does not change the running configuration.

Setting group	What to configure
Control: duty range (Linear ramp)	Minimum and maximum pump duty, each 0–100%. Select limits supported by the actual pump and selected output.
Control: prime defaults	Prime duty and default duration. These set a test command, not continuous injection.
Control: Control mode	Linear ramp or Boost table. In table mode, edit every required point in Pump Duty by Boost.
Boost Protection	Enable Reduce boost when WMI faults. The measured-protection setting chooses output cut or target reduction; see faults and the boost link.
Hysteresis & Smoothing	Off Below plus separate Smoothing Up and Smoothing Down. Smaller smoothing values make duty changes more gradual; 1 makes the response immediate.
Your WMI installation	Pump control, external monitor only or external enable interlock.
Setup: Pump output / Controller permit output	The pump or permit channel. Interlock operation requires immediate full on/off behavior: maximum 100%, no rising ramp and calibration that delivers 100% at a full command.

Protection → **Ignition protection** contains **Stop WMI output when ignition is off**. It accepts dedicated IGN or fresh running-engine OBD evidence and also inhibits priming when vehicle activity is off. This switch saves immediately with device acknowledgement, separately from Save WMI Settings; test the chosen activity source, loss of data and output response.

Choose the measurements

Each measurement has a **Source**, **Source scale** and **Source offset**. Choose a configured analog or compatible OBD/decoded CAN signal. The protection value equals the calibrated source value $\times$ scale + offset. WMI does not add an implicit unit conversion: enter the scale needed for the units below.

Measurement	Required units	Protection settings
Measured flow	mL/min	Minimum while delivery is requested and maximum flow. Alternatively enable Expected flow by duty and edit eleven minimum/maximum pairs at 0, 10...100% demand. The 0% upper limit can detect unexpected flow while idle.
Measured line pressure	psi	Minimum pressure while delivery is requested and maximum pressure.
Tank level	% full	Minimum tank level. A calibrated switch can represent empty/healthy as 0%/100%; see tank setup.
External controller duty / demand	%	Required in external modes. Establish which signal represents a delivery request and verify the conversion to 0-100%.

An unassigned measurement provides no protection. Once assigned, a missing or stale measurement is a fault condition rather than permission to continue.

Timing & recovery

- **Maximum input age:** the oldest acceptable measurement, in milliseconds.
- **Startup low-flow / low-pressure grace:** time for delivery to establish after demand starts.
- **Prime low-flow / low-pressure grace:** the corresponding allowance during a prime test.
- **Threshold fault debounce:** how long an out-of-limit threshold must persist before a fault is latched.
- **Healthy OFF time before manual clear:** how long fresh, safe readings must remain valid with demand off before Clear WMI Fault is accepted.

Grace applies only to the minimum flow/pressure checks. Missing or stale sources cut immediately; level and upper limits remain monitored. Tune grace and debounce to measured system response, rather than using them to hide a persistent delivery fault.

9.8 WMI states

State	Meaning
Disabled	System off; no FusionDrive pump/permit command.
Armed / standby	Enabled and waiting for eligible demand.
Injecting / active	Delivery has been requested. Check measured protection separately from commanded duty.
Priming	A temporary pump test is running.
Fault	A protection has stopped operation. Inspect the listed reason and recovery readiness before clearing.

9.9 Level switch interlock

Configure the tank sensor under **Sensors**, then select it under **WMI Control** → **Protection** → **Tank level**. For an active-high healthy switch reporting 0 or 1, scale 100 and offset 0 gives 0% empty and 100% healthy. For an active-low healthy switch, scale -100 and offset 100 reverses that mapping. Set Minimum tank level between the empty and healthy readings.

For a continuous level sender, calibrate the source and conversion to % full instead. Verify both states physically, including a disconnected wire. A level switch does not prove flow; add an actual flow measurement when flow protection is required. Follow the switch and pump manufacturer's electrical instructions; a small float switch is not automatically suitable for carrying pump current.

9.10 WMI faults and the boost link

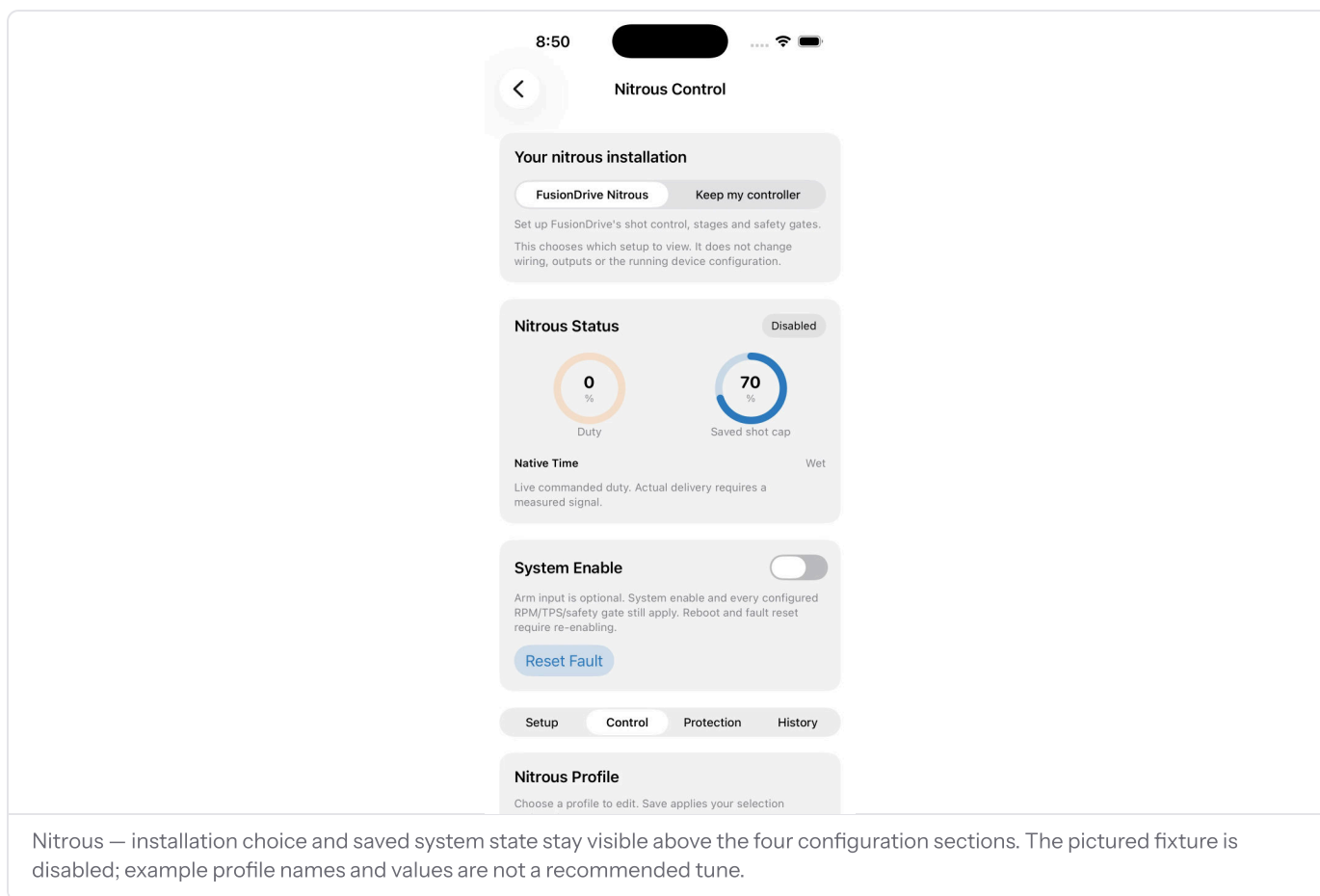
Measured-protection faults latch for the current powered run. Turn demand off, correct the fault and wait for fresh safe measurements through the configured recovery window, then use **Clear WMI Fault**. In external modes, demand must read 0% before clearing. Saved protections are checked again after reboot; the previous transient fault latch is not a permanent fault record.

To link a fault to internal boost control, enable **Reduce boost when WMI faults**. With **Cut linked boost output on fault** selected, the boost output uses its failsafe OFF path. With that cut option off, the existing 30% target reduction applies. Saved boost profiles remain unchanged. Neither response guarantees a mechanical boost limit; confirm the wastegate and external interfaces respond as intended.

9.11 Nitrous

Open **More** → **Nitrous**, choose **FusionDrive Nitrous**, then use **Setup**, **Control**, **Protection** or **History**. Use the single-stage setup or turn on **Independent stages** for up to three individually configured dry/wet stages. Each stage can use fixed duty, a timed ramp or an RPM table. Enable, arming, gate measurements, safety limits and output ownership still apply.

Keep my controller opens a guided route to feedback sensors, a compatible control output and local automations. This view selection does not disable FusionDrive Nitrous, release its outputs or configure an external controller. These settings control FusionDrive's own outputs. They do not configure a third-party nitrous controller's internal maps. An existing controller can be observed through available sensors/CAN and operated through a documented compatible control interface; only configure functions that interface actually supports.



9.12 Nitrous setup

1 Set up sensors and gate sources

Verify RPM, throttle and any enabled speed/temperature gates. Add fuel/bottle pressure and measured wideband AFR or lambda where those interlocks are required.

2 Choose arming and output mapping

Review Require arm signal and its calibrated input. Choose dry/wet outputs, or enable Independent stages and map each stage. Keep System Enable off while editing.

3 Configure the selected profile

Set activation windows, progression, maximum on-time, cooldown and protections. Wet independent stages have separate nitrous and fuel curves.

4 Save and verify

Save applies the selected profile and configuration. Wait for the device response; use Reload saved configuration and inspect the returned values before enabling.

5 Exercise every cut without injection

Use dummy loads and controlled inputs to test arming, stale signals, pressure/mixture limits, stage timing and fault reset. Qualify the actual load and installation before a controlled live test.

9.13 Nitrous Status and System Enable

The status card shows the state, commanded duty and profile. Expanded status also shows each stage's nitrous/fuel duty and any external retard request. A request being ON does not confirm that an external ignition controller applied retard.

System Enable is separate from the arm input and safety gates. Reboot and **Reset Fault** require re-enabling. A saved local automation can enable the system, so include automation rules in your arming review. Resetting a fault does not start another shot.

9.14 Control: profiles and progression

Three profile cards select the draft to edit. Timed ramps and six-point RPM tables include graph previews and duty sliders. Graphs show draft progression before caps and safety gates; saving applies the selected profile and settings. Independent stages expose labelled stage cards and separate nitrous/fuel curve editors. The status rings show saved live values, not unsaved edits.

Choose **Profile to edit** A, B or C and set its name. **Save applies the selected profile**; selecting a profile while editing is not proof that the device changed. In Independent stages, each profile holds its own stage settings and curves. Stage output assignments and system protection bindings are shared configuration, not three extra sets of physical outputs.

9.15 Basic Settings

Setting	Purpose
Mode	Dry uses a nitrous output. Wet adds a fuel output. The original single-stage wet behavior uses matching duty; Independent stages exposes separate fuel progression.
RPM Window / WOT Threshold	The RPM range and minimum throttle for activation. Use configured compatible signal sources; RPM and throttle need not come only from standard OBD.
Control Type	On/Off commands the cap; Ramp progresses over time; RPM Table interpolates across six increasing RPM points and their duty values.
Shot Cap	The maximum commanded duty. Duty is not a measured flow or horsepower value.

The RPM table is editable in the app. Use **Save Nitrous Settings** to save the selected profile and configuration; the shot cap and all gates remain in effect.

9.16 Outputs & Arm Input

Choose **Arm Sensor Input** and review **Require arm signal**. When required, the selected calibrated input must be valid and armed. If you deliberately make the arm input optional, System Enable and every configured gate still apply. Configure switch threshold/reverse logic in Sensors and verify the physical switch before use.

Gate input timeout determines when required gate measurements are stale. Under **RPM, throttle and safety gate sources**, choose compatible configured sources for RPM, throttle, vehicle speed, intake temperature and coolant temperature. A required missing signal blocks activation or cuts an active shot.

Assign available Auto outputs for the selected mode. Saving Dry mode releases the fuel output. Dedicated controllers cannot share a channel: boost, WMI, nitrous, external EBC and a retard request all draw from the same six-channel budget.

**COUNT THE OUTPUTS BEFORE PLANNING STAGES**

A dry stage uses one output; a wet stage uses two. Three wet stages consume all six channels, leaving no spare boost, WMI or retard output. They are possible only with electrically compatible loads/interfaces: AUX1/2 are low-side 1 A-class sinks, not additional high-current pump drivers. See Specifications.

9.17 Profiles: timing and safety

Controls	What they do
Ramp Settings	Start duty, end duty, hold at start and ramp duration. A time curve starts from the stage's activation, after its gate delay.
Safety	Maximum ON time, cooldown, throttle and RPM hysteresis. Hysteresis defines the reset boundary rather than adding permission to an invalid measurement.
Minimum speed	A positive value enables the gate; 0 disables it.
Maximum intake / coolant temperature	Set the relevant limit; -1 disables it. Enabled gates require fresh source values.

Independent stages

Turn on Independent stages and enable the stages you need. Each has dry/wet type and output mapping, plus profile-specific RPM minimum/maximum, throttle minimum, gate delay, maximum on-time, cooldown and reset hysteresis. Set the nitrous curve and, for wet stages, the separate fuel curve: On/Off, Time ramp or RPM table, with its own cap and progression.

Global speed and temperature limits apply to every stage. A stage needs a throttle/RPM reset or arm cycle before retriggering. Wet operation cannot command positive nitrous while its configured fuel output/curve requests zero. Saving prepares stage outputs without generic PWM ramp/calibration, so the stage curves define their progression.

Pressure and measured-mixture protections

- **Fuel pressure interlock:** enable, choose the source, set minimum/maximum pressure in your preferred pressure unit and freshness. Calibrated psi, bar or kPa pressure sources are converted to psi.
- **Bottle pressure interlock:** independently choose its source, window and freshness.
- **Measured mixture lean interlock:** choose measured Lambda or AFR, a matching wideband source, Lean cut above, freshness and lean trip delay. Commanded mixture is not valid measured feedback.

Missing or stale required pressure/mixture blocks a shot; loss during a shot cuts and faults. Lean trip delay applies to a measured lean condition while active, not to missing data. Source calibration, sensor response and physical placement determine what the measurement can establish.

External retard request

Enable an external request output only for a documented compatible ECU/ignition interface. Assign a spare output and set **Lead before shot** and **Tail after normal stop**. The output is a binary request; configure the retard amount in the receiving controller. It does not time coils or measure retard degrees. Fault and disable clear the request immediately. Saving prepares immediate full on/off behavior without generic ramp/calibration.

Use **Save Nitrous Settings** after reviewing the entire mapping and selected profile.

9.18 Nitrous states and cuts

State	What to check
Disabled	System Enable is off.
Disarmed	Required arming conditions have not been met.
Armed	Enabled and armed, waiting for eligible gates and stage timing.
Active	One or more outputs are commanded. Inspect individual stage state/duty and measured signals.
Cooldown	A shot has ended; cooldown and reset conditions must complete before another activation.
Fault	A protection stopped operation. Correct the cause, inspect fresh measurements, reset and explicitly re-enable when ready.

9.19 Recent Events

Review recorded state changes alongside selected profile, duty, protection and RPM channels. Event detail varies by source; not every transition includes a full reason. A connected phone recording at the time can retain controller channels and events in a drive log, including individual stage state and commanded duty. Full drive logging still requires the phone; the controller's local operation does not depend on it.

9.20 Basic starts and Advanced tuning

Choose retained third-party control or Fusion control to reveal the relevant setup. Retained controllers expose their supported trigger/inhibit and monitoring interfaces; they do not automatically expose every internal adjustment. Fusion control adds configured sources, protections and progression. Start with editable basic settings, then expand Advanced for tables and specialist options. A WMI table seeded from its basic ramp is an approximation on fixed 5 PSI points: values between the basic thresholds can differ, so review the preview. Nitrous arm/disarm preserves activation gates, paired fuel delivery and stage logic; WMI prime is a timed test, not an unlimited bypass of protection.

9.21 Related

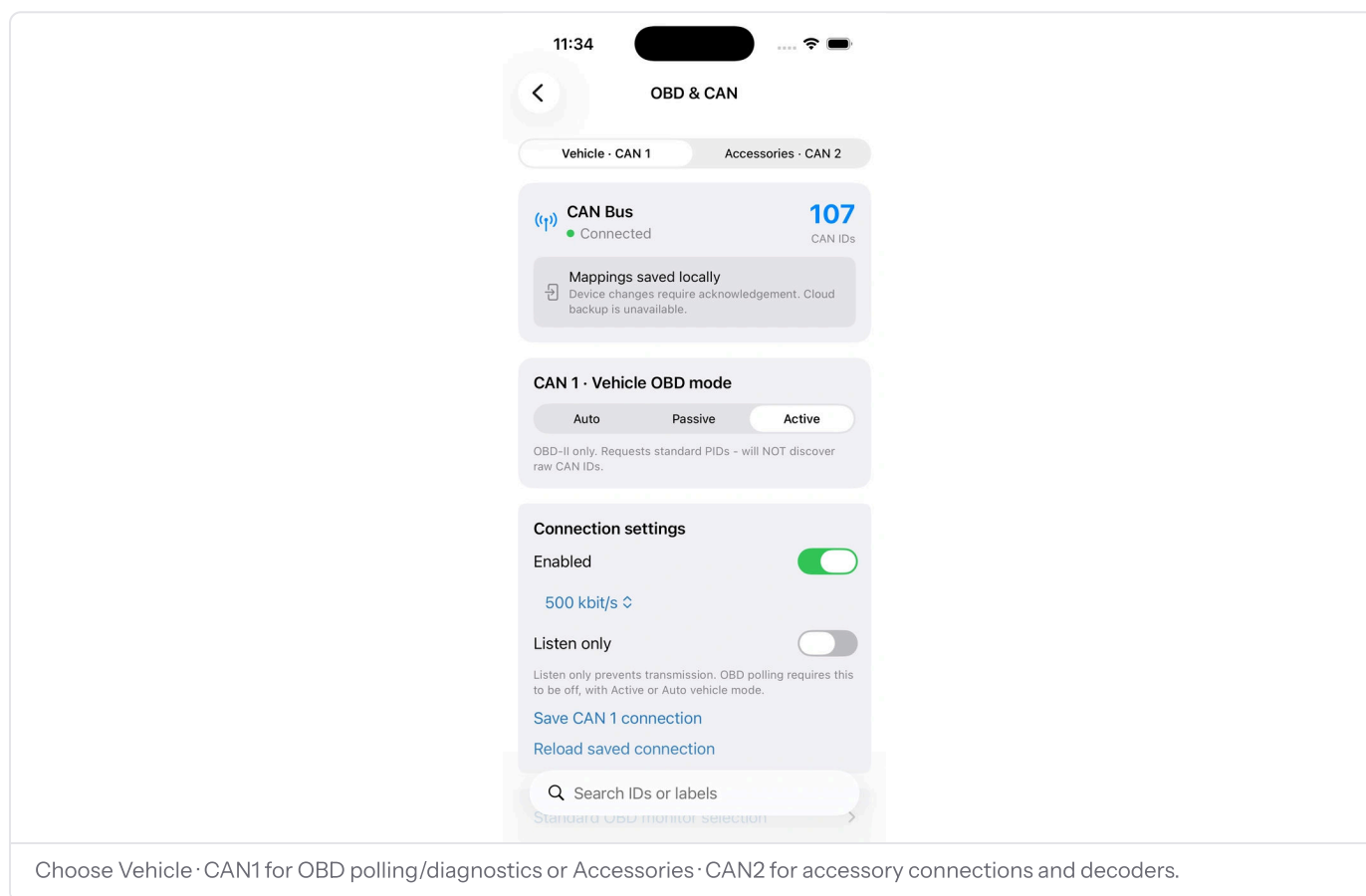
- Output presets — WMI Pump and Nitrous Solenoid.
- Level / switch inputs — wiring the tank and arm switches.
- Automation recipes — tank-empty and safety rules.
- Boost Control safety.
- CAN & OBD — reliable RPM and throttle for nitrous.
- Alerts — WMI fault and Nitrous fault notifications.



— APP MANUAL · CAN & OBD

OBD & CAN — vehicle and accessory data

Use supported vehicle data from CAN1 and configure a separate CAN2 accessory bus. Discover supported standard PIDs, choose what to monitor, and turn correctly defined CAN signals into useful measurements for dashboards, logging and compatible controller inputs. Open **More** → **OBD Settings**; or **Settings** → **OBD & CAN**.



Choose Vehicle · CAN1 for OBD polling/diagnostics or Accessories · CAN2 for accessory connections and decoders.

10.1 What the OBD connection gives you

CAN1 uses the OBD connector for compatible CAN-based vehicles. Standard PID discovery identifies what the ECU reports as supported and which responses have actually been received. It does not reveal every manufacturer-specific signal, and an OBD socket alone does not establish compatibility with older non-CAN diagnostic protocols.

CAN2 is a separate accessory connection. A frame needs the correct bus identity and definition before its bytes become pressure, temperature, flow or another measurement. Once a compatible signal is decoded and fresh, the supported dashboard, logging, automation and controller-source tools can use it.

These features read and configure FusionDrive's interfaces. They do not reflash the engine ECU or automatically interpret unknown proprietary traffic.

10.2 Status header

The header summarizes bus/discovery state. Choose **Vehicle · CAN1** or **Accessories · CAN2** first. Connection settings and signals follow the selected bus. Only Vehicle shows OBD operation mode, the standard PID catalogue and diagnostic codes. A configured/ready bus is not proof of live traffic, and a received ID is not yet a decoded sensor.

Search filters visible IDs/labels. Refresh to obtain the current device registry and configuration; the ESP remains the authority for saved mappings.

10.3 Operation Mode

- **Auto:** uses observed traffic to choose the vehicle listening/polling behaviour. If required standard data is not arriving, inspect the bus configuration and try the appropriate explicit mode.
- **Passive:** observes available traffic without the vehicle OBD request loop. It cannot request missing ECU values or perform a requested diagnostic scan.
- **Active:** requests enabled standard OBD values on CAN1. Raw-frame visibility is a separate view; it is not a switch that makes all other traffic disappear.

Per-bus **Allow transmitting on this bus** is the hard transmit permission. Listen-only blocks transmissions on that physical bus, including configured custom transmit. CAN1 OBD polling requires both permission to transmit and an appropriate Active/Auto mode.

10.4 Bus detection

Turn on the vehicle as required for its diagnostic session, verify the connection and match the configured bit rate. Traffic detection is not automatic decoding of arbitrary CAN signals or proof that every ECU supports standard polling.

If a bus is silent, check wiring, ground/reference, termination and its enabled/speed settings before adding transmit traffic. CAN2 has its own physical settings; enabling it is an explicit saved action.

10.5 Discovered OBD-II PIDs

Open **Standard OBD monitor selection**, then *Discover supported PIDs*. Allow responses to arrive and refresh. The catalogue distinguishes *response received*, *ECU reports supported*, *not in ECU support bitmap* and *support not known*.

Select the standard scalar PIDs you want polled and made available. A supported bitmap is not the same as a fresh reading. A missing response remains unavailable rather than zero. The current catalogue provides explicit enable selection; the older description of six permanently enabled PIDs does not describe this control.

The discovered/observed lists provide friendly labels, values and rates where available. Dashboard pins and logging selection are separate choices: pinning a gauge does not recover a channel that was never received or recorded. Multi-value/proprietary data needs the appropriate decoder.

10.6 How often data updates

Standard OBD requests share CAN1 polling time. Selecting more channels can reduce how frequently each refreshes; ECU response behaviour and bus load also matter. Passive signal rates follow the transmitting equipment. Watch reported rates and source ages rather than assuming a fixed 10–50 Hz vehicle update rate.

Controller freshness limits depend on the saved function/source configuration. Explicit boost feedback and measurement-dependent WMI/nitrous protections do not become valid just because a PID was once discovered. Select an appropriate fresh source and check behaviour when it stops updating.

The current implementation does not offer a generic CAN2 request/response polling editor. CAN2 equipment that requires proprietary requests needs a verified supported interface; selecting a bus speed or adding a decode rule alone does not generate those requests.

10.7 Diagnostic Trouble Codes

Scan for Codes requests supported stored diagnostic codes from the vehicle. It requires CAN1 transmit permission and appropriate Active/Auto OBD behaviour. **Clear All Codes** sends a diagnostic clear request after confirmation; the ECU determines its response and may reset associated readiness/freeze-frame information.

Record the codes and diagnostic context first. Clearing a code does not repair its cause, and this standard scan is not a promise of access to every manufacturer module.

10.8 Custom CAN Transmit (Sensor Injection)

Custom CAN Transmit broadcasts a configured analog sensor value in a supported format. Select CAN1 or CAN2, source input, label, scaling, interval and the intended frame layout. This is sensor transmission—not a generic accessory polling transaction or an ECU-tuning function.

- 1 Identify the recipient's expected format**
Use its specification. The app's sensor/formula presets are encoding conveniences, not proof that every ECU, dash or tuning package accepts the value.
- 2 Select the bus and source**
Choose the configured analog input and destination bus. Confirm the physical bus is enabled and deliberate transmit permission is set.
- 3 Review encoding and rate**
The editor offers scaling and supported OBD-style/raw formats. Check ID, byte/bit layout, units and update interval against the recipient.
- 4 Save and verify**
Wait for acknowledgement and confirm the receiving equipment interprets the intended measurement. Saved transmit configuration can run without the phone.

ID conflicts matter. 0x7E8 can conflict with ECU replies; IDs 0x500–0x5FF are not universally safe. Use an agreed ID and the required isolation/interface for that network. Disable unexpected transmissions before investigating. Do not spoof an existing ECU sensor.

10.9 Vehicle / Accessory signals & decoders

The raw registry retains exact bus/frame identity, including standard versus extended IDs. The top Vehicle/Accessories selection chooses the bus; filter its module list and inspect the reported bytes/rate. Names help organize the list; they do not decode a signal.

Open a frame to manage one or more signal definitions. Enable the required frame/signal and select the decoded channels for the dashboard, controller inputs or recording. The device supports up to 70 decode rules shared across its configured signals.

Latest bytes in the registry are snapshots. For bounded individual-frame evidence, configure the optional receive journal in Logging settings; it is not a lossless full-bus analyser.

10.10 Decode rules

A rule combines the exact bus, frame ID/ID type and signal identity with a layout and conversion. Give the accessory and signal useful names; signal labels must be unique within the supported registry.

- **Byte layout:** offset 0–7 and length 1–8 bytes, fitting the received classical-CAN frame.
- **Packed layout:** start bit 0–63 and length 1–64 bits. Intel counts upward from the least-significant bit; Motorola uses its most-significant-bit layout across byte boundaries.
- **Numeric conversion:** signed/unsigned integer, multiplier, offset and units. $\text{Value} = \text{raw} \times \text{multiplier} + \text{offset}$.
- **Multiple signals:** add separate definitions for several signals in one frame; one ID is not limited to one value.

Use a matching manufacturer specification or supported DBC. Validate the decoded value against a known measurement before using it as controller feedback or a protection input. Saves are acknowledged by the device; failed writes do not become successful just because a local draft exists.

10.11 Import DBC

1 Choose the destination bus and file

The importer accepts a text DBC up to 2 MiB for CAN1 or CAN2.

2 Review supported and skipped definitions

Current support is classical-CAN message lengths 1–8, standard/extended IDs and 1–64-bit integer signals, including packed Intel/Motorola layouts and multiple signals per frame. Multiplexed and floating-point signals are not supported.

3 Select what you need

The device has 70 rule slots. Duplicate selected names/layouts are checked before writes; unsupported definitions are reported rather than silently advertised as imported.

4 Import and read the result

Rules are saved sequentially after acknowledgement. If a later rule is rejected, the importer reports the partial result; earlier acknowledged rules remain saved.

A matching bus/frame/signal layout is replaced after acknowledgement; other signals are retained. The imported rules, not the original DBC file, are the operating definitions saved on the ESP. A successful parse does not prove that the file matches the connected accessory or firmware version.

10.12 The second CAN bus

Connect CAN2 H/L on the dedicated accessory wiring described in Wiring. Choose **Accessories · CAN2**, enable the bus in its connection settings, choose 250/500/1000 kbit/s to match the network, and start with transmitting off. Use **Save CAN 2 connection** and wait for acknowledgement. The CAN1 connection is not rewritten by this save.

1 For an accessory that broadcasts

Listen for its frames. Open **Accessory signals & decoders**, name the accessory and add supported signal definitions or import its matching DBC.

2 For an accessory that accepts FusionDrive sensor broadcasts

Configure the supported Custom CAN Transmit format on CAN2, then explicitly permit transmission and verify the recipient's interpretation.

3 For an accessory that needs polling or a proprietary handshake

Confirm an implemented compatible interface before relying on it. There is no generic request/response polling wizard or universal accessory preset library in this release.

CAN1 standard OBD polling remains on CAN1. CAN2's settings and decode rules are saved independently on the device; a CAN1 frame with the same numeric ID is not the same signal. The board contains CAN-FD-capable controllers, but current firmware support is classical CAN; complete CAN FD operation is not established by this guide.

10.13 Clearing the CAN registry

Under **Maintenance, Clear registry for both buses** clears discovered registry entries on CAN1 and CAN2 after confirmation and allows discovery to rebuild the list. Review what you need to retain before using it when changing vehicles. Decode rules and custom transmit settings are separate stored configurations; this is not a factory reset.

Clearing a list does not disable every previously configured control function. Review controllers, input bindings and transmit definitions separately when moving the hardware to a different car.

10.14 Backing up mappings

Names, selected monitoring and supported CAN configuration are saved on the ESP and operate without an account. Optional Cloud synchronization can retain a configuration snapshot for review.

A Cloud snapshot is not an automatic restore over the device. Review pending web edits, approve them through the connected phone, and wait for ESP validation/acknowledgement/readback. A local cache or uploaded draft does not override current device settings by itself. See FusionDrive Cloud.

10.15 Troubleshooting pointers

- **No traffic:** check vehicle/accessory power, compatible protocol, physical wiring, termination, enabled state and matching bit rate.
- **Traffic but no usable values:** confirm the right bus and decode definition. For standard CAN1 OBD data, check operation mode and transmit permission.
- **Missing expected PID:** inspect support/observed status; the ECU or diagnostic session may not provide it. Proprietary data needs a correct supported definition.
- **Wrong units or implausible values:** check source calibration, gauge/absolute pressure reference, signedness, layout, multiplier and offset.
- **Stale protection input:** check actual rate, channel selection and controller timeout; a former valid value is not current evidence.
- **Unexpected behaviour after transmit:** disable the definition and inspect ID/format conflicts with the installer. Do not assume another numeric ID is safe without the network specification.
- **Partial import/save:** read the device acknowledgement and reload its stored configuration before retrying.

See Troubleshooting for further checks.

10.16 Related

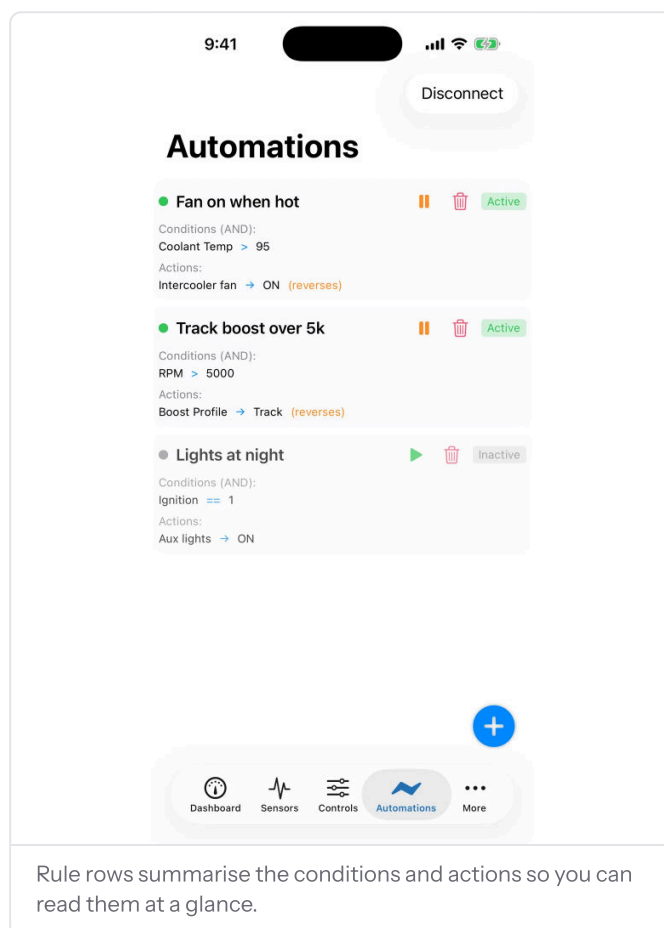
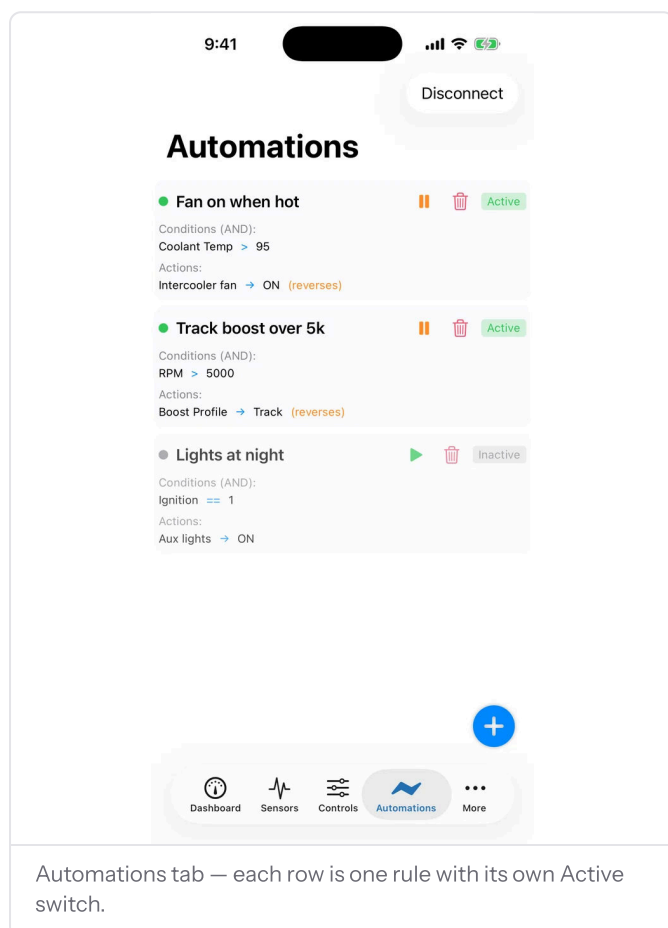
- Wiring — physical buses and sensor interfaces.
- Dashboard — available engine values.
- Automations — compatible signal conditions.
- Boost sources — explicit feedback and freshness.
- Water/meth & Nitrous — measurement-dependent protection.
- Logging — decoded values and bounded raw capture.

11

— APP MANUAL · AUTOMATIONS

Automations (Rules)

Build rules around the sensors, vehicle data and controls you have configured: switch a fan, select a boost profile, manage an accessory or start another rule. The Automations tab is the editor; the saved rules run on FusionDrive, including when your phone is disconnected.



11.1 What an automation is

A rule combines a name, an Active switch, conditions and actions. The current firmware supports **10 rules, with up to 8 conditions and 8 actions per rule**. The editor shows the limits reported by the connected device; older firmware may expose fewer options.

- **Conditions** compare available inputs, controller states or system values.
- **Logic** combines them with ALL, ANY or an expression containing nested groups.
- **Timing** controls when a matching rule starts, stops and can run again.
- **Actions** change supported controls, optionally after a delay or for a finite hold.

Actions run once per activation, not once on every control tick. A rule must end and become eligible again before it starts another sequence. Dedicated controller ownership and protective cuts remain in force.

11.2 The Automations tab

Control	Use
Rule row	Read the condition/action summary; tap to edit.
Active switch	Enable or disable the saved rule on the device. Disabling stops its active sequence and applies the engine's safe exit to affected controls; do not expect an active output to stay on.
+	Create a rule in an available slot.
Delete	Remove the rule after confirmation. Review any rules that refer to that slot before changing the rule set.
Refresh	Read the current device state again.

A saved unavailable input or target is shown as unavailable rather than silently replaced. Reassign it deliberately, or cancel editing while you investigate the original configuration.

11.3 Creating a rule

1 Configure its sources and outputs first

Name and calibrate sensors, enable the OBD values you need, and define CAN signals. Select compatible output modes and leave controlled equipment disabled during setup.

2 Add the rule

Tap +, enter a useful name and choose whether it should become Active when saved.

3 Add conditions

Choose each parameter, operator and value. For an ordered numeric comparison, set hysteresis if needed. Check the unit displayed by the editor.

4 Set logic and timing

Use ALL/ANY for a simple rule, or enter an expression using condition numbers. Review trigger/release delay, cooldown, maximum active time and any linked-trigger requirement.

5 Add actions

Choose each supported target and value. Set start delay and, where appropriate, a hold duration and restoration behavior.

6 Save and verify

Save sends the complete rule to the ESP. Wait for acceptance and inspect the returned configuration. Rejected or disconnected saves are not applied confirmations.

7 Test the complete cycle

With suitable dummy loads, make conditions true, false and unavailable. Confirm timing, restoration, cooldown and behavior after restarting without the phone.

11.4 Automation Details

Field	Meaning
Name	A nonempty label shown in the app and recorded events.
Active	Whether the device may evaluate and run this rule. Review active rules before enabling any attached controller.
Condition Logic	ALL conditions (AND) or ANY condition (OR). Used when the optional expression is empty.
Expression and timing	Nested expression, linked-trigger requirement and rule timers. See logic and timing.

11.5 Conditions

The picker combines the connected device's supported fields with your configured sensors and decoded signals. Use the displayed signal identity and unit; two signals with similar names are not automatically interchangeable.

Source group	Examples
Vehicle data	Available OBD parameters such as RPM, coolant, speed and throttle. Availability and update rate depend on the vehicle and connection.
CAN 1 / CAN 2	Enabled, defined signals identified by bus, frame and signal. A received raw CAN ID needs a correct decoder before it becomes a meaningful numeric condition.
Inputs	Configured IN1-IN6 values, level/switch state, validity, connector voltage and acquisition age.
Outputs and boost	Output state/duty where offered; boost target, actual, error, profile, mode, enable/state and external EBC group/target/pulsing.
WMI	Enable, state, duty, priming/fault, measured flow/pressure/level, delivery/grace/recovery and protection status supported by the firmware.
Nitrous	Enable, state, profile, duty/fault and individual stage nitrous/fuel duty, state/time and retard-request status.
System and rules	Ignition, reported dedicated-rail state, CAN connection state, sensor validity and other rules' enabled/triggered state.

Every condition's source must remain available. A missing input does not become zero or false permission, including under NOT or OR logic. Missing required measurements immediately end the affected sequence and apply the safe exit. A reported output duty or rail indication is not a measurement of load current or successful physical operation.

11.6 Operators

Numeric fields offer the comparisons supported by the device, including greater than, less than, equality and their inclusive/not-equal variants. Switches use ON/OFF; state fields use named choices. Enter values in the displayed units—the app converts applicable values and hysteresis widths to their stored units.

Hysteresis width is available for ordered numeric comparisons. Once a condition has matched, the value must cross back by that width before it releases. For example, a condition **Coolant > 95 °C** with **5 °C hysteresis** starts above 95 °C and releases at 90 °C or below. Hysteresis does not apply to equality, text or switch conditions.

Use hysteresis for a stable temperature/pressure boundary. Use trigger delay for a condition that must persist for a period. Neither should hide a missing or stale source.

11.7 ALL (AND) vs ANY (OR)

- **ALL conditions:** every condition must match.
- **ANY condition:** at least one condition must match, while all configured sources remain available.
- **Expression:** combine numbered conditions using & (AND), | (OR), ! (NOT) and parentheses. For example, (1 & 2) | !3. An empty expression uses the ALL/ANY selector.

The numbers refer to the condition rows above. After adding, deleting or reordering conditions, recheck the expression. The device rejects invalid expressions rather than guessing what you meant.

Rule timing

Setting	Meaning	Range
Trigger delay	How long the rule must remain eligible before activating.	0–600,000 ms
Release delay	How long normal false conditions may persist before ending an active rule. Unavailable required input bypasses this delay.	0–600,000 ms
Cooldown	Waiting period before another eligible activation.	0–3,600,000 ms
Maximum active time	Bounds the duration of one activation, even if conditions remain true.	0–3,600,000 ms

Zero disables the corresponding timer. Timers use whole milliseconds; the controller's execution cadence still determines when it can act.

Linking rules

Enable **Require a linked trigger** on a rule that should run only after another rule opens its trigger window. In the parent rule, add **Automation N Trigger** and set the window duration. The child must still meet its own conditions; a trigger does not bypass its gates or cooldown.

Automation N Enable changes a rule's enabled state; **Automation N Reset** resets its active runtime state. Links cannot target the same rule or form a cycle. Review every reference when changing the rule set. These are bounded links between saved rules, not an unrestricted script engine.

11.8 Actions

Target	Available changes
Available output	ON/OFF, commanded duty from 0–100%, or supported Mode selection. The output must be enabled and in an operating mode.

Target	Available changes
Boost	Target within the configured maximum, profile, control mode and enable. External Boost Group is offered when the EBC is configured.
WMI	Enable, Basic/Table mode or a bounded Prime command. Prime is an event, not a setting that can be undone.
Nitrous	System enable and profile. Enabling still requires the controller's configured arm/gate/protection checks.
Other automations	Trigger for a defined window, enable/disable or reset, subject to cycle validation.

Sensors are conditions, not actuator targets. The editor disables targets that are unavailable or owned by a dedicated controller. To change boost, WMI or nitrous, use that controller's supported action instead of writing directly to its reserved output. Naming the same physical setting differently does not create a separate output.

Sequence timing

Start delay is measured from the rule's activation. Each action runs at most once in that activation and only while the rule remains active. Different delays let you build a bounded sequence without creating a rule for every step.

For a reversible setting, enable restoration and set **Hold duration** to restore the captured prior value after that many milliseconds. A hold of 0 lasts until the rule exits, when the selected restore behavior applies. Start delay accepts up to 600,000 ms; hold accepts up to 3,600,000 ms. WMI Prime, rule Trigger and rule Reset cannot have a restorative hold or reverse action. Missing required input cancels pending actions immediately.

11.9 Reverse When Conditions Not Met

The current editor calls this **Restore Previous Value When False**. It restores the value captured when the action actually started—not an assumed opposite. If an output was at 30% before a temporary 70% action, normal restoration returns it to 30%.

With restoration off, a setting change can remain after normal conditions become false. Disabling/resetting a rule or losing required input uses the engine's safe exit instead; do not rely on normal restoration to maintain an actuator during a fault. Events such as Prime, Trigger and Reset have no inverse.

Avoid overlapping rules that compete for the same setting. The device arbitrates shared targets, and dedicated controller ownership and failsafes take priority over a requested action.

11.10 Limits and validation

- **Current LS firmware:** 10 rule slots, up to 8 conditions and 8 actions each.
- **Device-reported capabilities:** the editor uses the connected firmware's limits. Update compatible firmware before relying on new timing or expanded fields.
- **Valid shape:** a name, at least one condition and one action when creating a working rule, valid values and a valid expression.
- **Valid references:** available sources, supported action targets and no self-links or cycles.

- **Output ownership:** a direct output action cannot take a channel reserved by boost, WMI, nitrous or external EBC control.
- **Timed actions:** finite holds require restoration; event-only actions cannot be reversed.

Read a save error, correct the identified configuration and save again. A rule remains a draft until the ESP accepts it. After reconnecting, read the device's saved rule rather than assuming an older phone or cloud draft is current.

11.11 How rules run on the device

Rule definitions, source calibration, CAN definitions and controller settings are stored on the ESP. Configured rules can operate without a connected phone. The rule/controller scheduler has a nominal 20 ms cadence; this is not a measured end-to-end sensor-to-actuator latency guarantee.

On activation, the engine starts the sequence once. Delayed actions run only while the rule remains active. Missing source data cancels the sequence immediately, without waiting for release delay. On power-up, an eligible saved active rule can run again—including a rule that enables nitrous—so check startup behavior as part of the installation.

A phone must be connected and recording to capture a full drive log. Selected automation conditions, activity and controller effects can be included in that log, with events and acquisition information for review. Local rule execution continues independently of phone logging or Cloud upload.

11.12 Recipes

These are setup patterns, not values qualified for your vehicle. Substitute your own calibrated signals, limits and electrically compatible outputs. Test normal, false and missing-input cases with the equipment safely isolated.

1. Radiator fan on when hot

Condition: Coolant > your chosen temperature, with a hysteresis width. Action: the available fan output ON, with Restore Previous Value When False. Start with that output off so normal release returns it to off. Use a compatible fan controller or relay interface when direct PWM is unsuitable.

2. Water/meth tank empty warning

Condition: the configured tank level is below your minimum. Action: an available warning-lamp output ON. Configure WMI's own tank/flow/pressure interlocks for injection protection; a warning rule does not replace measured delivery protection.

3. Low fuel pressure protection

Conditions: low measured fuel pressure and the operating state where that pressure matters. Action: Boost Enable OFF, or a deliberately chosen supported boost target/group action. Configure the nitrous fuel-pressure interlock separately if nitrous is installed. Review how and when the system will be re-enabled.

4. Intercooler spray on hard pulls

Use ALL conditions for throttle, RPM and intake temperature. Action: an available spray output ON with restoration. Add a maximum active time and cooldown if required. Test loss of each source as well as normal release.

5. Dash switch controls an output

Condition: a calibrated level/switch input ON. Action: an available accessory output ON with restoration. Verify switch polarity and disconnected-wire behavior before fitting the load.

6. Oil pressure warning lamp

Use ALL conditions for low oil pressure and RPM above the engine-off range. Action: a warning lamp ON with restoration. Select a threshold based on the engine and sender rather than assuming one pressure fits every RPM.

7. Two-stage fan with a dead band

Use one rule for each independently driven fan or supported fan-speed setting, each with its own threshold and hysteresis. Give both explicit restoration and inspect their shared-output behavior if they target the same channel. A dedicated multi-speed fan interface may be preferable to conflicting output commands.

8. Ethanol-based boost map (external controller)

With a calibrated ethanol percentage signal and compatible configured EBC, use thresholds/hysteresis to select a supported Boost Group. Frequency-output flex-fuel sensors need a conditioner or CAN interface before they can provide a value through the analog inputs. Confirm the external controller's actual group and startup synchronization physically.

A timed accessory sequence

For a compatible test accessory, start one action immediately and delay a second. Give reversible actions finite holds if they should return to their prior values. Alternatively trigger a second saved rule for a limited window; it must still meet its own conditions. Interrupt the parent conditions during each delay and hold to confirm the sequence stops as intended.

11.13 CarPlay Rules tab

CarPlay shows configured rules and their enabled state. Its rule toggle changes the same saved rule as the phone; it is not an independent rule engine. Create and edit rules in the phone app or review configuration changes through the connected-device workflow. Make configuration changes while stationary.

11.14 Manual control and saved rules

For a generic output, a live manual command takes control until you choose to resume saved rules. For an assigned controller, use its own live actions. An explicit controller Stop holds off matching rule actions until you explicitly start or resume it. Profiles, protections and saved rules stay configured; a live command is not a new persistent unattended demand. Global safety and interrupted-configuration recovery still inhibit outputs.

11.15 Related

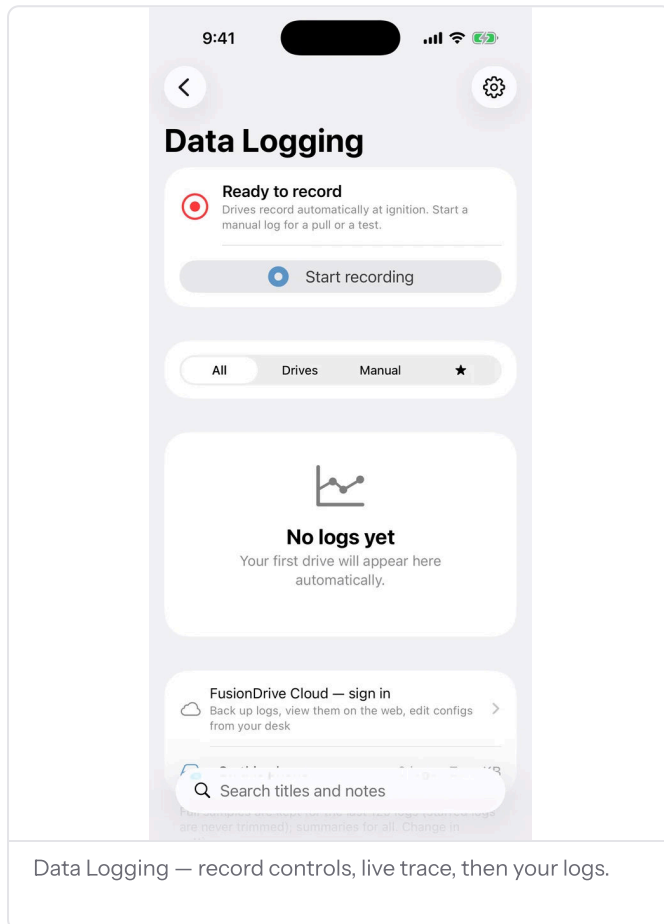
- Level / switch inputs — wiring switches and floats as conditions.
- Output modes — operating modes and dedicated controller ownership.
- OBD Settings — enabling the parameters you want as conditions.
- External boost controller — the Boost Group target.
- Alerts — phone notifications on thresholds, independent of rules.
- Data Logging → Event timeline — see when rules fired.

12

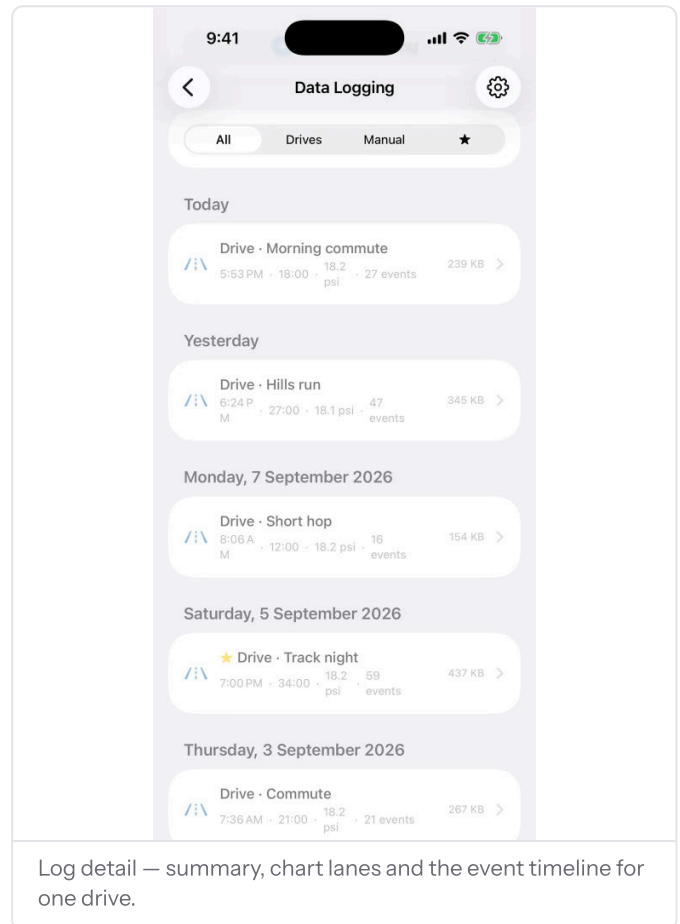
— APP MANUAL · DATA LOGGING

Data Logging

Record the available signals that matter to your setup: vehicle data, calibrated inputs, controller targets, output commands and events. Review them together, export a log or share an uploaded recording with your tuner. Open **More → Data Logging** or the Dashboard's Recording card. Local recording does not require a Cloud account.



Data Logging — record controls, live trace, then your logs.



Log detail — summary, chart lanes and the event timeline for one drive.

12.1 How logging works

- **The phone records the log.** FusionDrive streams telemetry over Bluetooth; the connected app stores samples and events. Without the phone, this recording is not collected. The ESP still runs its saved controllers/automations and retains its separate configured device statistics.
- **Drive and Manual logs.** Enabled ignition-based recording starts Drive logs while the app is connected and able to receive data. Manual logs start and stop on your command. Automatic recording cannot guarantee every drive if the phone is absent or iOS suspends it.
- **Requested versus achieved rate.** Active choices are 5, 10, 20 and 50 Hz; idle choices are 1, 2 and 5 Hz. The recorder requests its own telemetry cadence independently of the live screen.
- **Samples and events serve different purposes.** Samples record selected values; events mark reported transitions, alerts and your markers. Their timestamps aid comparison, not a claim that all sources were

measured simultaneously.

Phone receipt timing, ESP uptime/sequence evidence, source ages and detected gaps describe acquisition quality. Faster recording cannot make a slow ECU or multiplexed analog input update faster. Duplicate telemetry frames do not manufacture extra samples.

12.2 Record card

The Record card shows recording state, elapsed time, sample count, selected rates/channel count and achieved recording information. **Start/Stop** controls a manual log. **Marker** adds a timestamped note such as “third-gear pull” or “heard a noise”; optional haptics confirm the action. The gear button opens Logging settings.

Check that recording is active before a test. The saved file and actual sample count provide better evidence than simply having a live gauge on screen.

12.3 Live trace

The rolling live trace helps check that available pressure, RPM, throttle, input and duty channels respond. On/off values use steps; numeric values use lines. A moving preview is separate from starting a saved recording, and interpolated chart lines do not imply extra measurements.

12.4 The log list

Filter by All, Drive, Manual or Favourites and search titles/notes/tags. Logs are grouped by day. Each row summarizes the recording and its Cloud state; open it for full detail. Available row actions include favourite, delete and upload. The footer reports local storage use.

A Cloud icon reflects transfer status, not proof that a local file still has every original sample after trimming. Keep important logs starred and verify a backup/export before removing local data.

12.5 Log detail

Open a log for its device/firmware context, summary, selected chart lanes, cursor values, event timeline and notes. Rename, choose channels, export/share, favourite or delete from its controls. The viewer uses the data that was actually recorded; selecting a channel later cannot recover values excluded during acquisition.

12.6 Summary

Summaries include available peak boost, maximum RPM/speed, estimated distance, time on boost, pull/overshoot counts, recorded protection events, temperatures, voltage and rule activity. These are indicators derived from the recording and its coverage.

A voltage dip or pressure change is a reason to inspect the evidence, not a diagnosis by itself. Missing channels and interrupted acquisition limit what a summary can tell you.

12.7 Chart, zoom and scrub

- Use selected channels in aligned lanes with units. Pan, zoom, place a cursor and scrub the recording; event markers help jump to a reported transition.
- Compare boost target, actual pressure and commanded duty with available RPM, throttle, fuel or temperature data.
- Compare external-controller demand with measured WMI flow/pressure, or nitrous stage activity with measured fuel pressure and mixture—when those sources were installed and recorded.
- The current phone detail view displays up to 12 chosen lanes at a time. Narrow the selection for readability; the log can contain more channels.

The cursor reports values from the stored sample series. Check source age, gaps and changing acquisition rate before interpreting event order. A common timeline does not establish same-millisecond measurement across the ECU, analog sensors and accessories.

12.8 View presets

Built-in selections include Everything, Boost tuning, Engine health, Outputs & rules, Wired inputs and Electrical. Only available recorded channels can appear. Custom selections let you return to a useful combination; manage saved presets in Logging settings.

A preset organizes the view. It does not add a physical measurement: an output duty channel remains a command, and a pressure channel is only measured pressure if the configured source supplies it.

12.9 Event timeline

The timeline places recorded events alongside the sample history: automation activity, output/controller transitions, WMI and nitrous states, sensor availability changes, ignition/CAN changes, alerts and manual markers as reported by the device/app.

Modern device events identify a runtime transition with its available index/value and timing metadata. They do **not** provide an exact causal explanation for every change. Use the associated measurements and configuration to investigate; do not interpret a generic state event as proof of why an ECU or external controller acted.

Raw CAN entries are retained as diagnostic data and kept separate from the human/automation event narrative used in Intelligence.

12.10 Titles, notes and favourites

Give a test a useful title, add setup/context notes, and star important recordings. Favourites are excluded from automatic sample trimming. Notes are stored locally and accompany an upload; editing a local note does not by itself prove an already-uploaded copy was updated.

12.11 Export and share

Use Export/share to open the iOS share sheet for AirDrop, Files or another app.

- **CSV:** a samples file with relative time, timestamp, channel names and matching preferred display units; when events exist, an additional events CSV is exported. Empty values remain missing rather than becoming zero.
- **JSON:** the FusionDrive log envelope, metadata, summary, sample series and events. This preserves more structured detail for archiving and supported import.
- **Cloud link:** upload first, then create a sharing link through the supported app/web controls. Share only recordings you intend the recipient to see.

Raw CAN receive records remain part of saved/exported log evidence. A CSV workflow and a structured JSON archive serve different purposes; neither turns a sampled log into a lossless bus trace.

12.12 Logging settings

Setting	Current behaviour
Record every channel	Records the available decoded/status/quality catalogue. Disable it to select channels explicitly. Optional latest raw CAN bytes are separate from individual frame capture.
Active rate	5, 10, 20 or 50 Hz requested; default 20 Hz. Activity includes configured boost/load/controller/rule activity. The achieved rate can be lower.
Idle rate	1, 2 or 5 Hz; default 2 Hz.
Start a drive log at ignition	Automatic Drive recording while connected and receiving. Default on.
Stop after engine off	5–300 seconds of grace; default 20 seconds.
Discard short drives	10–600 seconds minimum automatic duration; default 60 seconds.
Haptic on marker	Optional confirmation vibration.
Keep samples for	10–1,000 recent logs; default 120. Starred logs are exempt from trimming.
Open logs with	Default built-in/custom view selection.

Raw CAN receive journal: explicitly enable individual-frame recording; choose CAN1, CAN2 or both, enabled-registry filtering, a global interval and a 100–10,000-frame cap per log. Options apply to the next recording. The ESP repeats a 32-frame window and the phone deduplicates it. Loss counters distinguish missed sequences, deliberate sampling/skips, buffer pressure and the phone cap.

Raw capture is a renewable recording lease, not a permanent device-operating setting. It does not change polling or transmit traffic. The separate *Include latest raw CAN bytes* option samples latest-frame values and is not equivalent to the receive journal.

12.13 Choosing channels

- **Inputs:** configured IN1–IN6, onboard pressure and relevant signal-quality fields.
- **Engine/OBD and CAN:** enabled supported ECU values and configured decoded signals, retaining their source identities and availability.
- **Outputs and Boost:** output commands/duty, effective targets, pressure feedback, profile, controller state and relevant configuration/status.

- **WMI:** duty/demand, installed flow/pressure/level measurements and delivery, grace, recovery or fault state where provided.
- **Nitrous:** profile and individual-stage state, nitrous/fuel duty, timing and retard-request state.
- **Automations/System:** rule activity, ignition, CAN status, external-EBC command state and the other reported system channels.

Third-party equipment is covered through the compatible signals it exposes and you configure. Commanded pump duty, solenoid state or retard request does not prove fluid delivery, electrical continuity or actual ignition retard. Missing measurements remain unavailable.

12.14 Storage and trimming

Trimming keeps the configured recent logs' full sample data and preserves older summaries/events. Starred logs are exempt. Use *Trim now* to apply that policy; *Delete all logs* is a separate confirmed deletion of phone-local logs.

Successfully uploaded Cloud copies are separate from local trimming/deletion. Verify upload completion or export an important recording before depending on that copy. Local recording settings and files live on the phone; the ESP's saved controller/automation configuration remains on the device.

12.15 Cloud upload

A local account-free log can be uploaded after signing in with the relevant Cloud access. Auto-sync controls automatic transfer; manual upload controls are also available. Cellular use follows the saved Cloud network preference—do not assume the default is Wi-Fi only. Disabling cellular prevents new covered transfers from using it; it does not cancel a transfer already in progress.

The portal provides uploaded-log charts, channel selection, events, export/sharing and available Intelligence views. An uploaded log is a stored recording, not a continuous remote live connection to the car. See FusionDrive Cloud.

12.16 Recording at a glance

The logging card appears on the Dashboard by default; its settings allow you to hide it. Logs retain source measurements and controller events, while preferred units change their presentation. Only available, configured and recorded channels can be overlaid; a missing sensor or unreported third-party state cannot be reconstructed as a measurement.

12.17 Related

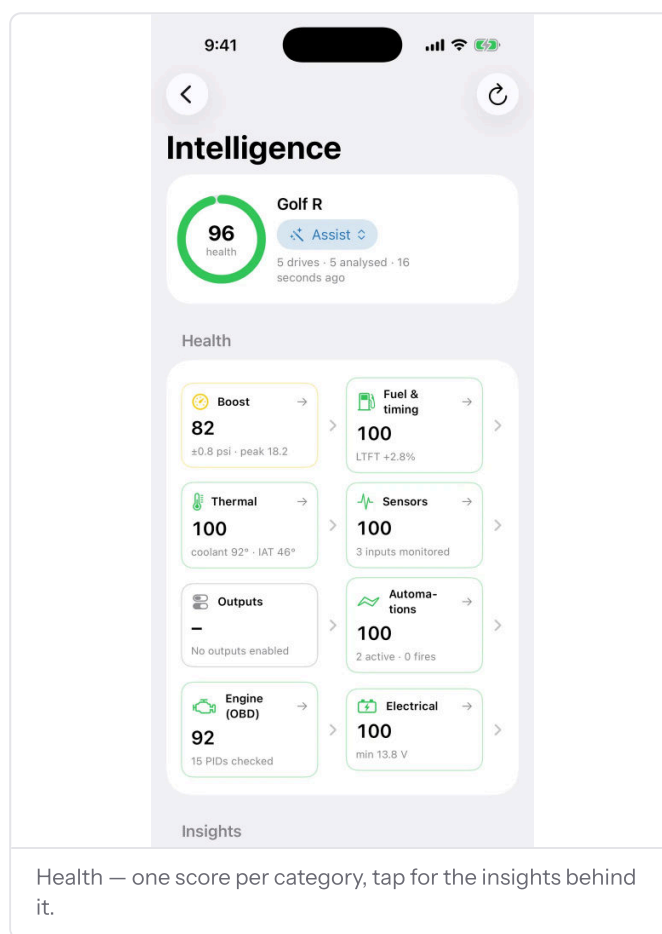
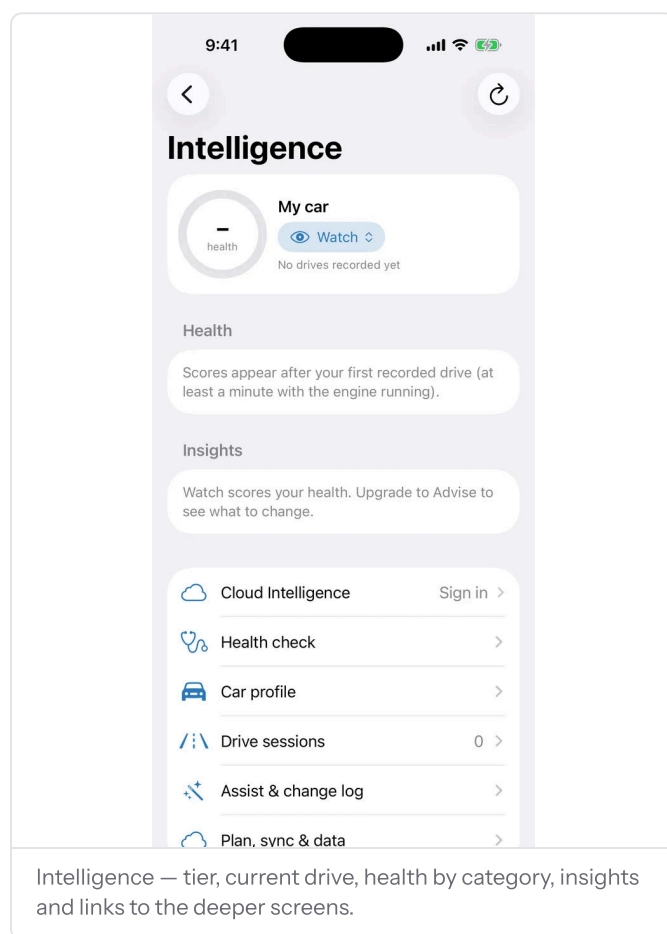
- Boost Control — target, pressure and duty comparisons.
- CAN signal definitions — identify the measurements you record.
- Intelligence — inspect recorded evidence.
- Cloud — uploaded logs and sharing.
- Automations — saved rules and recorded transitions.

13

— APP MANUAL · INTELLIGENCE

FusionDrive Intelligence

Understand your car and connected modifications in more depth. Intelligence brings together **health indicators, changing trends, recorded warning signs and gaps in the data**. Optional Cloud AI explains observations, possible causes and checks that can help you and your tuner decide where to focus. Greater confidence comes from better evidence; it is not a guarantee of failure prediction, diagnosis or extra power. Open **More → Intelligence** or the Dashboard's Intelligence card.



13.1 What Intelligence is

Every time the device is connected and the engine runs for more than a minute, the app records a *drive session*. After each drive, Intelligence analyses the session on your phone: how consistently boost hit its target, whether fuel trims drifted, how hot things got, whether any sensor dropped out or stuck, how the outputs and automations behaved, and how the electrical system held up. The results are scored, compared with previous drives, and turned into plain-language insights. Cloud uploads follow your Intelligence sync preferences.

Use the health categories to follow boost consistency, temperature patterns, fuel corrections, sensor quality and accessory activity. A recurring protection event or deteriorating recorded trend can draw attention to a developing concern. Missing flow, pressure, mixture or source-freshness data is a gap to investigate, not evidence that the relevant system is healthy.

To assess an improvement, start with a recorded baseline and compare the relevant measurements under comparable controlled conditions. Load, gear, ambient conditions, sensor calibration and configuration all affect the result. Intelligence helps focus the investigation; the owner and tuner verify any adjustment separately.

13.2 Tiers: Off, Watch, Advise, Assist

Tier	What it does	Cost
Off	New Intelligence analysis is disabled. Device telemetry, drive recording and Cloud uploads follow their separate settings.	—
Watch	Uses available recorded drive data to show signal/controller indicators and trends. You see the health scores and the channel health check, but not what to change.	Free
Advise	Adds detailed findings, recorded evidence and suggestions for what to inspect or compare. Current generated findings do not issue device-changing recommendations.	One-time purchase, licensed per device
Assist	Includes the detailed review available in Advise. The app retains Assist settings and a change log, but current generated analysis is read-only and does not automatically adjust the device.	One-time purchase (or upgrade from Advise), licensed per device

The picker at the top of the Intelligence screen sets the tier you *want*. If your account does not hold a licence for that tier on this device, the screen shows "wants Advise" in orange and an *Unlock ... on this car* button that opens the store sheet. Until then the effective tier is the highest one you are licensed for.

13.3 The Intelligence screen

Section	Contents
Header	Car nickname (from the car profile), tier picker, number of drives recorded and analysed, time of the last analysis.
Current drive	While connected and the engine is running: elapsed time and sample count of the session being recorded. Otherwise "Connect to the device to record drives".
Health	Overall score and one row per category. "Scores appear after your first recorded drive (at least a minute with the engine running)." Tap a row for that category's insights.
Insights	Open findings ordered by severity. Current generated findings are read-only; retained action controls do not imply an available automatic fix. Toggle <i>Show resolved & dismissed</i> to see history.

Section	Contents
Performance & potential	Context for further investigation. Current analysis withholds power, acceleration-time and safe boost-headroom estimates because these recordings do not establish them.
Links	Cloud Intelligence · Health check · Car profile · Drive sessions (count) · Assist & change log · Plan, sync & data.

13.4 Health score and categories

Each category is scored 0–100 from your recent drives. Green is 85 and above, yellow 65–84, orange 40–64, red below 40. The overall score combines categories with data. These are recorded-data indicators, not a mechanical health certificate; an unmeasured system is not cleared by a high overall score. In plain words, each category considers:

Category	What it measures	Typical findings
Boost	How closely actual boost tracks the target on pulls, overshoot size and frequency, spool time, overboost cuts, and whether the controller's learning is converging.	Consistent overshoot; slow to target; boost falling off at high RPM; overboost cuts.
Fuel & timing	Available fuel corrections and timing-advance changes, with supporting sensor data where recorded. Absolute advance is not knock retard, and fuel trim is not measured mixture or fuel pressure.	Fuel-correction drift or changed timing advance requiring matched load/RPM review; independently verify mixture and pressure.
Thermal	Coolant, intake air, oil and exhaust temperatures (where available) against load and ambient; heat-soak recovery; fan behaviour.	IAT climbing pull after pull; coolant creeping in traffic; fan output never switching on.
Sensors	Signal quality of every wired input and engine parameter: dropouts, stuck values, spikes, impossible readings, pinned inputs, chattering switches.	Oil pressure sensor flat-lining; a level switch flickering; MAP disagreeing with the onboard sensor.
Outputs	Whether outputs do what their role implies: fan on when hot, pump duty following boost, solenoid duty within limits; outputs that never change state.	Unused output left in Manual at 100 %; a low pump-duty command requiring actual delivery verification.
Automations	How often each rule fires, whether it flaps around a threshold, whether it ever fires at all.	Rule flapping (needs a dead band); rule that never fires (threshold unreachable).
Engine (OBD)	Engine parameters as a whole — load, RPM behaviour, fault codes, data freshness on the CAN link.	New fault codes; parameters going stale mid-drive.
Electrical	Control-module and battery voltage under load, dips when big outputs switch, the state of the dedicated 12 V rail, ignition sense.	Voltage dipping when the pump starts; 12 V rail missing with a pump preset configured.

Category	What it measures	Typical findings
Performance	Recorded behaviour relevant to comparing a setup; power, acceleration and safe headroom estimates are currently withheld.	Identify what measurements and controlled comparisons are needed.
System	Device-level items: firmware version, reboots, storage, connection drops.	Firmware update available; frequent disconnects.

13.5 Insights

An insight is one finding. Tap it to open the detail view.

Field	Meaning
Severity	GOOD nothing wrong · NOTICE worth knowing · WARNING should be addressed · CRITICAL stop and fix (red).
Category	Which health category it belongs to.
Confidence	Strength of support for a recorded pattern. It is not a calibrated probability of component failure, a confirmed cause or a safety verdict. Current local findings cap this indicator at 65 %.
Drives analysed	How many sessions the finding is based on.
Title, summary, detail	What was seen, why it matters, possible explanations and what to check next; inference is not a confirmed diagnosis.
Evidence	The numbers behind it: e.g. "Mean overshoot 2.3 psi over 7 pulls".
Recommendation	What to inspect, verify or compare next. Detailed guidance depends on the effective tier. Generated analysis currently removes device-changing actions.
Apply	The app contains guarded apply/revert controls, but current generated findings do not supply device-changing actions. Configure controllers separately using their normal settings screens.
Dismiss / Snooze	Hide the insight permanently, or until a later date. Dismissed insights return only if the evidence changes materially.
Status	New · Applied (date) · Dismissed (date) · Snoozed until (date).

13.6 Recommendations and device control

Current Intelligence analysis is **read-only**. Findings can direct you to inspect wiring, check a measurement, review recorded conditions or make a controlled comparison. They do not automatically change boost, PID gains, protection thresholds, WMI, nitrous, outputs or automations.

The app contains guarded apply/revert infrastructure and related controls. Their presence does not mean the current analysis generates commands for them. Cloud AI recommendations are explanatory text, not device commands.

13.7 Assist settings and change history

Intelligence → Assist & change log. These retained settings define the limits of the app's apply/revert framework. Current generated local findings remove device-changing actions, so they do not trigger autonomous adjustments. Treat the settings below as the controls shown in the app, not a promise of automatic tuning.

Setting	What it does	Range / options	Default
Assist mode	Retained automatic-apply permission. Requires Assist access; current generated findings contain no device-changing actions.	On / Off	Off
Auto-apply in Boost / Outputs / Automations / Thermal	Category permissions in the guarded apply framework. They do not enable autonomous changes from current generated findings.	On / Off each	Boost, Outputs, Automations on; Thermal off
May lower boost on a critical fuel/knock warning	Retained permission for a qualifying downward target action. Current generated findings do not provide that action.	On / Off	Off
Owner boost step limit	Maximum owner-requested upward step accepted by the retained action framework. Current analysis does not propose boost increases.	0.5 – 3.0 psi, step 0.5	1.5 psi
Minimum confidence to act alone	Confidence threshold in the retained framework; it does not convert a finding into a device command.	30 – 95 %, step 5	60 %
Notify me when Assist changes something	Notification preference for the retained apply framework.	On / Off	On
Protected outputs	Owner-selected protected outputs. The action framework also checks assigned boost, WMI, primary nitrous/fuel and external EBC outputs for controller ownership.	Any of OUT 1–4, AUX 1–2	None ticked
Boost ceiling (from Car profile)	Read-only profile ceiling used by the action framework. Current analysis supplies no boost-changing actions.	—	20 psi

13.8 Change log and undo

Below the guard rails is the retained history for changes previously recorded through the apply/revert framework: what changed, when, whether Assist or you did it (wand vs hand icon), and a *Revert* button that writes the previous value back to the device. Reverted entries are struck through. *Clear log* removes the history (it does not undo anything).

13.9 Car profile

Intelligence → Car profile. Tells the analysis what it is looking at. The more you fill in, the more specific the insights.

Field	What it is for	Options / range	Default
Nickname	Shown at the top of Intelligence and CarPlay.	Free text	Empty
Make, Model, Year, Engine code	Identify the car; used to group you with similar builds for fleet benchmarks.	Free text / year	Empty
Displacement (L), Cylinders	Vehicle context for analysis and profile matching. Current power estimates are withheld.	Litres; 2 – 16 cyl	—; 4
Induction	Whether boost-related analysis applies.	Single turbo · Twin turbo · Supercharged · Twin-charged · Naturally aspirated	Single turbo
Fuel	Fuel context. A fuel choice does not establish measured knock margin or safe boost.	91 RON · 95 RON · 98 RON · E85 · E30 blend · Diesel · Methanol · LPG	98 RON
Goal ("What you want from it")	Records your priorities: Reliability first, Balanced, Maximum power, Economy or Track day. Selecting a goal does not make current analysis issue tuning commands or establish headroom.	5 options	Balanced
Boost ceiling	Owner limit used by the action framework. Choose it from independently validated engine, fuel and calibration requirements.	psi	20 psi
Redline	Used for RPM-related checks.	rpm	6500 rpm
Estimated power, Weight	Owner-supplied context. Current analysis does not calculate power or acceleration estimates from these fields.	kW; kg	Empty
Inputs (IN1–IN6) roles	What each wired sensor represents, so the analysis can cross-check it.	Not used · Boost / MAP · Oil pressure · Oil temperature · Fuel pressure · Coolant temperature · Intake air temperature · Exhaust gas temperature · Wideband AFR / lambda · WMI tank level · WMI line pressure · Nitrous pressure · Battery voltage · Other	Inferred from sensor name/preset
Outputs roles	What each output drives.	Unused · Boost solenoid · WMI pump · Cooling fan · Fuel pump · Nitrous solenoid · Intercooler spray · Oil cooler / pump · Lighting · Other	Inferred from output preset

Field	What it is for	Options / range	Default
Modifications	Free-form list ("front-mount intercooler").	Text items	Empty
Notes	Anything else.	Free text	Empty
Restore from server	Pulls the profile saved in your FusionDrive Cloud account (after reinstalling the app, for example).	—	—

13.10 Drive sessions

Intelligence → Drive sessions. "Drives are recorded automatically whenever the device is connected and the engine is running for more than a minute." The screen shows a *Boost consistency trend* chart ("Deviation from target while on boost, per drive. Lower is better."), then a list of sessions with date, duration, peak boost, distance, WOT pulls and overboost cuts. Tap a session for its full summary, the configuration that was in force (boost settings, active automations) and its samples; swipe to delete. Older sessions may say "Sample data for this drive has been pruned; the summary above is kept." Sessions share storage limits with Data Logging: full samples for the last *Keep samples for logs*, summaries for the rest.

13.11 Health check (channels)

Intelligence → Health check. The health check reviews available recorded channels for patterns such as dropouts, repeated or flat values, spikes, range issues and switch chatter, with selected cross-channel checks where supporting data exists. Channels are grouped (Engine, Inputs, Outputs, Boost...) with an indicator of OK, Notice, Warning or Critical; tap for the evidence and what to check. Some current labels use diagnostic shorthand. A label alone does not confirm a component fault, and OK does not assess unmeasured behaviour.

13.12 Performance & potential

Intelligence helps you identify what deserves closer measurement and comparison: changes in boost tracking, heat recovery, fuel correction, sensor availability or accessory behaviour. Use the recorded evidence with your tuner to decide what to investigate and to assess whether a separately configured change helped.

Current analysis deliberately withholds estimated power, acceleration times and safe boost headroom. It does not establish how much power a modification will add, when a component will fail, or whether more boost is safe. Those conclusions require suitable independent measurements and validation.

13.13 Cloud Intelligence

The local indicator and evidence analysis runs on your phone. **Cloud Intelligence** is the optional subscription that adds longer-history analysis and, when the AI service is available, evidence-based written interpretation. It brings recorded vehicle and modification behaviour into a common review; it is not a trained component-lifetime or failure-prediction model. In practice:

- **Long-term drift** — trends the phone cannot hold: fuel trims over a season, boost consistency over hundreds of drives.
- **Intelligence brief on the web** — on your device page in the web viewer, a written brief ("Your car, read by Intelligence") produced from the supported recorded evidence available to the analysis: a headline, summary, findings with evidence references, uncertainties, alternative explanations and verification steps, plus "moments worth a look" you can tap to jump into the log. Without the subscription the card shows it is locked.
- **Web health check and channel trends** — the channel health verdicts and their history in your browser.
- **Log retention** — full-resolution uploaded logs kept beyond the 30 days included with a free account.
- **Fleet benchmarks** — see below.

Cloud Intelligence "needs a FusionDrive Cloud account" and offers monthly or yearly terms through your Apple ID, as shown at purchase; "cancel any time in Settings → Apple ID → Subscriptions."

13.14 Fleet benchmarks and privacy

With Cloud Intelligence, the Intelligence screen shows "Fleet: N similar cars" under a category. Your car's numbers — boost consistency, overshoot, thermal recovery, trims — are compared with anonymised aggregates from cars with a similar profile (induction, displacement, fuel, goal). Benchmarks are car-agnostic: they compare behaviours, not identities, and no one can see your individual data.

With sync enabled, selected drive summaries, car-profile fields and compressed samples are uploaded against the device serial for analysis. User-entered names and notes can contain personal information; review those fields and your sharing preferences. The app does not collect location.

13.15 Plan, sync & data

Intelligence → Plan, sync & data.

Item	What it does
Plan · Subscription	Your current tier and Cloud Intelligence status.
Sync to FusionDrive server	Uploads sessions and profile to your account. Shows <i>Waiting to upload</i> count and a <i>Sync now</i> button.
Fleet benchmark	How many similar cars your benchmarks are drawn from.
Drives stored / Sample data on phone	Local storage in use. "Full samples are kept for the last N drives; summaries for the last M ."
Delete all Intelligence data	Removes every session, score and insight from the phone after confirmation. Does not delete uploaded data — use the account's delete option for that.

13.16 Licences

From the store sheet: "Advise and Assist are one-time purchases held on your FusionDrive Cloud account. Each licence unlocks one device at a time; move it to another of your devices whenever you sell or swap a car (one move per 30 days, waived when you release the old device). Cloud Intelligence is an auto-renewing subscription covering every device on your account." You must be signed in (free) to buy or use a licence, and connected to the device to buy or move a licence for it. A purchase made before signing in "registers to your account as soon as you sign in." See FusionDrive Cloud → Licences for moving a licence between devices.

13.17 Dashboard visibility

Health / Intelligence appears on the Dashboard by default and can be hidden in its settings. Findings depend on the available, correctly configured signals and recorded evidence. A score is a summary of detected indicators, not a guarantee of component health or certain future performance.

13.18 Related

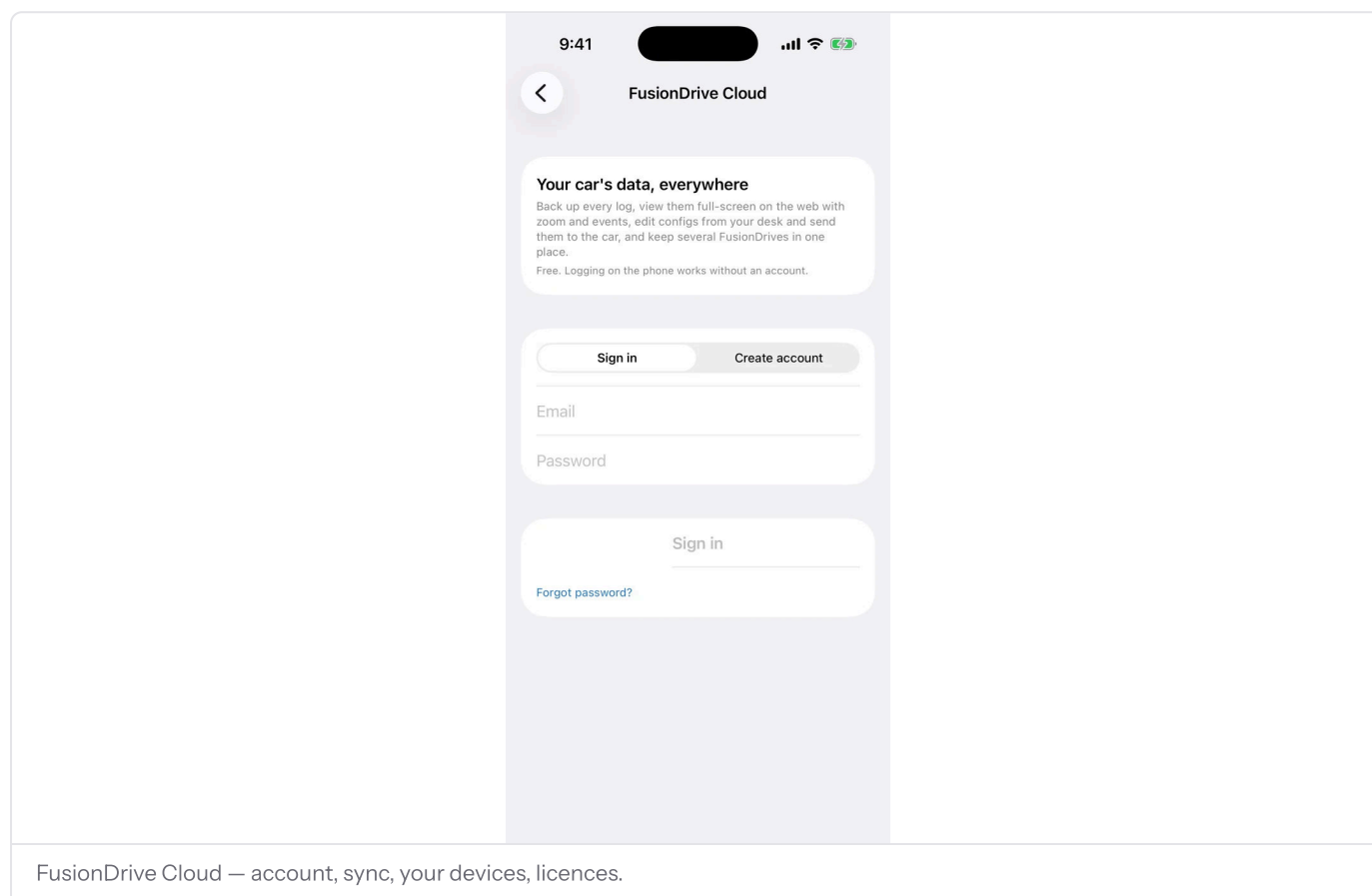
- Boost Control → Learning and overshoot tolerance — the separate device controller's learning settings.
- Data Logging — the drives Intelligence analyses.
- FusionDrive Cloud — account, sync, subscription.
- Automations → Operators — dead bands for flapping rules.

14

— APP MANUAL · FUSIONDRIVE CLOUD

FusionDrive Cloud account

Review your linked devices, recorded logs and settings in the app and online. An account is optional for local use; Cloud adds syncing, sharing and account services. Open **More** → **FusionDrive Cloud** or sign in to the web portal.



FusionDrive Cloud — account, sync, your devices, licences.

14.1 What the account gives you

- **Backup** of selected finished logs and supported configuration snapshots according to your sync preferences and account access.
- **The web viewer** — a full-screen log workbench in your browser, device pages with health and configuration, and the ability to edit settings from a desk and push them to the car.
- **Several devices in one place**, each with its own name, logs and configuration.
- **Deeper analysis** with eligible Cloud access: longer-history health indicators, channel trends and AI explanations of recorded evidence, uncertainties and checks. See Cloud Intelligence.
- **A home for Intelligence add-ons** — Advise and Assist licences live on the account so you keep them when you change cars; Cloud Intelligence is subscribed per account.
- **Restore** — pull a log back to a new phone, or one you trimmed off this one.

14.2 Create an account / sign in

1 Open More → FusionDrive Cloud

Not signed in, the screen explains the benefits and shows a form with a *Sign in / Create account* switch.

2 Create account

Name, Email and a password. The email is your login and where password resets go.

3 Sign in

Email and password. *Forgot password?* sends a reset link: "If that address has an account, a reset link is on its way."

4 You are in

The screen switches to the account view below. Sign-in persists until you sign out.

The same email and password sign you into the web portal (*Open web portal* link at the top of the account screen).

14.3 The FusionDrive Cloud screen

Section	Contents
Account	Your name and email; <i>Open web portal</i> .
Sync	<i>Auto-sync</i> and <i>Sync on cellular</i> toggles, <i>Waiting to upload</i> count, upload progress, <i>Sync now</i> , <i>Last sync</i> time.
Web changes	" <i>N</i> changes from the web to review" — opens Pending changes.
Restore	<i>Logs in the cloud</i> — "Pull a log from another phone or one you trimmed off this one."
Intelligence	Cloud Intelligence status with <i>Subscribe</i> , your Advise/Assist licences and which device each is on, <i>Get Advise or Assist for a device</i> .
Devices	Every device on the account with name, serial, last seen, pending-change badge; <i>Add this device (serial)</i> when connected to one that is not yet on the account.
Account actions	<i>Sign out</i> , <i>Delete account...</i>

14.4 Adding (claiming) a device

"A device can only be added while your phone is connected to it. Several devices can live in one account."

1 Connect to the FusionDrive over Bluetooth

The Devices section shows *Add this device (serial)*. If not connected: "Connect to your FusionDrive to add it to your account."

2 Tap Add this device

The device hands the app a one-time claim code over the Bluetooth link — proof that you are physically with the car — and the app registers the serial to your account. Nothing to type.

3 Done

The device appears in the list. Its configuration is uploaded on the next sync, and Intelligence licences can now be assigned to it.

If someone else already owns it you will see: "This device is claimed by another account. Ask them to release it (app or web), or contact support." Second-hand devices must be released by the previous owner before you can add them.

14.5 Several devices

Tap a device in the list to:

- **Name** it (the name shows in the list, on the web and in the app header — separate from the Bluetooth name set in Settings → Device Name).
- **Open on the web** — its device page in the portal.
- See **pending changes** waiting for it.
- **Release from my account** — see below.

Logs, configuration backups and Intelligence sessions are stored per device serial, so cars never get mixed up.

14.6 Releasing a device

"Releasing lets someone else claim it. Logs already uploaded stay in your account, and any Advise/Assist licence on it comes back to you to move onto another device." Do this when you sell the car or the device. Releasing does not touch the device itself — its settings stay as they are until the new owner factory-resets or reconfigures it.

14.7 Licences and Cloud Intelligence

"Add-ons are yours, not the device's: each unlocks one device at a time and can be moved to another of your devices (one move per 30 days, waived when you release the old one). Cloud Intelligence covers every device on the account."

Item	Detail
Advise / Assist licence	One-time purchase through your Apple ID. Held on the account. Shows which device it is assigned to and, if recently moved, "Can move again <i>date</i> ".
Move a licence	Connect to the target device and choose <i>Move Advise here / Move Assist here</i> in the store sheet (Intelligence → Unlock, or FusionDrive Cloud → Get Advise or Assist for a device). "It will stop working on <i>old device</i> . Licences can move again after 30 days." The 30-day lock is waived when you release the old device first.
Unassign	Detaches the licence from its device without assigning it elsewhere.

Item	Detail
Cloud Intelligence	Monthly or yearly subscription via your Apple ID, as offered at purchase, covering the devices on your account. Status shows <i>Renews</i> or <i>Until</i> a date. Cancel in iOS Settings → Apple ID → Subscriptions.
Purchases made before signing in	Register to your account automatically the first time you sign in.

What each tier does is described in Intelligence → Tiers.

14.8 Auto-sync and what syncs

Setting	What it does	Options	Default
Auto-sync	"With auto-sync on, every finished log and every config change on your device is copied to your account. Turn it off to upload logs one at a time."	On / Off	On
Sync on cellular	Allow uploads on mobile data. Off means uploads wait for Wi-Fi. Disabled when Auto-sync is off.	On / Off	On
Sync now	Uploads everything waiting and refreshes account data.	—	—

What is uploaded, per device:

- **Data logs** — every finished log (samples, events, summary, title, notes). Manual uploads: swipe a log → Upload, or the Upload button in log detail.
- **Configuration** — outputs, sensors, automations, boost, water/meth, nitrous, OBD labels and decode rules, whenever they change. This is what the web portal shows and edits.
- **Car profile and Intelligence drive sessions** — when *Sync to FusionDrive server* is on in Intelligence → Plan, sync & data.
- **Basic device status** — only if *Share basic device status* is on in Update service & privacy (see Settings); independent of the account.

Not uploaded: Wi-Fi passwords, your location (never collected), phone contacts or anything outside the app.

14.9 Pending changes from the web

On the web portal you can edit a device's configuration — boost targets, output settings, automations — from a desk. The edit does not reach the car directly; it becomes a *pending change* that the app applies over Bluetooth.

1 Notice

The Dashboard shows a *Pending web changes* banner and FusionDrive Cloud shows "*N* changes from the web to review". The device row shows an orange badge.

2 Review

Each change lists its title, the device serial, when it was created, and a diff against what the device has right now — or "No differences from what the device has now." if the car already matches.

3 Apply to car

Available when connected to that device ("Connect to *serial* to apply." otherwise). The app sends the reviewed changes and waits for FD acknowledgement/readback before recording them as applied. Stale or conflicting revisions require review again.

4 Reject

Discards the change. Nothing is written.

"Edits you make on the web show up here." Nothing you do on the web changes the car until you apply it in the app, with the phone next to the car — so a web session cannot surprise you while driving.

14.10 The web viewer and log workbench

Sign in at the portal (link in the app). You will find:

- **Home** — your devices, last seen, health at a glance, an Intelligence brief when Cloud Intelligence is active.
- **Device page** — configuration as last synced (editable → pending change), health check and channel trends, recent logs, firmware version.
- **Logs** — every uploaded log with search; click to open the workbench.
- **Account** — profile photo, preferences, devices, licences and provider-specific billing controls. Reservations show deposits, payment status, receipts, order history and available tracking; support requests can link to an order.

The **log workbench** is a full-screen analysis view:

- Multiple *panes*; drag channels from the channel library into a pane or onto the "new pane" strip; one-pane-per-channel or everything overlaid; resize, rename and reorder panes.
- Mouse: drag on a chart to zoom, wheel to zoom at the cursor, shift+drag to pan, click to seek, double-click to fit.
- Playback: play/pause, step by 1 s or one sample, speed control, loop the window or an A-B range; previous/next event; markers A and B; zoom to A-B.
- Events drawn over the charts; an inspector showing every channel's value at the cursor with *Copy values*.
- Views: the same presets as the app plus layouts saved in your browser. "The URL always carries your exact layout, window and markers — copy it to share what you see."
- Edit title and notes; delete from the cloud.

14.11 Sharing a log

In the workbench, press *Share*. The log gets a read-only public link — "Anyone with this link can view" — shown in a box you can copy. Recipients see the log with a banner "Shared FusionDrive log · read-only" and do not need an account. Press *Sharing on* again to turn sharing off and invalidate the link. *Copy link to this exact view* in the view menu copies a link that also carries your pane layout, time window and markers, so a tuner opens exactly what you were looking at.

14.12 Restoring logs

FusionDrive Cloud → *Logs in the cloud* lists every uploaded log for your devices. Tap one to download it back to this phone — useful after changing phones, or for a log whose samples were trimmed locally. Downloaded logs behave like any other in Data Logging.

14.13 Sign out and delete account

Sign out ends the phone's account session and stops that account's sync. Saved device operation and local logs are separate.

Manage billing: use the provider shown beside the purchase. Apple subscriptions and refund requests are managed through Apple; the portal supplies the appropriate link. Web payments expose the available Stripe receipt/payment-management actions. Cancelling a subscription, requesting an order cancellation and deleting an account are different actions.

Delete account: review the confirmation in the app or portal. It removes account access and the deletable Cloud data shown there; local phone logs and saved FD configuration are separate. Active Apple subscriptions require provider cancellation. Order/payment records that must be retained are not a promise to erase every financial record.

14.14 Privacy

- Data is keyed by device serial and your account email. No location is ever collected by the app.
- Wi-Fi credentials used for firmware updates stay on the device and are never uploaded.
- Fleet benchmarks use anonymised aggregates; other users cannot see your logs unless you share a link.
- Shared links are public to anyone holding the link until you switch sharing off.
- You can manage and delete your log data — locally (Data Logging → Delete all logs; Intelligence → Delete all Intelligence data) and in the cloud (Delete account).

14.15 Related

- Data Logging → Cloud upload.
- Intelligence → Cloud Intelligence.
- Settings → Device & firmware → Update service & privacy.
- OBD Settings → Backing up mappings.

15

— APP MANUAL · MORE & SETTINGS

More tab, Settings, Firmware Update & Alerts

The **More** tab is the doorway to every feature that is not on the four main tabs, plus firmware updates and the Settings screen. This page covers the More menu, updating firmware, every row in Settings, the alert system, and how to send a support report.

15.1 The More tab

Row	Opens	Manual page
Data Logging	Recorder, log list, logging settings. Badge: red dot while recording.	Data Logging
Intelligence	Health score, insights, car profile, drive sessions. Badge: unread insight count.	Intelligence
FusionDrive Cloud	Account, devices, sync, licences. Badge: pending web changes / uploads waiting.	FusionDrive Cloud
Outputs	Full configuration of OUT 1-4 and AUX 1-2.	Outputs
Boost Control	Built-in electronic boost control.	Boost Control
WMI Control	Water/methanol injection.	Water/meth & Nitrous
Nitrous	Nitrous control.	Nitrous
OBD Settings	CAN & OBD: parameters, fault codes, custom CAN.	CAN & OBD
Firmware Update	Check for and install device firmware (sheet).	below
Settings	Device and app settings.	below

The header shows the connected device name and a *Disconnect* button on every tab.

15.2 Firmware Update

FusionDrive updates its own firmware by downloading it over a Wi-Fi network you give it (your garage or home Wi-Fi, or a phone hotspot). Your phone stays on Bluetooth the whole time and shows progress. "Enter garage WiFi once — the device remembers it until factory reset."

Section	What it shows / does	Options	Default
Header	Connected device name, device model, current firmware version, serial.	—	—

Section	What it shows / does	Options	Default
Auto-check for updates	The app checks the update server about once an hour while open and sends a lock-screen notification when a newer version is available.	On / Off	On
Screen will stay awake during update	Informational — the phone will not lock while an update is running.	—	—
Garage WiFi (OTA only)	Shows the saved network (with <i>Online / Saved</i> state and signal strength once connected), a <i>Scan</i> button listing networks the device can see, or manual <i>Network name</i> and <i>Password</i> . <i>Save WiFi on device</i> stores it on the FusionDrive; <i>Forget</i> clears it.	—	None saved
Available Updates	<i>Check</i> asks the server for firmware newer than yours; shows <i>Last checked</i> . Either "Your firmware is up to date" or a list of versions with release notes. Badges: CRITICAL (recommended immediately) and BETA .	—	—
Start Firmware Update	Enabled when a version is selected and Wi-Fi is saved. Shows percent, bytes transferred and estimated time remaining. <i>Cancel Update</i> aborts.	—	—

1 Park with the ignition on

The device must stay powered throughout. Do not start the engine mid-update or switch the ignition off.

2 Open More → Firmware Update

Confirm the current version at the top.

3 Save a Wi-Fi network

Scan, pick your network, enter the password, *Save WiFi on device*. If your network does not appear in the scan, make sure its 2.4 GHz band is enabled, or enter the name manually. A phone hotspot placed near the car also works.

4 Check, select, Start

Tap *Check*, tap the version you want, read the release notes, then *Start Firmware Update*. The device joins Wi-Fi, downloads, verifies and reboots itself. The app reconnects automatically; a *Firmware update complete* notification confirms it.



DURING THE UPDATE

Outputs, boost control, water/meth and nitrous are not active while the device flashes and reboots (a minute or two). Do not drive on the update.

What the device sends: its serial, model and firmware version to the update server so it receives the right file. The Wi-Fi password never leaves the device.

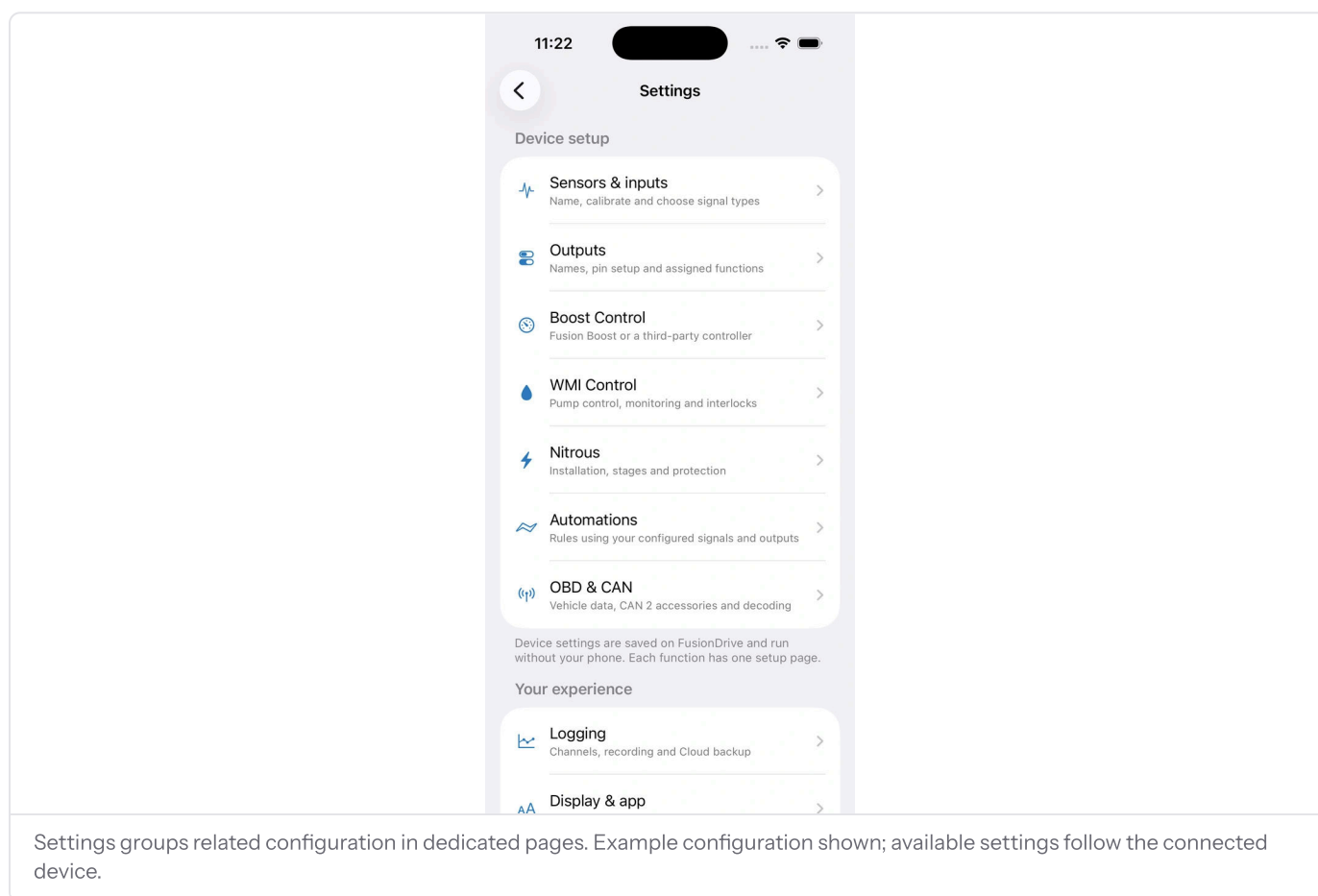
15.3 If an update fails

A failed download or verification is abandoned and the device keeps running its current firmware — you will see a *Firmware update failed* alert. Wi-Fi is turned off again afterwards. Check:

- Network name and password (case-sensitive), and that the network has internet access.
- Signal strength at the car — the value shown next to the saved network; move the router or use a hotspot placed near the car.
- The ignition stayed on and the phone stayed within Bluetooth range.
- Then *Check* and *Start Firmware Update* again.

If the device restarts more than five times in a row it starts in a protective mode with automations paused until it has run stably, so you can reconnect and reinstall firmware or restore settings. If it will not reconnect at all, see Troubleshooting or send a report.

15.4 Settings overview



Choose **Sensors & inputs**, **Outputs**, **Boost Control**, **WMI Control**, **Nitrous**, **Automations** or **OBD & CAN** to configure that feature. **Logging**, **Display & app**, **Account** and **Device & firmware** hold the remaining preferences and device actions.

Save/Apply writes device settings to FD; wait for acknowledgement. If it fails, reload and review the saved state before enabling loads. Phone-only preferences, recording and account state stay on the phone.

Device & firmware

Open this destination from Settings for device information, naming, maintenance and firmware actions.

Row	Meaning
Device Status	Connected / Disconnected.
Serial Number	The device's serial (also its Bluetooth identity). Quote it in support requests.
Device Model	Hardware model.
Device Firmware Version	Version and build currently running.
App Version	This app's version.
OTA Support	Yes / No — whether this device can update over Wi-Fi.
Device Name	Friendly name shown in the connection list and header. Type and press return (or tap away) to save. Cannot be empty. Separate from the cloud device name.

External boost setup has moved

Open **More** → **Boost Control** → **Third-party EBC** → **Controller setup**. See Third-party EBC setup for model, wiring, groups, pulse duration and ignition restore.

Controller settings stay with their feature

EBC pulse and ignition settings are in Third-party EBC setup. WMI, nitrous and output settings are reached from their own feature screens. The Settings overview links to those screens without duplicating their editors.

Display & app: units

Setting	What it does	Options	Default
Temperature	Display unit for every temperature, including OBD values.	°C / °F	°C
Pressure	Display unit for boost, manifold, oil and fuel pressures. Targets entered in the app are converted for you.	psi / bar	psi
Speed	Display unit for vehicle speed.	km/h / mph	km/h
Baro Fallback (Boost Control → Fusion Boost → Configure Fusion Boost → Connection → Pressure reference)	Atmospheric pressure the device assumes when your car does not report barometric pressure, used to turn absolute manifold pressure into boost. "Typical sea-level is ~101.3 kPa." Lower it at altitude (about -1.2 kPa per 100 m).	60–120 kPa, step 0.5	101.3 kPa

Unit preferences are saved on FusionDrive. In the iOS app they apply to sensor and OBD/CAN readings, controller targets and protection limits, charts, log cursors, alerts and CarPlay. Speed preference also controls distance labels. Offline log viewing remembers the last confirmed display preference.

Entering a preferred-unit value converts it back to the controller's stored units before saving. Sensor calibration units, CAN decoder definitions and raw protocol values remain explicitly identified as source configuration. Changing display preferences never recalibrates a sensor, changes a controller target, or rewrites a recording. Absolute and gauge pressure references remain distinct.

CSV sample exports use the selected display units and matching column headers. Full JSON exports retain original source units for re-import. A temperature difference is marked Δ and converts as a difference; a disabled protection limit remains Disabled.

OBD & CAN

The Settings overview links to OBD & CAN. Choose Vehicle · CAN1 for vehicle polling and diagnostics or Accessories · CAN2 for the separate accessory connection and signal definitions.

Display & app preferences

Setting	What it does	Options	Default
Keep Screen Awake	"Prevents the screen from auto-locking while the app is open." Handy for a phone mounted as a gauge display.	On / Off	Off
Alerts & Notifications	Opens the alert configuration described below; shows On/Off.	—	On

Demo Mode & PIN

Explore without hardware: choose *Demo mode* on the welcome or connection screen. This uses simulated data and does not command a real FD device. Exit Demo before connecting to your hardware.

Revisit welcome: open *Settings* → *Display & app* and use *Welcome & getting started*. An account remains optional; local use does not require sign-in.

Connected configuration snapshot: the separate PIN-protected tool in Settings → Display & app captures core controller, output, sensor, automation, available bus and dashboard settings. It is not the device-free simulator. Commands in this connected mode affect real hardware. Reset reapplies the stored core configuration; CAN mappings/transmit rules and fields absent from the snapshot are not restored. Nitrous remains disarmed after restoration. Review the confirmation and readback before use.

Device & firmware: Support & Actions

Action	What it does
Report an Issue	Opens the support report described below.
Reboot Device	Restarts the FusionDrive after confirmation. All settings are kept; outputs go off during the restart and the app reconnects in a few seconds. Try this before a factory reset if something looks stuck.
Disconnect Device	Drops the Bluetooth link (same as the header button). The device keeps running your configuration on its own.

Factory Reset



WARNING

"Factory reset wipes outputs, sensors, automations, CAN/OBD, EBC, Boost, WMI, and Nitrous. The boot serial number is kept so the unit still identifies as itself." "Use this before selling the unit. The app disconnects after reset."

Tap *Factory Reset*, then *Reset Device* in the confirmation. The screen shows "Factory Reset in Progress... Device will restart automatically". After it reboots, reconnect; the app lands on the Dashboard with everything at defaults: all outputs off and unassigned, no sensors, no automations, external controller Not Configured, boost/water-meth/nitrous disabled, saved Wi-Fi forgotten. Logs, Intelligence data and your cloud account on the phone are not affected. If the device is on your FusionDrive Cloud account, also release it before handing it over.

15.5 Alerts & Notifications

Settings → Display & app → Alerts & Notifications. "Alerts come from this phone over Bluetooth." The app watches the live data while it is connected and raises alerts as in-app banners and lock-screen notifications. Because they come from the phone, alerts only fire while the app is running (foreground or background) and connected.

Master and delivery

Setting	What it does	Range / Options	Default
Enable alerts	Master switch for everything below.	On / Off	On
Lock-screen notifications	iOS notifications (need the system permission — the <i>System permission</i> row shows Allowed / Denied in iOS Settings and offers to request it).	On / Off	On
In-app banners	Banner at the top of the app while it is open.	On / Off	On
Sound	Play a sound with notifications. Critical alerts always sound.	On / Off	On
Cooldown	Minimum time before the same alert can repeat.	15–600 s, step 15	60 s
Quiet hours	Suppress non-critical alerts between Start and End. "Critical alerts (overboost, WMI, nitrous, failed update) still fire during quiet hours."	On / Off; Start, End times	Off; 22:00–07:00
Send test notification	Fires a sample so you can check the phone shows it.	—	—

Built-in alerts

"Turn on only what you want. Overboost and faults stay recommended." Each has its own toggle.

Alert	Fires when	Critical	Default
Device disconnected	Bluetooth to the FusionDrive dropped.	—	On
Device reconnected	Bluetooth came back.	—	Off
Overboost	Boost Control entered overboost recovery — boost exceeded the safe limit.	Yes	On
Boost sensor stale	The boost / manifold pressure reading is no longer valid.	—	On
WMI fault	Water/methanol injection entered a fault state.	Yes	On

Alert	Fires when	Critical	Default
Nitrous fault	The nitrous controller locked out.	Yes	On
Dedicated 12V lost	The dedicated 12 V output supply is no longer present — outputs cannot drive loads.	—	On
Ignition off	The ignition-sense wire went low.	—	Off
New fault codes	The stored OBD trouble-code count went up.	—	On
Firmware update available	A newer firmware is on the update server.	—	On
Firmware update complete	The device finished flashing and rebooted.	—	On
Firmware update failed	The Wi-Fi firmware update did not finish.	Yes	On

Intelligence also uses this channel for new warning/critical insights after a drive, regardless of the per-kind toggles (they still respect the master switch and cooldown). Current generated analysis does not make autonomous Assist changes.

Custom thresholds

"Fires once when the value crosses the limit, then again after it recovers and crosses again." Add as many as you like with +.

Field	What it does	Options	Default
Name	Title shown in the notification.	Text	Custom alert
Enabled	Turn the rule on or off without deleting it.	On / Off	On
Source	What to watch.	Boost actual · Analog sensor	Boost actual
Sensor	Which input, when Source is Analog sensor. Configured sensors show by name.	IN1–IN6	IN1
When	Direction of the crossing.	Above / Below	Above
Threshold	The limit, in the sensor's unit.	Number	20
unit	Label appended in the message (e.g. psi, °C, %).	Text	psi

Examples: *Fuel pressure below 40 psi, Oil temperature above 120 °C, Ethanol content below 60 %, Boost actual above 22 psi.* Swipe a rule to delete it.

Recent alerts

A history of everything fired, with time and message. *Clear history* empties it.

15.6 Report an Issue

Settings → Device & firmware → Report an Issue. "Help us improve FusionDrive by reporting any issues you've encountered. Your session logs and device information will be included to help us diagnose the problem."

1 Check the summary

Session duration, number of app log entries captured, connection status, device and firmware version.

2 Describe it

"Please describe what happened and what you were trying to do when the issue occurred." The more specific the better — which screen, what you tapped, what you expected.

3 Email (optional)

"Provide your email if you'd like us to contact you for more information or updates." It is used only for this report.

4 Submit Issue Report

"Collecting diagnostics..." then "Report Submitted".

What is included: your note, the last 20 minutes of app logs, a snapshot of the live device data, device diagnostics and recent device logs, and hardware status. **Not included:** your Wi-Fi password, location, contacts, or anything outside the app. The report is sent from the phone's own internet connection; the device does not go online for it. Support may also ask you to read values from Settings → Device & firmware or to enable a hidden diagnostics screen; they will walk you through it.

15.7 Update service & privacy

Open **Settings → Device & firmware → Update service & privacy**. Review update-service connectivity and the phone's device-status sharing preference. Automatic update checks and available firmware remain on Firmware Update.

Setting	What it does	Saved where
Update service	Shows service status and the last update check. <i>Check connection</i> tests the service.	Read-only status
Share basic device status	About every 12 hours, the phone can send the device serial, firmware, app version and power/ignition state. This excludes logs and Wi-Fi passwords. Turn it off to stop this sharing.	Saves immediately on this phone; on by default
Advanced → Server address	Use the normal FusionDrive service unless support provides another address. Enter the full HTTP/HTTPS URL and tap <i>Save server address</i> , then check the connection.	On this phone

15.8 Appearance

There is no theme switch in the app: it follows the iPhone's Light/Dark setting (Settings → Display & Brightness). CarPlay follows the car's day/night mode. Text size follows the iPhone's Dynamic Type setting.

15.9 A single setup path

Open each function from the main settings navigation: Sensors & inputs, Outputs, Boost Control, WMI Control, Nitrous, Automations and OBD & CAN. Device & firmware contains device identity, updates, restart and factory reset rather than another copy of these function links. Display & app contains viewport preferences. If a save was interrupted, review the recovered setup, save it and wait for device confirmation; re-enable the required functions afterward.

15.10 Related

- Getting started — pairing and first connection.
- External boost controller groups on the Controls tab.
- FusionDrive Cloud — releasing a device before sale.
- Troubleshooting.

16 — APP MANUAL · CARPLAY

CarPlay

FusionDrive appears on your car's CarPlay screen as a glanceable dashboard with a few large, deliberate controls: switch boost profiles or external controller groups, nudge the boost target, toggle outputs and water/meth, and arm or disarm rules. Everything else — configuration, calibration, logs, Intelligence detail — stays in the phone app, where it belongs.

16.1 Overview

CarPlay runs the same app; the phone keeps the Bluetooth link to the FusionDrive and mirrors a car-friendly view to the head unit. Nothing is configured in CarPlay — it shows what you set up on the phone. Five tabs are always present: **Dash**, **Outputs**, **Boost**, **OBD** and **Rules**. Head units that allow more than five tabs also get a **Sensors** tab.



NOTE

CarPlay is designed to be glanceable. Live values update in place; if you do not see something you expect (a sensor, an output, an OBD parameter), it is because it is not switched on for the Dashboard in the phone app — see Sensors → Show on Dashboard, Outputs → Show on Dashboard and OBD → Show on dashboard.

16.2 Connecting in the car

If the phone is not yet connected to the FusionDrive when CarPlay starts, the connection screen appears:

Row	What it does
Scan for Devices / Stop Scanning	Starts or stops the Bluetooth search. Scanning also starts automatically. "Make sure your FusionDrive is powered on" (ignition on).
Available Devices	Each FusionDrive found, by name — "Tap to connect". A "Connecting to ..." screen shows until the tab bar appears.
Demo Mode	"Test without real device" — loads a simulated car so you can see the layout in a showroom or before installation. Nothing is sent to any device.

Once the phone is connected — whether you connected in the car or earlier on the phone — the tab bar replaces this screen. If Bluetooth drops, CarPlay returns to the connection screen and reconnects when the device is back in range.

16.3 Dash tab



Dash — live values in two columns, with boost profile (or controller group) buttons along the bottom.

A two-column information view. Rows appear in a fixed priority order and the number shown depends on the head-unit screen size (4 rows on small displays, 8 on most, 10 on very wide ones):

Row	Shown when	Value
Boost	Boost Control is enabled	Actual boost (signed psi) and, on larger screens, "target x". "— psi" if the sensor is invalid.
Boost (MAP)	Boost Control is off but the onboard sensor is valid	Onboard manifold pressure as boost.
OBD parameters	Parameters marked <i>Show on dashboard</i> (or all enabled ones if none are marked)	Up to 6 (3 on small screens), in a sensible order: RPM, speed, coolant, intake air, oil temperature, throttle, load, voltage, timing, air flow, then the rest alphabetically. Units follow your Unit Preferences.
Wired sensors	Sensors with <i>Show on Dashboard</i> on	Value and unit, ON/OFF for level sensors, or "no signal".
Water/meth	WMI is enabled	"Injecting n%", "Priming", "FAULT" or "Armed".
Nitrous	Nitrous is enabled	"FAULT", "INJECTING", "Armed" or the current state.
Rules firing	At least one active automation is currently true	Names of the rules firing right now.
Intelligence	At least one drive has been analysed	"Health score · top insight" or "Health score · all clear".

With nothing configured you will see "Connected · nothing on dashboard yet".

Buttons along the bottom (up to three):

- If Boost Control is enabled: one button per configured profile (three by default on new firmware), the active one highlighted. Tap to switch profile — the device changes target immediately. If you have more than three profiles you get ◀ / current / ▶ instead; tapping the centre opens a list with each profile's target.
- Otherwise, if an external boost controller is configured and *Show on Dashboard* is on: one button per group (up to three), or ◀ / current group / ▶ for more, with the centre opening a group list.

16.4 Outputs tab

A grid of large buttons, one per output that is enabled or marked *Show on Dashboard* (up to eight), plus a Water/meth button when WMI is set up.

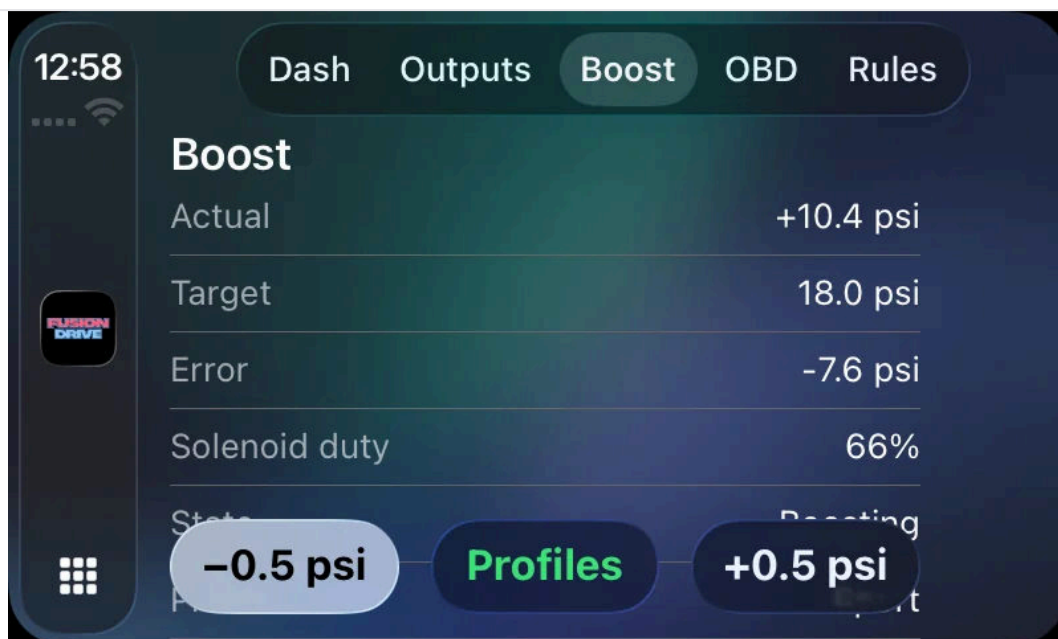
Button	Label	Tap
Output (solid disc glyph)	"Name · ON" or "ON n%"	Turns the output OFF (0 %).
Output (outline power glyph)	"Name · OFF"	Turns the output fully ON (100 %). CarPlay does not set intermediate duty — use the phone for that.
Output (dashed ring)	"Name · Disabled"	Nothing — enable it in the phone app first.
Water/meth	"Water/meth · ON/OFF"	Enables or disables the water/methanol system (same as the Enable switch in WMI Control).



CAUTION

Dedicated controller ownership is enforced by the app and device. Control boost, WMI or nitrous through its own feature; a manual CarPlay command cannot take over a controller-owned channel. Ordinary manual outputs can still be affected by saved rules. Configure and test these interactions while parked.

16.5 Boost tab



Boost — the live control loop at a glance, with ± 0.5 psi target buttons and the profile list.

When Boost Control is enabled:

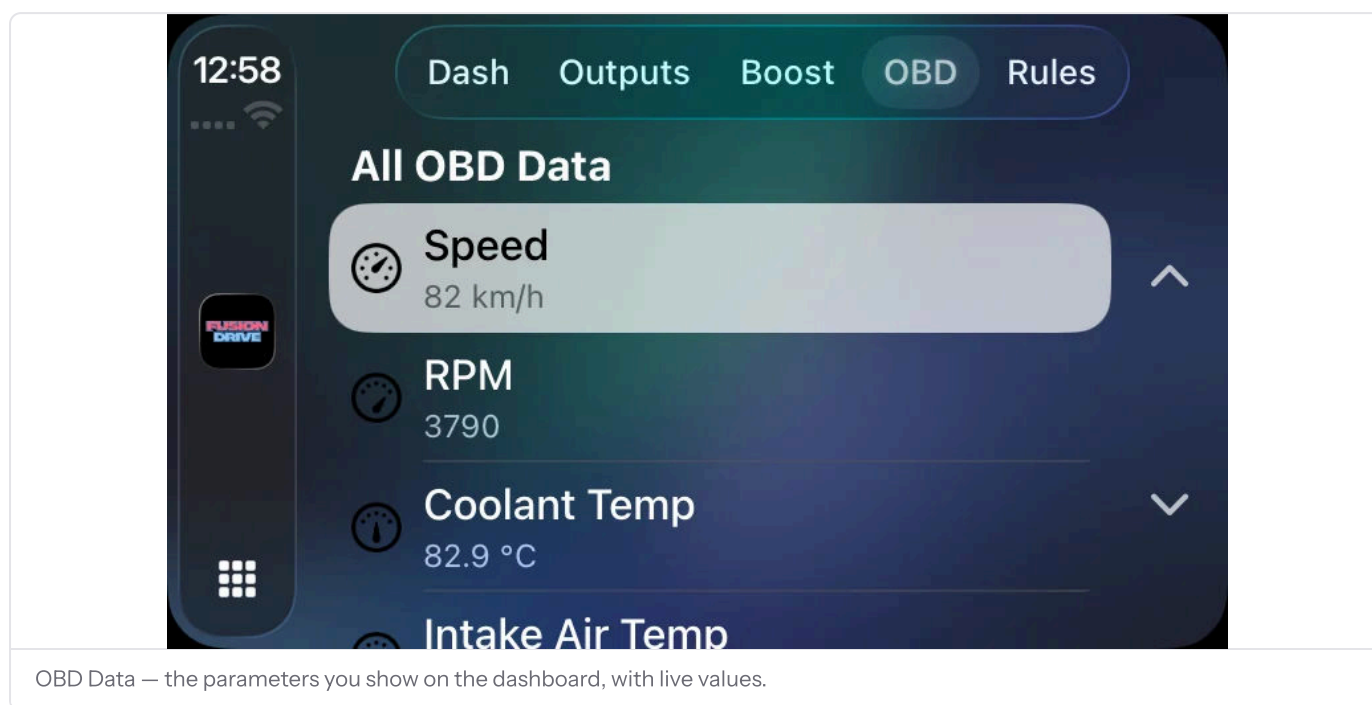
Row	Meaning
Actual	Current boost (or "no sensor").
Target	Target of the active profile.
Error	Actual minus target — negative while spooling, positive on overshoot.
Solenoid duty	How hard the controller is driving the solenoid (0-100 %).
State	Idle, Spooling, On boost, Overboost recovery, Cooldown or Disabled — see Boost status states.
Profile	Active profile name.
Mode	Manual, Open loop or Closed loop.
Sensor	Onboard or OBD source.
Ceiling	Your Max boost limit.
MAP temp	Onboard sensor temperature, when valid.

Buttons: **-0.5 psi** (never below 0), **Profiles** (list with each profile's target; tap to switch), **+0.5 psi** (never above the ceiling). Target changes apply to the active profile immediately and are kept.

When an external boost controller is configured instead: rows show Controller, Group and MAP (onboard boost if valid); buttons are ◀ **Previous**, **Groups** (list) and **Next** ▶.

Neither configured: "Boost control — Not configured · Set up Boost → in the FusionDrive app".

16.6 OBD tab



OBD Data — the parameters you show on the dashboard, with live values.

A scrolling list of OBD parameters with live values, in the units you chose. It shows the parameters marked *Show on dashboard* in OBD Settings; if none are marked, every enabled parameter is listed. Values are read-only. Empty states: "No OBD Data — Enable PIDs in the iOS app" or "Not Connected — Connect to see OBD data". Fault codes are not shown or cleared from CarPlay.

16.7 Rules tab

Lists every automation on the device with a one-line summary:

- **Status:** *Armed* (active, conditions currently false), *FIRING NOW* (active and true) or *Disabled*.
- **Summary:** "If *condition* AND/OR *condition* → *action*, *action*".
- **Icon:** filled bolt when firing, outlined bolt when armed, faint bolt when disabled.

Tap a rule to toggle it between active and disabled — the same as the switch on the phone's Automations tab. Disabling stops its active sequence and applies the engine's safe exit to affected controls; do not expect an active output to stay on. The + button only reminds you that rules are created on the phone ("Configure Automations"). Rules keep running on the device whether or not the car screen is showing them.

16.8 Sensors tab (wide screens)

On head units that permit more than five tabs, a **Sensors** tab lists each configured wired sensor with its live value, unit and signal state ("Configure sensors in the iOS app" if none).

16.9 Intelligence in the car

The Dash row "Intelligence · Health *n*" and, where present, an Intelligence section open a read-only list: category scores with their headline, then active insights with their recommendation. "Nothing needs attention — Keep driving — FusionDrive is learning your car" when no issue has been detected in the available data. This is not proof that every system is healthy. Tapping an insight shows its summary. With an Advise or Assist licence and the device connected, insights whose action is conservative — softer boost response, wider overshoot tolerance, turning learning on or off, tightening an output's limits, switching an output or a rule *off* — offer *Apply / Not now*. Anything that would raise boost or the ceiling, or switch something *on*, is only ever applied from the phone.

16.10 Controls available on CarPlay

From CarPlay	Phone app only
Switch boost profile; ± 0.5 psi on the active target (within 0 ... ceiling)	Enable/disable Boost Control, control mode, ceiling, response, advanced settings, profile names/targets
Step external boost controller groups	Controller model, wiring, pulse duration, group names
Toggle outputs fully ON/OFF	Duty percentages, modes, presets, frequency, naming, enabling
Enable/disable water/meth	Prime, Test, start/full boost, duty mapping, nitrous entirely
Arm/disable a rule	Create, edit, reorder, delete rules
View OBD values, sensors, health headline	Enable parameters, read/clear fault codes, sensor setup, logging, cloud, firmware, settings

16.11 Safety



EYES ON THE ROAD

Make configuration and tuning changes while parked, then validate them under controlled conditions. CarPlay presents selected views and controls from the phone; it does not turn an untested setup into a validated one. If a fault or overboost state appears, stop safely and investigate before continuing.

- Everything CarPlay shows comes from the phone's Bluetooth link. If the phone disconnects, the device keeps running your configuration, automations and boost profile on its own — the screen simply loses live data until it reconnects.
- Configured device protections (overboost cut, sensor-loss behaviour, water/meth and nitrous gates) run locally and depend on valid configured sources.
- Some head units restrict which apps may run while moving; FusionDrive follows the car's rules.

16.12 Related

- Boost Control — profiles and states shown on the Boost tab.
- Controls & Outputs — what the Outputs grid toggles.
- Automations — the rules listed on the Rules tab.
- CAN & OBD — choosing which parameters appear.



Questions?

Documentation · fusiondrive.io/docs

Support · in the app: [More](#) → [Settings](#) → [Device & firmware](#) → [Report an Issue](#)

Latest PDFs · fusiondrive.io/docs/#downloads

FusionDrive switches real current to real loads and can control boost, water/methanol injection and nitrous. Fuse every feed and every load, respect the ratings in the specifications, and set failsafes before you drive. Configure and tune with the vehicle stationary. The installer is responsible for compliance with local vehicle regulations. This is a beta-build document; figures marked as design targets will be confirmed for production units.