



— 02 / REPLACE YOUR CONTROLLER

FD boost control

Compatible solenoids, control modes, source selection and setup.



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1

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Decide what you are replacing

This route removes the old electronic boost controller from command of the boost valve. FusionDrive reads suitable pressure and vehicle signals, calculates duty and operates a qualified solenoid through an appropriate output. Its configuration lives on the ESP; the phone is the setup, display and logging interface.

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Replacing a controller does not automatically qualify its valve, proprietary sensor or loom for FusionDrive. Preserve the old system until the replacement has passed a controlled commissioning process. This is an engineering review draft, not a manufacturer-approved conversion or a record of physical testing.

The common route is a conventional pneumatic wastegate with a compatible two-wire boost solenoid. A motorized wastegate, HKS stepper valve, dual-solenoid dome-pressure arrangement or CO₂ pressure-control system needs a separately designed driver and control strategy. Do not convert these into a generic two-wire PWM installation by guessing.

1.1 The three installation choices

- 1 Qualified existing valve:** retain a conventional solenoid only after its exact part number, operating voltage, resistance/current, polarity or suppression, permitted PWM frequency and plumbing are established.
- 2 Replacement documented valve:** fit a solenoid with available electrical and pneumatic specifications, then commission it as a new system.
- 3 Retain the original controller:** use the companion retain-controller guide where the electrical contract or actuator is not yet qualified.

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Plan the electrical and pneumatic installation

2.1 Allocate one output and the necessary measurements

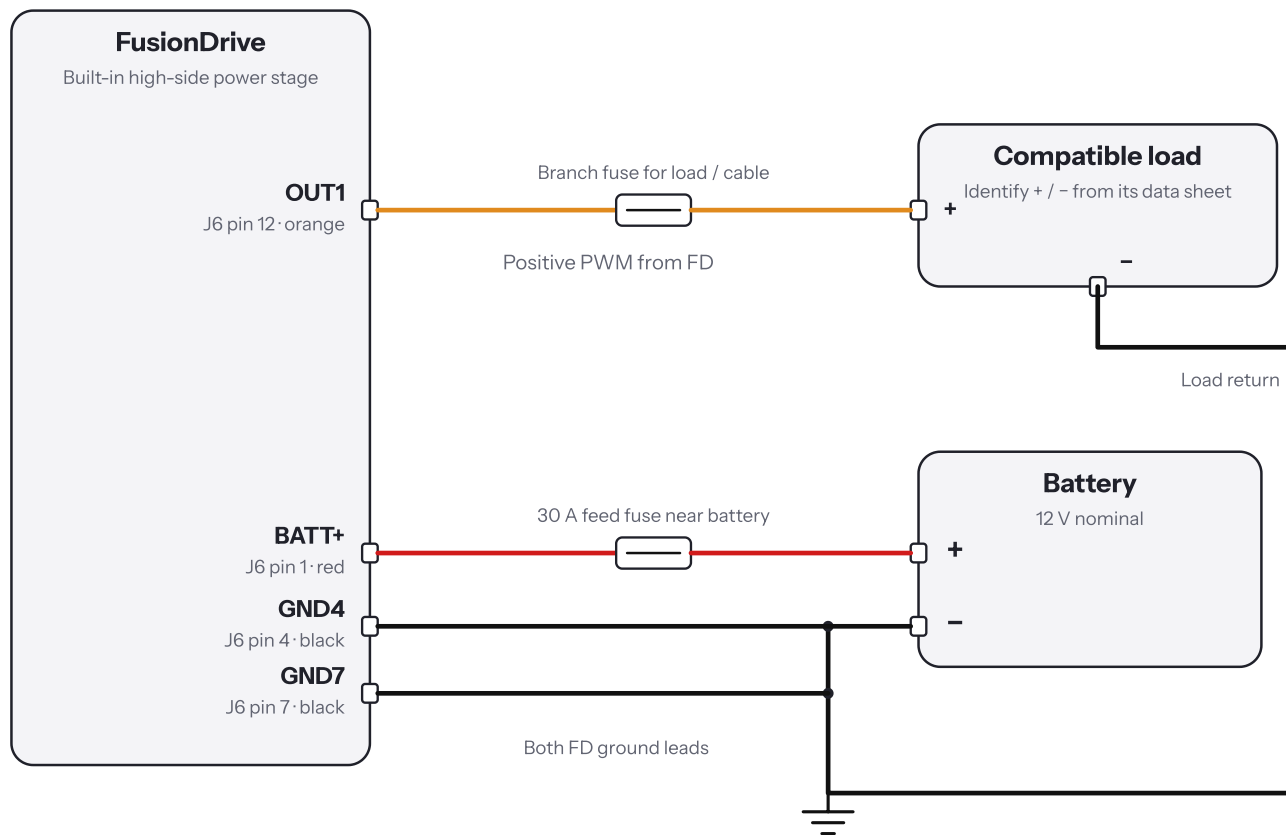
FD AUX1 is J6 pin 2 and AUX2 is pin 8. Both are low-side sinks in the nominal 1 A class. They are not universally qualified valve drivers. OUT1, OUT2, OUT3 and OUT4 are high-side channels on J6 pins 12, 11, 10 and 9 respectively. Their shared fused supply and per-channel limits must suit the actual load; a 30 A shared feed does not establish a 30 A continuous rating per channel.

Use a high-side channel for a compatible valve whose other side can be grounded, or an external power interface only where current or electrical requirements need it. If reusing a valve with an internal diode, electrical polarity matters. Do not apply an arbitrary suppression diode without checking the valve and output-driver requirements: clamp behaviour affects current decay and valve response.

The board's heavy supply, J6 pin 1, must have the documented fused battery feed. Do not infer valid high-current power from LEDs or USB/OBD backfeed. J6 pin 3 is ignition sense; pins 4 and 7 are ground. Use the final loom drawing to identify cavities and separate logic-reference wiring from load-return routing.

2.2 Direct high-side functional wiring

E-04 | FD high-side load ownership



OUT1-4: designed 10 A each, shared 30 A fused feed. Verify actual running / start current and heat.

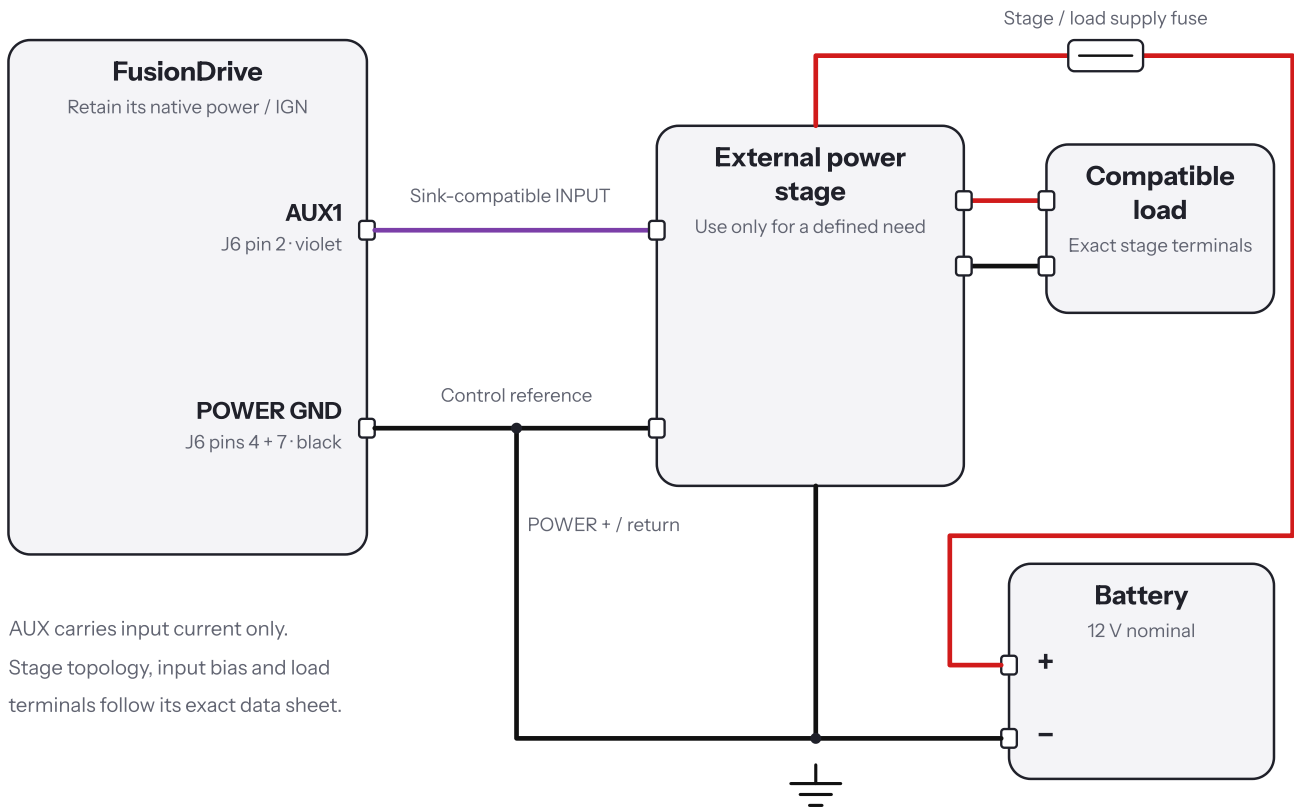
Disconnect both old controller/load wires. Use the load maker's required suppression and PWM frequency.

FD OUT1 supplies compatible load positive directly; load negative returns to power ground. Four built-in outputs are designed for 10 A each within the shared 30 A feed. Remove old driver connections; verify current, PWM and suppression.

For a qualified direct valve, the diagram's load is the boost solenoid. Example allocation: **FD OUT1 / J6 pin 12 → valve positive; valve negative → suitable common power return**. FD receives its separately fused heavy supply. This describes a functional topology, not approval of an unknown valve's current or clamp characteristics.

2.3 External-driver functional wiring

E-05 | External power stage only when required



FD already contains high-side power stages. Use this separate-stage route only for an identified current, inrush, thermal, polarity or interface requirement; verify its missing-command OFF state.

Where an external driver is needed, its power path has its own rated fuse and wiring. The driver must accept FD's actual low-side sink or high-side signal; the words "PWM input" alone do not prove compatibility. A low-side AUX cannot generate an analog voltage or a logic-high level without a specified interface. Match input thresholds, pull-up voltage, polarity, permissible frequency, off state and ground reference before use.

Do not connect the FD output and the original controller output to the same coil. If keeping an old gauge, electrically separate its valve drive and prove it still operates as a display without influencing the valve. Some old units report faults or cease normal operation when their valve is disconnected.

2.4 Pressure and reference wiring

Use a pressure sensor with a documented voltage curve and suitable pressure range, or supported sufficiently fresh OBD/CAN pressure data. Configure its units and whether it reports gauge or absolute pressure. A gauge-pressure target is not an absolute MAP value. An existing controller's internal sensor cannot be assumed available to FD.

FD's conditioned analog inputs cover the intended 0–5 V signal range. Verify sensor supply requirements and signal ground; do not join two 5 V sensor supplies. If sharing a documented external sensor with another device, establish that the combined input loading and references preserve calibration. Use a buffer or separate sensor when the interface requires one.

2.5 Pneumatic checks

Keep a written diagram of pressure source, wastegate reference, valve ports and any vent/filter. Use the exact valve and wastegate instructions: port numbers are not universal. Establish the de-energized route and mechanical spring pressure before electronic control. “Cut output” only returns to the designed de-energized pneumatic state; it cannot fix a blocked hose, stuck valve, unsuitable spring or other mechanical fault.

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eBoost2, eBoost3 and eBoost Street conversions

The retain guide lists the original main-loom valve and trigger functions. In a replacement installation those trigger wires are unnecessary: FD controls the qualified valve, not the eBoost switch inputs. Disconnect the original valve driver completely before connecting the replacement.

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The current eBoost3 data sheet identifies a 25 Hz drive and a supplied 12.7 W valve. That valve is not an automatic match for a nominal 1 A AUX output; its nominal power divided by 12 V already exceeds 1 A, before installation qualification. Use direct FD OUT for a compatible valve; use the external power interface only if capacity or the electrical drive requires it. Do not transfer that valve specification to an older eBoost2 or Street without identifying its exact part. [R1]

For eBoost2 and Street, the researched material does not establish every supplied valve's current, clamp and allowed frequency. Preserve the old valve only after obtaining that information, or use a separately documented replacement valve. The brown/grey pair in an original loom does not itself establish the electrical contract.

Recreate only the intended function in FD: choose three internal profiles, build the base-duty table from measured results and add RPM, gear, speed or time scheduling only when the corresponding valid signals are present. Do not copy eBoost set-point, gate-pressure or sensitivity numbers into PID fields: the algorithms and units differ.

3.1 Functions that do not transfer automatically

The old controller's saved settings, display layouts, shift/auxiliary functions and proprietary learning are not imported. If the original controller or its internal pressure sensor is removed, those measurements and functions need separate replacements. eBoost3 CAN wiring is documented, but a complete supported protocol was not obtained for a telemetry recipe. Any motorized or specialized dome-pressure installation remains outside this simple replacement route.



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GFB G-Force III conversion

The G-Force III has its own controller tuning and wideband-related functions. Its retained-controller input is a preset/scramble interface; it is not a remote duty-command interface. A full replacement therefore separates the GFB valve driver and supplies FD with its own qualified pressure and other required measurements. [R2]

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The exact valve's current, suppression and permitted PWM frequency were not established from the reviewed official manual. Identify it and obtain specifications or substitute a documented valve. Keep its original pressure plumbing only after confirming it matches the chosen valve's fail-state routing.

If the existing installation uses GFB's wideband-dependent protection, connect a documented wideband output to a qualified FD input or decode its supported CAN output, with correct units and freshness. Explicitly build and test any intended FD rule; removing GFB also removes protection that existed only inside it. A visually similar setting does not establish equivalent timing or behaviour.

Rebuild FD profiles and duty tables from controlled measurements. Do not transfer the GFB duty, gain or sensitivity settings numerically. Preserve the original tune sheet so the installer can compare measured boost curves, overshoot and protection response after conversion.



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AEM Tru-BoostX conversion

AEM's original controller provides valve fault reporting and its own operating protections. FD Design LS does not have equivalent per-output current feedback, so replacing the AEM valve driver loses its coil short/disconnection diagnostics unless separately implemented with suitable hardware. [R3]

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Disconnect the AEM valve-control wire from the coil before FD takes command. The manufacturer's CAN data can be useful while retaining the complete original controller, but an AEM gauge left powered with a disconnected valve is not automatically a qualified standalone pressure sensor. Its fault behaviour and data validity would require a separate validation.

Use an independent qualified pressure measurement for the baseline FD conversion. Confirm the actual valve's electrical and frequency requirements; they were not established sufficiently in the reviewed material for a universal reuse instruction. Rebuild the FD base-duty curve and limits on the installed valve.

The old A/B/Scramble values do not import into FD profiles. FD's profile target, open-loop map and PID configuration are separate. A CAN field labelled output duty is the AEM controller's reported command, not proof of FD coil current after conversion.



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GReddy Profec and HKS conversions

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6.1 Profec OLED, Profec MAP and Profec B-spec II

Remove the original power unit's valve command from the reused coil before applying any FD drive. The reviewed sources do not establish a universally qualified electrical contract for all Profec valve generations. Identify the exact part or select a documented replacement. [R4]

Profec MAP is an accessory for its associated Profec controller, not an automatic FD data interface. Removing that controller does not transfer its RPM, throttle or speed input definitions to FD. Configure available signals in FD separately, then rebuild the desired schedule. HI/LO, scramble and vendor-specific boost-response settings do not map numerically into FD PID values.

6.2 HKS EVC6-IR2.4

This system uses an HKS stepping-motor valve. FD's generic PWM outputs cannot replace the required stepper drive. For this draft's supported topology, replace the actuator/control assembly with a qualified conventional solenoid and provide FD with a qualified pressure signal. Retaining that stepper requires a separate driver/control development, not the installation shown here. [R5]

Do not join a subset of its valve wires to OUT or AUX pins. Keep the HKS unit intact if retaining its stepper response and functions is important to the installation. Its proprietary tuning and EasyWriter configuration are not imported into FD.

6.3 HKS EVC-S and EVC-S2

Treat their valves and pressure sensors as model-specific components. Their controller wiring does not establish a generic FD remote-group interface, nor does a whole-unit power rating establish the solenoid's usable current or PWM characteristics. Obtain exact valve/sensor specifications or replace them with documented compatible parts. [R6]

Rebuild the intended profiles and response on FD. Local A/B or A/B/C/D labels do not represent four settings that FD automatically reads or restores. Record which original protections are being removed and which independent systems remain.



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Apexi AVC-R conversion

AVC-R integrates vehicle-specific signal wiring and its own tuning functions. Its orange scramble node is only relevant when retaining the controller; it is not a direct valve PWM input. For replacement, disconnect the original coil driver and qualify or replace the exact solenoid. The reviewed sources do not establish a universal coil-current/frequency recipe. [R7]

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Preserve the integrity of existing ECU sensor and ground wiring during removal. Do not cut through original vehicle wires that were merely tapped by the AVC-R. Remove or isolate accessory taps using the original vehicle and Apexi diagrams; confirm the stock ECU still receives correct signals.

FD does not inherit AVC-R injector-duty information, gear learning or sensor calibration just because the old loom remains in the car. Configure supported RPM, throttle, speed and gear sources separately, and leave unavailable functions disabled. An independent gauge or sensor is required unless a retained, documented measurement interface has been validated.

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Configure the FD output and controller

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Current app workflow: Configure this installation from its function in Settings. Controls provides live actions and the Dashboard provides glance controls; use a card's edit menu to return to setup. A configured output remains visible even when disabled. Enabled rules operate their assigned enabled outputs automatically; there is no extra output mode to select. Live Off, On or duty takes over a generic output until you choose Resume automation. Setup keeps the electrical limits, calibration and response settings. Assigned boost, WMI and nitrous outputs use their controller-specific actions, preserving sensor protections and any paired fuel/stage logic. Nitrous Arm allows its configured activation conditions to operate; it is not an unconditional spray command.

Setup and vehicle data: Starting presets remain editable; Add Sensor includes calibration and fine tuning before Create. Use dedicated IGN, fresh running-engine OBD evidence, or both for vehicle activity; a dedicated IGN wire is optional when valid OBD evidence is available. If the pressure hose is unused, explicitly select OBD pressure in setup. A valid atmospheric sensor reading cannot identify a disconnected hose. These app choices do not change the product-specific electrical compatibility or limitations described below.

8.1 Begin disabled

- 1 Connect the app to the real FD device. Turn the internal controller off while making electrical or configuration changes.
- 2 In **More → Boost Control → Third-party EBC → Controller setup**, set the external EBC interface to **Not Configured** and tap **Save EBC setup** when its original controller has been removed. This avoids reserving AUX for an unrelated pulse engine.
- 3 Open **More → Outputs** and select the physically assigned channel. Give it a clear name, for example **Boost solenoid**. Review **Enabled**, **Switching frequency**, and minimum/maximum duty explicitly. Do not assume a preset automatically replaced every old field.
- 4 Enter only the frequency approved for the actual valve/driver. The maximum duty must respect the validated valve and installation limits; a UI range of 0–100% is not an instruction to use either extreme under load.
- 5 Assign the output from the controller connection settings. Review **Turn off on ignition off** using dedicated IGN, fresh running-engine OBD evidence, or both, and test power sequencing.
- 6 Open **More → Boost Control → Fusion Boost → Configure Fusion Boost → Connection**. Assign the same **Solenoid output**. Leave boost disabled until sources, profiles and protections have been saved and verified.

8.2 Select measured sources

In **Connection → Shared boost pressure**, select the pressure source. Choose the required RPM, throttle and warmup temperature inputs in **Connection → Feedback & load inputs**. Explicitly chosen pressure sources must stay valid; they do not silently switch to another sensor. AUTO uses the existing onboard/OBD selection logic and must still be verified for the installed car.

Check live units, reference and source age. Test the source at known pressure points; check engine-off pressure and the absolute/gauge conversion. A readable OBD PID is not automatically fast enough for closed-loop control. Use a sufficiently fast, fresh and accurate signal, and validate actual update cadence under load and with other selected channels enabled.

8.3 Configure protections first

In **Configure Fusion Boost → Protection**, set **Max Boost Limit** to the installation's professionally established limit. In **Configure Fusion Boost → Protection**, set the overboost margin and sensor timeout for the qualified installation. For initial commissioning use **Invalid MAP feedback → Cut output**; verify physically what de-energized output does.

The current implementation offers reduced open-loop or held-duty fallback only for AUTO pressure with the Profile/existing-RPM strategy. Explicit pressure and gear/speed/time strategies cut output on invalid required data. Do not use a positive-duty fallback to conceal a missing sensor. Enable **Require warm coolant** only with a valid fresh temperature source and the intended °C threshold.

Keep **Learn duty corrections OFF** during initial commissioning. The learning options are not a substitute for calibration or independent engine protection. Retain suitable ECU/mechanical safeguards and an independent reference measurement.

8.4 Profiles and tables

Under **Configure Fusion Boost → Profiles**, name the installed profiles (three by default, up to eight on supported firmware), set their pressure targets, and deliberately choose each **Profile can drive the output** state. Profiles should start from a verified conservative configuration; do not retain default targets simply because they are populated.

In **Configure Fusion Boost → Tables → Base Duty by Boost Target**, enter the measured target-PSI-to-duty curve. The editor has eleven points at 5 PSI intervals. Open Loop uses that map; Closed Loop adds PID correction. Response and enabled learning may also change final duty. The base table is not a pressure sensor calibration table.

Use **Save Fusion Boost settings**, wait for the device acknowledgement, then reread the saved state. Confirm the assigned channel and output ownership. Power-cycle and repeat the read-back before engine-load testing. The phone must not be the only place the settings exist.

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Commission modes and schedules

9.1 Manual, Open Loop and Closed Loop

Manual is a direct duty request for controlled commissioning; it ignores target scheduling. Use an appropriate non-boosting electrical/pneumatic setup first. Verify output polarity, frequency and valve action with suitable instruments before controlled load testing.

Open Loop selects duty from the calibrated base-duty map. It does not adjust duty to eliminate measured pressure error. The installed engine, exhaust, weather and wastegate behaviour can change the resulting boost, so protections and actual pressure measurement remain essential.

Closed Loop uses feedback and PID correction. First establish a stable base map. In **Configure Fusion Boost** → **PID**, configure proportional, integral and derivative values with a qualified tuner; do not copy another controller's numbers. Review **Correction limit (%)** and **Derivative filter**. A zero correction limit disables PID duty correction. Observe overshoot, settling and source freshness before expanding the operating envelope.

9.2 Choose one target strategy

Profile / existing RPM curve: profile targets form the baseline. The optional **Boost Target by RPM** curve only replaces the profile target in Closed Loop, uses fresh RPM and spans 0–10,000 RPM at 1,000 RPM intervals. It is inactive when another schedule is selected.

Gear × RPM grid: select a valid gear input and edit each required gear row. Current valid gears are whole numbers 1–8. Neutral, reverse and unavailable gear cut output. Values interpolate along RPM within the selected gear; confirm a real gear source before enabling this strategy.

Vehicle speed curve: select a qualified speed source and define pressure targets. The schedule's units are km/h; the firmware converts supported mph inputs. Above the curve's final 250 km/h point, the final target is held. This UI range is not a suggested test speed.

Time after load request: define a curve duration and targets. Timing starts only when fresh RPM and throttle satisfy their activation thresholds. Release or missing data resets the curve; after the duration the last point is held. A zero starting target keeps the solenoid off while the timer advances.

Gear, speed and time schedules work in Open Loop and Closed Loop and are capped by the active profile target and Max Boost Limit. Configure **Throttle activation/release**, **RPM activation/release**, and **Maximum target rise**. Release thresholds cannot exceed activation thresholds. Zero rise limit means immediate changes; reductions and safety cuts remain immediate.

9.3 Add automations after baseline validation

Use the internal boost actions exposed by the current app to change a validated controller state/profile. Do not add generic PWM rules that fight a channel already owned by Boost Control. Conditions must use configured, fresh inputs and an intentional exit behaviour. Prove each rule using safe simulated sensor values or a controlled bench setup, then inspect both the requested state and measured physical response.

Disconnect the phone during a safe bench test and establish that saved ESP rules continue. A phone or Cloud connection is not required for stored controller logic, but phone logging and Cloud upload have their own connection and availability requirements.

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Record evidence before release

Create a named commissioning log containing measured pressure, target, base/final requested duty, mode, profile, required source values and age/validity, controller protections, automation transitions and the relevant available vehicle signals. Label requested duty separately from measured current: FD has no per-output current feedback.

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Use independent instruments to confirm electrical frequency/duty and pressure. A configured high logging rate cannot make a slow sensor, ECU response or CAN broadcast update faster. Check actual timestamps and repeated values rather than inferring source rate from a recorder setting.

- 1 Confirm exact valve, sensor and driver specifications and polarity.
- 2 Confirm output OFF, safe de-energized plumbing and mechanical base pressure.
- 3 Confirm calibrated signals, units, freshness and timeout behaviour.
- 4 Confirm output ownership, saved settings and restart read-back.
- 5 Test lost pressure, lost RPM/throttle where required, lost gear/speed, invalid temperature and ignition transitions.
- 6 Test profile changes, schedule activation/release, bounds, and automation exits in a non-boosting setup first.
- 7 Complete controlled, professionally supervised load validation, comparing target, measured boost and independent protections.
- 8 Record every removed original-controller function and its replacement or explicit absence.

No physical competitor conversion, actuator test or dyno result is claimed by this draft. Release requires evidence for the actual installed model, not just a matching product-family name or a passing software simulation.

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Source and implementation record

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R1 — Turbosmart eBoost3 data sheet, valve and PWM specifications; current v1.3.0 controller instructions.
<https://turbosmart.gorgias.help/en-US/eboost-3-data-sheet-5707829> and <https://turbosmart.gorgias.help/en-US/ts-0311-100x---eboost-3-v130-io-130-6061499>

R2 — GFB G-Force III official instructions; retained mode/input details are in the companion book.
<https://www.gfb.com.au/wp-content/uploads/2018/11/g-force3-instuctions.pdf>

R3 — AEM 10-4352, 22 January 2021, wiring, operation and faults.
https://documents.aemelectronics.com/techlibrary_30-0352-tru-boostx-controller_gauge-instructions.pdf

R4 — GReddy Profec OLED, B-spec II and MAP official manuals linked by manufacturer technical support.
<https://www.greddy.com/pages/tech-support-profec-boost-control>

R5 — HKS EVC6-IR2.4 product information; stepping-motor valve. <https://www.hks-power.co.jp/product/electronics/boost/evc6-ir24/index.html>

R6 — HKS EVC-S2 45003-AK015 / E05121-K00240-00, 25 January 2024, Ver 3-1.01, printed p20 wiring.
https://www.hks-power.co.jp/product_search/product/download/5330/en/45003-AK015%28E05121-K00240-00%29EVC-S2_E.pdf

R7 — A'PEXi AVC-R manufacturer instructions and support.
https://www.apexi.co.jp/pdf/products/avc_r_torisetu.pdf and <https://www.apexi.co.jp/others/faq/>

FD evidence reviewed: `docs/V1_LS_HARDWARE_LIMITATIONS.md`; `modules/control/EBCController.h`; `FusionDrive.ino` EBC presets; `BLECmd_EBCDevice.inc`; `iOS SettingsView.swift`, `PWMOutputsView.swift`, `BoostControlView.swift`, `BoostScheduleEditor.swift` and automation editor. This records source inspection, not physical qualification. Exact releases and installation results must be added to the acceptance record.



Questions?

Documentation · fusiondrive.io/docs

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

Review copy · [Local FD V3 installation library](#)

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. Local review draft. These accessory installations have not received physical compatibility sign-off or manufacturer approval. Follow the exact-model qualification and commissioning steps in this guide before use. Match the exact model, generation, connector and manual revision. Terminal labels identify electrical connections, not connector mating-face or cavity order. Follow cavity markings and the official harness view; do not wire by colour alone. Manufacturer names identify equipment only. These independent FD instructions do not replace the manufacturer's manual.