



— 04 / REPLACE YOUR CONTROLLER

FD water/meth control

Drive a compatible pump directly, map its control and measure delivery.



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Retain compatible fluid hardware. Design the control properly.

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This is a commissioning guide for replacing a compatible progressive-pump controller with FD. It is not a plug-and-play adapter for every WMI kit. The original tank, pump, valves and nozzles may be reusable, but their electrical, hydraulic and control requirements remain. None of the competitor pumps in this review has yet been qualified against a delivered FD LS board.

FD contains four high-side PWM power drivers, designed for **10 A per OUT**, sharing a **30 A fused supply**. A compatible pump connects directly to an OUT and power ground; an additional power-driver module is not a default requirement. Match running/inrush/stall current, switching method and temperature to the complete installation. Four simultaneous 10 A loads exceed the shared supply budget. The 10 A figure is documented design intent; assembled-board continuous performance still requires testing.

Retain the original controller when its injector tracking, pump electrical diagnostics, fast fluid valve or integrated flow protection is required and has no validated equivalent in the proposed FD setup.



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What the current FD controller provides

FD pump mode provides a boost-based linear progression or an 11-point boost-duty table, output ownership, minimum/maximum duty, start/full/off pressure, smoothing, finite priming, calibrated flow/pressure/tank monitoring and fault recovery. Settings save on the ESP and run without the phone. The phone holds recordings and can back them up to Cloud.

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The pump algorithm uses the shared pressure measurement selected in **WMI Control → Connection → Shared boost pressure**, even when Fusion Boost actuation is off. It does not offer an arbitrary WMI injector-duty, MAF-frequency, gear or EGT load axis. Automations can enable/disable WMI or select basic/table mode, but they do not convert the algorithm into Aquamist's fuel-injector-tracking valve controller.

Flow, line pressure and tank level are physical measurements only if suitable sensors exist. FD does not measure per-output motor current, pump continuity, stall or nozzle delivery from the board alone. Protecting a WMI-dependent tune needs an independently validated engine-load reduction or safe fallback; stopping injection alone may increase risk.



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Decide whether your kit can be converted

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AEM internal-MAP/30-3305 progressive pump: a conditional redesign candidate. Disconnect the original pump driver fully before connecting the pump to FD or a separately required driver. The conductive level sensor must not be treated as a dry switch. Original pump electrical diagnostics and Boost Safe do not transfer automatically. For 30-3305 installations previously using MAF frequency or injector duty, the FD load strategy is different. See the retained book's AEM source facts.

Snow VC-30/VC-50 progressive pump: a conditional redesign candidate. Pump waveform/current limits must be established. Any second-stage output and anti-siphon solenoid must be included in the new IO/safety plan; a single FD pump output does not recreate every original function. Exact harness revision is essential.

Snow Stage 3/DI: not functionally equivalent merely by joining the pump. The existing injector-dependent strategy (310), fuel-pressure-voltage strategy (320) or dual-stage strategy is not automatically reproduced by FD's boost table. Either redesign the strategy with the tuner and verified sources, or retain Snow and add FD monitoring.

Aquamist HFS3/HFS4: not a supported drop-in replacement. Its constant-pressure pump and fast-acting fluid valve require a coordinated control/driver design, injector-load interpretation and flow-failsafe integration. Do not PWM its pump and claim the original valve strategy has been retained. Keep the system until that separate design exists and is validated.

Coolingmist CMGS/FCB or Cool Boost: conditional redesign, not a bypass of the original current/pressure supervision. The original pump–return path must be understood before disconnection. Replace lost protections with actual new measurements and a documented fallback, not a renamed duty channel.

DevilsOwn DVC-30: no model-specific replacement wiring is released here. Obtain the exact pump/controller manual and identify the installed pump before using this procedure.

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The release gate: complete the hardware worksheet

Record these items before buying connectors or choosing a PWM frequency:

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- Pump manufacturer, exact part/revision, nominal voltage, allowed voltage range, continuous current at the intended pressure, stall/inrush current, permitted PWM method/frequency and permitted operating duty.
- Whether positive supply or negative return may be PWM switched; whether either terminal must remain isolated from chassis; required suppression/freewheel arrangement.
- Assigned FD OUT, load current versus its 10 A design envelope and the shared 30 A feed, fuse, wiring/connector limits and startup/fault behavior. If a specific mismatch requires an external driver, record its model, command interface and derated current rating.
- Nozzle and valve model, normal state, opening pressure, fluid compatibility, flow vs differential pressure and shutdown/siphon prevention.
- Real flow/pressure/tank sensor models and transfer functions; source sample rates and failure indications.
- Safe response if FD loses power, a sensor fails, a hose leaks, a nozzle blocks, or the phone disconnects.

A published fuse size is not a pump current specification. [AEMPUMP] The available AEM pump leaflet addresses mounting and fittings, but does not establish an external PWM frequency or inrush/stall specification. This evidence gap must be closed before direct-drive approval. Similar missing ratings remain for the reviewed Snow pumps.

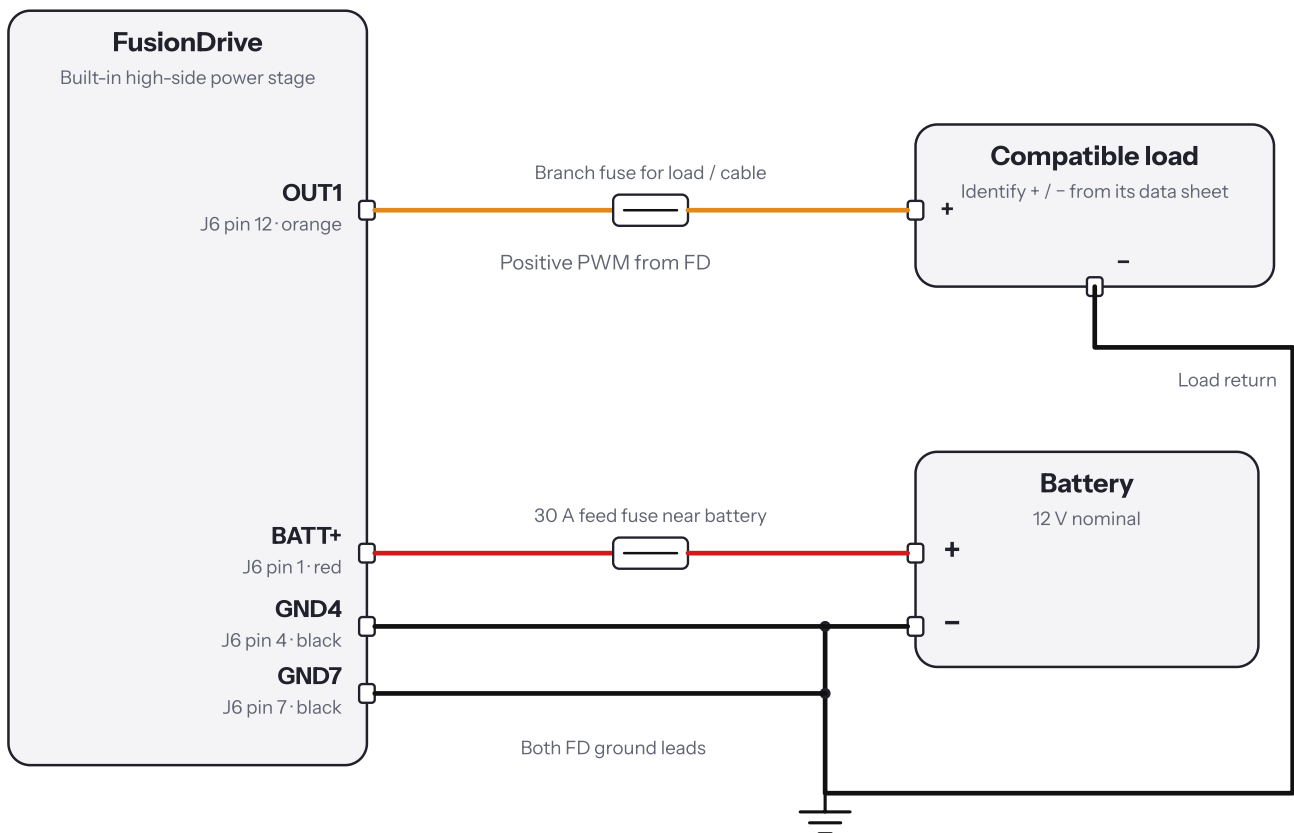
Exact AEM/Snow pump compatibility still requires qualification. Missing pump inrush/PWM evidence is a verification gap, not proof FD needs another power driver. Use the pump's specification and physical measurements; do not adopt a prefilled WMI frequency without checking it.

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Circuit R1: connect a compatible pump directly to FD

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.

FD's OUT1-4 already contain the high-side PWM power stage. Use direct control when the pump's current, inrush, waveform and installation fit that stage; no separate pump-driver module is needed for a compatible load.

- 1 Battery → specified dedicated fused supply → **J6 pin 1**. Each OUT is designed for 10 A; the four outputs share the board's 30 A fused path. Account for all simultaneous loads and validate the assembled-board thermal/current envelope.

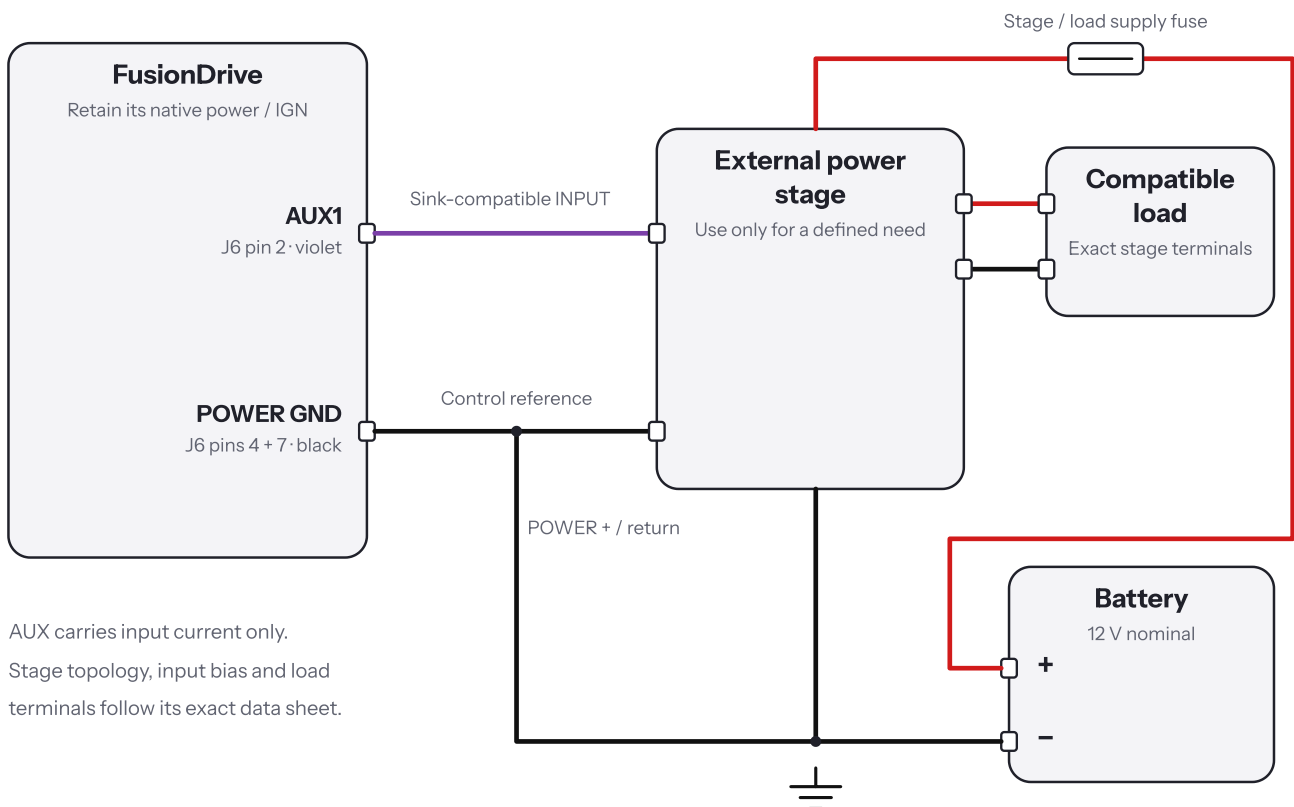
- 2 **OUT1/J6-12 → pump positive** and pump negative → designated common power ground. The pump must support this high-side PWM topology. Connect both FD power grounds, **J6 pins 4 and 7**, using the specified power-return wiring.
- 3 Disconnect the original controller from both pump leads before transferring control. Do not join two drivers or parallel FD outputs for additional current.
- 4 Match PWM frequency, duty bounds, flyback and turn-off behavior to the pump. Verify wiring, connectors, inrush/stall protection and enclosure temperature with the real load and simultaneous outputs.
- 5 Flow → **IN1/J8-1**; pressure → **IN2/J8-2**; tank → **IN3/J8-3**; compatible sensor returns → **J8-8**. Use the specified excitation/conditioning; keep motor current out of sensor ground.
- 6 Configure the assigned OUT before attaching the pump. AUX is a separate smaller low-side sink, not an interchangeable pump power output. Allocate and test any anti-siphon valve separately.

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Circuit R2: external driver for a specific load requirement

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.

Use this alternative when current/inrush, required switching polarity, PWM interface or another documented load requirement exceeds or differs from FD's built-in power stage. Record that requirement first. An unverified external module does not close a missing pump specification.

- 1 Battery → correctly sized pump fuse → selected driver's power input.
- 2 Driver power output(s) → pump terminals, with pump/driver returns and suppression wired exactly for that supported topology. Keep motor current out of sensor ground.
- 3 FD AUX1/J6-2 → **compatible ground-sink PWM command input**; FD J6-4 and J6-7 → compatible command/power reference. Verify input voltage, current and supply sequencing. An analog command input needs a defined converter; AUX cannot supply 0-5 V.

- 4 Define idle and missing-command behavior. A floating input must not unintentionally start the pump. Retain native enable/interlocks where required by the selected driver.
- 5 Retain the same calibrated flow/pressure/tank inputs and any separately driven anti-siphon valve described in R1. The extra driver does not create additional FD channels or delivered-flow feedback.

Select exact terminals from the driver's specification. A mechanical relay can isolate power or provide binary permission, but cannot produce progressive pump PWM. No particular external driver has been electrically qualified by this document.



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Plumbing and measurement plan

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Keep compatible filters, correctly oriented check valves and required anti-siphon hardware. Use a flow transducer compatible with the fluid, pressure and required minimum flow. Fit it where the selected sensor's installation requirements and the desired measured quantity agree. A branch upstream of multiple nozzles measures total delivery; it does not prove each individual nozzle is open.

A pressure transducer cannot distinguish all nozzle restrictions from healthy spray. Combining actual flow, pressure, demand and tank status gives a more useful record. A pulse sensor requires an external conditioner or a compatible decoded CAN accessory. Do not wire a turbine pulse output directly to the ADC and interpret the average voltage as flow.

Retain manufacturer mounting, hose, valve and nozzle instructions for the reused parts. Controller replacement does not make an incompatible seal, pump or hose suitable for methanol.

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App commissioning: sources first

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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.

- 1 Keep **WMI enabled** disabled and pump power isolated.
- 2 In **Sensors**, calibrate flow (mL/min), line pressure (psi), tank (% or explicitly binary healthy/empty) and the pressure source used by Boost. For CAN sources, use the actual accessory definition and valid update expectations.
- 3 In **WMI Control → Connection → Shared boost pressure**, select the installed pressure source. Use **Save shared pressure source**, then **Reload saved source**. This changes only the shared pressure selection, without enabling a controller or preparing an output. Confirm the measured pressure at rest and at known applied pressure. OBD or CAN MAP is suitable only when its definition, absolute/gauge conversion and freshness are verified. A visible PID name alone is insufficient.
- 4 Save and reload from the device. Move each sensor through its expected range; observe disconnected/stale conditions. Establish safe zero, not merely a plausible dashboard number.
- 5 Add actual ECU/RPM/MAP where available, all installed WMI measurements, WMI duty/state/fault flags, output duty and automation events to a log selection. Keep units and names explicit.



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App commissioning: output and pump mode

In **Outputs**, select the high-side OUT assigned directly to the compatible pump, or the command channel for a separately required external driver. Enable it and enter the validated PWM frequency, duty limits and ramp/calibration. Inspect every field after selecting a role preset: the preset fills starting frequency and duty limits, which remain editable.

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In **WMI Control > Your WMI installation**, choose **FusionDrive WMI**. Under **Connection**, choose the same **Pump output**. No other controller or automation may own the same physical output.

Select **Injection > Linear ramp** for an initial documented curve. Set **Start Injection** and **Full Injection** to the tuner's chosen measured boost points. Set **Minimum Duty** to the lowest experimentally stable pump/driver command and **Maximum Duty** to the qualified upper limit. Neither value should be guessed from another installation.

Set **Off Below** lower than the activation threshold to establish appropriate hysteresis. **Smoothing Up** and **Smoothing Down** change the commanded progression; they also affect hydraulic delay and therefore the expected-flow envelope. Record these settings with each test.

For **Injection > Boost table**, enter **Pump Duty by Boost** at the displayed 5 psi intervals from 0 to 50 psi. The firmware interpolates between points; start/off pressure still governs activation. Do not label this as an RPM or injector-duty table. Do not extrapolate a validated range beyond the actual sensor/vehicle envelope.



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Measured protection and recovery

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Bind **Measured flow**, **Measured line pressure** and **Tank level** to actual calibrated sources. Conversion is $\text{source} \times \text{scale} + \text{offset}$. Use scale 1/offset 0 if the source already supplies the displayed canonical units. For a binary tank source, map healthy-high 0/1 with scale 100 / offset 0, or healthy-low with scale -100 / offset 100. This indicates healthy/empty, not measured fluid volume; verify open-wire behaviour.

Record stable flow and pressure at each intended command and supply condition. Set a measured min/max envelope, then use **Expected flow by duty** if the full 0...100% table has valid data. Account for real ramp and startup, without making grace periods so long they hide a failed delivery event. The idle maximum should detect unwanted flow.

Set **Maximum input age**, **Startup low-flow / low-pressure grace**, **Prime low-flow / low-pressure grace**, **Threshold fault debounce** and **Healthy OFF time before manual clear**. Invalid/stale configured measurements cut immediately. Low tank and high-limit protections remain active during grace. Faults remain latched until the safe OFF recovery conditions and manual clear are satisfied for that powered run. Before service clearing, remove engine/injection demand and turn WMI enabled OFF. Clearing a fault does not disable the system; if it remains enabled, pump/permit control can resume immediately.

If FD controls a commissioned boost output, enable **Reduce boost when WMI faults** and choose the intended **Cut linked boost output on fault** behavior. Confirm what actual mechanical boost follows an OFF command. Do not assume this can command an untouched external EBC, alter the ECU calibration or change ignition timing.

Select **Save WMI Settings**, wait for acknowledgment, then **Reload saved values**. Verify output assignment, units, protections and table values before power is restored to the pump.



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Prime and capture a baseline

Remove the injection nozzle from the engine and secure a collection setup first. Fill with appropriate test fluid and complete the reused component manufacturer's purge procedure.

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Use **WMI Control > Prime / Test** only after safe output behavior is proven. Set **Prime Duty** and **Default Prime Duration** to the commissioning values, start a short test, and confirm **Stop Prime** works. Firmware limits the requested time to the saved permitted duration. A priming command is not permission to inject into a stopped engine.

Measure actual collected volume over a known interval and compare it with the flow sensor and log. Observe pressure buildup, residual pressure and post-command flow. Recalibrate sensor and envelope if necessary. Repeated duty values should give reproducible measured delivery within the defined operating conditions; when they do not, diagnose the fluid/electrical issue before adjusting the limits.

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Automations without conflicting owners

In **Automations**, use actual configured sources, validity and age. A protective condition can set **WMI Enable = OFF**. **WMI Mode** can select basic/table only after both sets of values are commissioned. **WMI Prime** is a finite event; do not attach it to an ordinary ignition-on rule or automatically repeated road condition.

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Use an explicit recovery procedure for safety-related disable rules. Do not automatically re-enable after a brief return to a threshold. Avoid direct duty writes to the pump's WMI-owned output; alter the supported controller target instead. Settings/rules belong on FD; phones and Cloud are configurators and recording/review surfaces.



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Acceptance record

Record a result, timestamp, equipment and log reference for each check. This manual does not claim those checks have already passed on competitor hardware.

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- Original controller entirely removed from reused load circuits; isolation and continuity checked with power off.
- Power-off, ignition-off, startup, FD reboot, disabled WMI and open command wire produce the intended physical state.
- Phone disconnect leaves the saved valid ESP configuration operating; no phone-held dependency remains.
- Calibrated idle/part/full flow and pressure, start/full/off transitions, smoothing and table interpolation checked in the approved range.
- Empty tank, disconnected sensor, stale CAN, out-of-range measurement, low flow, high flow and pressure limits generate the intended fault and load response.
- Safe recovery does not rearm early; manual clear only succeeds after the saved healthy OFF interval.
- Output, driver, fuse, harness and connector temperatures/current remain within the qualified envelope under simultaneous loads.
- Anti-siphon closure, residual flow and mechanical boost/engine fallback demonstrated independently of app status.
- Final settings save/readback, firmware/app versions and phone-free restart documented.

A tuner completes final vehicle calibration under controlled load. Bench validity, software behavior, fluid delivery and actual engine response are separate evidence; one does not prove the others.

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Source and evidence notes

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Exact official/dealer-manual titles, revisions, page references, download hashes and unresolved questions are in `sources.json` and `models.json`. See the companion retained-controller guide for the concise model-specific manufacturer facts. FD output design figures are documented in `PCB/FD Design LS/docs/pcb-layout-and-routing.md` (lines 156 and 241) and `docs/firmware-and-programming.md` (line 147): 10 A per OUT design, shared 30 A feed. These are design figures, not completed physical compatibility tests. Current FD behavior was read from `WMIControlView.swift`, `WMIMonitoringView.swift`, `WMIController.h`, `WMIMonitoringConfig.h`, `AutomationEngine.h` and `V1_LS_HARDWARE_LIMITATIONS.md`. No firmware behavior, web publication or manufacturer approval was changed by writing this guide.

[AEM 30-3018 pump manual](#), instruction 10-3018, page 1. This establishes the limited published pump instructions referenced above. The companion retained-controller book includes the complete model source register; all exact files are included in the local review package.



Questions?

Documentation · fusiondrive.io/docs

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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.