



— 06 / REPLACE YOUR CONTROLLER

FD nitrous control

Direct solenoid control, stages, fuel curves and measured gates.



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Controller replacement and app setup review draft

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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.

FD Design LS · September 2026 · Independent integration proposal

This guide plans how to retain compatible nitrous-system hardware while replacing its electronic controller with FusionDrive. It covers current FD functions, required signals, output allocation, app setup and validation. It does not replace the kit's mechanical installation, fuel-system specification, jetting or engine tune.

FD already contains four high-side PWM power drivers, designed for 10 A per OUT, with a shared 30 A fused supply. Compatible solenoids connect directly to those outputs; an external power module is only needed for a specific current, inrush or interface requirement. Four simultaneous 10 A loads exceed the shared supply budget.

The exact solenoid installations in this guide have not received electrical qualification. The 10 A figure is documented design intent; assembled-board continuous current, heat, transients and connector performance still require testing. Match the actual coil and switching method rather than inheriting the removed controller's larger rating.

The replacement is complete only when every function your installation actually relies on has a verified FD or retained-hardware equivalent. If a required function is missing, keep the original controller and use the separate integration guide.

Power-stage design sources: PCB/FD Design LS/docs/pcb-layout-and-routing.md, lines 156 and 241, documents the 10 A-per-OUT routing and dissipation design. PCB/FD Design LS/docs/firmware-and-programming.md, line 147, documents approximately 10 A per channel and the shared 30 A feed. These design figures do not certify a particular solenoid installation or completed assembled-board testing.

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Start with a function-transfer record

Record the exact existing controller and saved tune. List each used function, where it currently runs, and where it will run after conversion. Include:

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- Physical arming, WOT and RPM windows.
- Each nitrous stage and its fuel delivery.
- Progressive axis, point count, ramp delay and restart/resume behaviour.
- Maximum runtime, cooldown, shift/gear/transbrake lockouts.
- Fuel/bottle pressure limits and wideband response.
- Closed-loop fuel correction, if used.
- Actual ignition-retard control and activation lead/tail.
- Bottle heater control, purge and remote bottle opening.
- Local logging, display and sensor supply requirements.

Write **not transferred** next to an unavailable function. Do not mark it covered by an automation merely because an approximate rule seems possible. Direct-control decisions need the exact behaviour and timing established.

The current FD Nitrous controller provides fixed duty, time ramps and RPM tables, with up to three independent dry/wet stages, three profiles, separate wet fuel curves and configured protection sources. It does not provide a general closed-loop AFR fuel servo, four nitrous stages or arbitrary speed/TPS/boost progression curves.



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What can stay in the car

Subject to the kit and installer review, the existing bottle, bracket, pressure relief, lines, filter, nozzle/plate and suitable solenoids can remain. Retain an independently verified fuel supply and pressure regulator, physical arm and any necessary native safety interlocks. Retain gauges whose sender/controller must stay to produce the signal.

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Do not remove the wideband controller and connect its raw oxygen sensor to FD. Do not remove an ECU/fuel controller that provides dry-system enrichment. FD does not reflash the ECU or operate injectors as a replacement fuel ECU.

A gauge sender may be a conditioned voltage, a resistive sender or a proprietary sensor. Only a verified suitable output is an FD analog input. If a sensor depended on the removed controller's reference/excitation, replace that function with a documented compatible supply or conditioner before expecting a reading.

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Plan the six shared outputs

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FD Design LS has four high-side outputs: OUT1–4 are J6 pins 12, 11, 10, 9. AUX1/2 are low-side sinks on J6 pins 2/8. J6 pin 1 is the dedicated fused heavy feed; pins 4/7 are ground. The built-in high-side power stages are designed for 10 A per OUT and share a 30 A fused supply. Those design figures require real assembly/load verification; four 10 A loads cannot run together within the shared budget. AUX is a separate 1 A-class circuit.

A wet stage uses separate nitrous and fuel commands. A dry stage uses one nitrous command and relies on an external validated fuel strategy. A retard request consumes another output. A boost solenoid, WMI pump or EBC interface uses the same shared output bank.

Example allocation	Command channels used	Practical boundary
One wet stage	2	Two suitable OUTs can directly drive the nitrous/fuel coils with separate curves
One wet stage + boost + WMI + retard request	5	One channel remains; electrical roles still matter
Two wet stages + boost + WMI	6	No spare retard output
Three wet stages	6	No other outputs; AUX needs compatible driver interfaces
Four independent nitrous stages	Not available	Current dedicated controller supports up to three

Do not parallel FD pins for more current. An unused AUX cannot inherit a high-current solenoid rating from the controller being removed.

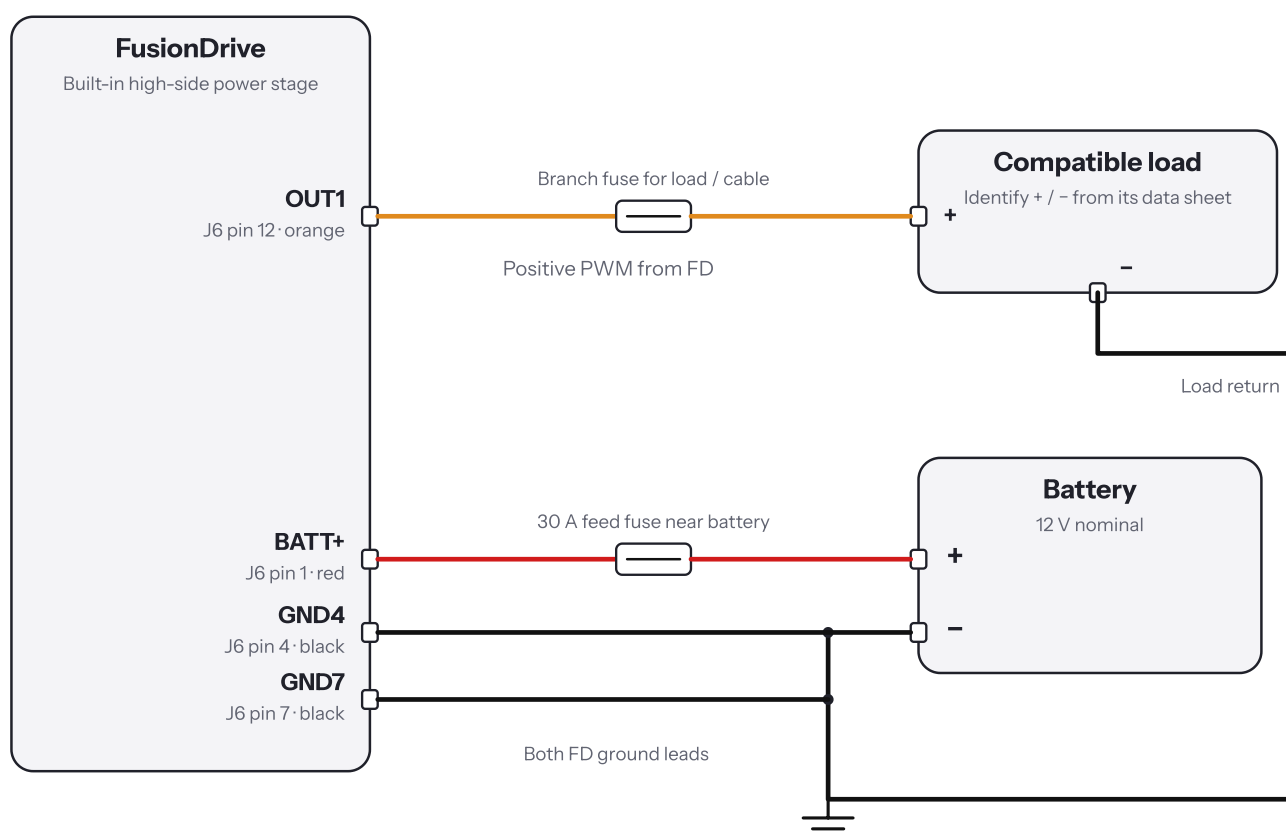
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Circuit R1 - connect compatible solenoids directly to FD

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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.

Use FD's built-in high-side PWM power stages for suitable two-wire loads. Connect dedicated fused feed → **FD J6 pin 1** → selected **OUT1-4** → load positive; load negative → rated power return. Connect both FD power grounds, **J6 pins 4 and 7**. A compatible load needs no additional power-driver module.

For one wet stage, use distinct suitable OUT channels for nitrous and fuel. Disconnect both old driver-to-load connections before transferring either coil; do not combine drivers or parallel FD outputs. OUT1/2/3/4 are J6 pins 12/11/10/9. Allocate all other controllers before choosing the pair.

Check each coil's current against the **10 A-per-OUT design** and all simultaneous loads against the **30 A shared feed**. Verify hot/cold current, inrush, duty/frequency, connector/ground voltage, temperature and inductive turn-off on the real assembly. The removed controller's 40 A-class channel does not imply its installed coil draws 40 A.

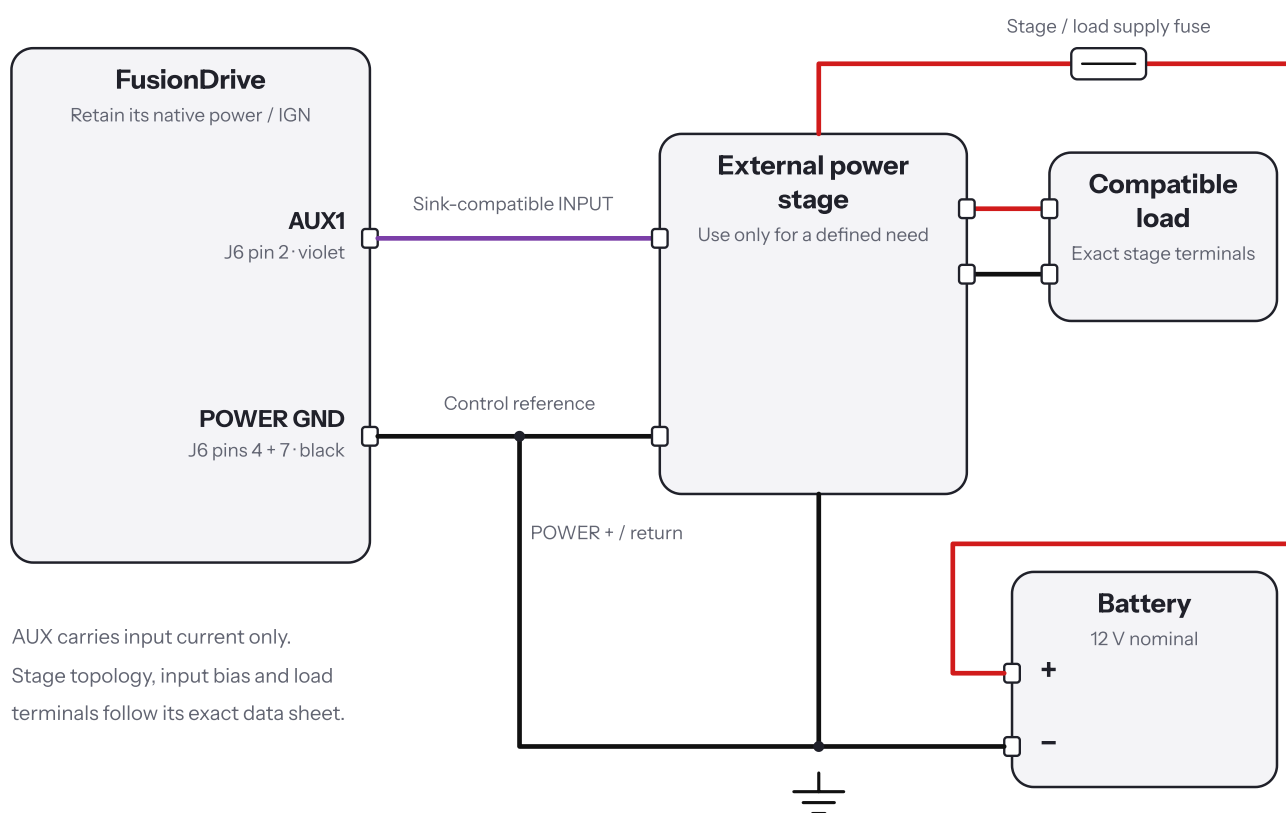
Use the solenoid's verified suppression arrangement. A conventional diode has stripe/cathode toward OUT and anode toward return; do not add one that conflicts with a required fast-closing waveform. Retain physical isolation and coherent fuel/nitrous stopping. If the return must remain switched through another device, use a suitable interface instead of assuming high-side conversion is valid. Do not work on live inductive loads.

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Circuit R2 - external PWM stage for a specific 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 an external stage only where an actual load's current/inrush, required low-side topology or command interface calls for it. A missing coil specification requires investigation; it is not by itself a reason to assume FD has no suitable power stage.

- 1 Assigned FD channel → selected driver's compatible command input. The illustrated low-side AUX command requires a ground-sink-compatible input; verify its voltage, current, polarity, PWM range and power-off behavior.

- 2 Driver command reference → compatible FD reference. Connect both FD power grounds; keep load current on rated power returns.
- 3 Separate fused feed → driver/load power circuit, retaining the kit's required physical arm/interlocks.
- 4 Driver power output → nitrous solenoid; an independently controlled output → fuel solenoid for a wet stage. Wire returns and suppression to the exact driver/coil requirements.

A retained low-side circuit normally supplies fused positive to the coil and switches its return. FD OUT1-4 supply positive instead: never attach an OUT to the old low-side driver wire without correctly changing the topology. Identify the selected driver's exact terminals, ratings and safe idle behavior before wiring. A mechanical relay may gate power or permission, but cannot generate progressive solenoid PWM.

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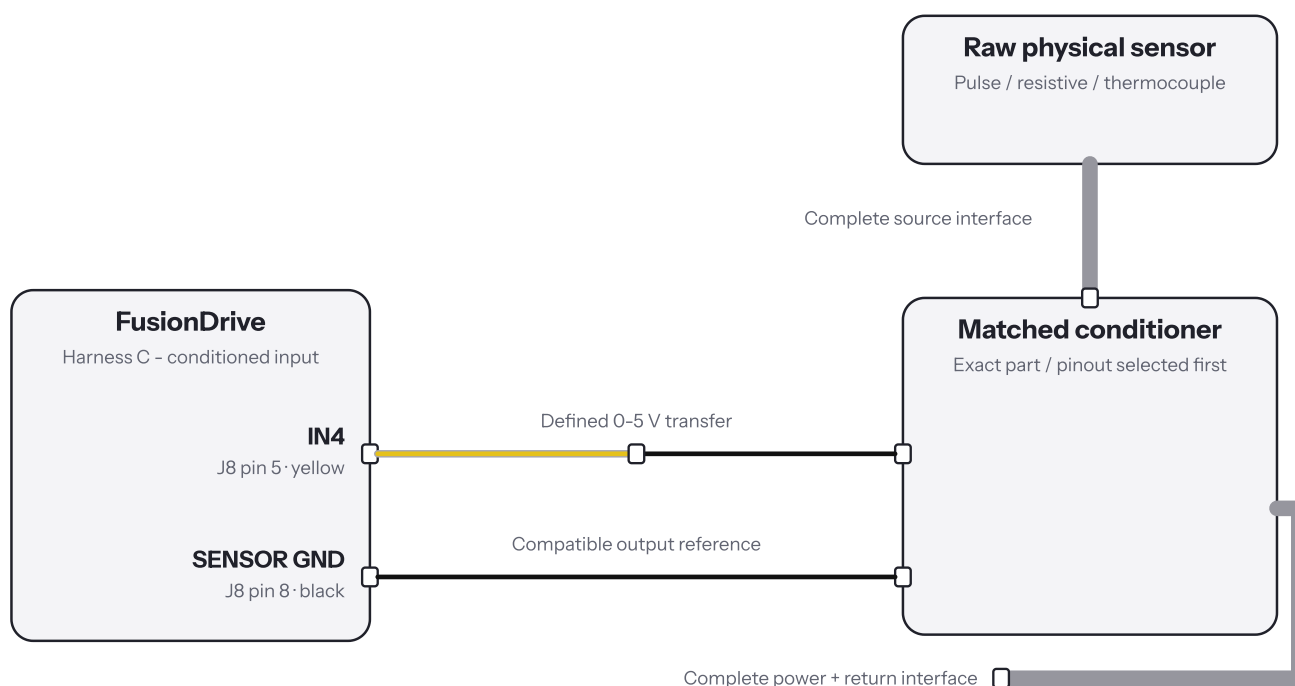
Sensors and timing: rebuild the evidence path

For direct FD nitrous control, configure reliable **RPM and throttle** sources. If the removed controller took a dedicated tach or injector pulse, FD IN1–IN6 cannot accept that function directly: they are multiplexed conditioned analog inputs, not fast edge counters. Use a documented conditioner or compatible decoded CAN source and prove its timing.

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For pressure, use a compatible measured source with correct units. For wideband, use the controller's documented analog/CAN output, not commanded mixture. A source that is merely present on OBD is not automatically fast enough for a cut you depend on.

S-08 | Condition a non-analog sender



Grey bands = complete specified multiwire interfaces, including required excitation and returns.

The conditioner must provide a documented linear transfer, fault behaviour, isolation and supply rating.

Measure end-to-end age and response from physical change to FD's command. Include sensor delay, conditioning, CAN/OBD updates and controller processing. Set freshness limits from that evidence. A 50 Hz requested log rate does not establish 50 Hz source updates or protection latency.

Keep independent native gates where their faster or separate hardware path is part of the installation's protection. Removing a competitor controller is not a reason to remove the safety it supplied.

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App setup: prepare inputs and outputs

Keep nitrous delivery isolated and **System Enable OFF** throughout configuration.

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- 1 In **Sensors**, name, calibrate and test the physical arm input and measured analog sensors. Verify low/high points, units, switch threshold, hysteresis, reverse logic and disconnected states.
- 2 Configure required CAN/OBD sources and prove actual values/freshness. Label measured pressure/mixture distinctly from requested targets.
- 3 In **Outputs**, identify each intended nitrous, fuel and optional retard channel. Ensure no boost, EBC, WMI or other stage owns it.
- 4 Set the frequency and duty bounds explicitly. Selecting **Nitrous Solenoid** identifies a role; the current iOS preset picker retains the displayed frequency/limits. A preset is not proof that the installed coil supports those values.
- 5 The current frequency Stepper moves in 10 Hz increments from the loaded value. If the exact validated value cannot be entered, obtain a verified supported configuration path before proceeding; do not substitute an arbitrary nearby frequency.
- 6 Begin each electrical test at 0% with the load safely isolated. Controller assignment uses Auto mode; save and inspect the returned mapping.

Record the physical pin next to every app label. A name such as `stage 1 fuel` does not change an output's high-side/low-side electrical behaviour.



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App setup: stages and profiles

Open **More** → **Nitrous** → **FusionDrive Nitrous**. **Connection** holds the main output/arm mapping, **Profiles** holds progression and independent stages, **Protection** holds gate sources and measured interlocks, and **Events** shows activity. **Keep my controller** is a separate guided route to inputs, outputs and automations; choosing that view does not transfer control.

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For the original single-stage mode, select **Dry** or **Wet**, map **Nitrous Output** and the wet **Fuel Output**, then review the RPM window, WOT threshold, control type and shot cap. Original single-stage wet operation uses matching duty.

For separate fuel curves or multiple stages, turn on **Independent stages**. Enable only the stages required. For each, select dry/wet and map distinct nitrous/fuel channels. The three profiles share those physical mappings; they do not create more outputs.

Under **Profile to edit**, choose A, B or C. Saving applies the selected profile. Set each stage's RPM minimum/maximum, throttle minimum, delay, maximum on-time, cooldown and reset hysteresis. Choose the nitrous curve and wet fuel curve separately:

- **On/Off**: applies the configured cap while eligible.
- **Time ramp**: defines start/end duty and timing after the stage delay.
- **RPM table**: interpolates across the increasing RPM points and duty values.

Current FD staged control requires a throttle/RPM reset or arm cycle before another activation. Verify this against the native controller's hold/resume behaviour. Tune values are installation-specific: there is no universal duty-to-horsepower mapping, and copying jet horsepower into a duty field is invalid.

Wet operation must not command nitrous with zero fuel demand. The software checks this logical mismatch, but that does not prove fuel pressure, valve opening or delivered mixture. Those require measurements and physical acceptance.



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App setup: arming, gate sources and protections

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Under **Outputs & Arm Input**, enable **Require arm signal** and select the calibrated **Arm Sensor Input**. Review **Gate input timeout**. Keep the physical master arm in the actual installation.

Under **RPM, throttle and safety gate sources**, bind RPM and throttle, and any enabled speed, intake-temperature or coolant-temperature gates. Minimum speed 0 disables that gate; temperature -1 disables the relevant limit. Use measured source behaviour when choosing limits and timeout.

Under **Fuel pressure interlock** and **Bottle pressure interlock**, enable the required protection, select its measured source and set minimum/maximum and freshness. FD converts supported pressure units to psi for these settings.

Under **Measured mixture lean interlock**, select **Lambda** or **AFR**, choose a measured wideband source, set **Lean cut above**, freshness and lean trip delay. A stale/missing required mixture source is not allowed the measured-lean grace period. A commanded lambda PID is not measured feedback.

These interlocks stop or block operation; they do not continuously tune fuel duty to maintain an AFR target. If the removed controller's closed-loop AFR correction was required, retain that controller until a validated replacement exists.

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Ignition retard and other accessories

Under **External ignition retard request**, enable the request only for a documented compatible ECU/ignition input. Assign a spare output and set **Lead before shot** and **Tail after normal stop**. Configure the amount and application of retard in the receiving device.

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The FD channel is a binary request. A low-side receiver may use a qualified AUX connection; a positive receiver needs a compatible source/interface. It is not a coil output and cannot impose ignition timing on an undocumented stock ECU. The app's request ON indication does not prove degrees of retard occurred. Fault and disable clear the request immediately; test whether the receiving ignition strategy handles that correctly.

Bottle heaters, purge solenoids and bottle openers are separate loads with their own requirements. Do not import a removed controller's heater function as an unbounded generic output rule. Preserve the bottle-pressure control, physical protection and qualified power hardware specified for that accessory.

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Migration notes: NOS Mini and Launcher

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15974NOS / 25974NOS: the Mini family uses 40 A-class low-side solenoid channels; this is its driver rating, not the installed coil current. FD provides 10 A-design high-side OUTs with a shared 30 A feed. Compatible coils can transfer directly using R1; coils or retained topologies requiring more current or a different interface need R2. The legacy and current GPO polarity differ, so retained timing/status wiring needs a separate interface review. [15974 source](#), [25974 source](#).

Re-enter only the chosen FD-equivalent time/RPM/fixed progression and gates. Split wet nitrous/fuel commands as FD requires. Check the installed solenoid's supported frequency and minimum effective duty. Verify that FD's restart/cooldown behaviour suits the vehicle; do not label it an automatic Mini tune import.

Launcher: the native system can use a slave for four stages and has MAP-based progression/NOSbus accessories. [Launcher source](#).

If any of those are essential, this is a partial migration. FD supports at most three dedicated stages and does not decode an unspecified NOSbus stream. Keep the controller for unmapped functions, or change the system design and validate it as a new installation. Do not discard a native wideband/display module if it is still supplying required measurements.

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Migration notes: Maximizer 5/6 and ProMax

MAX5/6 offer closed-loop AFR correction and progression axes beyond current FD nitrous curves. ProMax likewise includes an AFR correction mode, with different nitrous/fuel wiring from its two-stage mode. [MAX5 source](#), [MAX6 source](#), [ProMax source](#).

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For each active native tune, write down whether AFR correction, speed/TPS/MAP progression, hold/resume, native gear logic or more than three stages are used. None may be silently replaced with “similar” FD settings. A fixed independent fuel curve plus a lean cut is not an AFR servo.

If using the native solenoid-percent output to request fuel from an ECU, establish how that enrichment will work after removal. FD does not currently reproduce an undocumented signal protocol or automatically configure the receiving ECU.

ProMax's nonfunctional CAN-labelled pins are not a path for retaining all its signals after removal. Its pressure/wideband inputs need an independent compatible signal path; the removed controller cannot keep powering them accidentally through another connection.

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Migration notes: simpler progressive and window switches

The Nitrous Outlet 00-61001 uses an external high-current progressive driver. Its reviewed manual does not establish every electrical requirement of that driver's input for reuse with FD. [00-61001 source](#).

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First assess whether the actual solenoids fit the direct FD OUT route. If a separate stage is required, reuse the native driver only after identifying its exact part number, logic level, active polarity, PWM range and off-state, or choose another qualified stage for that requirement. Translate the needed time/RPM control into FD, retaining any independent fuel-pressure switch.

For NOS 15982, NX 18959, NX 18961 and NX 15961, a new FD configuration must provide the checks that their combined installation previously supplied. A TPS switch and a separate RPM switch may have been two necessary gates, not redundant boxes. Match the exact source documents cited in the companion retain-controller guide, preserve the physical arm, and validate source latency before retiring either gate.

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Save, test and keep a recovery plan

Use **Save Nitrous Settings** to save all reviewed sections and apply the selected profile. Wait for success. Use **Reload saved configuration**, inspect the returned mappings/curves/sources, then record the configuration version and screenshots. A disconnected phone or an unsaved editor is not proof the ESP holds the intended settings.

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Reboot with loads isolated. Nitrous requires re-enabling after reboot or fault reset; a local automation may enable it, so review every rule. Confirm reset alone does not initiate another shot. Save the original controller tune and wiring record so the existing installation can be restored deliberately if a required function is not reproduced.

Complete these tests with instrumented dummy loads before any delivery test:

- One stage at a time, then all allowed combinations; no output ownership overlap.
- Arm OFF, RPM outside window, throttle low, each enabled temperature/speed gate and each pressure/mixture violation.
- Loss/staleness of every required source during a shot.
- Correct independent nitrous/fuel duty, frequency, timing and coherent stop.
- Maximum on-time, cooldown, reset/retrigger and profile changes.
- Wet-stage zero-fuel rejection and measured pressure loss; neither test substitutes for actual fuel-flow qualification.
- Retard request lead/tail, receiver response and fault/disable release.
- FD power loss, reset, update, phone disconnect and stored-rule behaviour.
- Worst-case electrical loading, driver temperature and suppression.

Document expected and observed waveforms, source ages, failure response and remaining gaps. The first controlled vehicle/dyno session then verifies delivery and tune with suitable instrumentation. Only after both electrical and vehicle acceptance should the finished manual describe that exact hardware combination as a validated replacement.



Questions?

Documentation · fusiondrive.io/docs

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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.