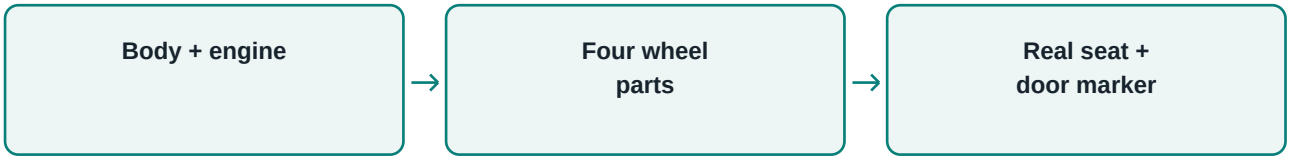
Runtime kda25 / Converter V2.0 kda12 | Updated 2026-10-29

01 Vehicle architecture

Kerbal Drift Agency V1.0 - documentation updated 2026-10-29 for runtime kda25 and Converter V2.0 kda12. This release packages the tested KDA vehicle framework with two included Automation cars, Lizard GT and Rabbit Rally x. The runtime uses KDA module names and KDAVehicles.dll.



Component	Purpose
Body	Rigid exterior, fixtures, chassis/engine/exhaust art; engine, aero, controller, protection and HUD modules.
Four corner parts	Independent native KSP wheel contact, motor torque, steering, springs, dampers, grip and selection colliders.
Race seat	One real crew slot, command, IVA portrait and driver view. An occupied seat supplies control.
Doorway marker	A safe outward exit and stock B boarding trigger linked to a seat channel.

Clean installation

Download ModuleManager and HarmonyKSP separately using the main README; both are required for KDA crew/mass patches. Shabby and Resurfaced add optional PBR visuals. Then copy GameData/KDAVehicles into KSP 1.12.5 GameData. No third-party KSP mod is bundled. Keep one copy of each mod. Lizard GT is the only included car.

Optional: copy Ships/SPH/Lizard GT - KDA.craft into your save's Ships/SPH folder. Assign a Kerbal to its physical seat before launch. FAR and AtmosphereAutopilot are optional and are not bundled; additional mods and terrain can change handling.

source/plugin contains the C# runtime; source/converter contains the converter. The top-level GameData is the sole installable asset tree. Builds stage into ignored source/.build/runtime and do not create duplicate release resources.

02 Included Lizard GT

This is the Lizard GT export, not Lizard GTR. Values come from the selected BeamNG configuration and embedded Automation metadata. They describe the exported engine and chassis, not a preset chosen from appearance.

Property	Imported value
Engine	Buddy mk1; naturally aspirated V8, approximately 5.251 L; idle 1,400 rpm, limit 8,400 rpm.
Peak engine output	Approximately 514.82 Nm; exported torque curve produces approximately 385.36 kW peak. Actual applied torque varies with rpm, throttle, shifting and aids.
Transmission	Manual; five forward ratios 2.59 / 1.65 / 1.13 / 0.84 / 0.66; final drive 5.74; reverse 2.72.
Drive	Rear wheel drive; front drive weights zero, rear nominal weights 0.5 per wheel before differential adjustment.
Tires	Front radius 0.305 m, width 0.215 m; rear radius 0.330 m, width 0.305 m. Imported base grip calibration about 1.578 front and 1.600 rear.
Reference mass	1,033 kg for generated body, four wheels and full fuel; attached KDA seats, doorway markers and their crew are weightless in the car.
Aerodynamics	At 200 km/h and 1.2041 kg/m3: front -89.51 N and rear -7.39 N. Negative downforce means lift, not ground adhesion.

The export includes independent front suspension anchors. Rear suspension art is retained rigidly because the adapter does not have independent rear articulation anchors for this layout. Its physics still uses the same four native wheel contacts.

Engine and induction type are locked for imports. The export is naturally aspirated; selecting a turbo conversion is deliberately unavailable. The imported manual gearbox is likewise fixed.

03 Suspension and tire calibration

KDASuspension owns the native wheel spring, damper and anti-roll settings. It replaces stock automatic spring updates so the selected coilover settings persist. Suspension is real native wheel contact physics; visual arm motion adds no extra forces.

Chassis preset	Front / rear spring (N/mm)	Ride height	Grip multiplier
Road	112.50 / 103.125	+14 mm	0.75
Sport	168.75 / 150.00	0 mm	1.15
Race	263.25 / 234.00	-12 mm	2.00

Presets are editor-only. They are distinct from the flight SC mode. Manual spring range is 93.75-280 N/mm; ride height is -20 to +30 mm; grip multiplier maximum is 3x. Multipliers act on the converted compound/dimension calibration, not on an identical base tire for every car.

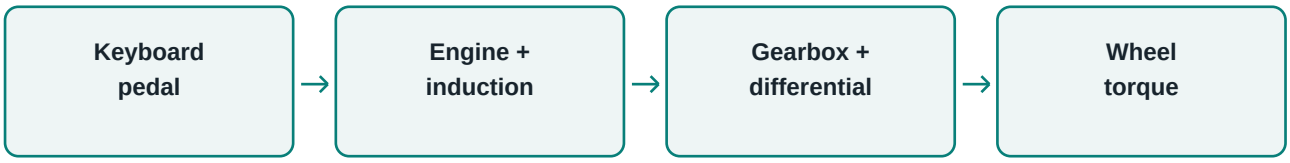
Damping and support

Critical damping is 2 * sqrt(spring stiffness * supported mass). Compression/rebound and low/fast shaft-speed ratios scale that reference. Preset stiffness raises spring and anti-roll rates together; damping ratios rise with the square root of the stiffness factor to keep effective damping proportional.

Anti-roll force compares paired axle compression and is capped by the available grounded normal load. Static spring sag participates in the anchor offset so changing ride height does not silently change the target spring rate. Toe is independently configurable.

Standard hardware uses 0.16 m travel. Optional Rally and Desert kits add adjustable wheel travel, sag, progressive bump stops, damping and visual articulation; ride height remains a separate setting. Compound grip and width are approximations of BeamNG data; this is not an identical contact-patch simulation.

04 Engine, gearbox and differential



EngineCore evaluates the torque curve at engine rpm. KDAEngine applies progressive keyboard throttle, selected induction, shifting and aid scales, then distributes torque to driven wheels through gearbox ratio and final drive. Engine torque in the PAW is a current operating value, not the engine's rated peak.

Turbo response

Imported turbo engines carry a pressure-versus-rpm curve and a peak boost calibration. The adapter separates the exported boosted curve from the base torque to avoid multiplying boost twice. Rotor and manifold response create spool delay and lift-off decay. Exported inertia, turbo sizing and pressure response help estimate timing; this is an approximation, not BeamNG Lua execution.

Transmission

Imported type and ratios remain authoritative. Manual shift actions are available to KSP action groups; automatic mode uses the current shift scheduler. Gear changes have a short finite shift interval and limiter/shift sound modulation. Wheel radius changes the speed represented by a ratio. A metadata top-speed number is not a speed cap.

Differential / AWD

Open, Mild LSD, Sport LSD and Drift LSD adjust axle torque sharing from wheel speed/slip. The total remains normalized. On an AWD export, front/rear weights encode the selected split; a 40% front / 60% rear car nominally allocates 20% to each front and 30% to each rear wheel before differential redistribution. A wheel's 100% motor limiter is its local allowance, not 100% of total engine power.

Imported active center redistribution and electronic axle vectoring are enabled only for the selected export hardware. AWD modes add their own assistance profile without changing RWD behavior. Holding the rear handbrake temporarily decouples the AWD rear drive path, then reconnects on release.

Current engine braking is implemented as a wheel drag request through the native brake-input path. This is a known engineering approximation. It has not yet been replaced with a physically complete negative driveline-torque model, and this release does not retune it.

05 Brakes, aero, sound and effects

System	Runtime behavior
Service brake	Normal B braking reaches both axles in Road/Sport/Race. In Drift it uses front brakes only.
Rear handbrake	Bind Rear handbrake (hold key) to a custom action group. The configured group key applies rear-only lock while physically held; release clears it. It is applied after ABS.
ABS	Modulates wheel pressure to reduce wheel lock. Independently enabled/disabled through HUD/PAW.
TCS	Reduces spinning-wheel torque and requests selective traction braking. Disabled and locked off in Drift.
SC yaw brakes	Support stability correction independently of TCS in non-Drift modes. Disabling SC removes these requests. No separate yaw-brake-only toggle is present.
Invincibility	KDAProtection supplies the car protection toggle. It does not make every unrelated vessel part universally indestructible.

Aerodynamics

KDAAero scales signed front/rear reference forces by air density and forward speed squared. It applies force at the imported axle/aero points, with N converted to KSP rigidbody kN. Reversing and inverted attitude reduce downforce. Lift remains lift. Drag acts along local axes and consumes power at speed; downforce cannot guarantee contact over a jump or crest.

Sound and visuals

Original generated coast/load banks at eight RPM anchors are shared across cars. Only neighboring bands play: at most twelve combustion layers per audible car and four audible hybrid cars. Clips are calibrated offline; no per-car PCM copying or startup normalization is performed. Close-range engine distance is 20 m. KSP ship/master volume still apply.

Original hybrid combustion banks and live intake/boost/shift layers replace exported engine samples. Engine-family selection follows the import. Player audio controls are Engine volume and Exhaust in Garage / Tune / Sound / FX; Engine volume is also available in flight. Advanced voice/tone/pulse/body controls are hidden; saved mix parameters are preserved. Tire smoke follows wheel slip and ground contact; integrated exhaust flame outlets use detected exhaust-tip positions, including multiple outlets when detected. Physics wheel transforms drive cosmetic suspension arms; unsupported layouts remain rigid.

06 Crew, materials and maintenance

Seat and doorway workflow

Place the race seat inside the car, rails down and facing forward. Put a matching-channel doorway marker beside a usable exterior door. Move it clear of the body. Assign crew in SPH/VAB. Portrait EVA exits at the linked marker; approaching the airlock supports stock B boarding. Obstruction checks remain active, and a missing/blocked marker prevents exit.

Imported bodies have zero crew capacity and no ModuleCommand after the supplied ModuleManager patch. Empty command seats cannot drive. Native IVA portraits, driver view and the external occupant share the lowered seat position. The seat mesh has 4,880 triangles; external occupant geometry is visual only.

Interior and paint

Converted materials preserve fixture layers and alpha cutouts. The Resurfaced/Shabby backend translates albedo, metalness, roughness and normals to KSP PBR materials. A legacy shader fallback remains available. Per-material classification avoids treating transmission castings as mirror paint. Material output is a translation, not exact Automation rendering.

The driver-view shell renders selected original surfaces from inside, preserves cutout masks, skips window groups and adds matte-black floor/firewall coverage. It has no colliders and is hidden outside IVA. It cannot invent a fully modeled cockpit from absent source geometry. FreeIVA/ThroughTheEyes compatibility is not certified.

Telemetry and diagnostics

HUD Record starts a folder under the installation's KDATelemetry directory; Stop flushes it and Mark adds a timestamped event. setup.cfg stores part definitions and current module fields; vehicle.csv and wheels.csv join by sample/time; settings.csv tracks changes; events.csv and summary.txt report stops, markers, errors and dropped packets.

For a reproducible test record car/build hash, surface, mode, chassis, grip, differential, aid state and speed. Compare turn-in, recovery and airborne periods separately. See SC.pdf for interpretation and Prompts.pdf for safe changes.

Implementation sources: source/plugin/KDAModules.cs, KDASuspension.cs, KDAWheelBrakes.cs, KDAAero.cs, KDAAudio.cs, KDASampleAudio.cs, KDACrew.cs and KDAInteriorShell.cs. License status and public-release blockers are documented in CREDITS.md.

07 Garage tuning, nitrous and effects

Use the KDA badge in the mod toolbar, then Go to KDA Garage. A placed KK garage opens its workshop; without a placed garage the editor overlay is available. Cars selects or prebuilds craft; Build retains native placement tools, WASDQE rotation and right-drag camera orbit; Tune edits suspension, brakes, sound/FX, travel, nitrous and tires. Preview, Apply, then Save Car. Choose a chassis preset before fine tuning.

Nitrous is an opt-in kit with 25-300 hp shot strength, three bottles and a held activation key (N by default, rebindable in Tune). Release to recharge; sustained grounded drifting replenishes charge three times faster. It respects gearbox, limiter and input interlocks. Blue flames and an original spray sound accompany activation.

Stock and Crackle exhaust tunes use varied short original pressure/noise sounds. Flame emphasizes a smooth orange plume during hard acceleration with brief lift/shift tails and very quiet pops. Existing flame size/duration controls remain active. Nitrous takes blue-plume priority; ordinary flame tunes do not alter power or fuel.

Prebuild Car uses complete supplied Lizard GT and Rabbit Rally x templates, with saved seat and outward doorway positions. Other imports get wheels and a doorway marker to check; add a seat. Existing saved cars are offered instead of duplicate prebuilds. Return to SPH/VAB keeps the car in the stock editor. With the world workshop, Drive Out launches at the garage; stop near its entrance and press F8 to return.

08 Optional rover ECU and world garage

The optional ECU is a separate Control-category rover part. Unstable uses conservative Road-like aids and anticipatory pitch-under-braking protection. Normal allows limited oversteer and reactive pitch help when wheels unload. Only two front wheels steer while enabled; toggling off restores native steering settings. It does not replace rover power, suspension or grip. See Rover ECU.md for setup.

The optional KK garage now appears automatically at the supplied location near KSC when Kerbal Konstructs and Custom Pre Launch Checks are installed. Move it with Ctrl+K in KK. Omit Garage/Garage-instances.cfg to disable the default position or avoid a duplicate of a manually placed garage. SPH/VAB garage mode works without KK.

09 Version, credits and licenses

Current runtime: V1.0 / 2026-10-28-kda25. Converter: V2.0 / 2026-10-26-kda12. Their build numbers are independent. Runtime behavior, audio controls and KK placement described here are supplied by the base GameData; the car-only converter does not upgrade that base.

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