



TRUE RIDE RIG

CINEMATIC VEHICLE ANIMATION SYSTEM

USER DOCUMENTATION

Cinematic Vehicle Animation System for Unreal Engine 5.7

Version 1.0 - PRO / STUDIO
Kinetic Pulse Studio

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1. Overview

WHAT TRUE RIDE RIG IS

True Ride Rig is a C++ cinematic vehicle animation plugin for Unreal Engine 5.7. It is designed for artists who need direct, repeatable control over vehicle shots in Sequencer.

The plugin replaces the need to rely on unpredictable gameplay vehicle simulation for cinematic work. Instead, it gives you an art-directable vehicle rig with believable procedural behavior: wheel rotation, steering, suspension, body roll, pitch, drift, burnout, lights, tire tracks, Niagara VFX data, cache and export.

Core principle: rig the car, add a path, keyframe the motion in Sequencer, then render. No Play mode is required for the main cinematic workflow.

Designed for

- Automotive commercials and product films
- Car configurator and presentation shots
- Cinematic trailers and game cutscenes
- Unreal Engine previs and motion design
- CGI / VFX pipelines that need exportable vehicle animation

What it is not

- Not a gameplay vehicle framework
- Not a multiplayer racing simulator
- Not an interactive driving system
- Not a car model pack
- Not a replacement for Chaos Vehicles in gameplay projects

True Ride Rig is built for art-directed animation: timing, camera marks, predictable rendering and visual control matter more than physically perfect or player-controlled behavior.

2. Requirements and Installation

BEFORE YOU START

Requirement	Notes
Unreal Engine	Target version: Unreal Engine 5.7.
Platform	Windows build for launch.
Project type	Any Unreal project that can load C++ plugins and use Sequencer.
Car asset	A prepared static mesh vehicle with at least the body and wheels separated.
Skill level	Basic Unreal Engine, Content Browser and Sequencer knowledge.

Installation

- Copy the TrueRideRig plugin folder into your project Plugins directory.
- Open or restart the Unreal Engine project.
- If prompted, allow Unreal to load the plugin.
- Open the Plugins window and confirm True Ride Rig is enabled.

- Open a level and add the TrueRideActor and TruePathSpline actors.

```
YourProject/  
Plugins/  
TrueRideRig/  
Binaries/Win64/  
Source/  
TrueRideRig.uplugin
```

The distributed plugin package includes compiled binaries, the plugin source folder, and the .uplugin descriptor. A normal user should not need to touch the source code to use the plugin.

3. Preparing a Vehicle Model

ASSET PREPARATION

True Ride Rig works best when your car is prepared as a set of separate static meshes. You do not need a skeletal rig for the basic workflow.

Minimum required meshes

- Body mesh - the main vehicle shell.
- Front wheel mesh - used for front left and front right wheels.
- Rear wheel mesh - used for rear left and rear right wheels.

Optional meshes

- Body inner mesh / interior
- Front and rear brake calipers
- Doors, windows, hood, trunk
- Seats, backrests and other interior parts
- Extra movable parts such as custom panels, accessories or mechanism details

Practical setup notes

- Keep body and wheels as separate meshes.
- Front and rear wheels can use different meshes, sizes and width settings.
- Left wheels are mirrored automatically by the rig.
- If a part should move in True Ride Rig, keep it as a separate mesh.
- Use clean pivot placement when possible. The plugin also provides pivot offsets and viewport gizmos for movable parts.

4. Quick Start Workflow

FROM EMPTY LEVEL TO FIRST SHOT

Step	Action	Result
1	Import your prepared car meshes.	Body, wheels and optional parts are available in the Content Browser.
2	Add TrueRideActor to the level.	This is the main vehicle rig actor.
3	Add TruePathSpline to the level.	This spline defines the driving path.
4	Assign body, wheels and optional meshes in the Details panel.	The vehicle appears as a controllable rig.

Step	Action	Result
5	Open Sequencer.	Animate the actor parameters directly on the timeline.
6	Keyframe DistanceTraveled or TargetSpeedKmh.	The car moves along the path.
7	Adjust steering, suspension, body physics, drift, lights and VFX.	The shot becomes art-directed and cinematic.
8	Render with Movie Render Queue.	Final output is generated from the approved Sequencer animation.

You do not need to create a vehicle simulation recording. The primary workflow is direct Sequencer control.

5. Main Actors and Scene Structure

ACTORS IN THE LEVEL

Actor	Purpose
TrueRideActor	The main vehicle rig. It holds the mesh slots, driving controls, suspension, body physics, VFX, cache, export and visibility settings. It appears in the level as TrueRideRig, TrueRideRig1, TrueRideRig2, etc.
TruePathSpline	The path actor used by the vehicle. The rig evaluates its position and direction along this spline. It appears as TruePathSpline, TruePathSpline1, etc.
TrueRideBodyMount	Optional helper actor that follows the full body transform. Use it for cameras, lights or accessories that should inherit terrain tilt, body roll, pitch and vibration.

Camera parenting

Cameras can be parented directly to TrueRideActor when they only need to follow vehicle position and yaw. This is useful for stable chase cameras or camera rigs that should follow the car without inheriting every body physics detail.

For cameras or accessories that must feel attached to the physical body - for example GoPro-style shots, roof-mounted lights or body-mounted props - use TrueRideBodyMount.

6. Details Panel Map

UI CATEGORIES

True Ride Rig is organized into numbered Details panel categories. This makes the tool predictable once you understand the main areas.

Category	Area	What it contains
0	Helper	Speed-O-Meter, read-only speed values and output dynamics.
1	Import Setup	Mesh slots, vehicle dimensions and ground tracing.
2	Driving	Path following, Distance Traveled, Speed Based mode, drift and burnout controls.
3	Suspension	Presets, spring-damper suspension, vibrations and steering geometry.
4	Body Physics	Weight transfer, body pitch / roll / heave, terrain smoothing and downforce.
5	Movable Parts	Doors, windows, hood, trunk, seats, backrests, steering wheel and extra parts.
6	VFX	Headlights, auto lights, audio data, tire tracks and Niagara wheel VFX.
7	Cache	Deterministic bake and playback of calculated vehicle behavior. Studio only.
8	Export	FBX, Alembic, USD and USDZ export. Studio only.
9	Visibility	Hide/show body, wheels, calipers, helper and editor updates.

Category	Area	What it contains
Debug	Debug information and teleport threshold settings.	
HELP	Documentation button inside the actor UI.	

7. Category 0 - Helper and Output Dynamics

DIAGNOSTICS WITHOUT BLUEPRINTS

Speed-O-Meter

The Speed-O-Meter displays the current vehicle speed as a 3D billboard above the vehicle. It is intended as a viewport helper and is not meant to appear in final renders.

Parameter	Purpose
bEnableSpeedOMeter	Turns the 3D speed display on or off.
SpeedOMeterHeight	Controls the height of the text above the vehicle.
SpeedOMeterScale	Controls the scale of the displayed text.

Read-only output

- CurrentSpeedKmh - current speed in kilometers per hour.
- CurrentSpeedMph - current speed in miles per hour.
- AccumulatedDistanceDisplay - accumulated distance in Speed Based mode.
- WorldVelocity - vehicle velocity vector used by other systems.
- Per-wheel output data - wheel location, forward vector, contact point, surface normal, RPM, normalized spin, radius, ground contact and surface type.

These outputs are useful for diagnostics, Blueprint logic and Niagara systems.

8. Category 1 - Import Setup and Ground Tracing

MESH ASSIGNMENT AND GROUND CONTACT

Mesh slots

Slot	Use
Body Mesh	Main vehicle body.
Body Inner Mesh	Optional interior or secondary body mesh.
Front Wheel Mesh	Front wheel mesh used for FL and FR.
Rear Wheel Mesh	Rear wheel mesh used for RL and RR.
Front / Rear Caliper Mesh	Optional brake caliper meshes.

Car setup parameters

- Car Scale - global vehicle rig scale.
- Body Height Offset - vertical body adjustment.

- Front / Rear Axle Offset - wheelbase positioning.
- Front / Rear Wheels Side Offset - half-width of each axle.
- Front / Rear Wheels Scale - independent scale per axle.
- Front / Rear Wheels Extra Width - independent width multiplier per axle.

Ground tracing

Ground tracing checks the surface under each wheel. It allows the rig to align wheel contact and body behavior to the environment while remaining controllable from Sequencer.

Parameter	Use
bTraceGround	Enables or disables wheel ground tracing.
TraceCollisionType	Choose Complex or Simple collision.
TraceShapeType	Choose Sphere or Line tracing.
TraceLength	Length of the downward trace.
TraceSphereRadius	Radius for sphere trace mode.
TraceDebugMode	Displays debug lines or hit points for troubleshooting.

If the car does not follow terrain correctly, first check mesh assignment, ground collision, trace length and whether ground tracing is enabled.

9. Category 2 - Driving

PATH NAVIGATION AND DRIVETRAIN POWER

Driving modes

Mode	How it works	Best for
Distance Traveled	You keyframe DistanceTraveled in centimeters along the spline.	Exact camera marks, locked timing, product films and commercials.
Speed Based	You keyframe TargetSpeedKmh and the rig accumulates distance over time.	Natural acceleration, braking and motion based on vehicle speed.

Key driving controls

- DistanceTraveled - exact position along the spline.
- TargetSpeedKmh - target speed for Speed Based mode.
- DistanceOffset - additional forward/backward offset along the spline.
- PathSideOffset - left/right offset from the spline.
- WholeCarRotation - artistic yaw offset for the whole vehicle.
- DriveType - FWD, RWD or AWD behavior for burnout and acceleration-related logic.
- PathFollowPoint - Center or RearAxle tracking. RearAxle gives more realistic low-speed turning behavior.

Choosing a mode

Need	Recommended mode
The car must stop exactly at frame 120.	Distance Traveled
The shot needs a natural acceleration curve.	Speed Based
Client wants a precise timing change.	Distance Traveled
You want to think in km/h instead of centimeters.	Speed Based

10. Steering, Drift and Burnout

ART-DIRECTED DRIVING BEHAVIOR

Steering

True Ride Rig can calculate steering from spline curvature, but it also gives you manual controls for art direction.

- `bAutoSteeringOnPath` - calculates steering from path curvature.
- `Steering` - manual steering override from -1 to 1.
- `SteeringSmoothingSpeed` - smooths steering transitions.
- `MaxSteeringAngle` - maximum front wheel steering angle.
- `AckermannPercentage` - controls inner/outer wheel angle behavior.
- `SteeringExaggeration` - artistic multiplier for the steering amount.
- `RearSteeringRatio` - enables rear-wheel steering when needed.
- `SteeringNoise` - adds subtle steering life instead of perfect robotic motion.
- `Steering wheel animation` - rotates the steering wheel with the vehicle steering behavior.

Drift

The Drift control is a keyframeable artistic slider. It lets you add a controlled yaw angle while the system handles counter-steer and body response.

- `Drift` - drift angle in degrees, from -90 to +90.
- `DriftCounterSteerMult` - controls how strongly the front wheels counter-steer.
- `DriftBodyLeanMult` - increases or reduces body roll during drift.

Burnout and brake lock

- `FrontBurnout` and `RearBurnout` multiply wheel rotation for stylized wheel spin.
- `bFrontBrakesLock` and `bRearBrakesLock` can lock wheel rotation for braking and handbrake-style moments.
- `DriveType` affects which wheels are expected to spin or react depending on FWD, RWD or AWD.

True Ride Rig is not trying to be a racing simulator. These controls are meant to create a shot that looks right and can be directed frame by frame.

11. Category 3 - Suspension and Steering Geometry

PER-WHEEL SPRING-DAMPER BEHAVIOR

Presets

Physics presets are DataAssets that store suspension and body behavior settings. You can apply presets or save the current setup for reuse.

Preset	Typical use
Sport	Stiffer, sharper response for performance cars.
Comfort	Softer, smoother response for luxury or road cars.
SUV	Higher center of gravity and more body movement.
Race	Very stiff and controlled with minimal body movement.

Suspension controls

- SuspensionStiffness - spring frequency in Hz.
- SuspensionDamping - main damping amount.
- SuspensionMaxTravel - maximum droop travel.
- CompressionDamping - damping multiplier during compression.
- ReboundDamping - damping multiplier during rebound.
- BumpStopStiffness and BumpStopRange - behavior near suspension travel limits.

Vibrations

Vibrations are useful when the road is visually flat but the shot should not feel perfectly dead. OverallVibration is the main keyframeable multiplier. You can tune wheel, height, roll and pitch vibration separately.

Steering geometry

Steering geometry settings give you more control over how wheels look in turns. Adjust these when you need a more stylized, realistic or vehicle-specific steering response.

12. Category 4 - Body Physics

WEIGHT TRANSFER, TERRAIN AND BODY MOTION

Vehicle weight and auto tuning

VehicleWeightKg defines the baseline mass used by the rig. Changing it automatically adjusts several related physics settings such as suspension stiffness and pitch / roll response. Manual tuning remains available after the auto baseline is set.

Common body controls

- bBodyPhysicsEnabled - enables or disables body physics.
- BodyPitchDampingRatio and BodyRollDampingRatio - damping for body motion.
- BodyTerrainSmoothing - how much the body lags behind wheel terrain changes.

- WeightTransferPitchStrength - braking / acceleration pitch behavior.
- WeightTransferRollStrength - cornering roll behavior.
- WeightTransferHeaveStrength - vertical body movement from acceleration forces.
- ManualBodyPitch, ManualBodyRoll and ManualBodyHeight - artistic overrides.

Terrain roll architecture

Terrain pitch and roll are applied to VehicleBase so the wheels follow the terrain correctly. BodyPivot receives the secondary body physics such as weight transfer, manual overrides, downforce and vibration. This keeps the vehicle aligned to uneven ground while allowing cinematic body motion on top.

Downforce

Downforce can be enabled for high-speed compression effects. It is controlled by start speed, max speed, max compression and front/rear bias. Use it subtly unless the shot needs a strong performance or race-car feeling.

13. Category 5 - Movable Parts

BUILT-IN KEYFRAMEABLE PARTS

The Movable Parts system lets you animate doors, windows, hood, trunk, seats, backrests, steering wheel and custom parts without building a separate skeletal rig. Each part is driven by a simple 0-1 value that can be keyframed in Sequencer.

Part group	Examples
Steering	Steering wheel auto-rotation and assigned steering wheel mesh.
Doors	Front left/right and rear left/right doors.
Windows	Parented to the corresponding door.
Trunk / Hood	Rear trunk and front hood.
Seats	Front seats and front seatrests.
Back seat	Rear bench and left/right backrests.
Extra 01-04	Additional custom movable parts.

Each part includes

- Enabled checkbox.
- Keyframeable Value from 0 to 1.
- Mesh slot.
- Pivot Offset.
- Mode: Hinges or Sliding.
- Direction, axis, maximum angle or slide distance settings.

Parent-child cascade

Some parts are connected logically. For example, disabling a door also disables the corresponding window. Disabling a seat also disables its seatrest. This helps avoid invalid partial setups.

Viewport gizmos

Movable part gizmos show pivot points and update during interactive editing. They help you place and test hinges directly inside the Unreal viewport.

14. Category 6 - VFX, Lights and Audio

CINEMATIC ILLUMINATION AND WHEEL DATA

Headlights

True Ride Rig includes two SpotLight headlights and two RectLight brake lights. The headlight profile slot accepts IES Light Profiles and Texture2D projection images.

Feature	Use
IES Light Profile	Photometric light distribution for realistic headlight beams.
Texture2D projection	Projection-style headlight texture for custom patterns.
Mirrored right headlight	Right headlight can mirror the left settings or be edited independently.
Bundled profiles	Modern LED, Xenon, Halogen, FogLight and Punctal style profiles.

Brake lights and auto lights

- Brake lights use RectLight components for directional rear lighting.
- Automatic brake lights can react to deceleration.
- Turn signals can be triggered using lookahead curvature detection.
- Hazard lights can be keyframed.

Tire tracks

Tire tracks are generated as decals on geometry and landscape. They can be controlled by width, length, scale, projection depth, rotation, spawn interval, lifetime, max decals and slip threshold.

Niagara wheel VFX

The rig can drive Niagara systems per wheel. This is intended for smoke, dust, dirt, snow and stylized wheel effects.

- Wheel location and forward direction
- RPM and normalized spin
- Vehicle velocity
- Surface type
- On-ground state
- Slip amount and wheel speed
- VFX intensity multiplier

MetaSounds-ready audio data

When enabled, the rig outputs values such as EngineRPM, EngineLoad, TireSlip, SpeedNormalized, BrakeAmount, IsDrifting and IsBurnout for procedural audio setups.

15. Category 7 - Cache (STUDIO)

RENDER CONSISTENCY

The STUDIO version includes deterministic cache. Cache records the calculated vehicle behavior into a Vehicle Cache Asset and plays it back frame by frame.

Why cache matters

- Locked client-approved motion can be replayed consistently.
- Movie Render Queue output can be stabilized across renders.
- Multiple camera angles can share the same approved vehicle behavior.
- Tire track events can be recorded and rebuilt during cache playback.
- Physics no longer needs to be recalculated during final playback.

Recommended cache workflow

- Animate and approve the shot in Sequencer.
- Bake the vehicle behavior to a cache asset.
- Enable cached playback.
- Scrub the timeline and confirm that the motion matches the approved shot.
- Render or export from the cached result.

Cache is a production safety tool. Use it when the shot is approved or when you need identical playback across repeated renders.

16. Category 8 - Export (STUDIO)

EXTERNAL PIPELINE OUTPUT

The STUDIO version can export approved animation and geometry to external DCC or VFX pipelines.

Format	Typical use
FBX	General DCC animation exchange, Maya / Blender-style pipelines.
Alembic / ABC	Geometry cache, VFX and simulation workflows.
USD	Universal scene exchange, Houdini / Omniverse-style pipelines.
USDZ	Packaged USD-style workflows and compatible preview pipelines.

Recommended export workflow

- Finalize the vehicle motion in Sequencer.
- Bake cache to lock the behavior.
- Confirm cached playback.
- Export the selected format.
- Use the exported files downstream for rendering, VFX or additional pipeline steps.

For production work, cache first and export from the locked motion. This avoids exporting a shot that later changes because of live recalculation or timeline differences.

17. Category 9 - Visibility and Viewport Optimization

KEEP THE VIEWPORT CLEAN

Visibility options help you inspect the rig, simplify the viewport and improve performance while working.

Control	Use
Body visibility	Hide the main body to inspect suspension, wheels or interior parts.
Wheels visibility	Hide wheels for debugging or special renders.
Caliper visibility	Hide brake calipers if not needed.
Editor updates	Disable editor updates to reduce processing when animating many vehicles.
Helper display	Keep diagnostics visible only when needed.

18. True Ride Body Mount

ATTACHING OBJECTS TO REAL BODY MOTION

TrueRideBodyMount is a separate helper actor. It follows the vehicle BodyPivot world transform and inherits position, yaw, terrain pitch/roll, body physics, vibration and manual body overrides.

Use it for

- GoPro-style camera mounts.
- Roof lights or mounted accessories.
- Props that should physically follow the car body.
- Cameras that should feel attached to suspension and body movement rather than only position/yaw.

Basic setup

- Add TrueRideBodyMount to the level.
- Assign TargetVehicle to the relevant TrueRideActor.
- Adjust MountOffset and MountRotationOffset.
- Parent your camera, light or accessory to the mount actor.

19. Sequencer Keyframe Reference

COMMON KEYFRAMEABLE PARAMETERS

Area	Parameters
Driving	DistanceTraveled, TargetSpeedKmh, DistanceOffset, PathSideOffset, WholeCarRotation, Drift, Steering, FrontBurnout, RearBurnout, brake locks.
Body Physics	WeightTransferPitchStrength, WeightTransferRollStrength, WeightTransferHeaveStrength, ManualBodyPitch, ManualBodyRoll, ManualBodyHeight.
Steering	SteeringExaggeration, RearSteeringRatio, SteeringNoise.
Vibrations	OverallVibration, VibrationTime.
Headlights	Headlight intensities and light colors where exposed.
Auto Lights	Hazard lights and related controls.

Area	Parameters
VFX	VFXIntensity for wheel effects.
Movable Parts	Door, window, trunk, hood, seat, backrest and Extra values from 0 to 1.

The full rig exposes roughly 47 keyframeable parameters across driving, physics, lights, VFX and movable parts. Not every shot needs all of them. Start with motion, then tune only the systems that matter for the shot.

20. Recommended Production Workflow

A PRACTICAL SHOT PIPELINE

Phase	What to do
Setup	Prepare the car, assign meshes, create the spline and verify ground tracing.
Blocking	Choose Distance Traveled or Speed Based mode and block the timing in Sequencer.
Vehicle behavior	Tune steering, suspension, body physics, drift, burnout and vibrations.
Interaction	Add movable parts, lights, tire tracks and Niagara VFX only where needed.
Approval	Scrub in Sequencer and render previews through Movie Render Queue.
Lock	In STUDIO, bake cache once the behavior is approved.
Final	Render final cameras or export FBX / ABC / USD / USDZ for downstream work.

Do not over-tune too early. Block the path and camera first. Then tune suspension, drift, VFX and small details once the shot timing is stable.

21. Troubleshooting

COMMON PROBLEMS AND FIXES

Problem	First things to check
The car does not follow the terrain.	Enable ground tracing, verify collision on the ground, increase TraceLength, use debug lines or hit display.
The car floats above or sinks into the ground.	Check Body Height Offset, wheel radius/scale, axle offsets and ground trace length.
Wheels are in the wrong place.	Adjust Front/Rear Axle Offset and Front/Rear Wheels Side Offset. Confirm mesh scale.
The body feels too stiff.	Lower SuspensionStiffness, increase BodyTerrainSmoothing, adjust damping and vehicle weight.
The body feels floaty.	Reduce BodyTerrainSmoothing, increase stiffness or damping, reduce extreme manual body offsets.
Drift looks too aggressive.	Lower Drift angle, DriftBodyLeanMult or DriftCounterSteerMult.
Tire tracks do not appear.	Enable tire tracks, assign a deferred decal material, check projection depth, spawn interval and ground contact.
VFX does not spawn.	Enable wheel VFX, assign Niagara system, lower VFXSlipThreshold or increase VFXIntensity.
Headlights are not visible.	Enable headlights, check intensity, profile, attenuation radius, direction and whether lights are registered.
MRQ render differs from preview.	For STUDIO, bake cache and render from cached playback after approval.

22. FAQ

FREQUENTLY ASKED QUESTIONS

Is True Ride Rig for gameplay vehicles?

No. It is a cinematic animation tool for Sequencer, not a gameplay or multiplayer driving framework.

Do I need to click Play?

No. The main workflow works directly in the editor and Sequencer. You can scrub the timeline and render through Movie Render Queue.

Can I use my own car model?

Yes. Prepare a static mesh car with separated body and wheels. Separate any part you want to animate.

Does it include car models?

No. True Ride Rig is a plugin and workflow tool, not a licensed car model pack.

What is the difference between PRO and STUDIO?

PRO contains the main rig, driving, suspension, body physics, VFX, lights and movable parts. STUDIO adds deterministic cache, export and priority support.

What export formats are supported in STUDIO?

FBX, Alembic, USD and USDZ.

Can I render with Movie Render Queue?

Yes. Movie Render Queue is the recommended final rendering path. STUDIO cache is recommended when motion needs to be locked.

Can I use custom Niagara systems?

Yes. The rig can push per-wheel data to Niagara systems for smoke, dust, dirt, snow or other effects.

Can I animate doors and seats?

Yes. Movable parts use simple 0-1 values and can be keyframed directly in Sequencer.

What Unreal Engine version is this built for?

The launch target is Unreal Engine 5.7.

23. Support and Links

WHERE TO GET HELP

Resource	Link / Contact
Product page	https://www.kineticpulse.studio/true-ride-rig/
Kinetic Pulse Studio	https://www.kineticpulse.studio/
Documentation	https://www.kineticpulse.studio/documentation/
Promo video	https://youtu.be/_2oSo0TR8io
Overview video	https://youtu.be/MBCJBDYBq6c

Resource	Link / Contact
Tutorial playlist	https://www.youtube.com/playlist?list=PLQErF9CyxO5fCC6moWBDz5kVFDqAGLpHs
Discord	https://discord.gg/hayzjWVFFx
Support email	hello@kineticpulse.studio
YouTube	https://www.youtube.com/@KarolMichalikVFX

When reporting an issue, include

- Unreal Engine version.
- PRO or STUDIO build.
- Short description of the issue.
- Steps to reproduce.
- Screenshot or screen recording if possible.
- Crash log if relevant.

True Ride Rig by Kinetic Pulse Studio.