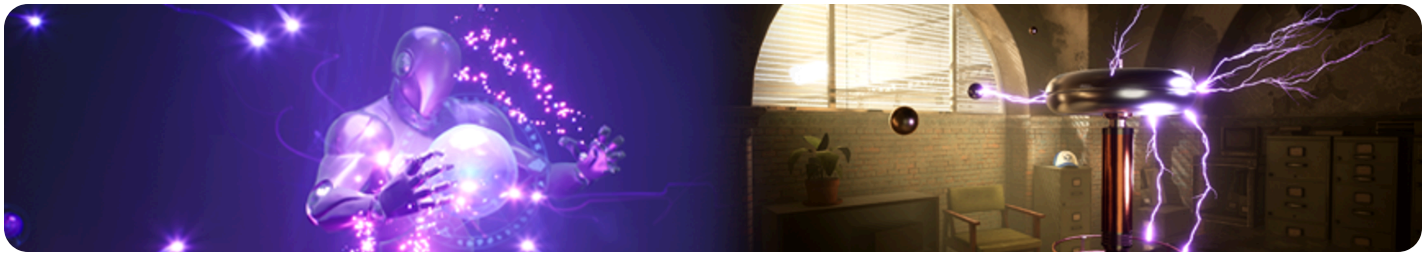
Particle Spawn Group

This page provides reference information for modules in the Particle Spawn group.



Particle Spawn modules occur once for each created particle. Modules in this section set up initial values for each particle. If **Use Interpolated Spawning** is set, some Particle Spawn modules will be updated in the Spawn stage instead of in the Particle Update stage. Modules are executed in order from the top to the bottom of the stack.

Each of the module types in the Particle Spawn group has its own section in this document, with tables that list and describe the default options available for that type of module. Keep in mind that you can create custom modules for any part of the Niagara Emitter. The ones listed here are just the ones that are automatically included with Unreal Engine 4.

Beam Modules

Module	Description
Beam Width	This module controls the width of the spawned beam and writes that width to the **Particles.RibbonWidth** parameter. To vary the width along the length of the beam, use a curve indexed into the **Particles.RibbonLinkOrder** as provided from the default spawn beam module.

Module	Description
Spawn Beam	This module places particles along a bezier spline, or simply along a line between two points. This is useful for sprite facing along a beam-style path, or for using with the ribbon renderer for a classic-style beam. Spawn Beam creates a static beam that does not recalculate the start and endpoints each frame.

Camera Modules

Module	Description
Camera Offset	This module offsets the particle along the vector between the particle and the camera.
Maintain in Camera Particle Scale	This retains the in-camera particle size by taking into account the camera's FOV, the particle's camera-relative depth, and the render target's size.

Chaos Modules

Module	Description
Apply Chaos Data	This sets the particle position, velocity, and color from a Chaos solver.

Color Modules

Module	Description
Color	This module directly sets the **Particles.Color** parameter, with scale factors for the Float3 Color and Scalar Alpha components.

Event Modules

Module	Description
Generate Location Event	This generates an event that contains the position of the particle. The event payload for each particle also contains the particle velocity, a particle ID which can be used to create a Ribbon ID per particle, the age of the particle generating the event, and a random number that can be used in various ways. This module is placed after the Solve Forces and Velocity module, so that the event can contain both position and velocity data.

Forces Modules

Module	Description
Acceleration Force	This adds to the **Physics.Force** parameter, which will translate into acceleration within the solver.
Apply Initial Forces	This module converts rotational and linear forces, such as Curl Noise Force, into rotational and linear velocity.
Curl Noise Force	This adds to the **Physics.Force** parameter using a curl noise field. Samples a medium resolution baked tiling curl noise field by default, but can optionally sample a perlin-derived curl function directly at increased cost.
Drag	This applies the Drag value directly to particle velocity and rotational velocity, irrespective of mass. It accumulates into **Physics.Drag** and **Physics.RotationalDrag**, which are solved in the **Solve Forces and Velocity** and **Solve Rotational Forces and Velocity** modules.

Module	Description
Gravity Force	This applies a gravitational force (in cm/s) to the **Physics.Force** parameter.
Limit Force	This scales the **Physics.Force** parameter down to the magnitude specified if it exceeds the **Force Limit**.
Line Attraction Force	This accumulates a pull toward the nearest position on a line segment. It then adds that value to **Transient.PhysicsForce**.
Linear Force	This adds a force vector (in cm/s) to the **Physics.Force** parameter in a specific coordinate space.
Mesh Rotation Force	This adds a rotational force as described by the newtons applied on the yaw, pitch and roll axes, and accumulates that value to the **Physics.RotationalForce** parameter.
Point Attraction Force	This accumulates a pull toward **AttractorPosition** into the **Physics.Force** parameter.
Point Force	This adds force from an arbitrary point in space with optional falloff. Uses the vector between the velocity origin and the **Particles.Position** parameter in order to determine the force vector. If positions have not been initialized (that is, the particle position and velocity origin are on top of each other), the module will inject random velocity. You should place this module after any location modules in the stack, to make sure that the particle positions have already been initialized.
Vector Noise Force	This introduces random noise into the **Physics.Force** parameter.
Vortex Force	This takes a velocity around a vortex axis (with an optional additional pull towards the vortex origin) and injects it into the **Physics.Force** parameter.

Module	Description
Wind Force	This applies a wind force to particles, with an optional **Air Resistance** parameter. If the particle is moving faster than the wind speed in the direction of the wind, no additional force is applied.

Initialization Modules

Module	Description
Initialize Particle	This module contains several common particle parameters, which you can enable or disable as needed. There are **Point Attributes** such as **Lifetime**, **Position**, **Mass** and **Color**; **Sprite Attributes** such as **Sprite Size** and **Sprite Rotation**; and **Mesh Attributes** such as **Mesh Scale**. This module should be at the top of the stack in the Particle Spawn group.
Initialize Ribbon	This module contains several common parameters for ribbons. It has the same **Point Attributes** as the Initialize Particles module, and additionally has **Ribbon Attributes** such as **Ribbon Width** and **Ribbon Twist**. This module should be at the top of the stack in the Particle Spawn group.

Kill Modules

Module	Description
Kill Particles	This switch kills all particles if set to True (the box is checked). It allows for particles to be dynamically killed, based on this boolean, at any point in the execution stack.
Kill Particles in Volume	Kill particles if they are inside of a series of analytical shapes. It can compare against a box, a plane, a slab (two planes facing inward), or a sphere. The result can also be inverted.

Module	Description
	If this module is used in Particle Update, you should have **Interpolated Spawn** turned on. Otherwise the particles will spawn for one frame and then die.

Location Modules

Module	Description
Box Location	This spawns particles in a rectangular box shape.
Cone Location	This spawns particles in a cone shape.
Cylinder Location	This spawns particles in a cylinder shape, with lathe-style controls to modify the profile of the cylinder.
Grid Location	This spawns particles in an even distribution on a grid.
Jitter Position	This jitters a spawned particle in a random direction, on a delay timer.
Rotate Around Point	This module will find a position on a forward vector-aligned circle around a user-defined center point. The radius and position along the circle can be modified over time.
Skeletal Mesh Location	This places particles on a bone, socket, triangle or vertex of a Skeletal Mesh.
Sphere Location	This spawns particles in a spherical shape, with options for hemisphere shaping and density.
Static Mesh Location	This spawns particles from the surface of a static mesh.

Module	Description
System Location	This spawns particles from the system's location.
Torus Location	This spawns particles in a torus shape.

Mass Modules

Module	Description
Calculate Mass and Rotational Inertia by Volume	This parameter calculates the mass and rotational inertia based on the particle's bounds and a density value. The density is measured in kilograms per cubic meter.
Calculate Size and Rotational Inertia by Mass	Calculates the particle's scale and rotational inertia based on user-driven mass and density values. The density is measured in kilograms per cubic meters.

Materials Modules

Module	Description
Dynamic Material Parameters	These write to the Dynamic Parameter Vertex Interpolator node in the Material Editor. To use Indices 1-3, change the **Parameter Index** on the node itself in the Material Editor to the corresponding number. This allows the use of up to four unique dynamic parameter nodes in a given material.

Math/Blend Modules

Module	Description
Cone Mask	This module defines a cone in 3D space and checks if the position input lies inside the cone. If the position lies inside the cone, it returns **1**; otherwise it returns **0**.
Lerp Particle Attributes	This module enables linear interpolation (lerp) of all default particle parameters. You can select the specific parameter to interpolate each default particle parameter against, and also the interpolation factor for each default particle parameter.
Recreate Camera Projection	This module recreates the camera-relative world position of a 2D scene capture's pixel. The projector transform fields allow you to reposition and rotate the projected positions.
Temporal Lerp Float	This module performs a slow linear interpolation (lerp) according to the user's specified **Current Value** over time. The convergence rate is specified through the **Rate of Change** input.
Temporal Lerp Vector	This module performs a slow linear interpolation (lerp) according to the user's specified **Current Value** over time. The convergence rate is specified through the **Rate of Change** input.

Mesh Modules

Module	Description
Initialize Mesh Reproduction Sprite	This module first chooses a random location on a skeletal mesh. Then, using the chosen triangle, it calculates an ideal particle size, UV scale, sprite alignment, and so on. To properly align a particle to a mesh surface, set the sprite's **Render Alignment** to **Custom Alignment**, and set the **Facing Mode** to **Custom Facing**. Then set the **Custom Facing Vector Mask** to **1, 1, 1**. If the mesh does not animate, you can check the box for **Overwrite Intrinsic Variables** to set all of the particle

Module	Description
	system's intrinsic parameters. If you want the Facing Mode to update during the effect, do not check the **Overwrite Intrinsic Variables** box. Instead, add the **Update Mesh Reproduction Sprite** module to the Particle Update group. Within your material, use **Niagara_MeshReproductionSpriteUVs** to sample the mesh's UVs. Both the **Initialize Mesh Reproduction Sprite** module and the **Update Mesh Reproduction Sprite** module assume that the skeletal mesh UVs are square, and not compressed on one axis.
Sample Skeletal Mesh Skeleton	This module samples the bone or socket positions of a skeletal mesh, and then writes those sampled values to particle parameters. These particle parameters can then be used later in the stack.
Sample Skeletal Mesh Surface	This module samples the surface of a skeletal mesh, and then writes those sampled values to particle parameters. Those particle parameters can then be used later in the stack.
Sample Static Mesh	This module samples a static mesh, and then writes those sampled values to particle parameters. Those particle parameters can then be used later in the stack.
Update Mesh Reproduction Sprite	This module is used along with the Initialize Mesh Reproduction Sprite module. To recreate the effect in the Niagara level of Content Examples, follow these steps: 1. Place the **Initialize Mesh Reproduction Sprite** module in the **Particle Spawn** group. 2. Place the **Update Mesh Reproduction Sprite** module into the **Particle Update** group. 3. In the Sprite Renderer, set **Alignment** to **Custom Alignment**; set **Facing Mode** to **Custom Facing**

Module	Description
	Vector; set **Custom Facing Vector Mask** to **1, 1, 1**. 4. In your Material, use **Niagara Mesh Reproduction Sprite UVs** to sample the mesh's UVs. 5. If **Module.OverwriteIntrinsicVariables** is set to **False**, make sure that this module's output variables drive the particle's attributes (such as position, alignment and so on).

Orientation Modules

Module	Description
Align Sprite to Mesh Orientation	This module aligns sprites to a mesh particle's orientation. This enables you to use the **Mesh Rotation** and **Rotational Velocity** modules to control a sprite's alignment in relation to the world. Make sure that the **Alignment** and **Facing Mode** settings in the Sprite Renderer are set to **Custom Alignment** and **Custom Facing**. Set your **Custom Facing Vector Mask** to **1, 1, 1**.
Initial Mesh Orientation	This module aligns a mesh to a vector, or rotates it in place using a rotational vector.
Orient Mesh to Vector	This module aligns a mesh to an input vector.

Physics Modules

Module	Description
Add Rotational Velocity	This module adds to the **Rotational Velocity** value in a user-defined space.

Module	Description
Find Kinetic and Potential Energy	This module returns the following: 1. A particle's kinetic energy, based on the particle's velocity. 2. A particle's potential energy, which is the sum of all force modules that write to **Physics.PotentialEnergy**. 3. The sum of 1 and 2.

SubUV Modules

Module	Description
SubUVAnimation	Some sprites are made in a grid, with each individual sprite representing an animation frame. This module accepts the total number of sprites that are to be animated, and plots those sprites along a curve so that they animate smoothly.

Texture Modules

Module	Description
Sample Pseudo Volume Texture	This module samples the color of a pseudo volume texture, based on UVW coordinates.
Sample Texture	This samples a texture at a specific UV location, and returns the color of that part of the texture. ⓘ This module is only supported in GPU simulations.
Sub UV Texture Sample	This module samples a single texture pixel in a row-by-column fashion. This module takes a phase 0-1 and finds the row by

Module	Description
	column index from it, then samples a pixel in a texture with that UV index.
World Aligned Texture Sample	This module samples a texture's color based on particle position, much like a world-aligned texture does in the Material Editor.

Utility Modules

Module	Description
Do Once	This module keeps track of whether its trigger condition has ever been true in a previous frame. If not, **Particles.Module.Execute** returns True. If the trigger condition has returned True in a previous frame, **Particles.Module.Execute** returns False.
Increment Over Time	This module increases a value each frame. The counter variable increments using the tick delta value and multiplying it by a user-specified rate.
Update MS Vertex Animation Tools Morph Targets	This module reads morph target texture data, and outputs positions and normal vectors for a given pixel-per-particle index. Pipe the module's world space normal output into the asset's material, with tangent space normals disabled within the material in order to reproduce the mesh's surface. For more information on generating morph target textures, see Vertex Animation Tool. This module can directly set a particle's position. If you use it this way, do not use another module that directly sets a particle's position.

Vector Field Modules

Modules	Description
Apply Vector Field	This module takes the vector samples by a vector field sampler, and applies it as a force or velocity.
Sample Vector Field	This module samples a vector field, applying a per-particle intensity factor and an optional falloff factor, that fades the influence of the vector field towards the edges of the bounding box. This can optionally apply a local translate, rotate or scale transformation.

Velocity Modules

Module	Description
Add Velocity	This module assigns a velocity to spawned particles. You can add various dynamic inputs to modify the values you enter in this module.
Add Velocity from Point	This module adds velocity from an arbitrary point in space, with optional falloff. It uses the vector between the velocity origin and the particle's position to determine the velocity vector. If particle positions have not been initialized (causing the particle position and velocity origin to be too close together), the module will inject random velocity. For the most accurate results, place this module below any location modules in the stack. This ensures that particle positions have been initialized.
Add Velocity in Cone	This module adds velocity to the **Particles.Velocity** parameter in a cone shape, with parameters for cone angle, and for velocity distribution along the cone axis.
Inherit Velocity	This module adds inherited velocity from another source. This defaults to the position of the system that owns the current emitter.

Module	Description
Scale Velocity	This module multiplies **Particles.Velocity** by a separate vector in a specific coordinate space.
Static Mesh Velocity	This module adds velocity based on the normals from a static mesh, as well as adding the inherited velocity of a static mesh.
Vortex Velocity	This module calculates an angular velocity around a vortex axis, and injects it into the **Particles.Velocity** parameter. This is added to the initial velocity the particle has when spawned.

New Scratch Pad Module

Selecting this item in the **Add** (Plus sign) menu opens the **Scratch Pad** panel (by default this docks next to the **System Overview**) and places a **Scratch Pad module** in the **Selection** panel. You can also open the Scratch Pad panel by using **Windows > Scratch Pad**. However, by placing a Scratch Pad module in the stack, any modules or dynamic inputs you create in the Scratch Pad are automatically connected to your script. If you open the Scratch Pad panel using the Windows menu, any items you create there will have to be added to your script manually.

Set New or Existing Value Directly

Selecting this item from the **Add** (Plus sign) menu places a **Set Parameter** module in the **Selection** panel. Click the **Plus sign** (**+**) icon to select **Add Parameter** or **Create New Parameter**.

Add Parameter

When you select **Add Parameter**, you select from the parameters listed. This adds that parameter to the **Set Parameter** module in the Particle Spawn group.

Some of these parameters can be set or modified in other modules. Some are only set using a Set Parameter module.

Parameter	Description
DataInstance.Alive	This parameter is used to determine whether or not this particle instance is still valid, or if it can be deleted.
Particles.Age	This defines the age of a particle.
Particles.CameraOffset	This sets the Camera Offset for a particle. The Camera Offset determines the distance between the particle and the camera.
Particles.Color	This directly sets the color of the particle.
Particles.DynamicMaterialParameter	This is a four-float vector used to send data to the renderer.
Particles.DynamicMaterialParameter 1	This is a four-float vector used to send data to the renderer.
Particles.DynamicMaterialParameter 2	This is a four-float vector used to send data to the renderer.
Particles.DynamicMaterialParameter 3	This is a four-float vector used to send data to the renderer.
Particles.ID	This is an engine-managed attribute that provides a persistent ID to each spawned particle.
Particles.Initial.Color	This sets the initial color of a particle.
Particles.Lifetime	This is the lifetime of a spawned particle in seconds.

Parameter	Description
Particles.LightRadius	This parameter determines the radius of emitted light when you are using a Light Renderer.
Particles.Mass	This parameter determines the mass of a spawned particle.
Particles.MaterialRandom	This parameter is used to drive the **Particle Random** node in the Material Editor. When this is not set, any Particle Randoms will get **0.0**.
Particles.MeshOrientation	This determines the axis-angle rotation that is applied to a spawned mesh particle.
Particles.NormalizedAge	This is the value of **Particles.Age** (in seconds) divided by the value of **Particles.Lifetime** (in seconds). This is useful for animation, because the value generated is between **0** and **1**.
Particles.Position	This sets the position of a spawned particle.
Particles.PreviousVelocity	This is used with the **Solve Forces And Velocity** module to calculate a particle's position in response to force and velocity. Previous velocity is needed to solve for acceleration.
Particles.RibbonFacing	This sets the facing vector of the ribbon at the ribbon particle's position, or the side vector that the ribbon's width is extended along, depending on which **Facing Mode** is selected.
Particles.RibbonID	This assigns a **Ribbon ID** to a ribbon particle. Particles with the same Ribbon ID are connected into a ribbon.
Particles.RibbonLinkOrder	This sets an explicit order for linking particles within a ribbon. Particles with the same Ribbon ID are connected

Parameter	Description
	into a ribbon in incrementing order according to this value.
Particles.RibbonTwist	This sets the amount of twist a ribbon particle has, in degrees.
Particles.RibbonWidth	This sets the width of a ribbon particle, in UE4 units.
Particles.Scale	This sets the XYZ scale of a non-sprite particle.
Particles.SpriteAlignment	This makes the texture point toward the sprite's selected alignment axis. When using this parameter, the Sprite Renderer's **Alignment** must be set to **Custom Alignment**.
Particles.SpriteFacing	This makes the surface of the sprite face towards a custom vector. To use this parameter, the Sprite Renderer's **Facing Mode** must be set to **Custom Facing Vector**, and values must be provided in the Sprite Renderer's **Custom Facing Vector Mask** setting.
Particles.SpriteRotation	This sets the screen-aligned roll of the particle, in degrees.
Particles.SpriteSize	This determines the size of the sprite particle's quad.
Particles.SubImageIndex	This sets a value which ranges from 0 to a value equal to the number of entries in the table of SubUV images.
Particles.UniqueID	This is an engine-managed attribute that serves as a unique ID for each spawned particle. The ID is incremented for each new particle spawned.
Particles.UVScale	This is used to multiply the generated UVs for Sprite Renderers.

Parameter	Description
Particles.Velocity	This determines the velocity of a particle in centimeters per second (cm/s).

Create New Parameter

When you select **Create New Parameter**, you select from the parameters listed. This adds that parameter to the **Set Parameter** module in the Particle Spawn group.

Parameter	Type	Description
Audio Oscilloscope	**Data Interface**	This adds a new Audio Oscilloscope data interface module to the emitter. The Audio Oscilloscope module can directly access the waveform data of the audio signal.
Audio Spectrum	**Data Interface**	This adds a new Audio Spectrum data interface module to the emitter. The Audio Spectrum module can drive a visualization based on how loud the audio is at specific frequencies.
Bool	**Primitive**	This adds a **Set Variable** module that has a true/false checkbox.
Camera Query	**Data Interface**	This adds a new Camera Query data interface module to the emitter. This data interface can be used to retrieve camera information (such as camera position, rotation, or FOV) for the specified controller index.
Collision Query	**Data Interface**	This adds a collision data interface to the emitter stack. This is usually used in conjunction with Collision modules.

Parameter	Type	Description
Curl Noise	**Data Interface**	This adds a curl noise data interface to the emitter stack. If you use this in conjunction with Curl Noise Force modules, this data interface injects different types of noise into your simulation.
Curve for Colors	**Data Interface**	This adds a four-channel color curve data interface for the simulation. This curve can be sampled by dynamic inputs or other modules to create a time-varying color.
Curve for Floats	**Data Interface**	This adds a single-channel curve data interface for the simulation. This curve can be sampled by dynamic inputs or other modules to create a time-varying float value.
Curve for Vector 2Ds	**Data Interface**	This adds a two-channel curve data interface for the simulation. This curve can be sampled by dynamic inputs or other modules to create a time-varying pair of floats
Curve for Vector 3s	**Data Interface**	This adds a three-channel curve data interface for the simulation. This curve can be sampled by dynamic inputs or other modules to create a time-varying set of floats.
Curve for Vector 4s	**Data Interface**	This adds a four-channel curve data interface for the simulation. This curve can be sampled by dynamic inputs or other modules to create a time-varying set of floats.

Parameter	Type	Description
ENiagaraBooleanLogicOps	**Enum**	This is an enumeration used by various modules and dynamic inputs that want to test using boolean logic: • **Greater Than** • **Greater Than Or Equal To** • **Equal To** • **Not Equal To**
ENiagaraCoordinateSpace	**Enum**	This is an enumeration used by various modules and dynamic inputs to distinguish between coordinate spaces: • **Simulation**: If the emitter is set to local, use local. Otherwise, use World. • **World**: In the world space of the game. • **Local**: In the coordinate space of the owning component.
ENiagaraExecutionState	**Enum**	This enumeration type is used by parameters that manage system or emitter execution states, such as Emitter.ExecutionState or System.ExecutionState.
ENiagaraExecutionStateSource	**Enum**	This indicates the source of an execution state setting. It is used to allow scalability to change the state, but only if the state has not been defined by something with higher precedence.
ENiagaraExpansionMode	**Enum**	This enumeration is used by location modules to determine where the origin point of expansion is: • **Inside**

Parameter	Type	Description
		• **Centered** • **Outside**
ENiagaraOrientationAxis	**Enum**	This is an enumeration used by several modules to determine which axis to do calculations with: • **X Axis** • **Y Axis** • **Z Axis**
ENiagaraRandomnessMode	**Enum**	This sets the type of random number generation used by this emitter. Valid choices are: • **Simulation Defaults** • **Deterministic** • **Non-Deterministic**
Float	**Primitive**	This creates a float value variable.
Grid 2D Collection	**Data Interface**	This is used with simulation stages. It enables the user to read or write to a 2D array of data, and then iterate over each pixel in the grid during a simulation stage.
Int32	**Primitive**	This creates an integer variable.
Linear Color	**Primitive**	This creates an RGBA color variable, represented as a color picker.
Matrix	**Primitive**	This creates a 4×4 matrix variable.
Mesh Tri Coordinate	**Struct**	This is a simple struct containing a triangle index along with a barycentric

Parameter	Type	Description
		coordinate on the face of that triangle.
Neighbor Grid3D	**Data Interface**	This is used with simulation stages. It enables the user to read or write to a 3D array of data, and then iterate over each pixel in the volume during a simulation stage.
Niagara ID	**Struct**	This is a two-part struct used to track particles. It allows fast access to this particle's data. It is always unique among currently living particles, but will be reused after the particle dies. **AcquireTag** is a unique tag for when this ID was acquired. It allows us to differentiate between particles when one dies and another particle reuses the dead particle's index.
Occlusion Query	**Data Interface**	This adds a new Occlusion Query data interface module to the emitter. The data interface is used to read depth buffer occlusion information. This can only be used with GPU emitters.
Particle Attribute Reader	**Data Interface**	This adds a new Particle Attribute Reader data interface to the emitter. The data interface can be used to query particle payload values from other emitters, and can sometimes be easier to use than Events.

Parameter	Type	Description
Quat	**Primitive**	This creates a quaternion variable, used to represent rotations.
Simple Counter	**Data Interface**	This adds a new Simple Counter data interface module to the emitter. This data interface enables you to increment a thread-safe counter. This can only be used with CPU emitters.
Skeletal Mesh	**Data Interface**	This is a data interface with functions to interact with a skeletal mesh's bones/sockets and skinned geometry.
Spawn Info	**Struct**	This is a structure used in spawning to specify the **Count** of particles to create, **InterpStartDt** or offset from the current frame begin time to start spawning, **IntervalDt** defining the time gap between particles being spawned, and **SpawnGroup** allowing spawned particles to belong to different categories.
Spline	**Data Interface**	This is a data interface that interacts with a Spline Asset.
Static Mesh	**Data Interface**	This is a data interface with functions to interact with a static mesh's surface.
Texture Sample	**Data Interface**	This is a data interface with functions to interact with a texture on the GPU.

Parameter	Type	Description
Vector	**Primitive**	This creates a three-channel set of floats.
Vector 2D	**Primitive**	This creates a two-channel set of floats.
Vector 4	**Primitive**	This creates a four-channel set of floats.
Vector Field	**Data Interface**	This is a data interface with functions to query a vector field.
Volume Texture Sample	**Data Interface**	This adds a new Volume Texture data interface module to the emitter. You can use this to sample a volume texture.