# orxBODY structure

Allows the creation and handling of physical bodies. They are used as a container with associated properties. Bodies are used by objects. They thus can be referenced by objects as structures.

## Summary

### Body

```
[BodyTemplate]
PartList           = BodyPartTemplate1#BodyPartTemplate2#...
AngularDamping     = <float>
CustomGravity      = <vector>
Dynamic            = <bool>
FixedRotation      = <bool>
HighSpeed          = <bool>
Inertia            = <float>
LinearDamping      = <float>
Mass               = <float>
```

### BodyPart

#### Sphere

```
[BodyPartSphereTemplate]
Type        = sphere
Center      = <vector> | full
Radius      = <float> | full
CheckMask   = <16b flags>
SelfFlags   = <16b flags>
Density     = <float>
Friction    = <float>
Restitution = <float>
Solid       = <bool>
```

#### Box

```
[BodyPartBoxTemplate]
Type        = box
TopLeft     = <vector> | full
BottomRight = <vector> | full
CheckMask   = <16b flags>
SelfFlags   = <16b flags>
Density     = <float>
```

```
Friction    = <float>
Restitution = <float>
Solid       = <bool>
```

#### Mesh (polygon)

```
[BodyPartMeshTemplate]
Type        = mesh
VertexList  = <vector>#<vector>#...
CheckMask   = <16b flags>
SelfFlags   = <16b flags>
Density     = <float>
Friction    = <float>
Restitution = <float>
Solid       = <bool>
```

## Details

### Body

Here's a list of the available properties for an `orxBODY` structure:

- `PartList`: List of all the parts that will compose a body. There's no limit on the number of parts that can be defined for a single body. This property *needs* to be defined if you want it to collide with other bodies.
- `AngularDamping`: Damping of angular velocity for this body. By default its value is 0.0, which means no damping.
- `CustomGravity`: Defines a gravity vector to use for this body instead of the world's one. By default it doesn't exist, which means world's gravity will be used for this body.
- `Dynamic`: Defines if this body should be dynamic or static. If your object is expected to move, this property should be set to `true`. Static bodies can't collide with other static bodies. By default, its value is `false` (ie. static).
- `FixedRotation`: Defines if your dynamic object is allowed to rotate as a result of collision forces. By default its value is `false` which means it can rotate freely.
- `HighSpeed`: For high velocity objects (like bullets), this property should be set to `true` to avoid collision errors. However, every object flagged as `HighSpeed` will cost more when processed by the physics engine. By default its value is `false`.
- `Inertia`: Defines an inertia value for this body. By default its value is 0.0.
- `LinearDamping`: Damping of speed (linear velocity) for this body. By default its value is 0.0, which means no damping.
- `Mass`: Defines a mass, in kg, for this body. If parts are defined, the mass will be overridden by an automatically calculated value based of parts' sizes and positions.

### BodyPart

#### Common

Here's a list of the available properties for all types of body parts:

- `Type`: Defines the type of the body part. Available types are `sphere`, `box` and `mesh` (ie. convex polygon). This property *needs* to be defined.
- `CheckMask/SelfFlags`: Both properties are flags expressed on 16bits. The `SelfFlags` defines this part identity whereas the `CheckMask` defines which parts are allowed to collide with it. For a collision to happen between two parts the expressions (Part1.CheckMask & Part2.SelfFlags) and (Part2.CheckMask & Part1.SelfFlags) have both to evaluate to `true`. NB: Two parts of the same body won't collide whichever `CheckMask/SelfFlags` they have. [1)]
- `Density`: Defines the density of this part, an influences the body's mass. Its default value is 1.0.
- `Friction/Restitution`: Define the friction and restitution of this part, usually between 0.0 and 1.0. [2)] By default both their values are 0.0. Restitution is how much “Bounce” an object has.
- `Solid`: Defines if this part is solid or not. Only solid parts will trigger a reaction on their body when colliding with others. By default its value is `false` which means the collision info will be signaled through events, but the physics simulation of this body won't be automatically affected by it.

#### Sphere

Here's a list of the available properties only available to sphere parts:

- `Center`: Defines the center of the sphere (in 2D it's a circle, of course) in the parent's space (ie. in object's space). By default its value is `full` which means the center will match the object's one (ie. the center of its current graphic).
- `Radius`: Defines the radius of the sphere (or 2D circle). By default its value is `full` which means the sphere's radius will match the biggest dimension of the parent object. You can find an example in the spawner tutorial [3)].

#### Box

Here's a list of the available properties only available to box parts:

- `TopLeft/BottomRight`: Define the extrema of the box (in 2D it's a rectangle, of course) in the parent's space (ie. in object's space). By default their values are `full` which means `TopLeft` and `BottomRight` will match the full rectangle defined by the parent object's current graphic. You can find an example in the physics tutorial.

#### Mesh (polygon)

Here's a list of the available properties only available to mesh [4)] parts:

- `VertexList`: Provides a list of vertex coordinates in parent object's space. The resulting polygon *needs* to be convex. Up to 8 vertices can be defined and they ***have to be entered clockwise***. You can find an example in the spawner tutorial [5)].

## Latest config settings for the Development Version

We endeavor to keep the config properties on this page up to date as often as possible. For up to the minute config information for the latest version of Orx, check the most recent published at:

CreationTemplate.ini and

SettingsTemplate.ini

Additionally these files can be found under your orx source tree in the `orx/code/bin` folder.

[1]
Check the documentation of Box2D for more information on filtering
[2]
Check the documentation of Box2D for more information on friction/restitution
[3], [5]
by looking directly at the config files as they're not covered in the wiki
[4]
convex polygon

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https://orx-project.org/wiki/ - **Orx Learning**

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Last update: **2025/09/30 17:26 (14 months ago)**