AD FALCON API Manual

Boundary Conditions

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Contents

1 Boundary Conditions

The `% BoundaryConditions` section applies prescribed (Dirichlet) boundary conditions to nodes by specifying one or more DOF/value pairs per node.

For general rules about comments and numeric formats, see Input File Structure.

1.1 Important placement rule

Place `% BoundaryConditions` **after** `% Elements` (and after `% Infinite Elements`, if used). Node DOF availability (especially `PW`/`PA` on principal nodes) is determined from element connectivity, and the node DOF tables are initialized when elements are read.

This section is **required** even if you do not restrain anything. You may provide an empty block:

```
% BoundaryConditions
%%%
```

1.2 Syntax

1.2.1 Section header

FALCON treats section names as case-insensitive and whitespace-insensitive, so these headers are equivalent:

```
% BoundaryConditions
% Boundary Conditions
% boundary_conditions
% Boundary-Conditions
```

1.2.2 Section format

```
% BoundaryConditions
<NodeID> <DOF1> <Value1> [<DOF2> <Value2> ...]
<NodeID> <DOF1> <Value1> [<DOF2> <Value2> ...]
...
%%%
```

1.2.3 Rules and behavior

- **NodeID** must reference an existing node from `% Nodes`.
- **DOF names are case-sensitive** (use the exact forms in the table below).
- Each DOF must be followed by a numeric value (pairs `DOF Value`).

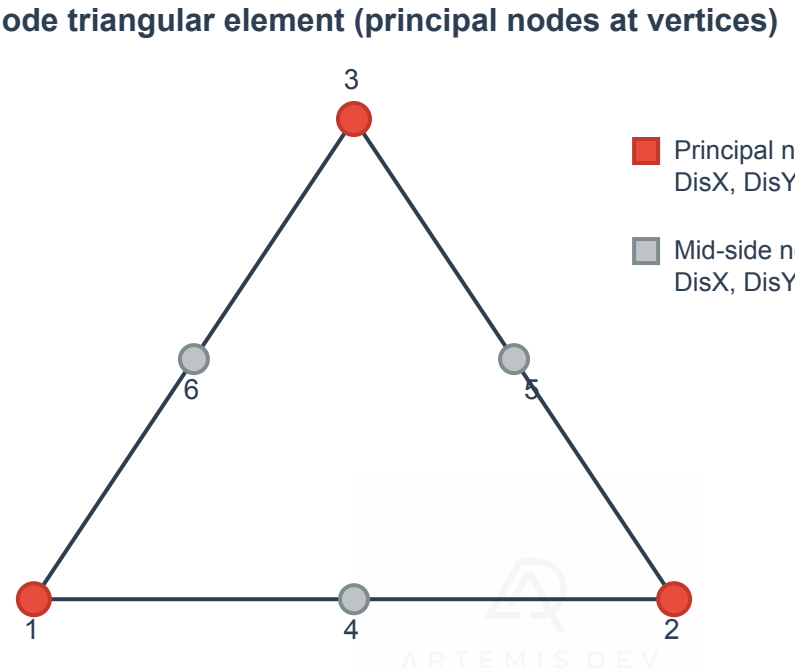

Figure 1: Principal nodes on a 6-node triangle

- A line may contain multiple DOF/value pairs for the same node.
- If the same node/DOF is specified multiple times (across one or more lines), the last value is used.
- Unknown DOFs, or DOFs that are not valid for the current analysis type / node type, are skipped with warnings.

1.3 Supported DOFs

DOF	Meaning	Availability
`DisX`	displacement in X	always
`DisY`	displacement in Y	always
`DisZ`	displacement in Z	`ThreeD*` analyses only
`PW`	pore-water pressure	coupled / fully coupled analyses, principal nodes only
`PA`	pore-air pressure	fully coupled analyses, principal nodes only

Principal nodes are determined by element connectivity; see Elements.

1.4 Tagging numeric values (optional)

You can tag any numeric value by inserting a `$name` token immediately before it. Tags do not change the analysis values; they are metadata used for parametric studies and surrogate training.

Example:

```
% BoundaryConditions
1 DisX $ux0 0.0 DisY 0.0
%%%
```

1.5 Examples

1.5.1 2D uncoupled analysis

```
% BoundaryConditions
1 DisX 0.0 DisY 0.0
2 DisX 0.1
3 DisY -0.2
%%%
```

1.5.2 2D coupled analysis

```
% BoundaryConditions
1 DisX 0.0 DisY 0.0 PW 0.05
2 DisX 0.1 PW 0.03
3 DisY -0.2
%%%
```

1.5.3 2D fully coupled analysis

```
% BoundaryConditions
1 DisX 0.0 DisY 0.0 PW 0.05 PA 0.02
2 DisX 0.1 PW 0.03 PA 0.01
3 DisY -0.2 PW 0.04 PA 0.015
%%%
```

1.6 See also

- Prescribed / time-dependent nodal values: Prescribed Values

- Tractions / pressures: Stress Boundary
- Seepage faces (active-set PW boundary): Brooks-Corey (and related flow boundary pages)
- Rigid motion constraints: Rigid Motion Constraints