Implicit Setup Tool

What is the Implicit Setup Tool?

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- The Implicit Setup Tool can be used to help setup the ***CONTROL** cards required for various implicit analysis types.

- This tool can be accessed via the **Tools → Implicit** button.

- This tool should ideally be used when no ***CONTROL_IMPLICIT_...** keywords already exist in the model, however the tool has settings to control how it behaves when they do.

NOTE: this tool will not setup any loads/boundary constraints/etc. that may be needed for the analysis – these must be setup outside of this tool.

Implicit vs. Explicit

Implicit vs. Explicit

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Applications	
Implicit	**Explicit**
• Low rate dynamic analyses • Linear and non-linear Static analysis • Modal and vibration analysis • Strength and buckling • Springback • Gravity loading & Pre-loading	• High rate dynamic analyses • Car crash • Impact / Penetration problems • Explosives

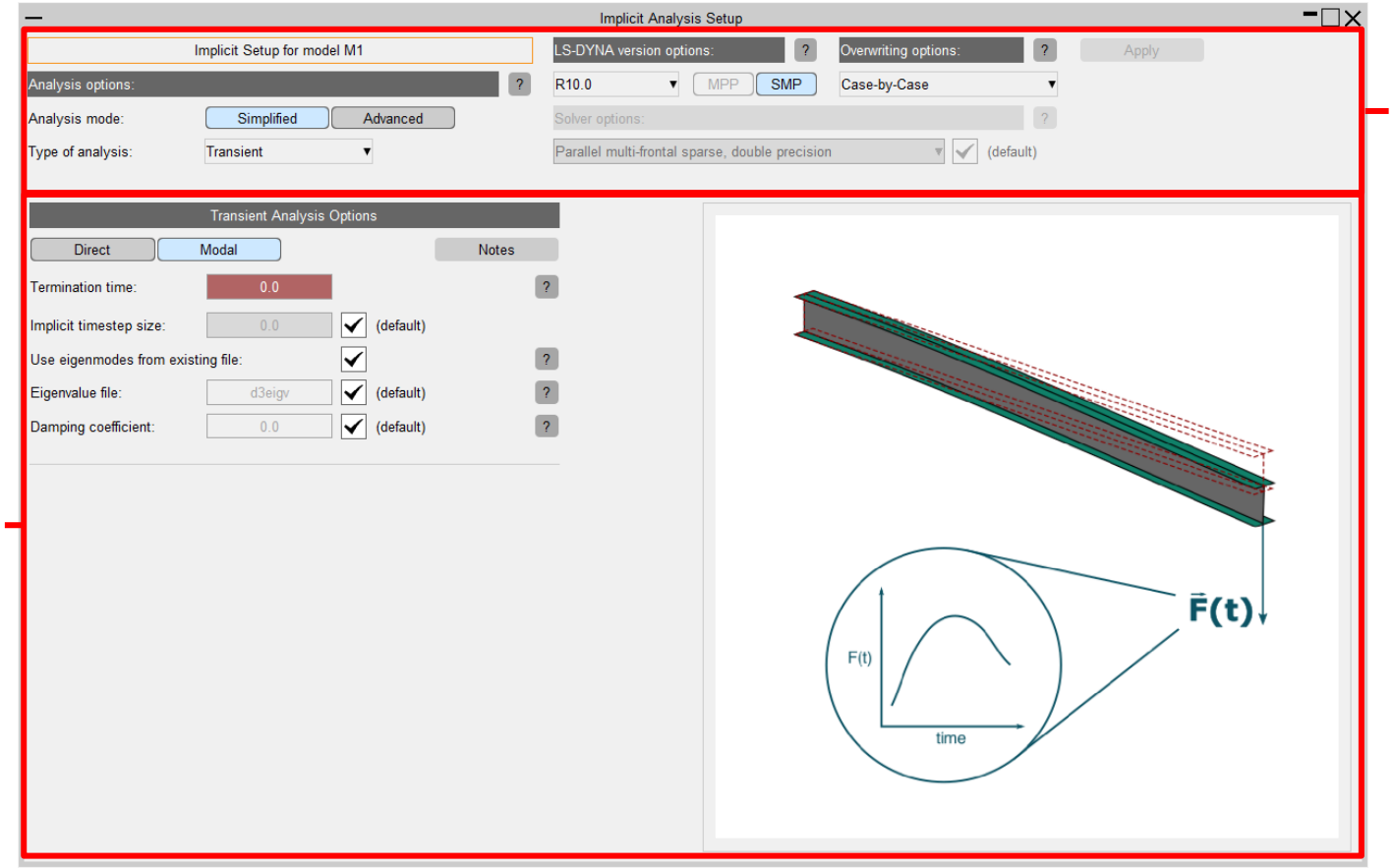
Advantages / Disadvantages	
Implicit	**Explicit**
• Unconditionally stable (no timestep limit) • Can be used for static analysis • Relatively inexpensive for long duration analyses • Often requires a large amount of memory • Can have problems with strongly non-linear models	• Computationally fast • Robust even for strongly non-linear models • Low core / RAM intensive • Conditionally stable (timestep limit) • Expensive to conduct long duration analyses

General window overview

Implicit Setup Tool – Top section options

The Implicit Setup Tool can be split into two sections:

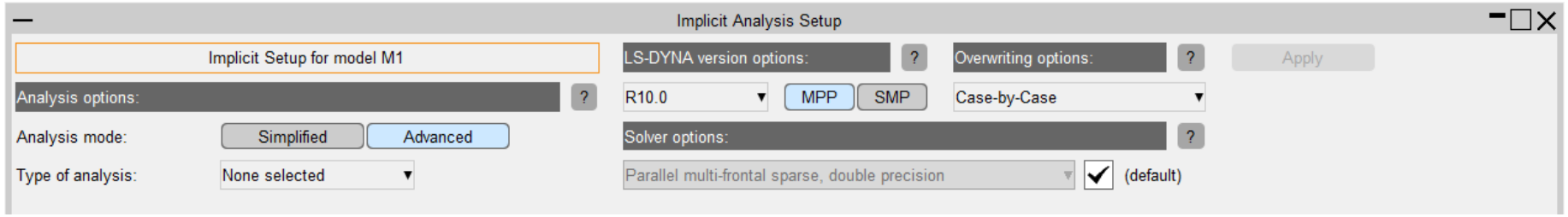
- **Top Section** – settings that apply to all analysis types.
- **Analysis options** – settings that apply specifically to the chosen analysis type.



Top section settings

Implicit Setup Tool – Top section options

The settings at the top of the window apply to all analyses:



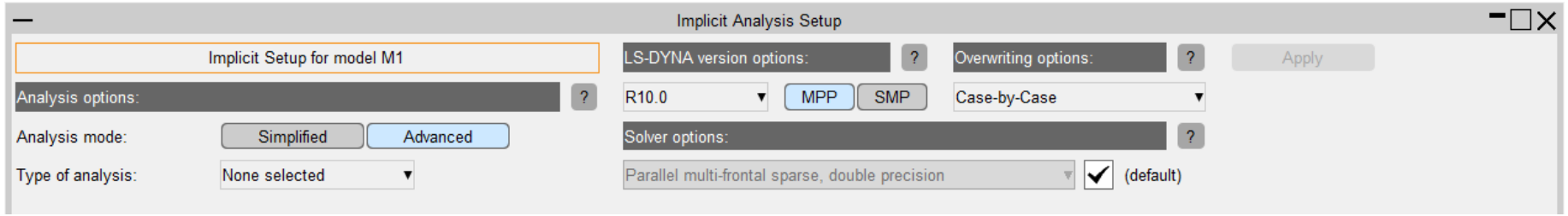
- **Simplified/Advanced** – Switch between **Simplified** mode: default/best guess settings are used to reduce the amount of input required; and **Advanced** mode: more options are available for a more customised/complex analysis.

- **Type of analysis** – Select from: Static, Transient (Direct or Modal), Buckling, Eigenvalue, or Frequency Domain (FRF).

- **LS-DYNA version options** – Set the output LS-DYNA version (this must be honoured when saving the model as it can affect what options are available), and choose between MPP and SMP (this must match the option used when submitting the analysis job).

Implicit Setup Tool – Top section options

The settings at the top of the window apply to all analyses:



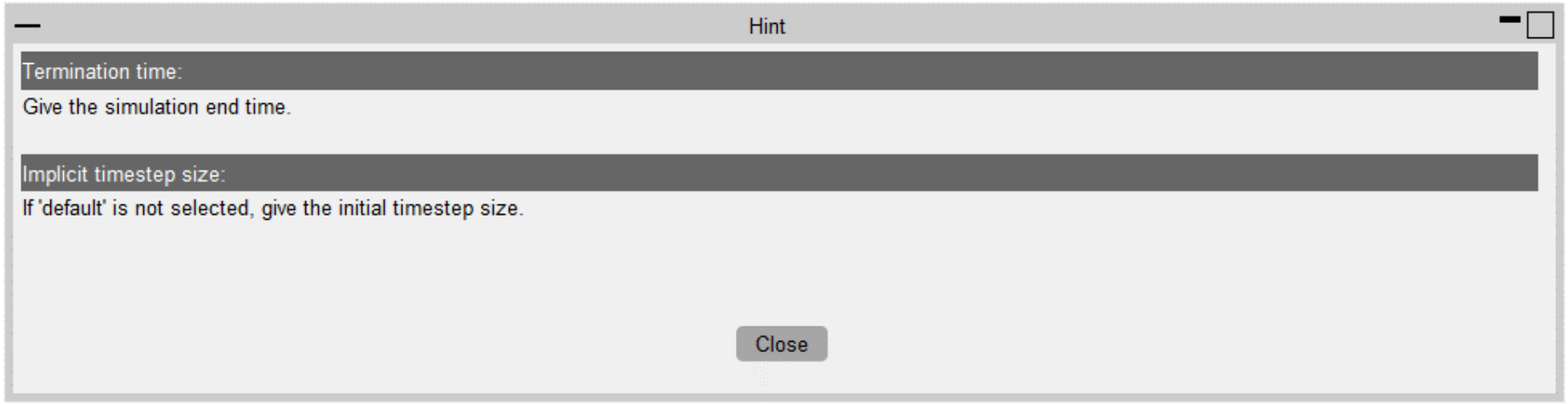
- **Solver options** – Select which linear solver method will be used to solve the inverse of the stiffness matrix (see *CONTROL_IMPLICIT_SOLVER *LSOLVR* for details). *NOTE: This option can only be changed when using Advanced mode.*

- **Overwriting options** – Select how the tool will handle writing to keywords that already exist in the model:
  - **Overwrite** will overwrite all keywords that clash with the options from the tool.
  - **Ignore** will not overwrite any keywords that clash.
  - **Case-by-Case** will present the keywords that clash and offer the choice whether to ignore/overwrite them.

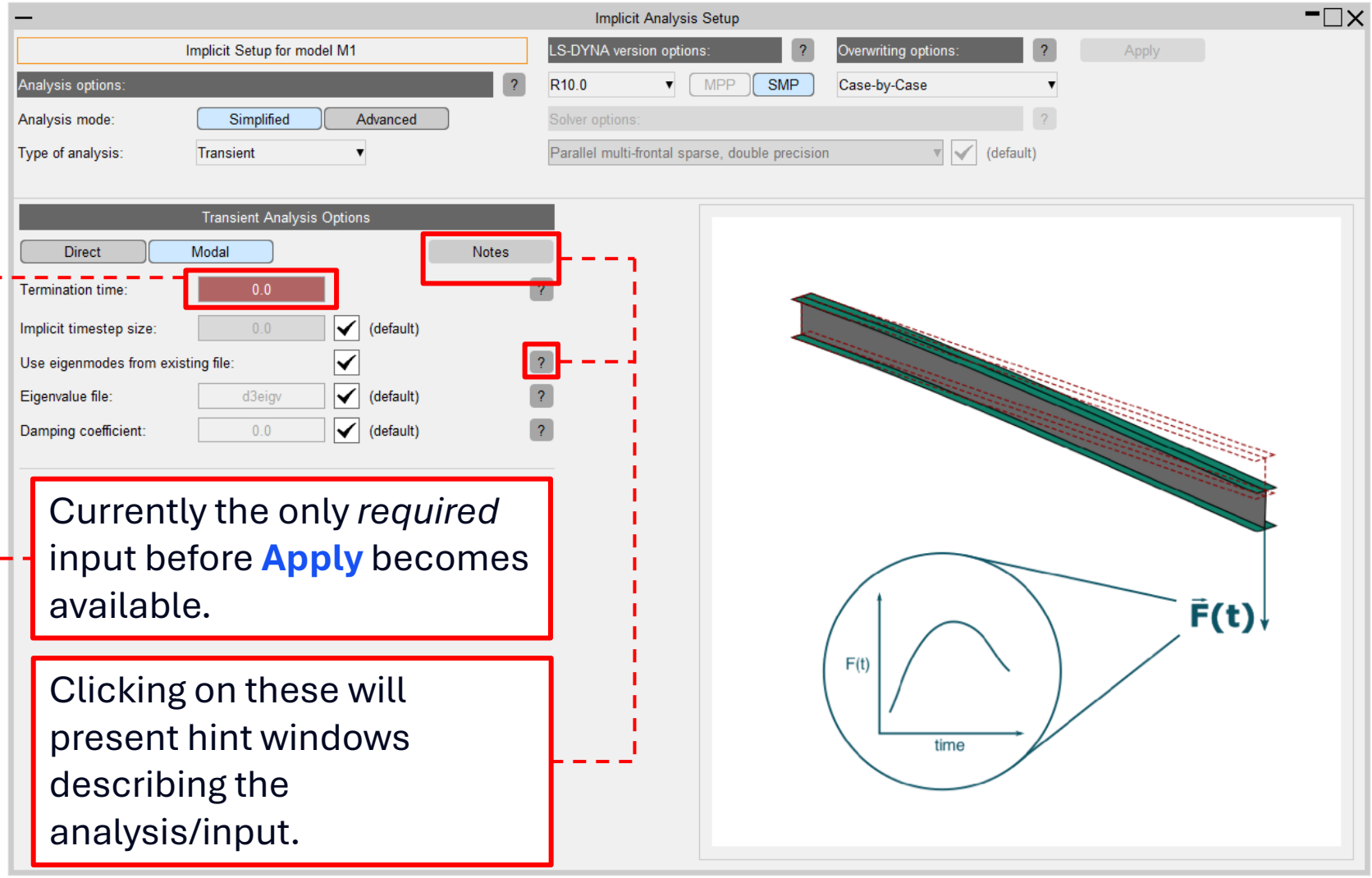
Guide to input

Implicit Setup Tool – Top section options

- The **Apply** button will only become available when all required input has been provided. This can be checked by looking for textboxes with a red background – these have invalid/missing input. When using the **Advanced** mode, sections may need expanding to reveal which input is still required.
- Clicking the **?** buttons will present a hint window describing the expected input for the prompts in the same vicinity as the ? button.
- The **Advanced** mode will offer more options than the **Simplified** mode for each analysis type. However, some options will be initially selected such that similar input is required for the SAME analysis in the simplified mode.



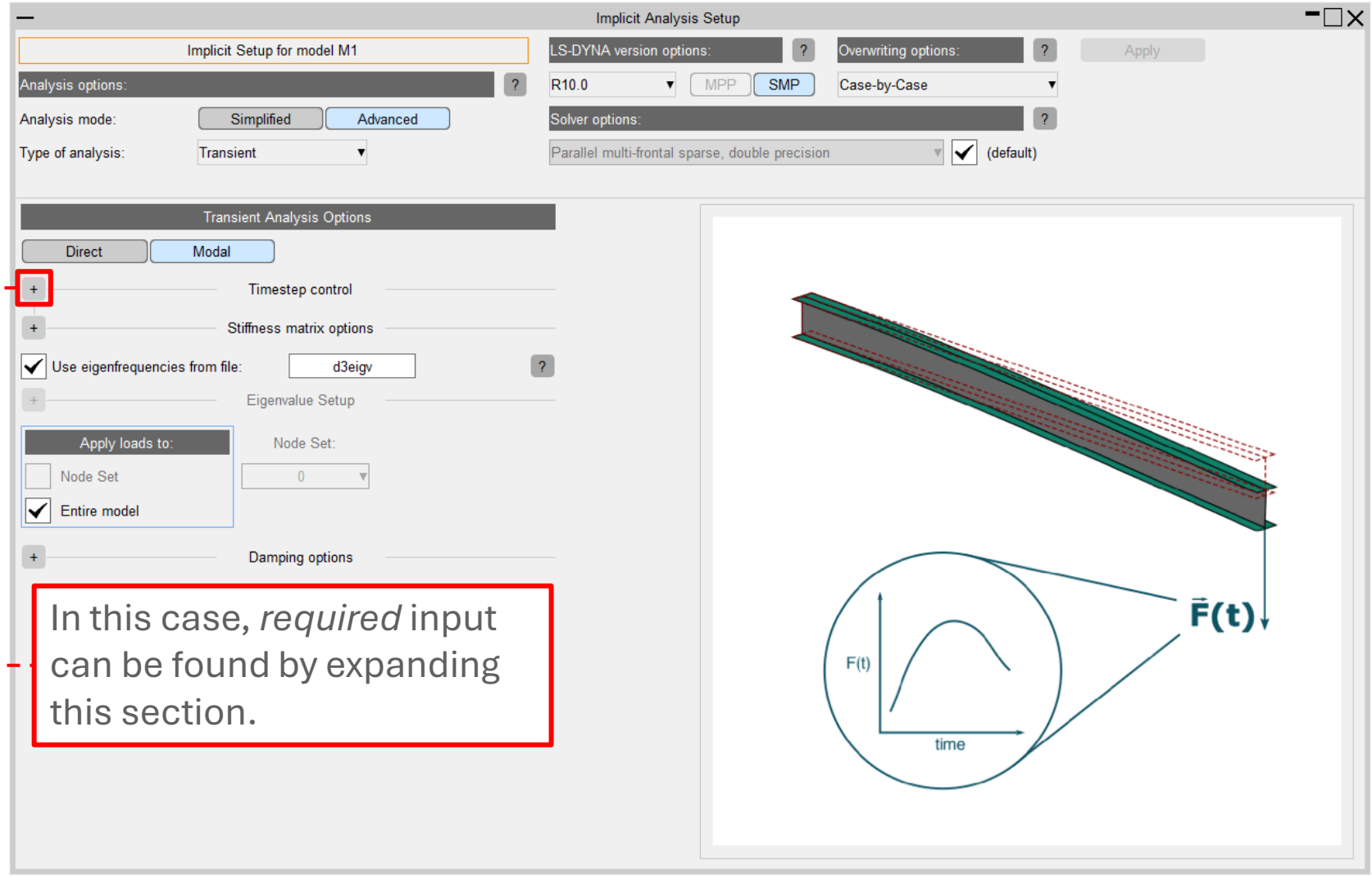
Implicit Setup Tool – Simplified Mode



Currently the only *required* input before **Apply** becomes available.

Clicking on these will present hint windows describing the analysis/input.

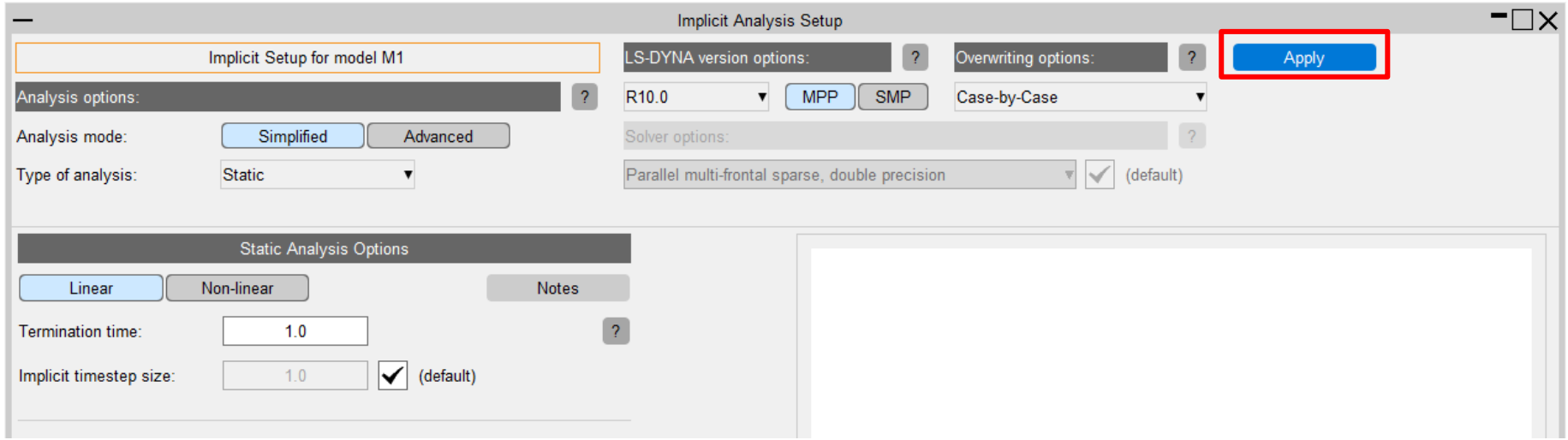
Implicit Setup Tool – Advanced Mode



Writing out options

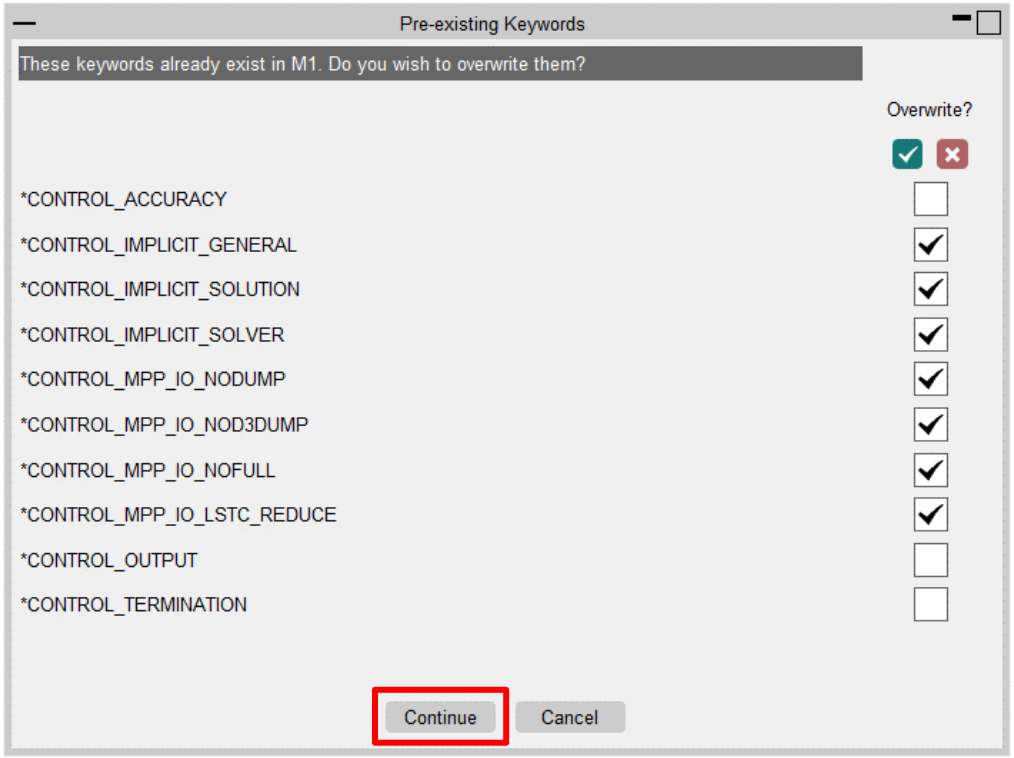
Implicit Setup Tool – Output

Once all required options have been set (these will be highlighted in red when current input is invalid/required) the **Apply** button will become available. Clicking this button will present a window reviewing the affected keywords.



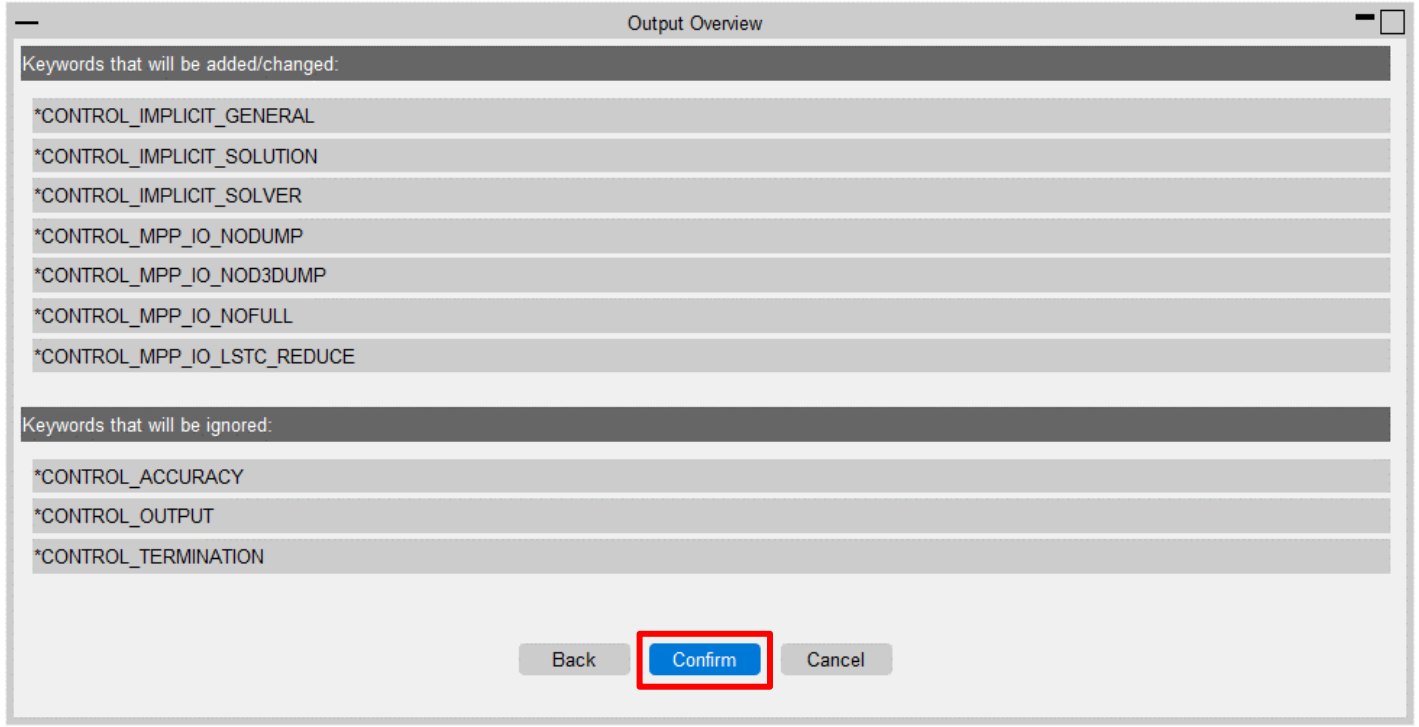
Implicit Setup Tool – Output

If the **Overwriting** option was set to **Case-by-Case**, any clashing keywords can be completely overwritten (corresponding box ticked) or ignored after clicking **Apply**. Clicking **Continue** will proceed to the final summary window.



Implicit Setup Tool – Output

Finally, the **Output Overview** window will summarise which keywords will be written to the model, and which will be ignored (these keywords already exist in the model). Clicking **Confirm** will apply the settings and write the keywords to the model.



Example: Frequency Domain FRF

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This Example will cover setting up the ***CONTROL** cards for a Frequency Domain Frequency Response Function (**FRF**) analysis. The analysis will be set to:

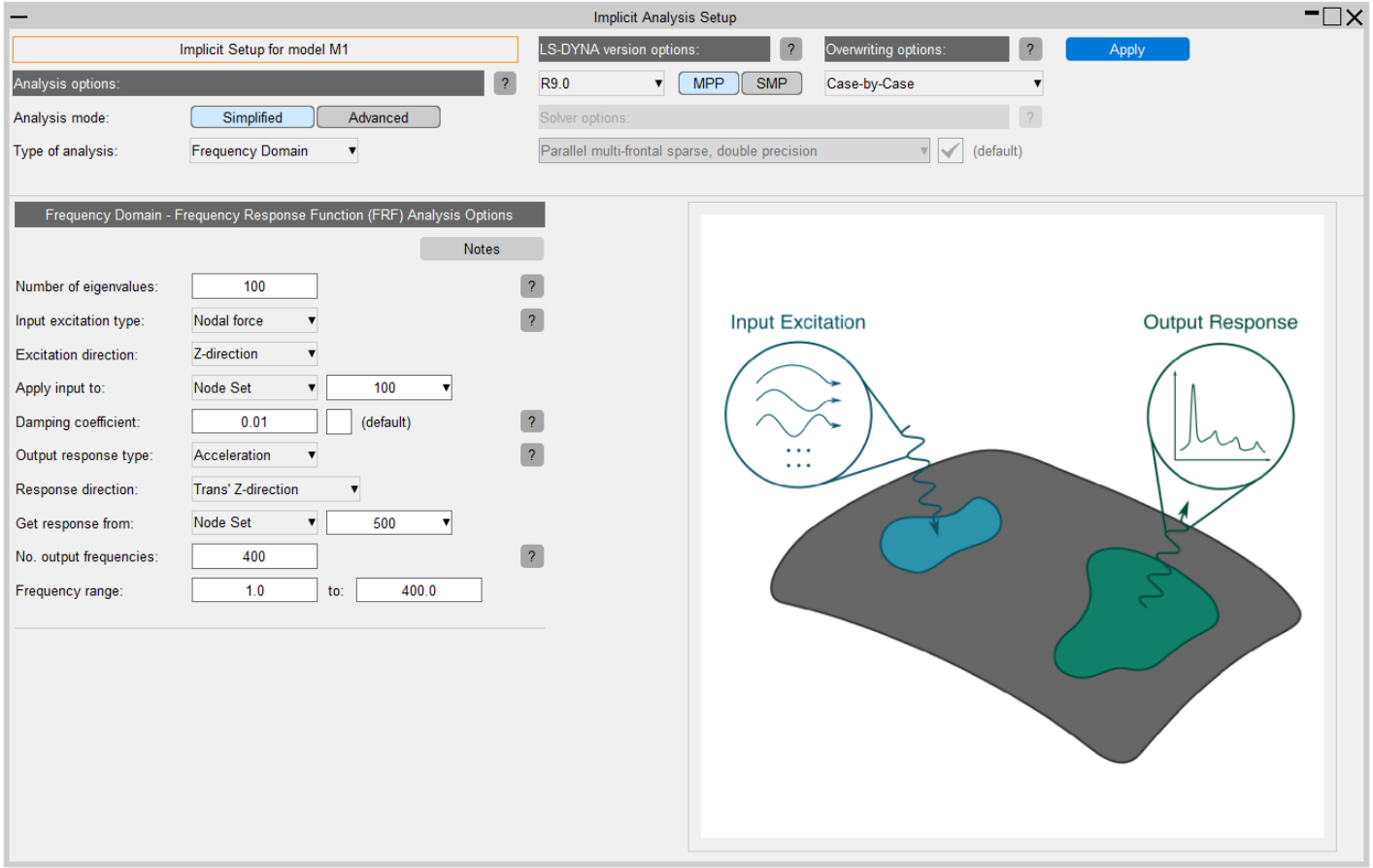
- Apply an excitation **Force** to **Node Set 100** in the -Z direction.
- The analysis will adopt modes of frequencies up to **2000.0Hz**.
- A **Constant Damping** coefficient of **0.01** will be applied across all modes.
- The frequency response will be taken from **Node Set 500**, in the form of **Acceleration**, in the translational Z direction.
- The response for **400 frequencies** in the range of **1.0 – 400.0Hz** will be output.

NOTE: This exact setup can only be achieved in the Advanced mode, as the Simplified mode will use all modes found in the initial eigenvalue analysis, not just those < 2000.0Hz, and will apply the input excitation in the +Z direction.

FRF Example: Simplified mode

Example: Frequency Domain FRF - Simplified

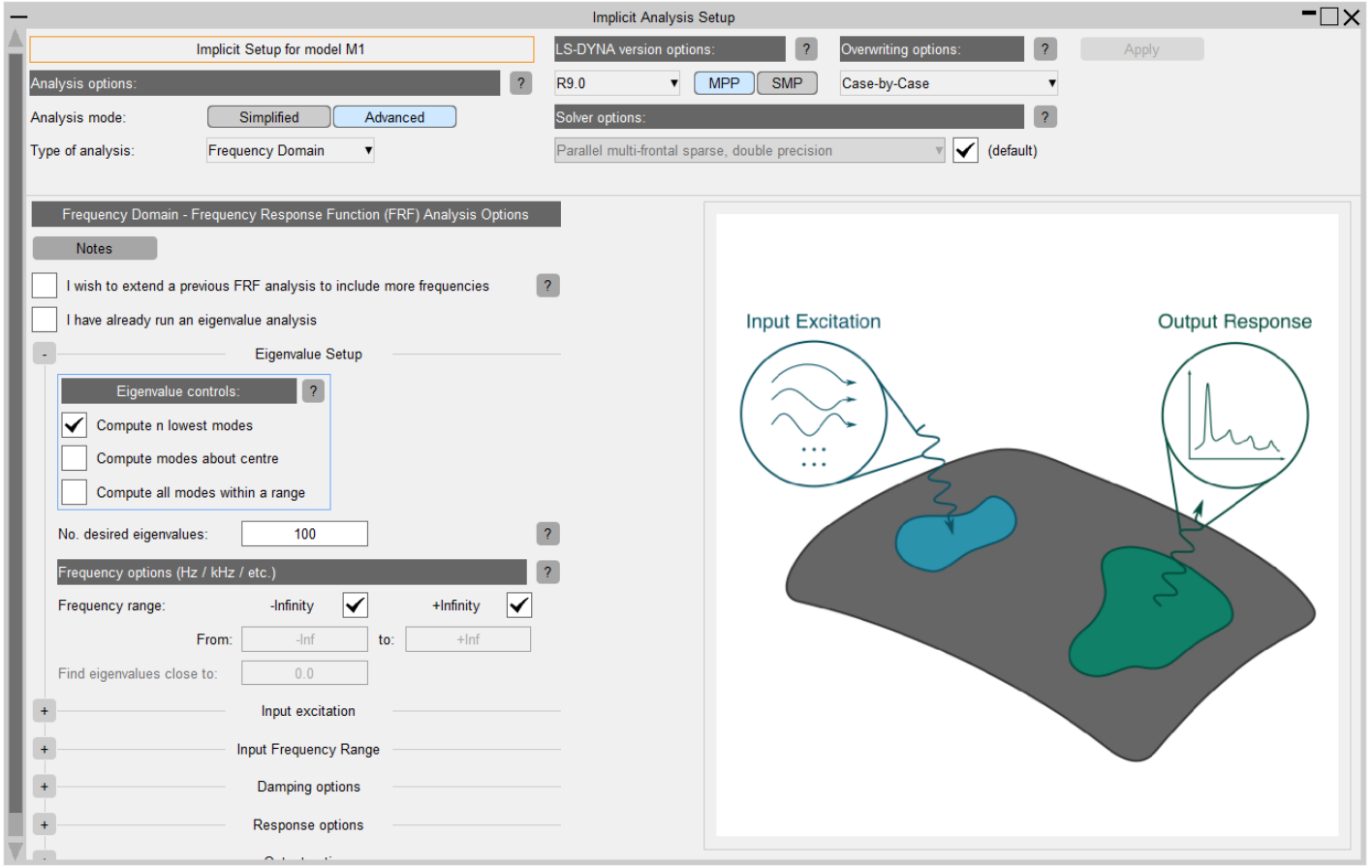
100 modes have been requested for the initial eigenvalue analysis to ensure frequencies of up to 2000.0Hz are covered. Now click **Apply**.



FRF Example: Advanced mode

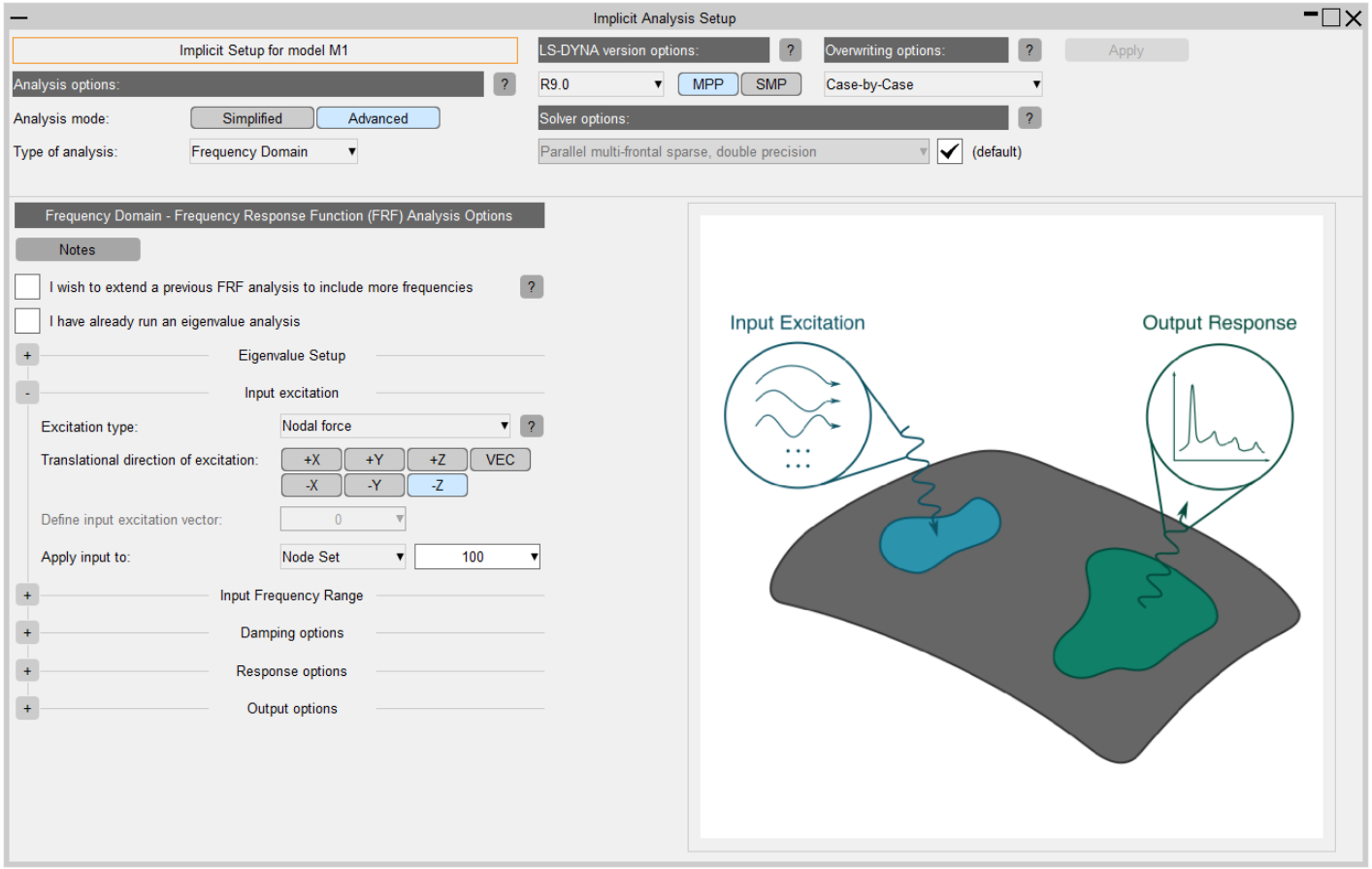
Example: Frequency Domain FRF - Advanced

Begin by setting the number of eigenvalues to find in the initial eigenvalue analysis. 100 has been chosen here to ensure enough frequencies are covered (up to 2000.0Hz).



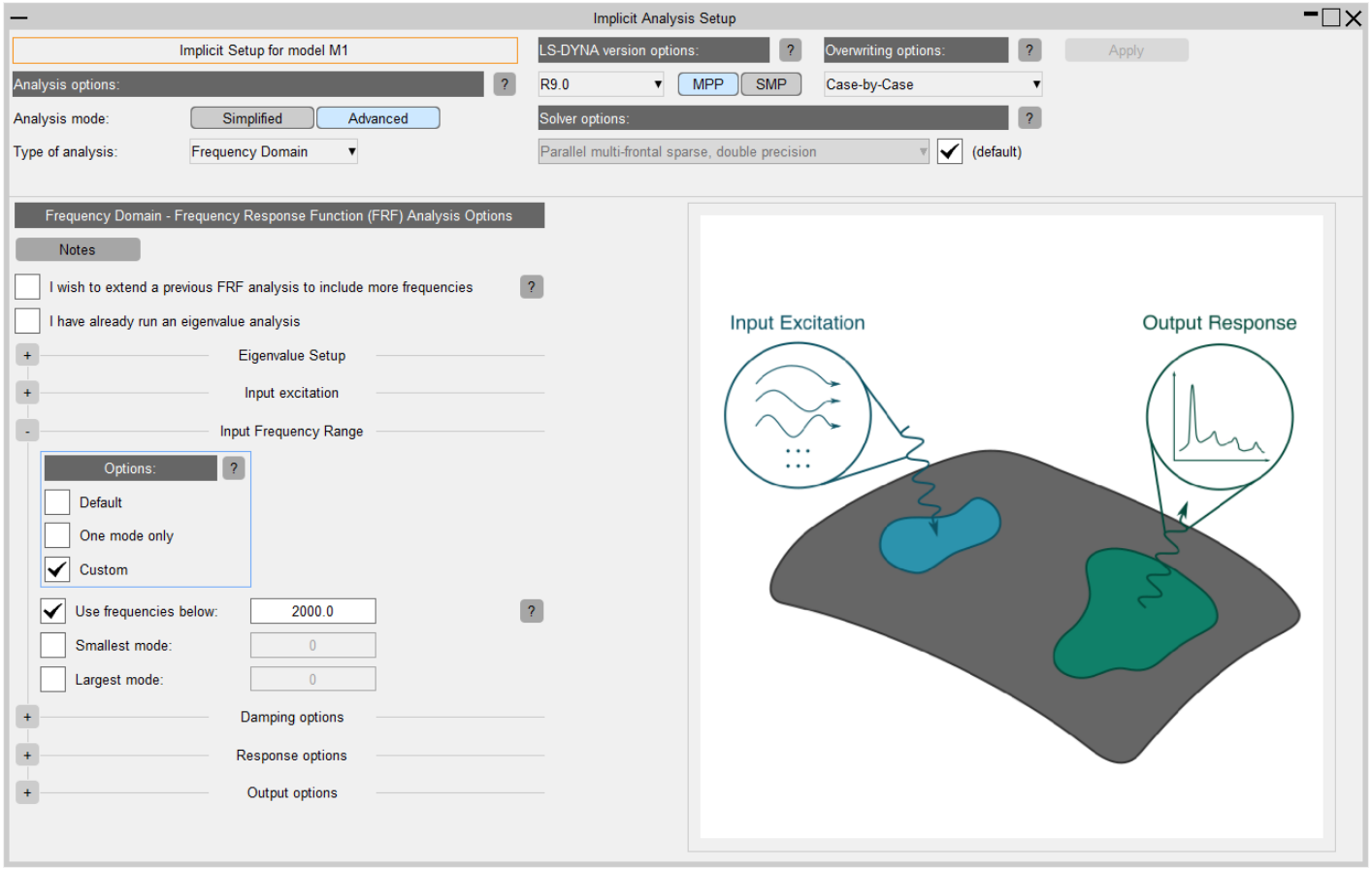
Example: Frequency Domain FRF - Advanced

Input excitation in the form of **Nodal Force**, in the -Z direction, applied to Node Set 100.



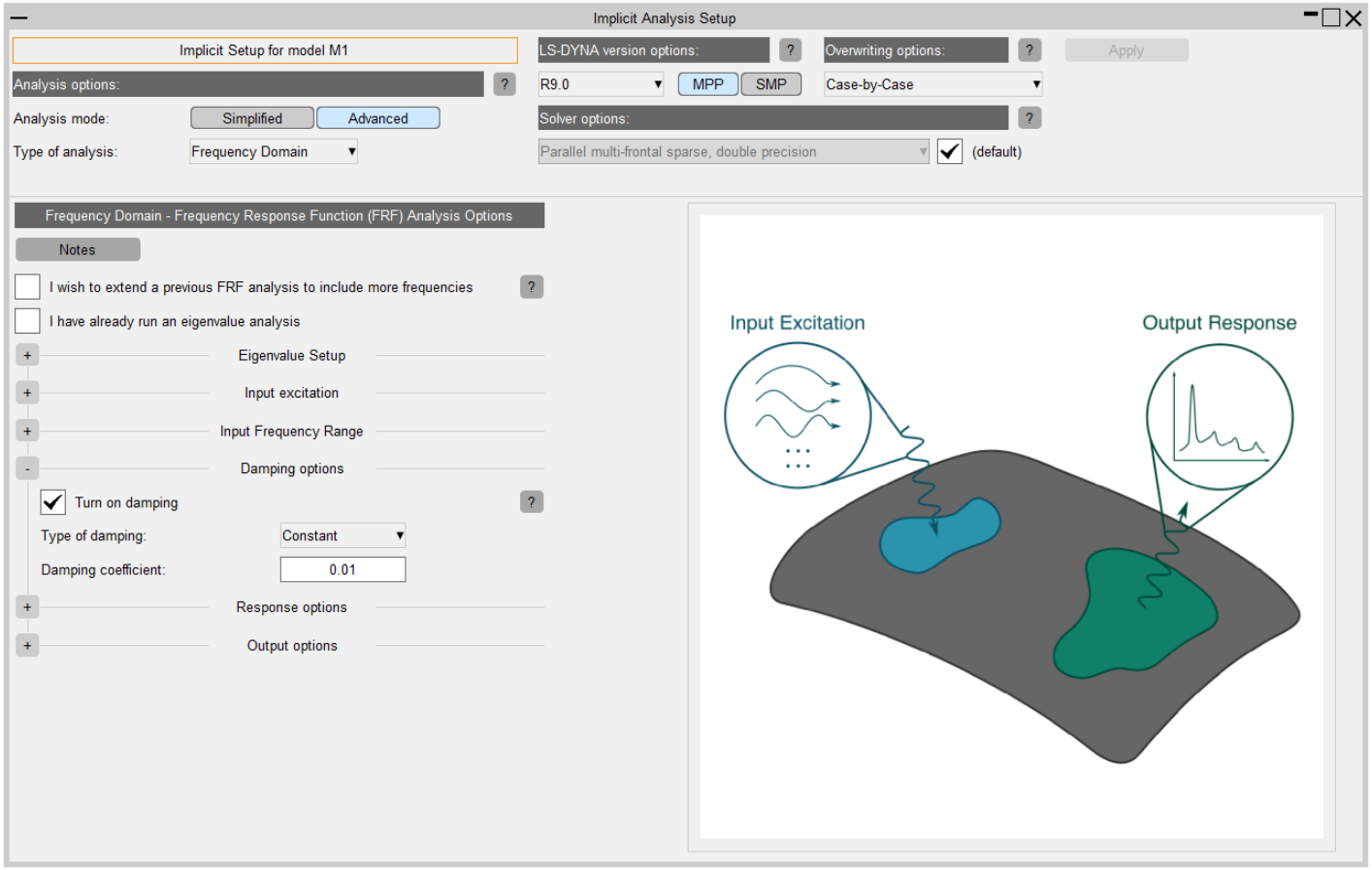
Example: Frequency Domain FRF

Adopt modes of frequencies less than 2000.0Hz.



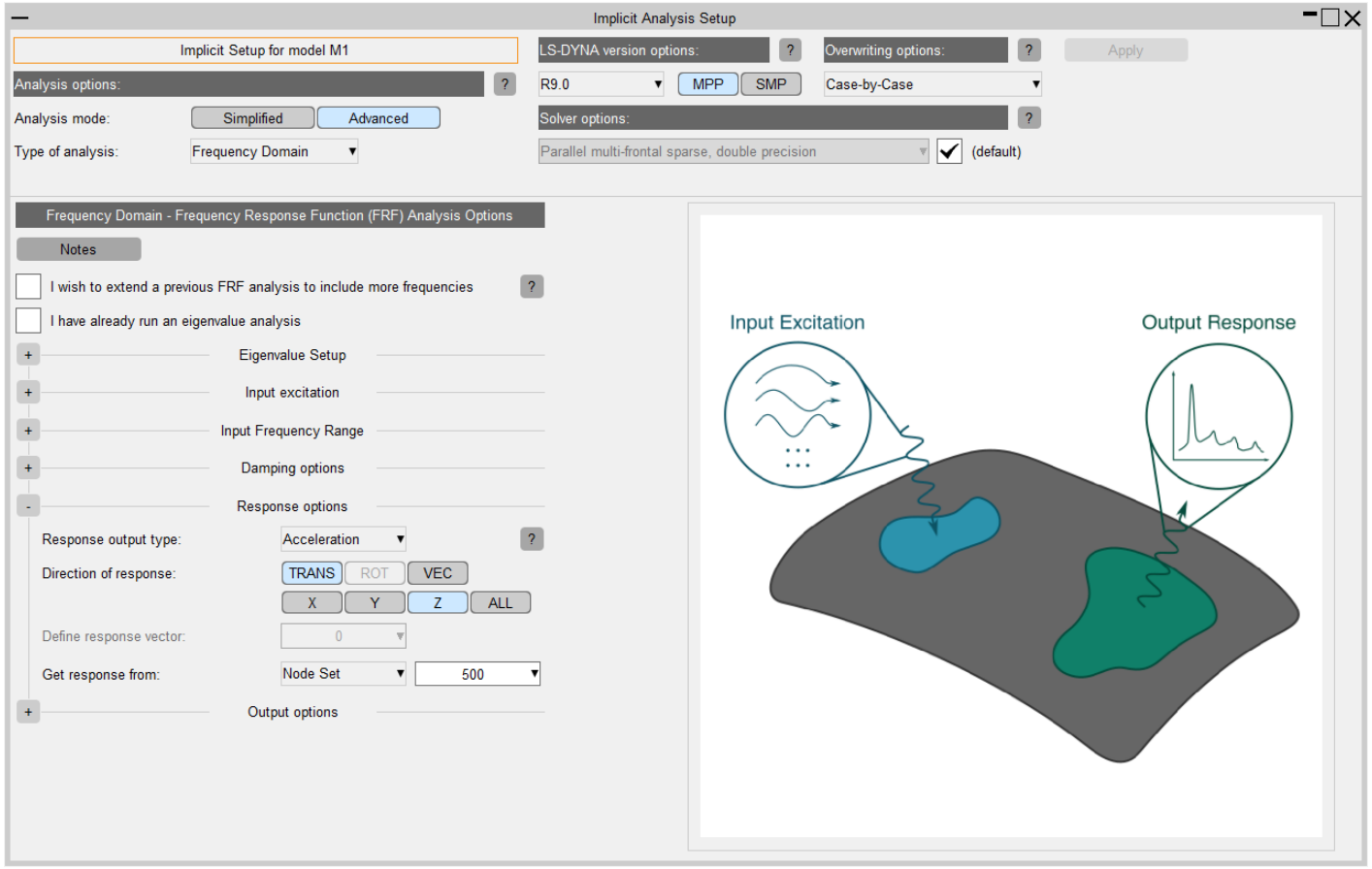
Example: Frequency Domain FRF - Advanced

Apply a **Constant Damping** coefficient of 0.01 across all modes.



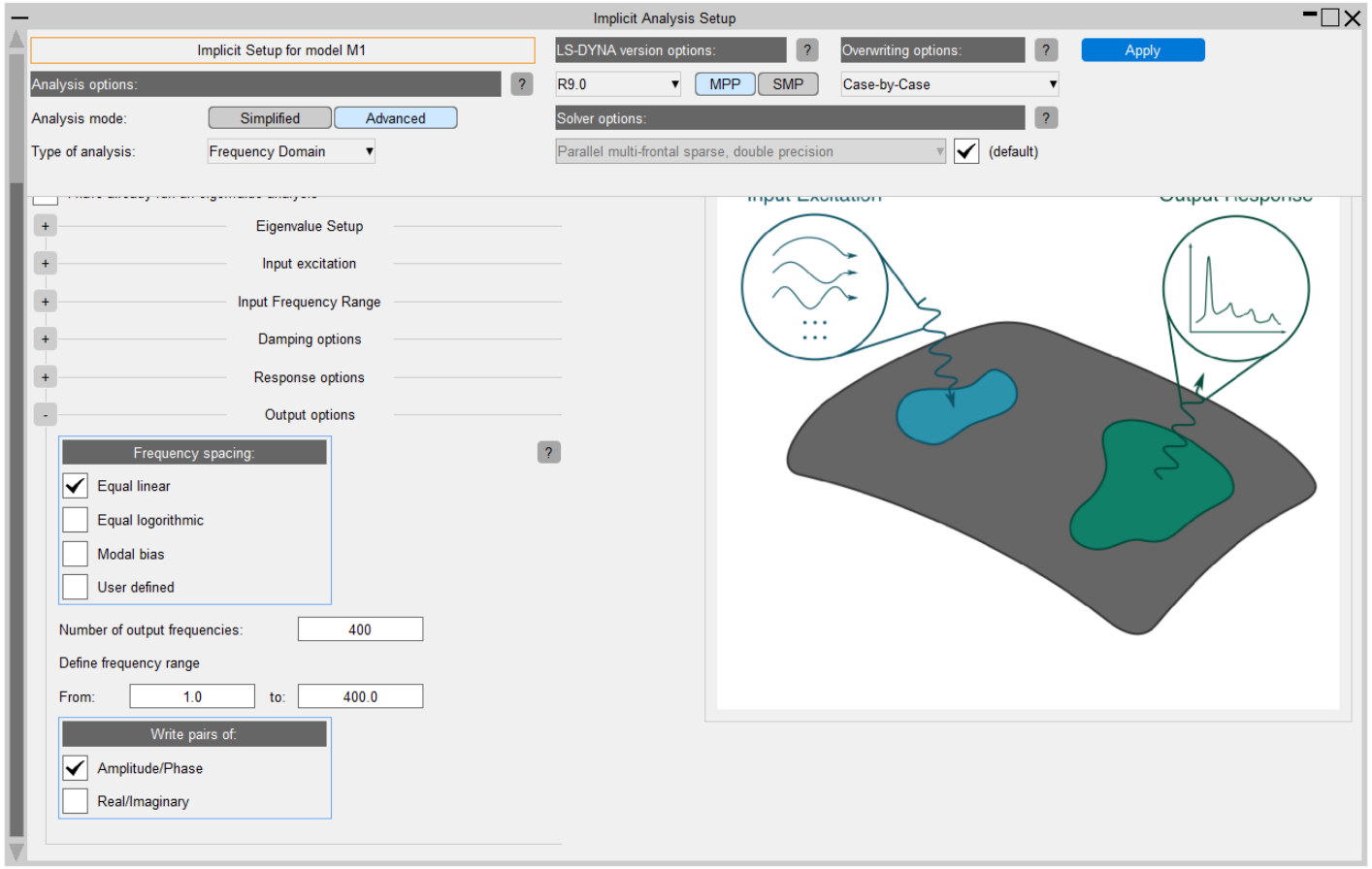
Example: Frequency Domain FRF - Advanced

Take the output **Response** from Node Set 500, in the form of **Acceleration** in the translational Z direction.



Example: Frequency Domain FRF - Advanced

Output the response for 400 frequencies in the range of 1.0 – 400.0Hz. Now click **Apply**.



Contact us

Oasys
LS-DYNA Environment

Global / UK
T: +44 121 213 3399
E: dyna.support@arup.com

India
T: +91 40 69019723 / 98
E: india.support@arup.com

China
T: +86 21 3118 8875
E: china.support@arup.com

USA
T: +1 415 940 0959
E: us.support@arup.com

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