

Transition Guide for Experienced Users

DeltaE Version 5 to DeltaEC Version 6 (LA-UR-07-6100)

Change in default thermal boundary condition:

In version 5, DUCTs and similar segments were thermally anchored by default, leading to the default assignment $\dot{H}_{\text{out}} = \dot{E}_{\text{out}}$. This default could be overridden with an upstream INSULATE segment. In version 6, insulation is the default, so $\dot{H}_{\text{out}} = \dot{H}_{\text{in}}$ by default in DUCTs and similar segments. This default can now be overridden with an upstream ANCHOR segment. Thus, insertion of ANCHOR immediately after the BEGIN segment is needed to make some simple models run the way they used to; in models that formerly had INSULATE at segment 1, the INSULATE can be deleted.

New calculation features:

In almost all segments, thermoacoustics can now be calculated with superimposed steady flow, and time-averaged pressure gradients are calculated. This allows modeling of Gedeon streaming in thermoacoustic systems with toroidal topology, steady flow caused by gas diodes, and effects of steady flow on oscillating flow such as Doppler shifts. These features are enabled by checking “Enable Ndot” in the BEGIN segment.

Segments VX** have been added. These combine features of previous stacks and heat exchangers into one segment class. Temperature can vary with x , and heat can be added or removed externally as a function of x .

Thermoacoustic mixture separation is now included, using segments MIX**. New in version 6.2: Segments MIXT* allow simultaneous nonzero dn_L/dx and dT_m/dx .

User-defined gas mixtures are now supported.

The volume integral of the complex gas momentum is now available, so vibrations of thermoacoustic systems can be analyzed.

The RPN segment includes new “change” operators that let the user force a change in any integration variable. For example, “Tm 1 + =Tm” increments T_m by 1 Kelvin.

An RPN segment in one model can access a variable in another model. Together with the “change” commands, this allows several models to be numerically linked and run simultaneously. New in version 6.2: Incremental plotting of such interlinked models is also supported.

Exergy flow is displayed for all segments, in the `<.sp>` file.

User interface changes:

A new user interface has been created, with color indicating important features. The user can employ mouse clicks, scrolling, and other Windows-style features. Most features of the old keyboard user interface are accessible via keystrokes that experienced users have grown accustomed to. Useful features such as the Guess–Target Summary and the Highlights Display appear in separate windows so they can be watched constantly. Segments and blocks of segments can be copied and pasted, much like paragraphs and blocks of paragraphs are copied and pasted in word processing software.

A schematic display lets the user see the topology of the model, with segments having length and lateral dimensions drawn to scale. Edit dialogs for a segment’s parameters are accessible by right clicking on the segment’s pictograph.

The `<.out>` file format has changed slightly, but DELTAEC should read the format of old DELTAE files correctly. The `<.dat>` file no longer exists. The `<.sp>` file (formerly known as the `<.spl>` file) is automatically created at the end of every successful run. The previous `<.des>` and `<.plt>` files are now combined in the `<.ip>` file.

A built-in plotter can display both “state plots” based on the `<.sp>` file, e.g., p_1 or \dot{E} vs x , and “incremental plots” based on the `<.ip>` file, in which the horizontal axis follows changes in a user-specified input variable such as frequency or driver amplitude. Model-specific user preferences for plots are saved in `<.ssv>` and `<.isv>` files. Our intention is that the user will often display automatically updated plots of the `<.sp>` file. New in version 6.2: “Rewind from plot” lets the user graphically select a desired operating point from an incremental plot.

Users Guide

The Users Guide (a `<.pdf>` document) is internally hyperlinked, to make it easier for experienced users to find information. A segment index and a subject index at the end, and the `<.pdf>` bookmarks on the left side of the Adobe window, are good places to start. The Users Guide is accessible from DELTAEC’s pulldown “Help” menu.

Elimination of segment types:

The arithmetic segments that pre-dated RPN have now been abandoned. The eliminated segments include COPRTARG, EFFTARG, PRODTARG, QUOTARG, DECOMPOSE, ...

The *XFRST, *XMIDL, and *XLAST segments have been eliminated. Use HX, TX, SX, and PX.

INSDUCT, ISODUCT, INSCONE, and ISOCONE have been eliminated. Use DUCT and CONE, whose default behavior is the same as the former INSDUCT and INSCONE. Use ANCHOR if ISO** behavior is desired.

Vocabulary and output changes:

Some segments have been renamed: ENDCAP → SURFACE, CONDUCT → ANCHOR, RPNTARG → RPN. If DELTAEC cannot confidently translate an old DELTAE file into the new vocabulary, a warning is issued and a `<.err>` file is written.

Some parameters have been renamed. For example: T-beg \rightarrow TBeg, B x L \rightarrow BLProd.

What used to be called “special modes” are now called “master–slave links.”

A few output parameters that are easily available by other means (e.g., HeatIn in some segments) have been eliminated. Any RPN calculations that relied on such output parameters will require human attention in the transition from Version 5 to Version 6.

Master–slave links

There are some new master–slave links, such as for maintaining taper angle in cones.

Some bugs in the stack-porosity master–slave links have been fixed.