April 30, 2026

Instructions for generating and implementing look-up tables with refrigerant thermophysical properties in EVAP-COND and ACSIM

EVAP-COND and ACSIM use refrigerant property look-up tables to enable fast simulations. These tables contain the full set of thermodynamic and transport properties. The look-up scheme includes eight property routines, each designed to retrieve a specific state or transport property based on the variables defining the refrigerant's thermodynamic state. The tables are formulated in pressure–enthalpy coordinates and can extend into the supercritical region for high-pressure refrigerants. The look-up tables distributed with EVAP-COND and ACSIM were generated using TableGen2.exe, a stand-alone program based on the property routines in REFPROP (Lemmon et al., 2018).

EVAP-COND and ACSIM use separate look-up tables for evaporator (EVAP) and condenser (COND) models, each with distinct low- and high-pressure limits. For all refrigerants except R744 (carbon dioxide), the evaporator tables span bubble-point temperatures from −32 °C to +28 °C (−25.6 °F to 84.2 °F). For condenser simulations, the temperature range is approximately 10 °C to 70 °C (50 °F to 158 °F). Exceptions include R507A (10 °C to 68.5 °C; 50 °F to 155.3 °F) and R32, R404A, R410A, and R744, for which the tables extend into the supercritical region. If a requested refrigerant property falls outside the bounds of a look-up table, it is computed directly using REFPROP routines.

To add new refrigerants to EVAP-COND or ACSIM, separate look-up tables must be generated for the evaporator and condenser and then copied into the designated program directories.

Steps to generate a loop-up table

- Extract files from TableGen2.zip file
  Extract all files to a user-accessible folder of your choice. The extraction process will create subfolders 'fluids', 'mixtures', and 'UserDefinedMixture'. The 'fluids' subfolder will contain only two fluid files for R134a and R290 for training purposes.

- Load subfolder 'fluids' with data files in the REFPROP-compatible format for other refrigerants of interest. These fluid files can be obtained from the 'fluids' folder of any one of the following NIST Standard Reference Data (SRD) programs:
  - SRD 23, REFPROP https://www.nist.gov/srd/refprop,
    Location: C: >Program Files (x86)>REFPROP>fluids
  - SRD 49, CYCLE_D https://www.nist.gov/srd/nist-standard-reference-database-49,
    Location: C:>Program Files (x86)>NIST>CYCLE_D 6.0>fluids
  - SRD 73, REFLEAK https://www.nist.gov/srd/nist-standard-reference-database-73,
    Location: C:>Program Files (x86)>NIST>REFLEAK 6.0>fluids.

- Execute TableGen2.exe
  Execute TableGen2.exe by clicking on it with the left mouse key. The main screen of the table generator will open (Figure 1).

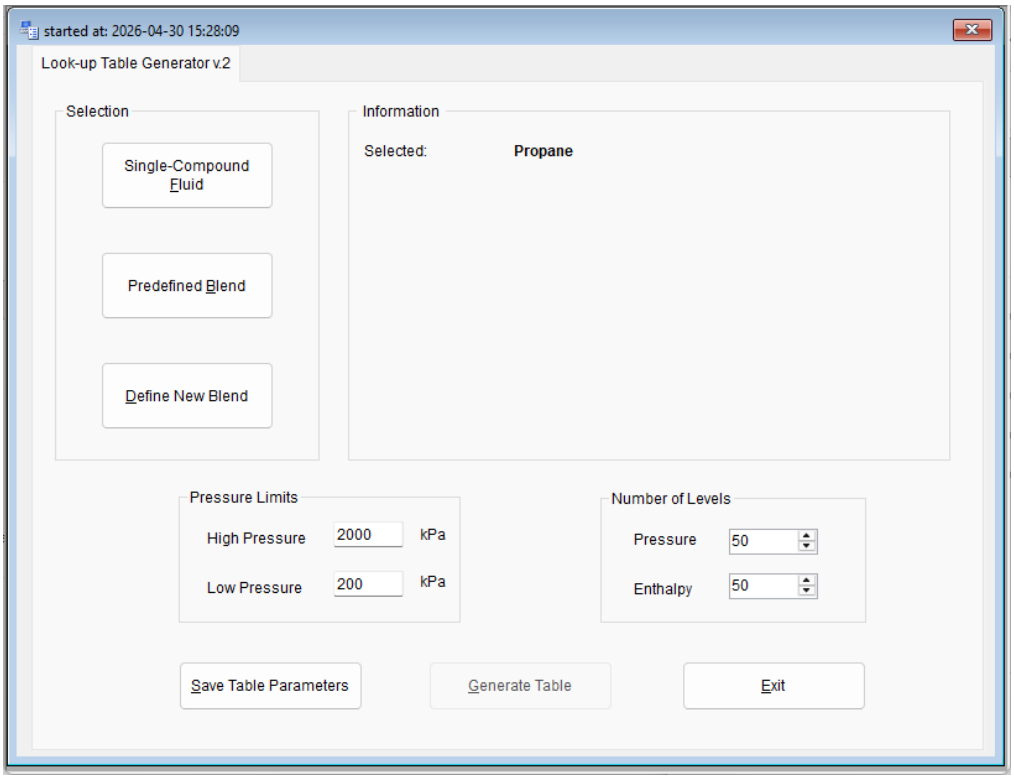

Figure 1. TableGen2.exe main window

- Select refrigerant
  A selected refrigerant can be a single-compound fluid, predefined blend, or a blend the user wants to define. In this example, we will use this last option. After clicking on the 'Define New Blend' button, a new window opened for selecting blend components (Figure 2).

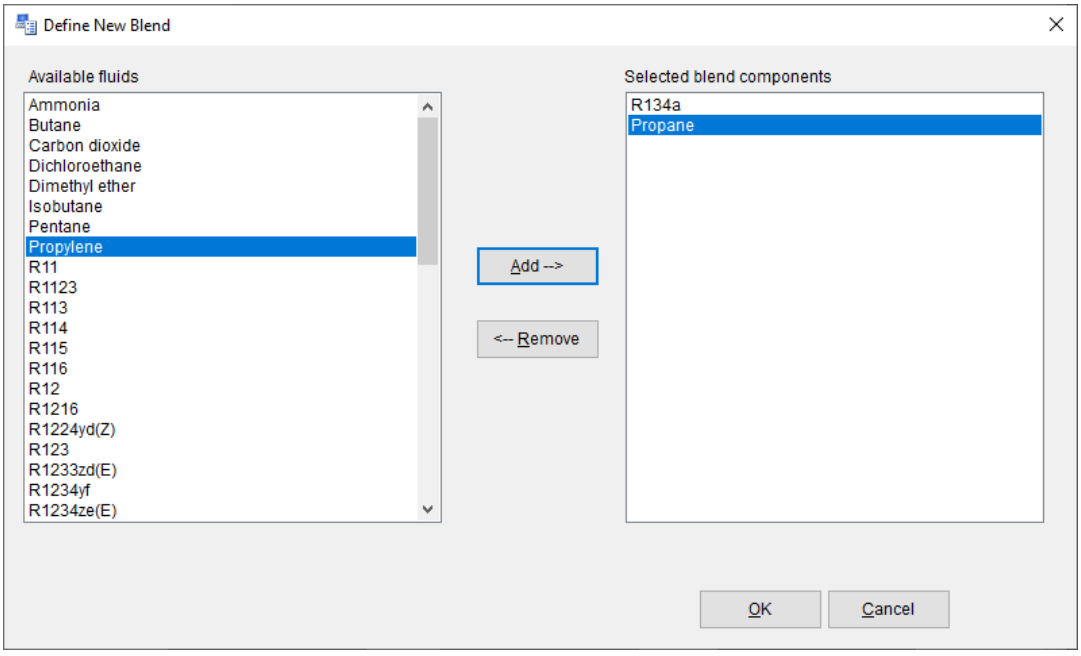

Figure 2. 'Define New Blend' window

The refrigerants displayed in the left-side window of Figure 2 as 'Available fluids' are those for which a REFPROP-compatible fluid file was saved in the 'fluids' subfolder. Select each blend component by clicking on it with the left mouse key and follow by clicking on the 'Add' button. Up to six components can be selected. Click on the 'OK' button when all components were selected and appeared in the right-side window. In this example, R134a and propane were selected. A 'Specify Blend Composition' window will open (Figure 3).

- Specify blend composition
  Adjust the mass or molar fraction by placing the cursor in a proper box and entering the desired value.

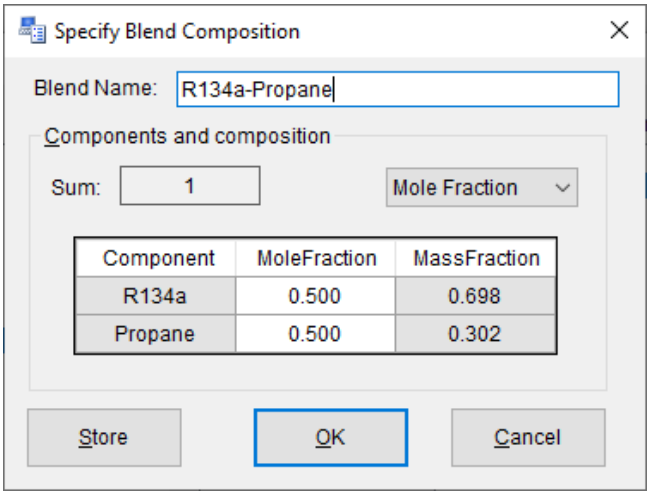

Figure 3. 'Specify Blend Composition' window

- Store the blend for future simulations (optional).
  After clicking on the 'Store' button, a generic 'Save As' window will open (Figure 4). Enter the name for the new blend. You can specify any name with up to 20 characters, letters and numbers only (no special characters). After clicking on the 'Save' button, the program will return to the main window (Figure 5).

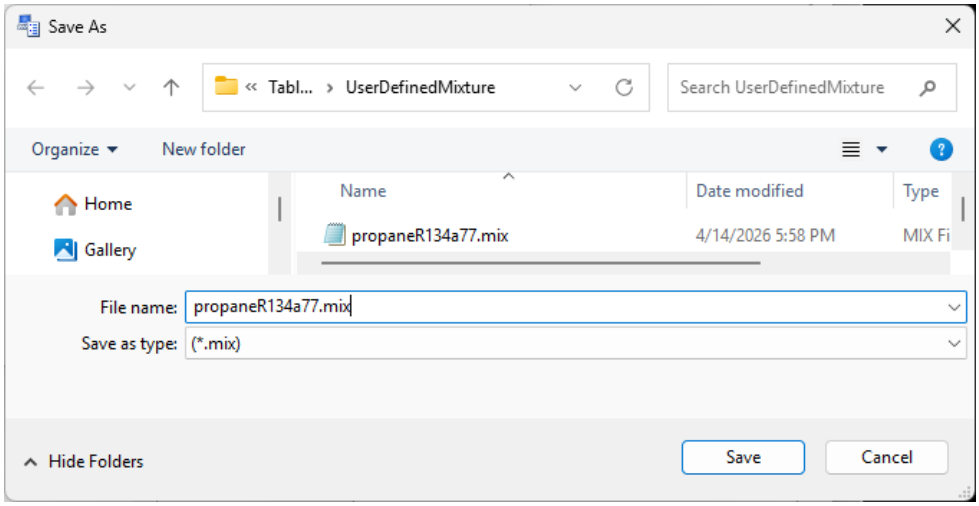

Figure 4. 'Save As' window

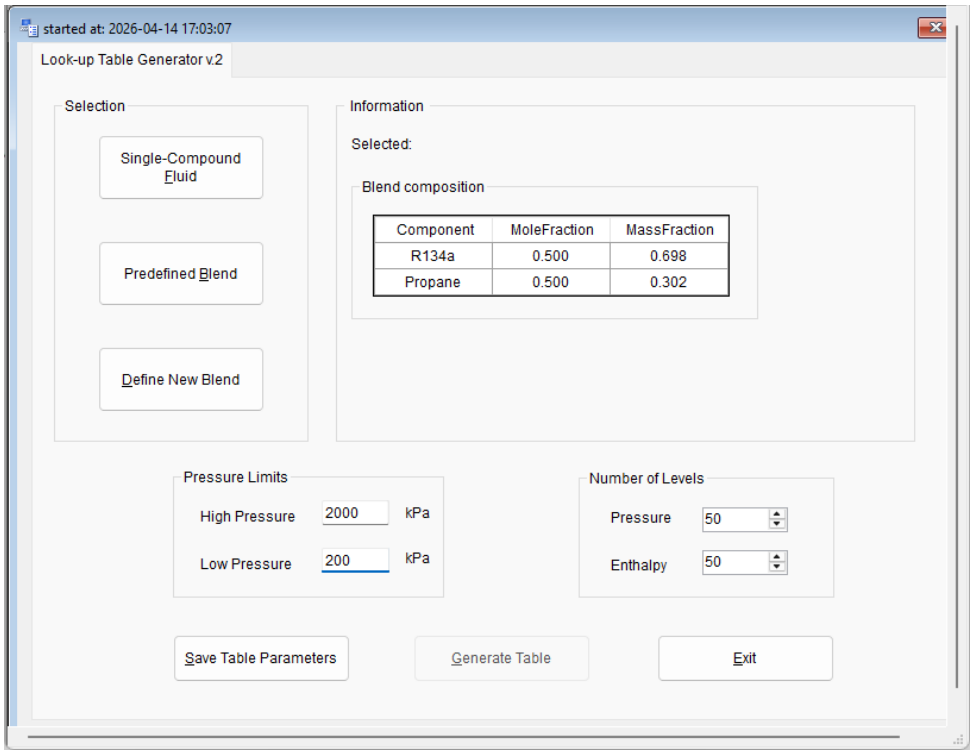

Figure 5. Main window after blend selection

- Specify table parameters

  a) Pressure limits

  Enter values for high- and low-pressure limits in respective boxes.

  Note: The pressure limits used for blends included in the EVAP-COND and ACSIM packages were selected to cover the operating regime considered to be suitable for broad applications. A user may be interested in other operating conditions and may prefer different pressure limits. In such a case, the user may generate a new table and replace the one provided in the EVAP-COND or ACSIM package.

  b) Number of pressure and enthalpy levels

  The granularity of table grid is determined by the number of pressure levels and enthalpy levels. Enter the values in respective boxes. The maximum number of pressure levels is 150, and the maximum number of enthalpy levels is 100.

  To limit the size of EVAP-COND and ACSIM installation packages, the look-up tables included in the package were generated with the following entries:

  Pressure levels:
  - 50 for look-up tables with properties under the critical point
  - 75 for condenser look-up tables extending above the critical point (R32, R404A, R410A and R744).

  Enthalpy levels:
  - 50 for all single-compound fluids, azeotropic blends and zeotropic blends with a two-phase temperature glide below 1 K (1.8 °F) at the normal boiling point
  - 75 for zeotropic blends with a two-phase temperature glide greater than 1 K (1.8 °F) at the normal boiling point.

  An EVAP-COND or ACSIM user may choose to use higher numbers for pressure and enthalpy levels for refrigerants of particular interest.

- Save table parameters
  Click on the ‘Save Table Parameters’ button.

- Generate table
  Click on the ‘Generate Table’ button. A DOS window will open showing the progress of calculations (Figure 6). Follow the command “Press ‘Enter’ key to exit…”.

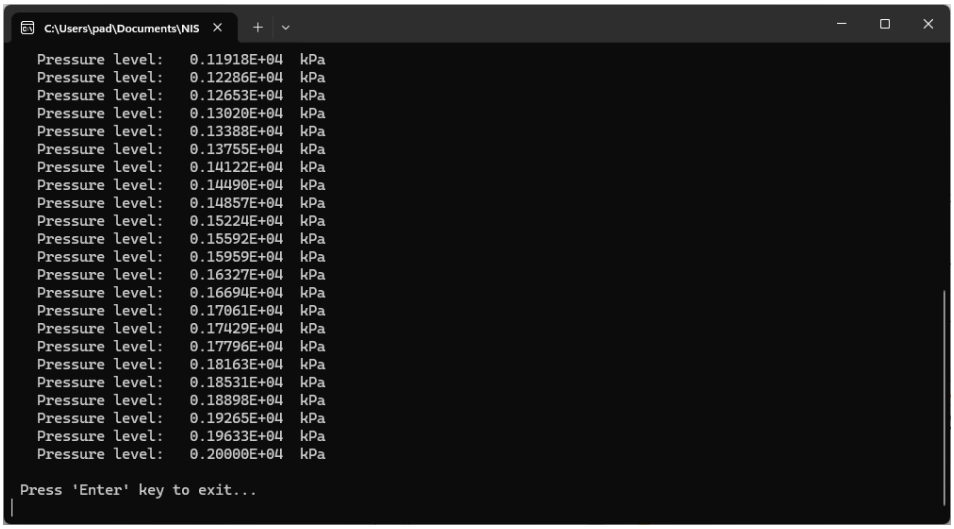

Figure 6. DOS window showing progress of table generation

The table was generated and written to propaneR134a77.txt file located in the default folder, where ‘propaneR134a77’ is the name we gave to the blend earlier in this example (Figure 7).

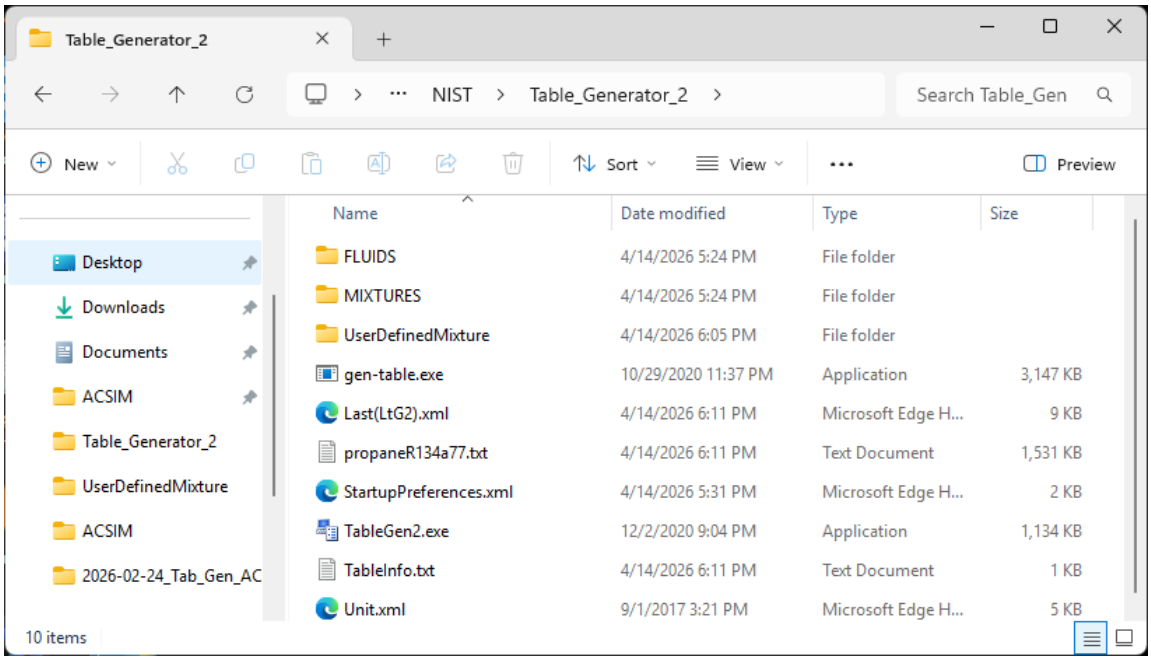

Figure 7. TableGen2 folder with a generated look-up table named propaneR134a77.txt

EVAP-COND’s and ACSIM’s name convention requires loop-up table files to have extensions ‘ev’ and ‘cd’ for EVAP and COND, respectively. If the generated table is intended for use by EVAP, you need to

change manually the ‘txt’ extension to ‘ev’; in this example the name of the file will be propaneR134a77.ev. For use by COND, the name of the file would be propaneR134a77.cd.

Implementation of look-up tables in EVAP-COND

To add a new refrigerant or refrigerant blend to EVAP-COND, you need to generate look-up tables for both the evaporator and condenser and copy these files to three TABLE folders. Figure 8 shows the location of these folders in the EVAP-COND folder structure. EVAP-COND must not be running during the copying process. Names of the look-up table files must conform to the EVAP-COND convention stated above. On the program start up after the copying is complete, EVAP-COND may take 15 seconds to update itself to a new content of TABLE folders. Note that EVAP-COND ‘fluids’ folders must include fluid files for all blend’s components.

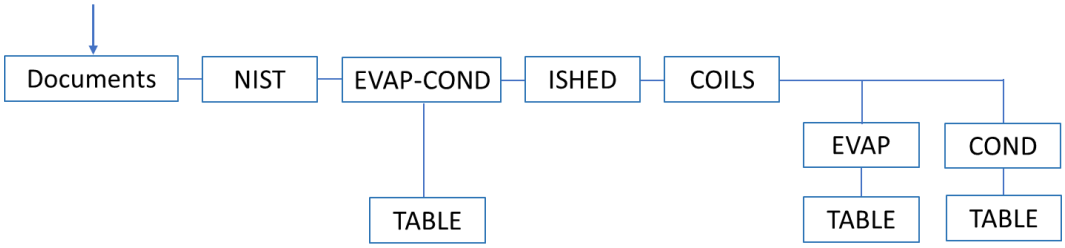

Figure 8. EVAP-COND folder structure

Implementation of look-up tables in ACSIM

To add a new refrigerant or refrigerant blend to ACSIM, you need to generate look-up tables for both the evaporator and condenser and copy these files to the C:>…>NIST>ACSIM>table folder. Note that the C:>…>NIST>ACSIM>fluids folder must include fluid files for all blend’s components.

Reference

Lemmon, E. W., Bell, I.H., Huber, M. L., McLinden, M. O., 2018. NIST Standard Reference Database 23: Reference Fluid Thermodynamic and Transport Properties – REFPROP, Version 10.0, National Institute of Standards and Technology, Standard Reference Data Program, Gaithersburg, Maryland, U.S.A.