



# Making Prebuilt Models

## What are Prebuilt Models?

A prebuilt model is essentially a SinapsPlus®-based SINDA/FLUINT model that may be modified in a number of ways (described below) and then re-executed. Prebuilt models represent a means of analyzing a number of problems that are “variations on a theme.”

SinapsPlus depictions of thermal/fluid models can be passed to unlicensed users (along with SINDA/FLUINT results files and the evaluation version of SINAPSPlus) to provide “pictorial documentation” of both models and results.

New versions of SINDA/FLUINT and SinapsPlus take this a step further, enabling licensed users to create models that can be reexecuted by recipients, even if those recipients do not have a Fortran compiler much less a license to use SINDA/FLUINT or SinapsPlus.

Although unlicensed recipients of such models cannot add or delete network elements, they can change input values, calculator registers, etc. and see how the changes affect the results. With a little foresight, the licensed user can “program” a model to accept a wide variety of changes. For example, the material, geometry, working fluid(s) etc. and even the type of analysis performed (steady-state or transient) may all be changed by the recipient.

This document contains information useful to the licensed SINDA/FLUINT and SinapsPlus user who wishes to create a prebuilt model (or “prebuilt”) for use by others.

## Guidance

When you create a prebuilt, you are essentially writing a computer program to be run by others. The program should be flexible, documented, and reasonably robust. (You use SINDA/FLUINT and SinapsPlus as the “compiler,” and the user employs SinapsPlus as the environment for running the program.)

C&R has prepared a series of prebuilt models. While not an exhaustive list, these models (including their documentation, installation notes, etc.) should be reviewed and perhaps used as templates since they embody many of the guidelines listed below.

### Basis: Run Existing Processor

To launch a SINDA/FLUINT run from within SinapsPlus, you may choose to skip the compilation and link steps if you have made only minor changes to your model and you have already launched a run. Using the **Run SINDA/FLUINT-->Preprocess and Run--> Run Existing Executable** option can save time.

In a prebuilt model, the target user can *only* employ the **Run Existing Executable** option. You provide the user with:

1. A machine-independent model desktop binary file (created from the **archive** option on the model control panel)
2. A copy of the complete working subdirectory that was created by SINDA/FLUINT under the last **Normal Operation** command you performed. This must be created on the same host type that will be used by the target user.
3. Any INCLUDE files required to preprocess the model.
4. Documentation on how to run your prebuilt model (features, parameters intended to be changed,

etc.)

5. Optionally, existing SAVE files, output files, etc.

## Designing for Maximum Flexibility

The **Run Existing Executable** option cannot be used if the network itself has been changed (elements added, deleted, etc.) or if any logic blocks have been altered, it *can* be used if only input values have been changed (e.g., values of control constants, user data, calculator registers, and any network inputs). *The User's Manual lists full restrictions and provides guidance.*

Because analyses are often repeated with only minor changes to inputs, this option is quite useful and better enables rapid parametric analyses. In fact, experienced users have found themselves organizing a model and its associated logic such that the **Run Existing Executable** can be used more often. When this process has been fine-tuned, use of the **Normal Operation** option may become rare. Thus, creating a flexible pre-built model follows the same steps performed by a user who makes every effort to avoid having to regenerate a new processor via the **Normal Operation** option. *Setting up a model to be reexecuted repeatedly by one's self is the same process as setting up a prebuilt model to be used by others.*

The key is to organize your model such that changes to logic and network are unnecessary. In other words, by applying a little foresight into the kinds of problems that will be investigated, you can plan flexibility into a model.

Calculator registers play an important role in setting up a prebuilt by avoiding “hard-wired” inputs. Although network input parameters (e.g., initial temperatures, diameters, etc.) can be changed without requiring regeneration of the processor, it is more convenient to use calculator registers to change the data indirectly. Single calculator registers can be used in multiple input fields and expressions within those fields, thus providing a “control panel” for changes that do not render an existing executable invalid. Furthermore, named calculator registers are passed to SINDA/FLUINT as global (named) user data, meaning that their values can be used to control logical operations, as described below.

It is common to build a single model with multiple intended uses, and to employ slight changes in the network to accommodate each type of analysis. For example, a subsystem may be present or absent, or a heat transfer path or fluid connection may appear or disappear during various “what if?” scenarios. To avoid network changes, such model variations can be performed without actually adding or deleting elements, but by turning on or off connections (conductors, paths, and ties). Such usage has the side-benefit of making the model more self-documenting and facilitating future maintenance.

To turn on or off a conductor, set its conductance to a very small value (say 1.0E-10, which avoids the restriction that the sum of conductances must be positive for each node). To turn off a fluid path or tie, its duplication factors can be set to zero. Other means specific to each type of element exist, such as setting a user constant small or zero if it is used as the factor of a SIV conductor, setting the SPD of a VPUMP equal to zero, etc.

The submodel-level BUILD manipulations are often used for such changes, but a change to the BUILD or BUILD command itself violates the restrictions of the **Run Existing Executable** option, since a logic block (OPERATIONS DATA) must be modified. However, even expert SINDA/FLUINT users may not know that the BUILD and BUILD commands can actually be contained within IF/THEN/ELSE/ENDIF blocks, as shown in the following example:

```
      IF (JTEST .EQ. 0) THEN
BUILD CON, WALL, SHEET
      ELSE
BUILD CON, WALL, MPLY
      ENDIF
```

Thus, a change to JTEST changes the BUILD command, avoiding a change to the content of the logic block.

Named calculator registers and global user data may be used to control logic instead of rewriting it, thereby preserving the option of rerunning an existing processor instead of recreating it.

The process is analogous to building switches into an electric circuit (or valves into a fluid loop) as contingencies. While such an analogy is easy to see for network changes, it similarly applies to the flow of logical instructions.

By planning ahead, not only can faster executions be achieved, but the resulting model is easier for others to use as a prebuilt or otherwise.

## **Usage Documentation**

see also C&R's generic prebuilts

## **Distributing a Prebuilt Model**

Prebuilt models may be freely distributed within the limits of U.S. export restrictions. If you are unsure of these restrictions, please contact C&R Technologies for additional guidance. C&R Technologies does not restrict the distribution of prebuilt models, including commercial sales of a prebuilt. C&R Technologies cannot be responsible for support to end users.

### **Distributing SINAPS*Plus***

If you are providing an unlicensed user a prebuilt model, you can make copies of your Sinaps*Plus* installation disks and send those to the user. But to ensure that there are not problems with the disks, you may want to direct the end user to C&R Technologies' web site (at [www.crtech.com](http://www.crtech.com)) to download a copy of the Sinaps*Plus* evaluation version, or you may request a copy from C&R. We will be happy to provide a set of disks to your end user.

### **Distributing Prebuilts**

The following platforms are currently supported for both SINDA/FLUINT and Sinaps*Plus*.

**PC: Windows 95, 98, NT, 2000**

**HP**

**Sun: Solaris 2 (SunOS 5.X), Solaris 7**

## **Installation Documentation**

see also C&R's generic rebuilts

## **For Other Machines or Operating Systems**

If the end user of the prebuilt does not have the same computer or operating system as the creator of the prebuilt, C&R Technologies will be happy to convert the model for you. Please e-mail or send the Sinaps*Plus* binary file to us, and we will run the model on the desired end user platform. We will then send the necessary subdirectory and model back to you or on to the end user.