Advanced Design System 2011.01

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Netlist Exporter

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About Netlist Exporter

Front End Flow (FEF) is a design flow tool in which the Advanced Design System (ADS) schematic editor is used as a single point of entry to drive an entire design flow. ADS supports three other design flow tools: Netlist Translator, Intermediate File Format (IFF), and RFIC Dynamic Link.

Design Flow Tool Overview

Netlist Translator	Third party schematic entry tools are used to create SPICE or Spectre netlists. The netlists are translated into ADS netlists or schematics. This requires that schematic data must be duplicated and synchronized in multiple environments.
IFF	ADS is used as a schematic entry tool. The schematic is transferred from ADS to other tools using IFF to complete the design. This requires that schematic data must be duplicated and synchronized in multiple environments.
RFIC Dynamic Link	A single schematic entry tool, Cadence Virtuoso Composer, is used as the point of entry for schematic designs. ADS is used to add test bench data around the top level IC schematic symbol. All of the schematic data is represented in a single environment (Cadence); and there is a *limited* link to the ADS simulation tools and Instrument Server.
Front End Flow	Front End Flow allows all schematic design entry to be done in ADS. There is a single data representation for the schematic data with a direct link to the ADS simulation tools and Instrument Server. In addition, there are new customizable netlisters and tool interfaces available to allow the ADS schematic tool to interface with third party layout and Layout Versus Schematic (LVS) tools.

Front End Flow

The Front End Flow tool enables you to perform the following:

- Create schematic and layout designs from a single design entry point (ADS).
- Use the powerful ADS simulation and Instrument Server tools.
- Use third-party layout and LVS tools while maintaining a single schematic data source (no redundant data to maintain).
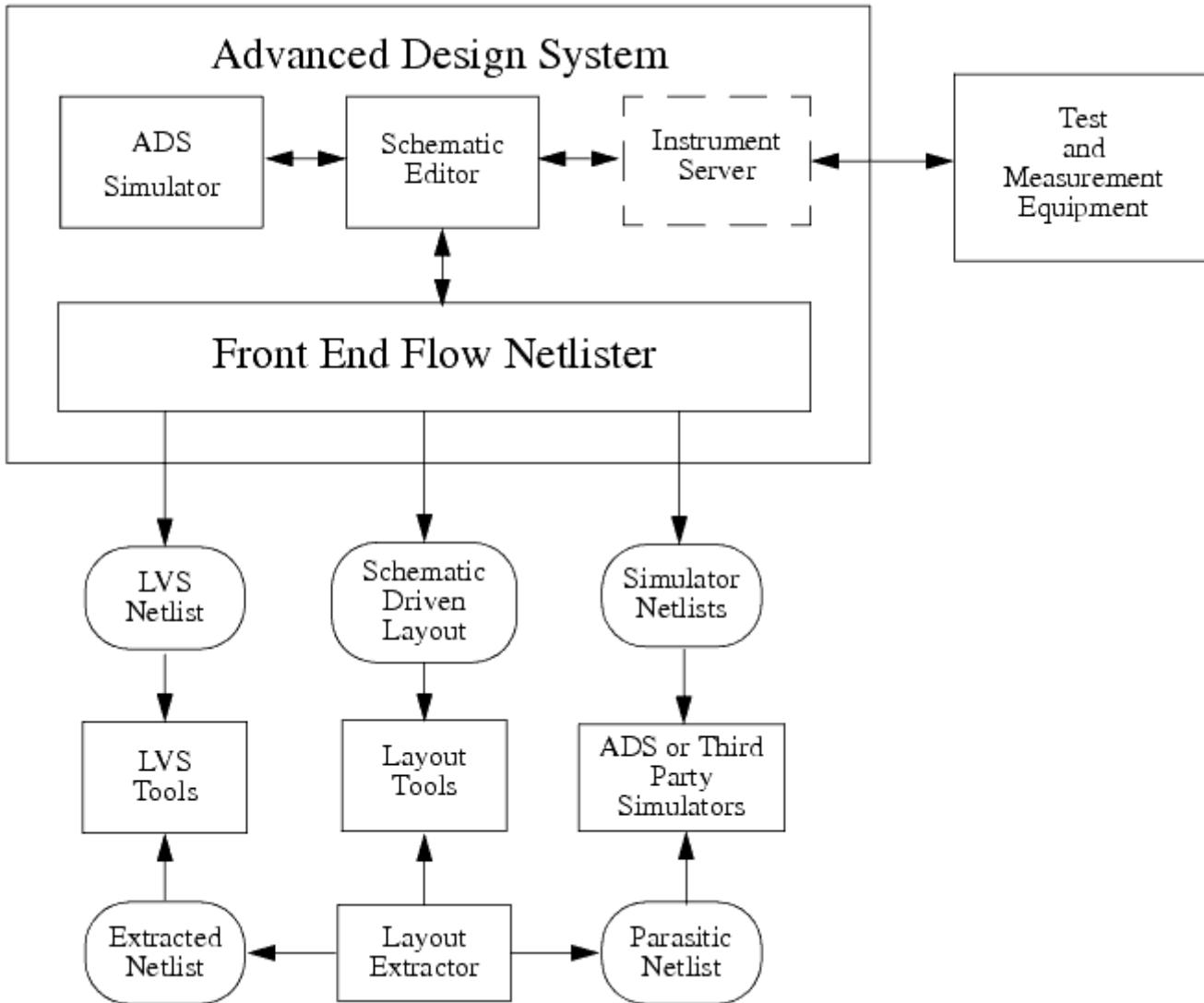- Use third-party simulation tools.

Front End Flow tool can be used to generate netlists on one platform that are transferred to other systems. This is necessary in a case where the third party tool does not run on the same system as ADS. For example, you may be running ADS on a PC and the LVS tool from Cadence that will only run on UNIX.

Design Flow Using Front End Flow

The key feature of the ADS Front End Flow tool is a configurable netlister that is able to target the netlist format required for any CAD tool. The most common target format is

HSpice, which is supported by many CAD tools. ADS includes configurations for several HSpice derived formats including those for Cadence Assura, Cadence Dracula, and Mentor Graphics* Calibre. In addition, the netlister can be configured by modifying certain functions to support any other target format. The *Netlist Exporter Installation and Configuration* Guide covers the steps required to custom configure the Front End Flow netlister.

Front End Flow Flowchart (adshbapp) depicts the design flow using the Front End Flow tool. Note that the Front End Flow netlister can generate netlists for several tools.
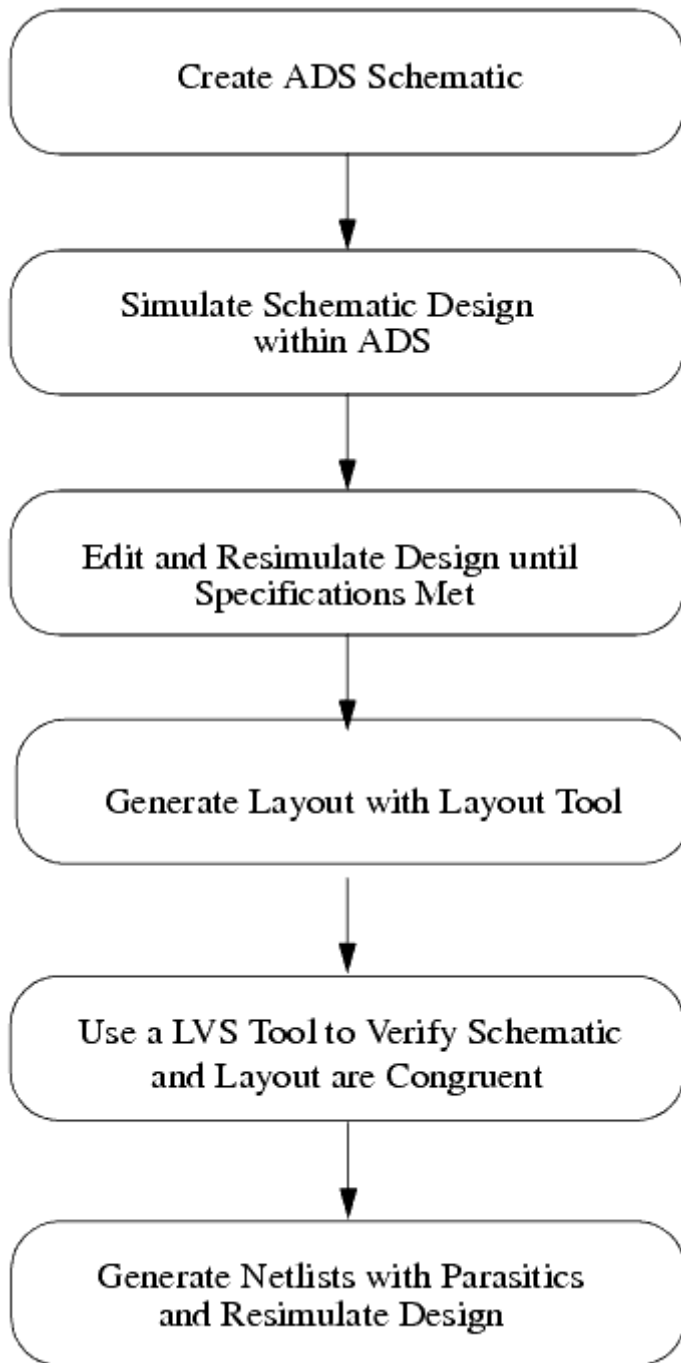
Front End Flow Flowchart

General Process

The following describes the typical task flow using Front End Flow. Refer to *Simplified Task Flow* (adshbapp).

1. A schematic design is created within ADS.
2. This design is simulated using ADS.
3. When the simulation results match the circuit specification, a layout for the schematic is generated.
4. The Front End Flow netlister creates netlists that is utilized to generate layouts, such as VirtuosoXL.
5. Once the layout is generated, the LVS tool is used to verify that the layout representation is same as the schematic representation.
6. To do this, a netlist is generated in an appropriate format for the LVS tool. Additionally, a layout extraction utility generates a netlist that the LVS tool will compare to the Front End Flow netlist.
7. When the layout and schematic matches, the layout extractor is used to generate netlists with parasitics.
8. If ADS is not the simulator used for the parasitic resimulation, the Front End Flow netlister generates a netlist for third party simulator.
9. Resimulate the netlist.

Simplified Task Flow (adshbapp) depicts the steps for using Front End Flow.

Simplified Task Flow

Intended Audience

The intended audience for this documentation is CAD System Administrators and RFIC Designers who are using ADS 2001 or newer to create RFIC designs. It is assumed that the designer using Front End Flow has some working knowledge of ADS. This

documentation does not cover how to use third party tools that can be accessed from ADS. For information on other vendor's tools, consult that vendor's documentation.

Main Requirements

To use ADS Front End Flow, you must have ADS 2001 or newer installed. Front End Flow can be used on all platforms that are supported by ADS.

What's in this Documentation

The goal of this documentation is to help you get started, provide relevant examples that teach you how to setup and use the software, and show you where you can get more information as you need it.

Creating Netlists (feflowug) provides step by step instructions for generating netlists using Front End Flow. This section covers procedures to use the pre-configured Front End Flow tools. Refer to the *Netlist Exporter Setup* documentation for instructions on generating custom netlists.

Creating Netlists

Front End Flow is able to produce netlists in non-ADS formats. These netlists can then be used within various non-ADS design tools. For more information, refer to the *Netlist Exporter Setup* documentation.

Creating a Netlist

To create a Front End Flow netlist, use the following procedure:

1. Open the design to be netlisted (refer to the ADS *Schematic Capture and Layout (usrguide)* documentation for information on opening designs).
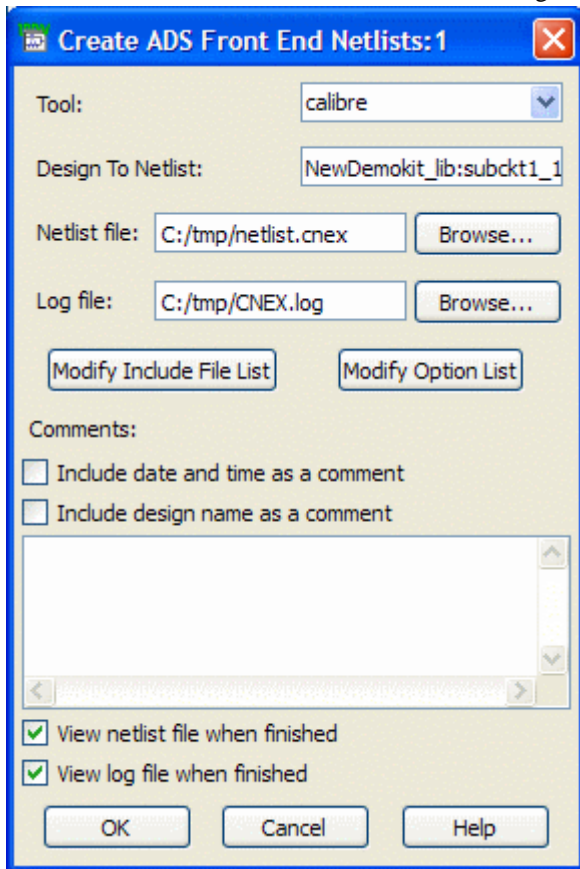
   > **ⓘ Note**
   > The design must be saved with a title at least once prior to netlisting. Front End Flow netlisting options will not be activated for untitled designs.

2. From the Schematic window, choose **Tools > Netlist Export > Create ADS Front End netlist...**. The *Create ADS Front End Netlists* dialog box appears (see Create Front End Netlists Dialog).

3. Select the desired design tool from the **Tool** drop-down list. Front End Flow will produce a netlist compatible with that tool.

   > **ⓘ Note**
   > The tool will be remembered between ADS sessions, so it is not necessary to select the tool every time a netlist is generated. The **Tool** drop-down list is generated each time the dialog box is displayed, and provides you choices that are available based on the component definition directories that are within the component path. In this example, the tools *Assura*, *Calibre*, and *Dracula* are available.

Create Front End Netlists Dialog Box

4. The *Design to Netlist* field contains the design name that will be netlisted (source file). The field defaults to the design name that is in the active window. If you prefer, enter a different design to netlist.

5. Click the *Netlist file* **Browse** button, or directly enter full path and file name, to define the file that will be created by the netlister (target file).

> ℹ️ **Note**
> If no path is specified, the file is created in the current workspace directory.

> ⚠️ **Caution**
> If the specified *Netlist file* already exists, it will be overwritten without warning.

6. Click the *Log file* **Browse** button, or directly enter full path and file name, to define the log file name. The *Log file* includes netlisting errors or warnings (if any).

> ℹ️ **Note**
> If no path is specified, the file is created in the current workspace directory.

> ⚠️ **Caution**
> If the specified *Log file* already exists, it will be overwritten without warning.

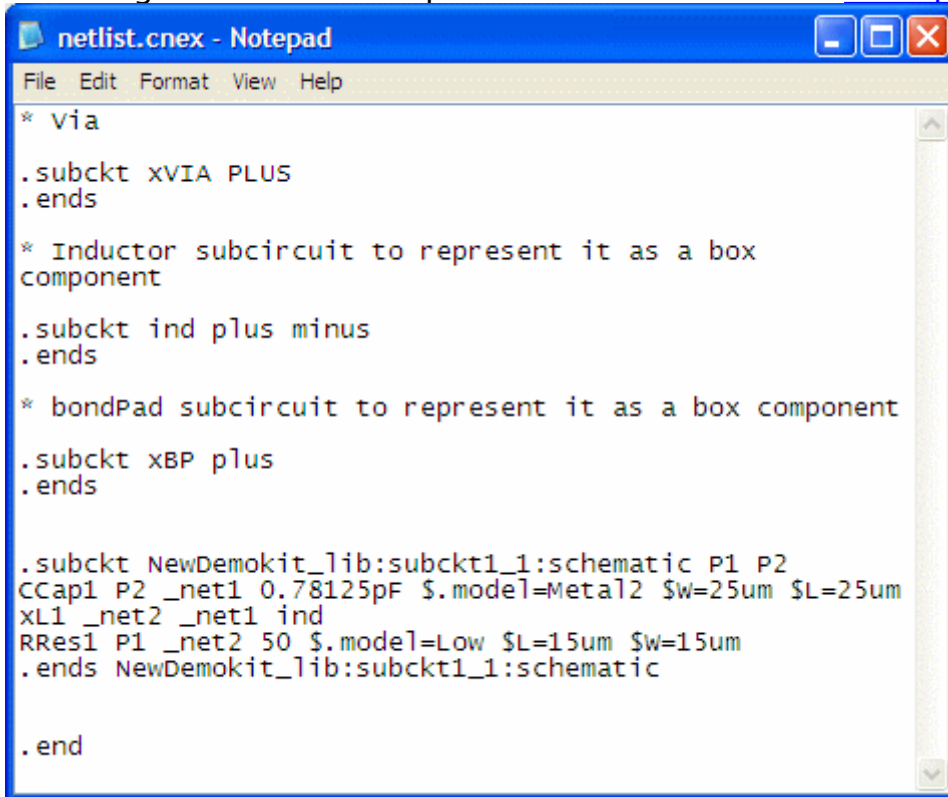7. Click **Modify Include File List** to specify the files to include in the final netlist. For more information, refer to Including Files in Netlists.

8. Click **Modify Option List** to specify the options that will generate output in the netlist header file. For more information, refer to Setting up Options for a Netlist.

9. Specify comments within the *Comments* section that the output will be generated in the netlist header file.

- Select **Include date and time as a comment** checkbox to place a comment line in the file that specifies date and time on which the netlist was generated.
- Select **Include design name as a comment** checkbox to place a comment line in the file that specifies the design used to generate the netlist.
- Enter comment text, to be included in the header of the netlist file, within the edit text box (located below the *Include design name as a comment* checkbox).

> ⓘ **Note**
> Comments from the edit box will be automatically output with the line comment character, so it is not necessary to type the comment character with the comments. The comments will be remembered through the current ADS session only. They are not stored between ADS sessions.

10. Select **View netlist file when finished** checkbox to load the netlist file into the standard text editor after netlisting is finished. This allows you to visually inspect for netlisting errors. An example netlist file is shown in Example Netlister Netlist File.

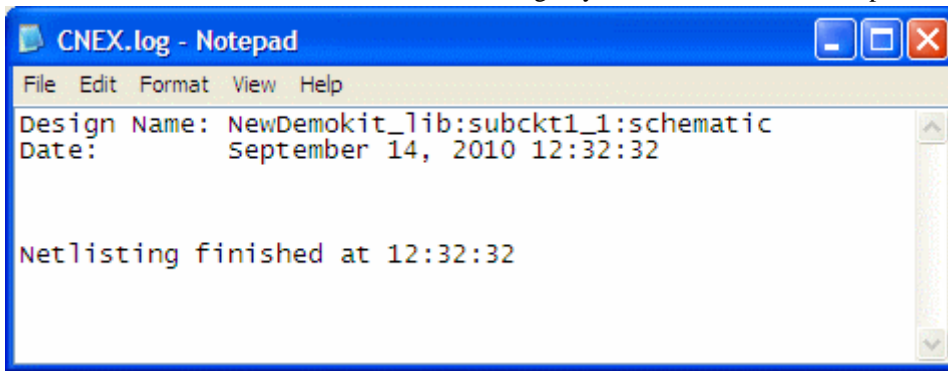**Example Netlister Netlist File**

11. Select **View log file when finished** checkbox to load the netlist file into the standard text editor after netlisting is finished. An example log file is shown in Example Netlister Log File.
    If neither the *View netlist file when finished* nor the *View log file when finished* checkbox is set, an information dialog will appear that informs you that netlisting has completed.

Example Netlister Log File

12. Click **OK** to create the netlist.

Including Files in Netlists

Most IC Foundries place symbols within schematics that refer to subcircuits. These subcircuits will typically contain parasitic and non-parasitic devices. Subcircuit component representation allows for a more accurate representation than primitive device representation. Since a single foundry process may use multiple design tools with different subcircuit definitions, most foundries elect to include model files in the final netlist. The Front End Flow netlister allows the inclusion of model files within netlists, although this is not a preferred practice for the ADS simulator.
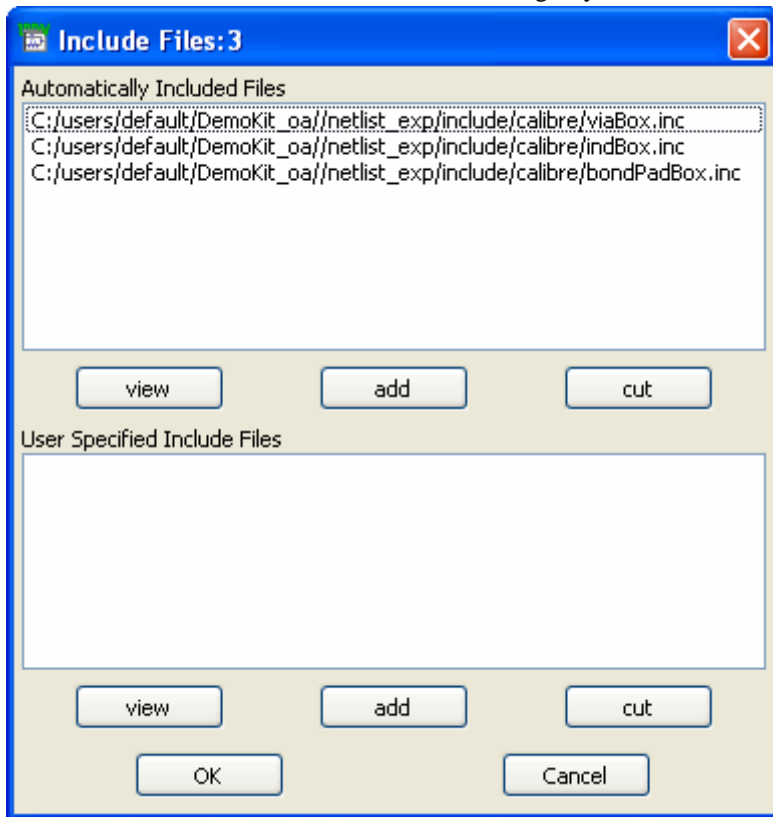
> ⚠ **Caution**
> Options defined in include files will be set regardless of the settings in the *Options* dialog box(see Setting up Options for a Netlist).

Defining Files to Include

To define the files to include in a netlist, use the following procedure:

1. If not already open, open the *Create ADS Front End Netlists* dialog box(from the Schematic window, select **Tools > Netlist Export > Create ADS Front End netlist...**).
2. Select the desired design tool from the **Tool** drop-down list.
3. Click **Modify Include File List**. The *Include Files* dialog box will appear (see The Include Files Dialog).

The Include Files Dialog Box

4. Add or cut automatically included files as required. See Automatically Included Files for information about these files.
5. Add or cut user specified include files as required. See User Specified Include Files for information about these files.
6. Click **OK** to close the *Include Files* dialog box.
7. Refer to Creating a Netlist to create the netlist.

Automatically Included Files

To determine the files listed in *Automatically Included Files* , Front End Flow will check all paths, looking for an *include* subdirectory under any *netlist_exp* directory that contains components (the component definitions should always be in an *netlist_exp* directory). If the *include* directory contains a directory for the tool selected in the *Create ADS Front End Netlists* dialog, all of the files within the tool directory will be included in the *Automatically Included Files* list. For example, all of the files located within the directory *<ADS Installation Directory>/netlist_exp/include/calibre* will be included in the list if *<ADS Installation Directory>/netlist_exp* contains components and *calibre* is the selected tool. These files can be manually removed from the list, see Cutting Automatically Included Files.

> **ⓘ Note**
> If new files are added into the directories that have automatically included files, they will show up in the *Automatically Included Files* list the next time the *Create ADS Front End Netlists* dialog is opened.

Normally, the automatically included files will be a part of a design kit, and will contain specific subcircuits necessary for simulation or LVS. These files can also be placed in other directories if there are particular options that must be set for all newly created designs. In the example, the two files, *standard.inc* and *indBox.inc* , were placed in *<ADS Installation Directory>/netlist_exp/include/calibre* , see User Specified Include Files. The two files will be included automatically in every workspace.

Viewing Automatically Included Files

Files within the *Automatically Included Files* list can be viewed by selecting the file to view and clicking the **view** button. This will open the file in the ADS text editor.

Cutting Automatically Included Files

All files that are under the *include* directories will be in the *Automatically Included Files* list until manually removed, see Automatically Included Files.

To remove files from the list, use the following procedure:

1. If not already open, open the *Create ADS Front End Netlists* dialog (from the Schematic window, select **Tools > Netlist Export > Create ADS Front End netlist...**).
2. Select the desired design tool from the **Tool** drop-down list.
3. Click **Modify Include File List**. The *Include Files* dialog box appears.
4. Select the file within the *Automatically Included Files* field to cut.
5. Click **cut** under the *Automatically Included Files* field.
6. Repeat steps 3 and 4 as required. Click **OK**.
   This will remove the selected files from the *Automatically Included Files* list. The removed files will remain removed from session to session. Files can be added back into the *Automatically Included Files* list by using the add procedure.

Adding Automatically Included Files

To add files back into the list (that were previously cut), use the following procedure:

1. If not already open, open the *Create ADS Front End Netlists* dialog box(from the Schematic window, select **Tools > Netlist Export > Create ADS Front End netlist...**).
2. Select the desired design tool from the **Tool** drop-down list.
3. Click **Modify Include File List**. The *Include Files* dialog box appears.
4. Click **add** under the *Automatically Included Files* field. The *Add Automatically*

Included Files dialog box appears (see *Add Automatically Included Files Dialog*).

5. Select the file to include.
6. Click **OK** or **Apply** to add the file.
7. Repeat steps 5 and 6 as required.
   If there are no files left to include, and you click **Apply**, the dialog will automatically be dismissed.

User Specified Include Files

Files that are not in an *include* directory can be selected for inclusion into the netlist by adding these files in the *User Specified Include Files* list. These files can reside in any path. User specified include files are useful for selecting files that need to be included for a one time usage or files that are under test.

Adding User Specified Include Files

To add files into the list, use the following procedure:

1. If not already open, open the *Create ADS Front End Netlists* dialog box(from the Schematic window, select **Tools > Netlist Export > Create ADS Front End netlist**).
2. Select the desired design tool from the **Tool** drop-down list.
3. Click **Modify Include File List**. The *Include Files* dialog appears.
4. Click **add** under the *User Specified Included Files* field. The ADS file browser appears.
5. Select the file to include.
6. Click **OK** in the browser.

> **ⓘ Note**
> Make sure to select the correct file; Front End Flow does not validate the format of the included file. The list of files to include will be stored in a configuration file, so the user specified include file list is maintained between ADS sessions.
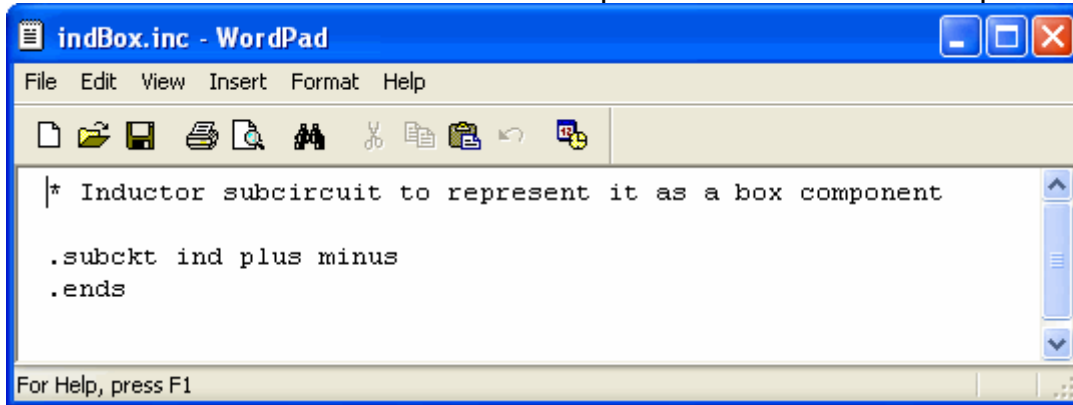
Cutting User Specified Include Files

To remove files from the list, use the following procedure:

1. If not already open, open the *Create ADS Front End Netlists* dialog box(from the Schematic window, select **Tools > Netlist Export > Create ADS Front End netlist**).
2. Select the desired design tool from the **Tool** drop-down list.
3. Click **Modify Include File List**. The *Include Files* dialog box appears.
4. Select the file within the *User Specified Included Files* field to cut.
5. Click **cut** under the *User Specified Included Files* field.
6. Repeat steps 3 and 4 as required. Click **OK**.

Example Include File

For this example the *Include Files* dialog box shown in The Include Files Dialog Box will be used. Click *view* with the *indBox.inc* file selected in the *Include Files* dialog box, will open the file in the text editor, as shown in The indBox.inc file.

The *indBox.inc* file in this example automatically sets the appropriate Calibre options. The file contains Inductor subcircuit to represent it as a box component.

The indBox.inc file

Since *indBox.inc* files has options set within it, you may not want it to be included in the final netlist. That is, the appropriate options are already set by using the options dialog and you do not want the *indBox.inc* options to override them. In this case, cut the *indBox.inc* file from the *Automatically Included File* list, see Cutting Automatically Included Files.

Setting up Options for a Netlist

This section refers to options for a particular tool that are output into a netlist (for example, .Temp=25 in a SPICE netlist). Front End Flow has an options dialog that can be configured for each tool. For information on how to configure the options dialog, refer to the *Netlist Exporter Setup* documentation.

> ℹ **Note**
> Options defined in include files will be set regardless of the settings in the *Options* dialog (see Including Files in Netlists).

Setting Netlist Options

To set or modify netlist options, use the following procedure:

1. If not already open, open the *Create ADS Front End Netlists* dialog (from the Schematic window, select **Tools > Netlist Export > Create ADS Front End netlist**).
2. Select the desired design tool from the **Tool** drop-down list.
3. Click **Modify Option List**.
   A dialog that is specific to the selected tool will be displayed. For information on each option for a specific tool, you must consult the documentation for that tool.
4. Select the options you want contained in your netlist.
5. Click **OK** to close the options dialog.
   The selected options will be saved in the file, < *tool* >.cfg, in the current workspace directory. The options are available for later use.
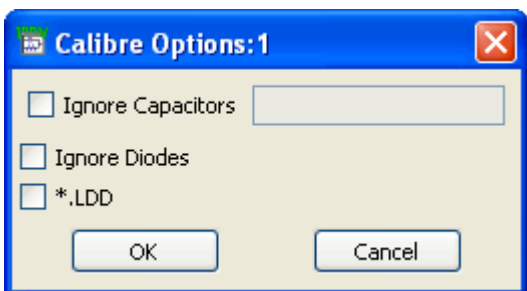
   > **ⓘ Note**
   > The option format in the netlist will be dependent on the tool being used.

6. Refer to [Creating a Netlist](#) to create the netlist.

Setting Netlist Options Example

In this example, the selected tool is Calibre. When the *Modify Option List* button is clicked, the *Calibre Options* dialog box appears (see [Calibre Option Dialog](#)).

Calibre Option Dialog

The *Calibre Options* dialog has been configured to contain only the Calibre netlist options relevant to ADS. In addition, the *Calibre Options* dialog is set up to have dependent options become enabled or disabled based on whether certain options are set.

Each tool's options dialog may have different behavior depending on the approach taken when customizing for your use. For more information, refer to the *Netlist Exporter Setup* documentation.

Click **OK**, to save the selected options in the file, < *tool* >.cfg, in the current workspace directory. The options are available for later use.

The option format in the netlist will be dependent on the tool being used. For Calibre, each option outputs with the line comment character (therefore, for a simulator, the Calibre

options would be seen as comments).