Source Wizard for the BRO Light Source Library

Creating user-specified raysets and source models in ASAP

This technical publication describes the BRO Light Source Library Wizard in the Advanced Systems Analysis Program (ASAP®) from Breault Research Organization (BRO).

The BRO Light Source Library Wizard in ASAP supports your control of coordinate positioning and axis alignment of sources, and facilitates your performing two key functions:

- Constructing raysets for any listed source in either single-wavelength or multiple-wavelength format.
- Generating multiple instances of sources.

The Wizard uses sources that are available in the BRO Light Source Library.

The Light Source Library contains an extensive selection of filament lamps developed for the automotive industry augmented by the D-series automotive arc lamps. The library also includes CCFLs and LED models. For a list of currently available source models, visit the Light Source Library Web page:

http://www.breault.com/software/asap-lightsourcelib.php

To download sources from the Light Source Library from ASAP, users must be current on ASAP maintenance.

Sources are most often added to the library based upon specific customer requests. BRO encourages customer interaction and relies on customer feedback to continually improve the fidelity of the source models offered in the BRO Light Source Library. Please use the Feedback Form link on the Light Source Library Web page.

USING THE WIZARD

The BRO Light Source Wizard may be used when you need to:

- Create user-specified raysets for later use
- Implement source models and predefined raysets in script files
- Include a source from within the Exterior Lighting Test Module (ELTM) in ASAP

The Wizard is launched in ASAP in one of three ways:

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- Selecting a source from the **Sources** tab on the Quick Start toolbar in ASAP,
- Selecting **Rays> Use BRO Light Source Wizard** from the ASAP menu, or
- Selecting the **Sources** button on the **Geometry** tab of the ELTM dialog box.

Click the Help button on any dialog box of the Wizard for information.

When the Welcome dialog box of the BRO Light Source Library Wizard is displayed, select a source library file by part name from the drop-down list. See Figure 1.

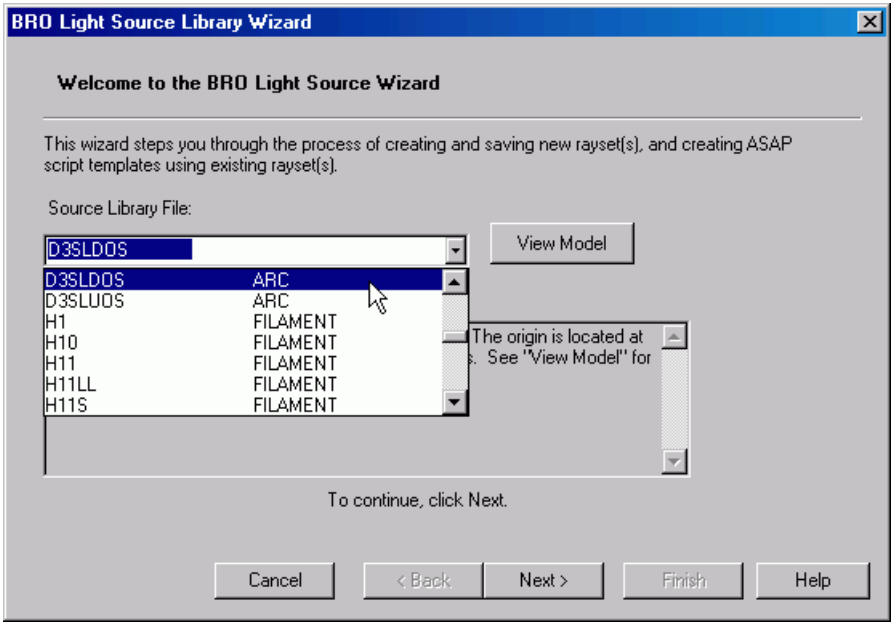

Figure 1 Selecting a source on the Welcome dialog box of the Wizard

When a source library file is selected, a short description of the source is displayed below the list.

Click **View Model** if you want to view the specification and a picture of the selected source, and then click **OK** to return to the Welcome dialog box.

Click **Next** to move to the Rayset Creation Setup dialog box.

Selecting a rayset

You have three choices on the Rayset Creation Setup dialog box. See Figure 2.

- Step 1 – Create and save new rayset(s)

Use to create and store rayset(s) for future use. See “Step 1: Create and save new rayset(s)” on page 3.

- Step 2 - Write ASAP script commands to template using existing rayset(s)

Use a rayset(s) file that was previously created by Step 1.

See “Step 2: Writing Script Commands to A Template” on page 8.

STEP 1: CREATE AND SAVE NEW RAYSET(S)

Select Step1 on the Rayset Options dialog box of the Wizard. Click **Next**. See Figure 2.

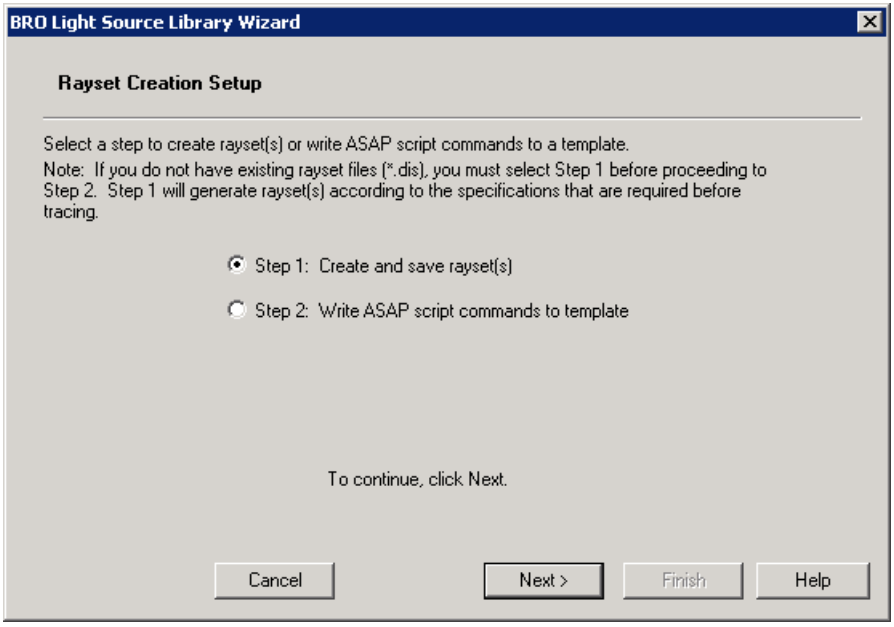

Figure 2 Selecting the step to create and save raysets

Create raysets

On the Source Geometry Setup - Create Raysets dialog box, select either **Single Wavelength** or **Multiple Wavelengths**. Single wavelength is the default. The fields on this dialog box change depending on which format you select.

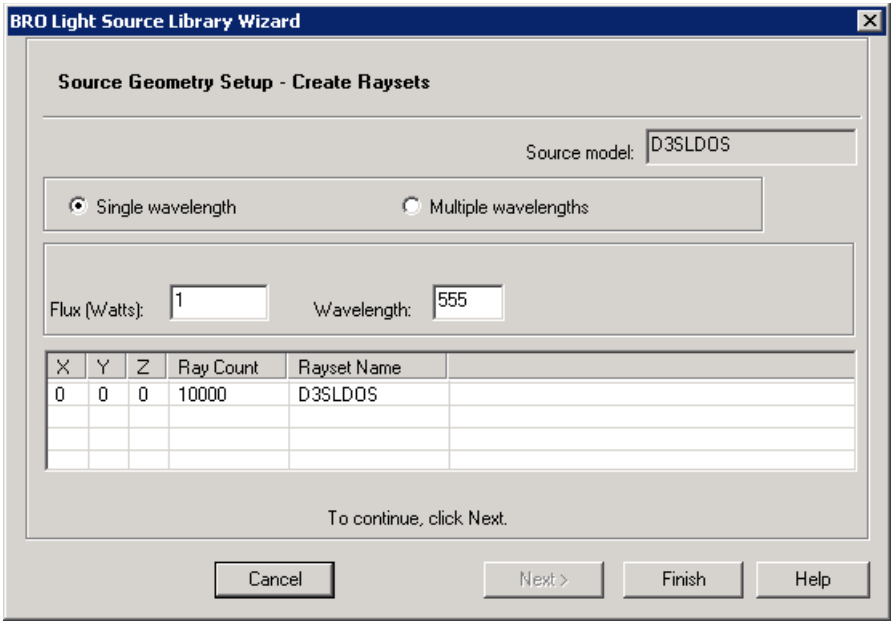

Figure 3 Create raysets in either the single or multiple wavelengths

SINGLE WAVELENGTH FORMAT

In single wavelength format, one rayset file is created for the selected source. See “Single wavelength Sources” on page 13 in the Appendix.

Complete the requested input for this format. See Figure 3. Click **Help** on this dialog box for information. Click **Finish** to complete Step 1. A rayset file is created that may be used later for Step 2.

MULTIPLE-WAVELENGTH FORMAT

In multiple-wavelength format, a separate rayset is created for each user-selected wavelength.

See "Saving sources" on page 13 in the Appendix for the rayset naming convention.

Complete the requested input. See Figure 4.

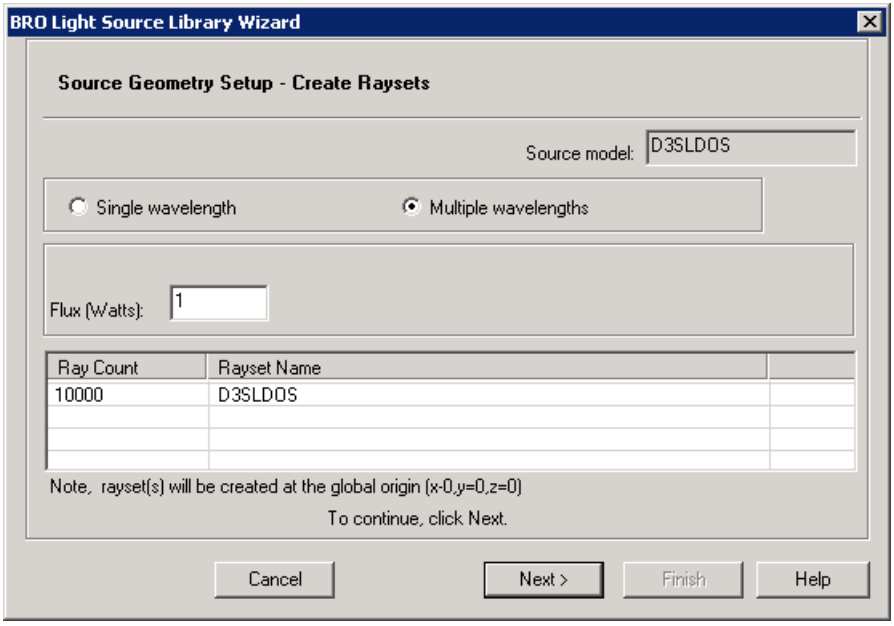

Figure 4 Completed input for multiple wavelengths

Some options on the Create Raysets dialog box have default settings that you can override.

The spectral intensity for filament sources is determined from a blackbody curve for the specific color temperature.

Click **Next** to move to the Spectral Selection dialog box.

SPECTRAL SELECTION IN MULTIPLE-WAVELENGTH FORMAT

The Wizard displays a Lamp Spectra chart for multiple wavelengths. See Figure 5. At this point, the Wavelength table on the right is empty.

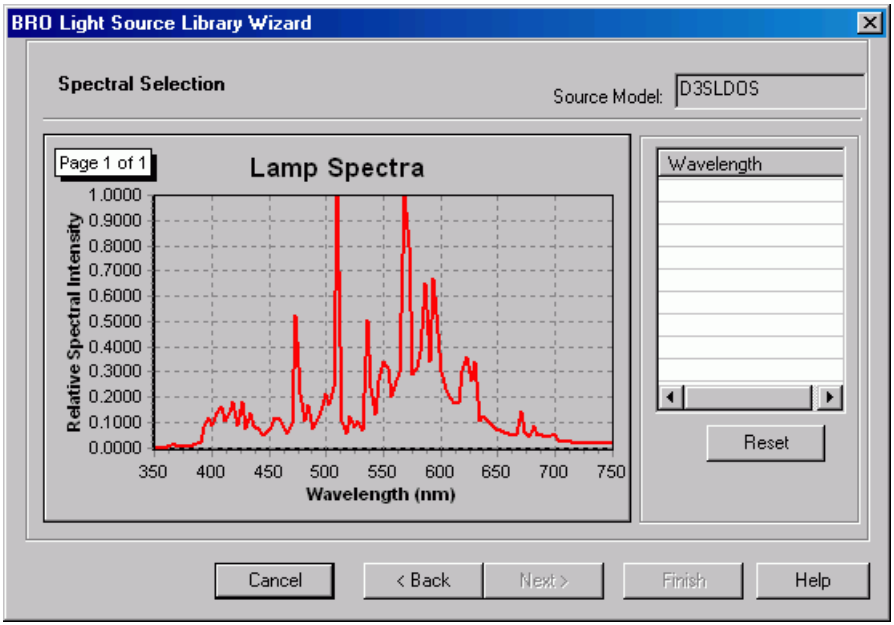

Figure 5 Results of wavelength and spatial intensity

Double-click each wavelength on the Lamp Spectra chart that you want to add to the Wavelength table, or double-click a row in the Wavelength table and enter the numerical wavelength in the selected row. See Figure 6. Click **Help** on this dialog box for information.

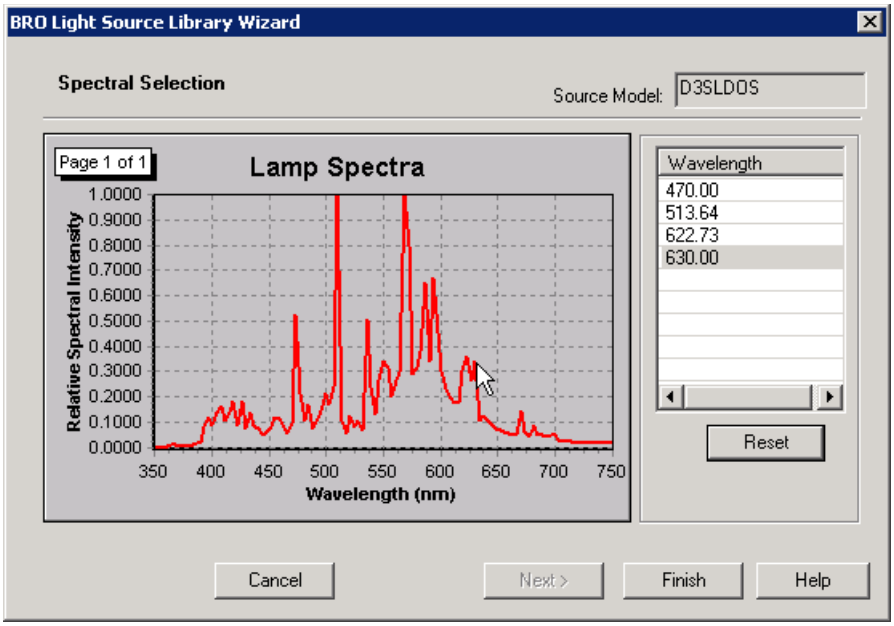

Figure 6 The cursor on the chart corresponds to the 630 wavelength in the table

See "Saving sources" on page 13 in the Appendix.

Click **Finish** to complete Step 1. Rayset file(s) are created for each selected wavelength, and these files may be used for Step 2.

If you selected a dual filament bulb (for example, B1154), you are prompted to choose either the high (H) or low (L) filament. See Figure 7.

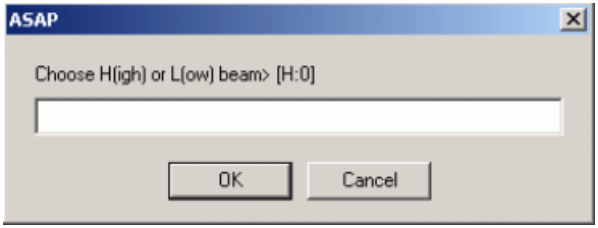

Figure 7 Filament bulb requiring user input for high or low beam

STEP 2: WRITING SCRIPT COMMANDS TO A TEMPLATE

Select Step 2 on the Rayset Creation Setup dialog box to create a macro template, and click **Next**. See Figure 8.

If you select Step 2, the Wizard requires an existing rayset file (*.dis), which results at the completion of Step 1.

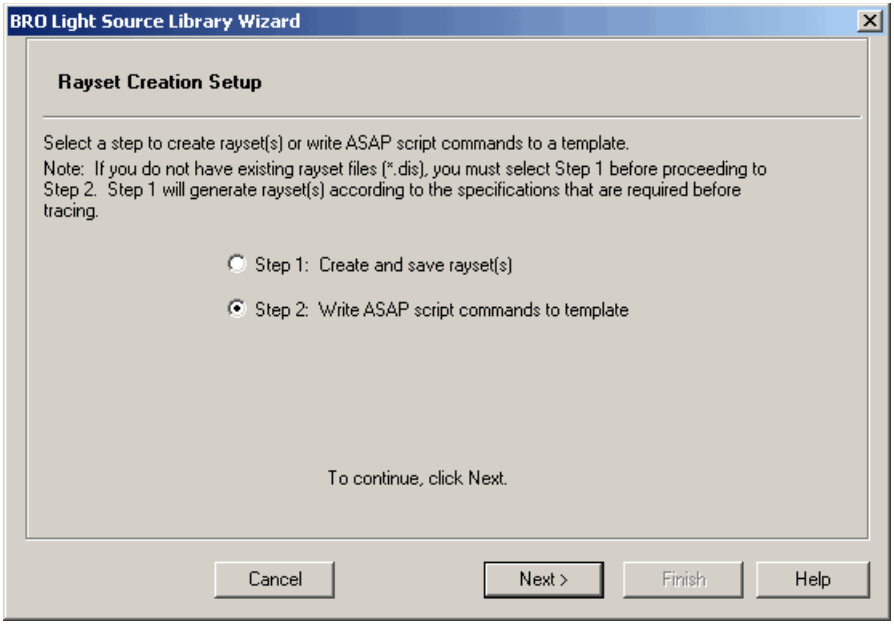

Figure 8 Selecting Step 2 on the Rayset Creation dialog box

ASAP builds source geometry by running a macro. See "Template macros" on page 15 in the Appendix.

Enter a script template name

Enter a template name on the ASAP Script Template Entry dialog box. The template name defaults to the name of the currently selected source. See Figure 9.

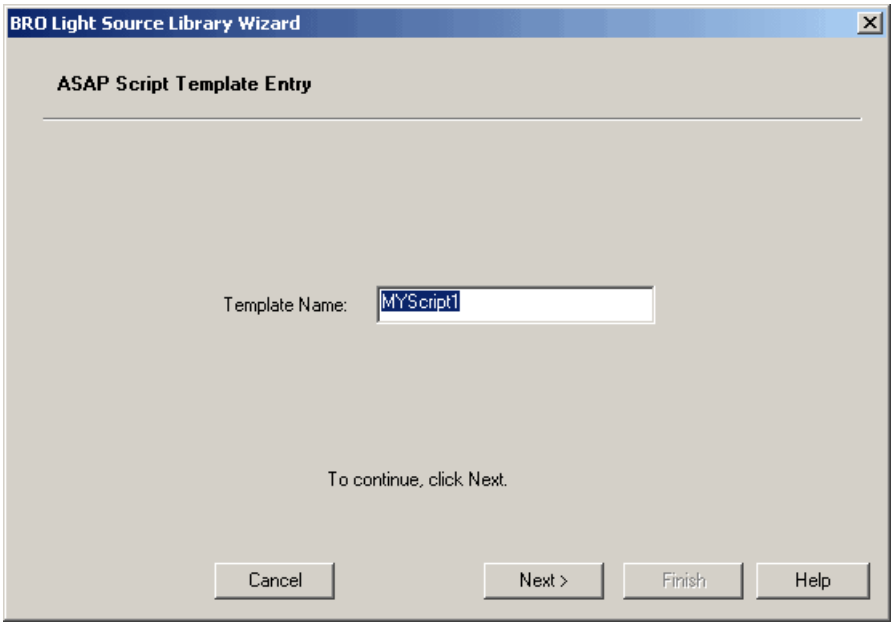

Figure 9 A script template name is entered in Step 2

Click **Next** to move to the dialog box, Source Geometry Setup - Write ASAP Script.

Select rayset(s)

On the dialog box, Source Geometry Setup - Write ASAP Script, enter information for each available input. Default values may be changed. See Figure 10.

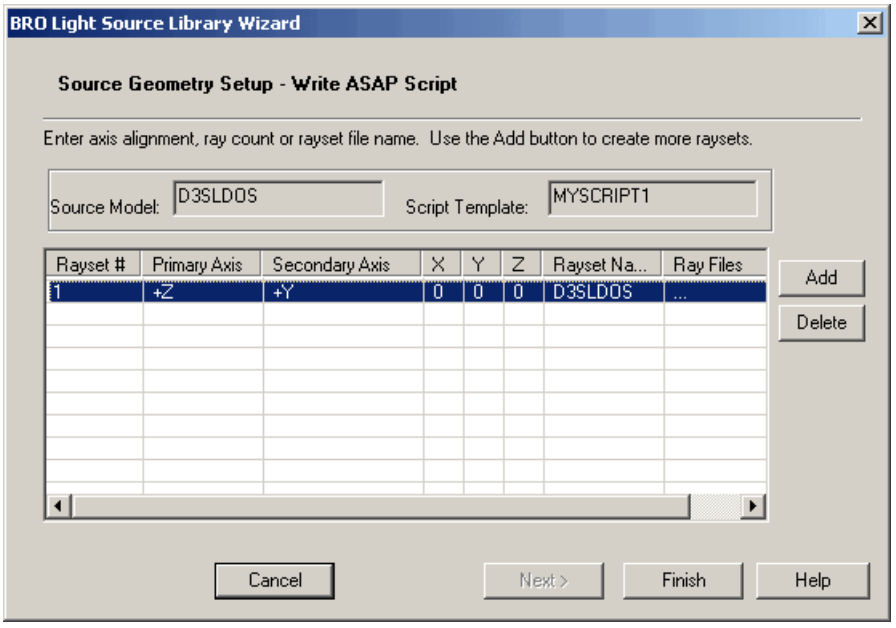

Figure 10 Source geometry is entered for writing to an ASAP script

Click **Add** to add source instances. Click **Delete** to delete source instances. See Figure 11.

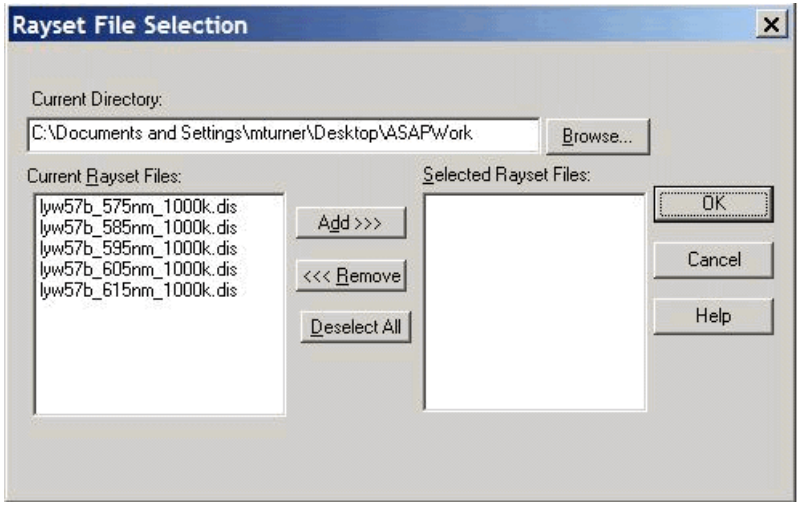

Figure 11 Adding a rayset file to the list of selected files

To browse to other ray files, double-click a cell in the **Ray Files** column.

For dual filament bulbs, add an H (high) or L (low) to the end of the rayset name.

You may enter a wildcard name in the Rayset Name column to search for DIS files in your working directory. For example, entering an asterisk (*) displays all DIS files in your working directory. Refining your entry to include a specified name string followed by an asterisk, such as myrayset*, narrows your search. You must enter a rayset name before selecting the ray files.

Click **Finish** to complete Step 2. If you have an existing template by the same name, you are prompted about overwriting it. The results of a rayset file search are displayed in an Editor window.

A template macro file (*.int) is created and automatically opens in the ASAP Editor window. See Figure 12.

You can insert the contents of a template file into an ASAP script file (*.inr) by selecting File> Template> Import on the ASAP menu bar and selecting the *.int file.

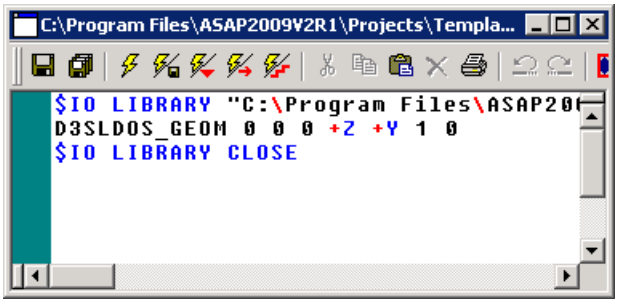

Figure 12 Template file (*.int) in the ASAP Editor

See "Template macros" on page 15 in the Appendix to learn about macro functions for the macro <partnumber>_GEOM.

APPENDIX

Source flux

When you use the multiple-wavelength format in the ASAP Light Source Library Wizard, you must assign a flux value to all sources. Total flux is apportioned to the selected wavelengths during the ray creation process in accordance with a stored spectral curve and displayed during Step 1. Since libraries no longer contain preset flux values, a manufacturer's datasheet should be consulted in each case.

Spectral data for all filament sources is derived from the blackbody distribution, and therefore in radiometric units of Watts. Bulb manufacturers typically provide no spectral data for filament sources, choosing instead to specify lamp output in terms of only color temperature. All other sources in the BRO Light Source Library (arc lamps, CCFLs, and LEDs) are assumed to be in photometric units of lumens. The human eye response curve is implicit in photometric units such as the lumen. Since calculation and display of CIE data requires application of color matching functions that also describe human eye response, CIE calculations performed with photometrically-weighted source spectra will necessarily give erroneous results. Use lumen values during Step 1 if no CIE analysis is anticipated, or if the source model is a single wavelength.

Monte Carlo ray tracing in ASAP is a random process governed by Poisson statistics. Consider carefully the solid angle into which the source is radiating along with sampling requirements before selecting ray count. Statistical noise can lead to unexpected results. For a source to be accurately represented, more than a few million rays are usually required.

Saving sources

MULTIPLE-WAVELENGTH SOURCES

Table 1 Naming multiple-wavelength source files

File name	<filename>_<wavelength>NM_<group total number of rays (in thousands)>.dis
Example	MYPW09_450NM_5000K.DIS MYPW09_520NM_5000K.DIS MYPW09_611NM_5000K.DIS
Note	Multiple wavelength rayset files may be used singly or as a group, with the understanding that fluxes were initially weighted according to predefined spectral data.

SINGLE WAVELENGTH SOURCES

Table 2 Naming single-wavelength source files

File name	<filename>_<wavelength>NM_<total number of rays (in thousands)>.dis
Example	MYW3W_532NM_2000K.DIS
Note	Users may assign any wavelength to single wavelength sources after finishing the Light Source Library Wizard in the single wavelength format.

For dual filament bulbs, <filename> includes H (high) or L (low).

Saving spectral data files

During the course of Step 1 for the multiple-wavelength format, ASAP creates temporary files that contain spectral data. These files are automatically deleted upon completion of Step 1. If you want to preserve these files for

other purposes, they can be generated by one of the methods shown in Table 3.

Table 3 Methods for saving files in Step 1 in the Wizard

Filaments: $IO LIBRARY <partnumber> SETSPEC colortemperature <partnumber>_CALC_SPEC $10 LIBRARY CLOSE	Source spectral data is stored in the file, <partnumber>_CALC_SPEC with extensions DIS, DIN, and TXT
Arc Lamps and CCFLs: $10 LIBRARY <partnumber> <partnumber>_CALC_SPEC $IO LIBRARY CLOSE	
LEDs: $I0 LIBRARY <partnumber> SETSPEC 0 <partnumber>_CALC_SPEC $10 LIBRARY CLOSE	

Template macros

ASAP builds source geometry by running the macro <partnumber>_GEOM, called from the ASAP library file <partnumber>.lib, which is in the <asap install >\Projects\LightSource directory. The functions of this macro are:

- units, media, coatings, and scatter model assignments
- object creation
- faceting and computation of emitting object areas
- load source spectral content

partnumber_GEOM a b c d e f g

where

- a = x-coordinate of datum
- b = y-coordinate of datum
- c = z-coordinate of datum
- d = Primary axis (+X,+Y,+Z,-X,-Y,-Z)
- e = Secondary axis (+X,+Y,+Z,-X,-Y,-Z)
- f = Copy number (1….n)
- g = set to zero in all templates

ASAP recalls existing raysets by running the macro PLACERAYS, called from the ASAP library file <partnumber>.lib found in the <asap install>Projects\LightSource directory. This macro creates an ASAP source using **`EMITTING DATA`** from existing rayfiles *.dis, assigns its wavelength, and then performs the required translation and orientation operations.

`PLACERAYS a  b c d e f g`

where

- a = x-coordinate of datum
- b = y-coordinate of datum
- c = z-coordinate of datum
- d = Primary axis (+X,+Y,+Z,-X,-Y,-Z)
- e = Secondary axis (+X,+Y,+Z,-X,-Y,-Z)
- f = Ray distribution file name
- g = Wavelength in nm