OFFSCALE: A PC Input Processor for the SCALE Code System

The CSASIN Processor for the Criticality Sequences

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ABSTRACT

OFFSCALE is a suite of personal computer input processor programs developed at Oak Ridge National Laboratory to provide an easy-to-use interface for modules in the SCALE-4 code system. CSASIN (formerly known as OFFSCALE) is a program in the OFFSCALE suite that serves as a user-friendly interface for the Criticality Safety Analysis Sequences (CSAS) available in SCALE-4. It is designed to assist a SCALE-4 user in preparing an input file for execution of criticality safety problems. Output from CSASIN generates an input file that may be used to execute the CSAS control module in SCALE-4. CSASIN features a pulldown menu system that accesses sophisticated data entry screens. The program allows the user to quickly set up a CSAS input file and perform data checking. This capability increases productivity and decreases the chance of user error.

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1 INTRODUCTION

The Criticality Safety Analysis Sequence (CSAS)¹ control module in the SCALE-4 code system² offers a variety of calculational sequences for performing criticality safety analyses. These sequences activate the cross-section processing codes BONAMI and NITAWL-II to provide resonance-corrected cross sections. Control sequences ending with "X" utilize the one-dimensional (1-D) discrete-ordinates XSDRNPM code to provide cell-weighted mixture cross sections. ICE is used by CSASI and CSASIX to provide a Monte Carlo formatted mixed cross-section library. KENO V.a uses the processed cross sections and calculates the effective neutron multiplication factor (k-effective) of the system. Criticality search capability is achieved by repeatedly activating the control module MODIFY to alter the pitch or other dimensions, and the functional module KENO V.a to calculate the k-effective for the new pitch or dimensions. The sequences are listed in Table 1.1 with the modules they invoke and the function they perform.

Although CSAS was designed to provide an improved interface for executing several of the SCALE-4 functional modules, the number of input parameters and options can be overwhelming for the new or occasional user. The types of input data include materials descriptions, cross-section processing parameters, and geometry descriptions. To provide the program with a user-friendly interface that would be easy to learn and useful for most applications, a personal computer (PC) input processor named CSASIN (formerly known as OFFSCALE) has been developed. CSASIN is a program designed to assist a SCALE-4 user in preparing an input file for any of the criticality sequences contained in the CSAS criticality control module of SCALE-4 and is part of the OFFSCALE suite of PC

input processors. The purpose of OFFSCALE is to provide updated easy-to-use interfaces to a wide range of SCALE users. Development of OFFSCALE separate from SCALE-4 prevented the need for major changes to the established and tested input routines currently used by SCALE-4.

The CSASIN program is written in Microsoft BASIC 7.1 (Ref. 3) and runs on an MS-DOS-based PC. CSASIN generates a card-image input file that may be used to execute the CSAS control module. CSASIN features a pulldown menu system similar to those in many commercial PC software products. The menu system organizes the major command categories as menu titles and pulldown commands, and may be used with either a keyboard or a mouse.

When an option is selected from the menu system, an input screen or series of input screens are displayed. Each field on a screen has a help message associated with it that may be displayed by pressing a function key. The message gives a brief description of the input parameter and occasionally refers to a section of the SCALE-4 manual² for more detailed information. This method minimizes the amount of time that might be used searching through the documentation when setting up a CSAS input file. Some fields have a multiple-choice menu associated with them. These menus minimize the possibility of input errors by providing a complete list of valid choices for given parameters. Depending on input options selected, the program protects other fields that are not needed for those options. CSASIN performs extensive error checking for each input screen and displays appropriate warning and error message boxes when applicable.

Table 1.1 CSAS criticality sequences

Sequence	Function	Functional modules executed by the control module					
CSASI	Monte Carlo format mixed cross-section library	BONAMI	NITAWL-II		ICE		
CSASIX	Monte Carlo format mixed cross-section library ^a	BONAMI	NITAWL-II	XSDRNPM	ICE		
CSASN	Resonance-corrected cross-section library	BONAMI	NITAWL-II				
CSAS1X	1-D criticality calculation ^a	BONAMI	NITAWL-II	XSDRNPM			
CSAS25	3-D criticality calculation	BONAMI	NITAWL-II		KENO V.a		
CSAS2X	3-D criticality calculation ^a	BONAMI	NITAWL-II	XSDRNPM	KENO V.a		
CSAS4	3-D criticality with search	BONAMI	NITAWL-II		KENO V.a	MODIFY ^b	
CSAS4X	3-D criticality with search ^a	BONAMI	NITAWL-II	XSDRNPM	KENO V.a	MODIFY ^b	

^aProduces and/or uses cell-weighted cross sections.

^bMODIFY is a control module.

2 GETTING STARTED

To install CSASIN, make a directory on your hard disk where CSASIN will reside by using the DOS MKDIR command:

```
MKDIR \CSASIN
```

Next, change to that directory:

```
CHDIR \CSASIN
```

Then place the CSASIN distribution diskette into drive A or B:

```
COPY A:\CSASIN\*.*
```

This will install all the CSASIN files. To execute the program, enter the program name:

```
CSASIN
```

The easiest way to learn how to use CSASIN is to read through the rest of the documentation while running the program so you can use the options and keys as you read about them. The following two sections, "Using the Menu System" and "Using the Input Screens," give an over-view of how to use the program. Following those sections is a detailed description of how to use each of the menu options.

3 USING THE MENU SYSTEM

After paging through the introductory screen, you reach the CSASIN pulldown menu system. The menu system contains a menu bar across the top of the screen. Under each menu bar option there is a unique pulldown menu. The menu bar options are summarized below.

Files	Options to retrieve or save files or quit the program
MIPLIB Data	Options to input Material Information Processor (MIP) library data
KENO Data	Options to input KENO V.a data
Search Data	Options to input data for criticality searches in CSAS4 or CSAS4X

When CSASIN begins, it presents the Files pull-down menu. You may scan across the menu bar by using the left and right arrow keys. You may select an option from a pulldown menu by using the up and down arrow keys. A description of the highlighted option will appear on the bottom line of the screen. To execute the option, simply press the <Enter> key or the highlighted letter (known as the "hot key") of the desired option.

The mouse may also be used to select an option by moving it left or right along the menu bar or up and down on a pulldown menu. To choose a pulldown menu command, simply move the mouse cursor over the desired option and click the left mouse button. Some users may prefer to "drag" the mouse (holding the left mouse button) over the menus and then release the left button when the cursor is over the desired command. One difference between the two methods of using the mouse is that dragging the mouse will cause the description of the highlighted option to be displayed on the bottom of the screen as when using the keyboard.

Some pulldown menu commands are black with a hot key, while others are gray. The black commands are active; the gray commands are inactive and will produce no effect if selected. Commands will be activated as necessary data are entered. For example, once the MIP data are entered, the standard composition options are active. Most of the options will become active when CSASIN files are retrieved.

4 USING THE INPUT SCREENS

Once an option is selected, an input screen or series of input screens will be displayed. The cursor will appear at the first data field on the screen which is not protected. Fields may be protected by the program, depending on the input options selected. For example, on the Basic Standard Composition screen, if "Default density" is "Y," the density field is protected. To move from one field to the next, press <Enter> or <Tab>. To move backward to the previous field, press <Shift+Tab> or <Backspace>. The cursor must be at the beginning of the field for <Backspace> to move to the previous field, because within a data field it moves back one space and deletes the previous character. You may also change fields with the arrow keys, but the movement will be somewhat erratic as the cursor skips fields if there is more than one field per screen line. <Home> moves the cursor to the beginning of the field, and <End> moves to the end of the field. The <Ins> and <Del> keys perform their normal functions for editing a field. <Ctrl+Home> moves the cursor to the first field on the screen, and <Ctrl+End> moves the cursor to the last field. <PgUp> and <PgDn> may perform the same respective functions, if they are not active functions listed on the bottom of the current input screen.

Some fields have a multiple-choice menu associated with them. Pressing <Enter> or the Space Bar at one of these fields will activate the multiple-choice menu. When this menu is displayed, all other processing and function keys are disabled until a

choice is selected and the menu disappears from the screen. Pressing a letter on the keyboard will move the cursor to the next choice which begins with that letter. If there is not a choice which begins with that letter, the cursor moves to the beginning of the list. The up and down arrow keys, <PgUp>, <PgDn>, or the mouse may be used to make a selection. <Home> moves the cursor to the first choice, and <End> moves the cursor to the last choice.

Logical (YES or NO) fields use "Y" and "N," unless otherwise noted. No other values will be accepted. You may type "Y" or "N," or you may toggle between the two choices with the space bar.

Most fields have a help message associated with them. Pressing <F1> displays the message. Often the message will refer to a section of the SCALE manual for more detailed information. Press <Enter> or <Esc> to remove the message from the screen. If there is no message for a particular field and it is one of several identical fields on a screen, try moving the cursor to the first of these fields on the screen and pressing <F1>. For the KENO geometry screens, the help messages are only active for the first screen of each geometry unit.

Title and comment fields must be entered whenever they appear on an input screen. Delimiters are automatically provided by CSASIN and should not be input by the user.

5 MENU SYSTEM OPTIONS

The purpose of this section is to present an overview of the menu system commands. Menu bar options are presented next to square bullets; corresponding pull-down commands are listed next to round bullets. The underlined letter in commands discussed below represents the hot key for the command; these hot keys appear on screen as bright letters, and they allow immediate access to an item by pressing the highlighted key.

■ Files

The Files menu allows you to retrieve and save files and to exit the program.

● Retrieve Files

This option allows you to retrieve random-access files that you have previously saved with CSASIN. A random-access file is saved for each pulldown menu option for which data are entered. Each random-access file for a problem has the same file name as specified by the user but a different file extension designated by CSASIN. A listing of these file extensions is given in Table 5.1. CSASIN presents a list of all files in the current directory that have the ".MIP" file extension (this random access file is always required). When you select the desired file name, CSASIN loads all files with that file name and one of the extensions listed in Table 5.1. The program copies the files to a set of temporary files, OFFTEMP.* (i.e., file extensions remain the same). If you wish to retrieve only a portion of the CSASIN files associated with a SCALE input file you have previously generated (e.g., the standard composition data), rename or copy those files using the same file extensions. Two sets of sample files have been provided on the distribution diskette. The naming conventions are SAMPLE2.* and SAMPLE3.* and correspond to Sample Problems 2 and 3, respectively, in Sect. C4.B of the SCALE manual. These sample problems are discussed in detail in Sect. 6 of this document.

● Save Files / Input Deck

This option saves the data you have entered in random-access files which can later be retrieved by the program for modification. A card-image SCALE input file is also generated. CSASIN will not save files unless sufficient data have been entered to generate a meaningful SCALE input file. A random-access

Table 5.1 CSASIN random access files

CSASIN file extensions	Contents	Corresponding SCALE Manual section No.
.ARB	Arbitrary material (ARBM) compositions	C4.4.4
.ARR	KENO V.a arrays	F11.4.5
.AUX	Auxiliary criticality search commands	C4.4.10.2
.BIA	KENO V.a biasing data	F11.4.7
.BND	KENO V.a boundary condition (albedo) data	F11.4.6
.GEO	KENO V.a geometry data	F11.4.4
.LAT	LATTICECELL data	C4.4.6
.MIP	Material Information Processor options	C4.4.3
.MOR	MORE DATA input	C4.4.8
.MUL	MULTIREGION data	C4.4.7
.PAR	KENO V.a parameter data	F11.4.3
.PLO	KENO V.a plot data	F11.4.11
.SEA	Criticality search data	C4.4.10.1
.SOL	Solution compositions	C4.4.4
.STA	KENO V.a neutron starting data	F11.4.8
.STD	Basic standard compositions	C4.4.4

file will be saved for each menu option used to input data, up to a maximum of fifteen files. CSASIN will prompt you for the file name for the CSASIN files and the file name and the extension for the card-image SCALE input file. If files with these names already exist, CSASIN will ask if you want to overwrite these files.

● Save Partial Files

This option saves random-access files, regardless of the amount of data entered. It does not generate a card-image SCALE input file. This option is designed to allow you to occasionally save input data so that they will not be lost if the program terminates abnormally. Note that if CSASIN does fail, the data entered still exist in the OFFTEMP.* files. When CSASIN is restored, it will notify you that it has detected these files and will give you an opportunity to rename and save them.

• Quit

This option terminates the program. If you have selected any option other than retrieving or saving files immediately prior to this option, the program will verify if this is what you want to do. Since this option does not save files, you may also use it to cancel any changes you have made since the last time you saved files.

■ MIPLIB Data

The **MIPLIB Data** menu provides selections to input the information required by the Material Information Processor in SCALE. These data include the criticality sequence, the cross-section library, material compositions, and unit cell descriptions.

• MIP Data

This option is the only active option other than Retrieve Files when you enter the program. It includes such basic information as the desired CSAS sequence, PARM=, MIP title card, cross-section library, and unit cell calculation type. Use <F4> to cancel or <F10> to save the data and return to the main menu. When you select a cross-section library, CSASIN compiles a list of all the valid nuclides for that library in the Standard Composition Library. This list will be used for Standard Composition input. If you change cross-section libraries after compositions have been entered, CSASIN will check if the compositions previously entered are valid for the new cross-section library. If a composition is no longer valid, a warning message will be printed and that composition name will be erased. All the other data for that composition will be kept, but you must select a new composition name from the list of valid choices.

• Basic Standard Compositions

This option displays one screen and a second optional screen. The first screen contains the data for one basic standard composition. To page through the data for additional compositions, press <F10> to move forward to the next composition and <F9> to move backward to the previous composition. If any changes have been made to the data for a composition, they are saved when you press <F9> or <F10>. To avoid

saving changes on the screen, you can press <F4> to return to the main menu system. CSASIN will ask whether to save the changes on the screen before returning.

The screen initially displayed when you enter this option is for a new mixture with a mixture number one greater than the highest mixture number used in any of the existing compositions. To view mixtures already created, use the <F9> key to move backward as explained above. Notice that CSASIN automatically increments the mixture number for you as you page forward to a new mixture. You may override this mixture number with another if you want to have two compositions with the same mixture number or you want to skip a mixture number (e.g., if you wanted to use it for an arbitrary material). You may review mixtures that you have already made by pressing <Ctrl+R>. This will display a list of mixture numbers and composition names. To remove the list from the screen, press <Enter> or <Esc>.

If you want to create a new composition that is very similar to one you have previously entered, you may page back to the old one and enter a new mixture number, and CSASIN will recognize that you are creating a new composition rather than modifying an old one. Once a composition has been created in CSASIN, you can change the composition name to replace it with a different composition using the same mixture number or you can delete it by pressing <Ctrl+D>. CSASIN will ask you if you want to delete the current composition.

The number density field is protected unless the density multiplier has been entered as zero and the composition is a single nuclide. This feature is consistent with SCALE input requirements.

The second screen is only available for multiple-isotope nuclides (e.g., UO₂, BORON, B₄C, etc.). It contains the isotopic distribution by wt %. To move between the first and second screen, use the <PgDn> and <PgUp> keys. The SCALE default distribution, which is natural for all nuclides except plutonium, will be displayed initially. The distribution must sum to 100%. The <F2> key may be used to calculate the balance for the isotope where the cursor is positioned after the values for all other isotopes have been entered.

Options

● Arbitrary Materials

This option displays two screens for each arbitrary material defined and a third optional screen if a multiple-isotope nuclide is input. These screens function similarly to the Basic Standard Composition screens described above. If you specify that there is a multiple-isotope nuclide (SCALE allows only one per arbitrary material), it must be the first nuclide entered on the second screen. CSASIN will present you with a different multiple-choice menu containing only the multiple-isotope nuclides for that field. The nuclide distribution on the second screen will be by atoms per molecule if you specify the material as a compound. Otherwise, the distribution will be by wt %. <Ctrl+D> and <Ctrl+R> on the first screen and <F2> on the second and third screens function as they do for Basic Standard Compositions.

● Solutions

This option displays two screens very similar to those for Basic Standard Compositions. The second screen is not optional, because all the solutions contain multiple isotopes. Note that the specific gravity field is optional and may be left blank. <Ctrl+D> and <Ctrl+R> on the first screen and <F2> on the second screen function as they do for Basic Standard Compositions.

● Review Mixtures Made

This option displays a list of mixture numbers and composition names for compositions which have been created. This function may also be performed by pressing <Ctrl+R> at the main menu or while using screens which require mixture numbers: Basic Standard Compositions (screen 1), Arbitrary Materials (screen 1), Solutions (screen 1), Unit Cell Data, MORE DATA (screen 2), Geometry, Starting, and Plot. To remove the list from the screen, press <Enter> or <Esc>.

● Unit Cell Data

The screens displayed by this option will depend on the unit cell type selected under the MIP Data option. There is one screen for the LATTICECELL option and two for the MULTIREGION option. Certain fields may be protected, depending upon your entries in other fields. This option will not be active for

INFHOMMEDIUM unless a sequence which executes XSDRNPM is selected.

● MORE DATA

This option displays one screen and a second optional screen for Dancoff factors. Most of the fields are options for the 1-D discrete-ordinates code XSDRNPM which calculates cell-weighted cross sections. Therefore, most of the fields are protected for CSAS sequences which do not execute XSDRNPM. This option may be bypassed if no XSDRNPM parameters are to be overridden and additional Dancoff input data are not necessary.

■ KENO V.a Data

The KENO V.a Data menu provides selections to enter all the KENO input. This menu will only be active if a CSAS sequence that executes KENO is selected and any required unit cell data have been entered. Parameters and Geometry are the only options for which data are always required if a CSAS sequence that executes KENO is selected.

● Parameters

This option displays two screens. The first screen contains the numeric parameters for controlling KENO. The second screen contains the logical parameters (YES or NO) and the logical unit numbers for SCALE input/output datasets. The parameter values are initially set to the SCALE default. Only the parameter values that are changed from default will be included in the SCALE card-image input file. The logical parameters are turned on and off by "Y" and " ", respectively. The blank was chosen to make it easier for the user to see which logical parameters are on.

● Geometry

This selection displays a maximum of five screens per KENO geometry unit. Each screen displays a maximum of 7 geometry region entries (e.g., ARRAY, CUBOID, HOLE, REPLICATE, etc.) for a maximum of 35 geometry region entries per unit. Note this limit does not exist in the CSAS or KENO modules, but only in CSASIN. There is no limit to the number of geometry units per problem. To make the screen as readable as possible, CSASIN only displays fields

for the regions where data have been entered plus one for the next region to be entered. As additional regions are entered, colors and fields are displayed for them. The remainder of the screen appears black. When a geometry type is entered for a region, the remaining fields appropriate for that geometry type are displayed for that region. For example, if CYLINDER is selected the dimensions R, +H, -H are displayed, and if CUBOID is selected the dimensions +X, -X, +Y, -Y, +Z, -Z are displayed. Because the same field may represent one parameter for one geometry type and a different parameter for another geometry type, most of the help messages cover multiple conditions and must be interpreted accordingly.

Four options may be used when the cursor is on the Geom field. To select or change the Geom field, simply select a geometry type from the multiple-choice menu. To erase unwanted geometry regions at the end of a unit, press <Ctrl+E> when the cursor is on the Geom field for that region. To insert a geometry region, press <Ctrl+P> to put a new region before the current one. To delete a geometry region followed by other regions, press <Ctrl+T> to take it away.

Dimension checking is performed within each region to ensure that the "+" dimension is greater than the "-" dimension. The dimensions are not required to be either positive or negative. No dimension checking is performed between adjacent regions to verify that each region fits within the region which follows. Due to the large number of geometrical types, the complexity of this task is beyond the scope of CSASIN.

NOTE: It is recommended that SCALE be executed with PARM=CHK to check for geometrical inconsistencies.

To page between units, use the <F9> and <F10> keys as you did in the Basic Standard Compositions. If any changes have been made to the data for a unit, they are saved when you press <F9> or <F10>. To avoid saving changes on the screen, you can press <F4> to return to the main menu system. CSASIN will ask you if you want to save the changes on the screen before returning. CSASIN automatically increments the unit number for you as you page forward to a new unit. You may override this unit number with another. If you want to create a new unit that is very

similar to one you have previously entered, you may page back to the old one and enter a new unit number, and CSASIN will recognize that you are creating a new unit rather than modifying an existing one. To delete an entire unit, press <Ctrl+D>.

If there are more than seven regions in a geometry unit, the program will automatically move to the next screen when the cursor advances beyond the last field on the current screen. You may also move between different screens for the same unit by using the <PgUp> and <PgDn> keys. <Ctrl+R> may be used to obtain a list of valid mixture numbers.

• Arrays

Input is required for this option if ARRAY is used in your geometry input. Arrays displays a maximum of two screens per array. You can page between arrays using the <F9> and <F10> keys as in the compositions and geometry input screens. <PgUp> and <PgDn> move between the first and second screen for each array. <Ctrl+D> may be used to delete an array. FILL or LOOP may be used to enter the orientation description. Be sure that you terminate the orientation description with END FILL or END LOOP, respectively. Because of the complexity of trying to read and interpret the free-form input for these options, CSASIN does not check for errors in the orientation description. It simply requires that at least one line of orientation input be entered for each array.

• Biasing

This option is designed to specify a material ID from the KENO V weight library and a corresponding range of bias IDs. Checks are performed to ensure that the number of bias IDs does not exceed the number of intervals for that material ID in the weight library. These data should be entered prior to entering the bias IDs in the Geometry option, since an error check is performed in the Geometry option for valid bias IDs.

• Boundary Conditions

This option allows you to specify the albedo boundary conditions for the outermost region of your KENO problem. A multiple-choice list is provided for each of the six faces. VACUUM is the default for all faces.

Options

● Starting

This selection allows the use of the special start options for controlling the initial neutron distribution in KENO. It supports all starting options except option NST=6, which is omitted due to its complexity. Certain fields will be protected based on the starting option chosen.

● Plot

This option displays one screen per plot with an internally generated plot number in the upper right-hand corner so that you always know which plot you are editing. <F9> and <F10> are used to page from one plot to another. A plot may be deleted with <Ctrl+D>. All coordinates and direction cosines must be entered, but only one plot-spacing parameter is required. Entering more than one is allowed but not recommended since it will usually generate a distorted plot. CSASIN will warn you if you choose to do this. The "NCH=" character string is not required. If it is not entered, the SCALE default is used. If you choose to enter a character string, make sure it contains enough symbols to cover all the mixtures or units you are plotting. A ruler is provided above the field to help you align your symbols with the correct mixture or unit numbers. Delimiters are automatically provided by CSASIN and should not be input by the user.

■ Search Data

The Search Data menu provides selections for the CSAS4 and CSAS4X sequences to perform criticality searches (including optimum or minimum k_{eff}) by varying geometric dimensions.

● Search Type

This option displays one screen which contains the Search Type Specification input data. These data are required for CSAS4 and CSAS4X. Default values are initially displayed for the optional search parameters.

● Auxiliary Search Commands

This option displays one screen per Auxiliary Search Command. These commands are not required to perform a criticality search, but allow the user much greater flexibility in specifying how a search is done. The <F9> and <F10> keys are used to page from one command to another. <Ctrl+D> may be used to delete a search command. An internally generated command number is displayed in the upper-right-hand corner so that you always know which command you are editing.

6 FILES ON THE DISTRIBUTION DISKETTE

CSASIN is available as part of the OFFSCALE package from the Energy, Science, Technology Software Center (ESTSC) and from the Radiation Shielding Information Center (RSIC) at ORNL. It is also distributed with the SCALE code package from RSIC.

Files included on the CSASIN distribution diskette which are necessary for running the program are listed in Table 6.1. CSASIN.EXE is the executable program. CSASIN.QSL is the CSASIN QuickScreen library developed with Crescent Software's QuickScreen program⁴ and contains all the input screens displayed by CSASIN. In addition, CSASIN contains several routines from Crescent Software's QuickPak Professional Library.⁵ The files with the ".FRM" extension contain the form definition for each of the screens in the CSASIN QuickScreen library. The files with the ".BSV" extension contain the SCALE Standard Composition library data written with Microsoft BASIC's BSAVE command.³

In addition to these files, sample CSASIN files for CSAS4 Sample Problems 2 and 3 (Sect. C4.B of the SCALE manual) are included on the diskette. These files are listed in Table 6.2 and may be retrieved in CSASIN. The card-image SCALE input files, which were generated with these files, have the extension ".IN".

Finally, a copy of this document is included on the diskette in the README.DOC file.

Table 6.1 Files required by CSASIN

<u>File name</u>	<u>Extension</u>
ARBCOMP	.BSV
ARBM1	.FRM
ARBM2	.FRM
ARBM3	.FRM
ARRAY1	.FRM
ARRAY2	.FRM
AUXSRCH1	.FRM
BIAS1	.FRM
BOUND1	.FRM
INFHOM	.FRM
ISOTARBM	.BSV
ISOTOPES	.BSV
KENOGE01	.FRM
KENOGE02	.FRM
LATTICE1	.FRM
MIPDATA1	.FRM
MOREDAT1	.FRM
MOREDAT2	.FRM
MULTIR1	.FRM
MULTIR2	.FRM
CSASIN	.EXE
CSASIN	.QSL
PARM1	.FRM
PARM2	.FRM
PLO 11	.FRM
RENAMFIL	.FRM
SAVEFIL	.FRM
SAVEPART	.FRM
SEARCH1	.FRM
SOLN1	.FRM
SOLN2	.FRM
SOLUTION	.BSV
START1	.FRM
STDCOMP	.BSV
STDCOMP1	.FRM
STDCOMP2	.FRM

Table 6.2 CSASIN sample problem files

<u>File name</u>	
SAMPLE2.ARR	Sample Problem 2
SAMPLE2.BIA	
SAMPLE2.BND	
SAMPLE2.GEO	
SAMPLE2.IN	
SAMPLE2.LAT	
SAMPLE2.MIP	
SAMPLE2.PAR	
SAMPLE2.SEA	
SAMPLE2.STD	
SAMPLE3.ARR	Sample Problem 3
SAMPLE3.BIA	
SAMPLE3.GEO	
SAMPLE3.IN	
SAMPLE3.LAT	
SAMPLE3.MIP	
SAMPLE3.PAR	
SAMPLE3.SEA	
SAMPLE3.STD	

7 REFERENCES

1. N. F. Landers and L. M. Petrie, "CSAS: An Enhanced Criticality Safety Analysis Module with Search Options," Sect. C4 of *SCALE: A Modular Code System for Performing Standardized Computer Analyses for Licensing Evaluation*, NUREG/CR-0200, Rev. 4 (ORNL/NUREG/CSD-2/R4), Vols. I, II, and III (draft November 1993). Available from Radiation Shielding Information Center as CCC-545.
2. *SCALE: A Modular Code System for Performing Standardized Computer Analyses for Licensing Evaluation*, NUREG/CR-0200, Rev. 4 (ORNL/NUREG/CSD-2/R4), Vols. I, II, and III (draft November 1993). Available from Radiation Shielding Information Center as CCC-545.
3. *MicroSoft BASIC Professional Development System Version 7.1*, Microsoft Corporation (1990).
4. *QuickScreen Version 3.0*, Crescent Software (1989).
5. *QuickPak Professional: Advanced Programming Library for BASIC Compilers, Version 3.2*, Crescent Software (1990).

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11. ABSTRACT (200 words or less)

OFFSCALE is a suite of personal computer input processor programs developed at Oak Ridge National Laboratory to provide an easy-to-use interface for modules in the SCALE-4 code system. CSASIN (formerly known as OFFSCALE) is a program in the OFFSCALE suite that serves as a user-friendly interface for the Criticality Safety Analysis Sequences (CSAS) available in SCALE-4. It is designed to assist a SCALE-4 user in preparing an input file for execution of criticality safety problems. Output from CSASIN generates an input file that may be used to execute the CSAS control module in SCALE-4. CSASIN features a pulldown menu system that accesses sophisticated data entry screens. The program allows the user to quickly set up a CSAS input file and perform data checking. This capability increases productivity and decreases the chance of user error.

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Input Processor

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