

Installation of R and MCSim

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- 1) Install R (<https://cran.r-project.org>). We recommend using the default installation directory, "C:\Program Files\R\".
- 2) Install Rtools (<https://cran.r-project.org/bin/windows/Rtools/>). This should be installed in the default location, "C:\Rtools\". Note that installation of Rtools requires administrative privileges. The Rtools suite of tools includes a C compiler (gcc) that will be used to generate a DLL version of a given MCSim model that can be called by the R package "deSolve".

NOTE: Users of ACSLX may experience issues after installing Rtools because a directory containing an alternate C compiler (gcc) will be added to the PATH environment variable. Changing the ordering of the directories listed in the PATH environment variable such that either the ACSLX or the Rtools directories are listed **first** (depending on which of these the user plans to run) should resolve any such problem. The relevant directories are listed in the **system** PATH environment variable (not the user-specific PATH environment variable), and administrative privileges are required to modify this PATH variable.

NOTE: Once Rtools is installed, it may be necessary to edit the PATH environment variable to ensure Windows can find "make.exe" and "gcc.exe", which are two of the utilities included with Rtools. To check this, simply open a "Command Prompt" window by searching "cmd" in the Windows "Start" menu (at the lower left of your desktop), and then type "where make" and press "Enter". Then, do the same for "gcc". If "make" or "gcc" are not in the PATH, you will see the error: "INFO: Could not find files for the given pattern(s)." To resolve this error, edit your PATH by taking the following steps:

- A. Search "Edit environment variables for your account" in the Start menu and open the resulting "Control Panel" utility.
- B. Select "Path" in the top list containing "User variables".
- C. Select the button "Edit..." just below the "User variables" list.
- D. Select the button "New" at the upper right of the newly displayed window.
- E. If you installed "Rtools40", add "C:\rtools40\usr\bin" and "C:\rtools40\mingw64\bin" to the PATH. If you are using an older version of Rtools, the equivalent directories are most likely "C:\Rtools\bin" and "C:\Rtools\mingw_64\bin". You can confirm the correct directory (or "folder") by going to the C drive (in your file system explorer) and finding the Rtools directory. In any case, you need to find the full path name for the "bin" directories inside the Rtools directory that contain "make.exe" and "gcc.exe" and add those full path names to the PATH environment variable.
- F. Finally, click "OK" and to save the edits to the PATH. Open a Command window again (from scratch) and test using "where make" and "where gcc". If the correct Rtools directory is displayed in each case, you should be "good to go"!

- 3) (Optional, but recommended.) Install Rstudio (<https://www.rstudio.com>). Rstudio includes a code editor and debugging and visualization tools.
- 4) From R or Rstudio, install the package "deSolve" (which provides methods for integrating ordinary differential equations). If using command line R, use the "install.packages" method. If using RGui, choose "Install package(s)..." from the "Packages" menu, then follow the instructions. If using Rstudio, choose "Install packages..." from the "Tools" menu, then follow the instructions.
- 5) Move a copy of the file "mod.exe", which was included with these instructions, to the directory "C:\Users\\MCSim_Uilities\". You will need to create the directory (or "folder") before moving the file there. Alternatively, you can build the executable file "mod.exe" on your system by following the instructions below labeled below as "Alternate Step 5".
- 6) Modify your PATH environment variable so that the directory containing "mod.exe" is listed in your PATH. To access your PATH environment variable, click on the search ("magnifying glass") icon in the lower left-hand corner of your Windows desktop and type "environment". Then select the option for "Edit environment variables for your account".

Alternate Step 5: Download essential files to build the "mod" utility of GNU MCSim. As stated on the MCSim website (<https://www.gnu.org/software/mcsim/>), "The basic tools needed to build and run GNU MCSim are not available to many users of Windows systems ... [but] R software when installed with its Rtools can compile and run GNU MCSim models." A compressed (ZIP) directory containing all necessary files and instructions can be found by following a link on the main page of the aforementioned website, or can be directly accessed here: https://www.gnu.org/software/mcsim/mcsim_under_R.zip . Examine the "README.txt" file in that directory and follow instructions for "Option 1".