

FAQ 012

Creating Libraries

Question

I want to store C source files in a library for use with RTI or ConfigurationDesk. How can I create such a library?

Relevant Products

Real-Time Interface (RTI) and ConfigurationDesk; differences between Real-Time Interface (RTI) and ConfigurationDesk are explicitly marked.

Solution

Note

The generated libraries can be exchanged between systems using the same MATLAB® and dSPACE Releases. Compatibility issues might occur if a library is copied to a system using a different MATLAB or dSPACE Release, especially if RTLib functions are used in the C code.

If the source files include function calls generated with Simulink Coder™, the model's timer task mode must be taken into account. Use libraries only in the timer task mode they were created for. For example, do not use a library created for single timer task mode in a model built in multiple timer task mode.

Method 1

This method can be used for dSPACE Release 2015-B and later and requires no additional tools or components.

As of dSPACE Release 2015-B, each platform-related RTLib contains a general-purpose makefile, DsBuildLibrary.mk, for creating a compatible compiler library.

Platform	Location of General-Purpose Makefile	Target Identifier
DS1005	%DSPACE_ROOT%\DS1005\RTLib\DsBuildLibrary.mk	DS1005
DS1006	%DSPACE_ROOT%\DS1006\RTLib\DsBuildLibrary.mk	DS1006
DS1007	%DSPACE_ROOT%\DS1007\DsBuildLibrary.mk	DS1107
DS1103	%DSPACE_ROOT%\DS1103\DsBuildLibrary.mk	DS1103
DS1104	%DSPACE_ROOT%\DS1104\RTLib\DsBuildLibrary.mk	DS1104
DS1202	%DSPACE_ROOT%\DS1202\DsBuildLibrary.mk	DS1202

DS1401	%DSPACE_ROOT%\DS1401\RTLib\DsbldLibrary.mk	DS1401
SCALEXIO/DS6001	%DSPACE_ROOT%\SCALEXIO \DsbldLibrary.mk	Dsx86_32

To create libraries from C source files:

1. Copy a DsbldLibrary.mk file instance to the folder containing the source files.
2. Open a **Command Prompt for dSPACE RCP and HIL <release number>** and go to the related folder.

Note

As of dSPACE Release 2014-A, environment variables and other settings, such as enhancements to the search path, are no longer set. Use the **Command Prompt for dSPACE RCP and HIL <release number>** for the archiving tools. A shortcut to the command prompt is integrated in the Windows Start menu. The required paths and environment variables are then set automatically.

3. Enter the following command:

```
dsmake -f DsbldLibrary.mk output_filename=<library filename>
source_files=<"blank separated list of files"> target=<target
identifier>
```

Example:

```
dsmake -f DsbldLibrary.mk output_filename=mylib
source_files="source1.c source2.c source3.c source4.cpp" target=DS1401
→ Creates the libmylib.lib library in the active folder for the MicroAutoBox. The output file name mylib is added to the fixed part lib.
```

```
dsmake -f DsbldLibrary.mk source_files="source1.c source2.c source3.c
source4.cpp" target=DSx86_32
→ Creates a library named lib.a (the fixed part of the name) in the active folder for the SCALEXIO system.
```

You can use additional command line parameters:

```
custom_c_options=<Additional custom C compiler options>
custom_cpp_options=<Additional custom C++ compiler options>
custom_obj_files=<Additional custom object files>
```

Alternatively, you can manually adapt the DsbldLibrary.mk makefile to shorten or omit the parameter list.

Method 2

This method is based on the MATLAB/Simulink environment. The instructions assume that a related model exists.

To create libraries from C source files

1. Open the model's Configuration Parameters dialog and specify the source files on the Code Generation – Custom Code page in 'Include list of additional:'.
Select 'Source files'.
Enter the required folders (space-separated list).

Example:

```
source1.c source2.c source3.c
```

2. Build the model. The object files are generated into the build directory.

RTI: <modelname>_rti<XXX>

ConfigurationDesk: <ConfigurationDesk Application>\

Build\<application process name>\Compile\<name of the model>.

It is possible that ConfigurationDesk itself creates a library file during the build process, which can be used instead. Therefore, check the output of the build process for the message "Making library <library name>".

The object file extension depends on the hardware platform and on the timer task mode the model was built with:

Platform	Single Timer Task Mode	Multiple Timer Tasks Mode ¹
DS1005	.o50	.m50
DS1006	.o86	.m86
DS1007	.o07	.m07
DS1103	.o04	.m04
DS1104	.o03	.m03
DS1202	.o07	.m07
DS1401	.o03	.m03
SCALEXIO	.o86	.m86

¹ In the multiple timer task mode, files with the extension *.m<xx> are generated if the respective model consists of at least two timer tasks.

3. Open a **Command Prompt for dSPACE RCP and HIL <release number>** and create the library with the compiler's archiving tool.

Note

As of dSPACE Release 2014-A, environment variables and other settings, such as enhancements to the search path, are no longer set. Use the **Command Prompt for dSPACE RCP and HIL <release number>** for the archiving tools. A shortcut to the command prompt is integrated in the Windows Start menu. The required paths and environment variables are then set automatically.

PowerPC Platforms (DS1005, DS1103, DS1104, MicroAutoBox/DS1401)

Enter the following command:

```
"%PPC_ROOT%\bin\"libppc -a <OBJECT1> <OBJECT2> ... <LIBRARY_NAME>
```

Example for DS1005:

```
"%PPC_ROOT%\bin\"libppc -a source1.o50 source2.o50 source3.o50  
user_library.lib
```

libppc might generate warnings. You can ignore the warnings if the generation of the library completes without error messages.

For detailed information on the PowerPC archiving tool, refer to the compiler documentation: *Assembler/Linker/Librarian User's Guide and Reference for the PowerPC Family* by Microtec at %PPC_ROOT%\Docs (PowerPC Compiler Vs. 3.x) or %PPC_ROOT%\doc\compiler (PowerPC Compiler Vs. 2.0).

DS1006 Platforms

Enter the following command (up to and including dSPACE Release 2014-A):

```
"%X86_ROOT%\bin\"x86-ar -r <LIBRARY_NAME> <OBJECT1> OBJECT2> ...
```

As of dSPACE Release 2014-B:

```
"%X86_ROOT%\bin\"i686-elf-ar -r <LIBRARY_NAME> <OBJECT1> OBJECT2> ...
```

Example (up to and including dSPACE Release 2014-A):

```
"%X86_ROOT%\bin\"x86-ar -r user_library.lib source1.o86 source2.o86  
source3.o86
```

Example (as of dSPACE Release 2014-B):

```
"%X86_ROOT%\bin\"i686-elf-ar -r user_library.lib source1.o86 source2.o86  
source3.o86
```

For more information on the x86 archiving tool, refer to documentation of bin utilities at %X86_ROOT%\Doc\binutils\ar.html.

SCALEXIO Platforms

Enter the following command (up to and including dSPACE Release 2017-A):

```
"%DSPACE_ROOT%\Compiler\QNX650\host\win32\x86\usr\bin\ntox86-ar -r
<LIBRARY_NAME> <OBJECT1> OBJECT2> ...
```

As of dSPACE Release 2017-B

```
"%DSPACE_CONFIG%\Compiler\QNX650\host\win32\x86\usr\bin\ntox86"-ar -r
<LIBRARY_NAME> <OBJECT1> OBJECT2> ...
```

Example:

```
"%DSPACE_ROOT%\Compiler\QNX650\host\win32\x86\usr\bin\ntox86-ar -r
user_library.a source1.o86 source2.o86 source3.o86
```

DS1007/MicroLabBox (DS1202) Platforms

Enter the following command (up to and including dSPACE Release 2017-A):

```
"%DSPACE_ROOT%\Compiler\QNX650_463\host\win32\x86\usr\bin\ntoppc-ar -r
<LIBRARY_NAME> <OBJECT1> OBJECT2> ...
```

As of dSPACE Release 2017-B:

```
"%DSPACE_CONFIG%\Compiler\QNX650_463\host\win32\x86\usr\bin\ntoppc-ar -r
r <LIBRARY_NAME> <OBJECT1> OBJECT2> ...
```

Example:

```
"%DSPACE_ROOT%\Compiler\QNX650_463\host\win32\x86\usr\bin\ntoppc-ar -r
user_library.lib source1.o07 source2.o07 source3.o07
```

4. Remove the source file list from the Code Generation – Custom Code pane (formerly Real-Time Workshop – Custom Code pane) of the Configuration Parameters dialog.
5. To use the new library in a model, refer to [FAQ 298](#).

Since dSPACE Release 2014-B, C++ has been natively supported. The workflow for generating libraries is not limited to C sources files, C++ source files can also be included. Related FAQs

- [FAQ 298](#): Best Practice for Handling S-functions, Libraries and Additional Source Code

FAQ Overview

<http://www.dspace.com/go/faq>

Support

To request support, please use the form at <http://www.dspace.com/go/supportrequest>

Updates and Patches

Software updates and patches are available at <http://www.dspace.com/go/patches>.
dSPACE strongly recommends to use the most recent patches for your dSPACE installation.

Important Notice

This document contains proprietary information that is protected by copyright. All rights are reserved. The document may be printed for personal or internal use provided all the proprietary markings are retained on all printed copies. In all other cases, the document must not be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine-readable form, in whole or in part, without the prior written consent of dSPACE GmbH.

© 2019 by:

dSPACE GmbH
Rathenaustraße 26
33102 Paderborn
Germany

This publication and the contents hereof are subject to change without notice.

A list of registered dSPACE trademarks is available at: <http://www.dspace.com/go/Trademarks>