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# Using Dynamic Links in AutomationDesk

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## Objective

With this solution for AutomationDesk 1.4 and AutomationDesk 1.5, you can use blocks from your Custom Library not only in the static link mode (used up to now) but also in the new dynamic link mode.

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## Where to go from here

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## Basic Information on the Dynamic Link Feature

Objective	<p>A sequence can contain blocks from the Custom Library in two different modes:</p> <ul style="list-style-type: none"><li>■ As statically linked Custom Library blocks</li><li>■ As dynamically linked Custom Library blocks</li></ul>
Statically linked Custom Library blocks	<p>Up to now, the method of inserting a Custom Library block in a sequence is to create an <i>instance</i> of the Custom Library template which contains copies of Custom Library blocks. The link to the template is stored as an attribute and used when you execute synchronization with the template explicitly.</p> <p>Each instance of a Custom Library template takes up extra memory and disk space, and increases the time needed for saving, loading, or synchronizing a project.</p>
Dynamically linked Custom Library blocks	<p>The new method of inserting a Custom Library block is to create a <i>reference</i> to the Custom Library template in the sequence. The dynamically linked Custom Library block includes only the library link and the interface of the template but does not contain copies of Custom Library blocks. The dynamically linked Custom Library block is always synchronous with the Custom Library template as the content of the library template is used dynamically at run time.</p> <p>As dynamically linked Custom Library blocks are references to Custom Library templates, they allow you to save disk space, and reduce the memory consumption and the time needed for saving, loading, or synchronizing a project.</p>
Appearance	<p>As the behavior of dynamically linked Custom Library blocks is determined by the referenced Custom Library templates, their inner structure is not displayed in the <b>Sequence Builder</b> and the <b>Sequence Hierarchy Browser</b>. Internal data objects cannot be viewed in the <b>Data Object Editor</b>.</p>
Synchronization of dynamically linked Custom Library blocks and their interfaces	<p>Dynamically linked Custom Library blocks are kept synchronous with the corresponding Custom Library templates implicitly.</p>

The dynamically linked Custom Library block has an interface of its own which is, in contrast to the block itself, not updated automatically when the interface of the Custom Library template is changed. The interface can be parameterized. To apply the changes to the interface of the Custom Library template to the interfaces of the dynamically linked Custom Library blocks, you can update them recursively.



With dynamically linked Custom Library blocks, it is important to keep in mind:

- That the **Synchronize** command does not *synchronize* dynamically linked Custom Library blocks with the corresponding Custom Library templates but converts them into statically linked Custom Library blocks, i.e., instances of the templates. Dynamically linked Custom Library blocks are kept synchronous with the corresponding Custom Library templates implicitly.
- That the **Synchronize** command does not update the interfaces of dynamically linked Custom Library blocks. To update the interfaces, use **Change to Dynamic Link and Update Interface**.

#### Converting dynamically and statically linked Custom Library blocks

Statically linked Custom Library blocks can be converted into dynamically linked Custom Library blocks and vice versa.

By default, Custom Library blocks newly inserted into a sequence are dynamically linked to the corresponding Custom Library template.



Before you build new sequences with dynamically linked Custom Library blocks or convert existing sequences containing statically linked Custom Library blocks, read the *Limitations* on page 7.

#### Editing dynamically linked Custom Library blocks

As with statically linked Custom Library blocks, adding data objects or blocks to or deleting them from dynamically linked Custom Library blocks breaks the link to the Custom Library template.



After breaking the link, the formerly dynamically linked Custom Library block is useless.

### Commands with linked Custom Library blocks

The following commands can be used with linked Custom Library blocks. There are important differences between statically and dynamically linked Custom Library blocks:

**Change to Dynamic Link and Update Interface** can be used in two different ways:

- To convert recursively *statically* linked Custom Library blocks into dynamically linked ones and to insert the interfaces defined at the Custom Library templates in the Custom Library.
- To update recursively the interfaces of *dynamically* linked Custom Library blocks with the interfaces defined at the Custom Library templates in the Custom Library.

The command is available on the context menus of projects, folders, sequences, Serial and Custom Library blocks. For further information, refer to *Creating Sequences with Dynamic Links* on page 5 and *Updating the Interface of a Library Block* on page 5.

**Synchronize** can be used in two different ways:

- To synchronize recursively *statically* linked Custom Library blocks with the corresponding Custom Library template.
- To convert recursively *dynamically* linked Custom Library blocks into statically linked ones.

The command is available on the context menus of projects, folders, sequences, Serial and Custom Library blocks. For further information, refer to *Changing Dynamic Library Links to Static Links* on page 6.

**Open Linked Library Block** can be used to open the Custom Library template in the **Sequence Builder**. The command is available on the context menus of the dynamically linked Custom Library blocks.

## Creating Sequences with Dynamic Links

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### Methods of creating sequences with dynamic links

There are two ways to create sequences with dynamic links:

- Creating new sequences
- Converting existing sequences with statically linked Custom Library blocks

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### Creating a new sequence with dynamic links

Dragging a block from the Custom Library to a sequence inserts a dynamically linked Custom Library block.

This is the default behavior.

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### Converting an existing sequence

You can convert existing sequences with static links into ones with dynamic links via the **Change to Dynamic Link and Update Interface** command. The statically linked Custom Library blocks are replaced with references of the Custom Library template.

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### Interface

With both methods, the interface of the Custom Library block is inserted as defined at the Custom Library template. As the dynamically linked Custom Library block has an interface of its own, it is not synchronized automatically afterwards.

## Updating the Interface of a Library Block

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### Objective

The interfaces of dynamically linked Custom Library blocks are not updated automatically. If the interface of a Custom Library template is modified in the Custom Library, the changes are not transferred automatically to the dynamically linked Custom Library block.

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### Updating the interface

To apply the changes to the interface of the dynamically linked Custom Library block, you have to call the **Change to Dynamic Link and Update Interface** command. It can be used to update the interfaces of several dynamically linked Custom Library blocks recursively.

## Changing Dynamic Library Links to Static Links

### Inserting instances of Custom Library templates

You can convert dynamically linked Custom Library blocks into statically linked Custom Library blocks via the **Synchronize** command, which is available on the context menus of projects, folders, sequences, and blocks. The command replaces recursively the references with instances of the corresponding Custom Library templates.



Depending on the level of the project the command is called from, **Synchronize** synchronizes *statically* linked Custom Library blocks with the corresponding library elements and converts *dynamically* linked Custom Library blocks into statically linked ones.

As **Synchronize** affects dynamically and statically linked Custom Library blocks in different ways, you are recommended not to mix link modes on the same level of the project.



With dynamically linked Custom Library blocks, it is important to keep in mind:

- That the **Synchronize** command does not *synchronize* dynamically linked Custom Library blocks with the corresponding Custom Library templates but converts them into statically linked Custom Library blocks, i.e., instances of the templates. Dynamically linked Custom Library blocks are kept synchronous with the corresponding Custom Library templates implicitly.
- That the **Synchronize** command does not update the interfaces of dynamically linked Custom Library blocks. To update the interfaces, use **Change to Dynamic Link and Update Interface**.

## Limitations

	<p>As replacing static links with dynamic ones might cause run-time errors, you should note the following limitations before you build new sequences with dynamically linked Custom Library blocks or convert existing sequences containing statically linked Custom Library blocks:</p>
<b>Custom Library templates must be available</b>	<p>During run time, the Custom Library blocks are temporarily replaced by the corresponding Custom Library templates, i.e., the corresponding Custom Library templates are used directly in the project.</p> <p>A sequence with dynamically linked Custom Library blocks can only be executed if the linked Custom Library templates are available. Otherwise an error message is displayed in the Log Viewer and the Output Viewer.</p>
<b>Implicit synchronization</b>	<p>Dynamically linked Custom Library blocks are kept synchronous with the corresponding Custom Library templates implicitly. Do not use the <b>Synchronize</b> command to update a block with its template, because this converts the dynamic link to a static link.</p>
<b>Interfaces</b>	<p>The dynamically linked Custom Library block has an interface of its own. Thus, the interface of a dynamically linked Custom Library block cannot be parameterized via the interface of the corresponding Custom Library template.</p> <p>Thus, changes to the interface of the Custom Library template do not apply automatically to the interface of the corresponding dynamically linked Custom Library block. If you want to apply changes to the interface of the Custom Library template to the dynamically linked Custom Library block as well, you can use the <b>Change to Dynamic Link and Update Interface</b> command.</p> <p>Parameters in the interface of a dynamically linked Custom Library block cannot be renamed.</p>
<b>Appearance</b>	<p>The inner structure of dynamically linked Custom Library blocks is not displayed in the <b>Sequence Builder</b> and the <b>Sequence Hierarchy Browser</b>.</p>

<b>Configuration of the Custom Library</b>	As the contents of dynamically linked Custom Library blocks are read from the Custom Library template during execution, projects that contain dynamically linked Custom Library blocks can be executed only if the library is configured accordingly, i.e., it contains all templates used in the project.
<b>Working with the Test Framework library</b>	If you use the Test Framework library, the values and value mappings of the interfaces of dynamically linked Custom Library blocks are not displayed in their specific dialogs.
<b>Parallel execution</b>	A dynamically linked Custom Library block can be executed only once at a time. Executing a dynamically linked Custom Library block several times in parallel results in run-time errors.
<b>Recursive execution</b>	A dynamically linked Custom Library block can be executed only once at a time. Executing a dynamically linked Custom Library block recursively results in run-time errors.
<b>Breaking the link</b>	Breaking the link of a dynamically linked Custom Library block to the corresponding Custom Library template makes the block useless.



## How to Contact dSPACE

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