

MATRIXx[™]

DocumentIt[™] User Guide

Worldwide Technical Support and Product Information

ni.com

National Instruments Corporate Headquarters

11500 North Mopac Expressway Austin, Texas 78759-3504 USA Tel: 512 683 0100

Worldwide Offices

Australia 1800 300 800, Austria 43 0 662 45 79 90 0, Belgium 32 0 2 757 00 20, Brazil 55 11 3262 3599, Canada (Calgary) 403 274 9391, Canada (Ottawa) 613 233 5949, Canada (Québec) 450 510 3055, Canada (Toronto) 905 785 0085, Canada (Vancouver) 514 685 7530, China 86 21 6555 7838, Czech Republic 420 224 235 774, Denmark 45 45 76 26 00, Finland 385 0 9 725 725 11, France 33 0 1 48 14 24 24, Germany 49 0 89 741 31 30, Greece 30 2 10 42 96 427, India 91 80 51190000, Israel 972 0 3 6393737, Italy 39 02 413091, Japan 81 3 5472 2970, Korea 82 02 3451 3400, Malaysia 603 9131 0918, Mexico 001 800 010 0793, Netherlands 31 0 348 433 466, New Zealand 0800 553 322, Norway 47 0 66 90 76 60, Poland 48 22 3390150, Portugal 351 210 311 210, Russia 7 095 783 68 51, Singapore 65 6226 5886, Slovenia 386 3 425 4200, South Africa 27 0 11 805 8197, Spain 34 91 640 0085, Sweden 46 0 8 587 895 00, Switzerland 41 56 200 51 51, Taiwan 886 2 2528 7227, Thailand 662 992 7519, United Kingdom 44 0 1635 523545

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The following conventions are used in this manual:

» The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options** directs you to pull down the **File** menu, select the **Page Setup** item, and select **Options** from the last dialog box.



This icon denotes a note, which alerts you to important information.

bold

Bold text denotes items that you must select or click in the software, such as menu items and dialog box options. Bold text also denotes parameter names.

italic

Italic text denotes variables, emphasis, a cross reference, or an introduction to a key concept. This font also denotes text that is a placeholder for a word or value that you must supply.

monospace

Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames and extensions, and code excerpts.

monospace bold

Bold text in this font denotes the messages and responses that the computer automatically prints to the screen. This font also emphasizes lines of code that are different from the other examples.

monospace italic

Italic text in this font denotes text that is a placeholder for a word or value that you must supply.

Platform

Text in this font denotes a specific platform and indicates that the text following it applies only to that platform.

Contents

Chapter 1

Introduction

Manual Organization	1-1
DocumentIt and the Rapid Prototyping Concept	1-2
Automatic Document Generation Process	1-4
Cruise Control Example.....	1-6
How to Access National Instruments-Supplied Files	1-10
Related Publications	1-11

Chapter 2

Invoking DocumentIt

How to Generate Design Documentation	2-1
Generating Documentation From Within SystemBuild	2-1
Platform Specific Differences	2-3
Template Information	2-5
Generating Documentation from Xmath	2-5
Generating Documentation from the OS	2-7
Generate a Textual Version of a Model	2-7

Chapter 3

Customizing the Generated Documentation

Appendix A

DocumentIt Options

Appendix B

Generating Documents Using FrameMaker

Appendix C

Generating 2167A Documents Using FrameMaker

Appendix D

Generating 2167A Documents Using Interleaf

Appendix E
Generating Documents Using Microsoft Word

Appendix F
Generating ASCII Documents

Appendix G
Technical Support and Professional Services

Index

Introduction

With SystemBuild and DocumentIt menu options, you can generate high-quality design documentation automatically from SystemBuild block diagrams. This guide provides the information you need to start using DocumentIt, as well as the more advanced details necessary to customize the generated design documentation.

Manual Organization

- Chapter 1 provides an overview of the National Instruments design documentation generation concept, a description of the basic steps required to produce documentation, and a brief example of documentation generation from a SystemBuild model. This chapter, along with Chapter 2, *Invoking DocumentIt*, will give you everything you need to know in order to generate documentation using any of the templates described in Appendix B, *Generating Documents Using FrameMaker*, through Appendix E, *Generating Documents Using Microsoft Word*.

If you want to create custom documentation, refer to the *Related Publications* section of Chapter 3, *Customizing the Generated Documentation*.

- Chapter 2, *Invoking DocumentIt*, tells how to generate documents from SystemBuild, the Xmath Commands window, and from the operating system command line.
- Chapter 3, *Customizing the Generated Documentation*, points you to a detailed explanation of template files (*.tpl) for formatting a document. NI supplies DocumentIt templates (*.tpl files) for each of the examples given in Appendix B, *Generating Documents Using FrameMaker*, through Appendix E, *Generating Documents Using Microsoft Word*. You can copy the *.tpl files from any of these examples and modify them using the information in this chapter.
- Appendix A, *DocumentIt Options*, provides a description of the DocumentIt options, and explains how to use an `autostar.opt` file.

- Appendix B, *Generating Documents Using FrameMaker*, provides a description of how to generate a sample design document using DocumentIt and FrameMaker templates.
- Appendix C, *Generating 2167A Documents Using FrameMaker*, provides a description of how to generate a sample design document conforming closely with DOD-STD-2167A using DocumentIt and FrameMaker templates.
- Appendix D, *Generating 2167A Documents Using Interleaf*, provides a description of how to generate a sample design document conforming closely with DOD-STD-2167A using DocumentIt and Interleaf templates.
- Appendix E, *Generating Documents Using Microsoft Word*, provides a description of how to use a template to create a general purpose document in Microsoft Word.
- Appendix F, *Generating ASCII Documents*, provides a description of how to generate a sample design document using a DocumentIt template.

DocumentIt and the Rapid Prototyping Concept

Conventional real-time system development usually takes place in stages with separate tools for control design, software engineering, data acquisition, testing, and design documentation. The MATRIXx product family integrates tools for each stage of system development into a single environment. This allows a design to move easily from one stage to the next, making it possible to create a well-documented working prototype early in the design process. Figure 1-1 shows DocumentIt in the MATRIXx product line.

Within the MATRIXx design automation product family, a system model can be built, simulated, analyzed, tested, and debugged using SystemBuild and Xmath. Real-time code in a high-level language for the model—C or Ada—using AutoCode and design documentation can be generated automatically with DocumentIt. The generated application code can be evaluated on the host with SystemBuild simulation or run on NI real time hardware. Finally, the generated application code can be cross-compiled and linked for implementation on an embedded processor. Documentation can be updated and automatically generated along each step of the process.

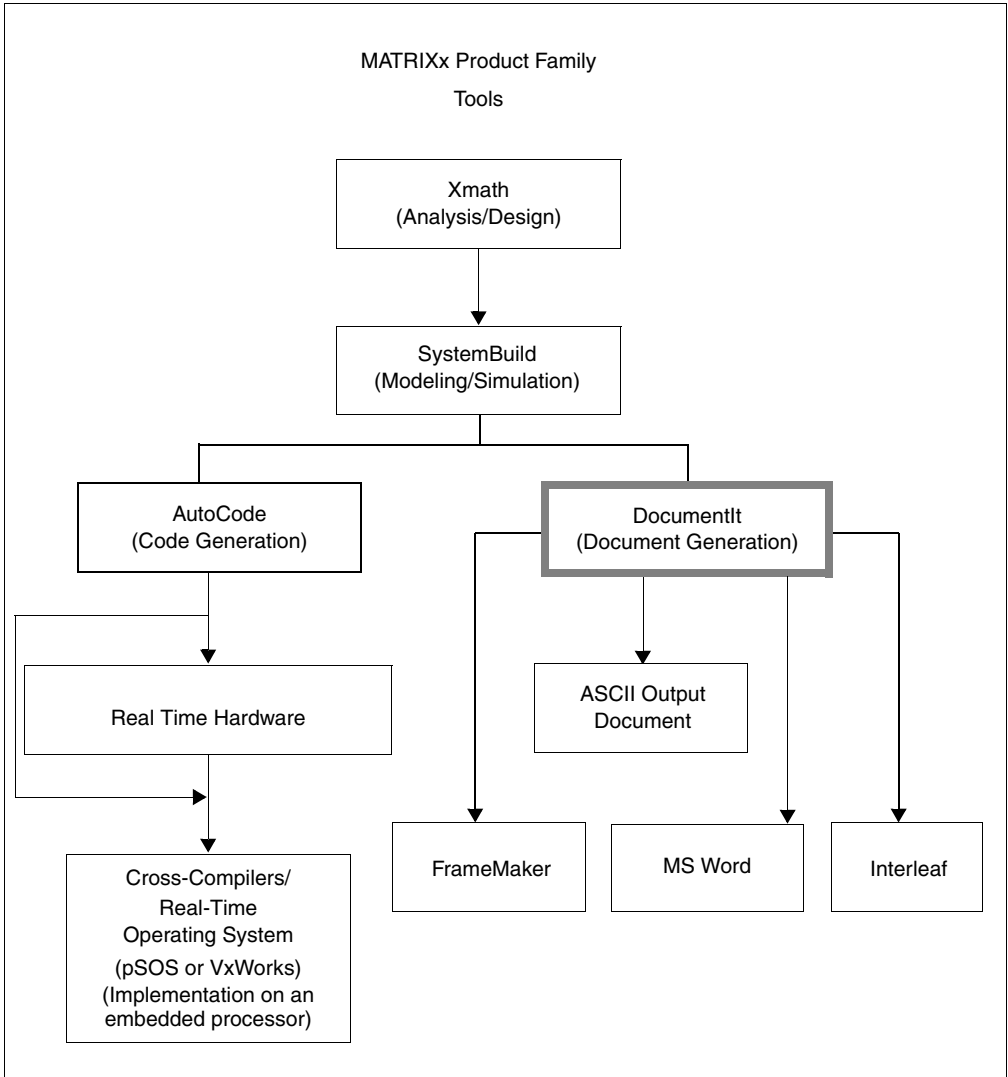


Figure 1-1. DocumentIt in the MATRIXx Product Line

Automatic Document Generation Process

As an integral part of MATRIXx Rapid Prototyping concept, DocumentIt lets you generate design documentation from a SystemBuild block diagram model quickly, automatically, and without programming skills.

DocumentIt details the software design in a uniform standardized documentation format and fully supports the SystemBuild hierarchical approach to system design.

Because DocumentIt uses templates to format documents and select specific contents, you can configure DocumentIt to suit your particular documentation needs. The templates can be readily modified to conform to any documentation standard. For example, DocumentIt can be used to generate the following:

- Detailed description of the design in ASCII format
- Most industry-standard formats
- Tables containing SuperBlock and Block inputs and outputs, State Transition Diagrams, and Global data
- Documents formatted for FrameMaker (including DOD-STD-2167A) and Microsoft Word (or any application that reads RTF)

A typical sequence for using DocumentIt is as follows. This sequence corresponds to the sequence of steps shown in Figure 1-2:

1. Build and Document the Model.

Develop the continuous-time plant model and corresponding discrete-time controller SuperBlocks using SystemBuild block diagrams. The SystemBuild model is built up from a large palette of blocks which combine to describe the way the model works and how it should be controlled. DocumentIt automatically extracts information from the Inputs, Outputs, Document, and Comment fields for SuperBlocks and primitive blocks.

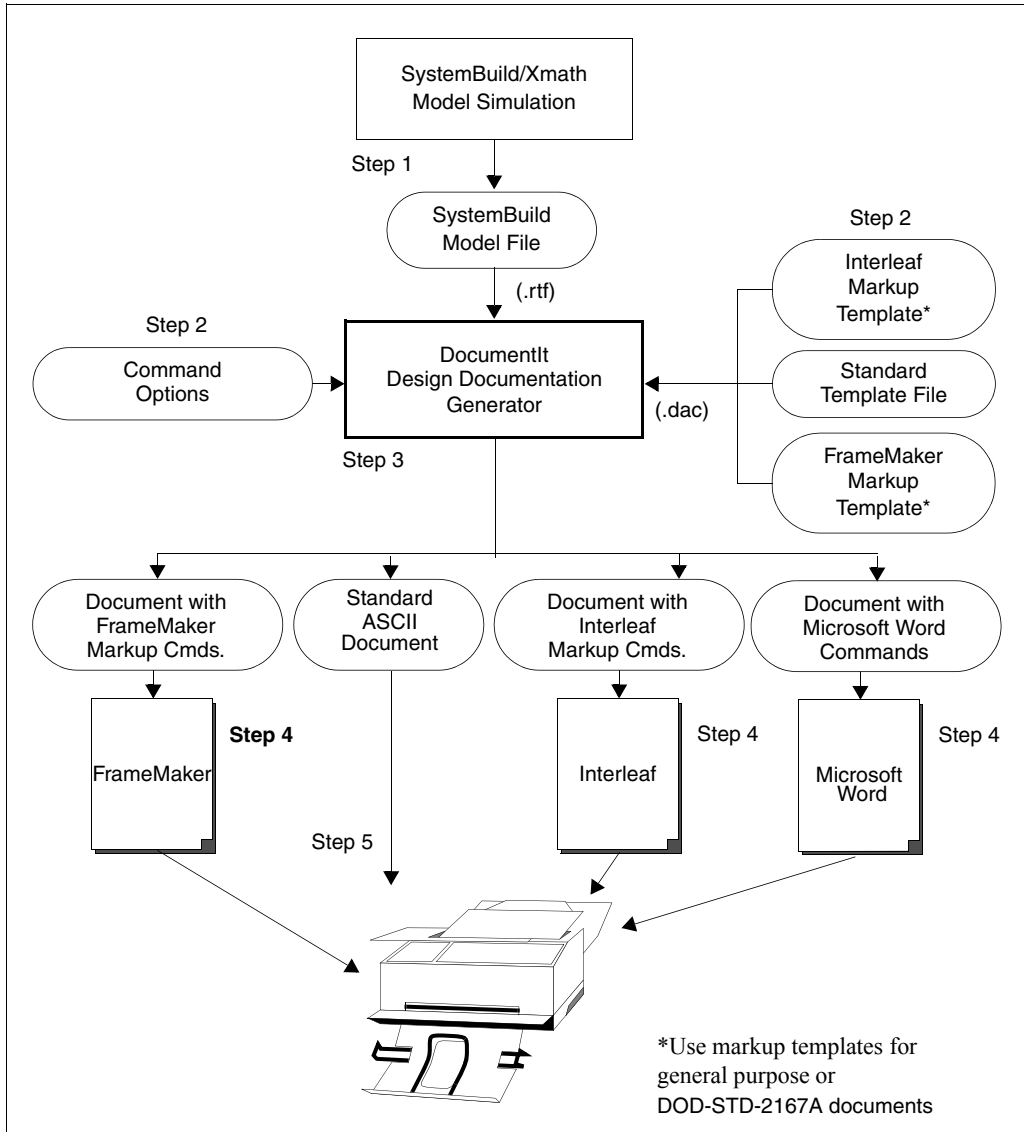


Figure 1-2. DocumentIt Automatic Documentation Generation Process

2. Customize documentation generation.

Tailor your generated design document using the template programming language (TPL) provided in DocumentIt. This programming language lets you implement virtually any template file

for a specialized purpose. DocumentIt output in this case is an ASCII text file, which you can use with almost any text editor. You can edit the file or print it as a simple unformatted ASCII file.

Typically, the template file contains DocumentIt parameters and publishing commands such as rich text format (RTF) or FrameMaker markup language (MML), which DocumentIt writes directly to the output file.

3. Generate the design document.

Invoke DocumentIt from inside SystemBuild, from the Xmath Commands window, or from the operating system prompt. DocumentIt loads discrete-time and continuous-time SuperBlocks, reading the associated data to generate the design documentation in accordance with the template instructions.

4. Process documents with markup commands.

Import DocumentIt document files with FrameMaker, Interleaf, or RTF markup commands into FrameMaker, Interleaf, or Microsoft Word, respectively. These applications automatically recognize the document formats.



Note RTF can be read by most word processing and desktop publishing programs, but it is the native format in Word.

5. Print the formatted document.

Save the model design document in RTF, FrameMaker (MML), or ASCII format, and send it to a printer in any printer output form such as PostScript or portable document format (PDF).

Cruise Control Example

This section illustrates the use of DocumentIt. Figure 1-3 shows a modified version of the cruise control model. This model is found in:

(UNIX) \$CASE/DIT/templates/fmaker/general/
 Controller_Logic_gen.dat

(Windows) %CASE%\case\DIT\templates\fmaker\general\
 Controller_Logic_gen.dat

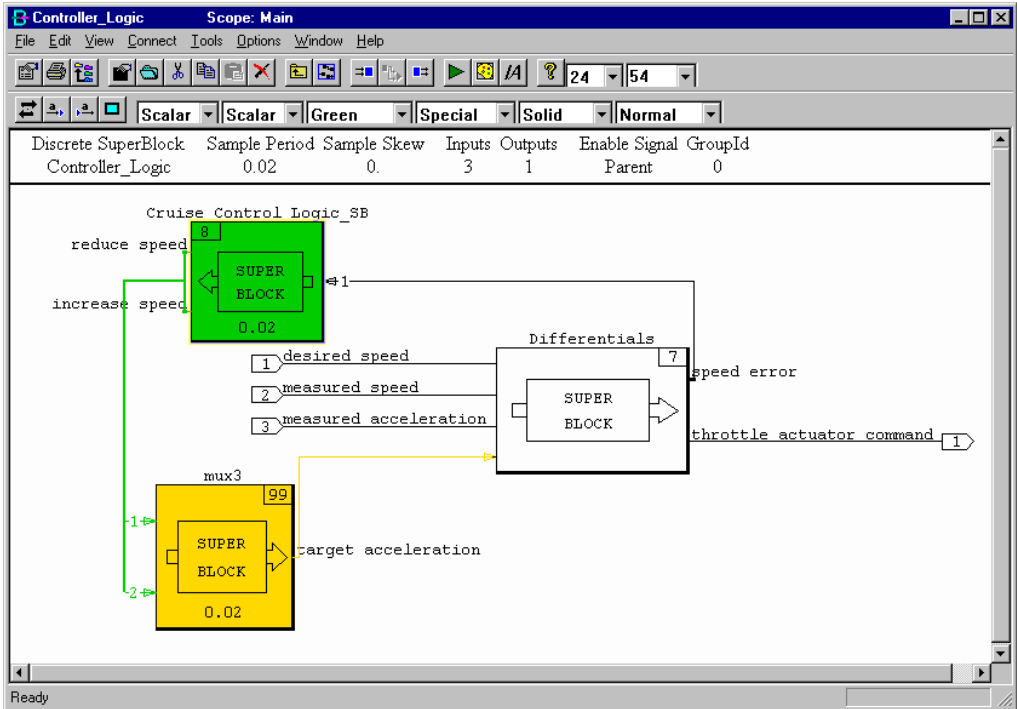


Figure 1-3. Cruise Control SystemBuild Diagram

The cruise control model consists of the highest-level SuperBlock, two embedded SuperBlocks, and associated units. Figure 1-4 shows the associated SuperBlock Properties dialog. Click **Help** for information on each field in the dialog.

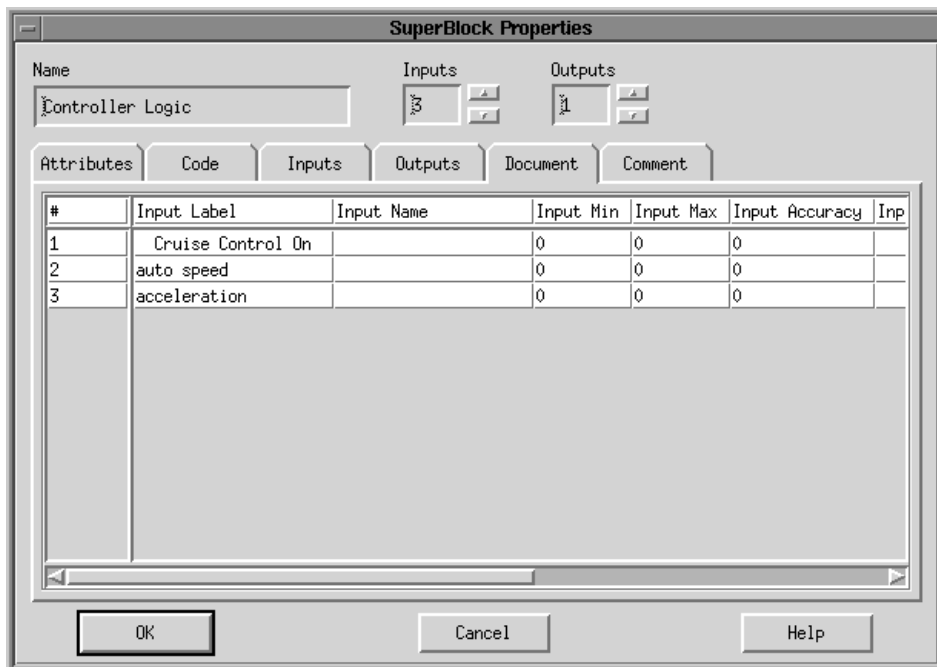


Figure 1-4. SuperBlock Properties for Cruise Control Diagram

The information from the SuperBlock Properties dialog can be included in the DocumentIt ASCII output file by using the appropriate keywords in the template file. The excerpt from a template file shown in Example 1-1 produces entries in the DocumentIt ASCII output file shown in Example 1-2.

Example 1-1 Template File Excerpt

```
@SEGMENT MAIN() STRING S1 @
Software Design Document
```

```
@SCOPE SUPERBLOCK 0@
```

```
Overview : @S1=user_param("OVERVIEW_s", "SUPERBLOCK")@@S1@
Architecture: @user_param("ARCHITECTURE_s", "SUPERBLOCK")@@S1@
System States and Models: @S1=user_param("SYSTEM_STATES_AND_MODES_s",
" SUPERBLOCK")@@S1@
```

```

Num Ext. In      = @num_sb_in_i@
Num Ext. Out    = @num_sb_out_i@
Num SuperBlocks = @num_blks_in_sb_i@
Attribute       = @sb_attr_s@
Frequency       = @sb_freq_r@

Has Input Data = @sb_has_in_data_b@
@ENDSEGMENT@

```

Example 1-2 DocumentIt ASCII Output File

```

=====
Software Design Document

```

Overview : This cruise controller regulates vehicle speed around a set point.

This cruise controller has three external inputs as follows:

the desired "speed" or velocity of the vehicle,

the current "speed,"

the current "acceleration" of the vehicle.

This cruise controller has one external output, which is the throttle actuator command.

Architecture: There are three SuperBlocks in this model.

The SuperBlocks are as follows:

the "Differentials" SuperBlock computes the difference between desired and measured velocity and acceleration, adds computed target acceleration to measured acceleration, and outputs a servo-limited throttle command based upon these differences

the "Cruise Control Logic" SuperBlock determines whether or not throttle position should be altered, based upon the difference between actual and desired vehicle velocity, and

the "Mux3" SuperBlock determines the target acceleration based upon inputs from the control logic.

System States and Models: This model is enabled and disabled externally.

```

Num Ext. In           = 3
Num Ext. Out         = 1
Num SuperBlocks      = 3
Attribute            = Discrete
Frequency            = 50.0000

```

Has Input Data = 1

Similarly, information from all SuperBlock/block dialogs and input/output description dialogs can be included within an ASCII output file by the appropriate use of the keywords in the template file.

How to Access National Instruments-Supplied Files

At several places in this manual, you are asked to execute, study, or copy and modify certain files we provide for your use. The paths to the files are specified by environment variables, which are established by the `xmath` startup software for your convenience. For UNIX, the environment variables are:

Variable	Status (as delivered)
<code>\$MTXHOME</code>	Available from operating system or Xmath Commands window
<code>\$SYSBLD</code>	Available from Xmath Commands window and SystemBuild Load/Save dialog
<code>\$XMATH</code>	Available from Xmath Commands window
<code>\$CASE</code>	Available from Xmath Commands window

To make `$SYSBLD`, `$XMATH`, or `$CASE` available from the operating system, in the Xmath Commands window, type:

```
oscmd ("echo $variable")
```

where *variable* is `SYSBLD`, `XMATH`, or `CASE`, as you require. The Xmath software will display the required path. From the operating system, place this path in a `setenv` statement and execute it.

For information on Windows environment variables, refer to the *Xmath User Guide*.

Related Publications

National Instruments provides a complete library of publications to support its products. In addition to this guide, publications (from NI and other sources) that you may find particularly useful when using DocumentIt include the following:

- *SystemBuild User Guide*
- *Xmath User Guide*
- *AutoCode User Guide*
- *AutoCode Reference*
- *Template Programming Language User Guide*
- Military Standard: Defense System Software Development, *DOD-STD-2167A*, February 1988
- *MML Reference* from Adobe Systems Incorporated

This manual will help you create custom documentation formats using FrameMaker MML markup language.

For additional documentation, refer to the *MATRIXx Help* or the NI Web site at ni.com.

Invoking DocumentIt

This chapter tells how to generate documents from SystemBuild, Xmath, and from the operating system prompt.

How to Generate Design Documentation

Using DocumentIt, you can generate design documentation from:

- **SystemBuild**—generates a real-time file (`.rtf`) and then extracts block and SuperBlock documentation from a model using the Generate Documentation dialog (the recommended method).
- **Xmath**—generates an `.rtf` file and then extracts block and SuperBlock documentation from a model using an Xmath command. Refer to Appendix A, *DocumentIt Options*, for the Xmath command options.
- **Operating system prompt**—lets you extract block and SuperBlock documentation from a `.rtf` file, using the `autostar` command. Refer to Appendix A, *DocumentIt Options*, for the operating system command options.

Generating Documentation From Within SystemBuild

To use DocumentIt while inside SystemBuild, complete the following steps:

1. Select a Top-Level SuperBlock. By default, the name of the SuperBlock you select is used for both the real-time file (RTF) file and the documentation output file.
2. Select **Tools»DocumentIt** from the Catalog Browser (or press <Ctrl-D>) to open the Generate Documentation dialog. Refer to the *Windows* section or the *UNIX* section for platform-specific information.

3. Select your options. The available options include:

- | | |
|-------------------------|---|
| Block Parameters | Select the source of the % Var information:
% Vars from Xmath —uses the latest values of the Xmath variables.
Block Defaults —uses the block’s default values. |
| Typecheck | If selected, the Analyzer checks for matching data types for input and output signals. AutoCode generates the appropriate data types in the target language that correspond to the SystemBuild data types. If not selected, input and output signals and parameter data are assumed to be FLOAT . In this case, DocumentIt only generates the RT_FLOAT data type for signals and data. Default = 0. |
| Template File | Specify (or browse for) the DocumentIt template <code>.tpl</code> or <code>.dac</code> file to be used to format the documentation. The standard ASCII template is used by default. |
| Config File | An options configuration file that lists the AUTOSTAR settings for both AutoCode and DocumentIt. The default options file is <code>autostart.opt</code> . By default, DocumentIt first looks for a file of that name in the current working directory; explicitly specified DocumentIt keywords are evaluated later, and override any options file settings. |
| MS Word | Enable special processing for Microsoft Word RTF file generation. This option is required if you are using the Microsoft Word template as described in Appendix E, <i>Generating Documents Using Microsoft Word</i> . |

4. Click **OK** and monitor the status of your document generation in the Xmath Commands window log area.

DocumentIt displays the following message:

```
Documentation generation complete.  
Document generated and saved in file: block_name.doc.
```

5. Open your generated document in the appropriate editor.

Platform Specific Differences

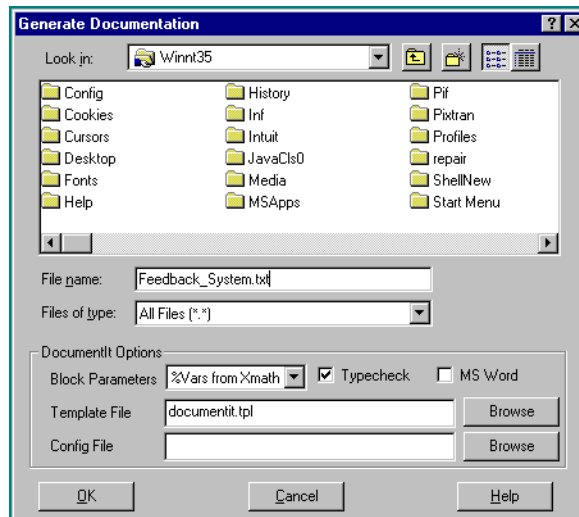
The DocumentIt Generate Documentation dialog has some platform-specific features.

Windows

SystemBuild uses the standard Windows selection dialog to display an output file name in the **File name** field. The **Look in** field displays the working directory which will be the output directory for your generated file. You can select any drive or directory for the generated file.

If you want more information on standard portions of the dialog, click the question mark (?) icon on the dialog title bar, and then position the question mark cursor over a field or icon and click. The Windows help for that field will be displayed.

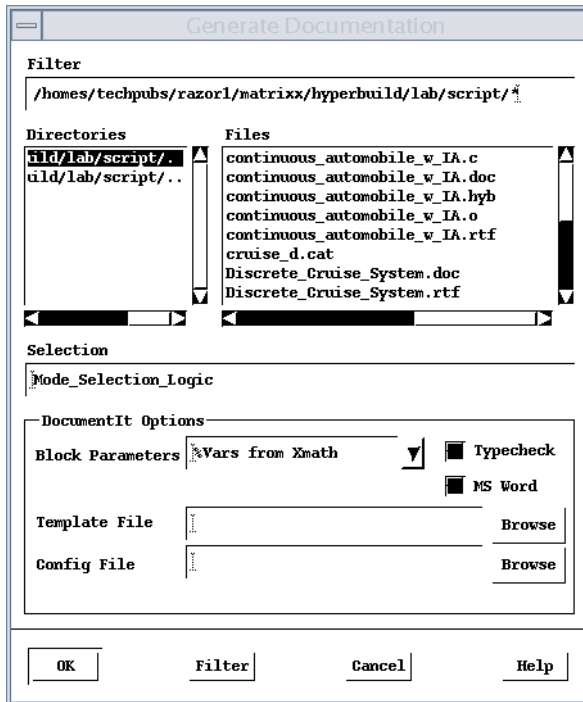
Depending on the template file used, the document can be either an ASCII text file or an ASCII file with embedded word processor markup language formatting commands. These commands are word processor specific. Example templates are provided to support FrameMaker, Interleaf, and rich text format (RTF), used by Microsoft Word and read by other programs.



Note A generated Microsoft Word file has the extension `.doc`. DocumentIt uses the extension `.rtf` for real-time files which can be used with the `autostar` command as described in the [Generating Documentation from the OS](#) section.

UNIX

The Generate Documentation dialog uses a standard Motif File Selection dialog to specify the name of the output documentation file in the Selection field.



Filter Displays the file selection directory path. Uses standard shell wildcard character(s) to select the files shown in the Files listing. Default value is the current directory with the * .cat filter. Pressing <Return> after changing the filter path updates the listings in **Directories** and **Files**.

Directories Lists the directories within the current directory. Double-click the directory name to change the current directory.

Files Lists the files in the selected directory that meet the filter criteria. If the rest of the dialog is filled out to your satisfaction, double-click a file to save to that file name.

Selection Displays the complete path to the file selected in the Files listing. Because this name is used for both the RTF file and the documentation file, any extensions will be stripped before creating the `.rtf` and source file names.

Template Information

Appendix B, *Generating Documents Using FrameMaker*, through Appendix E, *Generating Documents Using Microsoft Word*, provide examples of automatic documentation generation using DocumentIt templates, as follows:

- Appendix B, *Generating Documents Using FrameMaker*, describes how to generate a general purpose design document using DocumentIt and FrameMaker templates.
- Appendix C, *Generating 2167A Documents Using FrameMaker*, describes how to generate a sample design document conforming closely with DOD-STD-2167A using DocumentIt and FrameMaker templates.
- Appendix D, *Generating 2167A Documents Using Interleaf*, describes how to generate a sample design document conforming closely with DOD-STD-2167A using DocumentIt and Interleaf templates.
- Appendix E, *Generating Documents Using Microsoft Word*, describes how to generate a sample design document using DocumentIt and Microsoft Word templates.
- Appendix F, *Generating ASCII Documents*, describes how to generate a sample design document in ASCII text file format using a DocumentIt template.

Generating Documentation from Xmath

The `documentit` command lets you process a model to generate design documentation.

Two syntaxes are supported:

```
documentit, {model = name1, file = name2,  
template=name3}
```

```
documentit model, {options}
```

where *name1* identifies the model to be processed for documentation generation. The model can be either:

- A string in quotes (“”), which must be the name of a SuperBlock that exists in the current SystemBuild Catalog. This SuperBlock is analyzed and processed to generate documentation.
- A variable, not in quotes. Variables should be assigned to a string, the string must be the name of a SuperBlock in the current catalog. It is analyzed and processed to generate documentation.

Whenever a file name or other string is included in a command string, it must be enclosed in quotes, but a variable name must *not* be in quotes.

name2 is the name for the generated output document file. This value must be a string or string variable, as well. If the `file = name2` option is not provided, documentation will be generated in the file `model.doc`.

name3 is the name of the template file used to tailor the document. This value must be a string or string variable. If this option is not provided, the template `_documentit.tpl` (in the directory `$CASE/DIT/templates/ascii`) is used (%CASE% for Windows).

Refer to Appendix A, *DocumentIt Options*, for a complete list of DocumentIt options used in the second command syntax.

Examples:

```
documentit "topSB"
```

The system generates a real-time file named `topSB.rtf`. It loads this file and processes it to produce the document file. The output file name is `topSB.doc`.

```
documentit "topSB", {template="mytemplate"}
```

```
documentit, {model = "topSB", template = "mytemplate"}
```

Either syntax processes the SuperBlock `topSB` in the current catalog to produce documentation, using the template file `mytemplate`. The output file name is `topSB.doc`.

Generating Documentation from the OS

If a model file already exists, it is also possible to execute DocumentIt from the operating system prompt. The input file for processing must be a real-time file (.rtf). At the operating system prompt, execute the command:

```
% autostar {options} model_file.rtf
```

Many of the options are the same as the fields in the documentation generation dialog. Refer to Appendix A, *DocumentIt Options*, for a complete list of DocumentIt options.

DocumentIt runs, creating a document file. When the operating system prompt returns, the process is complete.

Examples:

```
% autostar -h
```

shows a help display.

```
% autostar -doc -t FM.tpl SysBld_file.rtf
```

processes the model file *SysBld_file.rtf* using a template file named *FM.tpl* to produce a document file named *SysBld_file.doc*. It assumes the template file *FM.tpl* exists in your working directory.



Note The DocumentIt real-time file (.rtf) input file is not the same as the rich text format file (.rtf) word processing output file. Only the file extension is the same.

Generate a Textual Version of a Model

One use of DocumentIt is to generate a textual version of a model. For example, the TPL sample file (*block_info.tpl*) shown in Example 2-1 generates output similar to the text shown in Example 2-2, which documents the Arbitrate Throttle Control SuperBlock from the Supercruise demo model.

Example 2-1 Sample TPL File for Documenting a Block

```
@SEGMENT MAIN() INT i, j@@
@LOOPP i eq 0, i lt nsupblks_i, i=i plus 1@@
@SCOPE SUPERBLOCK i@@
superblock name:           @sb_name_s@
superblock inputs:         @num_sb_in_i@
superblock outputs:        @num_sb_out_i@
```



```

number of blocks:          @num_blks_in_sb_i@
<display other desired superblock attributes here>

block list:
@LOOPP j=0, j lt num_blks_in_sb_i, j=j plus 1@@
@SCOPE BLOCK j@@
block name:                @blk_name_s@
block ID:                  @blk_id_i@
block type:                @blk_typ_s@
block inputs:              @num_blk_in_i@
block outputs:             @num_blk_out_i@
<display other desired block attributes here>

@ENDLOOPP@@
-----
@ENDLOOPP@@
@ENDSEGMENT@@

```

DocumentIt uses the TPL formatting language, such as the `block_info.tpl` file shown in Example 2-1, and built-in model parameters for automatic document generation. This template file generates default output in Microsoft Word format with the `blockname.doc` file name as shown in Example 2-2.

Example 2-2 Sample Output for Arbitrate Throttle Control SuperBlock

```

superblock name: Arbitrate Throttle Control
superblock inputs: 3
superblock outputs: 1
number of blocks: 3
<display other desired superblock attributes here>

block list:

  block name: throttle switch
  block ID: 24
  block type: Data Path Switch
  block inputs: 3
  block outputs: 1
  <display other desired block attributes here>

  block name: Block
  block ID: 34
  block type: Relational Operator -- LT-EQ-GT
  block inputs: 2
  block outputs: 1
  <display other desired block attributes here>

```

```

block name:          Block
block ID:            46
block type:          Logical Operator -- AND-OR-NOT
block inputs:        2
block outputs:       1
<display other desired block attributes here>

```

Pseudocode for the process of generating text for a SuperBlock is shown in Example 2-3.

Example 2-3 Pseudocode for Generating a Textual Printout of a Model

```

<get list of SuperBlock hierarchy>
<loop over all SuperBlocks selected>
  <extract, format and print SuperBlock comments, ...>
  <get list of all blocks>
  <loop over all blocks>
    <extract, format and print block comments, ...>
    <locate BlockScript blocks, print the code>
  <end loop>
<end loop>

```

Customizing the Generated Documentation

You can customize DocumentIt-generated output documentation to suit your specific needs by using templates. Template files are ASCII files containing text, interspersed with template command parameters that specify DocumentIt output.

In addition to template command parameters, template files can also use publishing software markup commands—for example, Microsoft Word RTF, Interleaf markup, and FrameMaker MML commands—which DocumentIt writes directly to the ASCII output file. The markup commands automatically format the document when it is imported into the corresponding publishing software.

For details about how to use TPL for DocumentIt output, refer to the *Template Programming Language User Guide*.

DocumentIt Options

This appendix provides additional information about invoking DocumentIt. Use this appendix together with Chapter 2, *Invoking DocumentIt*.

Options When Invoking DocumentIt

As described in Chapter 2, *Invoking DocumentIt*, DocumentIt can be invoked from the Catalog Browser, the Xmath Commands window, or the operating system prompt. Table A-1 lists the various DocumentIt options.

From the Catalog Browser, select **Tools»DocumentIt**.

From the Xmath Commands window, enter the following command. Refer to the *Generating Documentation from Xmath* section of Chapter 2, *Invoking DocumentIt*.

```
documentit options
```

From the operating system prompt, enter the following command. Refer to the *Generating Documentation from the OS* section of Chapter 2, *Invoking DocumentIt*.

```
autostar -doc options
```

Table A-1. Command Options when Invoking DocumentIt

Xmath Option	OS Option	Description
file	-o	A string defining the output file for generated documentation. If no name is supplied, the top level SuperBlock name is used with the .doc extension.
Xmath does not have a help keyword, but has the command <code>help autocode</code> for Netscape help.	-h	Obtains a help display.

Table A-1. Command Options when Invoking DocumentIt (Continued)

Xmath Option	OS Option	Description
model	This Xmath option is used for creating the .rtf file. When invoking from the OS, the .rtf file must already exist; therefore, there is no OS option equivalent.	A text string representing the name of a SuperBlock in the SystemBuild Editor—for example, <code>System</code> .
msrtf	-msw1	Provides special parsing for Microsoft Word documentation generation. Ignores the <code>\par</code> parameter in the rich text format (RTF) when you use <code>@@</code> and merges a word when it is divided across two lines.
options	-opt	A string specifying the name of the options file. Options are entered in the file using the same syntax as if they were specified in an operating-system call to AutoCode outside Xmath, except that options normally passed as strings must not be quoted. Command options override all the options in this file, and the RTF file name cannot be given here. Single line comments are done by using <code>//</code> characters. Refer to the Using the autostar.opt File section for more information about the options file.
rtf	The name of the .rtf file must always be specified when invoking from the command prompt.	A string specifying the RTF file name. You can use the RTF file along with the standalone AUTOCODE command to regenerate code. The RTF file is generated using the <code>CREATERTF</code> command.

Table A-1. Command Options when Invoking DocumentIt (Continued)

Xmath Option	OS Option	Description
<code>tpldac</code>	<code>-d</code>	A string specifying the location of the template dac file to be used in document generation. Default file is <code>\$XMATH/./case/DIT/templates/ascii/documentit.dac</code> (the code template dac).
<code>tplsrc</code>	<code>-t</code>	A string specifying the location of the template file to be used in document generation. The default file is <code>\$XMATH/./case/DIT/templates/ascii/documentit.tpl</code> (the code template).
<code>typecheck</code>	Xmath does not have a <code>help</code> keyword, but has the command <code>help autocode</code> for Netscape help.	Boolean (default=1). When TRUE, this option enables the checking of variable types for the SystemBuild analyzer. Typechecking is on by default.
<code>vars</code>	Xmath does not have a <code>help</code> keyword, but has the command <code>help autocode</code> for Netscape help.	Boolean (default=1). When TRUE, this flag forces <code>%</code> variables in the Xmath workspace to be used. When FALSE, SystemBuild default block form values will be used.

Using the `autostar.opt` File

If you invoke DocumentIt with the same options consistently, you can put these options into an options file, eliminating error-prone, repetitive typing each time you invoke DocumentIt. DocumentIt reads the options file at startup, and performs the options as though you had entered them on the command line. Although you can use an options file whether you invoke DocumentIt from the Xmath Commands window or the operating system prompt, the only options that you can specify in the options file are operating system command options.

The default options file is `autostar.opt`. If you have an `autostar.opt` file in the current working directory from which you invoke DocumentIt, the options in that file will be executed when you invoke DocumentIt. If you specify an option for the command prompt that is also in the options

file, the command option overrides the same option in the options file. Refer to Example A-1 and the following paragraphs.

For different applications, you might need to invoke DocumentIt differently. For this reason, you can have multiple options files. To invoke DocumentIt with an options file other than `autostar.opt`, specify the name of the options file when you invoke DocumentIt. Refer to Example A-2 and the following paragraphs.

Options are entered in the options file using the same syntax as if they were specified in the command syntax. The exception is that map specifications are not enclosed between quotes. Options can be on one line, separate lines, or a combination. The RTF file name cannot be specified in the options file. Single line comments are preceded and followed by `//` characters.

Example A-1 shows an options file.

Example A-1 Example autostar.opt Options File

```
// Sample options file //
-t c386_c860_mb2.tpl
-o myoutput
```

To use this file, invoke DocumentIt as follows:

```
autostar -doc model.rtf
```

This invokes DocumentIt with the `autostar.opt` options file.

Consider the following command:

```
autostar -doc -o myoutput3 model.rtf
```

The options file is again used, but the output file option (`-o`) is specified at the command prompt, so it overrides the corresponding command in the options file. The output documentation will be in the `myoutput3` file, not in the `myoutput` file as specified in the options file.

Example A-2 shows an options file called `myopt.opt`.

Example A-2 Example Options File Called myopt.opt

```
// Sample options file //  
-t c386_c860_mb2.tpl  
-o myoutput2
```

To use this file, invoke DocumentIt as follows:

```
autostar -doc -opt myopt.opt model.rtf
```

This invokes DocumentIt with the `myopt.opt` options file.

If you have both of the above option files in your directory, as shown in Examples A-1 and A-2, invoking `autostar` without the `-opt` option puts the generated documentation into the `myoutput` file. The `autostar.opt` options file is used. Invoking `autostar` with the `-opt myopt.opt` option as shown in the previous command puts the generated documentation into the `myoutput2` file, as specified in the `myopt.opt` file.

Generating Documents Using FrameMaker

This appendix provides instructions for using the FrameMaker documentation example. This includes describing how to:

- Generate documents and encapsulated PostScript files
- Import encapsulated PostScript files into a generated document automatically and manually
- Format table data for FrameMaker

All FrameMaker documentation example files are located in:

(UNIX) `$CASE/DIT/templates/fmaker/general`

(Windows) `%CASE%\DIT\templates\fmaker\general`

Using Your Own Templates

If you want to generate documentation using your own templates, you might consider copying the supplied example files and then modifying them. The purpose of each file is given in Table B-1. FrameMaker markup language (MML) commands also are listed in Table B-1.

Table B-1. FrameMaker Example Files

Filename	Description
fmgp.tpl	This template file determines what information will be extracted from the model to create an ASCII output file. Additionally, <code>fmgp.tpl</code> embeds FrameMaker MML commands, which define how the document will be formatted when it is imported into FrameMaker. Finally, the template also embeds an MML command that calls the include file <code>fmgpinc.mml</code> , which defines what MML commands FrameMaker should recognize from the FrameMaker template <code>fmgp.doc</code> .
fmgpinc.mml	This include file specifies what MML commands the FrameMaker template file <code>fmgp.doc</code> should recognize. However, the actual format definitions of these commands are not specified in this include file; rather, the format specifications for each MML command are incorporated into <code>fmgp.doc</code> . All MML commands listed in this include file are given in Table B-2. The table also gives a brief description of each MML command as it is defined by <code>fmgp.doc</code> .
fmgp.doc	This is a supplied FrameMaker template into which you must import an ASCII data file generated by DocumentIt using the DocumentIt template <code>fmgp.tpl</code> .
fmgpTOC.doc	This FrameMaker template receives the table of contents you generate from <code>fmgp.doc</code> . It is important to consider that FrameMaker normally generates a TOC file automatically from a document file, but no format is specified. The purpose of this file is to provide a suitable format for the TOC, rather than requiring you to develop one.
Controller_Logic_gen.dat	Controller logic model.

Table B-2. FrameMaker MML Commands

Command	Description
<Author>	Command on the title page; formats the name of the author providing the document (refer to Figure B-2).
<body1>	Normal text paragraph format.

Table B-2. FrameMaker MML Commands (Continued)

Command	Description
<body2>	Indented text paragraph which can be used to align with the text in a numbered list (first level number).
<body3>	Indented text paragraph which can be used to align with the text in a numbered list (second level number).
<bull1>	First level bulleted list.
<bull2>	Second level bulleted list.
<chap>	Chapter title.
<CoBody>	Name of the company providing the document given on the title page. Refer to Figure B-2.
<Date>	Title page entry for the document date. Refer to Figure B-2.
<DocTitle>	Document title. Refer to Figure B-2.
<EXample>	Numbered title of an example (automatic numbering).
<EXinit>	Numbered title of an example (reset count to 1).
<EXtext>	Text format for programming example.
<FIGcap>	Automatically numbered figure caption.
<head1>	First heading level.
<head2>	Second heading level.
<head3>	Third heading level.
<head4>	Fourth heading level.
<head5>	Fifth heading level.
<list1>	Numeric list (automatic numbering).
<list1init>	Numeric list (automatic numbering reset to 1).
<list2>	Alpha list (automatic numbering).
<list2init>	Alpha list (automatic numbering reset to a).
<NOTE>	Note paragraph with the word NOTE included.

Table B-2. FrameMaker MML Commands (Continued)

Command	Description
<NOTE+>	Indented paragraph that aligns with the text in the NOTE paragraph. The word NOTE is not included. This is used when a note has a second paragraph.
<Rev>	Revision of the document on the title page. Refer to Figure B-2.
<TBLcap>	Automatically numbered table caption.

Generating a Sample Document

To generate a sample document using DocumentIt and FrameMaker, complete the following steps:



Note If you want to generate a document from your own model, follow the same steps given in this example, but use your own model for document generation.

1. Create a directory in which you want the output document to reside.
2. Copy all files from:
 - (UNIX) \$CASE/DIT/templates/fmaker/general
 - (Windows) %CASE%\DIT\templates\fmaker\general
 to the document directory.
3. From the Catalog Browser File menu, select **Load**.
4. Browse through the document directory and double-click to load the file `Controller_Logic_gen.dat`.
5. In the Catalog pane of the Catalog Browser, select the top-level SuperBlock—in this case, `Controller_Logic`.
6. From the Catalog Browser, select **Tools»DocumentIt**. The Generate Documentation dialog appears.
7. In the File Name field, enter `Controller_Logic.mml`.



Note An ASCII file with MML markup commands must have a file extension of `.mml` to be formatted by FrameMaker.

8. With the Block Parameters combo box, select **% Vars from Xmath**.
9. In the Template File field, specify `fmgp.tpl` as the template file.
10. Select the **Typecheck** checkbox.
11. To generate the MML document file, click **OK**.

Changing the Generic Title Page

The MML file that you have generated—in this case, `Controller_Logic.mml`—includes a generic title page that appears as shown in Figure B-1 after it is imported into FrameMaker. If you want to change the data on the title page, you can accomplish this in one of the three following ways:

- Using a text editor, you can edit the `fmgp.tpl` data. Figure B-2 shows the data in the `fmgp.tpl` file that produces the title page shown in Figure B-1. You should make these changes to `fmgp.tpl` *before* you generate the document from SystemBuild. All subsequent documents generated by DocumentIt using `fmgp.tpl` will continue to have your new title page until you change the contents of `fmgp.tpl` again.
- Using a text editor, you can edit the MML output file you have just generated. Figure B-2 shows the data in the example file `Controller_Logic.mml` that produces the title page shown in Figure B-1. If you regenerate the document, you will have to edit this file again.
- If you are familiar with FrameMaker, you can edit the title page after you import the data into FrameMaker.

If your MML output files contain *less than* (<) or *greater than* (>) characters from your model, you must use your text editor to place a *backslash* (\) character in front of these characters. This is required because these characters will otherwise be interpreted as invalid MML commands when the `*.mml` file is imported into FrameMaker.



Figure B-1. Generic Title Page

```

<DocTitle>
Software Design Document
<Author>
Author's Name
<Rev>
X.X
<Date>
January 27, 1994
<CoBody>
Company Name

Street Address

City, State ZIP

```

Figure B-2. Title Page Data in fmgp.tpl and controller_logic_gen.mml

Generating an .eps file from SystemBuild

- To place an illustration in your FrameMaker document, you must insert an anchored frame where you want the figure to appear. Two anchored frames are inserted into this example so that you can see how they work. For details on .eps files, refer to the *Template Programming Language User Guide*. You can insert an anchored frame in your document in one of the following ways:
 - Using a text editor, insert `@include_img()@` to automatically import the illustration when you generate the document.
 - Using a text editor, you can insert the TPL function `@small_frame()@ (5 in. × 5 in. frame)` or `@large_frame()@ (7 in. × 5 in. frame)` in `fmgp.tpl` where you want the figure to appear. You should make these changes to `fmgp.tpl` *before* you generate the document from SystemBuild. After the document is processed and imported into FrameMaker, a blank frame is placed in your document in the location you specified. Refer to your FrameMaker documentation to use the *capture* feature to capture and import the figure that you want into the anchored frame.
 - Using a text editor you can insert the MML command `<AFrame <BRect 0 0 h" w">>` into the ASCII output file you have just generated, where the variables *h* and *w* are the height and width of the frame, respectively. After the document is imported into FrameMaker, a blank frame is placed in your document in the

location you specified. Use the FrameMaker *capture* feature to capture and import the figure that you want into the anchored frame.

- If you are familiar with FrameMaker, you can create an anchored frame and import the figure you want directly into your FrameMaker document by completing the following steps.
 - a. Highlight the top level SuperBlock (Controller_Logic).
 - b. Select **File>Page Setup** to make any adjustments to the image before creating the graphics file. In this case, accept the defaults.
 - c. Select **File>Print to File**.
 - d. From the Format pull-down menu, select **EncapPostScript**.
 - e. From the Output pull-down menu, select **Separate files**.
 - f. Click **OK**.



Note If the .eps illustration is too large for the anchored frame, use the FrameMaker Graphics Scale option to adjust the size.

2. From the system prompt in the document directory, start FrameMaker.
3. From FrameMaker, open `fmgp.doc`. You will find a blank file, with the exception of vertical lines on the left side of the page.
4. From the pull-down menu, select **File>Import**.
5. Select **Copy File into Document**.
6. Select `Controller_Logic.mml` and click **OK**.
7. After the import is complete, you will still have a blank page, except for a single paragraph text symbol at the top of the page somewhat hidden in the top portion of the vertical lines. Select the paragraph symbol and delete it.

The title page of the *Software Design Document* fills the page. Do not be concerned if the vertical lines display as broken lines; they will be restored as soon as you page through the document.



Note Do not save this file until you are prompted to do so.

Putting Information in Table Format

1. Page through the document to ensure it meets your needs. If you have information that you want in *table* format, complete the following steps, beginning with step a. If you have no tables, skip to step 2.
 - a. Select all the data you want to include in the table, but do not include the last paragraph symbol in the last row of table data. Refer to Figure B-3 for an example of exactly what information you need to select for reformatting.

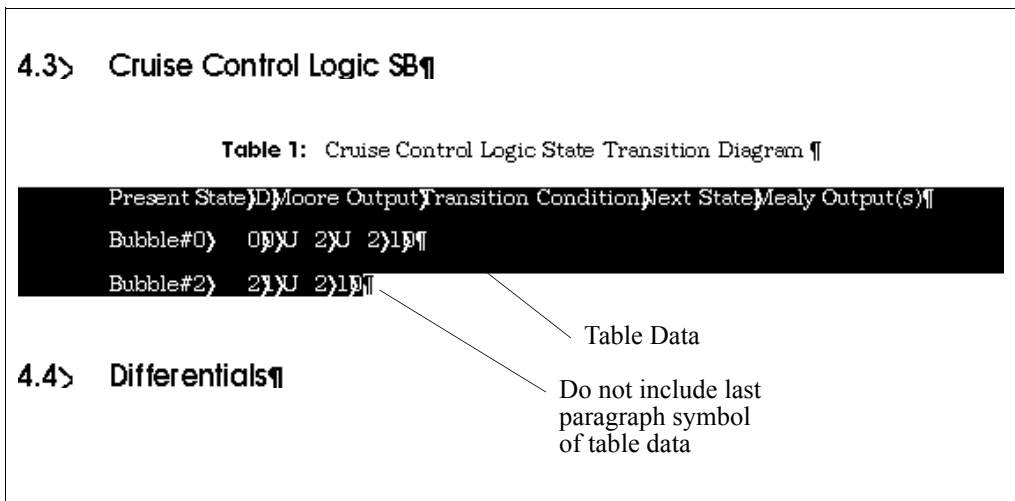


Figure B-3. Marking Data for Table Formatting

- b. From the pull-down menu, select **Table»Convert to Table**. When the Convert to Table dialog appears, leave the settings intact and click **OK**.
- c. From the pull-down menu, select **Table»Resize Columns**. When the Resize Columns dialog appears, click **By Scaling to Widths Totalling**. Change the value to 6.25 inches, and click **OK**. Make sure that the whole table is selected when you do this. At this point you can resize individual columns if necessary.

You can also click and drag to highlight one or more table columns. Click to grab the left column handles, and pull out or push in to resize the column.

- d. Delete any extraneous paragraph symbols that may have appeared below the table during the conversion process. This is necessary due to the way FrameMaker converts tables.
 - e. Complete steps a through d for each table you have in the document.
 2. From the pull-down menu, select **File»Generate**.
 3. Click **List Table of Contents**, then click **Generate**.
 4. Leave all the current settings in the Set Up Table of Contents dialog intact and click **OK**.
 5. The `fmgrpTOC.doc` file now appears on the screen with a complete list of sections and subsections. However, since FrameMaker lists all items in the order in which they appear in a document, some minor formatting is required for the list of figures and tables. Complete these tasks as follows:
 - a. Page down through the TOC. Using the Cut and Paste features under the **Edit** pull-down menu, put all figure references at the end of the Table of Contents. Do the same thing for all table references, so they follow the figures.
 - b. At the first *figure* entry, which is now near the end of the Table of Contents, put the cursor in front of the **Figure 1** entry.
 - c. Type in `Figures` and press <Enter>.
 - d. Click the word `Figures` once.
 - e. Click the Paragraph Catalog symbol in the upper right corner of the page to display the Paragraph Catalog. In the catalog, select the paragraph type **TabFigTC**.

The heading for the list of figures is now formatted correctly.
 - f. Repeat this process for the list of tables.
 6. Select the `fmgrp.doc` frame. From the **File** pull-down menu, select **Save As** and assign a new file name to your document file.
 7. (Optional) To print the document, select **File»Print**.

8. Select the `fmgpTOC.doc` frame. From the **File** pull-down menu, select **Save As**. You must specify the identical path and file name as you did in the previous step for your new document file, only add `TOC` to the file name before the extension. Refer to the following example.

Original File Name	New File Name
<code>fmgp.doc</code>	<code>FMsample1.doc</code>
<code>fmgpTOC.doc</code>	<code>FMsample1TOC.doc</code>

This scheme allows you to generate TOCs in the future—when you modify your document—without having to construct a new TOC template.

You now have a new document and your original templates have remained intact.



Note Refer to the *Using Your Own Templates* section for information about using your templates instead of the supplied templates.



Generating 2167A Documents Using FrameMaker

This appendix describes how to use the FrameMaker 2167A example. This includes describing how to:

- Generate documents and encapsulated PostScript files.
- Import encapsulated PostScript files into a generated document automatically and manually.
- Format table data for FrameMaker.

All FrameMaker 2167A example files are located in:

(UNIX) \$CASE/DIT/templates/fmaker/milstd

(Windows) %CASE%\DIT\templates\fmaker\milstd

Using Your Own Templates

If you want to generate documentation using your own templates, you might want to consider copying the supplied example files and then modifying them. The purpose of each file is given in Table C-1. FrameMaker markup language (MML) commands are listed in Table C-2.

Table C-1. FrameMaker 2167A Example Files

Filename	Description
fmmil.tpl	This template file determines what information will be extracted from the model to create an ASCII output file. Additionally, fmmil.tpl embeds FrameMaker MML commands, which define how the document will be formatted when it is imported into FrameMaker. Finally, the template also embeds an MML command that calls the include file fmmilinc.mml, which defines what MML commands FrameMaker should recognize from the FrameMaker template fmmil.doc.
fmmilinc.mml	This include file specifies what MML commands the FrameMaker template file fmmil.doc should recognize. However, the actual format definitions of these commands are not specified in this include file; rather, the format specifications for each MML command are incorporated into fmmil.doc. All MML commands listed in this include file are given in the next table. The table also gives a brief description of each MML command as it is defined by fmmil.doc.
fmmil.doc	This is a supplied FrameMaker template into which you must import an ASCII data file generated by DocumentIt using the DocumentIt template fmmil.tpl.
fmmilTOC.doc	This FrameMaker template receives the table of contents you generate from fmmil.doc. It is important to consider that FrameMaker normally generates a TOC file automatically from a document file, but no format is specified. The purpose of this file is to provide a suitable format for the TOC, rather than requiring you to develop one.

Table C-2. FrameMaker 2167A MML Commands

Command	Description
<Author>	Last command on the title page; formats the name of the company providing the document. Refer to Figure C-2.
<body1>	Normal text paragraph format.
<body2>	Indented text paragraph which can be used to align with the text in a numbered list (first level number).
<body3>	Indented text paragraph which can be used to align with the text in a numbered list (second level number).
<bul11>	First level bulleted list.

Table C-2. FrameMaker 2167A MML Commands (Continued)

Command	Description
<bull2>	Second level bulleted list.
<CDRL>	Title page CDRL sequence number. Refer to Figure C-2.
<chap>	Chapter heading level.
<Client>	Title page entry for the name of the client for whom the document was prepared. Refer to Figure C-2.
<contract>	Title page entry for the contract number. Refer to Figure C-2.
<DocTitle>	Document title. Refer to Figure C-2.
<EXample>	Numbered title of an example (automatic numbering).
<EXinit>	Numbered title of an example (reset count to 1).
<EXtext>	Text format for programming example.
<FIGcap>	Automatically numbered figure caption.
<head1>	First heading level (for example, 1.1).
<head2>	Second heading level (for example, 1.1.1).
<head3>	Third heading level (for example, 1.1.1.1).
<head4>	Fourth heading level (for example, 1.1.1.1.1).
<head5>	Fifth heading level (for example., 1.1.1.1.1.1).
<list1>	Numeric list (automatic numbering).
<list1init>	Numeric list (automatic numbering reset to 1).
<list2>	Alpha list (automatic numbering).
<list2init>	Alpha list (automatic numbering reset to a).
<NOTE>	Note paragraph with the word NOTE included.
<NOTE+>	Indented paragraph that aligns with the text in the NOTE paragraph. The word NOTE is not included. This is used when a note has a second paragraph.
<PrepBy>	Title page entry. Refer to Figure C-2.
<PrepFor>	Title page entry. Refer to Figure C-2.
<Rev>	Revision and date entry on the title page. Refer to Figure C-2.

Table C-2. FrameMaker 2167A MML Commands (Continued)

Command	Description
<TBLcap>	Table caption.
<TitlePar1>	Title page entries. Refer to Figure C-2.
<TitlePar2>	Title page CSCI name and system name entries. Refer to Figure C-2.

Generating the 2167A Document

To generate the sample 2167A document using DocumentIt and FrameMaker, complete the following steps:



Note If you want to generate a document from your own model, follow the same steps given in this example, but use your own model for document generation.

1. Create a directory in which you want the output document to reside.
2. Copy all files from:
 - (UNIX)** \$CASE/DIT/templates/fmaker/general
 - (Windows)** %CASE%\DIT\templates\fmaker\general
 to the document directory.
3. From the Catalog Browser File menu, select **Load**.
4. Browse through the document directory and double-click to load the file `Controller_Logic_mil.dat`.
5. In the Catalog pane of the Catalog Browser, select the top-level SuperBlock—in this case, `Controller_Logic`.
6. From the Catalog Browser, select **Tools»DocumentIt**. The Generate Documentation dialog appears.
7. In the File Name field, enter `Controller_Logic_mil.mml`.



Note An ASCII file with MML markup commands must have a file extension of `.mml` in order to be formatted by FrameMaker.

8. With the Block Parameters combo box, select **% Vars from Xmath**.
9. In the Template File field, specify `fmgp.tpl` as the template file.
10. Click the **Typecheck** checkbox.
11. To generate the MML document file, click **OK**.

Changing the Generic Title Page

The MML file that you have generated—in this case, `controller_logic_mil.mml`—includes a generic title page that appears as shown in Figure C-1 after it is imported into FrameMaker. If you want to change the data on the title page, you can accomplish this in one of the three following ways:

- Using a text editor, you can edit the `fmmil.tpl` data. Figure C-2 shows the data in the `fmmil.tpl` file that produces the title page shown in Figure C-1. You should make these changes to `fmmil.tpl` *before* you generate the document from SystemBuild. All subsequent documents generated by DocumentIt using `fmmil.tpl` will continue to have your new title page until you change the contents of `fmmil.tpl` again.
- Using a text editor, you can edit the MML output file you have just generated. Figure C-2 shows the data in the example file `controller_logic_mil.mml` that produces the title page shown in Figure C-1. If you regenerate the document, you will have to edit this file again.
- If you are familiar with FrameMaker, you can edit the title page after you import the data into FrameMaker.



Note If your output files contain *less than* (<) or *more than* (>) characters from your model, you must use your text editor to place a *backslash* (\) character in front of these characters. This is required because these characters will otherwise be interpreted as invalid MML commands when the *.mml file is imported into FrameMaker.

Revision X.X: June 12, 2000

Software Design Document

For The

CSCI NAME

Of

System Name

CONTRACT NO. xxxxxxxx

CDRL SEQUENCE NO. xxxxxxxxxxxx

Prepared for:
Contracting Agency Name, Department Code

Prepared by:
National Instruments Corp.

Figure C-1. Generic Title Page

```

<Rev>
Revision X.X: June 12, 2000
<DocTitle>
Software Design Document
<TitlePar1>
For The
<TitlePar2>
CSCI NAME
<TitlePar1>
Of
<TitlePar2>
System Name
<contract>
XXXXXXXX
<CDRL>
XXXXXXXXXXXXX
<PrepFor>
Prepared for:
<Client>
Contracting Agency Name, Department Code
<PrepBy>
Prepared by:
<Author>

```

Figure C-2. Title Page Data in fmmil.tpl and controller_logic_mil.mm

Generating an .eps file from SystemBuild

To place an illustration in your document, you must insert an anchored frame where you want the figure to appear. Two anchored frames are inserted into this example so that you can see how they work. For details on .eps files, refer to the *Template Programming Language User Guide*. You can insert an anchored frame in your document in one of the following ways:

- Using a text editor, insert `@include_img()@` to import the illustration automatically when you generate the document.

You must edit the .eps file generated from SystemBuild in the text editor and change the first line as follows:

```

%!PS-ADOBE-1.0
to
%!PS-ADOBE-3.0 EPSF-3.0

```

- Using a text editor, you can insert the `tpl` function `@small_frame()@ (5 in. × 5 in. frame)` or `@large_frame()@ (7 in. × 5 in. frame)` in `fmgp.tpl` where you want the figure to appear. You should make these changes to `fmgp.tpl` *before* you generate the document from SystemBuild. After the document is processed and imported into FrameMaker, a blank frame will be placed into your document in the location you specified. Refer to your FrameMaker documentation to use the *capture* feature to capture and import the figure that you want into the anchored frame.
- Using a text editor, you can insert the **MML** command `<AFrame <BRect 0 0 h" w">>` into the ASCII output file you have just generated, where the variables *h* and *w* are the height and width of the frame, respectively. After the document is imported into FrameMaker, a blank frame will be placed into your document in the location you specified. Refer to your FrameMaker documentation to use the capture feature to capture and import the figure that you want into the anchored frame.
- If you are familiar with FrameMaker, you can create an anchored frame and import the figure you want directly into your FrameMaker document.
 - a. Highlight the top level SuperBlock (Controller_Logic).
 - b. Select **File>Page Setup** to make any adjustments to the image before creating the graphics file. In this case, accept the defaults.
 - c. Select **File>Print to File**.
 - d. From the Format pull-down menu, select **EncapPostScript**.
 - e. From the Output pull-down menu, select **Separate files**.
 - f. Click **OK**.



Note If the `.eps` illustration is too large for the anchored frame, use the FrameMaker Graphics Scale option to adjust the size.

The following message appears in the SystemBuild menu bar to confirm that a hard copy `.eps` file was generated:

**5 SuperBlock(s) hardcopied into file
Controller_Logic.eps**

1. From the system prompt in the document directory, invoke FrameMaker.
2. From FrameMaker open `fmmil.doc`. You will find a blank file.
3. From the pull-down menu, select **File>Import**.

4. Click **Copy File into Document**.
5. Select **Controller_Logic_mil.mml** and click **OK**.
6. After the import is complete, you will still have a blank page except for a single paragraph text symbol at the top of the page. Select the paragraph symbol and delete it. The *Software Design Document* title page will fill the page.



Note Do not save this file until you are prompted to do so.

Putting Information in Table Format

Page through the document to ensure it meets your needs. If you have information that you want to be in *table* format, complete the following steps, beginning with step 1. If you have no tables, skip to step 6.

Select all the data you want to include in the table, but do not include the last paragraph symbol in the last row of table data. Refer to Figure C-3 for an example of exactly what information you need to select for reformatting.

4.3> Cruise Control Logic SB¶

Table 1: Cruise Control Logic State Transition Diagram ¶

Present State	Moore Output	Transition Condition	Next State	Mealy Output(s)
Bubble#0	0	1	2	1
Bubble#2	2	1	1	1

4.4> Differentials¶

Table Data

Do not include last paragraph symbol of table data

Figure C-3. Marking Data for Table Formatting

1. From the pull-down menu, select **Table»Convert to Table**. When the Convert to Table dialog appears, leave the settings intact and click **OK**.
2. From the pull-down menu, select **Table»Resize Columns**. When the Resize Columns dialog appears, click **By Scaling to Widths Totalling**. Change the value to 6.25 inches and click **OK**. Make sure that the whole table is selected when you do this. At this point, you can resize individual columns if necessary.

3. You can also click and drag to highlight one or more table columns. Click the left mouse to grab the left column handles, and pull out or push in to resize the column.
4. Delete any extraneous paragraph symbols that may have appeared below the table during the conversion process. This is necessary due to the manner in which FrameMaker converts tables.
5. Complete the steps 1 through 4 for each table you have in the document.
6. From the **File** pull-down menu, select **Generate**.
7. Click **List Table of Contents**, and then click **Generate**.
8. Leave all the current settings in the Set Up Table of Contents dialog intact and click **OK**.
9. The file `fmm11.TOC.doc` now appears on the screen with a complete list of sections and subsections. However, since FrameMaker lists all items in the order in which they appear in a document, some minor formatting is required for the list of figures and tables. Complete the following steps:
 - a. Page down through the TOC. Using the **Cut** and **Paste** features under the **Edit** pull-down menu, put all figure references at the end of the Table of Contents. Do the same thing for all table references, so they follow the figures.
 - b. At the first *figure* entry (now near the end of the Table of Contents), put the cursor in front of the **Figure 1** entry.
 - c. Type in *Figures* and press <Enter>.
 - d. Click *Figures* once.
 - e. Click the Paragraph Catalog symbol in the upper right corner of the page. This will display the Paragraph Catalog. In the catalog, click the paragraph type **TabFigTC**. The heading for the list of figures is now formatted correctly.
 - f. Repeat steps a through e for the list of tables.
10. Select the `fmm11.doc` frame. From the **File** pull-down menu, select **Save As** and assign a new file name to your document file. If you wish, you can print the file at this time.

11. Select the `fmml1TOC.doc` frame. From the **File** pull-down menu, select **Save As**. Now, you must specify the identical path and file name as you did in the previous step for your new document file, only add TOC to the file name before the extension. Refer to the following example.

Original File Name	New File Name
<code>fmml1.doc</code>	<code>FMsample1.doc</code>
<code>fmml1TOC.doc</code>	<code>FMsample1TOC.doc</code>

This scheme allows you to generate TOCs in the future—when you modify your document—without having to construct a new TOC template.

You now have a new document and your original templates have remained intact. You can now close your files.



Note Refer to the [Using Your Own Templates](#) section for information about using your templates instead of the supplied templates.

Generating 2167A Documents Using Interleaf

Here are instructions for using the Interleaf 2167A example. This tutorial tells how to:

- Generate documents and encapsulated PostScript files.
- Import `epsf` files into a generated document automatically and manually.
- Format table data for Interleaf.

All Interleaf 2167A example files are located in:

(UNIX) `$CASE/DIT/templates/ileaf/milstd`

(Windows) `%CASE%\DIT\templates\ileaf\milstd`

Using Your Own Templates

If you want to generate documentation using your own templates, you might want to consider copying the supplied example files and then modifying them. The purpose of each file is listed in Table D-1, and Interleaf markup commands are listed in Table D-2.

Table D-1. Interleaf 2167A Example Files

Filename	Description
ilmil.tpl	This template file determines what information will be extracted from the model to create an ASCII output file. Additionally, ilmil.tpl embeds Interleaf markup commands, which define how the document will be formatted when it is opened under Interleaf. Finally, the template also embeds a markup command that calls the include file ilmilinc, which defines how the document will be formatted by Interleaf.
ilmilinc	This include file specifies the markup commands that Interleaf will use to format the ASCII output file generated by DocumentIt. All markup commands listed in this include file are listed in Figure D-2. The table also gives a brief description of each command as it is defined by ilmilinc.
Controller_Logic_mil.dat	Controller logic model.

Table D-2. Interleaf Markup Commands

Command	Description
<"Author">	Command on the title page that formats the name of the company providing the document. Refer to Figure D-2.
<"body1">	Normal text paragraph format.
<"body2">	Indented text paragraph which can be used to align with the text in a numbered list (first level number).
<"body3">	Indented text paragraph which can be used to align with the text in a numbered list (second level number).
<"CDRL">	Title page CDRL sequence number. Refer to Figure D-2.
<"chap">	Chapter heading level.
<"Client">	Title page entry for the name of the client for who the document was prepared. Refer to Figure D-2.
<"contract">	Title page entry for the contract number. Refer to Figure D-2.
<"DocTitle">	Document title. Refer to Figure D-2.

Table D-2. Interleaf Markup Commands (Continued)

Command	Description
<"dummy">	First paragraph on the title page. This is an empty place holder required to provide the correct spacing from the top of the page.
<"FIGcap">	Automatically numbered figure caption.
<"head1">	First heading level (for example, 1.1).
<"head2">	Second heading level (for example, 1.1.1).
<"head3">	Third heading level (for example, 1.1.1.1).
<"head4">	Fourth heading level (for example, 1.1.1.1.1).
<"head5">	Fifth heading level (for example, 1.1.1.1.1.1).
<"list1">	Upper case Alpha list (automatic numbering).
<"list2">	Numeric list (automatic numbering).
<"list3">	Lowercase alpha list (automatic numbering).
<"NOTE">	Note paragraph with the word NOTE included.
<"NOTE+ ">	Indented paragraph that aligns with the text in the NOTE paragraph. The word NOTE is not included. This is used when a note has a second paragraph.
<"PrepBy">	Title page entry. Refer to Figure D-2.
<"PrepFor">	Title page entry. Refer to Figure D-2.
<"Rev">	Revision and date entry on the title page. Refer to Figure D-2.
<"row">	Table row.
<"TBLcap">	Table caption.
<"TBLhead">	Column headings in a table.
<"TitlePar1">	Title page entries. Refer to Figure D-2.
<"TitlePar2">	Title page CSCI name and system name entries. Refer to Figure D-2.

Generating the 2167A Document

To generate the sample 2167A document using DocumentIt and Interleaf, complete the following steps:



Note If you want to generate a document from your own model, follow the same steps given in this example, but use your own model for document generation.

1. From your system prompt, go to your Interleaf desktop directory (do not invoke Interleaf) using the change directory command.
2. Copy all files from:
 - (UNIX)** \$CASE/DIT/templates/fmaker/general
 - (Windows)** %CASE%\DIT\templates\fmaker\general
 to the document directory.
3. From the Catalog Browser File menu, select **Load**.
4. Browse through the document directory and double-click to load the file `Controller_Logic_mil.dat`.
5. In the Catalog pane of the Catalog Browser, select the top-level SuperBlock (in this case, `Controller_Logic`).
6. From the Catalog Browser, select **Tools»DocumentIt**. The Generate Documentation dialog will appear.
7. In the File Name field, enter `Controller_Logic_mil.asc`.
8. With the Block Parameters combo box, select **% Vars from Xmath**.
9. In the Template File field, specify `ilmil.tpl` as the template file.
10. Click the **Typecheck** checkbox.
11. To generate the ASCII document file, click **OK**.

Changing the Generic Title Page

1. The ASCII file that you have generated—in this case, `controller_logic_mil.asc`—includes a generic title page that appears as shown in Figure D-1 after it is opened from Interleaf. If you want to change the data on the title page, you can accomplish this in one of the three following ways:
 - Using a text editor you can edit the `ilmil.tpl` data. refer to Figure D-2 shows the data in the `ilmil.tpl` file that produces the title page shown in Figure D-1. You should make these changes to `ilmil.tpl` *before* you generate the document from SystemBuild. All subsequent documents generated by

DocumentIt using `ilmil.tpl` will continue to have your new title page until you change the contents of `ilmil.tpl` again.

- Using a text editor you can edit the ASCII output file you have just generated. Figure D-2 shows the data in the example file `controller_logic_mil.asc` that produces the title page shown in Figure D-1. If you regenerate the document, you will have to edit this file again.
 - If you are familiar with Interleaf, you can edit the title page after you have opened the file from Interleaf.
2. From the system prompt, invoke Interleaf.
 3. From Interleaf open `Controller_Logic_mil.asc`.
 4. After the file is opened, you will see that it is completely formatted.
 5. If the new document meets your specifications, you can save and print it.



Note Refer to the [Using Your Own Templates](#) section for information about using your templates instead of the supplied templates.

You can use the DocumentIt template `ilmil.tpl` and its associated include file `ilmilinc` in precisely the same manner for your own models to generate a document using Interleaf.

To generate documentation using your own templates, copy the supplied example files and modify them. The purpose of each file is given in Table D-1.

Revision X.X: November 26, 1999

Software Design Document

For The

CSCI NAME

Of

System Name

CONTRACT NO. xxxxxxxx

CDRL SEQUENCE NO. xxxxxxxxxxxx

Prepared for:
Contracting Agency Name, Department Code

Prepared by:
National Instruments Corp.

Figure D-1. Generic Title Page

**<“Rev”>
Revision X.X: November 26, 1999**

**<“DocTitle”>
Software Design Document**

**<“TitlePar1”>
For The**

**<“TitlePar2”>
CSCI NAME**

**<“TitlePar1”>
Of**

**<“TitlePar2”>
System Name**

**<“contract”>
XXXXX.XX**

**<“CDRL”>
XXXXXX.nnn**

**<“PrepFor”>
Prepared for:**

**<“Client”>
Contracting Agency Name, Department Code**

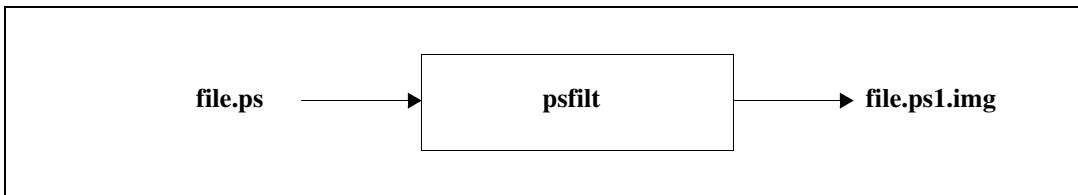
**<“PrepBy”>
Prepared by:**

**<“Author”>
National Instruments Corporation**

Figure D-2. Title Page Data in ilmil.tpl and controller_logic_mil.doc

Adding a Plot or SystemBuild Diagram to an Interleaf Document

1. To place a plot or SystemBuild diagram in your Interleaf document, complete the following steps:
 - a. Use the `hardcopy` command to create a PostScript file of each plot or SystemBuild diagram you want to include.
 - b. Convert each PostScript file to an Interleaf image file. The following diagram illustrates the conversion process (using `psfilt`) for each PostScript file.



Run each PostScript file through the Interleaf `psfilt` filter by selecting **Custom»Misc»psfilt**.



Note If the `psfilt` filter is not set up, refer to your Interleaf manual for instructions.

2. Use the `include_img` segment to add the image to your generated document. Refer to Chapter 3 of the *Template Programming Language User Guide* for information about `include_img`. Complete the following steps:
 - a. At the bottom of the `$(SIHOME)/platform/case/DIT/templates/ileaf/milstd/ilmil.tpl` template file is a `SEGMENT include_img` line. Example D-1 shows a portion of this `SEGMENT` section. Details of the frame itself are omitted. Include this `SEGMENT` section in your own TPL file.

Example D-1 Example of `include_img` in TPL File

```

@SEGMENT include_img()@
<Frame,
Name = "floating",
Placement = Following Anchor,
Horizontal Alignment = Center,
Width = 6.50 Inches,
Width = Page Without Margins,
Height = 9 Inches,
Height = Page Without Margins,

```

```

Page # =                               Autonom,
Diagram =
V11,
(g9,1,0,
(i18,1,0,,0,0,8.5333325,0,0,10.9999992,0,0,2559,3299,1,0,7,0,0,8.5333325,10
.999
9992,673657859,1,2559,0,0,3299,0,0,2559,3299,0,0,0,0,0,2559,3299,1,255,
@sb_mangled_name_s.ps1.img,2,639,0,0,824,0,0,2559,3299,0,0,0,0,0,486,674,1,
1,3157(X0,3157,FBC8FCFCFCFCFCFCFCFCFCFCFCFCFCFCFCFCFCFCFCFCFCFCFCFCFCFC
FCFCFCFCFC
.      (rest
.      of
.      frame)

FC91F9C706070EC7010AFCA1E50114FCA1EB0128FCA1F029FC9AC9E12D71FC9AC9DE5D79FC1
CAC1C896DFE4FF))
(E16,0,0,,5,1,1,0.0533333,1,15,0,0,1,0,0,0,1,5,127,7,0,0,7,0,1,1,0.0666667,
0.06
66667,6,6,0,0.0666667,6))>
@ENDSEGMENT@

```

- b. Scope on a SuperBlock. The `@include_img @` statement in the `SEGMENT` section includes the currently scoped SuperBlock image file in your generated document.

If necessary, you can customize the image in the `include_img` segment. Refer to Example D-1. Consult your Interleaf manual. You should be familiar with Interleaf markup language.

- c. To incorporate a plot, make a copy of the `include_img` segment, shown in Example D-1, and replace `@sb_name_s@.ps1.img`, highlighted in Example D-1, with the name of your plot image file.

Generating Documents Using Microsoft Word

This appendix describes how to use the Microsoft Word documentation example. This includes describing how to:

- Generate documents and encapsulated PostScript files.
- Import Enhanced Metafile (.emf) files into a generated document automatically and manually.
- Format table data for Microsoft Word.

All Microsoft Word documentation example files for Windows platforms, including a sample file that demonstrates these tasks, are located in the %CASE%\DIT\templates\msword\general\mswgp.wrd file.

Using Your Own Templates

To customize your generated document, make a copy of this file in your local directory and make appropriate changes. You must regenerate your document every time you make changes to mswgp.tpl and mswgp.wrd.

If you want to generate documentation using your own templates, consider copying the supplied example files and then modifying them. The purpose of each file is listed in Table E-1.



Note Your templates must be in rich text format (RTF), with TPL commands included. Do *not* make a template in Microsoft Word *.doc format.

The mswgp.tpl and mswgp.wrd files are in the %CASE%\DIT\templates\msword\general directory. The Controller_Logic_gen.dat file is in the %CASE%\DIT\templates\ascii directory.

Table E-1. Microsoft Word Documentation Example Files

Files in %CASE%\DIT\templates\msword\general:	
mswgp.tpl	The template file you must specify when using DocumentIt to generate an ASCII output file for use with the Word general purpose documentation. It determines what information is extracted from the model to create an ASCII output file.
mswgp.wrd	This is a template file included in the mswgp.tpl file. This file specifies RTF commands, which are recognized by Word. It contains the template TPL command to search the model for SuperBlocks and Blocks, and has RTF commands embedded with template TPL commands to generate the output document. You can load this file into Word to change the template program or font settings for the title/section names. The changes appear when you regenerate the document. Load this document into Word, to see what the generated document will look like.
Files in %CASE%\DIT\templates\ascii:	
Controller_Logic_gen.dat	Controller logic model.

Generating a Sample Document

To generate a sample document using DocumentIt and Microsoft Word, complete the following steps:



Note If you want to generate a document from your own model, follow the same steps given in this example, but use your model for document generation.

1. Create a directory where you want the output document to reside.
2. Copy all files from %CASE%\DIT\templates\msword\general to the document directory.
3. From the Catalog Browser, select **File»Load**.
4. Browse through the document directory and double-click to load the Controller_Logic_gen.dat file.
5. In the Catalog pane of the Catalog Browser, select the top-level SuperBlock (in this case, Controller_Logic).
6. From the Catalog Browser, select **Tools»DocumentIt**. The Generate Documentation dialog appears.

7. In the File Name field, enter `Controller_Logic.doc`. This output file is created in your working directory unless you specify another path.
8. With the Block Parameters combo box, select **% Vars from Xmath**.
9. In the Template File field, specify `msgwp.tpl` as the template file.
10. Click the **Typecheck** checkbox.
11. Click the **MS Word** checkbox.
12. To generate the document file, click **OK**.

If you have any graphics files to include in the document, complete the following steps, beginning with the *Generating an .emf file from SystemBuild* section. If you have no graphics to include, skip to step 1 of the *Changing the Generic Title Page* section.

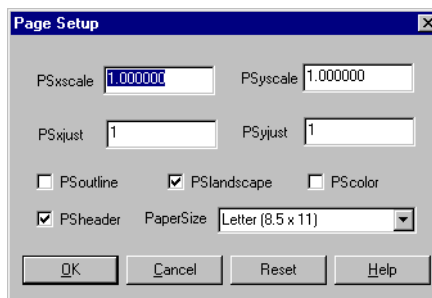


Note After you generate a document file, you may need to make format changes to select desired fonts or font sizes, or make other typographic choices.

Generating an .emf file from SystemBuild

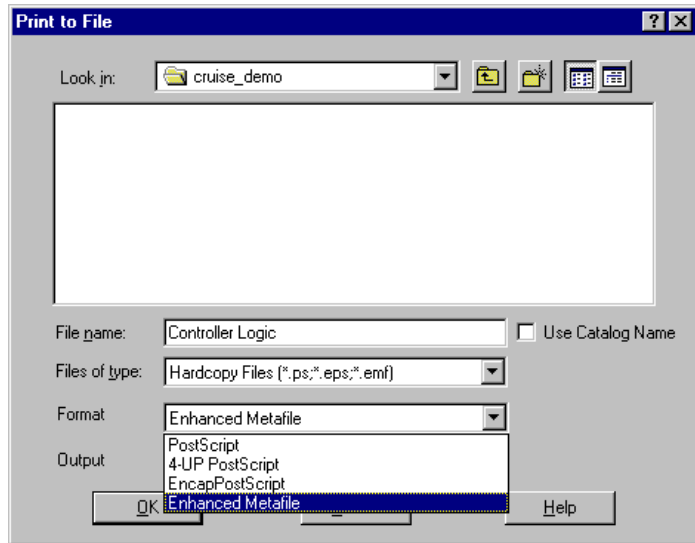
To generate an Enhanced Metafile (.emf file) from SystemBuild for Microsoft Word, complete the following steps:

1. Highlight the top level SuperBlock (`Controller_Logic`).
2. Select **File»Page Setup** to make any adjustments to the image before creating the graphics file. In this case, click **OK** to accept the defaults or **Cancel**.

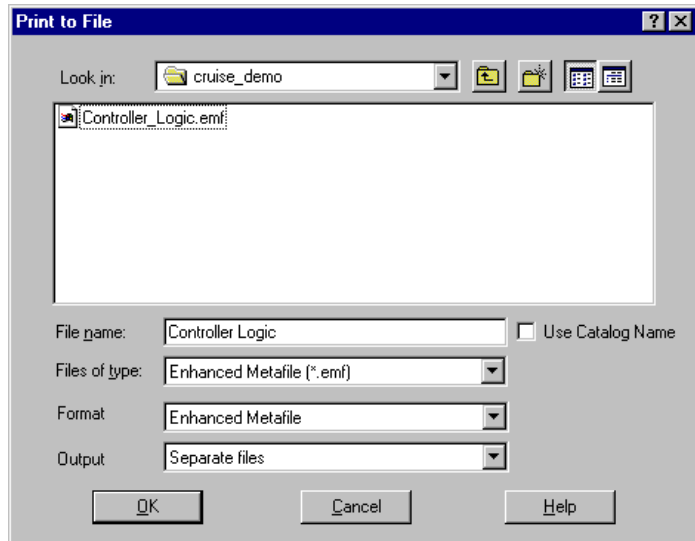


3. Select **File»Print to File**.

- From the **Format** pull-down menu, select **Enhanced Metafile**.



- From the **Output** pull-down menu, select **Separate files**.
- (Optional) You can use the **Files of type** pull-down menu to display .emf files only.



- Click **OK**.

8. By default DocumentIt automatically includes all the SuperBlock diagrams in the generated document. This is done by inserting template function `@include_img@` under every SuperBlock scope where the image is to be included. The template `mswgp.tpl` is written to handle only importing `.emf` files into the Word document. The generated document has links to the `.emf` files in your local directory. Whenever you update the graphics file, it will be automatically reflected in your generated document.

`@include_img@` is a template TPL segment defined in `mswgp.tpl`. This segment contains the RTF commands to include a graphics file named `@sb_mangled_name_s@.emf`. The `@sb_mangled_name_s@` token is filled in with the appropriate SuperBlock when you scope to a particular SuperBlock. For details on `.emf` files and scoping SuperBlocks, refer to the *Template Programming Language User Guide*.

A typical example to include SuperBlock 1 graphics into your document would look like this:

```
@SCOPE SUPERBLOCK 1@
@include_img( )@
```

Changing the Generic Title Page

1. The document file that you have generated—in this case, `Controller_Logic.doc`—includes a generic title page that appears after it is imported into Microsoft Word, as shown in Figure E-1. If you want to change the data on the title page or change the template TPL commands, you can accomplish this in one of the three following ways. Refer to the *Using Your Own Templates* section:
 - If you are familiar with Microsoft Word, load the `mswgp.wrd` file. Word interprets the RTF in this file and displays the template program commands along with chapter titles, section headings. You can edit the title page in the first page and save the document after you open the document in Word. All subsequent documents generated by DocumentIt using `mswgp.wrd` continue to have your new title page until you change `mswgp.wrd` again.
 - Using a text editor, you can edit the `mswgp.wrd` file. If you are familiar with RTF format, you can search for title generation and modify it there. You should make these changes to `mswgp.wrd` *before* you generate the document from SystemBuild. All subsequent documents generated by DocumentIt using `mswgp.wrd` continue to have your new title page until you change `mswgp.wrd` again.

- Using a text editor, you can edit the output document you have just generated. If you are familiar with RTF format, you can search for title generation and modify it there. If you regenerate the document, you have to edit this file again.
2. Generate a new DocumentIt output file.
 3. Start Microsoft Word.
 4. From the **File** pull-down menu, select **Open**.
 5. In the Open dialog, select **Controller_Logic.doc** and click **OK**. You can verify your changes in the new output file.

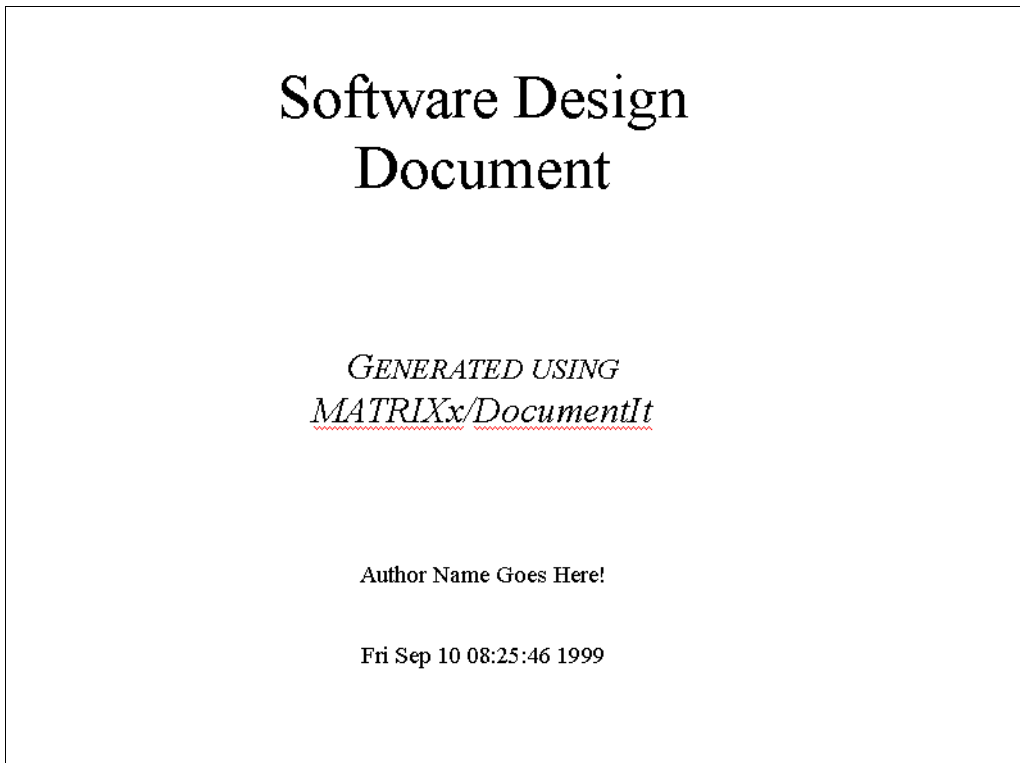


Figure E-1. Generic Title Page

If you have graphics files you want to include in the document, refer to the [Importing Graphics](#) section. If you have tabular information, refer to the [Creating Tables](#) section.

Importing Graphics

1. To place an illustration in your document manually, you must insert an anchored frame in the page where you want the figure to appear. You can insert an anchored frame in your document by selecting the **Insert** pull-down menu. A blank frame will be placed into your document in the location you specified.
2. Now you can select Picture under the **Insert** pull-down menu. There, you can select the graphics file you want to import. Click **Link to File** in the dialog, to create a link to your graphics file. Refer to your Microsoft Word documentation for more information about using the Insert utility to insert and import pictures.

Creating Tables

You can use DocumentIt to format tabular data to open as formatted tables when opened in Microsoft Word. These tables display as standard Microsoft Word tables. To see an example, generate the example document, and then examine the `mSWGp.wrd` template file using Microsoft Word. For information on how to create tables, see the procedure in the next section.

Converting Tabular Data to Tables

To set up tabular data so the DocumentIt template converts them to Microsoft Word tables, the input data must have Tab characters (>) separating columns and end-of-paragraph characters (¶) separating rows. Complete the following steps to create a table.

Select all the data you want to include in the table, but do *not* include the last paragraph symbol in the last row of table data. Refer to Figure E-2 for an example of exactly what information you need to select for reformatting.

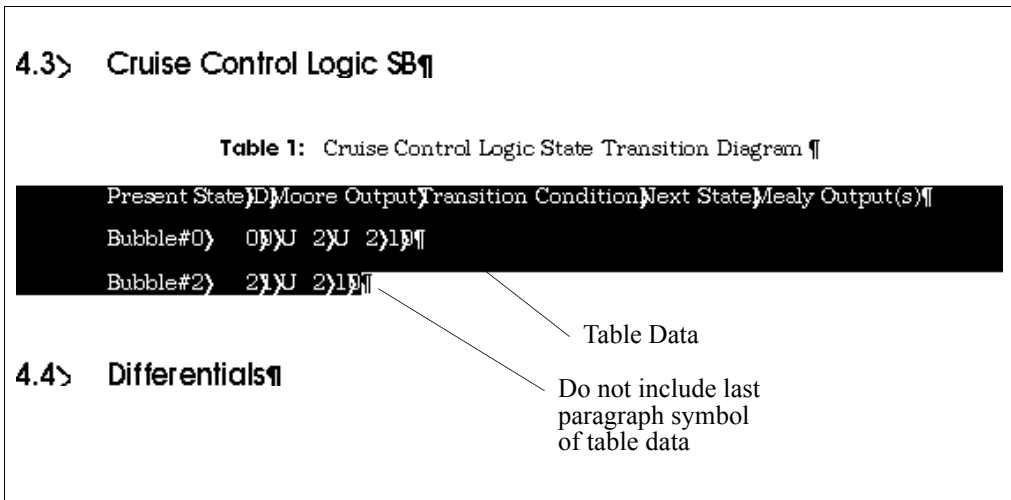


Figure E-2. Marking Data for Table Formatting

1. From the pull-down menu, select **Table»Convert Text to Table**. When the Convert Text to Table dialog appears, select **AutoFormat** and select *Grid 5* under that. Then leave the settings intact and click **OK** for the AutoFormat, and click **OK** for the Text to Table dialog. You can choose any design under the AutoFormat.
2. Delete any extraneous paragraph symbols that may have appeared below the table during the conversion process. This is necessary due to the way Microsoft Word converts tables.
3. Complete steps 1 and 2 for each table you have in the document. If you are going to choose the same format for all the tables, then follow step a, and select **Repeat Text to Table** under the **Edit** pull-down menu. This will repeat the macro for the table conversion.
4. Save your document.

Creating a Table of Contents

The DocumentIt template is unable to generate a table of contents (TOC); however, the template does create sections within the document so that it is easy to have Microsoft Word generate the TOC.

1. Go to the Table of Contents page in the document and place the cursor on that page.
2. From the pull-down menu, select **Insert»Index and Tables**. When the dialog appears, click **List Table of Contents**.

3. Leave all the current settings in the Set Up Table of Contents dialog intact and click **OK**.

Microsoft Word fills up the page with the Table of Contents. As Word lists all items in the order in which they appear in a document, some minor formatting is required for the list of figures. Repeat this process for the list of tables.

4. From the pull-down menu, select **File»Save** to save the document.

Generating ASCII Documents

This appendix describes how to use the ASCII document example. All ASCII document example files are located in:

(UNIX) \$CASE/DIT/templates/ascii/general

(Windows) %CASE%\DIT\templates\ascii\general

The files in this directory are:

documentit.tpl This is the supplied default template file that is used by DocumentIt to generate an ASCII output file when no other template file is specified.

Controller_Logic_gen.dat Controller logic model



Note If you want to generate a document from your own model, complete the following steps given in the example that follows, but use your model for document generation.

To generate the sample ASCII document using DocumentIt, complete the following steps:

1. Create a directory for the output document (for example, docout).
2. Copy the template files from:
(UNIX) \$CASE/DIT/templates/ascii/general
(Windows) %CASE%\DIT\templates\ascii\general
to the document directory.
3. From the Catalog Browser File menu, select **Load**.
4. Browse through the document directory and double-click to load the file Controller_Logic_gen.dat.
5. In the Catalog pane of the Catalog Browser, select the top-level SuperBlock—in this case, Controller_Logic.

- From the Catalog Browser, select **Tools»DocumentIt**. The Generate Documentation dialog appears.



- In the File name field, enter a name for your document—for example, `Controller_Logic_gen.txt`.
- With the Block Parameters combo box, select **% Vars from Xmath**.
- In the Template File field, specify `documentit.tpl` as the template file.
- Select the **Typecheck** checkbox.
- To generate the ASCII document file, click **OK**.

You can use the default template `documentit.tpl` to generate an ASCII document for any valid model.

To generate documentation using your own templates:

- Copy `documentit.tpl` file.
- Modify it to your specifications using the TPL programming information described in the *Template Programming Language User Guide*. You can also embed markup language commands to import the ASCII files into your software publishing application, or print the document.



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If you searched ni.com and could not find the answers you need, contact your local office or NI corporate headquarters. Phone numbers for our worldwide offices are listed at the front of this manual. You also can visit the Worldwide Offices section of ni.com/niglobal to access the branch office Web sites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

Index

Symbols

.dac file, 2-2
.emf file, E-1, E-3
.rtf file, 2-1
.tpl file, 2-2
@sb_mangled_name_s@ token, E-5

A

As, A-1
ASCII
 document example, F-1
 documentit, tpl function, F-1
autostar command, options, 2-1, 2-7, A-1
autostar.opt, A-3

C

code
 generated application, 1-2
 real-time, 1-2
Config File, 2-2
conventions used in the manual, *iv*
Ctrl-D, 2-1

D

design
 automation, 1-2
 generating documents, 1-6
diagnostic tools (NI resources), G-1
dialog, Generate Documentation for
 SuperBlock, B-4, C-4
document
 generation, 1-4, 1-5
 customizing, 1-5, 3-1
 example, 1-6

 example ASCII output file, 1-9
 example template file, 1-8
 file location, F-1
 FrameMaker mml commands, B-2
 from OS, 2-7
 from SystemBuild, 2-1, 2-5
 from Xmath, 2-5
 generating ASCII documents, F-1
 generating the design document, 1-6
 how to, 2-1
 printing the formatted document, 1-6
 processing markup commands, 1-6
 sequence, 1-4
 SystemBuild dialog, 2-1
 title page, B-7, D-7
 using publishing software, 1-6
documentation
 conventions used in the manual, *iv*
 NI resources, G-1
documenting a block, 2-7
DocumentIt
 See also documentit command
 customizing, 3-1
 example of usage, 1-6
 SystemBuild diagram, 1-9
 template file, 1-8
 invoking, 1-6
 from SystemBuild, 2-1
 from Xmath, 2-1
 using autostar command, 2-7
 options, A-1, A-3
 using (sequence), 1-4
documentit command
 options
 string, 2-5
 variable, 2-5

DOD-STD-2167A, 1-11
drivers (NI resources), G-1

E

encapsulated PostScript, D-1
Enhanced Metafile, E-3
eps file
 generating
 FrameMaker, B-7, C-7
 Interleaf, D-8
 Microsoft Word, E-3, E-7

epsf, D-1

examples

 ASCII document, F-1
 autostar command, 2-7
 documentit command, 2-6
 FrameMaker 2167A document, C-1
 FrameMaker 2167A document
 generation, C-4
 FrameMaker documents
 general purpose, B-5
 procedure, B-4, C-4
 Interleaf document, D-1
 Microsoft Word document, E-1
 RTF document, E-1
examples (NI resources), G-1

F

File, A-3
FrameMaker
 example
 2167A document, C-1
 2167A document generation, C-4
 2167A mml commands, C-2
 file containing < or >, B-5
 procedure, B-4, C-4
 example files
 description, B-2, C-2
 fmgp.doc, B-8, B-10

fmgpTOC.doc, B-10, B-11
fmmil.doc, C-8, C-10
fmmilTOC.doc, C-10, C-11

general purpose document
example files, B-1
mml commands, B-2

G

Generate Documentation for SuperBlock
 dialog, B-4, C-4
generated application code, 1-2
generating a textual version of a model, 2-7
generation code, options, A-1
graphical user interface, 2-1

H

help, technical support, G-1
HyperBuild, options
 error checking, 2-2
Generate KR compatible declarations, 2-2
Typecheck, 2-2

I

illustrations in documents
 FrameMaker, B-7, C-7, D-8
 fmgp.doc, B-8
 Interleaf, plot or SystemBuild
 diagram, D-8
 Microsoft Word, E-7
 importing graphics, E-7
instrument drivers (NI resources), G-1
Interleaf
 example document, D-1
 example files, description, D-2
 general purpose document example
 files, D-1
 markup commands, D-2

K

KnowledgeBase, G-1

M

manual organization, 1-1
 markup commands, Interleaf, D-2
 MATRIXx, 1-2, 1-4, 1-11
 block diagram, 1-3
 DocumentIt, 1-3
 document generation process
 diagram, 1-5
 Microsoft Word, *see* Word.
 mml commands, B-2, C-2
 2167A example, C-2
 general purpose example, B-2
 mml file extension, C-4
 model
 building, 1-4
 documenting, 1-4

N

National Instruments support and
 services, G-1

O

operating system prompt, 2-7
 options, 2-7
 output document, F-1

P

programming examples (NI resources), G-1
 prompt
 operating system, 2-7

R

rapid prototyping, 1-2
 DocumentIt, 1-4
 real-time code, 1-2
 real-time file, 2-1, 2-7
 related publications, 1-11
 RTF
 example document, E-1

S

software (NI resources), G-1
 support, technical, G-1

T

tables in documents, FrameMaker, B-9, C-9
 technical support, G-1
 templates, 1-4
 examples, 1-4
 keywords, 1-10
 use of, 3-1
 use with publishing software, 3-1
 user-written, B-1, C-1, D-1, E-1, F-2
 training and certification (NI resources), G-1
 troubleshooting (NI resources), G-1

U

using templates. *See* templates.

W

Web resources, G-1
 Word
 add SystemBuild .emf file, E-3
 add SystemBuild .eps file, E-3
 Controller_Logic_gen.dat, E-2
 document example files, E-1

example files

Controller_Logic_gen.dat, E-2

mswgp.tpl, E-2

mswgp.wrd, E-2

generate a sample document, E-2

generate Table of Contents, E-8

import graphics, E-7