

# Ada Programming

[Wikibooks.org](https://en.wikibooks.org/wiki/Ada_Programming)

March 22, 2013

On the 28th of April 2012 the contents of the English as well as German Wikibooks and Wikipedia projects were licensed under Creative Commons Attribution-ShareAlike 3.0 Unported license. An URI to this license is given in the list of figures on page 397. If this document is a derived work from the contents of one of these projects and the content was still licensed by the project under this license at the time of derivation this document has to be licensed under the same, a similar or a compatible license, as stated in section 4b of the license. The list of contributors is included in chapter Contributors on page 393. The licenses GPL, LGPL and GFDL are included in chapter Licenses on page 399, since this book and/or parts of it may or may not be licensed under one or more of these licenses, and thus require inclusion of these licenses. The licenses of the figures are given in the list of figures on page 397. This PDF was generated by the L<sup>A</sup>T<sub>E</sub>X typesetting software. The L<sup>A</sup>T<sub>E</sub>X source code is included as an attachment (`source.7z.txt`) in this PDF file. To extract the source from the PDF file, we recommend the use of <http://www.pdfplabs.com/tools/pdftk-the-pdf-toolkit/> utility or clicking the paper clip attachment symbol on the lower left of your PDF Viewer, selecting **Save Attachment**. After extracting it from the PDF file you have to rename it to `source.7z`. To uncompress the resulting archive we recommend the use of <http://www.7-zip.org/>. The L<sup>A</sup>T<sub>E</sub>X source itself was generated by a program written by Dirk Hünninger, which is freely available under an open source license from [http://de.wikibooks.org/wiki/Benutzer:Dirk\\_Huenniger/wb2pdf](http://de.wikibooks.org/wiki/Benutzer:Dirk_Huenniger/wb2pdf). This distribution also contains a configured version of the `pdflatex` compiler with all necessary packages and fonts needed to compile the L<sup>A</sup>T<sub>E</sub>X source included in this PDF file.

# Contents

<b>1</b>	<b>Basic Ada</b>	<b>3</b>
1.1	"Hello, world!" programs . . . . .	3
1.2	Compiling the "Hello, world!" program . . . . .	5
1.3	Things to look out for . . . . .	6
1.4	Where to ask for help . . . . .	8
1.5	Notes . . . . .	8
<b>2</b>	<b>Installing</b>	<b>9</b>
2.1	AdaMagic from SofCheck . . . . .	9
2.2	AdaMULTI from Green Hills Software . . . . .	9
2.3	DEC Ada from HP . . . . .	10
2.4	GNAT, the GNU Ada Compiler from AdaCore and the Free Software Foundation . . . . .	10
2.5	ICC from Irvine Compiler Corporation . . . . .	25
2.6	Janus/Ada 83 and 95 from RR Software . . . . .	25
2.7	MAXAda from Concurrent . . . . .	25
2.8	ObjectAda from Atego (formerly Aonix) . . . . .	26
2.9	PowerAda from OC Systems . . . . .	26
2.10	SCORE from DDC-I . . . . .	27
2.11	XD Ada from SWEP-EDS . . . . .	27
2.12	XGC Ada from XGC Software . . . . .	27
2.13	References . . . . .	28
<b>3</b>	<b>Building</b>	<b>29</b>
3.1	Building with various compilers . . . . .	29
3.2	Compiling our Demo Source . . . . .	33
3.3	External links . . . . .	36
<b>4</b>	<b>Control Statements</b>	<b>37</b>
4.1	Conditionals . . . . .	37
4.2	Unconditionals . . . . .	39
4.3	Loops . . . . .	41
4.4	See also . . . . .	44
<b>5</b>	<b>Type System</b>	<b>45</b>
5.1	Predefined types . . . . .	45
5.2	The Type Hierarchy . . . . .	47
5.3	Concurrency Types . . . . .	50
5.4	Limited Types . . . . .	50

5.5	Defining new types and subtypes . . . . .	51
5.6	Subtype categories . . . . .	54
5.7	Qualified expressions . . . . .	57
5.8	Type conversions . . . . .	58
5.9	Elaborated Discussion of Types for Signed Integer Types . . . . .	65
5.10	Relations between types . . . . .	67
5.11	See also . . . . .	67
<b>6</b>	<b>Integer types</b>	<b>69</b>
6.1	Working demo . . . . .	69
6.2	See also . . . . .	70
<b>7</b>	<b>Unsigned integer types</b>	<b>71</b>
7.1	Description . . . . .	71
7.2	See also . . . . .	72
<b>8</b>	<b>Enumerations</b>	<b>73</b>
8.1	Operators and attributes . . . . .	73
8.2	Enumeration literals . . . . .	74
8.3	Enumeration subtypes . . . . .	75
8.4	See also . . . . .	76
<b>9</b>	<b>Floating point types</b>	<b>77</b>
9.1	Description . . . . .	77
9.2	See also . . . . .	77
<b>10</b>	<b>Fixed point types</b>	<b>79</b>
10.1	Description . . . . .	79
10.2	Ordinary Fixed Point . . . . .	79
10.3	Decimal Fixed Point . . . . .	80
10.4	Differences between Ordinary and Decimal Fixed Point Types . . . . .	80
10.5	See also . . . . .	82
<b>11</b>	<b>Arrays</b>	<b>83</b>
11.1	Declaring arrays . . . . .	83
11.2	Using arrays . . . . .	87
11.3	See also . . . . .	88
<b>12</b>	<b>Records</b>	<b>91</b>
12.1	Basic record . . . . .	91
12.2	Null record . . . . .	91
12.3	Record Values . . . . .	91
12.4	Discriminated record . . . . .	93
12.5	Variant record . . . . .	93
12.6	Union . . . . .	95
12.7	Tagged record . . . . .	95
12.8	Abstract tagged record . . . . .	96
12.9	With aliased elements . . . . .	96
12.10	Limited Records . . . . .	97

---

12.11 See also . . . . .	97
<b>13 Access types</b>	<b>99</b>
13.1 What's an Access Type? . . . . .	99
13.2 Pool access . . . . .	99
13.3 General access . . . . .	102
13.4 Anonymous access . . . . .	103
13.5 Implicit Dereference . . . . .	104
13.6 Null exclusions . . . . .	105
13.7 Access to Subprogram . . . . .	106
13.8 Access FAQ . . . . .	106
13.9 Thin and Fat Access Types . . . . .	109
13.10 See also . . . . .	110
<b>14 Limited types</b>	<b>113</b>
14.1 Limited Types . . . . .	113
14.2 Initialising Limited Types . . . . .	115
14.3 See also . . . . .	116
14.4 References . . . . .	117
<b>15 Strings</b>	<b>119</b>
15.1 Fixed-length string handling . . . . .	119
15.2 Bounded-length string handling . . . . .	120
15.3 Unbounded-length string handling . . . . .	122
15.4 See also . . . . .	123
<b>16 Subprograms</b>	<b>125</b>
16.1 Procedures . . . . .	126
16.2 Functions . . . . .	127
16.3 Named parameters . . . . .	129
16.4 Default parameters . . . . .	129
16.5 Renaming . . . . .	130
16.6 See also . . . . .	131
<b>17 Packages</b>	<b>133</b>
17.1 Separate compilation . . . . .	133
17.2 Parts of a package . . . . .	134
17.3 Using packages . . . . .	137
17.4 Package organisation . . . . .	141
17.5 Notes . . . . .	145
17.6 See also . . . . .	145
<b>18 Input Output</b>	<b>147</b>
18.1 Overview . . . . .	147
18.2 Text I/O . . . . .	148
18.3 Direct I/O . . . . .	148
18.4 Sequential I/O . . . . .	149
18.5 Stream I/O . . . . .	149
18.6 See also . . . . .	150

[Click here to download full PDF material](#)