**Title:** Ada Compiler Validation Summary Report: Alliant Computer Systems Corporation, Alliant FX/Ada Compiler, Version 2.2; Alliant FX/80 (Host and Target). 890605W1.10089

**Performing Organization Name:** Wright-Patterson AFB Dayton, OH, USA

**Contract or Grant Numbers:**

**Report Date:** 05 June 1989 to 05 June 1990

**Number of Pages:**

**Distribution Statement:** Approved for public release; distribution unlimited.


**Abstract:** Alliant Computer Systems Corporation, Alliant FX/Ada Compiler, Version 2.2, Wright-Patterson AFB, Alliant FX/80 under Concentrix, Release 5.0 (Host and Target), ACVC 1.10.
Ada COMPILER

VALIDATION SUMMARY REPORT:
Certificate Number: 890605W1.10083
Alliant Computer Systems Corporation
Alliant FX/Ada Compiler, Version 2.2
Alliant FX/80

Completion of On-Site Testing:
5 June 1989

Prepared By:
Ada Validation Facility
ASD/SCEL
Wright-Patterson AFB OH 45433-6503

Prepared For:
Ada Joint Program Office
United States Department of Defense
Washington DC 20301-3081
Ada Compiler Validation Summary Report:

Compiler Name: Alliant FX/Ada Compiler, Version 2.2
Certificate Number: 890605V1.10083

Host: Alliant FX/80 under Concentrix, Release 5.0
Target: Alliant FX/80 under Concentrix, Release 5.0

Testing Completed 5 June 1989 Using ACVC 1.10

This report has been reviewed and is approved.

Ada Validation Facility
Steve P. Wilson
Technical Director
ASD/SCEL
Wright-Patterson AFB OH 45433-6503

Ada Validation Organization
Dr. John F. Kramer
Institute for Defense Analyses
Alexandria VA 22311

Ada Joint Program Office
Dr. John Solomond
Director
Department of Defense
Washington DC 20301
Ada Compiler Validation Summary Report:

Compiler Name: Alliant FX/Ada Compiler, Version 2.2
Certificate Number: 890605W1.10083

Host: Alliant FX/80 under Concentrix, Release 5.0
Target: Alliant FX/80 under Concentrix, Release 5.0

Testing Completed 5 June 1989 Using ACVC 1.10

This report has been reviewed and is approved.

Ada Validation Facility
Steve P. Wilson
Technical Director
ASD/SCEL
Wright-Patterson AFB OH 45433-6503

Ada Validation Organization
Dr. John F. Kramer
Institute for Defense Analyses
Alexandria VA 22311

Ada Joint Program Office
Dr. John Solomond
Director
Department of Defense
Washington DC 20301
# TABLE OF CONTENTS

**CHAPTER 1**  INTRODUCTION

1.1 PURPOSE OF THIS VALIDATION SUMMARY REPORT .... 1-2
1.2 USE OF THIS VALIDATION SUMMARY REPORT .... 1-2
1.3 REFERENCES ........ 1-3
1.4 DEFINITION OF TERMS ........ 1-3
1.5 ACVC TEST CLASSES ........ 1-4

**CHAPTER 2**  CONFIGURATION INFORMATION

2.1 CONFIGURATION TESTED ........ 2-1
2.2 IMPLEMENTATION CHARACTERISTICS ........ 2-2

**CHAPTER 3**  TEST INFORMATION

3.1 TEST RESULTS ........ 3-1
3.2 SUMMARY OF TEST RESULTS BY CLASS ........ 3-1
3.3 SUMMARY OF TEST RESULTS BY CHAPTER ........ 3-2
3.4 WITHDRAWN TESTS ........ 3-2
3.5 INAPPLICABLE TESTS ........ 3-2
3.6 TEST, PROCESSING, AND EVALUATION MODIFICATIONS ........ 3-5
3.7 ADDITIONAL TESTING INFORMATION ........ 3-5
3.7.1 Prevalidation ........ 3-5
3.7.2 Test Method ........ 3-6
3.7.3 Test Site ........ 3-6

**APPENDIX A**  DECLARATION OF CONFORMANCE

**APPENDIX B**  APPENDIX F OF THE Ada STANDARD

**APPENDIX C**  TEST PARAMETERS

**APPENDIX D**  WITHDRAWN TESTS

**APPENDIX E**  COMPILER OPTIONS AS SUPPLIED BY ALLIANT
CHAPTER 1

INTRODUCTION

This Validation Summary Report (VSR) describes the extent to which a specific Ada compiler conforms to the Ada Standard, ANSI/MIL-STD-1815A. This report explains all technical terms used within it and thoroughly reports the results of testing this compiler using the Ada Compiler Validation Capability (ACVC). An Ada compiler must be implemented according to the Ada Standard, and any implementation-dependent features must conform to the requirements of the Ada Standard. The Ada Standard must be implemented in its entirety, and nothing can be implemented that is not in the Standard.

Even though all validated Ada compilers conform to the Ada Standard, it must be understood that some differences do exist between implementations. The Ada Standard permits some implementation dependences—for example, the maximum length of identifiers or the maximum values of integer types. Other differences between compilers result from the characteristics of particular operating systems, hardware, or implementation strategies. All the dependencies observed during the process of testing this compiler are given in this report.

The information in this report is derived from the test results produced during validation testing. The validation process includes submitting a suite of standardized tests, the ACVC, as inputs to an Ada compiler and evaluating the results. The purpose of validating is to ensure conformity of the compiler to the Ada Standard by testing that the compiler properly implements legal language constructs and that it identifies and rejects illegal language constructs. The testing also identifies behavior that is implementation-dependent but is permitted by the Ada Standard. Six classes of tests are used. These tests are designed to perform checks at compile time, at link time, and during execution.
INTRODUCTION

1.1 PURPOSE OF THIS VALIDATION SUMMARY REPORT

This VSR documents the results of the validation testing performed on an Ada compiler. Testing was carried out for the following purposes:

- To attempt to identify any language constructs supported by the compiler that do not conform to the Ada Standard
- To attempt to identify any language constructs not supported by the compiler but required by the Ada Standard
- To determine that the implementation-dependent behavior is allowed by the Ada Standard

Testing of this compiler was conducted by SofTech, Inc. under the direction of the AVF according to procedures established by the Ada Joint Program Office and administered by the Ada Validation Organization (AVO). On-site testing was completed 5 June 1989 at Littleton MA.

1.2 USE OF THIS VALIDATION SUMMARY REPORT

Consistent with the national laws of the originating country, the AVO may make full and free public disclosure of this report. In the United States, this is provided in accordance with the "Freedom of Information Act" (5 U.S.C. #552). The results of this validation apply only to the computers, operating systems, and compiler versions identified in this report.

The organizations represented on the signature page of this report do not represent or warrant that all statements set forth in this report are accurate and complete, or that the subject compiler has no nonconformities to the Ada Standard other than those presented. Copies of this report are available to the public from:

Ada Information Clearinghouse
Ada Joint Program Office
OUSDRE
The Pentagon, Rm 3D-139 (Fern Street)
Washington DC 20301-3081

or from:

Ada Validation Facility
ASD/SCEL
Wright-Patterson AFB OH 45433-6503
Questions regarding this report or the validation test results should be directed to the AVF listed above or to:

Ada Validation Organization
Institute for Defense Analyses
1801 North Beauregard Street
Alexandria VA 22311

1.3 REFERENCES


1.4 DEFINITION OF TERMS

ACVC The Ada Compiler Validation Capability. The set of Ada programs that tests the conformity of an Ada compiler to the Ada programming language.

Ada Commentary An Ada Commentary contains all information relevant to the point addressed by a comment on the Ada Standard. These comments are given a unique identification number having the form AI-ddddd.


Applicant The agency requesting validation.

AVF The Ada Validation Facility. The AVF is responsible for conducting compiler validations according to procedures contained in the Ada Compiler Validation Procedures and Guidelines.

AVO The Ada Validation Organization. The AVO has oversight authority over all AVF practices for the purpose of maintaining a uniform process for validation of Ada compilers. The AVO provides administrative and technical support for Ada validations to ensure consistent practices.

Compiler A processor for the Ada language. In the context of this report, a compiler is any language processor, including
INTRODUCTION

cross-compilers, translators, and interpreters.

Failed test An ACVC test for which the compiler generates a result that demonstrates nonconformity to the Ada Standard.

Host The computer on which the compiler resides.

Inapplicable An ACVC test that uses features of the language that a compiler is not required to support or may legitimately support in a way other than the one expected by the test.

Passed test An ACVC test for which a compiler generates the expected result.

Target The computer for which a compiler generates code.

Test A program that checks a compiler's conformity regarding a particular feature or a combination of features to the Ada Standard. In the context of this report, the term is used to designate a single test, which may comprise one or more files.

Withdrawn test An ACVC test found to be incorrect and not used to check conformity to the Ada Standard. A test may be incorrect because it has an invalid test objective, fails to meet its test objective, or contains illegal or erroneous use of the language.

1.5 ACVC TEST CLASSES

Conformity to the Ada Standard is measured using the ACVC. The ACVC contains both legal and illegal Ada programs structured into six test classes: A, B, C, D, E, and L. The first letter of a test name identifies the class to which it belongs. Class A, C, D, and E tests are executable, and special program units are used to report their results during execution. Class B tests are expected to produce compilation errors. Class L tests are expected to produce compilation or link errors because of the way in which a program library is used at link time.

Class A tests ensure the successful compilation of legal Ada programs with certain language constructs which cannot be verified at compile time. There are no explicit program components in a Class A test to check semantics. For example, a Class A test checks that reserved words of another language (other than those already reserved in the Ada language) are not treated as reserved words by an Ada compiler. A Class A test is passed if no errors are detected at compile time and the program executes to produce a PASSED message.

Class B tests check that a compiler detects illegal language usage. Class B tests are not executable. Each test in this class is compiled and the resulting compilation listing is examined to verify that every syntax or semantic error in the test is detected. A Class B test is passed if every
illegal construct that it contains is detected by the compiler.

Class C tests check the run time system to ensure that legal Ada programs can be correctly compiled and executed. Each Class C test is self-checking and produces a PASSED, FAILED, or NOT APPLICABLE message indicating the result when it is executed.

Class D tests check the compilation and execution capacities of a compiler. Since there are no capacity requirements placed on a compiler by the Ada Standard for some parameters—for example, the number of identifiers permitted in a compilation or the number of units in a library—a compiler may refuse to compile a Class D test and still be a conforming compiler. Therefore, if a Class D test fails to compile because the capacity of the compiler is exceeded, the test is classified as inapplicable. If a Class D test compiles successfully, it is self-checking and produces a PASSED or FAILED message during execution.

Class E tests are expected to execute successfully and check implementation-dependent options and resolutions of ambiguities in the Ada Standard. Each Class E test is self-checking and produces a NOT APPLICABLE, PASSED, or FAILED message when it is compiled and executed. However, the Ada Standard permits an implementation to reject programs containing some features addressed by Class E tests during compilation. Therefore, a Class E test is passed by a compiler if it is compiled successfully and executes to produce a PASSED message, or if it is rejected by the compiler for an allowable reason.

Class L tests check that incomplete or illegal Ada programs involving multiple, separately compiled units are detected and not allowed to execute. Class L tests are compiled separately and execution is attempted. A Class L test passes if it is rejected at link time—that is, an attempt to execute the main program must generate an error message before any declarations in the main program or any units referenced by the main program are elaborated. In some cases, an implementation may legitimately detect errors during compilation of the test.

Two library units, the package REPORT and the procedure CHECK_FILE, support the self-checking features of the executable tests. The package REPORT provides the mechanism by which executable tests report PASSED, FAILED, or NOT APPLICABLE results. It also provides a set of identity functions used to defeat some compiler optimizations allowed by the Ada Standard that would circumvent a test objective. The procedure CHECK_FILE is used to check the contents of text files written by some of the Class C tests for chapter 14 of the Ada Standard. The operation of REPORT and CHECK_FILE is checked by a set of executable tests. These tests produce messages that are examined to verify that the units are operating correctly. If these units are not operating correctly, then the validation is not attempted.

The text of each test in the ACVC follows conventions that are intended to ensure that the tests are reasonably portable without modification. For example, the tests make use of only the basic set of 55 characters, contain lines with a maximum length of 72 characters, use small numeric values, and place features that may not be supported by all implementations in separate
INTRODUCTION

tests. However, some tests contain values that require the test to be customized according to implementation-specific values—for example, an illegal file name. A list of the values used for this validation is provided in Appendix C.

A compiler must correctly process each of the tests in the suite and demonstrate conformity to the Ada Standard by either meeting the pass criteria given for the test or by showing that the test is inapplicable to the implementation. The applicability of a test to an implementation is considered each time the implementation is validated. A test that is inapplicable for one validation is not necessarily inapplicable for a subsequent validation. Any test that was determined to contain an illegal language construct or an erroneous language construct is withdrawn from the ACVC and, therefore, is not used in testing a compiler. The tests withdrawn at the time of this validation are given in Appendix D.
CHAPTER 2
CONFIGURATION INFORMATION

2.1 CONFIGURATION TESTED

The candidate compilation system for this validation was tested under the following configuration:

Compiler: Alliant FX/Ada Compiler, Version 2.2
ACVC Version: 1.10
Certificate Number: 890605W1.10083

Host Computer:

<table>
<thead>
<tr>
<th>Machine:</th>
<th>Alliant FX/80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating System:</td>
<td>Concentrix</td>
</tr>
<tr>
<td></td>
<td>Release 5.0</td>
</tr>
<tr>
<td>Memory Size:</td>
<td>96 Megabytes</td>
</tr>
</tbody>
</table>

Target Computer:

<table>
<thead>
<tr>
<th>Machine:</th>
<th>Alliant FX/80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating System:</td>
<td>Concentrix</td>
</tr>
<tr>
<td></td>
<td>Release 5.0</td>
</tr>
<tr>
<td>Memory Size:</td>
<td>96 Megabytes</td>
</tr>
</tbody>
</table>
CONFIGURATION INFORMATION

2.2 IMPLEMENTATION CHARACTERISTICS

One of the purposes of validating compilers is to determine the behavior of a compiler in those areas of the Ada Standard that permit implementations to differ. Class D and E tests specifically check for such implementation differences. However, tests in other classes also characterize an implementation. The tests demonstrate the following characteristics:

a. Capacities.

(1) The compiler correctly processes a compilation containing 723 variables in the same declarative part. (See test D29002K.)

(2) The compiler correctly processes tests containing loop statements nested to 65 levels. (See tests D55A03A..H (8 tests).)

(3) The compiler correctly processes tests containing block statements nested to 65 levels. (See test D56001B.)

(4) The compiler correctly processes tests containing recursive procedures separately compiled as subunits nested to 17 levels. (See tests D64005E..G (3 tests).)

b. Predefined types.

(1) This implementation supports the additional predefined types TINY INTEGER, SHORT INTEGER, and SHORT FLOAT in package STANDARD. (See tests B86001T..Z (7 tests).)

c. Expression evaluation.

The order in which expressions are evaluated and the time at which constraints are checked are not defined by the language. While the ACVC tests do not specifically attempt to determine the order of evaluation of expressions, test results indicate the following:

(1) None of the default initialization expressions for record components are evaluated before any value is checked for membership in a component's subtype. (See test C32117A.)

(2) Assignments to subtypes are performed with the same precision as the base type. (See test C35712B.)

(3) This implementation uses no extra bits for extra precision and uses all extra bits for extra range. (See test C35903A.)
CONFIGURATION INFORMATION

(4) Sometimes NUMERIC_ERROR is raised when an integer literal operand in a comparison or membership test is outside the range of the base type. (See test C45232A.)

(5) Sometimes NUMERIC_ERROR is raised when a literal operand in a fixed-point comparison or membership test is outside the range of the base type. (See test C45252A.)

(6) Underflow is not gradual. (See tests C45524A..Z.)

d. Rounding.

The method by which values are rounded in type conversions is not defined by the language. While the ACVC tests do not specifically attempt to determine the method of rounding, the test results indicate the following:

(1) The method used for rounding to integer is round to even. (See tests C46012A..Z.)

(2) The method used for rounding to longest integer is round to even. (See tests C46012A..Z.)

(3) The method used for rounding to integer in static universal real expressions is round to even. (See test C4A014A.)

e. Array types.

An implementation is allowed to raise NUMERIC_ERROR or CONSTRAINT_ERROR for an array having a 'LENGTH that exceeds STANDARD.INTEGER'LAST and/or SYSTEM.MAX_INT.

For this implementation:

(1) Declaration of an array type or subtype declaration with more than SYSTEM.MAX_INT components raises no exception. (See test C36003A.)

(2) NUMERIC_ERROR is raised when 'LENGTH is applied to a null array type with INTEGER'LAST + 2 components. (See test C36202A.)

(3) NUMERIC_ERROR is raised when 'LENGTH is applied to a null array type with SYSTEM.MAX_INT + 2 components. (See test C36202B.)

(4) A packed BOOLEAN array having a 'LENGTH exceeding INTEGER'LAST raises NUMERIC_ERROR when the array type is declared. (See test C52103X.)
CONFIGURATION INFORMATION

(5) A packed two-dimensional BOOLEAN array with more than INTEGER'LAST components raises NUMERIC_ERROR when the array type is declared. (See test C52104Y.)

(6) A null array with one dimension of length greater than INTEGER'LAST may raise NUMERIC_ERROR or CONSTRAINT_ERROR either when declared or assigned. Alternatively, an implementation may accept the declaration. However, lengths must match in array slice assignments. This implementation raises NUMERIC_ERROR when the array type is declared. (See test E52103Y.)

(7) In assigning one-dimensional array types, the expression is evaluated in its entirety before CONSTRAINT_ERROR is raised when checking whether the expression's subtype is compatible with the target's subtype. (See test C52013A.)

(8) In assigning two-dimensional array types, the expression is not evaluated in its entirety before CONSTRAINT_ERROR is raised when checking whether the expression's subtype is compatible with the target's subtype. (See test C52013A.)

f. Discriminated types.

(1) In assigning record types with discriminants, the expression is evaluated in its entirety before CONSTRAINT_ERROR is raised when checking whether the expression's subtype is compatible with the target's subtype. (See test C52013A.)

g. Aggregates.

(1) In the evaluation of a multi-dimensional aggregate, all choices are evaluated before checking against the index type. (See tests C43207A and C43207B.)

(2) In the evaluation of an aggregate containing subaggregates, all choices are evaluated before being checked for identical bounds. (See test E43212B.)

(3) CONSTRAINT_ERROR is raised after all choices are evaluated when a bound in a non-null range of a non-null aggregate does not belong to an index subtype. (See test E43211B.)

h. Pragmas.

(1) The pragma INLINE is supported for functions and procedures. (See tests LA3004A..B, EA3004C..D, and CA3004E..F.)
i. Generics

(1) Generic specifications and bodies can be compiled in separate compilations. (See tests CA1012A, CA2009C, CA2009F, BC3204C, and BC3205D.)

(2) Generic unit bodies and their subunits can be compiled in separate compilations. (See test CA3011A.)

j. Input and output

(1) The package SEQUENTIAL IO can be instantiated with unconstrained array types and record types with discriminants without defaults. (See tests AE2101C, EE2201D, and EE2201E.)

(2) The package DIRECT IO can be instantiated with unconstrained array types and record types with discriminants without defaults. (See tests AE2101H, EE2401D, and EE2401G.)

(3) Modes IN FILE and OUT FILE are supported for SEQUENTIAL IO. (See tests CE2102D..E, CE2102N, and CE2102F.)

(4) Modes IN FILE, OUT FILE, and INOUT FILE are supported for DIRECT IO. (See tests CE2102F, CE2102I..J, CE2102R, CE2102T, and CE2102V.)

(5) Modes IN FILE and OUT FILE are supported for text files. (See tests CE3102E and CE3102I..K.)

(6) RESET and DELETE operations are supported for SEQUENTIAL IO. (See tests CE2102G and CE2102X.)

(7) RESET and DELETE operations are supported for DIRECT IO. (See tests CE2102K and CE2102Y.)

(8) RESET and DELETE operations are supported for text files. (See tests CE3102F..G, CE3104C, CE3110A, and CE3114A.)

(9) Overwriting to a sequential file truncates to the last element written. (See test CE2208B.)

(10) Temporary sequential files are given names and deleted when closed. (See test CE2108A.)

(11) Temporary direct files are given names and deleted when closed. (See test CE2108C.)

(12) Temporary text files are given names and deleted when closed. (See test CE3112A.)
(13) More than one internal file can be associated with each external file for sequential files when writing or reading. (See tests CE2107A..E, CE2102L, CE2110B, and CE2111D.)

(14) More than one internal file can be associated with each external file for direct files when writing or reading. (See tests CE2107F..H (3 tests), CE2110D, and CE2111H.)

(15) More than one internal file can be associated with each external file for text files when writing or reading. (See tests CE3111A..E, CE3114B, and CE3115A.)
CHAPTER 3
TEST INFORMATION

3.1 TEST RESULTS

Version 1.10 of the ACVC comprises 3717 tests. When this compiler was tested, 44 tests had been withdrawn because of test errors. The AVF determined that 328 tests were inapplicable to this implementation. All inapplicable tests were processed during validation testing except for 201 executable tests that use floating-point precision exceeding that supported by the implementation. Modifications to the code, processing, or grading for 10 tests were required to successfully demonstrate the test objective. (See section 3.6.)

The AVF concludes that the testing results demonstrate acceptable conformity to the Ada Standard.

3.2 SUMMARY OF TEST RESULTS BY CLASS

<table>
<thead>
<tr>
<th>RESULT</th>
<th>TEST CLASS</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Passed</td>
<td>129</td>
<td>1132</td>
</tr>
<tr>
<td>Inapplicable</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Withdrawn</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>130</td>
<td>1140</td>
</tr>
</tbody>
</table>
3.3 SUMMARY OF TEST RESULTS BY CHAPTER

<table>
<thead>
<tr>
<th>RESULT</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passed</td>
<td>198</td>
<td>577</td>
<td>545</td>
<td>245</td>
<td>172</td>
<td>99</td>
<td>161</td>
<td>331</td>
<td>137</td>
<td>36</td>
<td>252</td>
<td>292</td>
<td>300</td>
<td>3345</td>
</tr>
<tr>
<td>Inappl</td>
<td>14</td>
<td>72</td>
<td>135</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>77</td>
<td>-1</td>
<td>328</td>
<td></td>
</tr>
<tr>
<td>Wdrn</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>35</td>
<td>4</td>
<td>44</td>
</tr>
<tr>
<td>TOTAL</td>
<td>213</td>
<td>650</td>
<td>680</td>
<td>248</td>
<td>172</td>
<td>99</td>
<td>166</td>
<td>334</td>
<td>137</td>
<td>36</td>
<td>253</td>
<td>404</td>
<td>325</td>
<td>3717</td>
</tr>
</tbody>
</table>

3.4 WITHDRAWN TESTS

The following 44 tests were withdrawn from ACVC Version 1.10 at the time of this validation:

E2B005C  A39005G  B97102E  C97116A  BC3009B  CD2A62D
CD2A63A  CD2A63B  CD2A63C  CD2A63D  CD2A66A  CD2A66B
CD2A66C  CD2A66D  CD2A73A  CD2A73B  CD2A73C  CD2A73D
CD2A76A  CD2A76B  CD2A76C  CD2A76D  CD2A81G  CD2A83G
CD2A84M  CD2A84N  CD2B15C  CD2D11B  CD5007B  CD50110
ED7004B  ED7005C  ED7005D  ED7006C  ED7006D  CD7105A
CD7203B  CD7204B  CD7205C  CD7205D  CE2107I  CE3111C
CE3301A  CE3411B

See Appendix D for the reason that each of these tests was withdrawn.

3.5 INAPPLICABLE TESTS

Some tests do not apply to all compilers because they make use of features that a compiler is not required by the Ada Standard to support. Others may depend on the result of another test that is either inapplicable or withdrawn. The applicability of a test to an implementation is considered each time a validation is attempted. A test that is inapplicable for one validation attempt is not necessarily inapplicable for a subsequent attempt. For this validation attempt, 328 tests were inapplicable for the reasons indicated:

a. The following 201 tests are not applicable because they have floating-point type declarations requiring more digits than SYSTEM.MAX_DIGITS:

C45641L..Y  C46012L..Z
b. C35702B and B86001U are not applicable because this implementation supports no predefined type LONG_FLOAT.

c. The following 16 tests are not applicable because this implementation does not support a predefined type LONG_INTEGER:

   C45231C   C45304C   C45502C   C45503C   C45504C   C45504F
   C45504F   C45611C   C45613C   C45614C   C45631C   C45632C
   C45632C   B52004D   C55B07A   B55B09C   B86001W
   CD7101F

d. C45531M..P (4 tests) and C45532M..P (4 tests) are not applicable because the value of SYSTEM.MAX_MANTISSA is less than 47.

e. C86001F is not applicable because, for this implementation, the package TEXT_I0 is dependent upon package SYSTEM. These tests recompile package SYSTEM, making package TEXT_I0, and hence package REPORT, obsolete.

f. B86001Y is not applicable because this implementation supports no predefined fixed-point type other than DURATION.

g. B86001Z is not applicable because this implementation supports no predefined floating-point type with a name other than FLOAT, LONG_FLOAT, or SHORT_FLOAT.

h. C96005B is not applicable because there are no values of type DURATION'BASE that are outside the range of DURATION.

i. CD1009C, CD2A41A..B (2 tests), CD2A41E, and CD2A42A..J (10 tests) are not applicable because this implementation does not support size clauses for floating point types.

j. CD2A61I and CD2A61J are not applicable because this implementation does not support size clauses for array types, which imply compression, with component types of composite or floating point types. This implementation requires an explicit size clause on the component type.

k. CD2A84B..I (8 tests) and CD2A84K..L (2 tests) are not applicable because this implementation does not support size clauses for access types.

l. CD2A91A..E (5 tests), CD5012J, CD5013S, and CD5014S are not applicable because this implementation does not support size clauses for tasks or task types.

m. The following 42 tests are not applicable because this implementation does not support an address clause when a dynamic address is applied to a variable requiring initialization:

   CD5011R   CD5012A..I   CD5012L   CD5013B
   CD5013D   CD5013F   CD5013H   CD5013L

3-3
n. CE2102D is inapplicable because this implementation supports CREATE with IN_FILE mode for SEQUENTIAL IO.

o. CE2102E is inapplicable because this implementation supports CREATE with OUT_FILE mode for SEQUENTIAL IO.

p. CE2102F is inapplicable because this implementation supports CREATE with INOUT_FILE mode for DIRECT IO.

q. CE2102I is inapplicable because this implementation supports CREATE with IN_FILE mode for DIRECT IO.

r. CE2102J is inapplicable because this implementation supports CREATE with OUT_FILE mode for DIRECT IO.

s. CE2102N is inapplicable because this implementation supports OPEN with IN_FILE mode for SEQUENTIAL IO.

t. CE2102O is inapplicable because this implementation supports RESET with IN_FILE mode for SEQUENTIAL IO.

u. CE2102P is inapplicable because this implementation supports OPEN with OUT_FILE mode for SEQUENTIAL IO.

v. CE2102Q is inapplicable because this implementation supports RESET with OUT_FILE mode for SEQUENTIAL IO.

w. CE2102R is inapplicable because this implementation supports OPEN with INOUT_FILE mode for DIRECT IO.

x. CE2102S is inapplicable because this implementation supports RESET with INOUT_FILE mode for DIRECT IO.

y. CE2102T is inapplicable because this implementation supports OPEN with IN_FILE mode for DIRECT IO.

z. CE2102U is inapplicable because this implementation supports RESET with IN_FILE mode for DIRECT IO.

aa. CE2102V is inapplicable because this implementation supports open with OUT_FILE mode for DIRECT IO.

ab. CE2102W is inapplicable because this implementation supports RESET with OUT_FILE mode for DIRECT IO.

ac. CE3102E is inapplicable because this implementation supports CREATE with IN_FILE mode for text files.

ad. CE3102F is inapplicable because this implementation supports RESET for text files.
ae. CE3102G is inapplicable because this implementation supports deletion of an external file for text files.

af. CE3102I is inapplicable because this implementation supports CREATE with OUT_FILE mode for text files.

ag. CE3102J is inapplicable because this implementation supports OPEN with IN_FILE mode for text files.

ah. CE3102K is inapplicable because this implementation supports OPEN with OUT_FILE mode for text files.

3.6 TEST, PROCESSING, AND EVALUATION MODIFICATIONS

It is expected that some tests will require modifications of code, processing, or evaluation in order to compensate for legitimate implementation behavior. Modifications are made by the AVF in cases where legitimate implementation behavior prevents the successful completion of an (otherwise) applicable test. Examples of such modifications include: adding a length clause to alter the default size of a collection; splitting a Class B test into subtests so that all errors are detected; and confirming that messages produced by an executable test demonstrate conforming behavior that wasn’t anticipated by the test (such as raising one exception instead of another).

Modifications were required for 10 tests.

The following tests were split because syntax errors at one point resulted in the compiler not detecting other errors in the test:

B24009A  B33301B  B38003A  B38003B  B38009A  B38009B
B41202A  B91001H  BC1303F  BC3005B

3.7 ADDITIONAL TESTING INFORMATION

3.7.1 Prevalidation

Prior to validation, a set of test results for ACVC Version 1.10 produced by the Alliant FX/Ada Compiler was submitted to the AVF by the applicant for review. Analysis of these results demonstrated that the compiler successfully passed all applicable tests, and the compiler exhibited the expected behavior on all inapplicable tests.
3.7.2 Test Method

Testing of the Alliant FX/Ada Compiler using ACVC Version 1.10 was conducted on-site by a validation team from the AVF. The configuration in which the testing was performed is described by the following designations of hardware and software components:

- **Host computer:** Alliant FX/80
- **Host operating system:** Concentrix, Release 5.0
- **Target computer:** Alliant FX/80
- **Target operating system:** Concentrix, Release 5.0
- **Compiler:** Alliant FX/Ada Compiler, Version 2.2

A magnetic tape containing all tests except for withdrawn tests and tests requiring unsupported floating-point precisions was taken on-site by the validation team for processing. Tests that make use of implementation-specific values were customized before being written to the magnetic tape. Tests requiring modifications during the prevalidation testing were included in their modified form on the magnetic tape.

The contents of the magnetic tape were loaded directly onto the host computer. After the test files were loaded to disk, the full set of tests was compiled, linked, and all executable tests were run on the Alliant FX/80. Results were printed from the host computer.

The compiler was tested using command scripts provided by Alliant Computer Systems Corporation and reviewed by the validation team. The compiler was tested using all the following option settings. See Appendix E for a complete listing of the compiler options for this implementation. The following list of compiler options includes those options which were invoked by default:

```
-M ada_source.a
-01
```

Tests were compiled, linked, and executed (as appropriate) using a single computer. Test output, compilation listings, and job logs were captured on magnetic tape and archived at the AVF. The listings examined on-site by the validation team were also archived.

3.7.3 Test Site

Testing was conducted at Littleton MA and was completed on 5 June 1989.
Alliant Computer Systems Corporation has submitted the following Declaration of Conformance concerning the Alliant FX/Ada Compiler.
DECLARATION OF CONFORMANCE

Compiler Implementor:  Alliant Computer Systems Corporation
Ada Validation Facility:  ASD/SCEL, Wright-Patterson AFB OH  45433-6503
Ada Compiler Validation Capability (ACVC) Version:  1.10

Base Configuration

Base Compiler Name:  Alliant FX/Ada Compiler, Version 2.2
Host Architecture ISA:  Alliant FX/80
Host OS and Version:  Concentrix, Release 5.0
Target Architecture ISA:  Alliant FX/80
Target OS and Version:  Concentrix, Release 5.0

Derived Compiler Registration

Derived Compiler Name:  Alliant FX/Ada Compiler, Version 2.2
Host Architecture ISA:  Alliant FX/40
Host OS and Version:  Concentrix, Release 5.0
Target Architecture ISA:  Alliant FX/40
Target OS and Version:  Concentrix, Release 5.0

Derived Compiler Name:  Alliant FX/Ada Compiler, Version 2.2
Host Architecture ISA:  Alliant FX/8
Host OS and Version:  Concentrix, Release 5.0
Target Architecture ISA:  Alliant FX/8
Target OS and Version:  Concentrix, Release 5.0

Derived Compiler Name:  Alliant FX/Ada Compiler, Version 2.2
Host Architecture ISA:  Alliant FX/4
Host OS and Version:  Concentrix, Release 5.0
Target Architecture ISA:  Alliant FX/4
Target OS and Version:  Concentrix, Release 5.0

Derived Compiler Name:  Alliant FX/Ada Compiler, Version 2.2
Host Architecture ISA:  Alliant FX/1
Host OS and Version:  Concentrix, Release 5.0
Target Architecture ISA:  Alliant FX/1
Target OS and Version:  Concentrix, Release 5.0

Derived Compiler Name:  Alliant FX/Ada Compiler, Version 2.2
Host Architecture ISA:  Alliant FX/82
Host OS and Version:  Concentrix, Release 5.0
Target Architecture ISA:  Alliant FX/82
Target OS and Version:  Concentrix, Release 5.0

Derived Compiler Name:  Alliant FX/Ada Compiler, Version 2.2
Host Architecture ISA:  Alliant VFX/80
Host OS and Version:  Concentrix, Release 5.0
Target Architecture ISA:  Alliant VFX/80
Target OS and Version:  Concentrix, Release 5.0
<table>
<thead>
<tr>
<th>Derived Compiler Name:</th>
<th>Alliant FX/Ada Compiler, Version 2.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host Architecture ISA:</td>
<td>Alliant VFX/40</td>
</tr>
<tr>
<td>Host OS and Version:</td>
<td>Concentrix, Release 5.0</td>
</tr>
<tr>
<td>Target Architecture ISA:</td>
<td>Alliant VFX/4</td>
</tr>
<tr>
<td>Target OS and Version:</td>
<td>Concentrix, Release 5.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Derived Compiler Name:</th>
<th>Alliant FX/Ada Compiler, Version 2.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host Architecture ISA:</td>
<td>Alliant VFX/4</td>
</tr>
<tr>
<td>Host OS and Version:</td>
<td>Concentrix, Release 5.0</td>
</tr>
<tr>
<td>Target Architecture ISA:</td>
<td>Alliant VFX/4</td>
</tr>
<tr>
<td>Target OS and Version:</td>
<td>Concentrix, Release 5.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Derived Compiler Name:</th>
<th>Alliant FX/Ada Compiler, Version 2.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host Architecture ISA:</td>
<td>Alliant VFX/82</td>
</tr>
<tr>
<td>Host OS and Version:</td>
<td>Concentrix, Release 5.0</td>
</tr>
<tr>
<td>Target Architecture ISA:</td>
<td>Alliant VFX/82</td>
</tr>
<tr>
<td>Target OS and Version:</td>
<td>Concentrix, Release 5.0</td>
</tr>
</tbody>
</table>

### Implementor's Declaration

I, the undersigned, representing Alliant Computer Systems Corporation, have implemented no deliberate extensions to the Ada Language Standard ANSI/MIL-STD-1815A in the compiler(s) listed in this declaration. I declare that Alliant Computer Systems Corporation is the owner of record of the Ada language compiler(s) listed above and, as such, is responsible for maintaining said compiler(s) in conformance to ANSI/MIL-STD-1815A. All certificates and registrations for Ada language compiler(s) listed in this declaration shall be made only in the owner's corporate name.

Andrew F. Halford, Director of Software
Date: June 5, 1989

### Owner's Declaration

I, the undersigned, representing Alliant Computer Systems Corporation, take full responsibility for implementation and maintenance of the Ada compiler(s) listed above, and agree to the public disclosure of the final Validation Summary Report. I declare that all of the Ada language compilers listed, and their host/target performance, are in compliance with the Ada Language Standard ANSI/MIL-STD-1815A.

Andrew F. Halford, Director of Software
Date: June 5, 1989
APPENDIX B

APPENDIX F OF THE Ada STANDARD

The only allowed implementation dependencies correspond to implementation-dependent pragmas, to certain machine-dependent conventions as mentioned in chapter 13 of the Ada Standard, and to certain allowed restrictions on representation clauses. The implementation-dependent characteristics of the Alliant FX/Ada Compiler, Version 2.2, as described in this Appendix, are provided by Alliant Computer Systems Corporation. Unless specifically noted otherwise, references in this Appendix are to compiler documentation and not to this report. Implementation-specific portions of the package STANDARD, which are not a part of Appendix F, are:

package STANDARD is

  ...

  type INTEGER is range -2147483648 .. 2147483647;
  type SHORT_INTEGER is range -32768 .. 32767;
  type TINY_INTEGER is range -128 .. 127;

  type FLOAT is digits 15
      range -1.79769313486235E+308 .. 1.79769313486235E+308;
  type SHORT_FLOAT is digits 6 range -3.40283E+38 .. 3.40283E+38;

  type DURATION is delta 1.0E-03 range -2147483.648 .. 2147483.647;

  ...

end STANDARD;

B-1
APPENDIX F. Implementation-Dependent Characteristics

1. Implementation-Dependent Pragmas

1.1. INLINE_ONLY Pragma

The INLINE_ONLY pragma, when used in the same way as pragma INLINE, indicates to the compiler that the subprogram must always be inlined. This pragma also suppresses the generation of a callable version of the routine which saves code space.

1.2. BUILTIN Pragma

The BUILTIN pragma is used in the implementation of some predefined Ada packages, but provides no user access. It is used only to implement code bodies for which no actual Ada body can be provided, for example the MACHINE_CODE package.

1.3. RESOURCE Pragma

The RESOURCE pragma specifies the resource class of the task (or tasks of a task type) or the resource class of the main program. It is used to force a task to execute on a particular resource class when multiple processors are used to execute an Ada program. This pragma takes a static expression of the type RESOURCE_TYPE declared in package SYSTEM. This pragma is only allowed within the specification of a task unit or immediately within the outermost declarative part of a main program.

1.4. SHARE_CODE Pragma

The SHARE_CODE pragma takes the name of a generic instantiation or a generic unit as the first argument and one of the identifiers TRUE or FALSE as the second argument. This pragma is only allowed immediately at the place of a declarative item in a declarative part or package specification, or after a library unit in a compilation, but before any subsequent compilation unit.

When the first argument is a generic unit the pragma applies to all instantiations of that generic. When the first argument is the name of a generic instantiation the pragma applies only to the specified instantiation, or overloads instantiations.
If the second argument is TRUE the compiler will try to share code generated for a generic instantiation with code generated for other instantiations of the same generic. When the second argument is FALSE each instantiation will get a unique copy of the generated code. The extent to which code is shared between instantiations depends on this pragma and the kind of generic formal parameters declared for the generic unit.

The name pragma SHARE_BODY is also recognized by the implementation and has the same effect as SHARE_CODE. It is included for compatibility with earlier versions of FX/Ada.

1.5. EXTERNAL_NAME Pragma

The EXTERNAL_NAME pragma takes the name of a subprogram or variable defined in Ada and allows the user to specify an external name that may be used to reference the entity from other languages. The pragma is allowed at the place of a declarative item in a package specification and must apply to an object declared earlier in the same package specification.

1.6. INTERFACE_NAME Pragma

The INTERFACE_NAME pragma takes the name of a variable defined in another language and allows it to be referenced directly in Ada. The pragma will replace all occurrences of the variable name with an external reference to the second link_argument. The pragma is allowed at the place of a declarative item in a package specification and must apply to an object declared earlier in the same package specification. The object must be declared as a scalar or an access type. The object cannot be any of the following:

- a loop variable,
- a constant,
- an initialized variable,
- an array, or
- a record.

The INTERFACE_NAME pragma is also used to provide an external link name to a subprogram which has been defined using the INTERFACE pragma.

1.7. IMPLICIT_CODE Pragma

Takes one of the identifiers ON or OFF as the single argument. This pragma is only allowed within a machine code procedure. It specifies that implicit code generated by the compiler be allowed or disallowed. A warning is issued if OFF is used and any implicit code needs to be generated. The default is ON.
1.8. NO RECIPRICAL

This pragma takes one argument which can be the name of either a library subprogram or a subprogram declared immediately within a library package spec or body. It indicates to the compiler that the subprogram will not be called recursively allowing the compiler to perform specific optimizations. The pragma can be applied to a subprogram or a set of overloaded subprogram within a package spec or package body.

1.9. NOT ELABORATED

This pragma can only appear in a library package specification. It indicates that the package will not be elaborated because it is either part of the RTS, a configuration package or an Ada package that is referenced from a language other than Ada. The presence of this pragma suppresses the generation of elaboration code and issues warnings if elaboration code is required.

2. Implementation of Predefined Pragmas

2.1. CONFIGURED

This pragma is recognized by the implementation but has no effect.

2.2. ELABORATE

This pragma is implemented as described in Appendix B of the Ada RM.

2.3. INLINE

This pragma is implemented as described in Appendix B of the Ada RM.

2.4. INTERFACE

This pragma supports calls to 'C', Pascal, and FORTRAN functions. The Ada subprograms can be either functions or procedures. The types of parameters and the result type for functions must be scalar, access or the predefined type ADDRESS in SYSTEM. All parameters must have mode IN. Record and array objects can be passed by reference using the ADDRESS attribute.

2.5. LIST

This pragma is implemented as described in Appendix B of the Ada RM.
2.6. MEMORY_SIZE

This pragma is recognized by the implementation. The implementation does not allow SYSTEM to be modified by means of pragmas, the SYSTEM package must be recompiled.

2.7. OPTIMIZE

This pragma is recognized by the implementation but has no effect.

2.8. PACK

This pragma will cause the compiler to choose a non-aligned representation for composite types. It will not cause objects to be packed at the bit level.

2.9. PAGE

This pragma is implemented as described in Appendix B of the Ada RM.

2.10. PRIORITY

This pragma is implemented as described in Appendix E of the Ada RM.

2.11. SHARED

This pragma is recognized by the implementation but has no effect.

2.12. STORAGE_UNIT

This pragma is recognized by the implementation. The implementation does not allow SYSTEM to be modified by means of pragmas, the SYSTEM package must be recompiled.

2.13. SUPPRESS

This pragma is implemented as described, except that RANGE_CHECK and DIVISION_CHECK cannot be suppressed.

2.14. SYSTEM_NAME

This pragma is recognized by the implementation. The implementation does not allow SYSTEM to be modified by means of pragmas, the SYSTEM package must be recompiled.

2. Implementation-Dependent Attributes
For a prefix that denotes an object, a program unit, a label, or an entry:

This attribute denotes the effective address of the first of the storage units allocated to \( P \). For a subprogram, package, task unit, or label, it refers to the address of the machine code associated with the corresponding body or statement. For an entry for which an address clause has been given, it refers to the corresponding hardware interrupt. The attribute is of the type OPERAND defined in the package MACHINE_CODE. The attribute is only allowed within a machine code procedure.

See section F.4.8 for more information on the use of this attribute.

(For a package, task unit, or entry, the 'REF attribute is not supported.)

package SYSTEM
is
  type NAME is (fx_unix);
  SYSTEM_NAME : constant NAME := fx_unix;
  STORAGE_UNIT : constant := 8;
  MEMORY_SIZE : constant := 16_777_216;

-- System-Dependent Named Numbers
  MIN_INT : constant := -2_147_483_648;
  MAX_INT : constant := 2_147_483_647;
  MAX_DIGITS : constant := 15;
  MAX_MANTISSA : constant := 31;
  FINE_DELTA : constant := 2.0**(-31);
  TICK : constant := 0.01;

-- Other System-dependent Declarations
  subtype PRIORITY is INTEGER range 0 .. 99;
  MIN_PRIORITY : constant priority := priority'first;
  MAX_PRIORITY : constant priority := priority'last;

  type RESOURCE_TYPE is (any_resource,
    detached_co_resource, complex_resource, ip_resource);

  ...)
 unavailable_resource : exception;
MAX_REC_SIZE : integer := 64*1024;

type ADDRESS is private;

NO_ADDR : constant ADDRESS :=

function PHYSICAL_ADDRESS(I: INTEGER) return ADDRESS;
function ADDR_GT(A, B: ADDRESS) return BOOLEAN;
function ADDR_LT(A, B: ADDRESS) return BOOLEAN;
function ADDR_GE(A, B: ADDRESS) return BOOLEAN;
function ADDR_LE(A, B: ADDRESS) return BOOLEAN;
function ADDR_DIFF(A, B: ADDRESS) return INTEGER;
function INCR_ADDR(A: ADDRESS; INCR: INTEGER) return ADDRESS;
function DECR_ADDR(A: ADDRESS; DECR: INTEGER) return ADDRESS;

function ">" (A, B: ADDRESS) return BOOLEAN renames ADDR_GT;
function "<" (A, B: ADDRESS) return BOOLEAN renames ADDR_LT;
function ">=" (A, B: ADDRESS) return BOOLEAN renames ADDR_GE;
function "<=" (A, B: ADDRESS) return BOOLEAN renames ADDR_LE;
function "-" (A, B: ADDRESS) return INTEGER renames ADDR_DIFF;
function "+" (A: ADDRESS;
  INCR: INTEGER) return ADDRESS renames INCR_ADDR;
function "-" (A: ADDRESS;
  DECR: INTEGER) return ADDRESS renames DECR_ADDR;

pragma inline(ADDR_GT);
pragma inline(ADDR_LT);
pragma inline(ADDR_GE);
pragma inline(ADDR_LE);
pragma inline(ADDR_DIFF);
pragma inline(INCR_ADDR);
pragma inline(DECR_ADDR);
pragma inline(PHYSICAL_ADDRESS);

private

type ADDRESS is new integer;

NO_ADDR : constant ADDRESS := 0;

end SYSTEM;

5. Restriction on Representation Clauses

5.1. Pragma PACK

In the absence of pragma PACK record components are padded so as to provide for efficient access by the target hardware. Pragma PACK applied to a record eliminates the padding where possible. Pragma PACK has no other effect on
the storage allocated for record components, so a record representation is required to make record components smaller. Bit packing is not supported for components larger than STORAGE_UNIT. Components smaller than STORAGE_UNIT will be bit packed within a storage unit. Objects and larger components are packed to the nearest whole STORAGE_UNIT.

5.2. Length Clauses

For scalar types, a length clause which is a size specification will compress storage to the number of bits required to represent the range of the subtype. For fixed, float, and access types, this is 32.

A size specification applied to a composite type with components of composite types will not cause compression of component storage. To allocate the minimal number of bits for records of composite types, an explicit record representation clause must be given with length clauses for each component. An error will be issued if there is insufficient space allocated. Component clauses need not be aligned on STORAGE_UNIT boundaries. A component of a record representation clause may not specify fewer bits for a component type than would be used for values of the type.

Size specifications (T'SIZE) are not supported for task types. Specifications of storage for a task activation (T'STORAGE_SIZE) is supported. The minimum storage size for task activations is 5120, but can be larger depending on the size of data objects declared in the task.

The size specification T'SMALL is not supported except when the representation specification is the same as the value 'SMALL for the base type.

Specification of collection size is supported.

5.3. Address Clauses

Address clauses are supported for uninitialized variables and constants. They are not supported by the compiler for subprograms, packages, and task units.

5.4. Interrupts

Interrupt entries are supported for UNIX signals. The Ada for clause gives the UNIX signal number. The following is the meaning associated with the valid UNIX signals:

1  SIGHUP  hangup
2  SIGINT  interrupt
3. SIGQUIT  quit
4. SIGILL  illegal instruction (not reset when caught)
5. SIGTRAP  trace trap (not reset when caught)
6. SIGIO  I/O instruction
7. SIGEMT  EMT instruction
8. SIGFPE  floating point exception
9. SIGIOIT  IOT instruction
10. SIGFPE  floating point exception
11. SIGKILL  kill (cannot be caught or ignored)
12. SIGBUS  bus error
13. SIGSEGV  segmentation violation
14. SIGSYS  bad argument to system call
15. SIGPIPE  write on a pipe with no one to read it
16. SIGALRM  alarm clock
17. SIGTERM  software termination signal from kill
18. SIGURG  urgent condition on I/O channel
19. SIGTOSTOP  sendable stop signal not from tty
20. SIGTSTP  stop signal from tty
21. SIGCONT  continue a stopped process
22. SIGCHLD  to parent on child stop or exit
23. SIGTTIN  to readers pgrp upon background tty read
24. SIGTTOU  like TTIN for output if (tp->t_local&LTOSTOP)
25. SIGIO  input/output possible signal
26. SIGXCPU  exceeded CPU time limit
27. SIGXFSZ  exceeded file size limit
28. SIGVTALRM  virtual time alarm
29. SIGPROF  profiling time alarm
30. SIGWINCH  window changed

5.5. Representation Attributes

The ADDRESS attribute is not supported for packages and task entries. The compiler issues a warning message and the value which is type SYSTEM.ADDRESS is SYSTEM.NO_ADDR.

5.6. Machine Code Insertions

Machine code insertions are supported.

The general definition of the package MACHINE_CODE provides an assembly language interface for the target machine. It provides the necessary record type(s) needed in the code statement, an enumeration type of all the opcode mnemonics, a set of register definitions, and a set of addressing mode functions.

The general syntax of a machine code statement is as follows:

```
CODE_q`(`a1` `a2` `a3` `...` `aq`);
```

where q indicates the number of operands in the aggregate.
A special case arises for a variable number of operands. The operands are listed within a subaggregate. The format is as follows:

```plaintext
CODE (# operand (operand ..., operand));
```

For those opcodes that require no operands, named notation must be used (cf. RM 4.3(4)).

```plaintext
CODE (# op => opcode);
```

The `opcode` must be an enumeration literal (i.e. it cannot be an object, attribute, or a rename).

An `operand` can only be an entity defined in `MACHINE-CODE` or the `REF` attribute.

The arguments to any of the functions defined in `MACHINE-CODE` must be static expressions, string literals, or the functions defined in `MACHINE-CODE`. The `REF` attribute may not be used as an argument in any of these functions.

Inline expansion of machine code procedures is supported.

6. Conventions for Implementation-generated Names

There are no implementation-generated names.

7. Interpretation of Expressions in Address Clauses

Address clauses are supported for constants and variables.

8. Restrictions on Unchecked Conversions

None.

9. Restrictions on Unchecked Reallocations

None.

10. Implementation Limits

The following limits are actually enforced by the implementation. It is not intended to imply that resources up to or even near these limits are available to every program.
10.1. Line Length

The implementation supports a maximum line length of 500 characters including the end of line character.

10.2. Record and Array Sizes

The maximum size of a statically sized array type is 4,000,000 x STORAGE_UNITS. The maximum size of a statically sized record type is 4,000,000 x STORAGE_UNITS. A record type or array type declaration that exceeds these limits will generate a warning message.

10.3. Default Stack Size for Tasks

In the absence of an explicit STORAGE_SIZE length specification every task except the main program is allocated a fixed size stack of 10,240 STORAGE_UNITS. This is the value returned by T'STORAGE_SIZE for a task type T. The minimum stack size for tasks is 5120.

10.4. Default Collection Size

In the absence of an explicit STORAGE_SIZE length attribute the default collection size for an access type is 100 times the size of the designated type. This is the value returned by T'STORAGE_SIZE for an access type T.

10.5. Limit on Declared Objects

There is an absolute limit of 6,000,000 x STORAGE_UNITS for objects declared statically within a compilation unit. If this value is exceeded the compiler will terminate the compilation of the unit with a FATAL error message.
APPENDIX C

TEST PARAMETERS

Certain tests in the ACVC make use of implementation-dependent values, such as the maximum length of an input line and invalid file names. A test that makes use of such values is identified by the extension .TST in its file name. Actual values to be substituted are represented by names that begin with a dollar sign. A value must be substituted for each of these names before the test is run. The values used for this validation are given below.

<table>
<thead>
<tr>
<th>Name and Meaning</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SACC SIZE</td>
<td>32</td>
</tr>
<tr>
<td>$BIG ID1</td>
<td>(1..498 =&gt; 'A', 499 =&gt; '1')</td>
</tr>
<tr>
<td>$BIG ID2</td>
<td>(1..498 =&gt; 'A', 499 =&gt; '2')</td>
</tr>
<tr>
<td>$BIG ID3</td>
<td>(1..249 =&gt; 'A', 250 =&gt; '3', 251..499 =&gt; 'A')</td>
</tr>
</tbody>
</table>
## TEST PARAMETERS

<table>
<thead>
<tr>
<th>Name and Meaning</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SBIG_ID4</strong></td>
<td>$(1..249 =&gt; 'A', 250 =&gt; '4', 251..499 =&gt; 'A')</td>
</tr>
<tr>
<td>An identifier the size of the maximum input line length which is identical to <strong>SBIG_ID3</strong> except for a character near the middle.</td>
<td></td>
</tr>
<tr>
<td><strong>SBIG_INT_LIT</strong></td>
<td>$(1..496 =&gt; '0', 497..499 =&gt; &quot;298&quot;)</td>
</tr>
<tr>
<td>An integer literal of value 298 with enough leading zeroes so that it is the size of the maximum line length.</td>
<td></td>
</tr>
<tr>
<td><strong>SBIG_REAL_LIT</strong></td>
<td>$(1..493 =&gt; '0', 494..499 =&gt; &quot;69.0E1&quot;)</td>
</tr>
<tr>
<td>A universal real literal of value 690.0 with enough leading zeroes to be the size of the maximum line length.</td>
<td></td>
</tr>
<tr>
<td><strong>SBIG_STRING1</strong></td>
<td>$(1 =&gt; '&quot;', 2..200 =&gt; 'A', 201 =&gt; '&quot;')</td>
</tr>
<tr>
<td>A string literal which when catenated with <strong>SBIG_STRING2</strong> yields the image of <strong>SBIG_ID1</strong>.</td>
<td></td>
</tr>
<tr>
<td><strong>SBIG_STRING2</strong></td>
<td>$(1 =&gt; '&quot;', 2..300 =&gt; 'A', 301 =&gt; '&quot;')</td>
</tr>
<tr>
<td>A string literal which when catenated to the end of <strong>SBIG_STRING1</strong> yields the image of <strong>SBIG_ID1</strong>.</td>
<td></td>
</tr>
<tr>
<td><strong>$BLANKS</strong></td>
<td>$(1..479 =&gt; ' ')</td>
</tr>
<tr>
<td>A sequence of blanks twenty characters less than the size of the maximum line length.</td>
<td></td>
</tr>
<tr>
<td><strong>$COUNT_LAST</strong></td>
<td>2_147_483_647</td>
</tr>
<tr>
<td>A universal integer literal whose value is TEXT_IO.COUNT'LAST.</td>
<td></td>
</tr>
<tr>
<td><strong>$DEFAULT_MEM_SIZE</strong></td>
<td>16_777_216</td>
</tr>
<tr>
<td>An integer literal whose value is SYSTEM.MEMORY_SIZE.</td>
<td></td>
</tr>
<tr>
<td><strong>$DEFAULT_STOR_UNIT</strong></td>
<td>8</td>
</tr>
<tr>
<td>An integer literal whose value is SYSTEM.STORAGE_UNIT.</td>
<td></td>
</tr>
<tr>
<td>Name and Meaning</td>
<td>Value</td>
</tr>
<tr>
<td>------------------</td>
<td>-------</td>
</tr>
<tr>
<td>SDEFAULT SYS_NAME</td>
<td>FX_UNIX</td>
</tr>
<tr>
<td>SDELTA_DOC</td>
<td>0.0000000004656612873077392578125</td>
</tr>
<tr>
<td>SFIELD_LAST</td>
<td>2_147_483_647</td>
</tr>
<tr>
<td>SFIXED_NAME</td>
<td>NO_SUCH_FIXED_TYPE</td>
</tr>
<tr>
<td>SFLOAT_NAME</td>
<td>NO_SUCH_TYPE</td>
</tr>
<tr>
<td>SGREATER_THAN_DURATION</td>
<td>100_000.0</td>
</tr>
<tr>
<td>SGREATER_THAN_DURATION_BASE_LAST</td>
<td>10_000_000.0</td>
</tr>
<tr>
<td>SHIGH_PRIORITY</td>
<td>99</td>
</tr>
<tr>
<td>$ILLEGAL_EXTERNAL_FILE_NAME1</td>
<td>/illegal/file_name/2{][SZ2102C}.DAT</td>
</tr>
<tr>
<td>$ILLEGAL_EXTERNAL_FILE_NAME2</td>
<td>/illegal/file_name/CE2102C*.DAT</td>
</tr>
<tr>
<td>$INTEGER_FIRST</td>
<td>-2147483648</td>
</tr>
</tbody>
</table>
## TEST PARAMETERS

<table>
<thead>
<tr>
<th>Name and Meaning</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINTEGER_LAST</td>
<td>2147483647</td>
</tr>
<tr>
<td>A universal integer literal whose value is INTEGER'LAST.</td>
<td></td>
</tr>
<tr>
<td>SINTEGER_LAST_PLUS_1</td>
<td>2_147_483_648</td>
</tr>
<tr>
<td>A universal integer literal whose value is INTEGER'LAST + 1.</td>
<td></td>
</tr>
<tr>
<td>SLESS_THAN_DURATION</td>
<td>-100_000.0</td>
</tr>
<tr>
<td>A universal real literal that lies between DURATION'BASE'FIRST and DURATION'FIRST or any value in the range of DURATION.</td>
<td></td>
</tr>
<tr>
<td>SLESS_THAN_DURATION_BASE_FIRST</td>
<td>-10_000_000.0</td>
</tr>
<tr>
<td>A universal real literal that is less than DURATION'BASE'FIRST.</td>
<td></td>
</tr>
<tr>
<td>SLOW_PRIORITY</td>
<td>0</td>
</tr>
<tr>
<td>An integer literal whose value is the lower bound of the range for the subtype SYSTEM.PRIORITY.</td>
<td></td>
</tr>
<tr>
<td>SMANTISSA_DOC</td>
<td>31</td>
</tr>
<tr>
<td>An integer literal whose value is SYSTEM.MAX_MANTISSA.</td>
<td></td>
</tr>
<tr>
<td>SMAX_DIGITS</td>
<td>15</td>
</tr>
<tr>
<td>Maximum digits supported for floating-point types.</td>
<td></td>
</tr>
<tr>
<td>SMAX_IN_LEN</td>
<td>499</td>
</tr>
<tr>
<td>Maximum input line length permitted by the implementation.</td>
<td></td>
</tr>
<tr>
<td>SMAX_INT</td>
<td>2147483647</td>
</tr>
<tr>
<td>A universal integer literal whose value is SYSTEM.MAX_INT.</td>
<td></td>
</tr>
<tr>
<td>SMAX_INT_PLUS_1</td>
<td>2_147_483_648</td>
</tr>
<tr>
<td>A universal integer literal whose value is SYSTEM.MAX_INT + 1.</td>
<td></td>
</tr>
<tr>
<td>SMAX_LEN_INT_BASED_LITERAL</td>
<td>(1..2 =&gt; &quot;2:&quot;, 3..496 =&gt; '0', 497..499 =&gt; &quot;11:&quot; )</td>
</tr>
<tr>
<td>Name and Meaning</td>
<td>Value</td>
</tr>
<tr>
<td>------------------</td>
<td>-------</td>
</tr>
<tr>
<td><strong>SNUM&quot;&gt;&lt;/&gt;</strong> LEN_REAL_BASED_LITERAL</td>
<td>A universal real based literal whose value is 16:F.E: with enough leading zeroes in the mantissa to be SNUM&quot;&gt;&lt;/&gt;LEN long.</td>
</tr>
<tr>
<td><strong>SNUM&quot;&gt;&lt;/&gt;</strong> MAX_STRING_LITERAL</td>
<td>A string literal of size SNUM&quot;&gt;&lt;/&gt;IN_LEN, including the quote characters.</td>
</tr>
<tr>
<td><strong>SNUM&quot;&gt;&lt;/&gt;</strong> MIN_INT</td>
<td>A universal integer literal whose value is SYSTEM.MIN_INT.</td>
</tr>
<tr>
<td><strong>SNUM&quot;&gt;&lt;/&gt;</strong> MIN_TASK_SIZE</td>
<td>An integer literal whose value is the number of bits required to hold a task object which has no entries, no declarations, and &quot;NULL;&quot; as the only statement in its body.</td>
</tr>
<tr>
<td><strong>SNUM&quot;&gt;&lt;/&gt;</strong> NAME</td>
<td>A name of a predefined numeric type other than FLOAT, INTEGER, SHORT FLOAT, SHORT INTEGER, LONG_FLOAT, or LONG_INTEGER.</td>
</tr>
<tr>
<td><strong>SNUM&quot;&gt;&lt;/&gt;</strong> NAME LIST</td>
<td>A list of enumeration literals in the type SYSTEM.NAME, separated by commas.</td>
</tr>
<tr>
<td><strong>SNUM&quot;&gt;&lt;/&gt;</strong> NEG_BASED_INT</td>
<td>A based integer literal whose highest order nonzero bit falls in the sign bit position of the representation for SYSTEM.MAX_INT.</td>
</tr>
<tr>
<td><strong>SNUM&quot;&gt;&lt;/&gt;</strong> NEW_MEM_SIZE</td>
<td>An integer literal whose value is a permitted argument for pragma MEMORY_SIZE, other than SNUM&quot;&gt;&lt;/&gt;DEFAULT_MEM_SIZE. If there is no other value, then use SNUM&quot;&gt;&lt;/&gt;DEFAULT_MEM_SIZE.</td>
</tr>
</tbody>
</table>
## TEST PARAMETERS

<table>
<thead>
<tr>
<th>Name and Meaning</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$NEW_STOR_UNIT</td>
<td>8</td>
</tr>
<tr>
<td>An integer literal whose value is a permitted argument for pragma STORAGE UNIT, other than $DEFAULT_STOR_UNIT. If there is no other permitted value, then use value of SYSTEM_STORAGE_UNIT.</td>
<td></td>
</tr>
<tr>
<td>$NEW_SYS_NAME</td>
<td>FX_UNIX</td>
</tr>
<tr>
<td>A value of the type SYSTEM_NAME, other than $DEFAULT_SYS_NAME. If there is only one value of that type, then use that value.</td>
<td></td>
</tr>
<tr>
<td>$TASK_SIZE</td>
<td>32</td>
</tr>
<tr>
<td>An integer literal whose value is the number of bits required to hold a task object which has a single entry with one 'IN OUT' parameter.</td>
<td></td>
</tr>
<tr>
<td>$STICK</td>
<td>0.01</td>
</tr>
<tr>
<td>A real literal whose value is SYSTEM_TICK.</td>
<td></td>
</tr>
</tbody>
</table>
Some tests are withdrawn from the ACVC because they do not conform to the Ada Standard. The following 44 tests had been withdrawn at the time of validation testing for the reasons indicated. A reference of the form AI-dddd is to an Ada Commentary.

- **a. E2B005C:** This test expects that the string "-- TOP OF PAGE. --63" of line 204 will appear at the top of the listing page due to a pragma PAGE in line 203; but line 203 contains text that follows the pragma, and it is this text that must appear at the top of the page.

- **b. A39005G:** This test unreasonably expects a component clause to pack an array component into a minimum size (line 30).

- **c. B97102E:** This test contains an unintended illegality: a select statement contains a null statement at the place of a selective wait alternative (line 31).

- **d. C97116A:** This test contains race conditions, and it assumes that guards are evaluated indivisibly. A conforming implementation may use interleaved execution in such a way that the evaluation of the guards at lines 50 & 54 and the execution of task CHANGING_OF_THE_GUARD results in a call to REPORT.FAILED at one of lines 52 or 56.

- **e. BC3009B:** This test wrongly expects that circular instantiations will be detected in several compilation units even though none of the units is illegal with respect to the units it depends on; by AI-00256, the illegality need not be detected until execution is attempted (line 95).

- **f. CD2A62D:** This test wrongly requires that an array object’s size be no greater than 10 although its subtype’s size was specified to be 40 (line 137).

WITHDRAWN TESTS

tests wrongly attempt to check the size of objects of a derived type
(for which a 'SIZE length clause is given) by passing them to a
derived subprogram (which implicitly converts them to the parent type
(Ada standard 3.4:14)). Additionally, they use the 'SIZE length
clause and attribute, whose interpretation is considered problematic
by the WG9 ARG.

h. CD2A81G, CD2A83G, CD2A84H..N, and CD50110 (5 tests): These tests
assume that dependent tasks will terminate while the main program
executes a loop that simply tests for task termination; this is not
the case, and the main program may loop indefinitely (lines 74, 85,
86, 96, and 58, respectively).

i. CD2B15C and CD7205C: These tests expect that a 'STORAGE_SIZE length
clause provides precise control over the number of designated objects
in a collection; the Ada standard 13.2:15 allows that such control
must not be expected.

j. CD2D11B: This test gives a SMALL representation clause for a derived
fixed-point type (at line 30) that defines a set of model numbers that
are not necessarily represented in the parent type; by Commentary
AI-00099, all model numbers of a derived fixed-point type must be
representable values of the parent type.

k. CD5007B: This test wrongly expects an implicitly declared subprogram
to be at the address that is specified for an unrelated subprogram
(line 303).

l. ED7004B, ED7005C..D, and ED7006C..D (5 tests): These tests check
various aspects of the use of the three SYSTEM pragmas; the AVO
withdraws these tests as being inappropriate for validation.

m. CD7105A: This test requires that successive calls to CALENDAR.CLOCK
change by at least SYSTEM.TICK; however, by Commentary AI-00201, it is
only the expected frequency of change that must be at least
SYSTEM.TICK--particular instances of change may be less (line 29).

n. CD7203B and CD7204B: These tests use the 'SIZE length clause and
attribute, whose interpretation is considered problematic by the WG9
ARG.

o. CD7205D: This test checks an invalid test objective: it treats the
specification of storage to be reserved for a task's activation as
though it were like the specification of storage for a collection.

p. CE2107I: This test requires that objects of two similar scalar types
be distinguished when read from a file--DATA_ERROR is expected to be
raised by an attempt to read one object--as of the other type.
However, it is not clear exactly how the Ada standard 14.2.4:4 is to
be interpreted; thus, this test objective is not considered valid
(line 90).
WITHDRAWN TESTS

q. CE3111C: This test requires certain behavior, when two files are associated with the same external file, that is not required by the Ada standard.

r. CE3301A: This test contains several calls to END_OF_LINE and END_OF_PAGE that have no parameter: these calls were intended to specify a file, not to refer to STANDARD_INPUT (lines 103, 107, 118, 132, and 136).

s. CE3411B: This test requires that a text file's column number be set to COUNT'LAST in order to check that LAYOUT_ERROR is raised by a subsequent PUT operation. But the former operation will generally raise an exception due to a lack of available disk space, and the test would thus encumber validation testing.
APPENDIX E

COMPILER OPTIONS AS SUPPLIED BY ALLIANT

Compiler: Alliant FX/Ada Compiler

ACVC Version: 1.10
ada options

-a file_name.a
   (archive) Treats file_name.a as an archive file rather than an Ada source file.
-d
   (dependencies) Analyzes the source files for dependencies only. No syntax analysis occurs
   and no object files are produced. Used by a.make to establish dependencies among new files.
-e
   (error) Writes error lines and diagnostics to standard output. Only one of -e or -E should be
   used.
-E [file|directory]
   (error) Writes error lines and diagnostics to standard output and writes the raw error messages
   to the specified file. The name of the file defaults to ada_source.err; if a directory name is
   specified, the output is placed in ada_source.err in that directory. Only one of the -e or -E
   option should be used.
-e1
   (error listing) Writes a full listing with interspersed diagnostics to standard output, if any
   errors occur. Only one of -e1 or -E1 option should be used.
-E1 [file|directory]
   (error listing) Writes a full listing with interspersed diagnostics to standard output and writes
   the raw error messages to the specified file, if any errors occur. The name of the file defaults
to ada_source.err; if a directory name is specified, the output is placed in ada_source.err in
that directory. Only one of the -e or -E option should be used.
-ev
   (error vi) Embeds the raw error messages in the source file and calls vi on the source file.
-ix
   (link) Includes the library libx.a from /lib, /usr/lib, or /usr/local/lib. This option is a link
   option and must not precede the name of a file that references the library. See the Concentrix
   link command.
-M unit_name
   -(main) Produces an executable program using the named program unit as the main program.
   The main program must be either a parameterless procedure or a parameterless function return-
   ing an integer.
-M ada_source.a
   -(main) Like -M unit_name, except that the unit name is assumed to be the root name of the
   source file that follows.
-o executable_file
   (output) Names the output executable file; by default, the output executable file is named
   a.out. The -M option must also be specified.
-O[n]
   (optimize) Optimizes the output code. An optional digit limits the number of optimization
   passes; 9 specifies maximum optimization. The default number of optimization passes is 1.
-pg
   Produces a program that (at program execution time) monitors the calling of routines and
   writes a gmon.out file. The Concentrix command gprof -A processes this file.
-R library
   (recompile instantiation) Forces an analysis of all generic instantiations, causing reinstanta-
   tion of any that are out of date.
-S
   (suppress) Applies the suppress pragma to the entire compilation.
-sh
   (show) Shows the pathname of the tool actually called.
-T
   (timing) Prints timing information for the compilation.
-u
   (update) Updates the library ada.lib even if syntax errors are present.
-v
   (verbose) Prints the compiler version number, the date and time of compilation, and summary
   information concerning the compilation.
-w
   (warnings) Suppresses warning messages.