

## REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS  
BEFORE COMPLETING FORM

2

1. REPORT NUMBER	12. GOVT ACCESSION NO	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Ada Compiler Validation Summary Report: Alliant Computer Systems Corporation, Alliant FX/Ada Compiler, Version 2.2, Alliant FX/80 (Host and Target). 890605W1.10083		5. TYPE OF REPORT & PERIOD COVERED 05 June 1989 to 05 June 1990
7. AUTHOR(s) Wright-Patterson AFB Dayton, OH, USA		8. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION AND ADDRESS Wright-Patterson AFB Dayton, OH, USA		6. CONTRACT OR GRANT NUMBER(S)
11. CONTROLLING OFFICE NAME AND ADDRESS Ada Joint Program Office United States Department of Defense Washington, DC 20301-3081		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) Wright-Patterson AFB Dayton, OH, USA		12. REPORT DATE
		13. NUMBER OF PAGES
		15. SECURITY CLASS (of this report) UNCLASSIFIED
		16. DECLASSIFICATION/DOWNGRADING SCHEDULE N/A
18. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Back 26 of this report from Report) UNCLASSIFIED		
19. SUPPLEMENTARY NOTES		
20. KEYWORDS (Continue on reverse side if necessary and identify by block number) Ada Programming language, Ada Compiler Validation Summary Report, Ada Compiler Validation Capability, ACVC, Validation Testing, Ada Validation Office, AVO, Ada Validation Facility, AVF, ANSI/MIL-STD-1815A, Ada Joint Program Office, AJPO		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) 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.		

AD-A210 809

DTIC  
SELECTED  
AUG 03 1989  
D

AVF Control Number: AVF-VSR-275.0689  
89-04-06-ACS

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

Accession For	
NTIS CR&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By _____	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	



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

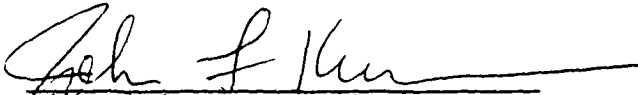
Target: Alliant FX/80 under  
Concentrix, Release 5.0

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

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

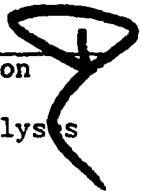
Target: Alliant FX/80 under  
Concentrix, Release 5.0

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 Analysis  
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 dependencies--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. Reference Manual for the Ada Programming Language, ANSI/MIL-STD-1815A, February 1983 and ISO 8652-1987.
2. Ada Compiler Validation Procedures and Guidelines, Ada Joint Program Office, 1 January 1987.
3. Ada Compiler Validation Capability Implementers' Guide, SofTech, Inc., December 1986.
4. Ada Compiler Validation Capability User's Guide, December 1986.

### 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.
Ada Standard	ANSI/MIL-STD-1815A, February 1983 and ISO 8652-1987.
Applicant	The agency requesting validation.
AVF	The Ada Validation Facility. The AVF is responsible for conducting compiler validations according to procedures contained in the <u>Ada Compiler Validation Procedures and Guidelines</u> .
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 test	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:

Machine: Alliant FX/80

Operating System: Concentrix  
Release 5.0

Memory Size: 96 Megabytes

Target Computer:

Machine: Alliant FX/80

Operating System: Concentrix  
Release 5.0

Memory Size: 96 Megabytes

## 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 for 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.)

## CONFIGURATION INFORMATION

### 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 CE2102P.)
- (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.)



## CONFIGURATION INFORMATION

- (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

RESULT	TEST CLASS						TOTAL
	A	B	C	D	E	L	
Passed	129	1132	1993	17	28	46	3345
Inapplicable	0	6	322	0	0	0	328
Withdrawn	1	2	35	0	6	0	44
TOTAL	130	1140	2350	17	34	46	3717

## TEST INFORMATION

### 3.3 SUMMARY OF TEST RESULTS BY CHAPTER

RESULT	CHAPTER														TOTAL
	2	3	4	5	6	7	8	9	10	11	12	13	14		
Passed	198	577	545	245	172	99	161	331	137	36	252	292	300	3345	
Inappl	14	72	135	3	0	0	5	1	0	0	0	77	21	328	
Wdrn	1	1	0	0	0	0	0	2	0	0	1	35	4	44	
TOTAL	213	650	680	248	172	99	166	334	137	36	253	404	325	3717	

### 3.4 WITHDRAWN TESTS

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

E28005C	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`:

C24113L..Y	C35705L..Y	C35706L..Y	C35707L..Y
C35708L..Y	C35802L..Z	C45241L..Y	C45321L..Y
C45421L..Y	C45521L..Z	C45524L..Z	C45621L..Z
C45641L..Y	C46012L..Z		

TEST INFORMATION

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	C45611C	C45613C	C45614C	C45631C
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\_IO is dependent upon package SYSTEM. These tests recompile package SYSTEM, making package TEXT\_IO, 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:

CD5003B..H	CD5011A..H	CD5011L..N	CD5011Q
CD5011R	CD5012A..I	CD5012L	CD5013B
CD5013D	CD5013F	CD5013H	CD5013L

TEST INFORMATION

CD5013N

CD5013R

CD5014T..X

- 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.

## TEST INFORMATION

- 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.

## TEST INFORMATION

### 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.

APPENDIX A

DECLARATION OF CONFORMANCE

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

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

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

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

#### 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  
 Alliant Computer Systems Corporation  
 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  
 Alliant Computer Systems Corporation  
 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.OE-03 range -2147483.648 .. 2147483.647;

...

end STANDARD;

## 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. BUILT\_IN Pragma

The `BUILT_IN` 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 overloaded 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. `NOI_REENTRANT`

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. `NOI_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. `CONTROLLED`

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 causes 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

### 3.1. P'REF

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.)

## 4. Specification Of Package SYSTEM

package SYSTEM  
is

type NAME is ( fx\_unix );

SYSTEM\_NAME : constant NAME := fx\_unix;

STORAGE\_UNIT : constant := 8;

MEMCRY\_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\_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. Restrictions 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'SORAGE\_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	SIGIOT	IOT instruction
7	SIGEMT	EMT instruction
8	SIGFPE	floating point exception
9	SIGKILL	kill (cannot be caught or ignored)
10	SIGBUS	bus error
11	SIGSEGV	segmentation violation
12	SIGSYS	bad argument to system call
13	SIGPIPE	write on a pipe with no one to read it
14	SIGALRM	alarm clock
15	SIGTERM	software termination signal from kill
16	SIGURG	urgent condition on IO channel
17	SIGSTOP	sendable stop signal not from tty
18	SIGTSTP	stop signal from tty
19	SIGCONT	continue a stopped process
20	SIGCHLD	to parent on child stop or exit
21	SIGTTIN	to readers pgrp upon background tty read
22	SIGTTOU	like TTIN for output if (tp->t_local&LTOSTOP)
23	SIGIO	input/output possible signal
24	SIGXCPU	exceeded CPU time limit
25	SIGXFSZ	exceeded file size limit
26	SIGVTALRM	virtual time alarm
27	SIGPROF	profiling time alarm
28	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 statements, 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_n'( opcode, operand [, operand] );
```

where n 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:

```
CODE_N'( opcode, (operand [, operand]) );
```

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

```
CODE_0'( 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 Deallocations

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.

Name and Meaning	Value
SACC SIZE An integer literal whose value is the number of bits sufficient to hold any value of an access type.	32
SBIG ID1 An identifier the size of the maximum input line length which is identical to SBIG ID2 except for the last character.	(1..498 => 'A', 499 => '1')
SBIG ID2 An identifier the size of the maximum input line length which is identical to SBIG ID1 except for the last character.	(1..498 => 'A', 499 => '2')
SBIG ID3 An identifier the size of the maximum input line length which is identical to SBIG ID4 except for a character near the middle.	(1..249 => 'A', 250 => '3', 251..499 => 'A')

TEST PARAMETERS

Name and Meaning	Value
<p><b>\$BIG_ID4</b>            An identifier the size of the maximum input line length which is identical to \$BIG_ID3 except for a character near the middle.</p>	<p>(1..249 =&gt; 'A', 250 =&gt; '4',            251..499 =&gt; 'A')</p>
<p><b>\$BIG_INT_LIT</b>            An integer literal of value 298 with enough leading zeroes so that it is the size of the maximum line length.</p>	<p>(1..496 =&gt; '0', 497..499 =&gt; "298")</p>
<p><b>\$BIG_REAL_LIT</b>            A universal real literal of value 690.0 with enough leading zeroes to be the size of the maximum line length.</p>	<p>(1..493 =&gt; '0', 494..499 =&gt; "69.0E1")</p>
<p><b>\$BIG_STRING1</b>            A string literal which when catenated with \$BIG_STRING2 yields the image of \$BIG_ID1.</p>	<p>(1 =&gt; '"', 2..200 =&gt; 'A', 201 =&gt; '"')</p>
<p><b>\$BIG_STRING2</b>            A string literal which when catenated to the end of \$BIG_STRING1 yields the image of \$BIG_ID1.</p>	<p>(1 =&gt; '"', 2..300 =&gt; 'A',            301 =&gt; '1', 302 =&gt; '"')</p>
<p><b>\$BLANKS</b>            A sequence of blanks twenty characters less than the size of the maximum line length.</p>	<p>(1..479 =&gt; ' ')</p>
<p><b>\$COUNT_LAST</b>            A universal integer literal whose value is TEXT_IO.COUNT'LAST.</p>	<p>2_147_483_647</p>
<p><b>\$DEFAULT_MEM_SIZE</b>            An integer literal whose value is SYSTEM.MEMORY_SIZE.</p>	<p>16_777_216</p>
<p><b>\$DEFAULT_STOR_UNIT</b>            An integer literal whose value is SYSTEM.STORAGE_UNIT.</p>	<p>8</p>

## TEST PARAMETERS

Name and Meaning	Value
SDEFAULT SYS NAME The value of the constant SYSTEM.SYSTEM_NAME.	FX_UNIX
SDELTA DOC A real literal whose value is SYSTEM.FINE_DELTA.	0.0000000004656612873077392578125
SFIELD LAST A universal integer literal whose value is TEXT_IO.FIELD'LAST.	2_147_483_647
SFIXED_NAME The name of a predefined fixed-point type other than DURATION.	NO_SUCH_FIXED_TYPE
SFLOAT_NAME The name of a predefined floating-point type other than FLOAT, SHORT_FLOAT, or LONG_FLOAT.	NO_SUCH_TYPE
SGREATER THAN DURATION A universal real literal that lies between DURATION'BASE'LAST and DURATION'LAST or any value in the range of DURATION.	100_000.0
SGREATER THAN DURATION BASE LAST A universal real literal that is greater than DURATION'BASE'LAST.	10_000_000.0
SHIGH PRIORITY An integer literal whose value is the upper bound of the range for the subtype SYSTEM.PRIORITY.	99
SILLEGAL_EXTERNAL_FILE_NAME1 An external file name which contains invalid characters.	/illegal/file_name/2{J\$%2102C.DAT
SILLEGAL_EXTERNAL_FILE_NAME2 An external file name which is too long.	/illegal/file_name/CE2102C*.DAT
SINTEGER FIRST A universal integer literal whose value is INTEGER'FIRST.	-2147483648



TEST PARAMETERS

Name and Meaning	Value
\$INTEGER_LAST A universal integer literal whose value is INTEGER_LAST.	2147483647
\$INTEGER_LAST_PLUS_1 A universal integer literal whose value is INTEGER_LAST + 1.	2_147_483_648
\$LESS_THAN_DURATION A universal real literal that lies between DURATION_BASE_FIRST and DURATION_FIRST or any value in the range of DURATION.	-100_000.0
\$LESS_THAN_DURATION_BASE_FIRST A universal real literal that is less than DURATION_BASE_FIRST.	-10_000_000.0
\$LOW_PRIORITY An integer literal whose value is the lower bound of the range for the subtype SYSTEM.PRIORITY.	0
\$MANTISSA_DOC An integer literal whose value is SYSTEM.MAX_MANTISSA.	31
\$MAX_DIGITS Maximum digits supported for floating-point types.	15
\$MAX_IN_LEN Maximum input line length permitted by the implementation.	499
\$MAX_INT A universal integer literal whose value is SYSTEM.MAX_INT.	2147483647
\$MAX_INT_PLUS_1 A universal integer literal whose value is SYSTEM.MAX_INT+1.	2_147_483_648
\$MAX_LEN_INT_BASED_LITERAL A universal integer based literal whose value is 2#11# with enough leading zeroes in the mantissa to be \$MAX_IN_LEN long.	(1..2 => "2:", 3..496 => '0', 497..499 => "11:")

TEST PARAMETERS

Name and Meaning	Value
<p><b>\$MAX_LEN_REAL_BASED_LITERAL</b>            A universal real based literal whose value is 16:F.E: with enough leading zeroes in the mantissa to be \$MAX_IN_LEN long.</p>	<p>(1..3 =&gt; "16:", 4..495 =&gt; '0', 496..499 =&gt; "F.E:")</p>
<p><b>\$MAX_STRING_LITERAL</b>            A string literal of size \$MAX_IN_LEN, including the quote characters.</p>	<p>(1 =&gt; '"', 2..498 =&gt; 'A', 499 '"')</p>
<p><b>\$MIN_INT</b>            A universal integer literal whose value is SYSTEM.MIN_INT.</p>	<p>-2147483648</p>
<p><b>\$MIN_TASK_SIZE</b>            An integer literal whose value is the number of bits required to hold a task object which has no entries, no declarations, and "NULL;" as the only statement in its body.</p>	<p>32</p>
<p><b>\$NAME</b>            A name of a predefined numeric type other than FLOAT, INTEGER, SHORT FLOAT, SHORT INTEGER, LONG FLOAT, or LONG INTEGER.</p>	<p>TINY_INTEGER</p>
<p><b>\$NAME_LIST</b>            A list of enumeration literals in the type SYSTEM.NAME, separated by commas.</p>	<p>FX_UNIX</p>
<p><b>\$NEG_BASED_INT</b>            A based integer literal whose highest order nonzero bit falls in the sign bit position of the representation for SYSTEM.MAX_INT.</p>	<p>16#FFFFFFFD#</p>
<p><b>\$NEW_MEM_SIZE</b>            An integer literal whose value is a permitted argument for pragma MEMORY SIZE, other than \$DEFAULT_MEM_SIZE. If there is no other value, then use \$DEFAULT_MEM_SIZE.</p>	<p>16_777_216</p>

## TEST PARAMETERS

<u>Name and Meaning</u>	<u>Value</u>
<b>\$NEW_STOR_UNIT</b> An integer literal whose value is a permitted argument for pragma STORAGE_UNIT, other than SDEFAULT_STOR_UNIT. If there is no other permitted value, then use value of SYSTEM.STORAGE_UNIT.	8
<b>\$NEW_SYS_NAME</b> A value of the type SYSTEM.NAME, other than SDEFAULT_SYS_NAME. If there is only one value of that type, then use that value.	FX_UNIX
<b>\$TASK_SIZE</b> 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.	32
<b>\$TICK</b> A real literal whose value is SYSTEM.TICK.	0.01

## APPENDIX D

### WITHDRAWN TESTS

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-ddddd is to an Ada Commentary.

- a. E28005C: 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).
- g. CD2A63A..D, CD2A66A..D, CD2A73A..D, and CD2A76A..D (16 tests): These

## 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, CD2A84M..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.
  - el (error listing) Writes a full listing with interspersed diagnostics to standard output, if any errors occur. Only one of *-el* or *-El* option should be used.
  - El [*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.
  - lx (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 *ld* 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 returning 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 *grmon.out* file. The Concentrix command *grprof -A* processes this file.
  - R *library*  
(recompile instantiation) Forces an analysis of all generic instantiations, causing reinstantiation 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.
-