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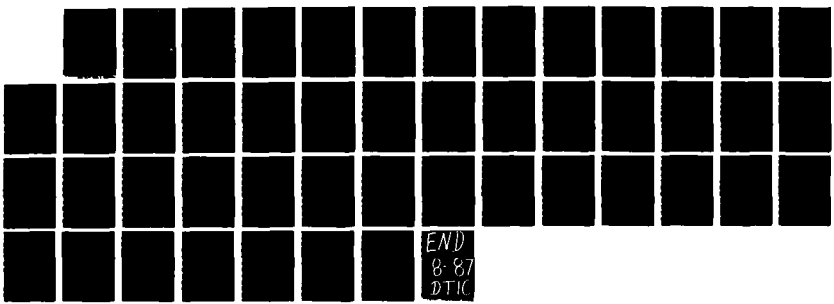

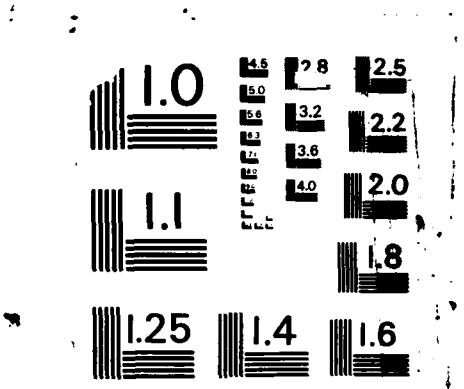

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See Attached.

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AD-A181 894

EXECUTIVE SUMMARY

This Validation Summary Report (VSR) summarizes the results and conclusions of validation testing performed on the 1750A Ada Real-Time Compiler, Version 201.16c, using Version 1.8 of the Ada® Compiler Validation Capability (ACVC). The 1750A Ada Real-Time Compiler is hosted on a VAX-11/785 operating under VMS, Version 4.2. Programs processed by this compiler may be executed on an ECSPO SIM50A, Release R0304-4.000 having no operating system. The ECSPO SIM50A simulates a MIL-STD-1750A Instruction Set Architecture with console I/O and no other optional features.

On-site testing was performed 24 October 1986 through 29 October 1986 at Cambridge MA, under the direction of the Ada Validation Facility (AVF), according to Ada Validation Organization (AVO) policies and procedures. The AVF identified 1945 of the 2399 tests in ACVC Version 1.8 to be processed during on-site testing of the compiler. The 19 tests withdrawn at the time of validation testing were not processed; the 278 Class C tests that make use of floating-point precision exceeding that supported by the implementation were not processed; and 157 Class C tests that require the creation of external files were not processed. After the 1945 tests were processed, results for Class A, C, D, or E tests were examined for correct execution. Compilation listings for Class B tests were analyzed for correct diagnosis of syntax and semantic errors. Compilation and link results of Class L tests were analyzed for correct detection of errors. There were 33 of the processed tests determined to be inapplicable. The remaining 1912 tests were passed.

The results of validation are summarized in the following table:

RESULT	CHAPTER												TOTAL
	2	3	4	5	6	7	8	9	10	11	12	14	
Passed	93	204	280	235	159	97	134	262	128	32	218	70	1912
Failed	0	0	0	0	0	0	0	0	0	0	0	0	0
Inapplicable	23	121	140	12	2	0	5	0	2	0	0	163	468
Withdrawn	0	5	5	0	0	1	1	2	4	0	1	0	19
TOTAL	116	330	425	247	161	98	140	264	134	32	219	233	2399

The AVF concludes that these results demonstrate acceptable conformity to ANSI/MIL-STD-1815A Ada.

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Ada® Compiler Validation Summary Report:

Compiler Name: 1750A Ada Real-Time Compiler, Version 201.16c

Host:	Target:
VAX-11/785 under	ECSPO SIM50A,
VMS, Version 4.2	Release R0304-4.000

Testing Completed 29 October 1986 Using ACVC 1.8

This report has been reviewed and is approved.

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Washington DC

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AVF Control Number: AVF-VSR-49.1286

Ada® COMPILER
VALIDATION SUMMARY REPORT:
Intermetrics, Inc.
1750A Ada Real-Time Compiler, Version 201.16c
VAX-11/785 Host, ECSPO SIM50A, Release R0304-4.000 Target

Completion of On-Site Testing:
29 October 1986

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

Prepared For:
Ada Joint Program Office
United States Department of Defense
Washington, D.C.

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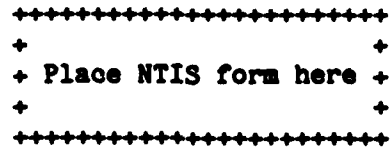
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CHAPTER 1

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 characteristics of particular operating systems, hardware, or implementation strategies. All of 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 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 unsupported language constructs 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 policies and procedures established by the Ada Validation Organization (AVO). On-site testing was conducted from 24 October 1986 through 29 October 1986 at Cambridge 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/SIOL
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, FEB 1983.

2. Ada Validation Organization: Policies and Procedures, MITRE Corporation, JUN 1982, PB 83-110601.

3. Ada Compiler Validation Capability Implementers' Guide, SofTech, Inc., DEC 1984.

1.4 DEFINITION OF TERMS

ACVC	The Ada Compiler Validation Capability. A set of programs that evaluates the conformity of a compiler to the Ada language specification, ANSI/MIL-STD-1815A.
Ada Standard	ANSI/MIL-STD-1815A, February 1983.
Applicant	The agency requesting validation.
AVF	The Ada Validation Facility. In the context of this report, the AVF is responsible for conducting compiler validations according to established policies and procedures.
AVO	The Ada Validation Organization. In the context of this report, the AVO is responsible for setting procedures for compiler validations.
Compiler	A processor for the Ada language. In the context of this report, a compiler is any language processor, including cross-compilers, translators, and interpreters.
Failed test	A 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	A 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	A 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 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	A test found to be incorrect and not used to check conformity to the Ada language specification. 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 link errors.

Class A tests check that legal Ada programs can be successfully compiled and executed. However, no checks are performed during execution to see if the test objective has been met. 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 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.

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.

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 these units 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 the tests in the ACVC follow 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 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. 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 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: 1750A Ada Real-Time Compiler, Version 201.16c

ACVC Version: 1.8

Certificate Expiration Date: 16 December 1987

Host Computer:

Machine:	VAX-11/785
Operating System:	VMS, Version 4.2
Memory Size:	16 megabytes

Target Computer:

Machine:	ECSPO SIM50A, Version R0304-4.000
Operating System:	None
Memory Size:	65536 words

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. This compiler is characterized by the following interpretations of the Ada Standard:

- Capacities.

  The compiler correctly processes tests containing loop statements nested to 17 levels and recursive procedures separately compiled as subunits nested to 6 levels. The compiler could not process block statements nested to 65 levels. It correctly processes a compilation containing 723 variables in the same declarative part. (See tests D55A03A..H (8 tests), D56001B, D64005E..G (3 tests), and D29002K.)

- Universal integer calculations.

  An implementation is allowed to reject universal integer calculations having values that exceed SYSTEM.MAX_INT. This implementation does not reject such calculations and processes them correctly. (See tests D4A002A, D4A002B, D4A004A, and D4A004B.)

- Predefined types.

  This implementation does not support additional predefined types in the package STANDARD. (See tests B86001C and B86001D.)

- Based literals.

  An implementation is allowed to reject a based literal with a value exceeding SYSTEM.MAX_INT during compilation, or it may raise NUMERIC_ERROR or CONSTRAINT_ERROR during execution. This implementation raises NUMERIC_ERROR during execution. (See test E24101A.)

- 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.

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

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

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.)

In assigning one-dimensional and two-dimensional array types, the expression does not appear to be 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.)

- Discriminated types.

  During compilation, an implementation is allowed to either accept or reject an incomplete type with discriminants that is used in an access type definition with a compatible discriminant constraint. This implementation accepts such subtype indications. (See test E38104A.)

  In assigning record types with discriminants, the expression does not appear to be 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.)

- Aggregates.

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

  In the evaluation of an aggregate containing subaggregates, all choices are not evaluated before being checked for identical bounds. (See test E43212B.)

  All choices are evaluated before CONSTRAINT_ERROR is raised if a bound in a nonnull range of a nonnull aggregate does not belong to an index subtype. (See test E43211B.)

. Functions.

An implementation may allow the declaration of a parameterless function and an enumeration literal having the same profile in the same immediate scope, or it may reject the function declaration. If it accepts the function declaration, the use of the enumeration literal's identifier denotes the function. This implementation rejects the declaration. (See test E66001D.)

. Representation clauses.

The Ada Standard does not require an implementation to support representation clauses. If a representation clause is not supported, then the implementation must reject it. While the operation of representation clauses is not checked by Version 1.8 of the ACVC, they are used in testing other language features. This implementation rejects 'SIZE and 'STORAGE_SIZE for tasks, 'STORAGE_SIZE for collections, 'SMALL clauses, and enumeration representation clauses. (See tests C55B16A, C87B62A, C87B62B, C87B62C, and BC1002A.)

. Pragmas.

The pragma INLINE is supported for procedures and for functions. (See tests CA3004E and CA3004F.)

. Input/output.

This implementation supports only the package TEXT_IO for file operations on STANDARD_INPUT and STANDARD_OUTPUT.

The package SEQUENTIAL_IO cannot be instantiated with unconstrained array types and record types with discriminants without defaults. The package DIRECT_IO cannot be instantiated with unconstrained array types and record types with discriminants without defaults. (See tests AE2101C, AE2101H, CE2201D, CE2201E, and CE2401D.)

. Generics.

Body and subunits of a generic unit must be in the same compilation as the specification if instantiations precede them. (See tests CA2009C and CA2009F.)

CHAPTER 3

TEST INFORMATION

3.1 TEST RESULTS

Version 1.8 of the ACVC contains 2399 tests. When validation testing of 1750A Ada Real-Time Compiler was performed, 19 tests had been withdrawn. The remaining 2380 tests were potentially applicable to this validation. The AVF determined that 468 tests were inapplicable to this implementation, and that the 1912 applicable tests were passed by the implementation.

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	67	862	915	10	12	46	1912
Failed	0	0	0	0	0	0	0
Inapplicable	2	5	453	7	1	0	468
Withdrawn	0	7	12	0	0	0	19
TOTAL	69	874	1380	17	13	46	2399

3.3 SUMMARY OF TEST RESULTS BY CHAPTER

RESULT	CHAPTER												TOTAL
	2	3	4	5	6	7	8	9	10	11	12	14	
Passed	93	204	280	235	159	97	134	262	128	32	218	70	1912
Failed	0	0	0	0	0	0	0	0	0	0	0	0	0
Inapplicable	23	121	140	12	2	0	5	0	2	0	0	163	468
Withdrawn	0	5	5	0	0	1	1	2	4	0	1	0	19
TOTAL	116	330	425	247	161	98	140	264	134	32	219	233	2399

3.4 WITHDRAWN TESTS

The following 19 tests were withdrawn from ACVC Version 1.8 at the time of this validation:

C32114A	C41404A	B74101B
B33203C	B45116A	C87B50A
C34018A	C48008A	C92005A
C35904A	B49006A	C940ACA
B37401A	B4A010C	CA3005A..D (4 tests)
		BC3204C

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. For this validation attempt, 468 tests were inapplicable for the reasons indicated:

- C34001D, B52004E, B55B09D, and C55B07B use SHORT_INTEGER which is not supported by this compiler.
- C34001E, B52004D, B55B09C, and C55B07A use LONG_INTEGER which is not supported by this compiler.
- C34001F and C35702A use SHORT_FLOAT which is not supported by this compiler.

- C34001G and C35702B use LONG_FLOAT which is not supported by this compiler.

- C55B16A makes use of an enumeration representation clause containing noncontiguous values which is not supported by this compiler.

- D55A03E..H (4 tests) contain loops nested to 31 or more levels which exceed the supported maximum of 24 nested loops.

- D56001B contains blocks nested to 65 levels which exceed the compiler's capacity.

- D64005F and D64005G make use of nested procedures as subunits to a level of 10. These tests compile and link correctly, but result in STORAGE_ERROR being raised during execution.

- B86001D requires a predefined numeric type other than those defined by the Ada language in package STANDARD. There is no such type for this implementation.

- C86001F redefines package SYSTEM, but TEXT_IO is made obsolete by this new definition in this implementation and the test cannot be executed since the package REPORT is dependent on the package TEXT_IO.

- C87B62A..C (3 tests) use length clauses which are not supported by this compiler. The length clauses are rejected during compilation.

- CA2009C and CA2009F compile the body and subunits of a generic unit in separate compilation files. Separate compilation of generic specifications and bodies is not supported by this compiler unless instantiations follow compilation of the corresponding body.

- AE2101C, CE2201D, and CE2201E use an instantiation of package SEQUENTIAL_IO with unconstrained array types which is not supported by this compiler.

- AE2101H and CE2401D use an instantiation of package DIRECT_IO with unconstrained array types which is not supported by this compiler.

- The following 278 tests require a floating-point accuracy that exceeds the maximum of 6 supported by the implementation:

  C24113C..Y (23 tests) C35708C..Y (23 tests) C45421C..Y (23 tests)
  C35705C..Y (23 tests) C35802C..Y (23 tests) C45424C..Y (23 tests)
  C35706C..Y (23 tests) C45241C..Y (23 tests) C45521C..Z (24 tests)
  C35707C..Y (23 tests) C45321C..Y (23 tests) C45621C..Z (24 tests)

TEST INFORMATION

- The following 158 tests require the use of external files. This implementation supports only the files STANDARD_INPUT and STANDARD_OUTPUT:

CE2104A..D (4 tests)	CE3108A..B (2 tests)	CE3413A
CE2105A	CE3109A	CE3413C
CE2106A	CE3110A	CE3602A..D (4 tests)
CE2107A..F (6 tests)	CE3111A..E (5 tests)	CE3603A
CE2108A..D (4 tests)	CE3112A..B (2 tests)	CE3604A
CE2109A	CE3114A..B (2 tests)	CE3605A..E (5 tests)
CE2110A..C (3 tests)	CE3115A	CE3606A..B (2 tests)
CE2111A..E (5 tests)	CE3203A	CE3704A..B (2 tests)
CE2111G..H (2 tests)	CE3208A	CE3704D..F (3 tests)
CE2201A..C (3 tests)	CE3301A..C (3 tests)	CE3704M..O (3 tests)
CE2201F	CE3302A	CE3706D
CE2204A..B (2 tests)	CE3305A	CE3706F
CE2210A	CE3402A..D (4 tests)	CE3804A..E (5 tests)
CE2401A..C (3 tests)	CE3403A..C (3 tests)	CE3804G
CE2401E..F (2 tests)	CE3403E..F (2 tests)	CE3804I
CE2404A..B (2 tests)	CE3404A..C (3 tests)	CE3804K
CE2406A	CE3405A..D (4 tests)	CE3804M
CE2407A	CE3406A..D (4 tests)	CE3805A..B (2 tests)
CE2408A	CE3407A..C (3 tests)	CE3806A
CE2409A	CE3408A..C (3 tests)	CE3806D..E (2 tests)
CE2410A	CE3409A	CE3905A..C (3 tests)
CE3102B	CE3409C..F (4 tests)	CE3905L
EE3102C	CE3410A	CE3906A..C (3 tests)
CE3103A	CE3410C..F (4 tests)	CE3906E..F (2 tests)
CE3104A	CE3411A	
CE3107A	CE3412A	

3.6 SPLIT TESTS

If one or more errors do not appear to have been detected in a Class B test because of compiler error recovery, then the test is split into a set of smaller tests that contain the undetected errors. These splits are then compiled and examined. The splitting process continues until all errors are detected by the compiler or until there is exactly one error per split. Any Class A, Class C, or Class E test that cannot be compiled and executed because of its size is split into a set of smaller subtests that can be processed.

Splits were required for two Class B tests, BA1101C and BC3205D.

3.7 ADDITIONAL TESTING INFORMATION

3.7.1 Prevalidation

Prior to validation, a set of test results for ACVC Version 1.8 produced by the 1750A Ada Real-Time 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 1750A Ada Real-Time Compiler using ACVC Version 1.8 was conducted on-site by a validation team from the AVF. The configuration consisted of a VAX-11/785 host operating under VMS, Version 4.2, and an ECSPO SIM50A, Release R0304-4.000 target having no operating system and executing on the VAX. The ECSPO SIM50A simulates a MIL-STD-1750A Instruction Set Architecture with console I/O and no other optional features. Two identical VAX configurations were used for testing.

A magnetic tape containing all tests except for the 19 withdrawn tests, 278 tests requiring unsupported floating-point precisions, and 157 tests requiring the creation or opening of external files 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 splits during the prevalidation testing were included in their split 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 using the two identical host configurations in a single batch stream on each, and all executable tests were linked and run on the ECSPO SIM50A. Results were printed from the VAX.

The compiler was tested using command scripts provided by Intermetrics, Inc. and reviewed by the validation team. Each test was run using a program library that contained only library units defined by the Ada Standard, the package REPORT, and the procedure CHECK_FILE. All tests were processed with the compiler's default options in effect except the Class B tests for which processing was terminated following the semantics phase (Stopafter => SEM). All tests were linked with the linker's default options in effect. All applicable executable tests were run using a default execution stack size of 1000 (hexadecimal) words, except for test D64005G for which a stack size of 3000 (hexadecimal) was used.

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

The validation team arrived at Cambridge MA on 24 October 1986, and departed after testing was completed on 29 October 1986. The computers used for testing were not dedicated to the testing effort.

APPENDIX A

COMPLIANCE STATEMENT

Intermetrics, Inc. has submitted the following compliance statement concerning the 1750A Ada Real-Time Compiler.

COMPLIANCE STATEMENT

Compliance Statement

Configuration:

Compiler: 1750A Ada Real-Time Compiler, Version 201.16c

Test Suite: Ada® Compiler Validation Capability, Version 1.8

Host Computer:

Machine:	VAX-11/785
Operating System:	VMS, Version 4.2

Target Computer:

Machine:	ECSPO SIM50A, Release R0304-4.000
Operating System:	None

Intermetrics, Inc. has made no deliberate extensions to the Ada language standard.

Intermetrics, Inc. agrees to the public disclosure of this report.

Intermetrics, Inc. agrees to comply with the Ada trademark policy, as defined by the Ada Joint Program Office.

Date: 11/17/86

Intermetrics, Inc.
Dennis D. Struble
Ada Compilers Manager

®Ada is a registered trademark of the United States Government (Ada Joint Program Office).

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 MIL-STD-1815A, and to certain allowed restrictions on representation classes. The implementation-dependent characteristics of the 1750A Ada Real-Time Compiler, Version 201.16c, are described in the following sections which discuss topics in Appendix F of the Ada Language Reference Manual (ANSI/MIL-STD-1815A). The specification of the package STANDARD is also included in this appendix.

```
package STANDARD is

     ...

     type INTEGER is range -32768 .. 32767;

     type FLOAT is digits 6 range -2#1.0#e127 ..
                     2#0.11111111111111111111111#e127;

     type DURATION is delta 2.0 ** (-14) range -86400.0 .. 86400.0;
       -- DURATION'SMALL = 2.0 ** (-14)

     ...

end STANDARD;
```

Appendix F. IMPLEMENTATION DEPENDENCIES

This section constitutes Appendix F of the Ada LRM, for this implementation. Appendix F from the LRM states:

> *The Ada language allows for certain machine-dependencies in a controlled manner. No machine-dependent syntax or semantic extensions or restrictions are allowed. The only allowed implementation-dependencies correspond to implementation-dependent pragmas and attributes, certain machine-dependent conventions as mentioned in Chapter 13, and certain allowed restrictions on representation clauses.*
>
> *The reference manual of each Ada implementation must include an appendix (called Appendix F) that describes all implementation-dependent characteristics. The Appendix F for a given implementation must list in particular:*
>
> 1. *The form, allowed places, and effect of every implementation-dependent pragma.*
> 2. *The name and the type of every implementation-dependent attribute.*
> 3. *The specification of the package SYSTEM (see 13.7).*
> 4. *The list of all restrictions on representation clauses (see 13.1).*
> 5. *The conventions used for any implementation-generated name denoting implementation-dependent components (see 13.4).*
> 6. *The interpretation of expressions that appear in address clauses, including those for interrupts (see 13.5).*
> 7. *Any restriction on unchecked conversions (see 13.10.2).*
> 8. *Any implementation-dependent characteristics of the input-output packages (see 14).*

In addition, the present section will describe the following topics:

9. Any implementation-dependent rules for termination of tasks dependent on library packages (see 9.4:13).
10. Other implementation dependencies.
11. Compiler capacity limitations.

F.1 Pragmas

This section describes the form, allowed places, and effect of every implementation-dependent pragma.

F.1.1 Pragmas LIST, OPTIMIZE, PAGE, PRIORITY

Pragmas LIST, OPTIMIZE, and PAGE are ignored. Pragma PRIORITY is supported exactly in the form, in the allowed places, and with the effect as described in the LRM.

F.1.2 Pragma SUPPRESS

Form: As specified in LRM B(14) : SUPPRESS

Allowed Place: As specified in LRM B(14) : SUPPRESS

Effect: Pragma SUPPRESS is ignored.

F.1.3 Pragma INLINE

Form: Pragma INLINE (SubprogramNameCommaList)

Allowed Places: As specified in LRM B(4) : INLINE

Effect: If the subprogram body is available, and the subprogram is not recursive, the code is expanded in-line at every call site and is subject to all optimizations.

The stack-frame needed for the elaboration of the inline subprogram will be allocated as a temporary in the frame of the containing code.

Parameters will be passed properly, by value or by reference, as for non-inline subprograms. Register-saving and the like will be suppressed. Parameters may be stored in the local stack-frame or held in registers, as global code generation allows.

Exception-handlers for the INLINE subprogram will be handled as for block-statements.

Use: This pragma is used either when it is believed that the time required for a call to the specified routine will in general be excessive (this for frequently called subprograms) or when the average expected size of expanded code is thought to be comparable to that of a call.

F.1.4 Pragma INTERFACE

Form: Pragma INTERFACE (language_name, subprogram_name)
where the language_name must be an enumeration value of the type

SYSTEM.Supported_Language_Name (see Package SYSTEM below).

Allowed Place: As specified in LRM B(5) : INTERFACE.

Effect: Specifies that a subprogram will be provided outside the Ada program library and will be callable with a specified calling interface. Neither an Ada body nor an Ada body_stub may be provided for a subprogram for which INTERFACE has been specified.

Use: Use with a subprogram being provided via another programming language and for which no body will be given in any Ada program. See also the LINK_NAME pragma.

The calling conventions for an Ada program calling a non-Ada subprogram are described in the Run-Time Model B-5.

F.1.5 Pragma LINK_NAME

Form: Pragma LINK_NAME (subprogram_name, link_name)

Allowed Places: As specified in LRM B(5) for pragma INTERFACE.

Effect: Associates with subprogram subprogram_name the name link_name as its entry point name.

Syntax: The value of link_name must be a character string literal.

Use: To allow Ada programs, with help from INTERFACE pragma, to reference non-Ada subprograms. Also allows non-Ada programs to call specified Ada subprograms.

F.1.6 Pragma CONTROLLED

Form: Pragma CONTROLLED (AccessTypeName)

Allowed Places: As specified in LRM B(2) : CONTROLLED.

Effect: Ensures that heap objects are not automatically reclaimed. Since no automatic garbage collection is provided, this pragma currently has no effect.

F.1.7 Pragma PACK

Form: Pragma PACK (type_simple_name)

Allowed Place: As specified in LRM 13.1(12)

Effect: Components are allowed their minimal number of storage units as provided for by their own representation and/or packing.

Use: Pragma PACK is used to reduce storage size. This can allow records and arrays, in some cases, to be passed by value instead of by reference.

Size reduction usually implies an increased cost of accessing components. The decrease in storage size may be offset by increase in size of accessing code and by slowing of accessing operations.

F.1.8 Pragmas SYSTEM_NAME, STORAGE_UNIT, MEMORY_SIZE

These pragmas are not supported and are ignored.

F.2 Implementation-dependent Attributes

This section describes the name and the type of every implementation-dependent attribute.

There are no implementation defined attributes. These are the values for certain language-defined, implementation-dependent attributes:

```
Type INTEGER.
     INTEGER'SIZE              = 16 -- bits.
     INTEGER'FIRST             = - (2**15)     --   - 32,768
     INTEGER'LAST              =   (2**15-1)   --     32,767

Type FLOAT.
     FLOAT'SIZE                = 32 -- bits.
     FLOAT'DIGITS              =  6
     FLOAT'MANTISSA            = 21
     FLOAT'EMAX                = 84
     FLOAT'EPSILON             = 2.0**(-20)
     FLOAT'SMALL               = 2.0**(-85)
     FLOAT'LARGE               = (2.0**84)*(1.0-2.0**(-21))
     FLOAT'MACHINE_ROUNDS      =  false
     FLOAT'MACHINE_RADIX       =      2
     FLOAT'MACHINE_MANTISSA    =     24
     FLOAT'MACHINE_EMAX        =    127
     FLOAT'MACHINE_EMIN        =   -128
     FLOAT'MACHINE_OVERFLOWS   =   true
     FLOAT'SAFE_EMAX                 =    127
     FLOAT'SAFE_SMALL          = 2#0.1000000000000000000000#E-127
     FLOAT'SAFE_LARGE          = 2#0.1111111111111111111110#E+127

Type DURATION.
     DURATION'DELTA            =  2.0**(-14) seconds
     DURATION'FIRST            = -86,400.0 seconds
     DURATION'LAST             =  86,400.0 seconds
     DURATION'SMALL            =  2.0**(-14)

Type PRIORITY.
     PRIORITY'FIRST            =   -127
     PRIORITY'LAST             =    127
```

F.3 Package SYSTEM

```
package SYSTEM is

   type ADDRESS is private;    -- "=", "/=" defined implicitly;
   type NAME is (UTS, MVS, CMS, Prime50, Sperry1100,
                 MIL_STD_1750A);

   SYSTEM_NAME : constant NAME := MIL_STD_1750A;

   STORAGE_UNIT : constant := 16;
   MEMORY_SIZE : constant := 2**16;
         -- In storage units

         -- System-Dependent Named Numbers:

   MIN_INT : constant := INTEGER'POS(INTEGER'FIRST);
   MAX_INT : constant := INTEGER'POS(INTEGER'LAST);
   MAX_DIGITS : constant := 6;
   MAX_MANTISSA : constant := 31;
   FINE_DELTA   : constant := 2.0**(-31);
   TICK : constant := 0.0001;

         -- Other System-Dependent Declarations

   subtype PRIORITY is INTEGER range -127..127;

-------------------------------------------------------
-- Implementation-dependent additions to package SYSTEM --
-------------------------------------------------------

   NULL_ADDRESS : constant ADDRESS;
         -- Same bit pattern as "null" access value
         -- This is the value of 'ADDRESS for named numbers
         -- The 'ADDRESS of any object which occupies storage
         --  is NOT equal to this value.

   ADDRESS_SIZE : constant := 16;
         -- Number of bits in ADDRESS objects, = ADDRESS'SIZE,
         -- but static.

   type ADDRESS_OFFSET is new INTEGER;
         -- Used for address arithmetic
   type ADDRESS_SEGMENT is new INTEGER;
```

```
        -- Always zero on targets with
        --    unsegmented address space.

    subtype NORMALIZED_ADDRESS_OFFSET is
      ADDRESS_OFFSET;
        -- Range of address offsets returned by OFFSET_OF

    function "+"(addr : ADDRESS; offset : ADDRESS_OFFSET)
      return ADDRESS;
    function "+"(offset : ADDRESS_OFFSET; addr : ADDRESS)
      return ADDRESS;
        -- Provide addition between addresses and
        --  offsets.  May cross segment boundaries on targets
        --  where objects may span segments.
        -- On other targets, CONSTRAINT_ERROR will be raised
        --  when OFFSET_OF(addr) + offset not in
        --  NORMALIZED_ADDRESS_OFFSET.

    function "-"(left, right : ADDRESS) return ADDRESS_OFFSET;
        -- May exceed SEGMENT_SIZE on targets where objects
        --  may span segments.
        -- On other targets, CONSTRAINT_ERROR
        --  will be raised if
        --      SEGMENT_OF(left) /= SEGMENT_OF(right).

    function "-"(addr : ADDRESS; offset : ADDRESS_OFFSET) return
      ADDRESS;
        -- Provide subtraction of addresses and offsets.
        -- May cross segment boundaries on targets where
        --  objects may span segments.
        -- On other targets, CONSTRAINT_ERROR will be raised
        --  when (OFFSET_OF(addr) - offset) not in
        --  NORMALIZED_ADDRESS_OFFSET.

  function OFFSET_OF (addr : ADDRESS)
      return NORMALIZED_ADDRESS_OFFSET;
        -- Extract offset part of ADDRESS
        -- Always in range 0..seg_size - 1

    function SEGMENT_OF (addr : ADDRESS)
      return ADDRESS_SEGMENT;
        -- Extract segment part of ADDRESS
        -- (zero on targets with unsegmented address space)

    function MAKE_ADDRESS (offset : ADDRESS_OFFSET;
                           segment : ADDRESS_SEGMENT := 0)
```

```
    return ADDRESS;
        -- build address given offset and segment.
        -- Offset may be > seg_size on targets where
        --  objects may span segments, in which case it is
        --  equivalent to "MAKE_ADDRESS(0,segment) + offset"
        -- On other targets, CONSTRAINT_ERROR will be raised
        --  when offset not in NORMALIZED_ADDRESS_OFFSET.

    type Supported_Language_Name is (  -- Target dependent
        -- The following are "foreign" languages:

      AIE_ASSEMBLER, -- NOT a "foreign" language - uses AIE IOPs
      UNSPECIFIED_LANGUAGE
    );

        -- Most/least accurate built-in
        --      integer and float types

    subtype LONGEST_INTEGER is STANDARD.INTEGER;
    subtype SHORTEST_INTEGER is STANDARD.INTEGER;

    subtype LONGEST_FLOAT is STANDARD.FLOAT;
    subtype SHORTEST_FLOAT is STANDARD.FLOAT;

private

    type ADDRESS is access INTEGER;
        -- Note: The designated type here (INTEGER) is
        --       irrelevant.  ADDRESS is made an access type
        --       simply to guarantee it has the same size
        --       as access values, which are single addresses.
        --       Allocators of type ADDRESS are NOT meaningful

   NULL_ADDRESS : constant ADDRESS := null;

end SYSTEM ;
```

F.4 Representation Clauses

This section describes the list of all restrictions on representation clauses.

"*NOTE: An implementation may limit its acceptance of representation clauses to those that can be handled simply by the underlying hardware.... If a program contains a representation clause that is not accepted [by the compiler], then the program is illegal.*" (LRM 13.1(10)).

There are no restrictions except as follows:

a. Length clauses are not allowed.

b. Representation clauses for enumeration types are not allowed.

c. Address clauses are not allowed.

d. Record-representation-clause:

Within a record-representation-clause, the object being represented must be no larger than one 16-bit word.

The range of bits specified must be in the range of 0..15.

Record components, including those generated implicitly by the compiler, whose locations are not given by the representation-clause, are layed out by the compiler following all the components whose locations are given by the representation-clause. Such components of the invariant part of the record are allocated to follow the user-specified components of the invariant part, and such components in any given variant part are allocated to follow the user-specified components of that variant part.

F.5 Implementation-dependent Components

This section describes the conventions used for any implementation-generated name denoting implementation-dependent components.

There are no implementation-generated names denoting implementation-dependent (record) components, although there are, indeed, such components. Hence, there is no convention (or possibility) of naming them and, therefore, no way to offer a representation clause for such components.

NOTE: Records containing dynamic-sized components will contain (generally) unnamed offset components which will "point" to the dynamic-sized components stored later in the record. AIMS/1750 offers no means to specify the representation of such components.

F.6 Address Clauses

This section describes the interpretation of expressions that appear in address clauses, including those for interrupts.

Address clauses are not allowed.

F.7 Unchecked Conversions

This section describes any restrictions on unchecked conversions.

The source and target values must both be of an integer, enumeration, or access type.

F.8 Input-Output

This section describes implementation-dependent characteristics of the input-output packages.

The 1750A is assumed to operate without an operating system and without other external I/O devices than the console device which supports text_io for STANDARD_INPUT and STANDARD_OUTPUT. The predefined exception USE_ERROR will be raised if an attempt is made to open any external file or use the console for other than text_io.

(a) Where are I/O exceptions raised beyond what is described in Chapter 14? [14.1(11)] None.

(b) What are the standard input and standard output files? [14.3(5)]
These files both map onto the 1750A console device.

(c) What are the forms of line terminators and page terminators? [14.3(7)]
Line terminator is ASCII.LF (line feed);
Page terminator is ASCII.FF (form feed)

(d) Effect of instantiating ENUMERATION_IO for an integer type? [14.3.9(15)]
The instantiated Put will work properly, but the instantiated Get will raise Data_Error

(e) Specification of package Low_Level_IO? [14.6]
Low_Level_IO is not provided.

F.9 Tasking

This section describes implementation-dependent characteristics of the tasking run-time packages.

Even though a main program completes and terminates (its dependent tasks, if any, having terminated), the elaboration of the program as a whole continues until each task dependent upon a library unit package has either terminated or reached an open terminate alternative. See LRM 9.4(13).

F.10 Other Matters

This section describes other implementation-dependent characteristics of the system.

a. Restrictions on SHARED variables (LRM 9.11):
   Must be of a scalar or access type.

b. Package Machine_Code
   Will not be provided.

c. Order of compilation of generic bodies and subunits (LRM 10.3:0):
   Body and subunits of generic must be in the same compilation as the specification if instantiations precede them (see AI-00257/02).

F.11 Compiler Limitations

(a) Maximum length of source line?

255 characters.

(b) Maximum number of "use" scopes?

Limit is 50, set arbitrarily by SEMANTICS as maximum number of distinct packages actively "used."

(c) Maximum length of identifier?

255 characters.

(d) Maximum number of nested loops?

24 nested loops.

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
$BIG_ID1 Identifier the size of the maximum input line length with varying last character.	(1..254 => 'A', 255 => '1')
$BIG_ID2 Identifier the size of the maximum input line length with varying last character.	(1..254 => 'A', 255 => '2')
$BIG_ID3 Identifier the size of the maximum input line length with varying middle character.	(1..154 => 'A', 155 => '3', 156..255 => 'A')
$BIG_ID4 Identifier the size of the maximum input line length with varying middle character.	(1..154 => 'A', 155 => '4', 156..255 => 'A')
$BIG_INT_LIT An integer literal of value 298 with enough leading zeroes so that it is the size of the maximum line length.	(1..252 => '0', 253..255 => "298")

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Name and Meaning	Value
$BIG_REAL_LIT A real literal that can be either of floating- or fixed-point type, has value 690.0, and has enough leading zeroes to be the size of the maximum line length.	(1..249 => '0', 250..255 => "69.0E1")
$BLANKS A sequence of blanks twenty characters fewer than the size of the maximum line length.	(1..235 => ' ')
$COUNT_LAST A universal integer literal whose value is TEXT_IO.COUNT'LAST.	32767
$EXTENDED_ASCII_CHARS A string literal containing all the ASCII characters with printable graphics that are not in the basic 55 Ada character set.	"abcdefghijklmnopqrstuvwxyz" & "!$%?@[\]^`{}~"
$FIELD_LAST A universal integer literal whose value is TEXT_IO. FIELD'LAST.	32767
$FILE_NAME_WITH_BAD_CHARS An illegal external file name that either contains invalid characters, or is too long if no invalid characters exist.	NO_FILES
$FILE_NAME_WITH_WILD_CARD_CHAR An external file name that either contains a wild card character, or is too long if no wild card character exists.	NO_FILES
$GREATER_THAN_DURATION A universal real value that lies between DURATION'BASE'LAST and DURATION'LAST if any, otherwise any value in the range of DURATION.	90_000.0
$GREATER_THAN_DURATION_BASE_LAST The universal real value that is greater than DURATION'BASE'LAST, if such a value exists.	10_000_000.0

Name and Meaning	Value
$ILLEGAL_EXTERNAL_FILE_NAME1 An illegal external file name.	NO_FILES
$ILLEGAL_EXTERNAL_FILE_NAME2 An illegal external file name that is different from $ILLEGAL_EXTERNAL_FILE_NAME1.	NO_FILES
$INTEGER_FIRST The universal integer literal expression whose value is INTEGER'FIRST.	-32768
$INTEGER_LAST The universal integer literal expression whose value is INTEGER'LAST.	32767
$LESS_THAN_DURATION A universal real value that lies between DURATION'BASE'FIRST and DURATION'FIRST if any, otherwise any value in the range of DURATION.	-90_000.0
$LESS_THAN_DURATION_BASE_FIRST The universal real value that is less than DURATION'BASE'FIRST, if such a value exists.	-10_000_000.0
$MAX_DIGITS The universal integer literal whose value is the maximum digits supported for floating-point types.	6
$MAX_IN_LEN The universal integer literal whose value is the maximum input line length permitted by the implementation.	255
$MAX_INT The universal integer literal whose value is SYSTEM.MAX_INT.	32767

TEST PARAMETERS

Name and Meaning	Value
$NAME A name of a predefined numeric type other than FLOAT, INTEGER, SHORT_FLOAT, SHORT_INTEGER, LONG_FLOAT, or LONG_INTEGER if one exists, otherwise any undefined name.	NO_OTHER_PREDEF_NUM_TYPE
$NEG_BASED_INT A based integer literal whose highest order nonzero bit falls in the sign bit position of the representation for SYSTEM.MAX_INT.	8#177776#
$NON_ASCII_CHAR_TYPE An enumerated type definition for a character type whose literals are the identifier NON_NULL and all non-ASCII characters with printable graphics.	(NON_NULL)

APPENDIX D

WITHDRAWN TESTS

Some tests are withdrawn from the ACVC because they do not conform to the Ada Standard. The following 19 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.

- C32114A: An unterminated string literal occurs at line 62.
- B33203C: The reserved word "IS" is misspelled at line 45.
- C34018A: The call of function G at line 114 is ambiguous in the presence of implicit conversions.
- C35904A: The elaboration of subtype declarations SFX3 and SFX4 may raise NUMERIC_ERROR instead of CONSTRAINT_ERROR as expected in the test.
- B37401A: The object declarations at lines 126 through 135 follow subprogram bodies declared in the same declarative part.
- C41404A: The values of 'LAST and 'LENGTH are incorrect in the if statements from line 74 to the end of the test.
- B45116A: ARRPRIBL1 and ARRPRIBL2 are initialized with a value of the wrong type--PRIBOOL_TYPE instead of ARRPRIBOOL_TYPE--at line 41.
- C48008A: The assumption that evaluation of default initial values occurs when an exception is raised by an allocator is incorrect according to AI-00397.
- B49006A: Object declarations at lines 41 and 50 are terminated incorrectly with colons, and end case; is missing from line 42.
- B4A010C: The object declaration in line 18 follows a subprogram body of the same declarative part.

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- B74101B: The begin at line 9 causes a declarative part to be treated as a sequence of statements.
- C87B50A: The call of "/=" at line 31 requires a use clause for package A.
- C92005A: The "/=" for type PACK.BIG_INT at line 40 is not visible without a use clause for the package PACK.
- C940ACA: The assumption that allocated task TT1 will run prior to the main program, and thus assign SPYNUMB the value checked for by the main program, is erroneous.
- CA3005A..D (4 tests): No valid elaboration order exists for these tests.
- BC3204C: The body of BC3204C0 is missing.

END

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DTIC