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| 1. REPORT NUMBER<br><b>DTIC FILE COPY</b>                                                                                                                                                                                                                                                                                             | 2. GOVT ACCESSION NO | 3. RECIPIENT'S CATALOG NUMBER                                      |
| 4. TITLE (and Subtitle)<br><b>Ada Compiler Validation Summary Report: Verdix Corporation, VADS VMS-MIL-STD-1750A, V6.0, MP, DEC MicroVAX III (Host) to Tektronix 1750A Emulator (Ethernet Download) vl.00-00 (Target), 891116W1.10194.</b>                                                                                            |                      | 5. TYPE OF REPORT & PERIOD COVERED<br>16 Nov. 1989 to 01 Dec. 1990 |
| 7. AUTHOR(s)<br>Wright-Patterson AFB<br>Dayton, OH, USA                                                                                                                                                                                                                                                                               |                      | 6. PERFORMING ORG. REPORT NUMBER                                   |
| 9. PERFORMING ORGANIZATION AND ADDRESS<br>Wright-Patterson AFB<br>Dayton, OH, USA                                                                                                                                                                                                                                                     |                      | 8. CONTRACT OR GRANT NUMBER(s)                                     |
| 11. CONTROLLING OFFICE NAME AND ADDRESS<br>Ada Joint Program Office<br>United States Department of Defense<br>Washington, DC 20301-3081                                                                                                                                                                                               |                      | 10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS        |
| 14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)<br>Wright-Patterson AFB<br>Dayton, OH, USA                                                                                                                                                                                                                |                      | 12. REPORT DATE                                                    |
|                                                                                                                                                                                                                                                                                                                                       |                      | 13. NUMBER OF PAGES                                                |
|                                                                                                                                                                                                                                                                                                                                       |                      | 15. SECURITY CLASS (of this report)<br>UNCLASSIFIED                |
|                                                                                                                                                                                                                                                                                                                                       |                      | 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE<br>N/A                  |
| 16. DISTRIBUTION STATEMENT (of this Report)<br><br>Approved for public release; distribution unlimited.                                                                                                                                                                                                                               |                      |                                                                    |
| 17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20. If different from Report)<br><br>UNCLASSIFIED                                                                                                                                                                                                                        |                      |                                                                    |
| 18. SUPPLEMENTARY NOTES<br><br><b>DTIC ELECTE</b><br><b>S D CG D</b><br>MAR 15 1990                                                                                                                                                                                                                                                   |                      |                                                                    |
| 19. KEYWORDS (Continue on reverse side if necessary and identify by block number)<br><br>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)<br><br>Verdix Corporation VADS VMS-MIL-STD-1750A, V6.0, MP, Wright-Patterson AFB, OH, DEC MicroVAX III under VMS 5.0 (Host) to Tektronix 1750A Emulator (Ethernet Download), vl.00-00 under VADS EXEC v6.0 (Target), ACVC 1.10                      |                      |                                                                    |

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AD-A219 058

AVF Control Number: AVF-VSR-345.0190  
89-08-30-VRX

Ada COMPILER  
VALIDATION SUMMARY REPORT:  
Certificate Number: 891116W1.10194  
Verdix Corporation  
VADS VMS->MIL-STD-1750A, V6.0, MP  
DEC MicroVAX III Host  
and Tektronix 1750A Emulator (Ethernet Download), v1.00-00 Target

Completion of On-Site Testing:  
16 November 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

90 03 14 038

Ada Compiler Validation Summary Report:

Compiler Name: VADS VMS->MIL-STD-1750A, V6.0, MP

Certificate Number: 891116W1.10194

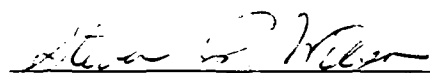
Host: DEC MicroVAX III under  
VMS 5.0

Target: Tektronix 1750A Emulator (Ethernet Download),  
v1.00-00 under VADS EXEC v6.0

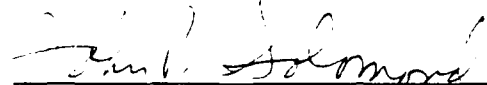
Testing Completed 16 November 1989 Using ACVC 1.10

Customer Agreement Number: 89-08-30-VRX

This report has been reviewed and is approved.

  
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## 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 . . . . .                              | 3-5 |
| 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 VERDIX CORPORATION |     |

## 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 16 November 1989 at Aloha OR. *DR*

### 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

## INTRODUCTION

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, Version 2.0, Ada Joint Program Office, May 1989.
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<br>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</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 cross-compilers, translators, and interpreters.                                                                                                                    |

## INTRODUCTION

|                   |                                                                                                                                                                                                                                                    |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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.

## INTRODUCTION

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 tests. However, some tests contain values that require the test to be

## INTRODUCTION

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: VADS VMS->MIL-STD-1750A, V6.0, MP

ACVC Version: 1.10

Certificate Number: 891116W1.10194

Host Computer:

Machine: DEC MicroVAX III

Operating System: VMS 5.0

Memory Size: 16 MB

Target Computer:

Machine: Tektronix 1750A Emulator  
(Ethernet Download), v1.00-00

Operating System: VADS EXEC v6.0

Memory Size: 2 MW

## 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 10 levels. (See tests D64005E..G (3 tests).)

#### b. Predefined types.

- (1) This implementation supports the additional predefined types LONG\_INTEGER and LONG\_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 `CONSTRAINT_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 gradual. (See tests C45524A..Z (26 tests).)

### 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 away from zero. (See tests C46012A..Z (26 tests).)
- (2) The method used for rounding to longest integer is round away from zero. (See tests C46012A..Z (26 tests).)
- (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 `CONSTRAINT_ERROR` only for a two-dim array subtype when the big dimension is the second one. (See test C36003A.)
- (2) `NUMERIC_ERROR` is raised when `'LENGTH` is applied to an array type with `INTEGER'LAST + 2` components with each component being a null array. (See test C36202A.)
- (3) No exception is raised when `'LENGTH` is applied to an array type with `SYSTEM.MAX_INT + 2` components with each component being a null array. (See test C36202B.)
- (4) A packed `BOOLEAN` array having a `'LENGTH` exceeding `INTEGER'LAST` raises `NUMERIC_ERROR` when the array objects are sliced. (See test C52103X.)

## CONFIGURATION INFORMATION

- (5) A packed two-dimensional BOOLEAN array with more than INTEGER'LAST components raises CONSTRAINT\_ERROR when the length of a dimension is calculated and exceeds INTEGER'LAST. (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 no exception. (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 (2 tests), EA3004C..D (2 tests), and CA3004E..F (2 tests).)

## 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) The Director, AJPO, has determined (AI-00332) that every call to OPEN and CREATE must raise USE\_ERROR or NAME\_ERROR if file input/output is not supported. This implementation exhibits this behavior for SEQUENTIAL\_IO, DIRECT\_IO, and TEXT\_IO.

## 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 637 tests were inapplicable to this implementation. All inapplicable tests were processed during validation testing except for 285 executable tests that use floating-point precision exceeding that supported by the implementation and 242 executable tests that use file operations not supported by the implementation. Modifications to the code, processing, or grading for 13 tests were required to successfully demonstrate the test objective.

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        | 1131 | 1698 | 16 | 16 | 46 | 3036  |
| Inapplicable | 0          | 7    | 617  | 1  | 12 | 0  | 637   |
| 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 | 192     | 547 | 496 | 245 | 171 | 99 | 160 | 331 | 137 | 36 | 252 | 294 | 76  | 3036  |
| Inappl | 20      | 102 | 184 | 3   | 1   | 0  | 6   | 1   | 0   | 0  | 0   | 75  | 245 | 637   |
| 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, 637 tests were inapplicable for the reasons indicated:

- a. The following 285 tests are not applicable because they have floating-point type declarations requiring more digits than `SYSTEM.MAX_DIGITS`:

|                       |                       |
|-----------------------|-----------------------|
| C24113F..Y (20 tests) | C35705F..Y (20 tests) |
| C35706F..Y (20 tests) | C35707F..Y (20 tests) |
| C35708F..Y (20 tests) | C35802F..Z (21 tests) |

# TEST INFORMATION

|                       |                       |
|-----------------------|-----------------------|
| C45241F..Y (20 tests) | C45321F..Y (20 tests) |
| C45421F..Y (20 tests) | C45521F..Z (21 tests) |
| C45524F..Z (21 tests) | C45621F..Z (21 tests) |
| C45641F..Y (20 tests) | C46012F..Z (21 tests) |

b. C35702A and B86001T are not applicable because this implementation supports no predefined type `SHORT_FLOAT`.

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

|         |         |         |         |         |
|---------|---------|---------|---------|---------|
| C45231B | C45304B | C45502B | C45503B | C45504B |
| C45504E | C45611B | C45613B | C45614B | C45631B |
| C45632B | B52004E | C55B07B | B55B09D | B86001V |
| CD7101E |         |         |         |         |

d. C45231D, B86001X, and CD7101G are not applicable because this implementation does not support any predefined integer type with a name other than `INTEGER`, `LONG_INTEGER`, or `SHORT_INTEGER`.

e. C45531M..P (4 tests) and C45532M..P (4 tests) are not applicable because the value of `SYSTEM.MAX_MANTISSA` is less than 48.

f. D64005G is not applicable because this implementation does not support nesting 17 levels of recursive procedure calls.

g. C86001F is not applicable because, for this implementation, the package `TEXT_IO` is dependent upon package `SYSTEM`. This test recompiles package `SYSTEM`, making package `TEXT_IO`, and hence package `REPORT`, obsolete.

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

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

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

k. 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.

l. CD2A61E and CD2A61G are not applicable because this implementation does not support an 8 bit integer type.

m. 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.

# TEST INFORMATION

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

o. 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 (7) | CD5011A..H (8) | CD5011L..N (3) | CD5011Q |
| CD5011R        | CD5012A..I (9) | CD5012L        | CD5013B |
| CD5013D        | CD5013F        | CD5013H        | CD5013L |
| CD5013N        | CD5013R        | CD5014T..X (5) |         |

p. CD5012J, CD5013S, and CD5014S are not applicable because this implementation does not support address clauses for tasks.

q. The following 242 tests are inapplicable because sequential, text, and direct access files are not supported:

|                 |                |                |                 |
|-----------------|----------------|----------------|-----------------|
| CE2102A..C (3)  | CE2102G..H (2) | CE2102K        | CE2102N..Y (12) |
| CE2103C..D (2)  | CE2104A..D (4) | CE2105A..B (2) | CE2106A..B (2)  |
| CE2107A..H (8)  | CE2107L        | CE2108A..B (2) | CE2108C..H (6)  |
| CE2109A..C (3)  | CE2110A..D (4) | CE2111A..I (9) | CE2115A..B (2)  |
| CE2201A..C (3)  | EE2201D..E (2) | CE2201F..N (9) | CE2204A..D (4)  |
| CE2205A         | CE2208B        | CE2401A..C (3) | EE2401D         |
| CE2401E..F (2)  | EE2401G        | CE2401H..L (5) | CE2404A..B (2)  |
| CE2405B         | CE2406A        | CE2407A..B (2) | CE2408A..B (2)  |
| CE2409A..B (2)  | CE2410A..B (2) | CE2411A        | CE3102A..B (2)  |
| EE3102C         | CE3102F..H (3) | CE3102J..K (2) | CE3103A         |
| CE3104A..C (3)  | CE3107B        | CE3108A..B (2) | CE3109A         |
| CE3110A         | CE3111A..B (2) | CE3111D..E (2) | CE3112A..D (4)  |
| CE3114A..B (2)  | CE3115A        | EE3203A        | CE3208A         |
| EE3301B         | CE3302A        | CE3305A        | CE3402A         |
| EE3402B         | CE3402C..D (2) | CE3403A..C (3) | CE3403E..F (2)  |
| CE3404B..D (3)  | CE3405A        | EE3405B        | CE3405C..D (2)  |
| CE3406A..D (4)  | CE3407A..C (3) | CE3408A..C (3) | CE3409A         |
| CE3409C..E (3)  | EE3409F        | CE3410A        | CE3410C..E (3)  |
| EE3410F         | CE3411A        | CE3411C        | CE3412A         |
| EE3412C         | CE3413A        | CE3413C        | CE3602A..D (4)  |
| CE3603A         | CE3604A..B (2) | CE3605A..E (5) | CE3606A..B (2)  |
| CE3704A..F (6)  | CE3704M..O (3) | CE3706D        | CE3706F..G (2)  |
| CE3804A..P (16) | CE3805A..B (2) | CE3806A..B (2) | CE3806D..E (2)  |
| CE3806G..H (2)  | CE3905A..C (3) | CE3905L        | CE3906A..C (3)  |
| CE3906E..F (2)  |                |                |                 |

r. CE2103A..B (2 tests) and CE3107A are not applicable because this implementation does not support external file CREATE and OPEN operations. These tests raise the exception USE\_ERROR. (See Section 3.6)

## TEST INFORMATION

### 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 13 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 |         |         |

CE2103A, CE2103B, and CE3107A required code modifications because the tests raise `USE ERROR`, for which there is no exception handler, and fail to execute properly. An exception handler for `USE ERROR` was added to each test. When `USE ERROR` was raised, a message was printed stating this. The AVO ruled that it was acceptable for these tests to raise `USE ERROR` and be graded as not applicable.

### 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 VADS VMS->MIL-STD-1750A, V6.0, MP 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 VADS VMS->MIL-STD-1750A, V6.0, MP 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:         | DEC MicroVAX III                                          |
| Host operating system: | VMS 5.0                                                   |
| Target computer:       | Tektronix 1750A Emulator<br>(Ethernet Download), v1.00-00 |

## TEST INFORMATION

Target operating system: VADS EXEC v6.0  
Compiler: VADS VMS->MIL-STD-1750A, V6.0, MP

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 and linked on the DEC MicroVAX III. After compiling, a SET HOST RENTAL was used to download and execute the tests from another VMS host (a DEC MicroVAX II). This machine was able to read the linked objects directly via DECNET. This additional machine was used only because the TEKTRONICS 8540 Ethernet Software and hardware is licensed only for that MicroVAX II. All executable tests were run on the Tektronix 1750A Emulator (Ethernet Download), v1.00-00. Results were printed from the host computer.

The compiler was tested using command scripts provided by Verdix Corporation and reviewed by the validation team. The compiler was tested using all default option settings. See Appendix E for a complete listing of the compiler options for this implementation.

Tests were compiled, linked, and executed (as appropriate) using a single host and target 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 Aloha OR and was completed on 16 November 1989.

APPENDIX A

DECLARATION OF CONFORMANCE

Verdix Corporation has submitted the following  
Declaration of Conformance concerning the VADS  
VMS->MIL-STD-1750A, V6.0, MP compiler.

## DECLARATION OF CONFORMANCE

Compiler Implementor: VERDIX 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:      | VADS VMS -> MIL-STD-1750A                                 | Version: | 6.0, MP        |
| Host Architecture ISA:   | DEC Microvax III                                          | OS&VER#: | VMS 5.0        |
| Target Architecture ISA: | Tektronix 1750A Emulator<br>(Ethernet Download), v1.00-00 | OS&VER#: | VADS EXEC v6.0 |

### Implementor's Declaration

I, the undersigned, representing Verdex Corp., have implemented no deliberate extensions to the Ada Language Standard ANSI/MIL-STD-1815A in the compilers(s) listed in this declaration. I declare that VERDIX 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 the Ada language compiler(s) listed in this declaration shall be made only in the owner's corporate name.



Date:

Stephen F. Zeigler  
Vice-President  
Ada Products Division

### Owner's Declaration

I, the undersigned, representing Verdex Corp., 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 of all the Ada language compilers listed, and their host/target performance are in compliance with the Ada Language Standard ANSI/MIL-STD-1815A.



Date:

Stephen F. Zeigler  
Vice-President  
Ada Products Division

## 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 VADS VMS->MIL-STD-1750A, V6.0, MP compiler, as described in this Appendix, are provided by Verdix 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 -32768 .. 32767;

type LONG\_INTEGER is range -2147483648 .. 2147483647;

type FLOAT is digits 6 range -1.70141E+38 .. 1.70141E+38;

type LONG\_FLOAT is digits 9 range -1.70141183E+38 .. 1.70141183E+38;

type DURATION is delta 0.001 range -2147483.648 .. 2147483.647;

...

end STANDARD;

## 1. Implementation-Dependent Pragas

### 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. If a user erroneously makes an `INLINE_ONLY` subprogram recursive a warning message will be emitted and an `PROGRAM_ERROR` will be raised at run time.

### 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. `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 VADS.

### 1.4. `NO_IMAGE` Pragma

The pragma suppresses the generation of the image array used for the `IMAGE` attribute of enumeration types. This eliminates the overhead required to store the array in the executable image. An attempt to use the `IMAGE` attribute on a type whose image array has been suppressed will result in a compilation warning and `PROGRAM_ERROR` raised at run time.

### 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 a different 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 or subprogram defined in another language and allows it to be referenced directly in Ada. The pragma will replace all occurrences of the variable or subprogram 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 or

subprogram 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.

### 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. OPTIMIZE\_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 whether the code should be optimized by the compiler. The default is ON. When OFF is specified, the compiler will generate the code as specified.

## 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' 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. NON\_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 subprograms within a package spec or package body.

### 2.8. NOT\_ELABORATED

This pragma can only appear in a library package specification. It indicates that the package will not be elaborated because it is either part of the RTS, a configuration package or an Ada package that is

referenced from a language other than Ada. The presence of this pragma suppresses the generation of elaboration code and issues warnings if elaboration code is required.

## **2.9. OPTIMIZE**

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

## **2.10. PACK**

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

## **2.11. PAGE**

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

## **2.12. PASSIVE**

The pragma has three forms :

```
PRAGMA PASSIVE;  
PRAGMA PASSIVE(SEMAPHORE);  
PRAGMA PASSIVE(INTERRUPT, <number>);
```

This pragma Pragma passive can be applied to a task or task type declared immediately within a library package spec or body. The pragma directs the compiler to optimize certain tasking operations. It is possible that the statements in a task body will prevent the intended optimization, in these cases a warning will be generated at compile time and will raise `TASKING_ERROR` at runtime.

## **2.13. PRIORITY**

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

## **2.14. SHARED**

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

## **2.15. 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.

## **2.16. SUPPRESS**

This pragma is implemented as described, except that `DIVISION_CHECK` and in some cases `OVERFLOW_CHECK` cannot be suppressed.

## **2.17. 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.

# **3. 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

```
-- Copyright 1987, 1988, 1989 Verdin Corporation
-- Preserve line numbers as they are reported in ACVC tests.

with unsigned_types;
package SYSTEM is

  pragma suppress(ALL_CHECKS);
  pragma suppress(EXCEPTION_TABLES);
  pragma not_elaborated;

  type NAME is ( m1750a );

  SYSTEM_NAME      : constant NAME := m1750a;
  STORAGE_UNIT     : constant := 16;
  MEMORY_SIZE      : constant := 65536;

  -- System-Dependent Named Numbers

  MIN_INT          : constant := -2_147_483_648;
  MAX_INT          : constant := 2_147_483_647;
  MAX_DIGITS       : constant := 9;
  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;

  MAX_REC_SIZE : integer := 255;

  type ADDRESS is private;

  function ">" (A: ADDRESS; B: ADDRESS) return BOOLEAN;
  function "<" (A: ADDRESS; B: ADDRESS) return BOOLEAN;
  function ">=" (A: ADDRESS; B: ADDRESS) return BOOLEAN;
  function "<=" (A: ADDRESS; B: ADDRESS) return BOOLEAN;
  function "-" (A: ADDRESS; B: ADDRESS) return INTEGER;
  function "+" (A: ADDRESS; I: INTEGER) return ADDRESS;
  function "-" (A: ADDRESS; I: INTEGER) return ADDRESS;

  function "*" (I: UNSIGNED_TYPES.UNSIGNED_INTEGER) return ADDRESS;

  function MEMORY_ADDRESS
    (I: UNSIGNED_TYPES.UNSIGNED_INTEGER) return ADDRESS renames "+";

  NO_ADDR : constant ADDRESS;

  -- 1750a-specifics
  EXTENDED_MEMORY : BOOLEAN := FALSE;

  type SHORT_ADDRESS is private;
  NO_SHORT_ADDR : constant SHORT_ADDRESS;

  subtype SEGMENT is INTEGER range 0 .. INTEGER'LAST;

  function OFFSET_OF(A: ADDRESS) return SHORT_ADDRESS;
  function SEGMENT_OF(A: ADDRESS) return SEGMENT;
  function SEGMENT_OF return SEGMENT;
  function MAKE_ADDRESS(A: SHORT_ADDRESS; SEG: SEGMENT) return ADDRESS;
  function PHYSICAL_ADDRESS(I: LONG_INTEGER) return SHORT_ADDRESS;

private

  type ADDRESS is new integer;

  NO_ADDR : constant ADDRESS := 0;

  pragma BUILT_IN(">");
  pragma BUILT_IN("<");
  pragma BUILT_IN(">=");
  pragma BUILT_IN("<=");
  pragma BUILT_IN("-");
  pragma BUILT_IN("+");
  pragma BUILT_IN("*");

  type SHORT_ADDRESS is new integer;
  NO_SHORT_ADDR : constant SHORT_ADDRESS := 0;

  pragma inline(OFFSET_OF);
  pragma inline(SEGMENT_OF);
  pragma inline(MAKE_ADDRESS);
```

```
pragma inline(PHYSICAL_ADDRESS);  
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 a record representation is required.

### 5.2. Size Clauses

For scalar types a representation clause will pack to the number of bits required to represent the range of the subtype. A size clause applied to a record type will not cause packing of components; an explicit record representation clause must be given to specify the packing of the components. A size clause applied to a record type will cause packing of components only when the component type is a discrete type. An error will be issued if there is insufficient space allocated. The SIZE attribute is not supported for access or floating point types.

### 5.3. Address Clauses

Address clauses are only supported for variables. Since default initialization of a variable requires evaluation of the variable address elaboration ordering requirements prohibit initialization of a variables which have address clauses. The specified address indicates the physical address associated with the variable.

### 5.4. Interrupts

Interrupt entries are not supported.

### 5.5. Representation Attributes

The ADDRESS attribute is not supported for the following entities:

- Packages
- Tasks
- Labels
- Entries

### 5.6. Machine Code Insertions

Machine code insertions are supported.

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

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

```
CODE_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 expressions in an address clause are interpreted as physical addresses.

## 8. Restrictions on Unchecked Conversions

None.

## 9. Restrictions on Unchecked Deallocations

None.

## 10. Implementation Characteristics of I/O Packages

Instantiations of `DIRECT_IO` use the value `MAX_REC_SIZE` as the record size (expressed in `STORAGE_UNITS`) when the size of `ELEMENT_TYPE` exceeds that value. For example for unconstrained arrays such as string where `ELEMENT_TYPE'SIZE` is very large, `MAX_REC_SIZE` is used instead. `MAX_RECORD_SIZE` is defined in `SYSTEM` and can be changed by a program before instantiating `DIRECT_IO` to provide an upper limit on the record size. In any case the maximum size supported is  $1024 \times 1024 \times \text{STORAGE\_UNIT}$  bits. `DIRECT_IO` will raise `USE_ERROR` if `MAX_REC_SIZE` exceeds this absolute limit.

Instantiations of `SEQUENTIAL_IO` use the value `MAX_REC_SIZE` as the record size (expressed in `STORAGE_UNITS`) when the size of `ELEMENT_TYPE` exceeds that value. For example for unconstrained arrays such as string where `ELEMENT_TYPE'SIZE` is very large, `MAX_REC_SIZE` is used instead. `MAX_RECORD_SIZE` is defined in `SYSTEM` and can be changed by a program before instantiating `INTEGER_IO` to provide an upper limit on the record size. `SEQUENTIAL_IO` imposes no limit on `MAX_REC_SIZE`.

## 11. 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.

### **11.1. Line Length**

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

### **11.2. Record and Array Sizes**

The maximum size of a statically sized array type is slightly less than  $32,000 \times \text{STORAGE\_UNITS}$ . The maximum size of a statically sized record type is slightly less than  $32,000 \times \text{STORAGE\_UNITS}$ . A record type or array type declaration that exceeds these limits will generate a warning message.

### **11.3. 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  $400 \text{ STORAGE\_UNITS}$ . This is a user-configurable parameter. This is the value returned by `T'STORAGE_SIZE` for a task type `T`.

### **11.4. 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`.

### **11.5. Limit on Declared Objects**

There is an absolute limit of approximately  $32,000 \times \text{STORAGE\_UNITS}$  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                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| <b>\$ACC SIZE</b><br>An integer literal whose value is the number of bits sufficient to hold any value of an access type.                           | 16                                              |
| <b>\$BIG ID1</b><br>An identifier the size of the maximum input line length which is identical to \$BIG_ID2 except for the last character.          | (1..498 => 'A', 499 => '1')                     |
| <b>\$BIG ID2</b><br>An identifier the size of the maximum input line length which is identical to \$BIG_ID1 except for the last character.          | (1..498 => 'A', 499 => '2')                     |
| <b>\$BIG ID3</b><br>An identifier the size of the maximum input line length which is identical to \$BIG_ID4 except for a character near the middle. | (1..249 => 'A', 250 => '3',<br>251..499 => 'A') |

## TEST PARAMETERS

| Name and Meaning                                                                                                                                    | Value                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| <b>\$BIG_ID4</b><br>An identifier the size of the maximum input line length which is identical to \$BIG_ID3 except for a character near the middle. | (1..249 => 'A', 250 => '4', 251..499 => 'A')      |
| <b>\$BIG_INT_LIT</b><br>An integer literal of value 298 with enough leading zeroes so that it is the size of the maximum line length.               | (1..496 => '0', 497..499 => "298")                |
| <b>\$BIG_REAL_LIT</b><br>A universal real literal of value 690.0 with enough leading zeroes to be the size of the maximum line length.              | (1..493 => '0', 494..499 => "69.0E1")             |
| <b>\$BIG_STRING1</b><br>A string literal which when catenated with \$BIG_STRING2 yields the image of \$BIG_ID1.                                     | (1 => '"', 2..200 => 'A', 201 => '"')             |
| <b>\$BIG_STRING2</b><br>A string literal which when catenated to the end of \$BIG_STRING1 yields the image of \$BIG_ID1.                            | (1 => '"', 2..300 => 'A', 301 => '1', 302 => '"') |
| <b>\$BLANKS</b><br>A sequence of blanks twenty characters less than the size of the maximum line length.                                            | (1..479 => ' ')                                   |
| <b>\$COUNT_LAST</b><br>A universal integer literal whose value is TEXT_IO.COUNT'LAST.                                                               | 255                                               |
| <b>\$DEFAULT_MEM_SIZE</b><br>An integer literal whose value is SYSTEM.MEMORY_SIZE.                                                                  | 65536                                             |
| <b>\$DEFAULT_STOR_UNIT</b><br>An integer literal whose value is SYSTEM.STORAGE_UNIT.                                                                | 16                                                |

## TEST PARAMETERS

| Name and Meaning                                                                                                                                           | Value                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| \$DEFAULT_SYS_NAME<br>The value of the constant<br>SYSTEM.SYSTEM_NAME.                                                                                     | M1750A                             |
| \$DELTA_DOC<br>A real literal whose value is<br>SYSTEM.FINE_DELTA.                                                                                         | 0.0000000004656612873077392578125  |
| \$FIELD_LAST<br>A universal integer<br>literal whose value is<br>TEXT_IO.FIELD'LAST.                                                                       | 32767                              |
| \$FIXED_NAME<br>The name of a predefined<br>fixed-point type other than<br>DURATION.                                                                       | NO_SUCH_TYPE                       |
| \$FLOAT_NAME<br>The name of a predefined<br>floating-point type other than<br>FLOAT, SHORT_FLOAT, or<br>LONG_FLOAT.                                        | NO_SUCH_TYPE                       |
| \$GREATER THAN DURATION<br>A universal real literal that<br>lies between DURATION'BASE'LAST<br>and DURATION'LAST or any value<br>in the range of DURATION. | 100000.0                           |
| \$GREATER THAN DURATION BASE LAST<br>A universal real literal that is<br>greater than DURATION'BASE'LAST.                                                  | 10000000.0                         |
| \$HIGH_PRIORITY<br>An integer literal whose value<br>is the upper bound of the range<br>for the subtype SYSTEM.PRIORITY.                                   | 99                                 |
| \$ILLEGAL_EXTERNAL_FILE_NAME1<br>An external file name which<br>contains invalid characters.                                                               | /illegal/file_name/2}J\$Z2102C.DAT |
| \$ILLEGAL_EXTERNAL_FILE_NAME2<br>An external file name which<br>is too long.                                                                               | /illegal/file_name/CE2102C*.DAT    |
| \$INTEGER_FIRST<br>A universal integer literal<br>whose value is INTEGER'FIRST.                                                                            | -32768                             |

# TEST PARAMETERS

| Name and Meaning                                                                                                                                          | Value                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| \$INTEGER LAST<br>A universal integer literal whose value is INTEGER'LAST.                                                                                | 32767                                            |
| \$INTEGER LAST PLUS 1<br>A universal integer literal whose value is INTEGER'LAST + 1.                                                                     | 32768                                            |
| \$LESS THAN DURATION<br>A universal real literal that lies between DURATION'BASE'FIRST and DURATION'FIRST or any value in the range of DURATION.          | -100000.0                                        |
| \$LESS THAN DURATION BASE FIRST<br>A universal real literal that is less than DURATION'BASE'FIRST.                                                        | -10000000.0                                      |
| \$LOW PRIORITY<br>An integer literal whose value is the lower bound of the range for the subtype SYSTEM.PRIORITY.                                         | 0                                                |
| \$MANTISSA DOC<br>An integer literal whose value is SYSTEM.MAX_MANTISSA.                                                                                  | 31                                               |
| \$MAX DIGITS<br>Maximum digits supported for floating-point types.                                                                                        | 9                                                |
| \$MAX IN LEN<br>Maximum input line length permitted by the implementation.                                                                                | 499                                              |
| \$MAX INT<br>A universal integer literal whose value is SYSTEM.MAX_INT.                                                                                   | 2147483647                                       |
| \$MAX INT PLUS 1<br>A universal integer literal whose value is SYSTEM.MAX_INT+1.                                                                          | 2147483648                                       |
| \$MAX_LEN_INT_BASED_LITERAL<br>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                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| <b>\$MAX_LEN_REAL_BASED_LITERAL</b><br>A universal real based literal whose value is 16:F.E: with enough leading zeroes in the mantissa to be \$MAX_IN_LEN long.                                    | (1..3 => "16:", 4..495 => '0', 496..499 => "F.E:") |
| <b>\$MAX_STRING_LITERAL</b><br>A string literal of size \$MAX_IN_LEN, including the quote characters.                                                                                               | (1 => '"', 2..498 => 'A', 499 => '"')              |
| <b>\$MIN_INT</b><br>A universal integer literal whose value is SYSTEM.MIN_INT.                                                                                                                      | -2147483648                                        |
| <b>\$MIN_TASK_SIZE</b><br>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. | 16                                                 |
| <b>\$NAME</b><br>A name of a predefined numeric type other than FLOAT, INTEGER, SHORT_FLOAT, SHORT_INTEGER, LONG_FLOAT, or LONG_INTEGER.                                                            | NO_SUCH_TYPE_AVAILABLE                             |
| <b>\$NAME_LIST</b><br>A list of enumeration literals in the type SYSTEM.NAME, separated by commas.                                                                                                  | M1750A                                             |
| <b>\$NEG_BASED_INT</b><br>A based integer literal whose highest order nonzero bit falls in the sign bit position of the representation for SYSTEM.MAX_INT.                                          | 16#FFFFFFFFD#                                      |
| <b>\$NEW_MEM_SIZE</b><br>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.     | 65536                                              |

## TEST PARAMETERS

| <u>Name and Meaning</u>                                                                                                                                                                                                        | <u>Value</u> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <p><b>\$NEW STOR UNIT</b><br/>An integer literal whose value is a permitted argument for pragma STORAGE UNIT, other than \$DEFAULT STOR UNIT. If there is no other permitted value, then use value of SYSTEM.STORAGE_UNIT.</p> | 16           |
| <p><b>\$NEW SYS NAME</b><br/>A value of the type SYSTEM.NAME, other than \$DEFAULT SYS NAME. If there is only one value of that type, then use that value.</p>                                                                 | M1750A       |
| <p><b>\$TASK SIZE</b><br/>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.</p>                                                        | 16           |
| <p><b>\$TICK</b><br/>A real literal whose value is SYSTEM.TICK.</p>                                                                                                                                                            | 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).

## WITHDRAWN TESTS

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

## WITHDRAWN TESTS

- 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).
- 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 VERDIX CORPORATION

Compiler: VADS VMS->MIL-STD-1750A, V6.0, MP

ACVC Version: 1.10

## VADS ADA — Ada compiler

### Syntax

VADS ADA *source\_file* [, ...]

### Description

The command **VADS ADA** executes the Ada compiler and compiles the named Ada source file, ending with the **.A** suffix. The file must reside in a VADS library directory. The **ADA.LIB** file in this directory is modified after each Ada unit is compiled.

The object for each compiled Ada unit is left in the **[.OBJECTS]** subdirectory in a file with the same name as that of the source with **.01**, **.02**, etc. substituted for **.A**. The executable file is left in the VADS library and has the name of the 'main' unit with the extension **.EXE**. For cross compilers, the file extension is **.VOX**. The **/EXECUTABLE** qualifier can be used to produce an executable with some other name.

By default, **VADS ADA** produces only object and net files. If the **/MAIN** option is used, the compiler automatically invokes **VADS LD** and builds a complete program with the named library unit as the main program.

Non-Ada object files may be given as arguments to **VADS ADA**. These files will be passed on to the linker and will be linked with the specified Ada object files.

Command line options may be specified in any order, but the order of compilation and the order of the files to be passed to the linker can be significant.

Several VADS compilers may be simultaneously available on a single system. The **VADS ADA** command within any version of VADS on a system will execute the correct compiler components based upon visible library directives.

Program listings with a disassembly of machine code instructions are generated by **VADS DB** or **VADS DAS**.

### Qualifiers

- |                                      |                                                                                                                                                                                                                                    |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>/APPE ND</b>                      | Append all output to a log file.                                                                                                                                                                                                   |
| <b>/DEPENDENCIES</b>                 | Analyze for dependencies only; no link will be performed if this option is given ( <b>/MAIN</b> and <b>/OUTPUT</b> options must not be used with this qualifier).                                                                  |
| <b>/ERRORS[ = (option [, ...]) ]</b> | Process compilation error messages using the <b>ERROR</b> tool and direct the output to <b>SYSS\$OUTPUT</b> ; the parentheses can be omitted if only one qualifier is given (by default, only lines containing errors are listed). |

## Options:

**LISTING** List entire input file.

**EDITOR**[ = "editor"]

Insert error messages into the source file and call a text editor (**EDT** by default). If a value is given as a quoted string, that string is used to invoke the editor. This allows other editors to be used instead of the default.

**OUTPUT**[ = *file\_name*]

Direct error processed output to the specified file name; if no file name is given, the source file name is used with a file extension **.ERR**.

**BRIEF**

list only the affected lines [default]

Only one of the **BRIEF**, **LISTING**, **OUTPUT**, or **EDITOR** options can be used in a single command.

For more information about the **/ERRORS** option, **see also** Chapter NO TAG THE COMPILER, Section NO TAG COMPILER ERROR MESSAGE PROCESSING on page NO TAG.

**/EXECUTABLE** = *file\_name*

Provide an explicit name for the executable when used with the **/MAIN** qualifier; the *file\_name* value must be supplied (if the file type is omitted, **.EXE** is assumed).

**/KEEP\_IL**

Keep the intermediate language (IL) file produced by the compiler front end.

**/LIBRARY** = *library\_name*

Operate in VADS library *library\_name* (the current working directory is the default).

**/LINK\_ARGUMENTS** = "value"

Pass command qualifiers and parameters to the linker.

**/MAIN**[ = *unit\_name*]

Produce an executable program using the named unit as the main program; if no value is given, the name is derived from the first Ada file name parameter (the **.A** suffix is removed); the executable file name is derived from the main program name unless the **/EXECUTABLE** qualifier is used.

**/NOOPTIMIZE**

Do not optimize.

**/NOWARNINGS**

Suppress warning diagnostics.

**/OPTIMIZE**[ = *number*]

Invoke the code optimizer (**OPTIM2**). An optional digit (there is no space before the digit) limits the number of passes by the optimizer:

- no **/OPTIMIZE** option, make one pass
- /OPTIMIZE** no digit, optimize as far as possible
- /OPTIMIZE = 0** prevents optimization
- /OPTIMIZE = 1** no hoisting
- /OPTIMIZE = 9** full optimization

The addition of the **INFO** directive, **OPTIM3:INFO:TRUE**, to the **ADA.LIB** will cause the compiler to use a new optimizer (**OPTIM3**) that generates faster code.

## VADS ADA

The default level of optimization for OPTIM3 is O4. Note that optimization levels for OPTIM3 are more than simply additional iterations:

|                      |                                                                     |
|----------------------|---------------------------------------------------------------------|
| <b>/OPTIMIZE</b>     | no digit, full optimization (same as OPTIM2 VADS ADA /OPTIMIZE = 9) |
| <b>/OPTIMIZE = 0</b> | prevents optimization                                               |
| <b>/OPTIMIZE = 1</b> | no hoisting (same as OPTIM2 VADS ADA /OPTIMIZE = 1)                 |
| <b>/OPTIMIZE = 2</b> | no hoisting but more passes                                         |
| <b>/OPTIMIZE = 3</b> | no hoisting but even more passes                                    |
| <b>/OPTIMIZE = 4</b> | hoisting from loops                                                 |
| <b>/OPTIMIZE = 5</b> | hoisting from loops but more passes                                 |
| <b>/OPTIMIZE = 6</b> | hoisting from loops with maximum passes                             |
| <b>/OPTIMIZE = 7</b> | hoisting from loops and branches                                    |
| <b>/OPTIMIZE = 8</b> | hoisting from loops and branches, more passes                       |
| <b>/OPTIMIZE = 9</b> | hoisting from loops and branches, maximum passes                    |

Hoisting from branches (and cases alternatives) can be slow and does not always provide significant performance gains so it can be suppressed.

For information on INFO directives see *IMPLEMENTATION REFERENCE, INFO Directive Names*, page 5-2. For information on adding and deleting INFO directives, see *[VADS COMMAND REFERENCE], VADS INFO*, page NO TAG and for more information about optimization, see *COMPILER, 4.4 Optimization*, page 4-3.

|                                          |                                                                                                             |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| <b>/OUTPUT = file_name</b>               | Direct the output to <i>file_name</i> (the default is SYSS\$OUTPUT).                                        |
| <b>/RECOMPILE_LIBRARY = VADS_library</b> | Force analysis of all generic instantiations causing reinstantiation of any that are out of date.           |
| <b>/SHOW_ALL</b>                         | Print the name of the front end, code generator, optimizer, linker and list the tools that will be invoked. |
| <b>/SUPPRESS</b>                         | Apply <b>pragma SUPPRESS</b> for all checks to the entire compilation.                                      |
| <b>/TIMING</b>                           | Print timing information for the compilation.                                                               |
| <b>/VERBOSE</b>                          | Print information for the compilation.                                                                      |

See also Chapter NO TAG *VADS COMMAND REFERENCE*, *VADS DAS* on page NO TAG, *VADS DB* on page 9-3, *VADS ERROR* on page NO TAG, *VADS LD* on page NO TAG, and *VADS MKLIB* on page 8-21.

### Diagnostics

The diagnostics produced by the VADS compiler are intended to be self-explanatory. Most refer to the RM. Each RM reference includes a section number and optionally, a paragraph number enclosed in parentheses.