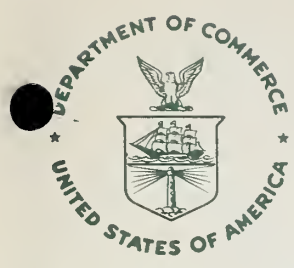

FIPS PUB 69

FEDERAL INFORMATION
PROCESSING STANDARDS PUBLICATION

1980 SEPTEMBER 4

U.S. DEPARTMENT OF COMMERCE / National Bureau of Standards

FORTRAN

CATEGORY: SOFTWARE STANDARD
SUBCATEGORY: PROGRAMMING LANGUAGE

U.S. DEPARTMENT OF COMMERCE, Philip M. Klutznick, Secretary

Jordan J. Baruch, Assistant Secretary for Productivity,
Technology and Innovation
NATIONAL BUREAU OF STANDARDS, Ernest Ambler, Director

Foreword

The Federal Information Processing Standards Publication Series of the National Bureau of Standards is the official publication relating to standards adopted and promulgated under the provisions of Public Law 89-306 (Brooks Act) and under Part 6 of Title 15, Code of Federal Regulations. These legislative and executive mandates have given the Secretary of Commerce important responsibilities for improving the utilization and management of computers and automatic data processing in the Federal Government. To carry out the Secretary's responsibilities, the NBS, through its Institute for Computer Sciences and Technology, provides leadership, technical guidance and coordination of Government efforts in the development of guidelines and standards in these areas.

Comments concerning Federal Information Processing Standards Publications are welcomed and should be addressed to the Director, Institute for Computer Sciences and Technology, National Bureau of Standards, Washington, DC 20234.

James H. Burrows, Director
Institute for Computer Sciences
and Technology

Abstract

This FIPS PUB announces the adoption of the American National Standard FORTRAN as a Federal Standard. This standard defines the syntax of the FORTRAN programming language and the semantics for its interpretation. It is to be used by implementors and other computer professionals as the authoritative reference for developing FORTRAN language processors. FORTRAN is recommended for the solution of numeric, scientific, or engineering problems.

KEY WORDS: Data processing; Federal Information Processing Standards Publication; FORTRAN; numeric methods; programming language; scientific computing engineering; software; standards.

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Federal Information Processing Standards Publication 69

1980 SEPTEMBER 4

ANNOUNCING THE STANDARD FOR

FORTRAN

Federal Information Processing Standards Publications (FIPS PUBs) are issued by the National Bureau of Standards pursuant to the Federal Property and Administrative Services Act of 1949, as amended, Public Law 89-306 (79 Stat. 1127), Executive Order 11717 (38 FR 12315, dated May 11, 1973), and Part 6 of Title 15 Code of Federal Regulations (CFR).

1. **Name of Standard.** FORTRAN (FIPS PUB 69).

2. Category of Standard. Software Standard, Programming Language.

3. **Explanation.** This publication announces the adoption of American National Standard FORTRAN, X3.9-1978, as a Federal Standard. The American National Standard FORTRAN, X3.9-1978, specifies the form and establishes the interpretation of programs expressed in the FORTRAN Programming Language. The standard consists of a full language, FORTRAN, and a subset language, Subset FORTRAN. The purpose of the standard is to promote portability of FORTRAN programs for use on a variety of data processing systems. The standard is used by implementors as the reference authority in developing compilers, interpreters, or other forms of high level language processors, and by other computer professionals who need to know the precise syntactic and semantic rules adopted by the American National Standards Institute (ANSI). It is not the primary purpose of this standard to explain the language to the beginning or casual user. This Federal Standard specifies the set of features that must be supported by a language processor designated as FORTRAN.

4. Approving Authority. Secretary of Commerce.

5. **Maintenance Agency.** U. S. Department of Commerce, National Bureau of Standards, (Institute for Computer Sciences and Technology).

6. **Cross Index.** American National Standard X3.9-1978, FORTRAN.

7. **Related Document.** Federal Property Management Regulation 101-36.1305, Implementation of Federal Information Processing and Federal Telecommunications Standards into Solicitation Documents, Software Standards.

8. **Objectives.** The basic objectives in applying Federal Standard programming languages are: (1) to achieve the advantages that are inherent in the use of higher level languages, e.g., the simplification of program development and the production of more easily maintainable source programs; and (2) to minimize data processing costs by making it easier and less expensive to

transfer programs among different computer systems, including replacement systems.

Government-wide attainment of the above objectives depends upon the widespread availability and use of high level programming languages to the exclusion of other programming languages such as assembly languages. Further, the availability of standard languages provides substantially better economy and efficiency in computer utilization. Federal Standard FORTRAN is for use by all Federal agencies for programming applications, particularly scientific or numeric computations, and for use by those who develop or acquire FORTRAN programs for government use.

9. Applicability.

a. Federal standards for high level programming languages shall be used for computer applications and programs that are developed or acquired for government use. To facilitate this requirement, a family of Federal high level programming language standards is provided. The use of specific programming languages is limited to the approved Federal Information Processing Standards languages. Federal Standard FORTRAN is hereby designated as one of the high level programming languages standardized and approved for Government-wide use.

b. Every Federal department and agency that establishes a requirement for FORTRAN must use Federal Standard FORTRAN as the basis for specification.

c. Every Federal department and agency shall establish the necessary guidelines for the implementation and use of this standard.

d. Every Federal department and agency should recognize that Federal Standard FORTRAN is a general-purpose computer programming language that is suited for:

- solving numeric, scientific, or engineering problems;

- efficient computation on a wide range of computing equipment of varying power and structure;

- programs that are to be interchanged among processors.

e. Exceptions to the applicability of approved standards for high level programming languages may be obtained through the waiver process, as described in paragraph 12.

10. Specifications. Federal Standard FORTRAN specifications are the language specifications contained in American National Standard FORTRAN, X3.9-1978. The FORTRAN standard describes two levels of the FORTRAN language. FORTRAN refers to the full language and Subset FORTRAN refers to the subset of the full language.

The ANS FORTRAN document specifies the form of a program written in the FORTRAN language, semantic rules for program and data interpretation, and formats of data for input and output.

The ANS FORTRAN document does not specify limits on the size or complexity of programs, the range or precision of numeric quantities or the method of rounding of numeric results, the results when the rules of the standard fail to establish an interpretation, the minimum automatic data processing re-

quirements, the means of supervisory control of programs, or the means of transforming programs internally for processing.

11. Implementation. The implementation of Federal Standard FORTRAN involves four areas of consideration: acquisition of FORTRAN processors, conformance to this standard, interpretation of FORTRAN, and use of FORTRAN.

11.1 Acquisition of FORTRAN Processors. The provisions of this publication are effective on September 4, 1980. All FORTRAN processors specified for Federal use after this date must implement Federal Standard FORTRAN. The requirements set forth in this paragraph are applicable to FORTRAN processors developed internally, acquired as part of an ADP system procurement, acquired by separate procurement, or used under an ADP leasing arrangement.

A transition period will provide time for industry to produce FORTRAN processors conforming to the standard. The transition period will begin on the effective date and will continue for eighteen (18) months thereafter. The policies for the acquisition of FORTRAN processors during the transition period are:

a. The provisions of this FIPS PUB will not apply to FORTRAN language processors or computing services ordered before the effective date.

b. The provisions of this FIPS PUB will apply to orders placed on or after the effective date; however, a FORTRAN language processor not conforming to this FIPS PUB may be acquired for interim use during the transition period. A standard-conforming processor must be delivered by the end of the transition period (eighteen (18) months from the effective date of this document).

11.2 Conformance to Federal Standard FORTRAN. A processor that conforms to Federal Standard FORTRAN must satisfy at least the following requirements: (1) The processor must include all of the language elements of one of the two levels of American National Standard FORTRAN, X3.9-1978; (2) The processor must satisfy all of the requirements defined in American National Standard FORTRAN, X3.9-1978, section 1.4 or section 1.4.1, as relevant; and (3) The processor must provide a facility that allows a FORTRAN source program to be analyzed with respect to Federal Standard FORTRAN. Any statement appearing in the source program that does not conform syntactically to the specifications of Federal Standard FORTRAN shall be explicitly identified.

The General Services Administration (GSA) has established the Federal Compiler Testing Center (FCTC) located at 5203 Leesburg Pike, Suite 1100, Falls Church, Virginia 22041 (703-756-6153) for the purpose of validating language processor conformance to this standard for Federal procurement, by means of a series of test programs. This service is offered on a reimbursable basis. The validation system reports the nature of any deviations that are detected.

Periodic changes will be required to the validation system in order to correct existing errors in the system, enhance test cases, and reflect official interpretations which affect this standard (see paragraph 11.3). In order to provide both currency and stability, new versions of the validation system will be introduced no more frequently than once per year. When a new validation system is introduced or changes are made to the existing validation system, the FCTC will make an announcement in the Federal Register, approximately six months prior to use of the system for official validation. The Federal Register notice will specify a comment

period of at least 90 days. All comments and responses to the comments will be made available to the public prior to use of the new or modified system for official validations. Copies of the new or modified system will be available through the National Technical Information Service (see paragraph 13).

11.3 Interpretation of Federal Standard FORTRAN. NBS will provide for the resolution of questions regarding Federal Standard FORTRAN specifications and requirements, and will issue official interpretations using the procedures of FIPS PUB 29, as appropriate. All questions about the interpretation of Federal Standard FORTRAN should be addressed to:

Standards Administration Office
Institute for Computer Sciences and Technology
Room B-64, Technology Building
National Bureau of Standards
Washington, D.C. 20234

11.4 Use of FORTRAN. Federal Standard FORTRAN should be used as determined according to paragraph 9, Applicability. FORTRAN source programs, whether developed internally or on contract (including purchased or leased) should be limited to the elements of Federal Standard FORTRAN. Nonstandard language features should be used only when the needed operation or function cannot reasonably be implemented with the standard features alone. It should be recognized that the use of nonstandard language elements may make the interchange of programs and future conversion to a replacement system or processor more difficult and costly. It is not intended that existing programs be rewritten solely for the purpose of conforming to the standard.

12. Waiver Process. Heads of agencies may request that the requirements of this standard for the acquisition of FORTRAN processors or for the applicability of standardized and approved high level programming languages be waived in instances where it can be clearly demonstrated that there are appreciable performance or cost advantages to be gained and that the overall interests of the Federal Government are best served by granting the requested waiver. Such waiver requests will be reviewed by and are subject to the approval of the Secretary of Commerce. The waiver request must address the criteria stated above as the justification for the waiver.

Forty-five days should be allowed for review and response by the Secretary of Commerce. Waiver requests shall be submitted to the Secretary of Commerce, Washington, D.C. 20230, and labeled as a Request for a Waiver to a Federal Information Processing Standard. No agency shall take any action to deviate from the standard prior to the receipt of a waiver approval from the Secretary of Commerce. No agency shall begin any process of implementation or acquisition of a nonconforming FORTRAN processor nor shall it make use of any nonstandard language unless it has already obtained such approval.

13. Where to Obtain Copies. Copies of this publication are for sale by the National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia 22161. (Sale of the included specifications document is by arrangement with the American National Standards Institute.) When ordering, refer to Federal Information Processing Standards Publication 69 (FIPS-PUB-69), and title. Payment may be made by check, money order, or deposit account.

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