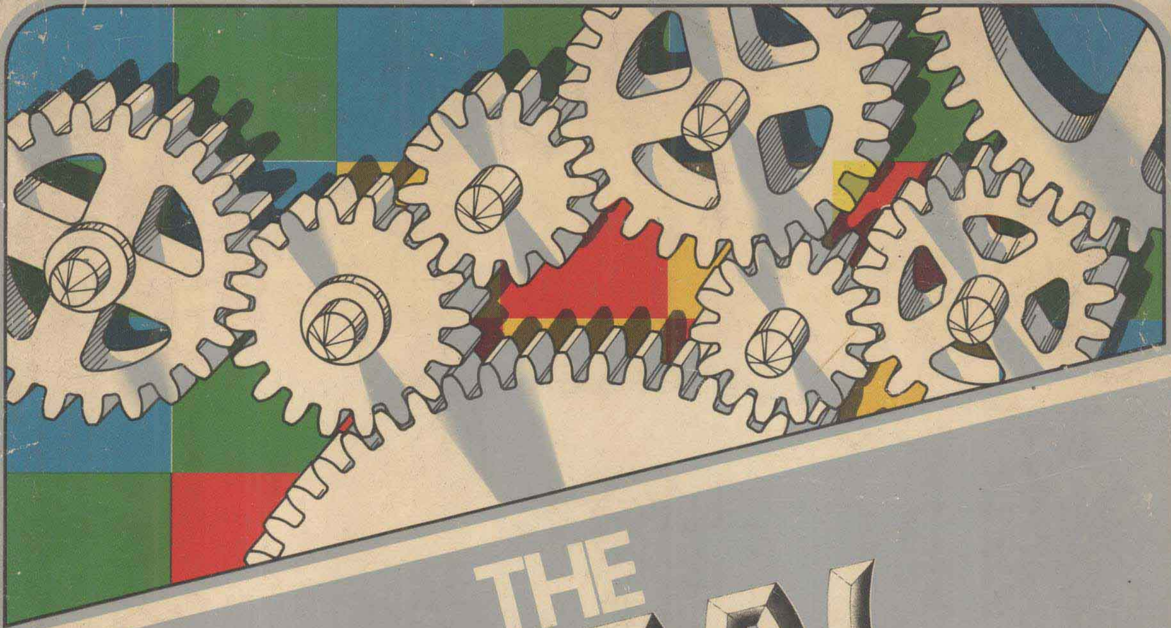
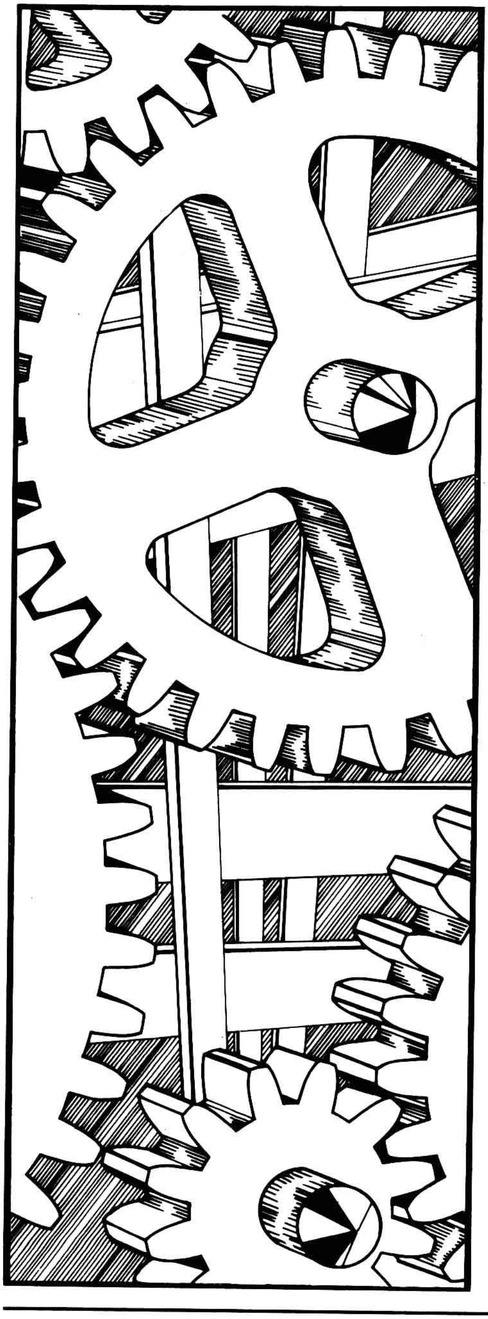


THE PASCAL HANDBOOK

JACQUES TIBERGHIEN

SYBEX



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THE PASCAL HANDBOOK

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Preface

When originally defined by Niklaus Wirth in 1971, Pascal was seen as a coherent, powerful and well-defined language and quickly gained wide acceptance. However, the very success of, and enthusiasm for, Pascal has led to the development of multiple and incompatible versions. These multiple versions have, in turn, created a worldwide effort at defining a new standard, the ISO (International Standards Organization) Standard. Despite this effort at standardization, new extensions are still being implemented.

As a result, most Pascal versions available today display some incompatibilities, and programs written in one version may not execute in another. When writing a Pascal program, a programmer must frequently verify and cross-check the definitions and effects of specific features being used.

Drawing together information scattered until now among diverse sources, this handbook has been written as a single reference manual designed to facilitate the use of Pascal by all Pascal users. Every feature of Pascal is explained in a convenient format for some major Pascal dialects including Jensen and Wirth's original definition, with the CDC implementation, the proposed ISO Standard, UCSD Pascal, Pascal 1000 (HP 1000), OMSI Pascal-1, and Pascal/Z. Compiler options are not included.

Organized alphabetically, this book is designed for ease in retrieving and understanding all features of the language. As such, it is a comprehensive and indispensible tool for the Pascal user.

Each significant feature of Pascal is a separate entry. Separate entries are found for:

— *symbols*, including:

reserved words	such as **PROGRAM, BEGIN** and **END**
operators	such as + – and *
delimiters	such as ; . ' and ( ).

— *predefined identifiers*, including:

types	such as REAL, INTEGER, CHAR
functions	such as ABS, SIN, SQR
procedures	such as READ, WRITE, GET
constants	such as MAXINT, TRUE, FALSE

— *concepts*, such as "global", "assignment" and "statement".

In order to provide easy access to information, a format with a quick-reference heading and up to four main sections has been consistently applied to the description of each entry.

The *heading* of each entry shows:

1. the feature being described in large, clear type with a brief definition
2. a chart indicating
   — whether the feature is a symbol, identifier, or concept
   — which versions of Pascal implement this feature.

The *description* of each entry is presented in four sections:

1. SYNTAX: a diagram showing how the entry may be legally used
2. DESCRIPTION: what it is, what it does
3. IMPLEMENTATION-DEPENDENT FEATURES: any differences between the various implementations, including appropriate syntax diagrams
4. EXAMPLES: whenever necessary, typical examples that clarify the use or meaning of the entry are presented.

The "Standard" referred to in this handbook is the *proposed ISO Standard* as published at this time (see reference list at the end of this book), not the original Jensen and Wirth definition of Pascal. This standard has not, however, been finalized and some features may still be modified. The author has therefore used his own judgment in the few cases where features were still under discussion. For example, *conformant arrays* are not described here, as they will probably not be included in the final standard.

Another practical problem that the author faced was to select the implementations to be described in this book. Some recent implementations are not widely used and some depart significantly from Standard Pascal. The author has selected widely used implementations that he feels conform to the original spirit of Pascal.

This book should provide a comprehensive and practical reference for Pascal programmers, whether novices or experienced users. By using a consistent and carefully organized format for the description of all Pascal features, this book will:

— encourage the use of all features of the language
— ease the programming process
— facilitate learning the language
— assist in the translation of programs from one version of Pascal into another.

The author hopes to have captured the current spirit of Pascal within the pages of this book and welcomes comments and suggestions for improvement.

HOW TO READ THIS BOOK

entry

A brief definition of the Pascal entry or feature is given here for quick reference.

- □ **SYMBOL**
- □ **IDENTIFIER**
- □ **CONCEPT**
- □ **STANDARD**
- □ **HP 1000**
- □ **J & W/CDC**
- □ **OMSI**
- □ **PASCAL/Z**
- □ **UCSD**

1
SYNTAX

The formal syntax of the entry is presented in diagram form or described in words. A syntax diagram illustrates the correct use of the word or symbol and reflects the rules for combining it with other legal constructs in a program. (See the next section for How to Read a Syntax Diagram.)

2
DESCRIPTION

What the entry means, what it is used for, and its effect in a program.

3
IMPLEMENTATION-DEPENDENT FEATURES

Enhancements or restrictions to the use of the entry that are specific to the various implementations of Pascal.

4
EXAMPLE

Whenever required, an example program featuring the Pascal entry is presented in order to:

- illustrate the correct syntax of the entry within an actual program
- show how it works with other elements of a program to accomplish a specific task.

ABOUT THE HEADING:

THE ENTRY BOX

The type-face used for the term in the entry box has a specific meaning:

BOLDFACE UPPERCASE	means that the term is a reserved word.
UPPERCASE	means that it is a predefined identifier or directive.
lowercase	means that it is a concept.

Note: Codes for ASCII characters are given in decimal.

THE CHART

1. The first column of the chart below the definition of the entry indicates the *type* of entry.

   SYMBOL refers to reserved words, symbols (operators and delimiters) or directives (context-dependent words) that have a fixed, predefined meaning in Pascal and cannot be redefined by the user.

   IDENTIFIER refers to words that have a predefined meaning in Pascal, but may be redefined by the programmer to take a different meaning. These include predefined program parameters, constants, types, procedures and functions.

   CONCEPT refers to general terms that describe or define the syntax and operation of the Pascal language. Unlike symbols and identifiers, concepts do not appear in programs.

entry

□ **STANDARD**
□ **HP 1000**
□ **J & W/CDC**
□ **OMSI**
□ **PASCAL/Z**
□ **UCSD**

2. The last three columns of the chart indicate in which *versions* of Pascal the entry has been implemented.

STANDARD is the proposed ISO Standard (DP 7185, first version).

HP 1000 refers to Pascal 1000 which was developed by Hewlett Packard for the HP 1000.

J&W/CDC refers to Jensen and Wirth's original definition of Pascal implemented on CDC 6000 series machines.

OMSI refers to OMSI Pascal-1, developed by Oregon Minicomputer Software, Inc. for the PDP-11.

PASCAL/Z is a Pascal compiler for Z-80 microcomputers distributed by Ithaca Intersystems, Inc.

UCSD refers to the II.0 Pascal system and language developed at the University of California, San Diego, for mini-micro-computer applications. Apple Pascal (1.0) is highly compatible with UCSD Pascal II.0.

HOW TO READ A SYNTAX DIAGRAM

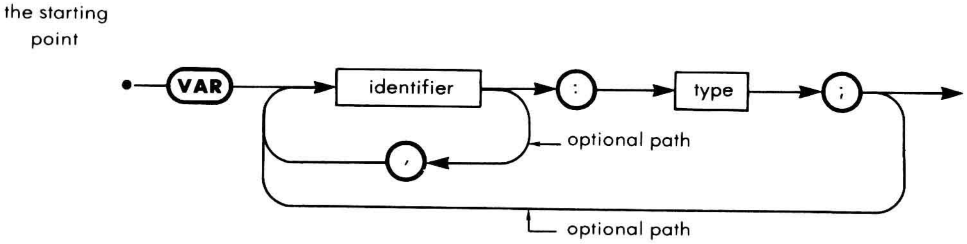
A box with rounded edges is used to represent predefined words including both reserved words **(BOLDFACE UPPERCASE)** and predefined identifiers (UPPERCASE). No blanks are permitted within such words.

A circle is used to represent reserved symbols (non-alphanumeric characters). No intervening blanks are permitted between the non-alphanumeric characters of a symbol.

A rectangle encloses syntax elements that are defined elsewhere in their own diagram. A qualifier, e.g., for type, may also be included.

Lines and arrows indicate authorized paths and are used to show the correct sequence of elements in the diagram. Except where noted in the text, blanks, comments and ends-of-lines may appear along the lines connecting enclosed words, symbols, and referenced syntax diagrams.

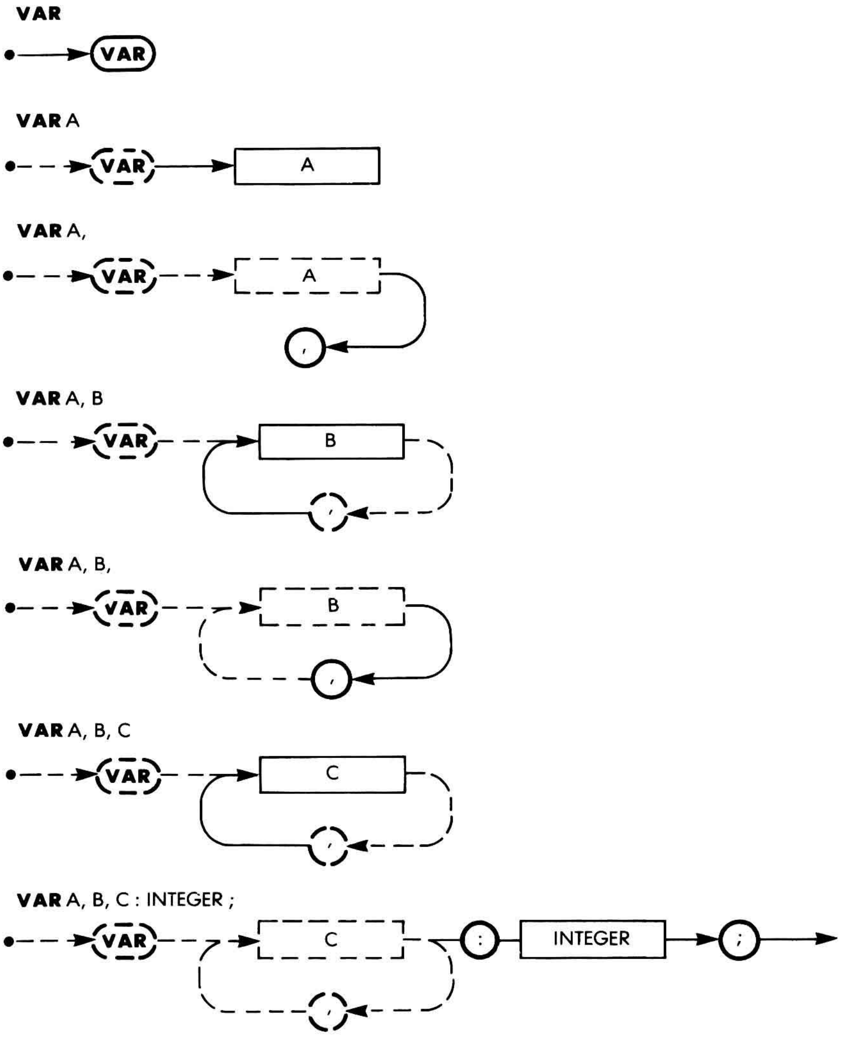
For example, the syntax for a VARiable declaration is drawn as follows:



The correctness of the declaration

VAR A,B,C : INTEGER;

can be verified by tracing through the syntax diagram. The diagram that follows is a step-by-step illustration of the way in which the VAR declaration is constructed (or verified) by following the syntax rules specified in the syntax diagram.



VAR

VAR A

VAR A,

VAR A, B

VAR A, B,

VAR A, B, C

VAR A, B, C : INTEGER ;

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