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23A

PASCAL NEWS



M. Pickel

PASCAL USERS GROUP (U.K.)

Pascal News 23a is a supplement, to plug the lengthening gap between US originating 23 and 24. Readers will note that its contents are quite different from those of previous editions. There is a shift of emphasis from matters of concern at leading edge University level, to those of concern to producers and users of inexpensive standardised products.

That shift has been wholly dictated by the content of material submitted for publication. Whether it is a temporary side-step or a permanent change, will also be decided by contributors ( to future editions ). PUG(UK) is the servant of you the subscribers and as such, will publish material originating from any section of the user community.

We are all indebted to each contributor but Tony Heyes's generosity in offering his Bibliography suite of programs for refinement through the medium of PN is particularly appreciated. Constructive critiques are welcome.

There is a widening of the user base and an overdue deployment of resources to that end, evidenced by the complementary nature of articles from widely differing sources. Read on and judge for yourselves. Although you will find that 23a is pitched at quite a different level from that of your usual expectations of PN, I sincerely hope that you will welcome it as a stop-gap until 24 becomes available from Rick, Andy, and Co.

The following is offered as an illustration of the scene which prompted the production of a supplement.

Intrigued by advertising which referred to "mere humans", I went along to the personal computer show at the Barbican on September 12th.

Imagine the disappointment at failing to find anything innovative or even mildly interesting. Discovered that with a single exception, exhibitors did not know whether standard Pascal was implemented on the machines offered to the public. More than one of those asked, replied "Yes, it's called UDCS or something like that". At one stand, sponsored by British Petroleum, the Department of Trade and Industry, the Council for Educational Technology, and others, an 'expert' merely looked blank and suggested that I ask someone else. 'Someone Else' replied "We are only interested in things for use in Education". At the

National Computing Centre stand, another expert, when asked if his stand offered any information about standard Pascal and its implementation or use in a microcomputer environment, replied "No, there is no demand", deftly followed by "Can I help you sir?" to someone standing behind me. In some instances, the initial answer was "Yes", followed by misrepresentative flannel when a demonstration was requested.

Met a guy who holds a powerful position in the largest education authority in Britain. He believes that BASIC is an "appropriate" language for the "mass" of young people who "won't bother" to become seriously interested in the technology. I should admit at this point, that had my first experience of a perception of machine intelligence been through the medium of BASIC ( or COBOL, FORTRAN, etc. ), I might easily have joined the ranks of those who either "won't bother" or are suitably unimpressed by obscure combinations of hunches, guesses, and a dash of perceptual skill which only occasionally fail.

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And now for something different --

1. To those of you who requested supply of back numbers, I regret that I still haven't found a solution to the very high direct and indirect costs of small numbers of reprints. Even when you are willing to cover all costs, there remains the burden of manual labour and time. Any ideas?
2. PLEASE, if you must use purchase orders, include subscription with it. Otherwise there will be a drowning in paperwork.
3. I still haven't resolved the problem of how to service subscribers to PUG(USA). Unfortunately, if they are serviced out of local funds, the EFFECT ( whatever the intention ) is subsidisation of more prosperous PUG(USA) by barely solvent PUG(UK) and a detrimental effect on local service.

In a similar vein, escalating costs necessitate an increase in the numbers of subscribers, or, an increase in subscription cost for '83. It is suggested that a subscription of 25 Pounds per annum for firms and institutions, with a personal subscription of half that amount, would be equitable.

Very Late News :

23rd October '82

Received a call from Andy Mickel yesterday evening. Apparently there has been another change of US editor. This accounts for the delay in producing PN24.

The good news is :

- (a) That production of 24 is now progressing again.
- (b) That I will receive a number of copies of back issues of PN. If you did not receive any editions prior to 22/23, please let me have details plus a large stamped addressed envelope for each copy you are due.

With any luck we may end up with a few surplus copies, so if you would like to make purchases ( sorry no more than one copy of each edition allowed ) please also let me know.

I hope we can now satisfy everyone who was disappointed by the very patchy coverage of subscribers that resulted from the 1981 attempt to service European subscribers directly from USA.

Remember the new address and telephone number for MIG(UK) is :

P.O. Box 52,  
Pinner,  
Middlesex. HA5 3FE  
UK.

Tel: 01 866 3816

There aren't any agreed procedures and deadlines (yep) for including European originating material in future editions, but if you have material you would like to publish please send it as soon as possible to the UK address. If for any reason I can't have it included in the next edition, the option is still there to produce further UK supplements.

From Wireless World.

Reproduced with Phillip Darrington's permission

## I.T. and M.I.S.S.

One of the aims of Information Technology Year and the Microelectronics Education Programme is to involve schoolchildren in the use of microcomputers and related electronic devices. There are the M.E.P., the Micros in Schools Scheme, exhibitions and events throughout the year and beyond. It is, perhaps, fortunate that Mr Callaghan happened to be watching television on the evening the programme "Now the Chips are Down" was broadcast and was spurred into action then, or we would probably find the propaganda even more frenetic than that now being put out by the energetic Mr Baker, the prophet of IT.

Information Technology is a curiously diffuse name for a Year. The official definition, "the acquisition, processing, storage, dissemination and use of vocal, pictorial, textual and numerical information by a microelectronics-based combination of computing and telecommunications" appears to encompass most of the activities of the average person, except eating and one or two other processes, although the use of a computer is not often considered essential to the more basic of these.

So far as its involvement of schoolchildren is concerned, the publicity is decidedly shrill, the Minister's aim being to have a computer in every secondary school by the end of the year and even to think about providing them for primary schools.

There can be no argument that young people must be aware of computers and how to use them, but it does seem possible that the present blaze of publicity tends to obscure the point that computers are a means, not an end. There is also the question of how the micros are to be used in schools.

According to the fifth edition of the Concise Oxford Dictionary (now, admittedly, modified), a computer is "a calculator - an electronic calculating machine" - an unfortunate description, taken too literally by at least some of those responsible for introducing youngsters to

computing, with the result that the school micro is often given to the senior maths teacher to guard with his life, presumably on the grounds that computers are electronically mathematical and possess no relevance to any other subject.

In other schools, the computer is treated as a kind of totem, and the pupils are taught "Computer Studies". As a subject, computing (meaning programming) is a singularly empty one, unless the pupil learning it intends to become a programmer. A computer is an aid to the process in which it is used - in this instance, learning - and an element of transparency to the user rather than an obscuring of the subject by undue attention to the computer must be the aim.

Clearly, an overnight transformation, after which every teacher would be using a micro as to the manner born, is hardly feasible. But, until the school micro (or one of its terminals or even a micro owned by a pupil or teacher) can be used naturally, as is a dictionary or pocket calculator or a video recorder, it will dominate the learning process. Utmost priority should be given to teachers from all disciplines, from home economics to athletics, to use the computer as an aid, rather than as a distraction, so that pupils who are not to specialize in science or engineering can see that it is of advantage to them to be at ease with computers, but no more than that.

The Inner London Education Authority is aware of these problems and is educating teachers in the use of computers so that, even though there may be only one micro or terminal in the classroom, the pupils will learn the place of a computer by, to use ILEA's word, "osmosis". However, there is evidence aplenty that education authorities in other areas are either hypnotized or revolted by the new equipment and, accordingly, either enshrine it or pass it to the school computer fanatic to impress people with.

In short, a computer is a useful tool, but that is all it is: it can help or it can dangerously hinder learning, and only the education of teachers in its natural use as an aid can decide which.

# ProPascal

is a native-code Pascal compiler for Z80-based microcomputers. It is designed to run under CP/M or CDOS, in a memory area of at least 48K RAM. The minimum disc storage required is two 120K drives.

Pro Pascal was produced by Prospero Software of London, England, and released in October 1981. The range of machines on which it is currently running includes:—

Apple + Softcard, Clenlo Conqueror, Comart Communicator, Cromemco, Digico Prince, Feltron Compulady, Gemini, Hewlett-Packard 125, Kontron Psi-80, Nascom 3, NEC PC8000, North Star Horizon & Advantage, Pet + Softbox, RML 380Z, Sharp MZ80B, Superbrain, TeleVideo, Vector MZ, Xerox 820, Zilog MCZ

Pro Pascal is a complete implementation of the recently published BSI/ISO Standard for Pascal, with just two restrictions: conformant array parameters are not included, and files may not be defined within structured- or pointer-types. A number of important extensions have been added to the language, making Pro Pascal suitable for a wide range of applications in the professional, business, scientific or educational sectors.

## Standard features

### Data types:

integer	range -2147483647 to +2147483647 (4 bytes)
real	7-digit precision, range E -38 to E +38 (4 bytes)
char	ASCII 128-character set (1 byte)
boolean	false, true (1 byte)
enumerated	up to 256 constants (1 byte)
subranges	including 1- and 2-byte integers
arrays	any number of dimensions
records	including variant records
sets	up to 128 elements (16 bytes)
pointers	(2 bytes)
files	text and non-text

### Statements:

assignment  
procedure call  
GOTO (including jumps out of blocks)  
compound (BEGIN ... END)  
IF ... THEN ... ELSE ...  
CASE  
REPEAT ... UNTIL ...  
WHILE ... DO ...  
FOR ... TO/DOWNTO ... DO ...  
WITH ... DO ...

### Operators:

arithmetic	+ - * / DIV MOD
logical	AND OR NOT
comparison	< = > <= <> >=
set	+ - * IN [...]

### Procedures and functions:

procedure/function declarations (fully recursive)  
value, VAR, procedural and functional parameters

### Standard procedures

reset, rewrite, get, put  
read, readln, write, writeln, page  
new, dispose, pack, unpack

### Standard functions:

abs, sqr, trunc, round, ord, chr  
pred, succ, odd, eof, eoln  
sin, cos, exp, ln, sqrt, arctan

## Extensions

### Data types:

string[n]	dynamic-length strings (1 to 255 bytes)
longreal	16-digit precision, range E -308 to E +308 (8 bytes)

### Statements:

CASE ... OTHERWISE

### Additional procedures:

delete, insert, str (string handling)  
assign, close, erase (CP/M file interface)  
update, seek (random-access file handling)  
chain, putcomm, getcomm (program chaining)  
move (assignment without type checking)

### Additional functions:

concat, copy, length, pos (string handling)  
fstat (does this CP/M file exist?)  
cstat (has a key been pressed?)  
memavail (how much dynamic storage left?)  
rand (random number generator)

### Separate compilation:

SEGMENT (as well as PROGRAM)  
COMMON (as well as VAR)  
EXTERNAL (as well as FORWARD)

### Lexical enhancements:

Source file inserts ({\$ I filename})  
Identifiers containing underscore (\_\_\_)  
Hex constants (e.g. 01FFH)  
Longreal constants (e.g. 1.0D0)

### Trademarks

Advantage, North Star: North Star Computers  
Apple: Apple Computer  
CDOS, Cromemco: Cromemco  
CP/M: Digital Research  
Pet: Commodore Business Machines  
Softcard: Microsoft Consumer Products  
Superbrain: Intertec Data Systems  
TeleVideo: TeleVideo Systems  
Z80: Zilog Corporation

Date :

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Pascal - an effective language Standard

B A Wichmann, 6/5/82

Article formed the basis of piece in  
Computer Weekly by Philip Hunter, 11th Feb 1982, page 14

Mr Nick Hughes  
Pascal Users Group (UK)  
Shetlandtel  
Wall  
Shetland SE2 9PF

Your reference

Our reference

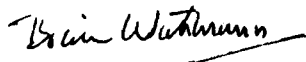
Date 13 May 1982

Dear Nick

Congratulations for getting PUG(UK) off the ground again. I enclose a contribution, labels for those having enquired about the Pascal validation suite, and a notice about the Standard. Could you ask PUG to change their policy statement on the back cover to refer to ISO 7135 rather than Jensen and Wirth?

Concerning the question of the transmission of Pascal via the CET telesoftware system, I now understand that this is possible.

Yours sincerely



BRIAN WICHMANN

ENC

Over the last few years, the programming language Pascal has grown in popularity very greatly. It is widely used for teaching in Universities, is available on most micro-processors and main-frames as well. In fact, Pascal is one of the few languages that form a bridge between microprocessor systems and the main-frame world.

Until recently, there has been one drawback to Pascal as a general purpose software tool. The definition of the language was not very precise and in consequence, the portability of Pascal programs was problematic. The British Standards Institution(BSI) set up a group under Dr Tony Addyman to produce a standard definition of the language. This was later superseded by an ISO group also under Tony Addyman. Last October, ISO agreed to the standardization of Pascal, and after editorial work on the document, BSI published the Standard in February of this year (BS 6192).

What does this mean for users of Pascal? The portability of Pascal programs should be much improved provided suppliers implement the Standard and users write their programs to conform to the Standard. One might think that the position with Pascal is no different from that of COBOL or FORTRAN and yet portability problems arise with these languages. There are several reasons for believing that Pascal is different:

1. The Pascal standard is more comprehensive than that of COBOL or FORTRAN. For instance, the COBOL and FORTRAN standards do not require that an invalid program is rejected by a compiler. The Standard for these languages is just a definition of a language rather than a set of requirements for a compiler. This is clearly not very satisfactory since we all write incorrect programs on occasions.
2. The Pascal Standard is simple and devoid of a multitude of options. If the language has lots of options, then program portability is reduced because a program may not be valid without a specific option. COBOL has a large number of options and FORTRAN 77 has two major levels (essentially distinct languages) whereas Standard Pascal has just one option, affecting only one part of the language. This option is to allow procedures to handle arrays whose size varies from call to call. This option, level 1 Pascal, would allow Pascal programs to call FORTRAN routines in many systems.
3. The Pascal test suite is more searching than that of COBOL and FORTRAN. This is essentially a consequence of the definition of the language. The National Physical Laboratory has been collaborating with the University of Tasmania on the construction of this suite for over two years. About 400 copies of the test suite have been sold worldwide. A new version of this suite has recently been issued to correspond to the new ISO Standard. Unlike the COBOL and FORTRAN test suites, the one for Pascal includes incorrect programs which must be rejected: ones to examine the error-handling capability of a compiler, and the "quality" of an implementation. The quality tests indicate if there is any small limit to the complexity of

programs that a system can handle and also assesses the accuracy of real arithmetic.

All the major components to make Pascal a good Standard are now available, that is, a Standard definition and tests to verify conformance of a compiler to the Standard.

A Standard and tests to check conformance to the Standard are not alone quite sufficient. The test procedures must be used and results made known to those using Pascal compilers. This can be achieved by independent testing of compilers which is currently being investigated by BSI (Hemel Hempstead). BSI have a wealth of experience with testing other goods but this is their first venture into computer software. For this reason, both NPL and NCC are assisting BSI in this important development.

The last step in this process is to encourage users to request a Standard compiler from the suppliers and for suppliers to meet that demand. As a contribution to this last step, NPL held a conference on this topic with its collaborators. Professor Arthur Sale from the University of Tasmania addressed the conference making it an international event. The other key speakers were John Charter from BSI who described how a validation service run by BSI would work, Professor Jim Welsh from UMIST who described how the Standard can be implemented and Lyndon Morgan from NCC who described a guide written to support the test procedures. Also Barry Byrne, from ICL explained how the provision of a standard compiler for Pascal is advantageous in both marketing and for internal use. Mr Ken Thompson from the European Commission explained the usefulness of international standards within the Community and some of the problems in their effective exploitation.

This program contains five errors, often undetected by compilers. Can you spot them?

```
program test;
const
  nil = '0';
begin
  if nil # '0' then
    writeln( 'WRONG', +nil, .123)
  else
    writeln( 'RIGHT' )
end.
```

Try it on your system and see how many errors are detected.

- Errors
1. program must contain output as parameter.
  2. nil cannot be used as an identifier (it is a reserved word).
  3. # is written as < > (not equals).
  4. nil cannot follow a sign.
  5. a decimal point must follow a digit.

The corrected program is:

```
program test(output);
const
  nil = '0';
begin
  if nil <> '0' then
    writeln( 'WRONG', nil, 0.123)
  else
    writeln( 'RIGHT' )
end.
```

Although this test is only an illustration, it does show the wide ranging capabilities of current compilers. The results of compilers tested so far can be summarised thus:

Compiler	Errors detected	Accuracy of error messages	Recovery from last error
A	4	3	4
B	2.5	2	3
C	2	2	2
D	1	2	1
E	2.5	3	2
F	3.5	3	3
G	4.5	4	3
H	5	4	4
I	3.5	1	2

All the marks are out of 5. The half marked for detecting an error indicates that the error message was confusing enough for it to be unclear if the error was properly detected. Naturally, the last two columns are subjective.

by

DAVID BLYTH, Standardisation Office,  
National Computing Centre

## 1 Introduction

Few Pascal users can be unaware of the recent publication of the British Standard for the language which will shortly be adopted internationally. Many users have heard of the suite of validation programs, developed by the University of Tasmania and the National Physical Laboratory, which can be used to check on the standard-conformance of an implementation. This suite is readily available and any user who has a copy can use it to test his own compiler or interpreter. For those brave users who undertake such testing this article presents a brief guide to the steps involved and draws upon experience gained at NCC in a joint NPL/NCC/BSI project to develop and document the validation procedures.

## 2 The Pascal Standard and Validation Suite

The Pascal standard defines the language itself and the manner in which Pascal programs are to be handled by an implementation. The validation suite contains over 400 test programs whose purpose is to check whether or not an implementation accepts the language as defined in the standard and whether or not programs which are accepted behave as the standard says they should. The standard and the validation suite have been developed in parallel with the result that the suite will provide an exceptionally strenuous test of any implementation. An implementation which performs well under test can be used with confidence in its conformance and reliability.

The suite contains eight types of test program which investigate respectively, conformance, deviance, implementation-defined features, implementation-dependent features, error handling conformance arrays, quality and extensions. These classes of tests are quite distinct and are used in characteristic ways.

### 2.1 Conformance Tests

Conformance test programs attempt to check that an implementation provides those features required by the standard and that it does so in the manner which the standard specifies. These programs are all correct standard Pascal. If the implementation conforms to the standard these programs all compile and execute. If a conformance test program fails then it is an indication that the implementation does not conform to the standard.

### 2.2 Deviance Tests

Deviance test programs check whether

- (i) the implementation provides an extension of Pascal;

- (ii) the implementation fails to check or limit in an appropriate manner some feature of Pascal;
- (iii) the implementation incorporates some common error.

No deviance test program is standard Pascal. Each such program contains exactly one such deviation. When a deviance test is run the results are inspected for evidence that the implementation does in fact detect the deviation. If it does not then the implementation does not conform with the standard.

### 2.3 Implementation-Defined Features

The standard defines an implementation-defined feature as one which may differ between implementations but which is defined for any particular processor. A conforming implementation must be accompanied by a document that provides a definition of all its implementation-defined features. The test programs for implementation-defined features are intended to show how these features are handled in any particular implementation. If they aren't handled in the manner claimed then the implementation does not conform.

### 2.4 Implementation-Dependent Features

An implementation-dependent feature may differ between implementations and is not necessarily defined for any particular implementation. Here the implementor can either state in his documentation that use of such features is not reported or else have the implementation issue some diagnostic for which such a use is encountered. The test programs in this area are designed to determine the behaviour of the implementation. The implementation conforms only if it behaves as claimed or reports implementation-dependent usages.

### 2.5 Error-Handling

An error is defined, in section 3.1 of the standard, to be a violation by a program of the requirements of the standard that the implementation is not obliged to detect. An implementation only fails to conform in respect of error-handling if it fails to process an error in the manner claimed in the documentation. The error-handling tests each present the implementation with one error with the aim of determining exactly what the implementation does with it.

### 2.6 Conformance Arrays

An implementation may conform with the standard at level-0 or at level-1. In plain terms it can either have conformance arrays or it can't. If conformance arrays are provided then all of the features specified for them must be provided according to the standard.



The conformant array tests are a collection of conformance, deviance, implementation-defined, implementation-dependent, error-handling and quality tests designed to test the conformant array features in isolation.

## 2.7 Quality

Many aspects of an implementation are beyond the scope of the standard, but it is still useful to investigate them. Quality tests explore these areas and investigate:

- (i) the limits on the size and complexity of programs imposed by the implementation
- (ii) the amount of store needed to perform certain well-defined tasks
- (iii) the accuracy of real arithmetic
- (iv) the meaningfulness of diagnostics for common types of error
- (v) the speed of the code produced.

Quality tests often throw up some surprising results!

## 2.8 Extensions

Many implementations offer extensions to the standard. The extension tests see whether common extensions (eg those approved by PUG) are implemented.

Together the test programs provide a very thorough test of an implementation.

## 3 Using the Validation Suite

### 3.1 Distribution Format

The validation suite is distributed on 9 track magnetic tape with characteristics as follows:

Recording density : 800 or 1600 bpi  
Recording mode : NRZI or PE  
Character code : ISO 646 or EBCDIC  
1200 bytes/block, 80 characters/record.

A purchaser of the tape can specify which density, recording mode and character code he wants.

There are 49 files on the tape. Three of these contain documentation. The rest contain the validation programs.

### 3.2 Media Conversion

Users whose machines have tape drives should experience no significant problems in reading the distribution tape. Their only concern will be with lexical conversion if necessary.

Users with floppy disc based systems need to do a media transcription to get the suite in a form in which they can use it. This conversion can be tricky, and is almost always done on an ad hoc basis for the particular system concerned.

### 3.3 Lexical Conversion

There are two character sets to consider when using the suite - the one used to encode the test programs, and the one used to represent "char-type" values on the target computer.

Roughly speaking any consistent set of lexical substitutions can be made, but some may render specific lexical test programs, and some programs which test the char type, irrelevant in validation.

Care is needed to ensure that lexical conversion is consistent throughout. This is particularly important if media conversion affects character code representations.

### 3.4 Integrity Checking

Following media and lexical conversion it is advisable to check that no corruption has occurred. For this purpose a program called the Checktext program is supplied. It produces a 96-bit binary check pattern using an algorithm originally developed for use in data transmission (CCITT Rec. V.41)

The Checktext program operates on a standardised internal representation of the program and will not be affected by legal lexical substitutions. Certain parts of the program may need customisation for use on particular systems and the source code is marked to show where such changes should be made.

The results of the Checktext program should be compared with standard results contained in the User Guide to the suite (supplied with the distribution tape) and if there is any discrepancy then transcription has introduced errors.

### 3.5 Checking Validation Suite Assumptions

A validation suite must necessarily make certain assumptions about the nature of the implementations which it will be used to test. The Pascal validation suite assumes that

- \* text files
- \* character-strings
- \* the real-type
- \* local files

are all implemented, also that

- \* lines up to 72 characters long can be accepted
- \* lines up to 72 characters long may be output
- \* the value of maxint is  $> 32,000$
- \* the relative precision for reals is  $< 0.001$
- \* the characters need to encode the test programs are all accepted as distinct by the implementation
- \* the "largest" procedure in the test suite is accepted by the implementation (except for certain quality test procedures).

A further implicit assumption is that the real arithmetic system is susceptible to investigation by certain types of method.

The validation suite contains a program called the "Check Assumptions" program which enables the user to determine whether or not the implementation violates any of the assumptions listed above.

## 4 Planning and Running the Tests

### 4.1 Planning is Important

Testing an implementation is not just a matter of running all the test programs. The test suite is large and on some machines it is not possible to run all the tests without breaking the suite into batches. Further more close attention must be paid to ensure that the behaviour of the implementation is accurately recorded throughout the test procedure. Finally provision must be made to make it easy to re-run any particular test after preliminary interpretation of test results.

Choice of the method of working can have a marked effect on the overall time taken to run the tests. There are two areas to consider. First some method must be chosen to extract test programs from the files which contain them. Second the organisation of the jobs which run the test programs must be decided. The User Guide illustrates three approaches for each of these methods which will cover most cases on a wide range of machines.

Some programs may prove to be rogues on certain implementations. There is no way of knowing in advance which programs will behave in this way for any given implementation. The user should take care so that such programs do not cause the loss of accumulated test results.

In any event some programs will need re-running because the results on the first run may have been inconclusive. The circumstances in which a re-run is needed are given in the Guide.

## 5 Reporting Results

It is desirable to adhere to a standard form of presentation when reporting the results of a validation. This offers two main advantages.

First, when a formal validation is being done, a standardised format reduces the risk of hidden bias and provides a concise statement of how an implementation has performed under test.

Second the user community can more closely monitor the extent of conformance with the standard.

The Guide specifies ten section headings for the standardised report:

- 1 Processor Identification
- 2 Test Conditions
- 3 Conformance Test Results
- 4 Deviance Test Results
- 5 Error-Handling Test Results
- 6 Implementation Defined Test Results
- 7 Implementation-Dependent Test Results
- 8 Level 1 Test Results
- 9 Quality Test Results
- 10 Extension Test Results

Guidance on the content and presentation of these sections is included and a sample validation report is included as an Appendix.

## 6 Practical Use

The present article offers only a brief sketch of the validation procedure. At first sight it may look somewhat daunting. In practice the key is attention to detail. The User Guide gives fairly detailed advice on transcription and test job organisation, and will be found helpful by most people undertaking tests of implementations. Once transcription and organisation have been sorted out the tests usually run smoothly. Carrying out a full test is a rewarding exercise which offers many lessons to language implementors. It is hoped that users and implementors alike will use the test suite and help to promote rapid practical standardisation of Pascal.

Tel. 0602-56101 Ext. 3187

BLIND MOBILITY RESEARCH UNIT

University Park,  
Nottingham.  
NG7 2RD.

26th. April 1982.

Dear Nick,

Please find enclosed an up to date version of my Pascal Bibliography. Naturally I would not expect any of the readers of Pascal News to have enough spare time to type up these programs so I will gladly let them have tapes in return for postage and administrative costs.

Finally as a self taught programmer I would appreciate comments from readers particularly if anyone finds an example of where I have failed to make use of the facilities available within the language.

THE UNIVERSITY OF NOTTINGHAM

BLIND MOBILITY RESEARCH UNIT

Programme Leader  
Professor C. I. HOWARTH



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Extension 3187

A Pascal Bibliography.

by Tony Heyes  
Blind Mobility Research Unit,  
Department of Psychology,  
University of Nottingham.  
England.

Introduction.

The Pascal Bibliography is a package of programs written in standard Pascal and should therefore be easily transported. It enables users to store references and to retrieve them either by AUTHOR name or by KEYWORD; or logical combinations of AUTHORS and KEYWORDS. The bibliography is designed for human use; it uses very explicit prompts.

Design Philosophy.

The bibliography consists of a collection of ITEMS. Each ITEM takes the form of :-

One line devoted to AUTHOR or ADDRESSEE names.  
Two lines devoted to TITLE or ADDRESS.  
Two lines devoted to LOCATION.  
DATE ITEM NUMBER.  
Two lines devoted to KEYWORDS.

For example:-

HEYES A.D., FERRIS A.J., ORLOWSKI R.J.  
COMPARISON BETWEEN TWO METHODS OF RESPONSE FOR  
AUDITORY LOCALISATION IN THE AZIMUTH PLANE.  
J. ACOST. SOC. AMER., 58; 1336-1339

1975 260  
DEAFNESS, LOCALISATION, AUDITORY DISPLAYS  
STEREOPHONIC SOUNDS, KINAESTHESIS

If ITEMS are addresses the convention is to store the address on the two lines of title.

*Dear Nick,*  
*Please find enclosed both Bibout.p and*  
*Bibupdate.p with mark and release changed to*  
*(\*mark \*) and (\*release \*) and with display*  
*introduced. It was trickier than I expected*  
*With best wishes,*

*Tony Heyes.*

For example:-

BLOGGS J.B.  
Mr.J.B.Bloggs,\13 Fishpond Rd.,\Beeston,  
Nottingham.\NG7 2RD.\U.K.  
Tel 0602-251234

1980                    27  
ADDRESS,CIRCULATION LIST,XMAS CARD

Note the use of the backslash (\) to indicate the start of a new line. Note also that additional information such as the telephone number can be stored on the location lines. Note, finally, the date has little meaning in this context.

Items may be located by running the program "bibout".

Items may be APPENDED or CHANGED by running the program "bibin".

Both programs are well supplied with prompts and are very simple to use.

Since additions and changes require that the current DICTIONARY be recompiled and this takes time, the actual changes take place during the night. The instructions to implement the changes reside in a PENDING TRAY until the night time run. The user will remain unaware of this slight restriction unless he tries to locate an ITEM during the day on which the ITEM was loaded.

#### Method of Use.

The following assumes the use of the UNIX operating system. Login with your user name, give your password, respond to the first system prompt "t" with "cd bib", ie. change directory to "bib". In answer to the next system prompt, "t", you may select any one of the programs from within the package. These are :-

- a) "bibin"                    to enter new items or to change an ITEM.
- b) "bibout"                  to search the bibliography for an ITEM.
- c) "outdict"                to produce a hard copy of the current DICTIONARY.
- d) "cat scratch !lpr"      to output a hard copy of the SCRATCH FILE.

NEW USERS SHOULD ASK IF THEY MAY HAVE ACCESS TO AN ESTABLISHED BIBLIOGRAPHY AND THEN TRY USING "bibout" TO LOCATE ITEMS OF INTEREST.

To logout respond to the system prompt "t" by typing "control z".

#### The Programs.

- a) "bibin"  
The opening prompt allows the selection of one of the following options :-

#### APPEND

The prompts should be sufficiently explicit, but note :-

- (1) Authors and keywords should be separated by commas. Since they are used in the dictionary they should not spill over the end of a line. They can be any 'length but only the first 20 characters are significant.
- (2) The terminal will probably be set to produce lower case letters. The program will automatically convert them to upper case. If you wish to override this, begin each line of text with a backslash (\).
- (3) The date must be a single integer e.g. 1980.
- (4) If addresses are to be stored use the two title lines, close pack but indicate new lines with a backslash (\).
- (5) A personal local storage reference may be kept on the second location line. It should be enclosed in square brackets; e.g. [BM760] means that a copy of this ITEM is in the BM library, entry number 760.

#### CHANGE

Answer the prompts but please take note of the following:-

- 1) You must know in advance the ITEM number of the ITEMS you require to change.
- 2) You have to retrieve the ITEMS from the bibliography so CHANGE is relatively slow; be patient. It saves time, if you are changing more than one ITEM to make the changes in numerical order of ITEM number.
- 3) You retrieve the ITEM to be changed from the bibliography, the changed ITEM goes into the PENDING TRAY. If you change the same ITEM more than once in a single day only the last version will survive.

#### SPECIAL FACILITY

This option moves the contents of the SCRATCH file into the PENDING tray. It can be used for moving ITEMS from one bibliography to another. Since SCRATCH is a text file, ITEMS may be changed using an editor and then loaded back into the PENDING tray. (Clever stuff!!).

b) "bibout"

The computer will count the ITEMS in the bibliography and then offer the option of producing a HARD COPY of the dictionary or doing a SEARCH for ITEMS.

SEARCH

You may either search by NUMBER or, more usually by using the DICTIONARY.

You may opt to send the results either to the TERMINAL or to the SCRATCH FILE for subsequent printing.

SEARCH by NUMBER

The search is terminated by asking to search for item number zero [0].

A block of ITEMS may be searched for by asking to search for item number minus one [-1]. You will then be asked for the lowest and the highest item numbers of the block.

SEARCH by DICTIONARY

You will be asked for a word i.e. an AUTHOR name or a KEYWORD. The computer will look this up in the DICTIONARY and list the ITEM numbers of all ITEMS containing this word in their AUTHOR or KEYWORD string. If you are doing a single word search answer the next prompt with a full stop [.] and then the instruction to LOOK UP. If, however, it is a multiple word search give the next word. Once again the corresponding ITEM number list will be printed out.

The answer to the prompt "AND, OR, or NOT" enables you to combine the current ITEM number list with the previous ITEM number list. For instance:-

AND Only numbers present in both lists are retained.

OR All numbers from both lists are retained.

NOT Numbers present in the current list are deleted from the previous list.

A new current list is printed out showing the results of the selection. The search sequence may be continued for any number of logical combinations of words. At any time a search for the ITEMS in the current list may be initiated by giving a full stop [.] After which you may either LOOK UP the selected ITEMS or, if you have made a mistake in your list combinations simply RESTART. There is one special word, namely \*\*\*, this word will match all the dictionary.

c) "outdict"

No prompts and no option, simply type "outdict" in answer to the system prompt "\*" to obtain a hard copy of the current DICTIONARY.

Note, you must have first prepared a copy of the DICTIONARY by running the appropriate HARD COPY option of "bibout".

d) "opr scratch"

This program is run to obtain the printed output from "bibout", provided the option had been chosen to send the output to the SCRATCH FILE.

No prompts and no options, simply type "opr scratch" in answer to the system prompt "\*" to obtain a hard copy of the contents of the SCRATCH FILE.

N.B. If you would like to list the SCRATCH FILE to the terminal to check the contents then run "cat scratch".

Acknowledgements.

I gratefully acknowledge the encouragement and support I have received from Roger Henry and Chris Blunsdon.

The bibliography was originally intended for use by the members of the BLIND MOBILITY RESEARCH UNIT it is however available to any members of the Pascal Users Group. Would anyone wishing to take up this offer please contact Tony Heyes to arrange medium of transportation.

**NOTES FOR IMPLEMENTORS**

The following notes outline the steps the implementer should take in order to establish a new bibliography. After this groundwork, the user can use the shell commands **bibin**, **bibout**, and **outdict** to build and manipulate the bibliography.

1. The bibliography system requires 6 workfiles named b1 to b6. The recommended practice is for the user to devote a directory to the bibliography, say 'user/bib'. The workfiles can be created easily using the cat command. E.g

```
cat > b1      ^z
```

File b3 requires a link named scratch. This can be created by the command -

```
ln b3 scratch
```

2. b6 is used as a temporary scratch file during the overnight run. It grows to be as large as b1. If there is insufficient room on the user's disc b6 may be coerced on to another disc.

3. The bib directory must contain the following shell commands :-

```
bibin      Bibin.out b1 b2 b3 b4 b5
```

```
bibout     Bibout.out b1 b2 b3 b4 b5
```

```
bibupdate  Bibupdate.out b1 b2 b3 b4 b5 b6
```

```
outdict    (lpr b4;rm b4; >b4)&
```

4. Finally, an entry must be made in the UNIX table 'crontab' so that bibupdate will be executed during the night.

```
program Bibin(input,output,bank,dict,scratch,dlist,PendingTray);
(* To ADD, CHANGE or REMOVE items,
instructions left in a PendingTray file 'pending',
actual changes made by running "Bibupdate.p" *)
(* written by Tony Heyes, Blind Mobility Research Unit,
Department of Psychology, The University,
Nottingham, U.K. *)
```

```
label 10;
```

```
const   LineLn = 70;
        RowLn  = 20;
        HiTag  = 10000;
        NonDate = -1066;
```

```
type    string = packed array [1..LineLn] of char;
        item = record
            authors,title1,title2,
            place1,place2 : string;
            date          : integer;
            key1,key2     : string
        end;
        word = packed array [1..20] of char;
        row = array [1..RowLn] of integer;
        dic = record
            name      : word;
            numbers  : row;
            cont      : boolean
        end;
        TagItem = record
            tag : integer;
            entry : item
        end;
```

```
var     empty,entry : item;
        bank : file of item;
        PendingTray,TempPendingTray : file of TagItem;
        dlist,scratch : text;
        dict : file of dic;
        TagEntry : TagItem;
        ch,AppendOption,ChangeOption,MainOption,HelpOption,SpecialOption : char;
        chge : boolean;
        a,n,nn,count : integer;
```

```
procedure In1Char (var ch : char);
(* to read the first character of a word typed into the terminal *)
begin
    ch := input^;
    while not (ch in ['A'..'Z','a'..'z']) do
    begin (* skips along until first character found *)
        get(input);
        if eoln(input)
        then
            begin
```

```

        writeln;
        write('ERROR: character required .... ')
    end;
    ch := input^
end;
while not eoln(input) do (* skips over rest of line *)
    get(input);
end; (* of InlChar *)

procedure InlInt (var int : integer);
(* to read an integer and not cause a fatal error if a character is given *)
var ch : char;
    a,OrdZero : integer;
    NegFound : boolean;
begin
    repeat (* skips along until integer is found *)
        get(input);
        if eoln(input)
        then
            begin
                writeln;
                write('ERROR: digit required .... ')
            end;
            ch := input^
        until ch in ['-','+', '0'..'9'];
        if ch='- '
        then
            begin
                NegFound := true;
                get(input);
                ch := input^
            end
        else
            begin
                NegFound := false;
                if ch='+'
                then
                    begin
                        get(input);
                        ch := input^
                    end
                end;
            end;
        a := 0;
        OrdZero := ord('0');
        repeat
            a := 10*a+ord(ch)-OrdZero;
            get(input);
            ch := input^
        until not (ch in ['0'..'9']);
        while not eoln(input) do (* skips over rest of line *)
            get(input);
        if NegFound
        then
            int := -a

```

```

        else
            int := a
        end; (* of InlInt *)

procedure VDUinString(var str : string);
(* to input from terminal *)

var i,n : integer;
    ch : char;
    AllCaps : boolean;
begin
    n := 0;
    AllCaps := true;
    repeat
        n := n+1;
        read(ch);
        if (n=1) and (ch=' ')
        then
            n := 0;
        if (n=1) and (ch='\')
        then
            begin (* defeat automatic shift with '\' *)
                AllCaps := false;
                n := 0
            end;
        if n<>0
        then
            begin
                if AllCaps
                then
                    if ch in ['a'..'z']
                    then
                        ch := chr(ord(ch)-32);
                    str[n] := ch
                end;
            until eoln(input);
            for i:=n+1 to LineLn do
                str[i] := ' '
            end; (* of VDUinString *)

procedure ScratchInStr(var str : string);
(* input from file scratch *)
var n,i : integer;
    ch : char;
begin
    if not eof(scratch)
    then
        begin
            n := 0;
            repeat
                read(scratch,ch);
                until (ch=:) or (eof(scratch));
                while (not eoln(scratch)) do
                    begin

```

```

        read(scratch,ch);
        n := n+1;
        str[n] := ch;
    end;
    if n+1<=LineLn
    then
        for i:=n+1 to LineLn do
            str[i] := ' ';
        end
    end;
end; (* of ScratchInStr *)

function ScratchHoldsItems : boolean;
(* to inspect the SCRATCH FILE and check that ITEMS are complete *)
var count,LineNo : integer;
    FaultFound,HeadingError,NegFound : boolean;
procedure CheckLine;
var CharCount : integer;
    LineTooLong,BadLine : boolean;
begin
    LineNo := LineNo + 1;
    CharCount := 1;
    BadLine := false;
    LineTooLong := false;
    get(scratch);
    while (not eoln(scratch)) and (CharCount < LineLn + 9 ) do
        begin
            get(scratch);
            CharCount := CharCount + 1;
            if (CharCount = 9) and (scratch^ <> ':') then BadLine := true;
        end;
    if CharCount < 9 then BadLine := true;
    while not eoln(scratch) do
        begin
            get(scratch);
            if scratch^ <> ' ' then LineTooLong := true
        end;
    if BadLine then
        begin
            FaultFound := true;
            writeln('Line',LineNo : 4,' bad line ':' missing.')
        end;
    if LineTooLong then
        begin
            FaultFound := true;
            writeln('Line',LineNo : 4,' overflow.')
        end
    end; (* of CheckLine *)
begin
    LineNo := 0;
    HeadingError := false;
    FaultFound := false;
    NegFound := false;
    writeln;
    writeln('SCRATCH FILE CHECK in progress.');
```

```

    writeln;
    while not eof(scratch) and not HeadingError do
        begin
            repeat
                get(scratch);
                if not eof(scratch) then
                    if eoln(scratch) then LineNo := LineNo + 1
                until (eof(scratch)) or (scratch^ = '-');
                if scratch^ = '-' then NegFound := true;
                LineNo := LineNo + 1;
                if eof(scratch) then
                    begin
                        if not NegFound then (* no ITEMS present *)
                            begin
                                HeadingError := true;
                                writeln('SCRATCH does not contain ITEMS.')
                            end
                        end
                    else
                        begin
                            while not eoln(scratch) do get(scratch);
                            for count := 1 to 5 do CheckLine;
                            LineNo := LineNo + 1;
                            get(scratch);
                            while (not eoln(scratch)) and
                                not (scratch^ in ['1'..'9']) do get(scratch);
                            while (not eoln(scratch)) and
                                not (scratch^ = ' ') do get(scratch);
                            while (not eoln(scratch)) and
                                not (scratch^ in ['1'..'9']) do get(scratch);
                            if eoln(scratch) then
                                begin (* two numbers not present *)
                                    FaultFound := true;
                                    writeln('Line',LineNo : 4,' two integers not found.')
                                end
                            else
                                while not eoln(scratch) do get(scratch);
                                for count := 1 to 2 do CheckLine;
                            end.
                        end;
                    if FaultFound then
                        begin
                            writeln;
                            writeln('Errors in SCRATCH use editor to correct, then try again.')
                            writeln;
                            ScratchHoldsItems := false
                        end
                    end
                else if not HeadingError then ScratchHoldsItems := true;
                reset(scratch)
            end; (* of ScratchHoldsItems *)

        procedure empt; (* to empty an ITEM *)
        var NoChar : string;
            a : integer;
```



```

ch : char;
begin
  NoChar[1] := ' ';
  NoChar[2] := ' ';
  NoChar[3] := ' ';
  for a:=4 to LineLn do
    NoChar[a] := ' ';
  with empty do
    begin
      authors := NoChar;
      title1 := NoChar;
      title2 := NoChar;
      placel := NoChar;
      place2 := NoChar;
      date := NonDate;
      key1 := NoChar;
      key2 := NoChar;
    end;
  for a:=2 to 9 do
    begin
      case a of
        2: ch := ' ';
        3: ch := 'e';
        4: ch := 'm';
        5: ch := 'p';
        6: ch := 't';
        7: ch := 'y';
        8: ch := ' ';
        9: ch := ' ';
      end; (* of case *)
      empty.authors[a] := ch;
    end;
  end; (* of empty *)

procedure OutRecord(entry : item; n : integer);
(* to write to the terminal *)
var a : integer;
begin
  for a:=1 to 7 do
    write('-----I');
  writeln;
  with entry do
    begin
      writeln(authors);
      writeln(title1);
      writeln(title2);
      writeln(placel);
      writeln(place2);
      writeln(date:8, '      Item number :',n :5);
      writeln(key1);
      writeln(key2);
    end;
  end; (* of OutRecord *)

```

```

procedure GetReference(n : integer);
(* to count through bank to find an ITEM *)
begin
  if n<count
  then
    begin
      reset(bank);
      count := 1;
    end;
  while (count < n) and (not eof(bank)) do
    begin
      count := count+1;
      get(bank);
    end;
  if eof(bank)
  then
    begin
      writeln;
      writeln(' You have only got',count -1,' Items. ');
      writeln;
      goto 10;
    end;
  else
    OutRecord(bank^,n);
  end; (* of GetReference *)

procedure change(var entry : item; m : integer);
(* to change the mth. ITEM *)
var line : integer;
    DMOption,LineOption : char;
    str : string;
begin
  writeln;
  writeln;
  repeat
    write('Do you wish to DELETE or MODIFY .... ');
    InlChar(DMOption);
  until DMOption in ['D','d','H','h'];
  if DMOption in ['D','d']
  then
    begin
      empty;
      entry := empty;
    end;
  else
    begin
      writeln;
      writeln('You may REPLACE a line,');
      writeln('move to the NEXT line,');
      writeln('or SKIP to the end of the item. ');
      writeln;
      line := 0;
      repeat
        line := line+1;
      until

```

```

with entry do
  case line of
    1: str := authors;
    2: str := title1;
    3: str := title2;
    4: str := placel;
    5: str := place2;
    6: ;
    7: str := key1;
    8: str := key2
  end; (* of case *)
if line <> 6
then
  begin
    writeln;
    writeln(str);
    writeln(output);
    repeat
      write('REPLACE, NEXT line or SKIP to end .... ');
      InlChar(LineOption)
    until LineOption in ['R','r','N','n','S','s'];
    writeln;
    if LineOption in ['R','r']
    then
      begin
        writeln('Type replacement line :');
        writeln;
        VDUinString(str);
        with entry do
          case line of
            1: authors := str;
            2: title1 := str;
            3: title2 := str;
            4: placel := str;
            5: place2 := str;
            7: key1 := str;
            8: key2 := str
          end; (* of case *)
        end
      end
    else
      begin
        writeln('Date ', entry.date :4);
        writeln;
        repeat
          write('REPLACE, NEXT line or SKIP to end .... ');
          InlChar(LineOption)
        until LineOption in ['R','r','N','n','S','s'];
        if LineOption in ['R','r']
        then
          begin
            writeln('Type replacement date ');
            write(': ');
            InlInt(entry.date)
          end
        end
      end
    end
  end
end

```

```

end;
until ((line=8) or (LineOption in ['S','s']));
end;
writeln;
writeln('Modified item reads : ');
writeln;
OutRecord(entry,m);
writeln;
end; (* of change *)

begin (* MAIN PROGRAM *)
  count := HiTag;
  n := 1;
  reset(PendingTray);
  rewrite(TempPendingTray);
  while not eof(PendingTray) do
    begin (* copy down existing contents of file 'PendingTray' *)
      TempPendingTray^ := PendingTray^;
      put(TempPendingTray);
      get(PendingTray)
    end;
    rewrite(PendingTray);
    reset(TempPendingTray);
    while not eof(TempPendingTray) do
      begin (* copy back 'PendingTray' and count contents *)
        PendingTray^ := TempPendingTray^;
        put(PendingTray);
        get(TempPendingTray);
        n := n+1
      end;
      rewrite(TempPendingTray);
    end;
  repeat
    writeln;
    repeat
      write('Do you wish to APPEND, to CHANGE, ');
      writeln('to use the SPECIAL facility, ');
      write('or to FINISH .... ');
      InlChar(MainOption)
    until MainOption in ['A','a','C','c','S','s','F','f'];

    (* MainOption= S is a special facility,
    used for loading from 'scratch' to 'PendingTray' *)

    case MainOption of
      'A','a': (* TO APPEND *)
        begin
          writeln;
          repeat
            write('Do you need help [YES or NO] .... ');
            InlChar(HelpOption)
          until HelpOption in ['Y','y','N','n'];
          if HelpOption in ['Y','y']

```

```

        then
        begin
writeln;
writeln('NOTES. ');
write(' (a) Authors and keywords separated');
writeln(' by a comma ",." ');
write(' (b) To remove the automatic conversion to ');
writeln(' upper case letters');
write('     begin a line of text with');
writeln(' a backslash "\." ');
write(' (c) Date must be a single integer number');
writeln(' eg. 1980.' );
write(' (d) If addresses are to be entered use the two');
writeln(' title lines');
write('     close pack but indicate new');
writeln(' lines with a backslash "\." ');
write(' (e) A personal local storage reference');
writeln(' may be kept on the 2nd. location line');
write('     but should be enclosed in square brackets');
writeln(' for example: [BM360]. ');
        end;
    repeat
        writeln;
        writeln('New item:- ');
        writeln;
        for a:=1 to 7 do
            write('-----I');
        writeln;
        with entry do
            begin
writeln( 'Line of author names, or name of addressee :' );
VDUinString(authors);
writeln('First line of title or address :');
VDUinString(title1);
writeln('Second line of title or address :');
VDUinString(title2);
writeln('First line of reference location :');
VDUinString(placel);
writeln('Second line of reference location :');
VDUinString(place2);
writeln('Date - just the year - ');
InlInt(date);
writeln('First line of keywords :');
VDUinString(key1);
writeln('Second line of keywords :');
VDUinString(key2);
            end;
        writeln;
        OutRecord(entry,n);
        repeat
            writeln;
        repeat
            write( 'Do you wish to make a change [YES or NO] .... ');
            InlChar(ChangeOption)

```

```

        until ChangeOption in ['Y','y','N','n'];
        if ChangeOption in ['Y','y']
            then
                change(entry,n)
        until ChangeOption in ['N','n'];
        if entry.date <> NonDate
            then
                begin
                    TagEntry.tag := HiTag;
                    TagEntry.entry := entry;
                    PendingTray^ := TagEntry;
                    put(PendingTray);
                    n := n+1
                end
            else
                begin
                    writeln;
                    writeln('Item withdrawn. ');
                    writeln
                end;
            writeln;
            repeat
                write( 'Do you wish to append more items [YES or NO] .... ');
                InlChar(AppendOption)
                until AppendOption in ['Y','y','N','n'];
                until AppendOption in ['N','n']
            end; (* of Append option *)

        'C','c': (* TO CHANGE *)
            begin;
                writeln;
                repeat
                    write('Do you need help [YES or NO] .... ');
                    InlChar(HelpOption)
                until HelpOption in ['Y','y','N','n'];
                if HelpOption in ['Y','y']
                    then
                        begin
                            writeln( 'You MUST know the ITEM NUMBERS of the ITEMS you wish to change.' );
                            writeln( 'If you do not, leave this program and run "bibout" to find them.' );
                            writeln( 'Changes do not take place immediately, they stay in the PENDING' );
                            writeln( 'tray until the "update" program is run.' );
                            writeln( 'If an ITEM is changed more than once only the last version survives.' );
                        end;
                    repeat
                        10: writeln;
                        chge := false;
                        writeln('Type 0 if no ITEM needs changing, otherwise type');
                        write('the ITEM number... ');
                        InlInt(nn);
                        if nn<0
                            then
                                begin

```

