Pascal/1000

Configuration Guide

HEWLETT PACKARD

PRINTING HISTORY

The Printing History below identifies the Edition of this Manual and any Updates that are included. Periodically, Update packages are distributed which contain replacement pages to be merged into the manual, including an updated copy of this Printing History page. Also, the update may contain write-in instructions.

Each reprinting of this manual will incorporate all past Updates, however, no new information will be added. Thus, the reprinted copy will be identical in content to prior printings of the same edition with its user-inserted update information. New editions of this manual will contain new information, as well as all Updates.

To determine what manual edition and update is compatible with your current software revision code, refer to the appropriate Software Numbering Catalog, Software Product Catalog, or Diagnostic Configurator Manual.

Table of Contents

INTRODUCTION

Pascal/1000 is the Hewlett-Packard implementation of the proposed ANSI standard Pascal language. It fully implements the standard Pascal and extends the language to take advantage of the HP 1000 Computer System capabilities. The features and their usage are fully described in the Pascal/1000 Reference Manual.

HP 92832A is a product consisting of the Pascal/1000 software and a set of manuals. The software consists of the Pascal/1000 compiler, several programs, libraries, and files that facilitate loading and provide syntax error information.

The software is supplied in one of the following media.

    800 BPI Magnetic Tape
    1600 BPI Magnetic Tape
    Mini-Cassettes

The manual set consists of the following:

Pascal/1000 Configuration Guide 92832-90003	Describes resource requirement information, steps needed to load the software, and how to optimize the compiler performance.
Pascal/1000 Software Numbering Catalog 92832-90004	Describes the 92832A software media part numbers, the module names, module descriptions and the date codes. The applicable manuals for a particular software revision are also included.
Programming in Pascal 92832-90002	A tutorial manual for the beginning programmer, presenting the basic fundamentals of both structured programming and the HP Pascal/1000. However, this is NOT a precise description of the HP 92832A software.
Pascal/1000 Programmer's Reference 92832-90001	Provides a ready reference for the Pascal/1000 programmer. It describes the features and use of Pascal/1000.

Pascal/1000 COMPONENTS

Pascal/1000 consists of several programs, libraries, relocatable files, transfer files, loader command files, and information files.

Programs:

   a. PASCL - Pascal "Monitor" program (schedules the compiler, assembler, and cross referencer). PASCL has no segments.

   b. PCL   - Pascal compiler; main and 20 segments.

   c. PXREF - Pascal cross referencer (produces a cross-reference table for the main Pascal/1000 program and for each procedure and function in that program). Two versions of this program exist - an EMA and a non-EMA version. The EMA version can cross-reference very large source programs. This program has a main and two segments.

Libraries and Relocatables:

   a. $PLIB - Pascal Run-Time Library, with which the compiler and user programs are loaded.

   b. $SHSLB - short versions of the heap management routines.

   c. %TRACA, %TRACB, %TRACC - the three different trace packages, used when the program is compiled with the TRACE option.

   d. %PRERS - short version of the run-time error message handler.

   e. %..GER - segment-loading module used with second copies of segmented programs.

Transfer, Loader Command, and Information Files:

a. *LOAD — loads PASCL, PCL, and non-EMA PXREF
b. *LDPAS — load PASCL
c. #PASCL — PASCL loader command file
d. *PCLM — loads PCL and segments on an M or E Series CPU
e. #PCLM — loader command file for *PCLM
f. *PCLF — loads PCL and segments on an F Series CPU
g. #PCLF — loader command file for *PCLF
h. *OFPCL — removes PCL and segments (OF)
i. *PUPCL — purges PCL and segments (PU)
j. *SPPCL — saves PCL and segments (SP)
k. *LDXF1 — loads non-EMA version of PXREF
l. #XREF1 — PXREF (non-EMA version) loader command file
m. *LDXF2 — loads EMA version of PXREF
n. #XREF2 — PXREF (EMA version) loader command file
o. *OFXRF — removes non-EMA version of PXREF (OF)
p. *SPXRF — saves non-EMA version of PXREF (SP)
q. *PUXRF — purges non-EMA version of PXREF (PU)
r. "PERRS — Pascal syntax error file
s. **PSG — Merge file for %PSG
t. **MSC — Merge file for %MSC
u. *UNL.C — Unload cassettes
v. *UNL.T — Unload tape

SUMMARY OF RESOURCE REQUIREMENTS

The resources required in order to run the Pascal/1000 compiler, its generated code, and the cross referencer are summarized below. Also given are the recommended resources for optimum Pascal/1000 operation.

HARDWARE REQUIREMENTS

Compiler:

HP 1000 M, E, or F Series.

code, Xref:

HP 1000 M, E, F, or L Series.

SOFTWARE REQUIREMENTS

Compiler:

RTE-IVB Operating System, 1926 and later versions
T5IDM (utility to manage Type 5 ID segments)
$CLIB (Compiler Library), 1926 and later versions
ASMB (assembler), 2013 and later versions

Xref:

RTE-IVB Operating System
T5IDM required to manage Type 5 ID segments

code:

RTE-IVB (2013 or later) or RTE-L Operating System
T5IDM (for segmented programs only)

FIRMWARE REQUIREMENTS

No firmware is required, but the following routines, if microcoded, will significantly improve the performance of the compiler, the cross referencer, and the generated code. In addition, the size of loaded programs will be smaller with the microcoded versions of the instructions.

Extended Instruction Group
Fast FORTRAN Instructions
Double Integer Instructions
EMA Access Routines

4

MEMORY REQUIREMENTS

Monitor:

17 pages (KW) at least

Compiler:

EMA partition size: 41 pages are required (42 pages for the M/E series computers); compilation speed increases with the partition size, up to a maximum size of 240-page.

Logical address space: 28 pages for an M or E Series.   27 pages for an F-Series computer with micro-coded FFP, floating point and double integer instructions, and EMA access routines).

Xref:

Heap 1 version: 21- to 29-page large background partition (more memory for cross-referencing large programs).

Heap 2 version: EMA partition. (The larger the partition, the larger the program that can be cross-referenced.)

code:

Heap 1 programs: 3- to 29-page partition depending on the program size and heap/stack space require-ments.

Heap 2 programs: any size EMA partition greater than 30 pages depending on program size and heap/ stack space requirements

DISC REQUIREMENTS

(Assuming 96 sectors/track)

(monitor) 3 tracks from the system or auxiliary disc

(compiler) 38 tracks from the system or auxiliary disc

(Xref) 5 tracks from the system or auxiliary disc

GENERATION CONSIDERATIONS

Pascal/1000 can be loaded on-line and used without regenerating your system, providing the resource requirements are met. However, you may want to optimize its operation. In this case, the following items should be considered.

* Only $PLIB can be generated into the system. (The compiler, monitor, and cross referencer must be loaded on-line.)

* If your system has the firmware, the following routines can be generated into the system for better performance: FFP, Floating Point, and Double Integer Instructions, and EMA Access routines.

* The Background Memory lock option must be on (YES in the answer file). This allows the compiler to lock itself into memory during compilation.

* You should have at least one ID extension generated into your system. Each copy of the compiler or any other EMA program requires one.

GETTING YOUR SYSTEM READY FOR Pascal/1000

Before loading Pascal on your system, you should check to make sure that the following steps have been done:

a. To load the compiler, you will need at least 38 contiguous tracks from the system track pool. If you intend to SP the compiler after loading it, there should be at least 38 free tracks either on LU 2 or on LU 3 for the compiler. In addition, there should be 3 contiguous tracks for PASCL and 5 tracks for PXREF on either LU.

b. Make sure there is an EMA partition in your system in which the compiler can run. It should be at least 41 pages in size (42 for M or E series computers), but the compiler will run much faster in a larger partition (refer to the PERFORMANCE TUNING section for details).

c. Your system must be configured such that you have a logical partition size of at least:

    28 pages (KW)   for an M or E Series CPU
    27 pages (KW)   for an F Series with microcode

d. Since segments are loaded via T5IDM, there should also be a small partition in which this program can run while the compiler is running in the EMA partition.

e. You may also want to make the microcoded versions of some routines available for use by the compiler and user programs, either by generating them into your system, or by creating RP files to be used at load time. Of particular importance to the compiler are the following: .ENTR and the EMA access routines .EMAP, MMAP, and .EMAST word and byte moves and compares, and double integer instructions.

f. The next step is to install the release tape (or cassettes) to a disc cartridge. Some of the files need only be accessed by the system manager in order to load, SP, etc. the various programs. Other files will need to be made available to Pascal users as well, and should be placed on a cartridge accessible by anyone programming in Pascal. It is often desirable to generate the run-time library, $PLIB, into your system to facilitate the loading of user programs. The transfer file *UNL.T provided can be used to store your software from magnetic tape to disc and the transfer file *UNL.C can be used to store the Pascal software from cassettes to disc. Both *UNL.C and *UNL.T include two merge operations that rejoin the relocatables %PSG and %MSC.

    Files that need to be available to Pascal users:

            $PLIB (if not generated into the system)
            "PERRS
            $SHSLB
            %TRACA
            %TRACB
            %TRACC
            %PRERS
            %..GER

LOADING Pascal

Once you have all the files installed on a cartridge, you will probably need to edit several command files to make some or all of the following changes:

a. As a means of protection, all file references in the loader command files have been suffixed with the cartridge reference "RL". If your cartridge is named PS, for example, you may use the editor to change all occurrences of "::RL" to "::PS" in the files #PASCL, #PCLM, #PCLF, #XREF1, #XREF2, and *LOAD.

b. The transfer file *LOAD transfers to the file *PCLM to load the compiler into a 28-page partition on an M or E Series computer, or an F without microcode. If you have an F Series with microcoded EMA, double integer, floating point, word and byte move and compare instructions, then you may replace "::*PCLM" with "::*PCLF", which will load the compiler into a 27-page partition.

c. If any microcode replacements are required, they should be generated into the system. If not, assembly subroutines must be created containing the entry points and relocated with the programs. The microcode instructions and their entry points can be found in the appropriate computer operating and reference manual.

d. If $CLIB is not generated into your system, you will have to add, to the file #PCLM (or #PCLF), the command

    LI,$CLIB

following the command

    LI,$ULB

e. The file #XREF1 contains the size command SZ,26 which can be adjusted if necessary. It needs to be at least 22, but will cross reference larger programs if it is sized larger. If a 27, 28, or 29 page partition is available, the size should be increased.

f. The transfer file *LOAD stores the user-available files to CRN 50 (::50). Change all references to CRN 50 to one that is available to all Pascal users.

Now you should be ready to load the Pascal/1000 programs. Transfer to the file "*LOAD" which will load the Monitor (PASCL), the Compiler (PCL), and the Cross Referencer (PXREF). For example, these programs can be SP'd onto LU 2 by the command sequence:

    :SP,PASCL::2
    ::*SPPCL,2
    ::*SPXRF,2

Programs PCL, PXREF, and segmented user programs use T5IDM to manage their segments. Be sure to remove T5IDM (when it is dormant) before loading a second copy (:OF,T5IDM,1). This is to prevent the possibility of running the second copy of the program with the segments of the first program. This situation usually results in a memory protect violation or other unpredictable errors.

The Pascal/1000 compiler, the EMA version of PXREF, and all $HEAP 2$ user programs (unless overridden with the EMA option) use the EMA pseudo instruction of the form EMA 0,0, where both the EMA size and the MSEG size are defaulted. The number of pages for the EMA size is determined at the first dispatch of the program as the maximum available partition size minus the program size. The MSEG size is set at load time as the maximum logical address space minus the program size minus 1. If a change in the system memory configuration causes the size of the mother partition(s) to change, the compiler and other programs should be modified on-line using the RTE SZ command, or reloaded.

Because the compiler takes the largest EMA partition, there should be as many partitions of equal size for the compiler as the maximum number of expected simultaneous compilations. Smaller partitions may also be configured for use by other programs, but the compiler will not use them.

LOADING THE EMA VERSION OF PXREF

If you intend to cross-reference large programs, you may want to load the EMA version of PXREF. This can be done by transferring to the file

    *LDXF2

which will produce a program called PXREF, the same name as the heap 1 version. If both versions are to be loaded, one of them should be renamed (only the main needs to be renamed since the segments already have unique names). Whichever version is named PXREF is the one which will be run by default from the compiler when the $XREF$ option is turned on. Therefore, if you typically compile many small- or medium-sized programs, you will probably want to leave the non-EMA version named PXREF.

When loading the heap 2 version, the loader will rename the main to ..REF if the heap 1 version is already loaded. After saving the program on disc, however, it can be renamed. Again, this will only happen to the main, since the segments have unique names.

To SP, OF, or purge the EMA version, create, with the editor, the files corresponding to *SPXRF, *OFXRF, and *PUXRF.

As shown in Figure 1, the EMA space of the compiler partition is divided into the memory segments area, the disc segment area, and the heap/stack area.

During a compilation, the compiler performs many segment loads. The segments, one at a time, are loaded into the segment area of the logical address space. Since it is much faster to load a memory segment from the memory segments area than it is to load a disc segment, the goal is to allow the memory segments area to be large enough so that the configuration process will make as many segments memory-resident as possible.

However, a larger memory segments area means a smaller heap/stack area. If the heap/stack area is too small, there may not be enough room for all of the compiler's symbol table, dynamic tables, etc., and the compile will fail.

ADJUSTING THE HEAP/STACK AREA SIZE

Ideally, the heap/stack area should be made as small as possible. For a particular Pascal program, the minimum size required by the compiler for its tables is a rather complex function of such factors as the number of symbols and "complicated" statements and expressions in the program. As a rule of thumb, the larger the program, the larger the heap/stack area must be.

The $STATS$ information will aid the user in finding the appropriate heap/stack area size. Refer to the Pascal/1000 Reference Manual for details.

If the heap/stack area is too small to compile a program, the compiler will fail with the message:

  /PASCL: Insufficient workspace.

followed by either the message

  /PASCL: Increase EMA pages in option file to at least n.

where n is the number of pages that will actually change the amount of workspace allocated (the program may need even more to compile); or the message:

  /PASCL: Maximum of n EMA pages are already allocated for workspace.
  /PASCL: Partition not large enough to compile this program.

LOGICAL   PHYSICAL

BASE PAGE

COMMON AREA
(4 PAGES)

MAIN PROGRAM
(12 PAGES)

SEGMENT AREA
(13 PAGES)

MSEG
(2 PAGES)

I II

0 0
1 1

4 5
5 6

16 16
17 17

29 29
30 30
31 31

EMA
BOUNDARY

BASE PAGE

MAIN PROGRAM

MEMORY
SEGMENT No. 1

MEMORY
SEGMENT No. 2

MEMORY
SEGMENT
AREA

MEMORY
SEGMENT No. n

DISK
SEGMENT
AREA

STACK

HEAP

HEAP/STACK (WORK)
AREA

(SHOWS MEMORY SEGMENT
NO. 2 CURRENTLY MAPPED IN.)

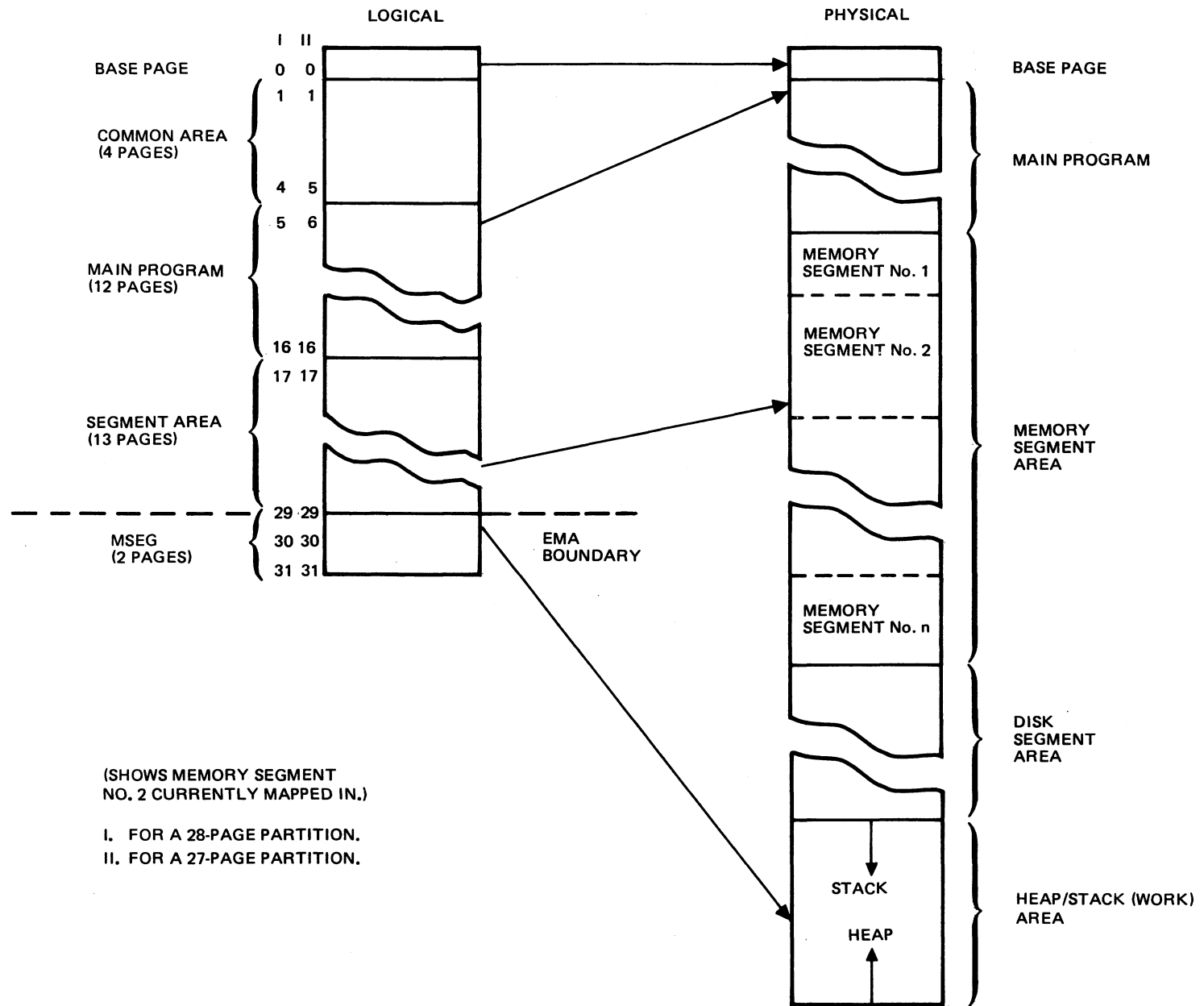I. FOR A 28-PAGE PARTITION.
II. FOR A 27-PAGE PARTITION.

Figure 1. Compiler Logical and Physical Layout

The first message means that the user should request at least n pages in the option file. Refer to the Pascal/1000 Reference Manual for the option file description. The second message means that the user should size (with the SZ command) the compiler larger to allow it to run in a larger partition.

When the compiler fails, the $STATS$ information is not printed. To obtain the information, the user can, with the same specified heap/stack area size, compile the following one-line program:

        $STATS$ PROGRAM stats; BEGIN END.

The information will then be printed.

COMPILER SPEED

One indication of the performance of the Pascal/1000 compiler is its speed, measured in the number of program lines compiled per minute.

Figure 2 shows the number of compiler segments that are made memory resident by the configuration process as a function of the memory segments area size.

The graph in Figure 2 shows a particular compilation speed when given a partition size and heap/stack (work space) size. This graph is provided for comparison purposes only. Your compiler performance may differ slightly because of various system and/or firmware options. Compile speed also varies with such things as the density of source programs and the constructs that are used. Compile speeds for small programs tend to be affected by the large start-up time for the compiler. The curves shown are for a particular 3000-line program with about 1200 lines of global declarations. Note that the compiler speed curve does not include the assembly time.

For example, a 180-page partition with a 27-page work area results in 10 memory-resident segments. With 10 memory-resident segments, a compilation speed of about 440 lines per minute (700 lines per minute syntax checking speed) can be obtained.

The total size of all the segments that can be memory resident is about 170 pages. Therefore, a partition size of about 200 pages plus the pages necessary for the heap/stack area produces the fastest compiler.
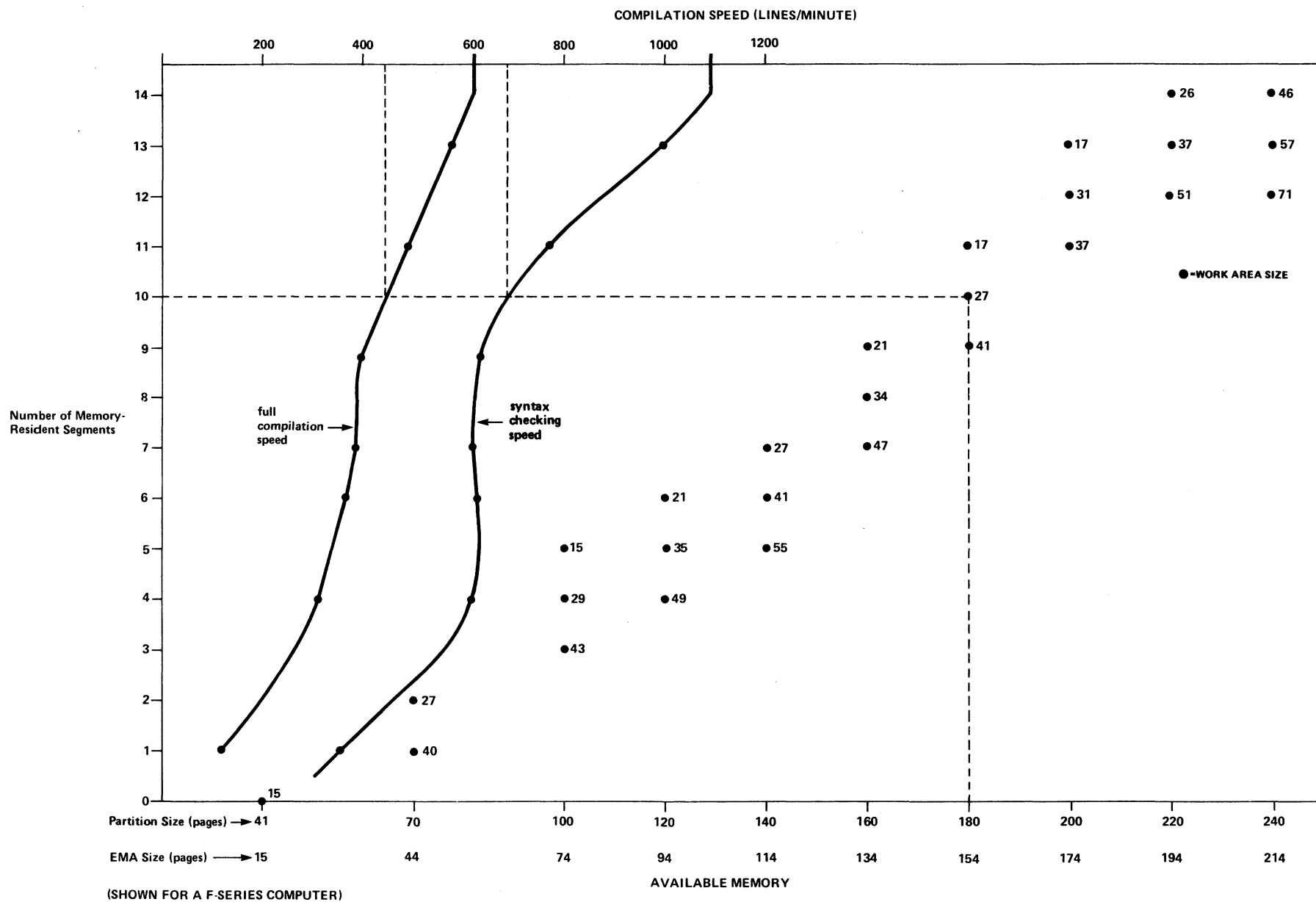
Figure 2. Typical Compiler Performance

SEGMENT LOADING ERRORS

The Pascal compiler's segment manager can abort the compilation if it encounters one of the following error conditions.

1. Segment not found
2. Mapping error
3. Invalid workspace size
4. Invalid segment count
5. Segment stack error
6. Memory segment loading error
7. Memory base page error
8. Disc segment loading error
9. Disc segment base page error

Error 1 will occur if one or more of Pascal segments have been purged. Reloading with *PCLM or *PCLF is required. Error number 3 can be corrected by adjusting the size of the compiler's workspace as described in the Adjusting the Heap/Stack Area Size section. Error number 5 is usually due to an expression which is "too complicated". Breaking the expression into smaller parts should solve the problem.

Errors 2,4, 6,7, 8, and 9 require the attention of the system manager. Most likely the compiler has been loaded incorrectly.

READER COMMENT SHEET

Pascal/1000
Configuration Guide

92832-90003   **January 1981**

Update No. _____

(If Applicable)

We welcome your evaluation of this manual. Your comments and suggestions help us improve our publications. Please use additional pages if necessary.

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Cable: CYEDE-Quito
A,CM,E,P

Hospitalar S.A.
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Cable: HOSPITALAR-Quito
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CM,E

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Hewlett-Packard France
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