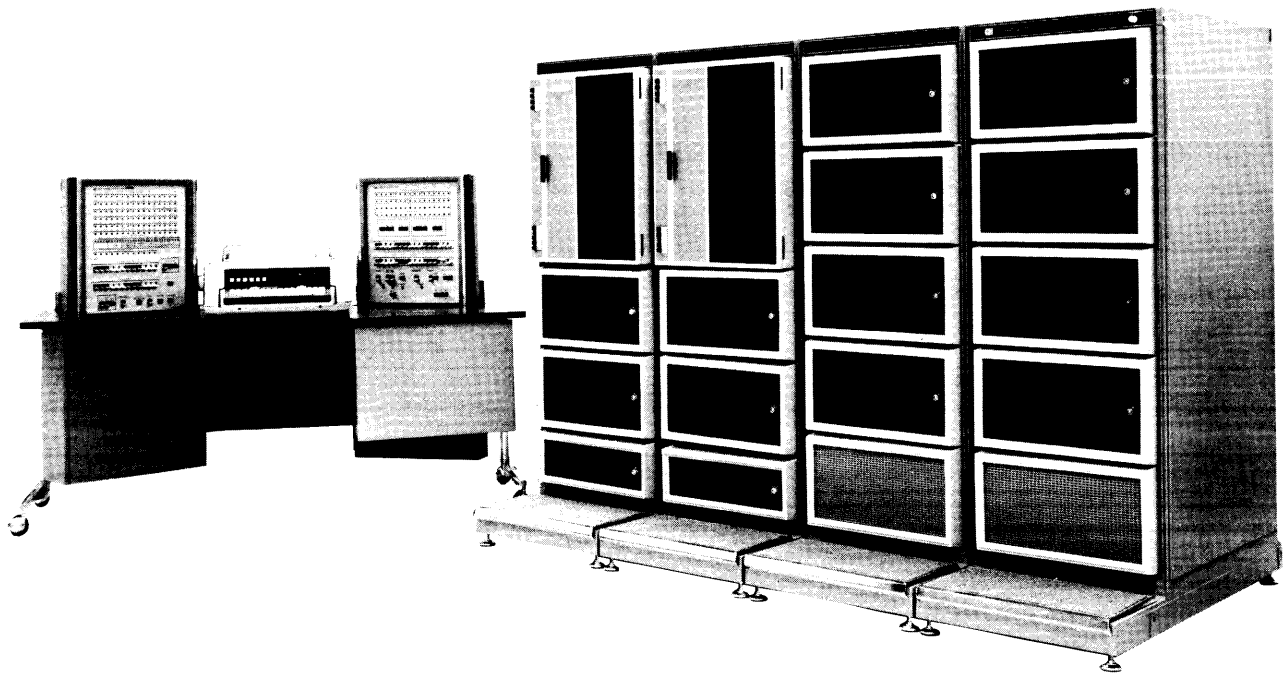


HP DATA SYSTEMS

HP 3000 Computer System and Subsystem Data



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Preface

This brochure describes the software and hardware subsystems that have been especially designed for integration with the HP 3000 Computer.

The subsystems described are classified into three sections which are edge-indexed for rapid location. The content of each section is outlined in the following:

- **Fundamental Operating Software**
Includes the software subsystems required to operate and support the HP 3000 Computer: • MPE (Multi-programming Executive) • Diagnostics • Compiler Library • Symbol Trace Facility • Utility Functions • SPL (Systems Programming Language)
- **Optional Software**
Multilingual solutions and software subsystems that offer powerful capabilities for your most demanding applications: • COBOL Compiler • FORTRAN Compiler • BASIC Interpreter • Text Editor • SORT Subsystem • Scientific Library • STAR (Statistical Analysis Routines)
- **Optional Hardware**
Terminals and peripheral subsystems are complete. They include necessary power supply, interface/controller, signal cables, integrating and diagnostic software, ready for integration with the HP 3000 Computer: • Interactive Terminals • Card Punch • Card Readers • Tape Punch • Tape Reader • Line Printers • Magnetic Tape Drives • Fixed and Moving Head Discs • CalComp Plotter Interface

The basic equipment supplied with an HP 3000 Computer includes an Asynchronous Terminal Controller, and a System Input/Output Multiplexer, each capable of connecting as many as 16 terminals and 16 peripheral device controllers respectively.

The last pages consist of a fold-out, graphic "Configuration Guide" and Notes On System Configuration. These are intended to provide an overview of the HP 3000 and the interrelation of the various peripheral subsystems. Call your HP Sales Representative. He can readily tailor a configuration to meet your needs.



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32001A Fundamental Operating Software

MPE/3000 Multiprogramming Executive

Features

- Concurrent multi-lingual capability, FORTRAN, COBOL, BASIC, and SPL
- Multiprogramming
- Virtual memory
- Stack architecture
- Simple command language
- Complete accounting of resources
- File backup and security
- Relocatable program modules
- ANSI standard languages
- Recursivity/reentrancy
- Dynamic resource allocation
- Remote processing via terminals

INTRODUCTION

MPE/3000 is a general purpose, disc-based software operating system that makes possible concurrent execution of many programs in a multi-lingual environment. When a user program enters execution, the commands within it are executed on a multiprogramming basis. Should one job be temporarily suspended, perhaps to await the completion of an I/O operation, another can immediately employ the central processor. Thus, when many users are active in the system, uninterrupted processing and high user throughput can be maintained.

User programs are independent of the mode through which they are input; the user can run the same code from either traditional batch input devices or interactive terminals. In fact, the same system code is used to accomplish particular functions in either mode, resulting in storage economy and reduced overhead.

STACK ARCHITECTURE AND VIRTUAL MEMORY

The employment of stack architecture by MPE/3000 automatically provides the separation of code from a user's data. This separation of data from code provides for both recursivity and reentrancy of user programs. That is, one copy of a program can be shared by many users while each still operates in his own environment free from interference by the other users.

Local stack storage is allocated only as needed and is automatically freed when no longer required. This allows reuse of that area of memory by other parts of the program. Consequently, programs require less temporary storage than conventional systems.

MPE/3000 virtual memory provides a total memory space that far exceeds the maximum main memory size of 128K bytes. Virtual memory consists of both main memory and disc storage. The concept of virtual memory is achieved by code segmentation.

STORAGE ECONOMY

MPE/3000 provides economized use of main memory and secondary mass storage, freeing the maximum storage possible for user programs and data. Priorities are used to control main-memory resources, eliminating the need for fixed or variable memory partitions to support MPE's unified multi-lingual, multiprogramming environment. Main memory is allocated for temporary and local variables only when needed, and is de-allocated upon exit. Disc storage is automatically allocated as needed, and files on disc can be accessed simultaneously by many users.

COMMAND LANGUAGE

The simplicity of the command language greatly enhances the MPE System's usability. The user interfaces with MPE/3000 through commands (for general functions external to his programs) and intrinsic calls (for specific functions invoked during program execution). Common system commands are used to initiate and terminate jobs and sessions, re-specify file characteristics, compile and execute programs, and call various utility subsystems. (As a matter of fact, each language processor and subsystem is accessed by a unique MPE/3000 command. The programmer need learn only one set of conventions for using these programs, because they all use the same command formats, special characters, and error-diagnostic methods). Intrinsic calls

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MPE/3000 (Cont'd)

implement such functions as reading, writing on, and updating files, skipping forward or backward on a file, or returning system table information to the user's program. These intrinsic calls are available not only to the SPL (Systems Programming Language) but also to the higher level languages FORTRAN and COBOL.

For example, the required command input for FORTRAN compile, program preparation (link edit), and program execution, is detailed for a worst case situation, as follows:

```
:FORTRAN
      } SOURCE
      } PROGRAM
:EOD
:BUILD PROGF;CODE=1029;REC=128,1,F,BINARY;
      DISC=1024,8,1
"PREP OBJECTF,PROGF
:RUN PROGF
      } PROGRAM
      } OUTPUT
```

These steps can be simplified with a single command, FORTGO, detailed below:

```
:FORTGO
      } SOURCE
      } PROGRAM
:EOD
      } PROGRAM
      } OUTPUT
:SAVE $OLDPASS,PROGF
```

FILE MANAGEMENT CAPABILITIES

MPE file system provides user program interaction with I/O devices in a manner that is device independent (the system furnishes default device specifications). Thus, for example, any program can read data from either a card reader, tape, or disc using an identical procedure.

File commands allow programs to reference files without specific knowledge of their actual names or characteristics, and allow file specifications to be altered at run-time.

The file system **simplifies** I/O programming and provides a **straightforward** method to access data.

The security file system and account/group/user structure provides many classes of security for user files. Access to files may be controlled at several levels which range from un-restricted access by anyone to controlled access available only to the creator of the file. For example, a user could make his data file available to any other user in a 'read-only' mode, while only members of his immediate account can append data to the file. The file and account/group/user structure provides the user with **security** and **integrity**.

ACCOUNTING

Accounting capability enables the HP 3000 system manager to set CPU time, connect time and disc space limits on individual accounts, and to obtain reports of the usage of these resources broken down by individual group. It also enables an account manager to set limits and obtain reports on groups within his account. Job/session data is also provided to individual users to enable the placement of limits on jobs.

Through logging capability, the system supervisor can collect, on a disc file, a record of system activity at the user level. The collected data enables the writing of a billing program which takes into account use of all significant system resources, or to analyze the manner in which the system is used. Examples of statistics collected are amounts of virtual memory used by a process, number of I/O transactions to a file, number of processes created, use of files by name, etc.

SYSTEM GENERATION AND MAINTENANCE

MPE/3000 consists of a single operating system which can be specifically tailored to the installation needs within minutes. Through the system generation facilities, file directories and files modified as of a specified date can be dumped to tape. This capability, along with the standard system reload procedure, provides for complete file backup.

SUPPORTING SOFTWARE

ANSI standard programming languages and software sub-systems greatly enhance and complement the capabilities of MPE/3000. These systems include the languages FORTRAN, COBOL, BASIC, and SPL, plus a text editor, sort/merge package, scientific library, statistical analysis package, utility functions, and system diagnostic software.

Diagnostics

Diagnostic software helps the computer operator to identify, diagnose and correct hardware problems in the HP 3000 system. Three levels of diagnostic software are provided:

- **SDM/3000**, System Diagnostic Monitor, performs on-line diagnostics under control of MPE/3000, and is a subset of MPE/3000, the computer's operating system. On-line diagnostics run concurrently with other programs under control of MPE/3000, and permit uninterrupted computer operation while diagnostic and routine maintenance checks are performed on the running system. Through the System Diagnostic Monitor, the user of the system console, invokes, executes, and modifies diagnostic programs, thus interacting on-line

Diagnostics (Cont'd)

through sets of commands and messages. A diagnostic program exists for the central processor and for every standard peripheral device offered for the HP 3000 computer system.

- **Stand-Alone Diagnostics**
If the minimum hardware configuration required by the operating system is not operable, Stand-Alone Diagnostics must be used in place of on-line diagnostics. Stand-Alone Diagnostics perform functions complementary to those of on-line diagnostic (SDM/3000); several independently operated programs run directly on the central processor while the operating system (MPE/3000) is shut-down.
- **Microdiagnostics**
If a problem prevents the use of both on-line and stand-alone diagnostics, the HP 3000 Microdiagnostics must be used. These are microprograms that replace the instruction set microprograms in the central processor and in certain controllers. They identify and diagnose problems by checking the functions of the hardware at the most basic level.

Compiler Library

The HP 3000 Compiler Library is a set of subroutines that provides many operations commonly needed by users programming in COBOL/3000, FORTRAN/3000, SPL/3000, and BASIC/3000. These operations include:

- Extended-precision floating-point arithmetic
- Matrix operations
- Complex arithmetic
- Trigonometric functions
- Mathematical functions
- Numeric conversions
- Utility functions

In addition, the Compiler Library includes a formatter program that simplifies input/output operations for the FORTRAN/3000 programmer. This program makes it unnecessary to specify precise machine operations; the user only specifies the format of the data, a list of variables, and a device or file.

TRACE/3000

TRACE/3000 is a programmatic debugging subsystem that aids the user in finding program logic errors in SPL/3000 and FORTRAN/3000 programs. TRACE/3000 helps the user follow the path of execution, computation of values, and manipulation of data in his programs by printing information about program identifiers (such as labels, variables, arrays, and subroutines), and structure

points (critical points of passage into and out of program units) during program execution. TRACE/3000 allows the user to specify selective conditions for reporting information, for example: Print data only when a variable exceeds a certain value, or when it is changed a specified number of times. The user communicates with TRACE/3000 by entering special paragraphs and sentences through his job or session input stream. TRACE/3000 offers these features:

- Operation in batch job or time-sharing session mode.
- Input of TRACE/3000 paragraphs and sentences in three ways:
 - Through a Batch File (on cards, disc, or tape) in a job.
 - Through the terminal in a session.
 - Through a Batch File (on cards, disc, or tape) in a session. (This method is ideal when the user plans to issue the same directives during several successive runs of his program in session mode).
- Option to either print a report, or print a report and halt the user's program, upon satisfaction of specified conditions.

Utility Functions

The utility, FCOPY, is a program used for general file copying operations. In addition to this basic capability, it has features for character code translation, set up of line printer dump formats, verification of a copy operation, selection of a subset of the file, and the capability of ignoring a specified number of read errors from the source file.

The capability to translate character codes allows the user to convert EBCDIC and BCD source files to ASCII and vice versa.

Dump formatting allows for the formatting of hexadecimal, octal and character dumps. The user specifies the dump formats and title if desired, and the utility automatically establishes the dump format according to the output device class.

Verification capability allows the user to compare two source files. When a compare error is found, the user is given both the record and the word or byte number where it occurred.

Through the subset option, the user can select a portion of a file based on field content, number of records starting with a given record, or all records contained between two record numbers.

These functions can be performed as a single operation or as multiple operations within a single access to FCOPY.

SPL/3000 Compiler

Features

- A unique Systems Programming Language (SPL). Modern successor to assembly language programming
- High-level yet machine dependent. ALGOL-like high level statements are combined with special machine dependent statements for full capability
- Efficient coding. The high level nature of SPL/3000 reduces coding errors and increases program production
- Self-documenting for ease of readability
- Permits access to all hardware features and data types
- One-dimensional arrays supported
- All object-code is re-entrant. Permits maximum utilization of HP 3000 CPU
- Dynamic allocation of local storage for working space and local variables in procedures. Memory de-allocated on exit from procedures
- Three program levels: Main program, procedures, subroutines
- Program segmentation feature
- Simple interface to other languages, and to the Multi-programming Executive operating and file systems (MPE/3000)
- Assemble statement permits machine level coding

INTRODUCTION

SPL/3000 is the Systems Programming Language for the HP 3000 Computer System. It serves as both a high-level language and a machine-dependent language. With SPL/3000 the programmer can express himself clearly and concisely while producing efficient object programs.

BACKGROUND

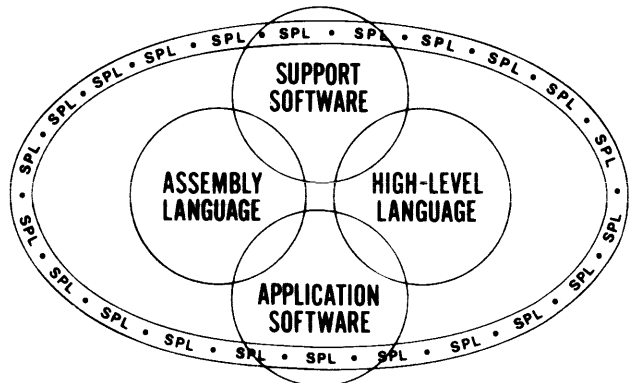
The choice of programming languages on most computers lies in selecting one of two mutually exclusive groups: a high-level machine-independent language such as FORTRAN, on the one hand, and a completely machine dependent assembly language on the other.

In assembly language, the syntax usually matches the structure of the machine language very closely. Assembly language can be used to attain a high degree of efficiency and control, but usually at the expense of lengthy development. To fully utilize assembly language capabilities, the programmer must have a thorough knowledge of the machine's structure and intricacies.

High-level languages, on the other hand, insulate the programmer from the details of the machine: They enable the overall program to be written clearly and concisely because they follow the structure of normal human discourse. Unfortunately, most high-level languages cannot generate code as efficiently as an assembly language. They do not offer the scope required for interrupt handling, bit and register manipulations, or precise control of peripherals such as graphic displays. For these reasons, systems software (operating systems, monitors, compilers, etc.) is usually written in assembly language.

THE STATE OF THE ART

To simplify systems programming, SPL/3000 combines the best features of both types of languages. It offers the programmer a high-level language similar to (but not equivalent to) ALGOL, to produce the more usual coding sequences. Moreover, it has added features which enable the programmer to easily exert control over machine-dependent functions of the computer system. SPL/3000 also provides excellent commenting facility, and the language structure aids documentation.



HIGH EFFICIENCY

SPL/3000 permits the programmer to include assembly code.

This facility allows the programmer (in the midst of high level constructs) to operate directly on hardware

SPL/3000 Compiler (Cont'd)

registers, perform branches based on hardware status, extract/deposit/shift bit fields, or generate any sequence of hardware machine instructions.

SPL/3000 has been made as structured as possible to ease the work of the programmer. Constructs have been included only where economical code generation is not sacrificed. The language provides many features normally found only in applications languages such as ALGOL and PL/1, and includes:

- Free-form structure
- Arithmetic and logical expressions
- High level statements with unlimited nesting (IF, FOR, SWITCH, CASE, DO-UNTIL, WHILE-DO, MOVE, SCAN, assignment and compound statements)
- Recursive procedures and subroutines
- Variables and arrays of many different data types

ENVIRONMENT

Programs may be compiled in batch mode or via a time-share "session". In batch mode, input is taken from the standard input device (card reader), and list output is directed to the standard list device (line printer). In time-share mode, all input and output occurs at the user's terminal.

The operating system automatically allocates these devices to the compiler; however, the user may override these decisions and allocate other suitable devices. Thus a time-share user can, for example, perform a compilation with the source code in a disc file and list the output to the line printer (subject to the user having the necessary authority).

LANGUAGE USE AND STRUCTURE

An ALGOL programmer can begin using SPL/3000 almost immediately, while other users will find it much easier to learn than a conventional language.

SPL/3000 is procedure oriented. A program written in SPL normally comprises a main program, and a set of procedures which may be called either from the main program or from within one of the procedures. The language not only generates re-entrant code, but easily lends itself to generation of recursive routines.

VARIABLES

Variables may be either "global" or "local". Global variables are those declared in the main program and are accessible from any part of the program including procedures. Local variables however, are declared within a procedure and are only accessible from within that procedure.

DATA TYPES SUPPORTED*

- *Logical*: 16-bit TRUE/FALSE or \emptyset to 65535
- *Byte*: 8-bit character data or arithmetic values \emptyset to 255
- *Integer*: 16-bit arithmetic variables (-32768 to +32767)
- *Double Integer*: 32-bit arithmetic variables (+2,147,483,648 to -2,147,483,647)
- *Real*: 32-bit floating point variables (6.9 digit accuracy) $\pm 10^{77}$
- *Long Real*: 48-bit floating point variables (11.7 digit accuracy) $\pm 10^{77}$

*Single dimensional arrays may be any of these data types.

SYNTAX FEATURES

Each SPL/3000 statement is either a high-level or machine-dependent feature.

High-Level Features

In all programming efforts, a need frequently arises for standard program constructs, such as loops, and evaluation of arithmetic expressions. Rather than hand-coding these often-used structures each time, SPL/3000 allows the programmer to write them at a high level. The compiler then provides an efficient, error-free code sequence in each case. Examples of such constructs include:

- `RESULT = (4*(J) + M - KJ MOD 10) / 31;`
- `IF J=1 THEN GO TO JP10 ELSE J:=J+5;`
- `WHILE VAR < 0 DO ARRY (VAR:=VAR+3):=0;`
- `DO (X:=X+7) UNTIL X = 1000;`
- `FOR P:=7 STEP 2 UNTIL 1000 DO BEGIN`
`X(P):=1;`
`Y(P):=3;`
`END;`

The high level features increase program production and contribute to documentation.

Machine-Dependent Features

SPL/3000 allows the use of machine-level constructs to insure complete control of the HP 3000 Computer System. These constructs permit the following:

- Direct register references
- Branching based on actual hardware conditions
- Bit extraction, deposit, and shift
- Generation of any sequence of hardware machine instructions (in the midst of high level constructs)

Examples Of Machine-Dependent Statements

- `IF A=6 THEN ASSEMBLE (LDI 3; RI00; STOR TIME)`
`<<reads time from I/O channel 3 if A=6>>`
- `SCAN INPUTDATA WHILE AN ;`
`<<scans the byte array "inputdata" until a character is found which is not alphanumeric (AN) i.e. 0-9, A-Z>>`

SPL/3000 Compiler (Cont'd)

- **IF OVERFLOW THEN RETURN;**
<<Tests the overflow condition in the arithmetic unit>>
- **MOVE ARY:=SOURCE WHILE N;**
<<moves bytes from array source to ARY as long as they are numeric>>
- **N02:=NUMBER. (13:3);**
<<extract 3 bits from 'number' starting at bit 13 and assign the resulting 3-bit field to N02 at its right-hand end. Rest of N02 set to zeroes>>

Example Of An SPL/3000 Procedure

The following SPL/3000 procedure is part of the SPL compiler with minor modifications made for clarity. It is used to sort the symbol table when the MAP option is chosen. Each entry in the symbol table has the identifier name preceded by the ASCII character corresponding to the number of characters in the symbol. If the number is greater than nine, the character is not numeric.

Name of procedure: SHELLSORT

Parameters:

INFO array of symbol table entries
INDICES array of indices each of which corresponds to an entry in the symbol table
SIZE number of entries

Subroutine is almost assembly language.
Procedure body is almost ALGOL.

For readers familiar with ALGOL, the following explanations should make the method of the procedure understandable.

1. <<>> A pair of broken brackets is used to enclose comments.
2. ; Statements are terminated by semicolons.
3. := This symbol means "is assigned the value".
4. TOS Refers to the value of the top of stack.
5. @ This means either 1) operate with the contents of a pointer, not the item pointed at, or 2) operate on the address of a variable, not the contents of the variable.
6. POINTER A pointer is a quantity that is used to point at another item (i.e., provides one-level indirect addressing).
7. LSL Logical Shift Left.
8. DDEL Delete the top two items on the stack.
9. * In a 'compare' this means that the parameter is in the stack.

SPL/3000 Compiler (Cont'd)

```

PROCEDURE SHELLSORT(INFO, INDICES, SIZE);
  VALUE SIZE;          << SPECIFICATIONS          >>
  INTEGER SIZE; ARRAY INFO, INDICES;
BEGIN
  INTEGER X1, X2, TEMP,          << LOCAL DECLARATIONS          >>
          D, I, J;
  BYTE POINTER SM0=S-0, SM1=S-1; << INDIRECT POINTERS          >>

  SUBROUTINE COMPARE;
  BEGIN COMMENT COMPARE THE TWO ASCII STRINGS INDEXED BY X1 AND X2. ;
    TOS:=#INFO(X1)&LSL(1);
    X1:=SM0;                    << ASCII CHARACTER COUNT          >>
    #SM0:=#SM0+1;                << NOW POINTS TO SYMBOL X1          >>
    TOS:=#INFO(X2)&LSL(1);
    X2:=SM0;                    << ASCII CHARACTER COUNT          >>
    #SM0:=#SM0+1;                << NOW POINTS TO SYMBOL X2          >>
    IF SM1=SM0 THEN              << 1ST POINTER NOW AT S-1          >>
      BEGIN
        TOS:=IF X1<X2 THEN X1    << MINIMUM OF LENGTHS          >>
              ELSE X2;
        TOS:=TOS-"0";           << CONVERT ASCII TO RINARY          >>
        IF *=#, (TOS) THEN      << COMPARE BYTE STRINGS          >>
          ASSEMBLE(LOAD X1;     << IF = THEN COMPARE SIZES          >>
                  CPM X2);
      END
    ELSE DDEL;                  << POINTERS WERE NOT USED          >>
  END; << COMPARE >>

  COMMENT START MAIN BODY OF SHELLSORT PROCEDURE. ;

  IF SIZE <= 1 THEN GO TO EXIT; << ONE OR NO ENTRIES          >>
  D:=1; WHILE (D:=D*D)<SIZE DO ; << DOUBLE D WHILE < SIZE          >>
L1:IF (D:=D/2)<=0 THEN GO TO EXIT
    ELSE I:=1;
L2:TEMP:=INDICES((J:=I)+D);     << INTERMEDIATE LOOP          >>
L3:X1:=TEMP;                    << TWO STRINGS TO COMPARE          >>
    X2:=INDICES(J);
    COMPARE;                     << SUBROUTINE CALL          >>
    IF < THEN                    << TEST CONDITION CODE          >>
      BEGIN
        INDICES(J+D):=INDICES(J); << REPLACE TEST VALUE          >>
        IF (J:=J-D)>0 THEN GO TO L3; << INNER LOOP WHILE J > ZERO >>
      END;
    INDICES(J+D):=TEMP;          << STORE VALUE BACK IN TABLE >>
    IF (I:=I+1)+D<=SIZE THEN    << CHECK FOR END OF TABLE >>
      GO TO L2
    ELSE GO TO L1;
  EXIT: END; << SHELLSORT >>

```



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32213A COBOL/3000 Compiler

Features

- Full ANSI standard (USAS X3.23-1968) COBOL
- Highest level federal COBOL
- Direct communication with SORT/3000 via SORT verb
- Communications with COBOL or non-COBOL subroutines
- Table handling up to 3 dimensions
- Sequential and random files
- Object code segmentation controlled by programmer
- Data segmentation through dynamic-type subroutines
- Packed decimal, binary, and display (zoned) data types
- Compile time editing
- Selective compilation

COBOL/3000 provides the user with language resembling English as a programming tool. It is self-documenting, easy to learn, and permits fast program development. The language has efficient statements to simplify file descriptions, I/O, table handling, sorting, mass storage manipulation and report generation. The compiler is integrated into the HP 3000 Multiprogramming Executive (MPE/3000) to allow great flexibility in every environment.

IMPLEMENTATION LEVEL

Two major standards describe COBOL compilers: ANSI standard COBOL and U.S. Federal Standard COBOL, as defined by the National Bureau of Standards. Hewlett-Packard COBOL/3000 has fully implemented* the ANSI standard while conforming to the high-level Federal Standard in all categories. The following table shows the COBOL/3000 rating in each standard.

*Every module except report writer.

MODULE	ANSI* RATING	FEDERAL RATING
Nucleus	High	High
Table Handling	High	High
Sequential Access	High	High
Random Access	High	High
SORT	High	High
Report Writer	Null	N/A
Segmentation	High	High
Library	High	High

NOTE: ECMA** COBOL conforms with ANSI COBOL.

*ANSI: American National Standards Institute

**ECMA: European Computer Manufacturers Association

COBOL MODULES

COBOL/3000 is a set of functional processing modules that have the following capabilities:

Table Handling: For defining tables of contiguous data items and accessing an item relative to its position in the table. Tables may be variable length and may have up to three dimensions.

Sequential Access: To access records of a file in an established sequence. Sharing memory area among files is also provided.

Random Access: To access records of a mass storage file according to a programmer-supplied key. Sharing memory area among files is also provided.

Sort: To order a file of records according to a set of user-specified keys within each record. Special processing of addition, deletion, creation, altering, editing, etc. is provided.

Segmentation: To specify object program segmentation requirements.

Library: For specifying text that is to be copied from a library. Library text is available to a source program at compile time and need not be actually written as part of the source program.

Interprogram Communication: Provides the capability to call (or be called by) a program written in COBOL/3000 or other HP 3000 Languages.

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Optional Software

Language Extensions: In addition to the ANSI Standard, Hewlett Packard has implemented a number of extensions which include:

- Interprogram Communication
- Packed Decimal (COMPUTATIONAL-3)
- Note Lines [defined by * (an asterisk) in column 7]
- Current-Date (MM/DD/YY)
- Time-of-day (HHMMSS)
- Then optional
- Multiple REDEFINES of a given location
- Unary +
- Go to MORE-LABELS EXIT
- Synchronized for index data items

DATA TYPES

COBOL/3000 allows Decimal, Binary (Computational), Packed Decimal (Computational-3), and Display (Zoned) data types.

ENVIRONMENT

COBOL/3000 is fully integrated into the Multi-programming Executive (MPE/3000), providing great flexibility in compiling, linking, segmenting and executing in batch and session mode.



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32102A FORTRAN/3000 Compiler

Features

- Six data types: Integer, logical, real, double precision, complex and character
- Character variables and character arrays
- Bit extract and deposit capability with **PARTIAL-WORD DESIGNATORS**
- Arrays may have up to 255 dimensions
- Named common blocks may be initialized by block data sub-programs
- Symbolic names may contain up to 15 characters
- Dynamic array declaration and allocation in sub-programs
- A label can be used as an argument in sub-program call statements to allow alternate return points
- **FUNCTIONS** and **SUBROUTINES** may be called recursively
- Parameters to non-FORTRAN subprograms may be passed by value rather than reference
- **ACCEPT** and **DISPLAY** statements for free field input/output
- Up to 99 files may be opened simultaneously during execution of a FORTRAN program
- Action labels may be specified in **READ/WRITE** statement to indicate point of transfer in case of end-of-file or I/O error
- Mixed mode arithmetic supported
- The dependent statement of a logical **IF** can be another logical **IF**
- Compilation time editing

HP FORTRAN/3000 is based on ANSI STANDARD FORTRAN (X3.9-1966). In addition, FORTRAN/3000 has many extensions which expand the capabilities and increase the power of the language.

ENVIRONMENT

The HP 3000 Multiprogramming Executive (MPE/3000) provides great flexibility for the FORTRAN user in the following areas:

- Compile in batch or timesharing mode, or call the compiler programmatically
- Compile subroutines written in other languages (e.g., COBOL) as part of the main FORTRAN object program
- Execute in either batch or timesharing mode
- File equate for device independent I/O
- Segment programs without re-compiling
- Call any program or subprogram compiled in any other language, limited only by security
- A debugging facility provided by the use of **TRACE/3000**

DATA TYPES

FORTRAN/3000 provides six types of data.

- **INTEGER** type: A 16-bit quantity including sign. The range is +32767 to -32768.
- **LOGICAL** type: A 16-bit mask. The least significant bit is used to determine the Boolean value (True and False).
- **REAL** type: A 32-bit quantity with sign, exponent and mantissa. The range is $\pm(2^{-256}, 2^{+256})$ with 6 to 7 decimal digit accuracy.
- **DOUBLE PRECISION** type: A 48-bit quantity with sign, exponent and mantissa. The range is identical to **REAL** but with 11 to 12 decimal digit accuracy.
- **COMPLEX** type: A 64-bit quantity consisting of two type reals, one for the real part and one for the imaginary part.
- **CHARACTER** type: Character values are represented by strings of 8-bit USASCII code.

SOURCE PROGRAM FORMAT

FORTRAN/3000 was designed with several powerful convenience features for time-sharing users. The nature of terminal devices makes the historical position-dependent

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fixed-format program representation extremely inconvenient; however, HP FORTRAN/3000 surmounts these drawbacks by offering both fixed format and free format representation for source language input.

CHARACTER MANIPULATION

FORTRAN/3000 supports exceptional capabilities in the areas of character string manipulation. A new data type, "CHARACTER", allows FORTRAN/3000 users to directly manipulate strings up to 255 characters in length. Subscript-like notation may be used to access substrings within a string, as small as one character. String operations include comparison and replacement.

Conversion of character expressions to numeric values (integer, real or double precision) and vice versa is provided by INTRINSIC FUNCTIONS.

EXAMPLE:

The following problem solved by FORTRAN/3000 demonstrates the utility value of character manipulation.

Given: An 80 column input card

Problem: Find the last non-blank character

Solution:

```
CHARACTER INPUT*80
READ (5,10) INPUT
10 FORMAT (S)
DO 20 I=80, 1, -1
IF (INPUT[I:1] .NE. " ") GO TO 25
20 CONTINUE
25 DISPLAY I
```

BIT MANIPULATION

PARTIAL-WORD DESIGNATORS act as unary operators which extract or replace a specified bit string to form a new value of the same type. This operator applies to INTEGER-type or LOGICAL-type data.

COMPOSITE NUMBERS provide a convenient method of representing specific bit patterns for any type of data except CHARACTER or COMPLEX.

FILE FACILITY

Uniform access to disc files and standard input/output devices is accomplished through the MPE/3000 file system. Users access their files using normal READ/WRITE statements. The structure of a file and method of access can be defined via a file statement by the programmer or left to default values. This provides device independence and easy access to all types of files.

Device type can be defined at execution time; consequently, the devices used by a program can be readily changed.

Sequential and random access of disc files is supported by FORTRAN/3000.

Users with highly specialized requirements may communicate directly with the MPE/3000 file system. Data file privacy is achieved through the normal MPE/3000 protection mechanisms.

DEBUG FACILITY

The HP 3000 TRACE program and FORTRAN/3000 are designed to work together, providing a convenient and powerful capability for the user in monitoring program execution. A TRACEable item is a symbolic name of a simple variable, array, statement-function, or external procedure or is a statement label of an executable statement. Monitoring can be conditional, thereby eliminating massive amounts of output.



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32101A BASIC/3000 Interpreter

Features

- A powerful language that's easy to learn
- Programs and data files can be accessed from either time-share or batch mode
- Conversational program generation with extensive messages
- Four numeric data types: real, integer, real extended precision, and complex
- Mixed mode arithmetic
- All standard functions (SIN, COS, LOG, etc.) plus matrices, strings and files
- Program segmentation with common storage
- User definable file security including password

BASIC/3000 is an easy to learn language designed especially for interactive terminal use. The HP BASIC/3000 language contains extensions that make it the most powerful implementation of BASIC currently available.

ENVIRONMENT

Time-Sharing Mode

Implementation of BASIC in the HP 3000 operating system results in a very powerful language which encourages the user to take advantage of extensive conversational capabilities.

Batch Mode

HP BASIC itself is such a flexible language that the BASIC/3000 Interpreter may be used in Batch Mode as well. In Batch Mode, all input (i.e. program statements, commands and data) is read from the batch input device; all output is directed to the batch output device.

User Tailored Modes

BASIC/3000 permits full use of HP 3000 device independence. Users can link each type of input (e.g. program statements, commands and data) and output (e.g. program output, messages and listings) with any available peripheral device. This flexibility within BASIC can be employed to construct end-user packages such that BASIC is invisible to the user. The resultant simplicity of execution is especially important to instructional/educational applications.

DATA TYPES

BASIC/3000 permits four types of numeric representation:

- **INTEGER Type:** A 16-bit quantity. The range is -32767 to +32767.
- **REAL Type:** A 32-bit quantity with sign, exponent and mantissa. The range is $\pm(10^{-78}, 10^{+77})$ with 6 to 7 decimal digit accuracy.
- **LONG Type:** A 48-bit quantity with sign, exponent and mantissa. The range is identical to REAL but with 11 to 12 decimal digit accuracy.
- **COMPLEX Type:** 64-bit quantity consisting of two real numbers, the real part and the imaginary part. Mixing of data types within an arithmetic expression is allowed.

CHARACTER STRING MANIPULATION

The user may define and manipulate ASCII character strings and string arrays. All digits, upper and lower case alphabetic characters, and all other printing and non-printing ASCII characters can be stored in string variables. They can be input and output at the terminal and stored and retrieved from data files. Substrings as small as zero characters and as large as 255 characters in length can be printed, concatenated and compared to other strings. These may be used for branching or sorting.

A CONVERT statement is available for conversion of numeric strings to numeric values and vice versa. Several built-in functions are available for manipulation (e.g. to obtain the numerical value of a character's ASCII code and remove leading and trailing blanks, etc.). Easy intermixing of string and numeric data is provided for program and file input and output.

DATA FILES

BASIC/3000 maintains three distinct file types:

- **FORMATTED files:** Provide advanced, easy-to-use capabilities that are intended for (but not restricted to) BASIC language use. These enable run-time checking of file datum type.
- **ASCII and BINARY files:** These are available for communicating data to and from programs written in languages other than BASIC.

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BASIC FORMATTED files may have a record size between 4 and 319 words. Data can be accessed either serially or on a record basis with random access of any record in the file. The **ADVANCE** and **UPDATE** statements provide the capability to access individual items within a record. Files may be created and purged either by commands or under program control.

Through the operating system, data file security among different levels of users is achieved by a set of restrictions (e.g. read-only, read-only with dynamic locking, etc.) which may be placed on the access of the files. A data scrambler may also be used. This security feature can be used in conjunction with the normal name and password security system.

PROGRAM SEGMENTATION AND SUBROUTINES

BASIC/3000 provides four types of subroutines:

- Built-in functions include **SIN**, **TAN**, **TNH** (hyperbolic tangent). Approximately 40 such functions are provided.
- User defined functions are established in the user's program and can be called from within the program. They may consist of multiple statements and local variables and arrays whose scope extends only within the declared function.
- A simple subroutine consists of a set of **BASIC** statements followed by a return statement. There is no explicit indication in a program as to which statements comprise a subroutine.
- External subroutines are not controlled by **BASIC** and may be written in another language, i.e. **FORTRAN**, **SPL**. **BASIC** programs may call external subroutines from one of the libraries accessible to the user.

Because program size is necessarily limited by machine memory, the **BASIC** system provides a means of segmenting programs. Two statements are provided for communication between programs:

- The **CHAIN** statement terminates the current program and automatically initiates the "CHAINED" program.
- The **INVOKE** statement is similar to **CHAIN**, but the current program is suspended rather than terminated. The called program may then transfer control back to the calling program (this is one method for calling general subroutines written in **BASIC**).

Programs "CHAINED to" or "INVOKED" may communicate with the "chaining" or "invoking" program through common blocks. Up to 10 different blocks may be used in a program.

TRACE-DEBUG FACILITY

This mode serves in an interactive debugging capacity. Several commands are available for:

- Tracing the path of execution through a program and the change in value of variables.
- Setting breakpoints, displaying and changing values of variables and resuming operation.
- Displaying names of files currently open to a program.
- Displaying a list of functions and programs which represent the path through which nested calls will return.

MATRIX OPERATION

One or two dimensional arrays are handled as easily as single valued variables. Addition, subtraction, multiplication, inversion, and transposition require only one program statement. A single statement creates an identity matrix or loads a matrix with all ones or zeroes. Matrix input and output statements are also available.

ADDITIONAL FEATURES

Among other features are:

- Multiline statements allowed
- **IF-THEN-ELSE** statements and compound statement blocks
- Program access to system clock
- Embedded **FOR** loops in input/output statements
- Formatting (**PRINT USING**) with dynamically definable output images
- Extra input items optionally stored in a buffer for optional subsequent input
- String arrays with complete substring accessibility
- Substring search functions
- File management under program control
- Move forward or backward any number of elements through a file without knowing what data types are being skipped
- User definable file security
- Program profile showing number of executions and amount of CPU time for each statement executed

PROGRAM COMPATIBILITY

Programs written for the **HP 2000 Series Time-Shared BASIC Systems** can be run using **BASIC/3000**.



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32201A EDIT/3000 Text Editor

Features

- All occurrences of a character string can be changed with one command
- A command to call user-written procedures for modifying or processing text
- USE mode for execution of pre-stored EDIT/3000 commands
- Nested, interactive loop facility for repetitive editing
- Multiple-line delete, insert, move and replace capability
- Metacommands to provide Boolean logic for conditional editing
- Many options for display before editing, display after editing, do not display, etc.
- Columns may be selected for restricted searches and edits.
- HOLD file for storing data to be duplicated into other text files
- Selective concatenation of portions of files
- Line by line template display for easy modifications to complex text

INTRODUCTION

The EDIT/3000 Text Editor permits the user to create and manipulate files of upper and lower case ASCII characters with great ease. Lines, strings and characters can be inserted, deleted, replaced, searched for, etc. The files to be edited can be source language programs, such as FORTRAN, SPL, COBOL, etc., or text material, such as reports.

EDIT/3000 interacts with the user through edit commands. The command language is so designed that a non-experienced user will find those commands that normally exist in all editors (e.g., DELETE, REPLACE, INSERT); the experienced users will find that EDIT/3000 contains all the commands necessary to write complex edit command sequences, where editing is based on conditions found within the text itself.

ENVIRONMENT

The EDIT/3000 Text Editor is designed to operate in the following three modes:

- Session Mode
Edit commands and text are entered interactively at the terminal.

- Batch Mode
The editor locates the commands and text in the job input stream.
- USE Mode
The editor reads the commands from a file, but sends messages to the standard output device. Text records are read from the standard input device. This text mode facilitates complex and repetitive editing where it's desirable to make the required commands transparent to the user.

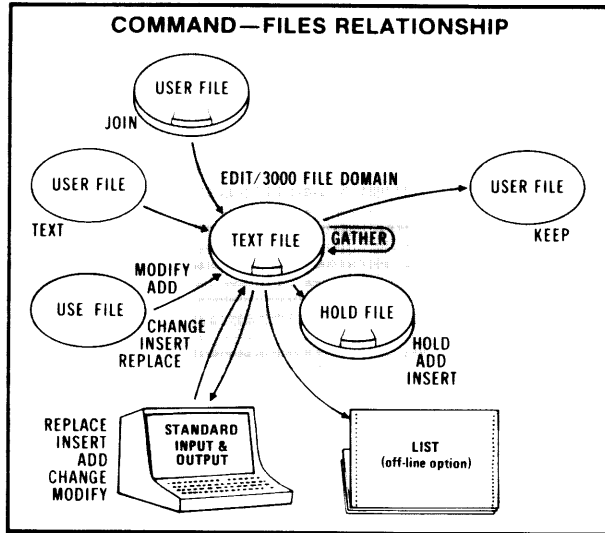
FILE HANDLING

Five files are maintained by EDIT/3000:

- Standard input file. Generally a terminal in Session mode or a batch input device in Batch mode. EDIT/3000 normally reads the edit commands and text records from this file.
- Standard output file. Generally a terminal in Session mode or a batch output device in Batch mode. EDIT/3000 normally outputs messages to this file.
- TEXT file. A temporary file that contains the information to be modified. EDIT/3000 never operates directly on a user file in order to minimize the possibility of an operator causing accidental destruction of an only copy.
- HOLD file. Serves as a temporary file for the editor. Used mainly for holding interim information (e.g., copying parts of the TEXT file to the HOLD file and to add or insert the HOLD file in the TEXT file, through the application of various commands).
- USE file. Specified by the USE command. Causes EDIT/3000 to read all commands from the file, but any messages and requests for text records are sent to the user terminal (if so desired). It is also possible to specify that all information (including text records) are to be found in the USE file.

In addition to these files, the user may add or insert other specified files to the TEXT file.

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Files required to be on disc are illustrated as discs.

COMMAND LANGUAGE SUMMARY

- ADD** Enter lines of text into the TEXT file from the standard input device or the HOLD file.
- CHANGE** Replace one string by another over a specified part of the text.
- DELETE** Delete characters and lines from the TEXT file.
- END** Terminate execution of EDIT/3000.
- FIND** Locate a string in the TEXT file.
- GATHER** Move and renumber portions of text from one location to another in the TEXT file.
- HOLD** Copy text from the TEXT file into the HOLD file.
- INSERT** Insert text into the TEXT file from the standard input device or the HOLD file.
- JOIN** Add all or portion of a file to the TEXT file.
- KEEP** Save all or part of the TEXT file in a USER file.
- LIST** Print out any portion or all of the TEXT file. Two options of this command are of special interest:
- OFFLINE** — Directs the listing to a specified file. If in session mode, it can be used for instance to direct listings to the line printer.

TRANSLATE — Converts all lowercase alphabetic characters to uppercase. This feature allows the use of output devices incapable of producing lowercase characters.

- MODIFY** Modify lines in the TEXT file using three operations: delete (D), insert (I), and replace (R).
- REPLACE SET** Replace lines in the TEXT file. Alter options that are normally set by the subsystem and govern editing operations.
- TEXT** Copy all or part of a user file onto the TEXT file.
- VERIFY XPLAIN** Obtain the setting of options (see SET). Print an explanation of selected commands or all commands.

ADVANCED FEATURES

EDIT/3000 has several commands designed primarily for complex editing. While these commands require programming-like knowledge on the part of the user, they provide superlative editing power. Some of these commands are:

- **PROCEDURE**
This command allows EDIT/3000 to call and use logical procedures written in FORTRAN, SPL, or COBOL. The called procedure may then act on the text records passed by EDIT. This very potent feature allows the user to implement his own editing functions.
- **USE**
Permits editing operations to be carried out in a combined interactive/batch mode. The user initially stores EDIT commands in an MPE file. Subsequently, while editing at an interactive terminal the USE command is entered to transfer temporary EDIT control to the file. When EDIT exhausts the file, control returns to the terminal.
- **WHILE**
Causes repetitive execution of blocks of EDIT commands until a "false" condition occurs. When used in conjunction with other EDIT metacommands, Boolean logic can be invoked on nested blocks of EDIT commands. The result is conditional execution of EDIT commands where execution is contingent on both the text and the EDIT commands.

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32214A SORT/3000 Subsystem

Features

- Sorts any file, up to 32,000 records
- Merges up to 16 sorted files
- Ascending or descending sort by keys
- Keys can be contiguous, separated, or overlapping
- Keys may be of multiple data types
- Record size is unrestricted and may be fixed or variable length
- Input and output media may be of various types (e.g. disc files, magnetic tapes, cards printer output, etc.)
- The sorted output can be chosen from sequenced records, key fields, disc addresses or disc addresses plus key fields
- No extra disc space required except for the sort file
- User specified routines may be used for key compare, pre-processing, and post processing

SORT/3000 Subsystem provides the capability to **sort and/or merge** multiple files of sequential records into a sequential record. This permits users of the HP 3000 Computer System to arrange large quantities of records (a file) into a prescribed order. Each record consists of a series of data fields which describe one "item" of information. Sorting is based on keys (values of one or more data fields). Merging forms one sorted sequence of records by combining one or more previously sorted sequences of records.

ENVIRONMENT

SORT/3000 is capable of operating in the minimum HP 3000 configuration. The program may be employed in a variety of applications:

- As a free standing subsystem, it can be activated through commands in Batch or Session mode.
- As a number of procedures, the subsystem provides a set of procedures callable by user programs written in SPL, FORTRAN, and also via the SORT verb in COBOL.

KEYS

The basis for determining the sequence of records in a file is a group of items that constitute the control word for a record. The data in the control words of all records are compared against each other to determine the sequence of the records.

The control word is made up of keys specified by the user. Most significant is the major key and is compared first. Other keys are minor and compared according to their relative position following the major key in the parameter description. Minor keys are compared only if the more significant keys result in an equal condition.

The SORT/3000 Subsystem is two programs capable of sorting or merging records on keys specified by the user. Individual keys may be contiguous, separated or overlapping and may appear anywhere in the record. Different key fields have their own sequences, thus indicating that different keys can be sorted in different order (ascending/descending) in the same run.

Length, type, relative position, number and priority of keys and type of sort, input and output files, are specified as parameters by the user.

The key data may be the following types:

ASCII
EBCDIC } sorted as 8-bit positive integers
Signed Integer (15 bits plus sign)
Positive Integer
Double Integer
Real Number
Double Precision Real Number
Packed Decimal
Numeric Display

FILES

Three files are required for sorting: Input, Output and Sort. The Sort file is built by the sort program and is always stored on a disc. The Input and Output files can

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generally be any type of medium such as cards, magnetic tape or disc files. Sorting requires disc space for only the sort file.

The output can be chosen from:

- Sequenced records
- Key fields or disc addresses*, or both*

**Requires that the input be a disc file.*

SORTING PROCEDURE

Sorting is accomplished using a variation of the replacement selection technique. During the input phase, some preliminary sorting of specified items (complete records, keywords only, etc.) takes place. A number of sorted records will form a block. Block size depends on the available buffer size. A number of such blocks will exist in the sort file at the beginning of the sort phase (the records within a block are sorted but the records within different blocks are not). The blocks are then merged into each other during the sort phase. The

technique used results in a total number of file accesses** within the SORT phase represented by the formula

$$\left(\frac{2 \times R \times S}{N}\right) + 2$$

where: R represents record size (in bytes)
S represents number of records to sort
N represents number of bytes in buffer

***Not the same as number of disc accesses (depending on blocking factor and buffer size within MPE/3000).*

MERGING PROCEDURE

The first record of each file to be merged is read into a buffer. The buffer contents are then compared to each other using specified key fields. The record with the highest or lowest collating sequence (depending on whether descending or ascending sequence was specified) is written to the output file. Other records are similarly processed. Input file records must be sorted in the same sequence as the specified merge keys.

The number of file accesses is equal to twice the total number of records.



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Scientific Software

Features

- Error and gamma functions
- Exponential, sine-cosine, and Fresnel integrals
- Elliptic functions and integrals
- Bessel functions
- Elementary statistics
- One-way frequency distribution
- Correlation
- Multiple linear regression

32205A

Scientific Library

The Scientific Library is a collection of procedures that perform the scientific functions required most often in scientific applications. These procedures can be called by user programs written in FORTRAN/3000, COBOL/3000, SPL/3000, or BASIC/3000.

Features

- Simplifies the use of statistical functions
- Generates easy-to-read analyses from on-line input or stored data
- Eliminates the need to program statistical operations
- Provides powerful computational capabilities through HP's Scientific Library
- Ensures correct values through extensive editing functions
- Provides a quickly-learned and easily-used operating procedure
- Provides versatility in applications through keyboard and batch operations
- Allows user to focus on research rather than programming requirements and numerical techniques
- Reduces analysis time through use of on-line terminals
- Provides a useful tool for instructional applications

32204A

STAR/3000 Statistical Analysis Routines

SIMPLIFIED STATISTICAL ANALYSIS

Statistical Analysis Routines consists of a sophisticated software package which provides simplified access to statistical functions of the HP Scientific Library through an interactive terminal or batch operation. Designed to run on the HP 3000 computer system, STAR is a subsystem of the Multiprogramming Executive (MPE) Operating System. As such, STAR/3000 enables the user to input data, manipulate file space, perform statistical operations and output the results in easy-to-read form.

Since STAR provides statistical functions in professionally programmed form, the user no longer has to create these functions himself. Nor does the user need to learn a programming language to use STAR, as all communication is done via commands (in batch mode) or questions and answers (in on-line terminal mode).

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STAR/3000 (Cont'd)

EXTENSIVE CAPABILITIES

STAR can perform many types of statistical analyses. Up to 32,767 observations of each of 63 variables can be analyzed, and this data can be edited to ensure correct values. These observations are represented internally as single precision (32-bit) floating point numbers; all calculations are done with single precision arithmetic.

Computational Routines

All STAR analyses are performed by modularized routines. These are as follows:

- Elementary Statistics Module
Calculates mean, standard deviation, standard error and mean, variance, kurtosis, skewness, minimum, maximum and range
- One-Way Frequency Distribution Module
Calculates one-way frequency distribution
- Correlation Module
Calculates product-moment correlation
- Regression Module
Calculates multiple linear regression
- Transformation Module
Transforms the observation values of one or more variables in the following ways: reciprocal, Napierian base e to the x power, natural logarithm, base 10 logarithm, square root, nearest integer, calculation of $10^n * x$ where n is a scale factor
- Scatter Diagram Module
Plots an x - y graph of the relationship between two variables
- Histogram Module
Constructs a distribution bar graph of the observations for a specified variable

Editing Facilities

STAR includes an Editor Module for changing erroneous observations or sets of observations (variables). Entire observation sets may be added, deleted or printed in order to ensure that their values are correct.

SIMPLE, EASILY-LEARNED PROCEDURE

Commands to STAR use familiar statistical terminology and a simple format. For example, commands such as FREQUENCY, TRANSFORM and CORRELATE are used to call the routines which perform these functions. When used from a terminal, STAR provides easily understood request messages, error messages and explanatory "help" messages. These assist the user in specifying exactly what he wants in the correct format. The sample print-out (adjacent) illustrates an interactive dialogue with STAR.

Keyboard or Batch

The data upon which STAR operates can be entered directly from a keyboard terminal or through a batch input device. STAR may also, at the user's direction, get its data from a previously constructed MPE data file. The reports which are generated may be directed to a user terminal or another output device such as a line printer.

A VALUABLE RESEARCH AID

STAR is particularly useful to researchers who need to do mathematical analyses on empirically gathered data. The fact that these analyses may be done interactively from a terminal can significantly reduce the amount of time necessary to discover important relationships among the variables.

All the necessary routines have been professionally programmed and are actively supported by Hewlett-Packard. This means that the researcher can focus on the problems involved in his research and experiments and need not concern himself with problems which result from inappropriate implementations of numerical techniques.

A USEFUL INSTRUCTIONAL TOOL

The ability of STAR to generate many easily readable reports from a previously prepared set of data makes STAR useful in instructional applications.

The student may choose or be required to generate several different reports from one or several data bases. In this way he discovers for himself the real meaning and relationships of various statistical methods. He may also be required to gather the data himself, thereby making STAR an important tool in any instructional laboratory in the sciences.

SAMPLE STAR RUN USING "PRINT" AND "PLOT" COMMANDS

The user is given the opportunity to declare himself an experienced STAR user, in which case the program would shorten all questions, assuming their context to be understood. In this example, questions are printed in full, since the user is inexperienced. For clarity, user responses have been underlined.

The Scatter Diagram Module plots two variables, one as a function of the other. One variable corresponds to the X-axis and the other to the Y-axis. Each axis is scaled independently according to the range of the corresponding variable. The plot symbol is designated by the user and can be any keyboard symbol. In this case, an asterisk is selected.

STAR/3000 (Cont'd)

Program Size

Approximately 40K bytes (includes all Scientific Library routines needed). Largest single code segment is 8K bytes.

```

:HELLO ...
:STAR ...
ARE YOU AN EXPERIENCED STAR USER?
>NO
WHAT IS YOUR DATA FILE?
>*
ENTER NUMBER OF VARIABLES AND OBSERVATIONS
>4,6
ENTER DATA
?1,6,1,1;
?2,5,3,2;
?3,4,5,4;
?4,3,7,8;
?5,4,11,16;
?6,5,13,32;
WHICH PROCEDURE DO YOU WISH TO USE?
#PRINT

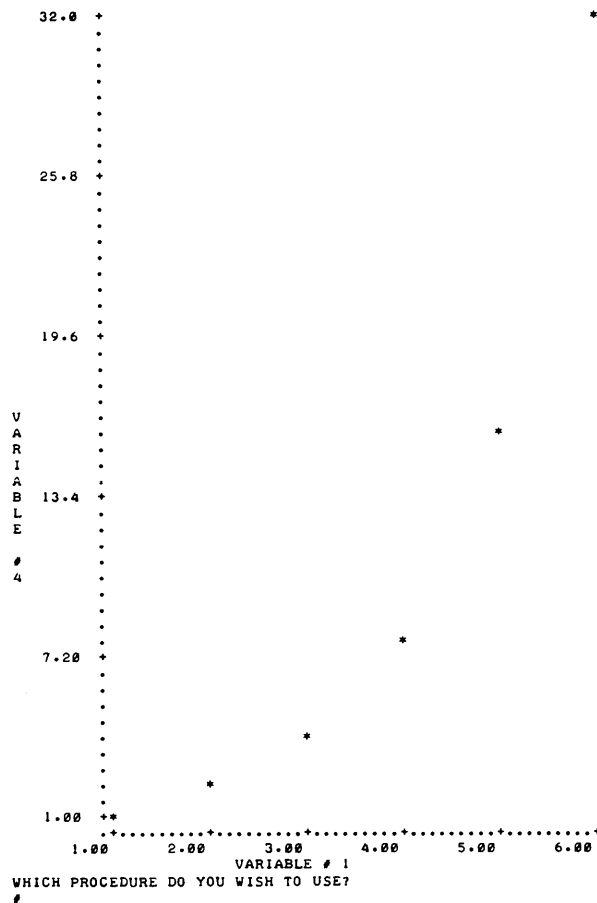
```

ROW	1	2	3	4
1	1.00000	6.00000	1.00000	1.00000
2	2.00000	5.00000	3.00000	2.00000
3	3.00000	4.00000	5.00000	4.00000
4	4.00000	3.00000	7.00000	8.00000
5	5.00000	4.00000	11.0000	16.0000
6	6.00000	5.00000	13.0000	32.0000

```

WHICH PROCEDURE DO YOU WISH TO USE?
#PLOT
ENTER X (HORIZONTAL) AND Y (VERTICAL) VARIABLES
>1,4
SPECIFY A PLOT SYMBOL
>*

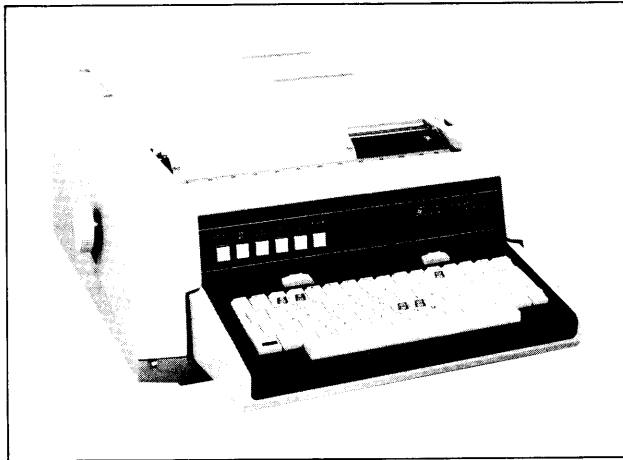
```





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30120A Printer Terminal



Features

- 75 or 118 column format
- 30 character per second print rate
- Heavy duty mechanism for continuous duty
- Quiet operation in a compact unit
- Completely integrated for use with the HP 3000

The HP Printer Terminal is a medium speed computer terminal for direct or remote communication. It serves as a system console or terminal for HP 3000 computer systems.

With an output printing speed of 30 characters per second, the HP 30120A enhances your system by making far more effective use of computer time than would be possible with conventional, slower terminals.

The HP 30120A is a modern self-contained, heavy duty unit that permits reliable, continuous duty. Acoustical design insures welcome quiet operation.

A Printer Terminal can be directly connected to the HP 3000 Computer System and employed as a system console*, or it can be interfaced through the asynchronous terminal controller and employed as a terminal. Input to the HP 30120A is RS-232C compatible, allowing

connection through modems and making possible remote use as a terminal. All necessary software for printer terminal operation with HP 3000 Computer Systems is supplied.

Many additional quality features provide operator and performance enhancements, including:

Print position indicator (a digital display that indicates next column to be printed) . . . Print position scale . . . End-of-line alarm . . . Internal illumination . . . Low paper alarm . . . Vertical tabulation (provides local or remote control tabulation, form feed, and programmable forms) . . . Horizontal tabulation (allows local or remote setting or total clearing of tabs at any character print position across print line).

**A 30120A is supplied with the HP 3000 Computer System as a console.*

Specifications

CONTROL UNIT

Transmission: Full duplex, serial asynchronous; 8 bits, 7-level ASCII plus parity (even)

Interface: EIA Standard RS232C (CCITT V-24), external modem (Compatible with Bell 103A or equivalent; direct distance dialing (300 baud), Bell 103A2 or equivalent; private line (300 baud), Bell 103F or equivalent)

PRINTING SYSTEM

Revolving print font belt; ink ribbon

Ink standard color: black

Character set: 96-character USASCII (CCITT no. 5)

Print positions (line length): 75 and 118 (characters)

Horizontal tabbing spacing: 10 characters per inch (2,54 cm)

Vertical tabbing spacing: 6 or 3 lines per inch (determined by line space switch)

Printed character size (typical):

Height: 0.1 inch nominal (2,5 mm)

Width: 0.060 to 0.085 inch (1,5 to 2,2 mm)

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Forms: provides crisp, clean, hard copy on six-part carbon or three-part carbonless, sprocketed forms (for pin-feed units) up to 12-27/32 inches (32,7 cm) wide

Single copy only on friction feed units

Maximum recommended pack thickness: 0.025 inch (0,64 mm)

Home paper rate: 6.66 inches (16,9 cm) per second

Indicators: local, standby, on-line, ready, interrupt, alarm, print pointers

KEYBOARD

Magnetically coupled key contacts ensure reduced wear, longer operating life, and high reliability. The full 128-character ASCII set (94 printable) can be generated.

Switches: All Caps, Auto Line Feed

PRINTING SPEED

10/15/30 characters/second

DATA TRANSFER

Bit serial 10-bit code (11-bit at 10 cps)

NUMBER OF COLUMNS

75 or 118 columns

POWER REQUIREMENTS

2.0A at 117V \pm 10%, 60 Hz -1.5 Hz +1 Hz

1.0A at 220 or 240V \pm 8%, 50 Hz \pm 0.5 Hz

Phases and Lines: Single phase, 3 wire

Power Consumption

Standby: 40 watts

Motor on: 85 watts

Printing: 110 watts

The Printer Terminal conforms to the following codes and standards:

Underwriters' Laboratory Standard 478 (60 Hz only)

Canadian Standards Association (60 Hz only)

Federal Communications Commission Rule 15

Electronic Industries Association Standard RS-232C

American National Standard USAS X3.4-1968

International Electrotechnical Commission 335-1

(50 Hz only)

ENVIRONMENTAL CONDITIONS

Operating Temperature: 0° to 43°C (+32° to +110°F)

Storage: -20° to +71°C (-4° to +160°F)

Relative Humidity

Operating and Non-Operating: 10 to 95%
(non-condensing)

Altitude

Operating: 0-12,000 ft.

Non-Operating: 0-50,000 ft.

Heat Dissipation: (Device) 820 BTU/hr
(207 kilocalories/hr)

PHYSICAL CHARACTERISTICS

Width: 20-3/8 inches (52 cm)

Height: 7½ inches (19 cm); with pedestal: 39½ inches high (100,3 cm)

Depth: 26½ inches (67,3 cm)

Weight: 80 lbs (36,3 kg)

Shipping Weight: 105 lbs (47,6 kg)

ORDERING INFORMATION

30120A: Printer Terminal with keyboard, 75 column, fixed width (8½ inches [21,6 cm]) pin feed, 30 cps. Without pedestal.

30120A-001: Printer Terminal with keyboard, 118 column, variable width forms feed tractors with external paper guide, vertical tab/form feed (including programmable vertical tabulation), horizontal tab, 30 cps. Includes pedestal.

30120A-003: Printer Terminal with keyboard, 75 column, friction feed, 30 cps; with pedestal.

All ordering numbers include HP 2762A printer terminal; power cable - 8 ft (2,44 m); signal cable* - 5 ft 2 in. (1,57 m); necessary software for integration with the HP 3000; diagnostic software.

OPERATING SUPPLIES AVAILABLE

Paper, Roll (75 column) HP Part No. 9280-0046

Paper, Stack
(75 column fanfold) HP Part No. 9280-0705

Paper, Stack
(118 column fanfold) HP Part No. 9320-0551

Ribbon, Black ink HP Part No. 9282-0524

Programmable Vertical
Format Discs HP Part No. 0950-0590

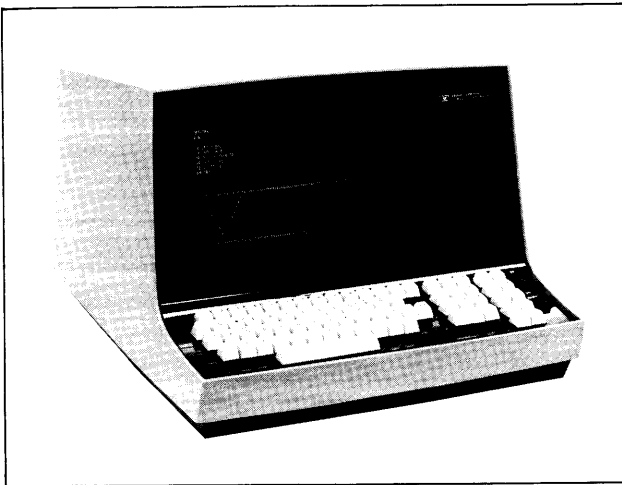
*Special length signal cables may be ordered.

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30123A CRT Terminal



Features

- Self-contained, including standard teleprinter keyboard, ten-key numerical keyboard, CRT, refresh memory, and power supply
- Easily read CRT screen displays 25 lines with 72 characters per line
- Software permits high data transmission rates, reducing terminal wait time
- Noiseless operation in a compact package
- Permits revision or deletion of one or more characters or an entire line
- Completely integrated for use with the HP 3000

The HP 30123A CRT Terminal provides reliable computer communications and a smooth flow of visual information. The high data transmission rates and operational flexibility of the HP 30123A reduces on-line time and simplifies computer communications. Operator efficiency is enhanced by including both a standard teleprinter keyboard and a ten-key numerical keyboard in the same unit. Since there is no humming or clattering, the terminal may be operated in any location. Base dimensions occupy a space similar to that of an executive typewriter.

Each character displayed on the CRT screen is refreshed at the power line frequency. Numbers and characters do not flicker and are distinctly formed. A tinted shield over the CRT reduces glare. Solid-state technology, including a metal oxide silicon (MOS) semiconductor memory, provides high-reliability and corresponding low-maintenance.

Specifications

SCREEN SIZE

12-inch rectangular tube (30.5 cm)

CHARACTER DISPLAY

Size: 0.11-inch by 0.18-inch (2.8 mm x 4.6 mm)

Characters Displayed: 1800

Characters per line: 72

Lines per display: 25

Refresh rate: 50 or 60 Hz, line synchronized

Character set: 64 character ASCII

MEMORY

MOS semiconductor

KEYBOARD

Electronic with ASR-33 Teletype layout plus 10-key numerical keyboard

CONTROLS

Cursor: up, down, left, right, home up, home down

Erase: to end of line, to end of frame

Frame Roll: up, down

Power: on, off

Mode: remote-local select

Transmission: full duplex-half duplex select

CURSOR

Flashing, remote or local control

I/O DATA RATE

110, 220, 440, 880, 1760, 150, 300, 600, 1200 or 2400 baud rate, switch selectable

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COMMUNICATIONS INTERFACE

EIA RS-232-B

POWER REQUIREMENTS

1.8A at 115V \pm 10%; 0.9A at 230V \pm 10%; 50 or 60 Hz \pm 5%

ENVIRONMENTAL CONDITIONS

Operating Temperature: 5° to 48°C (40° to 100°F)

Relative Humidity: 0% to 95% maximum

Heat Dissipation: (Device) 683 BTU/hr
(172 kilocalories/hr)

PHYSICAL CHARACTERISTICS

Width: 18½ inches (47 cm)

Height: 13 inches (33 cm)

Depth: 20 inches (50,8 cm)

Device Weight: 48 lb (21,8 kg)

Shipping Weight: 60 lbs (27,2 kg)

ORDERING INFORMATION

30123A CRT Terminal. Includes HP 2600A CRT terminal; power cable – 8 ft (2,44 m); signal cable* – 8 ft (2,44 m); necessary software for integration with the HP 3000; diagnostic software.

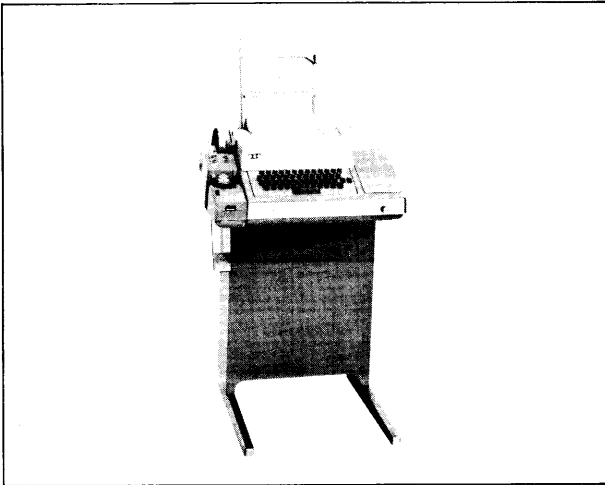
*Special length signal cables may be ordered



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30124A Teleprinter Terminal



Features

- EIA Standard RS-232 C coupling for data set operation
- Full duplex, 110 baud
- Time meter
- Pedestal mount
- ASCII code, even parity over 8 bits
- Alpha "0" and numeric "0"
- X-ON/ X-OFF-activated paper tape reader
- Automatic paper tape punch
- Automatic answer back
- Completely integrated for use with the HP 3000

The HP 30124A satisfies the basic needs for communication with the HP 3000 computer. The teleprinter combines a keyboard (similar to a typewriter), tape reader and tape punch in a single unit, and is suitable for standard duty (intermittent operation).

Data input to the computer can be made by means of a keyboard or punched tape. Tape sending and receiving can be manually or automatically (computer) controlled with simultaneous printing of local copy for visual reference. Tape can also be punched off-line with local printed copy. A coupling unit provides necessary voltage levels for connection to a data set.

Computer data output can be received at the terminal as printed copy with or without punched tape. An answer-back feature permits a called station to automatically identify itself.

Specifications

DATA TRANSFER

Full duplex, 10 cps, 110 baud, serial asynchronous, even parity over 8 bits, 11 unit code (1 start bit, 8 character bits, 2 stop bits).

EIA standard RS-232C interface, includes coupler for data set connections

PRINTING SYSTEM

Impact printer using a cylindrical typewheel; standard typewriter ink ribbon.

Character set: 63 printable characters. ME typewheel and DSL keytop (ASR 33 keyboard) with key interlock. Lower case ASCII code causes upper case to be printed

Print positions (line length): 72 characters. Signal bell at approximately 61st and 71st column

Horizontal spacing: 10 characters per inch (2,54 cm)

Vertical spacing: 6 or 3 lines per inch

Platten: Friction feed

Forms: Original and 1 carbon copy possible (roll paper, 400 ft. length), approximately 8½ inches (21,6 cm) wide

Typing speed: 100 words/minute (maximum)

Tape punching and printing speed: 10 cps

TAPE PUNCH AND READER

Manual or automatic operation

TAPE CODE

8-channel on 1-inch tape (2,54 cm)

TAPE TYPE

Oil-base stock, 0.004 inch (0,10 mm)

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POWER REQUIREMENTS

15A (start-up surge – maximum), 3A (running) at
115V ± 10%, 50 or 60 Hz ± 3/4%, single phase.
1.5A at 230 ± 10%, 50 Hz ± 3/4%, single phase.
Power consumption 250 watts, nominal. Conforms to
UL and CSA requirements.

ENVIRONMENTAL CONDITIONS

Operating Temperature: -40°C to +65°C
(-40° to 150°F)
Relative Humidity: 90% maximum at 38°C (100°F)
Heat Dissipation: 775 BTU/hr (195 kilocalories/hr)

PHYSICAL CHARACTERISTICS

Width: 22 inches (55,9 cm)
Height: 8½ inches (21,6 cm); with pedestal: 33 inches
(83,8 cm)
Depth: 18½ inches (47 cm)
Weight: 77 lb (34,7 kg) includes pedestal
Shipping Weight: 92 lb (41,8 kg) includes pedestal

ORDERING INFORMATION

30124A Teleprinter Terminal, 72 column, friction feed.
Includes HP 2749B Teleprinter with pedestal, running-
time meter, chad box, copy holder, paper shaft and
tape spools; power cable – 7½ ft (1,91 m); signal
cable* – 6 ft (1,52 m); necessary software for integration
with the HP 3000; device diagnostic software. Also
included are the following operating supplies: one roll
printer paper, one roll paper tape, lubrication kit.

**Other signal cable lengths may be specified.*

OPERATING SUPPLIES AVAILABLE

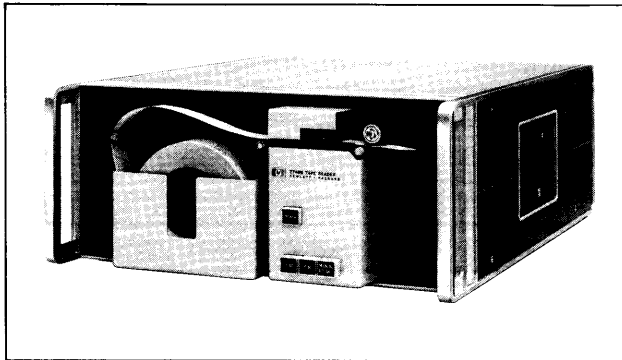
Paper, Roll 8½ inches wide (21,6 cm),
370 ft long (94 m) HP Part No. 9280-0046
Paper, Tape 1 inch wide (2,54 cm),
1000 ft long (304,8 m) HP Part No. 9280-0063
Lubrication Kit HP Part No. 5080-6610
Paper Tape Winder,
115V/230V/Battery.
Includes rechargeable
battery HP Part No. 12575C



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30104A Punched Tape Reader Subsystem



Features

- Reading speed to 500 characters-per-second
- Error-free reading of both dry and oil-base tape without adjustment
- Simple operation and rugged construction for long life
- Completely integrated for use with the HP 3000

The high speed of the reader permits rapid read in while offering the economy and versatility of punched tape input. A significant advantage in reading accuracy is also provided by using a new compensating sensing technique. Data reliability is enhanced as each character is read only once with no overshooting of characters. Positive feedhole control and a reliable clutch/brake mechanism ensure that the tape will stop on the character that initiates the stop. Simple operation, rugged construction and electrically-conservative design ensures long life at top performance.

Specifications

READING SPEED

500 characters per second (415 characters per second when operated from 50 Hz power)

READING TECHNIQUE

Photoelectric, character-by-character

TAPE

Code: 8 level code

Width: 1 inch (2,54 cm)

Material: Any material with less than 60% transmissivity

START/STOP TIMES

Start time: Less than 6 milliseconds

Stop time: Less than 500 microseconds
(stops on character)

CONTROLS

Load: Releases pinch roller and stops capstan for tape threading

Read: Enables all circuits for external control

Manual Advance: Advances tape when pressed

Power: Turns on reader

POWER REQUIREMENTS

2.5A at 115V \pm 10%;

1.25A at 230V \pm 10%, 50 or 60 Hz \pm 5%

ENVIRONMENTAL CONDITIONS

Operating Temperature: 0° to 55°C (32° to 131°F)

Non-operating Temperature: -40° to 75°C (-40° to 167°F)

Relative Humidity: 95% at 25° to 40°C

Heat Dissipation: (Device) 683 BTU/hr
(172 kilocalories/hr)

PHYSICAL CHARACTERISTICS

Height: 7 inches (17,8 cm)

Width: 17 inches (43,2 cm)

Depth: 16 inches (40,6 cm), not including panel controls and connectors

Device Weight: 42 lb. (19,1 kg)

Shipping Weight: 54 lb. (24,5 kg)

Mounting: Desk-top or HP 3000 Cabinet

ORDERING INFORMATION

30104A Punched Tape Reader Subsystem, 500 cps at 60 Hz or 420 cps at 50 Hz. Includes HP 2748B Punched Tape Reader; rack mounting kit; controller/interface; signal cable* - 18 ft (5,48 m); power cable - 7-1/2 ft (2,28 m); necessary software for integration with the HP 3000; device diagnostic software.

OPERATING ACCESSORY AVAILABLE

12575C Paper Tape Winder, 115/230V/Battery. Includes rechargeable battery.

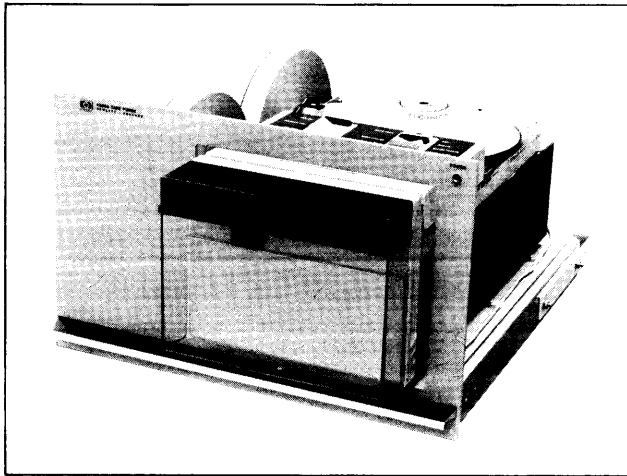
*maximum permissible signal cable length: 50 ft (15,24 m)



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30105A Tape Punch Subsystem



Features

- Compact and quiet-running
- Punches tape at 75 Characters-per-second
- Punches both paper tape and mylar tape
- Completely integrated for use with the HP 3000

The HP 30105A combines reliability and compactness in a self-contained unit. At 75 characters-per-second, the punch provides significantly faster tape punching speed when compared with ASR 33/35 punch rate. Intermediate assembly and compilation tapes can be punched and loaded much faster, permitting greatly improved system throughput rates.

Specifications

PUNCH SPEED

75 characters-per-second, asynchronous

TAPE TYPE

Paper, Mylar or plastic

TAPE WIDTH

Standard 5 level (11/16 inch, 17,5mm) and 8 level (1 inch, 25,4mm)

TAPE THICKNESS

Paper: 0.003 inch to 0.005 inch (0,08 to 0,13mm)
oil-base or dry

Mylar: 0.003 inch to 0.004 inch (0,08 to 0,10mm)

Plastic: 0.003 inch to 0.0045 inch (0,08 to 0,11mm)

POWER REQUIREMENTS

2A at 115V \pm 10%; 1A at 230V \pm 10%; 47.5 to 66 Hz

OPERATING CONTROLS

POWER ON: applies primary ac power

DC ON: applies dc power to internal circuits

TAPE FEED: feeds blank tape through unit

EXT: manually signals computer to request data

FEED HOLES: punches only feed holes as tape passes through unit

CODE HOLES: feeds tape (punches 8-level code and feed hole)

Tape Winding Direction switch: position 1 winds counter-clockwise, position 2 winds clockwise

Tape Winding Motor switch: position 1 is "On," position 2 is "Off"

ENVIRONMENTAL CONDITIONS

Operating Temperature: 10° to 40°C (50° to 104°F)

Relative Humidity: up to 80% at 40°C (104°F) with no condensation

Heat Dissipation: (Device) 683 BTU/hr
(172 kilocalories/hr)

PHYSICAL CHARACTERISTICS

Height: 10½ inches (26,7 cm)

Width: 16¾ inches (42,5 cm)

Depth: 21-3/16 inches (53,8 cm)

Mounting: Fits in HP 3000 cabinet

Device Weight: 35 lb (15,9 kg) including drawer

Shipping Weight: 47 lb (21,3 kg)

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ORDERING INFORMATION

30105A Tape Punch Subsystem, 75 cps. Includes HP 2895B Tape Punch; controller/interface; power cable — 7.5 ft. (2,28 m); signal cable — 15 ft. (4,57 m); necessary software for integration with the HP 3000; device diagnostic software.

OPERATING SUPPLIES AVAILABLE

Extra Tape (Order by Part No.; appropriate discount for large quantities)

Paper Tape, 1-inch wide (2,54 cm) 1000 foot roll (304,8 m) HP Part No. 9280-0063

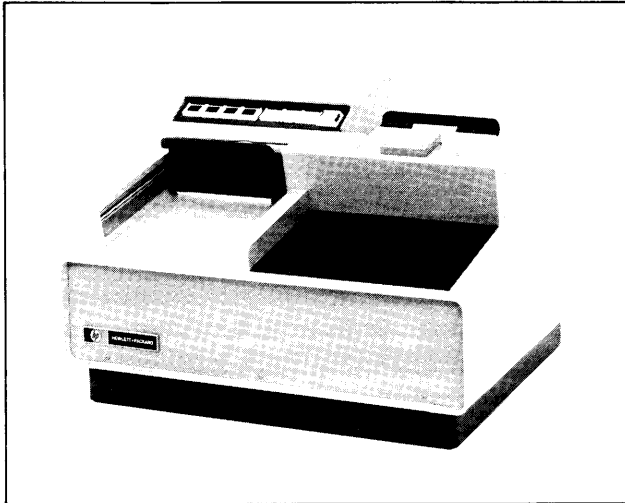
Mylar Tape, 1-inch wide, 500 foot roll (152,4 m), HP Part No. 0460-0747



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30106A Card Reader Subsystem



Features

- Reads 600 punched cards per minute
- Vacuum card picking
- Slant-top design for smooth card flow
- Straight-through card-track for long card life
- Automatic feed
- 1000 card hopper/stacker
- Completely integrated for use with the HP 3000

The HP 30106A Subsystem provides dependable medium speed, card reading capability. A vacuum pick mechanism is used in conjunction with riffle air for ease of card picking and minimum card wear. This technique also permits extremely high tolerance to damaged or worn cards. The card track is very short so that at no time is more than one card in motion. Card life is in excess of 1000 passes.

The many checking features of the reader insure safe, dependable operation. These include light/dark check, motion check, pick check for stapled cards, and hopper checks.

Specifications

CARD RATE

600 cards/minute

CARD TYPE

Standard 80-column EIA card

HOPPER/STACKER

1000 card capacity

CARD LIFE

Excess of 1000 passes

LIGHT SOURCE

Infrared light emitting diodes

READ STATION

Photo transistor, 12 bits simultaneously

INTERNAL CLOCK

Crystal Oscillator

CONTROLS

Stop Switch
Reset Switch
End of File Switch
Power Switch

INDICATORS

Read Check Indicator
Motion Check Indicator
Pick Check Indicator
Hopper/Stacker Indicator

DATA FORMATTING

The HP 3000 interface controller provides Hollerith to ASCII conversion with packing; packed binary formatting (packs four columns into six bytes), and column binary conversion (each column plus four leading zeros packed into two bytes).

POWER REQUIREMENTS

12.4A (starting), 4.0A (running) at 115V \pm 15%;
6.2A (starting), 2A (running) at 230V \pm 15%;
50 or 60 Hz \pm 2%

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ENVIRONMENTAL CONDITIONS

Operating Temperature: 10° to 40°C (+50° to +104°F)

Non-operating Temperature: -31° to +57°C
(-25° to +135°F)

Relative Humidity: 80% maximum

Heat Dissipation: (Device) 1230 BTU/hr
(310 kilocalories/hr)

PHYSICAL CHARACTERISTICS

Height: 15.5 inches (39.4 cm)

Width: 23-1/16 inches (58,6 cm)

Depth: 18 inches (45,7 cm)

Net Weight: 75 lbs (34 kg)

Shipping Weight: 100 lbs (45,4 kg)

ORDERING INFORMATION

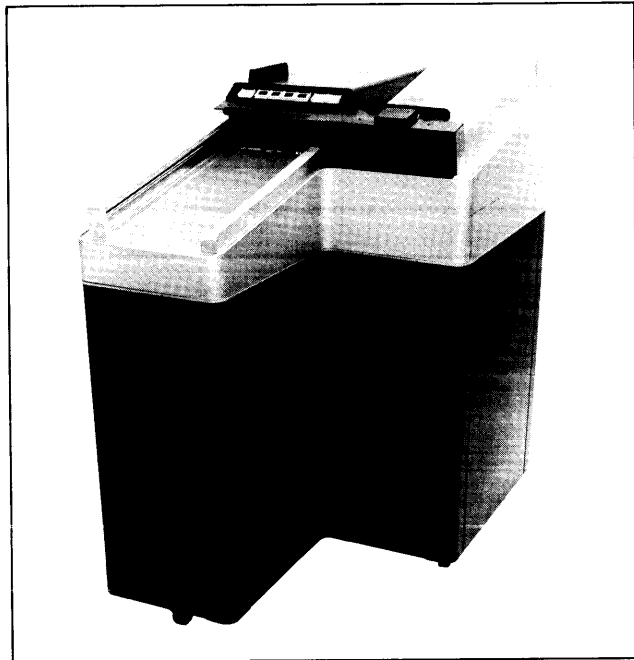
The 30106A Card Reader Subsystem includes HP 2893A Card Reader; controller/interface; power cable — 6 ft (1,83 m); signal cable* — 50 ft (15,24 m); necessary software for integration with the HP 3000; device diagnostic software.

*500 ft (152,4 m) maximum signal cable can be specified



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30107A Card Reader Subsystem



Features

- 1200-card per minute reading speed
- Vacuum card picking
- Optional dual read station
- Straight-through card-track for long card life
- Automatic feed
- 2250-card hopper and stacker capacity
- Completely integrated for use with the HP 3000

The HP 30107A Subsystem provides a high-speed, large-capacity and economical punched card reader. It features a reading speed of 1200 cpm, a hopper and stacker capacity of 2250 cards plus the most reliable card mechanism available.

The sophisticated vacuum picker mechanism has a high tolerance to mutilated, warped and edge-damaged cards. Stapled cards are rejected without damage to the cards. By using a straight-through card track, almost unlimited card life is assured. This also makes the reader virtually jam proof since only one card is in the card track at any time.

A photo-transistor array reads standard 12-row, 80-column punched cards in serial, column by column fashion. The data detected is compared for discrepancies providing maximum card reading accuracy. Standard checking features include light/dark check, motion check, pick check, and hopper checks.

A dual read station is available as an option.

Specifications

CARD RATE

1200 cards/minute

CARD TYPE

Standard 80-column EIA card

HOPPER/STACKER

18-inch capacity or approximately 2250 cards

CARD LIFE

Excess of 1000 passes

LIGHT SOURCE

Infrared light emitting diodes (LED's).

READ STATION

Photo transistor sensors, 12-bits parallel. Optional dual read station subsystem contains two sets of photo transistors spaced one card column apart.

CONTROLS

Stop Switch
Reset Switch
End-of-File Switch
Power Switch

INDICATORS

Read Check Indicator
Motion Check Indicator
Pick Check Indicator
Hopper/Stacker Indicator

DATA FORMATTING

Interface controller provides program control for Hollerith to ASCII conversion with packing; packed binary formatting (packs four columns into six bytes), and column binary conversion (each column plus four leading zeros packed into two bytes).

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POWER REQUIREMENTS

35A (starting), 5.8A (running) at 115V \pm 10%;
17.5A (starting), 4.9A (running) at 230V \pm 10%;
50 or 60 Hz \pm 1%

ENVIRONMENTAL CONDITIONS

Operating Temperature: 10° to 40°C (50° to 104°F)

Nonoperating Temperature: -30° to +57°C
(-22° to +135°F)

Relative Humidity: 90% (non-condensing)

Heat Dissipation: (Device) 2276 BTU/hr
(576 kilocalories/hr)

PHYSICAL CHARACTERISTICS

Height: 41½ inches (105,4 cm)

Width: 23½ inches (59,7 cm)

Depth: 39 inches (99 cm)

Net Weight: 200 lbs (90,7 kg)

Shipping Weight: 250 lbs (113,4 kg)

ORDERING INFORMATION

30107A Card Reader Subsystem. Includes HP 2950A Card Reader with single read-station; power cable — 6 ft (1,83 m); controller/interface; signal cable* — 50 ft (15,24 m); necessary software for integration with the HP 3000; device diagnostic software.

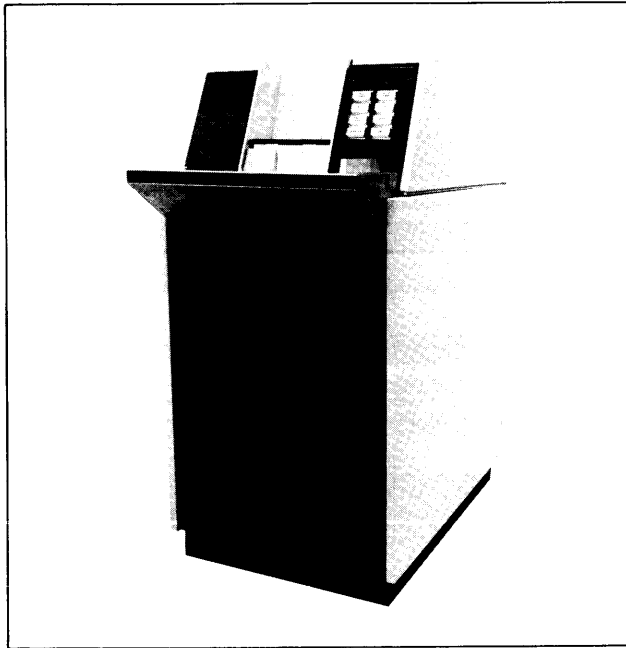
30107A-001 Card Reader Subsystem. Same as stated above but with dual read station.

*500 ft (152,4 m) maximum signal cable can be specified.



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30112A Card Punch Subsystem



Features

- Punches 250 cards/minute – maximum
- Complete hopper and stacker accessibility for ease of operation
- Precision 12-row indexing places card under 80 punches
- Check read station for accurate punch verification
- Comparison error causes automatic card offset
- Rugged construction for reliable operation
- Completely integrated for use with the HP 3000

The HP 30112A provides medium speed punched card output for use with HP 3000 computer systems. It features a punch speed of 250 cards per minute, offset reject capability and complete operator accessibility for loading and removing cards during operation.

Precise punch location is assured by use of 12-row indexing that accurately places the card under 80 punches. A punch ready station aligns the cards close to the punches for minimum delay when punch demand is given. Verification of the punch operation is provided by a check-read station. If an error is detected, an offset mechanism shifts the affected cards causing them to appear in an offset position in the output stacker. Corrected cards are automatically punched and the operator merely pulls the offset cards from the stack. Input hopper capacity and output stacker capacity are 1200 and 1500 cards respectively.

The card punch interface and controller provide all necessary data transfer and data formatting functions between the computer and the punch. Controller functions include ASCII to Hollerith conversion, packed binary formatting, or column binary conversion. This permits complete data compatibility between cards being punched and read on the HP 3000.

Specifications

CARDS

Standard 80-column EIA card

SPEED

Up to 250 cards per minute, maximum (± 6 cards per minute)

OPERATIONAL

Offset reject of error cards with automatic punching of correct cards

Punch and check-read ready stations

Prepunch edge reference and noncumulative indexing

Row by row punching and check reading

Punches EIA standard rectangular holes

CAPACITY

Input Hopper: 1200 cards

Output Stacker: 1500 cards

HEWLETT  PACKARD

DATA FORMATTING

Controller provides data formatting functions for ASCII to Hollerith conversion, packed binary formatting (packs six bytes into four columns on the card) or column binary conversion (lower 12 bits of 16 bit word recorded in one column). The ASCII to Hollerith conversion is American National Standard Hollerith punched card code, x3.26-1970. All 256 8-bit ASCII characters translate into a unique punched card code.

CONTROL PANEL SWITCHES AND INDICATORS

Main Power Switch with Indicator
Motor Power Switch with Indicator
Feed Failure Indicator
Stop Switch with Indicator
Single Pick Switch with Indicator
Ready Switch with Indicator
Interlock Indicator
Temperature Indicator

POWER REQUIREMENTS

25A (starting), 14A (running), at 115V \pm 10%, 60 Hz \pm 0.5%, single phase; 12.5A (starting), 7A (running), at 230V \pm 10%; 50 Hz \pm 0.5%, single phase

ENVIRONMENTAL CONDITIONS

Operating Temperature: +10° to +40°C (+50° to +105°F)
Storage Temperature: -34° to +65°C (-30° to +150°F)
Relative Humidity: 30% to 80% (non-condensing)
Heat Dissipation: (Device) 5500 BTU/hr
(1386 kilocalories/hr)

Does not include limitations imposed by cards

PHYSICAL CHARACTERISTICS

Height: 45 inches (114,3 cm)
Width: 22 inches (55,88 cm)
Depth: 39 inches (99,06 cm)
Cabinet mounted on rubber-wheeled casters
Device Weight: 610 lbs (276,7 kg)
Shipping Weight: 670 lbs (303,9 kg)

ORDERING INFORMATION

30112A Card Punch Subsystem. Includes HP 2890A Card Punch; 5 ft (1,52 m) power cord; controller/interface; signal cable* — 50 ft (15,24 m); necessary software for integration with the HP 3000; device diagnostic software.

*Other signal cable length can be specified



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30108A Line Printer Subsystem



Features

- 200 lines per minute (with 64-character set), 132 column line width
- Full vertical format capability
- Crisp, sharp printout on six copies
- Front-opening drum gate for ease of forms loading and ribbon changing
- Completely integrated for use with the HP 3000

The HP 30108A Line Printer Subsystem has a highly reliable, drum-type printer. It operates at 200 lines-per-minute, has a full 132 column line width and 8 level tape control for vertical formatting. Many operational features associated with big system line printers such as multiple copy printout and the use of a wide range of form sizes and types, are included.

The printer is designed for maximum operator convenience. Controls are contained on a single panel and status-at-a-glance indicators minimize operator attention.

The front opening drum gate allows easy loading and positioning of forms. A pedestal stand is supplied with the printer for paper handling convenience. The stand is removable for table-top mounting in specialized situations.

The standard printer is supplied with a 64 character set and a 96 character set is optionally available.

Specifications

PRINTING SPEED

200 lines per minute (64 character set)

150 lines per minute (96 character set)

CHARACTERS PER LINE

132

CHARACTER SET

64 Standard

96 Optional

CHARACTER PITCH

Horizontal: 10 characters per inch (2,54 cm)

Vertical: 6 lines per inch

VERTICAL FORMAT

8 channel paper tape

POWER REQUIREMENTS

6.0A at 115 ± 10%, 60 Hz ± 1%; 3.0A at 230V ± 10%, 50 Hz ± 1%

ENVIRONMENTAL CONDITIONS

Operating Temperature: 10° to 40°C (50° to 104°F)

Storage Temperature: -20°C to 65°C (-4° to +150°F)

Relative Humidity: 30% to 95% (non-condensing)

Heat Dissipation: (Device) 2160 BTU/hr

(545 kilocalories/hr)

PAPER SLEW

Approximately 15 in/sec. (38,1 cm)

CONTROLS

Power On/Master Reset

Power Off

Start

Stop

Page Eject

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INDICATORS

Paper Out
Paper Fault (Paper tear or runaway)

PHYSICAL CHARACTERISTICS

Height: 15½ inches (39,47 cm) without stand,
41¼ inches (104,8 cm) with stand
Depth: 25½ inches (64,8 cm)
Weight: 500 lbs with stand (227 kg)
Shipping Weight: 550 lbs (250 kg)

FORMS SPECIFICATIONS

Single Part: 15 to 25 pounds
Multiple Part: 15 pounds 1st part, 12 pounds for 5 copies
Multiple Copy: Up to six parts
Length: Up to 22 inches (55,9 cm)
Width: 4 to 20.5 inches (10,2 cm to 52,1 cm)

ORDERING INFORMATION

30108A Line Printer Subsystem. Includes HP 2610A
Line Printer (200 LPM, 64 characters, 132 columns).
30108A-001 Line Printer Subsystem. Includes
HP 2610A Line Printer (150 LPM, 96 characters, 132
columns).

Subsystems include power cable – 15 ft (4,57 m);
controller/interface; signal cable* – 50 ft (15,24 m);
necessary software for integration with the HP 3000;
device diagnostic software.

OPERATING SUPPLIES AVAILABLE

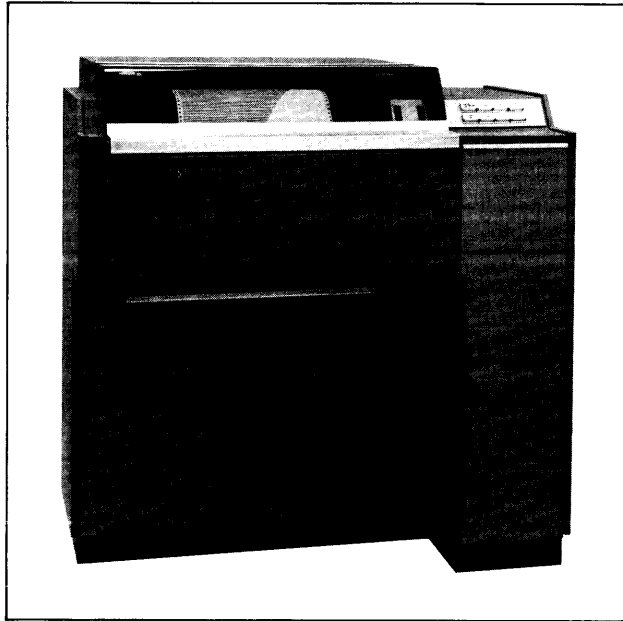
Format Tape Punch	HP Part No. 9164-0023
Adhesive, 3 Fl. oz. (8,9 cl)	HP Part No. 0470-0391
Blank Format Tape	HP Part No. 1535-2094
General Purpose Format Tape	HP Part No. 1535-2097
Ribbon	HP Part No. 1535-2098
Paper, Fanfold, 15 lb. bond	HP Part No. 9320-1659

*500 ft (152,4 m) maximum signal cable can be specified

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30109A Line Printer Subsystem



Features

- 600 lines per minute (with 64 character set), 132 column line width
- Drum design for long life and minimum maintenance
- Crisp, sharp type on up to six copies
- Full vertical format capability
- Completely integrated for use with the HP 3000

The HP 30109A provides intermediate speed and highly reliable printout capability. It features 600 lines-per-minute operation, 132 column line width and 8 level tape control for vertical formatting.

Forms are quickly loaded and aligned to their exact starting position. The front-opening drum gate swings clear to afford full accessibility to the forms loading area. Hammer force automatically adjusts to form thickness for crisp printout on one to six copies. Forms are powered to the stacking tray for sure stacking even at low humidity.

Specifications

PRINTING SPEED

600 lines per minute (64 character set)
500 lines per minute (96 character set)

CHARACTERS PER LINE

132

PRINTING METHOD

Rotating drum, impact-type

CHARACTER SET

64 Standard
96 Optional

CHARACTER PITCH

Horizontal: 10 characters per inch (2,54 cm)
Vertical: 6 lines per inch

PAPER ADVANCE SPEEDS

Single space: 25 msec

Multiple space: Use Formula $T = 25 + 8.4(n-1)$, where
T = time in milliseconds to advance paper, and
n = number of lines skipped

VERTICAL FORMAT

Format control codes for suppressing line advance, line advance (1-63 lines) and for selecting levels 1 through 8 of the format control tape

FORMS SPECIFICATION

Single Copy: 15 lbs. min., max. stock thickness of 0.006 inch (0,15 mm)

Multiple Copy: Original and five copies

Paper Dimensions: 3½ to 20-5/8 inches wide (8,9 cm to 52,5 cm), edge punched holes (½ inch, center to center (1,3 cm); ¼ inch (6,3 mm) center to edge

Paper Compartment: Accommodates fan-fold forms in page lengths up to 22 inches (55,9 cm) when stacked on floor or 11 inches (27,9 cm) stacked in rear basket

ADJUSTMENTS

Static: Vertical forms position, horizontal forms position.

Static/Dynamic: Vertical forms position (± 1 line)

horizontal forms position (± 2 columns), paper tension (horizontal and vertical)

HEWLETT  PACKARD

POWER REQUIREMENTS

10.0A at 115V ± 10%, 60 Hz ± 1%
5.0A at 230V ± 10%, 50 Hz ± 1%

ENVIRONMENTAL CONDITIONS

Operating Temperature: 10° to 40°C (50° to 104°F)
Relative Humidity: 10 to 95% (non-condensing)
Heat Dissipation: (Device) 3600 BTU/hr
(910 kilocalories/hr)

PHYSICAL CHARACTERISTICS

Height: 46 inches (1,17 m)
Width: 46 inches (1,17 m)
Depth: 34 inches (86,4 cm)
Mounting: Wheels and leveling screws
Weight: 900 lbs (409 kg)
Shipping Weight: 990 lbs (449 kg)

ORDERING INFORMATION

30109A Line Printer Subsystem. Includes HP 2614A
Line Printer 600 lpm (64 characters, 132 columns).
30109A-001 Line Printer Subsystem. Includes HP 2614A
Line Printer 500 lpm (96 characters, 132 columns).
Subsystems include power cable – 15 ft (4,57 m);
controller/interface; signal cable* – 50 ft (15,24 m);
necessary software for integration with the HP 3000;
device diagnostic software.

*500 ft (152,4 m) maximum signal cable can be specified

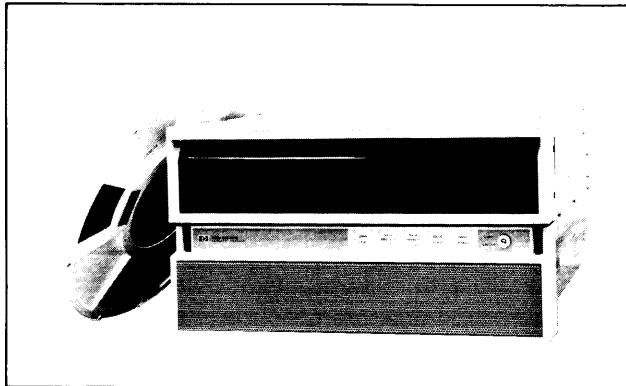
OPERATING SUPPLIES AVAILABLE

Ribbon, black ink, 15 in. (38,1 cm) wide	HP Part No. 9282-0505
Format Tape Punch	HP Part No. 9164-0023
Blank Format Tape	HP Part No. 1535-2094
General Purpose Format Tape	HP Part No. 1535-2097
Adhesive, 3 Fl. Oz. (8,9 cl)	HP Part No. 0470-0391
Paper, Fanfold 15 lb. bond	HP Part No. 9320-1659



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30110A Cartridge Disc Subsystem



Features

- Compact on-line storage
- Dual storage media for maximum convenience
- 4.9 million bytes
- Expandable to 19.6 million bytes (4 discs can be connected to one controller)
- Average access time less than 35 milliseconds
- Photo-optical head positioning for guaranteed interchangeability
- Reliability through simple and rugged design
- Completely integrated for use with the HP 3000

The HP 30110A Cartridge Disc Subsystem uses an efficient and dependable Moving-head Disc Drive. It serves as a low-cost mass storage device for use in HP 3000 computer systems.

Each drive has a removable cartridge disc in combination with a fixed disc. Together they store 4.9 million bytes of information. Both discs are served by the same moving-head mechanism. The removable disc is permanently enclosed in a cartridge for protection against contamination and damage.

Specifications

CAPACITY

Drive: 4,915,200 bytes; 200 cylinders; 800 tracks; 19,200 sectors
Track: 24 sectors; 6,144 bytes
Cylinder: 4 tracks; 96 sectors; 24,576 bytes
Sector: 256 bytes
Recording Surfaces: 4
Discs: 2

RECORDING

2200 bits/inch on inner track, 100 tracks/inch, 203 tracks/surface

ACTUATOR

Voice coil actuator with position and velocity feedback

CARRIAGE

Stainless steel rails life tested in excess of two hundred million seeks

AIR FILTRATION AND CIRCULATION

65 CFM squirrel cage blower distributes air to both discs. All air passing over the discs goes through an absolute filter located at outlet side of blower. Positive air pressure is maintained during cartridge change.

DATA ACCESS

Rotation Speed: 2400 RPM
Head Positioning (including settling time)

Track-to-Track (Maximum): 7 ms

67 Tracks (Maximum): 30 ms

203 Tracks (Maximum): 55 ms

Rotational Delay (latency)

Average (½ revolution): 12.5 ms

Maximum (1 revolution): 25 ms

Total Average Response Time

(position and rotation): 47.5 ms

Data Transfer

8 Bit Bytes/second: 245,760 average

Bits/Second: 1.96 million average

Cartridge Change at 60 Hz Power

Stop Time: 25 sec, maximum

Start Time: 30 sec, maximum

HEWLETT  PACKARD

POWER REQUIREMENTS

110/120V \pm 10%, 60 Hz \pm 2%, 3.4A, 1 \emptyset
220/240V \pm 10%, 50 Hz \pm 2%, 2.0A, 1 \emptyset

INTERCHANGEABILITY

The unit's unique photo-optical head positioning system allows any disc written on any HP 30110A within its operating temperature (10° to 40°C) to be read on any other HP 30110A unit operating within that temperature range.

ENVIRONMENTAL CONDITIONS

Operating Temperature: +10° to +40°C (+50° to +104°F)

Relative Humidity: 95% max., non-condensing

Vibration: 10 to 50 Hz at 0.01 inch (0,25 mm)
peak-to-peak excursion

Attitude (pitch and roll): Accuracy of position is not affected by attitude of the drive.

Heat Dissipation: (Device) 1393 BTU/hr
(351 kilocalories/hr)

PHYSICAL CHARACTERISTICS

Disc Drive

Height: 10½ inches (26,7 cm)

Width: 19 inches (48,3 cm), (16¾ inches (42,5 cm)
behind rack mounting ears)

Depth: 25-5/8 inches (65,1 cm), (22-15/16 inches
(58,3 cm) behind rack mounting ears)

Weight: 117 lbs. (53,1 kg)

Shipping Weight: 140 lbs. (63.5 kg)

Mounting: Fits in HP 3000 cabinet

Power Supply

Height: 7 inches (17,8 cm)

Width: 16¾ inches (42,5 cm)

Depth: 19¾ inches (50,2 cm)

Weight: 55 lbs. (25 kg)

Shipping Weight: 65 lbs. (29,5 kg)

Mounting: Fits in HP 3000 cabinet

ORDERING INFORMATION

30110A: Cartridge Disc Subsystem, 4.9M bytes.

Includes the HP 7900A cartridge disc drive; power supply; power cable – 15 ft (4,57 m); signal cable – 15 ft; controller/interface; disc cartridge.

30110A-010: Additional drive on same controller, 4.9M bytes. This option includes the HP 7900A disc drive; power supply; power cable – 15 ft (4,57 m); signal cable – 15 ft; disc cartridge. Up to 4 drives may be included on one interface controller.

Subsystems include necessary software for integration with the HP 3000; device diagnostic software.

OPERATING SUPPLIES AVAILABLE

30334A – Disc Cartridge



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30103A Fixed Head Disc Subsystem

Features

- Fixed-head design for efficient, high-speed operation
- Fits easily into cabinet bays
- 2 and 4 million byte storage capacities
- 8.5 millisecond average access time
- Helium atmosphere system for maximum life and reliability
- Completely integrated for use with the HP 3000

The HP 30103A Disc Subsystem assures maximum performance and throughput. The unit incorporates the latest advances in fixed-head disc design and modern integrated-circuit technology. Units are available with 2 or 4 million byte storage capacities. A modular system of plug-in circuits and heads allows capacity to be tailored to individual requirements.

High-density storage coupled with a disc rotational speed of 3520 rpm provide an average data transfer rate of 485 Kilobytes per second.* When the magnetic heads are lowered to their operating position, the heads fly at a nominal spacing of 120 microinches from the recording surface. All surface wear is eliminated. In addition, the rotating assembly is sealed in an inert helium atmosphere. This technique provides maximum protection against oxidation and contaminant damage to vital disc and head components.

*At 60 Hz operation

Specifications

CAPACITIES

30103A-001: 2,097,152 bytes (expandable)
30103A-002: 4,194,304 bytes (non-expandable)

ORGANIZATION

30103A-001: 256 tracks
30103A-002: 512 tracks
Track: 32 sectors; 8192 bytes
Discs: 4
Tracks/Surface: 64
Surfaces/Disc: 2
Head Configuration: One fixed-head per hardware track

DATA ACCESS

Disc Speed (nominal)
3520 RPM (60 Hz)
2940 RPM (50 Hz)
Access Time (average)
8.5 ms (60 Hz)
10.2 ms (50 Hz)
Data Transfer Rate (average): 485,000 bytes/sec, 60 Hz;
405,000 bytes/sec, 50 Hz
Bits/Second: 3.97 million (nominal)
Start Time: 6 minutes (nominal)

DISC CONTROL PANEL

Pressure Gauge
Motor Reset Switch
Motor Power On Indicator
Bottle Pressure Low Indicator
Speed Low Indicator
Pump On Indicator
Temperature High Indicator

POWER REQUIREMENTS

The Disc Unit derives power from power supply.
Power Supply Requirements: 2.5A (when loaded with disc), at 208V \pm 10%, 50 or 60 Hz \pm 3%. (Employs two-phase from three-phase connection.) Field-strapping permits 200 to 240V, 50 or 60 Hz in 10V increments. Load is determined by memory unit.
Disc Unit Power Requirements: 0.6A at 115V (drawn from Power Supply) \pm 10%, 50 or 60 Hz \pm 3%, single-phase. Also, 2.2A at +25Vdc, or 5.5A at +5Vdc, or 2.0A at -12Vdc. An initial (turn-on) current surge of 2.5A can be expected.

POWER FAILURE

No recorded data is affected by ac or dc power loss in any sequence other than the write mode. In the write mode, only the sector being written may be affected.

HEWLETT  PACKARD

ENVIRONMENTAL CONDITIONS

Temperature: 0° to +40°C (+32° to 104°F)
Relative Humidity: 5% to 95% (non-condensing)
Heat Dissipation: (Device) 600 BTU/hr
(151 kilocalories/hr)
(Power Supply) 1100 BTU/hr (277 kilocalories/hr)

PHYSICAL CHARACTERISTICS

Disc Memory

Front Panel Height: 21 inches (53,3 cm)
Rack Mount Width: 19 inches (48,3 cm)
Unit Depth: 23-1/8 inches (58,7 cm)
Device Weight: 180 lbs (81,7 kg)
Shipping Weight: 213 lbs (96,7 kg)
Mounting: Fits in HP 3000 cabinet

Power Supply

Height: 7 inches (17,8 cm)
Width: 19 inches (48,3 cm)
Depth: 19-3/4 inches (50,2 cm)
Weight: 62 lbs (28,1 kg)
Shipping Weight: 95 lbs (43,1 kg)
Mounting: Fits in HP 3000 cabinet

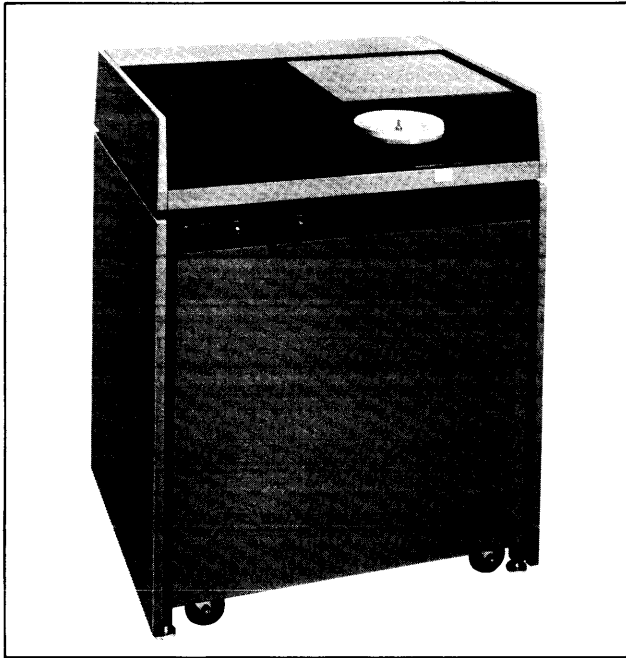
ORDERING INFORMATION

30103A-001 Disc Subsystem. Includes HP 2660A-001 Disc (2.0 Mbytes); power supply; power cable — 6 ft (1,83 m); signal cable — 10 ft (3,04 m); disc controller/interface; necessary software for integration with the HP 3000; device diagnostic software.
30103A-002 Disc Subsystem. Same as above except uses HP 2660A-022 Disc (4.0 Mbytes).



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30102A Moving Head Disc Subsystem



Features

- 47 million byte storage capacity
- Uses conventional disc packs
- 29 milliseconds average access time
- Electronic servoing and continuous temperature compensation for guaranteed interchangeability
- Completely integrated for use with the HP 3000

The Hewlett-Packard 30102A Moving Head Disc supplies 47 million bytes of on-line storage. Its fast average access time of 29 milliseconds coupled with high density storage permits rapid handling of large amounts of data. The Disc Subsystem uses a standard 11-high disc pack to supply twice the storage of comparable units.

This results in a significant cost per byte saving as well as less equipment to operate and maintain.

Electronic servoing and continuous temperature compensation enables 406 cylinders to be written on a single

pack. Removal and interchangeability of packs is assured. Contamination is eliminated through the use of absolute air filtration and disc pack brushes.

Up to eight disc subsystems can be handled from a single interface controller.

Specifications

CAPACITY

47,104,000 bytes

ORGANIZATION

Discs: 11

Number of Heads: 20

Number of Cylinders: 406 (including 6 spares)

Track: 23 sectors; 256 bytes/sector; 5888 bytes/track

DATA ACCESS

Minimum: 7 ms

Average: 29 ms

Maximum: 55 ms

Rotational Delay (Latency)

Average ($\frac{1}{2}$ revolution): 12.5 ms

Maximum (1 revolution): 25 ms

Total Average Response Time

Position and Rotation: 41.5 ms

Maximum Response: 80 ms

OPERATION

Start Up: 20 sec (nominal)

Stop Time: 25 sec maximum (nominal)

Disc Rotational Speed: 2400 RPM

Data Transfer Rate: 312,000 bytes/sec (maximum)

236,000 bytes/sec burst rate (average)

ACTUATOR

Electro-magnetic actuator with closed-loop optical servo positioning

DISC PACK – HP 30333A

No physical sectoring required

20 surfaces

400 tracks/surface plus 6 spare tracks/surface

HEWLETT  PACKARD

POWER REQUIREMENTS

The disc derives power from the Power Control Unit. Power Control Unit requirements: 230V \pm 10%, 50 or 60 Hz \pm 3%, three-phase. PCU uses a negligible amount of power. Load is determined by the number of disc files. Each disc requires 5A at 208/230V \pm 10%, three-phase, 60 Hz \pm 1/2 Hz. Turn-on surge 30A

ENVIRONMENTAL CONDITIONS

Temperature: 15° to 32°C (59° to 89°F)
Relative Humidity: to 80%
Heat Dissipation: (Device) 3500 BTU/hr
(882 kilocalories/hr)

PHYSICAL CHARACTERISTICS

Height: 40 inches (101,6 cm)
Width: 30 inches (76,2 cm)
Depth: 24 inches (61 cm)
Device Weight: 410 lbs (187 kg)
Shipping Weight: 510 lbs (231 kg)
Mounting: Casters and Levelers
Required Clearance: 18 inches (45 cm) front and rear

ORDERING INFORMATION

30102A Disc Subsystem. Includes HP 2888A Disc Subsystem with controller/interface; power control unit; signal cable* – 25 ft (7,62 m); junction panel for 8 drives; disc pack.

30102A-010: Additional Disc Subsystem (disc on same controller); signal cable – 25 ft (7,62 m); disc pack.

OPERATING SUPPLIES AVAILABLE

30333A: Additional Disc Pack

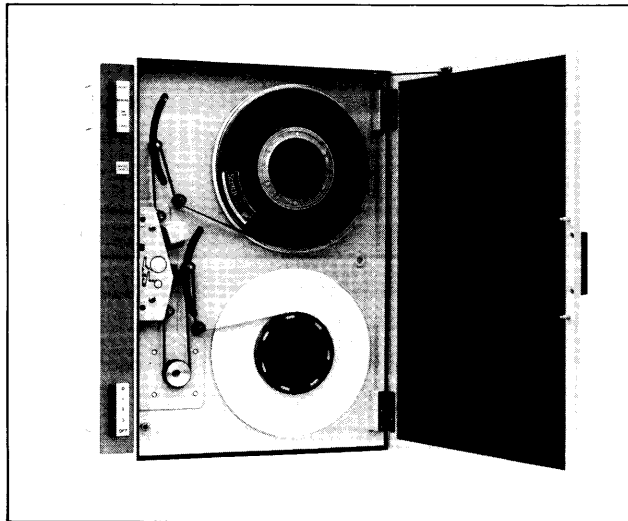
Note: Power supply cable is not provided. Local codes determine requirement.

*Distance to first drive 50 ft. maximum. Total accumulated distance 100 ft maximum. Distance from drive to drive depends on total number of drives connected to a single controller.



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30115A (NRZI) 30115A-100 (Phase Encoded) Digital Magnetic Tape Subsystems



Features

- Fast data transfer – up to 36Kbytes/sec (NRZI) – up to 72Kbytes/sec (phase encoded)
- 9-track configuration
- 800 cpi (315 bits/cm), NRZI electronics
- 1600 cpi (630 bits/cm), phase encoded data electronics
- 45 ips (114 cm/s) read/write, 160 ips (406 cm/s) rewind/fast forward
- Dynamic braking
- Up to 10½ (26,7 cm) inch reels
- IBM/ANSI compatible
- Completely integrated for use with the HP 3000

Hewlett Packard Digital Magnetic Tape Units are high performance, reliable magnetic tape drives for use in HP 3000 computer systems. IBM compatible NRZI recording mode is used at a density of 800 cpi. High packing density and data transfer rates are achieved by using ANSI-compatible 1600 cpi phase encoded data electronics. Data written on any IBM or ANSI-compatible equipment can be read on the HP 3000. An interface controller is provided with each subsystem. Two tape drives can be operated from a single controller.

Reel motors provide direct drive, eliminating troublesome belts and pulleys. Tape tensioning is performed by photo-resistive controlled tension arms, eliminating the need for vacuum system components. Head assemblies consist of read stack, write stack and full width erase head. The Tape Units are recognized under the component program of Underwriters Laboratories.

Specifications

NUMBER OF TRACKS

Nine

READ/WRITE SPEED

45 ips (114 cm/s)

DENSITY

800 cpi (315 bits/cm), NRZI electronics

1600 cpi (630 bits/cm), phase encoded electronics

DATA TRANSFER RATE

36,000 characters per second maximum, NRZI electronics

72,000 characters per second maximum, phase encoded electronics

WRITE ENABLE

Supply reel write enable ring and switch

Ring removal precludes writing

REEL DIAMETER

Up to 10½ inches (26,7 cm)

TAPE (Computer Grade)

Width: 0.5 inches (12,7mm)

Thickness: 1.5 mils (0,038mm)

REWIND SPEED

160 ips (406 cm/s)

START/STOP TIMES

8.33 ms (read-after-write) at 45 ips (114 cm/s)

EOT and BOT REFLECTIVE STRIP DETECTION

Photoelectric, IBM Compatible

HEWLETT  PACKARD

OPERATOR CONTROL PANEL

Reset Switch: Stops tape travel in any mode and returns unit to local control

Rewind Switch: Rewinds tape at 160 ips (114 cm/s)

On-Line Switch: Places unit under remote control

Load Switch: Initiates loadpoint (BOT) search

Write Enable Indicator: Illuminated when write enable ring is installed on the supply reel

POWER REQUIREMENTS

3.4A (maximum) at 115V \pm 10%, 50 or 60 Hz \pm 0.5%;

1.7A (maximum) at 230V \pm 10%, 50 or 60 Hz \pm 0.5%

ENVIRONMENTAL CONDITIONS (Hardware)

Ambient Temperature: 0° to 55°C (32° to 131°F)

Relative Humidity: 20 to 80% (non-condensing)

Heat Dissipation: (Device) 1400 BTU/hr
(350 kilocalories/hr)

PHYSICAL CHARACTERISTICS

Height: 24 inches (61 cm)

Width: 19 inches (48,3 cm)

Depth: 12 inches (30,5 cm) from mounting surface

Overall Depth: 16 inches (40,7 cm)

Mounting: Fits in HP 3000 cabinet

Device Weight: 140 lbs (63,5 kg) maximum

Shipping Weight: 190 lbs (86,2 kg)

ORDERING INFORMATION

NRZI Electronics

30115A: Digital Magnetic Tape Subsystem. Includes HP 7970B Digital Magnetic Tape Drive (9-Track, 800 cpi, 45 ips, NRZI electronics); interface controller; 2400 ft (731 m) reel of tape; and necessary connecting cables* (2 drives can be operated from one interface controller).

30115A-200: Additional 800 cpi drive, without controller

Phase Encoded Electronics

30115A-100: Digital Magnetic Tape Subsystem

Includes the HP 7970E Magnetic Tape Drive (9-track 1600 cpi, 45 ips PE electronics); interface controller; 2400 ft (731 m) reel of tape; and necessary connecting cables* (2 drives can be operated from one interface controller). This controller can control a mixture of 1600 cpi and 800 cpi tape drives.

30115A-300: Additional Drive (master) (9-track, 45 ips, 1600 cpi, PE electronics) on same controller; 2400 ft (731 m) reel of tape

30115A-400: Additional Drive (slave) (9-track, 1600 cpi, 45 ips, PE electronics) on same controller; 2400 ft (731 m) reel of tape

Note: One drive must be a master

OPERATING SUPPLIES AVAILABLE

Certified Magnetic Tape for Above Drives

9162-025: 2400 foot (731 m) roll of 0.5 inch, 800 cpi, 3200 frpi (PE), certified blank tape.

9162-026: 1200 foot (365 m) roll of 0.5 inch, 800 cpi, 3200 frpi (PE), certified blank tape

*Interconnecting cables:

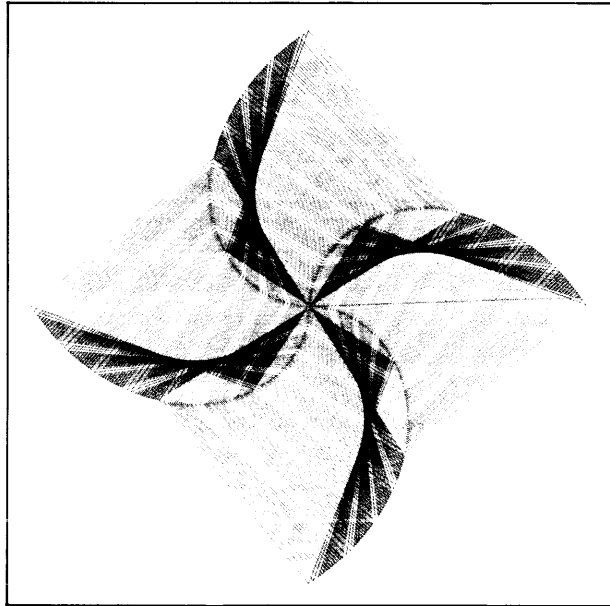
Power cable: 7.5 ft (2,28 m)

Signal cable: 20 ft (6,1 m) to first drive and 20 ft between drives



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30126A CalComp Plotter Interface Subsystem



Example Series 500 Plotter Capability

Features

- For CalComp Series 500 Plotters
- Permits the translation of computer information into graphic form
- Simple subroutines callable from FORTRAN, COBOL, SPL and BASIC

HP 30126A interfaces the HP 3000 computer with a CalComp 500 Series Plotter. The complete interface consists of a single printed circuit board, software driver, basic plotting software and a signal cable for interconnecting the plotter and interface.

The user initiated procedures are programmed to translate computed data into distinct plotter commands necessary to direct an on-line plotter. The resulting graphic form can include graphs, three-dimensional drawings, contour maps, charts, etc., and plot annotation (ASCII alphanumeric characters and special graphic symbols). The subsystem is also responsible for file maintenance operations related to the plotter file, and input/output error-handling.

EASY TO PROGRAM

The basic plotting software consists of five FORTRAN callable procedures; their functions are described below:

1. PLOTS Initialize plotter variables, initialize a user-defined plotter commands buffer, and open the plotter file.
2. PLOT Convert X-axis and Y-axis parameters into plotter commands, manage buffering of plotter commands, and close the plotter file when the plotting sequence is completed.
3. FACTOR Change the plot factor (the ratio of the plot physical size to the plot command size).
4. WHERE Return the X-axis and Y-axis coordinates of the present pen position (with respect to the current origin) and return the current plot factor.
5. SYMBOL Write plot annotation in the form of ASCII characters and special symbols.

In addition, through the courtesy of CalComp Corporation the following four additional routines are provided.

1. NUMBER Convert a floating-point number to the appropriate decimal equivalent in order that the number may be plotted in the FORTRAN F-Type format.
2. SCALE Examine the data values in an array, also determine a starting value and a scaling factor.
3. AXIS Indicate the orientation and values of the plotted data points. When both the X and Y axes are needed, AXIS is called separately for each one.
4. LINE Produce a line plot of the paired data points contained in arrays X and Y. Also compute the page coordinates and scaling factor of these points.



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Notes on System Configuration

INTRODUCTION

A complete system must include a CPU/Mainframe (HP 30000A), at least one magnetic tape drive, one disc unit and the Fundamental Operating Software. The minimum configuration consists of three bays.

The CPU/Mainframe (30000A) includes the following:

- CPU
- Power supplies
- Card cages
- Bays
- 64Kbytes of core memory (optional core memories available)
- Memory controller
- System control desk
- A 16-device Asynchronous Terminal Controller
- A 16-device controller SIO Multiplexer Channel
- A 30 cps Console Printer, power and signal cables
- Console interface and internal system clock

Thus the CPU/Mainframe number (30000A) represents all the minimum system components except those where hardware alternates are possible. Alternate hardware selections in the minimum system can be made in the choice of discs, and tape drives. The Fundamental Operating Software although priced separately, is not optional; it must be acquired.

The graphic configurator on the inside fold identifies hardware and software products for the HP 3000 Computer System.

AC POWER

The power option needs to be specified only once for the system. All other products will be set up compatible with the CPU power. For example, a 50 Hz, 30000A CPU/Mainframe (Option 015), typical in Europe, will have all peripherals automatically set for 50 Hz operation.

SYSTEM ACCENT COLOR

Four colors are available. Like power, the accent color need be specified only once for the entire system.

MEMORY

When a system requires more memory than the minimum 64 Kbytes of core supplied, additional memory can be specified on original orders, using one of the available options. Note that memory is specified as total memory in the system in bytes. There are 3 memory configurations (standard plus 2 options) ranging from 64 Kbytes to 128 Kbytes. These 3 memory organizations provide optimum price/performance ratio.

Memory upgrades can be made in the field after the initial order.

MAGNETIC TAPE UNITS

One magnetic tape drive subsystem is required on each HP 3000 system. All software, including updates, will be distributed on magnetic tape.

All 9-track magnetic tape drives use the same basic product number (30115A), because they all use the same interface controller. The two-drive, 9-track interface controller can serve a mix of drives: 800 cpi and 1600 cpi drives (the 1600 cpi drive must be a master); a 1600 cpi master and 1600 cpi slave; two 1600 cpi masters; two 800 cpi masters; and 800 cpi master and 800 cpi slave.

Two masters on the same controller are more reliable than a master and a slave. With the master-slave relationship, the slave shares the master's electronics; if the master goes down so does the slave. With a master-master relationship, if the first master goes down it has absolutely no effect on the second master's performance.

The 1600 cpi units have twice the transfer rate of 800 cpi units. Tape speed for both is 45 ips. HP 1600 cpi units are considerably less than twice the price of HP 800 cpi units; thus in performance orientation, they exhibit a better price/performance ratio. All tape units are mounted at the top of a bay. Two tape units for example, will automatically result in at least a four bay system.

DISCS

One disc per system is required because the HP 3000 has a disc-based operating system, MPE 3000. The space needed for MPE must be considered when planning for total disc space requirements.

Notes on System Configuration (Cont'd)

The 30110A Cartridge Disc Subsystem has as its heart the 4.9 Mbyte HP 7900A disc. The interface controller will handle up to four discs.

When greater mass storage is needed, HP 30102A, 47 Mbyte, 11-high Moving-Head Disc Subsystem is recommended. Its controller will handle up to 8 units.

The HP 30103A Fixed-Head Disc Subsystem (or swapping disc), is a performance improvement feature. In the HP 3000 (a virtual memory computer), the fixed-head disc, because of its limited storage capability (2 or 4 Mbytes), is always used with another disc on the system for mass storage. Simply, the 30103A Fixed-Head Disc Subsystem allows the user to swap system programs, user's code or user's data, much faster than with the moving-head discs, and the data can be accessed in far less time.

SYSTEM CONSOLE

A Printer Terminal (30120A) is provided as a console for the HP 3000. Its interface is contained in the CPU/Mainframe.

OPTIONAL TERMINALS, SOFTWARE AND HARDWARE SUBSYSTEMS

Various types of terminals (some available from Hewlett-Packard) can be interconnected with the HP 3000 Computer. A current listing appears on the graphic Configuration Guide (inside fold). The optional HP terminals, software and hardware are presented in the configurator and detailed in the preceding individual sections.

Complete ordering information is available from your local HP sales representative.

HEAT DISSIPATION TABLE

Ordering Number	Nomenclature	BTU/kilocalories/hr
30000A	CPU (Mainframe)	11350/2860
30120A	Printer Terminal	820/207
30123A	CRT Terminal	683/172
30104A	Punched Tape Reader Subsystem	683/172
30105A	Tape Punch Subsystem	683/172
30106A	Card Reader Subsystem	1230/310
30107A	Card Reader Subsystem	2276/576
30112A	Card Punch Subsystem	5500/1386
30108A	Line Printer Subsystem	2160/545
30109A	Line Printer Subsystem	3600/910
30110A	Cartridge Disc Subsystem	1393/351
30103A	Fixed Head Disc Subsystem	600/151
	Power Supply	1100/277
30102A	Moving Head Disc Subsystem	3500/882
30115A	Digital Magnetic Tape Subsystem	1400/350

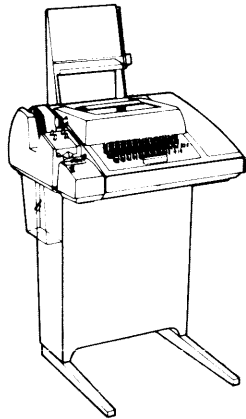


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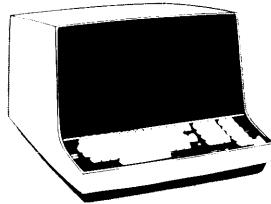
TERMINAL OPTIONS ①

HP 3000 Operating System Software will accommodate the following:

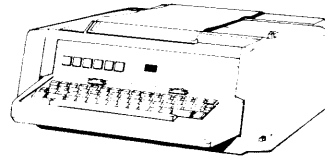


□ 30124 (ASR 33) Teleprinter
\$1,925

HP TERMINALS



□ 30123A CRT
\$3,850



□ 30120A Printer
\$4,775

NON-HP

IBM 2741
MEMOREX 1240
EXECUPORT
GE TERMINET 300
TELETYPE ASR 35
TELETYPE ASR 37

OPTIONAL SIGNAL CABLES ①		
Length	HP Part Numbers for:	
	Data Set	Hardwired
25 feet	30062-60004	30062-60006
50 feet	30062-60007	30062-60009
100 feet	30062-60010	30062-60012

OR

□ 30000A-001 \$1,200 ②

MODEM SUPPORT FOR
BELL 202@†

- ① All terminals except TELETYPE ASR 37, can be hardwired to the Asynchronous Terminal Controller. TELETYPE ASR 37 requires connection via data set.

The Asynchronous Terminal Controller supplied with the mainframe accommodates up to 16 hardwired terminals and BELL 103@ Data Set. See "Optional Signal Cables."

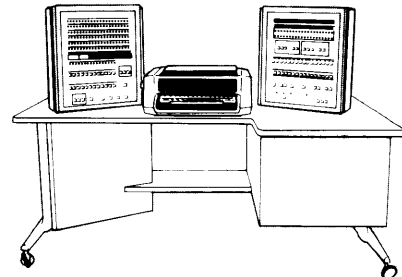
- ② Addition of the 30000A-001 modem support equips the Asynchronous Terminal Controller for hardwired terminals, BELL 103@ and BELL 202@ Data Sets.

- ③ Aggregate data transfer rate on the SIO Multiplexer Channel Bus greater than 880,000 bytes/second, requires the addition of a Selector Channel. Selector Channel inputs completely by-pass the Input/Output Processor permitting concurrent data transfer with the Multiplexer Channel, and permits single device transfer rates up to 1.9 million bytes per second. The High Speed Selector Channel interfaces up to eight control units which communicate on a one-at-a-time basis.

HP 3000 CONFIGURATION GUIDE

30000A MAINFRAME

INCLUDES: CPU, cabinets, power supplies, card cages, SIO multiplexer channel, 64 Kbytes core, memory controller, system control desk with system console (30120A), system clock, asynchronous terminal controller.



System Control Desk with Console Terminal

AC POWER OPTIONS FOR TOTAL SYSTEM (No Charge)

- Standard-120/208V, 3 Phase, 60 Hz
- 015 230V, Single Phase, 50 Hz
- 025 120/240V, Split Phase, 60 Hz

COLOR-SYSTEM ACCENT (No Charge)

- Standard-Sun Gold
- 050 Woodgrain
- 051 Marine Blue
- 052 Red

MEMORY OPTIONS

Total System Capability in Bytes

- Standard 64K
- 140 96K, 32x64, 2 mcu + \$10,000
- 181 128K, 64x64, 2 mcu + \$20,000 (mcu = module control unit)

30000A Mainframe \$95,000

The Following Items Must be Acquired For System Operation:

- 1 Magnetic Tape Drive
- 1 Disc Fundamental operating software

SIO MULTIPLEXER CHANNEL
(For 16 Devices, 880000 cps)

30030A
1.9M cps \$5,900

HP
2741
MOREX 1240
CUPORT
TERMINET 300
ETTYPE ASR 35
ETTYPE ASR 37

001 \$1,200

SUPPORT FOR
LL 202†

ASYNCHRONOUS
TERMINAL
CONTROLLER
(For 16 devices)

*Includes modem support for Bell 103†
†Trademark of Bell Telephone Co.

SOFTWARE PRODUCTS

FUNDAMENTAL OPERATING SOFTWARE (Required for effective system operation)

Includes: MPE/3000 (Multi-Programming Executive)
Hardware Diagnostics
Compiler Library
Utility Functions
TRACE/3000 (Symbol Trace Facility)
SPL/3000 32001A \$25/mo

OPTIONAL SOFTWARE

- 32101A BASIC/3000 \$40/mo
- 32102A FORTRAN/3000 \$50/mo
- 32213A COBOL/3000 \$50/mo
- 32201A EDIT/3000 \$10/mo
- 32214A SORT/3000 \$10/mo
- 32204A STAR/3000 \$20/mo
- 32205A SCIENTIFIC LIBRARY \$10/mo

37, can be hardwired
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ardwired terminals and
Signal Cables."

support equips the
r hardwired terminals,
ts.

D Multiplexer Channel
d, requires the addi-
channel inputs com-
essor permitting
multiplexer Channel, and
to 1.9 million bytes
Channel interfaces up
cate on a one-at-a-

HARDWARE OPTIONS

Card Readers

- 30106A 600 cpm \$6,950
- 30107A 1200 cpm \$18,000
- 001 Dual Read Station +\$2,500

Line Printers

- 30108A 200 lpm, 64 Char. \$16,500
- 001 150 lpm, 96 Char. +\$2,500
- 30109A 600 lpm, 64 Char. \$32,500
- 001 500 lpm, 96 Char. +\$2,500

Card Punch

- 30112A Punch: 250 cpm \$32,000

Plotter Interface

For Cal Comp Series 500 Plotter

- 30226A Interface \$1,000

Magnetic Tape Drives

9-Track (Racked)

- 30115A 800 cpi; 45 ips drive and 2 drive interface. Transfer Rate 36000 cps. \$11,400
- 100 1600 cpi; 45 ips; Master drive and 2 drive interface. Transfer Rate 72000 cps +\$3,200
- 200 800 cpi; 45 ips drive. Additional Unit Transfer Rate 36000 cps \$6,475
- 300 1600 cpi; 45 ips, Master drive. Additional Unit Transfer Rate 72000 cps \$10,000
- 400 1600 cpi; 45 ips; Slave* drive. Additional Unit Transfer Rate 72000 cps \$7,975

*(Must be used with 1600 cpi master on same interface)

Paper Tape

- 30104A Reader (Racked) Reader and interface \$3,250
- 30105A Punch (Racked) Punch and interface \$4,100

Discs

Cartridge (Racked)

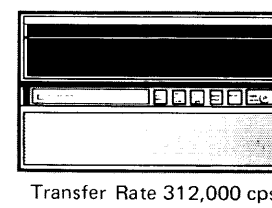
- 30110A 4.9MByte Cartridge Disc and 4-drive interface \$14,750
- 010 Additional drive \$8,800

Fixed Head (Racked)

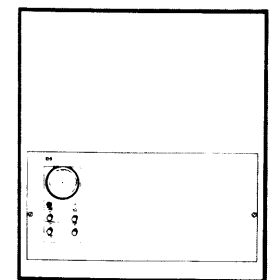
- 30103A-001 2MByte total and interface \$42,000
- 002 4MByte total \$53,000

11-High Moving head Disc (Removable)

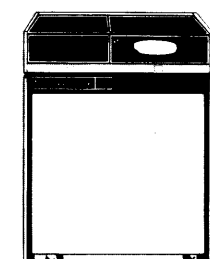
- 30102A 47MByte drive and 8 Drive Interface \$32,000
- 010 Additional Drives \$20,000



Transfer Rate 312,000 cps



Transfer Rate 485,000 cps for 60 Hz; 405,000 cps for 50 Hz



Transfer Rate 312,000 cps

OR

HP 3000... A New Way of Thinking

The HP 3000 is a unique new concept in low cost computer systems. Built around a unified multiprogramming operating system, its contribution is to provide an equal level of powerful computational capabilities to multiple users, concurrently, from both interactive terminals and traditional batch devices.

The HP 3000 is directed toward the computer problem that lies between the limited dedicated computer and the remote large computing installation. It fills the need for immediate, convenient access to flexible advanced computing capability — at a cost no other computer system can match.

Whether the application is scientific or commercial, requires creative work at a terminal or the processing

of production jobs, the multiprogramming HP 3000 means people working with computers for more productivity in your organization.

The HP 3000 is a product of Hewlett-Packard, one of the world's leading manufacturers of computer systems, calculators and electronic instruments.

The HP 3000, like every Hewlett-Packard system or product, is fully supported by a network of 172 offices, service centers, supply depots and data centers, in 65 countries around the world.

HP 3000 users, in turn, are supported by comprehensive system training, documentation, regional and local service offices, and a flexible financial program ranging from lease agreements to direct purchase.

