

HP 3000CX Mini DataCenters and Subsystems Data



Preface

HP 3000 computers form the basis for the most powerful minicomputer systems available anywhere. A continuing development program incorporates the state-of-the-art in computer architecture, software and peripherals, into products that are highly cost-effective and easy-to-use solutions for existing user needs, and for future requirements.

The products described can be employed in any Hewlett-Packard 3000 or 3000CX Mini DataCenter. Additional systems enhancements can be anticipated on a continuing basis.

The subject matter in this publication is indexed to first present whole system configurations, then software and hardware subsystems in that order.

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3000CX Series Mini DataCenters

Introduction

The HP 3000CX Series Mini DataCenters are designed to meet the needs of distributed computer network users as well as those with single-unit dedicated computer requirements. Any Mini DataCenter within the HP 3000CX Series can be selected to fit individual hardware and software needs without altering the CPU operating system.

An HP 3000CX Mini DataCenter may be easily integrated into networks of interconnected Mini DataCenters and large central computing systems.

SYSTEM FEATURES

Designated Models 50, 100, 200, and 300, these interactive Mini DataCenters have a common multiprogrammed operating system(MPE/C) that features spooling, virtual memory and a communications subsystem to link CX Series systems to each other and to larger computers as well. The operating system also offers data base management software and supports access to multiple interactive terminals and batch devices concurrently.

Other features of 3000CX Mini DataCenters are the ability to expand the CPU microprocessor to include decimal arithmetic instruction for business applications and extended precision floating point instructions for scientific use. Software includes six language subsystems, COBOL, Report Program Generator (RPG), FORTRAN, System Programming Language (SPL), BASIC Interpreter, and the first full BASIC language compiler. Also available is a complete line of peripheral equipment.

ARCHITECTURE

- Hardware implementation of stack provides efficient memory utilization and a highly effective multi-programming environment
- Separation of code and data for multi-user code sharing
- Concurrent CPU and I/O processing for maximum systems utilization
- Modular organization built around a high speed (175-ns) data bus for high system throughput

- CPU utilizes 32-bit LSI bipolar ROM-based microprocessor to form the basis of 182 instructions. The comprehensive instruction set reflects compiler, execution and operating systems requirements
- 16-port terminal controller with autospeed detect and type 103 modem capability for effective communications with terminals
- 16-channel SIO multiplexer with 880,000 byte/second transfer rate for rapid data transfers

MULTIPROGRAMMED EXECUTIVE OPERATING SYSTEM

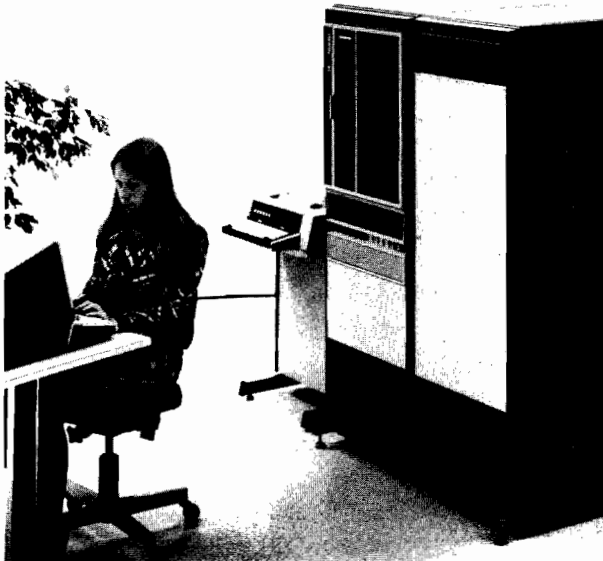
- Virtual memory in the form of code segmentation provides cost-effective use of main memory and the capability to handle large programs
- Dynamic memory manager for maximum memory utilization
- Advanced file system for extensive data handling
- Automatic input and output spooling for efficient peripheral usage
- Accounting and logging to aid system management
- Comprehensive file security for protection of sensitive data
- Simple file and program backup on magnetic tape for data integrity
- Power-fail with auto-restart for continuous system operation
- On-line peripheral access and resource sharing for flexible I/O use

MINI DATACENTER CONFIGURATION

The four different hardware configurations use a common multi-user operating system built on a full hardware implementation of stack architecture. These Mini DataCenters with their specific hardware, sets of peripherals and selected software, represent the various levels of throughput and capability to handle a specific number of functions.



Model 50 Mini DataCenter



The Model 50 Mini DataCenter is the smallest of the HP 3000CX Series. It consists of 96 Kbyte processor, 5-megabyte disc, 800-bpi magnetic tape unit, system console and a 16-port asynchronous terminal controller. It is a starter system—the basic building block from which larger, more powerful systems may be formed.

HARDWARE SUPPLIED

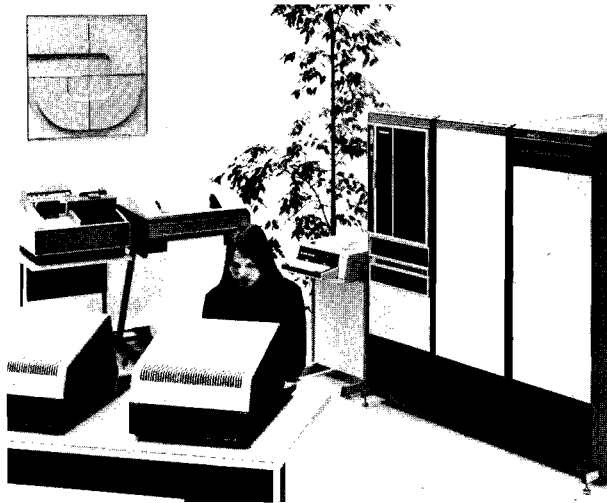
HP 3000CX fundamental hardware, including:

- central processing unit (CPU)
 - 96 Kbytes of core memory
 - memory controller
 - system clock
 - 16-port asynchronous terminal controller
 - 16-channel SIO multiplexer
 - Hard copy system console
 - cabinet bays, card cages and power supplies
- 30110A: 4.9 million-byte moving-head cartridge-disc unit
- 30115A: 800-bpi magnetic tape unit

FUNDAMENTAL OPERATING SOFTWARE

- multiprogramming executive operating system (MPE/C)
- systems programming language (SPL)
- text editor (EDIT)
- program debugging aids (DEBUG and TRACE)
- file-copying utilities (FCOPY)
- sort and merge subsystems (SORT)

Model 100 Mini DataCenter



The Model 100 Mini DataCenter provides increased interactive terminal and batch processing capabilities. A wide range of software makes the Model 100 ideal for scientific, commercial and timesharing applications requiring terminal oriented processing. Depending on the specific application, the system can support four to eight terminals. With optional core expansion it can support as many as 16 terminals.

TIMESHARING OPTION

A timesharing option, including a full BASIC compiler, and a BASIC interpreter is available. The interpreter provides an effective program development medium, while the full compiler provides efficient execution of frequently run programs.

SCIENTIFIC AND BUSINESS OPTIONS

A versatile on-line interactive editor, ANSI standard FORTRAN compiler, scientific library and statistical analysis software package, provide a powerful scientific processing capability. For business oriented applications, the Model 100 offers RPG II with hardware decimal instruction.

MINI DATACENTER FEATURES

On-line disc storage of 14.75 million bytes is provided by a fast-access moving-head disc operating through a special high-speed channel. The disc, with 5-ms maximum track-

to-track positioning and data transfer rate of 937.5 Kbytes/sec are the basis of the system's terminal responsiveness. An 800-bpi, 9-track (NRZI), IBM-compatible tape unit provides an efficient data-file backup mechanism.

HARDWARE SUPPLIED

HP 3000CX fundamental hardware, including:

- central processing unit (CPU)
- 96 Kbytes of core memory
- memory controller
- system clock
- 16-port asynchronous terminal controller
- 16-channel SIO multiplexer
- selector channel
- hard-copy system console
- cabinet bays, card cages and power supplies

30106A 600-cpm card reader

30129A 15 million-byte cartridge disc unit

30115A 800-bpi magnetic tape unit

30118A 200-lpm line printer

FUNDAMENTAL OPERATING SOFTWARE

- multiprogramming executive operating system (MPE/C)
- systems programming language (SPL)
- text editor (EDIT)
- program debugging aids (DEBUG and TRACE)
- file-copying utilities (FCOPY)
- sort and merge package (SORT)

SOFTWARE OPTIONS

Timesharing Option

- BASIC interpreter (32101A)
- BASIC compiler (32103A)

Scientific Option

- FORTRAN compiler (32102A)
- scientific library (32205A)
- statistical analysis package (32204A)
- expanded instruction set — extended precision floating point (30011A)

Business Option

- RPG II compiler (32104A)
- expanded instruction set — decimal (30011A-001)

Model 200 Mini DataCenter



The Model 200 Mini DataCenter is ideal for the terminal-oriented user. Enhancing the operating system are 128 Kbytes of core memory and a system swapping disc. This combination extends the number of terminal users allowing an additional 16-port terminal controller.

TIMESHARING OPTION

A BASIC interpreter and BASIC compiler comprise the timesharing option. File independence and virtual memory are features that allow the user to broaden the scope of an application and maintain the benefits of on-line processing.

SCIENTIFIC OPTION

An ANSI FORTRAN IV compiler, scientific library, statistical analysis package and floating-point hardware are available through the scientific option. The performance enhancements of the system bring more resources to a greater number of engineering users.

BUSINESS OPTION

A full capability terminal, the HP 3000 system's technological contribution to the commercial user, is augmented by the Model 200, which adds another dimension allowing even more terminal users. This capability is complemented by 47 million bytes of mass storage, a 600-cpm card reader and a 200-lpm line

printer. The commercial hardware and software options include an ANSI COBOL compiler, RPG II compiler and decimal arithmetic hardware.

HARDWARE SUPPLIED

HP 3000CX fundamental hardware, including:

- central processing unit (CPU)
 - 128 Kbytes of core memory
 - memory controller
 - system clock
 - 16-port asynchronous terminal controller
 - 16-channel SIO multiplexer
 - selector channel
 - hard-copy system console
 - cabinet bays, card cages and power supplies
- 30102A 47-million-byte moving-head disc
30129A 4.4-million-byte system disc
30106A 600-cpm card reader
30115A 800-bpi magnetic tape unit
30118A 200-lpm line printer

FUNDAMENTAL OPERATING SOFTWARE

- multiprogramming executive operating system (MPE/C)
- systems programming language (SPL)
- text editor (EDIT)
- program debugging aids (DEBUG and TRACE)
- file-copying utilities (FCOPY)
- sort and merge package (SORT)

SOFTWARE OPTIONS

Timesharing Option

- BASIC Interpreter (32101A)
- BASIC compiler (32103A)

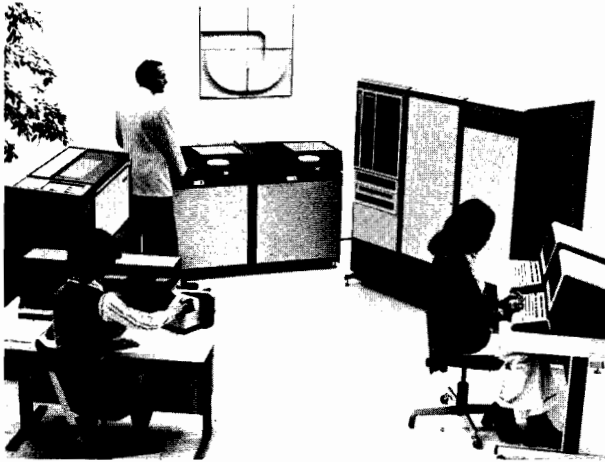
Scientific Option

- FORTRAN compiler (32102A)
- scientific library (32205A)
- statistical analysis package (32204A)
- expanded instruction set — extended precision floating point (30011A)

Business Option

- ANSI COBOL compiler (32213B)
- RPG II compiler (32104A)
- expanded instruction set — decimal (30011A-001)

Model 300 Mini DataCenter



The Model 300 Mini DataCenter is designed for the maximum processing needs of today's computer user. The Model 300 Mini DataCenter can handle six to 32 users in both batch and terminal-oriented environments. It features a hardware-implemented stack, code sharing, microcoded instruction set and virtual memory. These features enable users to implement applications with minimal impact on overall system resources.

TIMESHARING OPTION

Timesharing users are provided an option which includes a BASIC interpreter and a full BASIC compiler. Efficient software, a fixed-head disc and a powerful CPU offer concurrent terminal users more capability than any other minicomputer.

SCIENTIFIC OPTION

A FORTRAN compiler, scientific library, statistical analysis package and floating-point instruction hardware are featured in the scientific option. Versatile on-line capabilities and powerful batch features give users the needed tools and performance.

BUSINESS OPTION

This option provides a Data Base Management package (IMAGE/3000) and a Data Base Inquiry facility (QUERY/3000). Also included are RPG II, ANSI COBOL, and decimal arithmetic hardware. These features added to HP's MPE/C operating system, text editor, sort and merge package, file copier, program debug intrinsics, a card reader/punch, 47 Mbyte storage device and 1250-lpm line printer, give the production-oriented user full system capabilities in a multi-user environment.

HARDWARE SUPPLIED

HP 3000CX fundamental hardware, including:

- central processing unit
 - 128 Kbytes of core memory
 - memory controller
 - system clock
 - 16-port asynchronous terminal controller
 - 16-channel SIO multiplexer
 - selector channel
 - hard-copy system console
 - cabinet bays, card cages and power supplies
- 30102A 47 Mbyte moving-head disc
30129A 4.4 Mbyte system disc
30115A 800-bpi magnetic tape unit
30119A card reader punch, includes:
 200-cpm card reader
 up to 75-cpm card punch
30128A 1250-lpm line printer

FUNDAMENTAL OPERATING SOFTWARE

- multiprogramming executive operating system (MPE/C)
- systems programming language (SPL)
- text editor (EDIT)
- program debugging aids (DEBUG and TRACE)
- file-copying utilities (FCOPY)
- sort and merge package (SORT)

SOFTWARE OPTIONS

Timesharing Option

- BASIC interpreter (32101A)
- BASIC compiler (32103A)

Scientific Option

- FORTRAN compiler (32102A)
- scientific library (32205A)
- statistical analysis package (32204A)

- expanded instruction set – extended precision floating point (30011A)

Business Option

- ANSI COBOL compiler (32213B)
- RPG II compiler (32104A)
- IMAGE/3000 data base management package (32215A)
- QUERY/3000 data base inquiry facility
- expanded instruction set – decimal (30011A-001)



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3000CX Series Fundamental Operating Software

MPE/3000

Features

- Concurrent multi-lingual capability, FORTRAN, COBOL, RPG, 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
- Spooling – input and output
- Power fail/automatic restart

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.

Storage for local data is allocated only as needed and is automatically freed when no longer required, allowing reuse of that area of memory by other parts of the program. Consequently, programs require less average 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

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
:PREP $OLDPASS,PROGF
:SAVE 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 'ready-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**.

SPOOLING

Jobs and job input/output are automatically buffered, if desired, thus removing the contention that would normally be encountered with non-shareable devices.

This spooling capability requires no modification to programs or data to implement, thus it is "transparent" to the HP 3000 user. For example, a simple STREAM command is used to initiate a spooled job. After a spooled job is started a SHOWJOB Command will interactively display the progress of the job.

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 a record of system activity at the user level on a disc file. 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.

POWER FAIL/AUTOMATIC RESTART

In case of a power failure the HP 3000 preserves system and user permanent information, so that continuity of processing is maintained when the system automatically restarts.

DEBUGGING FACILITIES

Extensive system tools are provided for indepth debugging of System Programming Language (SPL) programs. These capabilities are especially useful when machine dependent and privileged routines are being developed.

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 subsystems 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 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.

Utility Functions(Cont'd)

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.

EDIT/3000

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

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.

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.

EDIT/3000 (Cont'd)

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	Obtain the setting of options (see SET).
XPLAIN	Print an explanation of selected commands or all commands.

ADVANCED FEATURES

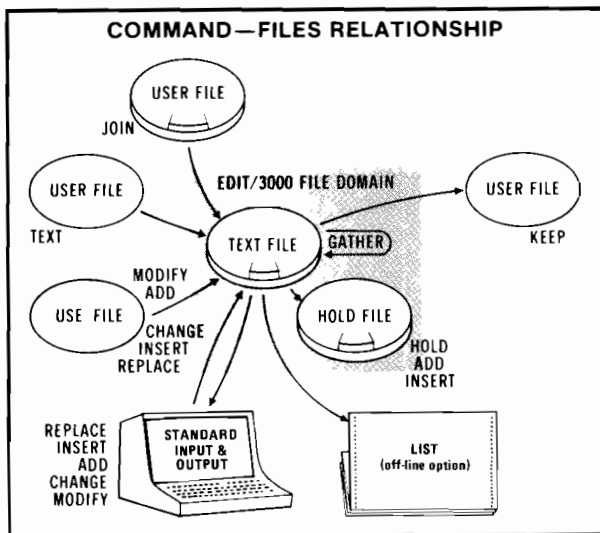
EDIT/3000 has several commands designed primarily for complex editing. While these commands require programming-like knowledge on the part of the user, they provide superlative editing power. Some of these commands are:

- **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.

SORT/3000

Features

- Sorts any file
- Merges any 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, record numbers or record numbers 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



Files required to be on disc are illustrated as discs.

SORT/3000 (Cont'd)

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 with any precision
Positive Integer with any precision
Real Number with any precision
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 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 record numbers, or both

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

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.

SPL/3000 Compiler (Cont'd)

BACKGROUND

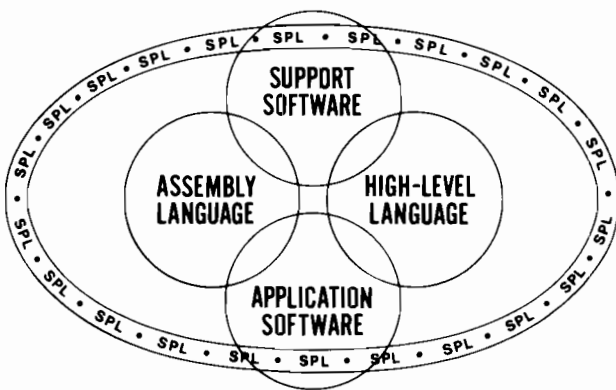
The choice of programming languages on most computers lies in selecting one of two mutually exclusive groups: a high-level machine-independent language such as FORTRAN, on the one hand, and a completely machine dependent assembly language on the other.

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 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.

SPL/3000 Compiler (Cont'd)

DATA TYPES SUPPORTED*

- *Logical*: 16-bit TRUE/FALSE or 0 to 65535
- *Byte*: 8-bit character data or arithmetic values 0 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:

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

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

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

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

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.

- $<<>>$ A pair of broken brackets is used to enclose comments.
- $;$ Statements are terminated by semicolons.
- $:=$ This symbol means "is assigned the value".
- TOS Refers to the value of the top of stack.
- @ 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.
- POINTER A pointer is a quantity that is used to point at another item (i.e., provides one-level indirect addressing).
- LSL Logical Shift Left.
- DDEL Delete the top two items on the stack.
- * 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);  << MAKE BYTE POINTER TO ENTRY >>
    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 BINARY >>
        IF #=(TOS) THEN         << COMPARE BYTE STRINGS    >>
          ASSEMBLE(LOAD X1;      << IF = THEN COMPARE SIZES >>
            CMPM 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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32213B COBOL/3000 Compiler

Features

- 1968 ANSI standard 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
- Optimizing compiler provides for faster execution times.
- Concurrent batch and terminal capability
- Optimal bounds checking for tables at program execution time.

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:

Nucleus: Provides a basic language capability for the internal processing of data within the basic structure of the four divisions of a COBOL program.

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.

HEWLETT  PACKARD

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

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
- Forms message for special forms

OPTIMIZER

COBOL/3000 consists of two compilers, one of which is an optimizer. The optimizer, while a somewhat slower compiler, generates optimal code. This generated code when used in conjunction with the decimal firmware, can increase execution speeds by at least a factor of three.

Thus, the optimizing compiler would not be used when compile times are more important than execution times (e.g. during the checkout phase of program development).

DATA TYPES

COBOL/3000 allows
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 flexibility in compiling, linking, segmenting and executing in batch and session mode.



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32104A RPG/3000 Compiler

Features

- Automatic program segmentation
- Edit codes
- Calculation control of I/O
- Closed subroutines
- Single dimension arrays
- Automatic EBCDIC/ASCII file translation and alternate collating sequence
- Cross reference
- Formatted dump
- Run time error options can be preselected or dynamic
- DEBUG allows source level debugging
- Spread cards
- File error option

RPG/3000 is a machine-independent, problem-oriented language that is easy to learn, use, and code. It allows the user to specify many important operations with a minimum of effort, by making simple entries on specially-formatted coding sheets. Because RPG is a standard language available on many different machines, programs can be submitted coded in another manufacturer's RPG or RPG II, directly to the RPG/3000 compiler with little or no re-coding for conversion. In addition, the RPG/3000 Compiler helps the user detect errors at the source language level with extensive diagnostic messages.

RPG/3000 EXTENSIONS TO RPG II

Parameters for external subroutine calls:

Parameters may be specified after an EXIT (external subroutine call) operation, simplifying interfacing with COBOL, SPL, BASIC or FORTRAN subroutines.

Run-time error options:

Three methods are provided for handling run-time errors:

Specifying on the Control Record at compile time, whether the run-time error should be ignored or the program terminated.

Allowing the operator to determine the mode of operation at run time.

Testing an error code in RPG calculations and determining the mode of operation programmatically.

Cross reference option:

A cross reference may be requested showing all references to file names, indicators and field names.

Automatic program segmentation:

RPG/3000 will automatically segment code generated for an RPG program in 1K, 2K, 3K, or 4K-word segments resulting in a virtually unlimited size RPG program.

EBCDIC/ASCII automatic translation:

The user can request RPG/3000 to automatically generate file translation tables for EBCDIC to ASCII or ASCII to EBCDIC conversions, or to use an EBCDIC alternate collating sequence.

Combined terminal file:

The user may define an Input/Output terminal file.

Calculation indicator repetition:

Duplicate conditioning indicators need not be repeated line-to-line in calculation.



DATA TYPES

RPG/3000 allows data to be input or output in the following formats:

- binary — one or two word binary data
- packed decimal
- alphanumeric
- unpacked decimal
- unpacked decimal with leading or trailing sign

ENVIRONMENT

RPG/3000 runs under the Multiprogramming Executive Operating System (MPE/3000), providing the user with flexibility such as:

- compile/execute in batch or timesharing mode
- device independence
- call any program compiled in any other language
- an interactive debugging facility

MPE FILE SUPPORT

All file types supported by the Multiprogramming Executive Operating System are available to the user through RPG/3000. This includes input, output and update files accessed sequentially, or randomly by relative record number.

SPECIFICATION TYPES

The statements that describe the input, processing, and output to the compiler must be written according to the rules of RPG/3000. These statements are written on specifications sheets which can be ordered from Hewlett-Packard. There are seven types of specifications accommodated on five different specification sheets. The seven specification types are:

Control Record¹
File Description¹
File Extension²
Line Counter²
Input
Calculation
Output

¹ Same specification sheet

² Same specification sheet



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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 used 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



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
- Can be used alone or in conjunction with HP/3000 BASIC Compiler

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

Timesharing 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 inter-mixing 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 data type.
- **ASCII and BINARY files:** These are available for communicating data to and from programs written in languages other than BASIC.



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 to 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 name and password security provided by the operating system.

PROGRAM SEGMENTATION AND SUBROUTINES

BASIC/3000 provides four types of subroutines:

- Built-in functions include **SIN**, **TAN**, **TANH** (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. Files opened in an invoking program may be accessed by the invoked 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

- 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 saved 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
- Specification of many operating system commands under program control

PROGRAM COMPATIBILITY

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



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1501 Page Mill Road, Palo Alto, California 94304

32103A BASIC/3000 Compiler

Features

- Supports all BASIC/3000 interpreter language extensions
- Average execution speed 10-30 times faster than interpreter
- Shareable machine code
- Can be combined with SPL procedures and FORTRAN subroutines in the same program file
- Load-and-go capability

The BASIC/3000 compiler provides the means for converting BASIC/3000 programs (having been written, debugged and saved via the BASIC/3000 Interpreter), into machine code. Compiled BASIC/3000 programs exist in the system as actual code segments and can be run directly, rather than through line-by-line interpreting. This method is 10 to 30 times faster.

ENVIRONMENT

There are three general phases in the development of a BASIC/3000 compiled program.

Program Development

In the first phase, a BASIC/3000 program is written and debugged interactively using the BASIC/3000 Interpreter commands and statements. The interpreter constructs the interpretive version of a program. When the user is satisfied that the BASIC/3000 program runs properly in its interpretive form, the program is saved (SAVE,FAST) in a file. This fast save file is the "source" input to the BASIC/3000 Compiler.

Compile and Prepare

The BASIC/3000 compiler is used to compile the fast save file. The program is then prepared in a form that results in an efficient machine code version of the original program.

Execution

The third phase is to execute the program directly under the operating system using the RUN command.

BASIC/3000 programs may be compiled in batch or timesharing mode, and programs may be run in either mode.

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.



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PROGRAM SEGMENTATION AND SUBROUTINES

BASIC/3000 provides four types of subroutines:

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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

- 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 saved in a buffer for optional subsequent input
- String arrays with complete substring accessibility
- Substring search functions
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- Move forward or backward any number of elements through a file without knowing what data types are being skipped
- User definable file security
- Specification of many operating system commands under program control

PROGRAM COMPATIBILITY

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32215A IMAGE/3000 Data Base Management System

Features

- Security at the data base, data set, and data item levels
- Multiple master-detail data set relationships
- Logically related files can be accessed and maintained as a single entity (a data base)
- Network structuring allows for complex relationships among data items
- Access methods are serial, directed, calculated, and chained
- Data types include packed decimal, ASCII character strings, real numbers, etc.
- Shared or exclusive data base access
- Deleted record space automatically reusable
- Data base restructuring without reprogramming
- Dump and load backup capability
- Storage and retrieval of related entries in sorted sequence
- Ten library routines callable from COBOL, FORTRAN or SPL
- Automatic linkage management when data is added, modified or deleted
- Access to multiple data bases
- Efficient disc utilization (no index or overflow areas)

IMAGE/3000 is a general purpose data base management system for use with the HP/3000 computer. It provides the basis for developing information systems tailored to today's industrial, educational, and corporate needs. IMAGE/3000 operates in both terminal and batch environments. Hence, input sources may be paper tape, punched cards, magnetic tape or disc, or interactive terminals. Application programs which interface with IMAGE may be written in COBOL, FORTRAN, or SPL (Hewlett-Packard's powerful Systems Programming Language). The host language issues its requests to IMAGE via simple CALL statements. These serve as a manipulation language that permits the user to interface

with the data base. Thus, a programmer can concentrate on the data processing power of his host language and leave the complex accessing activity to IMAGE.

MANAGING THE DATA BASE

IMAGE/3000 provides the capabilities to implement a data base through the following procedures:

Describing Data Base Structures

The data base designer describes the items (length, data type, symbolic name), security, data sets, data set relationships, and storage needed using the *schema* language (data base description statements). The *schema* statements are then processed by the *schema* processor, to create the stored data structure called the Data Base Root File. The location and relationships of information are known to IMAGE through this root file.

Creating Data Bases

Disc space for each data set of a referenced data base is allocated and initialized to an empty condition by an IMAGE utility. The data base is then ready for initial loading.

Accessing And Maintaining Data

To access or maintain data, a set of IMAGE Library Routines callable from user written programs is provided. These routines perform such functions as opening the data base, reading and writing at the data item and/or entry level, obtaining structure information, deleting entries, and locking and unlocking the data base. IMAGE makes possible the retrieval of entries with a specific search item value in sorted sequence.

Backup

Utility programs are included to enable dumping of data bases to magnetic tape for backup purposes, and for restoring data bases from magnetic tape. These utilities handle a data base in its entirety, and ascertain that all the data sets and the root file are successfully transferred.

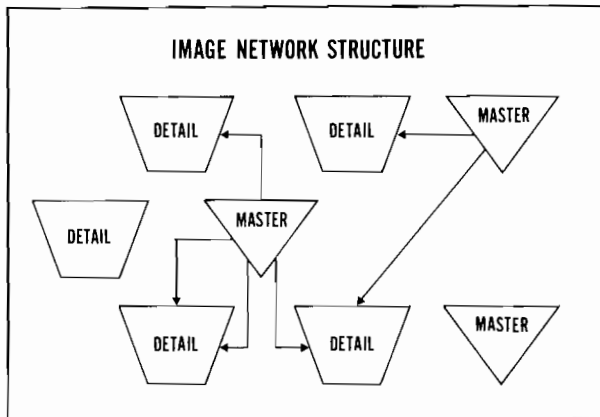
Restructuring

Utilities are provided for restructuring data bases in



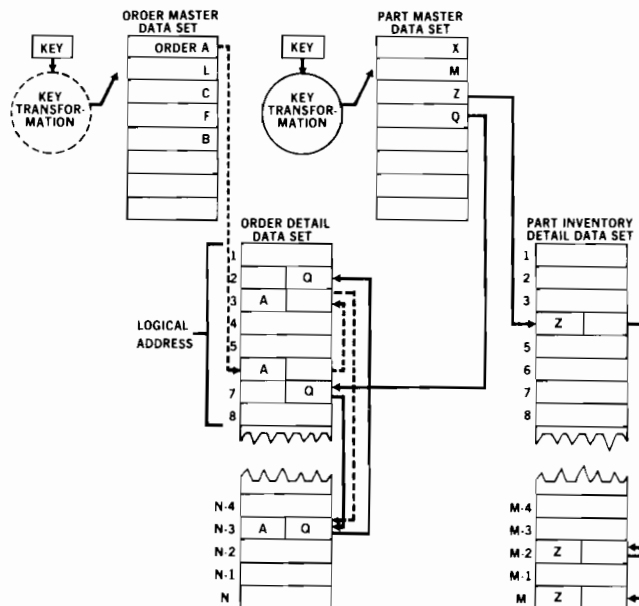
the following ways:

- Change a data item name or data set name
- Change security provisions
- Increase data set capacities
- Add or remove data items at the end of a data entry
- Change data set relationships



Data Set Types

IMAGE/3000 allows two types of data sets, master and detail. Access to data entries in a master data set is direct, and is based on the key value of the data entry. Access to a data entry in a detail data set is usually via a particular master entry and a particular relationship between the master and detail data sets. An example is diagrammed below:



MASTER-DETAIL CHAIN PATHS:

Order Master entry A links to Order Detail entries 6, 3, and N-3.
Parts Master entry Q links to Order Detail entries 7, N-3 and 2.
Parts Master Z links to part inventory entries 4, M-2 and M.

This data structure allows a master entry to be related to many detail entries, and a detail entry related to many master entries.

Specifications

Data item names per data base: 255

Data sets¹ per data base: 99

Characters per item name: 16

Characters per data set name: 16

Data items per entry: 127

Maximum entry size: 4094 bytes¹

Keys per detail data set: 16

Detail data sets per master data set: 16

Entries per chain: 65,000

Note:

¹ The space occupied by any single data set cannot exceed the capacity of any one disc drive; however, the total data base is limited only by the total available storage.

SERVICE

Hewlett-Packard installs and validates the software and provides a complete service contract for ninety days at no charge. An extended term service contract is optionally available.

TRAINING

Data Base Management courses are offered at a nominal cost, and presented on a regular schedule. Courses involve both classroom and "hands-on" workshop sessions.

ORDERING INFORMATION

32215A IMAGE/3000 Data Base Management System.

Includes 800 bpi magnetic tape and manual¹.

32215A-100 Same as 32215A, but on 1600 bpi magnetic tape.

Note:

¹ Additional user manuals are optionally available; order as part number 32215-90001.



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32216A QUERY/3000 Data Base Inquiry Facility

Features

- Interactive or batch data base interrogation
- Boolean-logic selection of data
- 9 data types converted, error checked and displayed
- Extensive editing of output items
- Multiple level sort for grouped items
- Formatted reporting of retrieved data including page titles, column headings, group sub-totals, totals and averages
- Command files to store complex or frequently-used commands for repeated execution
- Data base updating through addition, deletion and modification of data records
- English-like commands for simplified use by non-programmers
- Display of the data base structure accessible to an individual user

QUERY/3000 is designed to easily locate, report and update data values within an IMAGE/3000 data base. QUERY may be executed from either a terminal or batch device; reported output may be directed to either a terminal or a line printer. The user communicates with QUERY through 17 unique commands.

SECURITY CONSIDERATIONS

QUERY adheres to all the security provisions that a data base designer includes in the IMAGE data base. After QUERY is invoked, the user must enter a data-base name and a security-level word. The security-level word, obtained from the data base designer, determines which data elements (i.e., data items and data sets) the user is allowed to access. QUERY will return an error whenever a user's security level does not match the security level within an IMAGE element.

The user may determine which data elements are accessible to him by entering the FORM command. QUERY responds by listing all the data elements available to the user, based upon the level word that he entered.

LOCATING DATA

QUERY is capable of retrieving all occurrences of data within a data set which meet user-specified conditions. To accomplish this, the user enters a FIND command which includes logical terms that are similar to phrases spoken in English. For example, suppose a production control manager wishes to know which part numbers are in short supply or over supply when compared with outstanding customer orders. Assuming the data base contains a part-number data set, the manager could locate all such parts with one FIND command as follows (note — ILT means "is less than" and IGT means "is greater than"):

```
FIND QUANTITY ILT "100" AND CUST-ORD IGT "50"  
OR QUANTITY IGT "10000" AND CUST-ORD  
ILT "1000" END
```

QUERY responds to the FIND command by locating all the data records which contain the requested data item values.

REPORTING DATA

After the data records have been located through the FIND command, the user may enter a REPORT command to specify which items within those records QUERY is to display. The REPORT command may also specify:

- top-of-page titles including date and time
- addition, counting and averaging of selected data items
- column headings, group subtotals and totals
- line spacing
- up to 5 levels of sorting to produce grouped items
- edit masks to suppress leading zeroes, insert punctuation characters, etc.
- page skipping

For quick information, the REPORT command can simply specify that all data item names and their values are to be displayed without formatting.



UPDATING A DATA BASE

Maintenance of the data base can also be performed using QUERY/3000. The UPDATE command, designed for this purpose, allows insertion and deletion of data records and replacement of data item values. When UPDATE ADD is entered, QUERY will prompt a terminal user for data item values. The user is not required to enter values for all items.

FREQUENTLY USED PROCEDURES

Repetitive or complex operations are easily performed through QUERY's ability to execute FIND, REPORT and UPDATE commands from a command file stored on disc. A command stored within a file is referred to as a procedure; a procedure may consist of one or more lines. QUERY provides commands for creating, deleting and listing procedures within a command file. Also, the lines within a procedure may be added, deleted or replaced.

DATA TYPES

The following data types are converted and error-checked during QUERY I/O operations:

- one word integer numbers
- two word integer numbers
- two word real numbers
- three word extended precision numbers

- one word logical values as absolute numbers
- ASCII character strings containing no lower-case alphabets
- general ASCII character strings
- zoned decimal numbers
- packed decimal numbers

SERVICE

Hewlett-Packard installs and validates the software and provides a complete service contract for ninety days at no charge. An extended term service contract is optionally available.

TRAINING

Data Base Management courses are offered at a nominal cost and presented on a regular schedule. Courses involve both classroom and "hands-on" workshop sessions.

ORDERING INFORMATION

32216A QUERY/3000 Data Base Inquiry Facility. Includes 800 bpi magnetic tape and manual¹.

32216A-100 same as 32216A, but with 1600 bpi magnetic tape.

Note:

¹ Additional user manuals are optionally available; order as part number 32216-90001.



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32205A Scientific Library

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

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.

32204A STAR/3000 Statistical Analysis Routines

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

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 $10^n \times x$ 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?

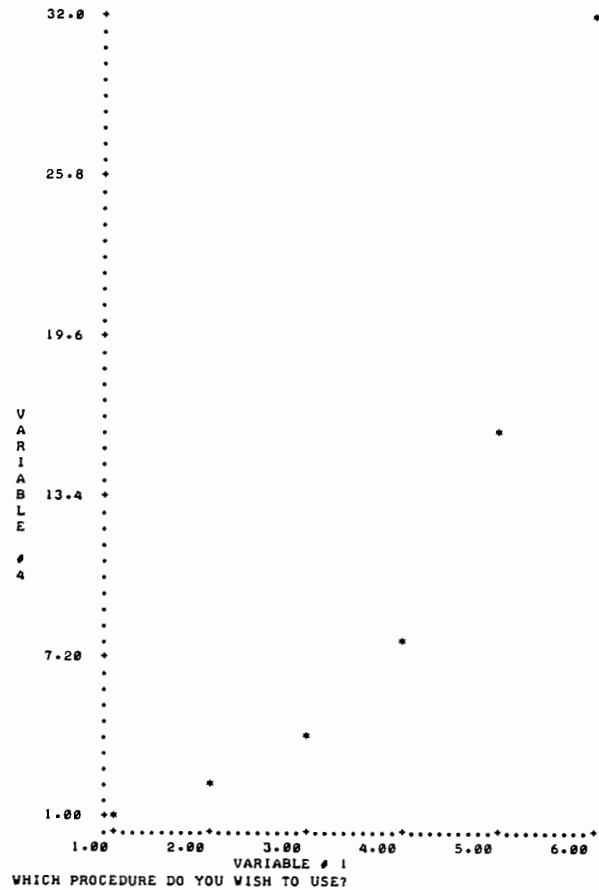
#PLOT

ENTER X (HORIZONTAL) AND Y (VERTICAL) VARIABLES

>1,4

SPECIFY A PLOT SYMBOL

>*



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30011A Expanded Instruction Set Extended Precision Floating Point

Features

- Microcode in bipolar memory for
Long floating point addition, subtraction,
multiplication, division
Long floating point negation
Long floating point comparison
- Provides 7 to 15 fold increase in instruction
performance
- Requires no software changes

The 30011A Expanded Instruction Set consists of a single plug-in circuit board, containing a set of long (48 bits) extended precision floating point routines stored in bipolar read-only memory. It provides six additional arithmetic instructions that are executed by the micro-processor, greatly increasing the performance of all software executing long floating point operations.

MICROCODED ROUTINES

- EADD** adds two long floating point numbers
ESUB subtracts two long floating point numbers
EMPY multiplies a long floating point number by another
EDV divides a long floating point number by another
ENEG negates a long floating point number
ECMP compares two long floating point numbers.

Specifications

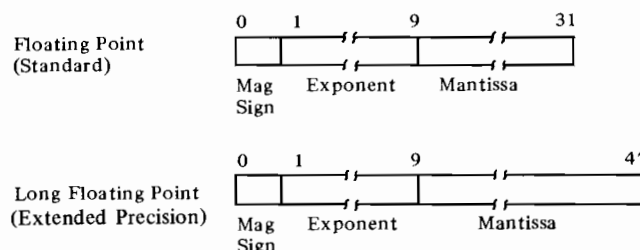
PHYSICAL CHARACTERISTICS

The 30011A is mounted on a single upper ROM board.

ENVIRONMENT

The 30011A meets all HP 3000 Computer System environmental specifications.

DATA FORMAT



INSTRUCTION SPEEDS

Name	Time in μsec	
	Minimum	Maximum
EADD	26.5	44.3
ESUB	27.0	44.8
EMPY	59.3	64.2
EDIV	74.6	82.6
ENEG	6.7	13.0
ECMP	6.1	16.6

INSTALLATION

When ordered for existing computer installations, an HP representative will install the 30011A at the customer location, without charge. When requested with the initial order for an HP 3000 System, the product is installed at the factory.

ORDERING INFORMATION

HP 30011A Expanded Instruction Set, Extended Precision Floating Point includes upper ROM board, diagnostic software and manuals.

HP 30011A-001 Expanded Instruction Set, Decimal is also available (see data sheet). Both capabilities are also provided combined as HP 30011A-002.



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30011A-001 Expanded Instruction Set Decimal

Features

- Microcode in bipolar memory for
 - Conversions between packed decimal numbers and external decimal (ASCII) numbers
 - Conversions between packed decimal numbers and multi-word binary numbers
 - Packed decimal add, subtract, compare
 - Packed decimal right shift, left shift, and normalizing left shift
- Provides a 6 to 40-fold increase in instruction performance over simulations
- Requires no software changes

The 30011A-001 Expanded Instruction Set, Decimal, consists of a single plug-in circuit board, containing a set of routines in bipolar read-only memory; these perform conversions between several data types, packed decimal arithmetic, and packed decimal shifts.

MICROCODED ROUTINES

- CVAD** converts a 1 to 28-digit number in external decimal (ASCII) format to packed decimal format
- CVDA** converts a 1 to 28-digit number in packed decimal format to external decimal (ASCII) format
- CVBD** converts a 1 to 6-word two's complement number to a packed decimal number of 1 to 28 digits
- CVDB** converts a 1 to 28-digit packed decimal number to a two's complement binary number of 1 to 6 words in length
- ADDD** adds two packed decimal numbers, each 1 to 28 digits in length
- SUBD** subtracts two packed decimal numbers, each 1 to 28 digits in length

- CMPD** compares two packed decimal numbers, each 1 to 28 digits in length
- SRD** takes a packed decimal number of 1 to 28 digits in length, shifts it by the specified number of positions to the right, and copies it to another field in memory
- SLD** takes a packed decimal number of 1 to 28 digits in length, shifts it by the specified number of positions to the left, and copies it to another field in memory
- NSLD** takes a packed decimal number of 1 to 28 digits in length, shifts it by the specified number of positions to the left (or by a lesser shift amount, such that no significant digits are lost), and copies it to another field in memory

Specifications

PHYSICAL CHARACTERISTIC

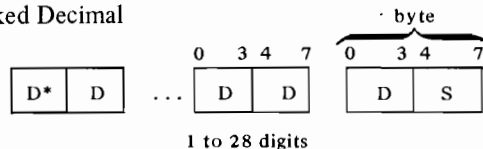
The 30011A-001 is mounted on a single upper ROM board.

ENVIRONMENT

The 30011A-001 meets all HP 3000 Computer System environmental specifications.

DATA FORMATS

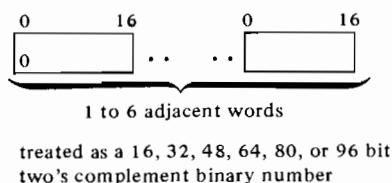
Packed Decimal



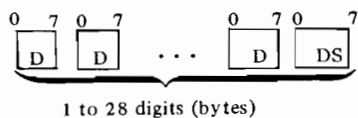
- S** Sign (binary 0000 to 1111 are legal, but 1100 is +, 1101 is -, 1111 is absolute)
- D** Digit (binary 0000 to 1001)
- D*** most significant digit position is ignored (but preserved) if an even number of digits is specified in the field



Multi-Word Binary



External Decimal



- DS the least significant digit carries the sign of the field according to **COBOL** external decimal conventions (ASCII characters 0 to 9 imply an unsigned number); [is a positive 0, A to I are positive 1 to 9;] is a negative 0, J to R are negative 1 to 9)
- D ASCII 0-9 (octal 60 to 71) or a leading blank (octal 40). No embedded blanks are permitted.

INSTRUCTION SPEEDS

	Time in μsec	
	Minimum	Maximum
CVAD	31	173
CVDA	33	146
CVBD	42	400
CVDB	35	216
ADDD	59	180
SUBD	59	180
CMPD	59	138
SRD	51	125
SLD	59	139
NSLD	59	139

INSTALLATION

When ordered for existing computer installations, an HP representative will install the 30011A-001 at the customer location, without charge. When requested with the initial order for an HP 3000 System, the product is installed at the factory.

ORDERING INFORMATION

HP 30011A-001 Extended Instruction Set, Decimal includes upper ROM board, diagnostic software and manuals.

HP 30011A Expanded Instruction Set, Extended Precision Floating Point is also available (see data sheet). Both capabilities are available combined as HP 30011A-002.



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30130 B 2780/3780 Emulation Subsystem

Features

- Communicates with any station that supports an IBM 2780 or 3780 capability
- Runs in full multiprogramming environment
- Accessible from both interactive terminals and traditional batch devices.
- Unrestricted peripheral and file access for input and output
- Provides for multiple users to queue jobs to be transmitted
- Supports all significant 2780/3780 standard and optional capabilities on point-to-point lines
- Automatic blank compression and trailing blank truncation
- Unlimited record blocking

The 2780/3780 Emulation Subsystem allows the user to transfer data between an HP 3000 Computer System and a variety of remote processors, in a full multiprogramming environment. It communicates over public telephone- or private leased-lines at speeds up to 4800 bits-per-second. The emulator causes the HP 3000 to appear (to a remote processor) as either an IBM 2780 or 3780 Data Communication Terminal; however, the Emulation Subsystem is more flexible than the IBM terminals in that it allows

the user to employ a greater variety of input/output devices.

The package provides the user with all standard 2780 and 3780 capabilities plus 22 additionally optional capabilities. The most significant of these follow:

- Blank compression
- Short record truncation
- EBCDIC and ASCII transparency
- Horizontal tabulation
- All 2780/3780 vertical format control
- Multi-record transmission (can optionally transmit more than seven records per block under user control)
- Print/punch component select

The user interfaces with the emulator through seven commands which control the sequence of input/output processing. Additionally, the file system and service utilities (i.e., EDIT/3000) make job control language, program and data files easier to maintain and transfer.

ORDERING INFORMATION

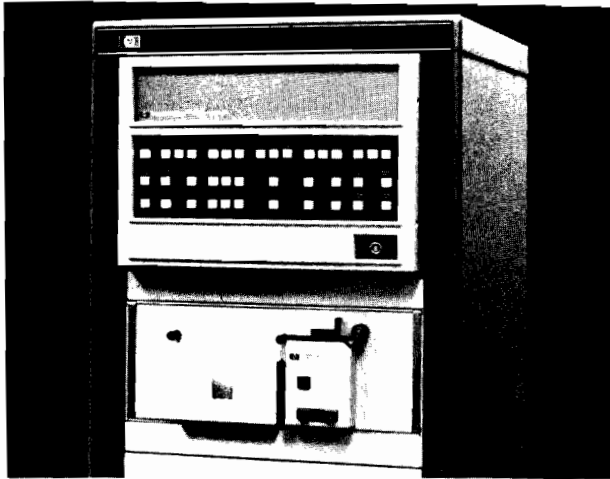
HP 30130 B 2780/3780 Emulation Subsystem includes HP 30055A Synchronous Single Line Controller, emulation software, diagnostics, 7.62m (25 feet) cable (for modem connection), and manual.



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30300A Programmable Controller Subsystem



Features

- Independent, core resident I/O processor, for immediate response to external events
- Hardwired, 16-bit parallel, transfer up to 200K words/sec.
- Self-contained, multilevel priority interrupt structure, for efficient I/O handling
- Access through HP 3000 file system
- Connects via hardwired link to HP 2100 I/O system, interfaces, drivers, and I/O software
- Capability to communicate with other computer systems
- Program development and down-load facility from HP 3000
- Convenient access to HP instrumentation or foreign devices
- Control and access from HP 3000 terminals and batch devices

The Programmable Controller brings to the HP 3000 the additional power of the HP 2100S, operating under the Basic Control System (BCS). With its I/O system, inter-

faces, drivers, and I/O software it is specifically designed for attachment of foreign devices and on-line instrumentation applications. It adds to the HP 3000, a self-contained, multilevel priority interrupt structure, and the ability to have core resident programs responsive to critical on-line tasks.

Like any other device on the HP 3000 system, the Programmable Controller is accessed through the file system of the HP 3000 Multiprogramming Executive (MPE), and may be remotely located up to 250 feet away.

The standard Programmable Controller System (HP 30300A) provides an HP2100S computer which includes 8192 words of core memory, dual-channel direct memory access (DMA), hardware extended arithmetic and floating point instructions, programmable time-base generator, and self-contained power supply. Also supplied is an interconnecting kit to the HP 3000, paper tape reader, cross loader and cross assembler, and necessary cabinetry.

Eleven input/output channels remain available to the user for the connection of device interfaces. The HP 2155A I/O Extender may be added to provide 31 additional input/output channels. Memory sizes up to 32K words are also optionally available.

The HP 30300A automatically inherits a comprehensive range of input/output drivers, the result of HEWLETT-PACKARD's long proven experience with the BCS operating system. The availability of a complete line of I/O interface kits permits complete monitoring systems to be tailored around the HP 30300A.

Software provided with the sub-system allows user written programs executing in the HP 3000, to monitor and control the application program executing in the Controller. Data transfer between the Controller and

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the HP 3000 file system as well as direct control of Programmable Controller operation, are performed through application programs in the HP 3000 and HP 2100. HP 3000 terminals can access an application program, provide terminal control of Programmable Controller functions and control of input and output.

Programs that execute in the Programmable Controller, and their associated configured BCS systems, can be stored as HP 3000 files in absolute binary format. The configured program for the Programmable Controller can be down-loaded from the HP 3000 to the Programmable Controller, under HP 3000 program control. The absolute binary code is automatically loaded in the HP 2100 Computer, and executed. The link between the HP 3000 application program and the Controller program is immediately established, and ready for data transfer or command information flow.

2100 CROSS ASSEMBLER

- Access from HP 3000 Computer terminals and batch devices
- Source code input and object code output treated as HP 3000 files
- Source code input using EDIT/3000 or input device external to HP 3000
- On-line source code modification using EDIT/3000
- Merge/edit of source file and edit file
- Selective assembly
- Source code assembled into relocatable or absolute object code
- Generation of programs that run on any HP 2100 Series Computer
- Extended Arithmetic Unit (EAU) and Floating Point instructions supported

The Cross Assembler allows a user of an HP 3000 Computer System to develop Assembly Language programs for the HP 30300A Programmable Controller or other HP 2100 Series Computer. The Cross Assembler accepts HP 2100 Assembly Language source as input, and outputs relocatable object code that can be loaded and executed.

Environment

The Cross Assembler is fully integrated into the Multi-programming Executive (MPE/3000). Consequently, the Cross Assembler can be run in batch or terminal (session) mode, and all input and output files are normal files found in the MPE/3000 file system.

Implementation Level

Source programs for the Cross Assembler are input to the HP 3000 from any HP 3000 input device, or may be created at a terminal through the use of EDIT/3000. The output generated by the Cross Assembler consists of relocatable object code or absolute code, optional program listings, optional symbol table listings, and

optional symbol cross reference table listings. These may be output to an I/O device, passed to the HP 2100 Cross Loader, or stored in the system.

The Cross Assembler augments the HP 2100 Extended Assembler, by providing assembler subsystem commands that allow a merge/edit capability between an HP 2100 Assembler source file and an edit file. IFN and IFZ pseudo-operations are provided with an IFa statement, to allow selective assembly of HP 2100 Assembler source. The ORB pseudo-operation is provided to define portions of relocatable code that must be assigned a base page origin. The Cross Assembler is compatible with all other HP 2100 assembler, and most closely resembles the HP 2100 DOS/DOS-M/DOS III Assembler. As with all HP 2100 Assemblers, extended arithmetic instructions and floating point instructions can be produced instead of subroutine calls.

EXAMPLE: Assembling A Source Program

The following MPE command sequence can be employed in assembling a source program residing on the disc file SRC. It is assumed the user wishes to list this program on the line printer, and transmit the assembled object code to a Magnetic Tape Unit. The entire job could appear as this simple sequence of commands:

Input	Function Performed
:JOB JONES.ACT2	Invokes MPE/3000, starts job.
:FILE XAOBJ; DEV=TAPE;REC=,U :FILE XATEXT=SRC,OLD	} Specifies input/output files.
:RUN XA2100	
:EOJ	Invokes Cross Assembler Terminates Job.

2100 CROSS LOADER

- Access from HP 3000 Computer terminals and batch devices
- Input and output code treated as HP 3000 files
- Accepts relocatable input from the HP 2100 Cross Assembler or any HP 2100 Series Computer assembler or compiler
- Supports BCS, TODS, TOPTS, RTE-C, RTE-E, and DOS III operating system environments
- Provides system generation for BCS, TODS, TOPTS, RTE-C, RTE-E, and DOS III
- Command files to generate operating systems can be stored as HP 3000 files

The Cross Loader runs on an HP 3000 computer to provide program relocation and linking for programs already assembled or compiled. The Cross Loader accepts as input, the relocatable output of HP 2100 Computer assemblers or compilers, and the 2100 Cross Assembler. The Cross Loader converts the object code

to absolute binary form, using a file of Cross Loader commands to create the operating system environment. The Cross Loader stores the output in absolute format in an HP 3000 file. This file can then be transferred to an output device, or down-loaded to the HP 30300A Programmable controller.

Environment

The Cross Loader is fully integrated into the Multi-programming Executive (MPE/3000). Consequently, the Cross Loader can be run in batch or terminal (session) mode, and all input and output files are normal files found in the MPE/3000 file system.

Command Language

Cross Loader operation is controlled by ten load-directive commands and nine keyword pointers. The load-directive commands are: RELOCATE, SAVE, OUTPUT, SEARCH, DISPLAY, SET, XEQ, LINK, END and EXIT. Their purpose is to:

- Establish system configuration parameters for the desired HP 2100 system
- Load relocatable program modules
- Create the EQT and SQT equipment tables
- Establish links to desired modules
- List the existing configuration by address
- Save configuration data in a "command" file that can be edited using EDIT/3000
- Establish entry point names and core locations to any desired value.

Operating System Generation

Operating system generation is performed to create an operating environment to which an HP 2100 relocatable object program can link.

For example, operating system generation with the Cross Loader for a BCS environment, is functionally equivalent to running Prepare Control System (PCS), during a BCS system generation on an HP 2100 computer. By simply building system tables, setting entry points, and relocating the necessary I/O drivers, the Cross Loader can generate an executable absolute file of the operating system for a given memory, I/O configuration, and set of application programs. Operating Systems that can be generated this way are Basic Control System (BCS), Test Oriented Disc System (TODS), Test Oriented Paper Tape System (TOPTS), and Real Time Executive C (RTE-C). The Real Time Executive E (RTE-E) and Disc Operating System (DOS, DOS/M, DOS III) can be generated by converting the absolute file generated from the Cross Loader, to core-image absolute.

Operating systems configuration for various memory and I/O configurations of the Programmable Controller Subsystem or other HP 2100 computers, can be stored as HP 3000 ASCII command files. These "Command" files are then available to the Cross Loader, for any

given HP 2100 application program which requires a specific operating system or HP 2100 I/O configuration.

EXAMPLE: Loading a User Program

The following series of inputs to the Cross Loader show a complete, authentic HP 3000 job for generating executable absolute binary code, consisting of application programs and a BCS system. The HP 3000 file ACOMR will contain the absolute binary output of the Cross Loader. HP 3000 file RTM contains HP 2100 application programs CONST and LIST in HP 2100 relocatable object code form. HP 3000 file EAU contains BCS Extended Arithmetic library routines. HP 3000 file BCSCMD is the BCS system "command" file generated in an operating system generation step.

Input	Function Performed
:JOB JONES.ACT1	Initialize Job
:RUN XL2100	Invoke Cross Loader
OUTPUT ACOMR	Specifies Output file
XEQ BCSCMD	Specifies the particular HP 2100 I/O configuration to be modeled.
RELOCATE TRM (CONST, LIST)	} Load Programs Resolve Undefineds Display Result
SEARCH EAU	
DISPLAY ALL	
END	} Terminate Cross loader
EXIT	
:EOD	} Terminate Job
:EOJ	

Specifications

MEMORY

Word size: 16 bits
Page size: 1024 words
Memory size: 8, 16, 24, 32K words configuration
Cycle time: 980 nsec

INPUT/OUTPUT

Multilevel automatic priority interrupt: determined by interface location.
I/O channels: 14, 11 of which are available for attaching I/O devices to the controller.
Additional channels: 31 I/O available with HP 2155A extender
Total possible available I/O channels: 42 (11 + 31)

DIRECT MEMORY ACCESS

Number of channels: 2, 1 channel is available for user tasks
Word size: 16 bits
Maximum size: 32768 words
Assignable: To any I/O channel

CRYSTAL-CONTROLLED TIME-BASE GENERATOR

Base Intervals

0.1 ms	1 second
1 ms	10 seconds
10 ms	100 seconds
0.1 second	1000 seconds

Stability: 2 parts in 10^6 per week

PAPER TAPE READER

Speed: 500 characters per second (415 characters per second at 50 Hz)

Technique: Photoelectric, character-by-character

Code: 8 level

Width: 1 inch

INTERCONNECTION

Speed: 200,000 words at 50 ft.

Components: HP 2100 and HP 3000 parallel interface cards and cable

POWER REQUIREMENTS

115V/230V $\pm 10\%$,

60 Hz $\pm 10\%$, 50 Hz $\pm 5\%$

Power consumption: 1040 watts, maximum

CURRENT AVAILABLE TO I/O

Supply Voltage	Current Available, Amperes (Depending on memory size)			
	8K	16K	24K	32K
+12	2.9	2.9	2.9	2.9
+5	22.8	21.9	20.8	20.0
-2	10.7	9.9	9.1	8.3
-12	3	3	3	3

ENVIRONMENTAL CONDITIONS

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

Non-operating Temperature: -40° to 73°C (-40° to 165°F)

Relative humidity: 95% at 40°C (104°F)

SOFTWARE SUPPLIED

HP 3000 Computer

- A procedure for transferring programs from the HP 3000 to the Controller
- A driver to execute file system intrinsics to open, close, read, write, and obtain information about transfers
- Cross Loader for HP 2100
- Cross Assembler for HP 2100

Programmable Controller

- BCS System with input/output control (IOC), paper-tape-reader driver, extended-arithmetic-unit library
- A loader to accept the transfer of programs from the HP 3000 and initiate them
- A driver to execute I/O control subroutine requests to read, write, clear, and obtain status information (uses 1 DMA channel)

ORDERING INFORMATION

HP 30300A Programmable Controller. Includes HP 2100s Computer with 8K memory, DMA, programmable time-base generator, hardware extended arithmetic and floating point instructions; HP 12925A Paper Tape Reader Subsystem; interconnection interfaces for HP 2100 and HP 3000; signal cable,* 15.24m (50 ft.); necessary cabinetry⁽¹⁾; supporting HP 3000 and HP 2100 software.

HP 30300A-001 Programmable Controller. Same as standard HP 30300A, but mounted in separate, stand-alone cabinet for remote location.

HP 30300A-016 Programmable Controller. Same as standard HP 30300A, but with 16K memory.

HP 30300A-024 Programmable Controller. Same as standard HP 30300A, but with 24K memory.

30300A-032 Programmable Controller. Same as standard HP 30300A but with 32K memory.

HP 30361A Programmable Controller Interface Kit⁽²⁾. Includes interfaces for HP 2100 and HP 3000, signal cable,* 14.24m (50 ft.); supporting HP 3000 and HP 2100 software. Assumes existence of an HP 2100-based computer with DMA and a paper tape reader.

Notes:

¹ Provided as an additional bay contiguous with the HP 3000 Computer, or as a separate, stand-alone rack for a remote location.

² For existing HP 2100 installations, an HP 2100 computer may become a "programmable controller" by interconnecting with the HP 3000 Computer through the HP 30361A Interface Kit. Requires a 2100A or 2100S Computer, 8K memory, HP 12925A Paper Tape Reader Subsystem, and HP 12985A DMA for HP 2100 Series Computer.

*76.2m (250 ft.) maximum cable length can be specified.



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30301A Real-Time Programmable Controller Subsystem



Features

- Simultaneous real-time instrumentation, data analysis and software development
- Full use of RTE-C on the HP 2100 Minicomputer with MPE multiterminal access
- Bi-directional data transfer between HP 3000 and HP 2100
- Hardwired, 16-bit parallel transfer rate up to 200K-words/sec
- Allows high-level scientific and business languages for data analysis and report writing
- Easier, lower-cost development of real-time software
- Time-scheduled execution of instrumentation programs
- RTE-C system generation and program development on the HP 3000 with download capability

- Extensive library of measurement and control programs available
- Either HP 3000 or HP 2100 can be configured as master as master or slave

The Real-Time Programmable Controller with proven RTE-C capability provides the HP 3000 with dedicated, real-time access to measurement and control devices simultaneously with general data processing. As instrumentation data is acquired by the controller it can be transferred to the HP 3000 for concurrent analysis, using high-level languages such as ANSI COBOL and FORTRAN, RPG, BASIC or SPL.

This combination is also a cost-effective alternative to expensive peripherals which are only occasionally needed, such as printers on a real-time computer. By connecting all peripherals to the HP 3000, they can be continuously shared by many different multi-programmed applications. Further, the HP 3000 supports terminal users over telephone lines, thus allowing technicians to control instrumentation devices from remote locations.

COMPONENTS

The HP 30301A includes the following:

- HP 2100S Computer with
 - 8K-words of core memory
 - dual-channel direct memory access (DMA)
 - extended precision floating point hardware instructions
 - programmable time base generator
- HP 2752 Teleprinter Terminal
- HP 12925A Paper Tape Reader
- HP 30361 Programmable Controller interface with
 - interface boards for both the HP 2100 and HP 3000
 - signal cable linking the HP 2100 to HP 3000 RTE-C/3000 software

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RTE-C/3000 SOFTWARE

HP 3000 Resident Software:

- HP 32223A Cross Assembler program XA2100
- HP 32226A Cross Loader program XL2100
- Cross RTE-C Generation program XRTCGEN
- Download-Program library routine DNLDUSER
- Download-System library routine DNLDSYS
- Diagnostic program LINETEST

HP 2100 Resident Software:

- Basic Binary Link Loader (BBLL)
- RTE-C Operating System (HP 3000 version)
- Diagnostic Program LTEST

RTE-C CAPABILITY

RTE-C is a core-resident, real-time executive operating system capable of running multiple instrumentation programs concurrently. It maintains a list of programs to be run and can initiate the programs on either a time schedule or in response to a special interrupt.

The RTE-C scheduler orders program execution according to 99 user-supplied priority levels. Interrupt-driven programs are initiated according to the hardware priority of an interrupt, with all other interrupts remembered.

I/O operations are performed concurrently with CPU execution. Programmable timeout notification for non-responding I/O devices permits operator intervention from the Teleprinter terminal.

APPLICATIONS

RTE-C is typically used for:

- Data acquisition
- Stimulus-response and sensor-based industrial testing
- Process monitoring and automation
- Experiment control and analysis
- High-resolution analog-to-digital conversion

SOFTWARE DEVELOPMENT

Application programs on the HP 3000 access the Real-Time Programmable Controller through the MPE file system, in the same fashion as any peripheral on the HP 3000. From SPL, for example, a program would call the standard file intrinsics FOPEN, FCONTROL, FREAD, FWRITE, FGETINFO and FCLOSE.

Programs for the Controller may be written in either HP 2100 Assembler or FORTRAN languages. I/O devices are accessed using standard RTE-C EXEC calls. Assembler programs may be assembled on the HP 3000 using the Cross Assembler. FORTRAN programs must be compiled on the HP 2100. The output may be transferred to the HP 3000. All relocatable Controller

programs must be converted to absolute form on the HP 3000 using the Cross Loader. Absolute programs for the Controller may be stored in HP 3000 disc files, and downloaded to the HP 2100 by HP 3000 program calls to the routine DNLDUSER.

The RTE-C operating system is generated on the HP 3000 by running the Cross RTE-C Generation program. An operating system may be stored on HP 3000 disc and downloaded to the Controller by calling the routine DNLDSYS.

Software development for the Controller is much easier, faster and more economical through the use of terminals and the powerful Editor (EDIT/3000) on the HP 3000. Paper tape operations are eliminated except for loading existing programs, FORTRAN compiles and hardware failure recovery.

Specifications

MEMORY

Word size: 16 bits

Page size: 1024 words

Memory size: 8, 16, 24, 32K-words configuration

Cycle time: 980 nsec

INPUT/OUTPUT

Multilevel automatic priority interrupt: determined by interface location

I/O channels: 14, 11 of which are available for attaching I/O devices to the controller

Additional channels: 31 I/O available with HP 2155A extender

Total possible available I/O channels: 42 (11 + 31)

DIRECT MEMORY ACCESS

Number of channels: 2, 1 channel is available for user tasks

Word size: 16 bits

Maximum size: 32768 words

Assignable: To any I/O channel

CRYSTAL-CONTROLLED TIME-BASE GENERATOR

Base Intervals

0.1 ms	1 second
1 ms	10 seconds
10 ms	100 seconds
0.1 second	1000 seconds

Stability: 2 parts in 10^6 per week

INTERCONNECTION

Speed: 200,000 words at 15.24m (50 ft.)

Components: HP 2100 and HP 3000 parallel interface cards and cable

POWER REQUIREMENTS

115V/230V $\pm 10\%$, 60 Hz $\pm 10\%$, 50 Hz $\pm 5\%$

Power consumption: 1040 watts, maximum

CURRENT AVAILABLE TO I/O

Supply Voltage	Current Available, Amperes (Depending on memory size)			
	8K	16K	24K	32K
+12	2.9	2.9	2.9	2.9
+5	22.8	21.9	20.8	20.0
-2	10.7	9.9	9.1	8.3
-12	3	3	3	3

ENVIRONMENTAL CONDITIONS

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

Non-operating Temperature: -40° to 73°C (-40° to 165°F)

Relative humidity: 95% at 40°C (104°F)

¹ For specifications on the HP 12925A Paper Tape Reader and the HP 2752A Teleprinter, see HP literature 5952-4616(22) and 5952-4334(22) respectively.

ORDERING INFORMATION

HP 30301A Real-Time Programmable Controller includes HP 2100S Computer with 8K memory, DMA, programmable time-base generator, hardware extended arithmetic and floating point instructions; HP 12925A Paper Tape Reader Subsystem; HP 2752A Teleprinter; interconnection interfaces for HP 2100 and HP 3000; signal cable,* 15.24m (50 ft.); necessary cabinetry¹; supporting HP 3000 and HP 2100 software.

HP 30301A-001 Real-Time Programmable Controller. Same as standard HP 30301A, but mounted in separate, stand-alone cabinet for remote location.

HP 30301A-016 Real-Time Programmable Controller. Same as standard HP 30301A, but with 16K memory.

HP 30301A-024 Real-Time Programmable Controller. Same as standard HP 30301A, but with 24K memory.

HP 30301A-032 Real-Time Programmable Controller. Same as standard HP 30301A, but with 32K memory.

HP 30361A-001 Programmable Controller Interface Kit for RTE-C². Includes interfaces for HP 2100 and HP 3000, signal cable,* 15.24m (50 ft.); supporting HP 3000 and HP 2100 software. Assumes existence of an HP 2100-based computer with 8K memory, DMA, time base generator, paper tape reader and a teleprinter console.

Notes:

¹ Provided as an additional bay contiguous with the HP 3000 Computer, or as a separate, stand-alone rack for a remote location.

² For existing HP 2100 installations, an HP 2100 computer may become a "programmable controller" by interconnecting with the HP 3000 Computer through the HP 30361A Interface Kit.

*76.2m (250 ft.) maximum cable length can be specified.



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2640A CRT Terminal for HP 3000 Systems



Features

- Completely supported for use with the HP 3000, in Character Mode.
- Enhanced high-resolution display
- Plug-in character sets
- Self-test
- Multi-task keyboard
- Off-screen storage with scrolling capability
- Programmable protected fields
- Inverse video for highlighting; optional blinking, underline, half-bright
- Cursor addressability and positioning control (tabulation)

The HP 2640A CRT Terminal provides reliable computer communications and a smooth flow of visual information. The high data transmission rates and operational flexibility of the HP 2640A reduces on-line time and simplifies computer communications.

ENHANCED HIGH-RESOLUTION DISPLAY

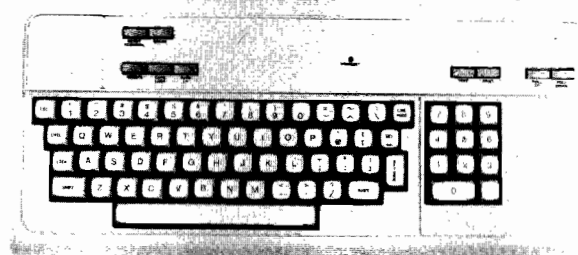
The CRT has a 5 inch by 10 inch rectangular display providing a 1,920 character capacity in 24 lines of 80 characters per line. The characters are formed by a 7 x 9 dot matrix generated in a 9 x 15 dot character cell. The high resolution of the 7 x 9 dot matrix is enhanced for precise character definition.

PLUG-IN CHARACTER SETS

The HP 2640A has the capacity to include up to four 128-character sets resident concurrently in the terminal. Adjacent characters on the display may be from any of the four character sets. A Math Character Set and Line Drawing Set are available with the optional Underline, Blinking and Half-Bright features.



Standard Multi-Task Keyboard



Optional Simplified Keyboard

SELF-TEST

The HP 2640A has been engineered for high reliability, ease of maintenance, testing, and rapid repair when needed. By depressing the TEST button on the keyboard the user receives a go/no-go indication from results of a memory test, firmware test, and display verification.

OPERATING MODE

The HP 3000 supports the HP 2640A only in character mode. It is supported when terminal type 10 (;TERM = 10) is designated during log on.

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Specifications

GENERAL

Screen Size: 127 mm (5 inches) x 254 mm (10 inches)
Screen Capacity: 24 lines x 80 columns (1,920 characters)
Character Size: 2.46 mm (.097 inches) x 3.175 mm (.125 inches)

Character Set: 64 upper-case Roman
Cursor: blinking underline
Display Modes: white on black; black on white (inverse video)

Refresh Rate: 60 Hz (50 Hz optional)
Memory: MOS; ROM: 8Kbytes (program); RAM: std. 1024 bytes; 8192 bytes max

Keyboard: Full ASCII Keyboard, 8 special function keys, and 12 additional control and editing keys; ten-key numeric pad; cursor pad; multi-speed auto-repeat; N-key roll-over; stand-alone, 4-foot cable. (keys related to block mode are not supported on HP 3000 Systems)

DATA COMMUNICATIONS

Data Rate: 110, 150, 300, 1200, 2400 baud, and external — switch selectable (110 selects two stop bits)

Communications Interface: EIA standard RS232C; type 103 and 202 modem compatible

Transmission Modes: Full or half duplex, asynchronous
Operating Modes: On-line; Off-line; Character

POWER REQUIREMENTS

Input Voltage: 110 (+15%, -20%) at 60 Hz
220 (+15%, -20%) at 60 Hz

Power Consumption: 75W to 125W max.

ENVIRONMENTAL CONDITIONS

Operating Temperature: 0 to +55°C (+32 to +131°F)
Relative Humidity: 5 to 95% (non-condensing)
Heat Dissipation: 107 kilocalories/hr (426 BTU/hour)

PHYSICAL SPECIFICATIONS

Display Monitor Weight: 16.8 kg (37 lbs)
Keyboard Weight: 3.2 kg (7 lbs)
Display Monitor Dimensions: 444.5 mmW x 457.2 mmD x 342.9 mmH (17.5"W x 18"D x 13.5"H) (647.7 mmD (25.5"D) including keyboard)

Keyboard Dimensions: 444.5 mmW x 215.9 mmD x 88.9 mmH (17.5"W x 8.5"D x 3.5"H)

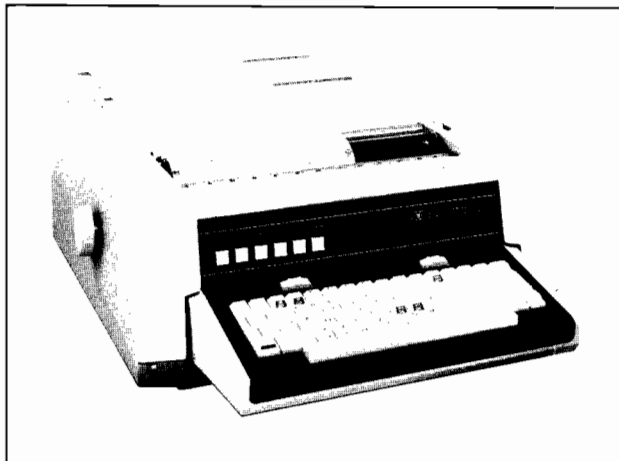
ORDERING INFORMATION

PRODUCT NO.	DESCRIPTION/NOTES
2640A	Interactive Display Terminal Character mode; 64 character upper case Roman set; 1024 bytes of storage, expandable to 8192 bytes maximum; inverse video; 110-2400 Baud; RS232; includes 2 option slots. (Option 005 required).
opt. 001	128 Character Set — Roman Add lower case and displayable control codes.
opt. 005	103/202 Modem Cable — for connection to 103/202 modem or HP 3000 asynchronous terminal controller (male RS232 connector)
opt. 010	Simplified Keyboard Replace standard multi-task keyboard with typewriter compatible keyboard (including numeric pad).
opt. 015	230V/50 Hz
13231A	Display Enhancements Adds blinking, half-bright & underline, and provides for addition of three 128 character sets (occupies one option slot)
opt. 201	64-character mathematic symbol set Adds display of integral signs, Greek letters, etc.
opt. 202	64-character line drawing set Adds display of continuous horizontal and vertical line segments for forms, histograms, etc.
13233A	Terminal Memory Module (+2K) 2048 bytes of additional storage for 2640A (occupies one option slot).
13234A	Terminal Memory Module (+4K) 4096 bytes of additional storage for 2640A (occupies one option slot).
13238A	Terminal Duplex Register For use with 2640A Interactive Display Terminal (occupies one option slot).
opt. 001	HP 9866 Cable Adds cable for connection to 9866 Line Printer. (Firmware currently supports 9866 printer only.)
13240A	2640A Option Slot Extender Adds five option slots in 2640A (includes fan).



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2762A Printer Terminal for HP 3000 Systems



Features

- 30 character per second print rate
- 75 column format
- Prints upper & lower case characters
- Heavy duty mechanism for continuous operation
- Quiet operation in a compact unit
- UL listed, CSA certified

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 2762A enhances your system by making far more effective use of computer time than would be possible with conventional, slower terminals.

The HP 2762A is a modern self-contained, heavy duty unit that permits reliable, continuous duty. Acoustical design insures welcome quiet operation.

**A 2762A is supplied with the HP 3000 Computer System as a console.*

A Printer Terminal can be directly connected to the HP 3000 Computer System through the asynchronous terminal controller and employed as a terminal. Input to the HP 2762A 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 switch selected vertical spacing of 6 or 3 lines per inch . . . print position indicator (a digital display that indicates next column to be printed) . . . print position scale . . . end-of-line alarm . . . internal illumination, and a low paper alarm.

Available options include pin feed paper handling, pedestal mounting, and operation from 50 Hz power sources.

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: 2.5 mm nominal (0.1 inch)

Width: 1.5 to 2.2 mm (0.060 to 0.085 inch)

HEWLETT  PACKARD

Forms: (Pin feed equipped units) One to six-part carbon forms or three-part carbonless, sprocketed forms 21.6 cm (8.5 inches) wide, 20.3 cm (8.0 inches) between feed holes.

Recommended paper weights:

1 part	15 lb. paper
2, 3, 4 parts	13.5 lb. paper, 8 lb. carbon
6 part	12 lb. paper, 8 lb. carbon

Maximum allowable pack thickness: 0.64 mm (0.025 in.)

Paper slew rate: 16.9 cm (6.66 in.) per second

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

KEYBOARD

Magnetically coupled key contacts ensure reduced wear, longer operating life, and high reliability. The full 128-character ASCII codes (94 printable) can be generated. Switches are provided to select all caps or auto line feed.

PRINTING SPEED

10, 15, or 30 characters/second, switch selected.

DATA TRANSFER

Bit serial 10-bit code (11-bit at 10 cps) at rates of 110, 150, or 300 baud.

NUMBER OF COLUMNS

75 columns

CODE CONFORMATION

The 2762A Terminal Printer 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)

POWER REQUIREMENTS

2762A Terminal

60 Hz models: 117 Vac $\pm 10\%$ Single Phase

60 Hz -1.5 to +1 Hz Line

Frequency

50 Hz models: 220 or 240 Vac (dependent on option) $\pm 8\%$

50 Hz ± 0.5 Hz

Power Consumed: 110 watts maximum

Power Cable: 3-wire, 7 ft. (2.1 m)

ENVIRONMENTAL CONDITIONS

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

Storage: -29° to +71°C (-20° to +160°F)

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

Altitude:

Operating: 0 to 3,650 m (12,000 ft.)

Non-Operating: 0 to 15,240 m (50,000 ft.)

Heat Dissipation: (Device) 95 kilocalories/hr (375 BTU/hr)

PHYSICAL CHARACTERISTICS

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

Height: 19 cm (7-1/2 inches)

Depth: 67.3 cm (26-1/2 inches)

Weight: 36.3 kg (80 pounds) without pedestal

45.5 kg (100 pounds) including pedestal

Shipping Weight: 59.1 kg (130 pounds) without pedestal

75 kg (165 pounds) with pedestal

ORDERING INFORMATION

2762A Configurations

Standard - Printer with keyboard, 75 columns, friction feed, 10/15/30 characters per second, 117 VAC/60 Hz operation

015 - As standard except 220 Vac/50 Hz operation

016 - As standard except 240 Vac/50 Hz operation

017 - Adds pin feed paper handling with paper guide

018 - Adds pedestal and paper shelf

EQUIPMENT SUPPLIED

The following is shipped with each 2762A:

Data Set Cable, RS-232C (CCITT V-24) Compatible, Length: 1.4 m (4.5 ft.)

Dust Cover

Spare Lamps and Lamp Extractor

Power Cord

9280-0292 Paper, 1 roll (friction feed models only)*

9280-0705 Paper, fan fold, 250 sheets (pin feed models only)*

9282-0524 Ribbon, black

02762-90030 Operators Manual

SERVICE DOCUMENTATION

02762-90001 Service Manual

02762-90034 Parts Breakdown Manual

INSTALLATION

List price includes installation

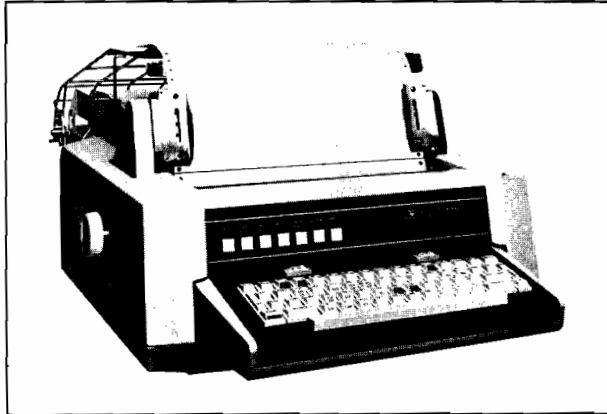
*Sufficient paper is supplied for installation testing. Operating quantities should be ordered prior to installation.



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2762B Printer Terminal for HP 3000 Systems



Features

- 120 character per second printing rate
- 120 column format
- Upper and lower case characters
- Quiet, heavy duty, impact printer
- UL listed, CSA certified

The high speed and 120 column format of the HP 2762B makes it ideal for use in applications previously not considered practical for low cost terminal devices. Examples are long program listings and forms printing. Switch selection of 10, 30, or 120 characters per second allows use of the terminal with applications having different speed requirements.

The standard HP 2762B provides the most often desired features of a printer terminal. These include multiple speed operation, 94 character keyboard, 120 column printing mechanism, forms tractors for precise paper positioning and a paper handler to ensure orderly paper stacking. The standard unit is wired for 117 Vac, 60 Hz power and includes an operating time indicator.

Options are provided to allow tailoring of the HP 2762B to the user's specific requirements:

Answerback — allows terminal to automatically transmit a 1 to 20 character user coded message (such as terminal identification) in response to a remote inquiry.

Vertical Tabs and Form Feed— Includes user programmable discs for either local or remote control of vertical forms positioning.

Horizontal Tabs — Allows local or remote setting of tabs in any character position.

Pedestal — Provides a free standing unit with paper shelf.

Power Options — 220V or 240V operation at 50 Hz.

The HP 2762B meets all product safety requirements of UL and CSA (60 Hz models only) and IEC (50 Hz only).

Specifications

CONTROL UNIT

Transmission: Full duplex, serial asynchronous standard. 7-level ASCII code plus parity bit (even), start and stop bits.

Interface: ETA Standard RS-232C (CCITT V-24).

Compatible with Bell 103 series full duplex modems or equivalent at rates of 110 or 300 baud.

PRINTING MECHANISM

Revolving print font belt; ink ribbon

Ink standard color: black

Printable characters: 94

Print positions (line length): 120 (characters)

Horizontal spacing: 10 characters per inch (2.54 cm)

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

Printed character size (typical):

Height: 2.5 mm (0.1 inch)

Width: 1.5 to 2.2 mm (0.060 to 0.085 inch)

Forms: One to six part carbon or three part carbonless, sprocketed forms 3.0 to 12.9 inches (7.6 to 32.8 cm) wide.

Recommended paper weights:

1 part 15 lb. paper

2, 3, or 4 part 13.5 lb. paper, 8 lb. carbon

6 part 12 lb. paper, 8 lb. carbon

HEWLETT  PACKARD

Maximum allowable pack thickness: 0.64 mm (0.025 inch)
Paper slew rate: 16.9 cm (6.66 inches) per second
Indicators: local, standby, on-line, ready, interrupt, alarm, print position

KEYBOARD

Magnetically coupled key contacts ensure reduced wear, longer operating life, and high reliability. The full 128 ASCII codes (94 printable) can be generated. Switches are provided to select all caps or auto line feed.

PRINTING SPEED

10, 30, or 120 characters/second, switch selected.

DATA TRANSFER

Bit serial, 10 bit code (11 bits at 10 character/second) including start and stop bits.

NUMBER OF COLUMNS

120 columns

CODE CONFORMANCE

The 2762B Terminal Printer 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)

POWER REQUIREMENTS

2762B Terminal

60 Hz Models: 117 Vac $\pm 10\%$ Single Phase

60 Hz -1.5 to +1 Hz Line Frequency

50 Hz Models: 220 or 240 Vac (dependent on option $\pm 10\%$)

50 Hz ± 1 Hz

Power Consumed: 175 watts maximum

Power Cable: 3-wire, 7 ft. (2.1 m)

ENVIRONMENTAL CONDITIONS

Temperature

Operating: 0° to 43°C (32° to +110°F)

Storage: -29° to 71°C (-20° to +160°F)

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

Altitude

Operating: 0 to 3,650 m (12,000 ft.)

Non-Operating: 0 to 15,240 m (50,000 ft.)

Heat Dissipation: (Device) 190 kilocalories/hr (756 BTU/hr)

PHYSICAL CHARACTERISTICS

Width: 52.1 cm (20.5 inches)

Height: 29.5 cm (11.6 inches)

Depth: 80.8 cm (31.8 inches)

Weight: 40.8 kg (90 lb.) without pedestal

50 kg (110 lb.) with pedestal

Shipping Weights: 79.5 kg (175 lb.) with pedestal

68.2 kg (150 lb.) without pedestal

ORDERING INFORMATION

2762B Configurations

Standard — Printer with keyboard, 120 columns, tractor paper feed, 10/30/120 characters per second, 117VAC/60 Hz operation

015 - As standard except 220 VAC/50 Hz operation

016 - As standard except 240 VAC/50 Hz operation

001 - Adds automatic answerback capability

002 - Adds vertical tabs and forms feed. Includes discs and punch.

003 - Adds horizontal tabs capability.

004 - Adds line control and interface for operation with 202 modems.

005 - Adds pedestal and restacking shelf.

EQUIPMENT SUPPLIED

The following is shipped with each 2762B:

Data Set Cable, length 1.4 m (4.5 ft.), compatible with option ordered.

Dust Cover

Spare Lamps and Lamp Extractor

Power Cord

9280-0551 Paper, fanfold, 250 sheets*

9282-0524 Ribbon, black

02762-90030 Operators Manual

SERVICE DOCUMENTATION

2762-90031 Service Manual

2762-90034 Parts Breakdown Manual

INSTALLATION

List price includes installation.

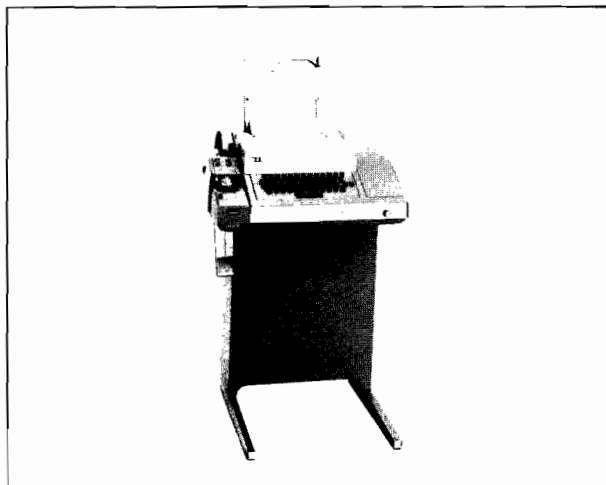
*Sufficient paper is supplied for installation testing. Operating quantities should be ordered prior to installation.

HEWLETT  PACKARD

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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 "O" 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 8.5 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)

HEWLETT  PACKARD

POWER REQUIREMENTS

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

ENVIRONMENTAL CONDITIONS

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

PHYSICAL CHARACTERISTICS

Width: 55.9 cm (22 inches)
Height: 21.6 cm (8½ inches); with pedestal: 83.8 cm
(33 inches)
Depth: 47 cm (18½ inches)
Weight: 34.7 kg (77 lbs) includes pedestal
Shipping Weight: 41.8 kg (92 lbs) 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 – 1.91 m (7½ ft); signal cable*
– 1.52 m (6 ft); necessary software for integration with
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.*

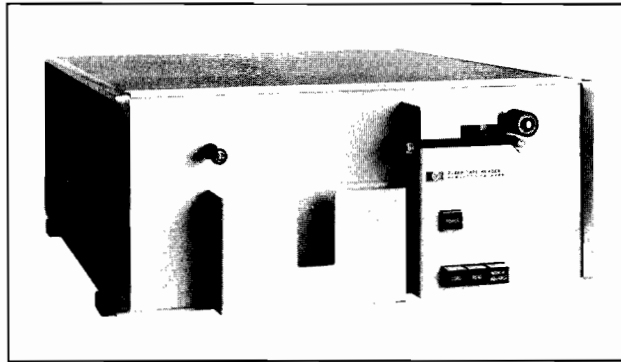
OPERATING SUPPLIES AVAILABLE

Paper, Roll 21.6 cm (8.5 inches wide), 94 m (370 ft long)
HP Part No. 9280-0046

Paper, Tape 2.54 cm (1 inch wide),
304.8 m (1000 ft long) HP Part No. 9280-0063
Lubrication Kit HP Part No. 5080-6610
Paper Tape Winder, 115V/230V/Battery, includes re-
chargeable battery HP Part No. 12575C



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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

30104A Punched Tape Reader Subsystem

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) 172 kilocalories/hr (683 BTU/hr)

PHYSICAL CHARACTERISTICS

Height: 17.8 cm (7 inches)

Width: 43.2 cm (17 inches)

Depth: 40.6 cm (16 inches), not including panel controls and connectors

Device Weight: 19.1 kg (42 lb.)

Shipping Weight: 24.5 kg (54 lb.)

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* — 5.48 m (18 ft); power cable — 2.28 m (7½ ft); necessary software for integration with the HP 3000; device diagnostic software.

OPERATING ACCESSORY AVAILABLE

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

Includes rechargeable software.

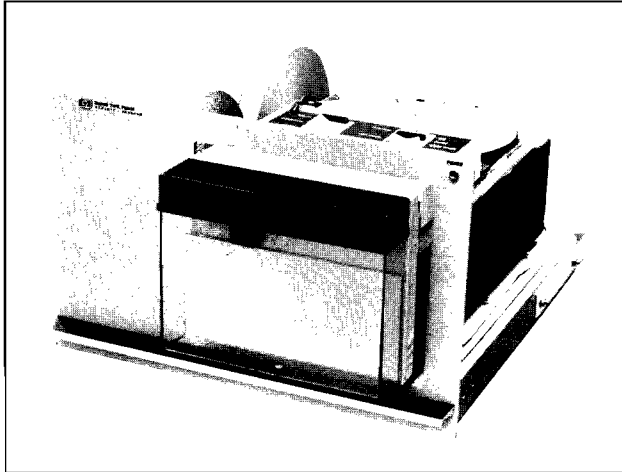
*maximum permissible signal cable length: 15.24 m (50 ft)



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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 17.5 mm (11/16 inch) and 8 level 25.4 mm (1 inch)

TAPE THICKNESS

Paper: 0.08 to 0.13 mm (0.003 inch to 0.005 inch)
oil-base or dry

Mylar: 0.08 to 0.10 mm (0.003 inch to 0.004 inch)

Plastic: 0.08 to 0.11 mm (0.003 inch to 0.0045 inch)

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) 172 kilocalories/hr (683 BTU/hr)

PHYSICAL CHARACTERISTICS

Height: 26.7 cm (10½ inches)

Width: 42.5 cm (16¾ inches)

Depth: 53.8 cm (21-3/16 inches)

Mounting: Fits in HP 3000 cabinet

Device Weight: 15.9 kg (35 lb) including drawer

Shipping Weight: 21.3 kg (47 lb)

ORDERING INFORMATION

30105A Tape Punch Subsystem, 75 cps. Includes HP 2895B Tape Punch; controller/interface; power cable — 2.28 m (7.5 ft); signal cable — 4.57 m (15 ft); 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, 2.54 cm (1-inch wide) 304.8 m (1000 ft. roll) HP Part No. 9280-0063

Mylar Tape, 1-inch wide, 152.4 m (500 ft.) roll, HP Part No. 0460-0747

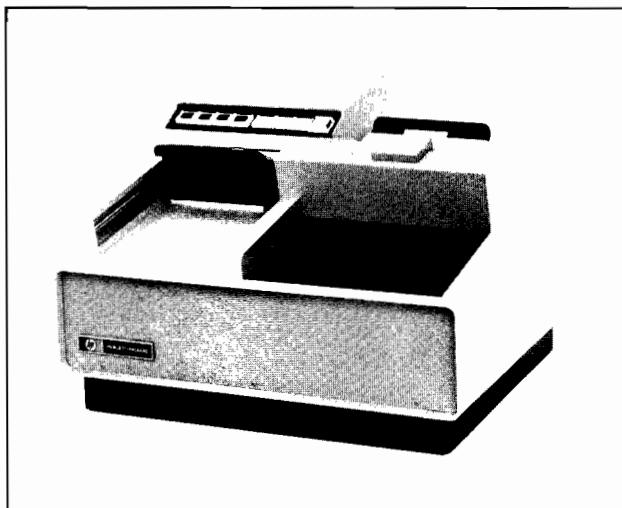


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30106A Card Reader Subsystem



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%

HEWLETT  PACKARD

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) 310 kilocalories/hr
(1230 BTU/hr)

PHYSICAL CHARACTERISTICS

Height: 39.4 cm (15.5 inches)

Width: 58.6 cm (23-1/16 inches)

Depth: 45.7 cm (18 inches)

Net Weight: 34 kg (75 lbs)

Shipping Weight: 45.4 kg (100 lbs)

ORDERING INFORMATION

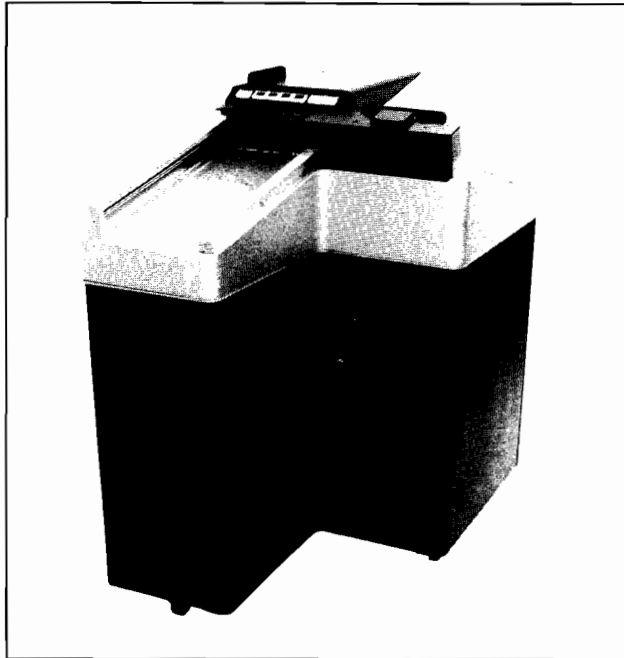
The 30106A Card Reader Subsystem includes HP 2893A Card Reader; controller/interface; power cable - 1.83 m (6 ft); signal cable* - 15.24 m (50 ft); necessary software for integration with the HP 3000; device diagnostic software

*152.4 m (500 ft) 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).

HEWLETT  PACKARD

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) 576 kilocalories/hr
(2276 BTU/hr)

PHYSICAL CHARACTERISTICS

Height: 105.4 cm (41½ inches)
Width: 59.7 cm (23½ inches)
Depth: 99 cm (39 inches)
Net Weight: 90.7 kg (200 lbs)
Shipping Weight: 113.4 kg (250 lbs)

ORDERING INFORMATION

30107A Card Reader Subsystem. Includes HP 2950A Card Reader with single read-station; power cable — 1.83 m (6 ft); controller/interface; signal cable* — 15.24 m (50 ft); 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.

*152.4 m (500 ft) maximum signal can be specified.



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30119A

Card Reader Punch Subsystem



Features

- On-line 80-column card reading, card punching and card printing
- Rapid throughput
- Read, punch and print functions independently controlled by the computer system
- Individual data storage buffers for each function
- Dual input hoppers and output stackers selectable under program control
- Multiple code formats
- Provides MPE-C software driver plus hardware interface for use with HP 3000 Series computers
- U/L listed and CSA certified

The HP 30119A provides complete punched card I/O capability in a single peripheral device, fully buffered, on-line 80-column card reading, punching, and printing capabilities for use with HP 3000 Series computers. Off-line data recorder (keypunch) capability is optionally available. Reading rate is 200 cards per minute. Punch/print rate is 45 to 75 cards per minute, depending on the number of columns involved. A fast slew rate allows rapid skipping of columns and fields not requiring punching or printing.

Separately buffered and independently controlled read, punch, and print functions may be utilized in any combination. This feature allows operations such as verification of previously punched cards, printing of information different from that punched, or duplication of existing cards.

Primary and secondary input hoppers are provided with capacities of 600 and 400 cards respectively. Under program control, cards may be selected from either input hopper and directed to either 400-card output stacker following reading, punching, or printing. This feature eliminates the need for interfiling of blank cards in decks to be duplicated, provides for automatic separation of original and duplicate cards, and allows for sort/merge operations under control of users' programs.

Input and output punched code formats include column binary card image and packed binary as well as Hollerith.

The printer employs a modified ASCII 64-character set as standard. A 64-character Swedish/Finnish character set is optional.

OFF-LINE FEATURES (Optional Configurations 002, 017 and 022 only)

- Off-line data recorder capability
- Expanded operator control panel
- Moveable, light touch keyboard
- Memory buffering of keyed data
- Card format program storage
- Automatic card remake cycle during verification

Selection of Optional Configurations 002, 017, or 022 provides the user with the following powerful off-line capabilities:

Complete off-line card preparation and on-line input/output operations in a single unit, increasing the cost effectiveness of the subsystem.

A comprehensive control panel allows the operator to select ON-LINE (computer controlled) operation or OFF-LINE (operator controlled) functions. OFF-LINE functions include card format program preparation, program loading, punching, verifying, reproducing, or printing. Included are illuminated machine status, error, and column number indicators.

HEWLETT  PACKARD

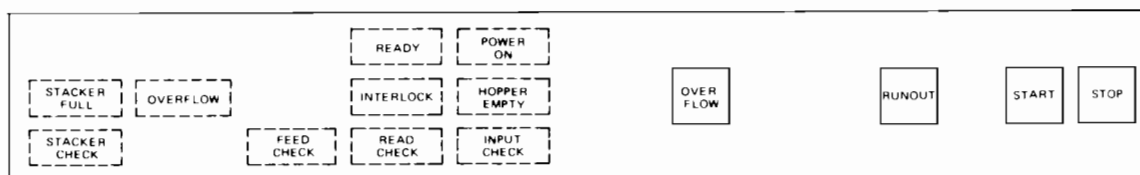
The 64 character keyboard is connected by a cable to the operator panel. This allows the operator to adjust its position for convenience and comfort. An audible feedback is provided for each successful keystroke. Color coding is used to differentiate data keys from function keys.

Keyed data is stored in an 80-character buffer memory prior to punching or printing. Backspace and Erase keys may be used to edit this data by character, field, or record.

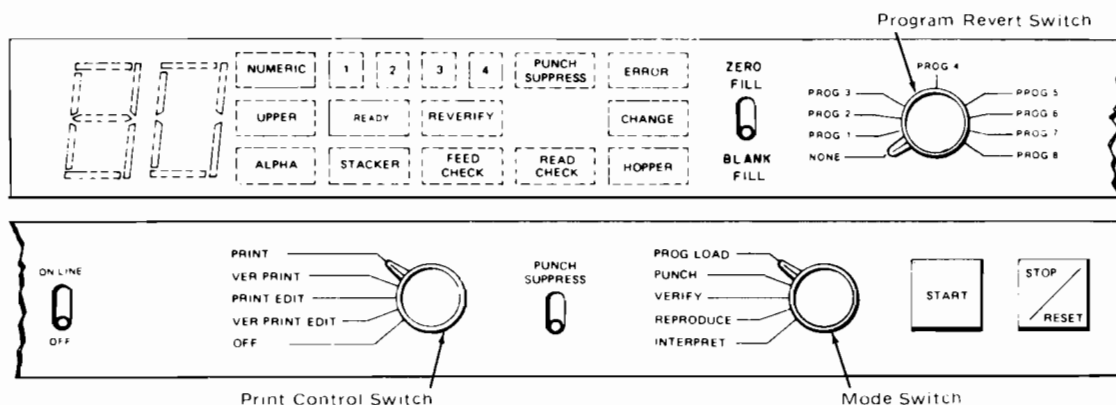
Control programs may be prepared by the operator. These programs define the format for various card operations by designating field boundaries, data type for each field (alpha or numeric) and columns to be skipped. Memory is provided in the unit for storage of up to 4 programs, each of which is keyboard selectable. Reversion to a designated program is automatic following temporary selection of any other program.

When an error has been corrected during verification, the errored card is automatically placed in the unused stacker and a blank card fed and punched with the corrected data.

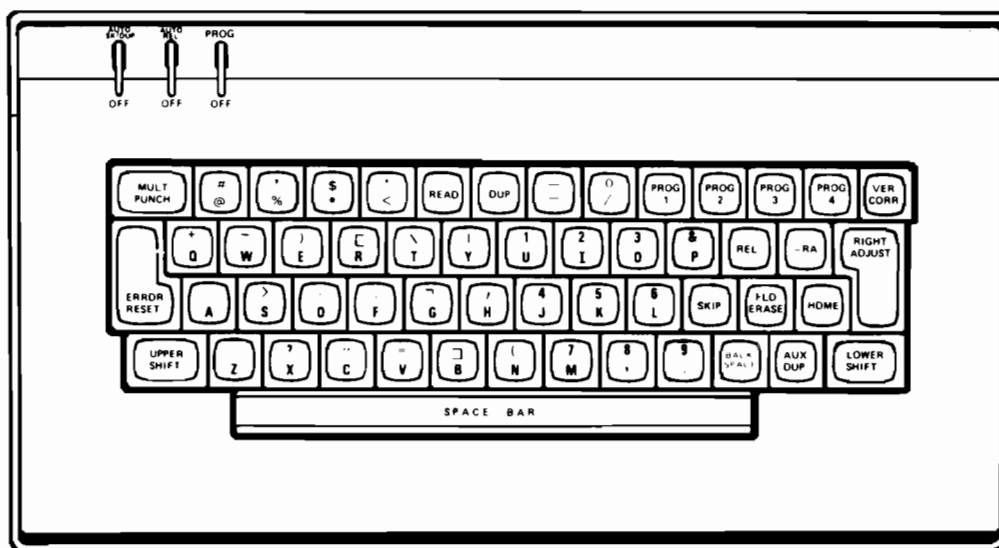
CONTROLS AND INDICATORS



Operator's Panel (included on Standard Unit and Optional Configurations 015 and 020)

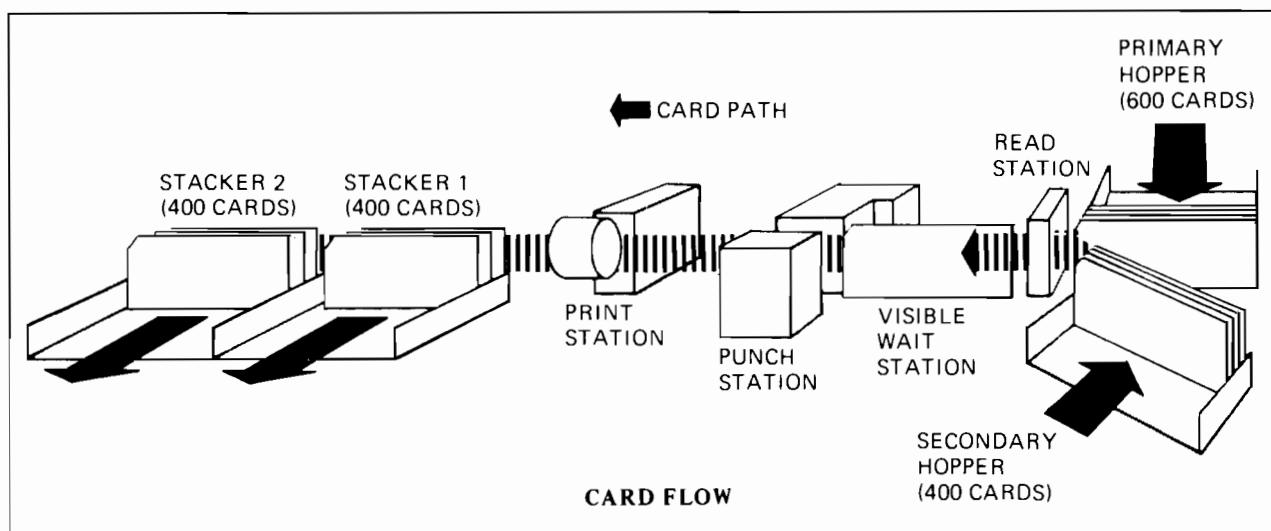


Operator's Panel (included on Optional Configurations 002, 017 and 022)



Keyboard (included on Optional Configurations 002 and 017)

Keyboard for Optional Configurations 002 and 017 shown above. Optional Configuration 022 (Swedish/Finnish) has characters Å, Ä, and Ö in position of ASCII comma, period, and backspace, respectively. Backspace key is relocated.



Specifications

SYSTEMS COMPATIBILITY

Operating System: MPE-C
Computers: HP 3000 Series

CODE COMPATIBILITY

Hollerith (ANSI X3.26-1970)
Column Binary Card Image
Packed Binary

CHARACTER SET (Printer)

Upper case modified ASCII standard
Upper case Swedish/Finnish optional

PERFORMANCE

Card Type: 80 column
Reading Rate: 200 cards per minute
Punching and/or Printing Rate: 45-75 cards per minute
depending on number of columns
Input Hopper Capacity, Primary: 600 cards
Secondary: 400 cards
Output Stacker Capacities, both: 400 cards

POWER REQUIREMENTS

2894A

60 Hz models: 115 VAC $\pm$ 10% single phase
60 Hz $\pm$ 1 Hz line frequency
50 Hz models: 220 VAC $\pm$ 10% single phase
50 Hz $\pm$ 1 Hz line frequency
Power consumption: 425 watts

ENVIRONMENTAL CONDITIONS

Temperature, Operating: +5°C to +43°C
(+41°F to +110°F)
Non-operating: -40°C to +60°C (-40°F to +140°F)
Relative Humidity,* Operating: 8% to 90% with maximum wet bulb of +29°C (+84°F)
Non-operating: 5% to 95% (may include condensation)
Heat Dissipation: 365 kilocalories/hr (1450 BTU/hour)

*This is a device specification. Card specifications must also be considered.

PHYSICAL CHARACTERISTICS

Height: 102 cm (40 inches)
Width: 107 cm (42 inches)
Depth: 69 cm (27 inches)
Weight: net: 113.5 kg (250 lb)
shipping: (approximate) 158.9 kg (350 lb.)

30119A OPTIONAL CONFIGURATIONS

FEATURES

	2894A Card Reader Punch Option Supplied	Provides On-Line Capabilities	Keyboard, Expanded Control & Off-Line Features	ASCII 64 Character Set	Swedish/ Finnish 64 Charac- ter Set	115 VAC 60 Hz Operation	220 VAC 50 Hz Operation
Standard	Standard	X		X		X	
002	002	X	X	X		X	
015	015	X		X			X
017	017	X	X	X			X
020	020	X			X		X
022	022	X	X		X		X

ORDERING INFORMATION

30119A Card Reader Punch Subsystem.
Includes HP 2894A Card Reader Punch; 30219A universal interface package, consisting of interface card and cable* — 15.24m (50 ft.); power cable — 2.44m (8 ft); necessary software for integration with the HP 3000; device diagnostic software.

*maximum length

OPERATING SUPPLIES PROVIDED

9320-1430: Box of 2000 80-column cards, 2 boxes supplied

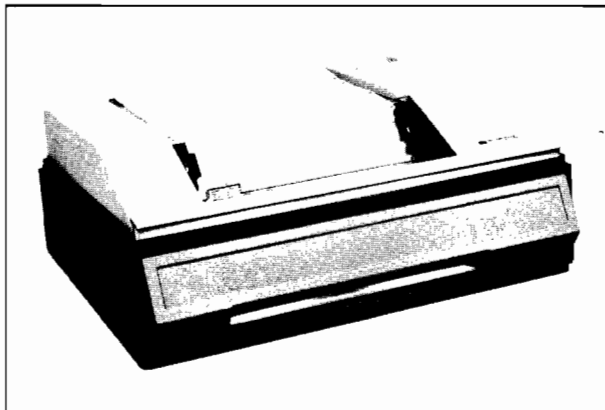
9260-0373: Ink Cartridge, 2 supplied

1535-3089 Card Removal Tool (supplied with HP 2894A)



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30118A Line Printer Subsystem



Features

- Prints 132 columns at 200 lines per minute
- Clear dot pattern characters on one original and five carbon copies
- 64-character ASCII set, standard
- Full 128-character set
- High-reliability comb printing mechanism
- Eight-channel vertical format unit
- Convenient paper loading
- Completely integrated with HP 3000 Computer Systems

The HP 30118A is a low cost line printer with comprehensive features that make it an excellent initial or expansion capability for the HP 3000 Computer System.

The standard device is a 64-character, dot pattern impact printer, producing an original and five clearly legible carbon copies. A unique comb printing mechanism with few moving parts produces a full 132-column line, one line at a time, at a rate of 200 lines-per-minute with high reliability. The printing rate is constant regardless of line length.

Also featured is an eight-level vertical format unit. The user may employ a standard format control tape supplied, or produce special format control tapes through the use of a tape format kit and the printer's built-in punch. The control tape is read by an eight-channel optical reader. The vertical format unit increases printing throughput of invoices, statements, reports and other forms.

An optional 128-character set includes lower case letters and 32 control codes. The full character set is completely transparent, printing a unique symbol for each ASCII code. The lower-case characters provide full text processing capabilities, thus making possible the generation of reports and specifications. The 32 control characters are printed with standard ANSI symbols, providing an excellent capability for analyzing terminal and data communication programs.

The HP 30118A is a flexible initial printer, ideal for applications that require moderate volumes of list output. As applications grow and require more throughput, an additional HP 30118A can be added. And as an auxiliary printer, it is especially valuable for text processing or program development.

Specifications

PRINTING SPEED

200 lines per minute (64 character set with a special symbol for control characters)
165 lines per minute (128 character set when printing lines containing lower case characters or control codes)

CHARACTERS PER LINE

132

CHARACTER STYLE

5 x 7 dot pattern
5 x 9 for lower case and control codes

CHARACTER SIZE

5 x 7: 1.6 mm x 2.5 mm (0.062 inches x 0.097 inches)
5 x 9: 1.6 mm x 3.2 mm (0.062 inches x 0.125 inches)

CHARACTER PITCH

Vertical: 6 or 8 lines per inch, switch selectable
Horizontal: 10 characters per inch, no overprint

VERTICAL FORMAT UNIT

8-channel optical tape reader
Integral punch and die for tape preparation

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CHARACTER SETS

Standard: 64 characters (conforms to ASCII). Lower case characters are printed in upper case.

@ – at, each	(– left parenthesis
A-Z – alphabet	) – right parenthesis
[– left bracket	* – asterisk
\ – left slash	+ – plus sign
] – right bracket	' – apostrophe
△ – caret	- – minus sign
– – lowest row of dots	• – period
– one space	/ – right slash
! – exclamation mark	0-9 – decimal digits
“ – double quote	: – colon
# – number	; – semicolon
\$ – dollar sign	< – less than
% – percentage	= – equal sign
& – ampersand	> – greater than
, – comma	? – question mark

Plus: (|) – a unique symbol whenever a control code is represented.

OPTIONAL

Full 128 characters (ASCII)

All the above characters plus:

a-z – alphabet (lower case)

| – vertical line

~ – tilde

{ – opening left brace

} – closing right brace

32 control codes (different ANSI symbols represent each control code, such as line feed, carriage return, bell, etc.)

POWER REQUIREMENTS

105-140V; 60 Hz $\pm$ 3 Hz

187-264V; 50 Hz $\pm$ 3 Hz

Standby: 10 VA

Non-printing: 500 VA

Printing: 800 VA

ENVIRONMENTAL CONDITIONS

Operating Temperature: +10° to +40°C (+50° to +105°F)

Storage Temperature: -17° to +62°C (0° to +145°F)

Relative Humidity: 50 to 90%, non-condensing

Heat Dissipation: 630 kilocalories/hr (2500 BTU/hr)

PAPER ADVANCE

8 cm/second (3.2 inches/second)

CONTROLS AND INDICATORS

ON – applies operating power

PRINT – places printer on-line

FORM FEED – advances paper to top of form

LINE FEED – advances paper one line

8LPI – selects either 6 or 8 line-per-inch spacing

PAPER OUT DETECTION – sounds audio alarm.

Form is automatically completed before printer is halted.

PHYSICAL CHARACTERISTICS

Cabinet Dimensions (including stand)

Height: 102 cm (40 inches)

Width: 71 cm (28 inches)

Depth: 58 cm (23 inches)

Weight: 118 kg (260 pounds)

Mounting: Printer may be removed from stand for table-top use

FORMS SPECIFICATIONS

Type: Continuous, fanfold, sprocket feed

Width: 10 to 37.7 cm (4 to 14-7/8 inches), including sprocket margins

Single Part: 15 to 25-pound paper stock

Multiple Part: 15-pound 1st part, 12-pound for each of 5 copies

Maximum Pack Thickness: 0.61 mm (0.024 inches)

Form Length:

Standard format tape, 6 lines per inch: 27.9 cm (11 inches)

Custom format tape, 6 lines per inch: to 40.2 cm (15-5/6 inches) in 4.2 mm (1/6 inch) increments

Custom format tape, 8 lines per inch: to 39.4 cm (15-1/2 inches) in 12.7 mm (1/2 inch) increments

ORDERING INFORMATION

30118A Line Printer Subsystem. Includes HP 2607A Line Printer, 200 lpm (64 character set, 132 columns)

30118A-001 Line Printer Subsystem. Includes HP 2607A Line Printer, 165-200 lpm (128 character set, 132 columns)

Subsystems include stand and form shelf, power cable – 2.3 m (7.5 ft.); controller/interface; signal cable* – specify either 15.2 or 30.5 m (50 or 100 ft.); necessary software for integration with the HP 3000; device diagnostic software; operating supplies including ribbon, HP standard format tape and vertical format tape kit; Operating and Reference manual.

OPERATING SUPPLIES AVAILABLE

- ¹ Vertical Format Unit Tape Kit. Permits user to punch format tape, 8LPI, 88 line page. Includes 25 self-adhesive splices, laminated tape – 6.1 m (20 ft.), alignment fixture. HP Part No. 1150-0897
- ¹ Pre-punched HP Standard Format Tape (66-line page, 6 lpi). HP Part No. 1535-2655
- ¹ Ribbon, black ink. HP Part No. 0282-0531
- Paper, fanfold, 15 lb. bond, green bar. HP Part No. 9320-1659

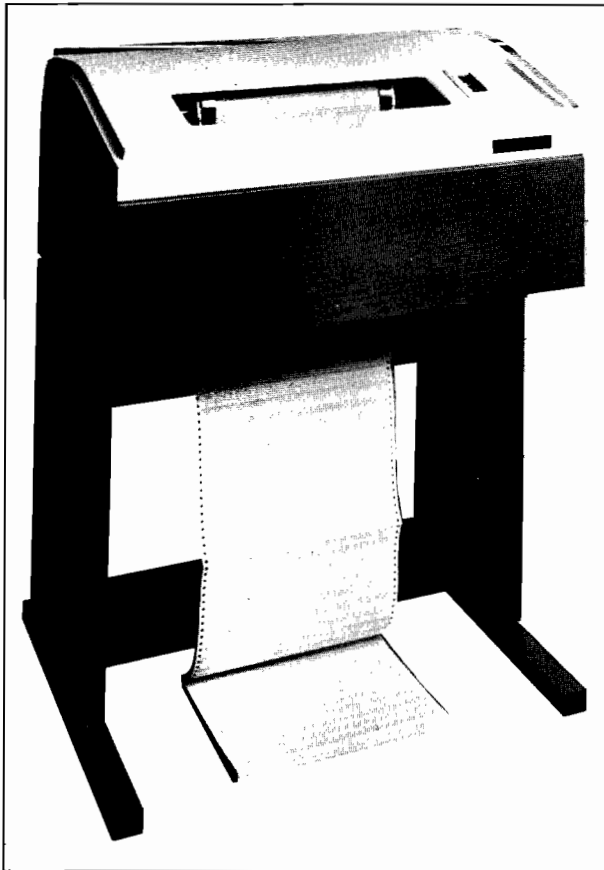
¹ Supplied with initial order

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



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30127A Line Printer Subsystem



Features

- Prints 136 columns of 64 characters at 300 lines per minute
- 12-channel vertical forms control
- Printer may be located up to 500 feet from CPU
- Clear, crisp printout
- Multiple copies — prints up to 6-part forms
- Both 64-character or 96-character ASCII available
- 6 or 8 lines per inch — operator selectable
- U/L listed

The HP 30127A Line Printer Subsystem represents an optimized combination of high print quality, moderate speed and low price in a drum printer subsystem. This subsystem is ideally suited to applications requiring a medium duty printer.

The unit attains a print rate of 300 lines per minute when printing a full 64-character set in a 136-column format. Print rate is 240 lines per minute for 96-character set configurations.

A 12-channel Vertical Format Unit allows convenient and efficient printing in predetermined formats such as business forms. The VFU uses industry standard control tapes. Under program control the VFU may be commanded to slew to the next hole in a given channel of the tape or to slew an absolute number of lines from 0 to 15.

A switch allows the operator to choose 6 or 8 lines per inch (60 or 80 lines/page respectively). A matching VFU tape will synchronize the forms to the VFU.

An ASCII 64-character set is standard with 96-character ASCII optional.

Six part forms are easily handled by the HP 30127A. Forms alignment is simplified by horizontal and vertical paper alignment guides. Fine vertical paper alignment adjustments can be made while printing. A paper receptacle is provided.

Differential line drivers allow the printer to be located up to 500 feet from the computer for flexibility of installation design.

Paper and ribbon loading are facilitated by a swing hinge which allows the drum-gate to be opened 90 degrees.

All EDP category safety requirements are met for equipment listing by Underwriters Laboratories.

HEWLETT  PACKARD

Specifications

CHARACTER DRUM

Characters per Line: 136

Character Type: Open Gothic

Symbol Size (Typical): 2.4 mm (0.095 inch) high
1.65 mm (0.064 inch) wide

Character Code: ASCII

Standard 64 Character Set:

@ - at, each	# - number	- - minus sign
A-Z - alphabet	\$ - dollar sign	. - period
[- left bracket	% - percentage	/ - right slash
\ - left slash	& - ampersand	0-9 - decimal digits
] - right bracket	, - comma	: - colon
^ - caret	(- left parenthesis	; - semi-colon
_ - underscore	) - right parenthesis	< - less than
(BLANK) - one space	* - asterisk	= - equal sign
! - exclamation mark	+ - plus sign	> - greater than
" - double quote	' - apostrophe	? - question mark

Optional 96 Character Set Adds the Following:

` - grave accent	- vertical line
a-z - alphabet	~ - tilde
{ - left brace	- space (delete)
} - right brace	

PAPER FEED

One set of pin tractors above drum, friction paper tensioner below drum

Line Advance: 50 milliseconds

Slew Rate: 50.8 cm (20 inches) per second

PAPER DIMENSIONS

Standard fanfold, edge punched paper 12.4 cm (4.875 inches) to 42.6 cm (16.75 inches) wide

PAPER TYPE

Single copy, 15 lb. bond minimum weight

Multi-copy up to 6 parts, 12 lb. bond with single shot carbon

VERTICAL FORMAT UNIT

Number of Channels: 12

Addressing: Slew to next hole in channel "n" or slew 0 to 15 lines

POWER REQUIREMENTS

2613A Printer

60 Hz Models: 115V AC $\pm$ 10% Single Phase
60 Hz $\pm$ 2% Line Frequency

50 Hz Models: 220 or 240V AC (jumper selectable)
 $\pm$ 10% Single Phase
50 Hz $\pm$ 2% Line Frequency

ENVIRONMENTAL CONDITIONS

Temperature

Operating: +10°C to +37°C (+50°F to 99°F)

Storage: -18°C to +66°C (0°F to 151°F)

Relative Humidity

Operating: 30% to 90% (non-condensing)

Storage: 5% to 95% (non-condensing)

Heat Dissipation: 454 kilocalories/hr (1800 BTU/hr)
nominal

PHYSICAL CHARACTERISTICS

Height: 114.5 cm (45 inches)

Width: 83.8 cm (33 inches)

Depth: 55.9 cm (22 inches)

Weight

Net: 154.2 kg (340 lb.)

Shipping: 165.6 kg (365 lb.)

PRINTING SPEEDS

Char. Set	Drum Speed	136 Char. Line Per Minute
64	1200	300
96	800	240

30127A CONFIGURATIONS

Standard - 64 character, 300 lpm, 115VAC/60 Hz

001 - 96 character, 240 lpm, 115VAC/60 Hz

ORDERING INFORMATION

30127A Line Printer Subsystem. Includes HP 2613A Line Printer, 300 lpm (64 characters, 136 columns)

30127A-001 Line Printer Subsystem. Includes HP 2613A Line Printer, 240 lpm (96 characters, 136 columns)

Subsystems include power cable - 3.66 m (12 ft.); controller/interface; signal cable* - 7.62 m (25 ft); necessary software for integration with the HP 3000; VFU tapes (6 and 8 lines/inch); VFU diagnostics software (6 and 8 lines/inch); printer ribbon; operating and service manual.

* 152.4 m (500 ft.) maximum signal cable can be specified.

OPERATING SUPPLIES AVAILABLE

9282-0545 Printer Ribbon

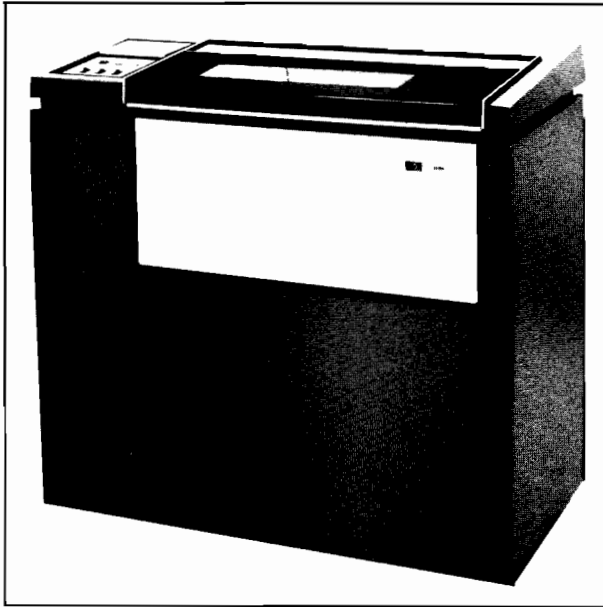
9320-1659 Paper stock, single part 37.8 x 27.9 cm (14.87 x 11 inches) green bar, 3000 pages per box.

Contact your HP Sales Office for other available stock. Sufficient paper is supplied with the printer for installation testing. User should order operating quantities in advance of installation.



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30128A High Speed Line Printer Subsystem



Features

- Prints 132 columns at rates to 1800 lines per minute
- Dual speed drum for high quality printout
- 12-channel vertical forms control
- Simplified control panel and front paper loading for operator convenience
- 6 or 8 lines per inch — operator selectable
- Both 64-character and 96-character ASCII available
- Multiple copies — prints up to 6-part forms
- Electronic static eliminator for improved forms stacking

The HP 30128A provides high speed, high quality printed output, and quiet operation for HP 3000 series systems. This printer is ideally suited for applications requiring high duty cycle or continuous operation.

The subsystem with a 64-character set prints at 1250 lines per minute. When printing a subset of 36 consecutive characters, 1800 lines per minute is achieved. Printing rate is independent of line length.

Two operator selectable drum speeds are incorporated. The higher rpm provides maximum printing speeds while the lower rpm provides enhanced print quality. Data is stored in a full line buffer prior to printing.

A 12-channel Vertical Format Unit uses industry standard control tapes. Under program control, the VFU may be commanded to slew to the next hole in a given channel of the tape or to slew an absolute number of lines from 1 to 15.

A single adjustment allows the operator to choose 6 or 8 lines per inch. A matching VFU tape will synchronize the forms to the VFU.

An ASCII 64-character set is standard and an ASCII 96-character set is optional.

Six-part forms are easily handled by the printer. Forms alignment is simplified by horizontal and vertical paper alignment guides. Fine vertical paper alignment adjustments can be made while printing.

Printer controls have been minimized and are easy to read. A swing hinge allows the drum-gate to be opened 90 degrees to facilitate both paper and ribbon loading.

An electronic static eliminator is provided to counteract charge build-up on forms.

Specifications

CHARACTER DRUM

Characters per Line: 132

Character Type: Open Gothic

Symbol Size (Typical): 2.4 mm (0.095 inch) high
1.65 mm (0.065 inch) wide

HEWLETT  PACKARD

Character Code: ASCII
Standard 64 Character Set:

@ - at, each	# - number	- - minus sign
A-Z - alphabet	\$ - dollar sign	. - period
[- left bracket	% - percentage	/ - right slash
\ - left slash	& - ampersand	0-9 - decimal digits
] - right bracket	, - comma	: - colon
^ - caret	(- left parenthesis	; - semi-colon
_ - underscore	) - right parenthesis	< - less than
(BLANK) - one space	* - asterisk	= - equal sign
! - exclamation mark	+ - plus sign	> - greater than
" - double quote	' - apostrophe	? - question mark

Optional 96 Character Set Adds the Following:

` - grave accent	- vertical line
a-z - alphabet	~ - tilde
{ - left brace	- space (delete)
} - right brace	

PAPER FEED

Two sets of pin tractors
 Line Advance: 14 milliseconds (maximum)
 Slew Speed: 89 cm (35 inches) per second

PAPER DIMENSIONS

Standard fanfold, edge punched paper 10.2 cm to 48.3 cm (4 to 19 inches wide)

PAPER TYPE

Single copy, 15 lb. bond minimum weight.
 Multi-copy up to 6 parts, 12 lb. bond with single-shot carbon.

VERTICAL FORMAT UNIT

Number of Channels: 12
 Addressing: Slew to next hole in channel "n" or slew 0 to 15 lines

POWER REQUIREMENTS

2618A Printer
 60 Hz Models: 115VAC $\pm$ 10% single phase
 60 Hz $\pm$ 2% line frequency
 50 Hz Models: 230 VAC $\pm$ 10% single phase
 50 Hz $\pm$ 2% line frequency
 Power Consumption: 1.95 kW maximum

ENVIRONMENTAL CONDITIONS

Temperature
 Operating: +10°C to +40°C (+50°F to 104°F)
 Storage: -17°C to +65°C (0°F to 149°F)
 Relative Humidity
 Operating: 50% to 90% (non-condensing)
 Storage: 5% to 95% (condensing)

Heat Dissipation

Printing: 1663 kilocalories/hr (6600 BTU/hour)
 Standby: 756 kilocalories/hr (3000 BTU/hour)

PHYSICAL CHARACTERISTICS

Height: 116.8 cm (46 inches)
 Width: 123.2 cm (48.5 inches)
 Depth: 92.7 cm (36.5 inches)
 Weight: Net: 362.9 kg (800 lb)
 Shipping: 409 kg (900 lb)

PRINTING SPEEDS

Characters On Drum	Drum Speed Switch Position	#Consecutive Characters Printed	Printer Speed Lines/Minute 132 Columns
64	1800	1-36/37-64	1800/1250
64	1200	1-46/47-64	1200/925
96	1200	1-67/68-96	1200/925
96	800	1-76/77-96	800/675

30128A CONFIGURATIONS

Standard — 64 char., 1250 lpm, 115VAC/60 Hz
 001 — 96 char., 925 lpm, 115VAC/60 Hz

ORDERING INFORMATION

30128A Line Printer Subsystem. Includes HP 2618A Line Printer 1250 lpm (64 characters, 132 columns).

30128A-001 Line Printer Subsystem. Includes HP 2618A Line Printer 925 lpm (96 characters, 132 columns).

Subsystems include power cable — 3.66 m (12 ft); controller/interface; signal cable* — 7.62 m (25 ft.); necessary software for integration with the HP 3000; device diagnostic software; printer ribbon; VFU tape (6 lines/inch, 60 lines/page); operating and reference manual.

*152.4 m (500 ft) maximum signal cable can be specified.

OPERATING SUPPLIES AVAILABLE

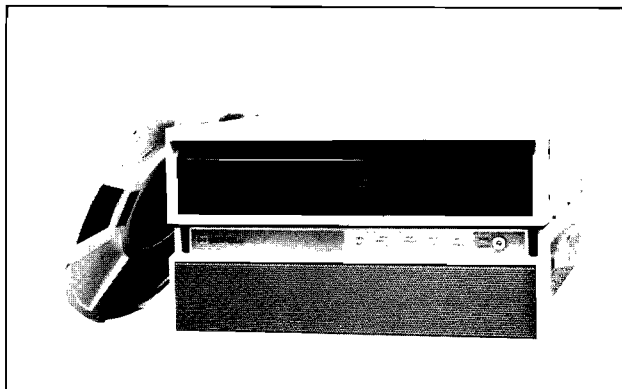
9282-0543: Printer Ribbon
 9320-1659: Paper Stack, single part, 37.78 x 27.94 cm (14.87 x 11 inches) green bar, 3000 pages per box.

Contact your HP Sales Office for other available stock. Sufficient paper is supplied with the printer for installation testing. User should order operating quantities in advance of installation.



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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 ($\frac{1}{2}$ 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

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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: 8 to 80%, non-condensing

Vibration: 10 to 50 Hz at 0.25 mm (0.01 inch) peak-to-peak excursion

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

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

PHYSICAL CHARACTERISTICS

Disc Drive

Height: 26.7 cm (10½ inches)

Width: 48.3 cm (19 inches), 42.5 cm (16¾ inches) behind rack mounting ears

Depth: 65.1 cm (25-5/8 inches), (58.3 cm (22-15/16 inches) behind rack mounting ears)

Weight: 53.1 kg (117 lbs.)

Shipping Weight: 63.5 kg (140 lbs.)

Mounting: Fits in HP 3000 cabinet

Power Supply

Height: 17.8 cm (7 inches)

Width: 42.5 cm (16¾ inches)

Depth: 50.2 cm (19¾ inches)

Weight: 25 kg (55 lbs.)

Shipping Weight: 29.5 kg (65 lbs.)

Mounting: Fits in HP 3000 cabinet

ORDERING INFORMATION

30110A: Cartridge Disc Subsystem, 4.9 kbytes. includes the HP 7900A cartridge disc drive; power supply; power cable—4.57 m (15 ft); signal cable—15 ft; controller/interface; disc cartridge.

30110A-010: Additional drive on same controller, 4.9 M bytes. This option includes the HP 7900A disc drive; power supply; power cable—4.57 m (15 ft.); signal cable—4.57 m; 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.

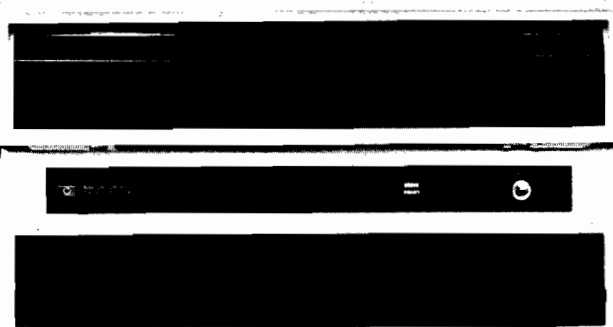
OPERATING SUPPLIES AVAILABLE

30334A — Disc Cartridge



Sales and service from 172 offices in 65 countries.
1501 Page Mill Road, Palo Alto, California 94304

30129A Cartridge Disc Subsystem



Features

- Software selectable dual application:
14.75 million byte general purpose storage
4.42 million bytes for high speed system disc
- Expandable to 120 million bytes (8 discs can be connected to one controller)
- Fastest access moving-head disc
- 937.5 Kbyte/sec transfer rate
- Compact size permits standard rack-mounting

The HP 30129A Cartridge Disc Subsystem offers a new standard in high performance moving-head discs for both system swapping and mass data storage.

CAPACITY

The unit's capacity can be selected through software: 4.42 Mbytes (120 cylinders) for use as a high-speed system disc or 14.75 Mbytes (400 cylinders) for general use. As many as eight disc drives may be used with a single controller.

The unit includes a front-loading cartridge with two data surfaces and a fixed disc with one data surface and one servo surface. MFM (Modified Frequency Modulation) recording is used with 4680 bpi and a track density of 192 tpi.

PERFORMANCE

A voice coil head positioner offers the fastest seek-times in the industry. Times, including head settling time: track-to-track is 5 ms (avg.); average random is 25 ms; maximum stroke is 45 ms. The 3600 RPM spindle speed yields an average rotational delay of 8.3 ms, which coupled with high bit density results in a data rate of 937.5 Kbyte/sec and thus is used in conjunction with the HP 30030A High Speed Selector Channel. This means the system can transfer 12,288 bytes of information in 16.7 ms, which is fixed-head disc performance.

Specifications

CAPACITY (Software Selectable)

	Data Bytes for 14.75 Mb System	Data Bytes for 4.42 Mb System
Sector	256	256
Track	12,288	12,288
Surface	4,915,200	1,474,560
Cartridge	9,830,400	2,949,120
Drive	14,745,600	4,423,680

Recording Surfaces: 4
Discs: 2

RECORDING (Modified Frequency Modulation)

4680 bits/inch on inner track, 192 tracks/inch;
411 tracks/surface (406 guaranteed usable)

ACTUATOR

Voice coil actuator with track follower servo and velocity feedback.

DATA ACCESS

Rotational Speed: 3600 RPM
Seek Time: Track-to-track 5 ms (avg)
Average Random 25 ms
Maximum Stroke 45 ms (max.)
Average Rotational Delay: 8.3 ms
Data Transfer Rate
8-bit bytes/second: 937.5 Kbyte/sec
Bits/second: 7.5 million

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INTERCHANGEABILITY

The 30129A allows any disc written on any 30129A within its operating specifications to be read on any other 30129A unit operating within that range.

POWER REQUIREMENTS

100, 120, 200, 220, 240V, all +5%, -10%
Single phase, 47 to 66 Hz
Power supply integrated into drive

ENVIRONMENTAL CONDITIONS

Operating Temperature: +10° to +40°C (50° to 140°F)
Non-Operating: -40°C to +65°C (-40°F to +149°F)
Relative Humidity: 8% to 80%, non-condensing
Storage Relative Humidity: 5% to 95%, non-condensing
Altitude:
Operating - Sea Level to 10,000 ft.
Non-operating - 1000 ft. below Sea Level to 15,000 ft.
Tilt: ±30° about either horizontal axis.
Heat Dissipation: 430 kilocalories/hr (1707 BTU/hr)
Vibration: Meets HP Class C vibration specs.
Test is 15 min. in each of 3 mutually perpendicular axes
Vibration input of 0.010 inches form 10 to 55 Hz results in amplitude of 1.54 g's at 55 Hz. Drive will operate with continuous vibration level of 0.15 g's.
Shock: Operating unit will withstand a shock of 2 g's at 11 milliseconds, one-half sine.

PHYSICAL CHARACTERISTICS

Panel Height: 26.52 cm (10.44 in.)
Width: 48.03 cm (18.91 in.)
44.15 cm (17.38 in.) behind panel
Depth: 71.12 cm (28.00 in.)
68.10 cm (26.81 in.) behind panel
Weight: 73.5 kg. (162 lbs.)

ORDERING INFORMATION

30129A: Cartridge Disc Subsystem, 14.75 million bytes includes the HP 7905A cartridge disc driver (power supply included); power cable - 1.53m (5 ft); two signal cables - 3.66 m (12 ft); controller/interface; disc cartridge.

30329A: Additional drive on same controller, 14.75 Mbytes. This option includes the HP 7905A disc drive (power supply included); power cable - 1.53 m (5 ft); two signal cables - 3.66 m (12 ft) - up to 8 drives may be included on one interface controller.

Subsystems include necessary hardware and software for integration with the HP 3000 and the device diagnostic software. A selector channel (HP 30030A) is required. One controller and one Selector Channel may be used per system.



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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

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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) 882 kilocalories/hr (3500 BTU/hr)

PHYSICAL CHARACTERISTICS

Height: 101.6 cm (40 inches)

Width: 76.2 cm (30 inches)

Depth: 61 cm (24 inches)

Device Weight: 187 kg (410 lbs)

Shipping Weight: 231 kg (510 lbs)

Mounting: Casters and Levelers

Required Clearance: 45 cm (18 inches) front and rear

ORDERING INFORMATION

30102A Disc Subsystem. Includes HP 2888A Disc Subsystem with controller/interface; power control unit; signal cable* — 7.62 m (25 ft); junction panel for 8 drives; disc pack.

30102A-010: Additional Disc Subsystem (disc on same controller); signal cable — 7.62 m (25 ft.), disc pack.

OPERATING SUPPLIES AVAILABLE

30333A: Additional Disc Pack

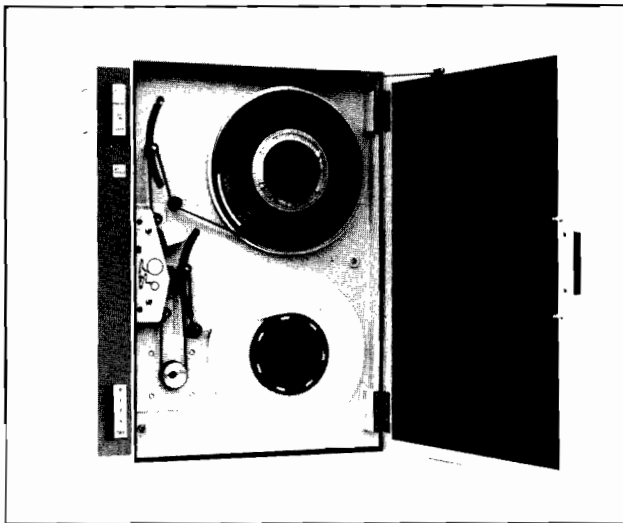
Note: Power supply cable is not provided. Local codes determine requirement.

*Distance to first drive 15.24 m (50 ft) maximum. Total accumulated distance 30.48 m (100 ft) maximum. Distance from drive to drive depends on total number of drives connected to a single controller.



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30115A 30115A-100 Digital Magnetic Tape Subsystems



Features

- Fast data transfer – up to 36Kbytes/sec (NRZI) – up to 72Kbytes/sec (phase encoded)
- 9-track configuration
- 315 bits/cm (800 cpi), NRZI electronics
- 630 bits/cm (1600 cpi), phase encoded data electronics
- 114 cm/s (45 ips) read/write, 406 cm/s (160 ips) rewind/fast forward
- Dynamic braking
- Up to 26.7 cm (10½ 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. Four 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

114 cm/s (45 ips)

DENSITY

315 bits/cm (800 cpi), NRZI electronics

630 bits/cm (1600 cpi), 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 26.7 cm (10½ inches)

TAPE (Computer Grade)

Width: 12.7 mm (0.5 inches)

Thickness: 0.038 mm (1.5 mils)

REWIND SPEED

406 cm/s (160 ips)

START/STOP TIMES

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

EOT and BOT REFLECTIVE STRIP DETECTION

Photoelectric, IBM Compatible

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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) 350 kilocalories/hr
1400 BTU/hr

PHYSICAL CHARACTERISTICS

Height: 61 cm (24 inches)

Width: 48.3 cm (19 inches)

Depth: 30.5 cm (12 inches) from mounting surface

Overall Depth: 40.7 cm (16 inches)

Mounting: Fits in HP 3000 cabinet

Device Weight: 63.5 kg (140 lbs) maximum

Shipping Weight: 86.2 kg (190 lbs)

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; 731 m (2400 ft) reel of tape; and necessary connecting cables* (4 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; 731 m (2400 ft) reel of tape; and necessary connecting cables* (4 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; 731 m (2400 ft) reel of tape

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

Note: One drive must be a master

OPERATING SUPPLIES AVAILABLE

Certified Magnetic Tape for Above Drives

9162-0025: 731 m (2400 foot) roll of 0.5 inch, 800 cpi, 3200 frpi (PE), certified blank tape.

9162-0026: 365 m (1200 foot) roll of 0.5 inch, 800 cpi, 3200 frpi (PE), certified blank tape.

*Interconnecting cables:

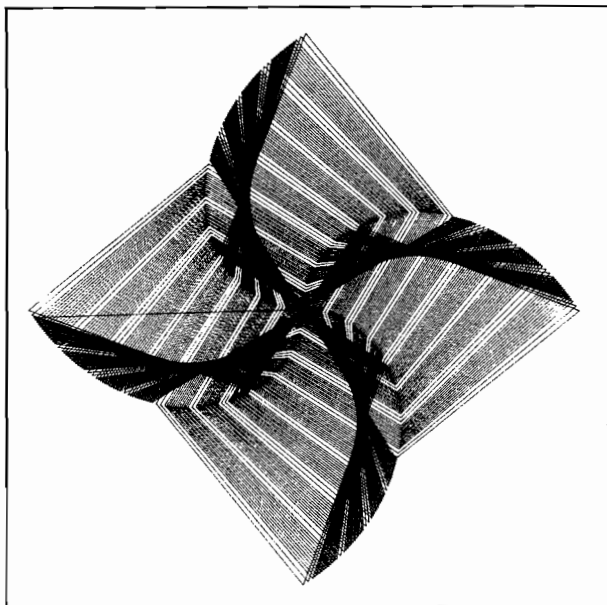
Power cable 2.28 m (7.5 ft)

Signal cable: 6.1 m (20 ft) to first drive and 6.1 m between drives



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30126A CalComp Plotter Interface Subsystem



Features

- For CalComp Series 500, 600 and 700* Plotters
- Zip mode format supported
- 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, 600 or 700* Series Plotter. Zip mode format is compatible with the software supplied. 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.

*Models 745 and 748 cannot be interfaced

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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ORDERING INFORMATION

HP 30126A CalComp Plotter Interface Subsystem includes interface board; signal cable — 7.62m (25 ft.),* for connection to 500 Series CalComp Plotter; test connector; diagnostic software.

**Maximum length signal cable can be special ordered:
15.24m (50 ft.).*

HP 30126A-001 CalComp Plotter Interface Subsystem. Same as above except signal cable supplied for connecting to CalComp 600 Series and 700 Series Plotters — 15.24m (50 ft.).

Note: Signal cable connectors for 500 Series plotters are not interchangeable with cable connectors for 600 and 700 Series Plotters.

MANUALS REQUIRED

Refer to CalComp manuals for plotter operation. HP 3000 Resident Routines are described in HP 3000 Compiler Library Manual (Chapter 3), publication number 03000-90009 (supplied with HP 3000CX Systems).



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HP 3000CX User Training Services

Hewlett-Packard's User Training Services are an expanding curriculum of courses and seminars developed to meet the needs of a diverse community of users. Courses are designed to include both classroom instruction and a generous amount of practical, hands-on computer system experience. Some courses have pre-requisites; students are encouraged to attend courses in the recommended sequence to gain the most benefit from their training.

Training courses are presented by professional instructors with strong backgrounds in computer applications. Scheduled courses for North America are conducted at large, well equipped Training Centers in Cupertino, California and Rockville, Maryland. By special arrangement, training at customer sites is also available.

Training courses are individually priced products. Those courses of instruction specific to the 3000CX systems are outlined below; for detailed course descriptions and prices, contact your local HP Sales Office.

Features

- Small class sizes for personalized instruction
- Extensive hands-on lab experience
- Instruction directed to problem solution rather than system internals

HP 22962A 3000CX USER TRAINING (Commercial/Business Orientation)

The student will learn to use the major features of the 3000CX's interactive terminals with special emphasis on solving problems commonly encountered in business applications. Students write and execute COBOL and/or RPG programs, deal with programming and file handling error conditions, and learn to use the command set of the operating system and the utilities in a variety of real-life situations.

Length: 5 days. Hands-on lab time: approximately 50%
Pre-requisites: Knowledge of a relevant programming language, preferably COBOL. Some previous computer experience is presumed.

HP 22963A 3000CX USER TRAINING (Scientific/Engineering Orientation)

The course is designed to teach the use of the tools available on the 3000CX system in the solution of computational problems. Students create, execute and debug programs in FORTRAN and/or BASIC, and learn to use the

MPE command set, the file system and the utilities. The focus of the course is on problem solving as it relates to typical engineering applications.

Length: 5 days. Hands-on lab time: approximately 50%
Pre-requisites: Knowledge of a relevant programming language, preferably FORTRAN. Some previous computer experience is presumed.

HP 22964A 3000CX SYSTEM MANAGEMENT TRAINING

The course will equip the student to assume responsibility for establishing how the resources of the system are to be used. The student will learn about considerations affecting operating efficiency; how to design, implement and modify the user/account structure; how to employ MPE commands to control system-wide activity. The student is taught the operation of the system and how to maintain system usage records.

Length: 3 days. Hands-on lab time: approximately 30%
Pre-requisites: Attendance at one of the User Training courses. A clear understanding of the user's organization to be served by the 3000CX is strongly recommended.

HP 22956A IMAGE/3000 DATA BASE MANAGEMENT TRAINING

This course provides the student with a working knowledge of data base concepts, IMAGE/3000 and QUERY/3000. The student will learn how to define a data base using the Data Base Definition Language (DBDL), how to create and maintain such a data base using the IMAGE utilities, and how to access the data base through programmatic calls and QUERY/3000. Data base privacy and security are also included. Case studies of existing IMAGE/3000 data bases will be discussed stressing design considerations and performance tradeoffs.

Length: 5 days. Hands-on lab time: approximately 40%
Pre-requisites: Attendance at one of the User Training courses and programming experience in COBOL, FORTRAN or SPL.



ACCOMMODATIONS

Students provide their own transportation, meals, and lodging. The Training Registrar will be pleased to assist in securing motel reservations at the time of registration.

CANCELLATIONS

In the event a registrant cannot attend a particular class your prompt notification is appreciated.

SELF STUDY COURSES

HP 3000 COBOL and HP 3000 BASIC courses are available as self study packages utilizing modularized audio cassettes, student workbooks, and language reference manuals. Each course is designed to acquaint the student with the essentials of the language. By completing lab problems in each module the student gains practical "hands-on" experience.

HP 3000 COBOL

This course, designed for the beginning and intermediate programmer, consists of the following modules:

1. Overview of COBOL
2. Language elements
3. Identification, environment and data divisions
4. Procedure division
5. Sorting and I/O procedure options
6. Interprogram communication
7. Library features
8. Table handling
9. Random access
10. Segmentation

Pre-requisites

The student should be familiar with basic data processing concepts and terminology, including an understanding of program logic.

Lab Work

This course requires access to an HP 3000 system with a card reader, line printer, and an HP 3000 COBOL compiler.

Course Time

Average 30 hours.

Ordering Information

HP 3000 COBOL SELF STUDY COURSE

Consists of: 10 cassette tapes, 2 card decks, student workbook, HP 3000 COBOL reference manual, coding pad, and complete Advisors Guide.

HP 3000 COBOL STUDENT MATERIALS (1 per additional student)

Consists of: Student workbook, destructible card deck, coding pad.

HP 3000 COBOL ADVISORS GUIDE (additional set)

Consists of: Advisors guide, tests, answer sheets, and answer key.

HP 3000 BASIC

Designed as an in-depth study of BASIC, the modules are as follows:

- 0 Introduction and Library Commands
- 1 Essentials of BASIC
- 2 Strings – data structure
- 3 Files – structure and direct access
- 4 Segmentation

Pre-requisites

The student should be familiar with HP 3000 log on procedures and know how to use the MPE Command Interpreter and File System.

Lab Work

The course requires student access to an HP 3000 system, terminal, and HP 3000/BASIC Interpreter.

Course Time

25-30 hours

Ordering Information

HP 3000 BASIC SELF STUDY COURSE

Consists of: 5 cassette tapes, student workbook, HP 3000 Basic Reference manual and MPE manual.

WESTERN TRAINING CENTER

Hewlett-Packard Company
11000 Wolfe Road
Cupertino, California 95014
(408) 257-7000

EASTERN TRAINING CENTER

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For locations outside the U.S.A., please contact your local Hewlett-Packard Representative.



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The Mini DataCenter Idea

Whatever your preconceptions about minicomputer systems, think again. Hewlett-Packard did. And developed a simple, new architecture and operating system that eliminates the redundancy and wasted memory inherent in traditional minis that echo big-computer design philosophy.

NO OTHER MINI CAN OFFER THE PERFORMANCE OF A MINI DATACENTER

Code and data are handled in separate modules. By dividing program elements into those that will change and those that do not, programs can be shared among all users while each maintains his own unique data space. As a result, no memory is wasted in pointless repetition of common code.

Virtual memory is provided by a user-determined form of code segmentation. This approach permits a program to be larger than the main memory while avoiding wasteful thrashing between disc and memory that often results when segmentation is totally machine determined. As a further aid to efficiency, our 3000CX Mini DataCenters monitor the frequency of use of code segments, automatically eliminating swap out of segments that are in frequent use.

A hardware-implemented variable stack design sharply reduces the amount of memory required to execute the 3000CX Mini DataCenter programs. Since the data stack expands and contracts to meet the need of the program in use, no data area is wasted by unused subroutines. The data stack also provides variable-sized arrays, re-entrant code, recursive programming, and an extremely efficient method of parameter passing to subroutines.

PERFORMANCE IS ENHANCED BY A STRONG RELATION BETWEEN ARCHITECTURE AND OTHER SYSTEM FEATURES

A 32 bit LSI ROM forms the basis of the microprocessor at the heart of our 3000CX Mini DataCenters. This

microprocessor implements 182 instructions, has a cycle time of 176 nanoseconds, utilizing overlapped microinstructions to provide both extreme speed and power — as many as 5.27 million operations per second.

Add to this interleaved memory modules for faster access, CPU and I/O processor designed for greater throughput and bus-oriented architecture for modularity, and the potential of 3000CX Mini DataCenters for your application begins to be evident.

Additionally, program size is kept small because of the very efficient code generation resulting from the system's strong instruction set, specifically designed to implement high-level languages. The subroutine call process is unusually fast because the microcode — not the user — shoulders the burden of determining whether code segments are in disc or memory. Program design is simplified because many features of the instruction set are reflected in the syntax of the programming languages.

A 3000CX MINI DATACENTER THAT PROVIDES A RANGE OF OPERATING FEATURES ON A PAR WITH LARGE-SCALE DATA SYSTEMS

At a fraction of the cost, it extends the capabilities of a major data system outward to users who want the features and convenience of a large system, but whose problems don't require the full brute force capabilities of a costly major system. In the corporate environment, it permits EDP management to shift time-consuming, lower-priority management demands out of the central system's work flow with measurable savings in time and cost. Able to communicate with all other HP computers and with major IBM systems, while performing other batch and interactive tasks, a 3000CX Mini DataCenter can form the basis of powerful distributed systems that enhance the reach, versatility and value of the corporate-level effort.



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