Hewlett-Packard HP 300

MANAGEMENT SUMMARY

The HP 300 Computer System was introduced on October 3, 1978 along with Hewlett-Packard's HP 3000 Series 33 (Report M11-472-601). These were the first commercial computers based on silicon-on-sapphire (SOS) LSI semiconductor technology. The SOS chips result in high-performance computers of smaller size and lower cost that require less power than computers using more traditional technologies.

The HP 300 is a general-purpose computer that, in HP's words, "takes no more space than a free-standing data terminal." The basic HP 300 system incorporates a unique integrated display system, 256K bytes of error-correcting MOS main memory, a one-million-byte flexible disk drive, a 12-million-byte fixed disk, and the operating software and utilities. The HP 300 can support up to 16 terminals, can be expanded to include up to 1 million bytes of main memory within the basic inclosure, and can have up to 490 million bytes of external disk storage.

The HP 300 system is controlled from the Integrated Display System (IDS) that forms the upper part of the system unit.

The HP 300 IDS is used to schedule, monitor, and control the concurrent activities of the Amigo/300 operating system, as well as to simplify the process of program development and testing. The IDS screen can be split into multiple "windows" (up to eight), each of which can be attached to a data file and scrolled both vertically and horizontally to make entries or changes. Each window is independently controlled. One window is used to dynamically label a column of soft keys at the right of ➢

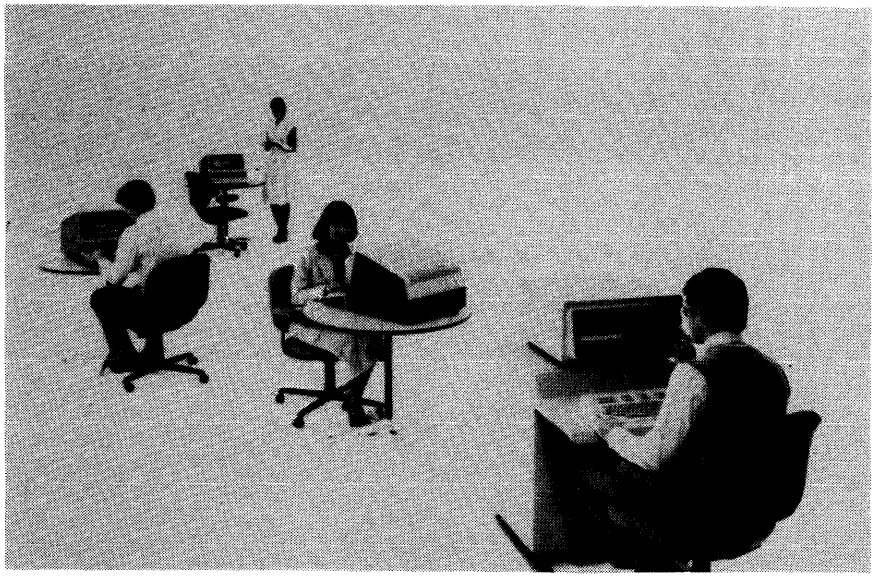
One of the first silicon-on-sapphire (SOS) systems from Hewlett-Packard, the HP 300 supports up to 1024K bytes of main memory, 240 million bytes of disk storage, and 16 terminals. A unique Integrated Display System (IDS) provides a screen that can be split into multiple "windows," independently controlled, for displaying data files. Software includes a virtual memory operating system, Business BASIC and RPG II programming languages, and a version of the IMAGE data base management system. The price of a basic system is $35,000.

CHARACTERISTICS

MANUFACTURER: Hewlett-Packard Company, General Systems Division, 19447 Pruneridge Ave., Cupertino, California 95014. Telephone (408) 725-8111.

Hewlett-Packard is one of the foremost manufacturers of sophisticated laboratory test equipment and specialized process control instrumentation. In addition to conventional laboratory equipment such as signal generators, oscilloscopes, and voltmeters, the company also manufactures more exotic instruments such as gas chromatographs, digital thermometers, network analyzers, and spectrum analyzers. Other related products include both digital and analog graphic recorders, analytic instrumentation, and medical electronic instrumentation systems.

The Computer Systems Group includes the General Systems Division that is responsible for the HP 3000, HP 300, and HP 250 computer systems; the Data Systems Division that is responsible for the HP 1000 and 21MX line; and the Computer Support Division that includes all customer engineer and systems engineer organizations. In addition, The Computer Systems Group has a tape and printer ➢



The HP 300 is a general purpose computer that "takes no more space than a free-standing data terminal." The system can support up to 16 terminals, a million bytes of memory within the basic enclosure, and 490 million bytes of external disk storage.

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the screen, allowing pushbutton selection of operating system functions and/or application menus. An "attention" key and message light allow the operator to communicate with the Amigo/300 operating system (and vice versa) without interrupting on-line operations. The IDS also serves as a programming station for developing HP 300 applications software, and application programs can use it as an application terminal.

The HP 300 system is designed for online, multiterminal applications processing, and up to 16 application terminals can be included in an HP 300 configuration. These application terminals are dedicated to application processing—they cannot control system operation as the IDS can. Instead, they operate totally under the control of HP 300 applications programs.

The HP 300 uses a new virtual memory operating system called Amigo/300, which, in conjunction with the intelligent Integrated Display System (IDS) is designed to simplify the development and control of dedicated on-line business applications. Amigo/300 is a multiprogramming, multitasking system capable of managing background jobs, such as printing reports or sorting data files, while higher-priority data entry, validation, or inquiry operations are taking place from application terminals. The operating system provides a potential addressing space of over 260 million bytes for each HP 300 program. Practical limits on program size are dictated by available mass storage.

Amigo/300 features both a file management system and data base management. The file management system provides high-level file and device access and a variety of file structures. For more highly structured data, the Image/300 Data Base Management System offers an integrated data base structure with powerful data storage and retrieval capabilities. In addition, a comprehensive set of system services provides program access to Amigo/300 capabilities. Through these services, application programs can invoke system features that are not directly accessible through the HP 300 programming language constructs. System services cannot be called from application programs written in RPG II/300.

The key to the HP 300 programming process is the "Language Subsystem" concept. A language subsystem is a combination of system software, advanced editing capabilities, and sophisticated display features that manages all aspects of the HP 300 programming environment. The language subsystem manages the programming environment, acting as a kind of "switchboard" connecting the programmer to the tools he needs while presenting a single, uniform programming interface. The same command set and editing features are used throughout all phases of program development, and many command functions are available as key-controlled pushbutton functions. The programmer is given direct, natural access to his program, editing it directly on the IDS screen much as he would edit a printed program listing with a pencil. Major language subsystem features include:

division, a disk memory division, a data terminals division, and two manufacturing divisions in Europe. The Calculator Products Group includes the Desktop Computer Division that is responsible for HP's 9800 line of computer products, and the Corvallis Division that is responsible for HP's pocket calculator operations.

Hewlett-Packard products are sold by 135 sales offices and serviced by 160 offices in 33 countries, and are manufactured in facilities in the U.S., United Kingdom, Germany, France, Japan, and Malayasia. The company employs about 35,100 persons worldwide, with about 14,100 worldwide involved in computational products.

MODEL: HP 300.

DATE ANNOUNCED: October 1978.

DATE OF FIRST DELIVERY: January 1979.

DATA FORMATS

BASIC UNIT: 8-bit byte.

INSTRUCTIONS: The HP 300 instruction set consists of 195 instructions, including specific support for commonly-executed system and user functions such as procedure calls/exits, loop processing, string manipulation, and list searching. Instructions can operate on bit, byte (2 or 4 byte), or floating-point (4 or 8 bytes), and packed decimal (1 to 14 bytes) operands.

INTERNAL CODE: ASCII.

MAIN STORAGE

TYPE: 16K-bit MOS RAM.

CYCLE TIME: 500 nanoseconds per 22-bit word (16 data, 6 error correction).

CAPACITY: 256K bytes to 1024K bytes in 128K-byte increments.

CHECKING: Automatic detection and correction of single bit memory errors; detection of all double bit and most multi-bit errors.

STORAGE PROTECTION Bounds checking on memory references through hardware limit registers.

CENTRAL PROCESSOR

The HP 300 central processor is a microprogrammed, stack architecture processor that provides control and processing functions for the system. The processor executes system programs and user programs, and under the control of specialized microcode, executes HP 300 channel programs that direct the operation of the HP 300 I/O channels. Processor features include stack architecture with hardware stack registers for improved stack performance, separation of code and data, hardware register support for the HP 300 code and data segmentation virtual memory scheme, extensive use of HP's CMOS/SOS (Silicon-on-Sapphire) LSI circuitry, automatic self-test of processor, low memory, and I/O channels at power on or under operator control via pushbutton.

INTERRUPTS: 15 interrupt priority levels.

PHYSICAL SPECIFICATIONS: The HP 300 System Unit (SU) is the central element in every HP 300 system configuration. It houses the processor, main memory, I/O channels, 12-megabyte fixed disk (optional), one-megabyte flexible disk drive, Integrated Display System, and power

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	PERIPHERALS/TERMINALS
DEVICE	**DESCRIPTION & SPEED**
PRINTERS	
2608A	Comb matrix 5 x 7 dot matrix (5 x 9 for lower case in 128-char. set), 132 positions, 64/129-character sets, 10 characters per inch, 6 or 8 lines per inch, 4 to 14.9-inch paper, 8-channel VFU; 400/320 lpm
2631A	Dot matrix, 7 x 9, 136 positions, 128-character set, 10 characters per inch, 6 or 8 lines per inch, 1.2 to 15.75-inch paper, 8 channel VFU, 180 cps
TERMINALS	
2640B	Interactive Display Terminal; 1K-byte memory expandable to 8K bytes; 2 option slots, 64-character set, inverse video, RS 232C 110-2400 bps
2645A	Display Station; block or character mode, 4K-byte memory expandable to 12K bytes, 7 option slots, 128-character set, inverse video, editing features, 8 user-defined soft keys, RS-232C 110-9600 bps
2648A	Graphics Terminal; 720 x 360 dot graphics image memory and random access alphanumeric memory (expandable by 4K bytes), 128-character Roman set, inverse video, editing, 9 user-definable soft keys, 110-9600 bps RS-232C, 4 option slots
2647A	Intelligent Graphics Terminal; 720 x 360 dot graphics image memory and random access alphanumeric memory, BASIC interpreter with graphics commands, multiple automatic plotting, 128-character Roman set, inverse video, 8 user-definable soft keys, 75 lines of display memory, RS-232C communications, integrated dual-cartridge tapes, 1 option slot
2621A/P	General purpose terminal; includes 4K bytes of display memory, 128-character set, lower case, underlining; 2621P model includes an integral thermal printer

- Integrated programming environment—all programming activities take place in a single programming environment using a single, uniform command set. Programming tools and files are managed by the language subsystem.

- On-screen editing—all IDS editing keys (including cursor control, character insert/delete, line insert/delete, and scrolling) are fully integrated with the language subsystem. Program changes are made by directly editing the screen image with these keys.

- Powerful editing commands—natural, sentence-like commands manipulate entire blocks of program text for bulk copying, moving, deleting, appending, inserting, changing, and finding of text.

- Online syntax checking—program lines are checked for syntax errors as they are entered. Errors are immediately reported for interractive correction.

- Interactive error correction—syntax and compile time error messages are displayed simultaneously with the section of the program containing the error. The error can be immediately corrected without a printed listing.

- Compiled languages—HP 300 languages are fully compiled into HP 300 machine instructions (object code).

- Single-key program testing—program test execution is initiated by pressing a single "TEST" key. The HP 300 automatically performs the steps required to bring the program into test execution (compilation, binding, linking, etc.).

- Program libraries—frequently used routines can be saved in segment-level libraries for common use by

supply. The SU is 24 inches wide, 33.5 inches deep, and 43.5 inches high. A basic HP 300 system, including a printer, occupies less than 10 square feet.

The system can be operated on 100, 120, 220, or 240 volts. The operating environment limits range from 50 to 104 degrees F., with a humidity tolerance ranging from 20 to 80 percent, non-condensing. Normal office air conditioning is adequate.

INPUT/OUTPUT CONTROL

The System 300's processor, main memory, and I/O channels communicate over a 4 megabyte/second Inter-Module Bus. A minimum HP 300 system includes a processor, 256K bytes of memory, and a single General I/O Channel. Additional memory modules and I/O channels plug directly into the System Unit card cage to expand the system.

The General I/O Channel (GIC) is a general-purpose channel that provides a standard method of attaching peripheral devices to the HP 300 system. A single GIC can attach up to eight devices or device controllers to which multiple devices may be attached. The GIC transfers data via direct memory access (DMA). The GIC can support a maximum of 8 devices, including the Integrated Display System, disk and diskette drives, and printers.

The Asynchronous Data Communication Channel (ADCC) is an optional channel for attaching terminals to an HP 300 system. It provides eight independent ports for device attachment in two stages; an ADCC-Main circuit board provides the first four ports, and an ADCC-Extender circuit board expands the ADCC to its full eight-port capacity. The Main Extender pair function as a single channel, and an ADCC-Main may be used as a four-port channel without the Extender. A maximum of two ADCC's may be configured with an HP 300 system. The ADCC supports terminals at data rates ranging from 50 to 9600 bps.

CONFIGURATION RULES

A minimum HP 300 Model A system consists of a System Unit that includes the CPU with 256K bytes of memory, an Integrated Display System, a GIC that supports up to five additional devices, an integrated 12 million byte non-

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many programs. Common program source text can also be saved and copied as needed from program to program.

- Partial compilation—individual subprograms can be compiled independently, so minor program changes often do not require complete program recompilation.
- Symbolic debugging—programs can be interactively debugged during text execution using source language variable names and statement labels. Capabilities include variable examination, variable modification, and setting break and trace points for tracing program flow (Business Basic only).

There is a separate Language Subsystem for each HP 300 programming language, tailored to meet its unique programming requirements. In addition, Typist and the Image/300 schema processor (DBSCHEMA) are modified Language Subsystems for text and schema editing, respectively.

HP offers Business Basic/300 and RPG II/300 for use with the HP 300 system. Business Basic/300 is an extension to the BASIC programming language that supports decimal arithmetic and character strings in addition to 16- and 32-bit integers and 32- and 64-bit floating point numbers; language constructs that provide string concatenation, substringing, character string extraction and deposit, and substring searching; construction of printed reports and formatted terminal displays; serial, direct, and indexed file access and programming file creation and purging through language constructs; alphanumeric variable names and statement labels up to 31 characters long; independently defined subprograms that can have their own local storage and passed parameters, in addition to sharing data through common storage; full access to system services.

RPG II/300 is highly compatible with HP 3000 RPG and with RPG on the IBM System/32 and System/34 and features interactive source entry with RPG screen templates, online syntax checking, and interactive error correction.

Also featured is an interactive multiterminal data entry extension that enables an executing RPG program to accept data entered from one or more HP 300 application terminals or the IDS. At the start of program execution, the system enters into a dialogue at the IDS to determine which terminal the program is to access. Terminals can also be dynamically added to and taken away from an executing RPG program using this capability. Terminal operation is transparent to the RPG program, which views the terminal as a conventional input file.

The HP 300 will provide stiff competition for IBM's System/34 in the end-user market and Series/1 in the value-added segment. The system offers power and versatility at a very attractive price, and includes many features that were obviously developed with these users in mind. It should be a successful addition to Hewlett Packard's line.□

removable disk, and a 1 million byte flexible disk. An HP 300 Model B is the same as a Model A but with an external 20 million byte non-removable disk instead of the 12 million byte disk.

One HP 300 system can support up to 8 128K-byte memory modules for a maximum main memory capacity of 1024K bytes, several 7906, 7920, or 7925 disk drives, in addition to the basic system disk, for a maximum storage capacity of 490 million bytes, two printers, 16 terminals, two workstation IDS units, plus the master IDS.

MASS STORAGE

INTEGRATED FLEXIBLE DISK DRIVE: Housed in the HP 300 System Unit, this unit uses a 2-sided, double density flexible disk with a storage capacity of 1,029,120 bytes. There are 67 tracks per surface and 30 256-byte sectors per track. Average seek time is 91 milliseconds, and average rotational delay is 83 milliseconds. Data transfer rate is 100K bytes per second in burst mode.

INTEGRATED FIXED DISK:A Winchester-style disk unit, housed in the System Unit, with a storage capacity of 12,042,240 bytes. There are two recording surfaces with 735 tracks per surface and 32 256-byte sectors per track. Average seek time is 71 milliseconds, and average rotational delay is 10 milliseconds. Data transfer rate is 410K bytes per second.

7906 DISK UNIT: Available in two models, the 7906M and 7906S. The 7906M includes a controller that supports the 7906S add-on drive. The 7906 has a capacity of 19,660,800 bytes stored on one fixed and one removable cartridge disk. The fixed disk has a single recording surface of 800 tracks and the cartridge disk has two surfaces with 400 tracks per surface. Data is stored on 48 256-byte sectors per track. Average seek time is 25 milliseconds, and average rotational delay is 8.3 milliseconds. The data transfer rate is 937.5K bytes per second.

7920 DISK UNIT: Available in two models: 7920M and 7920S. The 7920M includes a controller that supports the 7920S add-on drive. The 7920 has a capacity of 50,073,600 bytes stored on a removable disk spack. There are five recording surfaces with 815 tracks per surface and 48 256 byte sectors per track. Average seek time is 25 milliseconds, and average rotational delay is 8.3 milliseconds. The data transfer rate is 937.5K bytes per second.

7925 DISK UNIT: Available in a 7925M model that includes a controller and a 7925S add-on unit. The 7925 has a capacity of 120,176,640 bytes stored on a removable disk pack. There are nine recording surfaces with 815 tracks per surface and 64 256byte sectors per track. Average seek time is 25 milliseconds, and average rotational delay is 11.1 milliseconds. The data transfer rate is 937.5K bytes per second.

INPUT/OUTPUT UNITS

See the Peripherals/Terminals table for units other than the Integrated Display System, which is described below.

INTEGRATED DISPLAY SYSTEM: The HP 300 system is controlled from the Integrated Display System (IDS) that forms the upper part of the System Unit. The IDS provides direct control over all aspects of HP 300 operation. The IDS also serves as a programming station for developing HP 300 applications software. Application programs can also use it as an applications terminal.

The IDS keyboard includes a main typewriter key group, a numeric keypad, and separate control key clusters for editing and display control. The screen displays 1920 characters in 24 rows of 80 columns. A full 128-character upper/lower case character set is standard, and optional character sets

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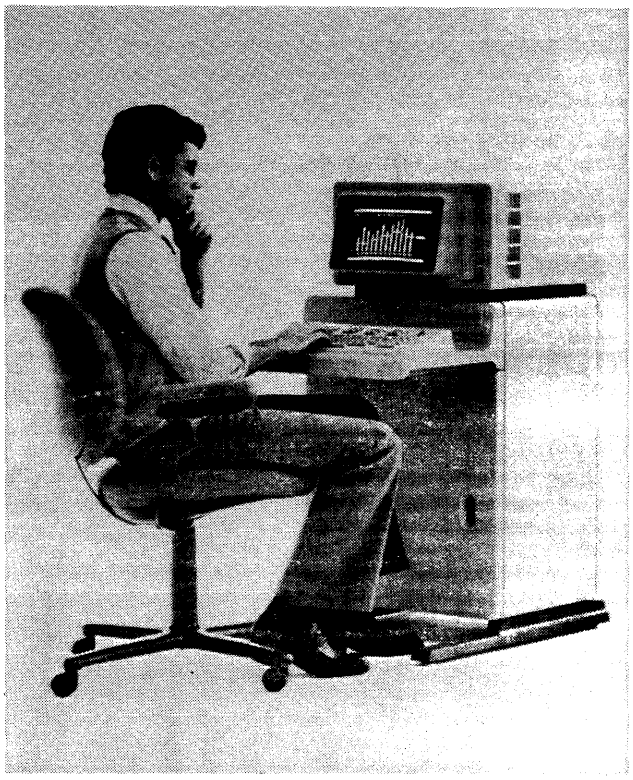

The HP 300 Integrated Display System (IDS) is used to schedule, monitor, and control the concurrent activities of the Amigo/300 operating system. The IDS screen can be split into eight "windows," independently controlled, which can be attached to a data file and scrolled both vertically and horizontally to make entries or changes.

can be added to display international and mathematical symbols, large characters, and line-drawn forms. For formatted screen displays, the IDS includes display enhancements for blinking, half-bright, underlined, and inverse video (black on white) fields. These can be combined with special IDS format modes for forms-oriented screen processing.

In addition to these basic features, the IDS incorporates a set of advanced display features that offer significant new display capability. Through its "windowing" feature, the display screen can be divided into multiple sections (called "windows") for greater display flexibility. Using several windows, the IDS can simultaneously display several different kinds of information on a single screen. Windows can be used to perform several different functions at once on the IDS, with each function handled in its own separate window. Each window is independently controlled as a "mini-display screen," so even complex, dynamic displays can be effectively presented.

Eight "softkeys" bordering the right side of the IDS screen provide a pushbutton choice capability for the IDS user. The softkeys are used in a variety of ways to represent alternative actions or special functions that can be invoked at the press of a button. One of the IDS windows is used to label each softkey on the adjacent screen area, including its function. Each label can be individually and dynamically changed, allowing the softkeys to be used over and over again for many different choices.

SOFTWARE

OPERATING SYSTEM: The Amigo/300 Operating System is the operating system offered for the HP 300 system. Amigo/300 is a multiprogramming, multitasking, virtual memory operating system that includes an extensive file management system. Control over HP 300 operation is provided through a highly interactive user interface to Amigo/300 at the IDS. In addition to accepting user commands, Amigo/300 provides run-time services that support program execution and creates the basic HP 300 execution environment.

Amigo/300 supports concurrent execution of many independent programs, along with program development or system utility operation. Programs are fully protected from interference with one another. A demand segmentation technique using variable-length code and data segments allows the sharing of main memory among programs and permits the execution of large programs in small memory configurations. A potential virtual addressing space of over 2 million bytes for code storage and 268 million bytes for data storage is available to each program. Multiple tasks can execute in parallel within a single HP 300 program, sharing code and global storage for efficient memory utilization. Processor and memory resources are scheduled for servicing of input/output requests on a task-by-task priority basis.

Amigo/300 includes a comprehensive file system that provides uniform, high-level access and control for all HP 300 files and devices. The file system features include:

- File and device independence. A common set of commands and system services provide uniform, high-level access to all types of files and devices.
- Dynamic file allocation. File space is dynamically allocated and reclaimed by the file system as the file grows and is processed.
- Seven data file structures are supported, including sequential, relative, keyed sequential, direct (hashed), library, primitive, and memory.
- Serial and keyed file access.
- Private file domains with password protection.
- Private volumes for removable online disk storage.
- Variable length records.
- File equation. Files can be specified with logical names within HP 300 programs, and associated with actual files through "file equations" stored with the program or entered as system commands.
- File sharing among multiple tasks or programs.
- Program access to file system capabilities through callable system services for file creation, purging, modification, and access.
- Wait and No-wait I/O. Applications programs can either wait for I/O completion before proceeding (normal mode) or proceed with other processing before synchronizing with I/O completion (No-wait I/O).
- Variety of key types for keyed file access.
- Unique or duplicate key operation.
- Partial and approximate key retrieval.
- User hashing support for direct files.
- User file labels for applications use.

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UTILITIES: HP 300 utility programs include a text and document editor, sort/merge, a HELP facility, a configuration utility, and a set of diagnostic/utility programs.

TYPIST is the HP 300 text and document editor. It is used from the IDS and features on-screen editing of text through the IDS editing keys; editing commands for bulk text manipulation; text formatting commands for control of page numbering, margins, titles, etc., on printed output, and named text modules for saving blocks of text that are used repetitively.

The HP 300 Sort/Merge utility features include:

- Interactive operation from the IDS as a utility program.
- Provision for calling from application programs through system services.
- Sorting/merging of data files of any length (limited only by available mass storage).
- Generation of full performance statistics for each sort or merge.

The sort/merge utility can handle up to 16 sequential, relative, keyed sequential, or direct input files, and sort on a maximum of 16 keys. Sorted/merged output options include complete records, sorted/merged keys only, sorted record addresses only.

System Build is an online system configuration utility. It is used to add or delete hardware or software on an HP 300 system, and for software updating. System Build is used from the IDS and features:

- Utility mode operation. Executes as a utility program under Amigo/300. Replacement of the executing system with a newly defined configuration takes place at the next power-on.
- Incremental operation. Incrementally adds and deletes features from a starting configuration, eliminating the need to respecify the entire system for small changes.
- Interactive operation. Major system build functions are softkey selectable, and the IDS is used to display and request configuration information.
- Inactive configuration library. Configurations can be defined and saved for later use.

The Diagnostic and Utility System (DUS) is a stand-alone memory based system for performing hardware diagnosis and stand-alone utility functions. The system is loaded from a flexible disk, and is designed for operation by a non-technical user. DUS features include:

- Pre-programmed diagnostic programs for isolating system failures.
- Volume formatting for flexible disks, disk cartridges, and disk packs.
- Volume analysis for detecting and configuring around defective tracks.
- Volume restoration from backup media for the system volume.
- Enabling of the backup system for the next system startup.

LANGUAGES: Programs to be run under the HP 300's Amigo/300 operating system can be written in either the Business Basic/300 or RPG II/300 programming language.

Business Basic/300 is an augmented implementation of the ANSI X3.60 Standard for Minimum BASIC. It is an extended and enhanced BASIC language, with advanced features that are especially designed for online commercial data processing applications. Program development in Business Basic/300 takes place at the IDS. Business Basic/300 is a fully compiled language. Features include:

- Interactive program development environment, using the IDS windowing and softkey capabilities.
- On-screen editing of source program text through the IDS editing keys.
- Online syntax checking as each statement is entered.
- Modular source program structure, permitting independent compilation of subprograms.
- Symbolic debug and trace facility for interactive program debugging using source language variable names and statement labels.
- Fully compiled code for run-time execution efficiency.
- Six data types, including Integer (2-byte and 4-byte), Real (6-digit and 16-digit), Decimal (up to 27 digits), and String.
- Long alphanumeric variable names.
- Alphanumeric statement labels.
- Formatted output with fixed or run-time format specification.
- File support for sequential, direct, and indexed access within the language syntax.
- Program-independent file or device allocation.
- Arrays of up to 32 dimensions for integers, real numbers, and character strings.
- Powerful string handling facilities, including concatenation, string searching, substring extraction and substring replacement.
- Large program and data areas through code and data segmentation and virtual memory.
- Parameterized subprograms, with dynamically allocated local storage.
- Common (global) data storage for data sharing among subprograms and the main program.
- Multi-line user definable functions.
- Access to callable system services through the ICALL statement.
- Full matrix package.
- Over 30 built-in numeric and string functions.
- Mixed mode arithmetic with automatic data type conversion.

RPG II/300 offers highly formatted source specifications that allow a programmer to specify many printing, data collection, and file maintenance operations with a minimum of effort. RPG II/300 programs can also access one or more HP 300 terminals for data entry through a multi-terminal data entry extension to the language. Program develop-

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ment in RPG II takes place at the IDS, in a highly interactive programming environment that features RPG II screen templates for simplified program entry and editing.

RPG II/300 features include:

- Industry standard RPG II language.
- High compatibility with HP 3000, IBM System/34 and System/32 RPG.
- Interactive source program entry and editing, using RPG II screen templates.
- Online syntax checking as each RPG II program line is entered.
- Automatic EBCDIC/ASCII file translation and alternate collating sequence.
- Access to keyed files (including record deletion).
- Multiterminal data entry capability. An extension to the RPG language provides automatic terminal handling, screen formatting and record grouping for data entry from one or more terminals into a single RPG program.

SL/300, announced in June 1979, is a block structured, high-level language designed for use by third-party program suppliers, such as OEM's, and other programming specialists. SL/300 features provide many capabilities normally found in languages such as PASCAL or ALGOL. SL/300 features include dynamic array allocation, high-level statements with unlimited nesting, macro capability, procedures that are both recursive and reentrant, and powerful data manipulation expressions.

IMAGE/300 DATA BASE MANAGEMENT SYSTEM: IMAGE/300 is the HP 300 version of HP's IMAGE Data Base Management System. IMAGE/300 allows logically related data to be structured into an integrated data base that expresses the structural relationships among data items. The data can then be accessed according to the defined structure, without being encumbered by its physical organization.

IMAGE/300 consists of four distinct components. A schema processor utility (DBSCHEMA) is used to enter, edit and compile data base schemas at the IDS. Schemas are written using the IMAGE/300 data base definition language to define the structure and capacity of a data base. Data base access procedures are system services called by application programs to access and maintain data bases. Data base utility commands are part of the Amigo/300 command set, entered through the IDS to create, erase, purge, store, and restore data bases. A Data Base Inquiry facility (DBI) is used to interactively retrieve and update data base contents. It can be used for data base debugging, and also provides an ad hoc query facility to answer simple inquiries without writing a program.

IMAGE/300 features include:

- Integrated structure. Logically-related files can be handled as a single entity (a data base).
- Network structuring. Master/detail data sets allow for complex relationships among data.
- Interactive schema definition and editing on the IDS.
- Data security through read and write access levels at the data set and data item level.
- Flexible data access from Business Basic/300 programs through four different access methods.
- Simultaneous access to multiple data bases.
- Concurrent access to a single data base from multiple tasks and programs.
- Locking at the data base or data set lock group level.
- Distribution of data sets from a single data base across multiple disk volumes.
- Data base lockup on flexible disks or via volume backup.
- Full compatibility of data base access procedures with Image/3000.

PRICING

POLICY: The HP 3000 system is available on a purchase or lease basis. Hewlett-Packard maintains a full customer sales financing capability. Options which may be selected include early buyout, purchase option, lease renewal, fiscal funding termination provision, and equipment upgrade. As with rental plans, the upgrade option permits the addition of new equipment to the original system at any time during the term of the agreement.

Purchase agreements are available to volume end-users and OEM's who resell HP products after adding value. For such purchases HP offers discounts based on volume. It is possible to combine various types of HP system and peripheral products under one purchase agreement for maximum discount benefits. Multi-Unit Purchase Agreements are made for one year and are renewable. Agreement terms and discount schedules are available from HP sales representatives.

HP warrants the HP 300 hardware against defects in materials and workmanship. During the warranty period of 90 days following installation, HP will, at its option, repair or replace hardware which proves to be defective.

HP warrants that its software and firmware designated by HP for use with a CPU will execute its programming instructions when properly installed on that CPU. HP does not warrant that the operation of the CPU, software, or firmware will be uninterrupted or error free. During the warranty period of 90 days following installation, HP will provide its normal Software Support Services at no charge.

The HP 300 has been designed for the office environment and in most cases needs no special provisions for power, noise abatement, or air conditioning. Upon delivery of all components an HP Customer Engineer will install the HP 300 and its peripherals. Start-up assistance will be provided by an HP Systems Engineer. On-site installation assistance includes travel up to 100 miles from the nearest HP service facility. A charge may be made for travel outside of the 100-mile service radius.

HP offers a number of maintenance plans as shown below.

Maintenance Plan	Coverage	Days Per Week
Basic Maintenance Plan	8-5 (9 hrs)	5 or 7
Extended Coverage Plan 01	8-9 (12 hrs)	5 or 7
Extended Coverage Plan 02	8-12 (16 hrs)	5 or 7
Extended Coverage Plan 03	8-8 (24 hrs)	5 or 7

The monthly cost of a maintenance contract is based on the type of plan, the service distance, and the Basic Monthly Maintenance Charge (BMMC) of the equipment under contract. BMMC charges are shown in the Equipment Prices section of this report. Users may also employ HP service on a time and material basis.

Hewlett-Packard HP 300

HP quotes typical response time for all plans as 4 hours within a Zone 1 radius (typically 100 miles from a maintenance office), and 24 hours or more for a Zone 2 radius (typically 200 miles) during the time of coverage.

HP offers a full range of software support services for the HP 300. Customer Support Service (CSS) is HP's standard software support service that provides a comprehensive set of software services and the personal attention of a trained HP Systems Engineer. A Software Subscription Service (SSS) is available for customers who choose to rely on in-house personnel; no HP Systems Engineering assistance is provided under this service. In addition to the software support services, Documentation Distribution Services (DSS) are available to keep additional sets of documentation up to date.

CSS consists of the following elements:

- Delivery of software and firmware updates.
- Right to use software and firmware updates.
- Software problem reporting.
- Account-responsible Systems Engineer.
- Phone-in consulting service (PICS).
- On-site systems engineering assistance.
- Software notification via HP's Software Status Bulletin and Communicator.
- Reference manual updates.

Extensions to CSS include the authorization of an additional caller to use the phone-in consulting service and a discounted CSS for an additional system which is supported by the user's central installation. The discounted CSS provides one set of firmware updates for the additional system, the right to make one copy of the software updates delivered to the central site and distribute and use these updates on one additional system, use of the phone-in consulting service through the central site on behalf of the additional site, and on-site assistance by an SE at the central site to identify and verify software problems encountered on the additional system.

The software subscription service (SSS) consists of:

- Delivery of software and firmware updates.
- Right to use software and firmware updates.
- Software problem reporting via mail.
- Software Status Bulletin and Communicator.
- Reference manual updates.

The Documentation Distribution Services included the Software Status Bulletin and Communicator and user reference manual updates.■

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.
System 31032A	HP 300 computer system; includes HP 300 System Unit with ICF/25 processor, integrated display system, 256K bytes of error-correcting memory, general I/O channel, 12-megabyte non-removable disk, 1-megabyte flexible disk drive and standard software with Amigo/300 Operating System, Business Basic or RPG II, Image/300, system utilities, HELP, Math Library, System Build, Diagnostics, Typist, Sort/Merge. Includes on-site installation and complete User Manual Set	$35,000	$160
31033A	Same as 31032A, except 12-megabyte non-removable system disk is replaced with external 10+10 megabyte 7906M fixed/removable system disk; includes disk data cable and on-site installation	45,000	225
	System options (including installation)		
31204A	128K-byte error-correcting memory module	2,500	15
31264A	Asynchronous data communication channel (ADCC Main)	1,600	7
31265A	Asynchronous data communication channel (ADCC Extender)	1,600	7
31224A	Integrated display system options: Mathematical symbol set	100	—
31225A	Line drawing set	150	—
31226A	Large character set	150	—
31227A	Roman extension character set	150	—
31381A	Work surface	250	—
MASS STORAGE			
	On-site installation of disk drives is included unless specified otherwise in an HP purchase agreement.		
7906M-102	10+10 megabyte master disk drive (first drive); includes disk controller and cartridge and cable	14,875	82
7906S	10+10 megabyte add-on disk drive; includes disk cartridge and data cables	10,000	55
7920M-102	50-megabyte master disk drive (first drive); includes disk controller, disk pack, and cable	17,875	81
7920S	50-megabyte add-on disk drive; includes disk pack and data cables	13,000	54
7925M-102	120-megabyte master disk drive (first drive); includes disk controller, disk pack, and cable	21,875	89
7925S	120-megabyte add-on disk drive; includes disk pack and data cables	17,000	62
PRINTERS			
2631A-330	Serial printer; 180 cps; 136 char./line at 10 char./inch, expanded and compressed print modes for 68 and 227 char./line; automatic bi-directional printing; automatic underline and display function mode; 8-channel fixed vertical forms control; horizontal tabs; includes installation	3,640	31
2631A-009	Add extended Roman character set	150	—
26098A	Pedestal for 2631A printer	275	—
2608A-330	Matrix; 320/400 lpm; 132 char./line, 128-character USASCII set, 16 channel VFU; prints 5 x 7 dot matrix upper case at 400 lpm, 5 x 9 dot matrix lower case at 320 lpm	10,465	*

*Monthly maintenance charge depends on printer usage.

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.
TERMINALS			
2621A	General purpose terminal with 4K bytes of display memory, 128-character Roman set, lower case, underlining	1,450	15
2621P	Same as 2621A with an integral thermal printer	2,550	25
2640B	Interactive display terminal with page or character mode (switch-selectable), 64-character upper/lower case Roman set, 5K bytes of storage expandable to 8192 bytes, inverse video, RS-232C 110-2400 Baud, and 2 option slots	2,600	18
2645A	Display station, block or character mode, 128-character Roman set, 4096 bytes of memory expandable to 12288 bytes, inverse video, editing features, 8 user-defined soft keys, 110-9600 Baud RS-232C, and 7 option slots	3,500	20
2645A-007	Integrated dual cartridge tape transports (requires 2 option slots)	1,600	8
2648A	Graphics terminal, has 720 X 360 dot graphics image memory and random access alphanumeric memory expandable by 4K bytes, 128-character Roman set, inverse video, editing, 9-user-definable soft keys, 110-9600 Baud RS-232C, and 4 option slots	5,500	22
2648A-007	Integrated dual cartridge tape transports (requires 2 option slots)	1,600	8
2647A	Intelligent graphics terminal, has 720 x 360 dot graphics image memory and random access alphanumeric memory, BASIC interpreter with graphics commands, multiple automatic plotting, 128-character Roman set, inverse video, 8 user-definable soft keys, 75 lines of display memory, RS-232C communications, integrated dual cartridge tapes, and 1 option slot	8,300	50
13231A	Display enhancements; adds blinking, half-bright and underline provides for an additional three 128-character sets; requires 1 option slot	250	—
13231A-201	Add mathematical symbol set	100	—
13231A-202	Add line drawing set	150	—
13231A-203	Add large character set	150	—
13234A	Terminal memory module, 4K bytes	300	—
13232W	RS-232 cable, female connector plug, 15-ft.	75	—

SOFTWARE PRICES

	Price	Customer Support Service	Software Subscription Service
Amigo/300 and System Utilities including Image/300	Included	$160	$50
System Language/300	$2,000	50	15
Business Basic/300	1,500	40	15
RPG II/300	1,500	40	15