

HP 9000 Computer Systems



Series 800 Software and Communications
Technical Data



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For HP 9000 Series 800 Systems

HP-UX is a superset of AT&T's System V Interface Definition (SVID), Issue 1, assuring portability of applications developed on other SVID compliant systems. HP-UX thus supports the trend for more and more computer professionals to choose the UNIX* operating system as technology moves towards the goal of universal software compatibility. HP-UX also incorporates features from AT&T UNIX System V, Release 2.0 and from U.C. Berkeley's 4.2 BSD.

Additionally, HP-UX includes a selection of enhancements along with many innovations of its own to extend the capabilities of the UNIX system. Those HP-UX features include: real-time operation, high performance file access, device I/O programming, and Native Language Support (NLS).

HP-UX offers three of the most popular languages in the scientific computing world: FORTRAN 77, Pascal, and C. And because all these languages and extensions are linkable at the object level, a programmer is free to mix the computational power of FORTRAN with the structured methodology of Pascal and C to produce optimum software solutions. Programs written in any of these languages can access all HP-UX system calls as well as other libraries.

Hewlett-Packard has included file and record locking and a rich assortment of software engineering tools, such as 2-D and 3-D graphics, symbolic debuggers, and data communications. For complex problems involving several software programs, HP-UX offers the standard ability to connect or "pipeline" separate programs together via a set of simple commands.

HP-UX is an exceptionally powerful, standards-based operating system offering high capacity, high performance, and excellent transportability of applications between systems operating under the UNIX system, including systems from different vendors.

Features

- Compliance with the AT&T System V Interface Definition (Issue 1) for compatibility with similarly compliant systems
- Real-time extensions to suit the UNIX operating system for real-time applications as well as time-sharing applications
- Fast and deterministic real-time response to meet the demanding performance needs of real-time applications
- HP 1000 migration through extensive emulation of the RTE EXEC, libraries, file system, and Edit/1000, plus a Migration Analysis Utility

- Choice of 16, 32, or 64-user license
- Berkeley 4.2 BSD Fast File System for quick access to data and excellent data recovery (omitting features incompatible with System V)
- Over 200 industry standard utilities to assist program development and data manipulation
- C compiler, symbolic debugger, assembler, screen editor, source code control system, make utility, and other tools for support of application development
- Compatibility with HP 9000 Series 200, 300, and 500 systems and the Integral PC
- Native Language Support (Internationalization)
- Device I/O library for programming HP-IB instruments
- Serviceability and system administration enhancements for maximum ease of use and reliability

Support for

- C, FORTRAN 77, and Pascal programming with optimizing compilers
- Starbase graphics software based on evolving ANSI and ISO standards, plus Device Independent Graphics Library (DGL) and Advanced Graphics Package (AGP) software to provide compatibility for existing applications
- ALLBASE database management system with network and relational interfaces
- HPtoday for transaction oriented application generation
- AdvanceNet Network Service and LAN software for communication with other HP 9000 Model 840 systems, HP 1000 A-Series systems, and HP 9000 Series 200, 300, and 500 systems
- ARPA/Berkeley Networking Services for multivendor communication
- Localization and use of applications in 16 different native languages

*UNIX is a trademark of AT&T in the U.S. and other countries.

Compatibility with Other UNIX Systems

HP-UX is completely compatible with the AT&T System V Interface Definition (SVID Issue 1). It is thus compatible with other systems that operate under a UNIX system to the extent that the other system complies with the SVID.

HP-UX also supports all machine-independent features of AT&T UNIX System V, Release 2.0 and many features of the Berkeley 4.2 BSD version of the UNIX system that are not part of the SVID. These additional supported features, described later in this data sheet, extend the potential compatibility of HP-UX.

Compatibility among HP 9000 Systems

Hewlett-Packard has designated HP-UX as its standard operating system for all HP 9000 Systems. The Series 800 Systems are the high end of the HP 9000 Systems running the HP-UX operating system. The Series 800 is source code compatible with existing HP 9000 Series 200, 300, and 500 Systems running the HP-UX operating system. Most applications from Series 200, 300, or 500 Systems will run on the Series 800 by simply recompiling and relinking the programs. Changes will need to be made, though, when non-standard features of the language or operating system have been used, and the compiler or linker cannot resolve the difference.

Compatibility with HP 1000 Systems

HP-UX includes a PORT/HP-UX package to help customers move applications from HP 1000 systems operating under RTE-A or RTE-6/VM to the HP-UX environment. In addition to emulation of about 95% of RTE calls on HP-UX, PORT/HP-UX provides a Migration Analysis Utility for analyzing applications to determine which program statements need to be changed and what kinds of changes are needed.

In addition to addressing operating system related migration issues, PORT/HP-UX and the new ALLBASE/HP-UX DBMS provide facilities for migration of IMAGE/1000 and IMAGE/1000-II databases. The DGL and AGP libraries for the Series 800 differ only slightly from the DGL and AGP libraries for HP 1000 systems, which simplifies migration of graphics applications to the HP 9000 Series 800. For more information on HP 1000 applications migration, see the PORT/HP-UX data sheet in this data book.

The Importance of a Standard Operating System

The wide acceptance of the UNIX system can be traced to three features:

1. It is the most important industry standard operating system for multi-user computers.
2. Its excellent software development environment.
3. Its ability to adapt to different applications.

The System V Interface Definition (SVID) specifies the operating system components that are available. The components and their functionality are defined, but no specification is made of their implementation. The

definition specifies the application source code interface as well as the runtime behavior seen by an application program. The emphasis is on defining a common computing environment for applications and users and not on the internals of the operating system.

Because the SVID defines a UNIX system, adherence to the SVID guarantees a high degree of compatibility between UNIX systems. This form of standardization simplifies the task of porting applications software between machines to the point where many times all that is required is a recompilation of the applications. Porting is thus a matter of hours instead of the days, weeks, months, or even years required to move applications from one proprietary operating system to another. This represents a move to software that is almost entirely processor independent.

The HP-UX to UNIX System Relationship

The UNIX operating system is a licensed software product. As a licensee of this product, Hewlett-Packard is required to distribute a UNIX System V, Release 2.0 binary license with every HP-UX operating system.

To support source code compatibility with AT&T UNIX System V, Release 2.0, HP-UX includes all hardware-independent System V, Release 2.0 system calls, including support for file and record locking. HP-UX also includes interprocess communication in messages, semaphores, and shared memory calls.

- Messages provide process synchronization and data communication between processes in a much more flexible way than pipes.
- Semaphore calls supply a general process synchronization mechanism. Semaphores are usually used to grant or deny permission to access some resource shared among cooperating programs.
- Shared memory provides the capability for sharing memory among processes.

HP-UX Standard Features

The HP-UX operating system offers a productive environment for those who depend upon computers to solve large, complex problems. Software developers can easily share files and tools without sacrificing system security or reliability.

With HP-UX, programming functionality is increased by several enhancements. Many commands have been added for file manipulation. Tools are also provided to create, modify, compile, assemble, debug, link, and execute programs, as well as to track changes to programs and to tune system operations. FORTRAN 77 and Pascal compilers and the Device Independent Graphics Library (DGL), the Advanced Graphics Package (AGP), and the Starbase Graphics Library may be added to enlarge HP-UX program development capabilities.

Virtual Memory Management

HP 9000 Series 800 Systems support a 48-bit address space, which is utilized by HP-UX as multiple 32-bit address spaces that are allocated one per process. The HP Precision Architecture and HP-UX support virtual memory for processes so users can run programs that do not fit into the system's physical memory. In virtual memory, processes can be partially memory-resident and partially disc-resident. HP-UX manages virtual memory automatically and transparently to the user. Processes may have up to 64 megabytes of data, 64 megabytes of text (instructions), 8 megabytes of stack, and multiple shared memory segments up to 64 megabytes each. HP-UX can be configured to support even larger process sizes.

With the Series 800, code may be shared among users on a machine so that only one copy is assigned physical memory space. With demand loading, portions of a program are loaded into memory only when they are accessed.

File System

The HP-UX file system is SVID-compatible. This system is well-suited for a software development environment in which users wish to share programs and data. The hierarchical or "tree-like" structure of the system supports convenient, logical organization of user's files. For each file, permission to read, write, or execute can be assigned on an individual, group, or system-wide basis. This ability to group users, files, and accesses facilitates sharing of resources among project teams.

The HP-UX file system is based on the McKusick/Berkeley implementation of the UNIX file system, which is much faster than a standard AT&T UNIX file system. This file system is better suited for multi-user and real-time applications, which are often dependent on file system throughput.

Interchange of data with other computers is supported by a set of utilities that will selectively convert and copy HP-UX files to Logical Interchange Files (LIFs). The LIF directory format is a vehicle for transporting ASCII files on removable mass storage media between a wide variety of Hewlett-Packard computers. A set of utilities which support access to media formatted on the HP 9000 Series 500 in the SDF file format is also provided.

HP-UX Extensions

Real-Time Functionality

HP-UX includes real-time functionality similar to that of the RTE-A and RTE-6/VM systems that manage real-time operation of HP 1000 Computer Systems. These features equip HP-UX HP 9000 Series 800 systems for computer-integrated manufacturing applications, where the system interfaces with machines, rather than with people as in a time-shared application.

Real-Time Features in HP-UX

- **Real-Time Priorities** can be assigned to processes to give them execution preference over time-shared and lower-priority processes
- **Time-based Scheduling** calls allow processes to manage time with microsecond resolution, and to schedule processes with an accuracy of tens of milliseconds. (System V only supports a 1 second resolution for time and time-based scheduling calls.)
- **Driver Asynchronous I/O** allows a process to read or write from a suitably equipped driver without wait
- **User Control of Buffering** is used by applications that must bypass disc caching for data consistency
- **Reliable Software Signals** support process interaction with asynchronous events, with deterministic results
- **Methods for Controlling Access to Real-Time Privileges**, such as real-time priorities and memory locking.
- **User Control of File System Buffering**
- **Interprocess Communication** is facilitated by sharing large segments of virtual memory among multiple real-time tasks. Semaphores coordinate shared memory, I/O, and other resources. Messages pass short blocks of data between processes. Pipes connect related task operations and signals permit or kill (terminate) task execution.
- **Process Locking** can be used by a program to lock itself, its data, or its shared data into memory. This ensures that critical programs or data are not swapped or paged to disc but remain in memory for best performance.
- **File Locking** makes it possible to give a program exclusive use of a file, thereby assuring its availability.

Real-Time Performance Enhancements in HP-UX

- **Fast, Deterministic Real-Time Response.** HP-UX on the Series 800 has been tuned for fast and deterministic real-time response, especially as measured by process dispatch latency (the time from when a process is ready to run until it is dispatched by the operating system). This measurement has been tuned in HP-UX to be orders of magnitude faster than typical UNIX systems.
- **Disc Queue Prioritization** orders requests in the disc queue according to the real-time priority of the requesting program, speeding completion of real-time processes.
- **The McKusick/Berkeley implementation of the UNIX file system** speeds file system throughput.

FORTRAN 77 Compiler

The HP 92430A FORTRAN 77/HP-UX compiler is a superset of the ANSI X3.9-1978 FORTRAN standard, including MIL-STD-1753 extensions. Further extensions, such as the NAMEDLIST feature, have been added to track de facto standards. This compiler is designed to facilitate portability of FORTRAN programs from other HP computer systems. It offers a compile-time choice of two levels of program optimization, or no optimization. The result is a modern compiler that supports growth and efficiency for building on a sizable base of existing FORTRAN programs.

Pascal Compiler

HP Pascal is the tool used for design of structured application software. Pascal has gained wide acceptance among software professionals as a block-structured, strong-typed language providing easily read source code. Because it is a simple and concise language, Pascal is recognized as being easy to learn and highly portable. The HP 92431A Pascal/HP-UX compiler conforms to the ANSI/ISO Pascal language standard, but is a superset that is richly enhanced with extensions to support data manipulation, strings, and I/O. HP Pascal/HP-UX offers a compile-time choice of two levels of program optimization or no optimization.

Device I/O Library

The Device I/O Library (DIL), part of HP-UX, provides users access to any device on HP-IB or parallel interfaces. Any program written for HP-UX can use the DIL. The user-programmer can read from, write to, and control via the HP-IB and parallel interfaces to operate instruments or custom peripherals.

Starbase Graphics Library

HP 92436A Starbase/HP-UX is a 2-D and 3-D graphics library. Starbase provides a high performance interface to Hewlett-Packard graphics input, display, and output peripherals. Starbase supplies procedures to perform basic graphics operations. Output operations include lines, markers, text, and polygons. Control functions, inquiry functions, and echoing are also supported. Starbase supports raster operations, multiple input and output devices, dynamic allocation of devices, and true device independence. The Starbase Graphics Library is based on the ANSI/VD-CGI standard.

DGL/AGP Graphics

The Device Independent Graphics Library (DGL) is a set of graphics tools that supports application program output to, and interaction with, a variety of HP graphics input, display, and output devices.

The Advanced Graphics Package (AGP) builds upon DGL. AGP provides picture segmentation, interactive picking, and 3-D viewing transformations.

DGL and AGP are provided in the HP 92437A DGL/AGP/HP-UX graphics library, along with the Starbase Graphics Library for customers who wish to move existing DGL/AGP graphics applications from an HP 1000 or HP 9000 system to an HP 9000 Series 800 system.

Database Management: ALLBASE

The HP 36217A ALLBASE/HP-UX database management system (DBMS) provides customers with relational and network data access in one DBMS. With HPSQL and HPIMAGE in one DBMS, the user can choose the data model most appropriate to the application on an application-by-application basis. Thus, ALLBASE provides maximum productivity and performance in a single DBMS.

HPtoday

The HP 92440A HPtoday Developer Pack/HP-UX is a software system for computer-assisted development of ALLBASE-related applications. HPtoday applications are developed by filling in blanks on formatted screens instead of coding reams of program instructions. By bridging the gap between conception and the resulting application, HPtoday significantly shortens the time required to develop useful, bug-free applications.

Local Area Network Data Communication

HP-UX supports the HP 98194A LAN/9000 Series 800 Link product and the HP 98195A NS/9000 Series 800 Network Services. Together, those two networking products support Remote File Access (RFA) between HP-UX based HP 9000 systems, Network File Transfer with HP 1000 A-Series and HP-UX based HP 9000 systems, and Network Interprocess Communication (NetIPC) between HP 9000 Series 800 systems.

HP-UX also supports communication over a Local Area Network (LAN), using ARPA/Berkeley Network Services*. The ARPA/Berkeley Network Services product requires the 98194A LAN/9000 Series 800 Link to establish connection to the LAN. (The ARPA/Berkeley Network Services product will be orderable and available by the end of 1986.)

The ARPA/Berkeley Network Services product for HP 9000 Series 800 will support the following services between HP 9000 Series 800 systems communicating over IEEE802.3 or Ethernet LAN:

1. ARPA FTP (File Transfer Protocol).
2. ARPA SMTP (Simple Mail Transfer Protocol).
3. ARPA Telenet (Teletype Network).
4. Berkeley rcp (remote copy).
5. Berkeley rlogin (remote login).
6. Berkeley rsh (remote shell).
7. Berkeley sendmail.

Asynchronous Data Communication

HP-UX B.1 includes asynchronous multiplexer manager software, which supports CCITT modem communication, BSD job control, block mode communication, and non-blocking I/O. In addition to providing local communication features, the asynchronous multiplexer manager supports HP 9000 Series 800 communication with other UNIX systems via one or more multiplexer channels and hardwired or modem links using the uucp (file transfer) capability of HP-UX. Uucp commands provide file transfer (uucp), remote process execution (uux), and virtual terminal (cu) capabilities.

Native Language Support (NLS)

Localization is the process of adapting a software application or system for use in different countries or local environments. In many cases, a user's native language or data processing requirements may differ dramatically from those in the environment of the software developer.

Native Language Support (NLS) provides the tools for an application designer or programmer to produce applications which are localizable without modifying source code. These tools include software facilities within the operating system and subsystems (libraries and commands), as well as peripheral support. NLS addresses the internal functions of a program, such as sorting, as well as its user interface, including displayed messages, user inputs, special formats (date, currency, etc.).

A major NLS objective is to provide the capabilities or adapting character sets and sequences to local language needs. This takes into account that internal character representation determines the maximum number of distinct characters contained in a set. The default set is the 7-bit ASCII character set; all non-localized programs use the ASCII set. Eight-bit character sets are required for most European languages, including upper and lower case, punctuation, and special symbols. For languages with larger character sets, such as Kanji (the Japanese ideographic character set based on Chinese), character codes greater than 8 bits are required; 2-byte characters are therefore used for support of those languages.

In addition to character support (editing, sorting, shifting, type analysis, etc.), NLS provides for regional and country requirements, such as date and time formatting, decimal number formatting, etc. These local customs and the character handling mentioned above are supported via library routines which are callable by application programmers. In addition, many HP-UX commands have been modified to perform the correct language-dependent functions on user data.

HP-UX supports localization and use of applications in 16 different native languages, as summarized in Table 1. Some of these languages are also supported by keyboard and character set capabilities of printers and plotters, as noted in the comments column of Table 1.

Messages. An Application Message facility provides for storage of application-related messages in tables that are separate from compiled program code. Several sets of messages can be provided, each in a different language. The messages are accessed from programs with very little overhead. Application programs written to communicate in one language can be modified to run in any other language without recompiling or modifying the source.

Flexible Support of Native Languages. Native languages are supported under HP-UX by language data tables. Library routines and messages appropriate to a particular supported language are selected by simply entering the name assigned to that language, prior to initiating a language-switchable application or operation. This approach will make it possible to support new native languages simply by preparing appropriate tables.

Auto Restart After Power Failure

If AC power is lost and restored within 15 minutes and the battery backup system is fully charged, HP-UX is automatically restarted and processing can resume without data loss.

Table 1. Supported Native Languages

Supported Language	Character Set	Comments
Amer. English Can. French Danish Dutch English (U.K.) Finnish French German Italian Norwegian Portuguese Spanish Swedish	ASCII Roman8 Roman8 Roman8 Roman8 Roman8 Roman8 Roman8 Roman8 Roman8 Roman8 Roman8	Supported by HP terminals, printers, and plotters
Greek Turkish	Greek8 Turkish8	Supported by HP terminal
Japanese	Japan15	Katakana is supported by HP printers and plotters. Katakana, Kanji, and Hiragana are supported by a special terminal available from Yokogawa-Hewlett-Packard in Japan

Functional Specifications

Environment

The HP-UX operating system operates in an HP 9000 Series 800, Model 840 Computer System with 8, 16, or 24 MB of main memory and requires a supported system console and a supported system disc for operation. See the HP 9000 Model 840 System data sheet in the HP 9000 Series 800 Hardware Technical Data book for supported terminals and discs and other system information.

Base Compatibility

HP-UX is a superset with the AT&T System V Interface Definition (Issue 1) of the UNIX system.

Ordering Information

HP-UX Operating System with 16-User License

Included as part of the HP 9741A System Processor Unit for the HP 9000 Model 840 Computer System.

The 16-User HP-UX system includes:

1. HP-UX Version B.1, featuring C and the HP-UX Symbolic Debugger. Also includes Assembler, DIL, Real-Time Package, and PORT/HP-UX. Software Media Option AA0 or AA1 must be ordered with the 9741A System Processor Unit.
2. 16-User License.
3. HP 92453K HP-UX Documentation Package, as summarized below.

92453A HP-UX as defined above, but with 32-User license

Must specify software Media Option AA0 or AA1.

-0A1 Credit for upgrade from 16-user license.

-0B0 Delete 92453K HP-UX Documentation Package.

92454A HP-UX as defined above, but with 64-User license

(maximum number of 60 users per system, due to limited I/O slots). Must specify software Media Option AA0 or AA1.

-0A1 Credit for upgrade from 16-user license.

-0A2 Credit for upgrade from 32-user license.

-0B0 Delete 92453K HP-UX Documentation Package.

Software Media Options

AA0: Software on CS-80 cartridge tape.

AA1: Software on 1600 cpi mag tape.

92453K HP-UX Documentation Package

Part

Number	Document Description
5958-9140	HP-UX User's Manual.
5958-9512	HP-UX Async Communication Programming Manual.
5958-9141	HP-UX Real-Time Programming Manual.
5958-9513	HP-UX System Administrator's Manual.
92077-90051	PORT/HP-UX Migration Analysis Utility User's Manual.
5958-9202	PORT/HP-UX User's Guide.
5958-9143	PORT/HP-UX Reference Manual.
5958-9514	Advanced UNIX Programming.
92434-90001	C Reference Manual.
92434-90002	C Programmer's Guide.
92434-90003	C Quick Reference Guide.
92434-90004	HP-UX C Reference Manual Supplement.
5957-4687	FORTRAN Quick Reference Guide.
31502-90003	Pascal Quick Reference Guide.
92435-90001	Symbolic Debugger User's Guide.
92435-90002	Symbolic Debugger Quick Reference Guide.
92432-90001	Assembly Language Reference Manual.

Additional Software

(Must order software media option AA0 or AA1.)

92430A/R FORTRAN 77/HP-UX compiler.

92431A/R Pascal/HP-UX compiler.

36217A/R ALLBASE/HP-UX Relational and IMAGE database management system package with IMAGE/1000 translator.

92437A/R DGL/AGP/HP-UX Graphics Libraries with Starbase/HP-UX Graphics Library to support Graphics/1000-II DGL/AGP applications on the HP 9000 Model 840 System.

92436A/R Starbase/HP-UX Graphics Library.

92438A Development System bundle, including FORTRAN 77 and Pascal compilers and DGL/AGP and Starbase graphics libraries.

92440A/R HPtoday Developer Pack/HP-UX (includes 92441A).

92441A HPtoday Run Time Environment/HP-UX.

92442A ALLBASE/HP-UX and HPtoday Developer Pack/HP-UX bundle.

Software Support Services*

Hewlett-Packard offers a full range of software support services from personal, on-site assistance to materials-only services to ensure system success. This range of service allows flexibility in choosing the level of HP support to meet changing requirements. Available support services include software update services, notification services, consulting, and on-site or call-in assistance.

Training*

A wide selection of training classes are available, including HP-UX, C, FORTRAN, Pascal, and System Administration.

*Consult your local Hewlett-Packard Sales Office for more details on these services.

SYSTEM CALLS

Developed by AT&T

SVID, Issue 1 (Base)

_exit	getpid
_abort**	getppid(getpid)
access	getuid
alarm	* ioctl
chdir	* kill
* chmod	link
chown	lockf
clearerr(ferror)**	lseek
close	mknod
creat	mount
* dup	* open
execl(exec)	pause
execle(exec)	pclose(popen)**
execlp(exec)	pipe
execv(exec)	popen**
execve(exec)	* read
execvp(exec)	rewind(fseek)**
* exit	setgid(setuid)
fclose**	setpggrp
* fcntl	setuid
fdopen(fopen)**	* signal
feof(ferror)**	sleep**
ferror**	stat
fflush(flclose)**	stime
fileno(ferror)**	sync
fopen**	system**
fork	time
fread**	times
freopen(fopen)**	ulimit
fseek**	umask
fstat(stat)	umount
ftell(fseek)**	* uname
fwrite(fread)**	unlink
getcwd**	* ustat
getegid(getuid)	utime
geteuid(getuid)	wait
getgid(getuid)	* write
getpggrp(getpid)	

Developed by U.C. Berkeley

acct
* brk
chroot
ftime
gtty
msgctl
msgget
msgrcv(msgop)
msgsnd(msgop)
nice
plock
profil
ptrace
* sbrk(brk)
semctl
semget
semop
shmat(shmop)
shmctl
shmdt(shmop)
shmget
stty

Developed by Hewlett-Packard

getprivgrp
prealloc
rtprio
setprivgrp(getprivgrp)
sigspace

*Enhanced by Hewlett-Packard

**SVID System Calls that are implemented as Library Calls

SUBROUTINES AND LIBRARIES

Developed by AT&T

SVID, Issue 1 (Base)

_tolower(conv)
 _toupper(conv)
 abs
 asctime(ctime)
 atof(srtod)
 atoi(strtol)
 atol(strtol)
 bsearch
 calloc(malloc)
 clock
 crypt
 ctime
 drand48
 encrypt(crypt)
 erand48(drand48)
 errno(perror)
 free(malloc)
 frexp
 ftw
 getenv
 getopt
 gmtime(ctime)
 gsignal(ssignal)
 hcreate(hsearch)
 hdestroy(hsearch)
 hsearch
 isalnum(ctype)
 isalpha(ctype)
 isascii(ctype)
 isatty(ttyname)
 iscntrl(ctype)
 isdigit(ctype)
 isgraph(ctype)
 islower(ctype)
 isprint(ctype)
 ispunct(ctype)
 isspace(ctype)
 isupper(ctype)
 isxdigit(ctype)
 jrand48(drand48)
 lcong48(drand48)
 ldexp(frexp)
 lfind(lsearch)
 localtime(ctime)
 _longjmp(setjmp)
 lrand48(drand48)
 lsearch
 malloc
 memccpy
 (memory)
 memchr(memory)
 memcmp(memory)
 memcpy(memory)
 memset(memory)
 mktmep
 modf(frexp)
 mrand48(drand48)
 nrand48(drand48)
 perror
 putenv
 qsort
 rand
 realloc(malloc)
 seed48(drand48)
 setjmp
 setkey(crypt)
 srand(rand)
 srand48(drand48)
 ssignal
 strcat(string)
 strchr(string)
 strcmp(string)
 strcpy(string)
 strcspn(string)

strlen(string)
 strncat(string)
 strncmp(string)
 strncpy(string)
 strpbrk(string)
 strchr(string)
 strspn(string)
 strtod
 strtok(string)
 strtol
 swab
 sys_errlist(perror)
 sys_nerr(perror)
 tdelete(tsearch)
 tfind(tsearch)
 toascii(conv)
 tolower(conv)
 toupper(conv)
 tsearch
 ttyname
 twalk(tsearch)
 tzset(ctime)
 acos(trig)
 asin(trig)
 atan(trig)
 atan2(trig)
 ceil(floor)
 cos(trig)
 cosh(sinh)
 erf
 erfc(erf)
 exp
 fabs(floor)
 floor
 fmod(floor)
 gamma
 hypot
 j0(bessel)
 j1(bessel)
 jn(bessel)
 log(exp)
 log10(exp)
 matherr
 pow(exp)
 sin(trig)
 sinh
 sqrt(exp)
 tan(trig)
 tanh(sinh)
 y0(bessel)
 y1(bessel)
 yn(bessel)
 ctermid
 fgetc(getc)
 fgets(gets)
 fprintf(printf)
 fputc(putc)
 fputs(puts)
 fscanf(scanf)
 getc
 getchar(getc)
 gets
 getw(getc)
 printf
 putc
 putchar(putc)
 scanf
 setbuf
 setvbuf(setbuf)
 sprintf(printf)

sscanf(scanf)
 tempnam(tmpnam)
 tmpfile
 tmpnam
 ungetc
 vfprintf(vprintf)
 vprintf
 vsfprintf(vprintf)
 assert
 calloc(malloc)
 free(malloc)
 mallinfo(malloc)
 malloc
 mallopt(malloc)
 realloc(malloc)
 regcmp
 regex(regcmp)

_longjmp(setjmp)
 _setjmp(setjmp)
 a641
 daylight(ctime)
 dial
 ecvt
 edata(end)
 end
 endgrent(getgrent)
 endpwent(getpwent)
 endutent(getut)
 etext(end)
 fcvt(ecvt)
 fgetrent(getgrent)
 fgetpwent
 (getpwent)
 ftok(stdipc)
 gcvf(ecvt)
 getgrent
 getgrgid(getgrent)
 getgrnam(getgrent)
 getlogin
 getpass
 getpw
 getpwent
 getpnam(getpwent)
 getpwuid(getpwent)
 getutent(getut)
 getutid(getut)
 getutline(getut)
 irand48(drand48)
 krand48(drand48)
 l3tol
 l64a(a641)
 ltol3(l3tol)
 monitor
 nlist
 putpwent
 pututline(getut)
 setgrent(getgrent)
 setpwent(getpwent)
 setutent(getut)
 timezone(ctime)
 ttyslot
 tzname(ctime)
 undial(dial)
 utmpname(getut)
 signgam(gamma)
 cuserid
 curses
 logname
 sgetl(sputl)
 sputl

Developed by U.C. Berkeley

closedir(directory)
 initgroups
 opendir(directory)
 readdir(directory)
 rewinddir(directory)
 seekdir(directory)
 telldir(directory)
 endsent(getfsent)
 getfsent
 getfsfile(getfsent)
 getfsspec(getfsent)
 setfsent(getfsent)
 tgetent(termcap)
 tgetflag(termcap)
 tgetnum(termcap)
 tgetstr(termcap)
 tgoto(termcap)
 tputs(termcap)

Developed by Hewlett-Packard

cthead
 curlangid(langinfo)
 datalock
 fprintf(printmsg)
 getmsg
 idtolang(langinfo)
 langinfo
 langtoid(langinfo)
 nl_asctime(ctime)
 nl_atof(strtod)
 nl_ctime(ctime)
 nl_gcvf(ecvt)
 nl_isalnum(nl_ctype)
 nl_isalpha(nl_ctype)
 nl_isgraph(nl_ctype)
 nl_islower(nl_ctype)
 nl_isprint(nl_ctype)
 nl_ispunct(nl_ctype)
 nl_isupper(nl_ctype)
 nl_strtod(strtod)
 nl_tolower(nl_conv)
 nl_toupper(nl_conv)
 printmsg
 stringmsg(printmsg)
 strcmp8(nl_string)
 strncmp8(nl_string)
 hplib_abort(dil)
 hplib_bus_status(dil)
 hplib_card_ppoll_resp(dil)
 hplib_eoi_ctl(dil)
 hplib_io(dil)
 hplib_pass_ctl(dil)
 hplib_ppoll(dil)
 hplib_ppoll_resp_ctl(dil)
 hplib_ren_ctl(dil)
 hplib_rqst_srvce(dil)
 hplib_send_cmnd(dil)
 hplib_spoll(dil)
 hplib_status_wait(dil)
 hplib_wait_on_ppoll(dil)
 io_eol_ctl(dil)
 io_get_term_reason(dil)
 io_interrupt_ctl(dil)
 io_on_interrupt(dil)
 io_reset(dil)
 io_speed_ctl(dil)
 io_timeout_ctl(dil)
 io_width_ctl(dil)
 getfstype(getfsent)

UTILITIES AND COMMANDS

Developed by AT&T

SVID, Issue 1 (Base)

ipcrm			
ipcs			
accept	dd	machid	split
acctcms	delta	mail	startup(acctsh)
acctcom	devnm	mailx	strip
acctcon1(acctcon)	df	make	stty
acctcon2(acctcom)	diff	makekey	su
acctdisk(acct)	diff3	man	sum
acctdusg(acct)	diffmk	mesg	tabs
acctmerge	dircmp	mkdir	tail
accton(acct)	dirname(basename)	mknod	tar
acctprc1(acctprc)	isable(enable)	mm	tbl
acctprc2(acctprc)	diskusg	monacct(acctsh)	tee
acctwtmpt(acct)	dodisk(acctsh)	mv(cp)	telinit(init)
adb	du	mmdir	test
admin	echo	ncheck	tic
ar	ed	neqn	time
as	edit	newform	touch
asa	egrep(grep)	newgrp	tput
at	enable	news	tr
awk	env	nice	true
banner	ex	nl	tsort
basename	expr	nm	tty
batch(at)	f77	nm3	turnacct(acctsh)
bc	factor	nohup	umask
bcheckrc(brc)	false(true)	nuladm(acctsh)	uname
bdiff	fgrep(grep)	od	unget
bfs	file	osdd(mm)	uniq
brc	find	pack	units
bs	fwtemp	passwd	unlink(link)
cal	get	paste	unpack(pack)
calendar	getopt	pcat(pack)	uucico
cancel(lp)	getty	pg	uuclean
cat	grep	powerfail(brc)	uucp
cb	grpck(pwck)	pr	uulog(uucp)
cc	hashcheck(spell)	prctmp(acctsh)	uuname(uucp)
cd	hashmake(spell)	prdaily(acctsh)	uupick(uuto)
cdc	help	primes(factor)	uustat
cflow	hp	prof	uusub
chargefee(acctsh)	hyphen	prs	uuto
checkmm(mm)	* id	prtacct(acctsh)	uux
chgrp(chown)	init	ps	uuxqt
chmod	install	pwck	val
chown	join	pwl	vedit(vi)
chroot	kill	ratfor	vi
ckpacct(acctsh)	killall	rc(brc)	view(vi)
cli	lastlogin(acctsh)	red(ed)	wait
cmp	ld	reject(accept)	wall
col	lex	rm	wc
comb	line	rmail(mail)	what
comm	link	rmciel	who
cp	lint	rmciel(rm)	whodo
cpio	ln(cp)	rsh(sh)	write
cpp	login	runacct(acctsh)	wtmpfix(fwtmpt)
cpset	logname	sact	xargs
cron	lorder	sccsdiff	yacc
crontab	lp	sdiff	
crypt	lpadm	sed	
csplit	lpmove(lpsched)	setrannt	
cu	lpsched	sh	
cut	lpshut(lpsched)	shutacct(acctsh)	
cxxref	lpstat	shutdown	
date	ls	size	
dc	m4	sleep	
		sort	
		spell	
		spellin(spell)	

Developed by U.C. Berkeley

catman
chsh
clear
csh
ctags
deroff
diffh(diff)
dmesg
expand
fold
from
* fsck[HFS]
* fsdb[HFS]
groups
head
hostname
iostat
l(ls)
last
lastb(last)
leave
ll(ls)
lock
lsf(ls)
lsr(ls)
lsx(ls)
* mkfs[HFS]
mkstr
more
* mount[HFS]
mt
news[HFS]
page(more)
prmail
ptx
reset(tset)
rev
savecore
strings
swapon[HFS]
sync
tset
tunefs[HFS]
ul
umount(mount)[HFS]
unexpand(expand)
uusnap
vmstat
whereis
which
whoami

Developed by Hewlett-Packard

adjust
fc
findmsg
findstr
fixman
fsclean
gencat
getprivgrp
getx25
insertmsg
lifcp
lifinit
lifls
lifrename
lifrm
lsdev
mkdev
mklp
opx25
pc(hp)
prealloc
rmnl
rtprio
setprivgrp
ssp
uuls
vis
xd(od)

*Enhanced by Hewlett-Packard



For migration from HP 1000 RTE to HP Precision Architecture HP-UX

PORT/HP-UX is a collection of tools and utilities for migrating applications from HP 1000 RTE-6/VM and RTE-A to HP Precision Architecture with HP-UX. PORT/HP-UX tools minimize the porting effort for high level applications and data, allowing most source code to be ported with only a recompile required. Key elements of PORT/HP-UX include a Migration Analysis Utility, file and data transport tools and RTE intrinsics emulation routines on HP-UX. These utilities are complemented by highly compatible high level languages and translators to ease the migration of subsystems.

Features

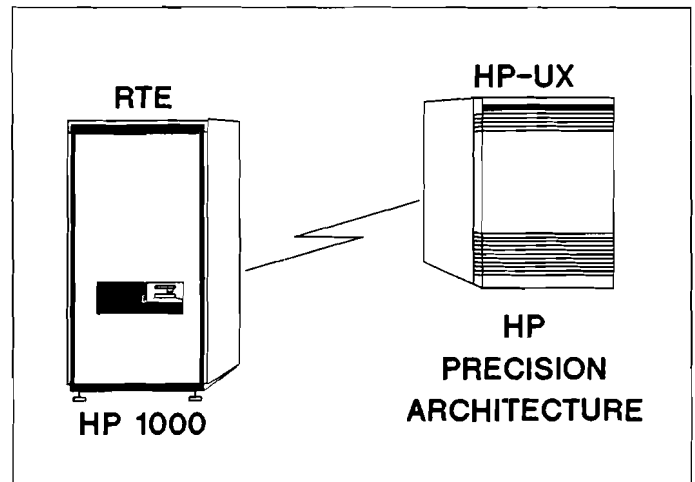
- Programming for Portability Documentation
- Migration Analysis Utility
- RTE Emulation Software
- rtesh – RTE interactive environment on HP-UX
- PORT/HP-UX Users Guide
- RTE to HP-UX Data Transfer Utilities
- IMAGE Migration Utilities
- FORTRAN Conversion Utilities
- Highly Compatible Subsystems:
 - FORTRAN
 - Pascal
 - C
 - IMAGE/ALLBASE
 - Network Services
 - AGP/DGL Graphics

The Migration Process

The objectives of PORT/HP-UX migration are to maximize performance in the new operating environment and to minimize the migration effort. PORT/HP-UX supports source level migration to fulfill these objectives. There are three steps in the migration process: evaluation, transport, and conversion.

Evaluation/Preparation

Using Programming for Portability documentation as a guide, applications currently being developed can be designed for maximum portability to HP Precision Architecture systems. The Migration Analysis Utility scans source code and identifies all RTE dependencies and notes whether or not they are emulated with PORT/HP-UX.



Application Transport

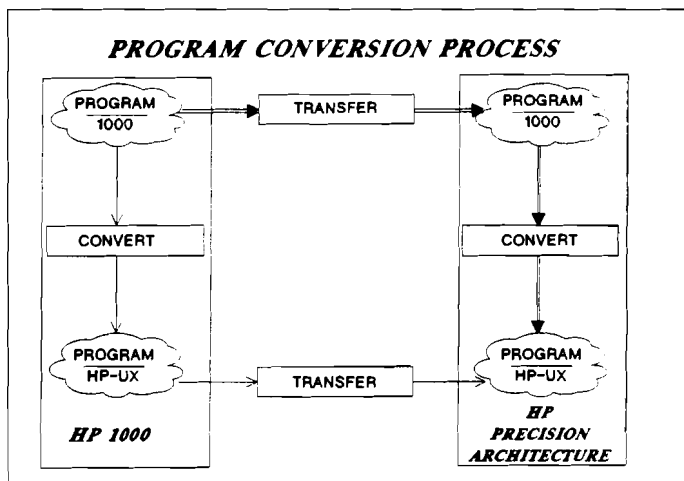
Programs (source code) and data (ASCII or binary) are transported to the HP Precision Architecture system via tape or NS/1000. PORT/HP-UX utilities correct for operating system differences to accomplish the application transport.

Conversion

Programs are compiled on the HP-UX system which allows non-emulated code to run in native mode. Most RTE file system, EXEC, and system library routines are emulated. RTE dependencies not emulated must be rewritten by the user.

Syntactic and semantic differences in HP 1000 FORTRAN programs are converted to their HP FORTRAN equivalents either programmatically or by the user. A FORTRAN conversion utility translates these differences or they are identified by the compiler. The Language Migration Guides also help identify language differences and provide conversion details.

ASCII data needs no conversion. Binary data is easily converted using instructions in the PORT/HP-UX reference manual and associated utilities. Data containing floating point format must be converted to IEEE format via a user program using the floating point conversion subroutines provided in PORT/HP-UX.



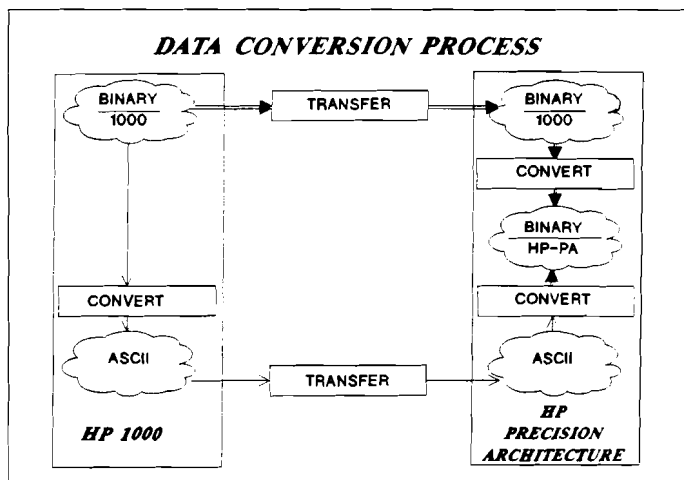
PORT/HP-UX and Migration Tools

Programming for Portability

The ease with which software is ported from one architecture to another depends on the emphasis placed on portability during the design of the application. Programming for Portability documentation is a set of documented guidelines for ensuring portability from RTE-6/VM and RTE-A applications to HP Precision Architecture HP-UX. Language, Operating System and Subsystem considerations are described in Programming for Portability.

Migration Analysis Utility (MAU)

The MAU is a utility that scans source code for HP 1000 dependencies. It generates a report pointing out the lines that contain non-emulated RTE calls. The MAU scans programs written in C, Pascal, and FORTRAN and flags RTE system library, FMP, EXEC, IMAGE, DS, and Graphics call dependencies on the HP 1000. The MAU can be used to estimate and plan the migration effort.



RTE System Library Emulation

Over 80% of RTE System Library calls are emulated in HP-UX. The non-emulated calls are those used for session accounting and programmatic spooling, which are not used frequently in RTE. The 80% that are emulated account for approximately 98% of users calls to system library routines. Recoding for non-emulated calls is documented in the PORT/HP-UX User's Guide.

RTE EXEC Emulation

Most RTE EXEC calls are emulated under PORT/HP-UX. The emulated EXEC calls include calls for I/O operations, to terminate or suspend programs, to load program segments into memory, to schedule other programs, to perform class I/O, and to time schedule programs. PORT/HP-UX supports EXEC calls to HPIB, GPIO, RS232, 9-track tape and line printers. Discs are supported through the file system; programs which do EXEC calls to disc will have to be modified to use HP-UX directly.

RTE File System Emulation

PORT/HP-UX contains an emulated RTE file system that includes both the FMGR and CI file systems. Over 85% of the RTE file system calls are emulated under PORT/HP-UX.

Assembly Language Programs

Due to the architectural dependencies and performance ramifications of assembly language, programs written in HP 1000 assembler must be rewritten to port to HP Precision Architecture systems. However, the System Library, EXEC, and File System emulation provided in PORT/HP-UX provide a very comprehensive RTE environment and support an estimated 95-100% of the occurrences of RTE calls in typical HP 1000 applications.

Interactive RTE Services

Entering the command "rtesh" at the HP-UX prompt will put the user in a "CI like" environment for controlling RTE emulated programs and to support the creation and maintenance of an emulated RTE file system. The following RTE commands are emulated under rtesh:

AT	BR	CL	CO	CR
DL	CRDIR	EX	GO	IO
LI	MO	OF	OWNER	PR
PROT	PU	RN	RP	RU
SS	WD	WH	XQ	??

In addition, an EDIT/1000-like screen editor is provided. It supports most EDIT/1000 features including screen mode and regular expressions.

Database Migration Utilities

Although the HPIMAGE interface of ALLBASE is quite similar to IMAGE/1000, architectural differences make 100% compatibility impossible. Migration utilities can be used to port application programs and databases. IMAGE/1000 applications can be recompiled and executed on HP-UX with a run time Translator intercepting IMAGE/1000 calls and making the appropriate call to HPIMAGE. Only 1% of the calls are architecturally dependent and will have to be changed or removed for Translator compatibility. The MAU flags those incompatible calls.

Two tools are used in moving the database from RTE to HP-UX. The Database Migration Unload utility (DBMUN) unloads and simultaneously converts IMAGE/1000 databases into HPIMAGE format. A Rootfile Decompiler utility (DBDECODE) converts IMAGE/1000-II root files into HPIMAGE schema files. DBDECODE does not support IMAGE/1000-I rootfiles; a manual conversion is necessary. DBDECODE, DBMUN and Translator come standard with ALLBASE.

Subsystem Compatibility

FORTRAN

FORTRAN on HP Precision Architecture systems is highly compatible with HP 1000 FORTRAN. Both are based on the ANSI 77 standard. Ninety percent of the HP 1000 FORTRAN feature set is compatible with FORTRAN on HP Precision Architecture. A PORT/HP-UX conversion utility is run on source programs prior to compilation on the HP Precision Architecture System. This utility increases feature set compatibility to 98%.

Pascal

HP Pascal is a superset of HP Standard Pascal. HP Standard Pascal is based on the ANSI standard. Pascal/1000 is based on HP Standard Pascal and includes some extensions. These extensions are flagged by the Pascal/1000 compiler. Pascal/1000 is 98% feature set compatible with HP Standard and HP Pascal.

C

Corporate Computer Systems (CCS) provides a C compiler for the HP 1000 that is 99% feature set compatible with HP C/HP-UX on HP Precision Architecture. Both HP C/HP-UX and HP 1000/C conform with the emerging ANSI standard.

Graphics

Graphics support for HP Precision Architecture HP-UX systems includes AGP/DGL, which differs slightly from AGP/DGL on HP 1000 systems. The differences relate primarily to error handling and the use of device file names in HP-UX vs LU parameters in RTE. The MAU flags differences and PORT/HP-UX documentation provides instructions for recoding. HP 1000 AGP/DGL is 98% feature set compatible with AGP/DGL on HP Precision Architecture.

Networking

Networking on HP Precision Architecture/HP-UX systems is based on Network Services software and LAN/Link hardware. HP Precision Architecture HP-UX systems can communicate via the LAN with HP 1000 A-Series systems and HP 9000 Series 200/300/500 systems running Network Services Software. HP 1000 A-Series can thus serve as gateways between HP 1000 E/F-Series systems running DS/1000-IV and HP Precision Architecture systems running Network Services Software.

HP 1000 A-Series applications using Network Services calls can be ported to HP Precision Architecture systems since the Precision Architecture networking products are also based on Network Services. A/E/F-Series applications using DS/1000-IV can be evaluated using the MAU to flag calls that don't map directly to NS/1000 and HP Precision Architecture NS. DS/1000-IV to NS/1000 migration documentation explains how to recode to achieve DS/1000-IV functionality on NS/1000.

Performance

HP 1000 applications which spend less than 70% of their time in RTE services will typically execute faster in the HP Precision Architecture system. Recompiled code will realize faster HP-UX native mode performance, except for the RTE emulation services. Some emulated RTE services may take longer to perform than on an HP 1000 system because additional processing is done to emulate the calls with HP-UX services. However, overall performance improvements will be realized for most applications. See the PORT/HP-UX Performance Brief.

Migration Consulting

Migration consulting for your specific application is available through HP's Applications Engineering Organization. Contact your local HP Sales Office for details.

Migration Documentation

PORT/HP-UX Documentation

Part

Number	Document Description
92077-90051	PORT/HP-UX Migration Analysis manual
5958-9202	PORT/HP-UX User's Guide
5958-9143	PORT/HP-UX Reference Manual

Other Migration Documentation

Programming for Portability, which is available free of charge through the Applications Engineering Organization

36217-90008	Migrating to HPIMAGE (ALLBASE/HP-UX)
92430-90003	FORTTRAN Migration Guide
92431-90004	Pascal Migration Guide

Ordering Information

PORT/HP-UX software is included with HP-UX on HP Precision Architecture Systems. PORT/HP-UX software includes the Migration Analysis Utility, FORTRAN conversion utilities, RTE emulation and data transfer utilities, and RTE floating point conversion routines.

The Programming for Portability documentation and the PORT/HP-UX Migration Utility are available without charge through the HP Applications Engineering Organization.

The database migration utilities are included with ALLBASE/HP-UX.

Contact your local sales office for further information.

For HP 9000 Series 800 Systems

product number 92430

FORTRAN 77, the most recent ANSI FORTRAN standard, incorporates a number of improvements and extensions to FORTRAN 66. Among the more important are an IF-THEN-ELSE control statement, a CHARACTER data type, and generalized Input/Output facilities. HP FORTRAN 77 is a superset of the ANSI FORTRAN 77 standard and includes MIL-STD-1753 extensions and other frequently offered extensions such as NAMELIST. It provides a well-defined language standard for software portability and offers extensions that enhance the flexibility and power of the FORTRAN 77 language.

HP FORTRAN 77/HP-UX is an implementation of HP FORTRAN 77 for the HP 9000 Series 800 systems. It runs under HP-UX and provides access to HP-UX subsystems and other HP-UX languages. It is highly compatible with FORTRAN 77/1000, FORTRAN 77/3000, and FORTRAN 77/9000 Series 200, 300 and 500.

Key Features

Program Structures

- SUBROUTINE and FUNCTION subprograms permit creation of modular programs.
- Multiple ENTRY points to a subprogram permit controlled sharing of data.
- Structured programming statements: IF-THEN-ELSE, Block DO, and DO WHILE, increase programmer productivity.

Data Manipulation

- INTEGER, REAL, and COMPLEX data types and operations provide efficient numeric computation.
- DOUBLE PRECISION and DOUBLE COMPLEX data types and operations provide extended precision numeric computation.
- CHARACTER data types and operations provide convenient string management operations.
- Bit manipulation functions provide shift, extract, and test operations.

Input/Output

- READ, WRITE, OPEN, CLOSE, and INQUIRE provide control and management of sequential or direct access, formatted or unformatted files.
- NAMELIST, list directed formatting, and standard devices, provide simplified I/O programming.
- Internal files provide in-memory FORMAT conversion.
- I/O specifiers ERR =, END =, and IOSTAT = allow I/O error handling.

Source Program Form

- INCLUDE statement allows insertion of program text (e.g. COMMON declarations) from another file.
- \$IF-\$THEN-\$ELSE directives provide conditional compilation.
- Names may have more than six characters to allow creation of meaningful names.
- End of line comments provide convenient placement of program commentary.

Compiler Features

- The compiler permits specification of three levels of optimization:
 - No optimization (default), necessary for symbolic debugging.
 - Level 1 optimization, produces smaller and faster code.
 - Level 2 optimization, produces the smallest and fastest code.
- Symbolic Debug/HP-UX support.
- Statement functions are implemented as macros.
- Compiler directives provide:
 - control of range checking and parameter checking.
 - control of conformance-to-standard checking.
 - selection of alternate semantics for DO loops, INTEGERS and LOGICALs, and data initialization.
 - control of program listing content.

Compatibility

HP FORTRAN 77/HP-UX is completely compatible with HP FORTRAN 77/XL, HP FORTRAN 77/V, and HP FORTRAN 77/9000-500. It is highly compatible with FORTRAN 77/1000, and FORTRAN 77/9000-300.

- Reference Manual Supplement (92430-90001) describes conversion to HP FORTRAN 77/HP-UX issues.
- A conversion utility, supplied with the compiler, translates FORTRAN 77/1000 features which have HP FORTRAN 77/HP-UX equivalents.
- Language extensions, provided by HP FORTRAN 77/HP-UX, support most FORTRAN 77/1000 features which do not have HP FORTRAN 77/HP-UX equivalents.

System Environment

HP FORTRAN 77/HP-UX is supported on HP-UX based HP 9000 Series 800 systems.

Ordering Information

Software

Product

Number	Product Description
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92430A	HP FORTRAN 77/HP-UX Right-to-Use Product.
92430R	HP FORTRAN 77/HP-UX Right-to-Copy product.

Documentation

For further technical information consult the following manuals:

Part

Number

Document Description

5957-4685	HP FORTRAN 77 Reference Manual
92430-90001	Reference Manual Supplement
5957-4686	HP FORTRAN 77 Programmer's Guide
92430-90002	Programmer's Guide Supplement
5957-4687	HP FORTRAN 77 Quick Reference Guide
92430-90003	HP FORTRAN 77/HP-UX Migration Guide

Customer Training

Two training courses are available: a self-paced courses with self study guide and videotape and a five day classroom course.

Course

Number

Course Name

22961C	HP FORTRAN 77 Self-Paced Training
22959C	Programming in FORTRAN 77

For HP 9000 Series 800 Systems

product number 92431

HP Pascal/HP-UX (subsequently referred to as HP Pascal) is Hewlett-Packard's implementation of the Pascal language for the HP 9000 Series 800 systems. It allows several extensions to the ANSI/IEEE and ISO standards for Pascal, including those which provide it with system programming capabilities. HP Pascal will be particularly useful for development of large systems and subsystems, and those applications which require system level programming.

Pascal offers a very rich and powerful set of data types and control flow structures. Along with control constructs, Pascal's basic building blocks of structure, namely procedures and functions, permit a top-down approach to program development. The modular, self documenting character of Pascal's programs provide code which is easy to maintain and to enhance. As a further aid to program development, the language offers strong type checking and range checking capabilities. A significant portion of the debugging responsibility now rests with the compiler and the language.

HP Pascal offers systems programming extensions to the above features. These extensions have permitted Pascal to be used extensively within Hewlett-Packard for systems level applications.

Key Features

Program Structures

- Powerful control structures, such as IF-THEN-ELSE, CASE, WHILE-DO, and REPEAT-UNTIL, eliminate the need for GOTOs and provide structure to the programs, improving their readability.
- PROCEDURE, FUNCTION and MODULE subprogram statement allow top-down, modular development of programs.

Data Manipulation

- REAL, LONGREAL, and INTEGER types provide efficient numeric computation.
- CHARACTER and STRING types, when coupled with pre-defined string handling functions, allow powerful string management operations.
- ARRAY, RECORD, SET, and FILE types facilitate the handling of data in structured, user-defined format.
- ENUMERATED and SUBRANGE types provide further customization of standard data types.
- CONFORMANT ARRAY parameter type provides flexibility in parameter passing.

Input/Output

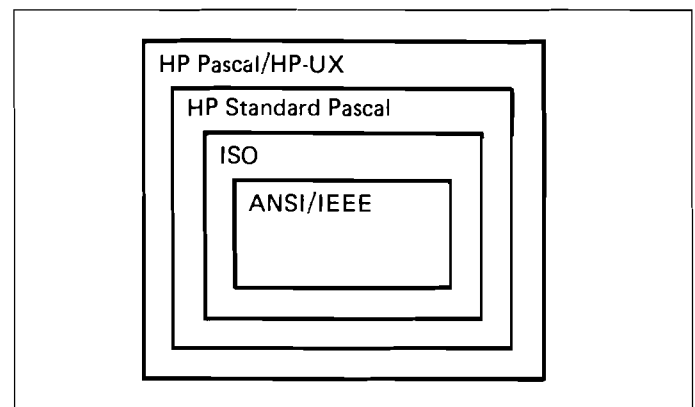
- I/O is with Files which are of two types: Text (sequential only), or structured files (can be sequential or direct access).
- Convenient I/O functions including READ, WRITE, OPEN, and CLOSE file functions, and other essential file management capabilities.
- Implicit data conversion for text files during input converts from ASCII to appropriate file variable format. The reverse is true for output.

Development Environment

- The full complement of utilities available with HP-UX can be used with HP Pascal. These utilities include full screen editing, version control via SCCS (Source Code Control System), and symbolic debugging via the HP-UX Symbolic Debugger.

Language Standards

HP Pascal is a superset of the ANSI/IEEE 770X3.97-1983 and ISO/DIS 7185 standards for Pascal. The systems programming extensions also make it a superset of the HP Standard for Pascal.



HP Standard Extensions to ANSI

The following are important extensions to ANSI/IEEE and ISO:

- STRING data type and associated functions
- Structured constants, Constant expressions
- Direct access and other I/O extensions
- MODULES and separate compilation
- LONGREAL data type

Systems Programming Extensions

HP Pascal includes extensions which permit a very high degree of flexibility for data manipulation. Some of the salient features are:

- Control over Pascal's type checking
- ANYPTR type and pointer manipulation routines
- Exception handling
- Procedure and Function variables
- Extended addressing
- Flexible procedure calling mechanisms

Compiler Features

- Compiler options facilitate control of:
 - source code, its conformance to ANSI or HP standards, and its conditional compilation.
 - content of program listings.
 - object code generated, and range checking.
 - data layouts and their manipulation.
- The HP 9000 Series 800 architecture permits special optimizing strategies. The following levels of optimizing are possible:
 - No optimization (default), which is necessary during symbolic debugging.
 - Level 1 optimization, done over small code sections, reduces code space and execution time.
 - Level 2 optimization, done over an entire procedure, results in the smallest and fastest code.

Subsystem Access

- Provides access and interaction mechanism for HP-UX file system, and all other HP-UX languages. Users can build their own "intrinsic", and enjoy the flexibility that is provided by the intrinsic mechanism.
- Provides access to data bases (via HPSQL and HPIMAGE), and all other HP-UX subsystems. Relevant data sheets provide more information.

Compatibility

- HP Pascal is a superset of the ANSI/IEEE, ISO and Hewlett-Packard standards for the Pascal language.
- HP Pascal offers a high degree of compatibility with the Pascal on the HP 1000 and HP 9000 Series 200/300/500 Systems.
- Migration documentation outlines issues regarding migration of Pascal programs on the HP 1000 and HP 9000 Series 200/300/500 to HP Pascal on the HP 9000 Series 800 Systems.

System Environment

HP Pascal is supported on the HP 9000 Series 800 Systems.

Ordering Information

Software

Product

Number Product Description

- | | |
|--------|---------------------------------------|
| 92431A | HP Pascal/HP-UX Right-to-Use product |
| 92431R | HP Pascal/HP-UX Right-to-Copy product |

Documentation

Part

Number

Document Description

- | | |
|-------------|---------------------------------|
| 31502-90001 | HP Pascal Reference Manual |
| 31502-90002 | HP Pascal Programmer's Guide |
| 31502-90003 | HP Pascal Quick Reference Guide |
| 92431-90004 | HP Pascal Migration Guide |

Customer Training

Course

Number

Course Description

- | | |
|---------|--|
| 31502AB | Advanced course that introduces Pascal programmers to HP Pascal extensions, particularly the system programming features, and to programming on HP-UX. |
|---------|--|

For HP 9000 Series 800 Systems

Bundled with HP-UX

C is a general-purpose programming language which features modern control flow and data structures, a rich set of operators, and economy of expression. It combines the convenience and portability of a high level language with the flexibility and efficiency of assembly language. C is the system programming language for UNIX* and a vehicle for transporting software from other UNIX systems.

HP C/HP-UX is an implementation of C for the HP 9000 Series 800 systems. It runs under HP-UX and provides access to HP-UX subsystems and other HP-UX languages. It is highly compatible with C/9000, and VAX** C and with C/1000 and C/3000 from Corporate Computer Systems.

Key Features

Program Structures

- Functions are recursive and can return scalar, structure, or union values, or void.
- Block structured scope of variables is provided.
- Public and private functions and data is provided.
- Structured programming statements: `if-else`, `for`, `while`, `switch`, are available.

Data Manipulation

- `int`, `float`, `double`, and `char` provide integer, floating point, and character data types and operations.
- `short`, `long`, `signed`, and `unsigned` provide control of size and interpretation of numeric data items.
- `auto`, `static`, `extern`, and `register` permit control of allocation of data items.
- arrays, structures, and unions provide composite data types.
- pointers provide effective manipulation of addresses.

Input/Output

- `fscanf`, `fprintf`, `fopen`, `fclose`, and their variants provide control and management of sequential, formatted files.
- standard input and output files simplify programming.
- standard error file is available for error messages.
- in-memory format conversion is available.

Source Program Form

A macro pre-processor provides a variety of source program management functions.

- `#define` statement allows definition of macros.
- `#include` statement allows inclusion of program text (e.g. common declarations) from another file.
- `#if-#else-#endif` directives provide conditional compilation.
- names may have more than eight characters to allow creation of meaningful names.

Compiler Features

- The compiler permits specification of three levels of optimization:
 - No optimization (default), is necessary for symbolic debugging.
 - Level 1 optimization, produces smaller and faster code.
 - Level 2 optimization, produces the smallest and fastest code.
- Symbolic Debug/HP-UX support.

Compatibility

HP C/HP-UX is highly compatible with C/1000, CCS C/3000***, C/9000, and VAX C.

- Documentation included with product describes compatibility issues.
- Compatibility with ANSI C will be provided when the standard is defined.

System Environment

HP C/HP-UX is supported on HP-UX based HP 9000 series 800 systems.

*UNIX is a trademark of AT&T.

**VAX is a trademark of DEC.

***Corporate Computer Systems, Inc. (NJ)

Ordering Information

Software

HP C/HP-UX is bundled with HP-UX.

Documentation

For further technical information, consult the following manuals:

Part Number	Document Description
92434-90001	HP C Reference Manual
92434-90002	HP C Programmer's Guide
92434-90003	HP C Quick Reference Guide
92434-90004	HP C Reference Manual Supplement

Customer Training

A five day classroom course is available:

Course Number	Course Name
35130A	The C Programming Language

For HP 9000 Series 800 Systems

Bundled with HP-UX

The HP Precision Architecture Assembler provides access to all architectural features of HP Precision Architecture computer systems.

HP Precision Architecture Assembler/HP-UX is an implementation of the Assembler for HP 9000 Series 800 systems. It runs under HP-UX and provides access to HP-UX subsystems and other HP-UX languages.

Key Features

- Symbolic statement labels
- Mnemonic instruction codes.
- Pseudo-operation codes for frequently used instruction sequences.
- Directives to control allocation of code and data.
- Directives to facilitate use of the standard call sequence.
- Execution options to control listing content.

System Environment

The Assembler is supported on HP-UX based HP 9000 series 800 systems.

Ordering Information

Software

Assembler/HP-UX is bundled with HP-UX on the Series 800.

Documentation

For further technical information consult the following manuals:

Part

Number

Document Description

92432-90001	Assembly Language Reference Manual
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Customer Training

A five day classroom course will be available.



For HP 9000 Series 800 Systems

Bundled with HP-UX

The HP-UX Symbolic Debugger is a powerful, full-featured symbolic debugger to help you find and correct errors in your programs. It runs under the HP-UX operating system on Hewlett-Packard's HP 9000 Series 800 systems. It supports interactive source level debugging for Hewlett-Packard's HP-UX languages of C, Pascal and FORTRAN 77. The HP-UX Symbolic Debugger is based on the popular industry debugger, **Cdb**, and has been extended to include additional features to provide greater user friendliness. For example, a windowing capability and macro facility have been added.

The HP-UX Symbolic Debugger allows you to examine the program state in which an error or some other condition, such as a signal, occurs. You may take corrective action and resume execution, or abort the program.

When first entered, the debugger displays the first executable statement, unless there is a core file present, in which case, the debugger will display the signal that caused the program to dump core and the location of the error. Once inside the debugger, a wide variety of commands are available for use.

- A **break** facility halts execution of your program at specified locations, allowing you to examine the state of your program.
- A **trace** facility lets you trace specified program flow by displaying the stack of a program.
- A **step** facility lets you single step through the program a source statement at a time.
- An **assertion** facility supports the execution of a list of commands before every source statement.
- **Data viewing commands** allow display of program data in various formats.
- A **record and playback** feature is provided to save debugger commands in a file and play them back for later use, allowing easy recreation of the state of a program.
- HP-UX Symbolic Debugger is **window-oriented** and will support up to three panes, allowing viewing of source statements and assembly instructions simultaneously. The window-oriented feature is implemented through the use of memory-locking, therefore, terminals that support memory-locking are required to support this feature. Terminals that do not support memory-locking may be used with the product, however, the viewing of debugger commands is limited to the lines present on the screen.

- A **macro** facility is supported to allow renaming of commands or creating a command consisting of several commands.
- A host of additional features beyond those just described, including an **on-line help and documentation facility**, make HP-UX Symbolic Debugger a friendly and powerful programmer's productivity tool.

Key Features

- Language sensitive expression evaluator for HP C, HP Pascal and HP FORTRAN 77 programming languages.
- Unrestricted number of breakpoints that can be set, deleted, suspended and activated.
- Single-stepping through a program at the source statement or the equivalent assembly instruction level.
- Assertions for tracing elusive bugs.
- Control of user program exceptions (signal handling) within the debugger.
- Display and modification of program variables
- Regaining control of free running user program initiated by the debugger.
- Multi-level stack tracing.
- Extensive interrogation of the debugger state, including breakpoints, files, globals, procedures and their variables.
- Record and playback of debugger commands to help recreate debugging sessions.
- Access to HP-UX operating system via running a shell program within the debugger.
- Macro facility allowing users to define their own names for command strings.
- Debugging of core files.
- Friendly user interface including online help, support of multiple skill levels, and windowing-orientation.

Functional Description

Source level symbolic debugging. While in the debug process, the HP-UX Symbolic Debugger recognizes the names, types and locations of all the variables and routines for the HP-UX languages of C, FORTRAN 77 and Pascal. Programs can be debugged without the need for load maps, symbol table dumps or mixed listings.

Assembly level debugging. The debugger will allow you to display high-level source code in assembly language. It can single-step at the instruction level and supports display and modification of registers.

Interactive debugging process. The user interacts with the program as it runs and can examine or alter variable values while the program runs without having to insert statements into the code.

Separate Process. HP-UX Symbolic Debugger runs as a process separate from the user program. No significant code or data space is lost and no extra statements are added in order to debug. The program being debugged runs exactly the same as it would normally. There is no need to restructure the program to debug it.

Unrestricted number of breakpoints. HP-UX Symbolic Debugger supports an unrestricted number of breakpoints to monitor program execution, for example, to halt if a variable reaches a specified value. Any number of possible paths can be trapped and values can be quickly tracked through the program to determine error conditions.

Supports command files and message logging. Debugging sessions may occur where users can submit debug commands in a file, and have results logged in another file. This automates the debugging process, so users don't have to wait for bugs whose symptoms may take a prolonged period of time to occur.

Compatibility

- The debugger is Hewlett-Packard's version of the **cdb** debugger, which runs on the HP 9000 Series 200, Series 300 and Series 500 product lines. HP-UX Symbolic Debugger is highly compatible with **cdb**, however, to support greater user friendliness, some modifications and extensions to the **cdb** debugger have been implemented. For example, the positioning of the command arguments has been altered slightly, and a windowing and macro capability has been added. To support additional languages beyond C, the separator for variable names has been changed from a period (.) to a colon (:), since a period is an operator used for accessing the fields of a record in the HP-UX languages of C and Pascal. Compatibility information is contained in the "HP-UX Symbolic Debugger Users Guide".
- HP-UX Symbolic Debugger does not support source-level debugging of optimized code.

System Environment

HP-UX Symbolic Debugger is supported on the HP-UX based HP 9000 Series 800 systems.

Ordering Information

Software

Bundled with the HP-UX Operating System.

Documentation

For further technical information consult the following manuals:

Part Number	Document Description
92435-90001	HP-UX Symbolic Debugger Users Guide
92435-90002	HP-UX Symbolic Debugger Quick Reference Guide

Customer Training

Bundled with advanced languages classroom training courses for HP C, HP Pascal and HP FORTRAN 77.



For HP 9000 Series 800 Systems

product numbers 92436A and 92437A

Starbase Graphics Library

The Starbase graphics library is a low-level two-dimensional (2-D) and three-dimensional (3-D) graphics library for HP-UX. Starbase is based on the American National Standards Institute's (ANSI) evolving Computer Graphics Virtual Device Interface (CG-VDI) standard and HP standards. Starbase is designed with the objective of high performance.

Starbase on the HP 9000 Series 800 Model 840 is 100% compatible with the current implementations of Starbase on the HP 9000 Series 300 and 500 computers, and supports specific HP terminals and plotters. A graphics application written on a Model 840 can be ported to run without change on the Series 300 or 500. Using peripherals supported on the Model 840, graphics applications supported on the Model 840, graphics applications written on a Series 300 or 500 workstation can be ported to run without change on the Model 840. A Series 300 or 500 interactive workstation can be used to generate graphics graphics output, which can be saved in a file for later plotting. For example, the Model 840 can be used as a peripheral server, spooling files to a large plotter from a network of workstations.

Features

- Two-dimensional (2-D) and three-dimensional (3-D) graphics.
- Multiple input and output devices.
- Independent viewing transformations per process per device.
- Dynamic allocation of devices (run-time device independence).
- Device independence.
- Based on evolving ANSI and HP standards.

Starbase and Standards

Starbase is based on the evolving CG-VDI ANSI standard. The big advantage of CG-VDI is its potential for industry-wide compatibility under many operating systems on different size computers. This means that programs can be easily ported. There is "programmer portability" as well, meaning shorter learning cycles.

CG-VDI makes all devices appear as identical virtual graphics devices by defining a standard input/output protocol. The unique characteristics of the physical graphics devices are isolated in device-driver software modules.

The CG-VDI structure is composed of two distinct units, the control software associated with the application and the device-driver software associated with an input or output device.

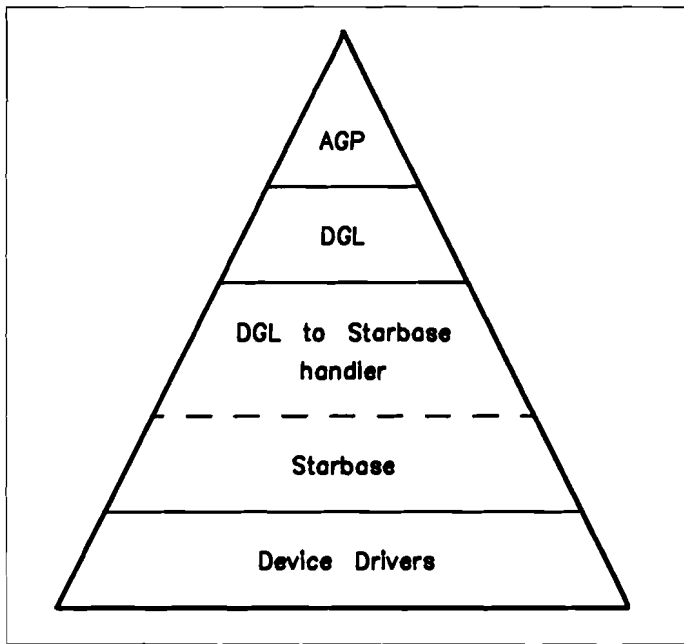
The language binding portion of CG-VDI accepts input from the application in the form of run-time library subroutine calls and translates the graphics requests into code for use by the device-driver portion.

Because CG-VDI only defines primitives for 2-D graphics, HP has chosen to extend the CG-VDI definition to support 3-D primitives. The 3-D functionality of Starbase relieves the application developer from programming all the mathematics and transformations necessary to produce and manipulate 3-D graphical images that have appropriate perspective, clipping, etc.

DGL/AGP

The Device-Independent Graphics Library (DGL) and the Advanced Graphics Programming language (AGP) are also offered on the HP 9000 Model 840. DGL/AGP applications can be run using a DGL-to-Starbase handler, which is part of the Starbase graphics library. This provides for porting of existing code and support of new peripherals, while maintaining DGL/AGP functionality. This makes it easier for DGL/AGP users to migrate future development to Starbase. The figure below helps illustrate the relationship between Starbase and DGL/AGP.

On previous HP 9000 family computers, DGL included device drivers to talk to the variety of devices directly, as well as through the the Starbase handler. DGL/AGP as offered on the Model 840 only uses the DGL-to-Starbase handler, which is part of Starbase. Therefore Starbase is required for DGL/AGP to run on the Model 840 and, for that reason, Starbase is bundled with DGL/AGP on the Model 840.



Starbase Graphics Library Commands

await_event – wait for an event to occur, then return the class of that event

await_retrace – wait for vertical retrace on raster scanning devices

background_color[—index] – set the background color

block_move # – frame buffer to frame buffer block copy procedure

block_read # – frame buffer to main memory block copy procedure

block—write # – main memory to frame buffer block copy procedure

buffer_mode – set the buffering mode for output primitives

character_expansion_factor – specify cell height-to-width ratio

character_height # – specify character height

character_slant – specify character slant

character_width # – specify character width

clear_control – select the portion of display surface to be cleared

clear_view_surface – set specified portion of display surface to background color

clip_depth – define the front and back clipping planes

clip_indicator – enable/disable clipping to specified boundary

clip_rectangle – define the current clip rectangle boundary

concat_matrix – multiply two matrices and return the resulting matrix

concat_transformation % – concatenate a matrix with current transformation matrix

dc_to_vdc – transform a DC point into a VDC point

define_color_table – set the entries in the device color map

define_raster_echo – define a raster echo

depth_indicator – enable/disable clipping to front and/or back clipping planes

designate_character_set – associate a G-set with a character set

disable_events – disable queuing of events from specified graphic input device

display_enable – select which planes of a raster device are to be displayed

draw* – draw line from current position to specified position

drawing_mode – select pixel replacement rule for output primitives

echo_type # – select output device's type of echo

echo_update # – specify the position of the output device's echo

enable_events – enable the queuing of events from the specified input device

fill_color[_index] – set the fill color for polygons

fill_dither – select number of colors searched for and placed in in dither cell

flush_matrices – pop all matrices from the matrix stack

gclose – close the specified graphics device

gerr_control – control the handling of a graphics error

gescape – device dependent input and output control

gopen – open a Starbase graphics device

initiate_request – start a request process without waiting for the result

inquire_color_table – return current color map entries

inquire_gerror – return information on the most recent graphics error

inquire_id – return device driver information

inquire_input_capabilities – inquire the capabilities of the input device

inquire_request_status – inquire status of a request to an input device

inquire_sizes – return device dependent sizes

inquire_text_extent – return the coordinates of the text extent rectangle

interior_style – select fill type and boundary visibility for polygons

intra_character_space – specify the spacing between character cells

line_color[_index] – select the color for line primitives

line_repeat_length – set the size of line type patterns for line primitives

line_type – select a line type for line primitives

make_picture_current – flush all internal output buffers

mapping_mode – select isotropic or anisotropic mapping

marker_color[_index] – select the color for polymarker primitives

marker_orientation – specify the orientation of markers

marker_size # – specify the size of markers

marker_type – select a type of marker for polymarker primitives

move * – update the current pen position

partial_polygon * – define a subpolygonal region

perimeter_color[_index] – select the color for polygon perimeters

perimeter_repeat_length – set size of line type patterns for

perimeter_type – select a line type for polygon perimeters

polygon * – define a polygonal region to be filled and/or edged

polyline * – move/draw between specified points

polymarker * – draw markers centered at specified points

pop_matrix % – pop and return TOS matrix

push_matrix % – push a matrix onto the TOS

push_vdc_matrix – push the VDC-to-DC transformation matrix onto the TOS

read_choice_event – read a choice event from the top of the event queue

read_locator_event – read a locator event from the top of the event queue

rectangle \$ – define a rectangular region to be filled and/or edged

replace_matrix % – replace the TOS matrix

request_choice – request choice input

request_locator – request locator input

sample_choice – immediately return current choice state

sample_locator – immediately return current locator state

set_locator – set the locator location

set_p1_p2 – set physical device limits

set_signals – disable/enable the signal function of the specified device

text *, append_text – output a string of characters

text_alignment – select the type of alignment of text lines

text_color[_index] – select the color for text primitives

text_font_index – select the character font for text primitives

text_line_path – define the relative position between successive lines of text

text_line_space – set the spacing between lines for text primitives

text_orientation % – specify text orientation

text_path – select the direction of text characters

text_precision – select how text will be drawn

text_switching_mode – select designation and invocation mode of character sets

track – asynchronously echo an input device's locator position on output device

track_off – stop asynchronous tracking

transform_points – transform points using the TOS matrix

vdc_extent – define a scaling transformation for p1, p2 region

vdc_to_dc – transform a VDC point into a DC point

vdc_to_wc – transform a VDC point into a WC point

viewport_justification – specify viewport placement within the physical limits

wc_to_vdc – transform a WC point into a VDC point

write_enable – select which planes of a frame buffer device are modifiable

Notes:

* - procedures allow 2-D, 3-D, or DC data (example - draw2d, draw3d, or dcdraw)

\$ - procedures allow 2-D or DC data (example - rectangle or drectangle)

% - procedures allow 2-D or 3-D data (example - pop_matrix2d or pop_matrix3d)

- procedures allow VDC or DC data (example - echo_update or dcecho_update)

Abbreviations:

VDC – virtual device coordinate

DC – device coordinate

WC – world coordinate

TOS – top of stack

Supported Graphics Peripherals

Graphics Terminals

HP 2393A 12-in. Monochromatic Graphics Terminal

HP 2397A 12-in. Color Graphics Terminal

Human Interface Accessories

(supported only with HP 2393A or 2397A terminal)

HP 35723A HP-HIL HP-Touch Bezel for use on HP 35731A or 35741A 12 in. CRT monitor

HP 46060A HP-HIL HP Mouse, two-button

HP 46083A HP-HIL Rotary Control Knob

HP 46087A HP-HIL A-size Digitizer

HP 46088A HP-HIL B-size Digitizer

HP 46089A 4-button Cursor for HP 46087/88A

Plotters

HP 7440A ColorPro A-size, 8-pen Plotter

HP 7475A A/B size, 6-pen Plotter

HP 7550A A/B size, 8-pen Sheet-feed Plotter

HP 7586B A..E size, 8-pen Roll-feed Drafting Plotter

Ordering Information

The right to use the Starbase and DGL/APG graphics Libraries is available according to the terms and conditions of the Hewlett-Packard Software Purchase Agreement.

Software

Product

Number Product Description

- 92436A Starbase Graphics Library Right-to-Use product on one of Media Options AA0 or AA1, which must be ordered.
- 92436R Starbase Graphics Library Right-to-Copy Product with Sublicense.
- 92437A DGL/AGP Graphics Library, which includes the 92436A Starbase Graphics Library, Right-to-Use product on one of Media Options AA0 or AA1, which must be ordered.
- 92437R DGL/AGP Graphics Library Right-to-Copy Product with Sublicense.
- 92438A HP-UX Development Pack (Starbase, DGL/AGP, HP FORTRAN 77, and HP Pascal). Right-to-Use product on one of Media Options AA0 or AA1, which must be ordered.

Software Media Options

AA0: Software on CS/80 1/2-inch cartridge tape

AA1: Software on 1600 cpi mag tape

Starbase Documentation

Part

Number

Document Description

Starbase Concepts and Tutorials
Starbase Graphics Device Drivers Library
Manual for HP 9000 Model 840
Starbase Graphics Reference Manual

DGL/AGP Documentation

Part

Number

Document Description

The Starbase Documentation listed above and the following additional manuals.

DGL Programmer's Reference Guide
DGL Supplement for HP-UX Systems
DGL/AGP to Starbase Device Handlers
Manual
AGP User's Guide
AGP Supplement for HP-UX Systems
AGP Language Reference Manual

For HP 9000 Series 800 Systems

product number 36217A

Making It Easy to Have It All

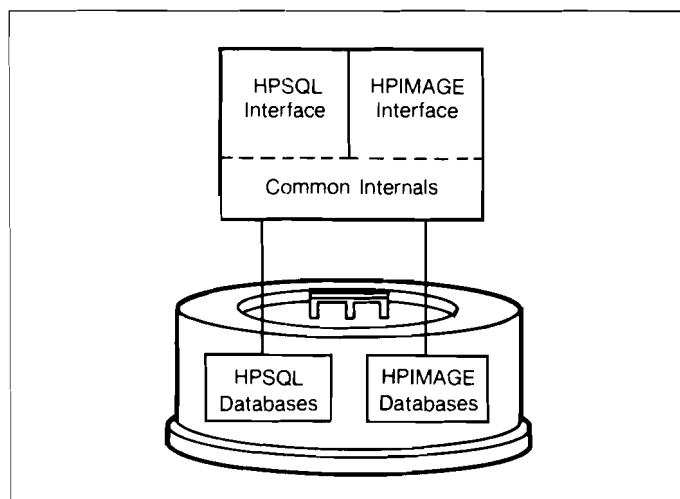
ALLBASE is the leading edge database management system (DBMS) which lets you choose the appropriate data model on an application by application basis. With ALLBASE's integrated relational and network data models, you are not forced to fit all of your applications to a single data model, relational or network. Since you are now provided with a choice, the decision of which model to use depends solely on which model provides the optimal foundation for each application.

ALLBASE offers a comprehensive set of functionality whether using HPSQL, the relational model interface, or HPIMAGE, the network model interface. There are many additional features tailored to the specific needs of each interface which may be used with the databases created using that interface. A future release of ALLBASE will allow HPIMAGE databases to be accessed via HPSQL.

ALLBASE is built on a solid foundation of common internals which have been designed specifically to exploit the performance of HP Precision Architecture.

Key Features

- Coexisting relational model interface and network model interface allow the optimal data model to be chosen on an application by application basis.
- Data may be accessed directly from a terminal or via application programs written in common programming languages.
- Security is maintained by allowing specification of appropriate levels of access privileges to individual users or groups of users.
- Concurrent access allows multiple users to access data simultaneously.
- Data independence allows changes to be made to the database structure without requiring that applications be modified.
- User controlled transactions ensure that data is always in a consistent state.
- Automatic locking ensures data integrity in a multi-user environment by preventing access to data while it is being updated.
- Automatic (rollback) recovery ensures logical data integrity in the event of a soft crash.
- The rollback capability may also be invoked in a program to allow erroneous data, usually generated in an on-line situation, to be purged before the transaction is completed.



- Rollforward recovery ensures logical and physical data integrity in the event of a hard crash.
- Fast data access is supported through B-tree indices (HPSQL and HPIMAGE) and hashing (HPIMAGE only).

HPSQL Specific Features

- Relational data model allows the user to specify only what data is required without specifying how to retrieve it.
- SQL relational language for data definition and manipulation is the de facto industry standard.
- Views may be defined which allow a group of users to view parts of one or more tables as a single, virtual table customized to their particular needs.
- Interactive SQL (ISQL) allows the database to be queried from a terminal using the powerful SQL relational language.
- Language preprocessors allow the same statements which are used for a direct query via a terminal to be embedded in FORTRAN, C, or Pascal application programs.
- A sophisticated query optimizer relieves the programmer of the details of query planning without sacrificing performance.
- Dynamic restructuring allows the data structure, table capacities, and security to be changed without unloading and loading the database.
- Null data values allow use of fields which are relevant to some, but not all, records in a table.

HPIMAGE: Specific Features

- Network data structure allows fast access to complex relationships among data.
- Multiple level relationships allow hierarchical data structures to be easily modeled.
- IQUERY provides the programmer and database administrator with a powerful query facility which includes the ability to report data combined from different data sets.
- IMAGE/1000 Translator facilitates a smooth migration of IMAGE/1000 applications and databases to HPIMAGE.
- High level intrinsics allow applications written in FORTRAN, C, or Pascal to easily access the database.
- Dynamic capacity expansion and security modification allow data set capacities to be expanded and security designations to be modified without unloading and loading the database.
- Generic search allows records to be located by specifying only a portion of the value in a field.
- Referential integrity may be maintained through definition of parent/child relationships.

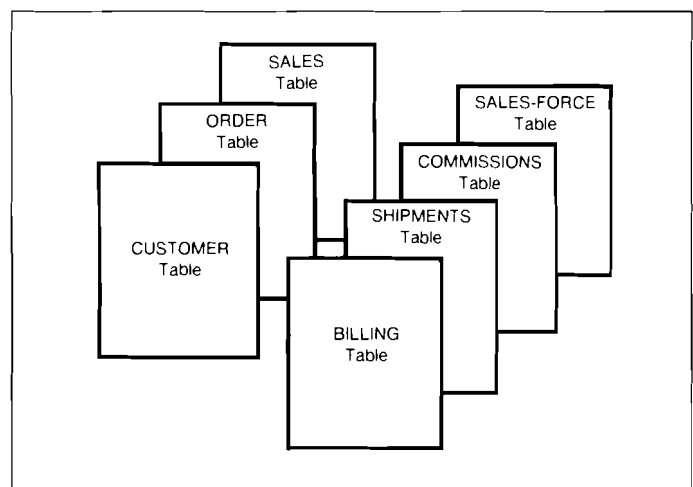
Functional Description

HPSQL: A complete relational model interface

HPSQL is a functionally complete, relational model interface which features a full implementation of the de facto standard SQL relational language. SQL is a non-procedural language whose powerful commands operate on entire sets of data at a time, rather than using the procedural, record-at-a-time approach of network and hierarchical model databases.

The select, project, and join operators of relational theory are supported. These are implemented through the SQL language with the SELECT command for reading data. HPSQL also supports the other three data manipulation language (DML) commands of the SQL language: INSERT, for inserting groups of records; UPDATE, for updating (modifying) groups of records; and DELETE, for deleting groups of records.

HPSQL does not require that explicit relationships between different tables (data sets) be defined. Relationships are determined, at the time a query is performed, by matching values between a column common to two or more tables. Since data from any number of tables which share a common column may be related as needed, an HPSQL database consists of a group of tables which the user decides he may have a need to relate.



Simplified HPSQL Relational Structure

SALES-FORCE TABLE

NAME	EMP-NO	DEPT	DIV
Smith	809	E21	CSY
Jones	201	C23	MPD
Nevitt	502	E21	CSY
Klein	702	D45	OED

SELECT Name, Emp-no
FROM Sales-force
WHERE Dept = 'E21'

NAME	EMP-NO
Smith	809
Nevitt	502

The Set-at-a-Time Query Approach of HPSQL

A sophisticated query optimizer determines the optimal data access strategy based on such factors as the presence of indices and the relative sizes of the tables being accessed. This frees the programmer from detailed query planning without sacrificing performance.

Language preprocessors provide easy, high level access to the database via common programming languages. This approach significantly improves performance by allowing query optimization to be performed when the application is compiled instead of at run time.

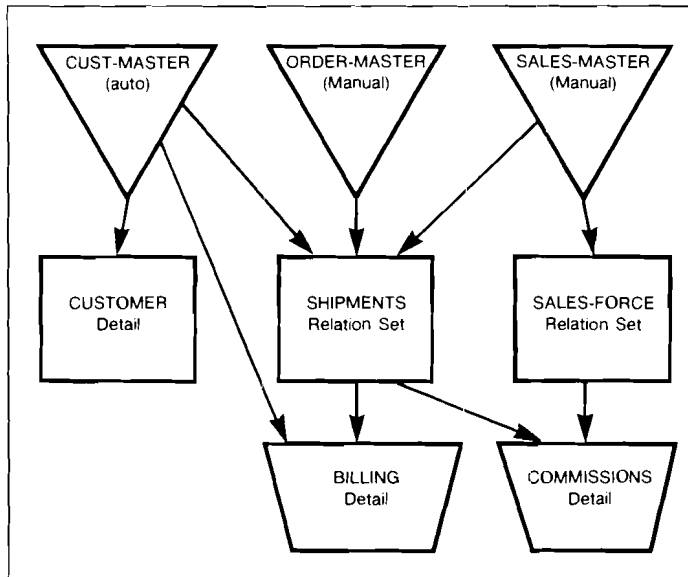
Interactive SQL (ISQL) is the comprehensive interactive interface to HPSQL. There are two distinct sets of functionality which may be used via ISQL. The first is the data definition language (DDL) which allows the database administrator (DBA) to control all aspects of database creation and modification.

The second set of ISQL accessible functionality is a complete implementation of the SQL data manipulation language which allows the programmer or frequent user to query the database from a terminal using the non-procedural SELECT, UPDATE, INSERT, and DELETE commands.

HPIMAGE: A complete network model interface

HPIMAGE is a functionally complete, network model interface which provides functionally beyond that of IMAGE/1000, TurboIMAGE, and IMAGE/9000. With HPIMAGE, relationships between data sets are predefined as part of the database structure (called the schema). These predetermined relationships provide application programs with the fastest data access ALLBASE has to offer. HPIMAGE allows multiple levels of parent/child relationships to be defined. A parent/child relationship, for example, exists between an order data set (parent) and a shipments data set (child) since a valid shipment can only be made against an existing order.

A rich set of relationships may be defined using HPIMAGE: a parent set may have multiple children; a child set may have multiple parents; and a set may be both a parent to some sets and a child to others (multiple levels). With these relationships, HPIMAGE can directly model the information flow of your business.



Simplified HPIMAGE Network Structure

HPIMAGE implements its data manipulation language with a full set of reading, inserting, updating, and deleting capabilities which may be exercised from an application program via intrinsics (library routines).

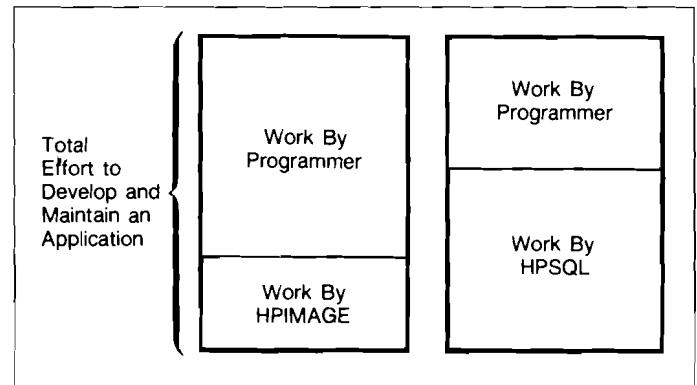
A comprehensive set of data definition language commands and utilities for defining and maintaining the database are provided by HPIMAGE.

HPIMAGE also includes IQUERY, which is a powerful query facility for the programmer and database administrator (DBA).

When to use HPSQL — When to use HPIMAGE

ALLBASE includes a relational model interface and a network model interface because both data models have their place in meeting your business needs.

Applications may be developed in less time with HPSQL than with HPIMAGE. With HPSQL, the programmer must specify only what data is required, not how to access it. This significantly reduces the amount of query preplanning required during application development and maintenance. The non-procedural nature of SQL also results in greater data independence and less application code. The high degree of data independence often allows the database to be restructured without requiring that applications be modified. The reduction in code also improves the productivity of maintenance programmers by allowing application code to be quickly understood and modified when changing business needs require that applications be updated.



Programmer Productivity Advantage of HPSQL

The procedural HPIMAGE interface allows the programmer to specify exactly how the data is to be accessed. While this requires more query preplanning, it allows the sophisticated programmer the granularity of control necessary to obtain optimum performance to support throughput or response-time critical applications.

A future release of ALLBASE will allow HPIMAGE databases to be accessed via HPSQL, although not vice versa. Thus, databases which you will eventually want to access via both interfaces should be created using HPIMAGE.

ALLBASE: Ensuring Data Integrity Views

HPSQL allows views to be created. A view is a table derived by defining a "filter" over one or more tables to let users or programs view only certain data in the tables. Views improve security by allowing users to access only data for which they have a need to know. Since the view is not actually a physical table, use of views does not result in redundant data. When data in a table is updated, all views which use that data are automatically updated.

Security

Security is maintained by allowing specification of appropriate levels of access privileges to individual users or groups of users.

HPSQL allows read (SELECT) access and write access privileges to be assigned at the table level. Read or write access restriction at a finer granularity than the table level, such as at the column level, may be obtained by defining a view of the table which omits the sensitive information. Modification (UPDATE) authority may be granted at the column level without requiring that a view be specified. Write access may be assigned to allow any combination of the following capabilities: row modification (UPDATE), row insertion (INSERT), and row deletion (DELETE). The DBA assigns access privileges by grouping users with common access needs into authorization groups. The particular read and write authorities are then assigned by the DBA to each of these groups. Users with unique access requirements may also be granted privileges directly.

HPIMAGE allows read and write access to be assigned at the data set and item level. The DBA groups all users into security classes. These classes are analogous to the authorization groups of HPSQL. The DBA specifies in the database schema which security classes have read access, which have write access, and which have both read and write access to each data item and data set. When a user opens the database, the password he gives identifies the security class to which he belongs and therefore his read and write access privileges throughout the HPIMAGE database.

Logical Transaction Defined

A logical transaction is a series of database modifications of which either all or none must be performed to leave the database in a consistent state. The particular grouping of modifications defined by the user to be a transaction will vary depending on the particular application. An example of a transaction is the sign-out of a tool from a tool crib: both the removal of the tool from the crib on-hand inventory records and the addition of the tool to the list of tools assigned to a particular department is required to keep the tool from being either double counted or lost in the system. This concept of a logical transaction is essential to ensuring that data integrity is maintained when multiple users are concurrently accessing the database or in the event of a system failure.

Concurrency

ALLBASE preserves data integrity when multiple users are accessing a database through a comprehensive locking scheme based on the transaction concept. When a user begins a transaction, a lock is automatically granted for each page read or modified by the transaction (a page is a unit of data storage which contains 4,096 characters). This ensures that no one else may update the data on those pages while the user is reading or updating them. If data is only being read, then other users are not prevented from reading it simultaneously; they just can't update it. If data is being

updated, however, then data integrity is ensured by preventing the other users from reading or updating the data. When the user's transaction is completed, all acquired locks are automatically released.

Tables (data sets) may also be locked explicitly. This feature is provided to allow the programmer greater flexibility in applications where it is advantageous to lock large portions of the database. Since explicit locks reduce concurrency, they are not recommended for general use.

ALLBASE also contains sophisticated deadlock detection and correction capabilities. When a lock conflict is detected, ALLBASE will rollback one of the transactions, thereby preserving data integrity, and notify the application program that it has done so. This notification allows the application program to determine how to continue processing.

Recovery

ALLBASE ensures that the logical and physical integrity of the database is protected in the event of a program abort, system failure, or destruction of the media on which the database resides.

Rollback recovery is an automatically activated recovery feature which ensures that the database is always in a logically consistent state. ALLBASE logs before-images and after-images for each write transaction to a log file on disc. In the event of a system failure or program abort, ALLBASE uses this log file to automatically back out any partially completed transactions.

The rollback capability may also be invoked in an HPSQL or an HPIMAGE program. This is a particularly valuable feature in an on-line application as it allows a user who has entered incorrect information to nullify the transaction before its completion.

Rollforward recovery protects the physical and logical integrity of the database against media failure. In the event of a hardware or software failure, the transactions from the log file are reapplied to a backup copy of the data to bring it up to the current state.

A simultaneously updated copy of the log files used for rollback or rollforward recovery may be kept on another disc to provide additional protection in the case of a disc failure.

Referential Integrity

The predefined relationships of HPIMAGE allow referential integrity to be maintained. Once a parent/child relationship has been established between HPIMAGE data sets, referential integrity is maintained by preventing the deletion of a parent record without first deleting all corresponding child records and by preventing the addition of a child record unless a corresponding parent record exists. For example, an HPIMAGE database could be easily defined which would prevent deletion of an order record (parent) until all of the shipments against that order (children) have been deleted and which also would prevent any shipment records from being inserted unless they are against a valid order.

ALLBASE: Interactive Data Access

ALLBASE includes two powerful query facilities which aid the application programmer and the database administrator in the creation and support of HPSQL and HPIMAGE databases. Interactive SQL (ISQL), for use with HPSQL databases, and IQUERY, for use with HPIMAGE databases, may be executed interactively (from a terminal) or in a batch mode. Output may be directed to a terminal or to any other output device (ie. line printer, disc, tape). Frequently used ISQL and IQUERY procedures may be stored on disc for future use.

ISQL and IQUERY both honor the ALLBASE security system. When accessing the database, the user may only exercise the read/write access privileges which have been allowed him in the database definition.

ISQL for HPSQL

ISQL is a database support tool integrated into HPSQL which features a powerful, non-procedural query facility. ISQL allows SQL queries to be executed directly from a terminal, giving programmers and frequent users the ability to use this powerful language for ad hoc queries. Since the syntax of the SQL query is the same whether executed using ISQL or embedded in an application program, the programmer can cut application development time by using ISQL to test database queries before embedding them in applications. ISQL also includes a powerful bulk load facility which is particularly useful when creating test databases.

IQUERY for HPIMAGE

IQUERY is a database support tool included with ALLBASE for use with HPIMAGE. IQUERY features a powerful, command driven interface designed for application programmers and database administrators. IQUERY provides extensive locating, reporting, and updating commands. These commands provide flexible data access on an ongoing basis and are particularly valuable when testing new database applications and structures.

ALLBASE: Access of Data via Programs

Both HPSQL and HPIMAGE databases may be easily accessed from application programs. A list of the high level languages from which each of the databases may be accessed is included in the *Other Specifications* section at the end of this data sheet.

Preprocessors for HPSQL

HPSQL uses language preprocessors to provide easy, high level access to the database via common programming languages. To access an HPSQL database from an application, SQL queries are embedded directly in the source code. Before compiling the application, it is preprocessed (precompiled). Preprocessing replaces the SQL queries with language specific calls and performs the query optimization.

The preprocessor approach improves performance by allowing query optimization to be performed when the application is compiled instead of at run time. At run time,

HPSQL will detect if a change in the database structure has invalidated the access strategy for any of the queries and will automatically optimize those queries for the new structure.

Intrinsics for HPIMAGE

HPIMAGE databases are accessed from application programs via intrinsics, which are calls to library routines. Intrinsics provide a straightforward method of database access. This direct access approach is optimal in HPIMAGE since the data access paths are specified in the application program. Intrinsics also ensure maximum compatibility with IMAGE/1000 and IMAGE/9000.

ALLBASE: Creating and Maintaining Databases

Database Creation

As part of the database design process, the DBA must decide how many databases should be included in each ALLBASE DBEnvironment. A DBEnvironment may contain one or more databases. Multiple databases which will be accessed via a single program should be placed in the same DBEnvironment. The DBEnvironment is also the granularity at which the data is backed up, therefore unrelated databases should be placed in separate DBEnvironments.

After the DBA has designed the database structure on paper, he may easily create the database. The first step in creating a database is the same for HPSQL and HPIMAGE. A DBEnvironment must be configured for the database unless it will be included with other databases in an existing DBEnvironment. The remaining step in creating an HPSQL database is to create the tables (CREATE TABLE command), indices (CREATE INDEX command), and views (CREATE VIEW command) which comprise the database.

The DBA who is creating an HPIMAGE database creates the *schema* for the database after configuring a new DBEnvironment (if required). A schema is a text file which describes the structure of the database. The final step when creating an HPIMAGE database is to run the schema processor which creates the actual database structure from the schema file.

Database Restructuring

ALLBASE provides a full set of database restructuring capabilities. HPSQL and HPIMAGE support dynamic restructuring for commonly required structural changes. Dynamic restructuring allows users to continue to access data, except for the affected areas, during restructuring.

HPSQL provides dynamic restructuring for the following cases: expanding table capacities; altering security designations; adding columns; and adding or deleting indices, views, and tables.

HPIMAGE provides dynamic restructuring capabilities for increasing data set capacities and for changing security designations.

Database Compatibility

HPIMAGE (ALLBASE) and IMAGE/1000

IMAGE/1000 applications can be run on the Model 840, in many cases with no source code changes, via the IMAGE/1000 Translator in conjunction with the HPIMAGE interface of ALLBASE. The IMAGE/1000 Translator translates, at run-time, the IMAGE/1000 calls from the application into the appropriate HPIMAGE calls. This translation is performed transparently to the application with little overhead. A data migration utility, DBMUN, simplifies data migration by unloading the IMAGE/1000 database for subsequent loading into an HPIMAGE database using the standard HPIMAGE LOAD utility. A third migration aid, DBDECODE, allows an HPIMAGE database schema to be generated from an IMAGE/1000-II (P/N 92081A) root file.

The IMAGE/1000 Translator, DBMUN, and DBDECODE are all included with ALLBASE/HP-UX.

HPIMAGE (ALLBASE) and IMAGE/9000

HPIMAGE provides a superset of functionality over that provided with IMAGE/9000 using similar, but not fully compatible, intrinsic calls. To move IMAGE/9000 applications from a Series 500 to HPIMAGE on the Model 840, the IMAGE/9000 calls in the application must be changed to HPIMAGE calls.

ALLBASE/HP-UX and ALLBASE/XL

ALLBASE is the common Hewlett-Packard DBMS across all HP Precision Architecture systems. ALLBASE/XL is the ALLBASE implementation on the HP Precision Architecture based 900 Series of HP 3000 computer systems. ALLBASE/HP-UX and ALLBASE/XL are fully compatible — the HPIMAGE interface of ALLBASE/HP-UX is 100% compatible with the HPIMAGE interface of ALLBASE/XL and the HPSQL interface of ALLBASE/HP-UX is 100% compatible with the HPSQL interface of ALLBASE/XL.

ALLBASE/HP-UX and HPtoday/HP-UX

HPtoday/HP-UX (P/N 92440A and 92441A) is a high productivity application development environment which can be used to quickly develop menu-driven applications based on HPSQL (ALLBASE/HP-UX) databases. A bundle of ALLBASE/HP-UX and the HPtoday/HP-UX development environment is also available (P/N 92442A). The HPtoday/HP-UX data sheet provides more information on the capabilities of the HPtoday products.

System Environment

ALLBASE/HP-UX is supported on the HP 9000 Series 800 systems.

Ordering Information

The right to use ALLBASE on the HP 9000 Series 800 systems is available according to the terms and conditions of the Hewlett-Packard Software Purchase Agreement.

Software

Product Number	Product Description
36217A	ALLBASE/HP-UX Right-to-Use product.
36217R	ALLBASE/HP-UX Right-to-Copy product with sublicense.
92442A	Bundle of ALLBASE/HP-UX Right-to-Use product and HPtoday Developer Pack/HP-UX Right-to-Use product.

Documentation

Part Number	Document Description
36217-90001	SQL Reference Manual
36217-90002	HPIMAGE Reference Manual
36217-90003	IQUERY Reference Manual
36217-90004	ISQL Reference Manual
36217-90005	HPSQL Database Administration Guide
36217-90013	HPSQL FORTRAN Application Programming Guide
36217-90014	HPSQL C Application Programming Guide
36217-90007	HPSQL Pascal Application Programming Guide
36217-90008	Migrating to HPIMAGE
36217-90009	HPSQL Message Manual
36217-90010	HPIMAGE Message Manual
36217-90012	HPSQL Quick Reference Guide

Customer Training

Six classes, each one tailored to the needs of a specific group of ALLBASE users, are available through the local sales office. Each course includes instruction and labs.

Course Number	Course Name
36217AB	Introductory Interactive SQL User's Course
36217AE	Introductory HPIMAGE User's Course
36217AC	HPSQL Database Administration Course
36217AF	HPIMAGE Database Design and Maintenance Course
36217AD	HPSQL Application Programming Course
36217AG	HPIMAGE Application Programming Course

Contact the local sales office for course outlines and schedules.

Other ALLBASE Specifications

	HPSQL	HPIMAGE
Data Types	Decimal (packed) IEEE Standard, Double Precision Floating Point (8 byte) Integer (2 & 4 byte) Fixed Length (<3996 bytes) Character Variable Length (<3996 bytes) Character	Decimal (packed & zoned) Floating point (4 & 8 byte) Integer (2, & 4 byte) Fixed Length (<3996 bytes) Character
Languages	FORTRAN C Pascal	FORTRAN C Pascal
Passwords/Security Groups (Classes) per Database	Unlimited Groups	63 Classes
Maximum Database Parameters		
Tables (sets) per database	Unlimited	199
Records per table (set)	Unlimited	Unlimited
Record Length	3996 bytes	3996 bytes
Columns (items) per table (set)	255	255
Field (item) length	3996 bytes	3996 bytes
Sub-items per item	n/a	255
Children per Parent	n/a	31
Indices per Table	Unlimited	n/a
Search Items per Set	n/a	31
Columns per Index	15	n/a
Sort Items per Path	n/a	8



For HP 9000 Series 800 Systems

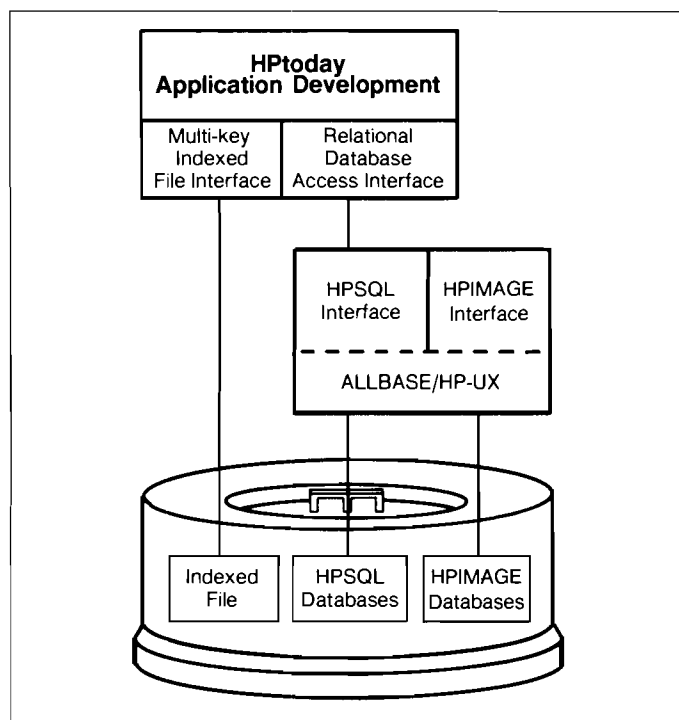
product numbers 92440A, 92441A

Computer-Assisted Programming

HPtoday is a Computer-Assisted Programming Package for development of data or transaction processing related applications on HP 9000 Model 840 computer systems. HPtoday typically speeds up application development by a factor of four to ten, depending on the application. Even more significant reductions can be expected in the workload associated with maintenance of applications.

Productivity multiplying power of this order of magnitude is particularly important on large systems like the HP 9000 Model 840 because of the large number of applications the system can support, the accompanying workload, and the potentially large number of end users who benefit if easy to use applications can be developed on short notice.

HPtoday gives you the tools to specify what an application is to do without concern for the detailed steps required to do it. With the HPtoday Developer Package, you fill in blanks on formatted screens instead of coding reams of program instructions. While the computer and HPtoday do most of the work, you still retain full control over the development of your application. Developed applications can be run by the HPtoday Run-Time Environment, which provides end-user support for the applications.



Key Features

- Fully integrated application development environment and programmer's toolset.
- Computer-assisted development of applications for multiplication of programmer's productivity.
- Easy interactive development of user interfaces in consultation with end users.
- Dictionary for definition of all field specifications, messages, records, and files avoids duplication during development and significantly reduces maintenance time and effort.
- Screen painter for simultaneous design and programming of application screens and menus.
- Report painter for interactive development of reports, with full control over layout, appearance and content.
- Comprehensive logic commands for procedural logic include decision tables for complex conditional expressions.
- External program interface, including full parameter passing, allows access to real-time and computationally intensive applications written in conventional languages.
- Application tailoring supports many different versions of a single application.
- Security locks can selectively protect part or all of an application from unauthorized modification.
- Batch programs can be run in background, freeing a terminal for other uses.
- Run-Time Environment supports delivery of applications developed using the HPtoday Developer package.
- Full access to ALLBASE/HP-UX (HPSQL) databases.
- Multi-key indexed file data storage subsystem provides fast data access when sophisticated database management is not required.
- Transaction-based record locking prevents corruption of data resulting from concurrent updating.
- Transaction logging allows transactions to be rolled back under program control, and allows restoration of files in the event of a system failure using rollforward recovery.

Functional Description

The Developer Package

The HPtoday Developer Package has a complete set of facilities for defining, testing and maintaining applications. These are integrated into a single cohesive package that requires no additional editors, compilers, or debugging utilities. The tools and facilities are grouped under the categories of Dictionary, Screen Processing, Reports, Logic Commands, and Application Testing. All of the Run-Time Environment facilities are also included in the Developer Package.

Dictionary

The dictionary provides for central definition of all field specifications, record layouts, files, messages, help screens, and validation tables and ranges. Changes made to dictionary specifications can be generated throughout an application.

Screen Processing

The screen processor provides all logic required to drive menu screens and formatted data input and output screens. Programmers use the screen painter to design the screens and HPtoday attaches the appropriate logic. Screens can be designed and programmed in less time than it takes to design them using conventional methods. The programmer has full control over the appearance of the screens, and HPtoday ensures a simple and consistent user interface.

Reports

The report writer includes a visual report painter for on-screen design of report layouts. The screen effectively becomes a moveable window to the report. Information for a report can be drawn from many data files, linked and sorted in any way the programmer requires.

Logic Commands

A comprehensive set of logic commands gives the programmer full procedural control over the application. The commands are used in short logic blocks called Procedures, which are equivalent to programs, and Functions, which are similar to subroutines.

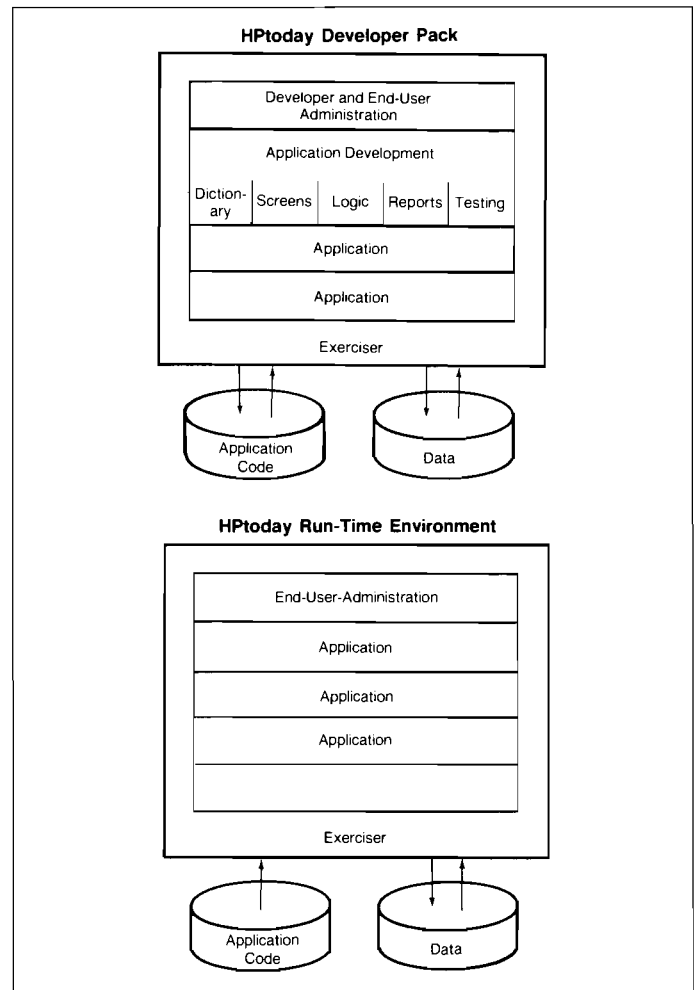
Application Testing

The programmer can test an application within the development environment. Any component of an application can be tested in isolation, optionally with full step tracing.

The Run-Time Environment

The HPtoday Run-Time Environment includes everything needed to run developed HPtoday applications. Applications are essentially sets of parameters, screen layouts, and report layouts. The Run-Time Environment has all of the required library routines and underlying logic to run the applications.

A set of administrator facilities is also included in the Run-Time Environment. Routine system operations like file backup and print spooler management can be controlled with the friendly menu-driven operator interface. The



Two Versions of HPtoday

administrator can also control user access to HPtoday and any portion of an application, and set system-wide parameters such as date formats, currency formats, numeric separators, etc.

Using HPtoday

Instead of designing an application on paper after discussions with users, the programmer can use the HPtoday screen and report painters to design and build a complete prototype of the external interface. The user or client can participate in this design phase or review the prototype to ensure that the result is exactly what is needed.

The prototype can include all menu screens and linkages, data input and inquiry screens, function keys, and report layouts. Help screens can also be included to document how each screen will work.

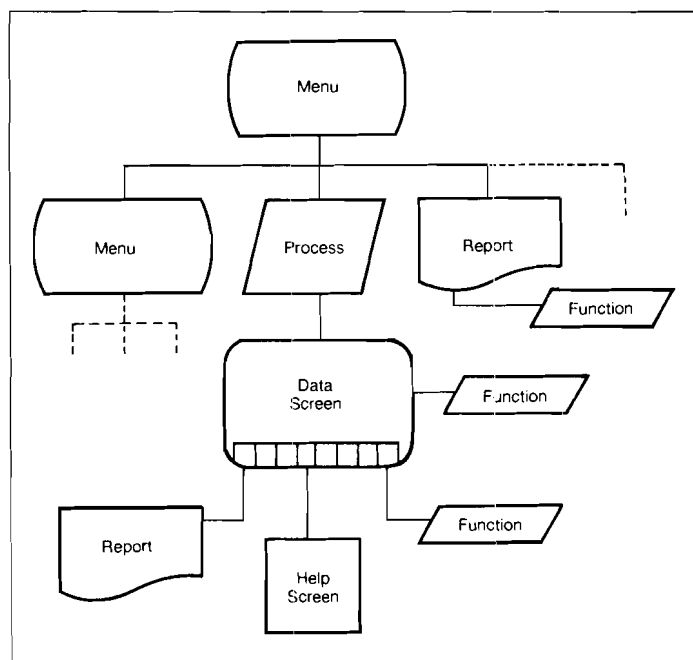
After the user or client has approved the prototype, the programmer can proceed to add detailed dictionary specifications, logic commands, file linkages and sorting for reports, etc, to convert the prototype to a completed application.

Application Structure

The components of an application include menus, data screens, reports, processes (similar to programs) and functions (similar to subroutines). Supporting these components are data specifications, help screens, and messages.

Any component can be linked directly to a menu selection, function key, or logic command. Functions can also be linked to fields on data screens for execution before and/or after the field is entered.

The discrete components of an application can be developed and tested in isolation or as a complete application from within the HPtoday Developer environment.



Simplified Application Structure

The Dictionary

The programmer can define a wide variety of types of data and information in the HPtoday dictionary. While the default values available for most specifications make the process very quick and easy, considerable detail can be specified if desired.

The dictionary holds specifications for fields, records, files, messages, help screens, validation tables and ranges, variables, constants, and scratchpad fields.

Screen Programming

HPtoday supports three types of screens: menus, data screens, and windows. Programmers can define data screens with an overlaying window area and/or an automatic scroll area.

The programmer paints each screen format on the screen exactly as it will appear in the application. The screen painter utilizes function keys and cursor control keys for creating, moving, copying and deleting a variety of field types and line drawing characters. The programmer can call up screen field definitions from the data dictionary, or create them within the painter. He can also control the field tabbing sequence, field validation, data movement, and special logic to be performed for each field.

Reports

The programmer also defines the layout and content of each report on the screen just as it will appear on paper. The report painter allows scrolling horizontally and vertically while painting a report that is larger than the screen.

On separate formatted screens the programmer specifies the files to be accessed for a report and the way they are to be linked together, along with record selection, sorting and control breaks. He can also indicate when special preprinted forms are to be loaded in the printer.

Logic

A comprehensive set of commands can be used in logic blocks called processes and functions, which are similar to programs and subroutines respectively. The power of these commands is such that each logic block can be limited to a maximum of 20 commands — they usually have fewer than 10. In addition to the facilities expected of any programming language, HPtoday supports decision tables for clear and concise definition of complex conditional structures.

The programmer creates logic blocks by entering the commands into formatted input screens that indicate the parameters and syntax required for each command.

When used with ALLBASE, HPtoday also supports relational access of data for inquiry, processing, or reporting.

Maintenance

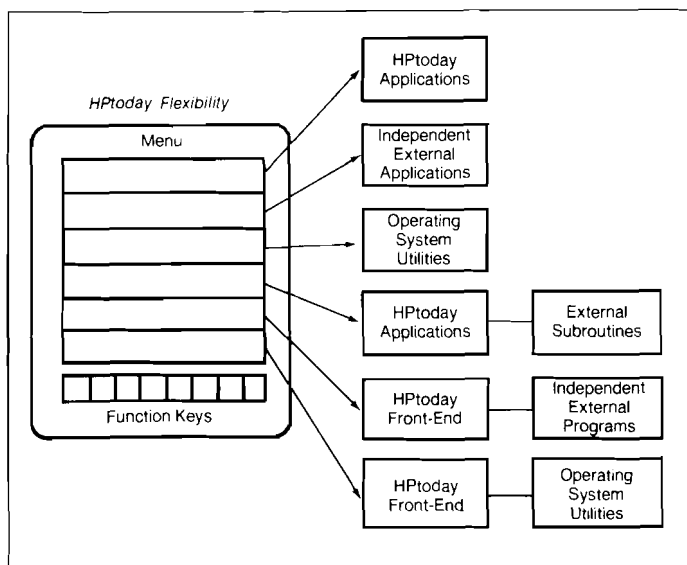
Maintenance and customization of applications are simplified by the screen and report painters, dictionary facilities and the version tailoring feature. When data item lengths or record layouts need to change, HPtoday will adjust all logic, screens, and reports at the touch of a key. If several different versions of an application are required for one user, HPtoday keeps track of the differences. Any changes made to the common portion are automatically reflected in all versions.

Application Documentation

HPtoday maintains a short description of each component of an application. The description can be printed with a full listing of the component or without any of the details.

External Program Interface

Independent programs written in conventional languages such as FORTRAN, Pascal, and C can be linked into HPtoday applications. Parameters and data can be passed both ways. HPtoday can therefore be used for all data handling and user-interface portions of technical applications that have heavy computation or real-time components that might better be handled by other languages. The HPtoday Run-Time Environment can then be used as a delivery vehicle for a total solution incorporating several applications under one consistent user interface.



HPtoday Run-Time Flexibility

Training and Documentation

HPtoday is a powerful and sophisticated application development package designed for professional programmers. As with any good tool it can be used more productively if some time and effort is first invested in training. However, the cost and disruption of training is minimized by the use of self-paced training.

A Developer Self-Paced Training Guide and a General Information Manual are provided with each copy of the HPtoday Developer Pack. The General Information Manual provides an overview of the product and explains the basic concepts. The Developer Self-Paced Training Guide leads a programmer through the entire process of developing a new application.

The Developer Pack also includes an Installation Guide, a Developer Administration Manual, and a comprehensive Developer Reference Manual.

New users of an application can work in HPtoday's training mode. This allows new users to learn HPtoday without risking data corruption. The HPtoday Run-Time Environment includes a Run-Time Administration manual and Installation Guide.

System Environment

The HP 92440A HPtoday Developer Pack and the HP 92441A HPtoday Run-Time Environment are supported on the HP 9000 Series 800 systems.

Ordering Information

The right to use HPtoday/HP-UX on the HP 9000 Series 800 systems is available according to the terms and conditions of the Hewlett-Packard Software Purchase Agreement.

Software

HPtoday/HP-UX may be ordered separately or as part of a bundled package with ALLBASE/HP-UX.

Product

Product Number	Product Description
92440A	HPtoday Developer Pack/HP-UX Right-to-Use product.
92440R	HPtoday Developer Pack Right-to-Copy product with sublicense.
92441A	HPtoday Run-Time Environment Right-to-Use product.
92442A	Bundle of ALLBASE/HP-UX Right-to-Use product and HPtoday Developer Pack/HP-UX Right-to-Use product.

Documentation

Part Number	Document Description
5954-6322	HPtoday General Information Manual
98111-90001	HPtoday Developer Administration Manual
98111-90002	HPtoday Developer Reference Manual
98111-90003	HPtoday Developer Self-Paced Training Guide
98117-90001	HPtoday Run-Time Administration Manual

Other HPtoday Specifications

Dictionary Items	Field Specifications, Range, Table, Variable, Calculated Item, Numeric Constant, Alpha-numeric Constant, Scratch-pad Fields, Record, File, Help Screen, Message, Application Title.
Screen Items	Screen Description, Screen Painter, Screen Field Specifications, Function Keys.
Screen Painter Functions	Text Field, Input Field, Output Field, System Item, Line Drawing, Move Field(s), Copy Field(s), Delete Field(s), Define Block, Move Block, Copy Block, Delete Block, Menu Action, Renumber Fields, Auto Number Fields.
Screen Field Editing	Character Type, Required Field, Minimum Length, Justification, Blank When Zero, Pad Character, Table Lookup, Range Check, Before/After Function, Auto Move to/from any HPtoday data item.
Report Specifications	Sort, Link Files, Select Records, Control Break, Total, Before/After Print Function, Report Painter, Page Headings, Column Headings, Detail Lines, Extra Lines, Sub Heading Lines, Cross Add, Justification, Field Mask, Underline.
Report Painter Functions	Text Field; Output Field; Zero Suppress; Floating Currency Symbol; Negative Indicator: hyphen before, hyphen after, CR after, parentheses; Move Field; Copy Field; Delete Field.
Logic Commands	BACKGROUND, CALC, CHECK, CLEAR, DATE, DECISION, DEFINE, DISPLAY, ENTER, EXIT, EXTERNAL, FILE (Buffer, Close, First, Last, Next, Previous, Unlock, Delete, Find, Insert, Modify, Read, Write), IF, IFLOOP, LENGTH, LINK, LINKLOOP, MATH, MATHLOOP, MESSAGE, MODE, MOVE, MOVELOOP, NOTE, OFF, ON, PRINT, PROCEED, REPORT, SCREEN, SCROLL, SELECT, SERIES, SHOW, TIE, TOP, TRANSACT, UPDATE, VALIDATE, VISIT, WINDOW, ZIP.
Developer Utilities	Generate Application Components, Copy Application Components, Print Application Components, Print All Application, Delete Application Components, Application Tuning.
Administrator Functions	Operator Functions, Application Specifications, Version Definition, User Definition and Security, Display Characteristics, System Specifications, Utilities, Data File Logging, File Backup/Restore, Data File Recovery, System Status Inquiry, Process Termination, Printer/Report Status Inquiry, Menu Item Security, User Security, Application Load/Unload.

(continued on next page)



Items Per Application	Processes	4000
	Functions	4000
	Menu and Data Screens	4000
	Reports	4000
	Messages	4000
	Help Screens	4000
	Function Key Sets	4000
	Decision Tables	4000
	Record Layouts	4000
	Field Specifications	4000
	File Definitions	255
	Ranges	255
	Tables	255
	Variables	255
	Alpha-numeric Constants	255
Other Ranges	Calculated Items	255
	Scratch Pad Fields	99
	Developer Names, User Names, and User Groups	254
	Fields per Record Layout	999
	Record Layouts per File	12
	Key Fields per Record	19
	Characters per Record Field	999
	Fields per Screen	99
	Characters per Screen Field	80
	Lines per Report Definition	255
	Fields per Report Line	127
	Characters per Report Field	255

HP AdvanceNet

product number 98195A/R

NS/9000 Series 800

Network Services/9000 Series 800 (NS/9000 Series 800) is a high performance, user-friendly networking product for HP computers in the factory and engineering market segments. Specifically, NS/9000 Series 800, working with the IEEE 802.3 LAN/9000 Series 800 Link interface, supports communication of HP 9000 Series 800, HP 1000 A-Series and HP 9000 Series 200, 300, and 500 systems over the high speed IEEE 802.3 LAN (see Figure 1). (Please see the LAN/9000 Series 800 Link data sheet for more information on the LAN.) Users can easily transfer files between processors without worrying about all the technical details of error checking and message routing. Engineers can share files and directories between Series 800 and HP 9000 Series 200, 300, and 500 systems.

A Series 800 system with NS/9000 Series 800 can communicate directly with a total mix of up to 99 Series 800, HP 1000 A-Series and/or HP 9000 HP-UX systems over an IEEE 802.3 local area network (LAN).

Key Features

- High speed, 10 Mbps IEEE 802.3 LAN. NS/9000 Series 800 supports two network services over the high speed IEEE 802.3 Local Area Network Link (LAN/9000 Series 800 Link):
 - Network File Transfer
 - Remote File Access (HP-UX systems only)
 With a LAN connection you get lower connection costs and better connectivity than with point to point configurations because every system requires only one connection to the network. LAN networks only require that each system have one connection to the LAN trunk for all systems to be logically connected to one another. Point to point configurations require connections to/from every system. Network Services for Series 800 over the IEEE 802.3 LAN will also provide connectivity to the HP 1000 A-Series and other HP 9000 systems.
- Easy, reliable and cost-effective access to other Series 800s, HP 9000 Series 200, 300, and 500 and HP 1000 A-Series systems (NFT, RFA — HP-UX). Users can copy files interactively between Series 800s, HP 9000 Series 200, 300, and 500 and HP 1000 A-Series computers when these systems all reside on the same IEEE 802.3 LAN.

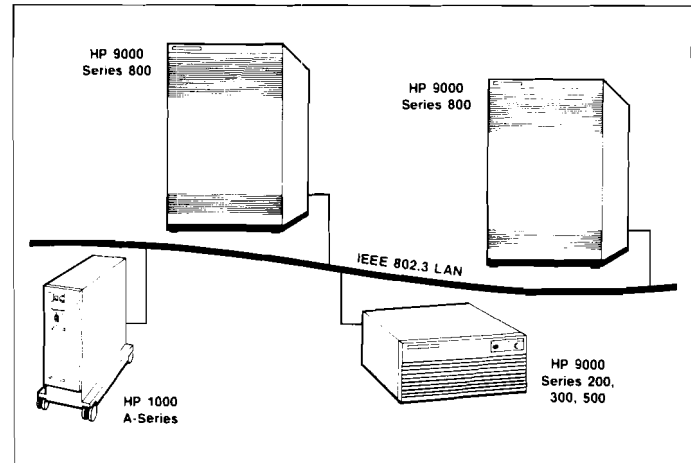


Figure 1

- Resource sharing between users in an HP-UX operating environment. Engineers can share disks and printers between Series 800 and other HP 9000 HP-UX systems.
- Industry Standards based protocols. Not only does NS/9000 Series 800 support the IEEE 802.3 Standard LAN/9000 Series 800 Link, the transport and internet modules of NS/9000 Series 800 are based on the Defense Advanced Research Projects Agency (DARPA) Transport Control Protocol and Internet Protocol, TCP/IP. (NS/9000 Series 800 has not been **certified** as DARPA compatible.)

Functional Description

NS/9000 Series 800 functionality combines the facilities of the NS Common Services and NS transports with the capabilities of the IEEE 802.3 LAN Link. These facilities are described in detail following Figure 2. Figure 2 shows the relationship between the NS Common Services, transports and link components of the product.

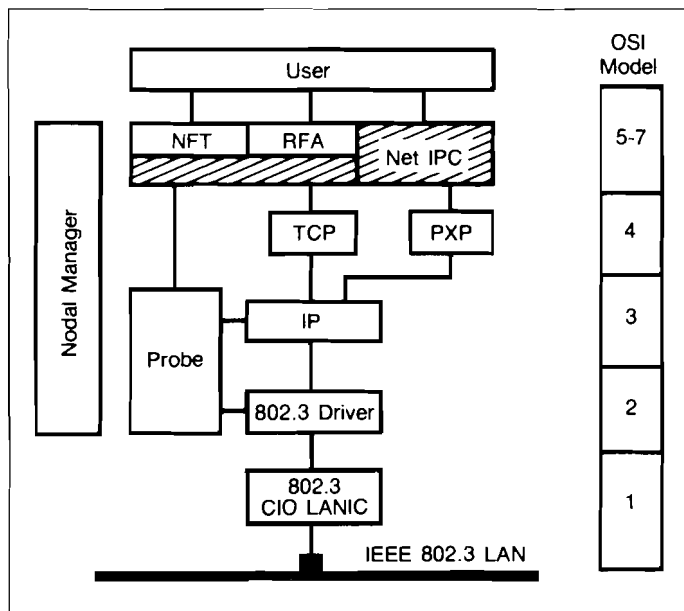


Figure 2. NS & LAN/9000 Series 800 Architecture

User Level Services

Network File Transfer

Network File Transfer (NFT) copies files between any two NS nodes on a network. The HP NFT protocol is common to all HP Network Services implementations. Files can be copied interactively or programmatically. Network File Transfer includes features that allow users to:

- **Copy Remote Files.** Using NFT on a local Series 800 system, a user can copy files from a local node to a remote node, from a remote node to a local node, and between remote nodes.
- **Translate File Attributes.** File attributes are translated transparently and on demand when files are copied between different systems. This means that when an HP-UX file is copied to an HP 1000 A-Series computer, the file attributes will be translated into RTE-A file format. NS/9000 Series 800 accomplishes this by negotiating, with the target node, a set of attributes that maps closely to the original attributes. These attributes must be legal on the target system.
- **Access Remote Accounts.** Files under any account can be accessed if the user provides the correct logon and password.
- **Copy All Types of Files.** FMGR files as well as files in the hierarchical file system can be copied using NFT.

The **dscopy** command is used to copy files from system to system over the network. This command is similar to the HP-UX **cp** command, which is used for local file copies. With **dscopy**, however, you must specify a system name and the appropriate login information before a file can be copied. For example, to copy a file from a system named *PC_design* to a system named *PC_fab*, you could execute the command (command is typed on one line by user):

```
dscopy PC_design#alpha:beta#sourcefile PC_fab
#delta:gamma#dest_file
```

The source and destination files are *source_file* and *dest_file*, respectively. The login for *PC_design* is *alpha:beta*, and the login for *PC_fab* is *delta:gamma*.

If a file is to be copied to or from the local system, the local system name and login information can be omitted.

Remote File Access

Remote file access allows users to logically extend the local HP-UX file system to include remote file systems. Thus users can use HP-UX commands and system calls to access remote directories and files from their local system.

To use remote file access a network special file is created to logically link a particular remote file system to the local file system. For example */net/admin* on the local node connects *node admin's* file system to the local node. For security purposes the user must establish his login with the remote system using the **netunam** command. For example, to login to a remote system named *PC_design* with the username *alpha* and the password *beta*, one would execute the command (command is typed on one line by user):

```
netunam /net/PC_design alpha:beta
```

To access the remote system, the pathname must include the network special file that corresponds to the remote node. For convenience, this special file usually has the same name as the remote node and resides in the network directory, */net*.

For example, to change your working directory to a directory named */users/hardware* on the remote system *PC_fab*, you would execute the command:

```
cd /net/PC_fab/users/hardware
```

Network Capacity and Performance

The maximum number of separate conversations with other nodes that a single processor can support and the peak user data rates achievable on each link are complex functions of many interrelated variables. Among these are the type of NS/9000 Series 800 capability being used, the main memory and speed of each processor that is a party to the conversation (and its peripherals), and the load on each system from non-network applications.

Because of the number and complexity of these factors, it is difficult to make accurate generalizations about capacity and performance.

Hewlett-Packard System Engineers and Data Communications Specialists are available to consult in network design. They can assist in designing an effective network.

Network Link Requirements

Use of NS/9000 Series 800 requires the Local Area Network Link (LAN/9000 Series 800, P/N 98194A). Briefly, using the LAN/9000 Series 800 Link, Series 800 computers can communicate with each other or with HP 1000 A-Series or HP 9000 Series 200, 300 and 500's via a single, high speed coaxial cable. Up to 30 computers are supported in a ThinLAN Link configuration and 100 computers in a ThickLAN Link configuration.

LAN/9000 Series 800 Link includes an interface board, cables, medium attachment unit, and software, to connect an HP 9000 Series 800 to an IEEE 802.3 coaxial cable. (Consult the LAN/9000 Series 800 Link data sheet for more details.) The distance between processors is a function of the length of the LAN cable, and the length of the Attachment Unit Interface (AUI) cable, which connects the LAN Interface Card (LANIC), installed in the Series 800 backplane, to the LAN cable. (Maximum segment length for a ThinLAN segment is 85 meters; 500 meters for a ThickLAN segment; and with repeaters, three segment combinations can be connected: Thin-Thin, Thin-Thick, Thick-Thick.) The maximum AUI cable length is 42 meters. The LAN cable speed is 10 million bits per second.

Communication with non-Series 800 computers over the LAN requires that the remote system be equipped with a LAN Link and Network Services software. Specific requirements for Series 800 and non-Series 800 processors are described in Table 1 and Figure 3.

Table 1. HP Network Services and LAN Links

System	Network Software	LAN Link
HP 9000 Series 800	NS/9000 Series 800 (98195A/R)	LAN/9000 Series 800 (98194A)
HP 1000 A-Series	NS/1000 (91790A/R)	LAN/1000 Link (12076A)
HP 9000 Series 200	NS/9000 Series 200 (50956A or 50952A)	LAN/9000 Series 300 (98643A)
HP 9000 Series 300	NS/9000 Series 300 (50951A or 50952A)	LAN/9000 Series 300 (98643A)
HP 9000 Series 500	NS/9000 Series 500 (50953A/R or 50954A/R)	LAN/9000 Series 500 (27125B)

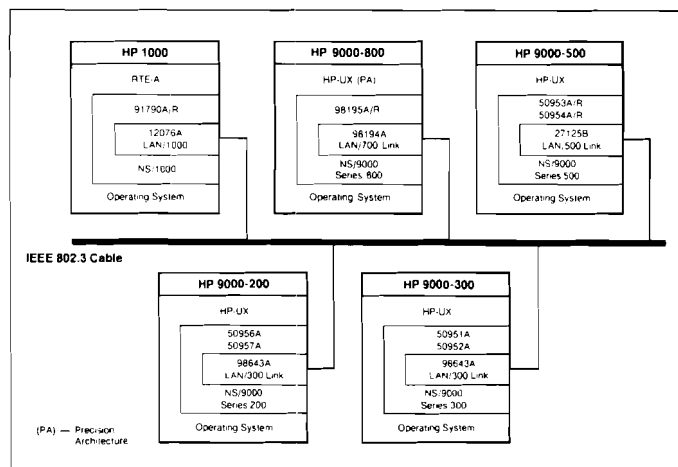


Figure 3. Local Area Network Connections

Compatibility

Compatibility with other active HP network products follows:

- NS/9000 Series 800 (98195A or R) software is compatible with:
 - NS/1000 (91790A/R) — NFT Service
 - NS/9000 Series 200 (50956A or 50957A) — NFT and RFA Services
 - NS/9000 Series 500 (50953A/R or 50954A/R) — NFT and RFA Services
 - NS/9000 Series 300 (50951A or 50952A) — NFT and RFA Services

System Environment

Series 800 computers running NS/9000 Series 800 must be running the HP-UX operating system version B.1. A minimal configuration for NS/9000 Series 800 functional operation is 8 Mbyte of memory, which includes the memory requirements for the HP-UX operating system, and at least one disc drive.

Customer Installation Responsibility

The NS/9000 Series 800 customer must assume the following responsibilities with the purchase of 98195A/R:

1. Customers must install their communication facilities (coaxial cables) and ensure their connection to the Series 800 Computer Systems which are equipped with NS/9000 Series 800. The establishment of successful communication between Series 800 systems with NS/9000 Series 800 is the customer's responsibility.
2. One person in the customer's organization must be designated as the Network Manager. This person will assume responsibility for configuration and generation of the customer's systems and will function as the focal point for Hewlett-Packard's support of the network.
3. The customer must install the NS/9000 Series 800 software.
4. Hewlett-Packard strongly recommends that the customer purchase Account Management Support (AMS) or Response Center Support (RCS) for NS/9000 Series 800 and related hardware and software support products.

Ordering Information

Software

Product

Number

Product Description

98195A	HP Network Services for the HP 9000 Series 800. Provides Right to use on the HP 9000 Series 800.
98195R	HP Network Services for the HP 9000 Series 800. Provides Right to copy and sublicense on the HP 9000 Series 800.

Options

Customers who order 98195A or R without designating any options will receive software products on 1/4" Linus tape media and hardware suited for a ThinLAN Cabling connection.

Customers ordering NS/9000 Series 800 who want a different software media type should use the option shown below:

Option AA1: Replaces 1/4" Linus tape media with 1600 bpi-9 track tape media.

Documentation

The following documentation is available to further describe the NS/9000 Series 800 products. These materials come with the NS/9000 Series 800 product or can be ordered separately.

- NS/9000 Series 800 User/Programmer Reference Manual (98195-90001)
- NS/9000 Series 800 Node Manager Reference Manual (98195-90002)

Support Products

For all new customers and customers without an existing contract, the available support services include Account Management Support (AMS), Software Materials Subscription (SMS), and Response Center Support (RCS) which includes all materials (SMS) and telephone assistance through the Response Centers.

For customers choosing AMS or RCS on their operating system, NS/9000 Series 800 is supported by purchasing Datacomm C category support. Only one datacomm category support product need be purchased for the "highest" datacomm category required on a system (A=lowest, C=highest).

For customers choosing SMS on their operating system, NS/9000 Series 800 is supported by purchasing SMS only. For additional systems, the extended datacomm category support and extended SMS are used. Manual Update Service (MUS) is available as well.

Support Products Numbers

Software Materials Subscription (SMS)	98195A + S00
Extended SMS (EMS)	98195A + W00
Datacomm Category C Support	99087N + C00
Extended Datacomm Category C Support	99087X + V00
Manual Update Service (MUS)	99087N + Q00

HP AdvanceNet

product number 98194A

LAN/9000 Series 800 Link

The Local Area Network/9000 Series 800 Link, LAN/9000 Series 800 Link, provides the HP 9000 Series 800 computers with a high performance reliable local communication link by connecting to an industry standard IEEE 802.3 compatible local area network (see Figure 1). The IEEE 802.3 network offers superior performance when a fully interconnected network is needed for high speed data communications over a distance of 500 meters or less within a single building (or group of interconnected buildings). The bus structure of this network allows every node to directly communicate with every other node via a single connection to the network. Each node's access to the network is controlled by the Carrier Sense Multiple Access with Collision Detection (CSMA/CD) protocol which ensures efficient use of the network. (All other components for the network, including the coaxial cable, are conveniently orderable from the Direct Marketing Division of Hewlett-Packard). HP 98195A/R, Network Services software that provides interactive and programmatic networking capabilities, is also required.

Key Features

- A complete link connection to the local area network coaxial cable, which includes hardware and transport software to ensure a reliable connection.
- Adherence to the IEEE 802.3 local area network baseband coaxial cable standard, implementing the IEEE 802.2 Type 1 link level protocol.
- 10 Mbit per second cable speed.
- Carrier-Sense Multiple Access with Collision Detection (CSMA/CD) protocol controls network access without centralized control. All nodes have equal access.
- Each HP 9000 Series 800 connected to the network can communicate directly with all other Series 800, HP 1000 A-Series, and HP 9000 Series 200, 300, and 500 systems connected to the same coaxial cable.
- Any node may be connected or disconnected while the network is active.
- Microprocessor-driven interface controller that minimizes the Series 800 overhead associated with communications line handling.
- Network transport software is based on de facto industry standard Defense Advanced Research Projects Agency (DARPA) protocols, corresponding to the transport and network layer functions from the OSI Reference model.

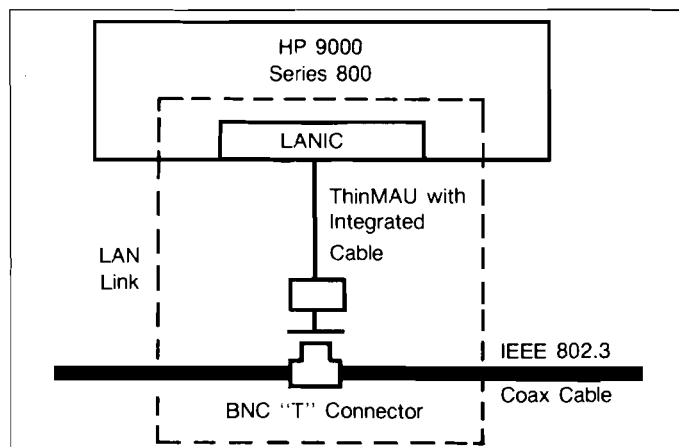


Figure 1

- Integrated node management software provides on-line network configuration and logging. An example of on-line network configuration would be adding another node to the network without having to shut down the network.
- Network components are suitable for installation in a light industrial or office environment.

Functional Description

LAN/9000 Series 800 Link contains the hardware and transport and interface software required to connect a Series 800 computer to an IEEE 802.3 coaxial cable.

Hardware Components

Figure 2 shows the three major hardware components of the 98194A LAN/9000 Series 800 Link: the Local Area Network Interface Controller (LANIC), the Attachment Unit Interface (AUI) Cable, and the Medium Attachment Unit (MAU).

Local Area Network Interface Controller

The Local Area Network Interface Controller (LANIC) is a microprocessor-based communication controller that plugs into the Series 800 backplane. It handles buffering, IEEE 802.2 and 802.3 protocols and error checking, and keeps track of network statistics. When addressed by another node on the network, the LANIC receives frames of information and checks for accuracy of the data before passing the frames to the host. Before transmission, an addressed frame is sent from the host to the LANIC, which adds error checking information. The LANIC then tests to see if the cable is busy and, if not, transmits the frame.

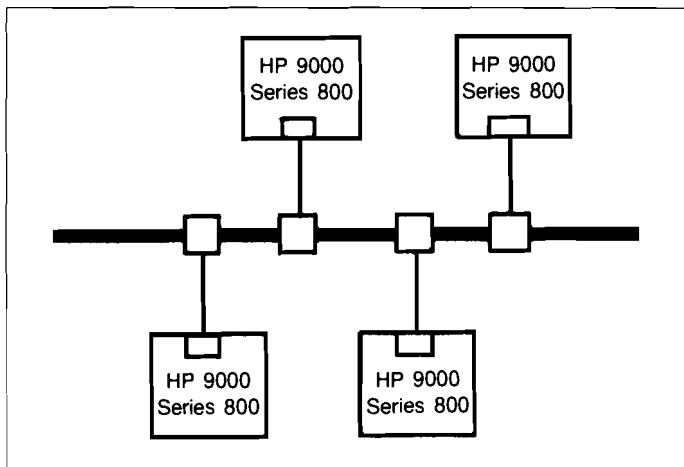


Figure 2

Features

- IEEE 802.2 link level protocol handling
- IEEE 802.3 CSMA/CD Access Method handling
- Built-in self-test
- On-line diagnostics run under HP-UX
- LAN statistics collection
- VLSI communication controller chip
- 8 bit microprocessor

Attachment Unit Interface Cable — available with option 740

The Attachment Unit Interface (AUI) cable and 2-meter internal LANIC cable connect the LANIC to the Medium Attachment Unit. The AUI cable included with 98194A LAN Link with Option 740 is 6 meters in length and coated with FEP Teflon®. Other lengths of AUI cables are available, to permit location of the computer system up to 48 meters from the coaxial cable. AUI cables may be selected with the lower cost PVC jacket if allowed by the safety regulations governing the installation.

Medium Attachment Unit

The Medium Attachment Unit (MAU) provides the physical and electrical connection by connecting the AUI cabling to the network coaxial cable. The MAU is powered by the LANIC through the AUI cable. The MAU receives signals from and sends signals to the coax cable, and also detects collisions resulting from two nodes starting to transmit simultaneously. The MAU also provides electrical isolation from the coaxial cable and performs several other functions to ensure network reliability, e.g., if a MAU fails by continuously transmitting, a circuit will detect the failure and shut down the MAU.

Customers ordering the ThinMAU hardware for the LAN connection, will receive the ThinLAN Medium Attachment Unit (ThinMAU) with a 1m integrated cable and BNC Tee Connector. These hardware components make the connection to the IEEE 802.3 Type 10BASE2 workstation ("thin") coaxial cable.

Customers ordering the ThickMAU hardware for the LAN connection, will receive the ThickLAN Medium Attachment Unit (ThickMAU) with a coaxial tap (which can remain permanently attached to the cable). These hardware components make the connection to the IEEE 802.3 Type 10BASE5 backbone ("thick") coaxial cable. Attachment of a MAU to thick coax cable is a simple procedure that usually takes less than 5 minutes and can be done on an active network without interrupting network traffic.

Software Components

HP 98194A LAN Link includes software corresponding to layers 1 through 5 of the Open Systems Interconnection (OSI) Reference Model (see Figure 3). It also includes node management software.

The lowest layers, corresponding to OSI Layers 1 and 2, consist of the IEEE 802.2 and 802.3 protocols. CSMA/CD gives every node on the coaxial cable equal access to the network; a sending node listens on the network to ensure that no other node is transmitting, before it attempts transmission. If, while transmitting, the sending node detects a collision, the sending node initiates a jam signal and waits for a random period of time before retransmitting. Transmission consists of sending addressed frames of data on the coaxial cable at a signalling rate of 10 megabits per second. The IEEE 802.2 type of service is Type 1 (unacknowledge datagrams).

The Network Layer, corresponding to OSI Layer 3, is based on the DARPA Internet Protocol (IP). IP provides fragmentation and reassembly of data. It also provides internet addressing.

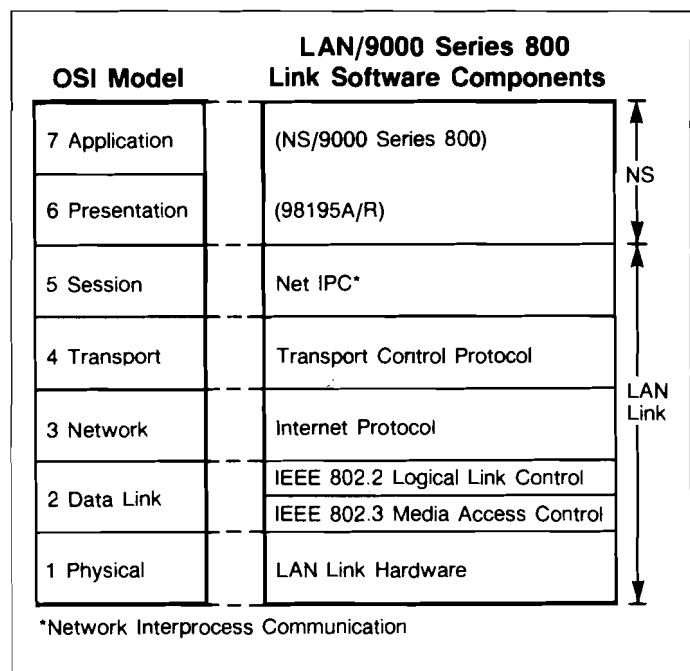


Figure 3

The Transport Layer, corresponding to OSI Layer 4, is based on the DARPA Transmission Control Protocol (TCP). TCP provides end-to-end reliable connection oriented services with flow control and multiplexing. TCP also provides mechanisms for detecting duplicate, lost, or out of sequence packets.

Network Interprocess Communication (*). NetIPC, is an interface between layers 6, 7 and the product's transport protocols. NetIPC as a user accessible service will be a fully supported feature of LAN/9000 Series 800 within 6 months of the product's first availability. Customers who order LAN/9000 Series 800 within the first six months of the product's first availability will receive the updated LAN/9000 Series 800 software, which includes NetIPC, at no extra charge. NetIPC will enable programmers to establish peer-to-peer communication between processes running on HP 9000 Series 800 computers.

HP 98195 A/R, NS/9000 Series 800 is also required. NS/9000 Series 800 provides interactive facilities such as file transfer and remote file access. (See the NS/9000 Series 800 data sheet for more details, P/N 5954-7285).

The node manager software uses the commands of the nodal management module to establish computer-to-network connections and to maintain the network. Network maintenance includes initialization and configuring; establishing network security; and using tracing and other diagnostic tools to assure proper network operation.

Functional Specifications

Signalling Rate: Data is transmitted in bursts at 10 megabits per second in accordance with the IEEE 802.3 standard.

Frame Length: User configurable, up to 1500 bytes.

Coaxial Cable Alternatives:

Cable Type	ThinLAN (Standard with LAN/9000 Series 800 Links)	ThickLAN (backbone) (Optional)
IEEE cable specification	Type 10BASE2	Type 10BASE5
Maximum segment length	185 meters	500 meters
Maximum number of nodes per segment	30	100
Minimum distance between nodes	0.5 meter	2.5 meter
Maximum AUI Cable length	1 meter	48 meters

Network Capacity and Performance

Although the signalling rate of the line may be 10 megabits per second, the throughput achieved by a user at a Series 800 node will be lower. This is primarily due to the overhead of the software providing network services and the user's applications programs. Among the factors affecting user throughput are the type of software capability being used, the main memory and speed of each processor (and its peripherals) involved in the transfer, and the load on each system from non-network applications.

Because of the number and complexity of these factors, it is difficult to make useful generalizations about the performance or capacity of the network in a particular application. Hewlett-Packard Systems Engineers and Data Communications Specialists are available to consult in network design. They can assist in designing an effective network.

Installation Policy

Hewlett-Packard will provide software installation of the Local Area Network Link for customers with Account Management Support (AMS). For customers not covered by AMS, Hewlett-Packard software installation is available on a time and material basis.

Installation of the LANIC and connection of the LANIC to the customer's AUI cable (only if the AUI cable is installed, connected to a MAU, and accessible) are included in the purchase of 98194A.

Customer Installation Responsibility

Prior to the installation of the LANIC and LAN software, the customer is responsible for installation of the coaxial cable, including terminators, T-connectors, taps, and MAU's, connecting the AUI cable to each MAU, and routing the AUI cables to the Series 800s. The customer must also ensure that all safety grounds in the power system for the area served by the coaxial cable are interconnected. The customer is responsible for compliance with all applicable building codes in the installation of LAN cabling and components.

Immediately prior to installation of the LAN software and LANIC, the customer must perform a full Series 800 system backup and make the Series 800 available.

Customer personnel must be available on site at the time the product is installed. These personnel should be trained in the use of the product. HP can provide this training, with a separate charge to the customer.

HP Installation Responsibility

During the installation of the LANIC and LAN software, HP will:

- Install and verify the operation of the LAN Interface Controller.
- Perform a System Update to add the product software modules to the system.
- Verify that the correct number and version of the software modules have been installed.
- Connect the LANIC to the customer's AUI cable (only if the AUI cable is installed, connected to a MAU, and accessible).
- Configure the LANIC and LAN software and verify against the system I/O configuration.
- Verify that the product properly accesses the AUI cable (if connected), when started by command.

At this point, installation of the Series 800 data communication product is complete.

After the customer installs and connects the coaxial cable, MAU, and AUI cable, HP will attempt to perform a test that demonstrates product operation over the coaxial cable. If problems are encountered during this operation, HP will, at the customer's option, attempt to resolve them. HP effort expended against problems related to improper installation of the coaxial cable or accessories will be considered HP consulting support, and is billable to the customer at normal HP time and material rates.

System Environment

LAN/9000 Series 800 is supported on the Series 800 computer systems. The minimum memory size required is 8 megabytes of main memory. This minimal configuration includes memory requirements for the HP-UX operating system. One LAN/9000 Series 800 Link is supported per system.

The MAUs which come with the 98194A LAN Link can be used with any coaxial cable which fully complies with the IEEE 802.3 specification for 0.4 inch diameter baseband coaxial cable. Use of Hewlett-Packard coaxial cable is recommended, since it contains relative distance markings to allow easy installation, maintenance and troubleshooting.

Ordering Information

Hardware and Software

Product Number	Product Description
98194A	LAN/9000 Series 800 Link. Includes everything needed to connect an Series 800 system to an IEEE 802.3 local area network: LANIC, Card Connector Cable, ThinMAU, Coaxial Cable Adapter, BNC "T" connector, and software on 1/4" Linus tape media.

Specify Software Media Option

Option AA1	AA1 Replaces 1/4" Linus tape media with 1600 bpi - 9 track tape media.
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Delete Options

Options 740	Replaces ThinMAU assembly with ThickMAU assembly, tap, and 6m AUI Cable Assembly.
Option 811	Deletes IEEE 802.3 Card Connector Cable.
Option 841	Deletes ThinMAU, Coaxial Cable Adaptor and BNC "T" Connector.
Option 842	Deletes IEEE 802.3 LANIC (Printed Circuit Assembly).

Documentation

Included with LAN/9000 Series 800 Link

Document Number	Document Description
27125-90003	Local Area Network Interface Controller (LANIC) Reference Manual

Related Documents

Document Number	Document Description
5957-4624	Making the LAN Connection
5955-7680	LAN Cable and Accessories Manual
5955-7681	LAN Link Hardware Troubleshooting Manual

Support Products

Product Number	Product Description
98194A + S00	Software Material Subscription (SMS) for LAN/9000 Series 800 Link
98194A + W00	Extend SMS for LAN/9000 Series 800 Link

Response Center Support and Account Management Support customers must also order the Data Communications Category Support C, if it has not already been purchased.

Customers with hardware support agreements must add the appropriate level of coverage (SMCC or BMMC) for this Link product to their support agreement.

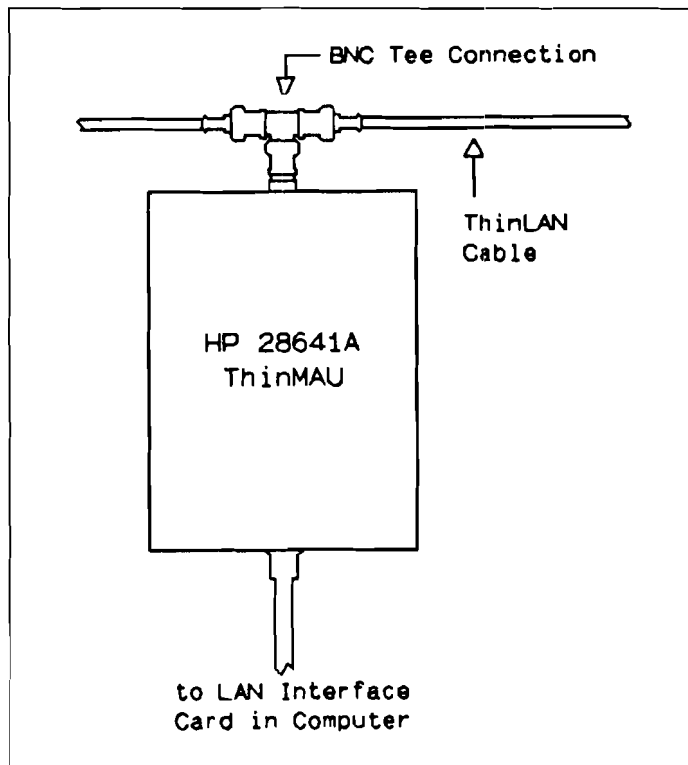
Coaxial Cable and LAN Accessories

HP 98194A LAN/9000 Series 800 Link provides all the components of a connection to the coaxial cable of an IEEE 802.3 Type 10BASE2 (workstation, "thin") local area network or, optionally, to a Type 10BASE5 (backbone, "thick") coaxial cable. A complete line of local area network products, including coaxial cable, installation tools, and connector products is available from Hewlett-Packard; refer to the current *Computer Users Catalog*. For cable planning information, refer to the LAN Cable and Accessories Installation Manual (P/N 5955-7680), available from your HP Sales Representative.

HP AdvanceNet Components

product number 28641A

The ThinMAU is a Medium Attachment Unit included with the HP 98194A LAN Link to provide an electrical connection from an HP 9000 Series 800 System to a 10 Mbps IEEE 802.3 Type 10BASE2 "ThinLAN" coaxial cable. It includes an integrated 1M Attachment Unit Interface (AUI) cable for connection to System's LAN interface controller card. The ThinMAU connects to a BNC Tee connector on the ThinLAN coaxial cable as shown in the illustration below. The ThinMAU sends and receives data, detects collisions on the network, and protects the network's reliability by detecting malfunctions between itself and the computer.



Features

- Operationally compatible with IEEE 802.3 Type 10BASE2 standard protocol
- Compact, convenient design
- Integrated 1M AUI cable
- Jabber and Heartbeat functions minimize the impact of controller, AUI, and ThinMAU malfunctions on the rest of the network
- User installability

Functional Description

The HP 28641A ThinMAU provides an electrically isolated connection between HP LAN interface products and the ThinLAN coax. Use of the ThinMAU with non-HP LAN interfaces and with extension is not supported.

Collision Detection, Jabber, and Heartbeat

Two or more nodes on the LAN transmitting simultaneously cause a collision. The ThinMAU detects collisions by detecting signals on the coax other than those provided by its transmitter, and signaling the LAN controller.

The Jabber circuitry simply turns the ThinMAU transmitter off if the computer tries to send data continuously. This ensures that a faulty LAN node will not tie up the network indefinitely.

The Heartbeat function is a signal sent from the ThinMAU to the LAN interface following each successful transmission. The signal exercises most of the collision detection circuitry when generated and functions to inform the controller that the collision detection path is operating correctly.

Environmental Specifications

Meets HP Class B Environmental Specifications

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

Relative Humidity: 5% to 95% at 40°C, non-condensing

Physical Characteristics

Dimensions: 100 mm (4.5 in.) by 152 mm (6 in.) by 25 mm (1 in.).

Approximate Weight: 454 grams (16 oz.).

Electrical Specifications

Power Requirement: 8.0 - 13.5V.

Power Consumption: 4.3W (typical); 5.1W (maximum)

Electrical Isolation: 500V AC RMS from coax to AUI cable

Ordering Information

HP 28641A ThinMAU

The HP 28641A ThinMAU is included in the HP 98194A LAN Link Interface-Software Package. The ThinMAU includes:

1. ThinMAU Assembly (28641-60001).
2. Installation Manual (28641-90001).
3. BNC Tee Connector (1250-0781).
4. Plastic Boot (1252-1154).

The ThinMAU, LAN cabling, and installation tools are available through Direct Marketing Division. The following documentation on hardware and installation for the entire network, including the ThinMAU, is also available through Direct Marketing Division:

LAN Cable and Accessories Installation Manual (5955-7680).

LAN Link Troubleshooting Manual (5955-7681).

Please refer to the HP Computer User's Catalog for ordering information.

HP AdvanceNet Components

product number 30241A

The Medium Attachment Unit (MAU) and the included coaxial cable tap together provide a physical and electrical connection from an HP 98194A Option 841 LAN Link in an HP 9000 Series 800 System to a 10 Mbps IEEE 802.3 Type 10BASE5 "thick" Local Area Network coaxial cable. The MAU transmits and receives data, detects collisions on the network, and improves the network's reliability by detecting malfunctions between itself and the computer. The figure below shows the MAU and coaxial cable tap.

Features

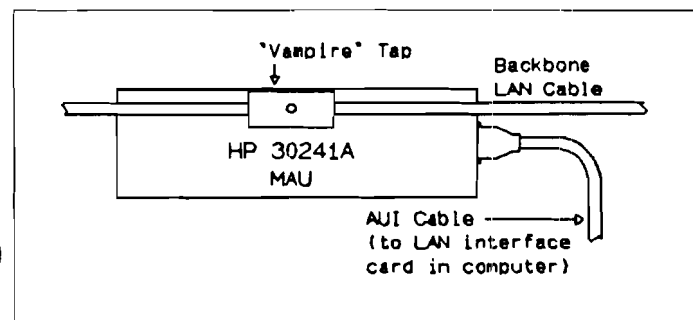
- Operationally compatible with IEEE 802.3 Type 10BASE5 standard protocol
- Easy tap installation and removal without disturbing network operations
- Jabber and Heartbeat functions minimize the impact of controller, AUI, and MAU malfunctions on the rest of the network

Functional Description

The HP 30241A MAU provides an electrically isolated connection to the thick "backbone" coaxial cable specified in the 802.3 Type 10BASE5 standard. For connection to the RG/58 "ThinLAN" cable, refer to the HP 28641A ThinMAU data sheet. Use of the MAU with non-HP LAN interfaces is not supported.

Receive and Transmit Functions

The receiver in the MAU amplifies and reshapes the signal before passing it to the Attachment Unit Interface (AUI) cable driver. The receiver and transmitter both turn the cable drivers off when no data is being sent over the coax or from the computer. Finally, the receiver monitors data sent by the transmitter, performing a local loop-back check.



Collision Detection, Heartbeat, and Jabber

Two or more nodes on the LAN transmitting simultaneously cause a collision. The MAU detects collisions by measuring a rise in the DC voltage on the coax cable, and signaling the LAN interface controller.

The Jabber circuitry turns the MAU transmitter off if the computer attempts to transmit continuously. This ensures that a faulty LAN node will not tie up the network indefinitely.

The Heartbeat function is a signal sent from the MAU to the LAN interface following each successful transmission. The signal exercises most of the collision detect circuitry when generated and functions to inform the controller that the collision detection path is operating correctly.

Environmental Specifications

Meets HP Class B Environmental Specifications

Storage Temperature: -10° to 65°C (14° to 149°F).

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

Relative Humidity: 5% to 95% at 40°C, non-condensing.

NOTE: Not suitable for installation in ducts, plenums, or other environmental air spaces according to the National Electrical Code, Article 300-22 b&c, or equivalent.

Physical Characteristics

MAU Dimensions: 310 mm (12.25 in.) long by 95 mm (3.75 in.) wide by 30 mm (1.25 in.) deep.

Tap Dimensions: 75 mm (3 in.) by 30 mm (1.25 in.) by 25 mm (1 in.).

Electrical Specifications

Power Requirement: 9.0 - 15.75W

Power Consumption: 4.6 Watts (typical) 6 Watts (absolute max).

Electrical Isolation: 500 V AC RMS from coax to AUI cable

Ordering Information

HP 30241A Medium Attachment Unit (MAU)

The HP 30241A includes:

1. MAU Assembly (30241-60101).
2. Coaxial Cable Tap (0362-0819).

The MAU, LAN cabling, and installation tools are available through HP's Direct Marketing Division. The following documentation on hardware and installation for the entire network, including the MAU, is also available through Direct Marketing Division:

LAN Cable and Accessories Installation Manual (5955-7680).

LAN Link Troubleshooting Manual (5955-7681).

Please refer to the HP Computer User's Catalog for ordering information.

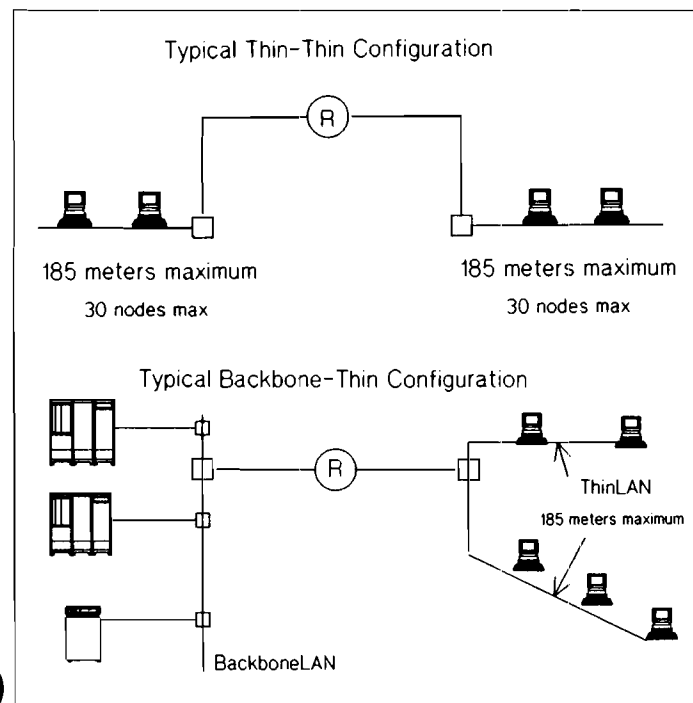
HP AdvanceNet Components

product numbers 92223A and 92223C

The HP 92223A Repeater Kit supports interconnection and extension of HP ThinLAN (IEEE 802.3 type 10BASE2) and BackboneLAN (IEEE 802.3 type 10BASE5) coaxial segments. The repeater greatly expands the area that can be covered by a single, fully interconnected ThinLAN and/or BackboneLAN.

Features

- Transparent increase in size of network
- A complete solution, including repeater, AUIs, and MAUs
- Customer installability with no tools required for ThinLAN to ThinLAN interconnection
- Support for up to two repeaters and three coaxial segments between any ends of the extended network
- Auto-segmentation to prevent disruption of the network by an unterminated coaxial segment
- Up to 50 meter separation between repeater MAU and repeater via extended repeater AUI cables (two 5 meter repeater AUI cables provided)



Functional Description

The HP 92223A Repeater Kit provides the means of extending local area networks beyond their limited single segment length of 500 meters for backbone segments and 185 meters for thin segments.

Repeater, Repeater MAU, and Repeater AUI Cable

The main function of the repeater is to transmit LAN signals from one cable segment to the other while maintaining synchronization across the network. If collision is detected, the repeater sends out a jam sequence to both network segments, causing the transmitting node to retransmit its message. Also, if the repeater detects more than 64 consecutive collisions from a segment, it "segments" that side, not passing any of its data to the other side until a packet of data is transmitted, without a collision to the "segmented" side.

The Repeater Media Attachment Unit (MAU) transmits signals onto the coaxial cable, receives signals from the cable, and detects any message collisions that may occur. It provides electrical isolation and high impedance to the coaxial cable. The Repeater Access Unit Interface (AUI) cable provides the physical connection of the repeater MAU and the repeater.

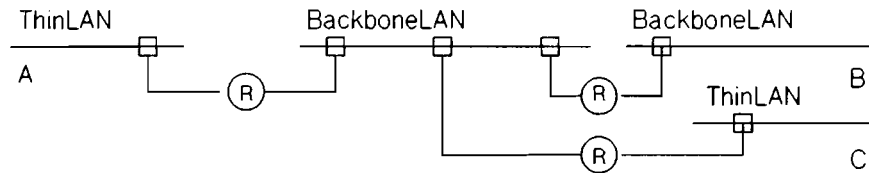
92223C 20 Metre Repeater FEP AUI

The HP 92223C 20 meter repeater AUI allows for increased separation of up to 50 metres between the repeater MAU and the repeater.

Compatibility

- The Repeater Kit supports the interconnection of ThinLAN (IEEE 802.3 type 10BASE2) and BackboneLAN (IEEE 802.3 type 10BASE5) coaxial segments. (Backbone-Thin; Thin-Thin; or Backbone-Backbone)
- Compatible with Digital Equipment Corporation repeaters. (DEREP-AA & DEREP-RA)
- The repeater MAUs and the repeater AUI provided in 92223A and 92223C must be used with that product. The repeater cannot be connected to a network segment via the standard 802.3 AUI cables or with HP 30241A or 28641A MAUs. (However, the repeater will operate on a network with nodes connected via the 802.3-AUI cables or the 30241A or 28641A MAUs.)

Acceptable Configuration



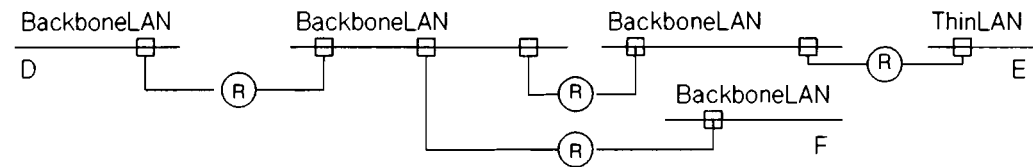
A - B: ThinLAN+Repeater+BackboneLAN+Repeater+BackboneLAN=
3 coaxial segments+2 repeaters=O.K.

A - C: ThinLAN+Repeater+BackboneLAN+Repeater+ThinLAN=
3 coaxial segments+2 repeaters=O.K.

B - C: BackboneLAN+Repeater+BackboneLAN+Repeater+ThinLAN=
3 coaxial segments+2 repeaters=O.K.

Since all network connections are acceptable (O.K.),
the network is an acceptable configuration.

Unacceptable Configuration



D - E: BackboneLAN+Repeater+BackboneLAN+Repeater+BackboneLAN+Repeater+ThinLAN=
4 coaxial segments+3 repeaters=Not O.K.

D - F: BackboneLAN+Repeater+BackboneLAN+Repeater+BackboneLAN=
3 coaxial segments+2 repeaters=O.K.

F - E: BackboneLAN+Repeater+BackboneLAN+Repeater+BackboneLAN+Repeater+ThinLAN=
4 coaxial segments+3 repeaters=Not O.K.

Since all network connections are not acceptable (Not O.K.), the
network is an unacceptable configuration.

Network Configurations

(See Cable and Accessories Installation Manual, Part Number 5955-7680, for details)

Synopsis:

- A repeater can be connected to a repeater MAU with a maximum of 50 meters of repeater AUI cable.
- The maximum topology is two repeaters and three coaxial segments between any two ends of the extended network.
- The maximum number of nodes on a backbone segment is 100 (including repeater MAUs) and 30 on a thin segment.

Environmental Specifications

Operating temperature: 5° to 55°C (41° to 131°F).

Relative Humidity: 10% to 90% with a maximum wet bulb temperature of 28°C (82°F) and a minimum dewpoint of 2°C (36°F).

Physical Characteristics

Repeater Unit

Dimensions: 45.72 cm (18 in.) long by 30.48 cm (12 in.) wide by 10.16 cm (4 in.) high.

Weight: 7.26 kg (16 lbs.).

Repeater MAU

Dimensions: 30.2 cm (11.9 in.) long by 9.5 cm (3.74 in.) wide by 9 cm (3.54 in.) high.

Weight: 1.36 kg (3 lbs.).

Repeater AUI Cable Length

5 m (16.4 ft.).

Two 5 meter repeater AUI cables are provided with the 92223A product.

Repeater Power Requirements

115 Vac @ 1.0A (50/60 Hz) or

230 Vac @ 0.5A (50/60 Hz).

Ordering Information

HP 92223A Repeater Kit

The 92223A Repeater Kit includes:

1. Repeater.
2. Two Repeater MAUs.
3. Two 5-metre FEP Repeater AUI Cables.
4. Four Barrel Insulating Boots.
5. Repeater Installation Manual.
6. Power Cord (Type depends on country)

HP 92223C 20 Metre Repeater FEP AUI Cable.

These products can all be ordered directly from the Direct Marketing Division (DMK) through HP sales offices or by using DMK's toll-free number 1-800-538-8787. In California, call (408) 738-4133.

NOTE: The HP 92223A Repeater Kit is a customer installable product. However, customers can contract with their local HP sales office or project center for HP installation service.

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For more information call the HP Sales Office listed in the
White Pages. Or write or phone Hewlett-Packard, Data Systems
Division, 11000 Wolfe Rd., Cupertino, CA 95014, (408) 257-7000.

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