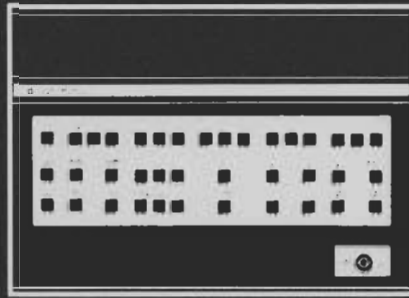


9701A/B

Distributed Systems



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www.hpmuseum.net

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HP 9701 Distributed Systems

Hewlett-Packard Distributed Systems solve many of the problems confronting those considering implementing a multi-computer system. Our distributed system concept lets you tailor the system to fit your particular application — be it data collection, sensor-based data acquisition, automatic test, laboratory instrumentation or process control and monitoring.

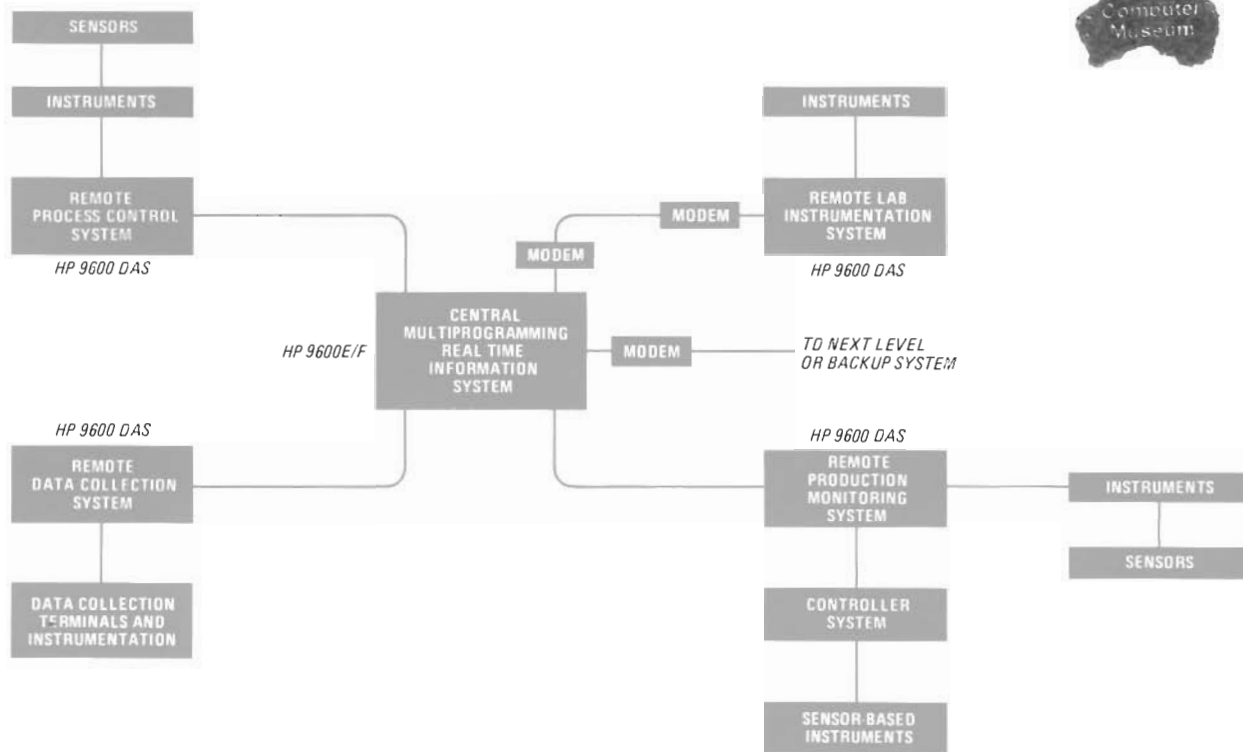
RELIABLE . . .

Hewlett-Packard 9701 Distributed Systems are based on the reliable HP 2100 family of small computers . . . a state-of-the-art computer, uniquely suited for multi-computer applications.

EASY TO USE . . .

The HP 9701 lets the operator dynamically interact with the system to **LOAD** a program, **RUN** that program and **ABORT** it. Programming is high level. You can prepare programs at either the central system or the terminal system in **FORTRAN IV**, **FORTRAN II**, **ALGOL**, or **HP 2100 ASSEMBLER**. The terminal programmer can easily perform remote sequential or random access on disc and non-disc files, remote I/O, and schedule special purpose programs at the central system.



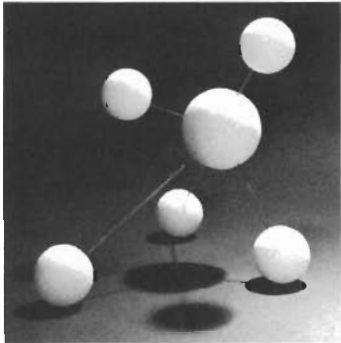


Typical HP 9701 Distributed System

ADVANTAGES AND BENEFITS FOR YOU . . .

- Combines the advantages of both dedicated and multi-task processor systems
- Number of expensive I/O devices can be reduced by concentrating them at the central system
- Terminal systems have access to the full data processing capabilities of the central system
- Maintenance of terminal system is minimized since high performance peripherals are centralized
- Closed loop control is possible between multi-terminal system operations in close real-time relation
- Reduces development costs by preparing all programs in high-level language at the central system
- Encourages centralized data compatibility planning across several areas of individual application
- Common data analysis and utility programs reduce development costs
- Applications engineer has both his own dedicated processor and the data processing power of a multi-task system
- Terminal systems may operate independently
- Application programmers can concentrate on the problem and not be concerned with reports and general purpose data processing. These tasks may be performed at the central system.
- Configurable to run as pure distributed system with RTE strictly "host" or RTE doing other work as well
- Equality of terminal response is assured

Modular, reliable, multi-computer systems



HP 9701 Distributed Systems are comprised of a network of minicomputer-based terminals connected and integrated into a central real-time, multi-programming data processing system. The central system consists of a HP 2100 computer, Real-Time Executive (RTE) operating system, Distributed System software, File Manager Package (FMP) software, one or more disc drives and the appropriate communications interface card(s). The terminal systems, too, are based on the HP 2100; however, they contain core-resident Basic Control System (BCS) operating systems, Distributed Systems software, the appropriate communications interface card, operator I/O capabilities, instruments and data collection or display peripherals.

TOTAL SYSTEM MODULARITY . . .

The HP 9701 is based on modular software and hardware. Throughout the design of the system, features which provide maximum flexibility and expandability were given the highest priority.

Modular Stand-Alone Terminal Systems

HP 9701 terminal systems use the reliable, stand-alone BCS operating system. This system is supplied with a library of support software, that includes instrument drivers, compilers, assemblers, peripheral drivers, loaders, an editor, and a relocatable debug, which allows it to stand alone and operate independently in an emergency or during the initial phases of system development.

Modular Terminal System Software

The terminal system software consists of a family of three mini-executives that control and execute communication between the central and terminal systems. You may select the terminal communications executive to best suit your needs. Individual terminal systems can dynamically switch from one terminal comm-exec to another—they are independent and upward compatible within themselves. In multi-terminal distributed systems, requiring more than one type of terminal comm-exec, each terminal can switch from one executive to another without affecting the central system or the other terminal systems.

This independence—hardware and software—gives you flexibility not usually found in distributed systems. For example, you can . . .

- Start implementing a distributed system solution to your problem with or *without* the central system.
- Physically move a terminal system that is dedicated to a particular process, if relocation of the process is necessary.
- Upgrade a terminal system as more hardware becomes available.

DATA COMMUNICATIONS

A new high-speed serial communications link is used to bind HP 9701 Distributed Systems together. Two methods of transmission are available: dedicated cable up to two miles in length, or common carrier telephone lines via standard data sets or modems. The dedicated cable connection used with the 9701A affords data transfer rates of up to 1,000,000 bits per second from one system to another. The common carrier telephone connection of the 9701B provides either asynchronous communications up to 1200 bits per second or synchronous communications at a rate of 10,800 bits per second.

More information may be found in the HP Serial Data Communications Technical Data Sheet (HP Literature Request No. 5952-1633).

with a powerful software package

TERMINAL COMMUNICATIONS EXECUTIVE FAMILY

The terminal communications executives range in complexity from a 64-word communications loader to an interactive system monitor occupying 3800 words of memory.

TCE/1 (Terminal Communications Executive/1) is the smallest member of the family. It is a special binary communications loader that occupies 64 words in the protected area of the terminal system memory. It permits the user to cold-load or initialize the system directly through the communications line. The cold-load software may be any software which resides on the central system disc such as, other terminal comm-execs, user programs, other terminal operating systems or any combination of these three. Since TCE/1 resides in the protected area of the core, it cannot be inadvertently destroyed by power failure, system error or operator error. It can be used for initial startup or for terminal systems with a minimum of peripherals.

TCE/2, the next level in complexity, is a non-interrupt, absolute executive that allows the terminal system operator to load programs from the central computer and execute them via commands entered through the console keyboard. It is interactive and contains a useful subset of the TCE/3 commands.

TCE/3, the largest and most flexible member of the family, gives the terminal operator capabilities most often found in disc-based operating systems. In addition to performing the

load and run functions of TCE/2, this BCS-relocatable executive is capable of scheduling programs to run at the central computer and requesting the time from the central real-time clock. The terminal operator may request a directory listing of all programs created at his terminal. Disc files at the central system may be created and purged; disc file names may be changed. All user programs of TCE/1 and TCE/2 are operable on the TCE/3 system and all TCE/2 operator commands are retained in a comparable format. TCE/3 operator commands are totally interactive; the user may interrupt terminal operation at any time.

FUNCTIONS	FORTRAN CALL NAME	TERMINAL OPERATOR'S COMMAND
1. Load a named program from the central disc into the terminal	RLOAD	:LOAD name
2. Load a named program and execute	CHAIN	:RUN name [, P1, ..., P5]
3. Execute a loaded program	RNPGM	:RUN [AT, NNN] [, P1, ..., P5]
4. Return TCE control to console	IDLE	:ABORT
5. Get the logical unit number at central for this terminal	GETLU	—
6. Send message to the central operator's display device	RMESG	:TELOP message
7. LIST the disc file directory	—	DLIST [filter] [, cartridge label]

Summary of Terminal System Functions



Two computer systems

REMOTE FILE MANAGEMENT

The terminal system programmer, with FORTRAN, ALGOL or Assembler programs, has simple, high-level access to the central disc. Remote File Management permits the terminal systems to dynamically and independently time-share the central disc for sequential or random access. Each terminal system programmer can simultaneously store large amounts of test data or access complex functions from the central mass storage. This gives the terminal system programmer the ability to, for example, archive large amounts of trend or historical data at a central data base.

at your command...



FUNCTION	FORTRAN CALL	TERMINAL CONSOLE COMMAND
Create a file	RCRET	: CREATE, name, # blocks [, record size [, type [, security]]]
Purge a file	RPURG	: PURGE, name [, security]
Open a file	ROPEN	—
Write data in a file	RWRIT	—
Read data from a file	RREAD	—
Position a record	RPOSN	—
Rewind a file	RWIND	—
Close a file	RCLOS	: CLOSE, name
Rename an old file	RNAME	: RENAME, name, new name [security]
File control	RCONT	—
Locate a record	RLOCF	—
Absolute position a record	RAPOS	—
File status	RSTAT	—

Summary of Remote File Management Functions

REMOTE TASK ASSIGNMENT

With an HP 9701, each terminal system operator has two computer systems—a powerful multiprogramming system and a dedicated processor system—to perform concurrent and simultaneous tasks.

The terminal system operator may partition his total application into logical and computation activities that can occur at the terminal system and activities that can be performed at the central system.

At the terminal system he may:

- Request data input from an A to D converter, digital voltmeter, counter or register.
- Direct data output to a relay, D to A converter, signal generator or register.
- Perform high-speed data reduction and local loop feedback.
- Perform data collection from a card reader or keyboard.

At the central system he may share the central multiprogramming RTE system via the Remote Task Functions. Thus, user programs in each terminal system can asynchronously cause high level actions to occur at the central system automatically. Programs running on the terminal system can:

- Schedule a program for execution at the central system at specified time intervals, starting after an initial offset or at a particular time.
- Request the current time on the central real-time clock in days/hours/minutes/seconds/tens of milliseconds.
- Read or write a block of data to a central peripheral I/O device.
- Perform various control operations on central I/O devices.
- Request information (status condition and device type) about a central peripheral device assigned to a specific logical unit number.

FUNCTION	FORTRAN CALL REXEC (ICODE,...) ICODE	TERMINAL SYSTEM CONSOLE COMMAND
Read from central device	1	
Write to central device	2	
I/O control of central device	3	
Get I/O status of central device	13	
Schedule a program without wait	10	: ON name [, P1..., P5]
Schedule a timed program wait	12	
Get current real time	11	: TIME

Summary of Remote Task Functions



9600E REAL-TIME EXECUTIVE SYSTEM

HEWLETT-PACKARD

HEWLETT-PACKARD

PROGRAM DEVELOPMENT PACKAGE

The Distributed System Program Development Package allows a terminal system operator to prepare programs at the central system while it is handling communications and tasks for other terminal systems. Application programs are written, compiled, configured and stored on the central disc, ready for immediate loading into the terminal system.

The program development package includes a unique system cross-loader that utilizes a terminal system configuration file to prepare a relocatable program for loading into and execution by the terminal system. The flexibility of the loader lets you use programs developed on one terminal system in any of the others by simply supplying a different configuration file for each terminal system.

The relocatable programs are prepared by compilation, editing or assembly in the background of the central RTE system.[†] This RTE background includes:

- Multi-Language Capability
 - FORTRAN IV
 - FORTRAN II
 - ALGOL
 - Assembly Language
- On-Line Editor
- File Manager[†]
 - Enables disc-to-disc or disc-to-any other peripheral transfer of programs.
 - Organizes programs and data in named files.
 - Provides any desired level of file integrity and security.
- System Cross-Loader
 - Enables cross-loading of programs on the RTE central system for another BCS terminal system.
 - Can take commands from disc or card reader without operator intervention.
 - Reduces storage for address links.

[†]For a detailed discussion of the RTE and File Manager, see the HP 9600E/F Real Time Executive Systems Brochure (HP Literature Request No. 5952-1623) and the HP 9600E/F Option Y01 File Manager Bulletin (HP Literature Request No. 5952-1641).

UTILITY FUNCTIONS

HP 9701 Distributed System software provides the terminal system operator with two utility routines that he would ordinarily have to write himself. Remote program loading and directory listing are explained below.

The remote program loading routine gives the terminal system operator the ability to load programs from the central disc into his system by simply typing LOAD, PROG. This routine permits a standard program, used by several systems, to be controlled and stored centrally.

The directory list routine permits the terminal operator to request *partial* or complete listing of programs currently stored by the central system File Manager Package.

This routine is unique in that it allows the terminal operator to specify which file is listed in a partial listing. He enters a six character "filter" word from his console to control the partial listing. After the filter word is entered, only those programs whose names contain characters that match the filter characters are listed. Any number of characters (up to six) may be input; character positions to be ignored are specified by an asterisk. For example:

:DLIST List all programs stored by the central system for the requesting terminal.

:DLIST, *AB*** List only programs stored by the central system that contain "AB" in the specified position (e.g., CAB, IABLE, etc.).

EXTENSIVE ERROR CHECKING

HP 9701 Distributed System software has error checking sequences which give the user extensive protection. All erroneous system actions are answered with either an error code to the terminal program or an error message to the terminal system operator console. Multi-level error checking is carried out on each terminal command; at the terminal system, at both the command and communications protocol levels; and at the central system, by either the central comm-exec, the central RTE, or the central File Manager, or, in some instances, by all three. In addition, hardware and other selected failures are reported to the central system operator.

ENGLISH-ORIENTED TERMINAL COMMANDS

COMMAND	COMMENT OR PURPOSE
:TIME	Print the current "real-time" of day.
:DLIST, A*****	List the data and program file starting with the letter A. Operator can't remember spelling of program's name.
:TELLOP, GOODMORNING	Says "Good morning" to central operator.
:LOAD, APROG1	Loads "APROG1", a P.C. Board test program, into the terminal system from the central disc.
:RUN,*,195, 777	Runs "APROG1" starting at the beginning and passes two parameters, 195 and 177, to the program.
:ABORT	Stop everything; wrong parameters.
:RUN,*,185, 677	Try again with different parameters; APROG1 is storing data on the central disc while running.
:ON, MARY, 1, 2	Schedule a program named "MARY" at the central system, which analyzes the data and prints a management report.



Reliable Hardware with traditional HP support...

SYSTEM CONFIGURATION

HP 9701A/B Distributed Systems include:

Central System (Minimum Requirements)

HP 9600E, including:

1. HP 2100S, 16K memory with Direct Memory Access and RTE
2. HP 7900A Cartridge Disc Drive
3. HP 12539B Time Base Generator
4. HP 2748A Paper Tape Reader
5. HP 2752A Teleprinter
6. 8K additional memory (option P04)
7. File Manager Package (option Y01)
8. System Cross-Loader (option Y10)

Optional Peripherals:

HP 2610A Line Printer

HP 2892A Card Reader

HP 7970 Digital Magnetic Tape Unit



Terminal System (Minimum Requirements for TCE/1 or TCE/2)

HP 2100A, 4K memory with BCS

Optional Terminal System (Minimum Requirements for TCE/3)

HP 9600A, including:

1. HP 2100S, 8K memory and BCS
2. HP 2752A Teleprinter
3. HP 2748A Paper Tape Reader

Distributed System Communications Package

A. An HP 91701A consisting of:

1. Central System Communications Executive
2. Terminal System Communications Executives
3. High-speed communications interface

or, optionally,

B. An HP 91701B consisting of:

1. Central System Communications Executive
2. Terminal System Communications Executives
3. Communications Interface to support Bell 103, 201, 202 and 203 Series Data Sets* or equivalent modems and acoustic couplers supplied by the user.

* Trademark of Western Electric Division of the Bell System.

TRAINING

Hewlett-Packard provides a two-week user training course with every computer system purchased. This general training is followed by a five-day course in operating and programming RTE systems. One day of training is added when a 9701 Distributed System is purchased. Included in the course is system configuration, operation, and programming.

INSTALLATION

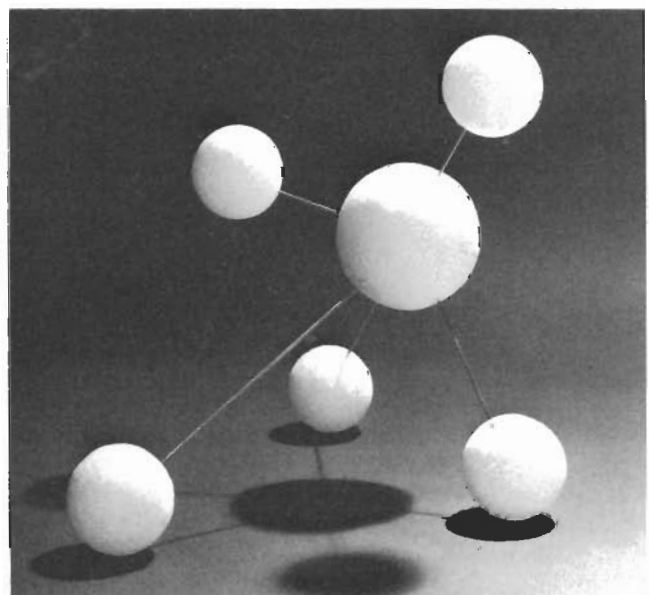
The price of an HP 9701 includes one day of installation assistance by an HP system analyst or systems support engineer.

SYSTEM WARRANTY

All Hewlett-Packard electronic measuring systems, including the instruments, peripherals, and supported software which are a part thereof, are warranted to be free from defects in material and workmanship for a period of 90 days. We will repair or replace, without charge, products which prove to be defective during the warranty period. Warranty service will be performed on-site at the customer's facility in the United States, Canada, and Western Europe and in other designated locations near qualified HP service facilities. No other warranty is expressed or implied. Hewlett-Packard is not liable for consequential damages.

ORDERING INFORMATION

HP 9701 Distributed Systems may be ordered through your local Hewlett-Packard Field Sales Office. Your HP System Sales Engineer or Data Systems Sales Engineer will provide information on price, delivery, and the terms and conditions under which HP 9701 Distributed Systems are supplied. He will also arrange for scheduling of the training and system analyst time which is included with the system.





For more information, call your local HP Sales Office or East (201) 265-5000 • Midwest (312) 677-0400 • South (404) 436-6181 • West (213) 877-1281. Or write: Hewlett-Packard, 1501 Page Mill Road, Palo Alto, CA 94304, In Canada: 275 Hymus Blvd., Point Claire, Quebec. In Europe: Hewlett-Packard, P.O. Box 85, CH-1217 Meyrin 2, Geneva, Switzerland. In Japan: Yokogawa-Hewlett-Packard, 1-59-1, Yoyogi, Shibuya-ku, Tokyo, 151.