# MP/M-86™


## MP/M-86 OVERVIEW

MP/M-86 is a multi-user, multi-tasking operating system designed for microcomputers that use the Intel 8086/8088 microprocessors.

MP/M-86 is compact and powerful. It has a time-tested, modular design which includes:

- TMP — (Terminal Message Process), the human interface of the system, reads the user's command line.
- SUP — (SUPervisor) manages the intermodule, network and user interfaces. SUP includes the Command Line Interpreter (CLI), program LOAD and program CHAIN.
- BDOS — (Basic Disk Operating System), the portion of the system that manages files and directories.
- RTM — (Real Time Monitor), the real-time nucleus of MP/M-86, which provides dispatching, process, queue, flag and time-base management.
- CIO — (Character Input/Output) handles character devices such as consoles and printers, designed for future expansion to support Standard I/O.
- MEM — (MEMory Manager) provides flexible memory management with the ability to support hardware memory management as it becomes available.
- XIOS — (eXtended Input/Output System), the variant portion of the operating system that contains all physical hardware-dependent code such as Input/Output device handlers.

MP/M-86 is small, residing in less than 36K bytes of memory. Total size is dependent on the XIOS and the number of Resident System Processes (RSP) included when the system is generated (GENSYS). The size of the XIOS is determined by the number and type of peripherals supported.

## MP/M-86 FEATURES

- Upward Compatible with CP/M®, MP/M II™ and CP/M-86™
- Offers multi-user capability with multi-programming for each user
- Supports up to 16 Logical Drives managing up to 512 Megabytes each
- Manages up to one megabyte of memory
- Supports up to 254 logical character devices such as consoles and printers
- Real-time capability
- Record and File locking
- Date and Time Stamps and Password Protection on Files
- Extensive error-handling and reporting
- Network Compatibility

## CP/M COMPATIBILITY

The MP/M-86 file system is upward compatible with CP/M 1.4, CP/M 2.2 and CP/M-86 files. All files generated by CP/M systems may be read under MP/M-86. In addition, the MP/M-86 file system allows larger files and supports file password protection.

Executable CP/M-86 (CMD) files will run under MP/M-86 when sufficient memory is available and when the program communicates with the operating system only through CP/M-86 BDOS calls.

To the end user, MP/M-86 commands are a superset of CP/M-86 commands. Familiar CP/M commands such as DIR, ERA, TYPE, PIP and STAT respond similarly in MP/M-86.

## RECORD AND FILE LOCKING

File integrity is enhanced with the MP/M-86 extended file system. MP/M-86 allows files to be opened in one of three modes: locked; unlocked; and read-only. These three modes are set by the Open File commands through a BDOS call.

Locked mode may be used when it is necessary to assure that only one user may open a specific file at a given time. Once a file is opened in the locked mode, other user requests for that file are denied.

In the unlocked mode, multiple open file requests may be serviced. If a file is opened in the unlocked mode, individual records or groups of records within that file may be temporarily locked by a user. Alternately, a record may be updated with a TEST AND WRITE RECORD command. In this case, before an update is performed an unaltered copy of the record in memory is compared with the record on the disk. If the disk copy has been altered, an error message is returned to the application program.

Finally, the read-only mode allows more than one process to open a file. Attempts to write to a file opened in this mode are denied.

## PASSWORD PROTECTION ON DIRECTORIES AND FILES

Protection for user files and directories is enhanced through the optional use of passwords. MP/M-86 allows a user to assign passwords to files and directory labels. Application programs may employ a password checking procedure to determine access authorization before opening files. Passwords are encrypted to provide additional security.

## DATE AND TIME STAMPING

MP/M-86's extended directory entries provide a facility for date and time stamping files. Each file may have up to two date and time stamps. This feature is controlled by an attribute in the directory label, which may be set by the system manager, and provides the ability to automatically add date and time of last update and either last access or file creation. The SDIR utility displays date and time stamp information.

## MULTI-PROGRAMMING CAPABILITY

In addition to multi-user support, MP/M-86 permits each user to detach programs from his or her console, allowing a user to execute multiple programs simultaneously.

## DISK MANAGEMENT

MP/M-86 can support up to 16 logical drives, each containing up to 512 Megabytes, for a maximum of four Gigabytes of on-line storage. Any one file can be up to 32 Megabytes in size, with space dynamically allocated and released. Each drive has a directory which maps each file's physical locations on the disk. Disk definition tables in the XIOS translate the logical drive, directory and file structure to the physical characteristics of the disk. One physical disk can be treated as one or more logical drives by MP/M-86.

## ERROR HANDLING AND REPORTING

MP/M-86 can handle errors in three modes: (1) it can display an error message and terminate the user's program; (2) it can display an error message and return to the user's program; or (3) it can return to the user's program without displaying an error message. In modes (2) and (3) the BDOS returns an error code which may be trapped by the application program. The application program can then provide more specific error handling and information.

## NETWORK INTERFACE

The MP/M-86 SUPervisor was designed with network interfacing in mind. Digital Research's network operating systems are essentially Resident System Processes (RSP). These network interface processes may be included in an MP/M-86 system at system generation.

## MEMORY MANAGEMENT

MP/M-86 can manage up to one megabyte of RAM. This memory may be partitioned at the time of system generation into an arbitrary number of partitions, each ranging in size from sixteen bytes to one megabyte. Memory requests are satisfied on a best-fit basis by forming a Memory Allocation Unit from one or more contiguous partitions. Depending on the most common applications to be run on the MP/M-86 system, the system manager may create many small partitions for essentially dynamic memory allocation or a few large partitions for a traditional fixed-partition model. The MEMory Manager module is designed for ease in updating as hardware memory management becomes available.

## MP/M-86 DISPATCHER

The MP/M-86 Dispatcher, that portion of the Real Time Monitor which changes the currently executing task, requires from 400-600 microseconds to switch tasks (5MHZ 8086). This low overhead leads to greater system throughput. For real-time applications, the interrupt mechanism is disabled for less than 150 microseconds during a dispatch. Thus, high priority interrupts may be serviced in a timely fashion.

## MULTIPLE PRINTER AND CONSOLE SUPPORT

MP/M-86 supports up to 254 Character-I/O devices, typically printers and consoles. At the application program level, MP/M-86 system calls allow the selection of a current console or list device. Additionally, list devices may be assigned dynamically by using the PRINTER utility.

## CUSTOMIZATION

MP/M-86 may be transported to a specific 8086/8088 hardware environment by tailoring its loader and hardware-dependent module (XIOS). CP/M-86 must first be implemented on the target machine.

The MP/M Loader (MPMLDR) may be executed under CP/M, or following reconfiguration, it may be loaded from the system tracks of the disk by the cold start loader. The MPMLDR is specially configured for a particular environment by inserting the BIOS code from CP/M-86 into the MPMLDR BIOS.

The hardware-dependent module of MP/M-86 (XIOS) must also be reconfigured. Most of the device handling code, including the Disk Drive Definition tables, may be copied from the CP/M-86 BIOS. Once a simple system is running, support for additional consoles, the system clock and interrupt-driven devices may be introduced. MP/M-86 can be loaded and run under the CP/M-86 debugger (DDT86™). A minimum of 128K of memory is required to run MP/M-86 and CP/M-86 with DDT86.

## MP/M-86 UTILITIES

**ABORT**
The ABORT utility allows a user to terminate a running program.

**ATTACH**
The ATTACH utility attaches a program to a console.

**ASM86™**
The latest version of the CP/M-86 "code-macro" assembler, supports most Intel mnemonics.

**CONSOLE**
The CONSOLE utility displays the system console number of the requesting console.

**DDT86**
The latest version of the CP/M-86 Dynamic Debugging Tool allows the user to test and debug programs interactively. Users may trace and execute programs with full register and status display. DDT86 contains an integral assembler/disassembler.

**DIR**
The DIR utility displays a disk directory for the currently logged user; by setting the SYS attribute, files may be made invisible to this utility.

**DSKRESET**
The DSKRESET utility resets the allocation map of a drive after the insertion of a new diskette. This allows a write to the new diskette.

**ED**
The latest version of the CP/M-86 editor.

**ERA**
The ERA utility erases a file or files.

**ERAQ**
The ERAQ utility queries the user for confirmation before erasing each specified file.

**MPMSTAT**
The MPMSTAT utility displays the run-time system status of MP/M-86.

**PIP**
The Peripheral Interchange Program supports the movement of files among the various logical devices and drives of the system. PIP also concatenates files or extracts portions of ASCII files. Options in PIP allow for archiving files that have been updated and for moving files between different directories.

**PRINTER**
The PRINTER utility sets the list device for a particular console. Several consoles may share the same list device, but only one can "own" it at a time.

**REN**
The REN utility RENames files.

**SDIR**
The SDIR utility displays all types of MP/M-86 files as well as their size, time and date stamps and a notation as to whether or not the file is password protected.

**SET**
The SET utility allows the setting of various file attributes and passwords. These attributes include Read-Only, SYS (invisible to DIR), and user defined attributes.

**SHOW**
The SHOW utility displays information about the characteristics of a logical drive such as capacity, number of directory entries and directory label information.

**SPOOL**
The SPOOL utility sends files to the spool queue for proper handling by the list device.

**STAT**
The STAT utility displays the space, attribute and directory status of drives and files.

**STOPSPLR**
The STOPSPLR utility stops the spooling operation in progress and empties the spool queue.

**SUBMIT**
The SUBMIT utility executes files of commands, each of which may be a program.

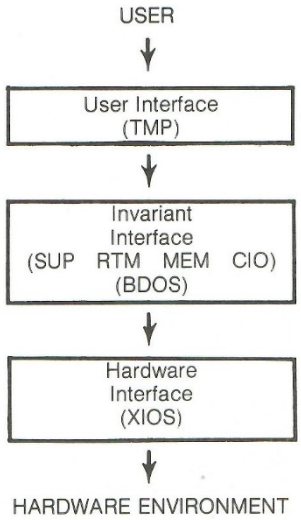
**TOD**
The TOD utility displays or sets the system date and time.

**TYPE**
The TYPE utility types the specified ASCII file on the console.

**USER**
The USER utility displays or sets the current user (directory) number.

Any or all of the above utilities may be password protected for increased system security.

## MP/M-86 INTERFACE



## THE MP/M-86 PACKAGE

MP/M-86 is shipped on two single-sided, single-density, 8-inch diskettes with an IBM-compatible physical format. These diskettes contain the following machine-readable files:

**Distribution Disk 1**

BDOS.MPM
CIO.MPM
CLOCK.RSP
DEBLOCK.LIB
ECHO.A86
ECHO.RSP
GENDEF.CMD
GENSYS.CMD
LDBDOS.H86
LDBIOS.A86
LDBIOS.H86
LDMPM.H86
MEM.MPM
MPM.SYS
MPMLDR.CMD
MPMSTAT.RSP
ROM.A86
RTM.MPM
SINGLES.DEF
SINGLES.LIB
SUP.MPM
SYSDAT.LIB
SYSDAT.MPM
SYSTEM.LIB
TMP.A86
TMP.RSP
XIOS.A86
XIOS.MPM

**Distribution Disk 2**

ATTACH.CMD
ABORT.CMD
ASM86.CMD
CONSOLE.CMD
DDT86.CMD
DIR.CMD
DSKRESET.CMD
ED.CMD
ERA.CMD
ERAQ.CMD
GENCMD.CMD
MPMSTAT.CMD
PIP.CMD
REN.CMD
SDIR.CMD
SET.CMD
SHOW.CMD
SPOOL.CMD
STAT.CMD
STOPSPLR.CMD
SUBMIT.CMD
TOD.CMD
TYPE.CMD

## SYSTEMS PERFORMANCE REPORTING

MP/M-86 is supported by Digital Research's Software Performance Reporting (SPR) system. This service provides a prompt response to technical problems associated with MP/M-86. Users are provided with SPR forms which serve as a communications device to inform the Digital Research Product Support staff of user identified problems. The SPR STATUS REPORT, published periodically by Digital Research, informs MP/M-86 users of product updates and revisions.

## HARDWARE REQUIREMENTS

- 8086/8088 microprocessor, 1 to 16 disk drives of up to 512 Megabytes capacity each, at least one ASCII console, and a real-time clock.
- 64K of RAM
- CP/M-86 must be implemented on target machine.

## DIGITAL RESEARCH

Digital Research, Pacific Grove, CA is the leading producer of microcomputer operating systems and utilities. For eight years Digital Research has been involved with the design, development and support of microcomputer software. The single user operating system, CP/M, multi-user MP/M II and software network CP/NET™, form the basis of a family of operating system software products spanning 8 and 16 bit microcomputers. Digital Research users include over 300,000 systems, 400 OEMs and 500 independent software houses.

## ORDERING INFORMATION

| Product | Order Description |
|---|---|
| MP/M-86 SYSTEM | Two 8" single-density, single-sided diskettes and three manuals. |
| MP/M-86 DOCUMENTATION | Three manuals: MP/M-86 User's Guide; MP/M-86 Programmer's Guide and MP/M-86 System Guide. |



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